UNIVERSITY OF BOTSWANA

DEPARTMENT OF ECONOMICS

EFFECTS OF FINANCIAL INCLUSION ON POVERTY REDUCTION AND INCOME INEQUALITY IN BOTSWANA

BY

LECHANI KGANGYAME

ID: 201804332

MAIN SUPERVISOR: DR M. NTSOSA

CO-SUPERVISOR: DR B. MOFFAT

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE MASTERS OF ARTS DEGREE IN ECONOMICS

24th July 2020

DECLARATION

I hereby declare that this dissertation is my own work towards the award of a Master of Arts in Economics. To the best of my knowledge, and with the exception of those acknowledged in the text, it does not contain any material previously published or accepted for the award of another degree in this University.

Name: Lechani Rachel Kgangyame

Signature:…… Date:……

APPROVAL

This dissertation has been examined and approved as meeting the requirements for the partial fulfilment of the Master of Arts Degree in Economics.

_____ _____

Dr. M. Ntsosa Date

Supervisor

_____ _____

Head of Department Date

DEDICATION

I would like to devote the paper to all the Fibromylygia victims all over the world. Not only do we fight misunderstandings from our primary world, but we also have to fight our own body for our survival. It is incredible how the patients win a daily fight against the most agonizing pain, fatigue, and brain fog episodes.

ACKNOWLEDGEMENT

My first gratitude goes to our Heavenly Father for protecting, guarding, and bringing me this far throughout my academic life, especially seeing me through my Master's programme successfully. I owe my whole life and the success of this thesis to the Lord.

My second sincere gratitude is highly indebted to my sponsor Botswana Insurance Holdings Limited Group through the BIHL Trust, for their generosity for giving me a scholarship for my Master of Arts Degree in Economics. The scholarship has allowed me to be one step closer to my goal and has inspired me to help others by giving back to the community.

I would like to acknowledge my supervisors, Dr. M.Ntsosa and Dr. B. Moffat, for their contribution to my work. I will forever appreciate all of their efforts. My gratitude is also extended to all the academic staff in the Department of Economics who have contributed emersely to shaping my work during the Proposal presentations. I would also like to appreciate Mrs Nampala from the Secretary office of the Department of Economics who have also been a great support from the beginning of the programme all the way to this day. Her kind heart has made all interactions in the Department easier and possible.

I am also grateful to my colleagues and friends I made during the two years of undertaking this programme. Most notably, I would love to thank my friend, Alexander Opoku, for the support, encouragement, and influence over my academic life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

BOB- Bank of Botswana

CBN-Central Bank of Nigeria

EAC- East African Community

ECOWAS- Economic Community of West African States

FI- Financial Inclusion

FMOLS-Fully Modified Ordinary Least Squares

GDP- Gross Domestic Product

GLS-Generalised Least Squares

GMM-Generalised Method of Momemnts

IFLS- Indonesia Family Life Survey

IMF- International Monetary Fund

ISPAAD- Intergrated Support Programme for Arable Agriculture Development

KYC- Know Your Customer

MENA- Middle, East, and North Africa

NBFIRA- Non-Banking Financial Institution Regulatory Authority

NDB-National Development Bank

NDP- Net Domestic Product

SADC- Southern African Development Community

SSA-Sub-Saharan Africa

SDG-Sustainable Development Goals

VLSS-Vietnam Living Standard Survey

WDI-World Development Indicators

ABSTRACT

The study examines the effect of financial inclusion on poverty reduction and income inequality in Botswana using quarterly time series data for the period 2004-2017. The Autoregressive Distributed Lag (ARDL) model is used to establish the effect of financial inclusion on poverty reduction and income inequality. The ARDL approach integrates both the short-run relationship and long-run relationship. The results showed that financial inclusion significantly reduces poverty and income inequality, both in the short run and in the long run.

Moreover, other socio-economic variables, per capita income, education, population growth, and age dependency ratio have a negative relationship with poverty rates, suggesting that an increase in these variables would promote a reduction in poverty rates in Botswana. Similarly, the age dependency ratio and per capita have a negative effect on income inequality in the long run.

These results suggest that, policies that promote financial inclusiveness are imperative for reducing the high rates of poverty and income inequality in Botswana.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Financial inclusion is defined as easy and voluntary access for all individuals and corporate groups to essential financial services such as savings accounts, forms of deposits, credit, and financial advice at a suitable fee (Sarma, 2008). The significance of an inclusive financial system is widely acknowledged in the policy area. In many countries, financial inclusion has recently become a policy priority. Molefhi (2019) asserted that the benefits of financial inclusion for the poor are incredibly significant. The access to and use of formal financial services, especially access to credit, enable poor households to increase their ability to consume, deal with disruptive shocks, manage risks, and improve their investment ability. Countries with more profound financial inclusion levels tend to increase access to financial credit and service, thereby improving economic growth, which will lead to a reduction in poverty and income inequality (Ravi, 2019).

Since independence in 1966, Botswana's economic growth has been remarkable. It has been one of the world's fastest-growing economies. Despite its history of strong growth, not all of Botswana's policies promoted inclusive growth and human development in a broad-based manner. Poverty and income inequality tend to be one of the country's significant challenges to development. Almost one-fifth of Batswana still lives in poverty, with almost 14 percent living in extreme poverty. Besides, Botswana ranks as one of the world's unequal countries, with a Gini coefficient of 60.52 (World Bank, 2015b). Various measures have been put in place to resolve this challenge, such as increasing agricultural incomes and subsidies through programmes such as the Integrated Support Programme for Arable Agriculture Development (ISPAAD). However, the overreliance on minerals and the public sector to mitigate poverty and income inequality is not

virtuous. Botswana remains one of the world's most unequal countries, with a high level of extreme poverty.

Moreover, empirical evidence has revealed that a surge in financial inclusion (FI) promotes inclusive growth and is perceived to be critical in addressing poverty and income inequality (World Bank, 2015a). Omojolaibi (2017) noted that it would be worth it to implement effective economic programs and policies to increase income levels, reduce poverty, and bridge the gap in income inequality. This is concurrent with the National Development Plan 11; "*Inclusive Growth for the Realisation of Sustainable Employment Creation and Poverty Eradication*" and Sustainable Development Goals (SDGs) goals 1 and 10, which seeks to end poverty and reduce inequality, respectively.

Since 1990, the share of the world population living below the extreme poverty line of $1.90 per day has fallen from 35.6% to 10.0% in 2015 (World Bank, 2018a). This indicates that poverty remains a stubborn challenge in the world, and Africa is no exception. Despite the backdrop, all countries aim to reduce extreme global poverty to 3%. The challenge for the world policymakers is to reach the socio-economic benefits associated with rapid economic expansion. Financial inclusion is vital, as increasing access to financial services for the poor is often seen as a useful tool that can help reduce poverty and reduce income inequality.

However, this seems not to be the case in Africa. Although the region has experienced an impressive economic growth rate of about 4.8% per annum on average for more than a decade, poverty and income inequality remain high. The greatest challenge facing the African continent is rising levels of income disparity and poverty. It can be argued that economic growth achieved thus far was not strong enough to exert a significant effect on poverty and income inequality. According to the Africa Development Bank (2012), in their briefing notes, acknowledge that Africa is the

second most unequal region. This rapid increase in income inequality threatens social cohesion in the region and is detrimental to economic growth and poverty reduction efforts. The persistent poverty and widening income disparities can be attributed to financial exclusion in the region where only 22% of enterprises have a loan or line of credit relative to 43% in other developing economies outside Africa (Demirgüç-Kunt & Klapper, 2012).

In addition, the Southern African Development Community (SADC) is slowly becoming the epicenter of economic activity in Africa with a combined gross domestic product (GDP) of US$ 655 billion in 2012. This is much higher than that of any other African regional community. In comparison, the GDP of the East African Community (EAC) was around $85 billion, and that of the Economic Community of West African States (ECOWAS) around $96 billion for the same period. However, this SADC growth pattern has been accompanied by high levels of poverty and income inequality. Southern Africa is reputed to have one of the highest levels of income inequality in the world. In 2016, six out of the ten most unequal countries worldwide were in Sub Saharan Africa, specifically in Southern Africa, including Botswana (Cornia, 2017).

According to Barrientos (2011), goals and policy recommendations for reducing poverty and income inequality should be approached in parallel. The two must be considered at the same time. They are derived from the same distribution that is household income, so they are intimately connected. McKnight (2017) reports that a standard model predicts that increased inequality will lead to an increase in demand for redistribution, which will reduce income inequality and poverty. Poverty and inequality trends are driven by rising labour-market, healthcare, and financial system dynamics. According to Trendlab (2013), the idea of financial inclusion involves the argument that if people are unable to participate in the formal financial system, they may be locked out of opportunities. Their income and socio-economic well-being may also be compromised. However,

there is a widespread discussion on whether financial exclusion contributes substantially to inequality or whether inequality from other sources leads to financial exclusion. This is because traditional banks and financial institutions do not find poor clients profitable. Therefore, the study is designed to help us understand the connection between Botswana's financial inclusion poverty and income inequality relationships. This is extremely necessary since the government of Botswana aims to tackle poverty and inequality.

1.2 Statement of the problem

The realization that economic growth does not directly translate to poverty reduction has created renewed interest in poverty and income inequality (Fauzel *et al*., 2015). Botswana has implemented several policies like agricultural subsidies and safety net programmes to reduce poverty and income inequality. The incidence of poverty based on the national poverty line declined from 30.6% to 19.4% between 2002/3 and 2009/10, and it continued to go down from 19.4% to 16.3% between 2009/10 and 2015/2016, respectively. Extreme poverty and food insecurity also fell from 22.7% in 2002/03 to 13.8% in 2009/10. Income inequality decreased from 64.7% to 60.5% between 2002/03 and 2009/10 (World Bank, 2015b). Despite the significant improvements over the years, striking disparities in income, wealth, and living standards and poverty remain a challenge in Botswana

The World Bank Report (2015b) new poverty evaluation has shown that half the population of Botswana is poor or vulnerable, with 46.2% of the population having children under 15 years of age. The study also found that larger families with more children have higher rates of poverty. The level of inequality in Botswana is the world's third highest, after South Africa and Seychelles, with about 64% of people living in rural areas have formal financial access (Finscope, 2014). This is because lower access to formal financial instruments forces the household to rely on age-old

informal mechanisms. These informal mechanisms are insufficient and unreliable as well as costly as the poor end up paying more in transaction costs and interest re-payments (Tita & Aziakpono, 2017).

According to Honohan (2008), one of the drivers of poverty and income inequality is financial exclusion. Financial exclusion imposes enormous opportunity costs on those who suffer from it the most. Therefore, financial inclusion is vital in ensuring that everyone has access to and understanding a range of appropriate financial services to reduce poverty and income inequality. Furthermore, empirical evidence has revealed that a surge in financial inclusion promotes inclusive growth and is perceived to be critical in addressing poverty and income inequality. Sahoo *et al*. (2017) noted financial inclusion as one way to promote the objective of inclusive growth through the provision of easy access to financial services among the most disadvantaged sections of society.

Therefore, the study seeks to examine how financial inclusion can promote the objective of inclusive growth through the provision of easy access to financial services among the most disadvantaged sections of society.

1.3 Research objectives

This study's broad objective is to examine the effect of financial inclusion on reducing poverty and income inequality in Botswana. Specifically, the study seeks to;

i) Estimate the effect of financial inclusion on poverty reduction in Botswana

ii) Estimate the effect of financial inclusion on income inequality in Botswana

1.4 Research hypothesis

H_0: Financial inclusion does not affect poverty reduction in Botswana

H_1: Financial inclusion affects poverty reduction in Botswana

H_0: Financial inclusion does not affect income inequality in Botswana

H_1: Financial inclusion affects income inequality in Botswana

1.5 Significance of the study

This study is of great importance, as it examines if financial inclusion can reduce poverty and income inequality in Botswana. Knowing the extent to which financial inclusion impacts on reducing poverty and income inequality will stabilize the well-being of households.

According to the World Bank Report (2015b), half of Botswana 's population is either living marginally above the poverty line or at risk of sinking back into poverty, with about 31% identified as vulnerable. As a result, inclusive growth has become Botswana's national policy goal. The need to understand the relationship between financial inclusion, poverty, and inequality in income will be critical to policymakers in their efforts to expand access to finance to reduce poverty and income inequality. The results of the study will help policymakers as there is a need to monitor the access to financial services of the poor to understand. This will help develop policies curb socio-economic challenges like poverty and income inequality in Botswana.

This study will help the various financial institutions improve access to financial credit and service to the poor. The study will also contribute to the relevant literature on financial inclusion, poverty reduction, and income inequality. Many studies were focused on microfinance analysis; therefore, this study will be directed to cover a broad scope of financial inclusion (Madigele & Mogomotsi, 2016; Mosene, 2002; Okurut et al., 2014; Bayen, 2015).

1.6 Organization of the study

The study proceeds to Chapter 2 which presents a brief review of the financial sector. Chapter 3 reviews the literature on the effect of financial inclusion on poverty and income inequality. Chapter 4 discusses the research methodology of the study. Chapter 5 discusses the empirical results, and lastly, Chapter 6 gives conclusions and policy recommendations.

CHAPTER 2

A BRIEF REVIEW OF BOTSWANA'S FINANCIAL SECTOR

2.1 Introduction

This chapter describes the economy of Botswana in relation to the financial sector development over the years. The chapter emphasizes more on the benefits of financial inclusiveness efforts in the Botswana economy.

2.2 Botswana's financial sector, financial inclusion reforms, and its impact on the economy

The Botswana financial sector consists of banks and non-bank financial institutions. The Bank of Botswana sets the banking institutions' regulations and supervision as the central bank. In contrast, the Non-Banking Regulatory Authority (NBFIRA) oversees the non-bank institutions like insurance companies, asset management companies, micro-lenders, and pensions (Jefferis & Tacheba, 2010). The non-banking institutions include government-funded institutions such as the National Development Bank (NDB) and other statutory financial institutions.

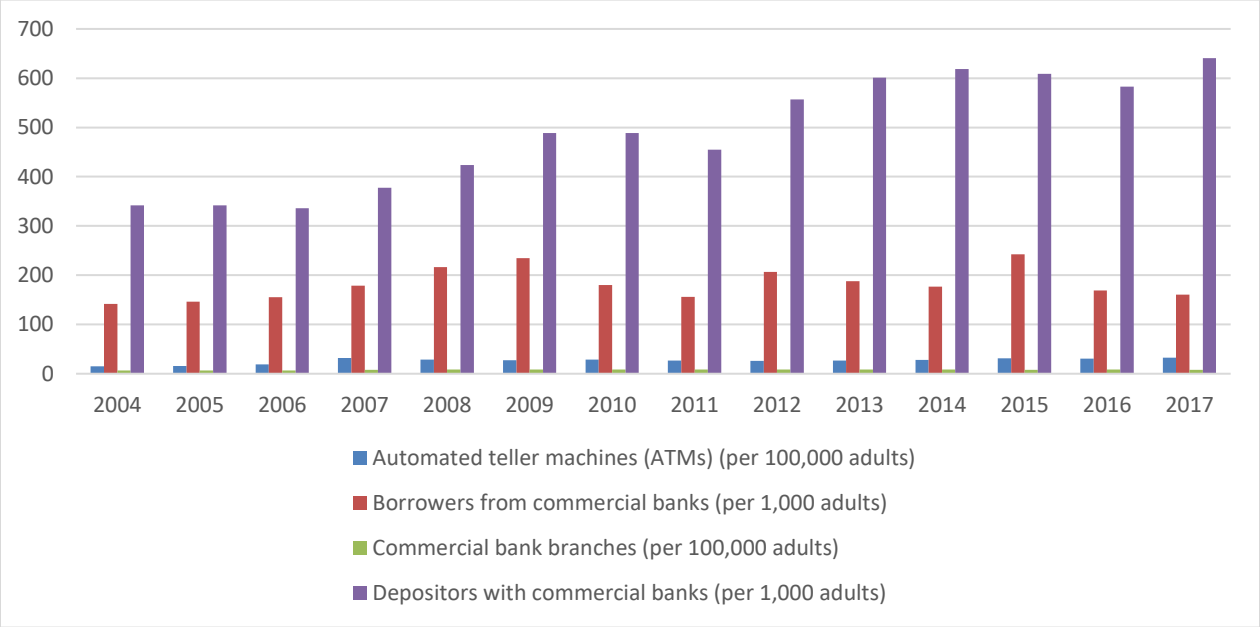
In Botswana, as in other countries, the banking and non-banking financial institutions perform two crucial functions. Firstly, they provide a means for effecting payments for transactions so that individuals and institutions can buy or sell goods and services. Secondly, the financial sector mobilises savings, and channels them to households and businesses, for consumption, housing, business investment, and working capital (NDP 10, 2009). According to SADC (2018), the banking institutions provide services to 50%, and 18% of the population are provided for by the non-banking institutions. The remaining portion of the population is either informally served or excluded (SADC, 2018).

In general, the division of responsibilities between the two regulators is clear. Many aspects of the regulatory framework make financial inclusion easier. However, several certain elements

restrict access. The Bank licensing framework is not ready to accommodate new, innovative financial service delivery; tiered KYC's for low-value bank accounts and low-income households are not provided; or the mobile/e-money regulatory framework is unclear (Finscope, 2014). The financial system in Botswana has grown and become more diversified over the past two decades. According to Tsheole (2006), Botswana's financial sector was not well developed and diversified before the late 1980s. Mostly due to a narrow range of financial products and a lack of competitiveness in the financial system. The reforms for financial inclusion can be traced back to the abolition of interest rate regulation in 1986. More developments were witnessed over the years to help the commercial banks to be more competitive against each other.

Setlhare (2002) explains that financial liberalisation has not led only to increased competition in banking in the banking sector but also technological transformation. According to the Bank of Botswana (2017), there has been an increase in the number of automated teller machines, bank branches, enhanced banking services, and improved access to them as shown on Figure 1 below. The enhanced banking includes e-banking where customers access their bank accounts through cell phones and online banking. Motsewakgosi (2019), further explains that there are mobile payments through mobile network operators such as e-wallets, my- Zaka, and Orange money. These technological innovations provide payment systems that are efficient and cost-effective. Furthermore, there have been increased entrances of new banks and innovation in product advertisement and financial deepening.

Figure 1: The Financial Inclusion dimensions trends (2004-2017)



Source: Authors computation

Botswana's economic liberalization policy was a definite step towards efficiency and economic integration. The main aim of these structural changes was to create and enhance healthy competition in the commercial banking sector (Ahmed, 2007). Four new commercial banks were licensed between 1991 and 1993 in response to changes in 1990, which led to the easing of entry regulations. According to the IMF report 2017, by the year 2016, there were ten commercial banks and two small government statutory banks, with ten banks holding about 80% of the banking system's assets. The entrance of these new commercial banks intensified competitiveness and led to several significant and measurable behavioural changes within the banking sector. First, new and modern products were expanded to meet the changing needs of customers. The scope of financial options and instruments has also increased and improved the quality of services (Jefferis & Harvey, 1995). Secondly, the margins of several previously highly profitable transactions, given the relatively competing market environment, have shown a decreasing trend (Ahmed, 2007).

Together, these developments in the industry culminated in both lending and deposit growth. Although the overall savings level in Botswana improved little after the reforms, private savings in the last years showed a growing trend. It appears that households started to have more savings on financial assets post liberalisation. Therefore, this led to improvements in deposit levels. The effect on private savings in Botswana for financial liberalization is highly encouraging (Molefhi,2015).

As measured by contribution to economic growth, share in overall output and employment, the financial sector plays an increasingly important role. The financial sector's value-added ratio to the total gross domestic product (GDP) rose from 11.9% in 2000 to 14.8% in 2016. At the same time, the financial sector's job ratio to the formal sector's total employment was 7.8% between 2000 and 2016 (Bank of Botswana, 2017).

According to the World Bank (2015a), there has been significant growth in banking and non-bank financial institutions over the years. Nevertheless, there are gaps in competition and efficiency in providing financial services to support inclusive economic activity fully. Structural reforms, which include policies aimed at promoting specific financial services to ensure productivity and sustainability, are required. Furthermore, the regulatory environment needs to embrace innovation and the advancement of secure financial services. Thus, enhancing the potential for promoting financial inclusion can significantly contribute to economic growth, the creation of jobs, and poverty reduction.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter discusses the theoretical and empirical literature review upon which the study is based. Section 3.2 provides a theoretical literature review on financial development theories. Section 3.3 provides an empirical review from different studies on the effects of financial inclusion, poverty, and income inequality and related issues.

3.2 Theoretical review

3.2.1 Finance-growth nexus

The theory can be traced back to Schumpeter (1934), and the finance-growth nexus is often described in terms of causal direction. Two fundamental hypotheses were stipulated by Patrick (1966), namely the demand following and supply-leading hypotheses. Agbetsiafa (2016) cites Patrick when he describes the demand-following hypothesis as a postulation that a causal relationship between real and financial growth exists. According to this theory, as the real sector develops, increased demand for financial services induces growth in the latter. Conversely, the supply leading hypothesis posits a causal relationship from financial to real growth. The cultivation and development of financial institutions and markets increase the supply of financial services, thereby promoting growth in the real.

Patrick (1966) also proposes a stage of development hypothesis whereby the supply leading financial development can induce real capital formation in the early stages of economic development. Financial innovation and development of new financial services creates new opportunities for investors and savers and, by induction, sustainable economic growth (Calderón & Liu, 2003). As financial and economic development proceeds, the

supply-leading characteristics of financial development diminish gradually and are eventually dominated by demand following financial development (Calderón & Liu, 2003). Choong et al. (2005) describe the feedback hypothesis as an approach that suggests a two-way causal relationship between financial development and economic growth. According to Choong et al., a country with a well-developed financial system will create a high demand for financing and services arrangements through technological changes. They describe as positively interdependent the relationship between financial development and economic growth.

3.2.2 Kuznets inverted U hypothesis

Kuznets (1955) shows that inequality in income distribution increases in initial stages of growth as a country's national per capita income rises. As the economy reaches the highest intermediate level, income distribution inequality drops. The Kuznets curve's explanation revolves around the fact that nearly everyone is equally poor in pre-industrial societies, so inequality is low. Nevertheless, inequality will continue to increase as the economy becomes less dependent upon low productivity and more dependent on more competitive industries. Generally, the industrial sector has a higher average income that is less standardized. The urban-rural gap is reduced as a population matures and becomes wealthier. The availability of old-age pensions, unemployment benefits, and social transfers will lead to a reduction in income inequality. Todara & Smith (2011) set out three possible scenarios where growth, measured in GDP per capita, can be followed by improved income distribution, stable distribution of income, or a case where the distribution of income is declining.

3.3 Empirical findings

Several studies have been done on financial inclusion, poverty, and income inequality. However, there is no single definition or measure of financial inclusion as a variable. The relationship between financial inclusion, poverty reduction, and income inequality is still unclear. Some studies discovered a significant and robust link between financial inclusion, poverty reduction, and income inequality, while some found no relationship between the three.

Park & Mercado (2015) constructed their own financial inclusion indicator to assess the impact of financial inclusion on poverty reduction and income inequality. The study used 37 developing countries in Asia from 2004 to 2012, and it followed the methodology of Sarma (2008). Financial inclusion was described as the means that ensure the increased access, availability, and use of formal financial services for all citizens. The results showed that there is a strong correlation between financial access, poverty, as well as income inequality. Making financial services more accessible to lower-income households, poverty, and income inequality rates in Asian countries has proven to be reduced. The two issues can, therefore, be tackled together by promoting inclusive growth through financial inclusion. The study further showed that rule of law, GDP per capita and demographic characteristics have a significant effect on financial inclusion.

In a follow-up study Park & Mercado (2018) realised the same effect of financial inclusion on poverty and income inequality in the full sample of the world. However, there was no relationship between financial inclusion and poverty and income inequality in terms of Asian countries examined. Their results showed that per capita income, the rule of law, demographic characteristics have a positive effect on financial inclusion for both the world and Asian countries.

Agyemang-Badu *et al*. (2018) followed the same methodology by Sarma (2008) and Park & Mercado (2015) to test the relationship between financial inclusion on poverty and income

inequality in 48 African countries from 2004 to 2015. For this study Financial inclusion was known as unlimited access to and use of affordable financial services, such as savings, loans, investment, insurance, and pensions, by all people irrespective of their level of income. The evidence revealed an inverse relationship between financial inclusion and poverty reduction and income inequality in Africa. They concluded that countries should invest in programs aimed to uplift the poor and make financial services easily accessible to them.

Tita & Aziakpono (2017) found out there is a negative relationship between financial inclusion and income equality in the short and long run. The study used the Findex 2011 data to analyse the relationship between financial inclusion and income inequality in Sub-Saharan Africa (SSA). This study employed seven aspects of financial inclusion; account ownership, account use for business, electronic payment, loans from formal financial institutions, formal loans to pay school fees, health insurance and formal savings. The estimated results also showed that formal use of an account, electronic payment, and formal savings have a positive effect on income inequality for SSA countries.

Neaime & Gaysset (2018) tested the impact of financial inclusion on income inequality, poverty, and financial stability in the Middle East and North African countries (MENA) from 2002-2015. The study used the Generalized Method of Moments (GMM) and Generalized Least Squares (GLS) and financial inclusion was proxied by the number of banks per 100,000 adults. They found out that an increase in financial inclusion will reduce income inequality, and it does not have any significant effect on poverty. The results also revealed that an increase in financial inclusion would positively impact financial stability. Population, inflation, and trade openness were all found to influence poverty positively.

Adebowale & Lawson (n.d) used the 2010/2011 and 2012/2013 General Household Survey Panel and a multi-nominal logit model to assess the relationship between access to finance and its susceptibility households to poverty in Nigeria. The study found that households with access to financial services are 27% less vulnerable to poverty. Specific factors that influence household welfare include household income, household size, and the number of dependents in the family. They also concluded that access to financial services is not the primary determinant of household vulnerability to poverty in developing countries. Therefore, policymakers must investigate other poverty alleviation reforms.

Moreover, Adeola & Evans (2017) analysed the effect of financial development and financial inclusion on Nigeria's economic diversification using the Fully Modified Least Square (FMOLS). They used the 1981-2014 Central Bank of Nigeria (CBN) Statistical Bulletin and World Development Indicators. the number of commercial bank branches per 1000 km2 and outstanding loans from commercial banks (% of GDP) are used as measures of financial inclusion. The results showed that financial inclusion has positive economic diversification effects in terms of financial access and use, suggesting that financial inclusion be a strong accelerator of economic diversification.

In another study, Ageme *et al*. (2018) used quarterly data from 2009: Q1- 2014: Q4 to test the effect of financial inclusion on poverty reduction in Nigeria. The results indicated that there is a long-run relationship between financial inclusion and poverty reduction. Financial inclusion was measured in terms volume of transactions through automated teller machines (ATMs) and internet banking, and volume of credit to the rural population. Therefore, access to automated teller machines had a positive impact on reducing poverty,

while internet banking and microfinancing loans had negative implications for reducing poverty.

In a study to measure the impact of access to credit on household indicators in Mauritania, Amendola *et al*. (2016) used a Household Living Conditions survey in 2014 covering 9557 households. The results showed that households who can acquire credit had higher living standards and greater food security. The education level, age of household head, and residence location proved to be a significant variable that influences the ability to access financial services by individuals. Older people have a better chance of accessing credit services, and urban households are more eligible for credit access. The report concluded that the policymakers must work towards developing rural financial infrastructure. The financial services can be accessed by delivering integrated services such as mobile banking and learning platforms. The structural reforms are thought to have a substantial impact on household economic growth and well-being. In another study, Imai *et al.* (2010) focused on microfinance access for households and their potential for poverty reduction. The findings verified the positive and essential effects of successful microfinance loans on multidimensional welfare measures using domestic household data from India and applied the treatment impact model.

Furthermore, Duong & Nghiem (2014) used a quasi-panel data approach and data from the Vietnam Living Standards Survey (VLSS). They tested the effect of microfinance in poverty reduction in Vietnam during the period 1992-2010. The study found a significant and positive relationship between microfinance and household consumption, income, and poverty reduction. The study results also revealed that access to microfinance would increase income and consumption per individual in the household. The results showed that a 1% increase in the volume of loans (proxy for access to credit) leads to an increase in income of 0.15% and an increase in

consumption of 0.23% per adult equivalent. However, there was no significant evidence between microfinance access and poverty reduction.

Addury (2019) used components of financial inclusion, credit value, and deposits or investments to measure the impact of financial inclusion on household welfare indicators (household income, household consumption expenditure, and household living facilities) in Indonesia. Financial inclusion was proxied by credit amount and saving/investment amount. This research used panel-data regression analysis from the Indonesian Family Life Survey (IFLS) 2000, 2007, and 2014. The analysis found out that the amount of credit has a significant influence on household income and expenditure. Moreover, savings/investments also had a significant effect on both household income and consumption. There was no significant relationship between the amount of credit and savings/investments with the household living facilities. This might have been caused by the fact that when a credit is acquired, it can only be paid later, and not with the current income. This is echoed by Okurut et al. (2014), where the analysis revealed that microfinance has no effect on household welfare in Botswana. However, there is a positive relationship between microfinance, education, household assets, and income.

3.4 Overview of empirical literature

Although financial inclusion has become prominent on the global sustainable development policy agenda, the economic literature on financial inclusion is in its initial stages in Botswana. Some research explored effective financial inclusion initiatives both at the household and country level, while some articles concentrated on the study of microfinance at the country level (Madigele & Mogomotsi, 2016; Mosene, 2002; Okurut et al., 2014; Bayen, 2015; Molefhi, 2019). Many articles discussed different financial inclusion rates in both developed and emerging economies (Jabir, 2015; Zius & Weill; Tita & Aziakpono, 2018; Park & Mercado, 2015: Park & Mercado, 2018; Mallick & Zhang, 2018). These papers have laid the foundations in this field and provide key policy insights on the importance of financial inclusion on sustainable development. However, more work needs to be done to consider how Botswana as an individual country can reduce poverty and income inequality through financial inclusion. This study, therefore, fills the gap that exists in the literature.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the methodology, the data used, and the explanation of variables considered when modelling the effects of financial inclusion on poverty and income inequality in Botswana. The chapter includes the theoretical framework based on the literature in Section 4.2. It also includes the model specification in Section 4.3. In section 4.4 deals with the description of variables and justification. Section 4.5 consists of data analysis and estimation techniques. Section 4.6 deals with data type and source used to analyse the effects of financial inclusion on poverty and income inequality in Botswana.

4.2 Theoretical framework

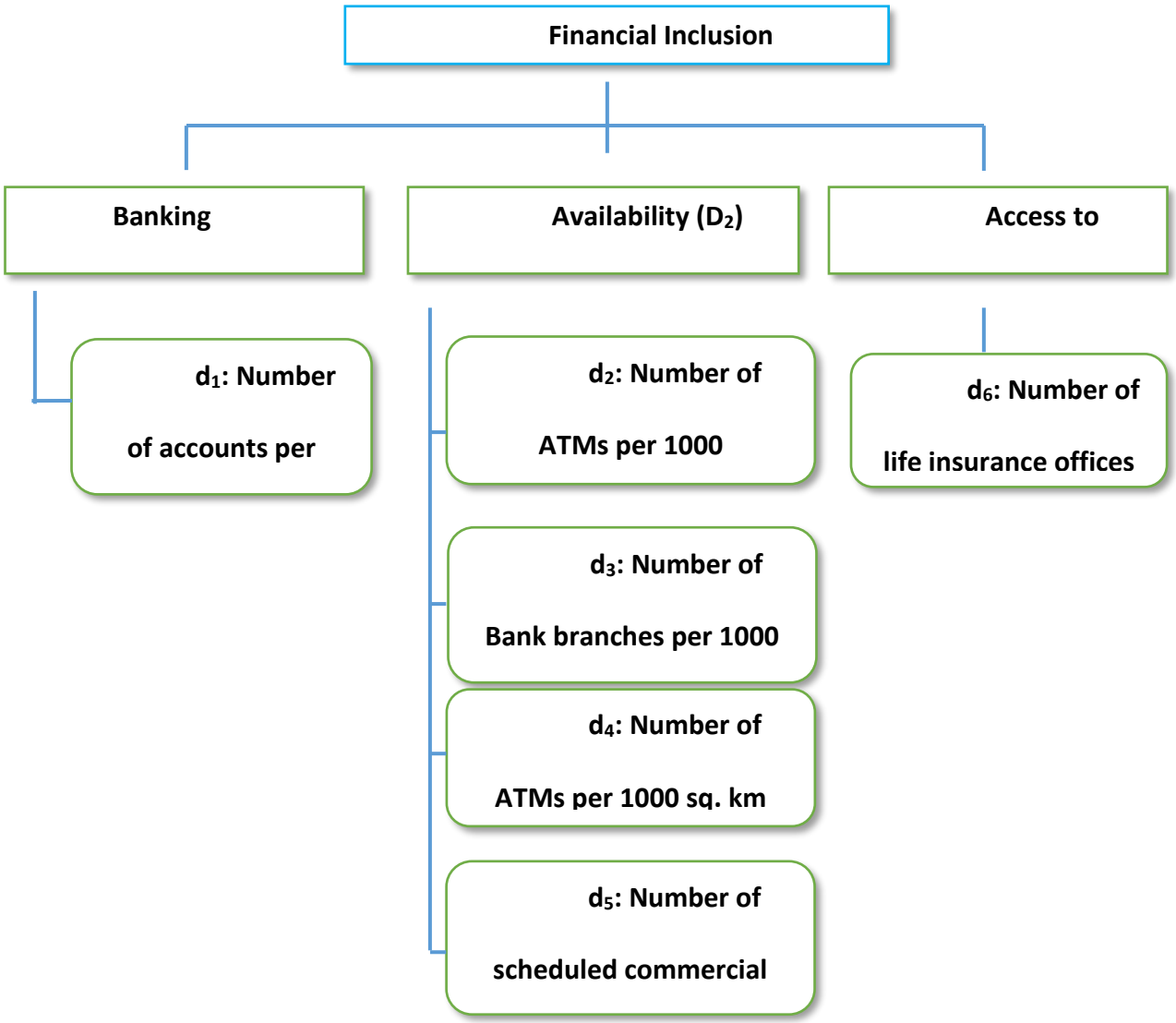
The present study adopted the method used by Park and Mercado (2015) to construct a Financial Inclusion Index (FII). The same methodology was used by the United Nations Development Programme (UNDP) to compute some popular indices such as the Human Poverty Index, Human Development Index, Gender Development Index, and so on. This study considered three dimensions for the indicators of an inclusive financial system. These dimensions and their indicators are examined elaborately as follows:

4.2.1 Dimensions

The study considered three dimensions for preparing the financial inclusion index. First is the Banking Penetration (***D1***). Thus, if every person in an economy has a bank account, the value of this measure would be 1. The demographic branch penetration measures this, i.e., the number of accounts (deposits and loans) per 1,000 populations with different financial institutions (***d_1***). The second dimension is the availability (D2) of banking services in the demographic and

geographic terms. That is the number of ATMs per 1,00,000 population (d_2), number of bank branches per 1,00,000 population (d3), number of ATMs per 1,000 sq. km (d4) and the number of scheduled commercial banks per 1,000 sq. km (d5). The third dimension is the Access to Insurance (D3). It is measured as the number of life insurance (LIC) offices (d6). Therefore, these six indicators cover all the three dimensions of financial inclusion, as depicted in Figure 1.

Figure 2: A chart showing the flow of the financial inclusion dimensions



The comprehensiveness of any financial system should be evaluated after considering various dimensions. Since the calculation of the Financial Inclusion Index (FII) depends upon various dimensions, which can further be divided into different indicators. This study followed a multidimensional approach for the comprehensiveness of the index. We need to have a dimension index for every dimension of the financial index before constructing the Financial Inclusion Index. The researcher has used the following formula to calculate the dimension index of various dimensions considered in the study:

$$d_d = W_d * \frac{A_d - m_d}{M_d - m_d} \quad \text{..... (1)}$$

Where, W_d is = Weight attached to the dimension d, $\mathbf{1} \geq W_d \geq \mathbf{0}$, A_d = Actual value of dimension d; m_d= Minimum value of dimension d; M_d = Maximum value of dimension d; d_d = Dimensions of financial inclusion d.

Formula (1) authenticates that $\mathbf{1} \geq W_d \geq \mathbf{0}$ and here, n dimensions of financial inclusion represented by a point ***X = (1, 2, 3…)***. Point ***W = (1, 2, 3 …)*** represents an ideal situation and point ***0 = (0, 0, 0…0)*** represents the point indicating the worst situation. To calculate the Financial Inclusion Index for the country, we have two important factors viz. the ideal point W and the worst point 0. This FII indicates the point of financial inclusion. This point will help in identifying whether financial inclusion in the country is low or high. If the gap between the 0 and X is wide, it signifies high financial inclusion, and similarly, if the gap is narrow between 0 and X, then it signifies low financial inclusion.

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2} + d_3^2 + \cdots + d_n^2}{\sqrt{w_1^2 + w_2^2 + w_3^2 \ldots + w_n^2}} \quad \text{..... (2)}$$

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2} + (w_2 - d_2)^2 + (w_3 - d_3)^2 + \cdots + (w_n - d_n)^2}{\sqrt{w_1^2 + w_2^2 + w_3^2 \ldots + w_n^2}} \quad \text{..... (3)}$$

$$\boldsymbol{FI} = \frac{\mathbf{1}}{\mathbf{2}}(\boldsymbol{X_1} + \boldsymbol{X_2}) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (4)$$

The formula (2), for financial inclusion index ($\boldsymbol{FI}$), $\boldsymbol{X_1}$specifies average of the Euclidian distance between $\mathbf{0}$ and $\boldsymbol{X}$. If the value of $\boldsymbol{X_1}$ is high, then it means that there is more financial inclusion. While the inverse Euclidean distance between $\boldsymbol{X}$ and $\boldsymbol{W}$ has been indicated by the formula (3), for $\boldsymbol{FI}$, $\boldsymbol{X_2}$. The formula (4) calculates the simple average of $\boldsymbol{X_1}$ and$\boldsymbol{X_2}$.

Depending on the value of $\boldsymbol{FI}$, the period under study has been categorized as

1. $\mathbf{0} \leq \boldsymbol{FI} \leq \mathbf{0.4}$; indicates low financial inclusion, LFI
2. $\mathbf{0.4} \leq \boldsymbol{FI} \leq \mathbf{0.6}$; indicates medium financial inclusion, MFI
3. $\mathbf{0.6} \leq \boldsymbol{FI} \leq \mathbf{1}$; indicates high financial inclusion, HFI

The most critical task in calculating the **FI** is to assign appropriate weights to the dimension indexes. Since each dimension is equally vital for the construction of **FI**, we have given equal weights to each of the three dimensions. In the present study, we have provided weight ***1*** for the index banking penetration (D1), ***1*** for the index of availability (D2), and ***1*** for the index of Access to Insurance (D3). Given these weights, we can represent Botswana by a point ***(D1, D2, D3)*** in the dimensional space, such that ***0<= D1<=1, 0<= D2<=1, 0<= D3<=1***, where ***D1, D2, D3*** are the dimension indexes for Botswana computed using formula (1). In the three-dimensional space, the point (0,0,0) will indicate the worst situation: complete financial exclusion, and the point (1,1,1) will indicate the ideal situation that means complete financial inclusion in the present context.

One difference between this study and Park and Mercado (2015) indicator is that we consider a specific country (Botswana) instead of considering many countries.

4.3 Model specification

The study examines the significance of financial inclusion on poverty rates, along with various indicators. As financial inclusion increases, we expect that poverty rates should decline as more people have access to financial services to smooth their consumption and engage in productive activities. Aside from the poverty rate, several indicators are also considered, including inflation as a measure of macroeconomic stability, primary school completion rate, and age dependency ratio. These variables are selected based on data availability. Thus, the study specifies the model in the form;

Poverty=f (F-inclusion, Inflation, Income, Population, Education Dependency) ……. (5)

Poverty represents poverty rate, ***F-Inclusion*** represents financial inclusion, ***Inflation*** represents the inflation rate, ***Income*** represents per capita income, ***Population*** represents population growth, ***and Education*** represents the primary school completion rate. ***Dependency*** represents the age dependency ratio. The econometric model will be written as;

$$\boldsymbol{Poverty_t = \alpha + \beta_1 F\ Inclusion_t + \beta_2 Inflation_t + \beta_3\ Population_t + \beta_4 Income_t + \beta_5 Education_t + \beta_6 Dependency_t + \varepsilon_t} \ldots\ldots\ldots\ldots \textbf{(6)}$$

Where $\boldsymbol{\alpha}$, is a constant term, $\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6}$ are the coefficient of financial inclusion, inflation, population growth, per capita income, Primary school completion rate and dependency ratio. $\boldsymbol{\varepsilon_t}$ is the error term, which is assumed to be uncorrelated with the explanatory variables.

Finally, the study tests the significance of financial inclusion and other variables on income inequality. As financial inclusion increases, income inequality should decline as more people at the lower income strata will have access to financial services. The objective is specified in the form;

Inequality=f (F-inclusion, Inflation, Income, Dependency, Education, Population) ……. (7)

Inequality represents income inequality and the econometric model will be written explicitly as;

$$\boldsymbol{Inequality_t = \alpha + \beta_1 F\ Inclusion_t + \beta_2 Inflation_t + \beta_3\ Population_t + \beta_4 Income_t + \beta_5 Education_t + \beta_6 Dependency_t + \varepsilon_t \ldots\ldots\ldots\ldots} \textbf{ (8)}$$

Where $\boldsymbol{\alpha}$, is a constant term, $\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6}$, are the coefficient of financial inclusion, inflation rate, population growth, per capita income, Primary education completion rate, age dependency ratio. $\boldsymbol{\varepsilon_{it}}$ is the error term that is assumed to be uncorrelated with the explanatory variables.

4.4 Description of variables and justification

This section provides a vivid understanding of the variables used for the study and justification for their choices.

Poverty rate

The poverty rate is the proportion of people who have incomes below the poverty line (for a given age group). Poverty refers to the deprivation of basic human needs, which commonly include health care, shelter, sanitation, water, food, clothing, and education (Erenstein, 2011). Poverty rates also refer to the poverty headcount ratio at the national poverty line as a percentage of the total population. An increase in access to financial services includes savings, remittance facilities, loans, payments, and insurance services. It will expand poor people's access to financial services, increase their economic opportunities, and improve their lives. Therefore, it is expected that financial inclusion will promote a reduction in poverty.

Income Inequality

Income inequality is an extreme disparity of income distributions with a high concentration of income, usually in the hands of a small percentage of a population. When there are income inequalities, there is a significant disparity in the wealth of one segment of the population. Greater financial inclusion, which includes access to services like deposits, loans, payments, remittances, and insurance, reduces income inequality by raising the incomes of the poorest income quintile (Beck et al., 2007). Promoting affordable, timely, and adequate access to a wide range of regulated financial products and services helps to bridge the gap between the rich and the poor. However, Batuo *et al.* (2010) argued that financial inclusion tends to benefit only the rich because they are politically connected and can provide the collaterals demanded by financial products and services. That notwithstanding, it is expected that the relationship between financial inclusion and income inequality to be negative.

Per capita income

It measures the amount of money earned per person in a nation or geographic region. The expectation is that an increase in per capita income will reduce poverty and income inequality. This is because an increase in income per capita indicates that the individual has enough funds to improve its standard of living, which, in turn, decreases poverty level and income inequality (Agyemang-Badu, 2018). Therefore, improvement in income induces households and firms to partake in financial transactions provided by the financial sector. This also means that households view financial products as normal service; thus, improvement in their income levels induces them to patronize financial products (Kelly & Rhyne, 2013; Kumar & Kumar, 2011).

Age Dependency Ratio

It measures the number of dependents aged zero to 14 and over the age of 65, compared with the total population aged 15 to 64. Thus, it refers to the percentage of dependents to the working-age population. It is expected that the age dependency ratio would increase poverty and income inequality. A higher dependency ratio indicates more financial stress on working people and possible political instability, which increases poverty and income inequality (see: Causa et al., 2016; Agyemang-Badu, 2018). This implies that the number of dependents relative to the number of earners is very high, which reduces the resource apportion to each dependent. Since these resources are not enough to provide their daily need (consumption), this causing them to fall under the poverty line and affect the distribution of resources being biased, leading to uneven distribution of resources.

Population Growth

The rate of population growth is the rate at which the number of people in a country rises over a given time, measured as a percentage of the initial population. It is expected that an increase in population growth will increase poverty and income inequality. According to Park & Mercado (2018), a rise in population growth is likely to reduce per capita income growth and well-being, which tends to cause their consumption level to fall, leading to an increase in poverty. With income inequality, so far as the disparity between rich and low-income families remains, an increase in the population indicates that the rich will continue to be more prosperous, which widens the inequality gap, all other things held constant.

Inflation Rate

Inflation is the rate at which the average price level of the basket of selected goods and services in an economy rises over time is a statistical measure of inflation. Inflation is the year-on-year change in the consumer price index. The poverty and income inequality problem intensifies, even more, when the prices of commodities in general changes, in particular prices for food (Sugema et al., 2010; Chaudhry and Chaudhry, 2008). According to Cardoso (1992), inflation increases poverty in two ways. First, the inflation tax can reduce real disposable income. Second, if nominal wages increase less than the price of goods consumed by wage earners, workers' real income will decline. Also, an increase in inflation would increase income inequality by lowering the purchasing power of the poor and reducing the real value of government aids that are usually not indexed to inflation (Siami-Namini & Hudson 2019; Yue 2011). Therefore, it is expected that higher inflation is associated with more robust economic growth, which can increase poverty and income inequality.

Primary completion rate

The primary completion rate is the percentage of students completing the last year of the primary school expressed as a percentage of the relevant age group. According to Batuo (2010), individuals acquire the skills and knowledge by at least completing primary school to better position them for high-paying employment opportunities. The expected relationship is that primary completion will reduce both poverty rates and income inequality.

Table 4.1: Summary of Variables and Predicted Effects

Dependent Variables and expected signs			
Independent Variable	Notation	Equation 6	Equation 8
Financial inclusion	***F-Inclusion***	Negative	Negative
Inflation rate	***Inflation***	Positive	Positive
Age Dependency Ratio	***Dependency***	Positive	Positive
Per capita income	***Income***	Negative	Negative
Population Growth	***Population***	Positive	Positive
Primary school completion rate	***Education***	Negative	Negative

4.5 Data analysis and estimation technique

4.5.1 Data analysis

The study used an Auto-Regressive Distribution Lag Model (ARDL) technique with selected data on Botswana to estimate the equations. The main motive for choosing this method to analyse this problem is that it can help study both the long-run and short-run dynamics of the economy.

4.5.2 Data estimation techniques

Unit Root Testing (Stationarity Test)

In estimating parameters of a time series model, it is required that all data should be tested in order to determine the order of integration of each of the variables specified in the model. Testing for stationarity before estimation is deemed necessary as most time series variables are non-stationary, and estimations with these series might produce spurious results. Testing for stationarity enables the researcher to determine the order of integrating the variables to choose an

appropriate estimator. The study opted for the use of the Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) tests in carrying out the stationarity test. These tests are employed concurrently for robust results. The lag length for the ADF test was done using the Akaike information criterion (AIC) whiles Newey-West Bandwidth was used to estimate the lag length for the PP test.

Augmented Dickey-Fuller (ADF) Test

The ADF test developed by Dickey and Fuller (1979) is an augmented version of the Dickey-Fuller (DF) test for more complicated and larger time series models. The ADF tests is a build-up on the DF tests to correct for autocorrelation by including lags. The procedure of stationarity testing using the ADF is like that of the DF test but instead applied to this model as specified below.

$$\Delta y_t = \alpha + \delta_t + \lambda y_{t-1} + \cdots + \beta_{i-1}\Delta y_{t+i+1} + \mu_t \quad \text{(9)}$$

Simply,

$$\Delta y_t = \alpha + \delta_t + \lambda y_{t-1} + \sum_{i=1}^{J} \beta_i \, \Delta y_{t-i} + \mu_t \quad \text{(10)}$$

where y_t represents the series at time t, α, δ, λ and β are parameters to be estimated, j is the optimal lag length, Δ is the difference operator, t represents the time trend, and μ_t is the stochastic random disturbance term. The test for stationarity is carried out under the null hypothesis $\lambda = 0$ as against the alternative hypothesis $\lambda < 0$. After the computation of the test statistic, it is then compared with the critical values. The null hypothesis is rejected if the ADF test statistic is less than the critical value and concludes that the series is stationary. On the contrary, if the ADF test statistic is greater than the critical value, we fail to reject the null hypothesis and conclude that the series is non-stationary. The rejection of the null hypothesis for the test in the study was based on the MacKinnon (1991) critical values and the probability values.

Phillips-Perron (PP) Test

An improvement of the ADF test is usually viewed as a DF test developed to cater for heteroskedasticity and autocorrelation. Considering this, Phillips and Perron (1988) proposed a modification of the ADF test technique using nonparametric test and a different way for correcting for autocorrelations in residuals. Specifically, the PP test is superior to the ADF test in circumstances where the time series variable under investigation has serial correlation and structural breaks. The test assumes that the errors are weakly dependent and heterogeneously distributed. These properties make PP test a robust estimation test over ADF test. The PP test is specified below;

$$\Delta Y_t = \alpha + \delta t + \lambda Y_{t-1} + \theta\left(t - \frac{T}{2}\right) + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + v_t \quad \text{..... (11)}$$

where y_t represents the series at time t, Δ is the difference operator, v_t is the stochastic random disturbance term, and $\alpha, \delta, \rho, \theta$ and β are parameters to be estimated. For the PP test, if the statistic is more negative than the critical value, the null hypothesis is rejected and we conclude that the series is stationary. Conversely, if the test statistic of PP is less negative than the critical value, we fail to reject the null hypothesis and conclude that the series is non-stationary.

Cointegration Test

Variables in time series analysis are classified as cointegrated if they exhibit long-run equilibrium relationship and share common trends. For this study, the Bounds test within the Auto-Regressive Distributed Lag (ARDL), as proposed by Pesaran et al. (2001), was employed. The ARDL-Bounds method was chosen over the residual-based cointegration test associated Engle and Granger because of its advantages over the latter. The Engle-Granger Residual-based tests was criticized due to the following reasons: (a) long run model suffers from small sample bias (b) problem of normalization in the system with more than two variables (c) compounding of errors

due to the step-wise procedure for testing (d) univariate cointegration test with residuals imposes possibly invalid restrictions on short run behavior. Due to the short comings of the Engle-Granger Residual-based method, the Johansen (1998) and Johansen and Juselius (1990) developed these procedures to avoid the short comings of Engle-Granger. However, the procedures of the Johansen (1998) and Johansen and Juselius (1990) requires that the variables included in the model are integrated of order one (I(1)).

Therefore, ARDL model was chosen because it provides consistent results irrespective of the order of integration of the variables under study. Thus, whether I(1) or I(0) or a mixture of both, but not orders greater than one. It also provides an unbiased estimation of the long-run model and provides authentic F-statistics though some of the regressors might be endogenous. The ARDL estimation technique is also relatively efficient and more robust in small samples, as in the case of this study. This technique also allows for the introduction of optimal lags of both the dependent and explanatory variables. Implying that, various variables can have their optimal speed of adjustment to the equilibrium. In order to implement the bounds test procedure for cointegration, the following restricted (conditional) version of the ARDL model is estimated to test the long-run relationship among the variables of interest. This framework is implemented by modelling equation (6 and 8) as a conditional ARDL, given as:

$$\Delta Q_t = \alpha_0 + \delta_1 Q_{t-1} + \delta_2 X_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta Q_{t-i} + \sum_{i=0}^{k} \alpha_i \Delta X_{t-i} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots (12)$$

where Q is the dependent variable; X is a vector of explanatory variables; Δ is the first difference operator and $\boldsymbol{\varepsilon}$ represents the error term.

The first step is by estimating equation (12) by applying OLS. The F-test statistic is used in checking the existence of a long-run equilibrium among the variables under study. This is done

by restricting the coefficients of the lagged level variables to zero. The null hypothesis for no cointegration among the variables is represented as $H_O: \delta_1 = \delta_2 = 0$ while the alternative hypothesis is represented by $H_O: \delta_1 \neq \delta_2 \neq 0$. The F-statistic test is a non-standard which relies on whether the variables included in the model are integrated of order zero I(0) or integrated of order one I(1), the number of regressors, and whether the model contains a trend and/or an intercept. The test involves using critical value bounds, which depend on the order of integration of the variables. Thus, whether I(0) or I(1) or a mixture of both. Two sets of critical values (i.e., I(0) series and I(1) series) are generated. The lower bound critical value is used to classify the critical values generated for the I(0) series. In comparison, the critical values for the I(1) series are referred to as the upper bound critical values.

After the generation of the F-statistic estimates, if the F-statistic exceeds the upper critical value, then the null hypothesis is rejected, and the conclusion is made that there exists a long-run equilibrium relationship among the variables irrespective of the order of integration. On the other hand, if the F-statistic is below the upper bound critical value, then the null hypothesis is accepted, implying that there is no cointegration among the variables. However, if the test statistic lies in-between the upper and lower critical values, a conclusive inference cannot be made.

Error Correction Model

After the cointegration test, the long-run relationship among the variables is established using the ARDL test for cointegration. The error-correction model (ECM) within the ARDL framework will be estimated to obtain the short-run and long-run relationships among the economic variables under study. The lag length selection criterion is based on the Akaike Information Criterion (AIC). A generalized form of the ECM within the ARDL framework is represented below:

$$\Delta lnQ_t = \beta_0 + [\gamma_1 lnQ_{t-1} + \gamma_1 lnX_{t-1}] + \sum_{t=1}^{p} \delta_1 \Delta lnQ_{t-1} + \sum_{t=1}^{q} \delta_2 \Delta lnX_{t-1} + \mu_t \ldots\ldots \quad (13)$$

$$\Delta lnQ_t = \beta_0 + \psi ECT_{t-1} + \sum_{t=1}^{p} \delta_1 \Delta \ln Q_{t-1} + \sum_{t=1}^{q} \delta_2 \Delta \ln X_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

where Q represents the dependent variable, X represents the regressors, γ_1 and γ_2 represents the long-run coefficient estimators, δ_1 and δ_2 represents the short-run dynamic coefficients, ψ represents the speed of adjustment parameter, ECT represents the error correction term in equation 14.

The error correction term indicates the speed of adjustment to long-run equilibrium in the dynamic model. It is expected to be statistically significant with a negative sign. The negative sign implies that any shock that occurs in the short-run will be corrected in the long-run. To ensure the goodness of fit and stability of the model, diagnostic tests was conducted. The diagnostic test examined the serial correlation, functional form, and normality associated with the selected model.

4.6 Data type and source

The study employed time series quarterly data spanning from 2004 to 2017 (2004Q1:2017Q4), which was sourced from IMF's International Financial Statistics and Financial Access Survey database, World Bank World Development Indicators (Global Financial Database) to estimate the impact of financial inclusion on poverty and income inequality in Botswana. The choice of the range of observations is purely based on data availability.

CHAPTER 5

EMPIRICAL ANALYSIS AND DISCUSSIONS

5.1 Introduction

This chapter presents the empirical estimations and discussions of the results obtained from estimating the empirical models specified in chapter four. We begin with an analysis of the variables' descriptive statistics, which is followed immediately with the analysis of the stochastic properties of the variables included in the model. Next, we estimate the ARDL model and perform a post-estimation analysis. These post-estimation analyses include testing for a level relationship (cointegration) and diagnostic analysis. Based on the results of the test for cointegration, we may proceed to derive the short-run and long-run parameters of the estimated ARDL model.

5.2. Descriptive Statistics

Descriptive statistics provide a summary of the basic structures of the study. The central tendency measures are used to provide numerical information about the typical observation in the data (Hollingsworth, 2016). It is also used to determine if the data tend to center around some value. The descriptive statistics provide a summary of the data from 2004-2017 and consists of quarterly data and 56 observations. The variables employed include the Age dependency ratio (Dependency), income inequality (Inequality), inflation (Inflation), per capita income (Income), financial inclusion (F-Inclusion), population growth (Population), poverty rate (Poverty) and primary school completion rate (Education).

The summarised statistics of these eight (8) variables are presented below in Table 5.1, The mean, median, standard deviation, and the number of observations of each variable are presented in the Table. From the results, the poverty rate in Botswana has grown at an average of 5.38% in the last 16 years, while income inequality increased at an average of 12.49%. The mean and median

measure the centre of distribution of the data and the midpoint of the data set, respectively. The standard deviation measures how spread out the data is around the mean. The less spread out the data, the smaller the standard deviation. From the table, the poverty rate has a standard deviation of 1.68%, while income inequality has a standard deviation of 3.59%.

Table 5.1: Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Obs
Education	25.06	25.17	25.52	24.27	0.31	56
Poverty	5.38	4.48	9.66	4.01	1.68	56
Income	0.67	0.75	2.75	-2.90	1.23	56
Population	0.43	0.45	0.54	0.28	0.09	56
Inflation	7.54	7.84	13.80	2.71	3.26	56
Inequality	12.49	13.16	16.20	6.57	3.59	56
F-Inclusion	0.57	0.64	0.86	0.05	0.28	56
Dependency	15.87	15.76	16.77	15.49	0.3	56

5.3. Unit Root Testing (Stationarity Test)

According to Phillips & Perron (1988), unit root tests are used to check the time series data stationarity. Testing for stationarity before estimation is deemed necessary as most time series variables are non-stationary, and estimations with these series might produce spurious results. Testing for stationarity also enables the researcher to determine the order of integration of the variables to choose an appropriate estimator. The variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP). These tests were employed concurrently for robust results, and results are presented in Table 5.2.

The ADF and PP statistics showed that some variables were non-stationary in level form. As a corrective mechanism, first difference was applied. Poverty, Inflation, Population, Inequality, and Dependency are stationary at levels. Education, Income, and F-Inclusion are stationary at first difference. There are no variables that are integrated of order 2. This justifies the use of the ARDL model. The null hypothesis of non-stationarity is rejected at a 5% critical value of all the variables.

Table 5.2: Unit root test

Variable	Augmented Dickey-Fuller (ADF)				Phillips-Perron (PP)			
	Levels		First Difference		Levels		First Difference	
	t-statistic	Prob	t-statistic	Prob	t-statistic	Prob	t-statistic	Prob
Poverty	-4.07	0.00***	-2.69	0.24	-3.90	0.00***	-1.96	0.05**
Inequality	-2.08	0.04	-3.42	0.06*	-2.41	0.02**	-1.49	0.82
Inflation	-3.61	0.04**	-5.57	0.00***	-2.77	0.21	-5.58	0.00***
Education	-1.22	0.90	-3.44	0.06*	-2.76	0.22	-3.17	0.03**
Dependency	-1.90	0.64	-2.38	0.02**	-3.48	0.01**	0.21	0.53
Income	-1.99	0.59	-3.14	0.03**	-2.78	0.07*	-2.98	0.04**
Population	-4.52	0.00***	-5.77	0.00***	-0.70	0.97	-1.36	0.86
F-Inclusion	-1.24	0.89	-3.93	0.01**	-1.12	0.92	-2.13	0.03**

• *** p<0.01, ** p<0.05, * p<0.1

5.4. ARDL estimations of Financial Inclusion and poverty in Botswana

The empirical estimations of the impact of financial inclusion on poverty reduction in Botswana are reported in Table 5.3 below. The Akaike Information Criterion (AIC) was employed to determine the optimal lags in the estimations. The estimated ARDL model based on the maximum lag selection of 4 for the model variables is ARDL (4, 0, 3, 4, 4, 1, 3).

Table 5.3: ARDL estimations of Financial Inclusion and poverty in Botswana

Variable	Coefficient	Standard Error	t-Statistic	P-value
Poverty (-1)	0.400**	0.156	2.557	0.017
Poverty (-2)	0.002	0.164	0.014	0.989
Poverty (-3)	0.057	0.122	0.467	0.645
Poverty (-4)	0.356***	0.110	3.237	0.003
F-Inclusion	-0.878***	0.215	-4.084	0.000
Education	-1.731***	0.179	-9.653	0.000
Education (-1)	1.057***	0.335	3.154	0.004
Education (-2)	-0.176	0.353	-0.498	0.623
Education (-3)	-0.364*	0.189	-1.930	0.065
Income	-0.009	0.028	-0.320	0.752
Income (-1)	-0.016	0.055	-0.296	0.770
Income (-2)	0.003	0.060	0.052	0.959
Income (-3)	-0.018	0.053	-0.348	0.731
Income (-4)	-0.046*	0.026	-1.808	0.082
Inflation	0.024***	0.008	3.057	0.005
Inflation (-1)	0.005	0.009	0.571	0.573
Inflation (-2)	0.012	0.009	1.328	0.196
Inflation (-3)	0.018**	0.009	2.066	0.049
Inflation (-4)	0.016**	0.007	2.377	0.025
Population	9.196***	3.075	2.990	0.006
Population (-1)	-9.238***	3.009	-3.070	0.005
Dependency	-2.266	1.641	-1.381	0.179
Dependency (-1)	3.425	3.498	0.979	0.337
Dependency (-2)	0.113	3.101	0.036	0.971
Dependency (-3)	-2.626*	1.307	-2.009	0.055
Constant	55.026***	8.056	6.830	0.000
R-squared	0.9999	F-statistic	13513.164***	
Adjusted R-squared	0.9998	Durbin-Watson stat	2.29	

• *** p<0.01, ** p<0.05, * p<0.1

Thus, the estimated ARDL model involves 4 lags for the dependent variable (autoregressive term), and 0, 3, 4, 4, 1, and 3 lags for F-Inclusion, Education, Income, Inflation, Population, and Dependency, respectively.

5.4.1 Cointegration Analysis

In the conventional regression analysis, a non-stationary variable cannot explain variations in a stationary variable. Therefore, examining the relationship between a stationary variable such as poverty reduction and non-stationary independent variables requires establishing a stable long-run relationship between them. This concept is known as cointegration. The ARDL Bounds test of cointegration allows us to examine the existence of a long-run stable relationship between the dependent and explanatory variables. The ARDL Bounds test results are presented in Table 5.4 below. The null hypothesis is that there exists no level/ long-run relationship between the variables.

Table 5.4: Bound cointegration test

Dependent Variable: Poverty			**Lower bound**	**Upper bound**
F-Statistic	11.40127	10%	2.12	3.23
K	6	5%	2.45	3.61
		2.5%	2.75	3.99
		1%	3.15	4.43

The ARDL Bounds test results suggest a rejection of the null hypothesis of no cointegration/long-run relationship at a significant level of 1 percent. The F-statistic value of 11.4 is higher than the lower and upper critical bounds of 3.15 and 4.43, respectively. Henceforth, conclude that the variables are cointegrated, and there exists a long-run relationship between the variables. The presence of a long-run relationship allows us to obtain the cointegration and long-run forms of the estimated parameters from the ARDL model. The estimates of the cointegration and long-run parameters are reported in Tables 5.5 below.

Table 5.5: Short-run and long-run estimates of Financial Inclusion and poverty reduction in Botswana

Variable	Coefficient	Std. Error	t-Statistic	P-value
Cointegrating Form				
D(Poverty(-1))	-0.415***	0.141	-2.953	0.007
D(Poverty(-2))	-0.413***	0.109	-3.797	0.001
D(Poverty(-3))	-0.356***	0.110	-3.237	0.003
D(F-Inclusion)	-0.878***	0.215	-4.084	0.000
D(Education)	-1.731***	0.179	-9.653	0.000
D(Education(-1))	0.176	0.353	0.498	0.623
D(Education(-2))	0.364*	0.189	1.930	0.065
D(Income)	-0.009	0.028	-0.320	0.752
D(Income(-1))	-0.003	0.060	-0.052	0.959
D(Income(-2))	0.018	0.053	0.348	0.731
D(Income(-3))	0.046*	0.026	1.808	0.082
D(Inflation)	0.024***	0.008	3.057	0.005
D(Inflation(-1))	-0.012	0.009	-1.328	0.196
D(Inflation(-2))	-0.018**	0.009	-2.066	0.049
D(Inflation(-3))	-0.016**	0.007	-2.377	0.025
D(Population)	9.196***	3.075	2.990	0.006
D(Dependency)	-2.266	1.641	-1.381	0.179
D(Dependency(-1))	-0.113	3.101	-0.036	0.971
D(Dependency(-2))	2.626*	1.307	2.009	0.055
Cointeq(-1)	-0.185***	0.033	-5.517	0.000

Cointeq = Poverty - (-4.752F-Inclusion -6.566Education -0.471Income + 0.405Inflation - 0.230Population-7.325Dependency + 297.774)

Long Run Coefficients				
F-Inclusion	-4.752***	1.107	-4.291	0.000
Education	-6.566***	1.053	-6.236	0.000
Income	-0.471***	0.078	-6.000	0.000
Inflation	0.405***	0.045	8.995	0.000
Population	-0.230	1.519	-0.151	0.881
Dependency	-7.325***	2.049	-3.575	0.001
Constant	297.774***	57.179	5.208	0.000

• *** p<0.01, ** p<0.05, * p<0.1

The first objective of the study was to estimate the effect of financial inclusion on poverty reduction. The poverty rate was regressed against Financial inclusion alongside various indicators to achieve this objective.

In the short run, the population growth coefficient is positive and statistically significant. This means that a percentage point increase in population growth will increase poverty by 9.2. The results are consistent with a-prior expectations. The larger the population growth, the more the effects of poverty on households. This is echoed by Klasen (2007), who found out that an increase in population growth makes it difficult for the poverty reduction schemes to be effective. A high population means that there is an increase in the dependency burden for individual households.

Inflation has a positive relationship with the poverty rate, which is consistent with a-prior expectations. This implies that an increase in the price of commodities will reduce and change the distribution of real disposable income, increasing poverty rates. The results are consistent with Chaudhry & Chaudhry's (2008) findings, who found out that an increase in prices for food and fuel increases the poverty headcount ratio in Pakistan. Another study by Kakawani & Son (2006) found that a change in commodity prices can influence the poverty rate.

Primary school completion has a negative relationship with the poverty rate. The negative relationship indicates that the higher the number of people who have completed primary school, the lower the poverty rate. This is consistent with a study by Park & Mercado (2015), who found that completing primary education reduces poverty rates for Asian countries. This is because education enables one to gain knowledge and skills that can increase employment chances and enhance the standard of living.

Financial inclusion has a negative and significant relationship with the poverty rate. This result shows that as more people get access to financial services, the poverty rate tends to reduce. The results are in line with the findings of the study by Jabir (2015), who found out that poverty levels could be reduced by financially including the poor. By gaining access to financial services, the poor can get their hand on financial capital. Therefore, setting up businesses will increase their income level and ultimately reduce the intensity of poverty they are exposed to. This is also parallel to a study by Fadum (2014), who found that financial inclusion is essential in alleviating poverty in Nigeria.

In the long run the results also show that there is a negative relationship between per capita income, primary school completion rate, age dependency ratio, financial inclusion, and poverty rate. A percentage point increase of these variables will cause poverty to reduce significantly in the long run.

Specifically, per capita income exerts a 0.47 percentage point decrease in poverty rates, which is statistically significant and well within expectation. This is plausible as an increase in individual incomes is expected to cause improvement towards their living standards. The results are line with a study by Kumar & Kumar (2011), who found that growth in per capita income

enables people to take part in the financial services offered therefore enhancing their standard of living.

An increase in the primary school completion rate shows that it reduces the poverty rate. The results are well within expectation. A gain of knowledge by individuals exposes them to a better employment chance and help them have better control over their finances. This result is line with findings by Ajayi & Ross (2019) that showed that as literacy rate increases, it would lead to higher access to financial services hence improving general living standards.

Financial inclusion has a 4.75 percentage point effect in decreasing poverty rates. Higher access to financial services enables the poor to increase their ability and even deal with economic shocks. According to Ravi (2019), access to financial services like financial credit improves economic growth, enabling poor households to participate in investment opportunities.

The coefficient of age dependency ratio shows a percentage point increase will lead to a 7.33 decrease in poverty rates. The results conflict with Angemi (2003), who found that large families tend to have a high dependency ratio and are generally poorer. These results could be because the elderly who retire from work have pension schemes and the old-age pension incentive from the government. The two provide a source of income, which therefore lessens the burden on the entire household.

Inflation has a positive relationship with poverty rates. A percentage point increase in prices of commodities will increase the poverty rate by 0.41. This is consistent with a-prior expectations. This implies that an increase in food prices will require people to spend more than they have as disposable income, hence increasing poverty rates. The results are parallel with a study by Cardoso (1992), who concluded that inflation reduces the disposable income of people rendering them poorer in return.

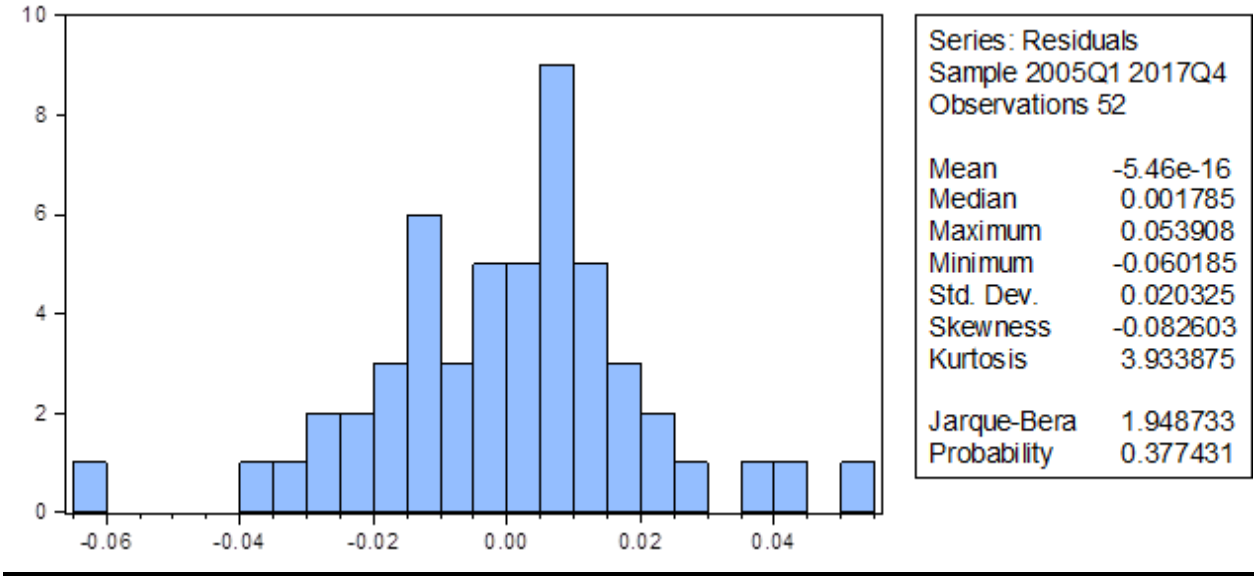
5.4.2 Model Diagnostic Analysis

In order to test the efficiency of the estimated parameters, diagnostic tests were carried out on our estimated models. These tests include serial correlation, and histogram normality tests on the residuals of the estimated models. These tests are in line with the fundamental assumptions and requirements of the ARDL model. These assumptions include the absence of autocorrelation, and the model requires that the data should be normally distributed. The results of the diagnostic tests are presented in Table 5.6 and Figure 3 below. The null hypothesis of these tests is that there is no serial correlation, and the residuals are normally distributed.

Table 5.6: Breusch-Godfrey Serial Correlation LM

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.327138	Prob. F (1,25)	0.2602
*Obs*R-squared*	2.621295	Prob. Chi-Square (1)	0.1054

Figure 3: Residual histogram normality test



The result of the test for autocorrelation (serial correlation) suggests that there is no autocorrelation in the error terms. This is because the chi-square probability is higher than 0.1. Therefore, the decision rule is to, do not reject the null hypothesis of no autocorrelation at all conventional levels.

From Figure 3, we observe that the Jarque-Bera statistic's probability is 0.37, which is higher than 0.1. We, therefore, do not reject the null hypothesis. This implies that the residuals are normally distributed. The results of our diagnostic tests, therefore, suggest that the estimated model is consistent and reliable.

5.5 ARDL estimations of Financial Inclusion and Income Inequality in Botswana

The empirical estimates of the impact of financial inclusion on income inequality in Botswana are reported below in Table 5.7. The optimal lags used in the estimations were based on the Akaike Information Criterion (AIC). The estimated ARDL model based on the maximum lag selection of 3 for the model variables is ARDL (2, 3, 0, 0, 0, 2, 3).

Table 5.7: ARDL estimations of Financial Inclusion and Income Inequality in Botswana

Variable	Coefficient	Standard Error	t-Statistic	P-value
Inequality(-1)	1.737***	0.043	40.484	0.000
Inequality(-2)	-0.796***	0.039	-20.522	0.000
F-Inclusion	-1.825**	0.684	-2.668	0.011
F-Inclusion(-1)	1.429	1.413	1.011	0.319
F-Inclusion(-2)	1.937	1.370	1.413	0.166
F-Inclusion(-3)	-2.322***	0.593	-3.915	0.000
Education	0.037	0.032	1.174	0.248
Income	-0.010*	0.005	-1.744	0.090
Inflation	0.021***	0.004	5.126	0.000
Population	2.779**	9.332	2.441	0.020
Population(-1)	-4.221**	18.975	-2.330	0.026
Population(-2)	2.086**	10.084	2.190	0.035
Dependency	-3.649**	1.409	-2.589	0.014
Dependency(-1)	3.855	3.063	1.259	0.216
Dependency(-2)	1.057	2.906	0.364	0.718
Dependency(-3)	-1.736	1.204	-1.442	0.158
Constant	7.250**	3.310	2.190	0.035
R-squared	0.9999	F-statistic	11550.96***	
Adjusted R-squared	0.9999	Durbin-Watson stat	2.0	

• *** p<0.01, ** p<0.05, * p<0.1

Therefore, the estimated ARDL model includes 2 lags for the dependent variable, and 3, 0, 0, 0, 2, and 3 lags for F-Inclusion, Education, Income, Inflation, Population, and Dependency, respectively.

5.5.1 Cointegration Analysis

The ARDL Bounds test results for the relationship between Financial Inclusion and income inequality in Botswana are presented in Table 5.8 below. The null hypothesis is that there exists a long-run relationship between the variables.

Table 5.8: Bound Cointegration Test

Dependent Variable: Inequality			**Lower bound**	**Upper bound**
F-Statistic	12.02415	10%	2.12	3.23
K	6	5%	2.45	3.61
		2.5%	2.75	3.99
		1%	3.15	4.43

The results from Table 5.8 show that the F-statistic of 12.02 is greater than both the lower and upper bounds of 3.15 and 4.43; the null hypothesis is rejected. This means that there exists a long-run equilibrium condition among the variables in equation 8. The null hypothesis of no cointegration is rejected at a 1% critical value of all the variables. The existence of a long-run relationship enables us to obtain the cointegration and long-run forms of the estimated parameters from the ARDL model. The cointegration estimates and long-run parameters are given in Tables 5.9 below.

Table 5.9: Short-run and long-run estimates of financial inclusion and inequality in Botswana

Variable	Coefficient	Std. Error	t-Statistic	P-value
Cointegrating Form				
D(Inequality(-1))	0.796***	0.039	20.522	0.000
D(F-Inclusion)	-1.825**	0.684	-2.668	0.011
D(F-Inclusion(-1))	-1.937	1.370	-1.413	0.166
D(F-Inclusion(-2))	2.322***	0.593	3.915	0.000
D(Education)	0.037	0.032	1.174	0.248
D(Income)	-0.010*	0.005	-1.744	0.090
D(Inflation)	0.021***	0.004	5.126	0.000
D(Population)	2.779**	9.332	2.441	0.020
D(Population(-1))	-2.086**	10.084	-2.190	0.035
D(Dependency)	-3.649**	1.409	-2.589	0.014
D(Dependency(-1))	-1.057	2.906	-0.364	0.718
D(Dependency (-2))	1.736	1.204	1.442	0.158
Cointeq(-1)	-0.059***	0.007	-8.107	0.000
Cointeq = Inequality - (-13.234F-Inclusion + 0.634Education -0.162Income + 0.355Inflation + 10.913Population -8.011Dependency + 122.81)				
Long Run Coefficients				
F-Inclusion	-13.234***	3.354	-3.946	0.000
Education	0.634	0.522	1.215	0.232
Income	-0.162*	0.095	-1.701	0.098
Inflation	0.355***	0.057	6.268	0.000
Population	10.913*	5.920	1.843	0.074
Dependency	-8.011**	3.377	-2.372	0.023
Constant	122.81*	62.985	1.950	0.059

• *** p<0.01, ** p<0.05, * p<0.1

In the short run, there is a positive relationship between population growth and income inequality. The results are consistent with our prior expectations as well as Agyemang-Badu (2018). An increase in population is expected to decrease per capita incomes of each poor household and, in a way, increase the gap between the poor and the rich.

Financial inclusion has a negative and significant coefficient of -1.83 on income inequality. This implies that as more people get access to financial services, there will a decrease in income

inequalities. Tita & Aziakpono (2017) also found that access to financial services saves the poor from paying a high-interest rate and transaction costs while using informal services.

Per capita income has a negative relationship with income inequality. A percentage point increase in individual incomes will reduce income inequality by 0.01. This result is well within expectations and findings by Agyemang-Badu (2018). An increase in per capita income means that people will have sufficient income, which will lessen the gap in income disparities.

The age dependency ratio has a negative relationship with income inequality. This implies that the more dependants, the less income inequality. This result is against our expectations and findings by Causa *et al*. (2016), who found that a higher dependency ratio exerts more strain on the distribution of available resources.

The inflation coefficient has a positive and statistically significant relationship with income inequality. The results are consistent with the prior expectation. According to Saimi-Namini & Hudson (2019), as inflation tax increases, it widens the income gap and lowers the poor's purchasing power.

In the long-run model, financial inclusion, per capita income, and age dependency ratio have a negative and statistically with income inequality. Inflation and population growth have a positive in income inequality. Specifically, financial inclusion has a 13.23 negative percentage point effect on income inequality. The result is as our a-prior expectation. Income inequality is expected to reduce as more people in the lower-income strata gain access to formal financial services (Batuo, 2010).

Per capita income increases will reduce income inequality. The result is as expected. An increase in earnings per person will offer households higher income strata. Therefore, this will lessen the gap between income levels.

The age dependency ratio has a negative coefficient, -8.01 on income inequality. This implies that an increase in the age dependency ratio will have an 8.01 percentage point decrease in income inequality. The results are in contrast with a study by Ssewanyana et al. (2004). They found that the differing size of the family between rich and poor influenced the increasing inequality in Uganda.

Population growth shows a positive effect on income inequality. The results for population growth are consistent with our prior expectations. This implies that as the population increases, the gaps in income distribution will also increase. The results are in line with a study by Klaasen (2007), who found that if the poor continue to have large families, then the improvements in the capital will not change to the wider gaps in the gap between the rich and poor.

Inflation shows a positive effect on income inequality. As inflation is increased, it has a dent on income for poor households. The distribution per person in the household will be reduced due to lower income. This is consistent with the results found by Li (2002) who found that inflations widen the income distribution, empowers the rich and lastly lowers income share of the poor and middle class.

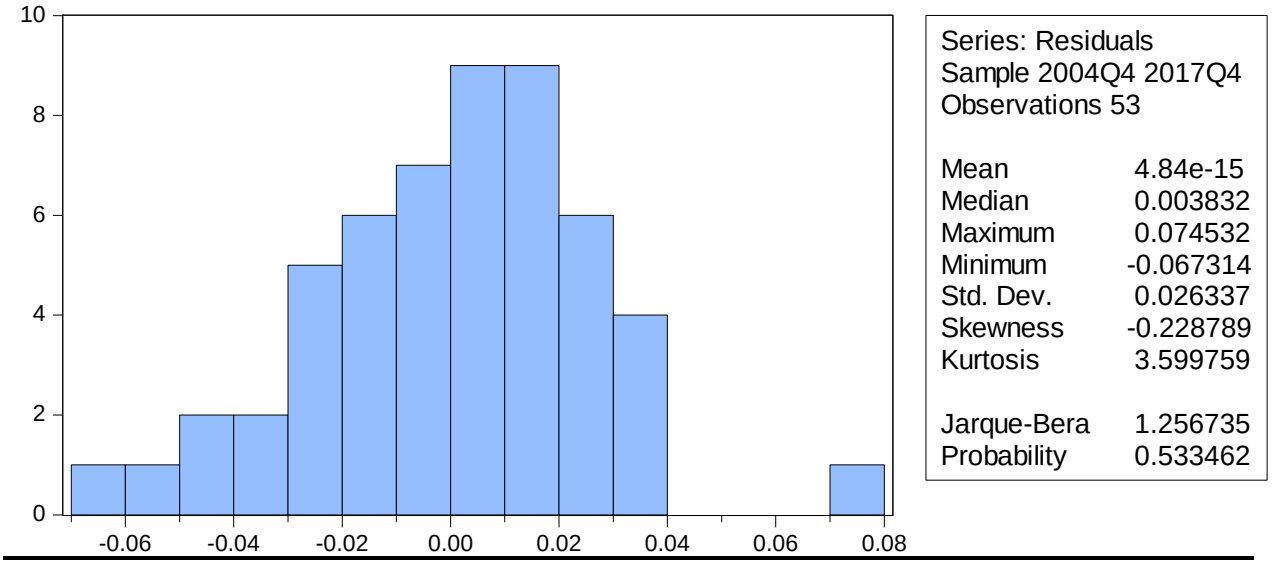
5.5.2 Model diagnostic

To test the statistical adequacy of our estimated parameters, we performed diagnostic tests. The tests performed include tests for serial correlation, and histogram normality tests on the residuals of the estimated models. The null hypothesis of these tests is that there is no serial correlation, and the residuals are normally distributed. The results of the diagnostic tests are presented in Table 5.10 and Figure 4 below.

Table 5.10: Breusch-Godfrey Serial Correlation LM

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.523371	Prob. F (2,34)	0.2325
*Obs*R-squared*	4.358746	Prob. Chi-Square (2)	0.1131

Figure 4: Residual histogram normality test



The results presented in Table 5.10 shows that there is no evidence of serial correlation. The LM version for serial correlation test result gives a co-efficient of 1.52 and a probability value of 0.23; hence the null hypothesis of no serial correlation is not rejected against the alternative hypothesis of the existence of serial correlation. From Figure 4, the probability values of the functional form and normality tests are 1.25 and 0.53, respectively, hence statistically insignificant. This shows that the residuals are normally distributed; hence, we do not reject the null hypothesis. The results of our diagnostic tests, therefore, indicate that the estimated model is accurate and reliable.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusion and policy recommendations of the study. The results in Chapter 5 guide the overall chapter.

6.2 Conclusion

Financial inclusion has gained growing attention in development circles, and international organizations recognize the increasing need for financial inclusion across the globe. This study was therefore undertaken to examine the effect of financial inclusion on poverty and income inequality in Botswana. Financial inclusion was measured as an index computed from six dimensions to cover access to financial services on a broader space. The stationarity of the variables was determined using the ADF and PP unit root test. The unit root test results revealed that variables were either stationary at levels or the first difference, that is, were integrated of I (0) and/or I (1). The ARDL bound test was used to investigate the relationship among variables. The ARDL approach integrates both the short-run relationship and long-run relationship. It is preferred over other cointegration methods such as Engle-Granger (1987) because it can be estimated besides the level of integration of variables.

The poverty rate and income inequality were used as dependent variables. Age dependency ratio, population growth, inflation, primary school completion, financial inclusion, and per capita income were used as independent variables. The empirical analysis results establish a negative and significant relationship between financial inclusion and poverty reduction in Botswana, both in the short-run and long-run. With income inequality, the empirical analysis revealed that financial

inclusion promotes a reduction in Botswana's income inequality. This is consistent with the implications in the theoretical literature as well as the theoretical proposition for this study. Therefore, this study concludes that providing solutions through financial inclusion to alleviate poverty will likewise address income distribution gaps. According to Molefhi (2019), access to finance also brings positive change in income, which leads to socio-economic empowerment.

6.3. Policy recommendations

To reduce poverty and income inequality, the study recommends that policymakers develop policies that will promote access to formal financial services to all segments of the population. The policies will help ensure that poor are not side-lined as the economy develops. The banking structure restrictions make it hard for low-income households to open an account, which is an essential financial inclusion indicator. Furthermore, an increase in accessibility, availability, and penetration in the financial system leads to employment creation hence an improvement in welfare. Therefore, Botswana's situation of high poverty and income inequality can be solved by increasing bank branches, loosening the tiered KYC requirements, and reducing the transaction costs associated with holding an account with a bank. Another option for policymakers is to swirl legislation to enforce that more people attain the highest education available. The results show that primary school completion reduces poverty in the short-run and long run. Education provides the individual with a comparative advantage in terms of knowledge. An educated individual will be exposed to information on the nature of financial institutions available, the importance of saving with a financial institution. As a result, an increase in the number of people who have been to school will likely increase the financial sector participants.

REFERENCES

Addury, M. M. (2019). Impact of Financial Inclusion for Welfare: Analyze to Household Level. *Journal of Finance and Islamic Banking*, *1*(2), 90-104.

Adebowale, O., & Lawson, D. Household Welfare Dynamics–Does access to finance matter? An empirical analysis of two-period panel data set from Nigeria.

Adeola, O., & Evans, O. (2017). Financial inclusion, financial development, and economic diversification in Nigeria. The Journal of Developing Areas, 51(3), 1-15.

Agbetsiafa, D. (2016). The Finance Growth Nexus: Evidence from Sub-Saharan Africa. Savings

Ageme, A. E., Anisiuba, C. A., Alio, F. C., Ezeaku, H. C., & Onwumere, J. U. J. (2018). Empirical assessment of the effects of financial inclusion on poverty reduction in Nigeria. European Journal of Economics, Finance and Administrative Sciences, 99, 21-29.

Aghion, P., Ljungqvist, L., Howitt, P., Howitt, P. W., Brant-Collett, M., & García-Peñalosa, C. (1998). Endogenous growth theory. MIT press.

Agyemang-Badu, A. A., Agyei, K., & Kwaku Duah, E. (2018). Financial Inclusion, Poverty and Income Inequality: Evidence from Africa., *Spiritan International Journal of Poverty Studies*, *2*(2).

Ahmed, A. D. (2007). Potential impact of financial reforms on savings in Botswana: an empirical analysis using a VECM approach. *The Journal of Developing Areas*, *41*(1), 203-219.

Ajayi, K. F., & Ross, P. H. (2017). The Effects of Education on Financial Outcomes: Evidence from Kenya.

Ajayi, K. F., & Ross, P. H. (2017). The Effects of Education on Financial Outcomes: Evidence from Kenya.

Amendola, A., Boccia, M., Mele, G., & Sensini, L. (2016). *Financial access and household welfare: evidence from Mauritania*. The World Bank.

Angemi, D. (2003). On the Way to Poverty Eradication. Kampala: MFPED.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics*, *68*(1), 29-51.

Bank of Botswana Annual Report (2013), Bank of Botswana, Gaborone

Bank of Botswana Annual Report (2017), Bank of Botswana, Gaborone.

Barrientos, A. (2011). Social protection and poverty. *International Journal of Social Welfare*, *20*(3), 240-249.

Batuo, M., Guidi, F., & Mlambo, K. (2010). *Financial Development and Income Inequality: Evidence from African Countries*. University Library of Munich, Germany.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of economic growth*, *12*(1), 27-49.

Botswana, 'National Development Plan 10', 2009. http://www.gov.bw/globalassets/mfdpministry/ndp-10-final-16th-dec-2009-edit-in-19-jan-2010.pdf, accessed on 19 August 2019.

Brian, K. (2015). *OECD Insights Income Inequality The Gap between Rich and Poor: The Gap between Rich and Poor*. OECD Publishing.

Briefing notes for AfDB's long-term strategy. (2012) *African Development Bank Group,* 2-3

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, *37*(2), 149-163.

Calderón, C., & Liu, L. (2003). The direction of causality between financial development and economic growth. *Journal of Development Economics*, *72*(1), 321–334.

Cardoso, E. (1992). *Inflation and Poverty* (No. 4006). National Bureau of Economic Research, Inc.

Causa, O., Hermansen, M., & Ruiz, N. (2016). The Distributional Impact of Structural Reforms (No. 1342). OECD Publishing.

Chaudhry, A., & Chaudhry, T. T. (2008). The effects of rising food and fuel costs in Pakistan. *The Lahore Journal of Economics, Special Edition*, 117-138

Chirwa, T. G., & Odhiambo, N. M. (2018). Exogenous and Endogenous Growth Models: a Critical Review. Comparative Economic Research, 21(4), 63-84.

Choong, C.-K., Yusop, Z., Law, S.-H., & Liew, V. K.-S. (2005). *Financial Development and Economic Growth in Malaysia:* The Perspective of Stock Market. Investment Management and Financial Innovations, *4*, 105–115.

Cornia, G. A., Odusola, A., Bhorat, H., & Conceição, P. (2017). *Income Inequality Trends in sub-Saharan Africa Divergence, Determinants and Consequences: Introduction, Motivation and Overview* (No. 2063-2018-609).

Demirguc-Kunt, A. and Klapper, L. (2012). *Measuring Financial Inclusion: The Global Findex Database.* Washington D.C: World Bank

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, *74*(366a), 427-431.

Duong, H. A., & Nghiem, H. S. (2014). Effects of microfinance on poverty reduction in Vietnam: A pseudo-panel data analysis. *Journal of Accounting, Finance and Economics*, *4*(2), 58-67.

Erenstein, O. (2011). Livelihood assets as a multidimensional inverse proxy for poverty: a district-level analysis of the Indian Indo-Gangetic Plains. *Journal of Human Development and Capabilities*, *12*(2), 283-30

Evans, O., & Alenoghena, O. R. (2017). Financial inclusion and GDP per capita in Africa: A Bayesian VAR model. *Journal of Economics & Sustainable Development*, *8*(18), 44-57.

Fadun, S. O. (2014). Financial inclusion, tool for poverty alleviation and income redistribution in developing countries: Evidences from Nigeria. Academic Research International, 5(3), 137.

Fauzel, S., Seetanah, B., & Sannassee, R. V. (2015). Foreign direct investment and welfare nexus in sub Saharan Africa. *The Journal of Developing Areas*, *49*(4), 271-283.

Finance Bien Commun, (2), 64-73.

FinScope Survey Botswana (2014). Access to Finance Report. Prepared DCDM E&M Botswana on behalf of FinMark Trust.

Gupta, P., & Singh, B. (2013). Role of literacy level in financial inclusion in India: Empirical evidence. *Europe*, *89*, 10-4.

Harvey, C., & Jefferis, K. (1995). *Botswana's exchange controls: abolition or liberalization?*. Institute of Development Studies.

Hayashi, F. (2000). Econometrics. 2000. *Princeton University Press. Section*, *1*, 60-69.

Hoff, K., & Stiglitz, J. E. (2016). Striving for balance in economics: Towards a theory of the social determination of behavior. *Journal of Economic Behavior & Organization*, *126*, 25-57.

Hollingsworth, B. (2016). The iteratile: A new measure of central tendency. Cogent Mathematics & Statistics, 3(1), 1149135.

Honohan, P. (2008). Cross-country variation in household access to financial services. *Journal of Banking & Finance*, *32*(11), 2493-2500.

Imai, K. S., Arun, T., & Annim, S. K. (2010). Microfinance and household poverty reduction: New evidence from India. *World Development*, *38*(12), 1760-1774.

Jabir, M. I. (2015). Financial Inclusion and Poverty reduction in Subsaharan Africa. Unpublished thesis. College of Humanities University of Ghana, 49 – 69

Jefferies, K., & Tacheba, A. (2010). Botswana financial sector overview 2009/10. *Capital Resources*.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, *12*(2-3), 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

Jongman, K. (2018). Sustainable Livelihood and Poverty Eradication in Botswana. *International Journal of Development and Sustainability*, *7*(4), 1317-24.

Kakwani, N., & Son, H. H. (2006). Measuring the Impact of price changes on poverty. *International Poverty Centre UNDP Working Paper*, (33).

Kelly, S., & Rhyne, E. (2013). Growing Income, Growing Inclusion: How Rising Incomes at the Base of the Pyramid Will Shape Financial Inclusion Financial Inclusion 2020 Project. Center for Financial Inclusion Publication, 19.

Kelly, S., & Rhyne, E. (2013). Growing income, growing inclusion: How rising incomes at the base of the pyramid will shape financial inclusion. Financial inclusion 2020 project: Mapping the invisible market. *Center for Financial Inclusion*, (19).

Kiiru, J. M. M. (2007). Microfinance: getting money to the poor or making money out of the poor?.

Klasen, S., & Lawson, D. (2007). The Impact of Population Growth on Economic Growth and Poverty Reduction in Uganda (No. 133). University of Goettingen, Department of Economics.

Kumar, R. R., Naidu, V., & Kumar, R. (2011). Exploring the nexus between trade, visitor arrivals, remittances and income in the Pacific: a study of Vanuatu. *Acta Universitatis Danubius. Œconomica*, *7*(4).

Kuznets, S. (1955). International differences in capital formation and financing. In *Capital formation and economic growth* (pp. 19-111). Princeton University Press.

Law, S. H., & Tan, H. B. (2009). The role of financial development on income inequality in Malaysia. *Journal of Economic Development*, *34*(2), 153.

Lekobane, K. R., & Seleka, T. B. (2017). Determinants of household welfare and poverty in Botswana, 2002/2003 and 2009/2010. *Journal of Poverty*, *21*(1), 42-60.

Li, H. (2002). Inflation, growth, and income distribution: A cross-country study. Annals of Economics and Finance , 3, 85-101.

Lucas Jr, R. E. (1988). On the mechanics of economic development. Journal of monetary economics, 22(1), 3-42.

MacKinnon, J. G. (1991). Critical values for cointegration tests. In *Eds.), Long-Run Economic Relationship: Readings in Cointegration*.

Madigele, P. K., & Mogomotsi, G. E. (2016). Improving financial inclusion of the socially and economically disadvantaged in Botswana through the Grameen bank microcredit model. *Botswana Journal of Business*, *9*(1), 55-65

Mallick, D., & Zhang, Q. (2019). The Effect of Financial Inclusion on Household Welfare in China (No. 95786). University Library of Munich, Germany.

McKnight, A., Duque, M., & Rucci, M. (2017). Double Trouble: A review of the relationship between UK poverty and economic inequality.

Molefhi, K. (2019). Financial Inclusion and its Impact on Employment Creation in Botswana. BIDPA Working Paper No.60.

Mosene, O. (2002). Informal credit demand in Botswana, micro-lending industry in Gaborone. *Unplished masters dissertation. University of Botswana*. Gaborone: University of Botswana.

Motsewakgosi, R. P. (2019). The effects of financial innovations on demand for money in Botswana. *Unplished masters dissertation. University of Botswana*. Gaborone: University of Botswana.

Mwangi, I., & Atieno, R. (2018). Impact of Financial Inclusion on Consumption Expenditure in Kenya. International Journal of Economics and Finance, 10(5), 114-128.Neaime, S., & Gaysset, I. (2018). Financial inclusion and stability in MENA: Evidence from poverty and inequality. Finance Research Letters, 24, 230-237.

Okurut, F. N., Kagiso, M., Ama, N. O., & Okurut, M. L. (2014). The impact of microfinance on household welfare in Botswana. *Botswana Journal of Economics*, *12*(1), 45-58.

Omojolaibi, J. A. (2017). Financial Inclusion, Governance and Economic Progress in Nigeria: What Happens to the Welfare of the Poor?. *Oman Chapter of Arabian Journal of Business and Management Review*, *34*(93), 1-14.

Park, C. Y., & Mercado, R. (2015). Financial inclusion, poverty, and income inequality in developing Asia. *Asian Development Bank Economics Working Paper Series*, (426).

Park, C. Y., & Mercado, R. (2018). Financial inclusion, poverty, and income inequality. *The Singapore Economic Review*, *63*(01), 185-206.

Patrick, H. (1966). Financial Development and Economic Growth in Underdeveloped Countries. Economic Development and Cultural Change, *14*(2), 174–189.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.

Piketty, T., & Saez, E. (2014). Inequality in the long run. *Science*, *344*(6186), 838-843.

Ravi, S. (2019). Accelerating Financial Inclusion in India. Brookings India Report.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy, 94(5),* 1002–1038.

Romer, P. M. (1990). Endogenous technological change. *Journal of political Economy*, *98*(5, Part 2), S71-S102.

Romer, P. M. (1994). The origins of endogenous growth. *Journal of Economic perspectives*, *8*(1), 3-22.

Sahoo, A. K., Pradhan, B. B., & Sahu, N. C. (2017). Determinants of Financial Inclusion in Tribal Districts of Odisha: An Empirical Investigation. *Social Change*, *47*(1), 45-64.

Sarma, M. (2008). *Index of financial inclusion* (No. 215). Working paper.

Schumpeter, R. (1912). Theorie der Wirtschaftlichen Entwicklung, Liepzig, Dunker and Humblot (The Theory of Economic Development). Harvard University Press, 1934.

Seghezza, E., & Morelli, P. (2018). Rule of law and balance of power sustain US dollar preeminence. *Journal of Policy Modeling*, *40*(1), 16-36.

Setlhare, L. (2002). Empirical foundations of monetary policy in Botswana. The South African Journal of Economics, 72:2

Siami-Namini, S., & Hudson, D. (2019). Inflation and income inequality in developed and developing countries. Journal of Economic Studies.

Solow, R. M. (1956). A contribution to the theory of economic growth. The quarterly journal of economics, 70(1), 65-94.

Son, H. H., & Kakwani, N. (2006). Measuring the impact of prices on inequality: With applications to Thailand and Korea. The Journal of Economic Inequality, 4(2), 181-207.

Ssewanyana, N. S., Okidi, A. J., Angemi, D., & Barungi, V. (2004). Understanding the determinants of income inequality in Uganda (No. 2004-29). Centre for the Study of African Economies, University of Oxford.

Statistics Botswana (2014) Statistics Botswana Annual Report. Gaborone: Government Printers

Sugema, I., Irawan, T., Adipurwanto, D., Holis, A., & Bakhtiar, T. (2010). The impact of inflation on rural poverty in Indonesia: An econometrics approach. *International Research Journal of Finance and Economics*, *58*, 51-57.

Tita, A. F., & Aziakpono, M. J. (2017). The effect of financial inclusion on welfare in sub-Saharan Africa: Evidence from disaggregated data. *Economic Research Southern Africa, Working Paper*, (679).

Todaro, M. P., & Smith, S. C. (2011). Economic Development 11. Addison-Wesley, Pearson, ISBN, 10, 0-13.

TrendLab., (2013). Poverty & inequality: Persistent challenges and new solutions. Knowledge@ Wharton.

Tsheole, T. (2006). *The demand for broad money (m2) in Botswana* (Doctoral dissertation, Rhodes University).

Ugur, M. (2016). Modeling growth: exogenous, endogenous and Schumpeterian growth models.

United Nations. (2011). Towards Human Resilience: Sustaining MDG Progress in an Age of Economic Uncertainty. United Nations Publications.

World Bank. (2015). *Botswana - Systematic country diagnostic (English)*. Washington, DC : World Bank Group. http://documents.worldbank.org/curated/en/489431468012950282/Botswana-Systematic-country-diagnostic

World Bank. (2018). Poverty and shared prosperity 2018: Piecing together the poverty puzzle

World Bank. (2015). *Botswana Poverty Assessment*. Report No 88473-BW. Washington: World Bank, Poverty Global Practice, Africa Region.

Yue, H. Y. (2011). Income inequality, economic growth and inflation: a study on Korea. International Journal of Economics and Research, 2(5), 14-21.

Zins, A., & Weill, L. (2016). The determinants of financial inclusion in Africa. *Review of Development Finance*, *6*(1), 46-57.