

**UNIVERSITY OF GHANA**

LEGON



College of Humanities

**BANKS, FINANCIAL INCLUSION AND HOUSEHOLD  
WELFARE IN GHANA**

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(10201616)

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Development Economics

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## DECLARATION

This is to certify that this thesis is the outcome of research undertaken by **Abdul Malik Iddrisu** towards the award of the Doctor of Philosophy degree in Development Economics in the Department of Economics, University of Ghana, Legon.



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## ABSTRACT

This thesis consists of three stand-alone empirical papers on the drivers and welfare effects of financial inclusion in Ghana. The first empirical paper (Paper I), presented in Chapter two of the thesis, examines the effect of access to credit on household welfare using a pseudo panel data set spanning the period 1991/92 – 2012/13. In addressing the welfare effects of access to credit, Paper I examine, specifically, the effect of access to credit on several measures of household welfare including total household consumption expenditure per adult equivalent and household food expenditure per adult equivalent. Also, the study examines the potential variations in the effect of access to credit on the welfare of households at different levels of welfare. Finally, the study investigates the mediating role of the gender of the household head in the effect of access to credit on household welfare. Empirical estimation techniques employed in this paper include the errors-in-variables, the weighted least squares and the dynamic generalised method of moments estimators.

The main empirical results of the paper suggest that access to credit has a beneficial effect on household welfare; this is true regardless of the measure of household welfare used. Specifically, the alleviation of households' credit constraints does not only enhance household consumption, more importantly, it reduces their likelihood of falling into poverty as well as the extent of poverty and the degree of inequality among the poor. The positive effect of access to credit on household welfare is however heterogeneous across gender and levels of household welfare. In this vein, the study finds that the welfare effect of access to credit is higher for female-headed households than for male-headed households. As well, access to credit benefits the poor more than the rich, indicating that access to credit could be a source of convergence in welfare across households. The results of this paper are robust to the measure of household welfare, the control for endogeneity and changes in the data structure.

Chapter three presents the second empirical paper of the thesis (Paper II). The study examines the effect of financial inclusion on household welfare using a cross-sectional household survey data set drawn from the sixth round of the Ghana Living Standards Survey (GLSS). Specifically, the paper first computes a multidimensional index of financial inclusion and then examine the effect of financial inclusion on household welfare. Robust estimation approaches including the Ordinary Least Squares, the Binary Probit and the Propensity Score Matching estimation techniques are utilised in this paper. The main findings of the study are as follows: first, the study's empirical results suggest strongly that financially deprived households have lower levels of welfare compared to their financially included counterparts; this finding is robust to the use of different measures of household welfare.

Second, we observe that poor households experience much larger welfare effects of financial inclusion relative to non-poor households. This indicates that financial inclusion does not only improve household welfare, but it may also help to reduce income inequality. Finally, on the possible channels through which financial inclusion might influence household welfare, we show that financial inclusion influences household welfare via its effect on households' farm and non-farm enterprise incomes. The results of the study are robust to alternative measurements of the financial inclusion index, to the use of different cut-off points and to the control for endogeneity and self-selection bias.

Chapter four presents the third empirical paper of the thesis (Paper III). Paper III examines, specifically, the role of banking system penetration on financial inclusion in Ghana using a three-period district-level panel data set over the period 1999 – 2013 whilst exploiting the change in the policy which guides banking operations in Ghana. Both the ordinary least squares and the instrumental variables estimators are used in this paper. The study elicits the following

findings: first, we show that the switch from the compartmentalised system of banking to the universal banking system in Ghana has resulted in an expansion of banks' branch network which has benefited hitherto financially less developed districts, although branch expansion into financially more developed districts continues unabated. Second, our instrumental variable evidence suggests that banking system penetration promotes financial inclusion in terms of access to bank and formal credit. The empirical results of the thesis point to the fact that improving the level of financial inclusion is a plausible tool that can be deployed towards the realisation of the Sustainable Development Goals, notably, the reduction in the incidence of poverty and vulnerability as well as inequality. Consequently, we recommend that policies that seek to promote meaningful access to financial services by all (especially, those that seek to deepen the extent of bank branch penetration and the roll-out of innovative financial products/services) must be strengthened.

**Keywords:** *Financial Sector Development, Financial Institutions, Formal Banks, Bank Branch Expansion, Banking System Penetration, Financial Inclusion, Financial Exclusion, Financial Deprivation, Household Welfare, Poverty, Inequality, Pseudo Panel, Access to Credit, Credit Constraint, Difference-in-Differences, Instrumental Variables, Propensity Score Matching, Errors-in-Variables, Ghana.*

**JEL Codes:** C21, C23, D13, G21, G28, I31, I32, O12, O16.

## DEDICATION

First and foremost, I dedicate this work to the Almighty Allah for His abundant grace and guidance in this life. I also dedicate this thesis to my father and my late mother, Rukaya Fuseini, may the Almighty Allah open the gates of Heaven to you... *Aameen!!* Lastly, I dedicate this thesis to my wife, Mukarama, and to my wonderful girls, Zakiya, Samira and Shamsia.

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## ABBREVIATIONS

2SLS	Two Stage Least Squares
AMA	Accra Metropolitan Assembly
ATMs	Automated Teller Machines
ATT	Average Treatment Effect on the Treated
CGAP	Consultative Group to Assist the Poor
DMBs	Domestic Money Banks
EAs	Enumeration Areas
EIV	Errors-In-Variables
ERP	Economic Recovery Programme
FGT	Foster, Greer, & Thorbecke
FINSAP	Financial Sector Adjustment Programme
GCC	General Credit Cards
GDP	Gross Domestic Product
GLSS	Ghana Living Standards Survey
GMM	Generalised Method of Moments
GSS	Ghana Statistical Service
HDI	Human Development Index
IFAD	International Fund for Agricultural Development
IV	Instrumental Variables

MDR	Minimum Deposit Requirement
MFIs	Microfinance Institutions
MPI	Multidimensional Poverty Index
NBFIs	Non-Bank Financial Institutions
NGOs	Non-Governmental Organisations
OLS	Ordinary Least Squares
PSM	Propensity Score Matching
PSU	Primary Sampling Unit
RAFiP	Rural and Agricultural Finance Programme
RCBs	Rural and Community Banks
RCTs	Randomised Controlled Trials
SDGs	Sustainable Development Goals
SMEs	Small- and Medium-Scale Enterprises
SSA	sub-Saharan Africa
UBL	Universal Banking License
UNDP	United Nations Development Programme
US	United States
WDI	World Development Indicators
WLS	Weighted Least Squares

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background and Problem Statement

*“People who can access financial services have greater security and privacy over their money. Savings accounts make it easier to save, so people save more and earn more”*

(Leora Klapper, 2016)

Financial markets and institutions, notably banks, exist to mitigate the adverse effects of information asymmetries and transaction costs that prevent the direct pooling of an economy's savings for investment purposes. Specifically, financial institutions mobilise savings, provide payment services that facilitate the exchange of goods and services, and advance credit to a large number of economic agents for investment purposes (Beck et al., 2009). Further, they produce and process information about investors and investment projects that is used to ensure the efficient allocation of funds and helps in diversifying, transforming and managing risk (Levine, 2005). Well-functioning financial institutions and markets especially an inclusive one will critically support not only economic growth but also make an important dent on poverty and inequality.

Cross-country evidence demonstrates that countries with higher levels of financial development perform better in terms of economic growth, poverty reduction and inequality relative to countries with shallow financial markets (see Beck et al., 2007; Honohan, 2008). Further, micro-level evidence suggests that access to formal financial services has a beneficial impact on household welfare by helping households to smoothen their consumption, manage risks better, accumulate assets and grow their incomes (see Banerjee and Newman, 1993;

Aghion & Bolton, 1997; Caskey et al., 2006; Geda et al., 2006; Levine, 2008; Demirguc-Kunt et al., 2008; Dupas & Robinson, 2013). However, other studies have been less optimistic about the welfare enhancing role of access to finance, in particular, access to credit (see Adams & von Pischke, 1992; Karlan & Zinman, 2010; Duflo et al., 2013).

The inclusive development literature, however, views financial inclusion – i.e. access to formal financial services (such as having a basic bank account, payment, savings, insurance and credit facilities) by all – as a key tool in tackling global poverty and inequality (see Chibba, 2009). In a recent study, Klapper et al. (2016) opine that the achievement of the sustainable development goals (SDGs) – especially, the first target of Goal 1 of the SDGs which is the *eradication of extreme poverty for all people everywhere by 2030* – would be difficult without bringing people into the banking system.

Associated with the rapid growth in the financial landscape in most parts of the world, including Africa, is the decline in the incidence of financial exclusion. Recent estimates show that the incidence of financial exclusion has dropped by about 11 percentage points in just three-years to hit 2 billion adults in the world in 2014 (see Demirguc-Kunt et al., 2015). Over the past few years, national-level policies and programmes targeted at scaling-up the level of financial inclusion is not absent in a number of developing countries; examples include the facilitation of a ‘no-frills’ accounts<sup>1</sup> by the Reserve Bank of India and the issuance of general credit cards (GCCs) to the poor and disadvantaged households in order to guarantee them an easy access to credit, as well as the introduction of the Rural and Agricultural Finance

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<sup>1</sup> i.e. accounts opened with nil or very low minimum balance and charges that creates an environment for large sections of the population, especially the poor, to open bank accounts.

Programme (RAFiP) in a number of developing countries such as Ghana. The RAFiP project has support from national governments and the International Fund for Agricultural Development (IFAD) and its goal is to provide financial services, technical assistance and risk management instruments to the rural poor and smallholder farmers.

Further, in most developing countries, reforms in the financial services industry aimed at increasing the efficiency and competitiveness of financial markets are gradually being implemented. A good number of countries in Africa, for example, have undergone several phases of financial market reforms over the past few decades. In Ghana, beginning in the late 1980s, the financial sector has witnessed the promulgation of a number of reforms including the deregulation exercise which was conducted in 1988 as part of the Financial Sector Adjustment Programme (FINSAP<sup>2</sup>), the passing of the Bank of Ghana Act (2002) to give independence to the Bank of Ghana and the introduction of the universal banking license regime in 2003<sup>3</sup> (see Adjei-Frimpong (2013) for a comprehensive review of the various financial sector policies that have been introduced in the Ghanaian financial system since 1988).

The reforms implemented thus far have arguably deepened the competitiveness of the Ghanaian financial system and the banking system, in particular. This seems plausible to have in turn promoted banking system penetration, especially in terms of the expansion of banks' physical branch networks and the introduction of innovative financial products with some new

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<sup>2</sup> Adopted in 1988, the FINSAP was part of the broader Economic Recovery Programme (ERP) which came into force in Ghana in 1983.

<sup>3</sup> The introduction of the universal banking license regime is not unique to Ghana within the sub-region as other countries in sub-Saharan Africa including Nigeria, Kenya, and Tanzania, among many others, also operate universal banking regimes.

financial products designed specifically to meet the banking needs of the unbanked poor. In addition, following a significant growth in the technological environment, globally, the current phase of Africa's financial landscape has seen a growing synergy between banks and non-bank or non-financial firms (e.g. mobile telecommunication companies) to develop financial products such as payment systems targeted at reaching hard to reach unbanked populations. These developments suggest that banks may play a role in deepening the extent of financial inclusion.

The above discussion raises some issues that warrant empirical investigations: First, the unsettled issue regarding the welfare effect of access to credit implies that more empirical research utilising different data structures and contexts as well as methodology would be necessary. Second, the growing concern that the measurement of financial inclusion should go beyond access to formal credit to include access to other formal financial services such as savings and insurance facilities goes to highlight the multidimensional nature of financial inclusion. Accordingly, an analysis of the effect of financial inclusion on household welfare would be incomplete if such analysis does not account for the multifaceted nature of the concept of financial inclusion. This therefore implies that a more comprehensive analysis of the welfare effect of financial inclusion would be one that accounts for the multidimensional nature of financial inclusion.

Third, the expansion in bank branches and changes in the product designs of banks in recent times suggest that banks may play a role in deepening the extent of financial inclusion. However, without any empirical investigation of the issue, it may be difficult to state categorically that banking system penetration promotes financial inclusion. As such, it is useful

to empirically examine the potential influence of banking system penetration on financial inclusion using data from Ghana. These issues form the basis for the three empirical chapters of the thesis.

## **1.2 Objectives of the study**

The overall objective of this thesis is to examine the drivers and welfare effects of financial inclusion in Ghana. We achieve this broad goal through the development of three stand-alone empirical papers. The specific objectives that motivates each of the three empirical essays or papers are as follows:

In paper I, we seek to achieve the following research objectives:

- (i) To ascertain the dynamic effect of access to credit on household welfare in Ghana;
- (ii) To establish the effect of access of credit on the extent of poverty and the degree of inequality among the poor in Ghana;
- (iii) To examine whether the effect of access to credit on household welfare varies across poor and non-poor households in Ghana;
- (iv) To establish whether the gender of the household head matters in the effect of access to credit on household welfare in Ghana;

In paper II, we seek to achieve the following research objective:

- (v) To examine the effect of financial inclusion (paying attention to the multidimensional nature of financial inclusion) on household welfare in Ghana;

In paper III, we seek to achieve the following research objective:

- (vi) To establish the role (if any) of banking system penetration on financial inclusion in Ghana.

### **1.3 Contribution to the Literature**

This thesis makes an important contribution to the literature on the welfare effect of financial inclusion as well as on the determinants of financial inclusion in a number of ways. In Paper I, presented in Chapter two, we argue that the inconclusiveness in the evidence on the effect of access to credit on household welfare in the current literature (see Karlan & Zinman, 2010; Duvendack & Palmer-Jones, 2012; Duflo et al., 2013; Khandker & Samad, 2014), implies that more research should be undertaken, perhaps using different data structures and methodologies. Roodman & Morduch (2014) notes that the apparent lack of consensus on the welfare effects of credit have raised a number of questions bordering, for instance, on the research methodologies and data types applied in the extant literature on the issue as well as context of the earlier studies.

Accordingly, Paper I therefore join in the debate on the welfare effect of access to credit by providing some new evidence on the issue using a pseudo panel dataset constructed from four waves of the Ghana Living Standards Survey (GLSS) while employing robust estimation techniques including the dynamic Generalised Methods of Moments (GMM) estimation technique to provide robust evidence on the welfare effects of access to credit. This approach enables us to capture the dynamic relationship between access to credit and household welfare.

Also, dissimilar to the approach used in most of the earlier papers on the relationship between access to credit and household welfare, in Paper I, we use different measures of household welfare such as household total consumption expenditure per adult equivalent, household food consumption per adult equivalent, household poverty status, and the Foster, Greer, & Thorbecke (FGT, 1984) class of poverty measures. The use of the FGT class of poverty indices

is to enable us provide evidence on how lack of access to credit affect the likelihood of households falling into poverty as well as the extent to which the poor are poor and the extent of inequality among the poor. In addition, Paper I provide a new evidence on the role of gender in the effect of access to credit on household welfare in the context of sub-Saharan Africa.

In Paper II, presented in Chapter three, we argue that the use of a single measure of financial inclusion, notably access to credit, to examine the welfare effect of financial inclusion (Imai et al., 2010; Duflo et al., 2013; Khandker & Samad, 2014) do not adequately gauge the welfare effect of financial inclusion since financial inclusion is a multidimensional phenomenon involving access to other financial services such as savings, payments and insurance facilities. Consequently, Paper II follows the approach adopted by Zhang & Posso (2017) to construct a multidimensional index of financial inclusion using household survey data on access to various financial services in Ghana. Using this index, we then examine the effect of financial inclusion on household welfare. Unlike the approach adopted in most of the earlier studies on this issue, we utilise both income- and consumption-based measures of household welfare in order to provide robust evidence on the welfare effect of financial inclusion. Further, similar to the approach used in Paper I, we examine the effect of financial inclusion/exclusion on not only the likelihood of households falling into poverty but also on the extent to which the poor are poor and the degree of inequality among the poor.

In addition, Paper II provides a household poverty status disaggregated analysis of the welfare effects of financial inclusion. In an attempt to purge endogeneity and self-selection biases, the empirical analysis in Paper II exploit the important property of the Propensity Score Matching (PSM) technique. Finally, in Paper III, presented in Chapter four, we examine the determinants

of financial inclusion with a focus on banking system penetration using a three-period district-level panel data set from 1999 – 2013 whilst exploiting the change in the policy which guides banking operations in Ghana. This paper is unique in two distinct ways: first, to the best of our knowledge, it is the first empirical attempt to examine the role of bank branch expansion in financial inclusion using data from sub-Saharan Africa. Second, it demonstrates the role of policy in enhancing the extent of financial inclusion.

#### **1.4 Organisation of thesis**

The thesis is organised into five main chapters: Chapter one presents the general introduction to the thesis which provides a background and problem statement to the thesis, the main research objectives of the thesis and the contribution of the thesis to the literature; Chapter two presents the first empirical paper of the thesis which addresses the specific objectives *i - iv* of the thesis; Chapter three presents the second empirical paper of the thesis which addresses objective *v* of the thesis; Chapter four presents the third empirical paper of the thesis which addresses objective *vi* of the thesis; finally, Chapter five concludes the thesis and it details the summary, conclusion and policy recommendations of the thesis.

## CHAPTER TWO

### THE EFFECT OF ACCESS TO CREDIT ON HOUSEHOLD WELFARE: EMPIRICAL EVIDENCE FROM GHANA

#### 2.0 Introduction to Chapter Two

This chapter presents the first empirical paper of the thesis (i.e. Paper I). The paper presents an empirical analysis of the effect of access to credit on household welfare using a pseudo panel data set drawn from the last four waves of the GLSS. The chapter is organised as follows: Section 2.1 presents the introduction to paper I; Section 2.2 presents the background of the study while Section 2.3 discusses the extant literature related to the paper. The study's data is discussed in Section 2.4 while Section 2.5 presents the econometric model and estimation strategy adopted in the study. Section 2.6 follows with the results and discussion of the main findings of the paper. In Section 2.7, we present the results of a dynamic analysis of the effect of access to credit on household welfare. Robustness test of our baseline estimates are presented in Section 2.8 while the concluding remarks of the study are contained in Section 2.9.

#### 2.1 Introduction to Paper I

*“If we are looking for one single action which will enable the poor to overcome their poverty, I would focus on credit.”*

(Muhammad Yunus, 2006 Nobel laureate for peace)

The role of credit in the process of economic development, notably in the reduction of poverty and inequality<sup>4</sup>, still remains an unsettled issue. In general, there are two major opposing

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<sup>4</sup> Following Dudley Seers conceptualisation of development to mean declines in three key indicators, namely, poverty, inequality and unemployment (see, for example, Seers, 1969; Brinkman, 1995).

viewpoints regarding the credit and economic development nexus in the development literature. The quasi-Keynesian doctrine of financial repression, on one hand, which was fashioned to facilitate investment (referred to as the *direct credit paradigm* in Vogel & Adams (1997))<sup>5</sup>, held the belief that the supply of credit would result in an increase in national capital. This may lead to growth in output and employment. Consequently, by assuming a *trickle-down* effect, this would ultimately improve the welfare of the poor (Niño-Zarazúa, 2007) even if the poor are not the direct recipients of credit. The opposing doctrine, held by the ‘Ohio School’<sup>6</sup>, however, posits that credit does not play a leading role in the process of economic development and that credit is not an effective tool for alleviating poverty (see, for instance, Adams & von Pischke, 1992).

Extant in the development literature, nonetheless, are the observations that capital investment crucially contributes to economic development (see Levine & Renelt, 1992) and that capital markets in developing countries are hugely underdeveloped with private commercial banks generally not showing interest in financing enterprises operated by the poor (Hulme & Mosley, 1996).<sup>7</sup> Indeed, much of the economic activities in developing countries are undertaken by small-scale producers and enterprises (Todaro & Smith, 2015). The availability of credit is a binding constraint to the development of these small-scale enterprises (see Beck et al., 2005; Klapper et al., 2006). Most of these establishments often require credit so as to purchase new inventories or agricultural inputs such as fertiliser and pesticides, to cushion themselves against

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<sup>5</sup> This view has largely provided impetus for state intervention in credit markets with governments assuming direct control of the banking system and ensuring the provision of subsidised credits as was witnessed in many parts of the developing world in the 1930s and persisted until the late 1980s and early 1990s with the onslaught of financial sector reform programmes.

<sup>6</sup> This school of thought is named so in honour of a group of economists based at the Ohio State University whose intellectual contributions contributed to the birth of this line of reasoning.

<sup>7</sup> The reasons behind this is generally twofold: (i) that the poor often borrow small and uneconomical amounts but the administration and carrying costs are high; and (ii) that they often do not have the needed collateral required by formal lenders. See Hulme and Mosley (1996) for a detailed discussion on the reasons why the poor generally have little access to formal credit.

uncertain seasonal fluctuations in income, and to purchase simple equipment or hire nonfamily labour.

Kumar et al. (2005), Claessens (2006), Banerjee & Duflo (2014), and others, show that access to credit is critical for firm growth as it lessens their financing constraints and enables them to invest in risky but profitable projects. The effect of access to credit on firm performance may also be seen in terms of its impact on the efficiency of microenterprises (see, for example, Akpalu et al., 2012). Beyond firm growth, access to credit can be beneficial for the individual and also for the economy at large; the presence of credit constraints reduces the efficiency of capital allocation and deepens income inequality by hindering the flow of capital to poor individuals with potentially high-return investment opportunities (see Beck et al., 2007; Lopez & Servén, 2009). Access to credit may therefore enhance the welfare of the poor by reducing their liquidity constraints and consumption variability (Morduch & Haley, 2002; Geda et al., 2006).

Others have argued that the lack of access to credit, notably by the poor, may result in self-perpetuating poverty (Geda et al., 2006; Collins et al., 2009). Poor households with no access to credit, for example, tend to invest in low risk and low return projects, and thus are unable to undertake long-term high return investments such as education. As well, credit constrained poor households are less likely to be able to smooth their consumption. Unambiguously, therefore, these forces will combine to significantly reduce the welfare of the poor leading to a potential perpetuation of poverty, and in some cases extending across generations (see Geda et al., 2006). Access to credit may therefore be construed as a vital tool for improving the welfare of the poor, and hence a source of equitable and sustainable development (Rahman, 1999; Guirkinger, 2008).

In spite of these, however, the role of access to credit on household welfare, especially at the micro-level is still a subject of great debate.<sup>8</sup> Indeed, the question of whether access to credit makes a significant dent on poverty at the micro-level is still inconclusively answered by the recent literature; while some studies show that access to credit improves household welfare (see Khandker & Samad, 2014), this is not the case in a number of other studies (see Duflo et al., 2013). In this paper, therefore, we join the debate on the welfare effect of access to credit by providing a new evidence on the issue using a pseudo panel data from Ghana.

In particular, we examine the following three hypotheses: First, we hypothesise that access to credit leads to an improvement in household welfare. In this vein, we assess the effect of access to credit on several welfare measures: total household consumption per adult equivalent, household food expenditure per adult equivalent, and household poverty status – we consider here the Foster, Greer & Thorbeck (FGT, 1984) class of poverty measures. Second, we hypothesise that access to credit has a differential impact on the welfare households at different levels of the wealth distribution. We examine, in particular, the effect of access to credit on the welfare of poor and non-poor households. Last but not the least, we follow the precedence of Pitt & Khandker (1998), Khandker (2005) and Islam (2015) to investigate the role of gender in the effect of access to credit on household welfare in Ghana. Specifically, we hypothesise that female-headed households benefit more from access to credit than their male-headed counterparts.

This paper contributes to the literature on the welfare impact of access to credit along several dimensions: First and foremost, unlike most of the earlier studies on the issue (see, for instance,

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<sup>8</sup> However, cross country regressions show strongly that countries with deeper financial systems have less absolute poverty (see Beck et al., 2004; Honohan, 2008).

Imai et al., 2010; Luan & Bauer, 2016) this paper uses a pseudo-panel data derived from a nationally representative repeated cross sectional surveys to unravel the dynamic effects of access to credit on household welfare. Islam (2011) and Banerjee et al. (2015) note that assessing the true effect of credit on wellbeing requires a long-term panel data. This is because a panel data does not only capture the effects of variations in access to credit on wellbeing across households (as in the case of a cross sectional data), it also captures temporal fluctuations, especially if there are temporal changes in welfare across households.

Given the absence of a true panel data in Ghana (this is not uncommon in most developing countries), however, the next best way to analyse the dynamic effects of access to credit on household welfare is to use a pseudo-panel data (see Deaton, 1985). Second, distinct from the earlier literature, we shed light on the effect of access to credit on different measures of welfare including the FGT class of poverty indices. We also examine the heterogeneous effect of access to credit on the welfare of households at different levels of the welfare distribution. Finally, given the apparent dearth of literature on the mediating role of gender in the effect of access to credit on household welfare in sub-Saharan Africa (SSA), we contribute to the literature on this issue by examining whether the gender of the household head in a credit recipient household matters in the effect of credit on household welfare in Ghana.

The salient findings of the paper are as follows: First, our empirical results show that access to credit promotes household welfare; in particular, access to credit relates positively to household total consumption expenditures and household food expenditures while it is negatively associated with the likelihood of a household being poor. Second, access to credit associates negatively with the poverty gap and the square of the poverty gap measures, indicating that access to credit does not only reduce the likelihood of falling into poverty, it also reduces both

the extent to which the poor are poor and the level of inequality among the poor. As well, we find that access to credit benefits the poor more than the rich, reflecting the fact that access to credit could help bridge the welfare gap between the rich and the poor. Our findings also suggest that female-headed households benefit more from having access to credit compared to male-headed households.

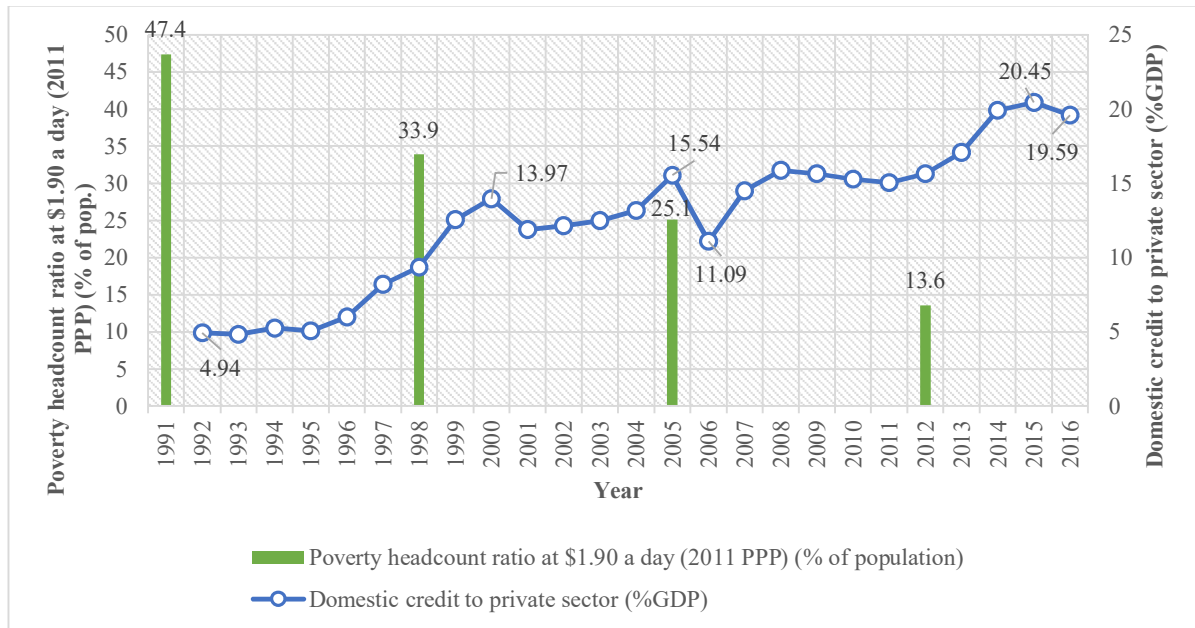
## **2.2 Background of the Study**

Over the past couple of decades, the financial landscape in most parts of the world, especially in developing countries have been transformed significantly (see Iossifov & Khamis, 2009). In SSA, for example, the median ratio of private sector credit to GDP – a proxy for financial sector development – has increased by about 10 percentage points in 2014 compared to its 1995 figure (Mlachila et al., 2016). Meanwhile, in Ghana, there has been a steady growth in domestic credit to the private sector over the years since the 1990s (see Figure 2.1).

However, the poor, especially, the very poor, often have little or no access to formal credit as traditional commercial banks often shy away from lending to people at the bottom-end of the income spectrum. To eliminate the financing gap faced by the lower segments of the population in the developing world, especially the rural poor, special initiatives such as development finance institutions and microfinance institutions (MFIs), backed mostly by state guarantee schemes and/or sponsorship from non-governmental organisations or multilateral donor organisations have been established in most parts of the developing world, including Africa (see Mayo et al., 1998; Napier, 2011). The outreach of these institutions in the developing world have grown tremendously over the past few decades; for instance, in Ghana, there are over 300 MFIs, 140 Rural and Community Banks (RCBs) and more than 70 Non-Bank Financial Institutions (NBFIs), all providing various financial services including credits to

customers.<sup>9</sup> Also, unlike in the past, traditional commercial banks in most parts of the developing world have, in recent times, designed products specifically aimed at meeting the financial needs of people at the lower end of the income spectrum.

**Figure 2.1: Trends in Headcount poverty ratio at \$1.90 a day and Domestic credit to the private sector in Ghana, 1991 ~ 2016**



Source: World Bank’s World Development Indicators Dataset (2017)

These developments have perhaps contributed to the growth in household credit obtained from formal financial intermediaries over the past few decades. Based on data drawn from four waves of the Ghana Living Standards Survey (GLSS), we show that household borrowing from formal financial intermediaries in Ghana have surged over the period 1991/92 – 2012/13. Specifically, as a share of total household borrowing, borrowing from formal financial institutions have increased from just around 10.3% in 1991/92 to close to 40% in 2012/13 (see Table 2.1). Conversely, the share of informal borrowing in total household borrowing dropped

<sup>9</sup> See <https://www.bog.gov.gh/supervision-a-regulation/register-of-licensed-institutions>.

by approximately 30 percentage points over the same period, albeit still remains the largest source of household credit.

**Table 2.1: Sources of household credit in Ghana (1991 – 2013)**

Sources of credit	Percent share of total household credit			
	GLSS 3 (1991/92)	GLSS 4 (1998/99)	GLSS 5 (2005/06)	GLSS 6 (2012/13)
<b><i>Formal sources</i></b>	<b>10.26</b>	<b>11.37</b>	<b>24.91</b>	<b>38.55</b>
State bank	4.97	4.24	8.80	11.06
Private bank	0.44	1.92	6.54	16.03
Cooperative	0.87	1.65	4.12	5.88
Government agency	1.12	1.16	1.89	0.90
NGOs	0.50	0.41	1.67	2.51
Business firm	1.43	0.98	1.00	1.01
Other formal	0.93	1.01	0.89	1.16
<b><i>Informal sources</i></b>	<b>89.74</b>	<b>88.63</b>	<b>75.06</b>	<b>61.46</b>
Money lender	2.92	4.70	3.34	3.67
Savings and loans scheme	-	-	-	16.88
Susu scheme	-	-	-	12.01
Trade	16.93	21.83	14.78	1.76
Farmer	1.00	2.37	2.15	1.66
Relative/Friend/Neighbor	67.21	58.30	52.75	23.97
Other informal	1.68	1.43	2.04	1.51

Source: Author's computation, based on GLSS 3, 4, 5, & 6.

The decline in the share of informal credit in total household credit could be attributed to the significant growth in both the geographical penetration of formal financial intermediaries and formal financial products, in particular, the increased diversification of formal financial products to compete with those offered by the informal financial services sector. It must be mentioned, however, that in spite of the decline in the patronage of the services offered by informal financial intermediaries, the operations of informal financial intermediaries do not

cease to exist, especially in the rural areas of developing countries. Indeed, the operations of formal and informal financial institutions often coexist and interact, especially in rural areas where the outreach of formal financial intermediaries is largely limited (Bardhan & Udry, 1999).<sup>10</sup>

Extant studies suggest that limited access to formal financial intermediaries may promote the development of informal financial intermediaries which could serve as either a complement or substitute of the formal financial sector (see Eswaran & Kotwal, 1989; Kiiza & Pederson, 2002). Thus, it may not be uncommon to find an individual holding credits from both formal and informal financial institutions simultaneously. Using the sixth wave of the GLSS dataset, we show that a non-negligible proportion of Ghanaian households have accessed credit from both formal and informal sources; see Table 2.2A (appendix). Campero & Kaiser (2013) show that informal financial intermediaries play a complementary role to the formal sector in the context of Mexico.<sup>11</sup> However, the cost of credit is often higher in the informal financial markets than in the formal financial sector. Pande et al. (2012) note that informal financial markets usually charge usurious interest rates on credit to cover the high screening and monitoring costs that are needed to ensure lower default rates.

Consistent with the evolution of access to credit in Ghana, especially from formal financial institutions, average welfare levels in the country has also been improving over the past couple of decades; for example, alongside a steady growth in domestic credit to the private sector over the years since the 1990s, the incidence of poverty in Ghana has declined consistently over the

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<sup>10</sup> The operations of formal financial intermediaries (such as banks) are regulated by the government and the Central Bank while informal financial institutions (e.g. money lenders) operate beyond the regulatory framework of the financial system.

<sup>11</sup> Due to the relative ease and flexibility in obtaining and managing informal credit – notably from friends and family – informal credit is usually the main source of funds for poor households in times of emergencies and for consumption smoothing (see Pearlman, 2010).

past few decades (Figure 2.1). Informed by this backdrop, this paper investigates the effect of access to credit on household welfare without regard to the source of credit. That is, we hypothesise that access to credit from either a formal or an informal financial intermediary or both is welfare enhancing relative to lack of access.

## **2.3 Literature Review**

### *2.3.1 Theoretical discussion of the link between credit and welfare*

The question we ask here is does access to credit raise household incomes or welfare? That is, if households receive credit facilities from financial intermediaries will it translate into increased incomes? Pande et al. (2012) notes that using an intertemporal substitution argument, the answer to this question is ‘yes’ and the reason is that access to credit allows households to borrow against future earnings and invest in higher return economic activities today. Theory posits that access to credit might influence household welfare positively through the following channels (see, for instance, Binswanger & Khandker, 1995; Zeller et al., 1997; Pande et al., 2012): The first channel is the *liquidity effect* of credit. By alleviating credit constraints, access to credit by households enables them to undertake new productive investments, including the creation of a new business or purchasing capital assets to help in the activities of an existing business. These activities help to boost business or firm output and ultimately contribute to an increase in household income.

Aside from raising input use, access to credit by a farm household may reduce the opportunity costs of capital-intensive assets relative to family labour and hence motivates these households to adopt labour-saving and high-yield technologies, thus enhances land and labour productivity (Zeller et al., 1997). The second channel is the *consumption smoothing effect* of credit and it highlights the role of credit in enabling households to smooth out consumption over time. This

is closely linked to the third channel which is the *risk-bearing and risk-coping effects* of credit. The availability of credit increases the willingness of risk-averse households to take risks and undertake investment activities (see Rosenzweig & Binswanger, 1993).

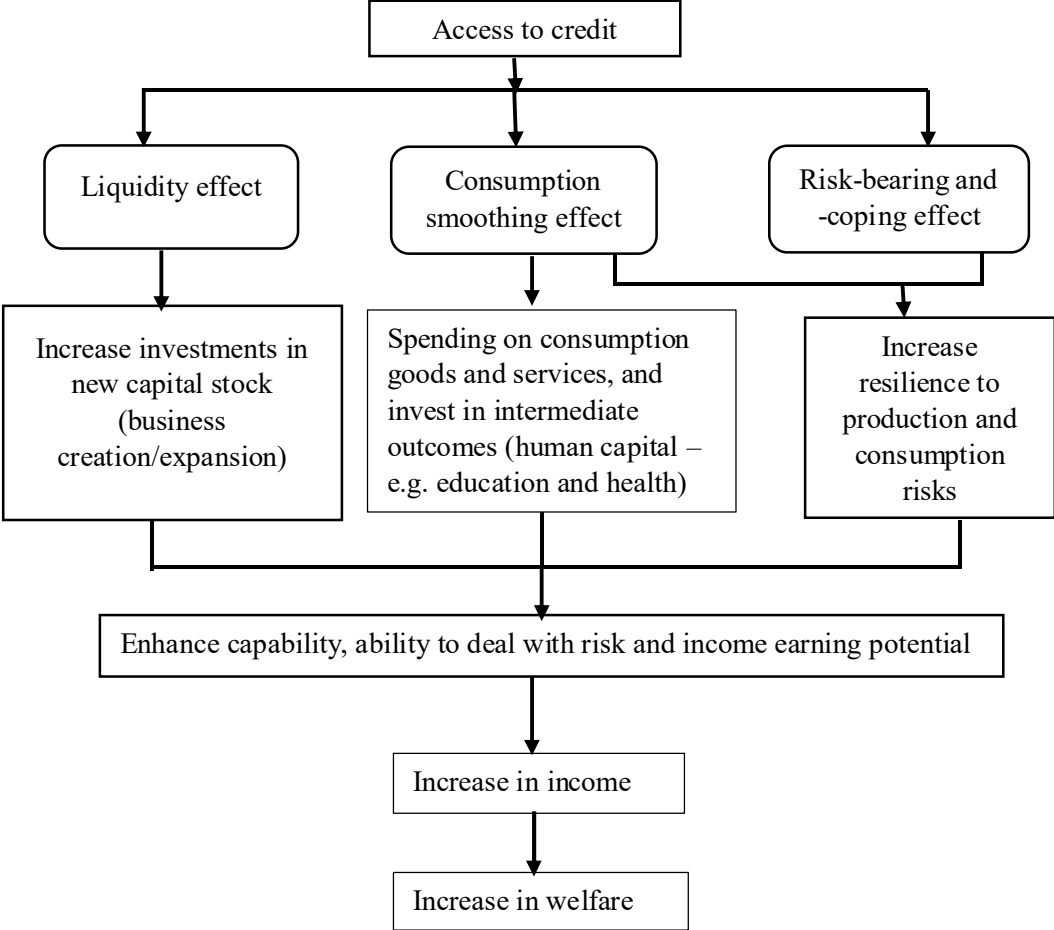
Both the consumption smoothing and, risk-bearing and risk-coping effects of credit affects the resilience of households to assume production and consumption risks. Indeed, the idea that credit will be available to cushion consumption against a shortfall in income in the event that a risky but potentially profitable investment fails may induce a household to assume the additional risk (Diagne & Zeller, 2001); such as investing in new and riskier technologies (Eswaran & Kotwal, 1990). Also, with the option of borrowing, a household can enhance its income by avoiding risk-reducing but inefficient income diversification strategies such as the production of low-risk but less profitable food crops (Eswaran, & Kotwal, 1990) and precautionary savings (keeping of cattle or cash, for instance) which are associated with very poor or even negative returns (Deaton, 1991).

Further, by promoting consumption smoothing, access to credit could increase income if it reduces the need to sell-off productive assets during negative income shocks (Pande et al., 2012). Ultimately, for access to credit to increase incomes, there must be opportunities for households to invest in high-return production activities; as such, the intertemporal argument on the link between access to credit and household welfare rests strongly on the availability of high-return economic activities.

We illustrate the above pathways diagrammatically in Figure 2.2 below. We show that access to credit through the above three channels enables households to undertake investment activities as well as increase expenditure on consumption and invest in intermediate outcomes

(such as education and health). These investments directly impact households' capabilities, their ability to deal with shocks and their income earning potential, thus leads to an increase in household income and hence, an increase in wellbeing.

**Figure 2.2: Access to credit and household wellbeing: Causal mechanisms**



Source: Adapted from Levine (2005) and Diagne & Zeller (2001)

*2.3.2 Empirical literature on the effect of credit on welfare*

This paper relates to a large and yet growing empirical literature on the link between access to credit and welfare (see, for example, Hulme & Mosley, 1996; Pitt & Khandker, 1998; Imai et al., 2010; Islam, 2011; Khandker & Samad, 2014; Roodman & Morduch, 2014; Luan & Bauer, 2016). It is noteworthy, however, that the evidence therefrom has been mixed. While some studies show that access to credit improves household welfare (see Pitt & Khandker, 1998;

Quach & Mullineux, 2007; Niño-Zarazúa, 2007; Imai et al., 2010; Khandker & Samad, 2014), this is not the case in a number of other studies (see Duvendack & Palmer-Jones, 2012; Duflo et al., 2013).

The study by Pitt & Khandker (1998) which provided immense impetus to the microfinance movement showed that microcredit promotes welfare. In particular, by employing an instrumental variables (IV) approach with a view of purging biases resulting from self-selection and endogeneity, the authors demonstrate that microcredit exerts a significantly positive impact on consumption expenditure and reduces poverty while at the same time improves the accumulation of non-land assets. They also demonstrate that the welfare impact of credit is relatively higher when microcredit is given to women; this corroborates the findings of earlier studies (see Hulme & Mosley, 1996). In an examination of a lending program in rural India, Garikipati (2008) show that loans received by women often helps to enhance household assets and incomes.

In a related study, Khandker (2005) employed an extended sample of the data used in Pitt & Khandker by adding data on the same households surveyed in 1998/99 to construct a household level panel data set, potentially overcoming the problems of evaluation posed by participant selection. The author shows that microfinance or microcredit has a beneficial impact on the welfare of the poorest. Similarly, Islam (2008), in examining the impact of micro-credit on welfare in Bangladesh, shows that microcredit improves consumption for only the relatively poor. Karlan & Zinman (2010) investigated the impact of expanding access to consumer credit in South Africa. The authors observe that credit has a significantly positive effect on income and food consumption. This finding is in line with the results obtained by Chemin (2008) for Bangladesh, Li et al. (2011) for China and Baye (2013) for Cameroon.

Islam (2011) used a four-period panel dataset of microcredit programs in Bangladesh to examine the medium- and long-term impact of microcredit. By employing a tripple difference in difference and propensity score matching methods to account for selection bias, the author observe that long term participants of a microcredit program obtain larger benefits than short term participants. In their recent paper, Roodman & Morduch (2014) sought to replicate the Pitt & Khandker's study and conclude that their results were in line with those obtained by Pitt & Khandker, albeit, demonstrates lower poverty-reducing effects of microcredit compared to the Pitt & Khandker's study. Khandker & Samad (2014) utilised a longitudinal data set spanning 20 years to examine the dynamic effects of microcredit on poverty in Bangladesh. They find that access to microcredit allows the poor to increase their welfare and that female borrowers benefit more from access to credit than their male counterparts.

Similarly, Nanziri (2016) utilised a South African data set to investigate the presence or otherwise of a gender gap in the welfare effects of access to financial services. The author observed that access to financial services is welfare enhancing and that the positive welfare effects of access to financial services are higher for male users than for female users of financial services. In addition, the findings of the study suggest that there is a non-linear relationship between access to financial services and welfare, indicating that the welfare effects of access to financial services depends on the user's position in the welfare distribution. In an examination of the effect of access to credit on the income of households at different levels of welfare, Luan & Bauer (2016) used data on 1338 households from rural Vietnam. The results of study demonstrate, among others, that access to credit have a heterogeneous impact on the wellbeing of credit recipients with different levels of welfare. Specifically, the authors contend

that the positive effect of access to credit on household welfare is higher among better-off or richer households than among less economically well-off households.

Contrary to the results obtained in the above studies, the empirical findings of some studies cast doubts on the welfare enhancing effect of access to credit. Notable among these studies are the works of Duflo et al. (2013) and Banerjee et al. (2009) which relied on Randomised Controlled Trials (RCTs). Morduch (1998), using a cross-sectional data set from Bangladesh show that access to credit has an insignificant effect on the level of consumption. Similar observations are reached by other scholars including Duflo et al. (2013), for instance, who utilised a randomised evaluation approach to identify the impact of microcredit on welfare. Specifically, Duflo et al.'s (2013) study revealed that access to credit do not significantly influence per capita consumption and that there are no observable changes on education, health and women's empowerment of credit recipient households. Using a randomised evaluation approach, Banerjee et al. (2009), as well, find insignificant effects of microcredit on household consumption in India. Further, Duvendack & Palmer-Jones (2012), in their replication and extension of the study by Chemin (2008), find insignificant effects of credit on welfare; their evidence was thus contrary to those obtained by Chemin (2008).

In sum, as noted earlier, the current evidence on the welfare effect of access to credit has been mixed. That is, while the findings of some studies demonstrates that access to credit has a positive effect on household welfare, this is not the case in a number of other studies wherein the results suggest that access to credit does not influence household welfare. The apparent lack of consensus on the welfare effects of credit in the extant literature have raised a number of questions bordering, for instance, on the research methodologies and data types as well as context used in the various studies (see Roodman & Morduch, 2014). For instance, Islam (2011) and Banerjee et al. (2015) posit that unlike short-term assesments, medium- and long-

term assessments which require panel data sets makes it easy to observe the true effects of access to credit. Thus, given the absence of such an analysis in the context of Ghana, at least to the best of our knowledge, this paper furnishes new evidence on the effect of access to credit on household welfare using a pseudo panel data set in Ghana while employing robust estimation techniques.

## **2.4 Data**

The data used in this paper is drawn from the Ghana Living Standards Surveys (GLSS), a nationally representative household surveys conducted by the Ghana Statistical Service (GSS) with support from the World Bank and other agencies. Currently, there are seven waves of the survey available; the first and second waves were conducted in 1987/88 and 1988/89, respectively. The third, fourth, fifth and sixth waves were conducted in 1991/92, 1998/1999, 2005/06, and 2012/13 respectively. The seventh wave was conducted in 2016/17 and the results are yet to be released fully. Specifically, we use the last four rounds (i.e. waves 3-6) of the GLSS to construct a pseudo panel data set.<sup>12</sup> Apart from the first two waves and the seventh wave of the GLSS, there has been about 7 years interval between any two consecutive surveys. Each wave of the GLSS, however, covered more households than the preceding one. For example, the GLSS 3 used a sample size of 4,523 households while the GLSS 4 covered a sample of 5,998 households. The GLSS 5 and GLSS 6, respectively, covered a sample of 8,687 and 16,772.

The GLSS contain detailed information on a number of socio-economic characteristics of individuals and households including educational attainment, gender, household size, income,

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<sup>12</sup> We do not include the first two waves of the GLSS (i.e. GLSS 1 & GLSS 2) in our construction of the pseudo panel data because the structure of the questionnaires used for these surveys were markedly different from those used in the subsequent waves (Demery & Mehra, 1997). Specifically, unlike the later waves, the first two GLSS do not contain most of the socioeconomic variables that are useful in our econometric estimations.

welfare, expenditure, poverty status, health, employment, access to credit, assets, and migration, among others. More importantly, the GLSS contain detailed information on household welfare variables such as household income, household consumption expenditure on both food and non-food items and its disaggregation as well as information on whether a household has a loan, source of credit and amount of credit. This information permits us to examine the effect of access to credit on household welfare.

#### *2.4.1 The pseudo panel data approach: Background*

In a seminal paper, Deaton (1985) reacted to the absence of genuine panel data sets on individuals/households in many countries (as it is the case in Ghana currently) by proposing that it is possible to create a panel data consisting of ‘cohorts’ of individuals from repeated cross-sections which are however relatively abundantly available in most countries. Deaton’s approach involves grouping individuals who share some common time-invariant characteristics (such as, year of birth) from cross sectional observations into cohorts and the averages within these cohorts are treated as observations in a pseudo panel. Even though pseudo panels are considered as substitutes to genuine panels, they are nonetheless not inferior to genuine panels. Indeed, unlike genuine panels, pseudo panels are immune to attrition bias; see Deaton (1985), Attanasio (1993) and Verbeek (2008).<sup>13</sup> A major restriction in the construction of pseudo panel data sets is that cohorts should be defined on the basis of time-invariant characteristics and that these characteristics must be observed for all individuals in the sample in order to ensure that each individual is a member of exactly one cohort, which is the same for all periods (see Verbeek, 2008). This restriction rules out the use of time-varying variables (such as income) to form cohorts.

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<sup>13</sup> Following the seminal contribution of Deaton, an incredible stream of studies has relied on the pseudo panel approach to analyse behavioural relationships over time (see, Quartey, 2006; Huang, 2007; Weis & Axhausen, 2009; Warunsiri & Mcnown, 2010; Tsai et al., 2014; Dang et al., 2014).

The goal of this therefore is to reduce within cohort variation and increase the variation between cohorts in order to ensure that each cohort can be treated as an independent individual and be traced over time; see, for instance, Verbeek (1992). Previous studies have relied on either a single variable or multiple variables to define cohorts. For instance, an important study by Browning et al. (1985) constructed cohorts of households defined on the basis of five-year age bands which is subdivided into two groups on the basis of whether a household's head is engaged in a manual or non-manual work. Blundell et al. (1998) employed year-of-birth intervals of 10 years, interacted with two education categories to construct their cohorts while Propper et al. (2001) constructed their cohorts by employing 7 date of birth groups interacted with 10 regions.

Quartey (2006) relied on three household characteristics, namely, poverty status, location and region to construct his pseudo panel. Warunsiri & Mcnown (2010) defined cohorts based on birth years. Apparent in the earlier empirical literature on the pseudo panel data approach is the fact that 'year of birth' is the most commonly used variable to create cohorts, perhaps due to its time-invariant nature and also the fact that it is often largely observable for all individuals in most surveys. Other time-invariant complementary variables used in some studies include gender, educational attainment, region or location, among others. The use of other time-invariant variables complementary to year of birth is often driven by the goal of ensuring that the observations within cohorts are as homogeneous as possible, thus increasing inter-cohort heterogeneity.

It is suggested that cohort sizes should be sufficiently large to provide unbiased estimates of the cohort population means (see Deaton, 1985; Verbeek, 1992). On this issue, Verbeek &

Nijman (1992) argue that cohort sizes can be smaller if the cohorts are constructed in a manner that maximises the inter-cohort variation. The cohort formation process therefore has to be carefully designed to increase the number of cohorts without compromising the representativeness of the cohorts. Essentially, in constructing a pseudo panel data set one encounters an obvious trade-off between the number of cohorts and the size of each cohort. While a small number of observations within cohorts increases the measurement error of the population (Deaton, 1985), one requires a large number of cohorts to ensure sufficient inter-cohort variation so as to maximise estimation efficiency (i.e. obtain small standard errors); see Verbeek & Nijman (1992), for instance. In sum, there are two important issues to consider when creating cohorts: (i) cohorts should be defined on the basis of time-invariant characteristics – these characteristics must be observed for all individuals in the sample, and (ii) there is a trade-off between creating many cohorts to maximise estimation efficiency and creating large cohort sizes to minimize measurement error.

#### *2.4.2 Constructing the pseudo panel*

In view of the salient issues discussed in the foregoing section, we carefully choose a grouping criterion which ensures sufficient inter-group heterogeneity in terms of both households' access to credit (our main independent variable) and household welfare (our dependent variable). Accordingly, we define a cohort based on the 'year of birth' and 'region of birth' of household heads. This choice is supported by our observation that both household welfare and households' access to credit exhibit a reasonable level of variation across the two variables as shown in Figures 2.1A, 2.2A, 2.3A, and 2.4A (see Appendix). In Figure 2.1A, for instance, household heads born between 1957 and 1961 have the highest access to credit relative to other generations. Indeed, household access to credit falls as individuals grow older. Household

welfare is also somewhat associated with age with younger household heads showing better welfare levels than their older counterparts (see Figure 2.2A).

Specifically, we employ the year of birth characteristic to create 11 year of birth cohorts with each cohort having an interval of 5 years. Given that individuals who are aged either more than 70 years old or less than 16 years old are less likely to be household heads, we eliminate all household heads born before 1922 (i.e. more than 70 years old in the year 1992) or after 1976 (i.e. less than 16 years old in the year 1992) from the sample. The oldest year of birth cohort contain individuals born on and between 1922 and 1926 while the youngest year of birth cohort contain individuals born on and between 1972 and 1976. It should be stressed however that the choice of the interval that defines a year of birth cohort is arbitrary. The narrower the definition, the lesser the number of individuals within each cell and hence the lesser the within cell heterogeneity (see Attanasio, 1993). Further, the region of birth characteristic is used to create 11 region of birth cohorts, representing the 10 administrative regions of Ghana and abroad.<sup>14</sup> Thus, these two characteristics (i.e. year of birth and region of birth) describe 121 potential (11 \* 11) cohorts over the four time periods (i.e. 1992 for GLSS3, 1999 for GLSS4, 2006 for GLSS5 and 2013 for GLSS6), hence generating potentially 484 synthetic observations. In Table 2.2, we report the number of households in the 11 year of birth cohorts, for each year of the survey.

The first row of Table 2.2 shows the sample representation of households headed by those born on and between 1922 and 1926, with an age range of 66-70 years in 1992 and an age range of 87-91 years in 2013. The sample representations of the various year of birth cohorts across the

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<sup>14</sup> Regions are the first administrative sub-division of Ghana and they include Western region, Central region, Eastern region, Volta region, Ashanti region, Greater Accra region, Brong Ahafo region, Northern region, Upper East region, and Upper West region. 'Abroad' captures individuals who were not born in Ghana.

surveys point to an interesting discovery. For much older cohorts, we observe a declining sample representation as we move from the 1992 survey year to the 2013 survey year; an occurrence that can be explained by the fact that individuals aged 87-91 years are much less likely to be household heads than those aged 66-77 years.

**Table 2.2: Number of households in each year of birth cohort, by survey year**

Year of Birth Cohorts	Survey year			
	1992	1999	2006	2013
Born 1922-1926	159	109	137	76
Born 1927-1931	241	255	195	180
Born 1932-1936	337	285	370	393
Born 1937-1941	344	395	407	625
Born 1942-1946	426	436	509	691
Born 1947-1951	477	631	605	905
Born 1952-1956	575	589	851	1065
Born 1957-1961	569	789	962	1520
Born 1962-1966	579	702	991	1658
Born 1967-1971	315	690	1083	1898
Born 1972-1976	54	453	1019	2136

Source: Authors' computation based on GLSS data

On the other hand, younger cohorts in 1992 are increasingly more sampled in later surveys than in earlier ones. For instance, the sample representation of households headed by persons born on and between 1972 and 1976 rose from 54 in 1992 to 2136 in 2013. It should be noted that this increase must not be construed to mean that the cohort of those born on and between 1972 and 1976 is rising or that the sample is drawn incorrectly, but must be seen to reflect the fact that persons in the 37-41 years age bracket are much more likely to be household heads than those in the 16-20 years age bracket (see Attanasio, 1993; Deaton & Paxson, 1994).

## 2.5 Econometric Model and Estimation Strategy

Following the works of earlier researchers (see Danquah et al., 2017; Quartey et al., 2017) we specify a basic model for the association between access to credit and household welfare as:

$$y = f(\textit{Credit}, X) \quad (2.1)$$

Equation (2.1) implies that household welfare ( $y$ ) is a function of access to credit ( $\textit{Credit}$ ) and a vector of control variables ( $X$ ) which are broadly established determinants of household welfare. These variables include demographic variables (age of the household head and its square, the gender of the household head, the highest educational attainment of the household head, the occupation of the household head, and household size), contextual factors (urban versus rural, and regional dummies); see, for instance, Danquah et al. (2017), Imai et al. (2010), Lanjouw & Ravallion (1995).

### 2.5.1 Defining dependent variables

The empirical analysis in this paper utilises three main measures of household welfare, all dependent on household consumption expenditure. That is, household total consumption expenditure per adult equivalent, household total food consumption expenditure per adult equivalent and household poverty status. Our choice of household consumption expenditure over household income or assets as a measure of household welfare is informed by the fact that, unlike household income or assets, household consumption expenditures is associated with less measurement error (Deaton, 1997) and it is also more stable than measured income (see Deaton, 2001). In addition to the household poverty status measure, we employ a more comprehensive measure of household poverty – that is, the Foster-Greer-Thorbecke Index (FGT, 1984). That said, we define the four welfare measures used in this paper as follows:

- (1) A household total welfare index which is computed as the total household consumption expenditure, per equivalent adult, and adjusted for variations in prices across households.<sup>15</sup> Formally, this can be expressed as:

$$w_i = \frac{\sum Expend_i}{(PI * Eqsc)} \quad (2.2)$$

That is, the welfare index of the  $i^{\text{th}}$  household ( $w_i$ ) is equal to the sum of the household's total annual expenditure on food and non-food items ( $Expend_i$ ) divided by the product of the price index ( $PI$ ) and the adult equivalence scale ( $Eqsc$ ).<sup>16</sup>

- (2) Household food welfare index which is computed as the total household food expenditures (including imputations for consumption from the output of own production), per adult equivalent, and adjusted for variations in prices across households. Formally, it is expressed as:

$$F_i = \frac{\sum FoodX_i}{(PI * Eqsc)} \quad (2.3)$$

Where  $F_i$  represent the food welfare index of household  $i$  and its equal to the sum of the household's total annual expenditure on food items ( $FoodX_i$ ) divided by the product of the price index ( $PI$ ) and the adult equivalence scale ( $Eqsc$ ).

- (3) Household poverty status is defined as a binary measure of household welfare. It assumes a value of 1 if a household is poor and zero otherwise. The categorisation of households into either poor or non-poor households is based on the Ghana Statistical

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<sup>15</sup> The use of per equivalent adults scale seeks to highlight the variations in consumption requirements across individuals (i.e. children versus adults and males versus females, for instance); see GSS (2007; 2014).

<sup>16</sup> This measure also includes imputations for consumption from other non-market sources such as consumption from the output of own production; see GSS (2000) for more details on the construction of the total household consumption expenditure measure.

Service's upper poverty lines of C900,000.00 and C1,314.00 used in waves 3 – 5 and wave 6 of the Ghana Living Standard Surveys, respectively (see GSS, 2000; 2007; 2014).

- (4) The Foster-Greer-Thorbecke Index (FGT, 1984) is a commonly used measure of poverty and it can be defined as:

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^{\alpha} 1(y_i \leq z) \quad (2.4)$$

where  $P_{\alpha}$  is a household welfare measure and it is defined in terms of the value that  $\alpha$  takes; when  $\alpha$  is 0, 1, and 2,  $P_{\alpha}$  equals the head count index ( $P_0$ ), the poverty gap index ( $P_1$ ), and the square of the poverty gap measure ( $P_2$ ), respectively.  $z$  is the poverty line; note that two poverty lines are used in computing the FGT indices in this paper, that is, the food poverty line or the lower poverty line and the upper poverty line.<sup>17</sup>  $y_i$  is the total household consumption expenditure.  $q$  is the number of poor households (i.e. households with consumption below  $z$ )  $n$  is the total population and  $1(y_i \leq z)$  is an indicator variable which assumes a value of 1 if the household is poor and zero otherwise (i.e. the poverty gap of the non-poor is set to zero). Note that, if the value of  $\alpha$  is high then the weight placed on the poverty of the poorest households is high.<sup>18</sup> We note however that the welfare measures used in this paper takes into account variations in the cost of living across households and differences in household size and

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<sup>17</sup> The lower and upper poverty lines are set at C700,000.00 and C900,000.00, respectively, for the GLSS waves 3, 4, and 5 and at C792.05 and C1,314.00, respectively, for the wave 6 of the GLSS. Note that the Ghanaian currency was redenominated in 2007 by the Bank of Ghana which converted C10,000.00 (old currency) to C1.00 (new currency). As a result, we multiply all monetary values in the survey years preceding 2007 by 1/10000 in order to make them comparable with the monetary values in the GLSS 6.

<sup>18</sup> Key differences in the three  $P_{\alpha}$  indices (i.e.  $P_0$ ,  $P_1$ , and  $P_2$ ) are as follows: while the  $P_0$  index is by far the most common measure of poverty, it does not account for how poor the poor are and so cannot give us an idea about minimum cost of eliminating poverty; this is captured by the  $P_1$  index. The  $P_1$  index measures the extent to which households/individuals fall below the poverty line as a proportion of the poverty line. However, the  $P_1$  index, in spite of its ability to reveal how poor the poor are, it fails to account for the inequality among the poor; this aspect is well captured by the  $P_2$  index (also referred to as the poverty severity index/the squared poverty gap measure).

composition. Also, the estimated welfare measures in Equations (2.2) and (2.3) are log-transformed before they are used in the empirical analysis of this paper. Table 2.1A presents the summary statistics of the weighted regression variables used in this paper.

### 2.5.2 Pseudo panel model and estimation approach

A static model based on the pseudo panel data which tracks cohorts of households over time can be expressed as:

$$\bar{y}_{ct} = \beta \overline{Credit}_{ct} + \gamma \bar{X}_{ct} + \bar{\alpha}_{ct} + \bar{u}_{ct}, \quad c = 1, \dots, C; \quad t = 1, \dots, T, \quad (2.5)$$

where  $\bar{y}_{ct}$  is the average value of all observed  $y$ 's in cohort  $c$  at time period  $t$  while,  $\overline{Credit}_{ct}$  is the mean value of all observed  $Credit$ 's in cohort  $c$  at time period  $t$  and  $\bar{X}_{ct}$  is the mean value of all observed  $X$ 's in cohort  $c$  at time period  $t$ .  $\bar{\alpha}_{ct}$  is a time-varying unobserved cohort specific effect while  $\bar{u}_{ct}$  is the random error term.

Empirical estimation of the parameters  $\beta$  and  $\gamma$  in Equation (2.5) is complicated by the fact that the unobserved cohort-specific effect,  $\bar{\alpha}_{ct}$ , depends on  $t$  and also potentially correlated with the regressors (i.e.  $\overline{Credit}_{ct}$  and  $\bar{X}_{ct}$ ) if the individual specific effects (i.e.  $\alpha_i$  for individual  $i$ ) from which  $\bar{\alpha}_{ct}$  is derived is correlated with the regressors in the associated individual-level specification of Equation (2.5). Under such circumstances, the treatment of  $\bar{\alpha}_{ct}$  as part of the random error term will likely produce inconsistent estimators (Verbeek, 2008). However, it is possible to obtain consistent estimates of the parameters in Equation (2.5) if cohort sample sizes are so large that  $\bar{\alpha}_{ct}$  is a very good approximation of the unobserved fixed effect for the cohort population mean, say  $\alpha_c$  (Deaton, 1985).<sup>19</sup> Alternatively, without regard to the number

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<sup>19</sup> Contrary to this, Verbeek & Nijman (1992) and Devereux (2007) maintain that even if the number of individuals in each cohort is large, the small sample bias in the within estimator on the pseudo panel data may still be significant.

of observations per cohort, the cohort fixed effect can be assumed to be constant if the cohort formation process ensures that the population cohorts contain the same individuals in each period (i.e. existence of intra-cohort homogeneity); see Deaton (1985) and Verbeek (2008). Consequently, Equation (2.5) can be replaced with:

$$\bar{y}_{ct} = \beta \overline{Credit}_{ct} + \gamma \bar{X}_{ct} + \bar{\alpha}_c + \bar{u}_{ct}, \quad c = 1, \dots, C; \quad t = 1, \dots, T, \quad (2.6)$$

where the cohort-specific effect ( $\alpha_c$ ) is no longer time dependent and so can be replaced by cohort dummies and  $\bar{y}_{ct}$ ,  $\overline{Credit}_{ct}$ , and  $\bar{X}_{ct}$  can be considered as error-ridden measurements of the true cohort means, say,  $y_{ct}$ ,  $Credit_{ct}$ , and  $X_{ct}$ , respectively. Equation (2.6) can then be estimated using the Errors-In-Variables (EIV) estimator where all variables (except the cohort dummies) are treated as being measured subject to error (Deaton, 1985). However, most empirical studies ignore the errors-in-variables problem caused by the possible dependence of  $\bar{\alpha}_{ct}$  on time and have employed standard estimators such as the within estimator (see, for instance, Browning et al., 1985; Blundell et al., 1994); See also Huang (2007) wherein the author utilised a Weighted Least Squares (WLS) estimation technique in order to eliminate potential biases in cohort means arising from significant variations in cohort sizes. The weights used in this case are the square roots of the respective cohort sizes (see Deaton, 1985). Accordingly, in this paper we follow the precedence of earlier scholars by estimating Equation (2.6) using both EIV and WLS estimation techniques with the goal of checking the robustness of the results.

### *2.5.3 Examining potential differences in the effect of access to credit on welfare across poor and non-poor households*

Given that the above estimation technique will provide only a partial view of the underlining relationship, we run a household poverty status disaggregated model of the effect of access to credit on welfare. Indeed, this technique allows for the analysis of the differential effect of

access to credit on welfare across different levels of household welfare (see Zhang & Posso, 2017; Luan & Bauer, 2016) and thus enables us to draw a more comprehensive picture about the relationship between access to credit and household welfare.

## **2.6 Results and Discussion**

In this section, we present and discuss the empirical results of the study. The empirical results are derived from a unique pseudo panel data set constructed from waves 3 - 6 of the GLSS. The presentation of the empirical results of the study follows this pattern: first, we present the results from the baseline model, wherein we compare the estimated outcomes from the WLS and EIV estimation techniques; second, we present the empirical results of the effect of access to credit on three different measures of household welfare – i.e. total household consumption expenditure per adult equivalent, total household food expenditure per adult equivalent and household poverty status (i.e. poor versus non poor); third, we present the results of the effect of access to credit on the FGT indices of poverty, computed at two different poverty lines; fourth, we present a household poverty status disaggregated estimation of the welfare impacts of access to credit; lastly, we present estimates of the role of gender in the effect of access to credit on household welfare.

### *2.6.1 Baseline estimates of the effect of access to credit on household welfare*

Table 2.3 presents the baseline results of the effect of access to credit on household welfare. Model 1 reports the estimated outcomes from the WLS estimation technique while Model 2 report the estimated outcomes for the EIV estimation technique. Respectively, columns I and V of Table 2.3 present the WLS and EIV estimates of the effect of access to credit on household welfare when we do not include other control variables as well as region, cohort and year fixed effects in the estimation. In columns II and VI of Table 2.3, we present, respectively, the WLS

and the EIV estimations of the effect of access to credit on household welfare while accounting for other control variables and a year fixed effect. Columns III and VII of Table 2.3 presents, respectively, the WLS and the EIV results on the determinants of household welfare while controlling for region and year fixed effects. Finally, columns IV and VIII of Table 2.3 presents same but with the inclusion of cohort fixed effects.

The overall regression statistics indicate that the two models are well specified; in each case, the inclusion of additional control variables raises the explanatory power of the models (i.e. R-squared). Both models also pass the goodness of fit test – i.e. the overall F-statistic is significant, at all times, at 1% of level of significance (see, for instance, columns IV and VIII of Table 2.3). In general, therefore results from both the EIV and the WLS estimation techniques are largely similar, especially, in terms of the importance of access to credit to household welfare. Specifically, both models show that household welfare increases with access to credit and this is significant at the 1% level of significance. This finding is in line with earlier observations that access to credit has a beneficial influence on household welfare (see Imai et al., 2010; Khandker & Samad, 2014).

Similarly, the effect of the control variables (e.g. age of household head and its squared, gender of the household head, household size, and sector of employment of the household head) included in this estimation shows a substantial degree of consistency across the two estimation techniques. Further, from Table 2.3, we show that regardless of the estimation technique used (i.e. whether WLS or EIV), the effect of access to credit on household welfare is robust to the inclusion of control variables, regional fixed effects, cohort fixed effects and time fixed effects. As a consequence, we would utilise the WLS estimation technique in our subsequent estimations.

**Table 2.3: Baseline estimation: The effect of access to credit on household welfare, WLS and EIV estimations**

VARIABLES	Model 1 (WLS estimation)			Model 2 (EIV estimation)				
	I	II	III	IV	V	VI	VII	VIII
<i>Dependent variable: Household welfare</i>								
Access_credit ( <i>Base: No credit</i> )	5.292*** (0.342)	0.550** (0.127)	0.653*** (0.130)	0.641*** (0.086)	4.927*** (0.303)	1.886*** (0.157)	1.035*** (0.203)	1.479*** (0.172)
Age_head		0.142*** (0.008)	0.112*** (0.009)	0.145*** (0.017)		0.137*** (0.009)	0.115*** (0.009)	0.164*** (0.015)
Age_head2		-0.110*** (0.008)	-0.083*** (0.009)	-0.048*** (0.010)		-0.102*** (0.010)	-0.087*** (0.009)	-0.069*** (0.010)
Household size		-0.269*** (0.025)	-0.249*** (0.029)	-0.157*** (0.020)		-0.297*** (0.030)	-0.272*** (0.030)	-0.211*** (0.020)
Sex ( <i>Base: female</i> )		0.660*** (0.142)	0.807*** (0.148)	-0.037 (0.131)		0.446*** (0.167)	0.791*** (0.146)	-0.085 (0.113)
<b><i>Educational attainment (Base: No education)</i></b>								
Basic education		0.353*** (0.099)	0.358*** (0.098)	-0.002 (0.079)		0.047 (0.111)	0.361*** (0.096)	0.058 (0.069)
Secondary education		0.588*** (0.128)	0.433*** (0.127)	0.053 (0.100)		0.071 (0.126)	0.426*** (0.124)	0.152* (0.088)
Post-secondary education		1.112*** (0.212)	0.895*** (0.205)	0.261 (0.158)		1.561*** (0.236)	0.950*** (0.203)	0.337** (0.138)
Tertiary education		1.458*** (0.177)	1.515*** (0.167)	0.692*** (0.124)		1.782*** (0.206)	1.413*** (0.169)	0.646*** (0.108)
<b><i>Occupation (Base: Agriculture)</i></b>								
Industry		0.727** (0.240)	0.795*** (0.255)	-0.081 (0.200)		0.995*** (0.279)	0.806*** (0.250)	-0.230 (0.175)
Service		0.140 (0.158)	0.439** (0.188)	0.293* (0.151)		0.160 (0.184)	0.430** (0.185)	0.245* (0.131)
Urban ( <i>Base: Rural</i> )		0.597*** (0.164)	0.246 (0.168)	0.285** (0.141)		0.277 (0.189)	0.135 (0.171)	0.048 (0.129)
Constant	0.283*** (0.017)	0.053*** (0.007)	0.043*** (0.007)	-0.617*** (0.145)	0.278*** (0.012)	0.061*** (0.007)	0.042*** (0.007)	-0.633*** (0.125)

*Continued Next Page*

**Table 2.3 Continued**

	Model 1 (WLS estimation)				Model 2 (EIV estimation)			
	I	II	III	IV	V	VI	VII	VIII
Observations	454	428	428	428	454	428	428	428
R-squared	0.384	0.961	0.967	0.993	0.394	0.945	0.968	0.995
Region FE	NO	NO	YES	YES	NO	NO	YES	YES
Cohort FE	NO	NO	NO	YES	NO	NO	NO	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R-squared	0.378	0.959	0.965	0.990	264.7	589.4	511	396.9
F-statistic	69.89	672.4	492.3	296.4				

Notes: Model 1 is estimated using the WLS technique while Model 2 is estimated using the EIV technique; standard errors are in parenthesis; robust standard errors are reported in the WLS estimations while non-robust standard errors are reported in the EIV estimations; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the dependent variable (household welfare) is measured as the total household consumption expenditure per equivalent adult, expressed in constant prices.

### *2.6.2 Effect of access to credit on household welfare: total and food consumption expenditures of households and household poverty status*

Table 2.4 presents the empirical results of the effect of access to credit on household welfare using three different measures of welfare; that is, the total household consumption expenditure, household total food expenditure and household poverty status. Model 1 in Table 2.4 presents the estimated results when household total consumption expenditure is used as the dependent variable while Models 2 and 3 depict the estimated results when household food consumption expenditure and household poverty status are used as dependent variables respectively.

The coding of the poverty status variables (as can be seen in Table 2.1A, appendix) implies that positive values means more poverty and thus the signs of the coefficients from the poverty status model are expected to be the opposite of those in Models 1 and 2. We use robust standard errors in all our estimations in order to account for potential heteroscedasticity. Most of the coefficient estimates in Table 2.4 are significant and their signs are consistent with *a priori* expectations.

In particular, the empirical results suggest that household welfare is influenced by access to credit across all the three specifications. Specifically, access to credit improves household welfare in terms of total household consumption per adult equivalent, household food expenditure per adult equivalent, as well as household's poverty status. This implies that the elimination of credit constraints faced by households does not only help households to increase their consumption, it more importantly enables them to move out of poverty. The effect of access to credit on household welfare is statistically significant at the 1% level of significance in all our specifications and corroborates the results obtained in earlier studies (see Zhang & Posso, 2017). A noteworthy feature of the results on the effect of access to credit on household

welfare, furthermore, is that these effects are not only statistically significant, but the effects are also large. Indeed, we observe that access to credit improves household total consumption expenditure by approximately 64 percent and household total food expenditure by about 56 percent (see Table 2.4, Models 1 and 2).

**Table 2.4: Effect of access to credit on household welfare: household total and food expenditures, and poverty status**

VARIABLES	I	II	III
	Total cons. Exp.	Total Food Exp.	Poverty status
<i>Dependent variable: Household welfare</i>			
Access_credit ( <i>Base: No credit</i> )	0.641*** (0.086)	0.555*** (0.092)	-0.139*** (0.049)
Age_head	0.145*** (0.017)	0.152*** (0.018)	-0.026* (0.015)
Age_head2	-0.048*** (0.010)	-0.056*** (0.011)	0.008** (0.004)
Household size	-0.157*** (0.020)	-0.192*** (0.021)	0.091*** (0.009)
Sex ( <i>Base: Female</i> )	-0.037 (0.131)	-0.090 (0.139)	-0.102* (0.058)
<b><i>Educational attainment (Base: No education)</i></b>			
Basic education	-0.002 (0.079)	0.028 (0.084)	0.041 (0.039)
Secondary education	0.053 (0.100)	0.119 (0.106)	0.014 (0.049)
Post-secondary education	0.261 (0.158)	0.366** (0.168)	-0.019 (0.070)
Tertiary education	0.692*** (0.124)	0.793*** (0.132)	0.071 (0.060)
<b><i>Occupation (Base: Agriculture)</i></b>			
Industry	-0.081 (0.200)	-0.139 (0.212)	-0.057 (0.088)
Service	0.293* (0.151)	0.162 (0.160)	-0.120* (0.071)
Urban ( <i>Base: Rural</i> )	0.285** (0.141)	-0.006 (0.149)	-0.096 (0.061)
Constant	-0.617*** (0.145)	-0.640*** (0.154)	2.407** (1.004)
Observations	428	428	428
R-squared	0.993	0.991	0.908
Region FE	YES	YES	YES
Cohort FE	YES	YES	YES
Year FE	YES	YES	YES
Adjusted R-squared	0.990	0.986	0.862
F-statistic	296.4	217.8	19.61

*Notes: Robust standard errors are in parenthesis; Models 1, 2 and 3 are estimated using the WLS technique; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the dependent variable in Model 1 is (log) household total consumption expenditure per adult equivalent; the dependent variable in Model 2 is (log) household total food expenditure per adult equivalent; the dependent variable in Model 3 is household poverty status; all the estimations control for region, cohort and year fixed effects.*

Beyond this, the effect of several other control variables is worthy of note in Table 2.4. First, as observed in previous studies (see Imai et al., 2010), we find that the age of the household head has a non-linear relationship with household welfare. Specifically, household welfare increases significantly with the age of the household head while the square of the age of the household head is significantly negatively related with household welfare; this indicates that the effect of the age of a household head on household welfare is not necessarily positive – it depends on the level of age reached by the head of a household.

Household size is a significant negative predictor of household welfare; for instance, using household poverty status as a measure of household welfare, we find that the larger the size of a household the poorer the household is, *ceteris paribus* (see Model 3 of Table 2.4). The gender of the household head matters for household welfare; but only when household welfare is represented by household poverty status. The effect of the gender of the household head on household welfare is negative and significant, suggesting that relative to male-headed households, female-headed households have lower levels of welfare. This finding corroborates the results of Imai et al. (2010) for India. The educational attainment of the household head matters for household welfare; however, this is largely observable for household heads who have tertiary educational qualifications. Having a tertiary level of educational qualification improves household welfare by more than 69 percent, all other things held constant.

Further, the occupation of a household head importantly explains household welfare. In this vein, we observe that relative to working in the agricultural sector, household heads who are engaged in the services sector have better welfare levels (see Models 1 and 3 of Table 2.4). However, working in the industrial sector is not significantly related with household welfare. These results are suggestive of the fact that relative to the services sector, employees in the

agricultural and industrial sectors are largely not very well educated or unskilled and thus are more likely to receive relatively lower wages. Urban households are significantly better-off than their rural counterparts; this is true only when household total consumption expenditure per adult equivalent is used as a measure of household welfare (i.e. Model 1 of Table 2.4).

### *2.6.3 Effect of access to credit on household welfare: FGT measures of welfare*

Apart from shedding light on how access to credit influences household welfare as measured by household consumption expenditures, we are also interested in providing insights on the effect of access to credit on the depth and severity of poverty which are undeniably not adequately captured by our earlier measures of household welfare. As such, we employ here the FGT (1984) measures of poverty to capture these aspects of welfare. In Table 2.5, we present the regression estimates of the determinants (including access to credit) of household welfare with household welfare measured by the FGT indices. The dependent variables in Model 1 are the FGT indices which are computed using the upper poverty line while the dependent variables in Model 2 are the FGT indices which are computed using the lower poverty line; we discussed the construction of the FGT indices and their key differences in the previous section. To briefly recap these, note that the  $P_0$  index measures the proportion of the households in the sample that are poor while the  $P_1$  and  $P_2$  indices measures, respectively, the extent to which the poor are below the poverty line and the severity of poverty which accounts for the inequality among the poor. As mentioned earlier, the coding style of the poverty status variable ( $P_0$ ) and its variants (i.e.  $P_1$  and  $P_2$ ) ensures that negative coefficients imply better welfare levels.

Turning now to the effects of the various covariates on the FGT welfare measures, we observe a number of interesting results. First, we find that access to credit does not only reduce the

likelihood of a household being poor, it also significantly reduces both the extent of poverty and the degree of inequality among the poor. This is true regardless of which poverty line is used to compute the FGT indices. For example, in Model 1 of Table 2.5, we find that the elimination of credit constraints faced by households reduces their likelihood of being poor (see column I of Model 1, Table 2.5). In the case of poor households, access to credit reduces the extent of deprivation of the poor and the inequality among the poor (see, respectively, columns II and III of Model 1, Table 2.5). Our results here are suggestive of the fact that the poor and the extremely poor do benefit from access to credit facilities and that access to credit importantly reduces both the incidence of poverty and the degree to which the poor are poor as well as the extent of inequality among the poor. These observations are consistent with those of earlier scholars (see Mahjabeen, 2008; Khandker, 2005); see also Islam (2008) and Khandker & Samad (2014) who showed that access to microcredit helps the poor to increase their consumption.

**Table 2.5: Effect of access to credit on household welfare: FGT measures of welfare**

VARIABLES	Model 1			Model 2		
	I		III	IV		VI
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>
<i>Dependent variable: Household welfare</i>						
<i>Access_credit (Base: No credit)</i>						
Age_head	-0.139*** (0.049)	-0.055*** (0.016)	-0.036*** (0.010)	-0.198*** (0.036)	-0.060*** (0.013)	-0.035*** (0.008)
Age_head2	-0.026* (0.015)	-0.008** (0.003)	-0.002 (0.002)	-0.027*** (0.007)	-0.004 (0.003)	0.001 (0.001)
Household size	0.008** (0.004)	0.003 (0.002)	0.001 (0.001)	0.008* (0.004)	0.002 (0.002)	-0.000 (0.001)
Sex (Base: Female)	0.091*** (0.009)	0.042*** (0.004)	0.021*** (0.002)	0.082*** (0.008)	0.027*** (0.003)	0.012*** (0.002)
<b>Educational attainment (Base: No education)</b>	-0.102* (0.058)	-0.102*** (0.024)	-0.039*** (0.015)	-0.242*** (0.055)	-0.038* (0.020)	-0.007 (0.012)
Basic education	0.041 (0.039)	0.024 (0.015)	0.016* (0.009)	0.061* (0.033)	0.015 (0.012)	0.003 (0.007)
Secondary education	0.014 (0.049)	-0.017 (0.018)	-0.023** (0.011)	0.022 (0.042)	-0.035** (0.015)	-0.032*** (0.009)
Post-secondary education	-0.019 (0.070)	-0.039 (0.029)	-0.030* (0.018)	-0.002 (0.066)	-0.040* (0.024)	-0.036** (0.014)
Tertiary education	0.071 (0.060)	0.028 (0.023)	-0.008 (0.014)	0.086* (0.052)	-0.015 (0.019)	-0.025** (0.011)
<b>Occupation (Base: Agriculture)</b>						
Industry	-0.057 (0.088)	-0.103*** (0.037)	-0.053** (0.022)	-0.185** (0.084)	-0.081*** (0.031)	-0.032* (0.018)
Service	-0.120* (0.071)	-0.111*** (0.028)	-0.064*** (0.017)	-0.146** (0.063)	-0.090*** (0.023)	-0.040*** (0.014)
Urban (Base: Rural)	-0.096 (0.061)	0.035 (0.026)	0.032** (0.016)	0.043 (0.059)	0.054** (0.021)	0.025** (0.013)
Observations	428	428	428	428	428	428
R-squared	0.908	0.906	0.895	0.863	0.874	0.848
Region FE	YES	YES	YES	YES	YES	YES

*Continued Next Page*

**Table 2.5 Continued**

	Model 1		Model 2		Model 1		Model 2	
	I	P <sub>0</sub>	II	P <sub>1</sub>	I	P <sub>0</sub>	II	P <sub>1</sub>
Cohort FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R-squared	0.862	0.862	0.859	0.842	0.811	0.811	0.772	0.772
F-statistic	19.61	16.86	19.13	16.86	13.82	13.82	12.48	11.12

Notes: Robust standard errors are in parenthesis; Models 1 and 2 are estimated using the WLS technique; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the dependent variables in Model 1 are the FGT indices of poverty based on the upper poverty line; the dependent variables in Model 2 are the FGT indices of poverty based on the lower poverty line; P<sub>0</sub> is the headcount poverty measure; P<sub>1</sub> is the poverty gap; P<sub>2</sub> is the square of the poverty gap; all the estimations control for region, cohort and year fixed effects.

Second, the effect of the other explanatory variables in the models are noteworthy. The age of the household head is significant and have a non-linear effect on household welfare, notably on the poverty incidence measure ( $P_0$ ). However, this effect is largely not confirmed when the poverty gap and the square of the poverty gap measures are used as dependent variables (see columns II, III, V and VI of Table 2.5). Household size detrimentally affects the welfare of a household; this is not only in terms of the likelihood of being poor but also in terms of the degree to which a household is poor and the level of inequality faced by the household. Unlike male-headed households, female-headed households have lower levels of welfare. At the same time, employment in the service sector is welfare enhancing compared to employment in the agricultural sector while living in urban areas is associated with higher levels of inequality among the poor (see column III of Table 2.5). Having a post-basic educational attainment is a significant predictor of the square of the poverty gap measure. In particular, we find that, relative to household heads with no educational attainment, household heads with a post-basic educational attainment face lower levels of poverty severity.

#### *2.6.4 Effect of access to credit on welfare across poor and non-poor households*

As stated previously, providing a household poverty status disaggregated estimation of the determinants of household welfare will allow us to more effectively understand how the welfare levels of households at different levels of economic wellbeing react to the availability of credit facilities. In this sense, we present the poverty status disaggregated estimates of the determinants of household welfare in Table 2.6. Our results show specifically that access to credit matter for the welfare of poor and non-poor households. However, the magnitude of the effect of access to credit on household welfare is larger for poor households than for non-poor households. To illustrate, access to credit improves household welfare by about 114 percent and 72 percent among poor and non-poor households, respectively. This corroborates the

results of Zhang & Posso (2017) for China wherein access to financial services is seen to exert a much larger impact on the welfare of households at the bottom-end of the income distribution relative to those at the upper income category. The results, however, fail to support the findings of Luan & Bauer (2016) for rural Vietnam wherein it was realised that relative to the poor, economically well-endowed households benefit more from access to credit.

**Table 2.6: Effect of access to credit on household welfare; poverty status disaggregated estimations**

Dependent variable: Household total consumption expenditure per adult equivalent (log)		
VARIABLES	I	II
	Poor HH	Non-poor HH
Access_credit ( <i>Base: No credit</i> )	1.144*** (0.234)	0.724*** (0.139)
Age_head	0.088 (0.085)	0.143*** (0.019)
Age_head2	-0.024 (0.040)	-0.043*** (0.012)
Household size	-0.068* (0.038)	-0.140*** (0.026)
Sex ( <i>Base: Female</i> )	0.116 (0.473)	0.023 (0.173)
<b><i>Educational attainment (Base: No education)</i></b>		
Basic education	0.034 (0.192)	-0.031 (0.120)
Secondary education	0.519** (0.189)	-0.207 (0.133)
Post-secondary education	0.315 (0.297)	-0.207 (0.227)
Tertiary education	0.736*** (0.239)	0.696*** (0.168)
<b><i>Occupation (Base: Agriculture)</i></b>		
Industry	0.348 (0.780)	0.194 (0.244)
Service	-0.480 (0.369)	0.596*** (0.196)
Urban ( <i>Base: Rural</i> )	0.785* (0.408)	0.262 (0.180)
Constant	-0.149 (0.737)	-0.729*** (0.196)
Observations	91	337
R-squared	1.000	0.994
Region FE	YES	YES
Cohort FE	YES	YES
Year FE	YES	YES
Adjusted R-squared	0.998	0.991
F-statistic	678.3	276.2

*Notes: Robust standard errors are in parenthesis; Models 1, 2 and 3 are estimated using the WLS technique; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the dependent variable used is (log) household total consumption expenditure per adult equivalent; all the estimations control for region, cohort and year fixed effects.*

### *2.6.5 Effect of access to credit on household welfare: any role for the gender of the household head?*

We follow the precedence of earlier scholars (see Pitt & Khandker, 1998; Khandker, 2005; Islam, 2015) to interrogate further the issue of whether the gender of the head of a credit recipient household plays any role in the effect of access to credit on household welfare. To do this, we estimate models that are akin to those presented in Table 2.4 but include a new explanatory variable which is an interaction between the access to credit variable and the gender of the household head variable ( $\text{Access\_credit} * \text{Sex\_head}$ ). Table 2.7 presents the empirical results on this issue.

In Table 2.7, we specify three alternative models, all capturing different measures of household welfare. Model 1 presents the estimated effect of access to credit on (log) household consumption expenditure per adult equivalent while Models 2 and 3 presents the results on the effect of access to credit on (log) household food expenditure per adult equivalent and on household poverty status, respectively. Similar to our earlier estimated outcomes, we find that access to credit is associated with an improvement in household welfare. This is true in all our specifications and significant at the conventional levels of statistical significance. The gender of the household head, however, is significantly related with household welfare only in Model 3. The finding therein suggests that relative to female-headed households, households that are headed by males have better welfare levels.

Now, turning to the issue of most interest in this part of the paper, we observe that the interaction term (i.e.  $\text{Sex\_head} * \text{Access\_credit}$ ) significantly explains household welfare, albeit in only two specifications (i.e. Models 2 and 3); the sign of the interaction term in the two

specifications are not in conflict. Apparently, this is an indication of the presence of the role of gender in the effect of access to credit on household welfare.

**Table 2.7: Gender and the effect of access to credit on household welfare**

VARIABLES	Model 1	Model 2	Model 3
	Total cons. Exp.	Total Food Exp.	Poverty status
<i>Dependent variable: Household welfare</i>			
Access_credit ( <i>Base: No credit</i> )	0.801*** (0.169)	0.901*** (0.178)	-0.180** (0.079)
Age_head	0.145*** (0.017)	0.150*** (0.017)	-0.027*** (0.008)
Age_head2	-0.048*** (0.010)	-0.057*** (0.011)	0.008* (0.005)
Household size	-0.158*** (0.020)	-0.193*** (0.021)	0.109*** (0.009)
Sex ( <i>Base: Female</i> )	0.038 (0.147)	0.073 (0.155)	-0.396*** (0.069)
Access_credit*Sex_head	-1.237 (1.122)	-2.679** (1.182)	2.054*** (0.524)
<b><i>Educational attainment (Base: No education)</i></b>			
Basic education	0.001 (0.079)	0.033 (0.083)	-0.005 (0.037)
Secondary education	0.049 (0.100)	0.111 (0.105)	-0.043 (0.047)
Post-secondary education	0.201 (0.167)	0.237 (0.176)	-0.172** (0.078)
Tertiary education	0.694*** (0.124)	0.797*** (0.131)	0.114** (0.058)
<b><i>Occupation (Base: Agriculture)</i></b>			
Industry	-0.057 (0.201)	-0.086 (0.212)	-0.168* (0.094)
Service	0.318** (0.153)	0.216 (0.161)	-0.102 (0.071)
Urban ( <i>Base: Rural</i> )	0.317** (0.144)	0.062 (0.151)	-0.058 (0.067)
Constant	-0.612*** (0.145)	-0.630*** (0.153)	0.391*** (0.068)
Observations	428	428	428
R-squared	0.993	0.991	0.913
Region FE	YES	YES	YES
Cohort FE	YES	YES	YES
Year FE	YES	YES	YES
Adjusted R-squared	0.990	0.987	0.868
F-statistic	294.5	219.5	20.56

*Notes: Robust standard errors are in parenthesis; Models 1, 2 and 3 are estimated using the WLS technique; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ; the dependent variable in Model 1 is (log) household total consumption expenditure per adult equivalent; the dependent variable in Model 2 is (log) household total food expenditure per adult equivalent; the dependent variable in Model 3 is household poverty status; all the estimations control for region, cohort and year fixed effects.*

Considering the results in Model 2 of Table 2.7, for example, the negative sign of the interaction term suggests that the positive effect of access to credit on household welfare is higher for female-headed households than for male-headed households. This implies that the welfare enhancing effect of access to credit is higher when the credit recipient household is headed by a female than by a male. This is consistent with the findings of Khandker & Samad (2014) for Bangladesh wherein the authors established that the effect of credit on welfare is higher for female borrowers than for their male counterparts. However, our findings on the role of gender in the welfare consequences of access to credit contradicts those of Nanziri (2016) for South Africa wherein the authors showed that male users of financial services benefit disproportionately more than female users of financial services in South Africa.

## 2.7 Access to Credit and Household Welfare: A Potential Endogeneity Problem?

Up to now, this paper has assumed away the potential endogeneity of access to credit in the model of household welfare. While the endogeneity problem could arise from three main sources, namely, measurement error, misspecification and simultaneity, we believe that the issue of simultaneity is chiefly responsible for the potential endogeneity problem in this case (see Johnson & Nino-Zarazua (2011) for a discussion on the important role of welfare/wealth on access to financial services). Indeed, there is reason to believe that well-to-do households are relatively more likely to obtain better access to credit. Using the pseudo panel data, we follow the precedence of the paper by Inoue (2008), published in the *Journal of Econometrics*, in specifying a linear dynamic version of Equation (2.6) as follows:

$$\begin{aligned} \bar{y}_{ct} &= \delta \bar{y}_{c,t-1} + \beta \overline{Credit}_{ct} + \gamma \bar{X}_{ct} + \bar{\alpha}_c + \bar{u}_{ct}, \quad |\delta| < 1; \quad c = 1, \dots, C; \quad t \\ &= 1, \dots, T, \end{aligned} \quad (2.7)$$

where  $\bar{y}_{c,t-1}$  is the lagged value of  $\bar{y}_{ct}$  and all other variables maintain their usual meaning. Following the suggestion by Inoue (2008), we estimate Equation (2.7) using the Generalised Method of Moments (GMM) technique,<sup>20</sup> which aside from effectively handling the endogeneity problem, also permit us to account for cohort-specific effects and to incorporate all available information in the cross section as well as the time series dimension (see Yang, 2008; see also Inoue (2008) for a comprehensive discussion on the application of the GMM procedure in pseudo panel data settings). Specifically, since the time dimension of our panel structure is short, we employ the ‘system GMM’ estimation technique (see Blundell & Bond, 1998) and the STATA routine used to execute this is the ‘xtabond2’ procedure introduced by Roodman (2009). This procedure allows us to check for the validity of the internal instruments used in the model; the Hansen J statistic (which is an alternative to the Sargan test in the context of system GMM is reported for this purpose.<sup>21</sup>

Table 2.8 presents the results from the dynamic pseudo panel estimation. Specifically, we assess the effect of access to credit on household welfare using the full sample and disaggregated samples for poor and non-poor households. The empirical results of the full sample estimation are presented in Model 1 of Table 2.8 while that for the sub-sample estimations are presented in Model 2 of Table 2.8. Further, in the full sample estimation, two different measures of household welfare – that is, (log) household consumption expenditure per adult equivalent, (log) household food expenditure per adult equivalent – are employed. However, the disaggregated sample estimations utilise the (log) household consumption

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<sup>20</sup> See Arellano & Bond (1991), Arellano & Bover (1995) and Blundell & Bond (1998) for a detailed exposition of this technique.

<sup>21</sup> Note that one could account for the endogeneity problem of access to credit in a model of household welfare by relying on other estimation techniques such as the two stage least squares (2SLS); these techniques, however, requires the availability of valid external instruments. Sadly, however, in most socio-economic research endeavours, getting valid external instruments both from theoretical and empirical viewpoints is often difficult. Thus, the GMM technique comes handy in such instances given that it relies on internal instruments.

expenditure per adult equivalent as a measure of household welfare. The empirical results on the effect of access to credit on household welfare in the dynamic panel estimation are qualitatively similar to those obtained in the static panel estimation (see columns I and II of Table 2.8). Specifically, the dynamic panel estimation results suggest strongly that the alleviation of credit constraints improves household welfare. This relationship is significant at the conventional levels of statistical significance. Thus, the important welfare enhancing effect of access to credit is robust to the control of the potential endogeneity bias in an analysis of the relationship between access to credit and household welfare.

**Table 2.8: Effect of access to credit on household welfare: dynamic panel estimation**

VARIABLES	Model 1 (Full sample)		Model 2 (Disaggregated samples)	
	I Total cons. Exp.	II Total Food Exp.	III Poor HH	IV Non-poor HH
Access_credit ( <i>Base: No credit</i> )	0.436*** (0.129)	2.463** (0.996)	2.689*** (0.412)	1.984*** (0.182)
Age_head	0.410*** (0.021)	-0.230 (0.263)	0.229** (0.098)	0.201*** (0.035)
Household size	-0.170*** (0.039)	-0.264 (0.250)	-0.078 (0.156)	-0.297*** (0.052)
Sex ( <i>Base: Female</i> )	0.094 (0.310)	0.714 (1.823)	-4.058 (2.347)	-0.523 (0.430)
<b><i>Educational attainment (No education)</i></b>				
Basic education	0.428 (0.663)	-4.625 (3.796)	5.883*** (1.882)	-0.449 (0.322)
Secondary education	0.268 (0.593)	-5.410 (4.435)	5.631*** (1.777)	-0.453 (0.343)
Post-secondary education	0.279 (0.576)	-3.672 (3.879)	5.516** (2.163)	0.102 (0.428)
Tertiary education	0.177 (0.612)	-6.929 (5.547)	7.072*** (1.798)	0.894** (0.428)
<b><i>Occupation (Base: Agriculture)</i></b>				
Industry	0.567* (0.338)	-2.473 (2.212)	-1.799 (1.562)	-0.701 (0.513)
Service	0.572* (0.314)	0.081 (2.007)	-6.184*** (1.724)	0.762* (0.424)
Urban ( <i>Base: Rural</i> )	0.106 (0.355)	3.664 (3.267)	5.902*** (1.518)	-1.442*** (0.465)
Observations	88	197	27	170
Number of cohorts	88	111	19	99
Region FE	YES	YES	YES	YES
F statistic	2741	6.807	1529	237.5
Hansen J statistic (p-values)	0.174	0.766	0.991	0.234

*Notes: Robust standard errors are in parenthesis; Models 1 present the full sample estimations while Model 2 presents the household poverty status disaggregated estimations; All the specifications are estimated using the system-GMM estimation technique; The null hypothesis of Hansen J statistic is that the instruments are valid; \*\*\**

*p*<0.01, \*\**p*<0.05, \**p*<0.1; the dependent variable in column I is (log) household total consumption expenditure per adult equivalent; the dependent variable in column II is (log) household total food expenditure per adult equivalent; the dependent variable in columns III & IV is (log) household total consumption expenditure per adult equivalent; all the estimations control for region fixed effects.

Similarly, the household poverty status disaggregated estimations reveal that access to credit improve household welfare; but the effect is higher for poor households than non-poor households. This clearly illustrates the importance of access to credit on household welfare, especially for poor households. This result is consistent with our findings from the static panel data estimations; refer to Table 2.6. We test for over-identifying restrictions (i.e. Hansen J statistic) in all our specifications and the results on this are reported in Table 2.8. The P-values of the Hansen J statistic in all our specifications are all insignificant at the conventional levels of statistical significance, indicating that our instruments (internal) are valid and reliable.

In sum, the empirical results presented in this paper, thus far, indicate clearly that access to credit has a strong positive influence on household welfare, and this is true irrespective of the measure of household welfare used and whether the potential endogeneity problem between access to credit and household welfare is accounted for or not. More specifically, our results suggest that access to credit improves household consumption expenditures. Further, access to credit reduces the probability of a household being poor and the extent of welfare inequality among poor households. Broadly, the findings in this paper confirms the observations made by earlier scholars regarding the important role of access to credit, and more generally, access to finance in reducing poverty and inequality (see Geda et al., 2006; Mahjabeen, 2008; Imai et al., 2010; Islam, 2011; Khandker & Samad, 2014).

## 2.8 Robustness Checks

We test the robustness of our pseudo panel data estimates on the effect of access to credit on household welfare by using two other types of data structures – that is, a pooled cross-sectional data set drawn from four waves of the GLSS (that is, GLSS 3, 4, 5 and 6) and the various cross-sectional GLSS data sets. In principle, we estimate models similar to those estimated in our pseudo panel model on the welfare effects of access to credit using both a pooled cross-sectional data and four independent cross-sectional data sets. Given that our chosen proxies for household welfare are both continuous and binary, we run simple OLS and binary probit regressions. The results from this exercise are presented in Table 2.9. Model I present estimates of the effect of access to credit on household total consumption per adult equivalent while Model II present estimates of the effect of access to credit on household food consumption expenditure per adult equivalent. Model III reports the marginal effects of the influence of access to credit on the probability of a household being poor.

Overall, the results show strongly that access to credit matters for household welfare, rendering credence to our pseudo panel estimates. Specifically, we find that access to credit improves household total consumption expenditure by over 9% compared to non-access to credit in the pooled cross-sectional estimation. This is statistically significant at the 1 percent level (see Model I of Table 2.9). Also, access to credit increases household food consumption expenditure by approximately 6% and reduces the likelihood of a household falling into poverty by about 5%. More importantly, the estimates from the pooled cross-sectional estimations are robust to the inclusion of survey year dummies. Further, the results from the separate cross-sectional estimates broadly supports our pseudo panel results. For example, relative to households without access to credit, households with access to credit have about 22.8 percent more total consumption expenditure in 2012/13. In general, therefore, the results from the pooled cross-

sectional estimations and the independent cross-sectional data models are qualitatively similar to those from our pseudo panel data models.

**Table 2.9: Effect of access to credit on household welfare: Pooled and cross-sectional estimates**

	I	II	III
	Total cons. Exp.	Total Food Exp.	Poverty status
<b>Pooled cross section estimation</b>			
Access_credit ( <i>Base: No credit</i> )	0.091*** (0.011)	0.058*** (0.012)	-0.046*** (0.007)
Dummy for GLSS 4	0.132*** (0.017)	0.179*** (0.017)	-0.038*** (0.009)
Dummy for GLSS 5	0.361*** (0.016)	0.300*** (0.016)	-0.130*** (0.009)
Dummy for GLSS 6	3.126*** (0.024)	2.942*** (0.025)	-0.119*** (0.008)
<b>Independent cross sections estimations</b>			
<i>1991/92 survey</i>			
Access_credit ( <i>Base: No credit</i> )	0.039* (0.023)	0.010 (0.023)	-0.013 (0.022)
<i>1998/99 survey</i>			
Access_credit ( <i>Base: No credit</i> )	0.077*** (0.018)	0.037* (0.019)	-0.030** (0.014)
<i>2005/06 survey</i>			
Access_credit ( <i>Base: No credit</i> )	0.117*** (0.017)	0.098*** (0.018)	-0.061*** (0.007)
<i>2012/13 survey</i>			
Access_credit ( <i>Base: No credit</i> )	0.228*** (0.020)	0.108*** (0.021)	-0.055*** (0.007)

*Notes: Robust standard errors are in parenthesis; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .*

However, it is worth mentioning that relative to the estimated effects from the pseudo panel data models, the estimates from both the pooled cross-sectional data models and the independent cross-sectional data models largely underestimates the effect of access to credit on household welfare. For instance, unlike in the pseudo panel data estimations wherein the magnitude of the effect of access to credit on households' total consumption expenditure and total food consumption expenditure stood at about 64 percent and 56 percent, respectively, we observe that access to credit only has a modest effect on household welfare within the pooled cross-sectional data models and the separate cross-sectional data models (see Table 2.9). This finding suggests that even though the welfare enhancing effect of access to credit is not in

doubt regardless of the data structure that is used to evaluate the issue, the extent to which access to credit influences household welfare varies across data structures.

## **2.9 Concluding Remarks**

This chapter sheds light on the importance of access to credit on household welfare. Using a pseudo panel data set constructed from four waves of the GLSS (i.e. GLSS 3 – 6). Aside the conventional measures of welfare (namely, household total consumption expenditure, per adult equivalent), we also constructed additional measures of household welfare using the FGT class of poverty indices. We apply a number of estimation techniques, including the WLS, EIV and the system-GMM, to ensure the robustness of our estimates. Household poverty status disaggregated models are also estimated with a view of shedding more insights on the heterogeneous effect of access to credit on the welfare of poor and non-poor households.

On the whole, our results suggest that access to credit leads to an improvement in household welfare. In particular, access to credit relates positively to household total consumption expenditures and household food expenditure while it is negatively associated with the likelihood of a household being poor. It is also negatively related to the poverty gap and the square of the poverty gap measures, indicating that access to credit does not only reduce the likelihood of falling into poverty, it also reduces both the extent of poverty and the degree of inequality among the poor. These findings suggest that the alleviation of the credit constraints of households, notably the poor, has an important positive effect on household welfare.

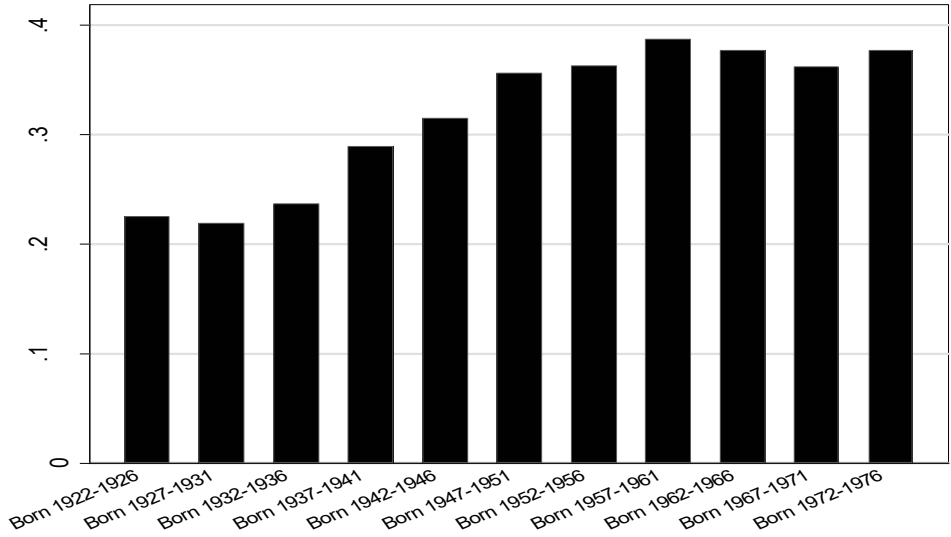
However, the magnitude of the positive effect of access to credit on household welfare is heterogeneous both across the gender of the household head and across households with different levels of economic welfare. In particular, female-headed households benefit relatively

more from access to credit than male-headed households while access to credit disproportionately benefits poor households more than economically better-off households; indicating that credit could be a source of convergence in welfare across households. Following the results of this paper, we offer some recommendations for future policy action: First, given our strong positive result on the welfare enhancing role of access to credit, especially for the poor and vulnerable, we recommend that the efforts to deepen access to financial services (especially credit) by the poor, in particular, should be strengthened. This will go a long way to bridge the income gap between the poor and the rich.

As well, given that borrowing from the informal financial markets still assumes the lion share in households' loan portfolio in Ghana, policy makers and industry regulators (that is, the Central Bank of Ghana) must strengthen the regulation of the Ghanaian financial sector by taking steps to meaningfully rope in the informal financial market operators (such money lenders) into the regulated formal financial sector. A potential limitation, however, of this paper is that it does not account for the source of credit in investigating the effect of credit on household welfare due to data limitations. The source of credit (that is, whether formal or informal; or more specific sources such as loans from microfinance institutions or friends and relatives) may matter in the extent to which access to credit influences household welfare given the potential variation in the ease and the management of credit from various sources. As noted earlier, it is often easy to access credit from informal sources such friends and relatives compared to formal sources (such as banks). As such, future studies that seeks to unravel this issue can be a sound course to chart.

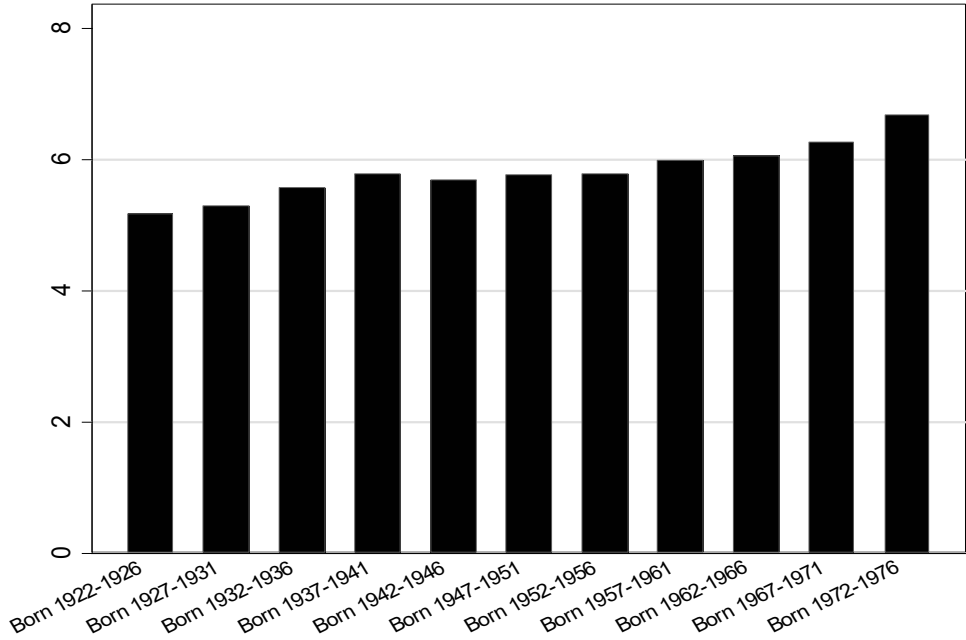
Appendix to Chapter Two

Figure 2.1A: Access to credit, by the year of birth cohort of household head



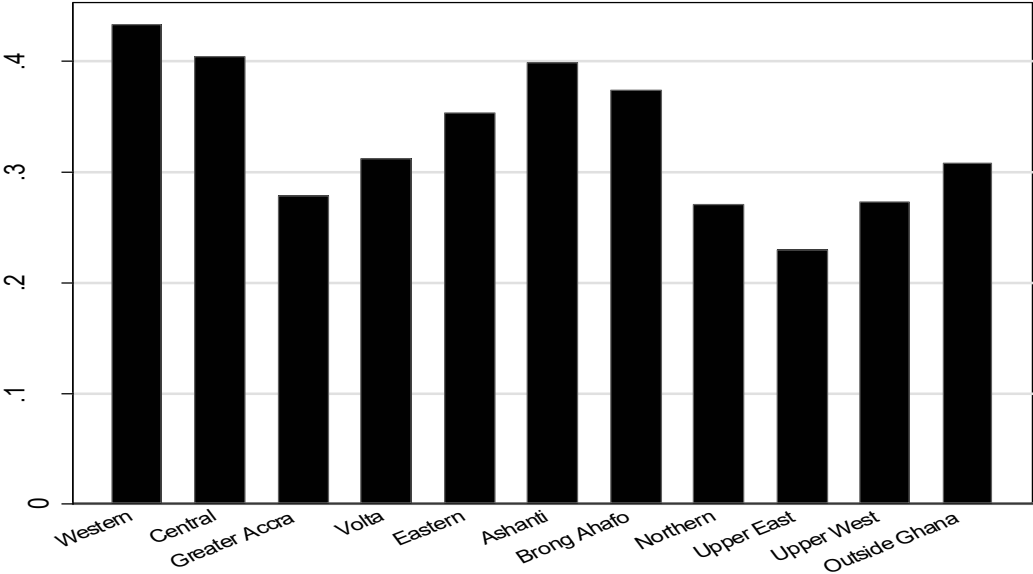
Source: Authors' computation based on GLSS data

Figure 2.2A: Average household welfare (logarithm), by the year of birth cohort of household head



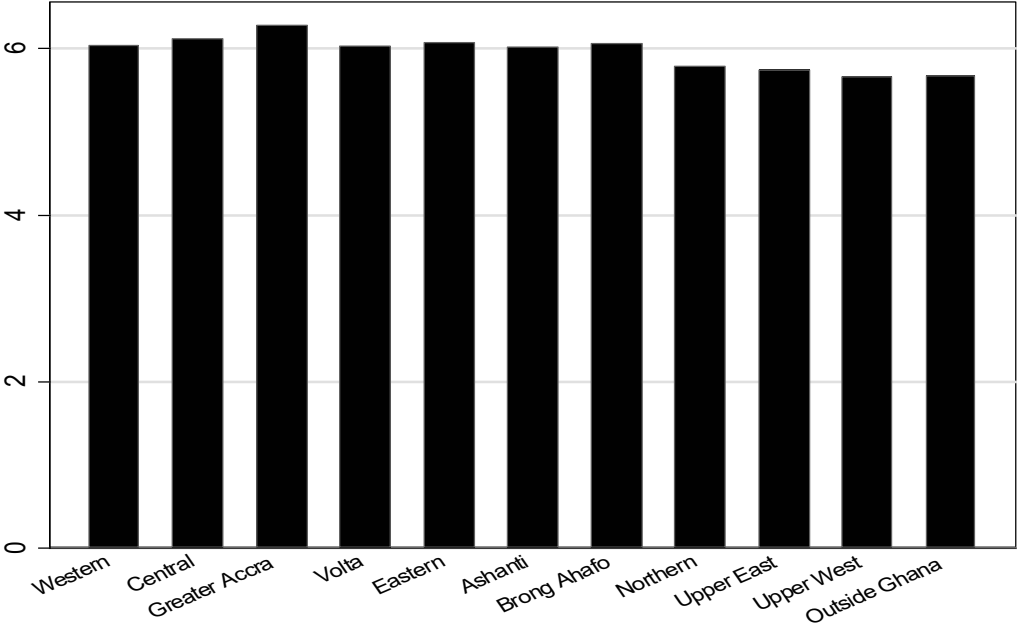
Source: Authors' computation based on GLSS data

**Figure 2.3A: Access to credit, by the region of birth of household head**



Source: Authors' based on GLSS data

**Figure 2.4A: Average household welfare (logarithm), by the region of birth of household head**



Source: Authors' computation based on GLSS

**Table 2.1A: Descriptive statistics of weighted regression variables, based on GLSS 3 – 6**

Variable	Description	Mean	Std. Dev.	Range
<i>Measures of household welfare</i>				
lfoodx	This is the log of household total food expenditure per equivalent adult and adjusted for variations in prices across households.	0.424	0.26	0.17 – 2.17
lwelfare	This is the log of household total consumption expenditure per equivalent adult and adjusted for variations in prices across households.	0.468	0.27	0.19 – 2.31
Poverty status	This is a binary measure of household poverty status and it assume a value of 1 if poor and zero otherwise.	0.032	0.03	0 – 0.29
<i>FGT measures of welfare (Based on upper poverty line)</i>				
P <sub>0</sub>	This is a poverty incidence measure and it is computed using the upper poverty line.	0.032	0.03	0 – 0.29
P <sub>1</sub>	This is a poverty gap measure and it is computed using the upper poverty line.	0.012	0.01	0 – 0.09
P <sub>2</sub>	This is a poverty gap square measure and it is computed using the upper poverty line.	0.006	0.01	0 – 0.07
<i>FGT measures of welfare (Based on lower poverty line)</i>				
P <sub>0</sub>	This a poverty incidence measure and it is computed using the lower poverty line.	0.02	0.03	0 – 0.19
P <sub>1</sub>	This a poverty gap measure and it is computed using the lower poverty line	0.007	0.01	0 – 0.08
P <sub>2</sub>	This is a poverty gap square measure and it is computed using the lower poverty line.	0.003	0.01	0 – 0.06
Access_Credit	This is a binary measure of household access to credit. It takes a value of 1 if a household has access to credit and zero otherwise	0.031	0.03	0 – 0.29
Age_head	This captures the age of the household head.	5.04	3.94	0.86 – 25.98
Age_head/100	This captures the square of the age of the household head divided by 100.	3.23	3.34	0.17 – 23.38
Household size	This captures the size of a household.	0.381	0.23	0.06 – 1.73
Sex	It captures the gender of the head of a household. It assumes a value of 1 if a household is headed by a male and zero otherwise.	0.059	0.04	0 – 0.29
No education	It measures the educational attainment of the household head. It takes a value of 1 if the head has no education and zero otherwise.	0.01	0.03	0 – 0.2
Basic education	It measures the educational attainment of the household head. It takes a value of 1 if the head has basic education and zero otherwise.	0.031	0.04	0 – 0.29
Secondary education	It measures the educational attainment of the household head. It takes a value of 1 if the head has secondary education and zero otherwise.	0.02	0.03	0 – 0.19
Post-secondary education	It measures the educational attainment of the household head. It takes a value of 1 if the head has post-secondary education and zero otherwise.	0.01	0.01	0 – 0.14
Tertiary education	It measures the educational attainment of the household head. It takes a value of 1 if the head has tertiary education and zero otherwise.	0.014	0.02	0 – 0.22
Agriculture	It captures the sector of employment of the household head. It takes a value of 1 if the head employed in the agricultural sector and zero otherwise.	0.054	0.04	0 – 0.29

*Continued**Next Page*

**Table 2.1A Continued**

<b>Variable</b>	<b>Description</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Range</b>
Industry	It captures the sector of employment of the household head. It takes a value of 1 if the head employed in the industrial sector and zero otherwise.	0.01	0.01	0 – 0.12
Services	It captures the sector of employment of the household head. It takes a value of 1 if the head employed in the services sector and zero otherwise.	0.022	0.03	0 – 0.29
Urban	It measures the geographical location of a household. It takes a value of 1 if the household is located in an urban area and zero otherwise.	0.029	0.03	0 – 0.29
<i>Regional dummies</i>				
Western	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Western region and zero otherwise.	0.01	0.02	0 – 0.17
Central	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Central region and zero otherwise.	0.006	0.02	0 – 0.11
Greater Accra	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Greater Accra region and zero otherwise.	0.012	0.03	0 – 0.19
Volta	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Volta region and zero otherwise.	0.009	0.03	0 – 0.29
Eastern	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Eastern region and zero otherwise.	0.007	0.02	0 – 0.12
Ashanti	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Ashanti region and zero otherwise.	0.009	0.02	0 – 0.12
Brong Ahafo	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Brong Ahafo region and zero otherwise.	0.01	0.03	0 – 0.29
Northern	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Northern region and zero otherwise.	0.008	0.02	0 – 0.14
Upper East	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Upper East region and zero otherwise.	0.007	0.23	0 – 0.19
Upper West	It measures the geographical location of a household. It takes a value of 1 if the household is located in the Upper West region and zero otherwise.	0.007	0.02	0 – 0.18

*Note: The lower and upper poverty lines are set at C792.05 and C1,314.00 respectively; All variables are weighted using  $w=1/(\text{size of cohort})^{0.5}$ .*

**Table 2.2A: Sources of household credit, GLSS 6**

<b>Sources of household credit</b>	<b>Percent</b>
Formal	37.44
Informal	60.35
Both	2.21
<b>Total</b>	<b>100</b>

## CHAPTER THREE

### THE WELFARE EFFECTS OF FINANCIAL INCLUSION IN GHANA: AN EXPLORATION BASED ON A MULTIDIMENSIONAL MEASURE OF FINANCIAL INCLUSION

#### 3.0 Introduction to Chapter Three

In this chapter, we present the second empirical paper of the thesis. The study attempts to examine the welfare effects of financial inclusion with financial inclusion measured multidimensionally using four main dimensions of financial inclusion. Using a nationally representative household survey data from the sixth round of the GLSS, the study first computes a multidimensional index of financial inclusion and then examine the effect of financial inclusion on household welfare. The chapter is structured into seven sections: Section 3.1 presents the introduction to the study; Section 3.2 provides a brief overview of access to financial services and welfare in Ghana while Section 3.3 discusses the related theoretical and empirical literature. Section 3.4 provide an overview of the data, the construction of the financial inclusion index and the empirical model that underpins the study's empirical analysis. Section 3.5 details the empirical estimation strategy adopted in the study while Section 3.6 presents the empirical results of the study. Section 3.7 concludes the chapter.

#### 3.1 Introduction to Paper II

*“Financial inclusion is important for improving the living conditions of poor farmers, rural non-farm enterprises and other vulnerable groups”*

(Dev, 2006; pp. 4310).

The global development agenda now focuses on sustainable development that is anchored on inclusive growth – that is, growth that benefits all. Financial inclusion, which can be defined

as the provision of formal financial services, including but not limited to payments, credit, savings and insurance facilities, to all, without discrimination, is considered critical in reducing poverty and achieving inclusive economic growth (Cnaan et al., 2012; Arora, 2014; Beck, 2015; Fungacova & Weill, 2015). Klapper et al. (2016), for instance, argues compellingly that the attainment of the post-2015 development agenda (that is, the Sustainable Development Goals (SDGs)) – which, among others, aims at *eradicating extreme poverty for all people everywhere by 2030* – would be difficult without promoting meaningful access to financial services by all. Indeed, financial inclusion has been perceived in a manner akin to access to basic needs such as water, basic education, and health services (Mehrotra et al., 2009). Access to financial services enables households to smooth consumption, manage risk, build assets, absorb financial shocks, and enhance their income earning potential (see Dupas & Robinson, 2013; Bruhn & Love, 2014). Access to financial services therefore leads to an improvement in household welfare (Danquah et al., 2017; Quartey et al., 2017).

The recognition of the crucial role of financial inclusion in economic development ignited the interest of policymakers across the world including multinational institutions and governments to undertake steps to promote financial inclusion; examples of such efforts include, the Maya Declaration on Financial inclusion, the G-20 Financial Inclusion Action Plan, and the World Bank’s strategic plan on the achievement of inclusive access to financial services by 2020. There are also country-level strategies that has been undertaken to promote financial inclusion; some of which include, the government of Ghana in collaboration with a number of development partners<sup>22</sup> implemented the Rural and Agricultural Finance Programme (RAFiP)

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<sup>22</sup> Among others, the development partners include, the International Fund for Agricultural Development (IFAD), the Italian government, the World Bank, and the African Development Bank (see [www.ifad.org/web/operations/project/id/1428/country/ghana](http://www.ifad.org/web/operations/project/id/1428/country/ghana)).

in 2008 with the primary goal of enhancing the access of the rural and agricultural population to sustainable formal financial services.

Similar efforts elsewhere include: the Community Reinvestment Act (1997) introduced in the United States which required banks to offer credit to all persons within their operational areas without discrimination; the Law of Exclusion (1998) which was passed in France to promote the right of every individual to a bank account; the constitution of a ‘Financial Inclusion Task Force’ in the United Kingdom in 2005 to monitor developments on financial inclusion; the introduction of a zero balance or low cost bank account termed a ‘no-frills’ bank account in India and ‘Mzansi’ account in South Africa to provide access to bank accounts by financially excluded poor persons. Also, the promulgation of several laws in the financial landscape in most countries that help to regulate the operations of alternate financial institutions such micro-finance institutions contributes to broaden access to reliable financial services, especially by the excluded.<sup>23</sup>

On the back of these developments, there has been a tremendous improvement in the level of financial inclusion both globally and within countries, notably among countries in the developing world. Recent estimates from the Global Findex Database show that about 69 percent of adults, globally, are financially included in 2017; with only 1.7 billion adults in the world deemed financially excluded. This estimate represents an increase of about 7 percentage points from its 2014 level and about 18 percentage points higher than its 2011 level (Demirgüç-Kunt et al., 2018). In Ghana, about a-third of the adult population own a bank account (InterMedia-CGAP, 2015).

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<sup>23</sup> Kenya’s MPESA initiative (a mobile phone-based money transfer service, payments and micro-financing service) which was launched in 2007 has also improved access to financial services.

In spite of the tremendous attention paid to the issue of financial inclusion and policies designed to promote it, surprisingly, there seems to be very little micro-level evidence that exploits the multifaceted nature of financial inclusion to examine the welfare effects of financial inclusion. The literature is however not bereft of studies examining the impact of some of the dimensions of financial inclusion, notably access to credit, on household welfare (see, for example, Khandker, 2005; Banerjee et al., 2010; Karlan & Zinman, 2010). Available macro-level evidence however suggests that the level of financial inclusion or financial sector development in a country is negatively associated with the extent of poverty and inequality in that country. That is, countries with greater levels of financial inclusion tend to exhibit lower levels of poverty and inequality (see Beck et al., 2007; Park & Mercado Jr, 2015; Neaime & Gaysset, 2018). However, these macro-level studies importantly tend to overlook the impressive amount of heterogeneities that often exist across households and communities, thus potentially posing a challenge towards the design of targeted interventions. Essentially, therefore, an understanding of the relationship between financial inclusion and welfare in the context of such individual or household level heterogeneities would be crucial in the design of effective policy interventions.

Consequently, this study investigates the effect of financial inclusion on household welfare using micro-level data set. Specifically, we provide a micro-level evidence on the effect of financial inclusion on household welfare while accounting for household- and region –specific idiosyncrasies using a nationally representative household survey data from Ghana. More importantly, this study seeks to provide a comprehensive analysis of the welfare effect of financial inclusion by employing a multidimensional index of financial inclusion. This approach is important given that financial inclusion is a multidimensional phenomenon involving not just access to formal credit, but also access to other financial services such as

savings accounts, payments, and insurance facilities. Our approach involves the following: first, we follow Zhang & Posso (2017) to construct an index of financial inclusion which incorporates four dimensions of access to financial services (that is, access to transaction and payment services, savings facilities, credit facilities and insurance products) using household-level data. The approach used to compute the financial inclusion index is akin to the computational strategy adopted in the computation of the multidimensional poverty index (MPI); see Alkire & Santos (2010), for instance. Second, we then apply our index of financial inclusion on a number of welfare indicators with the goal of providing robust estimates of the effect of financial inclusion on household welfare.

This study contributes to the literature in several distinct ways. First, we construct a multidimensional index of financial inclusion using household survey data on access to various financial services to examine the relationship between financial inclusion and welfare at the micro-level. Second, dissimilar to the approach adopted in most of the earlier studies on this issue, we utilise both income- and consumption-based measures of household welfare in order to provide robust evidence on the welfare effect of financial inclusion. Further, based on our consumption measure of household welfare we derive the Foster-Greer-Thorbecke (FGT) (1984) class of poverty indices to provide evidence on the role of financial inclusion on not only the likelihood of households falling into poverty but also on the extent to which the poor are poor and the extent of inequality among the poor.

In addition, given the potential variation in the response of household welfare to financial inclusion across households at different levels of the income spectrum, we provide a household poverty status disaggregated analysis of the welfare effects of financial inclusion. Also, we exploit the important property of the Propensity Score Matching (PSM) estimation technique

to account for the potential endogeneity of financial inclusion and selectivity bias in our model of household welfare. Lastly, we provide some insights on the potential channels through which financial inclusion might influence household welfare – the focus here is on the examination of the effect of financial inclusion on both households’ farm and non-farm enterprise incomes.

The main findings of this study are: first, financially included households have higher levels of welfare compared to financially deprived households. Second, we observe that poor households experience much larger welfare effects of financial inclusion relative to non-poor households. This suggests that financial inclusion does not only improve household welfare, but it may also lead to reductions in income inequality. Third, we observe that financial inclusion reduces the likelihood of a household falling into poverty, but it does not affect both the extent to which the poor are poor and the degree of inequality among the poor. Finally, on the possible channels through which financial inclusion might impact household welfare, we show that financial inclusion impacts household welfare via its effect on households’ farm and non-farm enterprise incomes. However, access to formal credit does not significantly explain households’ agricultural incomes; a finding that could be explained by the fact that the operations of agricultural activities often have little or no connection with formal or semi-formal financial intermediaries in terms of access to credit, for instance. The results of this study are robust to alternative measures of the financial inclusion index, to the use of different cut-off points and to the control for potential endogeneity and self-selection bias.

### **3.2 An Overview of Access to Financial Services and Welfare in Ghana**

The financial system in Ghana is well diversified with a myriad of formal and informal financial intermediaries providing a wide range of financial services. The formal financial sector is however dominated by formal banks (known as deposit money banks (DMBs) with

some of them now offering new products and services including a ‘zero minimum balance savings account’, and mobile banking services that has a large potential of improving the level of financial inclusion. Also, the number of rural and community banks (RCBs) with representations largely in Ghana’s poor rural areas operate essentially to meet the banking needs of the rural poor. There are also a good number of non-bank financial institutions (NBFIs), including savings and loans companies, microfinance institutions (MFIs), and insurance companies that are strategically positioned to meet the financial need of persons at the margins of the society. Currently, Ghana is home to about 35 DMBs with an increased penetration of physical bank branches and Automated Teller Machines (ATMs) across Ghana, 71 NBFIs, 140 RCBs, and 319 MFIs.<sup>24</sup> As a consequence of the high rate of mobile phone subscription in Ghana<sup>25</sup>, Ghana’s mobile banking industry which offers a variety of services including payments and savings accounts is well developed and continues to grow; this is arguably one of the key drivers of financial inclusion in a developing country like Ghana (see Aker & Wilson, 2013).<sup>26</sup>

A report from the Financial Inclusion Insights survey for Ghana (InterMedia-CGAP, 2015) revealed that about half of adults in Ghana have registered accounts with banks, mobile money or non-bank financial institutions. Specifically, the report shows that about 34% of Ghanaian adults have a bank account in their own name while about one in every five adults in Ghana own a mobile money account. A sizeable proportion of Ghanaian adults have accounts with non-bank financial institutions. About 59% of adults in Ghana subscribes to an insurance

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<sup>24</sup> These figures are based on the latest Bank of Ghana compilation of the list of registered financial institutions in Ghana; see <https://www.bog.gov.gh/supervision-a-regulation/register-of-licensed-institutions> (Date accessed: 15/04/2018).

<sup>25</sup> About 9 out of every 10 Ghanaian adults owns a mobile phone while almost all (about 96%) adults in Ghana have access to a mobile phone (see InterMedia-CGAP, 2015).

<sup>26</sup> As of 2016, Ghana’s mobile money system was made up of about 136,769 registered mobile money agents with approximately 8,313,283 mobile money customers (Bank of Ghana, 2016a)

policy, while about 67% and 10% of Ghanaian adults save and borrow money respectively; among those who save money, majority (about 32%) of them keep their savings with a bank.

In terms of welfare, the incidence of poverty in Ghana has plummeted from over 50 percent in 1991/92 to about 23.4 percent in 2016/17 with the number of persons deemed poor in Ghana currently estimated at around 6.8 million (GSS, 2019). Despite this marked performance, however, significant geographical variations exist in the incidence of poverty in Ghana and also in the extent of poverty reduction over the years. The report from the latest wave of the GLSS show that the incidence of poverty in Ghana is still largely a rural phenomenon with about 40.7 percent of rural inhabitants being poor relative to only 10.3 percent for urban dwellers (GSS, 2019). Over the years the rural economy has consistently accounted for a larger share of the population living below the national poverty line, despite modest improvements over time. For instance, in 2012/13, while the rural population accounted for 50 percent of Ghana's population, it accounted for 78 percent of those in living in poverty (see GSS, 2014). This is consistent with previous poverty profile reports in Ghana based on the earlier rounds of the Ghana Living Standards Survey (1998/99 and 2005/06) wherein above 80 percent of the total population living below the poverty line in Ghana were living in rural areas.

Further, on the regional distribution of poverty incidence in Ghana, the GSS (2019) show that regional poverty incidence ranges from a low of 2 percent in the Greater Accra region to over 70 percent in the Upper West region, indicating significant spatial disparities in the incidence of poverty in Ghana. Indeed, the three Northern regions of Ghana (Upper East, Upper West and Northern regions) – which consists mainly savannah areas have the highest rates of poverty incidence in Ghana – contribute over 40 percent to national poverty incidence in 2016/17. Considering the Northern region, in particular, the GSS (2019) report revealed that the

Northern region recorded a poverty incidence of around 61 percent in 2016/17, representing about 10.7 percentage point increase from its 2012/13 level. Consequently, the Northern region accounts for 26 percent of the poor in Ghana, making the region the highest single contributor to the level of poverty in Ghana – this is not different from the observed trends in 2012/13 and 2005/06. There are also significant regional disparities in the incidence of income inequality in Ghana (Aryeetey et al., 2009). For instance, according to the GSS (2019) report, the income inequality index ranges from a low of 1.38 in the Greater Accra region to 2.79 in the Upper West region.

### **3.3 Related Literature**

#### *3.3.1 Defining financial inclusion*

The concept of financial inclusion has been defined variously, albeit, all the definitions are broadly expressed within the context of a larger issue of social inclusion/exclusion of certain groups of individuals from the mainstream of a society. Some renditions of the concept of financial exclusion in the literature are: Carbo et al. (2005) defined financial exclusion broadly as the inability (however occasioned) of some groups of the society to access the financial system. Conroy (2005, pp.53) referred to financial exclusion as “a process that prevents poor and disadvantaged social groups from gaining access to the formal financial systems of their countries.”

Similarly, Dev (2006, pp.4310) conceived financial inclusion as “the delivery of banking services at an affordable cost to the vast sections of disadvantaged and low-income groups.” Dev (2006) further asserts that regarding access to credit, the financially excluded are those households that are refused credit despite their demand for it. The author contends further that even though credit is the most important aspect of financial inclusion, financial inclusion goes

beyond access to credit to encompass access to other financial services such as savings, insurance, payment and remittance facilities provided by the formal financial system.

Sarma & Pais (2011, pp.613) defined financial inclusion as “a process that ensures the ease of access, availability and usage of the formal financial system for all members of an economy.”

More recently, Demirguc-Kunt & Klapper (2013) and the World Bank (2017) defined financial inclusion as access to useful and affordable financial products and services that satisfy the transactions and payments, savings, credit, and insurance needs of individuals and businesses.

Allen et al. (2016, pp.2) defined financial inclusion simply as “the use of formal accounts.”

Efobi et al. (2014, pp.104) defined financial inclusion as “an increasing access to formal financial services such as having a bank account and using credit and savings facilities of banks.”

Apparent in the above definitions of financial inclusion is the idea that financial inclusion is a complex phenomenon that has several dimensions – that is, access to transactions, savings, credit and insurance products provided by formal financial intermediaries. For the purpose of the empirical analysis in this paper we adopt the definition offered by Demirguc-Kunt & Klapper (2013) and the World Bank (2017) which clearly highlights the core dimensions of financial inclusion. Given the multifaceted nature of the concept of financial inclusion, it sounds to reason that an appropriate measure of financial inclusion would be one that incorporate this multidimensionality.

### *3.3.2 Financial inclusion and welfare: The transmission mechanism*

There is broad consensus that financial inclusion which entails access to safe, easy, and affordable financial services by the poor and disadvantaged groups is a pre-condition for

accelerating growth and reducing poverty and income inequality (Swamy, 2014). Financial inclusion facilitates greater savings mobilisation and increases the efficiency of investment as well as allows households to accumulate both human and physical assets (Pande et al., 2012). Theoretically, therefore, it is possible to identify several ways in which financial inclusion can impact household welfare. First, financial inclusion can improve household welfare by providing efficient savings opportunities to households which in turn increases household savings.

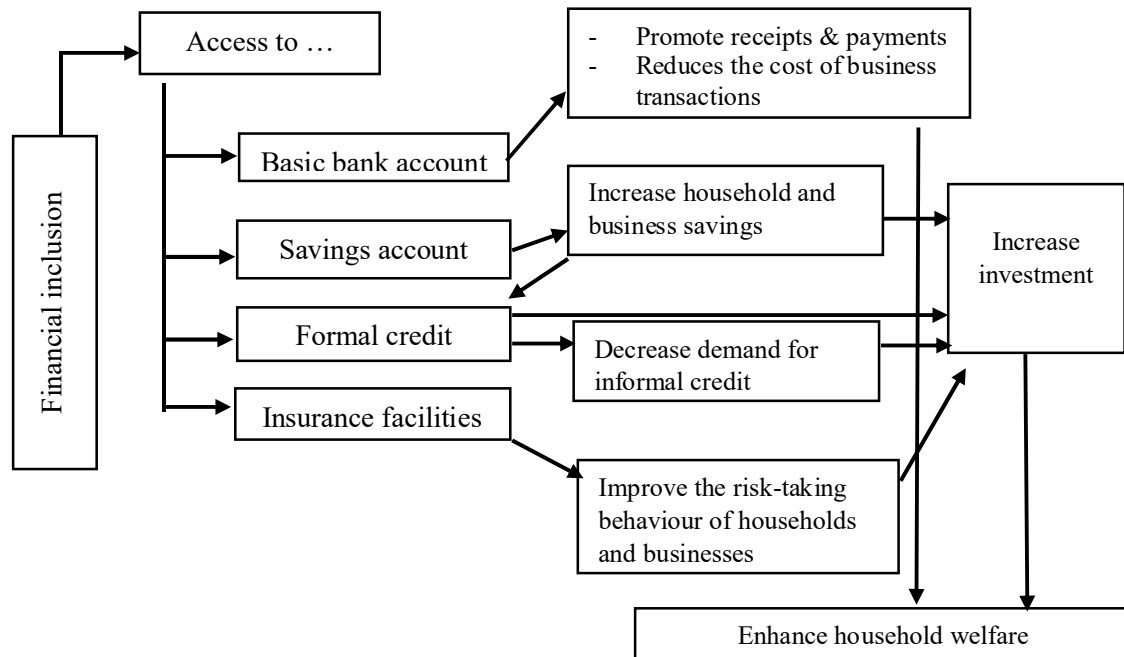
The extant literature suggests that access to savings instruments increases savings (see Ashraf et al., 2006). An increase in savings will potentially raise the amount of investible resources owned by a household which can positively impact household welfare. Second, by raising the volume of aggregate savings, financial inclusion is able to improve credit penetration, thereby enhancing the likelihood of hitherto excluded households to obtain access to credit. This may positively impact household welfare. In particular, by obtaining access to credit, households can invest in education, health and nutrition, and/or engage in new business creation or expand an existing business with potentially positive impacts on household welfare.

Third, by improving the availability of loanable funds, financial inclusion may more generally lead to a diversification of the loan portfolios of financial intermediaries and this may reduce the average credit risk of loans which then enhances the recycling of funds. This will lead to an increase in overall economic activity and hence an improvement in household welfare. Fourth, access to formal credit by households, notably the poor, may motivate them to reduce their demand for credit from informal sources such as money lenders that characteristically charge above market interest rates. Fifth, access to a formal bank account or a transaction account may facilitate households' business activities in terms of payment for goods and

services as well as receipt of payments for goods and services. It may also improve households' receipt of remittances. All this may contribute to an improvement in household welfare. A study by Lusardi (2010) show that having a bank account makes liquidity management and payments easy, and thus reduces the cost of business transactions.

Finally, by providing households with insurance facilities, financial inclusion allows households to invest in risky but profitable activities with potentially positive impact on household welfare. Access to financial services also enables households to react better to economic and health related shocks by providing households with liquidity support when such unexpected events occur, thus reducing households' vulnerability to poverty. Among low-income agricultural households, for instance, access to insurance facilities may prevent such households from falling into poverty when they are hit by shocks related to crop yield or commodity prices. It appears, however, that having a formal bank account serves as an entry key to the formal financial system since it facilitates the opening of a savings account, as well as access to credit and insurance facilities (see Fungacova & Weill, 2015). Rhine et al. (2006) argue that having a bank account can promote asset building and wealth creation with potentially positive effects on consumption smoothing during retirement or when faced with shocks. The above discussion is summarised in Figure 3.1.

**Figure 3.1: Schematic representation of the channels through which financial inclusion affects household welfare**



Source: Author's illustration (2018)

### 3.3.2 Financial inclusion and welfare: Empirical evidence

Empirical investigation of the relationship between financial development and/or financial inclusion and a wide range of development outcomes including poverty and inequality is well documented in the literature (see, for example, Jalilian & Kirkpatrick, 2005; Quartey, 2005; Sarma & Pais, 2011). Specifically, studies focusing on the broad-based provision of financial services to all persons including the poor – that is, financial inclusion – and its relationship with poverty show that access to financial services improves the welfare of the poor. For example, using state-level data from India, Burgess & Pande (2005) show that concerted efforts by the Reserve Bank of India to increase the level of financial inclusion through a rural bank branch expansion strategy that led to important reductions in rural poverty in India.

A new but growing literature, however, exists on the relationship between financial inclusion, measured multidimensionally, and development outcomes (see Sarma & Pais, 2011; Park & Mercado Jr, 2015; Zhang & Posso, 2017). Much of this literature, however, focuses on cross-country analysis of the relationship between financial inclusion and development outcomes (Sarma & Pais, 2011; Park & Mercado Jr, 2015). Park & Mercado Jr (2015) used data from 37 developing Asian economies to construct an index of financial inclusion for each country and then examine the impact of financial inclusion on poverty and income inequality. The authors establish that both poverty and income inequality are significantly negatively associated with financial inclusion.

Similarly, Sarma and Pais (2011) relied on data from 49 countries to examine the relationship between financial inclusion and development. The authors followed a method advanced earlier in Sarma (2008), to construct a multidimensional index of financial inclusion which assumes values lying between 0 and 1, where 0 represents complete financial exclusion and 1 represents complete financial inclusion in a country. Their multidimensional measure of financial inclusion utilised information on the three basic dimensions of financial inclusion, namely, accessibility, availability and usage of banking services. Using the multidimensional index of financial inclusion, the authors first examined the broad relationship between financial inclusion and human development. They observe that the extent of financial inclusion in a country is significantly positively associated with the level of human development, even though a few exceptions exist. More specifically, they find that income (proxied by GDP per capita) and income inequality are important determinants of financial inclusion in a country.

Dissimilar to the above studies, Zhang & Posso (2017) examined the welfare effects of financial inclusion (measured multidimensionally) using household-level data covering over

6200 Chinese households. Following the approach adopted by Alkire & Santos (2010) and Dotter & Klasen (2014) in the computation of the Multidimensional Poverty Index (MPI), the authors first computed a multidimensional measure of financial inclusion and then used this index to investigate the effect of financial inclusion on household welfare. The MPI is arguably one of the most prominent measures of household welfare which was developed by the United Nations Development Programme (UNDP) in 2010 to replace the Human Development Index (HDI). The MPI specifically measures households' deprivation in a multifaceted manner by focusing on three dimensions of welfare, namely, education, health and standard of living.

More specifically, Zhang & Posso (2017) identified four dimensions of financial inclusion, namely, access to a transaction account, access to savings, access to credit and access to insurance with each dimension having a weight of  $\frac{1}{4}$ . Using this, they arrived at a maximum deprivation score of 100 percent while each dimension had a maximum deprivation score of 25 percent. By adopting a cut-off of 50 percent (equivalent to  $\frac{1}{2}$  of the weighted indicators), the authors defined an index of financial deprivation which is a binary measure of financial inclusion and takes a value of 1 if a household is deprived (that is, if the deprivation score is greater than 50 percent) and zero otherwise. Using this index, the authors examined the effect of financial exclusion on household income.

Their empirical analysis employed the simple Ordinary Least Squares (OLS), the Quantile Regression and the Propensity Score Matching (PSM) estimation techniques. While using the index of financial exclusion as their main independent variable, the study included a host of other control variables including gender, age, marital status, ethnicity, family size, locality (rural versus urban), employment status and sector of employment, political party affiliation and educational attainment. Regarding the effect of financial inclusion on household income,

the authors observed that financial inclusion exerts a strong positive influence on household income and that low-income households benefit relatively more from financial inclusion than high and middle income households.

Notwithstanding the important contributions that these studies have made to the literature on the welfare effects of access to financial services, they are limited in several respects: First, most of the previous studies (see Jalilian & Kirkpatrick, 2005; Quartey, 2005; Sarma & Pais, 2011; Park & Mercado Jr, 2015) on the issue have sought to provide macro-level estimates of the effect of financial inclusion/financial sector development on poverty. An important challenge with these studies however is that they tend to overlook important dynamics in the underlying relationship that may exist at the household level, especially in the context of greater heterogeneities across households and communities. This potentially limits their usefulness in the design of targeted interventions. Second, even among studies that have relied on micro-level data to explore the effect of financial inclusion on welfare, most of them did not exploit the multifaceted nature of the concept of financial inclusion and so have at best provided only a partial view of the relationship between financial inclusion and welfare; an important exception however is the recent paper by Zhang & Posso (2017) wherein the authors constructed a multidimensional measure of financial inclusion and then analysed the impact of financial inclusion on household income using household finance survey data from China.<sup>27</sup>

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<sup>27</sup> There is a vast literature on the analysis of the of level financial inclusion within countries and the potential drivers of financial inclusion using country-level indicators of financial inclusion (see Beck et al., 2007; Sarma & Pais, 2011; Demirgüç-Kunt & Klapper, 2013; Allen et al., 2016). While most of these studies have often relied on single indicators of financial inclusion such as the number of bank accounts in a country, only a few studies have developed a multidimensional index of financial inclusion; for instance, Sarma (2008) used three dimensions of financial inclusion – that is, accessibility, availability and usage of banking services to construct a multidimensional index of financial inclusion while Chakravarty & Pal (2013), relied on six indicators of banking sector outreach to construct an index of financial inclusion.

The use of a multidimensional measure of financial inclusion – which captures information on multiple aspects of financial inclusion – to examine the welfare effects of financial inclusion is important because of the fact that an individual may be deprived in some dimensions of financial inclusion but not in others and so focusing on just a single dimension of financial inclusion (say, access to credit) may inappropriately capture the effect of financial inclusion on welfare. In addition, even for studies that have utilised a multidimensional approach to measure financial inclusion at the household level, they have focused on only household income as a measure of household welfare (see Zhang & Posso, 2017).

However, the use of household income as a measure of household welfare has been extensively challenged in the literature, mainly on the grounds that income may not necessarily capture the true economic status of a household given that households tend to smoothen consumption over time and so they may borrow to consume in the absence of income (Deaton, 1997; 2001). Hence, consumption-based measures have been touted as being relatively more representative in capturing the welfare of a household compared to income-based measures. Finally, to the best of our knowledge, no study has exploited the multifaceted nature of financial inclusion to provide a micro-level evidence on the welfare enhancing effects of financial inclusion using data from a sub-Saharan African (SSA) country. On the backdrop of the aforementioned limitations associated with the extant literature on the subject, this paper seeks to provide micro-level evidence on the impact of financial inclusion on welfare whilst exploiting both the multidimensional nature of financial inclusion and several measures of household welfare (including income and consumption-based measures) using a household survey data from Ghana.

### 3.4 Data and Empirical Model

The dataset used in this study comes from the sixth round of the Ghana Living Standards Surveys (GLSS 6). The GLSS are nationally representative household surveys with detailed information collected at the individual and household levels. To date, six rounds of the surveys have been conducted beginning in 1987/88. In particular, the GLSS commenced in 1987/88 and then in 1988/89 a second round of the survey was collected. Between 1988/89 and 2012/13, three waves of the survey were conducted (in 1991/92, 1998/1999 and 2005/06). The sixth round of the survey was conducted in 2012/13 and the seventh wave of the survey was conducted in 2016/17.<sup>28</sup>

The GLSS 6 covered a sample of 16,772 and 72,372 households and individuals, respectively. Detailed information on a number of socio-demographic and economic characteristics of individuals and households including, for instance, age and sex of individuals, educational attainment, household size, household income, household consumption expenditures, household poverty status, employment, access to financial services such credit, savings account, bank account, and insurance facilities. It also contains information on the source of credit. The presence of information on both household welfare indicators and a myriad of financial inclusion indicators available at the individual and household level provides an important avenue for the analysis of the impact of financial inclusion on household welfare.

To examine the welfare effects of financial inclusion, we specify a model of the form:

$$y_i = \beta Fin_i + \gamma X_i + \alpha_i + \varepsilon_i \quad (3.1)$$

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<sup>28</sup> The empirical analysis in this paper are however based on data from the sixth wave of the GLSS since the results were estimated several months before the final version of the survey data from the seventh wave of the GLSS become available.

where  $y_i$  is the dependent variable and it is a measure of the household  $i$ 's welfare; we proxy household welfare using a number of indicators, namely; (1) household annual consumption expenditure per adult equivalent, (2) household annual food expenditure per adult equivalent, and (3) household poverty status (1 if non-poor and 0 if otherwise). In spite of the inherent challenges associated with the use of income as a measure of welfare (as pointed out in Paper I), we include household income as an additional proxy of household welfare so as to enable us to compare the findings from this study with those of earlier scholars, who have mostly relied on household income as a measure of household welfare (see Zhang & Posso, 2017). Thus, our fourth measure of household welfare is household income. Household annual consumption expenditure per adult equivalent is measured in this paper as the sum of food and non-food consumption expenditures incurred by a household over a 12-month period and adjusted for price variations across regions and differences in household composition. Similarly, we measure household annual food consumption expenditure per adult equivalent as total household food consumption expenditures incurred over a 12-month period and adjusted for price variations across regions and differences in household composition.

Household income is measured as the total income earned by all household members over a 12-month period. It includes income from all possible sources such as agriculture, non-farm, self-employment, and wages, for instance. Household poverty status is a binary variable equal to 1 if a household's total annual consumption expenditure is higher than the moderate poverty line (i.e. GHC 1314.00) (see GSS, 2014). Further, in other estimations,  $y_i$  is measured using the FGT (1984) class of poverty indices; this index is discussed extensively in the previous paper of this thesis (i.e. Chapter two).  $Fin_i$  is our main independent variable and it is a measure of household  $i$ 's financial deprivation status (the computation of this index is discussed below), while  $X_i$  represents a vector of control variables that have been identified in the previous

literature as important correlates of household welfare (see Zhang & Posso, 2017). Among others, these variables include demographic variables (age of the household head and its square, the gender of the household head, the highest educational attainment of the household head, the occupation of the household head, and household size), contextual factors (urban versus rural); see, for instance, Danquah et al. (2017).  $\alpha_i$  captures a regional-level dummy variable that controls for regional-level fixed effects. Lastly,  $\varepsilon_i$  is the random error term.

### *3.4.1 Constructing an index of financial deprivation*

In this paper, we use the terms financial deprivation, financial exclusion and financial inclusion to describe access (or lack of access) to formal financial products and services. While financial deprivation or exclusion refers to the lack of access to formal financial products and services, the term financial inclusion, in contrast, indicates access to formal financial products and services. Hence, financial deprivation/exclusion is the direct opposite of financial inclusion.

We follow closely the methodological procedure used in the computation of the multidimensional poverty index (MPI) to compute an index of financial deprivation (Alkire & Santos, 2010; Dotter & Klasen, 2014; Zhang & Posso, 2017). Obviously, the measurement of a concept rests strongly on how it is conceptually defined. In this spirit therefore, we undertake to first provide a conceptual definition of financial inclusion (exclusion). As mentioned earlier, we define financial inclusion as access to useful and affordable financial products and services that satisfy the transactions and payments, savings, credit, and insurance needs of individuals (see Demirguc-Kunt & Klapper, 2013; World Bank, 2017).

This definition essentially highlights the multidimensional nature of the concept of financial inclusion and so any meaningful measure of financial inclusion should attempt to embrace the

multifaceted nature of the concept. It is clear from the conceptual definition of financial inclusion that there are about four dimensions of financial inclusiveness, namely, access to transactions and payment services, access to savings, access to credit, and access to insurance. Consequently, our measure of financial deprivation will make use of four dimensions – transactions and payment, savings, credit, and insurance – and, for each dimension, a relevant indicator(s) is identified as a measure.

The first dimension of financial inclusion is access to transaction and payment services. A plausible proxy for this component is a variable that provides information on whether or not any member in a household has access to a bank account. The second dimension of financial inclusion is access to savings facilities. This dimension can be represented by a variable that capture whether any member within a household has access to a savings product or account. Unlike the approach adopted by earlier scholars (Zhang & Posso, 2017, for instance), our approach captures not only access to a savings account or facility but more importantly it measures access to a savings account with a positive (or non-zero) balance.<sup>29</sup> The third dimension of financial inclusion is access to credit facilities. We represent this dimension by a variable that contain information on whether any member of a household has a loan from a formal financial institution. The last dimension of financial inclusion is access to insurance and it is represented by a variable that contain information on whether any member of a household has subscribed to an insurance facility.

A household, and therefore, all its members are financially deprived in a given indicator if no member of the household has access to that financial product or service. For instance, a

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<sup>29</sup> A simple tabulation of the data used in this paper suggest that among households with access to a savings account or product only 3.2% held a zero-balance savings account.

household is said to be deprived in access to credit if there is no member of that household who has access to a credit facility from a formal financial institution. Put differently, a household is considered non-deprived in access to credit, if there is at least one member of that household who has access to formal credit.

Given that each dimension is linked to an indicator and the cut-off for the indicators are specified, we now attach weights to each dimension of financial deprivation. Our strategy is to weight each dimension equally ( $\frac{1}{4}$ ). Since no dimension is represented by more than one indicator, it implies that each indicator has a weight of  $\frac{1}{4}$ . Given this, we compute, for each household, a deprivation score for each indicator. An overall deprivation score – which is the weighted sum of the deprivation scores for each indicator – is computed to give an idea of the extent to which a household is financially deprived. The overall deprivation score ranges from 0 to 100 and higher values indicates higher levels of financial deprivation.

We then compute a binary measure of financial deprivation (an index of financial inclusion, that is,  $Fin_i$  in Equation (3.1)) using a cross-dimensional cut-off of 50 per cent (equivalent to  $\frac{1}{2}$  of the weighted indicators) to classify households into financially deprived and non-deprived households.  $Fin_i$  is equal to 1 if a household is financially deprived and zero otherwise. Hence, a household is financially deprived or excluded if its deprivation score is higher than 50 per cent; the reverse is true. That is, households that lack access to at least two dimensions of financial inclusion are considered financially deprived. We check the robustness of this measure to the use of two other cut-offs; that is, 25 per cent and 75 per cent as well as to the exclusion of each of the four dimensions of financial inclusion, one at a time, in computing the financial deprivation index. Table 3.1 depicts the various dimensions of financial inclusion and the associated indicators.

**Table 3.1: Dimensions, indicators, deprivation cut-offs and weights**

Dimension (weight)	Indicator (weight)	Deprived if...
Transaction and payments (1/4)	Bank account (1/4)	No member of a household has a bank account
Savings (1/4)	Savings account (1/4)	No member of a household has a savings account
Credit (1/4)	Formal credit (1/4)	No member of a household has a loan from a formal financial institution
Insurance (1/4)	Insurance policy (1/4)	No member of a household subscribes to an insurance policy

The summary statistics of the variables used in the empirical analysis of this paper are presented in Table 3.1A (appendix). Regarding the key variables in this paper, we observe, for instance, that only 10% of sampled households are financially deprived while over 67% of households in the sample are non-poor.

### 3.5 Empirical Estimation Strategy

Given that we have set out to examine the effect of financial inclusion on household welfare using both continuous and binary variables as indicators of household welfare (as described in the previous section), the baseline estimation in this paper would employ two different estimation strategies; a simple Ordinary Least Squares (OLS) estimation technique and a binary probit estimation technique (see Wooldridge (2010) for a discussion of the salient properties of the OLS and the binary probit estimators). In particular, as a baseline estimation, therefore, we use the OLS estimation technique to examine the effect of financial inclusion on household welfare when the dependent variable is a continuous variable (household consumption expenditure, for instance) while the binary probit estimator is used to estimate the effect of

financial inclusion on a binary measure of household welfare (that is, household poverty status).

However, it is possible that Equation (3.1) might suffer from a potential endogeneity problem and issues of sample selectivity bias. Specifically, an endogeneity problem may exist because while households' welfare can be affected by their level of financial deprivation, as well, there is reason to suspect that households' level of financial deprivation can be reversely affected by their level of economic welfare. Indeed, it is plausible to assume that less economically endowed households are relatively more likely to be financially deprived than their economically better-off counterparts. Regarding the issue of sample selectivity bias, we believe that the problem of selection bias may arise due to the fact that individuals and/or households decide whether or not to participate in financial transactions, and these decisions may be driven by certain observable and/or unobservable factors peculiar to these households. For instance, the decision to take a loan from a formal financial institution may depend on the entrepreneurial drive of the individual (which is unobservable); thus, leading to issues of selection bias.

The presence of selection bias implies that one cannot obtain meaningful estimates of the impact of programme participation on a given outcome variable just by comparing the outcomes of programme participants and that of non-participants. Implicit in this, is the idea that programme non-participants may not serve as a good comparison group for those who have participated. Following the seminal work of Rubin (1974), the evaluation of programme impacts has been carried out within the counterfactual framework (also known as the *Rubin causal model*); see Austin (2011), Dehejia & Wahba (2002), and Imbens & Wooldridge (2009). Consequently, we adopt the counterfactual framework (presented below) to shed light on the impact of financial inclusion on household welfare.

The estimation of programme impacts begins with a counterfactual, where each household/individual has an outcome which is associated with and without programme participation (or treatment). To clarify ideas, let  $D_i$  be a binary indicator of programme participation for a given household (in this paper, household  $i$ 's financial deprivation status, equal to 1 if the household is financially deprived and zero otherwise).<sup>30</sup> Further, let  $Y_{i1}$  represent the outcome of that same household (in this paper, welfare of household  $i$ ) when it participates in the programme (i.e. is financially deprived) and  $Y_{i0}$  represent its outcome (or potential welfare) when it does not participate in the programme (i.e. financially non-deprived). Given this, we can show the impact of participation in the programme (or treatment) on household  $i$ 's welfare, represented by  $\theta_i$ , as:

$$\theta_i = Y_{i1} - Y_{i0} \quad (3.2)$$

However, a straight away estimation of Equation (3.2) is infeasible due to the potential problem of missing data or unobservability. This problem results from the fact both  $Y_{i1}$  and  $Y_{i0}$  cannot be observed simultaneously for the same household; that is, for each household, what is observed is either  $Y_{i1}$  or  $Y_{i0}$  but not both. Hence, for each household, at least one of the outcome values ( $Y_{i1}$  or  $Y_{i0}$ ) is missing (Wooldridge, 2010). A convenient way to circumvent this problem is to focus on a group statistic such as the 'average treatment effect on the treated (ATT)'. The ATT measures the mean effect for households that have actually received the treatment. Essentially, it is the difference between the outcome of households if they were exposed to the treatment (i.e. financially deprived) and their potential outcome assuming they were not treated

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<sup>30</sup> Note that participant households or individuals may also be referred to as 'treated households/individuals' while their non-participant counterparts can be referred to, alternatively, as 'untreated households/individuals'.

(i.e. financially non-deprived). The true impact of the treatment (measured by  $ATT$ ) can thus be expressed as:

$$ATT = E(Y_{i1}|D_i = 1) - E(Y_{i0}|D_i = 1) \quad (3.3)$$

where  $D_i = 1 (= 0)$  if the  $i$ th household is in a treatment (non-treatment) state.  $E(Y_{i1}|D_i = 1)$  depicts the outcome for household  $i$  if it is in a treatment state while  $E(Y_{i0}|D_i = 1)$  depicts the counterfactual outcome for treated households had they not been treated (see Dehejia & Wahba, 2002). Now, since the counterfactual mean for treated households,  $E(Y_{i0}|D_i = 1)$ , is not observed, a plausible way to observe it is to choose a proper substitute for it. If we can ensure that the treatment indicator,  $D_i$ , is statistically independent of the outcomes ( $Y_{i0}$ ,  $Y_{i1}$ ) as would be the case under randomisation, Equation (3.3) can be suitably estimated by the difference in sample means of the outcomes for treated and untreated households (see Wooldridge, 2010). However, in observational studies (as is the case of this paper), this process is bedevilled with the problem of selectivity bias. The selectivity bias problem arises from the fact that the outcomes of treated and untreated groups may differ even in the absence of the treatment.

An important way, however, to overcome this problem is to assume unconfoundedness (i.e. selection on observables or conditional independence); see Rosenbaum & Rubin (1983). The unconfoundedness assumption (or ignorability of treatment assumption) states that treatment assignment should be independent of the potential outcomes conditional on observed baseline characteristics and that every subject has a nonzero probability of receiving either treatment. That is, if the decision to participate in a programme is purely random for individuals with similar values of the pre-programme variables, then one could rely on the average outcome of some similar individuals who did not participate in the programme as a plausible counterfactual outcome for the programme participants in order to identify the true impact of programme

participation. Within this framework, the true impact of the treatment can then be estimated as follows:

$$ATT^* = E(Y_{i1}|D_i = 1) - E(Y_{j0}|D_j = 0) \quad (i \neq j \in N) \quad (3.4)$$

where  $ATT^*$  is the estimated value of  $ATT$ ,  $i$  and  $j$  represent two different households in a given sample of  $N$  households where household  $i$  receives the treatment while household  $j$  does not. The observed value of the outcome variable for households  $i$  and  $j$  are  $Y_{i1}$  and  $Y_{j0}$  respectively. Note that the pairing of treated households with their comparable untreated households is the crucial step in estimating the average treatment effects. In randomised control trials (RCTs), treatment assignment is conducted under randomisation and hence Equation (3.4) can be unbiasedly estimated. However, under observational studies (like this study), treatment assignment is not random and thus by merely taking the difference in the mean outcomes for treated and untreated units (as in Equation 3.4) will yield biased estimates of the average treatment effects.

The Propensity Score Matching (PSM) method – which tries to approximate the research design of RCTs by matching programme participants to non-participants based on a set of observed baseline covariates – has become a useful technique in evaluation of programme impacts in recent times; see Ravallion (2001), Caliendo & Kopeinig (2008), and Zhang & Posso (2017). In the first-step, the PSM approach estimates a binary dependent variable model of individual assignment possibilities as a function of observable baseline covariates,  $p_i = \Pr(T_i|X_i)$ , using a flexible logit model (Rosenbaum & Rubin, 1983), as in Equation (3.5):

$$p_i = \Pr(T_i = 1|X_i) = \frac{e^{\lambda h(X_i)}}{1 + e^{\lambda h(X_i)}} \quad ; \quad 0 < p_i < 1 \quad (3.5)$$

where  $T_i$  is the treatment status of a household or an individual. Rosenbaum & Rubin (1983) refer to the assignment probabilities,  $p_i$ , as propensity scores.  $h(X_i)$  represents the set of

covariates on which we condition to obtain an ignorable treatment assignment. A potential drawback of the PSM approach is that it does not account for selection bias due to unobservable factors (see Smith & Todd, 2005). However, Dehejia & Wahba (2002) note that when the covariates in the first stage estimation of the PSM captures adequately the relevant differences between the treatment and non-treatment units, matching methods can yield an unbiased estimate of the treatment impact.

Based on the fact that access to financial services varies across households' demographic and geographic characteristics in Ghana (see GSS, 2014; 2019), we include the following covariates in the estimation of the propensity scores: age and sex of the household head, educational attainment of the household head, sector of work of the household head, household size, and locality (rural versus urban dummy and north versus south dummy). Rosenbaum & Rubin (1983) showed that if treatment assignment is strongly ignorable, then conditioning on the propensity score allows for an unbiased estimation of Equation (3.4). So, once the propensity scores are estimated, matching methods can be used to match treated households with comparable untreated ones conditional only on the propensity score. Several matching methods have been used in the literature, although the most commonly used methods are; Nearest-Neighbor Matching (with or without caliper and with or without replacement), Radius Matching, Kernel Matching, and Local Linear Matching. Using any of the various matching procedures the comparison outcome  $E(Y_{j0} | D_j = 0)$  is derived, and hence the ATT (as in equation 3.4) can be estimated as:

$$\widehat{ATT} = \frac{1}{N^T} \sum_{i:D_i=1} [Y_{i1} - \hat{Y}_{i0}] \quad (3.6)$$

where  $N^T$  is the number of matched treated in the sample. It should be noted however that the various matching methods have advantages as well as disadvantages (see Caliendo & Kopeinig,

2008).<sup>31</sup> Consequently, for robustness sake, we employ four matching methods, namely, Nearest-Neighbor Matching, Radius Matching, Kernel Matching, and Local Linear Matching in our estimation. After successfully matching treated units to their comparable untreated units, untreated units which fail to find a match are dropped from the calculation of impacts. The treatment effect (as in Equation 3.6) is then estimated by comparing the mean outcomes of the treated units and their matches (Ravallion, 2001).

### **3.6 Empirical Results**

The empirical results of this study are presented in this section. The order of presentation of empirical results is as follows: first, we provide the baseline estimates of the effect of financial inclusion on household welfare – to check for the robustness of the estimates, we employ four different measures of household welfare (discussed earlier in section 3.4). Second, because of the potential variation in the response of household welfare to financial inclusion across economically better-off and less economically endowed households (see Luan & Bauer (2016), for instance), we derive estimates of the effect of financial inclusion on the welfare of poor and non-poor households, separately.

Third, given that financial deprivation has proven to be an important positive correlate of poverty, we delve deeper in this regard by exploring the potential role, if any, of financial deprivation on the poverty status of households as well as on the degree of poverty among the poor and on the extent of inequality among the poor – we approach this line of inquiry by relying on the FGT (1984) class of poverty indices. Fourth, we shed light on the potential

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<sup>31</sup> For example, using the Nearest-Neighbor Matching method, matching with replacement keeps bias low but at the cost of larger variance whereas matching without replacement yields a lower variance but at the cost of potential bias.

variation in the effect of each of our four dimensions of financial inclusion on household welfare – the idea here is to establish which of these dimensions matter most in explaining household welfare. Fifth, we embark on a number of robustness exercises to ensure the reliability of our baseline estimates – in this vein, we employ alternative computations of the financial deprivation index as well as the use two other cut-offs in defining the binary measure of financial deprivation.

Also, we exploit the important property of the PSM estimation technique to account for the potential endogeneity of financial inclusion in our model of household welfare; lastly, we provide some insights on the potential channels through which financial inclusion might influence household welfare – the focus here is on the examination of the effect of financial inclusion on both households’ non-farm enterprise incomes and income from agricultural activities.

### *3.6.1 Baseline results: effect of financial inclusion on household welfare*

Table 3.2 presents the results of the baseline estimates of the effect of financial inclusion on household welfare. In particular, Table 3.2 contains four separate estimations of Equation (3.1), capturing in each case one of our four measures of household welfare as a dependent variable; In Model I of Table 3.2, household welfare is measured by (log) household total annual consumption expenditure per adult equivalent while in Model II of Table 3.2, the dependent variable is household total annual food consumption expenditure per adult equivalent. Total annual household income is used as a measure of household welfare in Model III whereas a binary indicator of household poverty status (equal to 1 if a household is non-poor) is the dependent variable in Model IV. Models I – III are estimated using the OLS estimation technique while Model IV is estimated using the binary probit estimation technique;

accordingly, the estimated results in Models I – III are the coefficient estimates of the various regressors while those presented in Model IV are the marginal effects. In all estimations, we cluster standard errors at the household level to account for potential heteroscedasticity. Also, we control for regional fixed effects in all estimations.

Paying attention to the issue of most interest in this paper, we observe, across all the four separate estimations in Table 3.2, that financial deprivation ( $Fin_i$ ) is a significant negative correlate of household welfare. This indicates that households that are financially excluded have significantly lower welfare than those that are financially included; this is true regardless of the measure of household welfare used. Specifically, the coefficient estimate of financial inclusion on household welfare in the OLS estimations is in the order of 9% – 27% depending on the measure of household welfare used. We observe that the total annual consumption expenditure of financially deprived households is about 23% less than those of financially included households while households that are financially included have approximately 27% more income than their financially excluded counterparts.

Also, considering the estimated marginal effects from the probit estimation, we see that financially deprived households are about 5.4% less likely to be non-poor than their financially included counterparts (see Model IV of Table 3.2). These results are consistent with our a priori expectation and also lines up with the results of earlier scholars (see, for instance, Burgess & Pande, 2005; Zhang & Posso, 2017). Now, turning to the effect of the other included covariates in the model of household welfare, we observe that the gender of the household head is a significant predictor of household welfare. In particular, the results suggest strongly that male headed households have better welfare than households headed by females; this is consistent with the conclusions of Mallick & Rafi (2009).

**Table 3.2: Baseline estimation: Effect of financial inclusion on household welfare**

VARIABLES	I	II	III	IV
	lwelfare	lfoodx	Income	Mfx non-poor
<i>Finc<sub>i</sub></i>	-0.226*** (0.046)	-0.091* (0.050)	-0.266*** (0.095)	-0.054** (0.022)
Age_head	-0.001 (0.010)	-0.001 (0.011)	0.080*** (0.020)	0.000 (0.004)
Age_head2	0.000 (0.000)	0.000 (0.000)	-0.001*** (0.000)	0.000 (0.000)
Sexhead ( <i>Base: female</i> )	0.233*** (0.044)	0.155*** (0.045)	0.242*** (0.091)	0.054*** (0.021)
Household_size	-0.140*** (0.010)	-0.128*** (0.011)	0.106*** (0.016)	-0.016*** (0.003)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>				
Basic_education	0.110 (0.351)	0.148 (0.342)	0.557 (0.442)	0.054* (0.030)
Secondary_education	0.191 (0.348)	0.199 (0.339)	0.522 (0.431)	0.067* (0.037)
Post-secondary_education	0.217 (0.347)	0.183 (0.339)	0.324 (0.431)	0.065 (0.049)
Tertiary_education	0.378 (0.347)	0.283 (0.338)	0.572 (0.426)	0.097 (0.069)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>				
Industry	0.133** (0.061)	0.005 (0.067)	0.215 (0.143)	0.018 (0.019)
Service	0.284*** (0.050)	0.046 (0.050)	0.399*** (0.101)	0.025 (0.017)
Locality_urban ( <i>Base: rural</i> )	0.214*** (0.043)	0.163*** (0.043)	0.252*** (0.093)	0.055*** (0.016)
Constant	8.158*** (0.426)	7.453*** (0.423)	6.167*** (0.646)	
Observations	1,025	1,025	1,013	1,025
R-squared	0.433	0.310	0.155	
Adjusted R-squared	0.421	0.296	0.137	
Region FE	YES	YES	YES	YES
F-statistic	30.47	17.43	8.765	

*Notes: Robust standard errors are in parenthesis; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Models I - III are estimated using the OLS while Model IV presents the marginal effects from a binary probit estimation; Finc<sub>i</sub> is a binary measure of financial inclusion. It assumes a value of 1 if a household's deprivation score is greater than 50% and zero otherwise; the dependent variable in Model I is (log) household total consumption expenditure per adult equivalent; the dependent variable in Model II is (log) household total food expenditure per adult equivalent; the dependent variable in Model III is (log) household total income while the dependent variable in Model IV is household poverty status (with the base group being that the respective household is poor); all the estimations control for region fixed effects.*

In addition, household size matters for the welfare of the household. Interestingly, however, the direction of the effect of household size on household welfare depends on the nature of the indicator used to proxy household welfare; indeed, when household welfare is measured using a consumption-based measure, we find that household size is associated negatively with household welfare. However, when an income indicator is used to proxy household welfare a

contrary evidence is found; household size appears to be welfare enhancing. This reflects perhaps the idea that large-sized households have a higher potential in raking in more income than small-sized households, all other things being equal. The negative effect of household size on household consumption-based measures of welfare mirrors those obtained by Baye (2013) while the positive effect of household size on household income is in line with the findings of Zhang & Posso (2017) wherein the authors proxied household welfare by household income.

The age of the head of a household and its squared significantly influences household welfare; this is true only when we use household income as a measure of household welfare (see Model III of Table 3.2). The age of the household head relates positively with household total annual income while the square of the age of the household head is negatively associated with household income, indicating non-linearity in the effect of the age of the household head on household income. Estimating the turning point of the age effect on household income, we observe that the turning point of the effect of the household head's age on household income is 40 years; this shows that the positive influence of the household head's age on household income ceases to exist among households whose heads are older than 40 years.

The educational attainment of the household head largely does not explain household welfare in our estimations. The sector of work of the household head significantly explains household total annual consumption expenditure; the results therein show that households whose heads' main occupation is related to the industry or service sectors are significantly better-off than those with heads engaged in the agricultural sector. Last but not the least, we observe that households that are situated in urban areas are significantly better-off than their counterparts in rural areas. This finding is in line with the GLSS 6's poverty profile report which shows that urban households are economically better-off than their rural counterparts (see GSS, 2014).

### *3.6.2 Effect of financial inclusion on household welfare: household poverty status disaggregated estimations*

The empirical results on the effect of financial inclusion on the welfare of poor and non-poor households are presented in Table 3.3. Model I report the results for non-poor households while Model II present the results for poor households. The results in Table 3.3 is intriguing. We observe that financial inclusion importantly explains the welfare of both poor and non-poor households, albeit, with varying magnitudes. Specifically, we find that while the welfare effect of financial inclusion is around 20% for non-poor households, it is about 40% for poor households. This implies that, poor households experience much larger welfare effects of financial inclusion relative to non-poor households. This finding is consistent with those of Zhang & Posso (2017). Thus, our evidence shows that financial inclusion does not only improve household welfare, but it may also help in bridging the income gap between the poor and the rich.

### *3.6.3 Effect of financial inclusion on household welfare: FGT (1984) measures of poverty*

We rely specifically on the FGT (1984) class of poverty indices to examine not only the effect of financial inclusion on household poverty status (i.e. whether poor or non-poor) but as well provide some evidence on whether financial inclusion affects both the extent to which the poor are poor and the degree of inequality among the poor. The empirical evidence in this regard is presented in Table 3.4. In Table 3.4, Model I present the estimated results of Equation (3.1) when the dependent variable is the  $P_0$  index which measures the poverty status of a household. Models II and III, respectively, presents the estimated results of Equation (3.1) when the dependent variable is the  $P_1$  index and the  $P_2$  index.<sup>32</sup>

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<sup>32</sup>  $P_1$  index measures the extent to which the poor are poor while the  $P_2$  index measures the severity of poverty which accounts for the inequality among the poor.

**Table 3.3: Effect of financial inclusion on household welfare; Household poverty status disaggregated estimations**

VARIABLES	I	II
	Non-Poor HH	Poor HH
<i>Finc<sub>i</sub></i>	-0.230** (0.100)	-0.402* (0.227)
Age_head	0.077*** (0.021)	0.087 (0.063)
Age_head2	-0.001*** (0.000)	-0.001 (0.001)
Sexhead ( <i>Base: female</i> )	0.223** (0.097)	-0.027 (0.231)
Household_size	0.126*** (0.018)	0.111*** (0.038)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>		
Basic_education	0.592 (0.604)	0.354 (0.981)
Secondary_education	0.511 (0.592)	0.379 (0.958)
Post-secondary_education	0.376 (0.591)	-0.196 (0.986)
Tertiary_education	0.600 (0.587)	-0.136 (0.972)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>		
Industry	0.125 (0.154)	0.588* (0.334)
Service	0.318*** 0.125	0.549** (0.248)
Locality_urban ( <i>Base: rural</i> )	0.242** (0.097)	-0.284 (0.274)
Constant	6.220*** (0.771)	5.811*** (1.732)
Observations	919	94
R-squared	0.151	0.484
Adjusted R-squared	0.131	0.334
Region FE	YES	YES
F-statistic	7.650	3.217

*Notes: Robust standard errors are in parenthesis; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ; Model I and II presents the disaggregated estimates of the effect of financial inclusion on household welfare for non-poor and poor households respectively; The household welfare variable used in this estimation is the (log) household total income; *Finc<sub>i</sub>* is a binary measure of financial inclusion. It assumes a value of 1 if a household's deprivation score is greater than 50% and zero otherwise; all the estimations control for region fixed effects.*

Consistent with the marginal effect estimates reported in Table 3.2, the empirical results in Table 3.4 suggests that financial inclusion affects the likelihood of a household falling into poverty (see Table 3.4, Model I). However, beyond influencing the probability of a household falling into poverty, financial inclusion does not influence both the extent to which the poor are below the poverty line and the severity of poverty or the degree of inequality among the

poor (see Models II and III of Table 3.4). Interestingly, we find evidence that among the sub-sample of poor households, households that are headed by females are well-below the poverty line compared to those headed by males. This indicates that the incidence of extreme poverty is largely present among female headed households than among male headed households. This result is broadly in line with the conclusions of Mallick & Rafi (2009).

**Table 3.4: Effect of financial inclusion on household welfare; FGT measures of poverty**

VARIABLES	I	II	III
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>
<i>Finc<sub>i</sub></i>	0.054** (0.022)	0.014 (0.009)	0.004 (0.005)
Age_head	-0.000 (0.004)	-0.003 (0.002)	-0.001 (0.001)
Age_head2	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Sexhead ( <i>Base: female</i> )	-0.054*** (0.021)	-0.012** (0.006)	-0.004 (0.003)
Household_size	0.016*** (0.003)	0.006*** (0.001)	0.002*** (0.001)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>			
Basic_education	-0.054* (0.030)	-0.037 (0.050)	-0.006 (0.014)
Secondary_education	-0.067* (0.037)	-0.047 (0.050)	-0.011 (0.013)
Post-secondary_education	-0.065 (0.049)	-0.046 (0.049)	-0.011 (0.012)
Tertiary_education	-0.097 (0.069)	-0.048 (0.049)	-0.010 (0.012)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>			
Industry	-0.018 (0.019)	-0.006 (0.011)	-0.005 (0.005)
Service	-0.025 (0.017)	-0.015* (0.009)	-0.010** (0.005)
Locality_urban ( <i>Base: rural</i> )	-0.055*** (0.016)	-0.020*** (0.006)	-0.009*** (0.003)
Constant		0.107 (0.067)	0.044 (0.027)
Observations	1,025	1,025	1,025
R-squared		0.123	0.107
Adjusted R-squared		0.104	0.0887
Region FE	YES	YES	YES
F-statistic		2.920	1.899

*Notes: Robust standard errors are in parenthesis; Model I is estimated using the binary probit regression estimator with the results reported therein being the marginal effects; Models II and III are estimated using the OLS technique; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; the dependent variables are the FGT indices of poverty based on the upper poverty line; P<sub>0</sub> is the headcount poverty measure; P<sub>1</sub> is the poverty gap; P<sub>2</sub> is the square of the poverty gap; Finc<sub>i</sub> is a binary measure of financial inclusion. It assumes a value of 1 if a household's deprivation score is greater than 50% and zero otherwise; all the estimations control for region fixed effects.*

Further, household size importantly explains the depth and severity of poverty (see Models II and III of Table 3.4). In particular, among a sub-sample of poor households, households that have relatively large membership size are placed further away from the poverty line and also experiences higher levels of inequality. That is, the larger the size of a household, the more distant it is from the poverty line and the more unequal its welfare is, *ceteris paribus*. Furthermore, among a sub-sample of poor households, household heads engaged in services related activities show less deprivation and lower levels of inequality relative to those involved in agricultural related activities. Relative to rural poor households, poor households that are located in urban areas encounter lower levels of deprivation as measured by the poverty gap ( $P_1$ ) and the squared poverty gap ( $P_2$ ) indices.

#### *3.6.4 Effect of financial inclusion on household welfare: effect of the various dimensions of financial inclusion*

While financial inclusion is seen broadly as an important driver of household welfare, the question of which aspect of financial inclusion matters most in explaining the welfare of households remains an important issue in the development literature. In this section, we discuss the relative importance of each of our four dimensions of financial inclusion – that is, access to a bank account, access to credit, access to insurance, and access to a savings account – on household welfare. The results related to this discussion are presented in Table 3.5. The measure of household welfare we examine in this respect is (log) household consumption expenditure per adult equivalent. From Model I – IV of Table 3.5, financial deprivation is measured by the lack of a bank account (*Bank\_account*), the lack a credit facility (*Access\_credit*), the lack of an insurance facility (*Access\_insurance*) and the lack of a savings account (*Savings\_account*), respectively.

Overall, we find that each of the various dimensions of financial inclusion importantly explains household welfare, albeit, with varying magnitudes. The coefficient estimates of financial deprivation is statistically significant at the 1 percent level, in all instances. In particular, the results suggest that access to a bank account has the largest effect on household welfare with a magnitude of about 31.8% while access to credit has the lowest effect on household welfare (about 13.3%) (see Models I and II of Table 3.5). The effect of access to a bank account on household welfare indicates that households that have at least one member with a bank account have about 32% more consumption spending than those without a bank account holder. In terms of the effect of access to credit, the evidence suggests that households that have access to a credit facility have about 13.3% more consumption expenditure than those without a credit facility. Similarly, we observe that access to insurance facilities raises household welfare by close to 25% while access to a savings account improves household welfare by about 26% (see Models III and IV of Table 3.5, respectively). All the other included covariates attained their expected signs. Relatedly, we examine further the welfare effects of the various dimensions of financial inclusion among poor and non-poor households, separately.

**Table 3.5: Financial inclusion and household welfare; effect of the various dimensions of financial inclusion**

VARIABLES	Dependent variable: (log) household consumption per equivalent adult			
	I	II	III	IV
Bank_account	-0.318*** (0.013)			
Access_credit		-0.133*** (0.042)		
Access_insurance			-0.249*** (0.013)	
Savings_account				-0.260*** (0.013)
Age_head	0.006** (0.003)	0.000 (0.010)	0.006** (0.003)	0.007** (0.003)
Age_head2	-0.000* (0.000)	0.000 (0.000)	-0.000** (0.000)	-0.000** (0.000)
Sexhead ( <i>Base: female</i> )	-0.000 (0.014)	0.246*** (0.044)	0.039*** (0.014)	0.020 (0.014)
Household_size	-0.120*** (0.004)	-0.139*** (0.010)	-0.118*** (0.004)	-0.124*** (0.004)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>				
Basic_education	0.033 (0.068)	0.030 (0.337)	0.019 (0.071)	0.040 (0.069)
Secondary_education	0.121* (0.068)	0.131 (0.335)	0.134* (0.070)	0.141** (0.068)
Post-secondary_education	0.120* (0.068)	0.169 (0.334)	0.140** (0.070)	0.140** (0.068)
Tertiary_education	0.219*** (0.068)	0.330 (0.334)	0.233*** (0.070)	0.248*** (0.068)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>				
Industry	0.147*** (0.019)	0.160*** (0.062)	0.176*** (0.019)	0.163*** (0.019)
Service	0.216*** (0.016)	0.310*** (0.051)	0.259*** (0.016)	0.253*** (0.016)
Locality_urban ( <i>Base: rural</i> )	0.203*** (0.014)	0.212*** (0.043)	0.216*** (0.015)	0.209*** (0.014)
Constant	8.126*** (0.093)	8.151*** (0.415)	8.092*** (0.097)	8.024*** (0.094)
Observations	10,458	1,025	10,458	10,462
R-squared	0.411	0.427	0.396	0.401
Adjusted R-squared	0.409	0.415	0.395	0.400
Region FE	YES	YES	YES	YES
F-statistic	276.5	29.80	248.7	248

Notes: Robust standard errors are in parenthesis; the dependent variable is (log) household total consumption expenditure per adult equivalent; all Models are estimated using the OLS technique; Models I – IV presents individually the estimated effects of each of the four dimensions of financial inclusion; Bank\_account is a binary measure of financial inclusion. It assumes a value of 1 if no member of a household has access to a bank account and zero otherwise; Access\_credit is a binary measure of financial inclusion. It assumes a value of 1 if no member of a household has access to a formal credit facility and zero otherwise; Access\_insurance is a binary measure of financial inclusion. It assumes a value of 1 if no member of a household has access to a formal insurance facility and zero otherwise; Savings\_account is a binary measure of financial inclusion. It assumes a value of 1 if no member of a household has access to a formal savings account and zero otherwise; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; all the estimations control for region fixed effects.

Our results show that all the four dimensions of financial inclusion (i.e. access to a bank account, access to credit, access to insurance, and access to savings) matters for the welfare of non-poor households; for instance, among non-poor households, households that have access to a bank account have close to 24% higher welfare than those without access to a bank account (see Table 3.6, Model I). Access to credit raises the welfare of non-poor households by more than 10% while access to insurance facilities and savings account improves household welfare by about 20% and 18% respectively; these findings are significant at the conventional levels of statistical significance. On the other hand, the results from the poor sample estimations show that household welfare is significantly driven by all but one (i.e. access to credit) of the four dimensions of financial inclusion. Specifically, it shows that poor households that have access to a bank account are about 8% better off than their counterparts that do not have access to a bank account (see Table 3.6, Model V). Also, among a sample of poor households, households that have access to insurance facilities and savings account exhibit a higher level of welfare, in the order of 8% and 9% respectively compared to their counterparts without access to these services. Interestingly, we observe that having access to credit does not influence the welfare of poor households; this could be an indication of the acute lack of access to formal credit by poor households (see Hulme & Mosley, 1996).

**Table 3.6: Financial inclusion and household welfare (disaggregated by poverty status); effect of the various dimensions of financial inclusion**

VARIABLES	Non-poor households			Poor households				
	I	II	III	IV	V	VI	VII	VIII
<i>Dependent variable: (log) household consumption per equivalent adult</i>								
Bank_account	-0.236*** (0.012)				-0.077*** (0.018)			
Access_credit		-0.101** (0.040)				0.026 (0.074)		
Access_insurance			-0.202*** (0.012)				-0.077*** (0.021)	
Savings_account				-0.184*** (0.012)				-0.087*** (0.018)
Age_head	0.006** (0.003)	-0.002 (0.010)	0.006** (0.003)	0.007** (0.003)	0.004 (0.004)	0.040** (0.020)	0.004 (0.004)	0.004 (0.004)
Age_head2	-0.000* (0.000)	0.000 (0.000)	-0.000** (0.000)	-0.000** (0.000)	-0.000 (0.000)	-0.000** (0.000)	-0.000 (0.000)	-0.000 (0.000)
Sexhead ( <i>Base: female</i> )	-0.016 (0.013)	0.220*** (0.043)	0.013 (0.013)	0.000 (0.013)	0.033 (0.025)	-0.027 (0.062)	0.038 (0.025)	0.033 (0.025)
Household_size	-0.104*** (0.004)	-0.131*** (0.010)	-0.101*** (0.004)	-0.106*** (0.004)	-0.010*** (0.003)	-0.005 (0.009)	-0.009*** (0.004)	-0.011*** (0.004)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>								
Basic_education	-0.029 (0.060)	-0.247* (0.129)	-0.044 (0.062)	-0.033 (0.060)	0.076 (0.083)	0.121 (0.145)	0.078 (0.084)	0.088 (0.081)
Secondary_education	0.027 (0.059)	-0.175 (0.122)	0.034 (0.062)	0.034 (0.059)	0.051 (0.083)	0.067 (0.141)	0.050 (0.085)	0.065 (0.081)
Post-secondary_education	0.020 (0.059)	-0.115 (0.121)	0.031 (0.062)	0.028 (0.059)	0.066 (0.084)	0.114 (0.153)	0.071 (0.086)	0.076 (0.082)
Tertiary_education	0.122** (0.059)	0.027 (0.120)	0.122** (0.062)	0.136** (0.059)	0.044 (0.083)	0.040 (0.144)	0.056 (0.084)	0.057 (0.081)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>								
Industry	0.066*** (0.017)	0.121** (0.058)	0.083*** (0.017)	0.079*** (0.017)	0.072** (0.028)	-0.033 (0.091)	0.076*** (0.028)	0.071** (0.028)
Service	0.144*** (0.015)	0.263*** (0.047)	0.170*** (0.015)	0.173*** (0.015)	0.070*** (0.023)	0.127 (0.083)	0.076*** (0.023)	0.071*** (0.023)
Locality_urban ( <i>Base: rural</i> )	0.120*** (0.013)	0.147*** (0.041)	0.124*** (0.013)	0.124*** (0.013)	0.103*** (0.019)	0.084 (0.079)	0.110*** (0.019)	0.102*** (0.019)

Table 3.6 Continued

VARIABLES	Non-poor households				Poor households			
	I	II	III	IV	V	VI	VII	VIII
Constant	8.336*** (0.083)	8.572*** (0.260)	8.349*** (0.086)	8.264*** (0.083)	6.720*** (0.128)	5.940*** (0.539)	6.702*** (0.129)	6.706*** (0.126)
Observations	8,877	930	8,877	8,880	1,581	95	1,581	1,582
R-squared	0.305	0.399	0.297	0.295	0.140	0.337	0.138	0.144
Adjusted R-squared	0.304	0.385	0.295	0.293	0.129	0.146	0.126	0.132
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
F-statistic	148.77	24.59	136.24	131.22	11.19	1.76	11.15	11.37

Notes: Robust standard errors are in parenthesis; the dependent variable is (log) household total consumption expenditure per adult equivalent; all Models are estimated using the OLS technique; Models I – IV presents individually the estimated effects of each of the four dimensions of financial inclusion on the welfare of non-poor households while Models V – VIII presents individually the estimated effects of each of the four dimensions of financial inclusion on the welfare of poor households; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; all the estimations control for region fixed effects; these results are qualitatively similar to those obtained when we use our two other measures of household welfare – i.e. total household income and household food consumption expenditure (we have not reported them here).

### 3.6.5 Robustness check 1: test of alternative computations of the financial inclusion index

In this section, we test the robustness of our financial inclusion index to alternative computations of the measure (see Zhang & Posso, 2017). In doing so, we re-estimate the financial inclusion index by excluding a dimension out of our four-pillar financial inclusion index each time in four separate instances; in other words, we re-compute the financial deprivation index using only three of the four dimensions (that is, omitting a dimension in each case). This produces four different measures of financial inclusion: *FincBA* is the re-estimated financial deprivation index when access to a bank account is excluded in the computation of  $Fin_i$ ; *FincFC* is the re-estimated financial deprivation index when we exclude access to formal credit in the computation of  $Fin_i$ ; *FincINS* is the re-estimated financial deprivation index when access to insurance products is excluded in the computation of  $Fin_i$ ; *FincSAV* is the re-estimated financial deprivation index when we exclude access to a savings account in the computation of  $Fin_i$ . In each instance, the financial deprivation index is binary equal to 1 when a household's deprivation score is higher than 33.33%; that is, a household is considered as being financially excluded if it does not have access to at least one of the three dimensions of financial inclusion.

The results from this exercise (presented in Table 3.7) is consistent with our earlier findings on the effect of financial inclusion on household welfare. In Table 3.7, Model I – IV presented the coefficient of financial deprivation in a model of household welfare when *FincBA*, *FincFC*, *FincINS* and *FincSAV* is used as a measure of financial deprivation respectively. For example, we observe that financial deprivation (measured by *FincBA*) reduces household welfare by about 24%. That is financially deprived households are approximately 24% less well-off compared to financially included households. Strikingly, the coefficient of the financial deprivation indicator in each of the four different specifications (see Models I – IV of Table

3.5) is remarkably close to our initial estimates of the effect of financial deprivation on household welfare (as observed in Table 3.2, Model I). This finding proves somewhat the reliability of our index of financial inclusion.

**Table 3.7: Financial inclusion and household welfare; test of alternative computations of the financial inclusion index**

	Dependent variable: (log) household consumption per equivalent adult			
	I	II	III	IV
Finc <sub>i</sub> excluding:	Bank account	Formal credit	Insurance	Savings account
FincBA	-0.239*** (0.041)			
FincFC		-0.298*** (0.012)		
FincINS			-0.227*** (0.044)	
FincSAV				-0.245*** (0.043)
Age_head	-0.001 (0.010)	0.006** (0.003)	-0.000 (0.010)	-0.001 (0.010)
Age_head2	0.000 (0.000)	-0.000* (0.000)	0.000 (0.000)	0.000 (0.000)
Sexhead ( <i>Base: female</i> )	0.224*** (0.044)	0.008 (0.014)	0.232*** (0.043)	0.222*** (0.044)
Household_size	-0.139*** (0.010)	-0.121*** (0.004)	-0.140*** (0.010)	-0.138*** (0.010)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>				
Basic_education	0.038 (0.324)	0.030 (0.069)	0.118 (0.351)	0.040 (0.325)
Secondary_education	0.118 (0.322)	0.125* (0.068)	0.199 (0.348)	0.120 (0.322)
Post-secondary_education	0.152 (0.321)	0.123* (0.068)	0.223 (0.347)	0.148 (0.321)
Tertiary_education	0.301 (0.320)	0.222*** (0.068)	0.386 (0.347)	0.299 (0.321)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>				
Industry	0.120* (0.061)	0.149*** (0.019)	0.132** (0.061)	0.117* (0.062)
Service	0.267*** (0.050)	0.226*** (0.016)	0.283*** (0.050)	0.261*** (0.051)
Locality_urban ( <i>Base: rural</i> )	0.203*** (0.043)	0.203*** (0.014)	0.217*** (0.043)	0.203*** (0.043)
Constant	8.309*** (0.403)	8.112*** (0.094)	8.144*** (0.425)	8.324*** (0.404)
Observations	1,025	10,458	1,025	1,025
R-squared	0.438	0.407	0.434	0.438
Adjusted R-squared	0.426	0.406	0.422	0.426
Region FE	YES	YES	YES	YES
F-statistic	31.62	257.8	30.98	31.98

*Notes: Robust standard errors are in parenthesis; the dependent variable is (log) household total consumption expenditure per adult equivalent; all Models are estimated using the OLS technique; Models I – IV presents individually the estimated effects of a re-estimated indices for financial inclusion. In each case, Finc<sub>i</sub> is computed using only three of the four dimension (thus, omitting a dimension in each case); FincBA is the financial inclusion index when access to a bank account is excluded in the computation of Finc<sub>i</sub>; FincFC is the financial inclusion*

*index when access to formal credit is excluded in the computation of Finc<sub>i</sub>; FincINS is the financial inclusion index when access to insurance products is excluded in the computation of Finc<sub>i</sub>; FincSAV is the financial inclusion index when access to a savings account is excluded in the computation of Finc<sub>i</sub>; In each case, the financial inclusion index assumes a value of 1 (i.e. financially excluded) when a household's deprivation score is higher than 33.33% and zero otherwise; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; all the estimations control for region fixed effects.*

### *3.6.6 Robustness check 2: test of the use of two other cut-off points (an extreme lower and upper bound)*

Table 3.8 presents the results of a re-estimated financial inclusion index using two alternative cross dimensional cut-off points; i.e. a cut-off of 75% (an upper bound) which classifies a household as financially deprived only if it is deprived in more than three (or all) of the four dimensions of financial deprivation and a cut-off of 25% (a lower bound) which classifies a household as financially included if it is non-deprived in only one of the four dimensions of financial inclusion. Model I of Table 3.8 presents the empirical results of the effect of financial inclusion on household welfare when our financial deprivation indicator is derived using the cut-off of 75% while Model II presents same but with financial deprivation defined using a cut-off of 25%. In both estimations, we observe a significant influence of financial deprivation on household welfare; this is significant at the 1 percent level and thus corroborates our baseline estimations. This renders credence to our measure of financial inclusion.

**Table 3.8: Financial inclusion and household welfare; a test of the use of different cut-offs**

VARIABLES	Cut-offs used to construct $Finc_i$	
	I	II
	75%	25%
<i>Dependent variable: (log) household total consumption expenditure per adult equivalent</i>		
$Finc_i$	-0.198*** (0.058)	-0.250*** (0.041)
Age_head	0.001 (0.010)	-0.001 (0.010)
Age_head2	0.000 (0.000)	0.000 (0.000)
Sexhead ( <i>Base: female</i> )	0.250*** (0.044)	0.218*** (0.044)
Household_size	-0.140*** (0.010)	-0.138*** (0.010)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>		
Basic_education	0.065 (0.351)	0.050 (0.324)
Secondary_education	0.167 (0.348)	0.130 (0.321)
Post-secondary_education	0.200 (0.347)	0.159 (0.321)
Tertiary_education	0.363 (0.347)	0.308 (0.320)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>		
Industry	0.140** (0.062)	0.115* (0.061)
Service	0.305*** (0.049)	0.261*** (0.050)
Locality_urban ( <i>Base: rural</i> )	0.220*** (0.043)	0.205*** (0.043)
Constant	8.080*** (0.426)	8.315*** (0.403)
Observations	1,025	1,025
R-squared	0.427	0.440
Adjusted R-squared	0.415	0.428
Region FE	YES	YES
F-statistic	28.98	32.36

*Notes: Robust standard errors are in parenthesis; the dependent variable is (log) household total consumption expenditure per adult equivalent; all Models are estimated using the OLS technique; Models I and II presents individually the estimated effects of a re-estimated index for financial inclusion when the cut-off is fixed at 75% and 25% respectively; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; all the estimations control for region fixed effects.*

### 3.6.7 Robustness check 3: accounting for a potential problem of endogeneity and selectivity

#### *bias*

As discussed earlier (in the previous section), there is a potential endogeneity and selectivity bias problem in our estimation of Equation (3.1). And, not accounting for these poses a threat to the reliability of our empirical estimates. Following the works of earlier scholars (see Zhang

& Posso, 2017), we account for the problems of endogeneity and self-selection in our model of the determinants of household welfare using the PSM technique. In this vein, we adhere to the advances made by Caliendo & Kopeinig (2008) and use a number of different matching algorithms in order to ensure the reliability of our PSM estimates. The findings in this respect are summarised in Table 3.9. Given that the reliability of the match is an important step in estimating the ATT (average treatment effect on the treated), we conduct a sensitivity test of our match; the balancing test show that all the variables used in estimating the propensity scores attained a good balance (see Table 3.2A and Figure 3.1A, appendix).

By accounting for the potential endogeneity of financial inclusion in our model of household welfare, we observe that financially included households exhibit higher welfare levels than their financially excluded counterparts. The corresponding ATT is -0.48 with a significance level of 1 percent; the estimated coefficient is the same regardless of the matching algorithm employed. However, it noteworthy that the PSM coefficient is about twice that of the baseline estimation, indicating a downward bias in the baseline results. Thus, unlike the baseline estimate, our PSM estimates reveals that household welfare is approximately 48% lower for a household that is financially deprived relative to financially included households. Similarly, the estimated ATT for non-poor households is over twice of what we obtained in the baseline estimation while that for poor households is about the same as what we find in the baseline estimation. Overall, the PSM estimates are qualitatively similar to our baseline estimates of the welfare effect of financial inclusion. Hence, we conclude that our results on the effect of financial inclusion on household welfare is robust to the control for potential endogeneity and self-selectivity bias.

**Table 3.9: Endogeneity corrected estimation of the effect of financial inclusion on household welfare**

		<i>Finc<sub>i</sub></i> (index of financial deprivation)	
		Observed coefficient	Standard error
<b><i>PSM estimations with different matching methods</i></b>			
	1-NN	-0.475***	0.043
Nearest-Neighbour Matching	2-NN	-0.475***	0.048
	3-NN	-0.475***	0.050
Radius Matching		-0.475***	0.055
Kernel Matching		-0.475***	0.040
Local linear matching		-0.475***	0.058
<b><i>PSM estimation by HH poverty status</i></b>			
	Non-poor HH	-0.504***	0.093
	Poor HH	-0.434*	0.237
<b><i>Baseline result</i></b>			
OLS		-0.226***	0.046
<b><i>OLS estimation by HH poverty status</i></b>			
	Non-poor HH	-0.230**	0.100
	Poor HH	-0.402*	0.227

*Notes: Bootstrap standard errors with 100 replications are reported in PSM estimations; Coefficients reported in the PSM estimation are the ATT (i.e. average treatment effect on the treated); Robust standard errors are reported in simple OLS estimations; Sample size used in full sample estimations is 1025; Sample size used in household poverty status disaggregated models is 930 for Non-poor households model and 95 for poor households model; \*\*\*, \*\*, and \* indicates significance at the 1%, 5% and 10% levels respectively.*

### 3.6.8 Potential transmission channels: financial inclusion and household welfare

There are a number of channels through which financial inclusion can have a positive impact on household welfare. These channels include: (i) improvement in the production capacity (or incomes) of businesses including farm and non-farm enterprises through the provision of risk insurance, access to credit, efficient payment services and opportunities to save and invest in large-scale projects, (ii) improvement in the ability of households to accumulate human capital

assets such as education and health, and (iii) provision of insurance to protect households against idiosyncratic shocks.

In this section, however, we pay attention to the role of financial inclusion on business income; namely, the impact of financial inclusion on households' non-farm income and on households' agricultural incomes. Tables 3.10 and 3.11 presents respectively the empirical results of the effect of financial inclusion on non-farm income and on agricultural income. In both Tables, Model I present estimates of the effect of financial inclusion on enterprise income using our computed financial deprivation index as a measure of financial inclusion. In the subsequent models, we explore the possibility of differences in the effect of each of the four dimensions of financial inclusion on enterprise income.

Our results reveal that financial inclusion strongly improves households' non-farm enterprise incomes; this is not the case for households' agricultural incomes (see Table 3.11, Model I). In particular, we observe that financial inclusion improves households' non-farm income by about 55% (see Table 3.10, Model I). That is, among a sub-sample of households that operate non-farm enterprises, households that are financially included earn over 55% more income from their non-farm enterprises compared to those that are financially excluded. However, among a sub-sample of agricultural households, households that are financially deprived are not significantly worse off in terms of earning from agricultural activities relative to those that are financially included (see Table 3.11, Model I).

Analysing the various dimensions of financial inclusion on households' farm and non-farm enterprise incomes, we observe that all the four dimensions of financial inclusion significantly explains households' non-farm enterprises incomes (see Models II – V, Table 3.10). However, in relation to the effect of the various dimensions of financial inclusion on households'

agricultural incomes, we find that while access to a bank account, insurance and savings account improves households' agricultural incomes, access to credit does not significantly influence households' agricultural incomes; this finding can be attributed to the acute lack of access to adequate credit facilities from formal financial intermediaries by households or individuals engaged in agricultural activities. The evidence here, suggests generally that the welfare effect of financial inclusion can be seen through the positive impact of access to financial services on the performance of households' farm and non-farm enterprises. This is consistent with the results obtained by Banerjee & Duflo (2014) who found that improved access to credit by firms resulted in an increase in the sales and profits of firms.

**Table 3.10: Effect of financial inclusion on household non-farm enterprise income**

VARIABLES	Dependent variable: (log) household total non-farm enterprise income				
	I	II	III	IV	V
Finc <sub>i</sub>	-0.554*** (0.161)				
Bank_account		-0.396*** (0.046)			
Access_credit			-0.320** (0.160)		
Access_insurance				-0.183*** (0.050)	
Savings_account					-0.481*** (0.046)
Age_head	0.116*** (0.045)	0.096*** (0.012)	0.120*** (0.044)	0.097*** (0.012)	0.096*** (0.012)
Age_head2	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Sexhead ( <i>Base: female</i> )	-0.146 (0.153)	0.251*** (0.052)	-0.113 (0.152)	0.311*** (0.051)	0.266*** (0.051)
Household_size	0.033 (0.027)	0.059*** (0.010)	0.036 (0.027)	0.060*** (0.010)	0.052*** (0.010)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>					
Basic_education	0.004 (0.624)	-0.523** (0.232)	-0.180 (0.527)	-0.523** (0.233)	-0.505** (0.233)
Secondary_education	-0.048 (0.606)	-0.394* (0.229)	-0.180 (0.504)	-0.362 (0.231)	-0.365 (0.231)
Post-secondary_education	-0.395 (0.609)	-0.500** (0.229)	-0.507 (0.511)	-0.466** (0.230)	-0.481** (0.230)
Tertiary_education	-0.201 (0.590)	-0.490** (0.228)	-0.321 (0.487)	-0.458** (0.230)	-0.459** (0.230)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>					
Industry	0.677*** (0.210)	0.488*** (0.070)	0.707*** (0.216)	0.528*** (0.070)	0.497*** (0.070)
Service	0.485*** (0.181)	0.558*** (0.061)	0.511*** (0.190)	0.611*** (0.061)	0.578*** (0.060)
Locality_urban ( <i>Base: rural</i> )	0.520*** (0.166)	0.304*** (0.053)	0.523*** (0.164)	0.323*** (0.053)	0.297*** (0.053)
Constant	6.115*** (1.214)	6.286*** (0.365)	6.066*** (1.142)	6.131*** (0.372)	6.276*** (0.364)
Observations	551	4,961	551	4,961	4,962
R-squared	0.165	0.139	0.157	0.129	0.145
Adjusted R-squared	0.132	0.135	0.124	0.125	0.141
Region FE	YES	YES	YES	YES	YES
F-statistic	6.371	37.10	5.813	34.38	40.59

Notes: Robust standard errors are in parenthesis; the dependent variable is (log) household total non-farm enterprise income; all Models are estimated using the OLS technique; Model I reports the estimated effect of the index of financial inclusion (i.e. Finc<sub>i</sub>) while Models II – V presents individually the estimated effects of the four dimensions of financial inclusion; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; all the estimations control for region fixed effects.

**Table 3.11: Effect of financial inclusion on household agricultural income**

VARIABLES	Dependent variable: (log) household total agricultural income				
	I	II	III	IV	V
Finc <sub>i</sub>	-0.208 (0.130)				
Bank_account		-0.235*** (0.042)			
Access_credit			0.044 (0.126)		
Access_insurance				-0.135*** (0.049)	
Savings_account					-0.256*** (0.040)
Age_head	0.101*** (0.032)	0.045*** (0.010)	0.105*** (0.032)	0.046*** (0.010)	0.046*** (0.010)
Age_head2	-0.001*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Sexhead ( <i>Base: female</i> )	0.908*** (0.165)	0.553*** (0.056)	0.940*** (0.168)	0.582*** (0.056)	0.561*** (0.056)
Household_size	0.122*** (0.023)	0.122*** (0.008)	0.124*** (0.023)	0.125*** (0.008)	0.119*** (0.008)
<b>Head's educational attainment (<i>Base: no_education</i>)</b>					
Basic_education	-0.231 (0.209)	-0.223 (0.183)	-0.354* (0.184)	-0.240 (0.186)	-0.208 (0.184)
Secondary_education	-0.355* (0.203)	-0.370** (0.184)	-0.432** (0.186)	-0.368** (0.187)	-0.352* (0.185)
Post-secondary_education	-0.257 (0.184)	-0.254 (0.186)	-0.304* (0.165)	-0.241 (0.188)	-0.240 (0.186)
Tertiary_education	-0.493** (0.192)	-0.327* (0.184)	-0.547*** (0.174)	-0.315* (0.186)	-0.312* (0.184)
<b>Head's main occupation (<i>Base: agriculture</i>)</b>					
Industry	-0.761*** (0.207)	-1.072*** (0.085)	-0.703*** (0.204)	-1.049*** (0.085)	-1.071*** (0.085)
Service	-1.077*** (0.143)	-1.064*** (0.059)	-1.007*** (0.142)	-1.028*** (0.060)	-1.051*** (0.059)
Locality_urban ( <i>Base: rural</i> )	-0.435*** (0.141)	-0.476*** (0.052)	-0.411*** (0.142)	-0.468*** (0.052)	-0.483*** (0.052)
Constant	4.637*** (0.782)	6.042*** (0.303)	4.421*** (0.805)	5.962*** (0.310)	6.012*** (0.302)
Observations	614	5,464	614	5,464	5,465
R-squared	0.327	0.267	0.325	0.264	0.269
Adjusted R-squared	0.303	0.265	0.301	0.262	0.266
Region FE	YES	YES	YES	YES	YES
F-statistic	16.04	96.50	16.87	94.37	96.72

Notes: Robust standard errors are in parenthesis; the dependent variable is (log) household total agricultural income; all Models are estimated using the OLS technique; Model I reports the estimated effect of the index of financial inclusion (i.e. Finc<sub>i</sub>) while Models II – V presents individually the estimated effects of the four dimensions of financial inclusion; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; all the estimations control for region fixed effects.

### **3.7 Concluding Remarks**

In this chapter, we examined the welfare effects of financial inclusion using a cross-sectional dataset from Ghana. Our approach involves the following: First, using four known dimensions of financial inclusion, we derive a multidimensional index of financial inclusion, by employing a computational strategy akin to the approach used in computing the multidimensional poverty index. Second, we use our index of financial inclusion to analyse the welfare effect of financial inclusion, with welfare proxied by both consumption- and income-based measures. Third, given the potential variation in the influence of access to financial services on the welfare of households at different levels of the income spectrum, we conduct an analysis of the effect of financial inclusion on the welfare of poor and non-poor households, separately. Fourth, we attempt to show whether or not financial inclusion affects both the extent of poverty and the degree of inequality among the poor. Fifth, we examine further variations in the effect of the various dimensions of financial inclusion on household welfare. A series of robustness tests including controlling for potential endogeneity and self-selection bias are then undertaken to provide evidence on the reliability of our baseline estimates.

The study elicits a number of interesting results: First, our results suggest strongly that financially deprived households have lower welfare levels compared to their financially included counterparts; this finding is robust to the use of different measures of household welfare. Second, we show that financial inclusion has a much larger impact on the welfare of poor households than on the welfare of non-poor households. This suggests that beyond improving household welfare, financial inclusion may also help in bridging the income gap between the poor and the rich. Third, we observe that financial inclusion reduces the likelihood of a household falling into poverty, but it does not affect both the degree of poverty and inequality among the poor. Fourth, regarding the variations in the impact of the various

dimensions of financial inclusion, our results show that all the four dimensions of financial inclusion independently affects household welfare; however, we observe some differences across household poverty status. In this regard, while access to credit matters for the welfare of non-poor households, access to credit do not significantly influence the welfare of poor households – a finding that could be attributed to the acute lack of access to formal credit by poor households.

Finally, on the possible channels through which financial inclusion might impact household welfare, we show that financial inclusion impacts household welfare via its effect on households' farm and non-farm enterprise incomes. Access to formal credit does not significantly explain households' agricultural incomes; a finding that could be explained by the fact that the operations of agricultural activities often have little or no connection with formal or semi-formal financial intermediaries in terms of access to credit. The results of this study are robust to alternative measures of the financial inclusion index, to the use of different cut-off points and to the control for potential endogeneity and self-selection bias.

In sum, our results imply that providing improved access to formal financial services to households, especially poor households, will not only improve household welfare but will also facilitate reductions in inequality. Thus, development policy practitioners and national governments must continue their efforts in promoting financial inclusion in order to ensure the realisation of the sustainable development goals, in particular, the reduction in the incidence of poverty and vulnerability as well as inequality.

## Appendix to Chapter Three

**Table 3.1A: Descriptive statistics of regression variables**

Variable	Description	Mean	Std. Dev.	Range
<i>Measures of household welfare</i>				
lwelfare	Continuous: This is the log of household total consumption (including food and non-food) expenditure per equivalent adult and adjusted for variations in prices across households.	8.22	0.76	5.9 – 10.88
lfoodx	Continuous: This is the log of household total food expenditure per equivalent adult and adjusted for variations in prices across households.	6.85	0.77	3.0 – 11.5
Income	Continuous: This is the log of household total gross income per annum.	8.78	1.41	0.69 – 14.60
Non-poor	Binary: This is a binary measure of household welfare and it takes a value of 1 if the household is classified as non-poor (based on the upper poverty line) and zero otherwise.	0.67	0.47	0 – 1
P <sub>0</sub>	Binary: This a poverty incidence measure and it is computed using the upper poverty line.	0.34	0.47	0 – 1
P <sub>1</sub>	Continuous: This a poverty gap measure and it is computed using the upper poverty line	0.12	0.22	0 – 0.97
P <sub>2</sub>	Continuous: This is a poverty gap square measure and it is computed using the upper poverty line.	0.06	0.14	0 – 0.94
Finc <sub>i</sub>	Binary: This is a measure of households' level of financial inclusion and it takes a value of 1 if a household is financially excluded (or deprived) and zero if it is financially included.	0.10	0.30	0 – 1
Age_head	Continuous: This captures the age of the household head.	43.13	11.15	21 – 77
Age_head2	Continuous: This captures the square of the age of the household head.	1984.4	1026.96	441 – 5929
hsize	Continuous: This captures the size of a household.	4.31	2.63	1 – 20
Sexhead	Binary: It captures the gender of the head of a household. It assumes a value of 1 if the head is male and zero otherwise.	0.72	0.45	0 – 1
No education	Binary: It measures the educational attainment of the household head. It assumes a value of 1 if the head has no education and zero otherwise.	0.01	0.1	0 – 1
Basic_education	Binary: It measures the educational attainment of the household head. It assumes a value of 1 if the head's highest educational attainment is basic education and zero otherwise.	0.15	0.36	0 – 1
Secondary_education	Binary: It measures the educational attainment of the household head. It assumes a value of 1 if the head's highest educational attainment is secondary education and zero otherwise.	0.24	0.43	0 – 1
Post-secondary_education	Binary: It measures the educational attainment of the household head. It assumes a value of 1 if the head's highest educational attainment is post-secondary education and zero otherwise.	0.27	0.44	0 – 1
Tertiary_education	Binary: It measures the educational attainment of the household head. It assumes a value of 1 if the head's highest educational attainment is tertiary education and zero otherwise.	0.33	0.47	0 – 1

*Continued Next Page*

*Table 3.1A Continued*

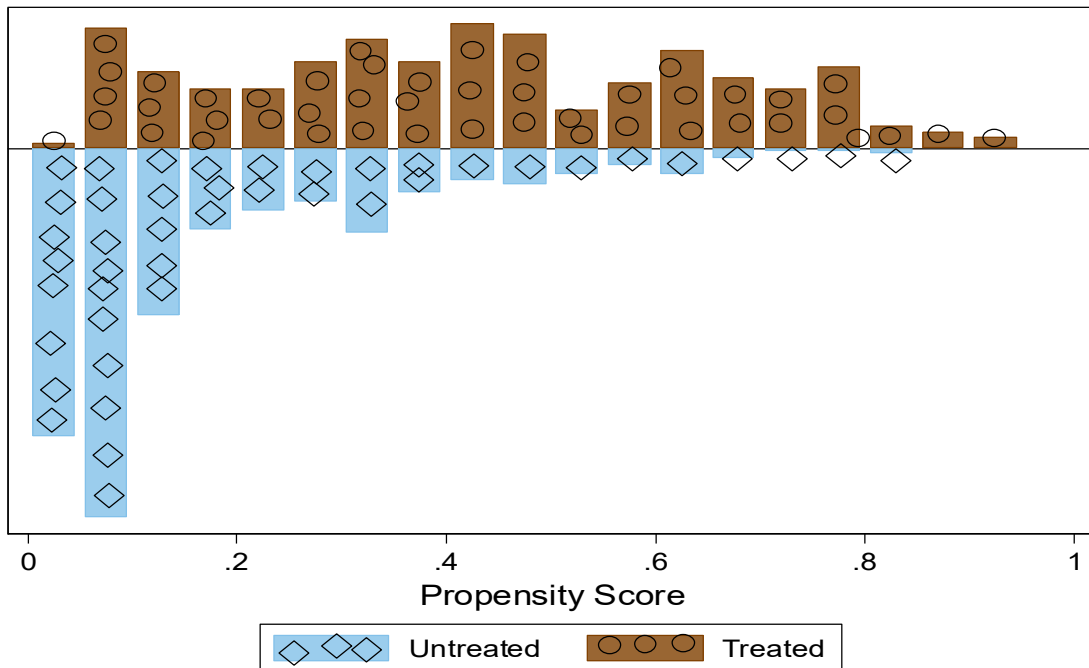
Agriculture	Binary: It captures the sector of employment of the household head. It takes a value of 1 if the head's main occupation is agriculture and zero otherwise.	0.49	0.50	0 – 1
Industry	Binary: It captures the sector of employment of the household head. It takes a value of 1 if the head's main occupation is industrial activity and zero otherwise.	0.13	0.34	0 – 1
Services	Binary: It captures the sector of employment of the household head. It takes a value of 1 if the head's main occupation is services and zero otherwise.	0.36	0.48	0 – 1
Urban	Binary: It measures the geographical location of a household. It takes a value of 1 if urban and zero otherwise.	0.39	0.49	0 – 1
<i>Regional dummies (a measure of the geographical location of households)</i>				
Western	Binary: It takes a value of 1 if the household is located in the Western region and zero otherwise.	0.15	0.29	0 – 1
Central	Binary: It takes a value of 1 if the household is located in the Central region and zero otherwise.	0.08	0.28	0 – 1
Greater Accra	Binary: It takes a value of 1 if the household is located in the Greater Accra region and zero otherwise.	0.09	0.28	0 – 1
Volta	Binary: It takes a value of 1 if the household is located in the Volta region and zero otherwise.	0.09	0.29	0 – 1
Eastern	Binary: It takes a value of 1 if the household is located in the Eastern region and zero otherwise.	0.15	0.36	0 – 1
Ashanti	Binary: It takes a value of 1 if the household is located in the Ashanti region and zero otherwise.	0.16	0.37	0 – 1
Brong Ahafo	Binary: It takes a value of 1 if the household is located in the Brong Ahafo region and zero otherwise.	0.14	0.35	0 – 1
Northern	Binary: It takes a value of 1 if the household is located in the Northern region and zero otherwise.	0.04	0.19	0 – 1
Upper East	Binary: It takes a value of 1 if the household is located in Upper East region and zero otherwise.	0.04	0.20	0 – 1
Upper West	Binary: It takes a value of 1 if the household is located in the Upper West region and zero otherwise.	0.06	0.24	0 – 1

*Note: The upper poverty lines is set at GH¢1,314.00.*

**Table 3.2A: Test of covariate balance (PSM estimation)**

Variable	Mean		%bias	<i>t</i> – test	
	Treated	Control		<i>t</i>	<i>P</i> >   <i>t</i>
Age_head	42.171	42.904	-6.1	-0.62	0.533
Age_head2	1945.5	2003.9	-5.1	-0.53	0.598
hsize	4.263	4.508	-9.8	-1.04	0.300
Sexhead	0.692	0.742	-11.0	-1.21	0.225
Basic_education	0.3	0.342	-11.1	-0.98	0.329
Secondary_education	0.271	0.213	14.0	1.49	0.136
Post-secondary_education	0.204	0.208	-1.0	-0.11	0.910
Tertiary_education	0.225	0.238	-2.7	-0.32	0.746
Industry	0.108	0.133	-7.7	-0.84	0.402
Services	0.192	0.158	7.5	0.96	0.338
Urban	0.233	0.246	-2.7	-0.32	0.749

**Figure 3.1A: Propensity Score Graph**



# **CHAPTER FOUR**

## **THE FINANCIAL INCLUSION AND BANKING SYSTEM PENETRATION**

### **4.0 Introduction to Chapter Four**

This chapter presents the third empirical paper of the thesis. The chapter specifically examines the role of banking system penetration in financial inclusion using data from Ghana. The chapter is structured into seven sections: Section 4.1 presents the introduction to the study while Sections 4.2 and 4.3 presents the background of the Ghanaian banking system and the review of the related literature, respectively. Section 4.4 discusses the empirical estimation strategy adopted by the study while Section 4.5 discusses the data and descriptive statistics of the main regression variables. In Section 4.6, we present and discuss the main empirical results of the paper while Section 4.7 concludes the study.

### **4.1 Introduction to Paper III**

It is well established that financial inclusion which entails the provision of formal financial services – that is, savings, insurance, credit and payment facilities – to poor households and microenterprises has a substantially positive impact on welfare (see Banerjee & Newman, 1993; Aghion & Bolton, 1997; Caskey et al., 2006; Levine, 2008; Khandker & Samad, 2014; Danquah et al., 2017). Specifically, micro-level studies show clearly that households with access to financial services are economically well-off than those without (see Khandker, 2005; Khandker & Samad, 2014; Luan & Bauer, 2016).<sup>33</sup> As well, access to finance has often been

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<sup>33</sup> Similar findings are reached in the first two empirical chapters of this thesis: First, our paper on the effect of access to credit on household welfare show strongly that access to credit improves household welfare. Second, the paper on the effect of financial inclusion – measured multidimensionally – on household welfare demonstrates that financial inclusion exerts a strong positive effect on household welfare.

cited as the main obstacle to the growth and transformation of small- and medium-scale enterprises (SMEs) (see, for example, Aryeetey, 1994; Bigsten et al., 2003; Beck et al., 2008; Abor & Quartey, 2010; Berg & Fuchs, 2013; Quartey et al., 2017). Beyond the household- and firm-levels effects of financial inclusion, it has also been suggested that the economies with deeper financial intermediation are associated with higher growth performance, lower inequality and macroeconomic stability (see Bernanke & Gertler, 1990; Jalilian & Kirkpatrick, 2005; Beck et al., 2007).

In spite of the significant developmental benefits that can be generated by a deeper level of financial inclusion, it remains a fact that such benefits are yet to be enjoyed by an extremely large number of individuals in the world. The World Bank's Global Findex report (2018) revealed that although there have been some improvements in the extent of financial inclusion, globally, over the past few years, about 1.7 billion working-age adults in the world still have no access to formal financial services; this figure puts the percentage of the world's adult population without access to formal financial services at around 31% (see Demirguc-Kunt et al., 2018). An understanding of the factors that potentially influence the extent of financial inclusion in a country is important for effective policy formulation on financial inclusion. Extant studies on access to financial services shows that the availability of financial services (a supply-side factor) as well as demand-side factors matter in the extent of financial inclusion (Claessens, 2006; Beck & de la Torre, 2007).

While a number of studies have chiefly explored the demand-side drivers of financial inclusion (see Allen et al., 2016; Demirguc-Kunt & Klapper, 2013), there is however little empirical evidence on the role of supply side factors – in particular, banking system penetration – in explaining the level of financial inclusion (see Chakravarty & Pal, 2013, for instance). Beck et

al. (2009) underscored the importance of geography or physical access to financial institutions as one of the key barriers to financial inclusion in the developing world. In this paper therefore, we examine whether banking system penetration impacts the level of financial inclusion using data from Ghana. Indeed, recent developments in the financial sector landscape in most countries, notably in the developing world, suggests that conventional banks may have a role to play in deepening access to financial services, especially for low income groups.

For instance, over the past few years, there has been a considerable growth in the physical presence of bank branches across geographical locations as well as in the type of products and services offered by banks. In recent times, conventional banks have taken a keen interest in designing financial products targeted at low-income households, and the poor generally, throughout the world (Chibba, 2009). In Guatemala, for instance, two of the largest commercial banks have introduced new business lines to serve the unbanked (see Gwinner et al., 2006) while in India, the banking industry has rolled out new products and services with the aim of addressing financial exclusion. In Ghana, furthermore, aside the growth in bank branch penetration in recent times, there have been significant changes in banks' product design and service outreach with the ultimate aim of attracting hitherto unbanked customers.

Similar to what pertains in most parts of the developing world, Ghanaian banks are now paying interest on savings accounts and zero-balances are now required to open bank accounts – this was not the case prior to the 2000s. Further, most Ghanaian banks have taken advantage of the strong growth in the Information Communication Technology (ICT) industry and the evolution of market-based approaches to serve the poor and unbanked by developing business alliances with non-financial firms in order to expand their outreach. Through collaboration with telecommunication companies and other non-financial firms, banks now undertake money

transfer services – such as mobile money transfer and other electronic money transfer services. They also offer innovative liability products such as bill payments including utility, satellite TV subscription, and payment of school fees, among others.

Other services offered by banks in recent times include internet and SMS banking platforms, insurance – for example, funeral policy and child education policy – and mortgage facilities, and *susu*<sup>34</sup> schemes. Furthermore, most Ghanaian banks now have a desk for small- and medium-scale enterprises (SMEs) lending with the view of engaging low-income clients or businesses. These innovations in the Ghanaian banking system have the potential of increasing the patronage of formal financial services, especially by those who are excluded from the formal financial system.

On the back of these developments, we exploit the policy environment of the Ghanaian banking system – specifically, the introduction of the universal banking regime in 2003 which matured fully in December 2006 – of the Ghanaian banking system to provide evidence on whether banking system penetration (that is, bank branch expansion) influences the extent of financial inclusion in Ghana. In this vein, we use trend breaks in the relationship between initial financial development and bank branch placement to control for endogenous bank branch placement and to identify the effect of banking system penetration on financial inclusion. Our reliance on the change in the policy environment of the Ghanaian financial sector allows us to circumvent the endogeneity problems that often bedevils causal analysis of this nature in empirical research. This approach assumes that the universal banking system which came to replace the hitherto compartmentalised system of banking in Ghana may affect the level of financial inclusion in

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<sup>34</sup> *Susu* is part of the informal financial market which is a means of collecting and saving money through a savings club or partnership. This has been practiced throughout in Africa and the Caribbean.

Ghana indirectly through its impact on banking system penetration. This approach is similar to the identification strategy adopted by Duflo (2001), Almond et al. (2002) and Burgess & Pande (2005).<sup>35</sup>

The current study is justified on the following grounds: First, to the best of our knowledge, it is the first empirical attempt to examine the role of bank branch expansion in financial inclusion using data from Africa; Second, the study adds important literature to the financial inclusion literature by critically analysing a supply-side bottleneck of achieving financial inclusion whilst exploiting the important role of banking sector policies. This approach sheds important insights on the role of policy in deepening the extent of financial inclusion in Africa; Lastly, we utilise a unique three-period district-level pseudo panel dataset constructed from three waves of the Ghana Living Standards Survey (GLSS) and complemented with administrative data on bank branch locations obtained from the Bank of Ghana to provide a new evidence on the role of banks in improving the level of financial inclusion in Ghana, and by extension in Africa.<sup>36</sup>

The main findings of the paper are: first, the move to the universal banking system in Ghana resulted in an expansion of banks' branch network which has benefited hitherto financially less developed districts, albeit, the expansion of bank branches into financially more developed districts continues unabated. Second, the results from our instrumental variable estimations suggests strongly that banking system penetration promotes financial inclusion in terms of

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<sup>35</sup> Duflo (2001) exploited a large-scale school construction programme engaged in by the Indonesian government to examine the causal influence of education on labour market outcomes. Almond et al. (2002) studied the role of health care access in black infant mortality rates using a county-level data set whilst exploiting an exogenous variation in black minority access to health care. Burgess & Pande (2005) exploited the introduction and removal of state-led rural branch expansion programme to provide evidence on the effect of bank branch expansion on poverty in India.

<sup>36</sup> Deaton (1985) argues that in the absence of genuine panel datasets, pseudo (synthetic) panels constructed from repeated cross sections can be used to study relationships over time in a manner akin to genuine panels.

access to both bank credit and formal credit. The findings of this paper point to the important role of policy in deepening financial inclusion.

#### **4.2 Background of the Ghanaian Banking System**

Over the past few decades, the Ghanaian banking industry has witnessed considerable transformation partly due to the gradual but steady implementation of a number of banking sector reforms since the 1980s. As part of the Economic Recovery Programme (ERP) which was launched in 1983 with profound assistance from the International Monetary Fund and the World Bank, Ghana embarked on a number of economic reforms including reforms that were aimed at restructuring the financial sector. The financial sector reforms aimed at promoting the competitiveness and performance of the Ghanaian financial sector, notably the banking industry.

The reforms in the banking sector began in 1988 with the launching of the Financial Sector Adjustment Programme (FINSAP). By the early 2000s, several banking sector reforms had been implemented including the Central Bank's decision to allow private and foreign banks to operate in the Ghanaian banking system, the removal of banks' minimum savings rate and sectoral credit controls, the liberalisation of commercial banks interest rates and bank charges, the increased supervisory authority of the Bank of Ghana, the introduction of a universal banking license regime, to mention but a few. In particular, the promulgation of the Universal Banking License (UBL) policy in 2003 to replace the three-pillar banking model – development, merchant and commercial banking – which was in place at time was an attempt to improve the competitiveness of the banking industry, encourage product innovation and entry. In the ensuing paragraphs, we discuss the key characteristics of the UBL policy, the

evolution of the banking system during the period 1999 – 2014, and the profile of households' sources of credit in Ghana.

#### *4.2.1 The Universal Banking License (UBL) policy*

The Ghanaian banking industry, prior to 2007, was characterised by a three-tier banking model – that is, banks were grouped into commercial, development and merchant banks. In particular, the Central Bank of Ghana, hitherto, issued operational licences to banks to undertake only one of three different types of banking activities, namely, commercial, merchant and development banking. Under the three-tier banking model, no single bank could operate in more than one dimension of banking activity. The system also imposed branch network restrictions on certain types of banking activities. For instance, merchant banks which were designed primarily to provide wholesale banking services to businesses, could not hold savings accounts for individuals. Also, merchant banks were constrained by their license to branch out only within the metropolis.

The introduction of the UBL regime by the Bank of Ghana entailed a switch from a compartmentalised/three-tier system of banking to a system where all banks are free to offer any product or service consistent with their capital, risk appetite and business orientation. Specifically, the UBL concept made the following changes to the Ghanaian banking system: (i) removal of restrictions on banking activity, (ii) removal of restriction on branch network expansion for certain institutional types – for example, Merchant Banks, (iii) allowance of banks to freely determine which segment of the market they desire to operate, (iv) an increase in banks' minimum capital requirement from twenty thousand Ghana cedis to seven million Ghana cedis; the satisfaction of this minimum capital requirement was a precondition for the

issuance of a universal banking licence and banks were required to comply with this directive by the end of December 2006.

Under the UBL concept, banks with universal banking licence have the liberty to engage in commercial, development and merchant banking activities simultaneously without necessarily acquiring separate licenses. This new system of banking therefore created a platform where banks can offer products that were previously the preserve of other traditional banking sectors whilst at the same time allow banks to diversify the range of financial services they offer. The UBL regime thus stripped off commercial bank's monopoly in the area of retail banking by allowing other categories of banks, especially merchant banks, to compete for retail deposits. The UBL regime may therefore help in easing the liquidity constraints of banks by increasing capital mobility, that is, enabling banks to use the deposits of one sector (say, households) to make loans to another sector (say, businesses). Therefore, it can be concluded that the UBL regime has increased the competitiveness of the Ghanaian banking industry and this may force banks' to among other things expand their bank branch networks in order to broaden their customer base. We test the validity of this assertion in Section 6 of this paper.

#### *4.2.2 Evolution of the Ghanaian banking industry since 1999*

The Ghanaian banking system which hosted 16 banks in 1999 with about 300 bank branches, was home to 23 banks with 425 bank branches in 2006 (see Table 4.1). Although the Bank of Ghana had set the end of December 2006 as the deadline for the fulfilment of the capital adequacy requirement for banks to attain a universal banking status, it was until 2007 that all operating banks in the country had officially attained a universal banking status (see Adjei-Frimpong, 2013). At the end of December 2006, only 16 of the operating banks in the Ghanaian banking industry had obtained a universal banking licence leaving behind 7 banks with 4 of

them still operating as commercial banks while the remaining 3 operated as development banks (see Table 4.1).

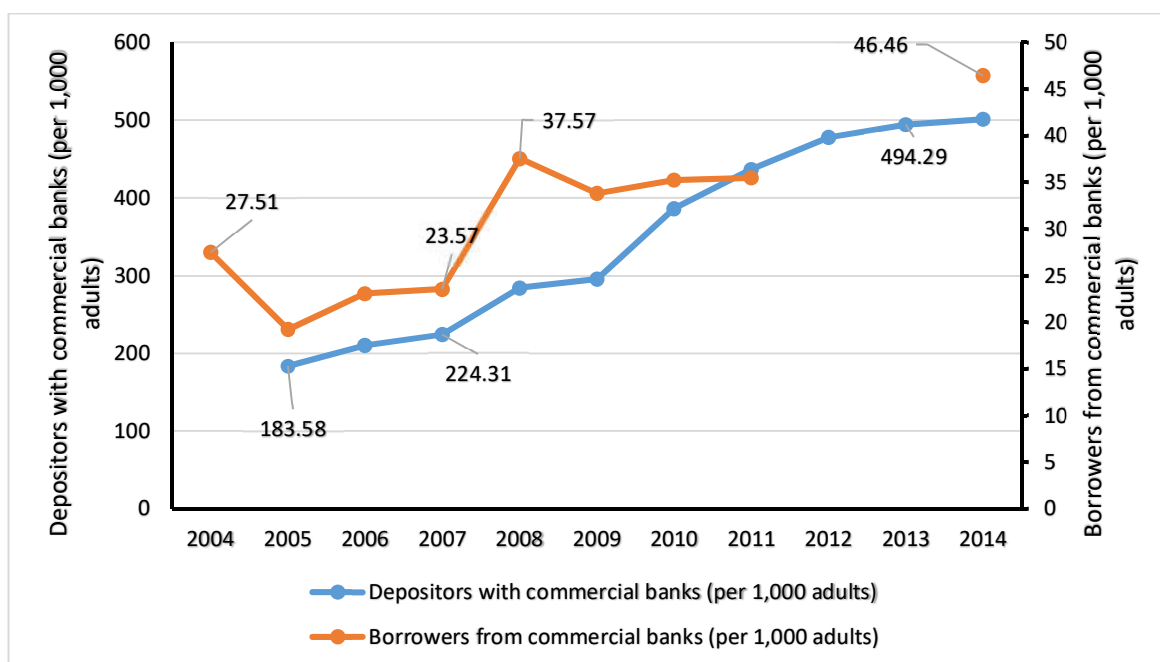
**Table 4.1: Structure of the Ghanaian Banking Industry, 1999-2014 (Selected years)**

<b>Banks</b>	<b>1999</b>	<b>2002</b>	<b>2003</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
Universal Banks	0	0	3	16	23	26	26	27	27	27	28
Commercial Banks	8	9	9	4	0	0	0	0	0	0	0
Development Banks	3	3	3	3	0	0	0	0	0	0	0
Merchant Banks	5	5	3	0	0	0	0	0	0	0	0
<b>No. of major Banks</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>23</b>	<b>23</b>	<b>26</b>	<b>26</b>	<b>27</b>	<b>27</b>	<b>27</b>	<b>28</b>
<b>Bank branches</b>	<b>300</b>	<b>309</b>	<b>295</b>	<b>425</b>	<b>453</b>	<b>619</b>	<b>776</b>	<b>795</b>	<b>870</b>	<b>892</b>	<b>967</b>

Source: Adjei-Frimpong (2013) and Bank of Ghana (2016)

Between 2007 and 2014, the number of bank branches in Ghana increased by over 113%, indicating a surge in bank branch penetration by about 514 additional bank branches (see Table 4.1). The increased penetration of bank branch network over the years as well as the significant changes in the product offering of banks are clear manifestations of the inherent competitiveness in the banking industry brought about by the introduction of the universal banking licence regime. The observed increase in the number of bank branches may be viewed in terms of the fact that areas that previously had less/no presence of a bank branch are currently witnessing improved presence of bank branches. Alongside the expansion in bank branch network, primary financial inclusion indicators point to some positive developments in the extent of financial inclusion in recent times. For instance, the number of depositors with banks per 1000 adults has increased from 183.6 in 2005 to about 501.2 in 2014, representing over 173% increase in the number of depositors with banks per 1000 adults over the period. Also, the number of borrowers from banks per 1000 adults rose from 27.5 in 2004 to over 46 in 2014 (see Figure 4.1).

**Figure 4.1: Trends in financial inclusion indicators, 2004 – 2014**



Source: Author’s illustration based on data from World Bank’s WDI dataset (2017)

#### 4.2.3 Profile of households’ sources of credits in Ghana, 1999-2013

Consistent with the country-level statistics on the profile of bank lending in Ghana over the past few years (as shown in Figure 4.1), we show, using household-level information on the sources of household credit obtained from the GLSS, that formal financial intermediaries (in particular, banks) are gradually becoming an important source of household credit in Ghana. In 1999, for instance, the dominant source of household credit was the informal financial sector – which accounted for close to 90% of total household credit (see Table 4.2). In contrast, less than 7% of total household credit came from commercial banks (that is, credit obtained from state and private banks). In the subsequent years, especially the years after the implementation of the universal banking license regime, however, an impressive proportion of total household credit is sourced from the formal financial sector and the banking sector, in particular. In 2013, for example, close to 56% of total household credit were obtained from the formal financial sector with banks accounting for about half of this figure.

On the other hand, the share of the informal financial sector, especially borrowing from relative/friend/neighbour in household credit has declined significantly over time. While borrowing from a relative/friend/neighbour constituted about 60% of total household credit in 1999, making it the single most important source of household credit, this is not the case in recent times (see Table 4.2). Indeed, borrowing from a relative/friend/neighbour constituted less than a quarter of total household credit in 2013; this reflects approximately 60% decline in the contribution of borrowing from relative/friend/neighbour in total household credit over the period 1999 – 2013. The observed decline in share of household credit sourced from informal financial intermediaries over the years in favour of formal financial intermediaries is arguably due to the transformation in the financial sector landscape in Ghana in recent times. The trend in access to credit from banks, in particular, is an indication of growth in banks’ engagement with the public which, perhaps, could be an outcome of wider bank branch network and an improvement in banks’ product offerings.

**Table 4.2: Sources of household credit & savings, GLSS 4, 5, & 6**

<b>Sources of credit</b>	<b>GLSS 4 (1998/99)</b>	<b>GLSS 5 (2005/06)</b>	<b>GLSS 6 (2012/13)</b>
<i><b>Formal sources</b></i>			
State bank	4.24	8.8	11.06
Private bank	1.92	6.54	16.03
Cooperative	1.65	4.12	5.88
Govt agency	1.16	1.89	0.9
NGOs	0.41	1.67	2.51
Business firm	0.98	1.0	1.01
Employer	1.01	0.89	1.16
<i><b>Informal sources</b></i>			
Money lender	4.7	3.34	3.67
Savings and Loans scheme			16.88
Susu scheme			12.01
Trader	21.83	14.78	1.76
Farmer	2.37	2.15	1.66
Relative/friend/neighbour	58.3	52.75	23.97
Other	1.43	2.05	1.51

Source: Author's computation, based on GLSS 4, 5, and 6.

### **4.3 Review of Related Literature**

This section discusses the related theoretical and empirical literature on the connection between banking system penetration and financial inclusion. In sub-section 1, we discuss the theoretical literature and present a framework of the linkage between banking sector penetration and financial inclusion while sub-section 2 presents a discussion of the relevant empirical literature.

#### *4.3.1 Theoretical Literature*

Financial institutions and markets provide mainly intermediation services to economic agents. They attempt to mitigate the effects of information asymmetries and transaction costs that prevent the direct pooling of an economy's savings for investment purposes. In particular, they mobilise savings, provide payment services that promotes the exchange of goods and services, and advance credit to a large number of economic agents for investment purposes (Beck et al., 2009). Further, by producing and processing information about investors and investment projects, they efficiently direct the allocation of funds and helps in diversifying, transforming and managing risk (Levine, 2005). Well-functioning financial institutions and markets therefore critically supports the accumulation of capital with important consequences on the process of economic growth and development. Supply-leading theorists, notably, Schumpeter (1911), Patrick (1966), and Goldsmith (1969) presented arguments in support of the critical role that a developed financial sector can play in the economic transformation of a nation.

Similar ideas were shared by Gurley & Shaw (1955), McKinnon (1973), Shaw (1973), Romer (1986), Romer (1990), Grossman & Helpman (1991) and Aghion & Howitt (1992). For instance, Gurley and Shaw (1955) noted the intermediation role played by a developed

financial sector and its consequence on economic growth. The authors focused mainly on the transformation role of financial intermediaries in reducing the imperfections arising from maturity mismatch. In simple terms, they argued that financial intermediaries help to remove frictions between surplus-spending units (lenders) and deficit-spending units (borrowers).

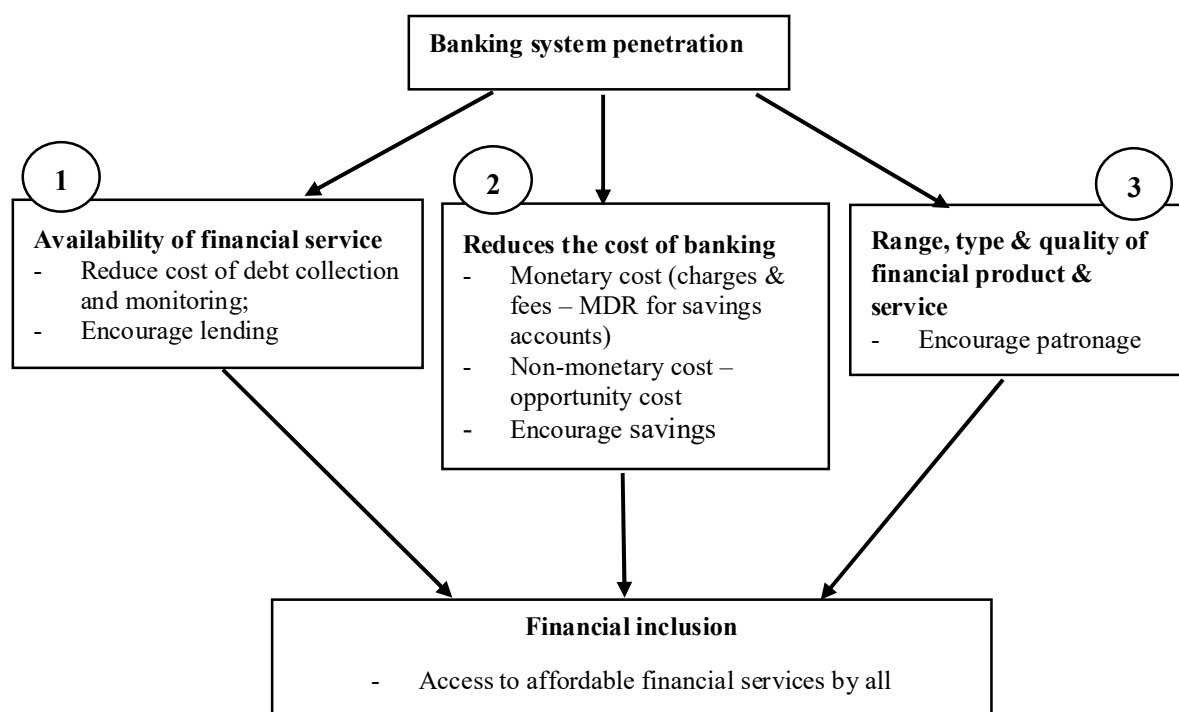
Essentially, banks provide opportunities for risk averse savers to hold bank deposits rather than liquid but unproductive assets. Savings held by banks can then be allocated, optimally, to other economic agents for productive investment. Thus, the presence of banks in an economy reduces the need to hold unproductive liquid assets – or consumption inventories in the context of underdeveloped economies –, and hence an alteration of the composition of savings that is favourable to capital accumulation. Moreover, the presence of banks in an economy may reduce the incidence of self-financing of capital investments, thus ensures that viable investments are not unduly liquidated. Bencivenga & Smith (1991) argue that, by promoting the availability of external financing for businesses, banks prevent the unnecessary liquidation of investments by entrepreneurs who might have had a need for liquidity. In summary, relative to a situation without banks (that is, financial autarky), the presence of banks discourages the holding of savings in the form of unproductive liquid assets as well as prevents the misallocation of invested capital due to liquidity needs.

Banking system penetration can influence access to and/or utilisation of financial services – that is, financial inclusion – through the following channels: (i) banking system penetration may improve the availability of financial services, geographically; for instance, an increase in the physical presence of banks makes a bank closer to its debtors and this reduces the cost of debt collection and monitoring. This can encourage lending. (ii) banking system penetration has the characteristic of reducing the cost of banking; that is, the price of financial services,

including all monetary costs – bank charges and minimum deposit requirements for a savings account, for example –, and non-monetary cost elements such as the opportunity cost of having to join long queues to be served by a teller or having to travel long distances to a bank branch. This potentially encourages savings. (iii) banking system penetration may be associated with an improvement in the range, type and quality of financial services being offered. The above channels are summarised in Figure 4.2 below.

Thus, banking system penetration promotes the realisation of the four dimensions of access to financial services, namely (see Morduch, 1999; Claessens, 2006): reliability – that is, is finance available when needed/desired; convenience – that is, what is the ease of access; continuity – that is, can finance be accessed repeatedly; and flexibility – that is, is the product tailored to the needs of customers.

**Figure 4.2: Banking system penetration and financial inclusion: causal mechanism**



Note: MDR = minimum deposit requirement

Source: Author’s illustration (2018)

More broadly, however, Beck & de la Torre (2005) classify the options to expanding access to finance into two categories, namely: first, individual financial institution's solutions (or moving towards a country's access possibilities frontier); and second, government actions (or expanding a country's access possibilities frontier). In terms of the first issue, access to formal financial services by households and firms may be limited by financial institutions' specific constraints such as distance to a bank branch, high minimum deposit requirement, high administrative fees and charges, cumbersome loan acquisition process, high loan application rejection rates, collateral requirements as well as other non-pecuniary barriers such as the request for greater literacy.

The relaxation of these bank specific constraints as well as the introduction of innovative financial products can propel banks to move towards the "access frontier". On the second issue, the profitability of financial services provision may be affected by the current state of technological and the institutional environment (legal, regulations and other requirements) that financial intermediaries face in a given market. As a result, through government action a country's access frontier can be expanded.

#### *4.3.2 Empirical Literature*

Empirically, a number of studies have examined the effect of bank branch expansion on a range of outcome variables including but not limited to economic growth, poverty reduction and financial inclusion (Binswanger & Khandker, 1995; Jayaratne & Strahan, 1996; Eastwood & Kohli, 1999; Burgess & Pande, 2005; Chakravarty & Pal, 2013). For example, Binswanger & Khandker (1995) examined the impact of formal finance on the rural economy of India. The authors employed a district-level time series data spanning the period 1972/73 to 1980/81 whilst exploiting the important property of the two-stage least squares estimation technique to

provide evidence on the impact of formal credit on a range of outcome variables including agricultural output, investment, farm and non-farm employment, rural non-farm output growth and rural wages. By estimating the effect of rural commercial bank branch expansion on access to credit (or financial inclusion), they observe that the rapid expansion of commercial banks in rural areas has a positive influence on rural credit expansion. In particular, the authors find that the expansion of rural credit was rapid in districts with a rapid growth in the number of commercial and co-operative bank branches.

In a related study, Burgess & Pande (2005) utilised a panel data set of 16 major Indian districts over the period 1961 to 2000 to shed light on the impact of the Indian Central Bank's financial inclusion-led rural bank branch expansion programme on poverty reduction. Specifically, the authors exploited the imposition of the 1:4 bank branch license rule in 1977 and its subsequent removal in 1990 to examine the impact of access to financial services on poverty and output. The 1:4 license rule stated that for a bank to open a branch in a location with an existing bank branch it must first open four branches in rural locations that do not have a bank branch. The bank branch licensing rule therefore sought to increase and equalise bank branch presence across Indian states. The authors find that the imposition of the 1:4 bank branch license rule increased the number of rural bank branches established in less financially developed districts relative to more financially developed districts during the 1977 – 1990 period when the 1:4 branch license rule was in place.

Further, the authors observe that the large-scale expansion of commercial bank branches in rural India led to improved financial inclusion in rural India. That is, the expansion of commercial bank branches in rural areas improved access to commercial bank credit, making commercial banks the largest lender in rural India. In addition, by employing trend breaks in

1977 and 1990 in the relationship between a state's initial financial development and rural branch expansion as an instrument for the number of rural locations banked in a state, they find that a percentage increase in the number of rural banked locations reduced rural poverty and increase total output by 0.36% and 0.55% respectively.

Chakravarty & Pal (2013), using a state-level panel data in India consisting of 17 states and spans the period 1972-2009, examine the effects of major banking policies on financial inclusion across states in India. Consistent with the findings of Burgess & Pande (2005), the authors find that the rural bank branch expansion program which was in force between 1977 and 1990 influenced the extent of financial inclusion across states in India. They concluded that geographic penetration of banks enhances financial inclusion. Guiso et al. (2006) analyse the impact of bank deregulation on access to and cost of finance whilst exploiting the introduction of the 1936 Italian banking law and its repeal in the 1980s as a natural experiment. Specifically, the authors exploited the exogenous variation in the level of restrictions to bank competition across Italian provinces to provide evidence on the effects of bank regulation and also on the impact of banking sector deregulation. Their results show that bank deregulation led to an increase in competition in the banking industry as well as broadens access to finance.

Moreover, other studies have exploited bank branch deregulation policies to provide causal evidence on bank branch expansion on economic growth, poverty and inequality. For instance, Jayaratne & Strahan (1996) exploited the natural experiment of a gradual relaxation of bank branch restrictions on state-wide branching and on the entry of out-of-state banks in the United States (US) to provide evidence on the effect of financial sector development on economic growth. They observe that the relaxation of bank branch restrictions led to an increase in bank presence across the different states which in turn resulted in about 0.5% - 1.19% increase in

economic growth. In a similar study, Black & Strahan (2002) investigated the effect of policy changes – that is, the US branch deregulation program – on entrepreneurship. They find that the deregulation of bank branch restrictions increased the rate of new firm incorporations by up to 8% while at the same time reduces the negative effect of concentration on new incorporations.

Furthermore, by exploiting the branch deregulation experience across US states in the 1980s and 1990s, Beck et al. (2007) examined the impact of US branch deregulation on income distribution. In particular, to address some of the concerns related to cross-country regressions such as endogeneity and measurement error, the authors exploited the cross-state and cross-time variation, thus accounting for state- and time-fixed effects, to provide evidence on whether liberalising restrictions on intra-state branching in the US has an influence on income distribution. They find that bank branch deregulation led to a decrease in income inequality and this is largely through its effect on labour market conditions. More specifically, the authors argued that the effect of financial deepening on income inequality is not only statistically significant but also economically significant as over 60% of the cross-state, cross-year variation in income distribution is attributed to the removal of branch restrictions.

More recently, some studies have relied on data from the World Bank's Global Findex database to provide evidence on individual and country level determinants of financial inclusion. Allen et al. (2016), for instance, used the Global Findex dataset for 123 countries to investigate the individual and country-level determinants of financial inclusion, focusing on two measures of financial inclusion, namely, ownership of a bank account and saving on a bank account. They find that a number of individual characteristics such as income and education positively impact financial inclusion. Similarly, Demircug-Kunt & Klapper (2013) examine the use of financial

services in 148 countries and the determinants of financial inclusion. In relation to the determinants of financial inclusion, they estimated models of the effect of various individual and country characteristics on three main indicators of financial inclusion – that is, ownership of a bank account, savings on a bank account, and the use of bank credit. The authors reveal that among others, income significantly explains the level of financial inclusion both among individuals and across countries.

In sum, the above discussion reveals that literature on the role of banks in financial inclusion exist. Starting from the work of Binswanger & Khandker (1995) to those authored more recently (see Chakravarty & Pal, 2013) the evidence suggests strongly that banking system penetration promotes financial inclusion. However, the present literature is silent about the effect of banking system penetration on financial inclusion using data from Africa. Against this backdrop, this paper seeks to provide evidence on the effect of banking system penetration on financial inclusion using data from an African context. In doing so, we exploit the policy environment of the financial system in Ghana to purge potential endogeneity bias in the relationship between bank branch expansion and financial inclusion.

#### **4.4 Empirical Estimation Strategy**

##### *4.4.1 Identification Strategy*

Causal empirical investigations are often bedevilled with concerns of endogeneity, arising from errors in measurement, simultaneity, and misspecification. In the presence of a potentially endogenous regressor, meaningful inferences can only be drawn from the use of estimation techniques or methods that address such endogeneity concerns. Given that the current paper seeks to shed light on the role of banking system penetration (otherwise referred to as bank branch expansion in this paper) on financial inclusion, we believe that our measure of banking

system penetration is potentially endogenous and so requires us to employ techniques that addresses this problem. In this vein, we show the policy-driven nature of bank branch expansion in Ghana and use this policy as an instrument for banking system penetration in our model of the determinants of financial inclusion. This identification strategy is in line with the approach adopted by Duflo (2001) for Indonesia and Burgess & Pande (2005) for India.

First, to examine the effect of banking system penetration on financial inclusion at the district-level, a simple way would be to estimate, for district  $i$  in year  $t$ , an OLS regression of the form:

$$F_{it} = \alpha_i + \beta_t + \phi B_{it} + \varepsilon_{it} \quad (4.1)$$

where;  $F_{it}$  represent the level of financial inclusion for district  $i$  at time  $t$ ;  $B_{it}$  represent bank branch penetration in district  $i$  at time  $t$  and it is computed as the total number of bank branches per capita operating in district  $i$  at time  $t$ , and  $\alpha_i$  and  $\beta_t$  are region and year fixed effects, respectively;  $\varepsilon_{it}$  is the random error term. Evidence from the above reduced form model is however not unproblematic. Indeed, a causal interpretation of the estimated  $\phi$  parameter from equation (4.1) may be elusive. In the absence of any policy change in the nature of banking business in Ghana we would expect that banks will situate branches in their ‘restricted’ service areas or in more financially developed areas. The case of Merchant Banks, for example, implies that such banks would only operate branches in the metropolis which are likely to be areas with a high degree of financial inclusiveness. So, if more financially included districts are relatively effective in deepening the level of financial inclusiveness, then  $\phi$  will likely overestimate the true financial inclusion impact of bank branch expansion. This problem can be solved if we have an instrument for bank branch expansion.

We argue that the change in policy regime (that is, the switch from the compartmentalised system of banking to the universal banking regime) in the banking industry can serve as an

instrument in this case. As mentioned earlier, prior to 2007, Ghanaian banks were issued different licenses to operate as either a commercial, merchant or a development bank and also the Ghanaian Central Bank imposed restrictions on the branching capacity of certain types of banks – that is, Merchant Banks. This system encouraged banks to branch out only in financially more developed areas or focus on serving their ‘restricted service areas’. The compartmentalised system of banking was associated with very low levels of competition among banks in the industry and so there was little incentive for banks to expand their branch network as well as develop innovative banking products.

The shift to the universal banking regime has arguably introduced a high degree of commonalities in the activities of banks and thus potentially engendering a high level of competitiveness in the banking system (see Isshaq & Bokpin, 2012). Indeed, by eliminating compartmentalisation in the banking industry as well as raising the minimum capital adequacy requirement for banks, the universal banking regime has promoted a change in the business model of all banks towards a point where all banks can offer financial products and services ranging from retail banking to corporate and wholesale banking. The convergence in the products and services offered by banks in the financial system undeniably fosters some degree of competitiveness and this may provide an incentive for banks to expand their outreach by establishing physical bank branches across the country, notably in previously less financially developed communities.

However, a theoretically plausible weakness of our proposed instrument is that even though the Central Bank have removed constraints on branching, there is no directive on *where* banks should open their branches – i.e. whether in financially less developed or financially more developed areas. The inherent competitiveness of the universal banking system, however,

should cause banks to expand their branch network and this may be more pronounced in financially less developed areas (this is conditional on the market size and profitability of the area). Consequently, we posit that, if the post-2006 banking licensing regime had any bite then it should cause banks to branch out *relatively* more into financially less developed communities during the post-2006 period. The post-2006 phenomenon in how a district's initial financial development affect bank branch expansion, may constitute a valid instrument for bank branch expansion if relative to the pre-2007 trend, this incidence is significant and have no direct impact on financial inclusion. Figure 4.3 provides a bird's eye view on the reliability of our proposed instrument. In pane (a) of Figure 4.3, we show that, in general, bank branch expansion exhibits a *strong* positive relationship with initial financial development; however, the same cannot be said about the relationship between initial financial development and our financial inclusion indicators – i.e. access to bank and formal credit (see panes (b) and (c) of Figure 4.3). Indeed, the relationship between initial financial development variable and the two financial inclusion indicators is *weakly* positive.

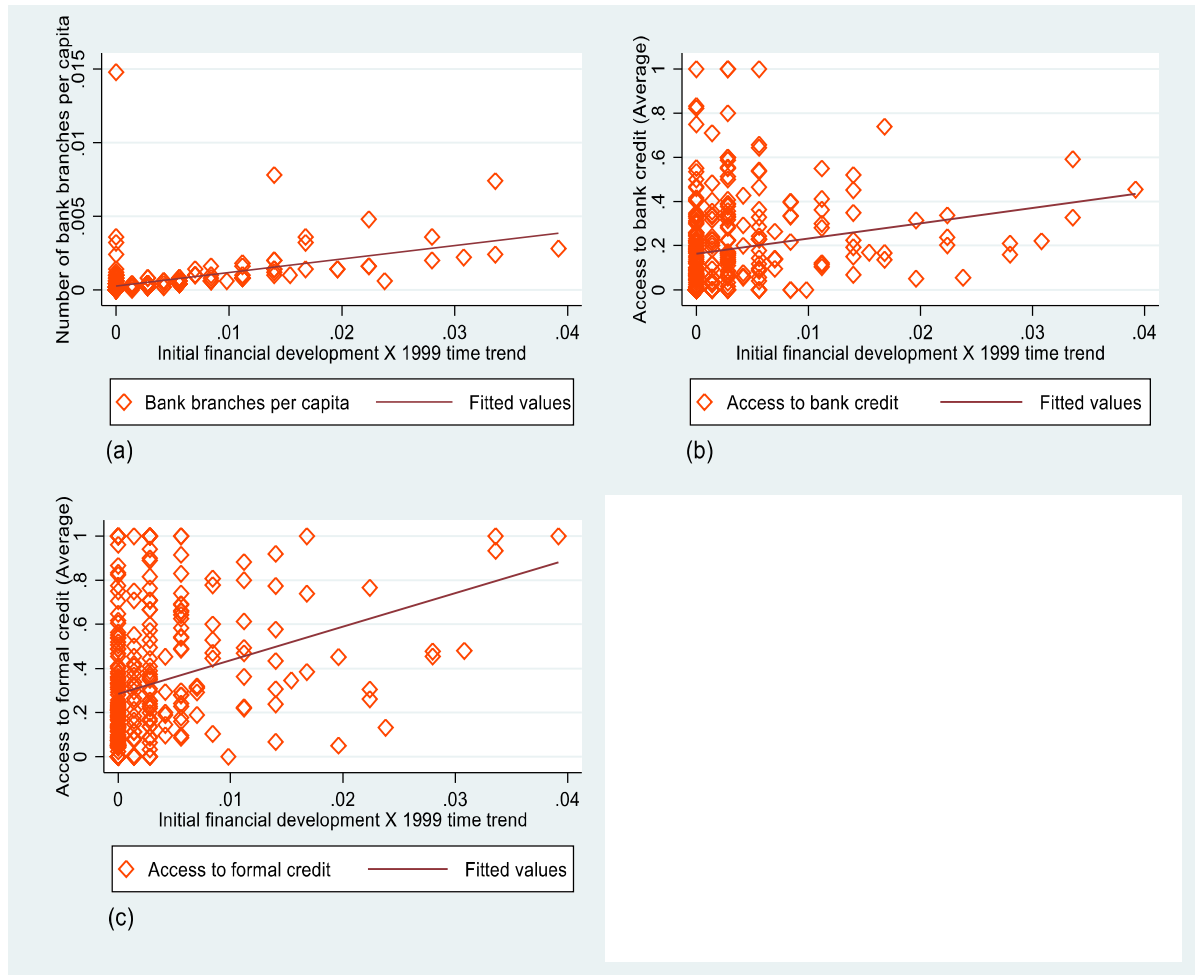
To examine this possibility, we would run a fixed effects regression of the form:

$$B_{it} = \alpha_i + \beta_t + \gamma_t B_{i1999} + \delta_t Z_{i1999} + \varepsilon_{it} \quad (4.2)$$

where,  $\alpha_i$  and  $\beta_t$  are region and year fixed effects, respectively.  $B_{it}$  is the number of bank branches per capita in district  $i$  at time  $t$ , which represents our indicator of banking system penetration (or bank branch expansion) and  $B_{i1999}$  is the number of bank branches per capita in the  $i^{\text{th}}$  district in the base year, say 1999 for the purpose of this study, and it represents our measure of initial financial development for the  $i^{\text{th}}$  district.  $B_{i1999}$  enters the regression interacted with year dummies, with the  $\gamma_t$  coefficients capturing the year-wise effect of initial financial development on bank branch expansion. The difference between  $\gamma_{t+1}$  and  $\gamma_t$  indicates

how a district's initial financial development affects bank branch penetration in the district between years  $t$  and  $t+1$ .

**Figure 4.3: Relationship between initial financial development and, bank branch expansion, access to bank and formal credit**



In order to ensure that convergence in economic activity across districts in Ghana is not driving the observed relationship between initial financial development and bank branch expansion, we include a vector of other control variables ( $Z_{i1999}$ ). These variables attempt to capture the effect of other initial conditions in a district that may have a time-varying effect on bank branch expansion. Included in this vector are factors such as the logarithm of real district welfare per capita, the population density of a district, the level of human capital endowment of a district, and the proportion of rural locations in a district, all measured in 1999. Similar to the initial

financial development indicator, these controls also enter the regression interacted with year dummies;  $\delta_t$  coefficients are the year-wise effects of the control variables on bank branch expansion.

From equation (4.2), we can deduce a linear trend break model as follows:

$$B_{it} = \alpha_i + \beta_t + \gamma_1(B_{i1999} * [t - 1999]) + \gamma_2(B_{i1999} * [t - 2006]) + \gamma_3(B_{i1999} * P_{2006}) + \varepsilon_{it} \quad (4.3)$$

where,  $[t - 1999]$  and  $[t - 2006]$  are linear time trends which turns on in 1999 and 2006 respectively and they enter the regression interacted with our measure of district  $i$ 's initial financial development (i.e.  $B_{i1999}$ ).  $P_{2006}$  is a dummy variable which assumes a value of one in the post-2006 period and zero otherwise. The main coefficients of interest in Equation (4.3) are  $\gamma_1$  and  $\gamma_2$ . These coefficients measure the average 1999–2006 trend relationship between a district's initial financial development and bank branch expansion, and the subsequent change in this relationship – i.e. between 2006 and 2013.  $\gamma_3$  measure the intercept change in the underlying relationship in 2006.

As in Equation (4.2), we also include the set of additional controls,  $Z_{i1999}$  (to capture a district's economic and demographic characteristics) which enters the regression in the same way as  $B_{i1999}$ . Region and year fixed effects account for permanent differences across regions and national events as well as other developments in the financial industry such as the rapid expansion in the non-bank financial services sub-sector (that is, Microfinance Institutions) which may affect bank branch expansion. Given that a problem of serial correlation in the errors often arises when one applies the difference-in-difference estimation technique on a panel data set, we attempt to circumvent this possibility by clustering the standard errors by

district (see Bertrand et al., 2004 and Burgess & Pande, 2005). A formal test of the validity of our proposed instrument is presented in Table 4.5.

#### 4.4.2 Instrumental variable model

Based on the results obtained by estimating Equation (4.3), we would use the deviation (if any) in the trend relationship between initial financial development and branch expansion which is caused by the change in the bank licensing regime after 2006 as an instrument for bank branch expansion. As such, our first stage regression is Equation (4.3) while the second stage regression can be expressed formally as:

$$F_{it} = \alpha_i + \beta_t + \phi B_{it} + \eta_1([t - 1999] * B_{i1999}) + \eta_2(P_{2006} * B_{i1999}) + u_{it} \quad (4.4)$$

where, all variable maintains their usual meanings. The deviation from the linear district-specific trend  $[t - 1999] * B_{i1999}$ , which we characterise as  $B_{i1999} * [t - 2006]$  is our instrument for bank branch expansion ( $B_{it}$ ). Implicit in this strategy is the assumption that the instrument affects the extent of financial inclusion in a district only through its effect on bank branch expansion; in Tables 4.5 and 4.6, we show that this assumption is valid. Equations (4.3) and (4.4) are estimated using the ordinary least squares (OLS) technique.

### 4.5 Data and Descriptive Statistics

This study utilises a unique district-level data set constructed from household survey data sets and administrative data on the location of bank branches in Ghana. Specifically, using three waves of the Ghana Living Standards Survey (GLSS 4 (1998/99), GLSS 5 (2005/06), and GLSS 6 (2012/13)), we carefully construct a three period (i.e. 1999, 2006 and 2013) district-level panel. The GLSS is a nationally representative repeated cross-sectional survey of households in Ghana which is conducted by the Ghana Statistical Service with assistance from the World Bank and other agencies. To date, seven rounds of the GLSS data sets exists; the

first round was conducted in 1987/88 while the second, third and fourth rounds were conducted in 1988/89, 1991/92 and 1998/99 respectively. The fifth and sixth rounds were carried out in 2005/06 and 2012/13 respectively. The most recent wave was conducted in 2016/17.

The key objective of the GLSS is to serve as a source of information for the analysis of wellbeing in Ghana and it focuses on a number of indicators including, demographic information on individuals and households such as education, health, employment, finance, assets, migration, among others. The sampling unit for the survey is the population living in private households in Ghana. The sampling design of the survey follows a two-stage stratified random sampling technique – this gives rise to two levels of aggregation; namely, the primary and secondary sampling units. At the first stage, the primary sampling unit (PSU) or the census enumeration areas (EAs) is selected and they are stratified into the ten administrative regions of Ghana based on proportional allocation using the population in each of the ten regions. At the second stage, however, the secondary sampling unit is defined as the households living in each of the EAs is systematically chosen from each of the selected EAs.

Dissimilar to the earlier waves, the three very recent waves of the GLSS are also identifiable at the district level. In other words, aside being geo-referenced at the PSU level, they also contain district codes of households' locations. Using the last three waves of the GLSS, therefore, we construct a district level pseudo-panel data set.<sup>37</sup> This process is however not without some challenges, especially regarding the addition of district level information in the GLSS 6 wave to that of the GLSS 4 and 5. This difficulty is however not present in the process of appending district level averages of our variables of interest in the GLSS 4 and GLSS 5 since both survey were based on the same set of 110 districts.

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<sup>37</sup> Districts are the second-level administrative sub-division of Ghana below the level of region.

Through creation and re-designation, the number of districts in Ghana has increased since 2004. From 110 districts in the late 1980s following the reforms through to the early 2000s, the number of districts in Ghana have expanded over the period, standing at 138 in 2006, 170 in 2008, 216 in 2016 and currently at 254. The fourth wave of the GLSS which was conducted in 1998/99 however collected information on only 102 out of the 110 districts that were available at the time while the fifth and sixth waves of the GLSS collected information on 110 districts and 170 districts, respectively.

Two main issues arise in constructing the district level data using the GLSS 4 wave: First, inconsistent with the coding scheme employed in GLSS 5 and 6, the GLSS 4 treated *Atebubu* and *Sene* – two adjoining districts in the Brong Ahafo region – as one district even though at the time of the survey they were already separate districts. To address this anomaly, we merged these two districts into a single district in the subsequent waves of GLSS in order to ensure consistency with the GLSS 4. This approach is ultimately the best way to deal with such a problem since it is absolutely not possible to split into two the observations on the *Atebubu/Sene* district as contained in the GLSS 4. Second, the GLSS 4 did not collect information on the following districts: *South Tongu*, *Berekum*, *Zabzugu-Tatale*, *Yendi*, *Savelugu-Nanton*, *Tolon-Kumbungu* and *Sissala* districts. To ensure consistently and especially for the purpose of our identification strategy we omit data on these districts in the two subsequent waves of the GLSS.

Thus, for the purpose of having a balanced panel and a more consistent district level data, we restrict the number of districts to 102 (base year sample size) by dealing with the issue of creation and re-designation of districts in the subsequent periods. Given that the expansion in

the number of districts over time is largely due to the splitting or division of old districts into two or more new districts, we build the same 102 districts from the 170 districts contained in the GLSS 6. Specifically, we carefully identified the origin of all the newly created districts – the additional 60 districts – contained in the GLSS 6 using information on districts in Ghana available from the Ministry of Local Government and Rural Development as well as online resources such as the web pages of the various district assemblies in Ghana. Using this information, we carefully merged the data on all newly created districts contained in the GLSS 6 with the data on their ‘mother’ districts as in the GLSS 4 and 5. This process allows us to create a consistent and balanced panel of 102 districts over a three-year period, yielding 306 observations. Table 4.3 presents the key features of the last three rounds of the GLSS.

**Table 4.3: Key features of the GLSS, waves 4 – 6**

<b>Item</b>	<b>GLSS 4</b>	<b>GLSS 5</b>	<b>GLSS 6</b>
Regions	10	10	10
Districts	102	110	170
Clusters/EA	300	580	1,200
Households	5,998	8,687	16,772
Individuals	26,411	37,128	72,372

Source: Author’s computation, based on GLSS

The derived district level data is then complemented with data on bank branches obtained from the Bank of Ghana. The bank branch data provides information on the number of banks that operated in each of the survey years – 1999, 2006, and 2013 – and their branch locations. The locational information of all existing bank branches enables us to map each bank branch onto the respective district. From this we compute the total number of bank branches in each district for each of the survey years. This process involves the use of detailed information on the

location of each bank branch together with a comprehensive district map of Ghana that contained detailed information on the communities in each district.

#### *4.5.1 Dependent variables*

The dependent variable considered in this paper is access to formal financial services – that is, financial inclusion. Even though financial inclusion is often proxied by indicators such as access to a formal bank account, access to a savings account at a formal financial institution, access to an insurance facility from a formal financial institution and access to formal credit (see, for example, Beck et al., 2009; Demirguc-Kunt & Klapper, 2013), in this paper, however, we focus a single dimension of financial inclusion, namely access to formal credit – that is, credit advanced by formal financial intermediaries such as banks, cooperatives, government agency, and non-governmental organisations (NGOs). This approach is informed by the inadequate information on the other dimensions of financial inclusion in our data set, especially regarding waves 4 and 5 of the GLSS data set. More specifically, unlike the GLSS 6, both the GLSS 4 and 5 do not contain information on the ownership of a formal bank account and also on whether or not an individual holds an insurance facility offered by a formal financial institution. Also, the GLSS data sets (except the sixth wave) do not contain comprehensive information on the ownership of a formal savings account.

Using the information on access to formal credit, we however, define two financial inclusion proxies; that is, (i) a narrower definition that concentrates on access to bank credit and (ii) a broader definition that looks at access to credit from formal financial institutions including banks. Consequently, in our empirical analysis we use two alternative measures of financial inclusion – that is, access to bank credit and access to formal credit. This approach is useful because it allows us to more appropriately capture the financial inclusion effects of bank branch

expansion. Put differently, it sheds insights on how bank branch expansion more specifically influences access to financial services provided by banks – that is, access to bank credit.

#### *4.5.2 Independent variables*

- i. **Bank branch:** This is our indicator of banking system penetration and it is a simple count of the total number of bank branches opened/operating in a district per capita. Three measures of banking system penetration are defined: (1) cumulative number of bank branches operating in a district divided by 5000<sup>38</sup>; (2) cumulative number of bank branches operating in a district divided by the 2000 population figure of that district. The population figures used here are derived using both the GLSS 4 and the 2000 population and housing census (see Coulombe, 2005); (3) cumulative number of bank branches operating in a district divided by the land area of that district – this measure has also been used by Binswanger et al. (1993).
  
- ii. **Initial financial development:** We identify a district's initial financial development by the number of bank branches per capita in that district in the base year. For instance, when we use 1999 as the base year, our initial financial development indicator for each district is computed as the total number of bank branches per capita in a district in 1999.
  
- iii. **Control variables:** We include a number of control variables to capture the effect of some initial conditions in a district that may have a time-varying effect on bank branch expansion as well as on financial inclusion. These variables are the real district welfare per capita, the population density of a district, the human capital endowment of a district, and the

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<sup>38</sup> The choice of 5000 is informed by the fact that the Ghana Statistical Service considers an area as urban if it has a population of 5000 or more (see Ghana Statistical Service (GSS), 2014).

proportion of rural locations in a district, all measured in the base year – that is, similar to the approach used in measuring initial financial development.

Summary statistics of our regression variables are presented in Table 4.4. A description of the variables contained in Table 4.4, however, is noteworthy: *Bank credit* captures the share of total household credit obtained from banks; *Formal credit* captures the share of total household credit obtained from formal financial intermediaries; *Bank branch* measures the total number of bank branches operating in a district in a given year; *Initial financial development* captures the number of bank branches operation in a district in the base year, 1999; *Welfare per capita* is the logarithm of a district's welfare per capita and it captures the income level of a district; *Population density* is the population density of a district and it is computed by dividing each district's population by the land area of the district – the district population figure is the 2000 district population size and it is sourced from Coulombe (2005);

*Human capital* measures the human capital endowment of a district and it is calculated as the proportion of the adult population (individuals aged 18+ years) in a district with a schooling experience; *Rural locality (proportion)* captures the extent of urbanisation in a district and it is measured as the share of rural communities in a district. The welfare measure (*Welfare per capita*) is adjusted to reflect changes in the value of the Ghanaian currency through the 2007 currency redenomination exercise carried out by the Bank of Ghana. The redenomination exercise converted 10,000 cedis (old currency unit) to 1 cedis (new currency unit). In this vein, all monetary values in the fourth and fifth waves of the GLSS are divided by 10,000 in order to ensure consistently with the values obtained from the GLSS 6.

From Table 4.4, we observe that the average number of bank branches in a district is 6 with a minimum of zero and a maximum of 373. Meanwhile, the average number of bank branches in a district in the base year is 4 with a minimum of zero and a maximum of 74. The shares of bank credit and formal credit in total household credit are about 19% and 35% respectively, on average. The mean level of district welfare per capita (logarithm) is around 13.78 with a minimum of 12.6 and a maximum of 14.56. The population density of a district in Ghana is about 261.78, on average, while about three-fifth of the adult population in Ghana has schooling experience. However, this average, masks wide variations across districts with some districts having as low as 2.7% of their adult population possessing an educational experience while other districts have about 9 in every 10 persons possessing a schooling experience. On average, about 71% of the communities in a district are rural communities; that is, about three-quarters of the total land area of a district in Ghana constitutes rural communities.

**Table 4.4: Summary statistics of regression variables**

<b>Variable</b>	<b>Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Bank credit	300	0.193	0.21	0	1
Formal credit	300	0.348	0.31	0	1
Bank branch	306	5.45	24.49	0	373
Initial financial development	306	4.35	10.76	0	74
Welfare per capita	306	13.779	0.390	12.60	14.56
Population density	306	261.777	753.255	7.953	5490.673
Human capital	306	0.605	0.214	0.027	0.897
Rural locality (proportion)	306	0.714	0.265	0	1

Source: Author's computation, based on GLSS data and Bank of Ghana data on bank branch locations.

## 4.6 Results and Discussion

This section presents the main empirical results of the paper. Specifically, we discuss the following issues: First, we show the soundness of our identification strategy by providing evidence on the validity of our chosen instrument. As mentioned earlier, this step involves a demonstration of a change in the relationship between initial financial development and bank branch expansion in a district in the post-2006 period relative to the pre-2007 period. Also, we show that our indicators of financial inclusion are not significantly related with initial financial development, especially during the post-2006 period; these two facts (if established) would provide a sound basis for the use of our chosen instrument for bank branch expansion in our attempt to identify the impact of banking system penetration on financial inclusion. Second, we then exploit the policy-driven nature of bank branch expansion to provide evidence on the relationship between banking system penetration and financial inclusion.

### *4.6.1 Banking system penetration and initial financial development*

Table 4.5 report the results of the test of the suitability of our proposed instrument (i.e. the linear trend model which is presented in Equation 4.3). Column I of Table 4.5 presents the results of the effect of initial financial development on bank branch expansion without the inclusion of other control variables while column II of Table 4.5 presents the empirical results of the effect of initial financial development and other control variables on bank branch expansion. Our results show, first hand, that the inclusion (or exclusion) of other control variables in our model do not alter the effect of the initial financial development variables on bank branch expansion. The empirical estimates (see column II of Table 4.5), suggests that bank branch expansion and initial financial development are positively related in the pre-2007 period. In particular, between 1999 and 2006, an additional point of initial financial development in a district increases the per capita branch expansion in that district by 0.24 units

annually. This means that, compared to less financially developed districts, 0.24 additional bank branches per capita were opened annually in more financially developed districts in the years prior to 2007.

**Table 4.5: Banking system penetration as a function of initial financial development**

VARIABLES	Bank branch expansion	
	I	II
Number of bank branches per capita in 1999*(1999-2013) trend	0.242*** (0.006)	0.235*** (0.004)
Number of bank branches per capita in 1999*(2006-2013) trend	-0.135*** (0.005)	-0.134*** (0.005)
Number of bank branches per capita in 1999*Post-2006 dummy	0.362*** (0.014)	0.264*** (0.026)
Region and Year FE	YES	YES
Other controls	NO	YES
R-squared	0.976	0.986
Adjusted R-squared	0.975	0.985
F-test	1486.46 [0.000]	1458.03 [0.000]
Observations	306	306

*Notes: Robust standard errors clustered by district are in parentheses; p-values are reported in square brackets; F-test is the joint significance test for coefficients in the first two rows; Bank branch expansion is number of bank branches in a district per 5000 persons. Explanatory variables reported are the number of bank branches in a district in 1999 per 5000 persons interacted with (row-wise) (a) a 1999 time trend, (b) a post-2006 time trend, (c) a post-2006 dummy interacted with a post-2006 time trend; Other control variables included are population density, log of district welfare per capita, share of rural localities in a district and human capital endowment, all measured in 1999; These controls enter the regression in the same way as bank branches per capita in 1999; the results are robust to alternative measures of bank branch expansion – i.e. we also measure branch expansion using the number of bank branches in a district divided by the population of the district in 2000 and by the district's land area. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .*

However, an important change in this relationship is observed in the post-2006 period. Between 2007 and 2013, financially less developed districts attracted relatively more bank branches than financially more developed districts. For instance, a unit decrease in a district's initial financial development leads to about 0.13 units increase in the number of bank branches per capita opened in that district, annually. This implies that although bank branch expansion into financially more developed districts continues unabated during the post-2006 period given that banks are free to choose where to locate their branches, it appears that the intensity with which

this is done has been attenuated by the increased branch penetration into hitherto financially less developed districts in the post-2006 period; considering the coefficient estimates presented in column I of Table 4.5, we compute this incidence as 0.10 and it is significant at the conventional levels of statistical significance.<sup>39</sup> Our results therefore suggest some form of enhanced financial intermediation in financially backward districts during the post-2006 period. It more importantly, demonstrates that bank branch expansion is significantly explained by our instrument (i.e.  $B_{i1999} * [t - 2006]$ ). As mentioned earlier, our inclusion of other control variables to capture district specific characteristics as well as controlling for year and region fixed effects ensures that other factors other than the change in the policy regime in the Ghanaian banking system is not driving the observed trends.

Overall, our empirical results demonstrate that the universal banking regime, unlike the hitherto compartmentalised banking regime, have caused banks to branch out relatively more into less financially developed districts. This evidence shows that the theoretical weakness of our proposed instrument as highlighted before does not appear to be an issue. Consequently, we exploit this fact to provide an understanding on the impact of bank branch expansion on financial inclusion. The result is again robust to the use of the other two measures of banking system penetration which we discussed in the previous section; see Tables 4.1A and 4.2A (appendix) for this evidence.

#### *4.6.2 Financial inclusion and initial financial development: Reduced form evidence*

To further check the robustness of our instrument we estimate models similar to Equation (4.3) but utilises instead our measures of financial inclusion as the dependent variable. The idea is

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<sup>39</sup> This is given by  $\gamma_1 + \gamma_2$ . F-test shows that  $\gamma_1 + \gamma_2$  is significantly different from zero.

to illustrate that, unlike bank branch expansion, our financial inclusion variables are not significantly related with initial financial development, especially during the post-2006 period. The reduced form results<sup>40</sup> in Table 4.6 shows the relationship between initial financial development and our two indicators of financial inclusion – the share of bank credit in total household credit and the share of formal credit in total household credit. Column I present the regression estimates when the share of bank credit in total household credit is used as the dependent variable while column II reports the regression estimates when the share of formal credit in total household credit is used as the dependent variable. Overall, the results suggest that our financial inclusion indicators are unrelated with initial financial development both before 2006 and during the post-2006 period (see columns I and II of Table 4.6).

**Table 4.6: Financial inclusion as a function of initial financial development**

VARIABLES	Financial inclusion	
	I	II
	Share of bank credit	Share of formal credit
Number of bank branches per capita in 1999*(1999-2013) trend	-1.225 (1.140)	-2.090 (1.506)
Number of bank branches per capita in 1999*(2006-2013) trend	-0.636 (1.246)	-0.431 (1.392)
Number of bank branches per capita in 1999*Post-2006 dummy	3.829 (3.105)	4.052 (3.031)
Region and Year FE	YES	YES
Other controls	YES	YES
R-squared	0.227	0.442
Adjusted R-squared	0.163	0.395
F-test	0.79 [0.458]	1.13 [0.327]
Observations	300	300

*Notes: Robust standard errors clustered by district are in parentheses; p-values are reported in square brackets; F-test is the joint significance test for coefficients in the first two rows; Explanatory variables reported are the number of bank branches in a district in 1999 per 5000 persons interacted with (row-wise) (a) a 1999 time trend, (b) a post-2006 time trend, (c) a post-2006 dummy interacted with a post-2006 time trend; Other control variables included are population density, log of district welfare per capita, share of rural localities in a district and human capital endowment, all measured in 1999; These controls enter the regression in the same way as bank branches per capita in 1999; the results are robust to alternative measures of bank branch expansion – i.e. we also measure branch expansion using the number of bank branches in a district divided by the population of the district in 2000 and by the district's land area. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .*

<sup>40</sup> The reduced form model we estimated is of the form:  $F_{it} = \alpha_i + \beta_t + \lambda_t B_{i1999} + \delta_t X_{i1999} + u_{it}$ .

Specifically, the two main coefficients of our model (that is, the coefficients in the first two rows in Table 4.6) are all not significantly different from zero, at least at the conventional levels of statistical significance; 1%, 5% and 10%. Further, the joint significance test for the coefficients in the first two rows (F-test) shows that the two coefficients are jointly insignificant, indicating that they do not jointly explain the behaviour of our financial inclusion variables. This indicates that the switch to the universal banking regime does not directly influence financial inclusion and thus provides the second rationale for the validity of our chosen instrument. The results obtained here is robust to the use of alternative measures of banking system penetration; the evidence on this is presented in Tables 4.3A and 4.4A (appendix). This finding coupled with our earlier observation that bank branch expansion exhibits a significant relationship with initial financial development provides a strong basis for our identification strategy. In simple terms, our results thus far suggest that the change in the policy regime of the Ghanaian banking system impacts financial inclusion indirectly through its effect on banking system penetration. As a further check, however, we report the results of the tests for weak-identification and endogeneity of the potentially endogenous regressor in our instrumental variable (IV) estimations.

#### *4.6.3 Financial inclusion and banking system penetration: Instrumental variable evidence*

In this sub-section, we provide a more structural analysis of the impact of bank branch expansion on financial inclusion. More specifically, we illustrate whether increases in the number of bank branches per capita in a district affects the degree of financial inclusion in that district – with financial inclusion proxied by access to formal credit and bank credit. In this vein, we present two types of findings: (i) the effect of banking system penetration on the share of bank credit in total household credit; and (ii) the effect of banking system penetration on the share of formal credit in total household credit. We estimate our models using both the simple

Ordinary Least Squares (OLS)<sup>41</sup> and Two-Stage Least Squares (2SLS) estimation techniques. While the simple OLS estimations does not account for the endogeneity of banking system penetration in the model of financial inclusion, the 2SLS estimation corrects for the potential endogeneity of banking system penetration in the model of financial inclusion.

Table 4.7 presents the empirical results on the effect of banking system penetration on financial inclusion. Model I of Table 4.7 presents the estimates on the effect of banking system penetration on the share of bank credit in total household credit while Model II of Table 4.7 shows the results of the effect of banking system penetration on the share of formal credit in total household credit. In Model I of Table 4.7, we present three types of results: column (1) reports the OLS estimates on the effect of banking system penetration on the share of bank credit in total household credit when other control variables are not included in the model while column (2) reports same but with the inclusion of other control variables. In column (3), we present the instrumental variables (IV) results on the effect of banking system penetration on the share of bank credit in total household credit.

Similarly, in Model II of Table 4.7, we present three types of results: columns (4) and (5) reports the OLS estimates on the effect of banking system penetration on the share of formal credit in total household credit without the inclusion of other control variables and with the inclusion of other control variables, respectively. Finally, column (6) (under Model II of Table 4.7) reports the results of the IV estimates on the effect of banking system penetration on the share of formal credit in total household credit. The Cragg-Donald Wald F statistic for the weak identification test and the p-value of the endogeneity test are reported in the IV estimations. These statistics suggest that our instrument for banking system penetration is not weak and that

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<sup>41</sup> The OLS estimation follows the model presented in Equation (4.1) – i.e.  $F_{it} = \alpha_i + \beta_t + \phi B_{it} + \varepsilon_{it}$ .

banking system penetration is endogenous in our model of the determinants of financial inclusion.

Overall, our results illustrate strongly that banking system penetration promotes the level of financial inclusion, be it access to bank credit or access to formal credit. In particular, banking system penetration is significantly positively related with both the share of bank credit in total household credit and the share of formal credit in total household credit. For instance, in terms of the impact on the share of bank credit in total household credit, we observe that banking system penetration increases the share of bank credit in total household credit by approximately 52% in the OLS estimation (see column (2), Model I of Table 4.7). This indicates that an increase in the number of bank branches per capita in a district raises the contribution of bank credit to total household credit by over 50%.

This can be explained by the fact that banking system penetration has the characteristic of increasing the proximity of banks to their potential borrowers and hence a reduction in the cost of debt collection and monitoring. This could enhance bank lending. Similarly, the result from our IV regression shows that banking system penetration raises the share of bank credit in total household credit by more than 76%. The IV evidence shows that without accounting for the potential endogeneity of banking system penetration in a model of financial inclusion, one runs the risk of underestimating the influence of banking system penetration on financial inclusion.

**Table 4.7: Financial inclusion and banking system penetration; OLS and IV estimates**

	Model I		Model II			
	Share of bank credit		Share of formal credit			
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Bank branch	0.048*** (0.011)	0.520*** (0.164)	0.769** (0.315)	0.077*** (0.026)	0.425*** (0.140)	0.604** (0.245)
Number of bank branches per capita in 1999*(1999-2013) trend		-6.612*** (2.492)	-10.873* (6.494)		-4.113** (1.914)	-7.389 (4.811)
Number of bank branches per capita in 1999*Post-2006 dummy		-17.540*** (6.756)	-24.149*** (9.165)		-14.400*** (5.248)	-18.950*** (6.900)
Constant	0.081*** (0.022)	0.475*** (0.074)	0.457*** (0.073)	0.129*** (0.026)	0.697*** (0.058)	0.686*** (0.064)
Region and Year FE	YES	YES	YES	YES	YES	YES
Other controls	NO	YES	YES	NO	YES	YES
R-squared (within/uncentered)	0.246	0.270	0.781	0.483	0.135	0.869
Wald Chi2/F-statistic	197.4	102.1	4.437	195	46.37	2.503
Cragg-Donald Wald F statistic			469			469
Endogeneity Test (p-value)			0.002			0.005
Number of districts	102	102	300	102	102	300
Observations	300	300	300	300	300	300

*Notes: Robust standard errors clustered by district are in parentheses; Bank branch is number of bank branches in a district per 5000 persons. Explanatory variables reported are Bank branch calculated as the total number of bank branches in a district per capita, the number of bank branches in a district in 1999 per capita interacted with (row-wise) (a) a 1999 time trend, (b) a post-2006 dummy interacted with a post-2006 time trend; In the IV estimations, the instrument is the number of bank branches per capita in 1999 interacted with a post-2006 time trend; The first stage regression corresponding to the IV estimation in columns (3) and (6) are reported respectively in columns I and II of Table 4.5. Other control variables included are population density, log of district welfare per capita, share of rural localities in a district and human capital endowment, all measured in 1999; These controls enter the regression in the same way as bank branches per capita in 1999; R-squared (within) and the Wald Chi2 statistics are reported for the OLS estimations while R-squared (uncentered) and the F-statistic are reported for the IV estimations; The weak identification test as*

represented by the Cragg-Donald Wald F statistic and the p-value associated with the endogeneity test of the endogenous regressor are reported for the IV estimations; \*\*\*  
 $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

The results on the effect of banking system penetration on the share of formal credit in total household credit are qualitatively similar to the estimated effects of banking system penetration on the share of bank credit in total household credit. We find that an increase in the number of bank branches per capita in a district increases in the share of formal credit in total household credit by about 60% (see column (6), Model II of Table 4.7). This finding is robust to the use of alternative measures of banking system penetration (see Tables 4.5A and 4.6A, appendix). This implies that banking system penetration improves households' access to formal credit. Put differently, the results suggest that opening an additional bank branch in a district improves the share of formal credit in total household credit.

The findings of this study lines up with the results obtained by earlier scholars on the effect of rural bank branch expansion on financial inclusion in India (see, for instance, Binswanger & Khandker, 1995; Burgess & Pande, 2005; Chakravarty & Pal, 2013). The study by Burgess & Pande (2005), for instance, reveals that the rapid expansion of commercial bank branches in the rural areas of India enhanced access to commercial bank credit. Thus, our results reinforce the earlier findings on the positive role of banking system penetration in expanding access to formal financial services using data from Africa.

#### *4.6.4 Robustness checks*

As usual, we undertake a number of robustness checks to ensure the soundness of our estimates. Specifically, we perform two main robustness checks on our estimations. First, as stated before, we estimate models similar to those presented in Tables 4.5 – 4.7 using two other alternative measures of banking system penetration; that is (i) the number of bank branches in a district per capita measured by the total number of bank branches in a district divided by the district's population size in 2000, (ii) the number of bank branches in a district per capita measured by

the total number of bank branches in a district divided by the district's land area. The results obtained by using these two alternative measures of banking system penetration mirrors our main results (presented in Tables 4.5 – 4.7). These results are presented, respectively, in Tables 4.1A and 4.2A (appendix) as comparable estimates to Table 4.5, in Tables 4.3A and 4.4A (appendix) as comparable estimates to Table 4.6, and in Tables 4.5A and 4.6A (appendix) as comparable estimates to Table 4.7.

Second, we depart from the use of the three-period panel data set to a two-period panel data set utilising only the fifth (GLSS 5) and sixth (GLSS 6) waves of the GLSS. This is an attempt to avoid some of the challenges we encountered during the construction of the district-level data set from the fourth wave of the GLSS (these issues have been extensively discussed in the previous section) and to check whether they exert any significant impact on our results. Using a two-period panel data set spanning the period 2005/06 – 2012/13, we show that our initial findings on both the reliability of our instrument as well as on the financial inclusion enhancing effects of banking system penetration remains unchanged (see Table 4.7A, appendix, for the OLS and IV estimates based on the two-period panel data set).

#### **4.7 Conclusion**

The importance of financial sector development and financial inclusion, in particular, in process of economic development is well documented. However, less is known about how developments in the financial sector and the banking industry in particular contributes to financial inclusion. This study examines the effect of bank branch expansion on financial inclusion – in terms of access to bank and formal credits. The current study is unique in two respects: first, to the best of our knowledge, this study is the first empirical attempt to provide empirical evidence on the link between bank branch expansion and financial inclusion using a

longitudinal district-level dataset from Africa; second, the study exploits the change in the operational policy regime of Ghana's banking sector – which involved a switch from a compartmentalised system of banking to a universal banking system – in order to identify the effect of banking system penetration on financial inclusion.

The salient findings of the paper are as follows: First, we show that the move to the universal banking system in Ghana has resulted in an expansion of bank branch network which has benefited hitherto financially less developed districts, although bank branch expansion into financially more developed districts continues unabated. Second, our instrumental variable evidence suggests that banking system penetration promotes financial inclusion. Specifically, bank branch expansion improves the share of both bank credit and formal credit in total household credit, suggesting that the expansion of bank branches improves banks' engagement with the populace in terms of the provision of credit facilities to households. Finally, our results are robust to alternative measures of banking system penetration as well as to a change in the length of our panel data set. Overall, akin to what has been observed elsewhere – notably, in India (Burgess & Pande, 2005) –, the paper demonstrates that banking system penetration promotes financial inclusion in Ghana and by extension in Africa. The paper therefore cast light on the important topic of how policy can affect financial inclusion.

A potential limitation of this study, however, is that the study has at best provided a partial analysis of the effect of banking system penetration on financial inclusion given that it focused on only one dimension of financial inclusion – i.e. access to credit facilities provided by formal financial intermediaries. This is due to the inadequate or unavailable information on the other dimensions of financial inclusion such as ownership of a formal bank account, ownership and use of a formal savings account and access to insurance facilities provided by formal financial

intermediaries in our dataset. The dataset used in this paper, however, is by far the best available dataset that can support this type of analysis. Thus, a more comprehensive analysis of the effect of banking system penetration on financial inclusion can be conducted when new waves of the GLSS collect detailed information on these other dimensions of financial inclusion as well as new dimensions of financial inclusion such as access to a mobile money account and savings on a mobile money account.

## Appendix to Chapter Four

**Table 4.1A: Banking system penetration as a function of initial financial development**

VARIABLES	Bank branch expansion	
	I	II
Number of bank branches per capita in 1999*(1999-2013) trend	0.187*** (0.009)	0.173*** (0.009)
Number of bank branches per capita in 1999*(2006-2013) trend	-0.136*** (0.013)	-0.141*** (0.006)
Number of bank branches per capita in 1999*Post-2006 dummy	0.126*** (0.038)	0.063*** (0.020)
Region and Year FE	YES	YES
Other controls	NO	YES
R-squared	0.711	0.839
Adjusted R-squared	0.697	0.826
F-test	238.28 [0.000]	277.09 [0.000]
Observations	306	306

*Notes: Robust standard errors clustered by district are in parentheses; p-values are reported in square brackets; F-test is the joint significance test for coefficients in the first two rows; Bank branch expansion is number of bank branches in a district per the 2000 population size of the district. Included explanatory variables similar to those reported in Table 4.5; \*\*\*  $p < 0.01$ .*

**Table 4.2A: Banking system penetration as a function of initial financial development**

VARIABLES	Bank branch expansion	
	I	II
Number of bank branches per capita in 1999*(1999-2013) trend	0.245*** (0.004)	0.241*** (0.005)
Number of bank branches per capita in 1999*(2006-2013) trend	-0.140*** (0.003)	-0.139*** (0.003)
Number of bank branches per capita in 1999*Post-2006 dummy	0.370*** (0.020)	0.245*** (0.022)
Region and Year FE	YES	YES
Other controls	NO	YES
R-squared	0.982	0.992
Adjusted R-squared	0.982	0.991
F-test	1850.54 [0.000]	2370.81 [0.000]
Observations	306	306

*Notes: Robust standard errors clustered by district are in parentheses; p-values are reported in square brackets; F-test is the joint significance test for coefficients in the first two rows; Bank branch expansion is number of bank branches in a district per the land area of the district. Included explanatory variables similar to those reported in Table 4.5; \*\*\*  $p < 0.01$ .*

**Table 4.3A: Financial inclusion as a function of initial financial development**

VARIABLES	Financial inclusion	
	I	II
	Share of bank credit	Share of formal credit
Number of bank branches per capita in 1999*(1999-2013) trend	266.763 (253.599)	253.993 (294.378)
Number of bank branches per capita in 1999*(2006-2013) trend	17.908 (254.873)	-74.347 (296.485)
Number of bank branches per capita in 1999*Post-2006 dummy	-1101.158 (696.706)	-472.691 (677.601)
Region and Year FE	YES	YES
Other controls	YES	YES
R-squared	0.237	0.442
Adjusted R-squared	0.173	0.396
F-test	0.56 [0.5756]	0.39 [0.6773]
Observations	300	300

Notes: Robust standard errors clustered by district are in parentheses; p-values are reported in square brackets; F-test is the joint significance test for coefficients in the first two rows; Bank branch expansion is number of bank branches in a district per the 2000 population size of the district. Included explanatory variables similar to those reported in Table 4.6.

**Table 4.4A: Financial inclusion as a function of initial financial development**

VARIABLES	Financial inclusion	
	I	II
	Share of bank credit	Share of formal credit
Number of bank branches per capita in 1999*(1999-2013) trend	-0.001 (0.093)	-0.095 (0.111)
Number of bank branches per capita in 1999*(2006-2013) trend	-0.011 (0.071)	-0.089 (0.102)
Number of bank branches per capita in 1999*Post-2006 dummy	0.081 (0.296)	0.373*** (0.136)
Region and Year FE	YES	YES
Other controls	YES	YES
R-squared	0.227	0.442
Adjusted R-squared	0.162	0.395
F-test	0.01 [0.9887]	1.14 [0.3233]
Observations	300	300

Notes: Robust standard errors clustered by district are in parentheses; p-values are reported in square brackets; F-test is the joint significance test for coefficients in the first two rows; Bank branch expansion is number of bank branches in a district per the land area of the district. Included explanatory variables similar to those reported in Table 4.6; \*\*\*  $p < 0.01$ .

**Table 4.5A: Financial inclusion and banking system penetration; OLS and IV estimates**

	Model I		Model II			
	Share of bank credit		Share of formal credit			
	OLS	IV	OLS	IV	OLS	IV
(1)	(2)	(3)	(4)	(5)	(6)	
Bank branch	0.108** (0.046)	0.411*** (0.158)	1.087* (0.574)	0.256*** (0.052)	0.333** (0.135)	1.070*** (0.401)
Number of bank branches per capita in 1999*(1999-2013) trend		355.519 (452.655)	-568.863 (926.696)		59.154 (388.428)	-969.190 (685.664)
Number of bank branches per capita in 1999*Post-2006 dummy		-1,639.017* (925.530)	-1,792.362* (925.888)		-706.489 (732.708)	-770.381 (832.514)
Constant	0.075*** (0.023)	0.473*** (0.077)	0.412*** (0.086)	0.113*** (0.026)	0.692*** (0.059)	0.630*** (0.072)
Region and Year FE	YES	YES	YES	YES	YES	YES
Other controls	NO	YES	YES	NO	YES	YES
R-squared (within/uncentered)	0.247	0.261	0.776	0.494	0.125	0.861
Wald Chi2/F-statistic	108.9	122.4	4.599	267.4	47.41	2.203
Cragg-Donald Wald F statistic			81.99			81.99
Endogeneity Test (p-value)			0.115			0.022
Number of districts	102	102	102	102	102	102
Observations	300	300	300	300	300	300

*Notes: Robust standard errors clustered by district are in parentheses; Bank branch is number of bank branches in a district per the 2000 population size of the district. Included explanatory variables similar to those reported in Table 4.7; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; R-squared (within) and the Wald Chi2 statistics are reported for the OLS estimations while R-squared (uncentered) and the F-statistic are reported for the IV estimations.*

**Table 4.6A: Financial inclusion and banking system penetration; OLS and IV estimates**

	Model I			Model II		
	Share of bank credit			Share of formal credit		
	OLS	IV	IV	OLS	IV	IV
(1)	(2)	(3)	(4)	(5)	(6)	
Bank branch	0.266*** (0.054)	2.127** (0.926)	3.102*** (1.034)	0.455*** (0.147)	2.450*** (0.714)	2.841*** (0.959)
Number of bank branches per capita in 1999*(1999-2013) trend		-0.286 (0.185)	-0.485** (0.209)		-0.278*** (0.079)	-0.362** (0.183)
Number of bank branches per capita in 1999*Post-2006 dummy		-0.697** (0.315)	-0.960*** (0.324)		-0.800*** (0.267)	-0.902*** (0.281)
Constant	0.081*** (0.022)	0.487*** (0.073)	0.473*** (0.072)	0.128*** (0.026)	0.700*** (0.057)	0.695*** (0.063)
Region and Year FE	YES	YES	YES	YES	YES	YES
Other controls	NO	YES	YES	NO	YES	YES
R-squared (within/uncentered)	0.244	0.259	0.780	0.483	0.133	0.869
Wald Chi2/F-statistic	268.7	127.9	4.659	195.5	45.19	2.487
Cragg-Donald Wald F statistic			804.85			445.18
Endogeneity Test (p-value)			0.029			0.078
Number of districts	102	102	102	102	102	102
Observations	300	300	300	300	300	300

Notes: Robust standard errors clustered by district are in parentheses; Bank branch is number of bank branches in a district per the land area of the district. Explanatory variables similar to those reported in Table 4.7; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ; R-squared (within) and the Wald Chi2 statistics are reported for the OLS estimations while R-squared (uncentered) and the F-statistic are reported for the IV estimations.

**Table 4.7A: Financial inclusion and banking system penetration; OLS and IV estimates (Based on a two-period panel data set: 2005/06 – 2012/13)**

	Model I		Model II			
	Share of bank credit		Share of formal credit			
	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Bank branch	4.466*** (1.364)	15.940* (8.699)	16.227* (9.517)	6.719*** (2.511)	12.127** (6.126)	12.258* (7.002)
Number of bank branches per capita in 2006*(2006-2013) trend		-5.376* (2.751)	-5.469* (2.974)		-2.670 (1.660)	-2.733 (1.925)
Constant	0.181*** (0.032)	0.846*** (0.046)	0.846*** (0.050)	0.264*** (0.040)	0.901*** (0.034)	0.900*** (0.036)
Region and Year FE	YES	YES	YES	YES	YES	YES
Other controls	NO	YES	YES	NO	YES	YES
R-squared (within/uncentered)	0.163	0.027	0.861	0.449	0.055	0.926
Wald Chi2/F-statistic	131.7	36	1.939	128.1	16.34	0.973
Number of districts	102	102	102	102	102	102
Observations	202	202	202	202	202	202

*Notes: Robust standard errors clustered by district are in parentheses; Bank branch expansion is number of bank branches in a district per 5000 persons. Explanatory variables similar to those reported in Table 4.7; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; R-squared (within) and the Wald Chi2 statistics are reported for the OLS estimations while R-squared (uncentered) and the F-statistic are reported for the IV estimations.*

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND POLICY RECOMMENDATION**

#### **5.0 Introduction to Chapter Five**

This chapter concludes the study by presenting the summary of the main findings of the thesis and the policy recommendations of the study as well as the conclusion and directions for future research. The chapter is structured into three sections: Section 5.1 presents the summary of the study's main findings while Section 5.2 presents the policy recommendations drawn from the empirical results of the study. Finally, Section 5.3 presents the conclusions and directions for further research.

#### **5.1 Summary of Main Findings**

This thesis consists of three stand-alone empirical essays or papers on the drivers and welfare effects of financial inclusion in Ghana. Chapter two presented the first empirical paper of the thesis while Chapters three and four presented the second and third empirical papers of the thesis, respectively.

In particular, Chapter two presented Paper I of the thesis which examines the effect of access to credit on household welfare using a pseudo panel data set spanning the period 1991/92 – 2012/13. The pseudo panel data set is drawn from four waves of the GLSS (that is, GLSS 3 (1991/92), GLSS 4 (1998/99), GLSS 5 (2005/06) and GLSS 6 (2012/13)). An important body of literature underscores the crucial role of access to credit in the process of economic development, in particular, in the reduction of poverty and inequality. The major conclusion arising from this literature is that access to credit improves the welfare of credit recipients.

However, some studies have provided evidence to the contrary. These studies conclude mainly that credit is not an effective tool for alleviating poverty and that credit may sometimes worsen the welfare of credit recipient households. The inconclusiveness of the current literature regarding the effect of access to credit on welfare therefore provides the need for more studies to be undertaken, especially, studies that attempt to use different methodologies, data structures and context.

Consequently, Paper I join the debate on the welfare effect of access credit by providing some evidence on the issue based on a pseudo panel data set from Ghana. Specifically, Paper I sought to achieve the following objectives:

- (i) To ascertain the dynamic effect of access to credit on household welfare in Ghana;
- (ii) To establish the effect of access of credit on the extent of poverty and the degree of inequality among the poor in Ghana;
- (iii) To examine whether the effect of access to credit on household welfare varies across poor and non-poor households in Ghana;
- (iv) To establish whether the gender of the household head matters in the effect of access to credit on household welfare in Ghana;

In order to address these objectives, Paper I employed different measures of household welfare such as household total consumption expenditure per adult equivalent, household food consumption per adult equivalent, household poverty status, and the Foster, Greer, & Thorbecke (FGT) class of poverty measures. The use of the FGT class of poverty indices is to enable us provide evidence on the role of access to credit on not only the likelihood of a household falling into poverty but also on the extent of poverty and the degree of inequality among the poor. Consistent with major advances in the literature on pseudo panel data

estimation techniques, the empirical approach of the paper involves the application of robust pseudo panel data estimation techniques including the Weighted Least Squares (WLS), Errors-in-Variables (EIV) and dynamic Generalised Methods of Moments (GMM) estimation techniques. This is to enable us render a robust account on the welfare effect of access to credit in Ghana.

The main results of Paper I are as follows: first, the study reveal that access to credit leads to an improvement in household welfare. Specifically, access to credit increases household consumption expenditures and reduces the likelihood of a household falling into poverty. Also, the study established that access to credit reduces the extent of poverty and the degree of inequality among the poor. In addition, the study observed that access to credit has a heterogeneous effect on the welfare of poor and non-poor households with poor households benefiting disproportionately more from access to credit than non-poor households. This finding highlights the fact that access to credit benefits the poor more than the rich. As well, the study demonstrates that the welfare effect of access to credit is higher for female-headed households than for male-headed households. Thus, Paper I provide new evidence on the role of gender in the effect of access to credit on household welfare.

In addition, the empirical estimates from Paper I showed that household welfare is strongly influenced by other factors including the age of the household head, the gender of the household head, the size of the household, the educational attainment of the household head and the locality (i.e. urban versus rural). For instance, we established that relative to male-headed households, female-headed households have lower levels of welfare. This finding is broadly consistent with the findings of earlier studies. Also, the empirical results of the study suggest that large-sized households are relatively poorer than small-sized households and that

households that are headed by individuals with a tertiary level of educational qualification are comparatively better-off than those headed by individuals with no schooling record. Further, consistent with recent poverty profile reports produced by the Ghana Statistical Service, our results showed that urban households are significantly better-off than their rural counterparts.

Chapter three presented the second empirical paper (that is, Paper II) of the thesis. This paper contends that, in spite of the tremendous attention paid to the issue of financial inclusion by national governments and multinational organisations in recent times, there is very little micro-level evidence which exploits the multifaceted nature of financial inclusion to examine the welfare effects of financial inclusion. Specifically, the study argues that even though studies that examine the welfare impacts of some of the dimensions of financial inclusion, notably access to credit, are not absent in the literature, the reliance of these studies on a single measure of financial inclusion do not adequately gauge the welfare effect of financial inclusion given that financial inclusion is a multidimensional phenomenon. On the back of this, Paper II sought to achieve the following objective: To examine the effect of financial inclusion (paying attention to the multidimensional nature of financial inclusion) on household welfare in Ghana.

To achieve this objective, Paper II first constructed a multidimensional index of financial inclusion which incorporates four major dimensions of financial inclusions (that is, access to transactions and payment services, access to a savings account, access to credit and access to insurance facilities). The computational strategy that is employed in the construction of the multidimensional index of financial inclusion in this study is akin to the approach used in computing the multidimensional poverty index. Second, we then used our index of financial inclusion to examine the effect of financial inclusion on household welfare in Ghana. The study used data from the sixth round of the GLSS, which is a nationally representative household

survey data set. The study measured household welfare using both income- and consumption-based measures. Also, we applied different estimation techniques – that is, the Ordinary Least Squares (OLS), binary probit and the Propensity Score Matching (PSM) estimation techniques – on this data in order to render a solid account of the welfare effect of financial inclusion in Ghana. Similar to Paper I, the study sheds additional insights on the effect of financial inclusion on not only the likelihood of a household falling into poverty but also on the extent of poverty and the degree of inequality among the poor. The study also sheds light on the differential effect of financial inclusion on the welfare of poor and non-poor households.

The empirical estimations of the study elicit a number of interesting results: First, the empirical results of the study suggest strongly that financially deprived households have lower welfare levels compared to their financially included counterparts; this finding is robust to the use of different measures of household welfare. Specifically, we find that the total annual consumption expenditure of financially deprived households is about 23% lower than that of financially included households. Second, in an examination of a possible heterogeneous effect of financial inclusion on the welfare of poor and non-poor households, the empirical results of the study suggest that financial inclusion has a much larger effect on the welfare of poor households than on the welfare of non-poor households. This suggests that beyond improving household welfare, financial inclusion may also help in bridging the income gap between the poor and the rich.

Third, we observed that financial inclusion reduces the likelihood of a household falling into poverty, but it does not affect both the extent of poverty and the degree of inequality among the poor. Fourth, regarding the variations in the effect of the various dimensions of financial inclusion, the results of the study show that all the four dimensions of financial inclusion

independently affect household welfare but with some differences across household poverty status. In this regard, while access to credit matters for the welfare of non-poor households, access to credit does not significantly influence the welfare of poor households. This observation may be attributed to the acute lack of access to formal credit by poor households. Additionally, we find that other socio-economic characteristics of a household (such as the age of the household head, the gender of the household head, household size, and the occupation of the household head) and locality status of a household (that is, whether the household is situated in an urban or a rural area) significantly explain household welfare, notably, household income.

Finally, on the possible channels through which financial inclusion might impact household welfare, we show that financial inclusion impacts household welfare via its effect on households' farm and non-farm enterprise incomes. However, access to formal credit does not significantly explain households' agricultural incomes; a finding that could be explained by the fact that the operations of agricultural activities often have little or no connection with formal or semi-formal financial intermediaries in terms of access to credit, for instance. The results of the study are robust to alternative measures of the financial inclusion index, to the use of different cut-off points and to the control for potential endogeneity and self-selection bias.

Chapter four presented the third empirical paper (that is, Paper III) of the thesis. Paper III sought to address the following objective: To establish the role (if any) of banking system penetration on financial inclusion in Ghana. The paper makes an important contribution to the literature by providing the first empirical evidence on the effect of banking system penetration on financial inclusion using data from Ghana. In particular, Paper III of the thesis examined the effect of banking system penetration on financial inclusion using a three-period district-

level pseudo panel data set spanning the period 1999 – 2013 from Ghana. To identify the causal effect of banking system penetration on financial inclusion, we adopt a quasi-natural experimental design approach. In particular, the paper exploits the change in the operational policy regime of the Ghanaian banking system – which involved a switch from a compartmentalised system of banking to a universal banking system – as an instrument for banking system penetration. We utilised the Two Stage Least Squares (2SLS) estimation strategy wherein observed trend breaks in the relationship between initial financial development in a district and banking system penetration is used as an instrument for bank branch expansion. This approach is principally a difference-in-difference (DD) estimation strategy and it has been applied widely by earlier scholars in an attempt to purge potential endogeneity biases.

The salient findings of the paper are as follows: First, the empirical results of the study reveal that the move to the universal banking system in Ghana has resulted in an expansion of bank branch network which has benefited hitherto financially less developed districts, although bank branch expansion into financially more developed districts continues unabated. That is, the switch from the compartmentalised system of banking – wherein separate banking licenses were issued for commercial, merchant and development banks – to the universal bank licensing regime has improved the degree of banking system penetration with important benefits to initially less financially developed localities. Second, our instrumental variable (IV) evidence suggests that banking system penetration promotes financial inclusion. Specifically, the study showed that bank branch expansion improves the share of both bank credit and formal credit in total household credit, suggesting that the expansion of bank branches improves banks' engagement with the populace in terms of the provision of credit facilities to households.

Finally, our results are robust to alternative measures of banking system penetration as well as to a change in the length of our panel data set.

Overall, akin to what has been observed elsewhere – notably, in India –, the paper demonstrates that banking system penetration promotes financial inclusion in Ghana. The paper therefore cast light on the important topic of how policy can affect the degree of financial inclusion in a country. In sum, the three empirical papers of the thesis demonstrate separately that household welfare is positively influenced by access to credit and more generally by financial inclusion and that financial inclusion is in turn driven by banking system penetration.

## **5.2 Policy Recommendations**

In the light of the empirical evidence emerging from the three papers of this thesis, the following recommendations are given with the view of deepening the extent of financial inclusion and ultimately promoting economic development, notably, reductions in poverty and inequality.

The results from Paper I of the thesis demonstrates that access to credit does not only increase household consumption but it also reduces the likelihood of a household falling into poverty and the extent of poverty as well as the degree of inequality among the poor. More importantly, the study showed that access to credit disproportionately benefits poor households more than economically better-off households. Also, the results from Paper II points to the important role of financial inclusion in improving household welfare, notably, the economic wellbeing of the poor and vulnerable. These results point to the fact that access to credit (or financial inclusion, more generally) could be a source of equalisation in welfare across households since it does

not only improve household welfare, but it also facilitates important reductions in welfare inequality, especially, among households at the bottom-end of the income distribution.

Further, our findings on the welfare enhancing effect of the other dimensions of financial inclusion (aside access to credit), imply that the provision of formal savings, transaction and payments, and insurance facilities to households can lead to important improvements in household welfare, especially, that of the poor. Thus, development policy practitioners and national governments must continue their efforts in promoting financial inclusion by introducing new financial inclusion-based programmes as well as deepening the roll out of existing targeted rural financial inclusion interventions (such as the RAFiP programme).

In particular, we recommend that innovative transaction and payment products as well as savings and insurance facilities, especially, one that is designed to meet the specific needs of the unbanked poor will promote the utilisation of formal financial services by individuals who are currently financially excluded. This would in turn offer the unbanked sections of the population an important opportunity to improve their welfare. For instance, access to transaction and payment services as well as savings and insurance facilities offered by formal financial intermediaries by the unbanked poor will enhance their potential to undertake investment projects and thus improve their economic welfare. Ultimately, this process will ensure the realisation of the sustainable development goals, in particular, reductions in the incidence of poverty and economic vulnerability as well as inequality. As well, given that borrowing from the informal financial markets still assumes a lion share in households' loan portfolio, policy makers and industry regulators must strengthen the regulation of the financial markets, especially, rope in the informal financial operators (such as money lenders) into the regulated formal financial market.

Further, the empirical results of the third paper cast light on the important topic of how policy can affect financial inclusion. Accordingly, the study recommends that various stakeholders in the financial services landscape including national governments, development partners and industry players must continue to develop strategies, policies and programmes that are aimed at improving the operational environment of the financial system (such as deepening the availability and accessibility of banking services through an increased penetration of bank branch networks, especially, into less financially developed areas as well as the introduction of innovative and pro-poor financial products). This would go a long way to relax some of the existing constraints to financial inclusion in the country, especially by the rural unbanked sections of the population and ultimately ensure the realisation of the important goal of an all-inclusive financial sector in Ghana.

### **5.3 Conclusion and Directions for Future Research**

This thesis makes a number of important contributions to the literature on the welfare effects of financial inclusion and on the drivers of financial inclusion. It highlights the crucial role of access to credit and more generally, financial inclusion, on the household welfare. In particular, it shows the potential role of financial inclusion in reducing the welfare gaps between the rich and the poor, thus suggesting that financial inclusion could be a source of economic convergence. Also, the thesis demonstrates the important role of policy in improving banking system penetration and ultimately, financial inclusion.

Notwithstanding the important contributions of the thesis to the existing literature on the drivers and welfare effects of financial inclusion, the empirical results of the thesis are limited in the following ways: first, due to data limitations, the empirical analysis in Paper I of the thesis did not account for the source of credit in investigating the effect of access to credit on household

welfare. Indeed, while information on the source of household credit is available in all the four waves of the GLSS data sets used in this study, they are nonetheless less comparable as the more recent waves of the GLSS datasets (that is, GLSS 6) have explicitly captured credit received from microfinance institutions and savings and loans companies which is not the case in the earlier waves of the GLSS. We believe that the source of credit (that is, whether formal or informal; or more specific sources such as loans from microfinance institutions or friends and relatives) may matter in the extent to which access to credit influences household welfare given the potential variation in the ease as well as in the management of credit from various sources. As noted earlier, it is often easy to access credit from informal sources such as friends and relatives compared to formal sources (such as banks). Thus, when more comparable data on the sources of household credit over time become available, one could investigate the dynamic interaction between access to credit and household welfare within a disaggregated framework for formal and informal sources of credit while accounting for potential overlapping influences.

Also, the second empirical paper of the thesis relied on four dimensions of financial inclusion, namely, access to credit, access to a savings account, access to a basic bank account and access to an insurance facility. However, it has become quite clear that the financial services industry in the developing world including Ghana has changed dramatically in recent times with unconventional financial services such as “mobile money” now providing one of the widest access to financial services, especially to the remotest parts of the world. While mobile money has become an important access point to financial services, data on individuals and households’ patronage of mobile money services is yet to become available at a more representative national scale. Thus, when such data becomes available, a similar study as in Paper II of this thesis

could be undertaken while incorporating information on the ownership and use of a mobile money account as an additional dimension of financial inclusion.

Lastly, the third empirical paper of this thesis has at best provided a partial analysis of the effect of banking system penetration on financial inclusion given that it focused on only one dimension of financial inclusion – that is, access to credit facilities provided by formal financial intermediaries. This is due to the inadequate amount of information on the other dimensions of financial inclusion such as ownership of a formal bank account, ownership and use of a formal savings account and access to insurance facilities provided by formal financial intermediaries in our dataset. The dataset used in this paper, however, is by far the best available dataset that can support this type of analysis. Thus, a more comprehensive analysis of the effect of banking system penetration on financial inclusion can be conducted when new waves of the GLSS collect detailed information on these other dimensions of financial inclusion as well as new dimensions of financial inclusion such as access to a mobile money account and/or savings on a mobile money account. In spite of these limitations, the thesis provides important insights on the welfare effects of financial inclusion as well as on the determinants of financial inclusion in the context of Ghana.

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