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Financial Development, Economic Growth and Income Inequality: A Panel Data Approach

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DECLARATION

I, the undersigned, hereby declare that this dissertation, save for supervisory guidance received, is the product of my own work and effort. I have, to the best of my knowledge and belief, acknowledged all the resources of information in line with normal academic conventions. I further certify that the dissertation is original, and has not been submitted before at this or any other university for the award of any degree at any other university purpose of obtaining a degree .

ABSTRACT

Since the pattern of income distribution can be influenced by financial development, it is of major importance to both developing and developed economies. To add to the body of literature, this paper tested empirically, within a panel data framework, the theoretical foundations of the linear relationship between financial development and income inequality developed by Galor and Zeira (1993) and Banerjee and Newman (1993). Moreover, the nonlinear theoretical relationship advocated by Greenwood and Javanovic (1990) was evaluated. The study employed an unbalanced dataset over the 1970 - 2014 period, involving 142 developed and developing countries.

It was found that financial development increases income inequality as measured by the Gini coefficient, after controlling for country fixed effects. These results are robust to different measures of financial development and control variables. The policy implication is that a wealth tax, as advocated by Piketty (2014) to subsidise social spending, is critical in order to address the disparities caused by financial development.

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2SLS	-	Two Stage Least Squares
3SLS	-	Three Stage Least Squares
ADF	-	Augmented Dickey-Fuller
AEG	-	Augmented Engle -Granger
AIC	-	Akaike Information Criterion
AR	-	Autoregressive
ARDL	-	Autoregressive Distributed Lag
APT	-	Arbitrage Pricing Theory
BLUE	-	Best Linear Unbiased Estimator
CAPM	-	Capital Asset Pricing Model
DBSA	-	Development Bank of Southern Africa
DF	-	Dickey-Fuller
DOLS	-	Dynamic Ordinary Least Squares
ECM	-	Error Correction Model (Mechanism)
EG	-	Engle-Granger
EHII	-	Estimated Household Income Inequality Data Set
EU	-	European Union
FMOLS	-	Fully Modified Ordinary Least Squares
FAS	-	Financial Access Survey
GEAR	-	Growth, Employment and Redistribution
GLS	-	Generalised Least Squares
GMM	-	Generalised Methods of Moments

GVA	-	Gross Value Added
GCIP	-	Global Consumption and Income Projects
IMF	-	International Monetary Fund
IFS	-	International Financial Statistics
IV	-	Instrumental Variable
KPSS	-	Kwiatkowski-Phillips-Schmidt-Shin
LDCs	-	Least Developed Countries
MENA	-	Middle East and North Africa
NPC	-	National Planning Commission
OECD	-	Organisation for Economic Co-operation and Development
OLS	-	Ordinary Least Squares
PMG	-	Pooled Mean Group
PP	-	Phillips-Perron
PSS	-	Pesaran, Shin and Smith
R&D	-	Research and Development
RDP	-	Reconstruction and Development Programme
RE	-	Random Effects
SAM	-	Social Account Matrix
SIC	-	Schwarz Information Criterion
WDI	-	World Development Indicators
STATS SA	-	Statistics South Africa
UTIP	-	University of Texas Inequality Project
UK	-	United Kingdom
U.S.	-	United States
VAR	-	Vector Autoregressive

VECM - Vector Error Correction ModeL

WIID - World Income Inequality Database

CHAPTER 1: OVERVIEW OF THE STUDY

1.1 Introduction and background

In the aftermath of the economic crises of 2008 and 2009, society was concerned about the harm to the financial sector and this was debated in political sectors. In most developed countries, the socialisation of their losses and bank's privatisation is the main political argument. The World Economic Outlook (WEO) International Monetary Fund (IMF) update states that global economic growth was projected to increase 3.4 percent in 2016 and in 2017. In both advanced and developing economies, gradual growth was predicted initially but was expected to pick up in the following two years. However, there are factors that could derail economic growth if not successfully addressed. One of these key elements is wealth inequality and as global economic interdependence and interconnectedness continues to increase, it becomes vital to analyse the relationship between economic growth and inequality.

Income inequality was a prominent topic, especially with the 2014 presidential campaign in South Africa, where they have 'radical' steps to reduce inequality. Candidates had their own notions and proposals on how to tackle the disparity in income. The president pledged to tackle inequality in South Africa, by tabling a series of measures, ranging from job creation to youth development and infrastructure investment, in order to address the challenge over the next five years. Income inequality impacts the poor and underprivileged the most because their quality of life depends largely on their level of income. Since income level and quality of life are so interrelated, income inequality impacts the poor in several negative ways.

First the primary effect of income inequality is that it prevents capital accumulation (both human and physical) (Mo 2000; Kaldor 1955; Aghion, Caroli et al. 1999). Secondly, inequality can generate socio-political instability that undermines incentives to save and invest and would generate pressure on government (Mo 2000). A study by Hodgson (2012) revealed that today, "rising inequality is a key challenge for South Africa that adversely impacts economic development and socio-political stability". Finally, inequality has a detrimental effect on social mobility; countries with higher levels of inequality show a dependence of children's future earning capacity on the current earning capacity of their parents (Corak 2013). Inequality, which currently shows no signs of undergoing income redistribution, is indisputably a problem that disrupts the balance within a society.

Economic growth has been a popular topic since the financial crisis of 2008. In fact, since the Great Recession, economic growth has been regarded as a sign of advancement, development and recovery. During a period of economic growth, poverty and unemployment are reduced, the standard of living of the population rises, it incentivises the young and the country's currency appreciates against that of other countries, giving it more international trade power. Ultimately, all countries desire to experience economic growth in order to progress. According to a German proverb on the subject of growth, "Stagnant water starts to stink at some point" (Health 1909). Economies cannot stand still; either they can go up or they go down − and everyone wants them to go up.

The distribution of income has been a concern for the majority of economists for a long time. (Kuznets 1955) claimed that economic development is related to the increase/decrease in income inequality, which is an inverted U-shaped relationship between the two variables. During the 1990s many economists (see for example, Li et al. 1998; Jalilian and Kirkpatrick 2002; Dollar and Kraay 2002; Clarke et al. 2003; Clarke et al. 2006; Lopez 2004; Beck et al.

2007; Jalilian and Kirkpatrick 2005; Raynal 2006), gave more attention to the link between financial markets and income inequality.

Financial development affects income inequality in two different channels, the direct and indirect effect. The indirect effect is through GDP, which is assuming that growth is good for the poor (Levine 1997). The direct effect is through the access barriers to the credit market. Economic growth is supported by the financial markets that authorise individuals to finance investments; as a result, capital is ensured to be distributed efficiently in a way that is unconnected to inherited wealth.

Many economists suggest that lower economic growth is positively associated with finance. Beck, Georgiadis et al. (2014) found that higher financial development decreases the growth after a certain point in time. This work aims to go further than financial development and economic growth relationship and critically examine the empirical and theoretical literature on financial development and the distribution of income amongst individuals in society. Does financial market development permanently decrease the income inequality in the community? Do the effects of finance on income inequality vary according to the income levels?

Critical analysis of the existing literature helped to identify a gap in the literature regarding these two questions needed to be filled. There are three schools of thought that explain the connection between financial development and income distribution, which shows that the expansion of the financial markets leads to inequality widening, inequality narrowing and Kuznets inverted U-shaped or non-linear hypothesis. Although a number of empirical studies (see, Li et al. 1998; Jalilian and Kirkpatrick 2002; Dollar and Kraay 2002; Clarke et al. 2003; Clarke et al. 2006; Lopez 2004; Beck et al. 2007; Jalilian and Kirkpatrick 2005; Raynal 2006; Huang and Singh 2011; Canavire Bacarreza and Rioja 2009; Kappel 2010; Mookerjee and Kalipioni 2010; Rosner 2010; Asongu 2011; Enowbi et al. 2010; Cojocaru 2011; De et al. 2011; Koeppl Monnet et al. 2011; Fowowe and Abidoye 2013; Asad 2012; Jauch and Watzka 2016; Liang 2006; Bittencourt 2012; Tan and Law 2012; Shahbaz and Islam 2011.) and theoretical studies (see, Galor and Zeira 1993 ; Banerjee and Newman 1993 and Greenwood and Jovanovic 1990) have been done to explore the relationship between financial development and income inequality, the existing literature still does not agree with any school of thought.

An estimate is made of the relationship using the recent data set on income inequality and the two standard proxies for financial development used in the literature**:** ratio of the private

credit over GDP and liquid liabilities (M3) as a percentage of GDP within countries. Different econometric techniques are applied such as pooled, fixed and random effects model and the general method of moments (GMM) system that is dealing with the problem of possible endogeneity and unobserved heterogeneity. Countries are also split according to their levels of development for robustness check. Our findings reject the theories that predict that income inequality decreases financial development.

1.2 Problem statement

Does financial market development permanently decrease the income inequality in the community? Do the effects of finance on income inequality vary according to income levels? The critical analysis of the existing literature helps to identify the above two questions (the gaps in the literature) that need to be filled. There are three schools of thought that the society believes explain the connection between financial development and income distribution, which shows that the expansion of the financial markets leads to inequality widening, inequality narrowing and Kuznets inverted U-shaped or non-linear hypothesis.

Although a number of empirical and theoretical studies (see for example, Li et al. 1998; Jalilian and Kirkpatrick 2002; Dollar and Kraay 2002; Clarke et al. 2003; Clarke et al. 2006; Lopez 2004; Beck et al. 2007; Jalilian and Kirkpatrick 2005; Raynal 2006; Huang and Singh 2011; Canavire Bacarreza and Rioja 2009; Kappel 2010; Mookerjee and Kalipioni 2010; Rosner 2010; Asongu 2011; Enowbi et al. 2010; Cojocaru 2011; De et al. 2011; Koeppl et al. 2011; Fowowe and Abidoye 2013; Asad 2012; Jauch and Watzka 2016; Liang 2006; Bittencourt 2012; Tan and Law 2012; Shahbaz and Islam 2011; Galor and Zeira 1993; Banerjee and Newman 1993 ; Greenwood and Jovanovic 1990) have done so much work to explore the relationship between financial development and income inequality, the existing literature still does not agree with one school of thought (inequality widening, inequality narrowing and Kuznets inverted U-shaped or non-linear hypothesis), hence most studies present ambiguous pictures in academic debates in this context.

The existing empirical studies remain silent about the combined impacts of economic growth and financial development on income distribution. According to the researcher's knowledge, no study investigates the effects of economic growth and financial development on income distribution using the ordinary least squares (OLS), fixed effects, random effects and dynamic general methods of moments (GMM) econometric techniques. Economic growth,

financial development and income inequality have undergone a considerable change from 1970 to 2014 and no study has covered that period.

Therefore, this study contributes to the existing literature on economic growth, financial development and income inequality nexus in different ways. First, it uses the sample of 142 developed and developing countries to examine a number of relationships, which include the impact of economic growth on income inequality and financial development on income inequality. Secondly, the empirical analysis is provided using two different measures of financial development and inequality that cover the time between 1970 and 2014. Lastly, various regressions are run to establish how economic growth and financial development have an impact on income inequality in low, middle, upper-middle and high-income countries.

The sensitivity analysis is another contribution of this study. For income inequality, the study used the data taken from the Global Consumption and Income Project (GCIP) database that, for financial development, used the private credit by deposit money banks and other financial institutions to GDP and the liquid liabilities (M3) as a percentage of GDP. No study has addressed the relationship between financial development and income inequality and has tested the results using the data source from GCIP database.

1.3 Objectives of study

- To test whether financial development has an impact on income inequality among the 142 countries.
- To test whether there is an inverted U-shaped relationship between financial development and income inequality among the panel countries.

1.4 Hypotheses

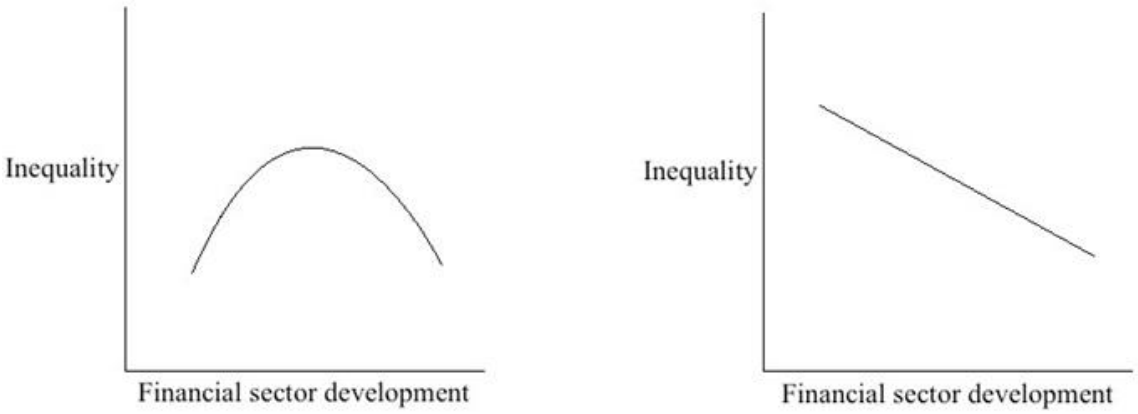
To accomplish the above objectives of this research, the following hypotheses are tested:

- Hypothesis 1: There is a significant and positive relationship between financial development and income inequality among the panel countries.

- Hypothesis 2: There is an inverted U-shaped relationship between financial development and income inequality among the panel countries.

1.5 Motivation for the study between inequality and financial sector development

Figure 1.1 inverted U-shaped hypothesis and linear hypothesis



Source: Clarke et al. (2003)

The above figures indicate two classes: the traditional and the modern theory. The traditional theory predicts the inverted U-hypothesis between financial development and income inequality that during the early stages of development inequality rises and decreases as the economy develops further. The modern theories, on the other hand, suggest that economies with greater capital market imperfections have higher levels of inequality, therefore, suggesting a negative relationship between financial development and income inequality (Clarke, Zou et al. 2003).The pioneering work on economic growth and inequality dates back to Keynes (1936) where he associates income with aggregate demand. Kuznets (1955) was the first classical economist to study the relationship between economic growth and inequality. His hypothesis was that inequality rises during the early stages of economic development as workers move from agriculture to industry. The industrial sector is characterised by higher mean income and a higher degree of inequality; when the industry is small, it leads to increased inequality and as the industry grows, inequality starts decreasing.

Todaro (1979) offers four general arguments why "greater equality in developing countries may, in fact, be a condition for self-sustaining economic growth", namely dissaving and/or unproductive investment by the rich; lower levels of human capital held by the poor; demand

pattern of the poor being more biased towards local goods; and political rejection by the masses.

Therefore, many studies have examined the impact of financial development on income inequality using different estimation techniques. Several studies tested this relationship using a panel of countries, like the study of Jauch and Watzka (2016) and Clarke, Zou et al. (2003)). Meanwhile others used the single country analysis for the relationship, which allows them to focus on time dimensions or geography dimensions (Hoi (2013), Sehrawat and Giri (2015). Therefore, the study used the different estimation techniques with different measures for financial development and a larger dataset with 142 developed and developing countries for the period of 1970 to 2014. The study splits the countries according to levels of income development using the World Bank income classification catalogue.

1.6 Data and organisation of the dissertation

This study consists of six chapters, which are distributed as follows: Chapter 1 serves as an introduction. Chapter 2 offers a brief discussion on the theoretical underpinnings surrounding the influence of economic growth on income inequality, financial development on economic growth and the financial development on income inequality. Chapter 3 examines the empirical evidence pertaining to the association between economic growth on income inequality, financial development on economic growth and the financial development of income inequality relationship. Chapter 4 discusses the analytical framework and methodology used in this study, including the OLS, fixed effects and random effects (RE) models and GMM system. The results produced by the models are presented and debated in Chapter 5 and 6. The presentation and discussion of the results are done chronologically as per each of the methodologies discussed in the preceding chapter. Chapter 7 provides a summary of the main findings, their implications on policies and recommendations for future research.

CHAPTER 2: THEORETICAL FRAMEWORK

2.1 Introduction

Chapter 2 reviews the relevant conceptual and theoretical literature devoted to exploring the impacts of financial development and economic growth on income inequality in order to localise this study within an appropriate theoretical framework. For representing the relationship between income inequality, financial development and economic growth, the chapter is divided into two sections. The first section demonstrates the theories on economic growth and inequality nexus, the second section is the analysis of financial development and income inequality nexus.

2.2 Economic growth and inequality theories

2.2.1 Classical and Keynesian models

According to the classical model, savings is the main determinant of long-run growth and inequality is good for growth because it distributes income to those with a higher marginal propensity to save. The variations of the classical model are that inequality is good for growth when credit markets function perfectly. The Keynesian case consumption is the main determinant of growth and inequality is bad for growth because it redistributes money away from those with a higher marginal propensity to consume (Keynes 1936). Therefore, the rich have declining marginal productivity of investment. Another two popular models suggest that inequality is good or bad for growth − termed the political and human capital models (Barro 2000). In a society in which the mean income exceeds the median income, the idea may occur to even out the distribution of income through the political process (Barro 2000).

According to political model, inequality is bad for growth because it results in more redistribution, which undermines effort and hence growth. The redistribution of income through a political process is only possible when political power is distributed evenly, for example, every consenting adult has only one vote (Barro 2000). If this is not the case, the distribution of votes defines the distribution of power and income. When incomes are distributed unevenly, the wealthier portion of the population may try to influence politicians not to increase taxes and income transfers, which can lead to a corrupt government (Barro 2000) .

According to human capital models, in conditions of imperfect credit markets, inequality reduces investment in human capital and, therefore, is bad for growth, hence in a learning-

by-doing model, the poor cannot accumulate sufficient human capital to get out of poverty (Fishman and Simhon 2002).

2.2.1.1 Mechanisms by which inequality affects growth

Four mechanisms suggest inequality affects growth, namely macroeconomic factors including stability and financial market risk; political factors, which are redistribution and institutions, including trust; credit market failures, which include investment opportunities and aspirational consumption and, lastly, mechanisms of human capital formation, which involve the credit markets and learning-by-doing model (Persson and Tabellini 1994 ; De La Croix and Doepke 2003).

2.2.1.1.1 Macroeconomic stability

In general, volatility is negatively associated with GDP growth and Breen and García-Peñalosa (2005) show correlation between volatility and lower growth. Berg, Ostry et al. (2012) found that unequal countries failed to sustain growth spells; the two periods 1918 to 1929 and 1980 to 2008 saw the fastest rise in inequality in the US (and the UK). Both periods were followed by severe economic crises – the Great Depression in 1929 and the Great Recession in 2009. The effect on consumption was that cyclical unemployment being the result of lower aggregate demand and rising inequality leading to lower aggregate demand, hence lower interest rates often resulted in credit bubbles, followed by a recession.

Evidence suggests that causality runs from high inequality to political instability to macroeconomic inequality; work by Aghion, Bacchetta et al. (2000) considered a small open economy and developed a model of financial crises. In this model, the real interest rate was fixed at the international market-clearing level and the transmission variable became the price of non-tradeable goods relative to tradeable goods. The accumulation of debt results in an increase in the relative price of non-tradeable relative to tradeable. At some point, the credit market constraint becomes binding and brings about collapse at the price of non-tradeable, that is, a financial crisis.

Rodrik (1999) provides empirical evidence that unequal societies are less likely to carry out the adjustments necessary to respond to negative macroeconomic shocks. Indeed, (Rodrik 1999) finds that what is particularly destructive is a combination of high inequality and poor institutions of conflict management (such as social safety nets, democratic institutions, rule

of law and efficient government institutions). He finds that an interaction of these is a strong predictor of growth collapse during the 1980s .

Vandemoortele (2010) asserts that inequity undermined macroeconomic resilience in four direct ways:

- First, it leads to **aspirational consumption** and increasing personal debt.
- Secondly, inequity leads to risky investment. Borrowers have to take on more debt simply to cope.
- Thirdly, inequity increases **household exposure to risk**. Financial liberalisation has shifted the burden of risk to households.
- Fourthly, inequity provides incentives for **crime and tax evasion**. (Alesina and Rodrik 1994) argue that high inequity creates incentives for people to engage in illegal activities, such as drug trafficking and other crimes, which contribute to instability. Research also indicates that rising income inequity makes it easier to avoid taxes and fines, reducing fiscal space. Bloomquist (2003) analysis of US data between 1947 and 2000 found a link between the wage share of those in the top 10 percent of income and the underreporting of their wages and salaries.

Two broad channels are examined when looking at the relationship between income inequality and growth: the credit market imperfection and political economy channel.

2.2.1.1.2 The credit market imperfections channel

Galor and Zeira (1993) have shown that the presence of fixed costs, which are related to occupational choices and investment human capital, are affected by income distribution. The higher interest rate of the borrowers compared to the lender's inequality causes the under-investment in human capital. Banerjee and Newman (1993) investigated the impact of inequality in various occupation choices - the occupational choice of becoming an entrepreneur or a general worker. They show that if the market is imperfect and fixed costs are related to entrepreneurial activities, inequality may be harmful to economic development and cause the under-investment in entrepreneurial activity. They conclude that if the wages are endogenous, credit market imperfection approach, which is the main hypothesis, is robust to random shocks, which results in human capital investment activities or entrepreneurial investment activities.

2.2.1.1.3 Credit market failures

There are many contradictory stories here, some argue that inequality leads to the poor not being able to access credit and, therefore, cannot they accumulate assets (including human capital) and others argue that stagnant middle-class incomes and aspirational consumption is what leads to debt-fuelled consumption. The investment opportunities story is more interesting, Banerjee and Newman (1993) and Aghion and Bolton (1997) both assume two people, A who has some initial wealth and B who has none. They both take a loan to start a business where there is a probability of success less than one. For person A, if successful, then return is equal to profit less loan repayment; if unsuccessful, even if loan is not fully paid, results in some loss for person A. For person B, if successful, then return is equal to profit less loan repayment; if unsuccessful, no loss since the person had no wealth to start with. The consequence is that person B is likely to put in less effort than person A (since there is no risk to the individual). The more Bs there are the fewer investment opportunities and lower aggregate effort diminishing returns to capital (Galor and Zeira 1993).

While the rich have a higher marginal propensity to save, they have lower marginal productivity of investment; hence, they invest in less productive assets as they get richer. Therefore, when credit markets are imperfect, the higher savings of the rich leads to lower productivity investments and less growth, conversely, when (poor) individuals are limited in their borrowing capacity, the distribution of wealth affects their production possibilities. This, in turn, has an impact on the aggregate level of output. Redistribution creates investment opportunities in the absence of well-functioning credit markets.

2.2.1.1.4 Human capital formation

This is probably the most powerful driver of low growth in the context of high inequality; hence, three broad arguments are formed:

- Distortions in credit markets mean that the poor spend less on education than they should.
- Learning-by-doing model suggests that the poor are locked in low-productivity jobs.
- With the best will in the world, schools in poor communities do worse than in richer communities, even with progressivity in spending.

2.2.1.1.5 The political economy channel

The political economy model suggests that inequality is harmful to economic development. Most of the earliest studies argued that redistributive policies are adopted by inequality, which adversely impacted on investment in human and physical capital and thus the economic growth.

Inequality weakens political institutions, in unequal societies; the poor perceive the 'system' to be unjust. This results in the breakdown of the rule of law and corruption was harder to fight. Therefore, trust being required to support long-term investments. In societies with low trust index, both business and labour took a shorter-term perspective and in unequal societies, willingness to finance public goods being lower. Political economy model suggested that when the median voter's income was far below the average, they chose redistribution since the gains were higher than the costs (tax) to them. The neo-classical model suggests that taxes were bad for growth and, therefore, inequality led to redistribution, which was bad for growth, but there was no empirical evidence that inequality led to higher taxes or that redistribution was bad for growth. In fact, empirical evidence suggested that redistribution was good for growth such as the work by Easterly and Rebelo (1993) and Perotti (1996) showed the positive contribution of redistribution through progressive taxation to growth and Aghion and Bolton (1997) argued for sustained redistribution in unequal societies to support growth.

All three arguments imply that when inequality rose social mobility fell and this being bad for incentives, stability and long-run growth. The learning-by-doing model suggests that the productivity growth largely was determined by prior knowledge and on-the-job experience. The poor are then locked in jobs that do not enable them to raise productivity significantly and become trapped in low productivity jobs for generations. Then with high inequality, it will render divergence in skills set and rising inequality, reinforcing each other. Nutrition, parents' education, a stimulating the home environment, time that parents spend on structured play, are all determinants of educational success, which in turn influences inequality. In the UK, grade three school scores determine about 70 percent of earning potential at age 30; this cycle is hard to break (Easterly and Rebelo 1993).

2.2.1.1.6 Technological change

Skills biased technological change benefited skilled workers, where this effect was sometimes confused with China entering the global economy (trade effects). Most analysis

on previous studies (see Krugman and Lawrence (1993), Borjas and Ramey (1995), Beaudry and Green (2005)) suggested that the former has had a greater effect on wage differentials than the latter. Other economists (see. Koeniger et al. 2007 ; Katz and Murphy 1992 ; Acemoglu 1998 ; Card and DiNardo 2002) argued that skill-biased technological change, in combination with more open capital markets, has had the effect of boosting skilled workers' salaries and raised returns to those with investable cash; technological change introduces some wage inequality since not all firms acquire technology at the same time. Therefore, technological change is good for growth when labour markets are flexible; the wage inequality introduced by technology dissipates quickly.

2.2.2 The unified theory of inequality and growth model

The unified theory of inequality and economic development model was advanced by (Galor and Moav 2004). The unified theory involved the reconciliation of the classical approach (i.e. inequality channels resources towards people with a high marginal propensity to save, increasing capital accumulation, which resulted in economic growth) and the credit market imperfections approach (i.e. insufficiently wealthy economies equality alleviates adverse effects of credit constraints on human capital formation, which leads to economic growth). The effect of inequality on growth depends on the relative return to physical and human capital, where the relative return to physical capital is high, inequality is beneficial for growth (i.e. inequality channels resources to towards people with a high marginal propensity to save).

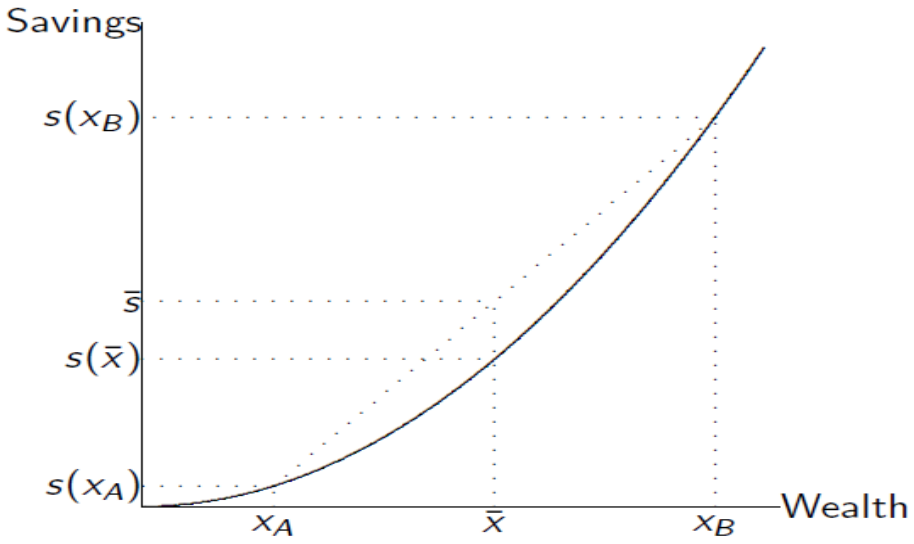
Therefore, the relative return to human capital is high inequality is harmful to growth, where equality alleviates adverse effects of credit constraints on the human capital formation and diminishing returns to human capital, which leads to investments that should be spread among individuals. During the early industrialisation physical capital was the engine for growth and later human capital became the engine for growth, then the relative return to physical capital decreased and the impact of inequality on growth went from positive to negative.

The capital accumulation determined from the domestic savings (i.e. endogenous) and the savings rate increasing in wealth where there is no borrowing and investments in human capital divisible and subject to decreasing returns. The homogeneous group of rich and poor capital-labour ratio starts out below $\check{k}$ on Figure 2.1 where there is no investment in human

capital (i.e. all bequests are invested in physical capital and only the rich leave bequests, which leads to inequality growth enhancing).

As physical capital accumulates, k exceeds $\check{k}$ then the rich start investing in education in addition to physical capital. Physical capital accumulates further k >$\check{k}$where the wages increase suffiently to make poor people able to acquire some education, therefore, the marginal return from education higher for the poor leads to redistribution and enhanced growth. As wages increase further, credit-constraints are no longer binding, meaning that the inequality has no effect on economic growth.

Figure 2.1 The classical approach



Source: Galor and Moav (2004)

2.2.2.1 The evidence of the unified theory

Becker, Hornung et al. (2011) investigated empirically the role of education in the process of industrialisation in Prussia and found that education played an important role and contributed to intensifying the later stages of industrialisation. Agrarian economies and early industrialisation characterised by low skill requirements and capital accumulation and technological progress made skilled labour more valuable for capitalists, which led to lobbies for the provision of public education that was costlier for land owners who in turn lobbied against such education provision. The concentration of land ownership was associated with lower levels of investments in human capital (i.e. concentration of power among those who had interests in opposing provision of public education). In several countries, education reforms have followed land reforms; these countries have experienced rapid economic growth. International capital inflows diminish the positive role of inequality and the adoption of new technology has increased the return to human capital; given credit constraints, equality has a positive effect on growth.

2.2.3 The Piketty's theoretical model

Thomas Piketty's (2014) arguments are on the changes of the inequality patterns by looking at the share of capital and output growth. He assumed that other things remain constant, as

the returns on capital (r) and growth rate output (g) rise and the capital share of the national income increases. Moreover, since the income of capital is more unequally distributed than the income of labour, the rises of the shares of labour leads to the rise of overall income inequality. According to him, both relationships are reasonable.

2.2.3.1 The model

The Piketty's model was derived from the standard growth model, according to Piketty (2014), the wealth and income patterns concentration are described as a point or the way in which the real capital return (r) and economic growth rates (g) are dissimilar.

The following is the derivation of the Piketty model and its implications:

The income is the function of labour and capital $Y_t = {K_t}^{\alpha}{L_t}^{1-\alpha}$, where the real capital return is defined as the marginal product of capital r ≡ $\frac{\partial Y_t}{\partial k_t}$, which seems as if the capital share of national income(α) can be appointed to act as a function of the capital return(r), since

r=$\frac{\partial Y_t}{\partial k_t}$=α$\frac{Y_t}{k_t}$……..(2.1)

If the capital law of motion is represented as $k_{t+1} = (1-\delta)k_t + sy_t$, s, is the savings rate, which is constant δ is the depreciation (i.e. constant), the population is constant and y_{t+1}= (1+g) Y_t, at the steady state phase $\frac{d}{dt}[\frac{k_t}{Y_t}]$ =o, which means that:

$\frac{\dot{K}}{k}=\frac{\dot{y}}{y}$, $\frac{sy-\delta k}{k} = \frac{gy}{y}$, $\frac{\hat{k}}{\bar{y}} = \frac{\hat{s}}{\bar{g}+\bar{\delta}}$……(2.2)

Where g is the economy's growth rate and bars on top of variables denote the steady state's point. Piketty looks all variables in net terms such as the income should deduct depreciation, savings rate and capital. But the two expressions in the condition of the steady state are equivalent. Krusell and Smith Jr (2015) use gross terms variables, therefore, it is important to account for the depreciation.

By substituting equation (2.2) into (2.1) gives rise to what Piketty (2014) called the "second fundamental law of capitalism" which is the inverse relationship between economic growth and the share of capital in the national income.

$\bar{\propto}=\frac{\bar{r}\bar{s}}{\bar{g}+\bar{\delta}}$"……

Piketty second law assumes that the 'net' saving rate is constant and positive, i.e. the economy increases its capital stock from year to year by an amount that is a constant fraction of (net) national income.

Then, the model introduce the random shocks in the above equation

$\propto_t = \bar{\alpha} + \emptyset(L)\varepsilon_t$ ……(2.4)

Where $\emptyset(L) \equiv (\sum_{j=0}^{\infty} \emptyset, L^j)$ are the stochastic innovation responses polynomial and the ε_t is the exogenous shock, Piketty and Zucman (2015) give reasons that income inequality capital share and wealth inequality are the increasing functions of r-g.

According to Piketty's hypothesis, one should expect changes in the share of capital to be explained by contemporaneous and past changes in the spread between r and g or r and g+δ, meaning that all other things equal, a temporary exogenous innovation to r − g should be expected to disturb the steady state and temporarily take α away from it in the same direction of the innovation.

Therefore, the economic growth increases temporarily and real capital return decreases and the share capital falls temporarily. The higher the capital share in the national income would cause more wealth and income inequality, which means capital returns are higher, unequally distributed compared to labour income (Piketty 2014).

The Piketty hypothesis is empirically testable, which asserts that positive changes in the r-g gap causes a rise in inequality (z) and an increase in the share of capital (α)

Then, the following are the Piketty (2014) hypotheses:

H_b : if $\Delta(r-g) > 0, then\ \Delta z > 0\ , \Delta\alpha > 0$

H_a : if $\Delta(r-g) > 0, then\ \Delta z \leq 0\ , \Delta\alpha \leq 0$

2.2.4 Kuznet's hypothesis: GDP level affects inequality

Figure 2.2 Kuznets curve

Source: Kuznets (1955:91)

Kuznets (1955) was the first classical economist to study the relationship between economic growth and inequality. His hypothesis, succinctly expressed in Figure 2.2, was that inequality rises during the early stages of economic development reaches a maximum threshold and then declines with the progression of development. Kuznets (1955) hypothesis is about the movements of workers from agriculture to industry. The industrial sector is characterised by higher mean income and a higher degree of inequality, when the industry is small this leads to increased inequality as the industry grows, inequality starts decreasing.

2.2.4.1 Testing the inverted u-hypothesis

Regarding data limitations, Kuznets (1955) used the ratio of the income share of the richest 20 percent to the poorest 60 percent compared to a small set of developing countries to a small set of developed countries. Paukert (1973) used the Gini cross-section of 56 countries for testing the inverted U-shaped hypothesis as suggested by (Kuznets 1955).

2.3 Financial development and inequality theoretical channels

2.3.1 Inverted U-shaped hypothesis by Greenwood-Jovanovic

One school of thought suggests the inverted U-shaped relationship between financial development and income inequality. In the context of endogenous growth model,

Greenwood and Jovanovic (1990) undertook pioneering work where they investigated the finance and inequality nexus. They considered the interval [0,1] of the economy, which is populated by continuum of agents with $k_t = c_t + i_t$, where k_t is the wealth at period t c_t is the consumption at period t and i_t is the investment at period t.

The agent that owns wealth at period t will make the decision about the allocation of consumption at period t and investment at period t. With the discounted rate of β∈ (0,1) the maximisation condition of the agent expected lifetime utility can be given by max {E[$\sum_{t=0}^{\infty} \beta^t u(c_t)$]}. The model assumes the availability of two types of production technologies in the economy. The one yields low returns for per unit of capital (δ) and its safe, while the other one offers the more risky rate of returns ($\theta_t + \epsilon_t$), with high expectations value, which is denoted as the technology shock composition, where theta is denoting the aggregate shock, which is idiosyncratic shock $\varepsilon_t \in (\bar{\varepsilon}, \bar{\varepsilon})$ with the expected value of E(ε_t)=0 and the composite shock is supposed to be positive with the lower bound.

Through analysing and collecting information of a bigger project in order to find the true aggregate shock θ_t, the financial intermediations can overwhelm the risky investment information. However, through trading and pooling and risk diversification the financial development smooths away the idiosyncratic shock ε_t. In further development of the financial inequity model, it is assumed that there is a fixed entry cost (q) for financial market participation (Townsend, 1978). Although the fixed entry cost is the agent that will join the financial sector and participate. Therefore, all the agents will be grouped into two groups. The first group are the agents who are the participants (i.e. already in the financial markets) and the second group are the agents who are not participants (i.e. currently not in the financial markets).

The agent who does not participate in the financial markets but decides to invest his portfolio fraction of $\emptyset_t$ into a high-risk technology in period t, then the output investment at period t+1 will be:

K_{t+1}=$i_{t+1}[\emptyset_t(\theta_t + €_t) + (1 - \emptyset_t)\delta]$ ……(2.5)

Which implies that the non-participant wealth is influenced by the idiosyncratic shock uncertainty. The agent who is already a participant in the markets can get the return promised of r(θ_t) per capital unit invested in the financial system. Therefore, the agents who invest $i_{t,}$ which is the amount of capital at period t, their wealth can be written as at the beginning of period t+1:

K_{t+1}=i_t r(θ_t) ……..(2.6)

From equation (2.2) the aggregate shock θ_t is the one that described the return function since the financial intermediaries are smoothing away the idiosyncratic shock ε_t.

The Greenwood and Jovanovic (1990) hypothesis defined V(k) as the financial markets value function of an agent and w(k) the financial market value function of an outside agent in the markets. Therefore, F(θ) and G(ε) represent the distribution cumulative functions of θ & ε respectively.

The non-participant agent (i.e. the one who is not in the financial markets) investment decision will depend on the following maximisation function:

W(K_t)=max{u(K_t-i_t) + β$\int max$[w(K_{t+1}) , v(K_{t+1} –q)] dF(θ_{t+1}) dG(€$_{t+1}$)} ……..(2.7)
$i_t Q_t$
subject to: K_{t+1}=i_t[$\emptyset_t$(θ_t+€$_t$) + (1-$\emptyset_t$) δ]

For the participant agents in the financial markets the functioning equation can be written as follows:

V(k)= max{u(K_t -i_t) + β$\int$ max[v(K_{t+1})] dF(θ_{t+1}) }……..(2.8)
i_t
Subject to: K_{t+1} =i_t r(θ_t)

From equation 2.8, for any given capital endowment (k), have V(k)> w(k) although the V is defined without references to w.

Therefore, the theoretical relationship between financial development and income inequality as suggested by Greenwood and Jovanovic (1990) gives the solution to the finance and inequality problems. Thus, when the financial markets are less developed in the early stage of economic development, slow economic growth occurs, which implies low but rising inequality as development progresses. At the intermediate level of economic development, faster economic growth coincides with widening income inequality and more financial development deepening, with a threshold inequality being attained at the climax of this phase. However, in the maturity stage of development, with many agents start to gain access to the financial structure is fully developed, the income inequality will become stable and the volume of inequality will decline.

According to Greenwood and Jovanovic (1990), the inverted U-shaped hypothesis nexus between financial development and income distribution provides a solution to the finance and inequality problem. Therefore, in summary, the financial markets at the early period might widen income inequality but when more individual households start gaining access to the financial market, the average income increases, which lowers income inequality.

2.3.2 The Galor Zeira model

The production of final output occurs in two sectors, the skilled labour sector and unskilled labour sector. The skilled labour sector is about neoclassical technology and unskilled labour sector about linear technology. The final output is equal to the sum of skilled labour and unskilled labour sector Galor and Zeira (1993).

$Y_t = {y_t}^s + {y_t}^u$……(2.9)

Where, Y_t is the sum of output produced at period t

${y_t}^s$ is the skilled labour sector

${y_t}^u$ is the unskilled labour sector

The skilled labour sector governed by neoclassical technology equation becomes ${y_t}^s = F(K_t, {L_t}^s)\ {L_t}^s \equiv f(K_t)$,

$K_t \equiv K_t/{L_t}^s$ *……..(2.10)*

Where K_t is the physical capital at period t

L_t is the labour employed at period t

The unskilled labour sector governed by linear technology equation becomes ${y_t}^u = a{L_t}^u$, a>0

Where a is the marginal productivity of unskilled workers

${L_t}^u$ is the labour of unskilled at period t

${y_t}^u$ is the unskilled labour sector

$\{K_t, {L_t}^s] = \max[{L_t}^s f(K_t) - {w_t}^s\ {L_t}^s - r_t K_t]$……(2.11)

The above equation shows the perfectly competitive environment where the producers are operating by the given r_t the interest rate ${w_t}^s$ as the wage rate of skilled labour sector in period t. Then we choose K_t and ${L_t}^s$ to maximise the profits. Therefore, the producer's reciprocal demand function of factors of production becomes:

$r_t = f'(K_t) \equiv \mathrm{r}(K_t)$……(2.12)

${w_t}^s = \mathrm{f}(K_t) - f'(K_t)\, K_t \equiv w^s(K_t)$ ……(2.13)

If the wage of the unskilled labour is not greater than marginal productivity, which is *a*, the producers of the unskilled labour sector will demand more labour. At the wage level ${w_t}^u$ =a the demand of unskilled labour sector is perfectly elastic at period t.

2.3.2.1 Factor prices

Suppose the perfect competition where the wage of an unskilled worker is equal to marginal productivity.

${w_t}^u$ =a

${w_t}^s$=f$(K_t) - f'(K_t) \equiv w^s(K_t)$ and interest rate $r_t = f'(K_t)$, then the individuals can lend and producers can borrow at a constant world interest rate $r_t = r$, meaning that the interest rate of the economy is equal to the constant world interest rate.

This determines the capital intensity and skilled wage.

And the skilled worker's wage is ${w_t}^s = w^s\,(k) \equiv w^s$ and the unskilled wage is ${w_t}^u = a \equiv w^u$

2.3.2.2 Individuals

Overlapping generation, where each individual leaves a bequest to the child and has one child and one parent, lives in two periods. In the first period, consumption is integral in parents' consumption and may choose to work as unskilled and save or invest in acquiring the skill. In the second period:

$u_t = \propto log c_{t+1} + (1-\propto) log b_{t+1}$,

$c_{t+1} + b_{t+1} \leq w_{t+1}$, , where maximising wealth w_{t+1} gives maximum utility.

2.3.2.3 Occupational choice

In the occupational choice theory, the investment in human capital is characterised by imperfect capital markets where r<i and fixed costs, where h= θw^s+(1- θ) w^u, the wealth of an unskilled worker and the wealth of a skilled worker is going to be looked at. The wealth of an unskilled worker is $w_{t+1}{}^u$=w^u+(1+r) w^u+(1+r) $b_t \equiv w^u(b_t)$ and the wealth of a skilled worker is

$w_{t+1}{}^s$=[w^s-(h-b_t)(1+i)] if b_t<h

[w^s+(b_t-h)(1+r)] if $b_t \geq h$ … … … … … … … … … … … … . . (2 . 1 4)

Occupational choice acquire education if $w_{t+1}{}^s$=$w^s(b_t)$> $w_{t+1}{}^u$=$w^u(b_t)$. The assumption is that education is profitable to those who can afford to finance the entire costs. Education is also not profitable for those who have borrowed the whole amount.

2.3.2.4 Short-run effects: skills composition

In the short-run effect, the income distribution translates directly into the distribution of bequests. The distribution of bequest affects occupational choices in the short run.

$I^u{}_{t+1}=\int_o^f D_t(b_t)db_t$

$I^s{}_{t+1}=\int_f^\infty D_t(b_t)db_t$

The occupational choice today determines the gross national products (GNP) today and the income distribution in the next period.

2.3.2.5 Long-run effects: skills composition

In the long run, the distribution of bequests today determines the long-run skill composition, then:

lim $I^u{}_{t+1}=\int_o^y D_t(b_t)db_t \equiv T^u$

$t \to \infty$

lim $I^s{}_{t+1}=\int_g^\infty D_t(b_t)db_t \equiv T^s$ … … … … … … … … … … … … … . (2 . 1 5)

$t \to \infty$

Over time, society will be segmented into a group of rich and a group of poor.

2.3.2.6 Skills composition and GNP

The GNP will consist of wage and capital income of both young and old, then in the equation form it will be:

$\bar{Y}$=(w^u+w^u+($\bar{b}^u$+$\bar{w}^u$)r)(1-$\bar{\iota}^s$) + (w^s + r($\bar{b}^s$ – h)) $\bar{\iota}^s$

= w^u(2 + r) + r$\bar{b}^u$ + (($w^s - rh$) – w^u($2 + r$) + $r(\bar{b}^s - \bar{b}^u)$) $\bar{\iota}^s$

$\frac{\partial \bar{Y}}{\partial \bar{\iota}^s}$ =($w^s - rh$) – w^u($2 + r$) + $r\left(\bar{b}^s - \bar{b}^u\right)$ > 0……(.2.16)

2.3.2.7 Long-run effects on GNP

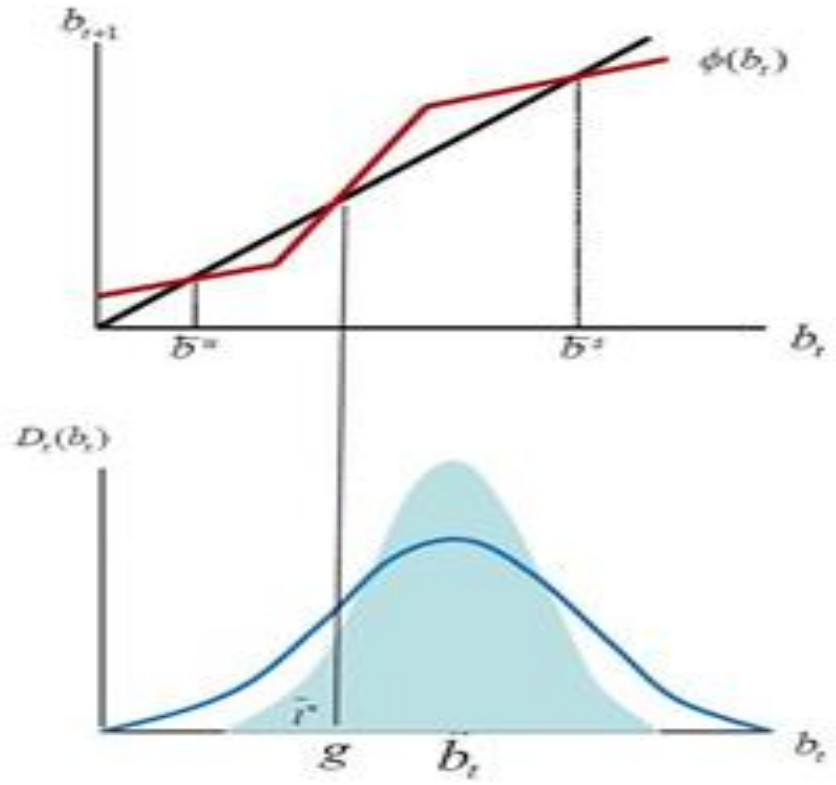
Income per capita is higher the larger the fraction of skilled workers, therefore, the fraction of skilled workers is higher the lower the threshold level of bequests. This threshold level is lower, meaning the lower the cost of education, the lower the interest rate for borrowers, the higher the wage of skilled workers and the higher the propensity to bequests.

2.3.3 Income distribution and economic growth

In the long run, the distribution of income affects the economic growth process and the income per capita level. In the non-poor economy, the distribution of income inequality has adverse effects on the economic growth process, but on the opposite side, in the poor economies the inequality has beneficial effects on the economic growth process. Figure 2.5 indicates the adverse impacts of inequality in the process of economic development by looking at the non-poor economy. Consider the model where the cost of education is less relative to the income per capita at period t. Specific, in period t the average level of bequest $\hat{b}_t$ is beyond the critical level g, above which the human capital investment is beneficial in the long-run for members of dynasty.

$\hat{b}_t \equiv {b_t}^s {l_t}^s {b_t}^u {l_t}^u$ > g

Figure 2.3 Inequality on the economic development process for non-poor economy



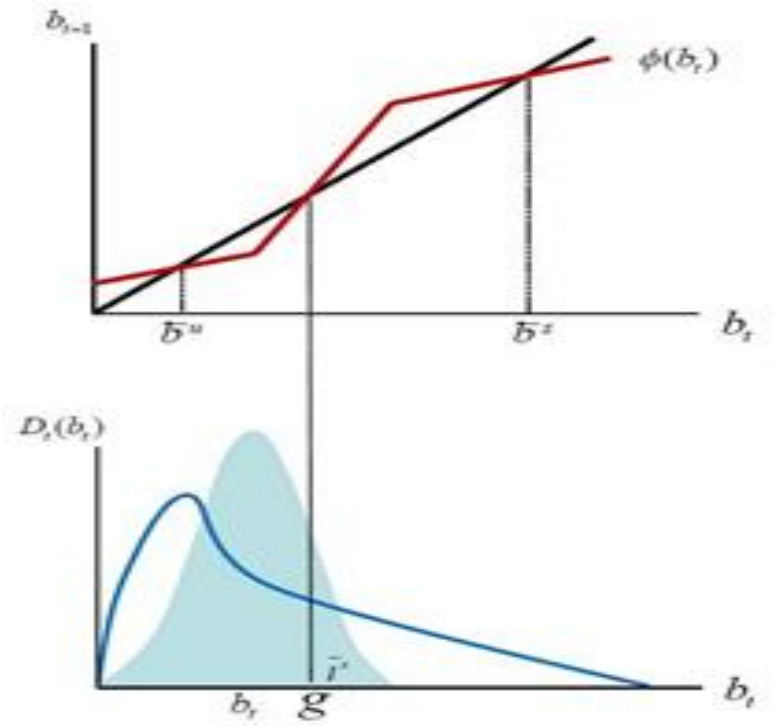
Source: Oded (2011:16)

As displayed in Figure 2.5, in the period t for a given amount of bequest $\hat{b}_t$ the higher the inequality (for broad class of inequality measures) the more it will be connected with the higher numbers of individuals who are below the critical level g. Thus, in the Galor-Zeira model in both rich and non-poor economies inequality hurts growth.

The model where the cost of education is higher relative to the income per capita at period t is considered also. Specifically, in period t the average level of bequest $\hat{b}_t$ is less than the critical level g, above which the human capital investment is beneficial in the long run for members of a dynasty.

$\hat{b}_t \equiv {b_t}^s {l_t}^s {b_t}^u {l_t}^u <$ g

Figure 2.4 The positive impacts of inequality on the economic development in the poor economy



Source: Oded (2011:17)

As displayed in Figure 2.6, in the period t for a given amount of bequest $\hat{b}_t$ the higher the inequality (for broad class of inequality measures) will be connected with the higher numbers of individuals who are above the critical level g. Thus, in the Galor-Zeira model, in a poor economy inequality may enhance growth.

The model generates the testable predictions that across poor economies the distribution of income inequality will be connected with the higher income per capita growth. In addition, the opposite is true that across the non-poor economies the distribution of income inequality will be connected with the lower income per capita growth. The results of the linear hypothesis have implications, which are important for wealth distribution. It implies that for the long-run income level, the wealth distribution is initial and through bequests between generations, income inequality will be perpetuated. During the long run, the high-income skilled labour

and low-income unskilled labour will have a polarisation of wealth, meaning that families who are educated and rich will converge towards the steady state of high incomes; on other side, the less educated poor families will converge towards the steady state of low incomes. Moreover, financial market developments will provide easy access to poor families, as the markets developed from the income inequality will be reduced since the low-income agent's credit constraints will be alleviated. Similar conclusions were also found on the Banerjee and Newman (1993) model. Therefore, one may conclude that both hypotheses predict the linear and negative relationship between financial development and income inequality.

2.4 Conclusion

In summary, the theoretical literature study has assisted to recognise a number of useful insights advantageous to this research. First, in the theoretical section of Greenwood and Jovanovic (1990), it has been highlighted that the financial markets might widen income inequality but when more individual households start gaining access to the financial market, the income average increases but lowers income inequality. Therefore, according to the linear hypothesis model, during the long-run, the high-income skilled labour and low-income unskilled labour will have a polarisation of wealth, meaning that the rich and educated will converge towards the steady state of high incomes, on other side the less educated poor families will converge towards the steady state of low incomes.

Secondly, different studies that examined the relationship between financial development and income inequality nexus and economic growth and income inequality nexus above have found various relationships. Some schools of thoughts found positive relationships, while others found it negative or non-linear related.

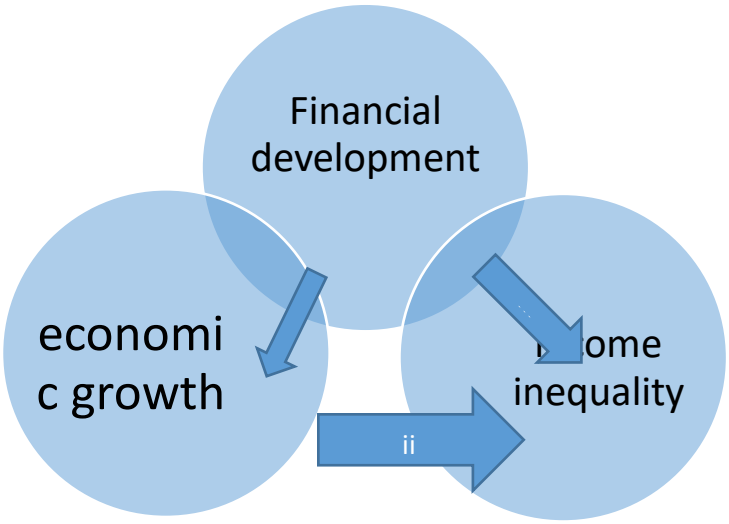
Therefore, in conclusion, this chapter put inequality theories on top that refer to financial development and its effects on income distribution. Additionally, the chapter offered the conceptual theoretical literature behind financial development links to inequality and an overview of economic growth on income inequality. Interestingly, most empirical studies were consistent with linear hypothesis between financial development and income inequality theories, as suggested by (Galor and Zeira (1993), Banerjee and Newman (1993)). Appropriate variables required for this dissertation for econometric analysis are chosen based on the Greenwood and Jovanovic (1990) theoretical background.

CHAPTER 3: EMPIRICAL LITERATURE REVIEW

3.1 Introduction

The main aim of this chapter is to discuss and review the existing empirical studies linking the dependent and independent variables − financial development, economic growth and income inequality − that the study will use in the empirical analysis of Chapter 5. All the possible logical relationships between the three variables are depicted below in a Venn diagram and should help to situate them in the theoretical discussions and interrelationships. Therefore, this chapter comprises three sections: First is the existing literature between the financial development and economic growth nexus (i.e. area one on the Venn diagram). The second section is the empirical literature between the economic growth and inequality nexus (i.e. the area two on the Venn diagram), lastly, the relationship between the financial development and income inequality (i.e. the area three on the Venn diagram).

Figure 3.1 Venn diagram indicating the interrelationship between finance, economic growth and income inequality



Source: Compiled by the author

3.2 The relationship between financial sector and economic growth

The basic principle for the financial institutions and markets in different economies is to inspire savings and encourage the efficiency of allocation of capital, hence boost economic growth, encouraging further the formation of capital, savings mobilisation, transactions facilitation and risks of management. The financial system attains this either through credit markets or equity markets, or together. The vast literature has been investigating the nexus between economic growth and financial development and suggests that financial systems promote economic growth (Levine 2005). The stock market, as measures of financial system provides the conflicting relationship with economic growth. Most researchers are more convinced that a well operated financial sector can boost economic growth by reducing transaction costs and enhancing information access (King and Levine 1993, Bencivenga, Smith et al. 1995, Beck, Demirguc-Kunt et al. 2004). Although, other models show that more returns from enhancing the allocation of resources lowers the rates of savings.

Financial development slows the economic growth in the long run if there are huge externalities associated with investment and savings rate (Bencivenga and Smith 1991, Naceur and Ghazouani 2007)**.** The purpose of this section is to discuss and review the existing empirical literature linking financial development and economic growth (area one of the Venn diagram).

When dealing with the relationship between financial development and economic growth, the different voices in the literature need to be considered (Levine 2003). There is no agreement in the existing literature between financial development and economic growth. As stated by Levine (1997), financial development might be measured by the access to financial services and credit. Schumpeter (1912) classical models have a similar voice where he concludes that financial development speeds up growth. Robinson (1952) believes that financial development makes more comprehensible the channels of economic growth. Miller (1998) considers that financial development promotes economic growth, but by also considering other control variables. Specifically, financial development is endogenous to the other side of real growth and Lucas (1998) is of the same opinion.

Porta, Lopez-de-Silanes et al. (1998) and Levine, Loayza et al. (2000) found a positive correlation by measuring the effect of financial development and economic growth. Levine, Loayza et al. (2000) and Beck, Levine et al. (2000) used the dynamic panel data approach to test the correlation between financial development and economic growth. Neusser and Kugler (1998) do not support that financial development explains the economic growth in OECD countries for the period between 1960 and 1993. In the relationship between financial development and economic growth, there are four competing schools of thought (Greenwood and Smith 1997). The first one believes that financial development causes economic growth and is the supply-leading hypothesis (Arestis and Demetriades 1997, Rousseau and Wachtel 2000, Christopoulos and Tsionas 2004, Eller, Haiss et al. 2006, Jalil and Ma 2008, Enisan and Olufisayo 2009, Hassan, Sanchez et al. 2011).

The second school of thought believes that economic growth is the main cause of financial development and is the demand-following hypothesis (Liang 2006, Tekin 2012). The third school of thought believes that economic growth and financial development both cause each other and is the feedback hypothesis (Calderón and Liu 2003, Ang 2008, Wolde-Rufael 2009, Bangake and Eggoh 2011, Pradhan 2011). Lastly, is the one that believes that there is no existing relationship between economic growth and financial development (Lucas 1998, Eng and Habibullah 2011).

The earliest empirical studies focused on the role of labour resources and capital resources and the consumption of technology as the sources of the economic growth. The majority of the early literature was ignored in the role of the finance and growth process. The nexus in financial development and economic growth was notably in the 1970s (Masakichi (1970), Shaw (1973) and McKinnon (2010)). Masakichi (1970) used the comparative approach with 35 countries for the period between 1860 and 1993. The author found that financial development contributes positively to economic growth. McKinnon (2010) and Shaw (1973) advise the public policy that there is a relationship between savings, financial development and investment rates.

The relationship between financial development and economic growth was given more attention especially after 1990. An empirical study that investigated the relationship between financial development and income inequality has shown that well-operating financial market has a positive impact on improving economic outcomes (King and Levine 1993, Rousseau and Wachtel 2000, Demirgüç-Kunt and Levine 2008).

3.3 Empirical evidence between income inequality and economic growth

Despite there being much literature on the link between income inequality and economic growth (i.e. see appendix A), there is a stark difference in findings as to whether there is a positive or a negative relationship. A number of theories about whether these two variables are related positively or negatively originated largely due to empirical findings from statistical models involving a varied range and combinations of explanatory variables. Moreover, some of these empirical studies involved different methodologies and covered different time periods thus leading to differing datasets that provided contradictory results.

There is a divide in the literature as to whether income inequality and economic growth are negatively or positively related, with the reasons stemming from differing empirical approaches, different datasets ranging different years and the use of different explanatory variables. A number of studies indicate a negative relationship between economic growth and income inequality(Alesina and Rodrik 1994, Chambers and Dhongde 2011)

However, Forbes (2000) criticised studies that arrived at a negative relationship between income inequality and economic growth argued that many of these studies, were not robust, as they did not account for omitted variable bias. By using panel estimation to control for time-invariant country-specific effects, she showed a positive relationship between income inequality and economic growth of a country. Specifically, she directly estimated the correlation between changes in inequality and changes in economic growth in a given country. The results showed that in both the short- and medium term there was a positive relationship between income inequality and economic growth.

Clarke (1995) showed a negative correlation between income inequality and GDP for a country and proposed that inequality is not a precondition for growth. The data used in that paper to conduct the research consisted of the Gini coefficient, coefficient of variance of income and the Theil index (an indicator of economic inequality). He noted that there were quality issues with the data because not all income was from the same year and in the case of some countries, he was unsure whether pre or post-tax income was being used. After running the appropriate regression tests, a number of conclusions were made. First, he stated that his results showed that inequality is negatively correlated with growth. Secondly, decreasing the inequality by one standard deviation caused the growth to increasing by or

non-democracy) did not affect the result. Overall, he concluded that income inequality is not a precursor for economic growth.

It was argued that as per trickle-down economics, higher levels of inequality lead to faster wealth accumulation, more savings and as a result, better redistribution of income and as a result more growth. It was also inferred that greater inequality caused more issues concerning redistribution of income, which causes the government to levy higher taxes that reduces capital accumulation and thus slows down growth by approximately 1.3 percent per annum. He also mentioned that the type of government structure (democracy or non-democracy) did not affect the result.

Fawaz et al. (2014) addressed the correlation between economic growth and income inequality. Many studies had been conducted prior, even as early as the beginning of the nineteenth century searching for a solution to this problem. Some previous analyses found an indirect relationship between economic growth and income inequality, whereas others produced the opposite result. These contrasting conclusions were the result of the analysis of different confounding factors, such as the relative importance of socio-political factors, collateral and credit market asymmetries. To avoid these issues Fawaz et al. (2014) focused on analysing developing countries. A model was created using data from the World Bank for the year 2012, where developing countries decided from a new threshold were chosen. A total of 111 countries were sampled, with roughly even amounts classified as high- and low-income developing countries (HIDC and LIDC).

A multiple regression analysis was conducted using these samples, with the dependent variable being per capita GNP growth for a country and income inequality an independent variable, represented by the Gini coefficient. The multiple linear regression models also included explanatory variables such as female and male school years. The results of the analysis failed to find a decisive result. A positive relationship was found between income inequality and economic growth in HIDC countries whereas a negative relationship was found between the variables in LIDC countries. It was suggested that the relationship between the variables might be nonlinear. This supported earlier findings that the variables are sensitive to the regressors chosen, resulting in contrasting outcomes, as shown in the prior literature.

3.3.1 Inequality and economic growth: the new growth theories perspective

There is a consensus among many authors in the literature that there is a negative relationship between the average rate of economic growth and the measure of inequality. Aghion, Caroli et al. (1999) examined case studies of South Korea and the Philippines. According to their research, the ratio of the income share of the top 20 percent and of the bottom 40 percent of the population in the Philippines was almost twice as large as in South Korea. Despite their differences in degree of income inequality, these two countries demonstrated similar levels of macroeconomic health (though GDP per capita, investment per capita, average saving rates, etc.) at the beginning of the study. Over the course of 30 years, however, Aghion, Caroli et al. (1999) found a marked difference in the rate of growth between the two countries (Aghion, Caroli et al. 1999). They ascertained that South Korea's output level underwent a five-fold increase, while that of the Philippines barely doubled, demonstrating that the country with a higher level of income inequality grew at a slower rate. After they determined these results in a case study, they conducted research on redistribution to find whether redistribution fosters or hinders growth. Aghion, Caroli et al. (1999) found that income inequality was found to be positively correlated with redistribution volatility and through a series of cross-country regressions found that greater redistribution volatility reduces the average rate of growth during a set period. Their findings were bolstered with results declaring that redistribution has a stimulating effect on economic growth, therefore, determining that inequality has a negative impact on economic growth. These results coincide with other literature, mentioned above, declaring a negative relationship between income inequality and economic growth.

As noted above, while some of the literature found a positive relationship and others supported a negative one, there are some studies in which no position is taken, see Shin (2012), for example. Shin (2012), chose not to pursue a particular stance on the topic but rather chose to examine reasons why this disparity exists. According to Shin (2012), there is a correlation between the positive/negative relationship between inequality and economic growth and whether or not the country is developed. The author performed a case study of East Asian and South American countries developing countries.

The findings revealed a negative relationship between income inequality and economic growth in those countries. Conversely, in a case study of the United States and France, which are developed countries, a positive relationship between income inequality and economic growth was found. In an agreement with Barro (1996) and (Shin (2012) declared that the effect of income inequality on economic growth was contingent on the state of economic development. Specifically he found that income inequality in poor countries retards

economic growth; that is, in countries with GDP per capita below $2070, the effect of income inequality was negative. According to Shin (2012), this is caused by a lack of opportunity to invest by the population of an underdeveloped country. This, in turn, would lead to political and social instability, which contributes towards economic decline.

Therefore, income inequality reduces economic growth. In contrast, income inequality in rich countries encourages growth; that is, in countries with GDP per capita over $2070, the effect was positive. Income redistribution from the rich to the poor reduces the saving rate of the economy, which would lower the incentive for the rich to work hard. Therefore, income equality would reduce economic growth. It can be inferred from this paper that the result of income inequality on economic growth varies depending on whether the country is developed or not. As stated before, there is a large divide in literature as to whether income inequality and economic growth are related through a positive or negative relationship.

Chambers and Dhongde (2011) pursued a non-parametric approach to examine an extensive and up-to-date dataset from the World Bank, inclusive of 1977 through 2007, representing more than 96 percent of the population of the developing world. Rather than GDP, measured the GEP and found that countries with higher levels of inequality had lower GEP and countries with lower inequality had higher GEP. Through more extensive research (and their non-parametric approach), they studied the typical linear model to measure the relationship between poverty, mean income and the Gini index and found evidence that the relationship between income inequality and growth is best described as non-linear. Chambers and Dhongde (2011), by analysing a model that considers the nonlinearity of the growth-poverty-inequality nexus, found that poverty declines rapidly with higher mean income, but slowly with lower values of the Gini index.

In short, their results were obtained using data that were much more comprehensive and methods that were more robust than those of most studies were. Their findings reflect those of Aghion, Caroli et al. (1999) as well as many others that have also found a negative relationship between economic growth and income inequality. While there seems to be insurmountable evidence in favour of a negative relationship between income inequality and economic growth, numerous studies yielded a positive connection between the two variables. In an analysis conducted by Li and Zou (1998), the results stated that empirical evidence revealed through a regression of GDP growth rate on the Gini coefficient that income inequality was positively associated with economic growth. Li and Zou (1998) followed Alesina and Rodrik (1994) and Barro (1996) found income inequality's relationship

with economic growth by dividing government spending into production services and consumption services.

However, in contrast with Alesina and Rodrik (1994) and Barro (1996) according to their results, income inequality can lead to fast economic growth when government spending is wholly driven by public consumption. In fact, by using this extension of government spending, Li and Zou (1998) found that since government spending is all for consumption, individuals will try to allocate resources between public and private consumption. Therefore, income inequality can generate high savings and growth rates if the rich have a larger share of income, or if income is more unequally distributed in the economy.

3.4 Financial development and income inequality

Liang (2006) investigated the impact of financial development on income distribution using the GMM system in urban China. The author concluded that easy access to financial credit improved income distribution in urban areas. Although, the linear and nonlinear hypothesis was not consistent with Greenwood and Jovanovic (1990). Ang (2010) could not prove the validity of the hypothesis of Greenwood and Jovanovic (1990). The author found banking density and financial development improved the share of income in India for the poor classes. Shahbaz and Islam (2011) used the autoregressive distributed lag (ARDL) approach to test the impact of financial development on income inequality in Pakistan for the period of 1971 to 2005. However, they found no evidence supporting the U-shaped hypothesis between financial development and income inequality as suggested by Greenwood and Jovanovic (1990). Their results support the linear hypothesis between financial development and income inequality as suggested by (Galor and Zeira (1993), Banerjee and Newman (1993)).

Jalil and Feridun (2011) examined the association between financial development and income inequality in China for the period between 1978 and 2007 using the annual dataset. They conclude that financial development helps to reduce income inequality, which supports the linear hypothesis as suggested by Galor and Zeira (1993) and Banerjee and Newman (1993) but they found less evidence that supports the inverted u-shape relationship between financial development and income inequality as suggested by (Greenwood and Jovanovic 1990). Another study by Deng and Su (2011) used the GMM to examine the impact of financial development on the period distribution of income and poverty in 21 provinces of China for the period stretching from 2001 to 2007. The authors found no evidence

supporting the U-shaped relationship between income inequality and financial development as proposed by (Greenwood and Jovanovic 1990).

Clarke, Zou et al. (2003) investigated the effect of financial development on income inequality in developed countries. They found no evidence supporting the inverted U-shaped relationship between financial development and income inequality as suggested by (Greenwood and Jovanovic 1990). They concluded that there is a positive relationship between financial development and income inequality. Noor and Ali investigated the relationship between financial development and income inequality between 1961 and 2011 for seven developed countries using the GMM system. They found that financial development minimised the income inequality and no evidence supporting the inverted U-shaped hypothesis between financial development and income inequality as suggested by (Greenwood and Jovanovic 1990).

Hoi (2013) used the static panel to test the impact of financial development on income inequality in Vietnam cities and 59 different provinces over the four-year period. He concluded that financial sector has a positive impact on reducing income inequality, which supported the linear hypothesis. Mansour and Wendel (2015) investigated the static panel to test the relationship between financial development and income inequality from East Asian countries for the period stretching from 1960 and 2012. They found the nonlinear hypothesis between financial development and income inequality, which follows the U-shaped normal curve. Their findings suggest that financial development helped in reducing income inequality but after a certain point (threshold) is reached of financial development, income inequality started to increase.

Sehrawat and Giri (2015) investigated the relationship between financial development and income inequality between 1982 and 2012 in India. The authors used the ARDL approach and found that financial development does not decrease the income inequality but it improves the volume in the gap between the rich and the poor. Their results do not support the non-linear hypothesis by (Greenwood and Jovanovic 1990). Another study by Jauch and Watzka (2016) investigated the effect of financial development on income inequality using the GMM system for 138 developed and developing countries. Their results reject the linear and non-linear hypotheses between financial development and income inequality as suggested by (Greenwood and Jovanovic 1990).

The empirical studies on the finance and income inequality nexus that can be referred to are (Li, Squire et al. (1998), Jalilian and Kirkpatrick (2002), Dollar and Kraay (2002), Clarke, Zou

et al. (2003), Clarke, Xu et al. (2006), Lopez (2004) ,Beck, Demirgüç-Kunt et al. (2007), Jalilian and Kirkpatrick (2005) ,Raynal (2006) , Huang and Singh (2011), Canavire Bacarreza and Rioja (2009) ,Kappel (2010), Mookerjee and Kalipioni (2010), Rosner (2010), Asongu (2011) , Enowbi Batuo, Guidi et al. (2010) ,Cojocaru (2011), De, Sarkar et al. (2011), Koeppl, Monnet et al. (2011), Fowowe and Abidoye (2013), Asad (2012) ,Jauch and Watzka (2016)), Liang (2006), Bittencourt (2012), Tan and Law(2012), Shahbaz and Islam (2011)).

The above studies are based on pooled estimation techniques of developed and developing countries, others such as Raynal (2006) and Canavire Bacarreza and Rioja (2009) focused on cases such as Latin America. Raynal (2006) covered the period between 1971 and 1998 for the sample of 12 countries and Canavire Bacarreza and Rioja (2009) studies look the finance and income inequality between 1960 and 2005 for 21 Latin American countries. Other studies are done in Africa such as the studies of (ie Asongu (2011); Enowbi Batuo, Guidi et al. (2010); Fowowe and Abidoye (2013)), for European economies (Cojocaru 2011). For the current study, the estimation technique used is the panel data analyses. Most of the empirical studies, with the omission of(Lübker, Smith et al. (2002), Lopez (2004), Rosner (2010) and Fowowe and Abidoye (2013)), find that financial development drops income inequality.

So, based on the existing empirical studies, financial markets could be regarded as an instrument aiming for “social fairness.” Additionally, no evidence was presented for the inverted-u-shaped hypothesis, except for the studies of (ie Jalilian and Kirkpatrick (2002), Canavire Bacarreza and Rioja (2009)) and Cojocaru (2011)), whose findings recommend that the relationship between financial development and inequality is U-shaped.

Table 3.3 in appendix B summarised the work that has been done to investigate the relationship between financial development and income inequality and testing the alternative theories. Jalil and Feridun (2011) in China examined the relationship between financial development and income inequality between 1978 and 2007. They found a positive relation between finance and inequality nexus, which supports the linear hypothesis voiced by Galor and Zeira (1993) and Banerjee and Newman (1993) but little evidence supporting the inverted U-shape hypothesis as suggested by (Greenwood and Jovanovic 1990).

Tan and Law (2012), in Malaysia, used annual data from 1980 to 2000 to examine the link between financial development and income distribution. They found no success of financial market on fighting against income inequality. Shahbaz and Islam (2011) used 1971-2005 data on Pakistan found financial development reduced income inequality while financial

instability increased income inequality. Bittencourt (2012) investigated the finance inequality nexus by employing the data between 1985 and 1999 from Brazil and found that broader financial markets helped to boost the personal credit of the poor. In Africa, Honohan (2004) investigated 160 countries using different measures of financial development and found that access financial services for the poor helped reduce inequality.

3.5 Conclusions

The purpose of this paper is to evaluate the effect of income inequality on economic growth and financial development and to contribute relevant findings to the discussion by examining extensive datasets from different data sources ranging from 2002 to 2014, which enables a long-term panel study. The world has been undergoing constant economic change; global interconnectedness and interdependence grows and changes each year. To better analyse the data, some other important variables were incorporated that may have an impact (helpful or detrimental) on the relationship between economic growth, financial development and inequality.

The above empirical studies focused on the finance and inequality nexus and the finance and growth nexus. A number of empirical studies predicted contradictory conclusions concerning the link between finance and growth and on finance and inequality, respectively. Concerning the finance and inequality nexus, the three hypotheses that the majority of the empirical studies analysed the ‘widening hypothesis’, the ‘narrowing hypothesis’ and the inverted U-shaped hypothesis. Lastly, the pioneering work of Kuznets curve theory was also analysed between the income inequality and economic growth nexus. Many empirical studies on finance-growth nexus supported the notion that financial development promotes the growth and reduces inequality, while other studies such as (Jauch and Watzka 2016) found no evidence that supports any of the above theories, but the positive effect between financial development and income inequality was observed.

CHAPTER 4: METHODOLOGY AND MODEL SPECIFICATION

4.1 Introduction

Chapter 4 describes the methodology and research design for the empirical analysis of this study. Section 4.2 highlights the chosen theoretical framework. Section 4.3 presents the justification of the selected variables, data sources and transformation as well as the chosen sample of developed and developing countries used in the analysis. In Section 4.4 is the specification of the empirical model while Section 4.5 covers the estimation strategy used in the study. All variables that are considered in the regression model are tested for unit roots and co-integration test, which are outlined in Section 4.6.

4.2 Theoretical framework

As discussed in Chapter 2, there are two economic theories that link financial development and income inequality hypothesis. The linear hypothesis by Galor and Zeira (1993) and Banerjee and Newman (1993) and the non-linear hypothesis by (Greenwood and Jovanovic 1990). The hypothesis of Kuznets (1955), which represents the inverted u-shape relationship between income inequality and economic growth was also tested. Greenwood and Jovanovic (1990) hypothesis assumes that there are two investment opportunities for an economic agent, one that is risky and offers a high rate of return and the other is safe but provides a low rate of return. The financial market is not well developed and there is an inefficiency of allocation of resources leading to modest economic growth. The financial intermediaries facilitate the investment portfolio of an individual.

The poor countries need time to accumulate wealth for them to reach a threshold where there is a transit from low to intermediate income levels; the gap in income between the rich and the poor increases together with the expansion of the financial market and rapid

economic growth. Furthermore, the non-linear hypothesis, which is reminiscent of Kuznets (1955) curve links the three variables into a single model, economic growth, financial structure and income inequality; their inverted -U shaped hypothesis, which implies that poor countries benefit from financial development as they depend more on borrowing compared to the rich countries and the inequality-narrowing hypothesis. The theory states that in the early stages of growth, financial development increases income inequality as only the rich have access to financial markets, meaning few people have access to financial markets.

As noted in Chapter 3, Banerjee and Newman (1993) and Galor and Zeira (1993) are the initiators of the linear hypothesis, which assumes that there are two periods that are producing the single goods in the economy, namely skilled labour-intensive sector and unskilled labour-intensive sector. Each individual comes to life with the initial amount of wealth, where each individual is old and young. Each individual benefits from each professional option; they either benefit from unskilled jobs for the rest of their lives or choose to invest in human capital and work as a skilled worker. The model assumes that each individual is identical except that they have different wealth in their pockets. People or families who are rich choose to invest in human capital during the first period and work as a skilled labour in the second phase where they will consume the benefits, earn more and bequest more. If the poor families want to invest in human capital during phase one; they should borrow so that they will live a life in the second period where they will work as a skilled labour. The borrowing is expensive and the investment in human capital is indivisible since the financial market is underdeveloped. Therefore, not all people from poor backgrounds will be able to borrow and invest in human capital and then those peoples will suffer for the rest of their lives and work as unskilled labour for their entire lives. Therefore, the model suggests that the initial wealth gap between the rich and the poor; in countries where the credit is underdeveloped, it becomes difficult to invest in human capital. Banerjee and Newman (1993), Galor and Zeira (1993) conclude that income inequality is negatively related to financial development.

For the analysis, the linear and non-linear hypothesis for testing the relationship between financial development and income inequality is considered. Therefore, the following regression model is adopted:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it}^2 + \beta_4 X_{4it} + \beta_5 X_{5it}^2 + \epsilon_{it} \text{.....4.1}$$

This theoretical model has also been used in related studies such as (Jauch and Watzka (2016) and Nasreddine and Mensi (2016) where Y_{it} denotes the Gini coefficient as a

measure of income inequality, X_{2it} denotes the financial development, X_{3it}^2 denotes the squared term of financial development for testing the inverted U-shaped relationship between income inequality and economic growth as proposed by Greenwood and Jovanovic (1990) and X_{5it}^2 denotes the squared term of economic growth to test the parabolic relationship between economic growth and income inequality as suggested by (Kuznets 1955).

The linear hypothesis of Banerjee and Newman (1993) and Galor and Zeira (1993) predicts the significant $\beta_2 > 0$ and an insignificant of β_3. The (Kuznets 1955) hypothesis predict a significant of $\beta_4 < 0$ and also significant of β_5<0 since the growth is normally associated with financial expansion, meaning that if the economic growth and inequality nexus is nonlinear than automatically the financial development might be not linear related to income inequality. According to non-linear hypothesis as suggested by Greenwood and Jovanovic (1990) the coefficient of financial development is insignificant and positive, while the coefficient of financial development squared is significant and positive, namely $\beta_2 > 0$ and significant, $\beta_3 < 0$ and significant. This study will test for the above effects by incorporating the mentioned levels and squared variables into a hybrid model, see equations 4.2 and 4.2.1, below.

4.3 Selected justification of variables, data sources and transformation

4.3.1 Selected justification of variables and data sources

This study employs the use of Gini coefficient, financial development, private credit/ GDP, stock market capitalisation (% of GDP), GDP per capita, inflation, agricultural sector, government consumption, access to finance, education and population to analyse the effects of financial development on income inequality. Based on the theoretical and empirical works discussed in chapters 2 and 3, the motivation is based on the choice of the selected variables. Clarke, Xu et al. (2006), Nikoloski (2013) and Jauch and Watzka (2016) used private credit over GDP as a proxy for financial development since it is a standard measure in the empirical literature for using the panel data analysis. GDP per capita, inflation, agricultural sector, government consumption, access to finance, education and population are recognised both in practice and in theory as major contributors to income inequality. As Jauch and Watzka (2016) emphasise, financial development is the way in which corporations and households may obtain credit, therefore, the higher the level of financial development, the more credit can be provided to the private sector and private individuals find the credit markets to be more accessible. Thus, this study studies both financial

development and economic growth, which, according to most literature, positively contributes to income inequality. The chosen variables for this study are defined in Table 4.2, below.

4.3.1.1 Data sources and sample size

Panel data for the following low-, low-middle-, upper-middle- and high-income countries across the world will be used in this analysis using the World Bank atlas method according to their income levels:

Table 4.1 Selection of countries (sample by GDP)

Low-income countries	Afghanistan, Bangladesh , Benin , Burkina Faso , Burundi , Central African Republic , Chad , Congo, Dem. Rep. ,Ghana , Guinea , Kyrgyz Republic , Madagascar , Malawi , Mali , Mozambique , Nepal , Niger and Uganda.
Low-middle income countries	Armenia , Belize , Bhutan , Bolivia , Cabo Verde , Cameroon , Djibouti , Ecuador , Egypt , El Salvador , Georgia, Guatemala, Guyana, Honduras, India, Jordan, Kenya, Lao, Moldova, Morocco, Nicaragua, Nigeria, Pakistan, Paraguay, Philippines, Sri Lanka, Sudan, Swaziland, Tajikistan, Thailand, Tunisia and Ukraine.
Upper-middle Income countries	Albania, Algeria, Argentina, Belarus, Botswana, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica ,Dominican Republic ,Fiji, Iran, Jamaica, Kazakhstan, Lithuania, Macedonia, FYR., Malaysia, Mauritius, Mexico, Montenegro, Panama, Peru, Romania, Russian Federation, Serbia, Seychelles, South Africa, St. Lucia, Suriname, Turkey, Uruguay and Vietnam.
High-income countries	Australia, Austria, Bahamas The, Barbados, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Rep., Latvia, Luxembourg, Malta, Netherlands, New Zealand, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom and United States.

Due to the availability of data, the choices of these countries were made. All the data are derived from annual country level observation taken from the Global Consumption and Income Projects (GCIP), International Financial Statistics (IFS), International Monetary Fund (IMF) , Global Stock Markets Factbook and supplemental S&P data, Standard & Poor's and the World Development Indicators, World Bank (2014) online database. Because of the limited data availability, the sample period of the study is from 2001 to 2014.

Table 4.2 Units of measurements variables

Variables	Definition	Data sources	Unit of measurement
Inequality	Gini coefficient of gross and net income	GCIP: Global Consumption and Income projects	Gini coefficient of gross and net income
Financial development one	Private credit by deposit money banks and other financial institutions to GDP[1]	International Financial Statistics (IFS), IMF	As the private credit/ GDP
Financial development two M3/PIB	Liquid liabilities (M3) as a percentage of GDP .World Bank (2014)	Global Stock Markets Factbook and supplemental S&P data, Standard & Poor's	(% of GDP)
Inflation	The change from previous year, consumer price index	World Development Indicators, World Bank (2014)	The consumer price index
Trade openness	Total exports and imports by GDP.	Financial Access Survey (FAS), IMF	
GDP per capita	Constant 2005 USD; country groups based on four income categories (low income, lower middle, upper middle and high income)"	World Development Indicators (WDI), World Bank (2014)	Which is Constant 2005 USD
Agricultural sector	As the share of GDP the value added by the agricultural sector	World Development Indicators, World Bank (2014)	The share of GDP

[1] According to the IMF and international financial statistics the long definition of the financial development is "Private credit by deposit money banks and other financial institutions to GDP, calculated using the following deflation method: {(0.5)*[Ft/P_et + Ft-1/P_et-1]}/[GDPt/P_at] where F is credit to the private sector, P_e is end-of period CPI and P_a is average annual CPI. Raw data are from the electronic version of the IMF's International Financial Statistics. Private credit by deposit money banks and other financial institutions (IFS lines 22d, 42d, FOSAOP and FFSAP); GDP in local currency (IFS line NGDP); end-of period CPI (IFS line PCPI); and average annual CPI is calculated using the monthly CPI values (IFS line PCPI)" World Bank (2014).

Government consumption	Total expenditure the government share	World Development Indicators, World Bank (2014)	Total expenditure (% of GDP)
population growth rate	Total Population	World Development Indicators, World Bank (2014)	Total population
Education	Enrolment in high school (% gross)	World Development Indicators, World Bank (2014)	(% gross)

Income inequality is measured on gross and net basis, where the gross income eliminates all the non-private sources of income, such as the pensioner's funds provided by the state, all social transfers to poor people, as well as social contributions, which are tax-free. All types of public deductions and transfers are included in the net income; therefore, the net income includes amounts that may be used for consumption and savings and what individuals have at hand. Other control variables were used that might have an effect on income inequality. These include the agricultural share sector economy and the GDP per capita for succeeding the hypothesis of Kuznets curve. The non-linear relationship in the inequality and growth by Kuznets hypothesis formed a statistical and economical model. The lower income inequality may be seen in the late and early phases of economic development but during the high stage of economic development, which is connected with urbanisation and industrialisation, the income inequality should be particularly high. Hereafter, included are the squared terms of the financial development and economic growth variables in the regression model.

Lastly, the econometric model to be estimated will also control for the government share of consumption and the inflation in the economy. There are various theories that predict that the better the access to the financial markets the better the rich can hedge against inflation; the high inflation debtors will benefit and when most contracts are written in nominal terms it will reduce the real debt burden. Therefore, the impact of inequality is sometimes not clear. The principle also applies to the government’s share in the economy. A strong determination indicates the large government share, which might also be strong in reducing the net income inequality. Also, rent-seeking activities might be caused by the large government shared by the powerful elite but small in government, which might lead to the increasing the income inequality.

4.3.2 Data transformation

This subsection will specify the regression models to be estimated and will outline the data transformations that were undertaken.

4.3.2.1 Natural log transformation

On all variables, the natural log transformation was performed. The log transformation of variables is important for allowing the coefficient values to be interpreted as elasticity, which assist the researchers to analyse the percentage changes between the two variables. Gujarati and Porter (2003) state that the log transformations also decrease the heteroscedasticity in the data sets.

4.4 Specification of empirical models

The study used the following variables: Gini coefficients, financial development-private credit/GDP, GDP per capita, inflation, agricultural sector, government consumption, access to finance, population and education, adopted from Jauch and Watzka (2016). In addition, population and education variables are added to specifications based on studies such as those conducted by Nikolosiki (2015), (linear and nonlinear) and others. The following regressions are the specified regressions model:

$$Lgini_{it} = \beta_1 + \beta_2 LFD1_{2it} + \beta_3 LFDD1_{3it} + \beta_4 LGDP_{4it} + \beta_5 LGGDP_{5it} + \beta_6 LINFL_{6it} + \beta_7 LPOP_{7it} + \beta_8 LEDUC_{8it} + \beta_9 LCONS_{9it} + \beta_{10} LAGRC_{10it} + \beta_{11} OPP_{11it} + \mu_t + \propto_i + \epsilon_{it} \quad \text{.....4.2}$$

$$Lgini_{it} = \beta_1 + \beta_2 LFD2_{2it} + \beta_3 LFDD2_{3it} + \beta_4 LGDP_{4it} + \beta_5 LGGDP_{5it} + \beta_6 LINFL_{6it} + \beta_7 LPOP_{7it} + \beta_8 LEDUC_{8it} + \beta_9 LCONS_{9it} + \beta_{10} LAGRC_{10it} + \beta_{11} OPP_{11it} + \mu_t + \propto_i + \epsilon_{it} \quad \text{.....4.2.1}$$

Where:

$Lgini_{it}$ = natural log of Gini coefficient.

$LFD1_{2it}$ = natural log of financial development one, which represents private credit divided by GDP; claims on the private sector by deposit money banks and other financial institutions.

$LFD2_{2it}$ = natural log of Liquid liabilities (M3) as a percentage of GDP.

$LFDD2_{3it}$ = the squared term of the logarithms of the Liquid liabilities (M3) as a percentage of GDP (% of GDP).

$LFDD1_{3it}$= the squared term of the logarithms of the private credit/ GDP, which is private credit divided by GDP.

$LGDP_{4it}$ = natural log of GDP per capita, which is constant 2000 USD; country groups based on four income categories (high, upper-middle, lower-middle and low income).
$LGGDP_{5it}$= the squared term of the logarithms of GDP per capita.
$LINFL_{6it}$= natural log of inflation, which is defined as consumer price index; change on previous year.
$LPOP_{7it}$= natural log of population growth rate.
$LEDUC_{8it}$= natural log of the enrolment in high school (% gross).
$LCONS_{9it}$ = natural log of Government consumption, which is defined as government share of total expenditure.
$LAGRC_{10it}$= natural log of agricultural sector, which is defined as value added by the agricultural sector as a share of GDP.

$LOPP_{11it}$= natural log of trade openness.

$\mu_t, \propto_i$ are the time-fixed and time effects for controlling the time trends and country-specific effects, respectively, which are unobservable. The year and country effects will be introduced in the model in order to test for robustness of results. The financial development as a private credit/GDP is the variable of interest and the other variables are the control variables in our model. The study is also concerned with the potential endogeniety in our regression model. Financial development may have an effect on income inequality and the reverse may occur where income inequality has an impact on financial development.

4.5 Estimation strategy

To assess the effects of financial development on income inequality, the panel data estimation techniques model is applied. The panel data model has more properties and advantages compared to time-series and cross-sectional techniques. According to Hsiao (2003), the panel data can be defined as “one that follows a given sample of individual’s over time and thus provides multiple observations on each individual in the sample”. Therefore, this is the main reason this study chose the panel data techniques over cross-sectional analysis used by other studies. The following are the panel data advantages compared to time series or cross-sectional data.

4.5.1 Panel data advantages

Baltagi and Kao (2001) and Hsiao (2003) suggest that the panel data have many advantages compared to time series or cross-sectional data, which gives the researchers the privilege in the identification of certain parameters or questions without making any restrictive assumptions. Below is the summary of the advantages in panel data analysis, which is the efficiency of parameters, Identification of parameters, Controlling for individual heterogeneity and the dynamics of adjustment.

4.5.1.1 Efficiency of parameters

The panel data parameters are efficiency, since the panel data are usually greater than time series data or cross-sectional data sets and independent variables. The panel data estimators are more accurate than other sources of data. They differ in two dimensions, which are individual and time.

4.5.1.2 Parameters identification

The problem of identification is reduced by the panel data, which may involve the identifications in the existence of measurement errors, the omitted variables robustness, endogenous regressors and the individual dynamics identifications. Therefore, this advantage can be seen in different angles or headings.

Controlling for individual heterogeneity

Individual firms, countries and states are heterogeneous according to panel data. Therefore, the main advantage here is that panel data analysis takes into account the issue of heterogeneity where else the time series and cross-sectional analysis studies do not control the heterogeneity problems, which increase the risk of getting biased results.

The dynamics of adjustment

Studying the panel data analysis is an advantage to be able to observe the dynamic adjustments. By using panel data analysis, complicated models are able to be studied, compared to time-series or cross-sectional analysis.

The following are steps that the study will follow when estimating the regression model:

Step one: to test the panel unit root or stationarity, in order to find that the variables are stationary at the level or high order differences. According to Gujarati and Porter (2003) regressing the variables that has a unit root or non-stationary results causes spurious regression. All the variables mentioned above were tested for stationarity using the augmented Dickey-Fuller test (ADF) since this became a popular method that is mostly used to test for unit root (Elder and Kennedy 2001). The other three-panel unit root was also tested (ie Hadri 2000, Levin, Lin et al. 2002, Im, Pesaran et al. 2003). Each test equation specifies the (1) individual intercept, (ii) individual intercept and trends (iii) none.

4.5.2 Pooled regression model

The second step will be running the pooled regression model, which assumes the non-existence of time and country-specific effects in the equation.

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it} + \beta_9 X_{9it} + \beta_{10} X_{10it} + \beta_{11} X_{11it} + \epsilon_{it} \quad 4.3$$

Equation 4.3 represents the pooled regression model, where each country is assumed to share the same intercept (β_1) and slope coefficients ($\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9 \; and \; \beta_{10}$). Note that i= 1…135, which denote the cross sectional countries in the dataset; while t=1…13 represent the 13 periods over while the analysis was undertaken. Y_{it} represents the natural log of gini coefficient of gross and net income while $X_{2it}, X_{3it}, X_{4it}, X_{5it}, X_{6it}, X_{7it}, X_{8it}, X_{9it} \; and \; X_{10it}$, represents, LFD1,LFDD1,LGDP,LGGDP,LINFL,LPOP,LEDUC,LCONS,LAGR and LACESS respectively. Further, note that ϵ_{it} are the random error terms with a mean value of zero, which are uncorrelated across individual countries and a constant variance.

4.5.3 Fixed effects model

Step three will be testing the fixed effects model:

$$Y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it} + \beta_9 X_{9it} + \beta_{10} X_{10it} + \beta_{11} X_{11it} + \epsilon_{it} \quad \text{.....4.4}$$

In equation 4.4 relaxes the assumption of the countries being identical hence the intercept term (β_{1i}) now captures individual country differences for each country (i) is allowed to vary (i.e. the country specific heterogeneity effects), while continue to maintain the assumption that the slope parameters are constant for all countries and for all time periods as we did in

the pooled regression model. The slope parameters must be interpreted as identical average responses across all countries and over different time periods.

Equation 4.3 assumes the zero of country-specific effect ($, \propto_i$) and time-fixed effects (μ_t). Therefore , $\propto_i$=0 and μ_t=0 respectively. The pooled model assumes that the error term (ϵ_{it}) are serially uncorrelated [E(e_t, e_{t-1}=0) and, lastly, strictly exogenous to the explanatory variables [E($x_1, x_2, x_{3,}$ e=0)]. Therefore, the consistent and unbiased estimates of equation 4.3 may result only if these assumptions hold.

The fixed effects have the following properties or characteristics:

- Related effects (i.e. the absence of unrelated effects on fixed effects model unlike the random effects model, where the existence of unrelated effects)
- Effects variance (i.e. The absence of the constant variance of the fixed effects unlike the random effects model)

4.5.4 The random effects model

The random effects model was also estimated where the individual countries are assumed to have been randomly drawn from a larger population, hence the heterogeneous components, that is, the intercept terms in the above fixed effect model are now seen as random terms. This assumption is captured in the following regression model.

$$Y_{it} = \overline{\beta_1} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it} + \beta_9 X_{9it} + \beta_{10} X_{10it} + \beta_{11} X_{11it} + (\mu_i + \epsilon_{it}) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 4.5$$

In equation 4.5, the random effects model continues to assume that all individual differences are captured by the intercept term ($\overline{\beta_1} + \mu_i$) but we also acknowledge that the individual countries in our sample were randomly selected. Hence, we treat the individual differences as random rather than fixed, as we did in the fixed effects models. Hence, the intercept term now comprises the population average ($\overline{\beta_1}$) and the random individual differences (μ_i) from the population average. This random individual differences (μ_i) are called the random effects and are analogous to the random error term; hence, in equation 4.5 it is grouped with the random regression errors (ϵ_{it}). Moreover, the same assumptions are made as for ϵ_{it},the error terms randomly distributed with a mean value of zero, are uncorrelated across individual countries and possess a constant variance.

The random effects have the following properties or characteristics:

- Unrelated effects E ($c_i/X_{i,}z_i$) =0
- Variance effects V($c_i/X_{i,}z_i$) =$\sigma_c{}^2$ < ∞ (homoscedastic)
- V($c_i/X_{i,}z_i$) =$\sigma_{c,i}{}^2(X_{i,}z_i)$< ∞ (heteroscedasticity)

Therefore, there is the assumption of constant variance on individual specific effects.

4.5.5 The Hausman test

The Hausman test is based on the idea that if there is no correlation between the regressors and the error terms then the fixed and random effects models will generate similar coefficient estimates. It has the following null and alternative hypothesis:

H_0: $\rho = o$

H_a: ρ not equal to zero.

Given $y_1 = z_1\partial_1 + \propto_1 y_2 + \mu_1$ ……..4.6

Equation 4.6 y_1 is the dependent variable (i.e. vector), z_1 is the exogenous variables (i.e. vector) and ∂_1 is the Mby M (MxM) coefficients matrix form, $y_2 \& \mu_1$ is the endogenous variable and error term respectively. Then Hausman derived equation 4.6 into the following reduced regression form:

$y_2 = z\Omega_2 + v_2$ (where Ω_2 is the MxM)

E (z'v_2) = 0

The endogeneity will exist only if E ($\mu_1 v_2$) is not equal to zero, which can be further tested by using linear projection of (μ_2 $on\, v_2$) in the error form as follows:

μ_1=$\rho_1 v_2 + e_1$

The y_1 is not endogenous if ρ_1=0 which can be tested by using the t-statistics running OLS.

4.5.6 The differencing GMM model by Arello and Bond (1991)

The dynamic pooled OLS and fixed effect method cannot account for the endogeneity problems, therefore, the GMM developed by (Arellano and Bond 1991) will be estimated.

The GMM system has its own characteristics such as removal of time-invariant individual specific effects by applying the differences of the explanatory variables.

The following is the set of moments conditions, which are formulated by differencing the GMM (orthogonalities):

$\underline{E}(z_{1,}\Delta e_1)=0$,

Where Δe_1 is the differenced uncorrelated serially error term and z_1 is the instrumental variable.

The matrix of instrumental variables can be written as follows by using the moment condition

$$z_1 = \begin{Bmatrix} y_{i1} & x_{i1} & 00 & \cdot\cdot & \cdot\cdot \\ . & y_{i1} & y_{i2} & x_{i1} & x_{i2} \\ . & . & y_{i1} & y_{i2} & y_{i3} \end{Bmatrix}$$

Which results in the following differenced error terms vector diagram:

$$\Delta e_1 = \begin{Bmatrix} \Delta e_{i3} \\ \Delta e_{i4} \\ \Delta e_{it} \end{Bmatrix}$$

Therefore, the differencing Surgen test will be run in order to test whether the internal instruments are weak or strong, since by differencing, the GMM will depend on internal instruments. Two hypothesis on the Surgen test the null that the internal instruments are weak and the other that is are not a weak.

4.6 Diagnostic tests

4.6.1 Unit root test

The OLS approach requires all the variables to be integrated [I(0)], meaning all the series should be stationary at level. According to Gujarati (1995), the stationary variables are those with a constant variance that are not serial correlated over time and constant covariance. The process is usually called white noise.

It is important to find out whether the variables are stationary at levels and first differences or high order differences, before running the standard regression techniques. If the non-stationary variables are regressed, the results may be spurious regression results (Gujarati and Porter 2003). The nonsense regression may seem good with significant variable

coefficients and higher R^2 but the bottom line is that the results are valueless since they are spurious. Therefore, the use of non-stationary variables makes the standard assumptions for asymptotic analysis invalid, hence the t-statistics will not follow the t-distribution and the F-ratios will not follow the F-distribution (Brooks 2014). For stationarity data to exist, the series must be differenced up to a certain number of times (Harris 1995).

All the variables mentioned above were tested for stationarity using the ADF test, which has become the popular method and mostly used test for unit root (Elder and Kennedy 2001). The other three-panel unit root was also tested (Hadri 2000, Levin, Lin et al. 2002, Im, Pesaran et al. 2003). Each test equation specified (1) individual intercept, (ii) individual intercept and trends,(iii) none.

4.6.1.1 (Levin, Lin et al. 2002)

The Levin, Lin et al. (2002) test abbreviated as LLC can be expressed by the following equations:

$$\Delta y_{i,t} = \rho\, y_{i,t-1} + \alpha_{0i} + \alpha_{1i,t} + u_{i,t} \quad \text{.....(8)},$$

where i= 1,2,3,4,……N and t=1,2,3,……T

The individual effects (α_1) as well as the time trends (t) are incorporated. The $u_{i,t}$ term is is independently distributed along the individuals and follows the directions of stationary invertible autoregressive moving average (ARMA), which results in the following expression for individual:

$$u_{i,t} = \sum_{z=1}^{\infty} \beta_{i,z} u_{i,t-z} + €_{i,t} \quad \text{.....(9)}$$

The above equation allows the two-way fixed effect and unit specific trends and unit specific fixed effects are included. The unit specific fixed effects are important component of heterogeneity, since the coefficients of lagged Y_i are limited to homogeneity across every unit of panel (Asteriou and Hall 2007). The main objective of the panel unit root is to reject the null hypothesis if it is false. The null hypothesis H_0 : P_i=p=0 series contains unit root against with alternative hypothesis of no unit root, hence the series is stationary H_0: P_i=p<0 for all i.

Unfortunately, the Levin, Lin et al. (2002) test is not without its limitations. The presence of cross-sectional correlation makes the test not applicable since it depends on independence

assumption across the individuals. The other major shortfall is that the autoregressive parameter is identical across the panel data.

H_0 : P_1=P_2=P_3=…….=P_n=p=0

H_a: [P_1=P_2=P_3=……= P_n=p<0

4.6.1.2 Im, Pesaran and Shin (IPS) Test

The Im, Pesaran et al. (2003) test continue extending the work of LLC to allow for the heterogeneity under the alternative hypothesis. The IPS can be expressed by the following equations:

$$y_{it} = \mu_i \phi_i(1) + \sum_{j=1}^{p_i+1} \mu_{ij} y_{i,t-j} + \varepsilon_{it}$$

$$i = 1,2,3,4, \dots, N \; t = 1,2,3,4, \dots, T$$

The IPS test is based on ADF test average across the groups Hurlin and Mignon (2007).

Where;

$$\mu_i \phi_i(1) = 1 - \sum_{j=1}^{p_i+1} \phi_{ij}$$

which is corresponding to the ADF (P_i) regression in the following form:

$$\Delta y_{i,t} = \gamma_i + \beta_i y_{i,t-1} + \sum_{j=1}^{p_i} \rho_{ij} \Delta y_{i,t-j} + \varepsilon_{it}$$

Where;

$$\gamma_i = \mu_i \phi_i(1), \beta_i = -\phi_i(1), \; \rho_{ij} = -\sum_{h=j+1}^{p_{i+1}} \phi_{ih}$$

Then IPS test the null hypothesis is given as:

$$H_0; \beta_i = 0, for \; all \; i$$

Meaning all the individuals followed the unit root processes or the non-stationary series.

The null hypothesis is tested in contrast to the following alternative hypothesis:

$$H_a; \beta_i < 0 \; for \; i = 1, \dots, N, \beta_i = 0 \; for \; i = N_{1+1}, N_{1+2}, \dots, N$$

IPS test combines the evidence that N unit root test performs the N cross-section units, the test assumes that the balanced panel is needed in order to perform the t-test; hence, T is similar to all cross-section units. The t-test for testing the $\beta_i = 0$ the $t - bar$ statistic is calculated as the average of individual test statistics as follows:

$$\bar{t}_{NT} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}(P_i, \rho_i)$$

where values are calculated from the mean (E[$t_{iT}/P_i = 1$]) and variance (Var [$t_{iT}/P_i = 1$]) for the t_{iT}statistics.

$$W_{\overline{t(P,\rho)}} = \frac{\sqrt{N}(\bar{t}_{NT} - \frac{1}{N}\sum_{i=1}^{N} E\{t_{iT}(P_i,0)|\beta_i = 0\}\ )}{\sqrt{\frac{1\sum_{i=1}^{N} var\{t_{iT}(P_i,0)|\beta_i = 0\}}{N}}}$$

the above equation represents standard normal distribution as $T \to \infty$ tracked by $N \to \infty$ successively (Guide 2007).

$\Delta y_{it} = s_t\left[\Delta y_{it} - \frac{1}{T-t}(\Delta y_{it+1} + \cdots + \Delta y_{iT})\right]$

The above test has low asymptotic power properties as proposed by Moon, Perron et al. (2006)

4.6.1.3 (Hadri 2000) test

The Hadri test assumes that all series are stationary around the deterministic trend and is also a first generation test. The Hadri test can be represented as,

$$y_{it} = \delta_{mi} d_{mt} + \varepsilon_{it}$$

Where the null hypothesis is as follows:

H_0: no unit root or stationarity

The Hadri test is extending the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root.

4.7 Classical linear regression model assumptions

The autocorrelation and heteroskedasticity econometric test was conducted on the model. The econometric test used to detect heteroskedasticity by means of Breusch-Pagan-Godfrey

test was used where the R-squared probability of less than 5 percent indicating the presence of heteroskedasticity and if R-squared is more than 5 percent indicating non-existence of heteroskedasticity. Nevertheless, the white cross-section test was used to correct the presence of heteroskedasticity.

Autocorrelation test was conducted where the OLS estimators are no longer BLUE (Gujarati 1995). The Durbin-Watson test statistic is the commonly used test to detect the presence of autocorrelation, which is caused by omitting the important variable in a regression model. As the commonly used rule of thumb, if the DW-statistics are closer to two than one it may be concluded that there is no autocorrelation presence. Therefore, this study is using the Breusch-Godfrey serial correlation LM test to detect the presence of autocorrelation since it provides the most reliable results compared to DW-statistics.

4.8 Testing for co-integration

The regression is given as follows:

$$y_t = \beta_1 + \beta_2 X_t + \varepsilon_t$$

With residuals: $\varepsilon_t = y_t - \beta_1 - \beta_2 X_t$

y_t and X_t are understood to be cointergrated in the long run when $\varepsilon_t \sim I(0)$.

4.8.1 The Kao co-integration test DF and ADF test (Kao 1999)

H_0: no cointegration

H_A: cointegration

In the Kao test, the null hypothesis suggests that there are no cointegration variables, meaning that the variables are not moving together over time. If the null hypothesis is rejected the alternative hypothesis will be appropriate, meaning that the variables are moving together over time. The Kao test combines the ADF and DF test to measure the cointegration in a panel data analysis.

The DF-type test will be calculated from fixed effects (within) residuals as follows:

$$y_{it} = a_i + \beta X_{it} + \varepsilon_{it}$$

Where the residuals based on panel co-integration test are applied to the model as follows:

$\varepsilon_{it} = \rho \varepsilon_{it-1} + v_{it}$

Where the OLS estimates of ρ and t_p are given as follows:

$$\rho = \frac{\sum_{i=1}^{N}\sum_{t=2}^{T}\varepsilon_{it}\varepsilon_{it-1}}{\sum_{i=1}^{N}\sum_{t=2}^{T}{\varepsilon_{it}}^{2}}$$

And

$$t_p = \frac{(\rho-1)\sqrt{\sum_{i=1}^{N}\sum_{t=2}^{T}{\varepsilon_{it-1}}^{2}}}{s_e}$$

With

$${S_e}^{2} = \frac{1}{NT}\sum_{i=1}^{N}\sum_{t=2}^{T}(\varepsilon_{it} - \rho\varepsilon_{it-1})^2$$

Therefore, the null hypothesis of no cointegration can be written as follows:

H_0: no cointegration $\rho = 1$ (in $\varepsilon_{it} = \rho\varepsilon_{it-1} + v_{it}$)

Also, Kao proposes four different DF-type statistics as well as an ADF-type statistics as follows:

$$DF_\rho = \frac{\sqrt{NT}}{\sqrt{10.2}}(\rho - 1) + 3\sqrt{N}$$

$$DF_\rho = \sqrt{1{,}25\ t_p} + \sqrt{1.875N}$$

$${DF_\rho}^{*} = \frac{"\sqrt{NT}(\rho-1)+\frac{3\sqrt{N{\sigma_v}^2}}{{\sigma_{OV}}^2}}{"\sqrt{3}+\frac{36{\sigma_v}^4}{5{\sigma_{ov}}^4}"}$$

and

$${DF_\rho}^{*} = \frac{t_p + \frac{\sqrt{6N\sigma_v}}{2\sigma_{ov}}}{\sqrt{\frac{{\sigma_{ov}}^2}{2{\sigma_v}^2}\frac{3{\sigma_v}^2}{10{\sigma_{ov}}^2}}}$$

Where, ${\sigma_v}^2 = \sum_{yy} - \sum_{yx}\sum_{yy}{}^{-1}{}_{xx}$

And ${\sigma_{ov}}^2 = \Omega_{yy} - \Omega_{yy}{\Omega_{xx}}^{-1}$

DF_ρ and DF_t test for cointegration based on the strong exogeneity of the regressors and errors, while ${DF_\rho}^{*}$ and ${DF_t}^{*}$ test for cointegration with endogenous relationship between regressors and errors.

4.9 Chapter summary

This chapter has given a comprehensive account of the econometric methodology the study will be using in the empirical analysis in order to evaluate the impact financial development has on income inequality in the society and thus address the objectives of the study emphasised in the first chapter of this thesis. The study has listed the chosen 135 developed and developing countries based on their data availability. All variables names have been given an explanation and the econometric techniques that will be used are also mentioned.

Lastly, the estimation results of simple OLS model, random effect model, the fixed effects model and differencing GMM system are presented in chapters 5 and 6.

CHAPTER 5: FIXED AND RANDOM EFFECTS MODEL

5.0 Introduction

This chapter presents the results of the study. Firstly, preliminary data consisting of summary statistics and a correlation matrix is presented. Model specification tests are presented in order to determine the robustness of the estimates. Results of different estimators like pooled OLS, fixed and random effect are presented and discussed.

5.1 Stationarity test results

5.1.1 PANEL UNIT ROOT TEST

Many literature studies suggest that a unit root test based on individual time series is less effective than panel-based unit root tests (Hadri 2000). As stated in the methodology section, the four-unit root testing techniques used in this study included those by Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003), Fisher–type tests employing ADF and PP tests (Maddala and Wu 1999; Choi 2001; Hadri 2000). The SIC were used to select the appropriate lag length for the four-unit root test and the lag length maximum was set at one. Unit root test probabilities were computed using asymptotic chi-square distribution and the rest of the test assumes the asymptotic normality. The supplement of these tests was used

using the ADF test. The followings tables represent the results of the tests at levels and first differences for LLC, IPS, ADF and PP panel root test.

The test results indicate that the variables of interest, which are Gini coefficient one and two respectively, financial development and GDP are stationary or I(0) on Table 5.1 in appendix C, hence no need for further adjustment such as panel co-integration test to make them stationary. Additionally, the squared of GDP, population, government final consumption expenditure, trade openness and inflation seems to be also stationary, meaning that from now on these variables can be used in levels. The rest of the variables in Table 5.2 in appendix C clearly have the unit root and further adjustments are needed to make sure that they will not complicate the modelling attempts. Table 5.2 indicates the panel unit root in first-difference test results. The full test results are found in Appendix C.

Table 5.3 Summary of stationarity test results for international countries

Variables	Status	Order of Integration
LGINI1	Stationary at level	I(0)
LGINI2	Stationary at level	I(0)
LFD1	Stationary at level	I(0)
LFD2	Stationary at first difference	I(1)
LFDD2	Stationary at first difference	I(1)
LFDD1	Stationary at first difference	I(1)
LGDP	Stationary at level	I(0)
LGDP	Stationary at level	I(0)
LAGRC	Stationary at first difference	I(1)
LCONS	Stationary at level	I(0)
LPOP	Stationary at level	I(0)
LEDUC	Stationary at level	I(0)
LTOP	Stationary at level	I(0)
LINFL	Stationary at level	I(0)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.3 summarises the panel unit root test results for international countries. As indicated on the table, all variables are stationary at the level, integrated of order zero I(0). The four variables, therefore, are integrated of order one I(1), meaning they become stationary upon first differencing.

5.1.1 STATIONARY TEST RESULTS FOR INCOME GROUPS OF COUNTRIES

The table's 5.4 to 5.15 in appendix C summarises the panel unit root test results of the LLC, IPS, ADF and PP for the variables mentioned. Four groups of countries are classified according to their income level by employing the World Bank Atlas method (high income above $ 11,906, upper-middle income range from $3,856 to 11,905, middle-income countries from $976 to $3,855 and low-income countries are those below $975, samples according to GDP).

According to the results in Table 5.4 in appendix C, the Gini coefficient, inflation, trade openness and government final consumption expenditure are stationary at the level, meaning that they are integrated of order zero I(0). The rest of the variables are clearly stationary at first differencing, therefore, they are denoted by I(0) on Table 5.5 in appendix C, which is the integration of order one.

Table 5.6 Summary of stationarity test results for low-income countries

Variables	Status	Order of Integration
LGINI1	Stationary at first difference	I(1)
LGINI2	Stationary at level	I(0)
LFD1	Stationary at first difference	I(1)
LFD2	Stationary at first difference	I(1)
LFDD2	Stationary at first difference	I(1)
LFDD1	Stationary at first difference	I(1)
LGDP	Stationary at first difference	I(1)
LGGDP	Stationary at first difference	I(1)
LAGRC	Stationary at first difference	I(1)
LCONS	Stationary at level	I(0)
LPOP	Stationary at first difference	I(1)
LEDUC	Stationary at first difference	I(1)
LTOP	Stationary at level	I(0)

LINFL	Stationary at level	I(0)

Source: Compiled by the author

The Table 5.6 summarises the panel unit root test results for low-income countries. As indicated in the table 5.6 four variables are stationary at the level, integrated of order zero I(0). The rest of the variables, therefore, are integrated of order one I(1), meaning are becoming stationary at first differencing.

Table 5.9 Summary of stationarity test results for the low middle-income countries

Variables	Status	Order of Integration
LGINI1	Stationary at first difference	I(1)
LGINI2	Stationary at level	I(0)
LFD1	Stationary at level	I(0)
LFD2	Stationary at first difference	I(1)
LFDD2	Stationary at first difference	I(1)
LFDD1	Stationary at first difference	I(1)
LGDP	Stationary at first difference	I(1)
LGGDP	Stationary at first difference	I(1)
LAGRC	Stationary at first difference	I(1)
LCONS	Stationary at level	I(0)
LPOP	Stationary at level	I(0)
LEDUC	Stationary at first difference	I(1)
LTOP	Stationary at level	I(0)
LINFL	Stationary at level	I(0)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

As indicated on Table 5.7 in appendix C panel unit root test results for Gini coefficient two, financial development, government final consumption expenditure, population, inflation and trade openness are stationary at level and are denoted as I(0) on Table 5.9, meaning that are integrated of order zero. The remaining variables becoming stationary at first differencing on Table 5.8; they are denoted as I(1), which is the integration of order one. Full test results are found in Appendix C.

Table 5.12 summary of stationarity test results for the upper middle-income countries

Variables	Status	Order of Integration
LGINI1	Stationary at level	I(0)
LGINI2	Stationary at level	I(0)
LFD1	Stationary at first difference	I(1)
LFD2	Stationary at first difference	I(1)
LFDD2	Stationary at first difference	I(1)
LFDD1	Stationary at first difference	I(1)
LGDP	Stationary at first difference	I(1)
LGGDP	Stationary at first difference	I(1)
LAGRC	Stationary at first difference	I(1)
LCONS	Stationary at level	I(0)
LPOP	Stationary at level	I(0)
LEDUC	Stationary at level	I(0)
LTOP	Stationary at level	I(0)
LINFL	Stationary at level	I(0)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Tables 5.10 to 5.12 in appendix C indicate the panel unit root for upper-middle-income countries. Full panel unit root test results are found in appendix C. The two dependent variables, which are the variables of interest such as Gini coefficient one and two respectively are stationary at the level, therefore, no further adjustments are needed. Government final consumption expenditure as a percentage of GDP, population, education, trade openness ratio and inflation are stationary at the level, meaning that are integrated of order zero I(0). The remaining variables are stationary after first differencing, therefore, are denoted as I(1), which is the integration of order one.

Table 5.15 Summary of stationarity test results for the high-income countries

Variables	Status	Order of Integration
LGINI1	Stationary at level	I(0)
LGINI2	Stationary at first difference	I(1)
LFD1	Stationary at first difference	I(1)
LFD2	Stationary at first difference	I(1)
LFDD2	Stationary at first difference	I(1)
LFDD1	Stationary at first difference	I(1)

LGDP	Stationary at level	I(0)
LGGDP	Stationary at level	I(0)
LAGRC	Stationary at first difference	I(1)
LCONS	Stationary at level	I(0)
LPOP	Stationary at level	I(0)
LEDUC	Stationary at level	I(0)
LTOP	Stationary at first difference	I(1)
LINFL	Stationary at level	I(0)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Tables 5.13 to 5.15 in appendix C indicate the panel unit root for high-income countries stationary at the level I(0) and stationary at first differences I(1) variables. Gini coefficient one, GDP, the squared term of GDP, government final consumption expenditure, population, education and inflation rate are stationary at level and are denoted by I(0), meaning that they are integrated of order zero. The remaining variables they are integrated of order I(1), meaning that are stationary at first differencing.

5.2 Descriptive statistics

5.2.1 Descriptive statistics for international countries

Tables 5.16 to 5.19 in appendix C indicate the summary of different equation variables used in the study. The annual data average for each country was calculated for the period between 1970 to 2014. Tables 5.16 to 5.19 also emphasise the maximum and minimum variables for the study, to know whether the observed variables are outliers or they are within the expected range. It is a well known that high rate of skewness is subjected to the time series data (Levine 1997, Alfaro, Chanda et al. 2004, Levine 2005). This is caused by the trend line with many existences of outliers along the line. From tables 5.16 to 5.19 of descriptive statistics, the researcher check whether the data are normally distributed or not using the Jarque-Bera test of normality. In the normality test, the null hypothesis assumes that the series are normally distributed. Likewise, check the symmetric variables nature using the mean based coefficients of kurtosis and skewness.

Table 5.16 in appendix C indicates that the values of the observed variables have a long tail to the left, meaning that they have a negative skewness for six of the eleven variables and

for the positive skewness a tail to the right. According to the observed probability results from tables 5.16 to 5.19 in appendix C, the variables are not normally distributed since the Jarque-Bera probability p-value is less than 0.005 percent. The kurtosis (greater than 3) and the skewness (different from zero) also indicate that these variables are not normally distributed. From Table 5.19 in appendix C the null hypothesis is formally accepted since the Jarque-Bera test P-value for financial development two (FD2) is greater than 0.05.

5.3 Correlation analysis

In the economic data, the correlation analysis is one of the statistical methods that are essential and widely employed to identify the extent of linear association between variables. The researcher used the correlation analysis to test whether the explanatory variables are correlated to one another for the purposes of assessing the extent of the multicollinearity problems that might exist. If the two quantitative variables are either associated or connected then a correlation relationship exists. The r coefficient denotes the correlation coefficient and can range between -1 and +1. If there is no direct relationship between the two variables than the value of correlation coefficient will be zero.

When the two or more variables are correlated and result in the spurious and redundant information of the response, the multicollinearity occurs (Farrar and Glauber 1967). A correlation of r<0,3 is regarded as low correlation, whilst a correlation of r>0,8 is considered as high correlation (Field 2013). For each country, category is represented by correlation matrix from tables 5.20 to 5.23 in appendix C.

The obtained results from tables 5.20 to 5.23 are mixed. The high correlation amongst a few of the variables and between the considered variables of interest are found to be relatively low.

5.4 Panel regression analysis

The following tables contain the regression estimates of the pooled regressions model.

5.4.1 Pooled regression

Table 5.24: The pooled OLS regression results for regression 1

Dependent variable: income inequality ($LGINI_{2it}$)	Regression 1	
Independent variables	**variable**	**coefficient**
Financial development one	LFD_{1it}	0.022780 (0.015986)
Squared term of Financial development one	$LFDD_{1it}$	-0.003297 (0.002463)
GDP per capita	$LGDP_{it}$	0.049887** (0.020797)
Squared term of GDP per capita	$LGGDP_{it}$	-0.009302*** (0.001204)
Agricultural sector	$LAGRC_{it}$	-0.033863*** (0.005145)
Government consumption	$LCONS_{it}$	-0.033319*** (0.008331)

population growth rate	$\mathrm{LPOP_{it}}$	-0.004523** (0.002093)
Education	$\mathrm{LEDUC_{it}}$	0.017389*** (0.005886)
openness	$\mathrm{LTOP_{it}}$	-0.044924*** (0.006132)
Inflation	$\mathrm{LINFL_{it}}$	-0.012081*** (0.002291)
Constant	β_0	4.321383*** (0.105124)
R-square		0.645558
Adjusted R-square		0.644398

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors.
Source: Compiled by the author

$$\mathbf{LGINI_{2it}}=\boldsymbol{\beta_1}+\boldsymbol{\beta_2 LFD_{1it}}+\boldsymbol{\beta_3 LFDD_{1it}}+\beta_4 LGDP_{it}+\beta_5 LGGDP_{it}+\beta_6 LAGRC_{it}+\beta_7 LCONS_{it}+\beta_8 LPOP_{it}+\beta_9 LEDUC_{it}+\beta_{10} LTOP_{it}+\beta_{11} LINFL_{it}+\epsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots 5.1$$

Regression 1 represents the pooled regression model, where each country is assumed to share the same intercept (β_1) and slope coefficients ($\beta_2, \beta_3 \ldots\ldots and \beta_{11}$). Note that i= 1…142 which denote the cross-sectional countries in the dataset; while t=1…45, represent the 45 time periods while the analysis was undertaken. L represents the natural log of variables. Further, note that ϵ_{it} are the random error terms with a mean value of zero, uncorrelated across individual countries and a constant variance. The model suggests that in regression 1 the financial development, which indicate the private credit by deposit money banks and other financial institutions to GDP (LFD1) has a positive relationship with income inequality but the relationship is statistically insignificant. The squared term of financial development (LFDD1) is negatively related to income inequality. All the other control variables like the squared of GDP, agriculture, government final consumption expenditure, population, trade openness and inflation have a negative impact on income inequality over time for all the slope coefficients are statistically significant at the conventional levels. GDP and education are also significant at the conventional levels and positively related to income inequality.

The coefficient may be interpreted as follows: A 1 percent rise in LGDP causes 0.049887 percent rise in LGini2. Moreover if one takes the derivative at the turning point:

$$\partial LGini2 / \partial LGDP = 0.0499 - 0.0186 LGDP = 0$$

$$= 0.0186LGDP = 0.0499$$

$$LGDP = 2.683$$

$$GDP = 14.63$$

Beyond this threshold level of $14,63 per capita GDP per annum inequality falls, however this magnitude is implausibly small.

Further, a 1 percent rise in LEDUC causes a 0.017389 percent rise in LGini2, in short this demonstrates empirically that a rise in the education level of an economy increases inequality. Similar findings were arrived at by (Enowbi et al. 2010). Finally, the opposite is expected on LGGDP, LAGRC, LCONS, LPOP, LTOP and LINFL respectively (see Annexure B). Therefore, a unit percentage increase in LGGDP, LAGRC, LCONS, LPOP, LTOP and LINFL will cause a decline in LGINI2 by -0.009302, -0.033863, -0.033319, -0.004523, -0.044924 and -0.012081 percent, respectively. Nasreddine and Mensi (2016) and Jauch and Watzka (2016) have obtained similar results in regard to all these variables. In the pooled model in regression 1, the model fits the data and the model is statistically significant (R^2 = 0.646668, p-value=0.00). The adjusted R^2 is 0.644398, which means 64 percent of Gini coefficient variation is explained by the variation in LFD1, LFDD1, LGDP, LGGDP, LAGRC, LCONS, LPOP, LEDUC, LTOP and LINFL variables in the model.

Table 5.25: The pooled OLS regression results for regression 2

Dependent variable: income inequality ($\mathbf{LGINI_{2it}}$)	**Regression 2**	
Independent variables	**variable**	**coefficient**
Financial development two	$\mathrm{LFD_{2it}}$	-0.040386 (0.034000)
Squared term of Financial development one	$\mathrm{LFDD_{2it}}$	0.004100 (0.004400)
GDP per capita	$\mathrm{LGDP_{it}}$	0.062027*** (0.020271)
Squared term of GDP per capita	$\mathrm{LGGDP_{it}}$	-0.010048*** (0.001173)
Agricultural sector	$\mathrm{LAGRC_{it}}$	-0.036034*** (0.005177)
Government consumption	$\mathrm{LCONS_{it}}$	-0.027735*** (0.008661)
population growth rate	$\mathrm{LPOP_{it}}$	-0.003714*

		(0.002072)
Education	$\mathrm{LEDUC_{it}}$	0.017242*** (0.005921)
openness	$\mathrm{LTOP_{it}}$	-0.043424*** (0.006192)
Inflation	$\mathrm{LINFL_{it}}$	-0.015271*** (0.002259)
Constant	β_0	4.378844*** (0.107706)
R-square		0.644159
Adjusted- R-square		0.641854

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

$$\mathbf{LGINI_{2it}}=\beta_1+\boldsymbol{\beta_2 LFD_{2it}}+\boldsymbol{\beta_3 LFDD_{2it}}+\beta_4 LGDP_{it}+\beta_5 LGGDP_{it}+\beta_6 LAGRC_{it}+\beta_7 LCONS_{it}+\beta_8 LPOP_{it}+\beta_9 LEDUC_{it}+\beta_{10} LTOP_{it}+\beta_{11} LINFL_{it}+\epsilon_{it} \quad \text{.....5.2}$$

The model suggests that in regression 2 the financial development, which is the liquid liabilities (M3) as a percentage of GDP (LFD2) is negatively related to income inequality and the squared term of financial development (LFDD2) is positively related to income inequality but the relationships are statistically insignificant.

All the other control variables like the squared of GDP, agriculture, government final consumption expenditure, population, trade openness and inflation have a negative impact on income inequality over time for all the slope coefficients are statistically significant at the conventional levels. GDP and education are also significant at the conventional levels and positively related to income inequality.

The coefficient may be interpreted as follows: A one percent rise in LGDP causes 0.062027 percent rise in LGini2. The threshold effects using the same approach as above, suggests that a per capita income of above $21,88 results in inequality falling, however this magnitude to too small to make any practical sense of the results. Further, a one percent rise in LEDUC causes a 0.017242 percent rise in LGini2. Finally, the opposite is expected on LGGDP, LAGRC, LCONS, LPOP, LTOP and LINFL respectively, the value of the coefficient is

negative. Meaning that when the coefficient is declined by a percentage, there will be an inverse for income inequality (see Annexure B).

Therefore, a unit increase in LGGDP, LAGRC, LCONS, LPOP, LTOP and LINFL will cause a decline in LGINI2 by -0.010048, -0.036034, -0.027735, -0.003714, -0.043424 and -0.015271 respectively. The pooled model in regression 2, one can conclude that the model fits the data and the model is statistically significant (R^2 = 0.644159, p-value=0.00). The adjusted R^2 is 0.641854, which means 64 percent of gini coefficient variation is explained by LFD2, LFDD2, LGDP, LGGDP, LAGRC, LCONS, LPOP, LEDUC, LTOP and LINFL variables in the model.

Table 5.26: The pooled OLS regression results for regression 3

Dependent variable : income inequality ($\mathbf{LGINI_{1it}}$)	**Regression 3**	
Independent variables	**variable**	**coefficient**
Financial development one	$\mathrm{LFD_{1it}}$	0.008951*** (0.003388)
Squared term of Financial development one	$\mathrm{LFDD_{1it}}$	0.001707*** (0.000491)
GDP per capita	$\mathrm{LGDP_{it}}$	0.488785*** (0.023485)
Squared term of GDP per capita	$\mathrm{LGGDP_{it}}$	-0.038204*** (0.001385)
Agricultural sector	$\mathrm{LAGRC_{it}}$	-0.083278*** (0.006528)
Government consumption	$\mathrm{LCONS_{it}}$	-0.021976** (0.009623)
population growth rate	$\mathrm{LPOP_{it}}$	-0.021124***

		(0.002433)
Education	$\mathrm{LEDUC_{it}}$	-0.123305*** (0.007132)
openness	$\mathrm{LTOP_{it}}$	-0.021071*** (0.008014)
Inflation	$\mathrm{LINFL_{it}}$	-0.005837** (0.002930)
Constant	β_0	-1.022607*** (0.124794)
R-square		0.595670
Adjusted- R-square		0.594354

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

$$\mathbf{LGINI_{1it}}=\beta_1+\boldsymbol{\beta_2 LFD_{1it}}+\boldsymbol{\beta_3 LFDD_{1it}}+\beta_4 LGDP_{it}+\beta_5 LGGDP_{it}+\beta_6 LAGRC_{it}+\beta_7 LCONS_{it}+\beta_8 LPOP_{it}+\beta_9 LEDUC_{it}+\beta_{10} LTOP_{it}+\beta_{11} LINFL_{it}+\epsilon_{it} \quad \text{.....5.3}$$

The model suggests that on regression 3 the financial development, which indicates the private credit by deposit money banks and other financial institutions to GDP (LFD1) has a significant and positive relationship to income inequality. The squared term of financial development (LFDD1) is positively related to income inequality. Applying the optimal condition $\partial LGINI/_{LFD1} = 0$ to estimate the threshold for financial development, similar to the approach used above, results in a threshold value for the LFD1 = 13,695, which suggests that inequality in an economy increases when this threshold value of private credit deposits to GDP ratio is exceeded. Similarly, solving the optimal condition for $\partial LGINI/_{LGDP} = 0$, results in threshold GDP =$601,85 which is higher than the previous two regression estimates but remains implausibly small.

All the other control variables agriculture (LGRC), government final consumption expenditure (LCONS), population (LPOP), trade openness (LTOP) and inflation (LINFL) have a negative impact on income inequality over time for all the slope coefficients are statistically significant at the conventional levels. GDP is also significant at the conventional levels and positively related to income inequality.

The pooled model in regression 3, the results conclude that the model fits the data and the model is statistically significant (R^2 = 0.595670, p-value=0.00). The adjusted R^2 is 0.594354, which means 59 percent of Gini coefficient variation is explained by the variation in LFD1, LFDD1, LGDP, LGGDP, LAGRC, LCONS, LPOP, LEDUC, LTOP and LINFL variables in the model.

Table 5.27: The pooled OLS regression results for regression 4

Dependent variable: income inequality ($\mathbf{LGINI_{1it}}$)	**Regression 4**	
Independent variables	**variable**	**coefficient**
Financial development two	$\mathrm{LFD_{2it}}$	-0.085766** (0.034153)
Squared term of Financial development one	$\mathrm{LFDD_{2it}}$	0.012953*** (0.004560)
GDP per capita	$\mathrm{LGDP_{it}}$	0.513144*** (0.024292)
Squared term of GDP per capita	$\mathrm{LGGDP_{it}}$	-0.039394*** (0.001432)
Agricultural sector	$\mathrm{LAGRC_{it}}$	-0.082103*** (0.006665)
Government consumption	$\mathrm{LCONS_{it}}$	-0.014585

		(0.009849)
population growth rate	$\mathrm{LPOP_{it}}$	-0.018896*** (0.002376)
Education	$\mathrm{LEDUC_{it}}$	-0.119946*** (0.007195)
openness	$\mathrm{LTOP_{it}}$	-0.022293*** (0.008082)
Inflation	$\mathrm{LINFL_{it}}$	-0.009743*** (0.002869)
Constant	β_0	-1.013020*** (0.125002)
R-square		0.596699
Adjusted- R-square		0.595377

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

$$\mathbf{LGINI_{2it}}=\beta_1+\boldsymbol{\beta_2 LFD2_{1it}}+\boldsymbol{\beta_3 LFDD_{2it}}+\beta_4 LGDP_{it}+\beta_5 LGGDP_{it}+\beta_6 LAGRC_{it}+\beta_7 LCONS_{it}+\beta_8 LPOP_{it}+\beta_9 LEDUC_{it}+\beta_{10} LTOP_{it}+\beta_{11} LINFL_{it}+\epsilon_{it} \quad \text{.....5.4}$$

The model suggests that on regression 4 the financial development, which is the liquid liabilities (M3) as a percentage of GDP (LFD2) is negatively related to income inequality and the squared term of financial development (LFDD2), is positively related to income inequality but the relationship is statistically significant at the conventional level. An estimate of the optimal condition $\partial LGINI/_{LFD2} = 0$, suggests that above the threshold level for LFD2= 27,39 results in a rise in inequality.

All the other control variables which include agriculture, population, education, trade openness and inflation have a negative impact on income inequality over time for all the slope coefficients are statistically significant at the conventional levels. GDP is also significant at the conventional levels and positively related to income inequality. Government final consumption expenditure is also negatively related to income inequality but the relationship is statistically insignificant in the model.

The pooled model in regression 4, conclude that the model fits the data and the model is statistically significant (R^2 = 0.596699, p-value=0.00). The adjusted R^2 is 0.595377, which

means 60 percent of Gini coefficient variation is explained by variation in LFD2, LFDD2, LGDP, LGGDP, LAGRC, LCONS, LPOP, LEDUC, LTOP and LINFL variables in the model.

The serious concern with the pooled regressions models is that it makes a strong assumption that all countries are the sample exhibit identical responses (homogenous) to changes in the explanatory variables. The countries in our dataset a quite diverse (heterogeneous), hence each is likely to be significantly different from the other, technically it implies that each country ought to have a unique intercept term (which captures the heterogeneous effects). Hence, the more appropriate model will be using the panel data approach to estimate a fixed effect model where the heterogeneity effects are taken into account for each country through the estimation of a unique intercept term per country.

5.4.2 Fixed effect regression analysis

In regressions from Table 5.28 to Table 5.34 for fixed effect we relax the assumption of the countries being identical, hence the intercept term (β_{1i}) now captures individual country differences for each country (i) is allowed to vary (ie. the country specific heterogeneity effects), while we continue to maintain the assumption that the slope parameters are constant for all countries and for all time periods as we did in the pooled regression model. The slope parameters must be interpreted as identical average responses across all countries and over different time periods.

Table 5.28: The Fixed-effect regression results for regression 1

Dependent variable: income inequality ($\mathbf{LGINI_{2it}}$)	**Regression 1**	
Independent variables	**variable**	**coefficient**
Financial development one	$\mathrm{LFD_{1it}}$	0.036570*** (0.013076)
Squared term of Financial development one	$\mathrm{LFDD_{1it}}$	-0.003961* (0.002051)
GDP per capita	$\mathrm{LGDP_{it}}$	-0.487181*** (0.042244)
Squared term of GDP per capita	$\mathrm{LGGDP_{it}}$	0.025709*** (0.002583)
Agricultural sector	$\mathrm{LAGRC_{it}}$	0.015804** (0.007391)
Government consumption	$\mathrm{LCONS_{it}}$	-0.000381

		(0.008673)
population growth rate	LPOP_{it}	0.086578*** (0.014714)
Education	LEDUC_{it}	0.040717*** (0.009744)
openness	LTOP_{it}	0.018792*** (0.006826)
Inflation	LINFL_{it}	-0.012034*** (0.001415)
Constant	β_0	4.212579*** (0.255534)
R-square		0.917238
Adjusted- R-square		0.910986

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to financial development and GDP together with their respective squared terms, suggest that there are threshold effects are significant. Optimal estimates of the respective threshold terms are 148.41 and 14913.17 respectively. In regard to the Financial Development threshold, the results suggest that beyond the threshold ratio of 148.41 inequality declines. In regard to GDP beyond threshold value of per capita income of $14 913.1 per annum inequality increases. LCONS and LINFL are the statistically significant variables that have a negative impact on the income inequality while government consumption is insignificant at the conventional significance levels. All other control variables that include LPOP, LEDUC, LAGRC, LGGDP and LTOP are positive and significant in the fixed effect regression model. The redundant fixed effects test (Table 5.29 in appendix C) for the equality of the intercept terms (ie. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

Table 5.30: The Fixed-effect regression results for regression 2

Dependent variable: income inequality (LGINI_{2it})	**Regression 2**	
Independent variables	**variable**	**coefficient**
Financial development two	LFD_{2it}	0.076904** (0.035090)
Squared term of Financial development two	LFDD_{2it}	-0.009048*

		(0.004822)
GDP per capita	$LGDP_{it}$	-0.448032*** (0.041340)
Squared term of GDP per capita	$LGGDP_{it}$	0.023490*** (0.002493)
Agricultural sector	$LAGRC_{it}$	0.010537 (0.007432)
Government consumption	$LCONS_{it}$	0.000340 (0.008939)
population growth rate	$LPOP_{it}$	0.072922*** (0.014898)
Education	$LEDUC_{it}$	0.040673*** (0.009755)
openness	$LTOP_{it}$	0.020598*** (0.006872)
Inflation	$LINFL_{it}$	-0.013671*** (0.001406)
Constant	β_0	4.189227*** (0.272269)
R-square		0.916413
Adjusted- R-square		0.910045

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

In regard to financial development and GDP together with their respective squared terms suggest that there are threshold effects are significant. Optimal estimates of the respective threshold terms are 72.24 and 14328.42 respectively. In regard to the Financial Development threshold, the result suggests that beyond the threshold ratio of 72.24 inequality declines. In regard to GDP beyond threshold value of per capita income of $14 328.42 per annum inequality increases.

The fixed effect model suggests that LINFL is statistically significant variable that has a negative impact on the income inequality. All other control variables like LPOP, LEDUC, LAGRC, LCONS, LGGDP and LTOP are positive and significant in the fixed effect

regression model while government consumption and agriculture are insignificant at the conventional significance levels.

The redundant fixed effects test (Table 5.31 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

Table 5.32: The Fixed-effect regression results for regression 3

Dependent variable: income inequality ($LGINI_{1it}$)	**Regression 3**	
Independent variables	**variable**	**coefficient**
Financial development one	LFD_{1it}	0.006888**
		(0.002760)
Squared term of Financial development one	$LFDD_{1it}$	-0.000199
		(0.000369)
GDP per capita	$LGDP_{it}$	0.303838***
		(0.038900)
Squared term of GDP per capita	$LGGDP_{it}$	-0.019791***
		(0.002524)
Agricultural sector	$LAGRC_{it}$	-0.031144***
		(0.008241)
Government consumption	$LCONS_{it}$	-0.011919
		(0.009428)
population growth rate	$LPOP_{it}$	-0.026491*
		(0.014322)
Education	$LEDUC_{it}$	-0.029782***
		(0.009430)
Openness	$LTOP_{it}$	0.035168***
		(0.007449)
Inflation	$LINFL_{it}$	-0.006177***
		(0.001690)
Constant	β_0	-1.418551***
		(0.254499)
R-square		0.907660
Adjusted- R-square		0.902903

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Concerning regression three, financial development squared is insignificant; hence, there are no threshold effects. However, the threshold effect is significant for GDP. Optimal GDP beyond threshold value of per capita income of $1808.04 per annum inequality increases. This figure is implausibly small compared to regression two.

The fixed effects model suggests LTOP is a statistically significant variable that has a positive impact on the income inequality. All other control variables like LFDD1, LPOP, LEDUC, LAGRC, LCONS, LGGDP and LINFL are negative and significant in the fixed effect regression model while government consumption and squared term of financial development are insignificant at the conventional significance levels.

The redundant fixed effects test (Table 5.33 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

Table 5.34: The fixed-effect regression results for regression 4

Dependent variable: income inequality ($LGINI_{1it}$)	**Regression 4**	
Independent variables	**variable**	**coefficient**
Financial development two	LFD_{2it}	0.051023* (0.026948)
Squared term of Financial development two	$LFDD_{2it}$	-0.006590* (0.003810)
GDP per capita	$LGDP_{it}$	0.324774*** (0.039859)
Squared term of GDP per capita	$LGGDP_{it}$	-0.020917*** (0.002586)
Agricultural sector	$LAGRC_{it}$	-0.035169*** (0.008222)

Government consumption	$LCONS_{it}$	-0.014274 (0.009543)
population growth rate	$LPOP_{it}$	-0.027252* (0.014292)
Education	$LEDUC_{it}$	-0.030792*** (0.009379)
Openness	$LTOP_{it}$	0.035067*** (0.007372)
Inflation	$LINFL_{it}$	-0.006153*** (0.001688)
Constant	β_0	-1.556290*** (0.259537)
R-square		0.908997
Adjusted- R-square		0.904271

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to financial development and GDP together with their respective squared terms, suggest that there are threshold effects are significant. Optimal estimates of the respective threshold terms are 35.52 and 2565.73 respectively. In regard to the Financial Development threshold, the result suggests that beyond the threshold ratio of 35,52 quality declines. In regard to GDP beyond threshold value of per capita income of $2565.73 per annum, inequality increases.

The fixed effects model suggests that LTOP is statistically significant and has positive impact on the income inequality. All other control variables like LPOP, LEDUC, LAGRC, LCONS and LINFL are a positive effect in the fixed effect regression model.

The redundant fixed effects test (Table 5.35 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

5.4.4 Random effect test regression results

The random effects model was also estimated where the individual countries are assumed to have been randomly drawn from a larger population, hence the heterogeneous components, namely the intercept terms in the fixed effect models are now seen as random terms.

Note two measures of inequality (m=1, 2) will be employed as well as two measures of financial development (n=1, 2), mentioned earlier, hence a total of four regressions will be estimated.

The following tables are representing the four regressions is termed the random effects model where the assumption that all individual differences are captured by the intercept term ($\overline{\beta_1} + \mu_i$) is maintained, but we also acknowledge that the individual countries in our sample were randomly selected. Hence, we treat the individual differences as random rather than fixed, as we did in the fixed effects models. Hence, the intercept term now comprises the population average ($\overline{\beta_1}$) and the random individual differences (μ_i) from the population average. These random individual differences (μ_i) are called the random effects and are analogous to the random error term, hence in above regressions it is grouped with the random regression errors (ϵ_{it}). Moreover, we make the same assumptions as we did for ϵ_{it}, the error terms are randomly distributed with a mean value of zero, are uncorrelated across individual countries and possesses a constant variance.

Table 5.36: The random-effects regression results for regression 1

Dependent variable: income inequality ($LGINI_{2it}$)	**Regression 1**	
Independent variables	**variable**	**coefficient**
Financial development one	LFD_{1it}	0.012201 (0.012330)
Squared term of_Financial development one	$LFDD_{1it}$	2.33E-05 (0.001934)
GDP per capita	$LGDP_{it}$	-0.309501*** (0.034262)
Squared term of_GDP per capita	$LGGDP_{it}$	0.012795*** (0.002091)
Agricultural sector	$LAGRC_{it}$	-0.014242**

		(0.006324)
Government consumption	$LCONS_{it}$	-0.017719** (0.008095)
population growth rate	$LPOP_{it}$	0.004272 (0.004530)
Education	$LEDUC_{it}$	0.070410*** (0.007107)
Openness	$LTOP_{it}$	0.022056*** (0.006115)
Inflation	$LINFL_{it}$	-0.013412*** (0.001389)
Constant	β_0	5.011955*** (0.154284)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Random effects regression results on Table 5.36 indicates that financial development and squared term of financial development are positively related to income inequality but the relationship are statistical insignificant. GDP per capita has threshold effects, beyond $150241.60 per capita income inequality increases, most economies fall short of this threshold level, thus implying a rise in income reduces inequality. Agricultural sector, government consumption and inflation are negatively related to income inequality under the random effects model. Other control variables are positive related to income inequality like education, trade openness is significant in the random effects regression model but the population growth rate is insignificant.

Table 5.37: The random-effects regression results for regression 2

Dependent variable: income inequality ($LGINI_{2it}$)	**Regression 2**	
Independent variables	**variable**	**coefficient**
Financial development one	LFD_{2it}	0.054928 (0.032759)
Squared term of_Financial development one	$LFDD_{2it}$	-0.006111 (0.004469)
GDP per capita	$LGDP_{it}$	-0.301921*** (0.033674)
Squared term of_GDP per capita	$LGGDP_{it}$	0.012552*** (0.002042)

Agricultural sector	LAGRC_{it}	-0.017669*** (0.006426)
Government consumption	LCONS_{it}	-0.016037* (0.008354)
population growth rate	LPOP_{it}	0.004665 (0.004574)
Education	LEDUC_{it}	0.065914*** (0.007112)
Openness	LTOP_{it}	0.022882*** (0.006152)
Inflation	LINFL_{it}	-0.014703*** (0.001384)
Constant	β_0	4.905530*** (0.158076)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

The random effect model also produced the results for the relationship between economic growth, financial development on income inequality. The squared term of financial development is insignificant thus indicating there is no financial development threshold effects. GDP per capita has threshold effects, beyond $102744.40 per capita income inequality increases, most economies fall short of this threshold level, thus implying a rise in income reduces inequality.

Education and trade openness are positive and significant according to regression 2. Other control variables such as GDP per capita, agricultural sector, government consumption and inflation are significant and negative related to income inequality in the random effects regression 2.

Table 5.38: The random-effects regression results for regression 3

Dependent variable: income inequality (LGINI_{2it})	**Regression 3**	
Independent variables	**variable**	**coefficient**
Financial development one	LFD_{1it}	0.008489*** (0.002712)
Squared term of_Financial development one	LFDD_{1it}	0.000635* (0.000353)

GDP per capita	$LGDP_{it}$	0.308549*** (0.035480)
Squared term of GDP per capita	$LGGDP_{it}$	-0.023827*** (0.002254)
Agricultural sector	$LAGRC_{it}$	-0.047467*** (0.007367)
Government consumption	$LCONS_{it}$	-0.016443* (0.008920)
population growth rate	$LPOP_{it}$	-0.003421 (0.006300)
Education	$LEDUC_{it}$	-0.041261*** (0.006965)
openness	$LTOP_{it}$	0.043257*** (0.006951)
Inflation	$LINFL_{it}$	-0.007782*** (0.001673)
Constant	β_0	-1.498792*** (0.172242)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

On Table 5.38 all the variables are significant at conventional level except the population growth rate. In regard to financial development and GDP together with their respective squared terms suggest that there are threshold effects are significant. Optimal estimates of the respective threshold terms are -757.48 and 632.70, respectively. In regard to the Financial Development threshold, the result suggests that beyond the threshold ratio of -757.48 inequality declines; however, this finding does not make any sense due to the negative threshold value. In regard to GDP beyond threshold value of per capita income of $632.70 per annum, inequality declines. In regard to the other variables, agricultural sector, government consumption, education and Inflation are negative related to income inequality. Moreover, openness is positively related to income inequality.

Table 5.39: The random-effects regression results for regression 4

Dependent variable: income inequality ($LGINI_{2it}$)	**Regression 4**

Independent variables	variable	coefficient
Financial development one	LFD_{2it}	0.030235 (0.026137)
Squared term of financial development one	$LFDD_{2it}$	-0.002610 (0.003676)
GDP per capita	$LGDP_{it}$	0.329977*** (0.036310)
Squared term of GDP per capita	$LGGDP_{it}$	-0.024943*** (0.002308)
Agricultural sector	$LAGRC_{it}$	-0.050985*** (0.007397)
Government consumption	$LCONS_{it}$	-0.018778** (0.009034)
population growth rate	$LPOP_{it}$	-0.002309 (0.006311)
Education	$LEDUC_{it}$	-0.042552*** (0.006969)
Openness	$LTOP_{it}$	0.042978*** (0.006905)
Inflation	$LINFL_{it}$	-0.008296*** (0.001667)
Constant	β_0	-1.632090*** (0.174478)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Financial development one is positively related to income inequality but the relationship is statistically insignificant. The squared term of financial development is insignificant thus indicating there is no financial development threshold effects. GDP per capita has threshold effects, beyond $735.10 per capita income inequality decreases. All other control variables such as agricultural sector, government consumption, population growth rate, education and inflation are negatively related to income inequality and the trade openness is positively related to income inequality on the random effect model in regression 4.

5.4.5 Hausman tests

However, the problem with the random effects model is that the error terms are likely to be correlated with some of the explanatory variables hence the resulting estimates are inconsistent and must not be trusted. The Hausman test may be used to test for correlations between the error terms and the regressors, which is reported in Table 5.40 to 5.40.3 in appendix C respectively for different regression analysis.

The Hausman test is based on the idea that if there is no correlation between the regressors and the error terms then the fixed and random effects models will generate similar coefficient estimates. The Hausman test suggests the mentioned correlation exits since the χ^2 = 154.003, which greater than the critical value at the 5 percent significance level, hence the random effects model cannot be trusted. Moreover the tests for the differences between the corresponding coefficients of the fixed and random effects models (see lower panel of Table 5.40 in appendix C) demonstrates via the p-values that the other coefficients are similar while some of the estimates are quite different.

In view of the above findings greater credence ought to be assigned to the fixed effects model, thus one may conclude that financial development and GDP have a significant impact on income inequality. The tables 5.40 to 5.40.3 in appendix C indicates the results of the Hausman test for different regression equations, the results of the Hausman test rejects the null hypothesis that the error terms are identically and independently distributed. This means that H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects that is appropriately.

5.6 Robustness check

5.6.1 Low-income countries regression results

Tables 5.49 and 5.52 indicate the results of different models for regression 3 and 4 respectively for low-income countries. There are different specification on the results shown on Table 5.49 because of different measures of financial development and income inequality indicator. The pooled regression model suggests that government consumption and openness have a positive impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels. Other variables, which include agricultural

sector, population growth rate and education have a negative effect on income inequality over time for all the slope coefficients are statically significant at the conventional levels.

In regard to the threshold effects for financial development, the results suggest that for the pooled, FEM and REM specification the threshold values are negative, which hardly makes economic sense. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $376.15, $214.86 and $244.69 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a reduction in inequality.

The fixed effects model suggests that Inflation and openness are the statistically significant variables that have a positive impact on the income inequality while education is insignificant at the conventional significance levels. Other control variables are negative related to income inequality and significant at the conventional significance levels. The random effects model suggests that all the explanatory variables have a statistically significant impact on income inequality.

Table 5.49: Low-income countries regression results for regression 3

Dependent variable : income inequality ($LGINI_{1it}$)		**Regression 3**		
Independent variables	**Variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{1it}	-0.017681** (0.007504)	0.028399*** (0.006736)	0.028673*** (0.006503)
Squared term of financial development one	$LFDD_{1it}$	-0.002099** (0.001059)	0.003473*** (0.000802)	0.003503*** (0.000775)
GDP per capita	$LGDP_{it}$	1.776261*** (0.613153)	1.613868*** (0.391398)	1.541145*** (0.380635)
Squared term of GDP per capita	$LGGDP_{it}$	-0.149876*** (0.053480)	-0.145087*** (0.034224)	-0.138073*** (0.033234)
Agricultural sector	$LAGRC_{it}$	-0.239200*** (0.035180)	-0.157256*** (0.025017)	-0.150870*** (0.024265)
Government consumption	$LCONS_{it}$	0.090739*** (0.023576)	-0.062911*** (0.016489)	-0.054410*** (0.015457)
population growth rate	$LPOP_{it}$	-0.072351*** (0.010333)	-0.080127** (0.031350)	-0.062192*** (0.019370)
Education	$LEDUC_{it}$	-0.111523*** (0.010876)	-0.008605 (0.016427)	-0.020666* (0.011638)
Openness	$LTOP_{it}$	0.063917** (0.025819)	0.031767* (0.018358)	0.030633* (0.017769)
Inflation	$LINFL_{it}$	0.020623*** (0.006175)	0.013273*** (0.003581)	0.013593*** (0.003486)
Constant	β_0	-3.925084** (1.789499)	-3.215841*** (1.120888)	-3.326790*** (1.097428)
R-square		0.492777	0.892801	
Adjusted- R-square		0.477902	0.882047	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

The redundant fixed effects test (Table 5.50 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions

(F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

Table 5.51 in appendix C indicates the results of the Hausman test for low-income countries in regression 3; the results of the Hausman test rejects the null hypothesis that the error terms are identically and independently distributed. This means that H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects that is appropriately.

Table 5.52 Low-income countries regression results for regression 4

Dependent variable : income inequality ($\mathbf{LGINI_{1it}}$) **Regression 4**				
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development two	$\mathrm{LFD_{2it}}$	0.145426** (0.057914)	-0.115177*** (0.036691)	-0.097105*** (0.035699)
Squared term of financial development two	$\mathrm{LFDD_{2it}}$	-0.045213*** (0.010591)	0.035306*** (0.006844)	0.029728*** (0.006678)
GDP per capita	$\mathrm{LGDP_{it}}$	1.626424*** (0.613139)	1.488397*** (0.433174)	1.284136*** (0.414773)
Squared term of GDP per capita	$\mathrm{LGGDP_{it}}$	-0.135610** (0.053553)	-0.135919*** (0.038069)	-0.116128*** (0.036363)
Agricultural sector	$\mathrm{LAGRC_{it}}$	-0.260759*** (0.034071)	-0.166539*** (0.024453)	-0.164559*** (0.023791)
Government consumption	$\mathrm{LCONS_{it}}$	0.099879*** (0.021479)	-0.072843*** (0.016052)	-0.053685*** (0.014828)
population growth rate	$\mathrm{LPOP_{it}}$	-0.075366*** (0.009726)	-0.102214*** (0.030212)	-0.059102*** (0.016428)
Education	$\mathrm{LEDUC_{it}}$	-0.078802*** (0.011211)	-0.008567 (0.016234)	-0.032798*** (0.011145)
Openness	$\mathrm{LTOP_{it}}$	0.041481* (0.024103)	0.039364** (0.017753)	0.034713** (0.017002)
Inflation	$\mathrm{LINFL_{it}}$	0.017196*** (0.005718)	0.008957*** (0.003499)	0.009754*** (0.003389)

Constant	β_0	-3.501240** (1.803262)	-2.305564* (1.222079)	-2.456926** (1.192358)
R-squared		0.547259	0.899737	

e: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Adjusted- R-squared	0.533982	0.889680

The above pooled regression, which assumes each country is identical, therefore, they share identical coefficients (i.e., the slope and intercept terms). The model suggests that government consumption, openness and inflation have a positive impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels. All other control variables are negatively related to income inequality. According to the fixed effect regression model, all the variables are statistically significant at the conventional levels.

In regard to the threshold effects for financial development, the results suggest that for the pooled, FEM and REM specification the threshold values 5.00, 5.17 and 5.05 respectively. The pooled results suggest that beyond the threshold level inequality will be falls, while the other two models suggest it will be increasing. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $336.97, $212.72 and $206,44 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a reduction in inequality.

Furthermore, the agricultural sector, population growth rate and education are negatively related to income inequality. The random effects model suggests that all variables are the statistically significant variables that have a positive and negative impact on the income inequality. The redundant fixed effects test (see Table 5.35 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercept are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects that is appropriately in regression is the most appropriate model for the assessment of low-income countries (i.e. p<5%).

5.6.2 Low-middle-income countries regression results

Table 5.55 Low-middle income countries regression results for regression 1

Dependent variable : income inequality ($LGINI_{2it}$) **Regression 1**				
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{1it}	0.037802 (0.028821)	0.075348*** (0.023610)	0.033549* (0.020216)
Squared term of financial development one	$LFDD_{1it}$	-0.005993 (0.005423)	-0.008704** (0.004112)	-0.002641 (0.003707)
GDP per capita	$LGDP_{it}$	-0.402305* (0.210907)	0.141341 (0.177686)	0.287091* (0.167581)
Squared term of GDP per capita	$LGGDP_{it}$	0.030048* (0.015767)	-0.016718 (0.013548)	-0.027283** (0.012718)
Agricultural sector	$LAGRC_{it}$	0.053437*** (0.019951)	-0.006739 (0.019693)	-0.030342* (0.017305)
Government consumption	$LCONS_{it}$	-0.064720*** (0.014289)	-0.081034*** (0.014491)	-0.081053*** (0.013552)
population growth rate	$LPOP_{it}$	-0.002395 (0.004340)	0.084202*** (0.031043)	-0.012277 (0.007829)
Education	$LEDUC_{it}$	0.000104 (0.009273)	0.056456** (0.023124)	0.089669*** (0.012631)
openness	$LTOP_{it}$	0.013585 (0.014845)	-0.001849 (0.012524)	0.008416 (0.011682)
Inflation	$LINFL_{it}$	-0.025571*** (0.004433)	-0.008807*** (0.002965)	-0.013522*** (0.002754)
Constant	β_0	5.188225*** (0.698833)	2.142312*** (0.676125)	3.284272*** (0.525733)
R-square		0.205291	0.751185	
Adjusted- R-square		0.179404	0.724215	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.5, only the REM model registered statistically significant threshold effects for financial development indicator, once the ratio exceeds the threshold level of 64.72 inequality decreases. In regard to the GDP threshold effects, both the pooled ($788.39) and REM ($125.21) regressions generated significant results, which suggest once per capita GDP exceeds these bracketed values inequality falls.

For the pooled regression model on Table 5.5 suggests that GDP per capita, government consumption, inflation and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels while the population is statistically insignificant at the conventional level. Other variables such agricultural sector, trade openness and education have a positive effect on income inequality over time.

The fixed effects model suggests that inflation, openness and trade openness are the statistically significant variables that have a negative impact on the income inequality while trade openness is insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.56 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercept are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects that is appropriately in regression 1 on low middle income countries(i.e. p<5%).

Table 5.58: Low middle-income countries regression results for regression 2

Dependent variable : income inequality ($LGINI_{2it}$) **Regression 2**				
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{2it}	-0.172501** (0.075477)	-0.063558 (0.075434)	-0.119101* (0.068185)
Squared term of financial development one	$LFDD_{2it}$	0.027757** (0.011104)	0.012449 (0.011197)	0.021611** (0.010203)
GDP per capita	$LGDP_{it}$	-0.371618* (0.208010)	0.150915 (0.170355)	0.259370 (0.161880)
Squared term of GDP per capita	$LGGDP_{it}$	0.027090* (0.015587)	-0.016737 (0.012907)	-0.024754** (0.012225)
Agricultural sector	$LAGRC_{it}$	0.046877** (0.020484)	-0.020529 (0.018907)	-0.030918* (0.016869)
Government consumption	$LCONS_{it}$	-0.067258*** (0.015277)	-0.066565*** (0.016012)	-0.062317*** (0.015117)
population growth rate	$LPOP_{it}$	-0.002597 (0.004570)	0.015594 (0.027676)	-0.015801* (0.008509)
Education	$LEDUC_{it}$	-0.015409 (0.009365)	0.088071*** (0.021840)	0.081291*** (0.013037)
openness	$LTOP_{it}$	0.020734 (0.013944)	0.002095 (0.012060)	-0.000744 (0.011574)
Inflation	$LINFL_{it}$	-0.028031*** (0.004172)	-0.015122*** (0.002682)	-0.016227*** (0.002646)
Constant	β_0	5.494241*** (0.705344)	3.350706*** (0.659926)	3.662053*** (0.528177)
R-square		0.235039	0.767555	
Adjusted- R-square		0.208931	0.741063	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Concerning the Financial development threshold effects, only the pooled and the REM regressions generated statistically significant results, with the respective ratios being 16.95 and 15.33. Both the results suggest that once these levels are exceeded then inequality reduces. Furthermore, only the pooled regression generated threshold effects for GDP, which suggests that once per capita income exceeds $478.19 per annum then inequality it reduced.

The pooled regression model on Table 5.58 suggests that GDP per capita, government consumption, inflation and population have a negative impact on income inequality over time for all slope coefficients are statically significant at the conventional levels while the education is statistically insignificant at the conventional level. Other variables such as, agricultural sector and trade openness have a positive effect on income inequality over time.

The redundant fixed effects test (see Table 5.35 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects model is the appropriate one for low middle-income countries (i.e. p<5%).

Table 5.61: Low middle-income countries regression results for regression 3

Dependent variable: income inequality ($\mathbf{LGINI_{1it}}$) **Regression 3**				
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	$\mathrm{LFD_{1it}}$	0.058132 (0.035591)	0.030185 (0.024229)	0.009118 (0.023771)
Squared term of financial development one	$\mathrm{LFDD_{1it}}$	-0.016031** (0.006412)	-0.004954 (0.004394)	-0.003481 (0.004354)
GDP per capita	$\mathrm{LGDP_{it}}$	0.945770*** (0.200419)	1.235386*** (0.180623)	1.339702*** (0.174942)
Squared term of GDP per capita	$\mathrm{LGGDP_{it}}$	-0.062224*** (0.014872)	-0.089085*** (0.013621)	-0.096590*** (0.013151)
Agricultural sector	$\mathrm{LAGRC_{it}}$	0.026593 (0.016481)	0.019889 (0.018768)	-0.009227 (0.016819)

Government consumption	$LCONS_{it}$	0.016832 (0.013589)	0.062850*** (0.016407)	0.046659*** (0.015526)
population growth rate	$LPOP_{it}$	-0.005905 (0.004460)	0.129457*** (0.024407)	0.016497 (0.010496)
Education	$LEDUC_{it}$	-0.100969*** (0.009831)	-0.118160*** (0.020512)	-0.058017*** (0.014331)
openness	$LTOP_{it}$	0.046089*** (0.015047)	0.005395 (0.012155)	0.026690** (0.011395)
Inflation	$LINFL_{it}$	-0.009014* (0.005450)	-0.003353 (0.003447)	-0.007028** (0.003378)
Constant	β_0	-4.039878*** (0.645640)	-6.894574*** (0.620566)	-5.512166*** (0.559167)
R-square		0.320015	0.793231	
Adjusted- R-square		0.310557	0.779305	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.61 none of the models found statistically significant threshold effects for the financial development variable, however, all three models found relevant results the GDP threshold effects. The pooled FEM and REM regressions generated threshold values of $2208.35, $1032.77 and $812.40 respectively. These threshold values suggest that once income exceeds these levels a reduction in inequality will arise.

For the pooled regression model suggests that, inflation, education and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels while the population is statistically insignificant at the conventional level. Other variables such GDP per capita, agricultural sector, government consumption, trade openness have a positive effect on income inequality over time.

The fixed effects model suggests that inflation and education are the statistically significant variables that have a negative impact on the income inequality while inflation is insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.35 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercept are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects as the appropriate model for low middle-income countries (i.e. p<5%).

Table 5.67: Low-middle income countries regression results for regression 4

Dependent variable: income inequality ($LGINI_{1it}$)		**Regression 4**		
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{2it}	-0.234266*** (0.085935)	0.026458 (0.070081)	-0.019884 (0.068533)
Squared term of financial development one	$LFDD_{2it}$	0.033118*** (0.012711)	-0.003622 (0.010635)	0.001249 (0.010391)
GDP per capita	$LGDP_{it}$	1.234436*** (0.196761)	1.295288*** (0.179438)	1.454003*** (0.172780)
Squared term of GDP per capita	$LGGDP_{it}$	-0.083813*** (0.014478)	-0.094506*** (0.013429)	-0.106246*** (0.012870)
Agricultural sector	$LAGRC_{it}$	0.031443* (0.016521)	0.012337 (0.019122)	-0.019466 (0.016979)
Government consumption	$LCONS_{it}$	0.023400 (0.014507)	0.047979*** (0.017310)	0.036107** (0.016436)
population growth rate	$LPOP_{it}$	-0.007228 (0.004479)	0.131617*** (0.023942)	0.018189* (0.010492)
Education	$LEDUC_{it}$	-0.094099*** (0.010543)	-0.110062*** (0.021329)	-0.047571*** (0.014970)
openness	$LTOP_{it}$	0.028807* (0.014998)	0.007665 (0.012112)	0.023006** (0.011482)
Inflation	$LINFL_{it}$	-0.005335 (0.005361)	-0.005951* (0.003451)	-0.008259** (0.003412)
Constant	β_0	-4.547609*** (0.665234)	-7.073426*** (0.624280)	-5.791447*** (0.572152)
R-square		0.275061	0.782256	

Adjusted- R-square	0.264675	0.767477

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.67, only the pooled regression found statistically significant threshold effects for the financial development variable where a threshold ratio of 17.43 was attained and which suggests that once this ratio is exceeded inequality will rise. Moreover, all three models found relevant results the GDP threshold effects. The pooled FEM and REM regressions generated threshold values of $1655.81, $1326,10 and $934.49 respectively. These threshold values suggest that once income exceeds these levels a reduction in inequality will arise.

For the pooled regression model suggests that inflation, education and population have a negative impact on income inequality over time for all the slope coefficients are statically insignificant at the conventional levels while education is statistically significant at the conventional level. Other variables such GDP per capita, government consumption agricultural sector, trade openness and have a positive effect on income inequality over time.

The fixed effects model suggests that inflation and education are the statistically significant variables that have a negative impact on the income inequality. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.68 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercept are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which is the fixed effects as being the appropriate model for low middle-income countries (i.e. p<5%).

5.6.3 Upper middle income countries regression results

Table 5.70: upper middle-income countries regression results for regression 1

Dependent variable : income inequality ($LGINI_{1it}$) Regression 1				
Independent variables	variable	Pooled	FEM	REM
Financial development one	LFD_{2it}	0.078308** (0.033006)	0.135140*** (0.027946)	0.126778*** (0.026243)
Squared term of financial development one	$LFDD_{2it}$	-0.014342*** (0.005124)	-0.023270*** (0.004529)	-0.022907*** (0.004149)
GDP per capita	$LGDP_{it}$	-0.712438*** (0.178433)	-0.796929*** (0.189819)	-0.713678*** (0.181231)
Squared term of GDP per capita	$LGGDP_{it}$	0.039555*** (0.011404)	0.041895*** (0.012101)	0.038171*** (0.011608)
Agricultural sector	$LAGRC_{it}$	-0.059494*** (0.008976)	-0.012788 (0.014916)	-0.028440** (0.013005)
Government consumption	$LCONS_{it}$	-0.008900 (0.014278)	0.020903 (0.014851)	0.012295 (0.013561)
population growth rate	$LPOP_{it}$	-0.012487*** (0.003809)	0.051582** (0.026722)	0.006264 (0.007132)
Education	$LEDUC_{it}$	0.041698*** (0.012120)	0.051099*** (0.018979)	0.055758*** (0.013129)
openness	$LTOP_{it}$	-0.074194*** (0.010620)	0.040607*** (0.012498)	0.023876** (0.010857)
Inflation	$LINFL_{it}$	-0.018244*** (0.003433)	-0.008902*** (0.002621)	-0.008434*** (0.002524)
Constant	β_0	7.413425*** (0.720402)	6.097113*** (0.880144)	6.527491*** (0.733151)
R-square		0.293159	0.755418	
Adjusted- R-square		0.278120	0.734990	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.7, the threshold effects for financial development the results suggest that for the pooled, FEM and REM specification the threshold values 16.28, 18.91 and 15.80 respectively. All three models suggest that beyond their respective estimated threshold ratios inequality will decrease. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $7331.97, $17326.63 and $12088.38 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a reduction in inequality. Notice these threshold levels are much higher than for the low-income economies.

For the pooled regression model suggests that GDP per capita, government consumption, agricultural sector , trade openness ,inflation and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels while government consumption is statistically insignificant at the conventional level. Education has a positive effect on income inequality over time.

The fixed effects model suggests that inflation and agricultural sector are the statistically significant variables that have a negative impact on the income inequality. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.71 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, i.e., the fixed effects model is deemed to be appropriate for the upper-middle income countries (i.e. p<5%).

Table 5.73: upper-middle income countries regression results for regression 2

Dependent variable : income inequality ($LGINI_{2it}$) Regression 2				
Independent variables	variable	Pooled	FEM	REM
Financial development one	LFD_{2it}	-0.037151 (0.081716)	0.229368*** (0.068271)	0.249035*** (0.064686)
Squared term of financial development one	$LFDD_{2it}$	-0.000248 (0.010844)	-0.033436*** (0.009181)	-0.037851*** (0.008600)
GDP per capita	$LGDP_{it}$	-0.717982*** (0.182030)	-0.887088*** (0.196128)	-0.765911*** (0.186078)
Squared term of GDP per capita	$LGGDP_{it}$	0.040126*** (0.011644)	0.047127*** (0.012573)	0.041524*** (0.011956)
Agricultural sector	$LAGRC_{it}$	-0.059012*** (0.008990)	-0.025836* (0.015129)	-0.035341*** (0.012901)
Government consumption	$LCONS_{it}$	0.002289 (0.015159)	0.025213 (0.015533)	0.019201 (0.014046)
population growth rate	$LPOP_{it}$	-0.015555*** (0.003636)	0.017852 (0.026908)	0.001406 (0.006671)
Education	$LEDUC_{it}$	0.034772*** (0.011699)	0.057879*** (0.018630)	0.052328*** (0.012761)
openness	$LTOP_{it}$	-0.074336*** (0.011018)	0.037549*** (0.013080)	0.013095 (0.011047)
Inflation	$LINFL_{it}$	-0.023773*** (0.003495)	-0.011249*** (0.002698)	-0.010616*** (0.002596)
Constant	β_0	7.710230*** (0.754155)	6.826640*** (0.908026)	6.631426*** (0.760152)
R-square		0.315631	0.757345	
Adjusted- R-square		0.301254	0.737349	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.73, the pooled regression did not generate statistically significant threshold effects for financial development; however, FEM and REM specifications did

generate significant threshold values 32.46 and 26.84 respectively. These two models suggest that beyond their respective estimated threshold ratios inequality will decrease. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $7186.79, $12964.89 and $11968.10 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a rise in inequality. Notice these threshold levels are much higher than for the low-income economies.

For the pooled regression model suggests that GDP per capita, inflation, trade openness , agricultural sector and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels. Other variables such government consumption and education have a positive effect on income inequality over time.

The fixed effects model suggests that inflation and agricultural sector are the statistically significant variables that have a negative impact on the income inequality. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.74 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, i.e., the fixed effects model is deemed to be valid for upper-middle income countries**.**

Table 5.76: upper-middle income countries regression results for regression 3

Dependent variable : income inequality ($LGINI_{1it}$)			**Regression 3**	
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{1it}	-0.065769* (0.035092)	-0.010221 (0.025380)	-0.004637 (0.024600)
Squared term of financial development one	$LFDD_{1it}$	0.013274** (0.005401)	0.002085 (0.004077)	0.001315 (0.003939)
GDP per capita	$LGDP_{it}$	1.021542*** (0.180945)	0.788732*** (0.129220)	0.841057*** (0.126993)
Squared term of GDP per capita	$LGGDP_{it}$	-0.068976*** (0.011582)	-0.047628*** (0.008411)	-0.050651*** (0.008289)
Agricultural sector	$LAGRC_{it}$	-0.144989*** (0.011760)	-0.033046*** (0.012511)	-0.030778** (0.012068)
Government consumption	$LCONS_{it}$	0.029021* (0.017149)	0.004485 (0.014305)	0.021123 (0.013594)
population growth rate	$LPOP_{it}$	-0.005623 (0.003767)	-0.093316*** (0.022924)	-0.017179 (0.010662)
Education	$LEDUC_{it}$	-0.151713*** (0.014800)	-0.000335 (0.016917)	-0.043063*** (0.013224)
openness	$LTOP_{it}$	-0.052721*** (0.013213)	-0.008700 (0.011557)	-0.016762 (0.011094)
Inflation	$LINFL_{it}$	-0.014314*** (0.004315)	-0.010436*** (0.002579)	-0.010201*** (0.002561)
Constant	β_0	-3.135143*** (0.717456)	-2.323219*** (0.641274)	-3.621411*** (0.524725)
R-square		0.269145	0.828749	
Adjusted- R-square		0.260942	0.819536	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

According to Table 5.76, the pooled regression did generate statistically significant threshold effect of 12.68 for financial development, while FEM and REM specifications did not. Thus as the financial development ratio exceeds 12,68 inequality will increase. In regard to GDP

per capita, statistically significant results were obtained for all three models, with the threshold values of $2 126 526, $4447.07 and $19 776 403 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a fall in inequality. The threshold values for pooled and REM regressions are extremely high, only the value estimated by the FEM model appears to be plausible.

For the pooled regression model suggests that, agricultural sector, trade openness and education, inflation and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels while the population is statistically insignificant at the conventional level. Other variables such GDP per capita and government consumption have a positive effect on income inequality over time.

The fixed effects model suggests that inflation, trade openness, population and agricultural sector are statistically significant variables that have a negative impact on the income inequality while trade openness and education are insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.76 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercept are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, i.e., the fixed effects model appears to be appropriate for upper middle-income countries.

Table 5.7: Upper-middle income countries regression results for regression 4

Dependent variable : income inequality ($LGINI_{2it}$)		Regression 4		
Independent variables	variable	Pooled	FEM	REM
Financial development one	LFD_{1it}	0.068794 (0.096464)	-0.045879 (0.060438)	-0.026745 (0.059485)
Squared term of_financial development one	$LFDD_{1it}$	-0.008474 (0.012820)	0.004022 (0.008299)	0.001029 (0.008123)
GDP per capita	$LGDP_{it}$	0.909316*** (0.182801)	0.783667*** (0.137065)	0.851862*** (0.133803)
Squared term of_GDP per capita	$LGGDP_{it}$	-0.062123*** (0.011731)	-0.046731*** (0.008808)	-0.050618*** (0.008647)
Agricultural sector	$LAGRC_{it}$	-0.152187*** (0.011855)	-0.038623*** (0.012386)	-0.035961*** (0.011954)
Government consumption	$LCONS_{it}$	0.030810* (0.018049)	0.008016 (0.014423)	0.026372** (0.013629)
population growth rate	$LPOP_{it}$	-0.001893 (0.003840)	-0.099410*** (0.023186)	-0.018540* (0.010872)
Education	$LEDUC_{it}$	-0.147190*** (0.014830)	-0.001048 (0.016639)	-0.045807*** (0.012743)
openness	$LTOP_{it}$	-0.038290*** (0.013671)	-0.009175 (0.011821)	-0.017538 (0.011293)
Inflation	$LINFL_{it}$	-0.020446*** (0.004400)	-0.011673*** (0.002599)	-0.011543*** (0.002581)
Constant	β_0	-2.992279*** (0.764697)	-2.130145*** (0.711861)	-3.589724 (0.587289)
R-square		0.264567	0.833464	
Adjusted- R-square		0.256359	0.824556	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

According to Table 5.79, none of the regression models generated any statistically significant threshold effects for the financial development indicator. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $2 373 794, $5014.05 and $2018.28 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a fall in inequality. The threshold value for the pooled regression is extremely high, while the value estimated by the FEM and REM appears to be plausible.

For the pooled regression model suggests that agricultural sector, inflation, trade openness, education and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels while the population is statistically insignificant at the conventional level. Other variables such government consumption, GDP per capita, have a positive effect on income inequality over time.

The fixed effects model suggests that agricultural sector, inflation, trade openness, education and population are the statistically significant variables that have a negative impact on the income inequality while education, trade openness and government consumption are insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.80 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, i.e. the fixed effects model is considered for data involving upper-middle income countries.

5.6.4 High income countries regression results

Table 5.82: High-income countries regression results for regression 1

Dependent variable : income inequality ($LGINI_{2it}$) **Regression 1**				
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{1it}	0.102738** (0.043115)	-0.017274 (0.021608)	-0.014486 (0.021350)
Squared term of financial development one	$LFDD_{1it}$	-0.011430** (0.005804)	0.006404 (0.003038)	0.006724** (0.002996)
GDP per capita	$LGDP_{it}$	-0.878946*** (0.105839)	-0.911645 (0.069819)	-0.806097*** (0.066608)
Squared term of GDP per capita	$LGGDP_{it}$	0.040111*** (0.005479)	0.048275 (0.004035)	0.041162*** (0.003774)
Agricultural sector	$LAGRC_{it}$	-0.035568*** (0.007597)	0.044819 (0.007485)	0.015806** (0.006676)
Government consumption	$LCONS_{it}$	-0.099519*** (0.015667)	1.19E-05 (0.014025)	-0.020563 (0.013459)
population growth rate	$LPOP_{it}$	6.80E-06 (0.003072)	0.235679 (0.026303)	0.017763** (0.007207)
Education	$LEDUC_{it}$	0.112098*** (0.020485)	-0.005385 (0.014629)	0.058256*** (0.012888)
openness	$LTOP_{it}$	-0.052185*** (0.009432)	0.036872 (0.009598)	0.045816*** (0.009006)
Inflation	$LINFL_{it}$	-0.007672** (0.003826)	-0.016114 (0.001730)	-0.015321*** (0.001708)
Constant	β_0	8.155411*** (0.480348)	3.885854 (0.487751)	6.809944*** (0.309457)
R-square		0.496569	0.934504	
Adjusted- R-square		0.488976	0.929247	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

According to Table 5.76, the pooled regression did generate statistically significant threshold effect of 87.36 for financial development, while FEM and REM specifications did not. Thus

as the financial development ratio exceeds 87.36 inequality will increase. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $59 874, $13 359.73 and $23 741.98 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a fall in inequality.

For the pooled regression model suggests that GDP per capita, government consumption, trade openness, inflation and agricultural sector have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels. Other variables such, population and education have a positive effect on income inequality over time.

The fixed effects model suggests that inflation and education are the statistically insignificant variables that have a negative impact on the income inequality. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.83 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which indicates that the fixed effects model is appropriate for high-income countries**.**

Table 5.85: High-income countries regression results for regression 2

Dependent variable : income inequality ($LGINI_{2it}$)		Regression 2		
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{2it}	0.261519*** (0.065318)	0.020314 (0.048996)	0.036306 (0.046849)
Squared term of financial development one	$LFDD_{2it}$	-0.029047*** (0.007654)	0.001574 (0.006568)	0.000566 (0.006215)
GDP per capita	$LGDP_{it}$	-1.010176*** (0.115471)	-0.981067*** (0.072114)	-0.862435*** (0.069477)
Squared term of GDP per capita	$LGGDP_{it}$	0.046830*** (0.005968)	0.052938*** (0.004119)	0.044847*** (0.003900)
Agricultural sector	$LAGRC_{it}$	-0.032800*** (0.007087)	0.050285*** (0.007681)	0.019314*** (0.006838)
Government consumption	$LCONS_{it}$	-0.108143*** (0.014971)	-0.001299 (0.014270)	-0.023303* (0.013588)
population growth rate	$LPOP_{it}$	0.000584 (0.003114)	0.227544*** (0.027726)	0.020945*** (0.007160)
Education	$LEDUC_{it}$	0.116650*** (0.020449)	0.004768 (0.014946)	0.068254*** (0.013055)
openness	$LTOP_{it}$	-0.048655*** (0.008975)	0.044206*** (0.009781)	0.052775*** (0.009055)
Inflation	$LINFL_{it}$	-0.008446** (0.003719)	-0.016630*** (0.001723)	-0.016004*** (0.001701)
Constant	β_0	8.418845*** (0.492346)	4.094130*** (0.500278)	6.782240*** (0.315254)
R-square		0.504163	0.931231	
Adjusted- R-square		0.496639	0.925676	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

According to Table 5.85, the pooled regression did generate statistically significant threshold effect of 91.84 for financial development, while FEM and REM specifications did not. Thus as the financial development ratio exceeds 91.84 inequality will increase. In regard to GDP per capita, statistically significant results were obtained for all three models, with the

threshold values of $46 166.05, $10 404.57 and $14 473.42 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a rise in inequality.

For the pooled regression model suggests that GDP per capita, government consumption, agricultural sector, inflation and trade openness have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels. Other variables such as population and education have a positive effect on income inequality over time.

The fixed effects model suggests that inflation, GDP per capita and government consumption are the statistically significant variables that have a negative impact on the income inequality while government consumption is insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (see Table 5.86 in appendix C) for the equality of the intercept terms (i.e. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercept are statistically different from one another. The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, which implies that the fixed effects model is suitable to assess high-income countries**.**

Table 5.88: High-income countries regression results for regression 3

Dependent variable: income inequality ($LGINI_{1it}$) Regression 3				
Independent variables	variable	Pooled	FEM	REM
Financial development one	LFD_{1it}	-0.235459*** (0.063597)	0.132265*** (0.045513)	0.116301*** (0.044791)
Squared term of financial development one	$LFDD_{1it}$	0.032213*** (0.008216)	-0.017647*** (0.006168)	-0.015188** (0.006058)
GDP per capita	$LGDP_{it}$	0.391412** (0.175131)	0.311708* (0.169327)	0.357761** (0.157069)
Squared term of GDP per capita	$LGGDP_{it}$	-0.028616*** (0.008988)	-0.021982** (0.009613)	-0.024955*** (0.008679)
Agricultural sector	$LAGRC_{it}$	-0.071437*** (0.010643)	-0.041346*** (0.015998)	-0.045375*** (0.013463)
Government consumption	$LCONS_{it}$	-0.218398*** (0.023049)	-0.096378*** (0.026879)	-0.114025*** (0.025756)
population growth rate	$LPOP_{it}$	-0.049406*** (0.004277)	-0.048958 (0.042164)	-0.016074 (0.012712)
Education	$LEDUC_{it}$	-0.067483** (0.033866)	0.086144*** (0.030188)	0.069621*** (0.025973)
openness	$LTOP_{it}$	-0.083752*** (0.014491)	0.058263*** (0.017427)	0.044852*** (0.015926)
Inflation	$LINFL_{it}$	-0.014881** (0.005999)	-0.005342 (0.003525)	-0.006253* (0.003497)
Constant	β_0	0.472903 (0.812539)	-1.743227* (0.917627)	-2.222804*** (0.706320)
R-square		0.447900	0.852257	
Adjusted- R-square		0.442825	0.844616	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.88, the threshold effects for financial development the results suggest that for the pooled, FEM and REM specification the threshold values 38.47, 39.25 and 46.53 respectively. The pooled regression suggests that beyond the threshold level

inequality will rise while the latter two models suggest that beyond their respective estimated threshold ratios inequality will decrease. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $845.56, $1199.98 and $1339.43 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a reduction in inequality.

For the pooled regression model suggests that agricultural sector, trade openness, education, government consumption, inflation and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels. Other variables such as GDP per capita have a positive effect on income inequality over time.

The fixed effects model suggests that inflation, population, government consumption and agricultural sector are statistically significant variables that have a negative impact on the income inequality while inflation and population are insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

The redundant fixed effects test (Table 5.89 in appendix C) for the equality of the intercept terms (ie. the null that the intercept term for each country is the same) via both the versions (F- and χ^2 –tests) of the likelihood ratio test confirms that the intercepts are statistically different from one another.

The H_0, which is the null hypothesis equal to random effect=0 is rejected and the alternative hypothesis H_a is accepted, thus fixed effects model is deemed to be appropriate for modelling high income countries**.**

Table 5.91: High-income countries regression results for regression 4

Dependent variable : income inequality ($LGINI_{1it}$) **Regression 4**				
Independent variables	**variable**	**Pooled**	**FEM**	**REM**
Financial development one	LFD_{2it}	0.255810** (0.106798)	0.430268*** (0.088774)	0.415920*** (0.083940)
Squared term of financial development one	$LFDD_{2it}$	-0.027161** (0.012393)	-0.053768*** (0.011351)	-0.051355*** (0.010625)
GDP per capita	$LGDP_{it}$	0.106428 (0.186612)	0.337743** (0.159455)	0.351123** (0.150438)
Squared term of GDP per capita	$LGGDP_{it}$	-0.014761 (0.009539)	-0.024316*** (0.008971)	-0.025361*** (0.008254)
Agricultural sector	$LAGRC_{it}$	-0.085581*** (0.010643)	-0.052882*** (0.015614)	-0.056022*** (0.013416)
Government consumption	$LCONS_{it}$	-0.208732*** (0.022366)	-0.096403*** (0.025936)	-0.114261*** (0.024835)
population growth rate	$LPOP_{it}$	-0.049328*** (0.004230)	-0.046302*** (0.042070)	-0.017683 (0.012779)
Education	$LEDUC_{it}$	-0.048544 (0.033715)	0.080649 (0.029112)	0.066671*** (0.024690)
openness	$LTOP_{it}$	-0.098944*** (0.013769)	0.055700*** (0.016677)	0.043190*** (0.015353)
Inflation	$LINFL_{it}$	-0.006540 (0.005894)	-0.002439 (0.003353)	-0.003027 (0.003332)
Constant	β_0	0.891589 (0.814871)	-2.373468 (0.877220)	-2.676023*** (0.666739)
R-square		0.455889	0.861376	
Adjusted- R-square		0.450851	0.854150	

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

With reference to Table 5.88, the threshold effects for financial development the results suggest that for the pooled, FEM and REM specification the threshold values 102.51, 57.97

and 61.56 respectively. The pooled regression suggests that beyond the threshold level inequality will rise while the latter two models suggest that beyond their respective estimated threshold ratios inequality will decrease. In regard to GDP per capita, statistically significant results were obtained for all three models, with the threshold values of $34.12, $1187.97.98 and $1096.63 were estimated for the pooled, FEM and REM models respectively. Annual per capita incomes beyond these threshold levels results in a reduction in inequality. The pooled regression results generated an excessively large value for financial development indicator, while on the other hand it generated an extremely small value for threshold GDP, while the latter two models generated plausible results.

For the pooled regression model suggests that agricultural sector, trade openness, education, government consumption, inflation and population have a negative impact on income inequality over time for all the slope coefficients are statically significant at the conventional levels while the inflation is statistically insignificant at the conventional level. GDP per capita has a positive effect on income inequality over time.

The fixed effects model suggests that inflation, population, government consumption and agricultural sector are statistically significant variables that have a negative impact on the income inequality while inflation is insignificant at the conventional significance levels. Other control variables are positive related to income inequality. The random effects model suggests that the majority of the explanatory variables have a statistically significant impact on income inequality.

5.7 Discussion of the results

The two key objectives of this study were to assess whether financial development and economic growth have nonlinear effects on inequality. The result convincingly demonstrated in majority of the cases that threshold effects to exist. Majority of the threshold results for GDP demonstrated that once the threshold is passed inequality is reduced for all economies (low, middle and high income), however there were a minority of cases that demonstrated beyond the threshold income inequality increases(i.e. regression two for upper middle income and high income countries). In regard to financial development a similar finding was noticed. The results were sensitive to which indicators were being used to serve as an indicator of financial development. The threshold results for financial development demonstrated that once the threshold is passed inequality is increases for high income countries, while the fixed and random effect demonstrated that inequality will decreases.

Hence, one may conclude that the inverted U-shaped phenomenon exists in most cases for both national income and in some of the cases for financial development.

The fixed effect model results were the particular type of model specification that was most appropriate for this sample size. Regression 4 on Table 5.34 and regression 2 in Table 5.30 reports the results of the financial development, which indicates the liquid liabilities (M3) as a percentage of GDP, has a positive and a statistically significant effect of 10 percent and 5 percent respectively on income inequality. These results show that in reducing the social gap between the richest and poorest classes the private funds play a significant and positive role. Referring to regression 4 on Table 5.34 and regression 2 in Table 5.30 respectively, the squared financial development in terms of the liquid liabilities (M3) as a percentage of GDP shows the statistically significant coefficients on both regressions.

We look back on that if the squared financial development is statistically significant, we retained or keep hold of the non-linear hypothesis between financial development and income inequality as suggested by the (Greenwood and Jovanovic 1990). Nevertheless, according to Clarke, Zou et al. (2003) if the squared financial development is not significant but the financial development is statistically significant we keep hold or retain the linear hypothesis. Our results based on regression 4 and regression 2 are consistent with the findings of Nasreddine and Mensi (2016) and Jauch and Watzka (2016) who used the static panel and GMM model. Therefore, based on our findings, we retained the non-linear hypothesis of Greenwood and Jovanovic (1990), which suggests the inverted U-shaped relationship between financial development and income inequality. Furthermore, our results suggest an inverted U-shaped relation between economic growth and income inequality as suggested by the Kuznets (1955), which is consistent with the findings of (Nikoloski 2013).

We recall that if the GDP per capita is positive and significant and the squared term of GDP is significant and negative, we retain the Kuznets hypothesis. Therefore, our results on regression 4 are keeping holding the Kuznet theory. However, in disagreement with Kuznets (1955) on regression 2, we don't observe the inverted U-shaped relationship between economic development and income inequality but preferably to a normal U-shaped relationship, which is consistent with the results of (Mansour and Wendel 2015).

Most of our control variables results are consistent with the theories in almost all regression results. In respect of the inflation rate variable, the coefficient is negative and statistically significant at the 1 percent levels for liquid liabilities (M3) as a percentage of GDP and

private credit by deposit money banks and other financial institutions to GDP. Inflation usually affects the poor population and the middle class more than the rich in a context of monetary instability, because this towards the ends have better financial instruments access that give them the opportunity to hedge their inflation exposure (Clarke, Zou et al. 2003). At the end of the day, inflation influences both social classes and it is the purchasing power level of deterioration of the rich and the poor that will affect income inequality. Appropriately, income inequalities widen and vice versa if the poor purchasing power deteriorates more than the rich do.

In all regressions equations, the trade openness ratio is significant at 1 percent level. As suggested by Stolper and Samuelson theorem, trade openness expands the income inequality in a nation that has a comparative advantage in delivering the goods that need skilled labour (i.e. the high-tech goods) and diminish the income inequality in a country that has a comparative advantage in producing goods that need labour abundance. Each exchanging country increase in wealth often comes with the opening borders, nevertheless, internal inequalities may decrease or increase.

In my regression, I found positive and negative results on the coefficients of trade openness ratio. The regression 1,2,3 and 4 the liquid liabilities (M3) as a percentage of GDP and private credit by deposit money banks and other financial institutions to GDP indicators, the results point a statistically significant and positive correlation with income inequality. These findings are consistent with the study of Meschi and Vivarelli (2009) who obtained that foreign trade amongst developed and developing countries results in the higher levels of income inequality.

In regression 4 and 3, we found the coefficient on education rate statistically significant and positive at the 1 percent level, meaning that if the levels of education are increasing, which implies an increase in labour skilled supply. Thus the workforce skilled salary increases compared to the workforce unskilled salary and an overall reduction in income inequality Enowbi Batuo, Guidi et al. (2010) . In regression 3, the government consumption expenditure as the percentage of GDP has negative effects on income inequality. We can conclude that in our sample the wealth redistribution policies through the government interventions, social transfers and tax system are generally pro-poor. Lastly, the total population variable rate is positively and statistically significant at 1 percent level of significant to income inequality with the exception of the final regression equation where the population variable negatively impacts on income inequality at 1 percent that retain the

private credit by deposit money banks and other financial institutions to GDP. This result means that the higher the gap between the poor and rich, the more the total populations' increases. According to the findings of Boulier (1975), the increase in income inequality is caused by the demographic trends. He also concludes that the decreases in the fertility levels and the total population growth ratio yields to a better income distribution levels and the total population growth ratio yields to a better income distribution.

5.8 Summary of regression results and conclusion

5.8.1 Summary of static panel regression results

In total 18 separate regressions were estimated, the following Tables summarises the finding in regard to the impact of the various explanatory variables on inequality. The results are separated into four categories of countries, which include all, low, lower-middle, upper-middle and high-income countries.

Table 5.92 All countries

	Regression1	**Regression2**	**Regression3**	**Regression4**
Financial development	**beyond threshold effects inequality Declines**	**beyond threshold effects inequality Declines**	**no threshold effects**	**beyond threshold effects inequality Declines**
GDP per capita	**beyond threshold effects inequality Rises**	**beyond threshold effects inequality Rises**	**beyond threshold effects inequality will Rises**	**beyond threshold effects inequality Increases**
Agricultural sector	**positive**	**positive**	**negative**	**negative**
Government consumption	**negative**	**positive**	**negative**	**negative**
population growth rate	**positive**	**positive**	**negative**	**negative**
Education	**positive**	**positive**	**negative**	**negative**
Openness	**positive**	**positive**	**positive**	**positive**
Inflation	**negative**	**negative**	**negative**	**negative**

The overall results demonstrate that financial development causes a decline in inequality on average in most countries, which per capita GDP causes inequality to rise on average. Inflation has a negative effect on inequality while trade and financial openness creates greater inequality. Further most of the results show that government consumption spending on average reduces inequality, while the results are mixed for agriculture sector, population growth and education.

Table 5.93 Low-income countries regression results

	Regression3	**Regression4**
Financial development	**After the threshold inequality decreases**	**In the pooled regression inequality falls after the threshold, while on fixed effects model inequality rises.**
GDP per capita	**After the threshold inequality decreases**	**Inequality falls after the threshold**
Agricultural sector	**negative**	**negative**
Government consumption	**negative**	**positive**
population growth rate	**negative**	**negative**
Education	**positive**	**negative**
Openness	**positive**	**positive**
Inflation	**positive**	**positive**

In regard to the financial development results, the assumption in a pooled regression is that all countries are identical which is a strong assumption while in the case of the fixed effect model individual country differences for each country is allowed to vary (i.e., the country specific heterogeneity effects), while the study continues to maintain the assumption that the slope parameters are constant for all countries and for all time periods as it did in the pooled regression model. Hence, one is more inclined to follow the results of the fixed effect model, which suggests that for low-income countries financial development increases inequality between citizens. Furthermore, the agriculture sector and population growth reduce inequality while openness and inflation increases inequality. However, the results are mixed for government and education.

Table 5.94 Lower-middle-income countries regression results

	Regression1	Regression2	Regression3	Regression4
Financial development	**After the threshold inequality decreases**	**Past the threshold inequality decreases**	**None found the threshold effects**	**Only pooled found a rise in inequality after the threshold**
GDP per capita	**Past the threshold inequality falls.**	**In pooled regression inequality falls past the threshold**	**past threshold inequality rises**	**past the threshold inequality rises**
Agricultural sector	**positive**	**positive**	**positive**	**positive**
Government consumption	**positive**	**negative**	**positive**	**positive**
population growth rate	**positive**	**negative**	**positive**	**negative**
Education	**positive**	**positive**	**negative**	**negative**
Openness	**negative**	**positive**	**positive**	**positive**
Inflation	**negative**	**negative**	**negative**	**negative**

Concerning the impact of financial development, the results of the majority of regressions suggest that after the threshold inequality decreases, however in regard to per capita GDP the results are mixed. The results also suggest the agriculture sector and government consumption expenditure have a positive effect on inequality, while the results are mixed for the rest of the variables.

Table 5.95 Upper middle-income countries regression results

	Regression1	Regression2	Regression3	Regression4
Financial development	**After the threshold**	**Past the threshold**	**Only pooled regression**	**No threshold**

	inequality decreases	**inequality decreases**	**inequality rises after the threshold**	**effects**
GDP per capita	**After the threshold inequality decreases**	**After the threshold inequality increases**	**After the threshold inequality decreases**	**After the threshold inequality decreases**
Agricultural sector	**negative**	**negative**	**negative**	**negative**
Government consumption	**positive**	**positive**	**positive**	**negative**
population growth rate	**positive**	**positive**	**negative**	**positive**
Education	**positive**	**positive**	**negative**	**positive**
Openness	**positive**	**positive**	**negative**	**negative**
Inflation	**negative**	**negative**	**negative**	**negative**

For upper middle-income countries, the results for financial development and per capita GDP for the majority of regressions suggest that after the threshold inequality decreases. The Agriculture sector and inflation have a negative effect on inequality while government spending, population growth and education have a positive effect. The results are mixed for openness.

Table 5.96 High-income countries regression results

	Regression1	**Regression2**	**Regression3**	**Regression4**
Financial development	**Only pooled regression generated a rise in inequality after the threshold**	**Only pooled regression generated a rise in inequality after the threshold**	**For pooled regression suggest beyond threshold effects inequality will rise while fixed effect inequality decreases.**	**For pooled beyond threshold effects inequality will rise. For fixed and random will decreases.**
GDP per capita	**Fall in inequality beyond the**	**rise in inequality beyond the**	**Fall in inequality beyond the threshold**	**Fall in inequality beyond the threshold**

	threshold	threshold		
Agricultural sector	**positive**	**positive**	**negative**	**negative**
Government consumption	**positive**	**negative**	**negative**	**negative**
population growth rate	**positive**	**positive**	**negative**	**negative**
Education	**negative**	**positive**	**positive**	**positive**
Openness	**positive**	**positive**	**positive**	**positive**
Inflation	**negative**	**negative**	**negative**	**negative**

Since the study is giving greater precedence to the fixed effect model for it is based on more realistic assumptions the study concludes that for high-income countries beyond the threshold financial development reduces inequality. Per capita GDP also causes inequality to fall beyond the threshold in most of the regressions. Government consumption and inflation has a negative effect on inequality, while education and openness have positive effects on inequality. However, however the agricultural sector and population growth exhibit mixed findings.

5.9 Conclusion

In summary, the regression results indicate that the squared coefficient of the private credit by deposit money banks and other financial institutions to GDP variable is not statistically significant while the coefficient of private credit is positive and statistically significant.The Kuznets (1955) hypothesis, which assumes the inverted U-shaped relation between economic development and income inequality is retained to some of the other regression results.

Therefore my results support and retained the non-linear hypothesis of Greenwood and Jovanovic (1990), which predict the inverted U-shaped relationship between financial development and income inequality. However, according to the results, the researcher can conclude that financial development reduces the gap between the poor and the rich, which is consistent with the findings of Jauch and Watzka (2016) who used the GMM system analysis. However, this hypothesis is not retained when using the liquid liabilities (M3) as an

indicator. Furthermore, we found that non-linear hypothesis of Greenwood and Jovanovic (1990) it is retained for the group of low –middle income and upper-middle-income countries.

CHAPTER 6: GENERAL METHODS OF MOMENTS MODELLING

6.0 Introduction

The study applied the Arellano and Bond (1991)) GMM (general methods of moments) model to account for the existence of endogeneity in the regression model. Ideally, in panel regressions, explanatory variables ought to be exogenous but in reality the empirical analysis of policy interventions, policy variables are most likely not strictly exogenous but simultaneously determined with the outcome variable of interest. Alternatively, even if they are not simultaneously determined they may still be influenced by past values of the dependent variable.

Due to these endogeneity problems, least squares based inference methods, i.e. fixed or random effects estimators are biased and inconsistent. Hence, it has become standard practice nowadays to use Instrumental Variables (IV) methods or the generalised method of moments (GMM), which produce consistent parameter estimates for a finite number of time periods, T and a large cross-sectional dimension, N.

The GMM approach involves first differencing which illuminates the individual specific effects. One main reason for their popularity in empirical research is that the GMM estimation approach may provide asymptotically efficient inference employing a relatively minimal set of statistical assumptions. The Sargan tests first differencing lead us to a point where we conclude that internal instruments are not weak. This study, therefore, used the internal instrument for the lag of dependent variable and another independent variable to account the problem of endogeneity.

6.1 PANEL GMM Model Results

Table 6.1: Differencing GMM model regression results for regression 1

Dependent variable: income inequality ($LGINI_{2it}$)	Regression 1	
Independent variables	**variable**	**coefficient**
Lag of income inequality	$LGINI_{2it-1}$	0.470066*** (0.085742)
Financial development one	LFD_{1it}	0.018079 (0.019216)
Squared term of financial development one	$LFDD_{1it}$	-0.002459 (0.002914)
GDP per capita	$LGDP_{it}$	-0.202669 (0.149085)
Squared term of GDP per capita	$LGGDP_{it}$	0.009319 (0.008675)
Agricultural sector	$LAGRC_{it}$	-0.000711 (0.016410)
Government consumption	$LCONS_{it}$	-0.006570** (0.017898)
population growth rate	$LPOP_{it}$	-0.013003 (0.034965)
Education	$LEDUC_{it}$	0.035830 (0.017234)
Openness	$LTOP_{it}$	-0.000139 (0.015149)
Inflation	$LINFL_{it}$	-0.001552 (0.001818)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

From the GMM results on Table 6.1, financial development one, squared term of GDP per capita and education are positively related to income inequality but the relationship is statistically insignificant and all the coefficients are fairly small, which means that the relationships are moderately weak. Inflation, trade openness, population growth rate, government consumption, agricultural sector and GDP per capita, on the other hand, are negatively related on income inequality.

Table 6.2: Differencing GMM model regression results for regression 2

Dependent variable: income inequality (LGINI_{2it})	Regression 2	
Independent variables	**variable**	**coefficient**
Lag of income inequality	LGINI_{2it-1}	0.461531*** (0.086966)
Financial development one	LFD_{1it}	-0.058284 (0.047929)
Squared term of financial development one	LFDD_{1it}	0.008835 (0.006570)
GDP per capita	LGDP_{it}	-0.174566 (0.136414)
Squared term of GDP per capita	LGGDP_{it}	0.007697 (0.007987)
Agricultural sector	LAGRC_{it}	0.003248 (0.016643)
Government consumption	LCONS_{it}	0.006034 (0.017929)
population growth rate	LPOP_{it}	-0.023456 (0.031426)
Education	LEDUC_{it}	0.035701** (0.016560)
Openness	LTOP_{it}	-0.001824 (0.014571)
Inflation	LINFL_{it}	-0.001882 (0.001875)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Table 6.3: Differencing GMM model regression results for regression 3

Dependent variable: income inequality ($LGINI_{1it}$) Regression 3		
Independent variables	**variable**	**coefficient**
Lag of income inequality	$LGINI_{1it-1}$	0.519257***
		(0.057605)
Financial development one	LFD_{1it}	0.002692
		(0.005285)
Squared term of financial development one	$LFDD_{1it}$	0.000285
		(0.000465)
GDP per capita	$LGDP_{it}$	0.382552**
		(0.157552)
Squared term of GDP per capita	$LGGDP_{it}$	-0.024969**
		(0.010404)
Agricultural sector	$LAGRC_{it}$	-0.029157*
		(0.016717)
Government consumption	$LCONS_{it}$	0.004719
		(0.018752)
population growth rate	$LPOP_{it}$	-0.072647
		(0.066698)
Education	$LEDUC_{it}$	-0.041688
		(0.036829)
Openness	$LTOP_{it}$	0.011730
		(0.016335)
Inflation	$LINFL_{it}$	0.003315
		(0.002273)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

Concerning regression three on table 6.3, financial development squared is insignificant hence, there are no threshold effects. However, the threshold effect is significant for GDP. Optimal GDP beyond threshold value of per capita income of $2122.90 per annum inequality increases. Agricultural sector is negatively related on income inequality and the relationship is statistically significant. Other control variables such as Government consumption,

openness and Inflation are positive related to income inequality while population growth rate and education are negative related to income inequality.

Table 6.4: Differencing GMM model regression results for regression 4

Dependent variable: income inequality ($LGINI_{1it}$) Regression 4		
Independent variables	**variable**	**coefficient**
Lag of income inequality	$LGINI_{1it-1}$	0.516341*** (0.060063)
Financial development one	LFD_{1it}	-0.001342 (0.029113)
Squared term of financial development one	$LFDD_{1it}$	0.002268 (0.004531)
GDP per capita	$LGDP_{it}$	0.436085*** (0.160280)
Squared term of GDP per capita	$LGGDP_{it}$	-0.028322*** (0.010478)
Agricultural sector	$LAGRC_{it}$	-0.032776** (0.015807)
Government consumption	$LCONS_{it}$	-0.005620 (0.018387)
population growth rate	$LPOP_{it}$	-0.075009 (0.068246)
Education	$LEDUC_{it}$	-0.045320 (0.035973)
Openness	$LTOP_{it}$	0.009164 (0.017497)
Inflation	$LINFL_{it}$	0.003242 (0.001975)

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%. Parentheses figures are standard errors

Source: Compiled by the author

According to the model results on Table 6.4 GDP per capita have threshold effects, beyond $2591.52 per capita income inequality decreases. Additionally, agricultural sector contributes towards reducing inequality for the relationships are statistically significant at conventional level. Other control variables such as education, population growth rate, government

consumption and financial development are positively related to income inequality but the relationship is statistically insignificant.

6.2 Summary of dynamic panel regression results

In total, four separate regressions were estimated, the following table summarises the findings in regard to the impact of the various explanatory variables on inequality. The results are separated into four dynamic panel regressions.

Table 6.5 All countries

	Regression1	**Regression2**	**Regression3**	**Regression4**
Financial development	**no threshold effects**	**no threshold effects**	**no threshold effects**	**no threshold effects**
GDP per capita	**no threshold effects**	**no threshold effects**	**beyond the threshold inequality rises**	**beyond the threshold inequality decreases**
Agricultural sector	**negative**	**positive**	**negative**	**negative**
Government consumption	**negative**	**positive**	**positive**	**negative**
population growth rate	**negative**	**negative**	**negative**	**negative**
Education	**positive**	**positive**	**negative**	**negative**
Openness	**negative**	**negative**	**positive**	**positive**
Inflation	**negative**	**negative**	**positive**	**positive**

None of the regression found statistically significant threshold effects for the financial development variable; however, last two regressions found relevant results for the GDP threshold effects but contradict one another. The results also suggest the agriculture sector and population have a negative effect on inequality. While the results are mixed for government consumption expenditure, education, openness and inflation. The dynamic panel regression results tend to be less conclusive for most of the variables compared to the static panel results discussed and summarised in the previous chapter.

6.3 Conclusion

In summary, the regression results indicate that the financial development variables for almost all regressions are statistically insignificant. The results obtained in the empirical analysis above are consistent with results of similar studies discussed in Chapter 5, which use different measures of financial development, inequality, data sources and time periods.

CHAPTER 7

RECOMMENDATIONS AND CONCLUSION

7.1 Introduction

Chapter 7 first provides a summary of the study and the resultant findings, by an outline of the limitations and future policy recommendations. The chapter consists of four sections. Section 7.2 presents the summary of the findings, while Section 7.3 provides the limitations of the study (strengths, weaknesses). Suggestions for future research are laid out in Section 7.4. Lastly, Section 7.5 outlines the policy implications and conclusion of the study.

7.2 Summary of findings and cohort-country policy implications

This study attempted to assess the impact of economic growth and financial development on income inequality. The researcher carefully selected macroeconomic variables that have been considered in the econometric models for empirical analysis of the research study in this dissertation through statistical estimation techniques as guided by Jauch and Watzka (2016) who used the GMM econometric analysis to examine the impact of financial development on income inequality, in this area of study. Two versions of the dependent variable (income inequality) were used which included Gini coefficient of gross and net income. The explanatory variables included GDP as an indicator for economic growth, financial development (ratio of private sector credit to GDP and ratio of liquid liabilities (M3) to GDP, population, school enrolment, inflation and government's final consumption expenditure as a percentage of GDP, respectively.

Since the pattern of income distribution can be influenced by financial development, it is of major importance to both developing and developed economies. To add to the body of literature, this paper tested empirically within a panel data framework, the theoretical foundations of the linear relationship between financial development and income inequality developed by (Galor and Zeira 1993) and Banerjee and Newman 1993). Moreover, the nonlinear theoretical relationship advocated by Greenwood and Jovanovic (1990) was evaluated.

The study employed an unbalanced dataset over the 1970-2014 period, involving 142 developed and developing countries. I also used the World Banks's Atlas method to classify the countries in terms of GDP. The researcher obtained four countries groups, thanks to this classification. The countries groups are low-income countries, middle-income countries, upper-middle income countries and high-income countries.

The overall results demonstrate that on average financial development causes a decline in inequality in most countries while per capita GDP causes inequality to rise on average. Inflation has a negative effect on inequality while trade and financial openness creates greater inequality (ie. a positive effect). Further most of the results show that government consumption spending on average reduces inequality. While the results are mixed for agriculture sector, population growth and education. However, when the data was separated into low, lower-middle, upper-middle and high-income countries the results varied substantially.

In regard to the low-income countries, the fixed effect model suggested that financial development increases inequality between citizens. Furthermore, the agriculture sector and population growth reduce inequality while openness and inflation increase inequality. However, the results are mixed for government and education. Hence, the policy recommendation is that the authorities must find ways to include the poor into the financial system so that they may benefit from it. Moreover, the agriculture sector must continue to be harnessed to benefit the poor and the authorities ought to be vigilant in regard to the pace of openness for the impact on the poor is debilitative.

Concerning the lower-middle income countries, the impact of financial development, the results of the majority of regressions suggest that after the threshold inequality decreases, however in regard to per capita GDP the results are mixed. The results also suggest the agriculture sector and government consumption expenditure have a positive effect on inequality. While the results are mixed for the rest of the variables. Hence, from a policy perspective financial development ought to be pursued vigorously, while government spending should be contained and the agriculture sector ought to be made more profitable for the poor to benefit from it.

In respect of upper middle-income countries, the results for financial development and per capita GDP for the majority of regressions suggest that after the threshold inequality decreases. The Agriculture sector and inflation have a negative effect on inequality while government spending, population growth and education have a positive effect. The results are mixed for openness. Policy ought to promote financial development, the agriculture sector and economic growth as aggressively as possible. Government ought to curb spending and promote education in a manner that inequality is reduced.

With reference to high-income countries beyond the threshold, financial development reduces inequality. Per capita GDP also causes inequality to fall beyond the threshold in

most of the regressions. Government consumption and inflation has a negative effect on inequality, while education and openness have positive effects on inequality. However, however the agricultural sector and population growth exhibit mixed findings. Government policy ought to encourage the promotion of financial development and government spending especially since inflation is not a challenge in these economies. The authorities must further ensure openness and education does not drive such a wedge between the income classes that it destabilises society.

The dynamic panel regression results, which were performed on all countries data, tended to be less conclusive for most of the variables compared to the static panel results discussed and summarised in the previous chapter

7.3 Limitations of the study

In this study, the first limitation is that the analysis excludes the influence of access to finance measure (the number of ATMs per 100 000 inhabitants and minimum amount required to borrow as ratio over GDP per capita) on income inequality in developed and developing countries due to general unavailability of data. The second possible limitation of this study is the exclusion of the degree of the ethnolinguistic fractionalisation of the population as the control variable on the impact of financial development on income inequality. Furthermore, this study neglected to consider running a panel VECM to check the long run relationship between financial development and income inequality and another possible limitation is the exclusion of the stock market capitalisation as another proxy for financial development indicator.

7.4 Suggestions for future research

Based on both the strengths and weaknesses and research findings, there is still a basis for conducting further research on the relationship between economic growth, financial development and income inequality. It is important for future research to focus on evaluating the respective access to finance and poverty on relationship between financial development and income inequality. Future research should also pay attention to the evaluation of the effect of ethnolinguistic fractionalisation on income inequality and use of the stock market capitalisation as the proxy for financial development indicator.

In addition, the implications of data unavailability are perhaps a need for future research to address that issue. Standardisation techniques of data for data reported and collected may be employed as well for any future research if resources allow. Lastly, closer interrogation of

available data and data sources may be useful if time and resources allow in order to minimise the problem of insufficient data.

The threshold results for both economic growth and financial development appeared to be sensitive to which indicators were used, thus raising doubts about the inverted U-shaped findings, hence future studies should endeavour to remove these uncertainties.

A number of the variables showed mixed results regarding a number of variables, future studies ought to attempt to unravel these uncertainties through alternative individual country studies.

This study neglected to assess which countries lie below or above the threshold for both financial development and per capita GDP, perhaps richer insights might be obtained concerning the country characteristics, hence future studies ought to pursue this line of research.

7.5 Conclusion

Banerjee and Newman (1993) and Galor and Zeira (1993) predicted a linear negative relationship between financial development and income inequality, while Greenwood and Jovanovic (1990) predicted an inverted U-shaped nonlinear relationship. Furthermore, the hypothesis of Kuznets (1955), which predicted the inverted U-shaped relationship between economic growth and income inequality was also tested, as noted above economic growth exhibit threshold effects that reduces income inequality, hence governments ought to ensure they follow business friendly economic policies that attract internal and external investment to promote economic growth. These business-friendly economic policies include trade and financial liberalisation, labour market flexibility, policies that keep inflation restrained, eliminating constraints to set up businesses, protection of private property and intellectual property rights, an efficient and effective legal system, education policy that ensures high quality education all-round but especially high proficiency in the mathematics and the sciences, policies to eliminate corruption, provision of necessary infrastructure for business to thrive in and good stable governance of country, are the main policies posited by mainstream economists.

The findings suggest that financial development reduces the gap between the competing hypotheses of Banerjee and Newman (1993) and Galor and Zeira (1993) and Greenwood and Jovanovic (1990) is sensitive to financial development variables, the sources of the Gini coefficient, the group of countries and the estimation technique. However, the results allow

us to retain the nonlinear hypothesis of Greenwood and Javanovic (1990), which predict the inverted U-shaped relationship between financial development and income inequality. Where, the results are consistent with those of Jauch and Watzka (2016) who used the GMM econometric analysis to examine the impact of financial development on income inequality . According to the researcher's knowledge, this study is the only study that used the EHII and Gcip databases, as sources to the Gini index, on the relationship between financial development and income inequality. The test of Kuznets (1955) for relationship between economic growth and income inequality was retained and the normal U-shaped relationship like the one obtained by (Mansour and Wendel 2015). Hence policies to make the banking system assessable to the poor is critical especially in less developed and emerging economies; some countries like Kenya and India are employing IT and cell-phone technology to achieve this end (Gow and Smith 2006).

The majority of the results of the control variables of international samples are generally significant and there is a strong relationship between the coefficients obtained, which are consistent with the theory. The policy implication is that a wealth tax, as advocated by Piketty (2014) to subsidise social spending is critical in order to address the disparities caused by financial development. It is additionally imperative to implement policies, which actively encourage education and increase skills for the low skilled in particular. Appropriately, it is good to promote and encourage education in rural areas or disadvantaged areas, provide favourable teaching conditions and provide good infrastructure.

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APPENDIX A

Table 3.1 Summary of empirical studies between economic growth and income inequality

Author(s)	Country, sample/ period, inequality measures	Findings/ main results
Persson and Tabellini (1991)	• 67 developed and developing countries • 1930 to 1985 • 9 developed and developing countries • 1830 to 1985	The authors found a negative relationship between economic growth and inequality, which in non-democratic countries becomes statistically insignificant.
Clarke (1995)	• 70 countries • Between 1970 and 1988 • Used the ratio between 40 percent bottom and 20 percent income share	The author negative relationship when he uses the Gini coefficient and Theil index as a measure of inequality.
Alesina and Rodrik (1994)	• 70 OCSE countries and developing countries • 1960 and 1985 • Land and income Gini coefficient	The authors find the negative relationship when they used the land and income Gini coefficient as a measure of inequality.
Perotti (1996)	• 67 countries • 1960 • Third and fourth income share of the population quintile	The authors find the negative relationship but in poor countries, the results are not statistically significant.
Partridge (1997)	• USA • Between 1960 and 1990 • Third quintile of the income share and Gini coefficient	The author found that there is a positive relationship between economic growth and inequality
Deininger and Squire	• 87 countries • Between 11960 and 1992	The author concludes that with the inclusion of regional dummies the negative statistically insignificant relationship exists.

Author(s)	Country, sample/ period, inequality measures	Findings/ main results
(1998)	• Land and Gini coefficient	
Li et al. (1998)	• 46 countries • Between 1960 and 1990 • Income Gini coefficient	The author found that there is a positive relationship between economic growth and inequality
Forbes (2000)	• 67 OCSE countries • Between 1970 and 1995 • Income Gini coefficient	The author found that there is a positive relationship between economic growth and inequality
Knowles (2001)	• 40 countries • Between 1960 and 1990 • Income Gini coefficient	The author concludes that there is a negative relationship between economic growth and inequality
Panizza (2002)	• 48 single states of USA • Between 1940 and 1980 • the income share of the third quintile and Gini coefficient	The author found that the results are not statistically significant between variables
Banerjee and Duflo (2003)	• 45 countries • Between 1965 and 1990 • Income Gini coefficient	The author concluded that negative changes in economic growth were associated with the changes caused by inequality in whatever direction changes take place.
Pagano (2004)	• 40 countries • Between 1950 and 1990 • Income Gini coefficient	The author found that in rich countries, there was a positive relationship and in poor countries, there is a negative relationship between economic growth and inequality.
Easterly	• Over 100 developed and developing countries	The author concluded that there was a negative relationship between economic

Author(s)	Country, sample/ period, inequality measures	Findings/ main results
(2007)	• Between the period of 1960 and 1998. • Ratio amongst the extension of land to grow wheat and for sugarcane	growth and inequality
Castelló-Climent (2010)	• 56 countries • Between 1965 and 2000 • Income and human capital Gini coefficient	The author found that there was a negative relationship between economic growth and inequality
Barro (2008)	• 47 to 70 developing and developed countries • between 1965 and 2004 • Income Gini coefficient	The author found that in rich countries there was a positive relationship and in poor countries, there is negative relationship between economic growth and inequality
Grijalva (2011)	• About 100 developing and developed countries • Between the period of 1950 and 2007 • Income Gini coefficient	The author concludes that in short and medium term of 5 to 10 years there was an inverted U relationship between economic growth and income inequality.
Assa (2012)	• 141 developed and developing countries (including the sample restricted of 100) • Between the period of 1998 and 2008. • Income Gini coefficient	The author found that in developing countries there was a negative relationship between growth and inequality with less evident from advanced economies.

Table 3.2 Summary of empirical studies between financial development and economic growth

Author(s)	Aim of the study	Country, Sample/period, Econometric techniques	Variable(s)/ indicators used	Findings/ main results
King and Levine (1993)	The main goals of the study were to investigate the relationship between finance and long-term output growth. The authors examined the improvements in economic efficiency and capital accumulation as two sources of economic growth	• 80 developed and developing countries • 1960-1989 • Cross-section analysis	The authors used financial depth as a measure of financial development and GDP per capita as a dependent variable	✓ During the period between 1960 and 1989 the financial development average level is very strongly correlated with economic growth for the study ✓ Financial development lead to economic growth ✓ During 1960 financial depth is significantly and positively correlated to economic growth for the next coming 30 years even after controlling country-specific effect and policy implications. ✓ Greater the level of financial development closely related to future rates of capital accumulation and efficiency future improvements. ✓ The author's findings are in line with Schumpeter's study that financial development encourage economic growth
De Gregorio and Guidotti (1995)	The aim of the study was to re-examine the nexus between financial development and long-term growth. The authors used bank credit to the private sector as a measure of financial development.	• 100 countries • Between 1960 and 1985 • 12 Latin American countries • 1950 and	The authors used the ratio bank to credit as a measure of financial development, GDP per capita, foreign investment, inflation, government spending	✓ Barro (1996) investigated the impact of financial development on long-term growth and the positive effect was found in this dataset. The author conclusion is that the impact of financial intermediation on economic growth is due to the efficiency of investment other than its volume. ✓ The investment is higher in low and middle-income countries compared to high-income countries. ✓ In Latin America, the author found the negative

		1985 • Panel data and cross-sectional data		relation between finance and growth.
Demetriades and Hussein (1996)	The main focus of this study was to investigate the causality between financial sector and growth using a time series techniques from 16 countries.	• 16 countries • Time series data analysis	The authors used the ratio bank to private sector GDP as a measure of financial development, government spending and real per capita GDP	✓ Little evidence was provided that finance is a leading sector in the economic growth process since many studies suggest the bi-directional relationship nexus between financial development and economic growth. ✓ The results are very country specific from the causality tests perspective, which are the limitations in panel studies, which necessarily involves cross-sectional data.
Odedokun (1996)	The main objective of the study was to investigate the effects of financial intermediation on growth in LDCs	• 71 countries • Between 1960 and 1980 • OLS techniques	The author used the financial depth as a measure of financial development, real export growth, investment GDP ratio, capital formulation and population growth	✓ About 85 percent of the country's economic growth is promoted by the financial intermediation. ✓ The promoting effect is more predominant in low - income countries compared to high-income countries

Allen and Ndikumana (2000)	The main aim of this study was to examine the role of financial intermediation in inspiring the growth in Southern Africa. The authors do so by using different estimation techniques such as panel data analysis for 8 countries (Botswana, Lesotho, Mauritius, Malawi, Swaziland, South Africa, Zambia and Zimbabwe). The authors used the annual data for the whole analysis .	• 8 countries • Between 1970 and 1996 • Panel data analysis	The authors used the credit to private sector as a measure of financial development and M3 as the second measure of financial development, government consumption as a % of GDP, trade openness and growth rate per capita.	✓ The author concludes that financial development is positively correlated with economic growth, which supports the hypothesis that the finance-growth nexus is a long-term phenomenon . ✓ The results are more robust if the author used the pooled data analysis for five years cross-sections.
Levine and Zervos (1998)	The aim of the study is to investigate the banks, stock markets and the economic growth relationship, the authors used the cross-country analysis as the econometrics tools for the 47 countries between the period of 1976 and 1993.	• 47 countries • Between 1976 and 1993 • Cross country analysis	• GDP per capita as the dependent variable • Capital stock growth, revolutions and coups, change rate of the GDP deflator and turnover • CAPM and APT integration	The authors found that the banking and stock market liquidity after taking into consideration of all the factors associated with the growth is positively and robustly correlated with the future economic growth rates. Those provided by the stock markets the banks provide them with different service since the measures of banking development and the stock liquidity markets both enter into the economic growth equation significantly. The authors also conclude that the financial factors are an integral part of the economic growth process then, they find the positive effects of the financial development and economic growth.

			• Capitalisation	
Luintel and Khan (1999)	The study used the cross-country estimation techniques to assess the empirically stock markets measures liquidity and volatility. The study pays too much attention to the current and future economic growth whether are robustly correlated with the capital markets, capital accumulation and savings rates.	• 10 countries(Colombia, Costa Rica, Greece, India, Malaysia, Korea, Sri, Lanka, Philippines and Thailand) • Between 1951 and 1955 • VAR Model(vector autoregression model)	• Capital stock on real per capita as the dependent variable • Interest rate deflated by the inflation • Financial depth • Real per capita output	Banking and stock markets are positively and correlated with the future and contemporaneous economic growth rates, productivity growth and capital accumulation. The results suggest that those that are provided by stock markets, the banks provide different service to them since the measures of stock markets and development of banks enter with significant results on the regression of economic growth, Therefore, the authors conclude that there is a positive and strong evidence between economic growth and financial development and financial markets are the parts of the economic growth
Xu (2000)	The author used the VAR model and impulse response analysis to investigate the impact of financial development on investment domestic output,	• 41 developing countries • Between the period of 1960 and	• Real domestic investment and the real GDP as the dependent variable • Financial	The theory that says the financial development follows the economic growth was rejected based on author's results and found that there is a little effect of financial development on economic growth.

	The annual data of 41 developing countries were used to identify the effects.	1993 • Impulse response analysis and the VAR model	development index and M2as a measure of financial sector • Current bank deposit less previous bank deposit divided by the GDP	The author concludes that there is a strong relationship between finance on economic growth and investment channel through which finance affect the growth process.
Levine (2002)	The main aim of the study was to choose which system is better between the bank and markets based financial system, the author does so by using the cross-country analysis for 48 countries between 1980 and 1995.	• 48 countries • Between the period of 1980 and 1995 • Cross-country as the estimation techniques	• Real GDP per capita as the dependent variable • Private credit ratio, bank credit ratio, market capitalisation ratio • Corruption, schooling and inflation rate • Government expenditure as the share of GDP and the value traded ratio.	Based on data observation no evidence that supports the better system between the bank and markets based financial system. Therefore, cross-country analysis supports the view of the financial services. Then the author concludes that by looking the countries level of financial development helps them to explain the cross-country economic growth.

Benhabib and Spiegel (2000)	The main aim of this study was to investigate the role of finance in investment and growth rate. The study employed the panel data analysis for the period between 1965 and 1985.	• Unkown sample of countries • Between the periods of 1965 and 1985 • Generalised Method of Moments and the fixed effects.	• Average years of schooling and the GDP physical capital stock as the dependent variables. • Exports, labour force, Depth, bank and bank domestic assets. • Financial development	Capital and physical accumulation and growth productivity are influenced by the financial development positively, however, different components of growth are important by using the different indicators of financial development. The growth process is influenced by the debts of the financial sector and credit relative to the GDP private shares. In addition, the physical and human capital both influenced the size of the banking sector.
Levine et al. (2000)	The main aim of the study is to investigate the causal relationship between the financial development and economic growth. The study does so by applying the system GMM for controlling the endogeneity problems with 71 developed and developing countries.	• 71 and 74 developing and developed countries • Two samples the first one is between the period of 1960 and 1995 and the second one is between the period of	• Gross domestic product as a dependent variable • Liquid liabilities divided by the GDP as a measure of financial development • Other control variables are education, trade openness,	The financial development has a large positive effect on economic growth by using the cross-sectional and panel data estimation techniques.

		1961 and 1995 • Cross-sectional analysis and the panel data analysis	inflation, political stability, dummy variables and measures of the size of government etc.	
Shan et al. (2001)	To empirically analyse the debate whether the Granger causality gives us the results suggesting that the financial development leads to economic growth. The study used the vector autoregression model (VAR) to complete the Granger causality procedures.	• 9 OECD countries and China • Quarterly data set • The vector autoregressio n model and Granger causality procedure.	• Output as defined as the GDP per capita as the dependent variable • Bank credit, total factor productivity and trade • Other control variables include the consumer price index, stock market prices and inventory	The hypothesis suggesting that financial development leads to economic growth, the author found little evidence supporting the hypothesis. The bi-directional causality and reverse causality for other countries were found. The study supports other studies.
Zang and Kim (2007)	The author's critical analyses the causal relationship between financial development and	• 74 countries • Between	• Liquid liabilities to GDP ratio and bank deposit	The authors conclude that to study the relationship between the financial development and economic growth needs the balanced approach to be adopted, therefore,

	economic growth using the panel data analysis as the estimation techniques.	1961 and 1995 • Panel data analysis	money assets ratio • GDP and government expenditure	the economic growth precedes subsequent financial development.
Ahlin and Pang (2008)	The aim of the study is to check whether the financial development and corruption rate are the substitutes or not in controlling the economic growth. The authors do so by employing the dynamic panel data analysis using the international data sample between the period of 1960 and 2000.	• 48 countries • Between 1960 and 2000 • Dynamic panel data analysis	• Real GDP per capita growth as the dependent variable • Liquid liabilities, total credit and deposit money banks as the measures of the financial development • Other control variables are: government expenditure and corruption indicator	The authors found that the low corruption and financial development are both the substitutes. Meaning that the economic growth effects on decreasing the corruption rate are higher when there is the less developed financial system. In addition, the opposite is true the economic growth effect of increasing the financial system is bigger when there is more corruption.
Bertocco (2008)	The aim of the study is to investigate the implications and importance of the Schumpeter's contributions by looking the recent work of the finance and growth	• It's a depth evaluation of the empirical and theoretical	• It's a depth evaluation of the empirical and theoretical model with no original	Rajan and Zingales (2003) show us the highlights of the Schumpeter's theory, but they do not take the implications of the theory into account. Therefore, this paper considers those implications.

	nexus as suggested by Rajan and Zingales (2003)	model with no original works for the authors	works for the authors	
Dawson (2008)	To analysis the finance and growth relationship in less developed countries using the panel cointegration methods for the 58 LDCs, which include the low, lower middle and upper-middle-income countries between the period of 1960 and 2002.	• 58 less developed countries • Between the period of 1960 and 2002 • Panel cointegration methods	• GDP and investment as the dependent variable • The ratio M3/GDP as a measure of financial development	The author found that in less developed countries there is a positive relationship between the financial development and income inequality. The financial development gross domestic product elasticity is 0.46, which varies between broad income groups.
Brezigar et al. (2011)	The main aim of this study is too critical analyses the non-linear relationship between the financial development and economic growth in Europe.	• 31 European countries • Between the period of 1995 and 2004 • Dynamic panel data analysis	• Real GDP as the dependent variable • Market capitalisation shares and domestic credit as a measure of financial development • Other control	The authors conclude that from the domestic financial markets transition economies benefits more compared to EU-a5 economies.

			variables are educational attainment, institutional factors i.e. administrative barriers, protection of the property rights etc.	
Vaona (2008)	The main aim of the study is to investigate the relationship between financial development and economic growth by using the regional dataset from 94 and 73 Italian provinces.	• 94 and 73 Italian provinces • Cross-sectional method • Panel data analysis	• Real GDP as the dependent variable • Short-term credit and long-term credit over value-added as the measures of the financial development • Other control variables are: number of crimes per head, finished public infrastructures students enrolled	The author found that the finance leads the economic growth by using the panel evidence and cross-sectional analysis and the finance-growth nexus is robust to the unobserved heterogeneity. Although the rejection of the spatial correlation in the residuals due to the data observation.

			in the secondary and sum of exports and imports over value added	
Acaravci et al. (2009)	The main aim of this study is to assess the link between finance and economic growth nexus. The author concentrates on the Sub-Saharan African countries by looking the causality between the two variables.	• 24 Sub-Saharan African countries • For the period between 1975 and 2005 • Panel GMM for causality estimation and panel cointegration	• Per capita real GDP as the dependent variable • Bank credit, liquid liabilities and private sector as the proxy for financial development.	By using the panel of 24 sub-Saharan African countries, the authors found the bidirectional causal relationship between economic growth and the banking sector domestic credit. The results implying that the African countries can increase their economic growth by increases their financial systems also the opposite or vice versa is true.
Beck et al. (2009)	The study employs the cross-country estimation techniques for 45 developed and developing countries to regulate the impacts of bank decomposing lending on real sector outcomes.	• 45 countries • Cross-country analysis estimation techniques	• GDP per capita as the dependent variable • Enterprise and household credit to GDP as the proxy for financial	The authors conclude that the credit enterprise raises the economic growth process on another hand the credit household has no impact. Credit enterprise reduces the income inequality, where the credit household, on the other hand, has no effects at all. No relationship was found between the excess consumption sensitivity and enterprise credit but credit

			development • Another control variable: secondary enrolment, trade, inflation, government transfers and government consumption.	household is negatively related to the excess consumption sensitivity.
(Caporale et al. 2009)	The author used the panel data analysis as the estimation techniques to review the features of the financial sector and the banking in 10 new EU member countries between the period of 1994 and 2007 to examine the relationship between finance and economic growth.	• 10 new EU countries members • Between the period of 1994 and 2007 • Dynamic panel data analysis	• Real per capita GDP the dependent variable • Credit to the private sector GDP, stock market capitalisation and liquid liabilities to GDP ratio as the measures of the financial development • Other control variables are: interest rate,	Credit markets and stock markets economic growth contribution is limited due to the lacking of the financial depth are still considered as the underdeveloped in these Economies. Then the authors found that the more efficient banking sector accelerate the economic growth process. The results of the Granger causality tests indicate that the causality is running not in the opposite direction but only in the direction from financial development to economic growth.

			education, trade openness, inflation and government consumption	
Ghimire and Giorgioni (2009)	The authors focus on the puzzles in finance and growth nexus by using the 121 countries for the period between 1970 and 2006.	• 121 countries • Between the period of 1970 and 2006 • Panel data analysis	• Growth of GDP per capita as the dependent variable • Private credit to GDP, capitalisation as the proxy for financial development • Another control variable: import and export to GDP, inflation, initial GDP per capita, black market premium and general government consumption.	The authors found that in the short term, the negative effects of private credit to economic growth exist and no positive effects were found between private credit and economic growth in the long-term.
Dabos and Williams	The authors used the dynamic panel data analysis to investigate	• 78 developing and	• Private credit / GDP and liquid	In areas like Africa and Latin America financial development has the positive effects of increasing the

(2009)	the impacts of financial development on economic growth between the period of 1961 and 1995 by introducing the new methodology.	developed countries • Over the period between 1961 and 1995 • Dynamic panel data analysis	liabilities / GDP as the financial development proxy measure. • Another control variable: exchange rate, inflation, GDP, trade	economic growth, with positive economic effects and statistically different from zero. Then they conclude that the transmission channel is more likely to be through productivity growth than compared to capital growth as Schumpeter suggestion.
Kiran et al. (2009)	The aim of the study is to investigate the relationship between financial development and economic growth in the long-term period by using the panel unit root and cointegration test for 10 emerging countries between the period of 1968 and 2007.	• 10 Emerging countries • Between the period of 1968 and 2007 • Panel cointegration and panel data estimation techniques	• GDP per capita as the dependent variable • Bank credit to GDP and turnover ratio to GDP as a proxy for financial development • Gross fixed capital, volume of trade as share of GDP and general government expenditure	The authors concluded that between the economic growth and the financial development measures there is a long-term relationship. In addition, the results support the hypothesis that there are statistically significant effects and positive effects the financial development on economic growth.
Yay and	The authors used the dynamic	• 16 developed	• Growth rate of	The results suggest that the stock markets and banks

Oktayer (2009)	panel data analysis (GMM) system to investigate the relationship between financial development and economic growth using the stock markets and banks to compare it has in developed and developing countries. The study uses the 21 developing and 16 developed economies from 1975 and 2006 period.	and 21 developing economies • Between the period of 1975 and 2006 • Dynamic panel data (GMM estimation techniques)	real GDP per capita as a dependent variable • Bank credit to GDP as the proxy for financial development • Other control variables: mean years of schooling, inflation rate, government expenditure and trade openness	positively influence the economic growth. In addition, the results based on the developed economies suggest that the stock markets only that positively influences the economic growth.
Antonios (2010)	The author used the 15 European union states members to examine the relationship between the finance and economic growth nexus for the period between 1965 and 2007 using the simultaneous system equations model.	• 15 members –states European unions • Between the period of 1965 and 2007 • Two-stage least squared	• GDP as a dependent variable • Lagged general stock market and private bank credits as the proxy for financial development • Other control variables are:	The author found that by taking into account the negative effects of interest rates and inflation rates, the relationship between financial development and economic growth is positive.

		method	consumer price index and interest rate	
Bittencourt (2012)	The author used the panel time series estimation techniques to investigate whether the Schumpeter is right and the effects of the finance on economic growth. The study used the annual data for the four Latin American countries between the period of 1980 and 2007.	• Four Latin American countries • Between the period of 1980 and 2007 • Panel time series estimation techniques	• GDP per capita as the dependent variable • M2/GDP as a liquid liabilities as the proxy for financial development • Other control variables are: inflation, years of schooling, political indexes, ratio of imports and exports	In the extreme economic and political environment like the one in the Latin America in the 1980s and 1990s, the prediction by the Schumpeterian that finance leads growth seems to hold.
Brezigar et al. (2011)	The study is investigating what was happening during the period of financial crises by using the dynamic panel data analysis estimation techniques. The author used 31 European countries and the real GDP per capita as the dependent variable.	• 31 European countries • Between the period of 1996 and 2004 • Dynamic	• Real GDP per capita as the dependent variable • Domestic credit and market capitalisation as a proxy for financial	The authors conclude that there is a high positive and significant effects on economic growth employed by the financial integration and the financial development. Furthermore, by cushioning the effect of the domestic supply of credit the higher the financial openness tends to decreases the financial crises contractionary effects.

		panel data analysis (GMM)	development • Other control variables are: inflation, educational attainment and lagged GDP per capita growth	
Goaied and Sassi (2011)	The study is about investigating the relationship between the financial development and economic growth in the MENA region	• 16 MENA countries • Between the periods of 1993 and 2006 • Dynamic panel data analysis (GMM)	• GDP per capita as the dependent variable • (M3) liquid liabilities to GDP as the proxy for financial development. • Other control variables are: inflation rate, exports plus imports ratio to GDP, constant 2000 USD initial income per capita	No significant evidence was found between banking and the economic growth. In addition, other evidence was found that the bank's indicator is negatively and significantly associated with the economic growth. In the MENA countries, the relationship between financial development and economic growth is found to be heterogeneous, while is also negatively for exporting petroleum and positive but insignificant in the MENA countries without oil.
Arcand et	The authors look whether there is too much finance or what on	• Cross-country	• GDP per capita as the dependent	The authors found that when the credit to private sector reaches 110 percent of GDP the finance starts having the

al. (2011)	economic growth, meaning there is threshold point above at which no positive effects caused by the financial development on economic growth. The study does so by applying the panel GMM system econometrics analyses between finance and growth.	studies • Over the period between 1976 and 2005 • Cross-sectional estimation techniques and dynamic panel data analysis (GMM)	variable • Stock markets turnover ratio and total credit to the private sector as the proxy for financial development • Other control variables are: trade openness, government expenditure ratio to GDP, inflation and years of schooling	negative influence on output economic growth,
Asongu (2011)	The main intentions of the author of this study are to bridge the gap between the Andersen and Tarp (2003) sympathisers and the Schumpeterian authors by looking the new evidence from the meta-regression analysis.	• 20 studies were selected • Between April to June 2011	• The finance and growth nexus could be influenced by the 20 different types of dummies for accounting the differences in studies for meta independent.	The author concludes that the financial crises frequency that is inhibiting the finance-growth nexus is more powerful in our era compared it was on the Schumpeter. And the authors support the Andersen and Tarp (2003) by concluding that the positive relationship between financial development and economic growth has not been satisfactorily sustained by recent empirical works.

Bezemer (2012)	The author used the descriptive statistics to investigate the approach when the credit helps or hinders the economic growth process.	• Developed countries • Descriptive statistics	• GDP growth as the dependent variable • Control variables used in the study was not specified but was there without inclusion.	The author concludes that the excess of economic growth of financial sector credit obstructs other than help the economic growth, even if the wealth and consumption fuels booms.
Demetriades and Rousseau (2016)	The study used the cross-sectional and panel data analysis between the period of 1975 and 2004 to investigate the changing face of financial development.	• 84 countries • Between the periods of 1975 and 2004 • Panel data analysis and cross-sectional analysis	• GDP growth rate per capita as the dependent variable • Liquid liabilities and bank entry was used as the proxy for financial development • Other control variables are: securities markets, liberalisation interest rate, secondary school initial enrolment rate and government final	The authors conclude that based on their findings the quality of financial development is more significant for economic growth than the quantity for a large number of different countries.

			consumption to GDP	
Ductor and Grechyna (2011)	The author investigates the possible negative influence of financial development on economic growth. The study used the panel data analysis between the period of 1970 and 2005 and the 33 OECD economies.	• 33 OECD economies • Over the period between 1970 and 2005 • Panel data estimation techniques	• GDP growth rate per capita as the dependent variables • between private credit divided by GDP and the financial and industrial output growth differences as the proxy for financial development • Other control variables are trade openness, labour productivity growth rate and the real GDP per capita at the initial level.	With the consequent financial crisis, there is a threat of reaching the productive capacity limit of the economy, if the financial development exceeds the development of the industries productive by 4.5 percent .
Fowowe (2011)	The aim of the study is to provide the evidence on the causal relationship in the Sub-Saharan	• 17 Sub-Saharan African	• Income real per capita as the dependent	The author found the bi-directional causality homogenous relationship between financial development and economic growth. For the Sub-Saharan African countries the results

	African countries between the financial development and economic growth. The author applies the panel co-integration and causality tests between the period of 1975 and 2005.	countries • Over the period between 1975 and 2005 • Causality tests and the panel cointegration	variable • The ratio of bank deposit liabilities and banks by providing the credit to the private sector to GDP as the proxy for financial development.	are robust to the alternative measures of the financial development, therefore, the financial sectors, the real sectors are complementary to one another, and their simultaneous development should be encouraged.
Hassan et al. (2011)	The author focus on the low and middle-income countries classified by the geographic regions between 1980 and 2007 to provide more proofs on the role played by the financial development on the economic growth. The author does so by employing the panel data regression method.	• 6 geographic regions • Over the sample of 1980 to 2007 • Variance decompositio n and the panel regressions estimation techniques	• Growth rate and annual GDP per capita as the proxy for economic growth and a dependent variable. • Credit domestic by the banking sector to GDP as the proxy for financial development • Other control variables are: government expenses, trade	The authors found that in the developing countries there is the positive relationship between financial development and economic growth. Therefore, it seems as if the financial system, which is well –functioning are more necessary but not sufficient condition for the economic growth. By using the short-term multivariate analysis, mixed results were found: for most regions, the two-way causality relationship between the financial development and economic growth was found and for the two poorest regions, the one-way causality was observed between finance and growth nexus.

			openness, inflation and savings	
Rachdi (2011)	To assess the causality direction between economic growth and finance by using the panel data approach between 1990 and 2006.	• 10 countries • Over the period between 1990 and 2006 • Dynamic panel data analysis (GMM) and panel data cointegration approaches.	• Real GDP per capita in the logarithm as the dependent variable • Liquid liabilities, private credit by depositing money in the banks and other financial institutions to GDP was used as the proxy for financial development • Other control variables are consumer price index and the government consumption to the GDP as the logarithms form.	The long-term relationship between the financial development and economic growth was confirmed by using the panel data co-integration analysis in the OECD and the MENA countries. The strongly positive relationship between finance and real GDP was confirmed by using the system GMM. The author found that there is a unidirectional effect on MENA countries and in OECD, there are causality bi-directional effects by using the error correction model approach method. Therefore, the growth stimulates the development of finance.

Barajas et al. (2013)	The aim of this study is to examine whether the effect of finance on economic growth differs across the types of economies and regions by using the cross-sectional and dynamic panel data analysis for 130 countries between the period of 1975 and 2005.	• 130 countries • Over the period between 1975 and 2005 • Cross-sectional and dynamic panel data analysis	• Growth rate GDP as the dependent variable • Bank private credit / GDP as the proxy for financial development • Other control variables: foreign direct investment,	There is a heterogeneity effect for the financial deepening on economic growth, in oil exporting countries it seems smaller i.e. regions such as lower-income countries, North Africa (MENA) and the Middle East.
Oluitan (2012)	The main aim of this study is to investigate whether the financial institutions within African countries are well positioned to help the poverty issues with their capability economic growth.	• 31 African countries • Between the period of 1970 and 2005 • Dynamic panel data estimation techniques	• Real per capita GDP as the dependent variable • Liquid liabilities to GDP (M3) as a proxy for financial development • Other control variables: inflation	✓ The author found that the growth is important through the intermediation of the contribution to the financial sector. ✓ Little evidence from the study found about the private sector, but the author concludes that the private sector is important for economic growth. Hence, no long-term association between private credit and economic growth.

rate, the ratio of government spending to GDP, the ratio of trade to GDP, which is the sum of export and imports.

Appendix B

Table 3.3 Summary of existing empirical studies between financial development and income inequality

Author (s)	Aim of the study	Country, sample/period, econometric techniques	Variable(s)/indicators used	Findings/main results
Li et al. (1998)	The main objective of this study was to explore the inter-temporal variations in income inequality and to examine if income inequality it varies significantly in different countries or stable within countries.	• 49 countries • Between the period of 1974 and 1994 • Panel data analysis	The author used different variables/indicators. The dependent variable was Gini coefficient as a measure of income inequality. Other control variables are M2/GDP as measures of financial development, mean years of secondary schooling 1960 data as a reference year and civil liberty index.	The authors discussed two empirical evidence for the recent literature, the political economy and capital market imperfection channel. The authors found that the inequality is determined by the factors that are changed very slowly within countries but different across the countries. These factors include a measure of civil liberties, the initial level of secondary schooling, a measure of financial depth and the initial distribution of land.
Jalilian and Kirkpatrick (2002)	The main aim of the study is to examine what is the contribution in low-income countries that the financial development makes on	• 42 countries • Unbalanced panel	The inequality was denoted by the income of the poorest as a proxy of GDP and other independent variables such as change in inflation, change in public expenditure and change in Gini	The authors concluded that the financial development has an impact on poverty reduction, therefore, provided the firms with policy implications that should be followed in the financial sector to make the poverty reduction in low-income countries.

	poverty		coefficient	
Dollar and Kraay (2002)	The study considered whether the growth was good for the poor, meaning that the poor society does benefits from the economic growth.	• 92 countries • 285 number of observations covered • Panel data approach	Income of the poor as a dependent variable, financial development and logarithm of average income	The authors found that the pro-growth macroeconomic policy has had a little effect on income distribution but raises the average income.
Clarke et al. (2003)	The main objectives of this study were to analyse whether the financial development has an impact on income inequality and also testing the existing alternatives theories that implied on the financial development and inequality nexus.	• 31 developing and developed countries • Between 1960 and 1995 • Panel data analysis	Gini coefficient as a measure of income inequality was the dependent variable. While the following were the regressors: • Credit to private sector as a proxy of GDP • Inflation rate • Government consumption • Real per capita to GDP • Fractionalisation • Dummy variables(legal origin)	Inequality declined with the development in the financial sector, which is consistent with the theoretical model suggested by Galor and Zeira (1993) and Banerjee and Newman (1993). The author found no evidence supporting the inverted U-shaped relationship between financial development and income inequality. The relationship between Gini coefficient and financial sector seems to rest on the sectorial structure of the economy, which is consistent with the insight of Kuznets relation.
Lopez (2004)	The aim of this study was to look whether the here is a trade-off between pro-growth and pro-poor, the	• 41 countries • Between 1960 and 2000 • Dynamic panel	• The Gini coefficient a measure of income inequality was the dependent variable, while the following were the explanatory	The results suggested different findings on convergence theory meaning the income inequality convergence speed is faster compared to the speed of per capita income levels. The Kuznets curve was retained during the

	author does so, by examining the policies under the pro-growth (including financial development policies) on income inequality and headcount poverty.	data analysis	variables • Gross secondary enrolment as a measure of human capital and the ratio of government consumption to GDP • Other control variables such as inflation, trade openness, real exchange rate and banking crises.	analysis of growth and inequality nexus, where the inequality increases up to $3,000 and decreases; thereafter and no evidence supporting the significant effect of inequality on economic growth. Other control variables such as financial crises would have an impact on the reduction of inequality, where on other sides the trade openness and size of government, as well as the financial development, will lead to all the policies that make the economic growth faster.
Beck et al. (2004)	The paper focused on a cross-country study, which examines the finance, inequality and poverty nexus. The author was assessing the relationship between financial development and changes in poverty and income inequality. The main aim of this study is to investigate the relationship between the financial markets system and the income	• .52 developing and developed • Between 1960 and 1999 • Also between 1980 and 2000 by using 58 developing countries • Cross-country analysis	• The private credit/GDP as a proxy for financial development • Inflation for 1960 and the growth rate between the period of 1960 and 1999 of the GDP deflator • The summation of export and imports as a share of GDP as another control variable i.e. Trade openness • Ethnic fractionalisation, legal origin and the latitude of the capital city as other instrumental variables of	Financial development decreases the income inequality particularly by improving the poor incomes. The faster decline measures of poverty and income inequality are caused by the countries with good developed financial markets experience. The robust results for potential reserve causality and county characteristics.

	distribution changes around the world by looking the different countries. Also, the author assesses the changes in the income inequality and changes in poverty. The association between financial development and poverty is the long-term analysis then, the cross-country analysis needs to be taken since the data on poverty and Gini coefficients are limited.		financial development.	
Jalilian and Kirkpatrick (2005)	The authors were examining whether the financial development has an impact on poverty reduction, by looking the contribution of financial development on poverty reduction in developing countries. The author used	• 42 countries • 16 developed and 26 developing • Panel data analysis	• The private credit-GDP ratio as a measure of financial development and the lag od dependent variable while the following were the explanatory variables: • The logarithms of primary school enrolment percentage • Change in inflation as other	Through the growth-enhancing effect financial development contributed to the reduction of poverty up to a threshold point of economic development. Therefore, the impact of financial markets on poverty reduction will be affected, nevertheless, the change on income inequality yield from the financial markets development. The effects of the financial sector on economic growth is most noticeable at the lower level of incomes, then the developing countries who are poorer will benefits from the

	the unbalanced dataset.		control variable, dummy variables of trade regime and the change of trade share and in manufacturing.	development of the financial markets. On the other side, the poverty and finance nexus is an indirect impact on growth. The results on the finance and inequality nexus suggest the U-shaped relationship between the variables.
Clarke et al. (2006)	The aim of the authors was to investigate what the data is saying about the finance and income inequality nexus. The authors use the different estimation techniques to examine the relationship between finance and income inequality. They used the cross-sectional analysis from the periods between 1960 and 1995 with the intention to capture the long-term growth rate. They used also the panel data analysis with	• 83 countries • Between 1960 and 1995 • Cross-sectional analysis and, • The panel data analysis	• Natural logs of Gini coefficients as a measure of income inequality • Real per capita GDP • Private to credit divided by GDP as a measure of financial development • Risk of expropriation and Ethno-linguistic fractionalisation • Government consumption • Consumer price index • Inflation rate	The narrowing hypothesis was retained. Once the endogeneity was controlled for, a significant negative coefficient of financial development was obtained, which is in line with the 'theory hypothesis'. The 'inequality widening' hypothesis was rejected based on their results. The used of the long-term data does not support the theoretical prediction that the inverted U-shaped relationship between financial development and income inequality but the uses of short-term the small support of U-shaped was observed. Therefore, the author concludes that the financial development is likely to be associated with the income distribution amongst the countries.

	the aim of testing the inverted U-shaped relationship between the finance and the income inequality nexus.			
Beck et al. (2007)	To examine the impact of financial development and distribution of income as well as the changes in relative and absolute poverty. The author used different estimation techniques to investigate the finance inequality nexus. The panel data analysis with instrumental variables was used and the cross-sectional analysis.	• International data • Between the periods 1980 and 2005 • Cross-sectional analysis and, • The dynamic panel data analysis by instrumenting some variables	• Gini coefficient as the dependent variables measured the income inequality and the population percentage who are living on less than $1 per day, while the following were the explanatory variables : • Private credit to GDP as a measure of financial development • GDP per capita • Age dependency ratio • Population growth • Inflation • Human capital • Trade openness	They found that the financial development helped the income of the poorest people by reducing the income inequality. The reduction of income inequality is about the 40 percent long-term effect on financial development on the poorest income distribution, while the remaining 60 percent is from the financial development on economic growth.

Raynal (2006)	The aim of the study was to assess the effect of financial development in economic growth (the capital growth and productivity growth) in the Latin America. The study used the dynamic panel data analysis as the econometrics estimation techniques for the sample of 12 American countries between the period of 1971 and 1998.	• 12 Latin American countries • Between 1971 and 1988 • Dynamic panel data analysis	• Inequality Texas index and GDP growth as the dependent variables, while the following were the explanatory variables: • Private credit and bank deposits as a share of GDP • Investment and government spending as a share of GDP • Inflation • Trade openness and GDP per capita	Financial development had no significant impact on GDP per capita, but the financial development had a positive effect on that portion of the population who completed their secondary education as well as on income inequality.
Huang and Singh (2011)	To assess the role of financial development and income inequality and poverty in sub-Saharan Africa. The authors used the panel data analysis as the estimation techniques with the 37 countries from the sub-Saharan African	• 37 countries in Sub-Saharan Africa • Between the period of 1992 and 2006 • The panel data analysis	• Gini coefficient and the poverty gap as the dependent variables used in this study, while the following were the explanatory variables: • Property right index • Consumer price index • Financial liberalisation index • Information sharing index	They found that financial development caused poverty reduction and narrowed income inequality. Other control variables such as lending liberalisation and the interest rate could be harmful to the poor if it was not accompanied with the institutional reforms.

	countries between the periods of 1992 and 2006.		• Trade openness	
Canavire Bacarreza and Rioja (2009)	To evaluate the impact of financial development on income distribution in Latin America and Caribbean. The author used the dynamic panel data analysis, which consists of 21 Latin American countries between the periods of 1960 and 2005.	• 21 Latin A American countries • Between the periods 1960 and 2005 • The dynamic panel data analysis	• Gini coefficient as a measure of income inequality while the following were the explanatory variables • Private credit as a measure of financial development • Trade openness • Inflation in logarithms • Mean years of schooling • GDP per capita	The expansion of the financial system did not affect the income of the poorest quintile. On the second, third and fourth income quintile the financial development had a positive effect on income inequality. The Greenwood and Jovanovic (1990) hypothesis evidence was found between financial development and income inequality.

Kappel (2010)	To study the impact of financial development on income inequality and poverty. The author used different econometric techniques to examine the effects of income inequality and poverty. The data source was obtained from the UNI-WIDER and WDI data sources. The 78 developing and developed countries were also used.	• 78 developed and developing countries • Between the period of 1960 and 2006 • Random effects panel data analysis and • 2SLS cross-country analysis and,OLS	• The dependent variable is the Gini coefficient as a measure of income inequality served as the dependent variable while the following were the explanatory variables: • Market capitalisation and private credit to GDP as measures of financial developments • Turnover ratio • Government expenditure • Financial access • Secondary enrollment • Human development index • Fractionalisation	Not only through the loan enhancement but also through the development of stock markets were responsible for the reduction in inequality and poverty. The distribution of lands had a significant effect the determinants of income inequality and poverty. In High-income countries, the government spending reduced income inequality whereas in Low-income countries no such evidence was found.
Mookerjee and Kalipioni (2010)	To examine the availability of financial services and income inequality from many countries. The authors used the cross-country analysis for 70 developed and developing countries between the	• 70 developing and developed countries • Between 2000 and 2005 • Cross-sectional analysis	• The dependent variable is the Gini coefficient as a measure of income inequality served as the dependent variable while the following were the explanatory variables: •	The author's findings suggested that the easier and greater access to financial markets reduced the income inequality across the countries where peoples they have access to the bank's branches. They also found that the barriers to the bank's access significantly increased the income inequality amongst the countries.

	periods of 1960 and 2006. The data for Gini coefficients were taken to UNU-WIDER and WDI data sources.	method	• GDP per capita • Inflation • Banks per 100,000 population • Telephones per 100,000 population • Trade openness	
Rosner (2010)	To examine the role of financial development on poverty in developing countries.	• 45 developing countries • Between the period of 1980 and 2004 • Cross-sectional analysis	• Annual growth rate of Gini coefficient as a measure of income inequality served as the dependent variable while the following were the explanatory variables: • M3/GDP • Private credit/GDP • Deposits/GDP • Inflation • GDP growth rate	Results suggested that financial development assisted the poor through various mechanisms. The reducing of the poverty ratio in countries was caused by the increasing of private credit and the availability of money. Secondly, in the developed countries, financial development had the greatest effect on poverty.
Asongu (2011)		• 13 African countries • Between 1980 and 2002 • Finance development	• The household income inequality as a dependent variable, • Gross domestic investment /GDP, foreign direct investment /GDP, gross public	Through the foreign direct investment channels, the financial development caused a reduction in income inequality. The U-shaped hypothesis was obtained through the study.

		as an instrumental variable and the two-least squares (TSLS)	investment/GDP, Government consumption/GDP • M2 and M3 financial development and other control variables.	
Enowbi Batuo et al. (2010)	To give full analysis how financial development is related to income distribution in African countries.	• 22 African countries • Between the period of 1980 and 2004 • Dynamic panel data analysis	• Gini coefficient as the dependent variable while the following were the explanatory variables: • GDP per capita level, Broad money to GDP (M2), liquid liabilities to GDP. Inflation and size of the modern sector • School enrolment rate.	As the economies developed their financial sector the income inequality decreased, which was in line with the theoretical and empirical studies. Moreover, it was found education played a significant role in the reduction of income inequality. No evidence supporting the inverted U-shaped relationship between the financial development and income inequality as suggested by the Greenwood and Javonoic (1990).

Cojocaru (2011)	To investigate the financial development role on inequality, the evolution of poverty and economic growth. The author used the dynamic panel data analysis (i.e. GMM system) from 1990. The dependent variable is the growth rate of GDP per capita and the Gini coefficient as a measure of income inequality.	• Independent states, Eastern Europe and Central countries • From 1990 • Dynamic panel data analysis(GMM) estimation techniques	• GDP per capita • Gini coefficient as a measure of income inequality was the dependent variable while the following were the explanatory variables: • Financial depth and efficiency • Other control variables such as openness, population growth rate and human capital.	By using the fixed effect model, the author found that financial development decreased the income share of the poorest citizens and increased the inequality. However, the inverted U-shaped relationship between the dependent and independent variable was observed. Therefore, the financial development helped to minimise the poverty, through its indirect effects on economic growth.
De et al. (2011)	To investigate the effects of financial development on income inequality, by using the system GMM as an econometrics techniques over the period between 1960 and 2006.	• 150 countries • Between 1960 and 2006 • GMM estimations	• Gini coefficient as a measure of income inequality served as dependent variable while the following were the explanatory variables: • Private credit and GDP as an indicator of the financial development. • Real GDP growth rate • Inflation	The reduction in income inequality was caused by the financial development that is econometrically significant. The increase in standard deviation by 0ne units to credit private GDP median country-year observations reduce the income inequality by 10.0 percent.

			• Trade openness • Education attainment • Financial access such as Geographic Branch penetration.	
Koeppl et al. (2011)	By endogenising the degree of incompleteness market the author looks the relationship between inequality and economic growth.	• Theoretical model • Empirical evidence	• Gini coefficient served as the dependent variable while economic growth were the regressor.	Financial development in investment complemented redistribution in the outcome of the economy, which leads to inequality reduction.
Fowowe and Abidoye (2013)	The aim was to investigate the impacts of financial development on poverty and income inequality in African countries.	• African countries • Dynamic panel data	Financial development, inequality and poverty.	In African countries, financial development has not had a significant effect on controlling the income inequality and poverty. The author concluded that more effort needed to be implemented in African countries to improve the access of the poor to financial systems.
Asad (2012)	The study was investigating three relationships between dependent and independent variables, the relationship between the financial development, human capital and income	• 107 developed and developing countries • Two samples covered the one between	• Gini coefficient served as the dependent variable while the following were the explanatory variables: • Real GDP growth	The inverse relationship between economic growth and income inequality was noted. The author's results showed that when there is a sufficient level of human capital available the financial development helps for reducing the inequality amongst the individual and in alleviating the poverty. Therefore, the study introduced the term “effective financial development” where financial

	inequality and the nexus between financial development, human development and poverty also the income inequality.	1960 and 2010 and the second one between 1980 and 2010 • Static and GMM panel data analysis	• Education(primary and secondary) • Private credit to GDP as a measure of financial development.	development was considered to be effective in accelerating the economic growth thereby reducing inequality.
Jauch and Watzka (2016)	The aim of the study is to analyse the relationship between financial development and income inequality using the dynamical panel data analysis between the 1960 and 2008.	• 138 developing and developed countries • Over the period between 1960 and 2008 • Dynamic panel data analysis	• the dependent variable is the Gini coefficients while the following were the regressors • legal origin • agriculture • government expenditure • deposits to GDP • credits to GDP	The results were robust to different econometric techniques and measures of financial development and control variables. Results rejected the hypothesis that suggested the negative relationship between financial development and income inequality. The study concluded that financial development had a positive impact on income inequality by using the inequality as a measure of Gini coefficient and controlling the country fixed effects and GDP per capita.

Table 3.4 Summary of linear (positive and negative) and non-linear (U-shaped and inverted U-shaped) hypothesis overview of empirical studies

Author	Number of countries (developed, emerging and developing), data source for inequality, period and empirical approach	The impacts of financial development on income inequality
Jauch and Watzka (2016)	• 138 developing and developed countries • SWIID data sources • Between 1960 and 2008 • Time dummies and panel fixed effect	There was a linear and positive relationship between financial development and income inequality
Jaumotte et al. (2013)	• 51 developed and emerging countries • Povcal, LIS data sources • Between 1981 and 2003 • Time dummies and panel demeaned	There was a linear and positive relationship between financial development and income inequality
Kappel (2010)	• 78 developed, emerging and developing countries • WIDER data sources • Between 1960 and 2006 • Panel random effect,2SLS and cross-country	There was a linear and negative relationship between financial development and income inequality
Clarke et al. (2006)	• 83 developed and developing countries • Lundberg and Squire data source • Between 1960 and1995	The financial development had a negative impact on income inequality and the data support

	• OLS,2SLS Panel random effect and cross-country	the linear hypothesis
Li et al. (1998)	• 49 developed and emerging market • Deininger and Squire data source • Between 1947 and 1994 • Pooled OLS,IV,AR(1)	There was a linear and negative relationship between financial development and income inequality
Hamori and Hashiguchi (2012)	• 126 developed and developed countries • UTIP data source • Between 1963 and 2002 • GMM system and fixed effect, LD	The financial development had a negative impact on income inequality and the data support the linear hypothesis
Beck et al. (2004)	• 52 developed and emerging market • Dollar and Kray data source • Between 1960 and 1999 • OLS and IV, cross-country	The financial development had a negative impact on income inequality and the data support the linear hypothesis
Tan and Law (2012)	• Emerging market • UTIP,SWII	There is a non-linear and U-shaped relationship between financial development and income inequality
Nikoloski (2013)	• 52 developed and developing countries • WIDER • GMM system, LD and panel fixed effect, LD	There is a non-linear inverted U-shaped hypothesis relationship between financial development

	• Between 1962 and 2006	and income inequality
Jauch and Watzka (2016)	• 138 developed and developing countries • SWIID data source • Between 1960 and 2008 • GMM system	There is a non-linear inverted U-shaped hypothesis relationship between financial development and income inequality

Appendix C

Table 5.1 Panel unit root test results for the international countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
LGINI1	-1.31165*	-0.73957	452.390***	325.393**
LGINI2	-2.76845***	-0.54783	261.516*	266.967**
LFD1	-10.2805***	-4.51451***	458.150***	364.861**
LFD2	-2.76522***	1.99740	324.774	341.733
LFDD2	0.36637	4.36863	283.769	262.956
LFDD1	-3.40195***	0.86312	342.683	227.458
LGDP	-10.8593***	3.08753***	441.352***	457.421***
LGGDP	-6.93712***	5.71651	386.560***	392.453***
LAGRC	-4.36053***	1.23491	308.665	344.919
LCONS	-8.76145***	-10.4664***	631.953***	576.480***
LPOP	-13.9038***	-3.05983***	647.924***	1431.85***
LEDUC	-10.6557***	-0.15918	419.924***	470.036***
LTOP	-6.35094***	-6.78978***	519.217***	520.744***
LINFL	-13.1296***	-16.6114	956.370	1445.35

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.2 Panel unit root in first –difference test results for international countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
D(LFD2)	-50.5928***	-49.8755***	2895.56***	3262.25***
D(LFDD2)	-50.1971***	-49.8339***	2881.26***	3200.25***
D(LFDD1)	-37.4282***	-38.7139***	2059.93***	2060.98***
D(LAGRC)	-60.6292***	-57.7694***	3197.94***	3945.56***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.4 Panel unit root test results for the low-income countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
LGINI1	-1.00272	0.65005	36.1504	22.0396
LGINI2	-5.74576***	-1.36841*	41.8594**	29.4895
LFD1	-1.67941**	-0.36074	50.0118	55.5611
LFD2	-2.58764***	0.42500	57.8844	73.7381***
LFDD2	1.05921	2.46697	37.5770	45.5066
LFDD1	-0.16328	0.78964	40.6106	25.8889
LGDP	4.01105	4.80832	28.5150	27.9237
LGGDP	4.64008	5.28704	27.1934	26.5772
LAGRC	-1.46115*	-0.85759	57.7749	59.3670*

LCONS	-4.69359***	-3.71938***	85.9555***	79.1805***
LPOP	0.10916	5.74834	38.8493	8.46561
LEDUC	-2.91142***	1.88620	33.1069	45.0750
LTOP	-4.27487***	-4.36167***	96.7428***	91.3788***
LINFL	-4.90204***	-5.93464***	146.757***	176.066***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.5 Panel unit root in first–difference test results for low-income countries

Variables	**Levin, Lin & Chu t***	**Im, Pesaran and Shin W-stat**	**ADF - Fisher chi-square**	**PP - Fisher chi-square**
D(LGINI1)	-15.646***	-18.8042***	374.147***	388.322***
D(LFD2)	-22.3222***	-22.1808***	496.103***	578.202***
D(LFDD2)	-23.421***	-22.7397***	513.219***	568.294***
D(LFD1)	-24.1659***	-21.7713***	368.443***	366.337***
D(LFDD1)	-22.2836***	-19.9846***	329.564***	347.310***
D(LGDP)	-23.8175***	-25.7503***	602.861***	625.069***
D(LGGDP)	-21.8371***	-23.8473***	559.424***	620.248***
D(LAGRC)	-28.9423***	-26.8324***	583.227***	629.416***
D(LPOP)	0.39391***	-2.30893***	70.5236***	61.4576***
D(LEDUC)	-7.2941***	-9.02454***	183.405***	244.162***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.7 Panel unit root test results for the low middle-income countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
LGINI1	0.70256	1.74729	89.2217**	54.5968
LGINI2	-3.13279***	-2.5348***	74.0737***	62.8054*
LFD1	-3.5871***	-3.22256***	134.471***	90.2969*
LFD2	0.21585	1.26032	71.8833	64.4562
LFDD2	1.49669	2.09652	73.3878	59.2140
LFDD1	-0.91752	-0.5297	98.1153**	53.8649
LGDP	3.98931	5.70566	52.8175	35.9214
LGGDP	6.26085	7.15472	47.1705	30.7426
LAGRC	0.20545	2.3336	51.3486	59.519
LCONS	-4.0222***	-5.09724***	162.305***	133.322***
LPOP	-10.2029***	-6.54751***	184.428***	370.897***
LEDUC	-3.31905***	2.34105	80.2671	97.6221**
LTOP	-1.93044**	-3.32892***	115.796***	126.709***
LINFL	-8.62121***	-11.368***	284.330***	348.561***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.8 Panel unit root in first–difference test results for the low middle-income countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF – Fisher chi-square	PP – Fisher chi-square
D(LGINI1)	-13.8797***	-30.097***	772.432***	778.837***

D(LFD2)	-23.8561***	-23.2615***	650.489***	687.352***
D(LFDD2)	-24.8051***	-24.1835***	669.012***	695.385***
D(LGDP)	-20.8177***	-22.3844***	619.482***	681.232***
D(LGGDP)	-20.4477***	-22.2751***	613.397***	670.183***
D(LEDUC)	-10.885***	-12.2151***	313.554***	360.746***
D(LAGRC)	-28.643***	-28.0844***	756***	848.222***
D(LFDD1)	-18.9691***	-19.4206***	516.933***	525.284***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.10 Panel unit root test results for the upper middle-income countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
LGINI1	-1.52719*	-0.96037	102.260***	115.572***
LGINI2	-2.30425**	-0.78442	71.7737*	71.9536*
LFD1	-3.91293***	-1.24394	108.525***	70.7631
LFD2	-2.42056***	0.15765	77.9416	87.7912
LFDD2	-1.4625*	0.94081	67.8874	63.6859
LFDD1	-1.80702**	0.15332	92.1588*	54.3893
LGDP	-2.04564**	3.85382	47.4612	38.9910
LGGDP	0.29548	5.37978	39.6578	33.2364
LAGRC	-1.92872**	1.60564	73.2694	80.5723
LCONS	-4.38054***	-5.83716***	164.637***	148.188***
LPOP	-12.1362***	-5.88684***	177.565***	580.985***

LEDUC	-8.09641***	-2.77391***	149.315***	165.623***
LTOP	-4.98894***	-6.22133***	162.869***	149.624***
LINFL	-8.05833***	-8.58881***	234.627***	505.403***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.11 Panel unit root in first–difference test results for the upper middle-income countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
D(**LFD1**)	-18.6591***	-19.2234***	519.654***	513.097***
D(**LFD2**)	-23.6741***	-24.8446***	694.461***	917.538***
D(**LFDD1**)	-17.5019***	-18.142***	491.382***	488.207***
D(**LFDD2**)	-24.0745***	-24.9303***	691.978***	905.081***
D(**LGDP**)	-20.124***	-20.8088***	572.358***	635.967***
D(**LGGDP**)	-20.3541***	-20.8089***	570.784***	626.952***
D(**LAGRC**)	-31.5987***	-32.0669***	833.321***	1024.41***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.13 Panel unit root test results for the high-income countries

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher chi-square	PP - Fisher chi-square
LGINI1	-2.09957**	-1.57607*	129.208***	86.0550
LGINI2	-0.44918	1.73308	63.2578	81.3155

LFD1	-3.42085***	0.66566	78.5158	83.9111
LFD2	-0.02269	3.33345	74.1702	71.5148
LFDD2	0.80467	3.91104	68.0811	59.6775
LFDD1	-2.30055	1.75858	68.0445	63.8910
LGDP	-16.899***	-6.00436***	265.810***	291.904***
LGGDP	-14.8335***	-4.44723***	229.248***	245.166***
LAGRC	-4.50851***	-0.54724	90.7299	107.331
LCONS	-5.86531***	-4.95411***	160.104***	147.079***
LPOP	-8.32356***	1.65538***	188.400***	282.140***
LEDUC	-6.90984***	-2.58382***	137.377***	147.551***
LTOP	-2.78093	0.03601	96.6392	98.5237
LINFL	-5.47617***	-6.22147***	225.772***	243.794***

Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.14 Panel unit root in first–difference test results for the high-income countries

Variables	**Levin, Lin & Chu t***	**Im, Pesaran and Shin W-stat**	**ADF - Fisher chi-square**	**PP - Fisher chi-square**
D(**LGINI2**)	-25.834***	-26.1397***	708.486***	739.176***
D(**LFD1**)	-17.7603***	-20.7826***	616.009***	621.858***
D(**LFDD1**)	-16.7756***	-20.1492***	601.233***	594.262***
D(**LFD2**)	-28.4564***	-27.2726***	840.352***	845.532***
D(**LFDD2**)	-25.2113***	-25.6571***	789.318***	820.657***

D(LAGRC)	-30.4967***	-27.7442***	835.558***	1205.34***
D(LTOP)	-37.7113***	-35.1594***	1093.28***	1246.13***

+Note: Statistically significant at * the level 10%, ** the level 5% and *** the level 1%.

Source: Compiled by the author

Table 5.16 Descriptive statistics for regression 1

	LGINI1	LFD2	LFDD2	LGDP	LGGDP	LAGRC	LCONS	LPOP	LEDUC	LTOP	LINFL
Mean	-0.79776	3.712056	14.24618	8.114757	68.30387	2.237911	2.692709	16.08145	4.053583	4.204847	1.780572
Median	-0.73427	3.724005	13.86821	8.061105	64.98141	2.321422	2.721059	16.12492	4.301177	4.194298	1.812610
Maximum	-0.16059	5.989237	35.87096	11.38251	129.5614	4.273268	4.709868	21.03389	5.104804	6.092712	10.07631
Minimum	-1.58572	-0.11653	0.013580	4.947447	24.47723	-3.14432	1.142766	11.01046	0.249723	1.843774	-7.39342
Std. Dev.	0.267833	0.683355	5.102101	1.566968	25.73688	1.113725	0.368297	1.772934	0.707405	0.562514	1.246592
Skewness	-0.65446	-0.05582	0.598093	0.074865	0.367160	-0.7552	0.023508	-0.143	-1.76003	-0.04973	0.253789
Kurtosis	2.674484	3.557239	3.706578	2.044662	2.112270	4.068361	4.438709	3.275751	6.941600	3.730865	7.198386
Jarque-Be	231.9535	41.17967	246.0895	119.2239	169.2296	436.3923	264.1920	20.12396	3560.699	69.36684	2280.220
Probabilit	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000043	0.000000	0.000000	0.000000
Sum	-2441.15	11358.89	43593.32	24831.16	209009.8	6848.008	8239.688	49209.25	12403.96	12866.83	5448.550
Sum Sq. D	219.4360	1428.473	79630.15	7511.038	2026241.	3794.332	414.9311	9615.335	1530.789	967.9344	4753.657
Observati	3060	3060	3060	3060	3060	3060	3060	3060	3060	3060	3060

Source: Compiled by the author

Table 5.17 Descriptive statistics for regression 2

	LGINI2	LFD1	LFDD1	LGDP	LGGDP	LAGRC	LCONS	LPOP	LEDUC	LTOP	LINFL
Mean	3.732402	3.483828	12.92124	8.322617	71.56794	2.160101	2.715908	16.22531	4.056380	4.141461	1.876592
Median	3.753028	3.470964	12.04759	8.220274	67.57290	2.198533	2.768182	16.15502	4.281605	4.108377	1.925205
Maximum	4.061017	5.271587	27.78963	11.38251	129.5614	4.237879	3.657348	21.00442	5.091355	6.090413	8.462719
Minimum	3.289691	0.086450	0.007474	5.139398	26.41341	-3.12541	1.142766	11.01046	0.347292	1.843774	-4.07397
Std. Dev.	0.157351	0.885823	5.923484	1.517713	25.24692	1.076503	0.336955	1.679733	0.715736	0.594452	1.250727
Skewness	-0.36213	-0.44176	0.202413	-0.05747	0.235379	-0.51936	-0.26267	-0.04982	-1.93974	0.011200	0.225630
Kurtosis	2.152172	3.064444	2.254159	2.110830	2.028376	3.330606	3.024905	3.222211	8.033031	3.757793	5.475683
Jarque-Be	81.18140	51.23776	47.02065	52.48382	76.10833	77.58237	18.05954	3.872278	2636.596	37.52647	413.4688
Probabilit	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000120	0.144260	0.000000	0.000000	0.000000
Sum	5848.673	5459.158	20247.58	13041.54	112147.0	3384.879	4255.828	25425.06	6356.348	6489.670	2940.619
Sum Sq. D	38.77305	1228.814	54947.28	3607.209	998179.6	1814.773	177.8011	4418.473	802.2284	553.3825	2449.723
Observati	1567	1567	1567	1567	1567	1567	1567	1567	1567	1567	1567

Source: Compiled by the author

Table 5.18 Descriptive statistics for regression 3

	LGINI1	LFD1	LFDD1	LGDP	LGGDP	LAGRC	LCONS	LPOP	LEDUC	LTOP	LINFL
Mean	-0.7947	3.365378	12.87999	8.105136	68.12993	2.241451	2.693465	16.06980	4.043799	4.209272	1.785272
Median	-0.73253	3.385580	11.52040	8.055212	64.88644	2.326903	2.724506	16.11526	4.299019	4.200129	1.816363
Maximum	-0.16059	5.570090	114.7239	11.38251	129.5614	4.273268	4.709868	21.03389	5.104804	6.092712	10.07631
Minimum	-1.58572	-10.7109	0.006363	4.947447	24.47723	-3.14432	1.142766	11.01046	0.249723	1.843774	-7.39342
Std. Dev.	0.268388	1.246887	7.976127	1.561243	25.62875	1.112668	0.367951	1.776163	0.714465	0.567753	1.242809
Skewness	-0.65266	-4.22477	3.918373	0.082125	0.373050	-0.77446	0.018296	-0.13315	-1.70394	-0.04896	0.234072
Kurtosis	2.693111	43.79794	41.80069	2.043598	2.117368	4.124910	4.429446	3.239642	6.602232	3.680907	7.191024
Jarque-Be	230.9700	222986.5	201282.4	120.9670	171.5823	470.7455	262.6529	16.48641	3158.757	60.78953	2284.482
Probabilit	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000263	0.000000	0.000000	0.000000
Sum	-2450.06	10375.46	39709.01	24988.14	210044.6	6910.392	8303.953	49543.21	12467.03	12977.19	5503.993
Sum Sq. D	222.0037	4791.666	196072.5	7512.316	2024359.	3815.609	417.2648	9722.954	1573.237	993.4613	4760.375
Observati	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083	3083

Source: Compiled by the author

Table 5.19 Descriptive statistics for regression 4

	LGINI2	LFD2	LFDD2	LGDP	LGGDP	LAGRC	LCONS	LPOP	LEDUC	LTOP	LINFL
Mean	3.731082	3.747335	14.4527	8.334543	71.75837	2.154496	2.713962	16.24462	4.066805	4.137079	1.890631
Median	3.751827	3.738384	13.97551	8.225605	67.66057	2.195539	2.762503	16.17144	4.286661	4.106581	1.932846
Maximum	4.061017	5.940724	35.2922	11.38251	129.5614	4.237879	3.657348	21.00442	5.091355	6.090413	8.462719
Minimum	3.289691	1.780024	3.168486	5.139398	26.41341	-3.12541	1.142766	11.01046	0.347292	1.843774	-4.07397
Std. Dev.	0.157759	0.64066	4.886473	1.515008	25.21151	1.076178	0.337484	1.67494	0.70696	0.594537	1.258542
Skewness	-0.35671	0.119249	0.654647	-0.06976	0.226866	-0.51599	-0.25099	-0.06227	-2.00759	0.024955	0.247152
Kurtosis	2.148795	3.096917	3.81108	2.130145	2.035578	3.339018	3.01785	3.247093	8.482853	3.77546	5.440648
Jarque-Be	79.92178	4.294039	153.6923	50.28566	73.60219	76.44888	16.34696	4.960814	2992.296	39.12308	401.7797
Probabilit	0	0.116832	0	0	0	0	0.000282	0.083709	0	0	0
Sum	5801.833	5827.106	22473.95	12960.21	111584.3	3350.241	4220.211	25260.38	6323.881	6433.158	2939.93
Sum Sq. D	38.67599	637.8311	37105.82	3566.818	987753.6	1799.78	176.9933	4359.626	776.6774	549.2983	2461.424
Observati	1555	1555	1555	1555	1555	1555	1555	1555	1555	1555	1555

Source: Compiled by the author

Table 5.20 Correlation results for regression

Covariance Analysis: Ordinary
Date: 12/05/17 Time: 21:21
Sample: 2006 2013
Included observations: 3060
Balanced sample (listwise missing value deletion)

Correlation
t-Statistic
Probability

	LGINI1	LFD2	LFDD2	LGDP	LGGDP	LAGRC	LCONS	LPOP	LEDUC	LTOP	LINFL
LGINI1	1										

LFD2	-0.39313	1									
	-23.6431	-----									
	0	-----									
LFDD2	-0.38804	0.989248	1								
	-23.2829	374.0506	-----								
	0	0	-----								
LGDP	-0.66845	0.621245	0.614904	1							
	-49.6999	43.84073	43.11897	-----							
	0	0	0	-----							
LGGDP	-0.69062	0.61838	0.615985	0.995262	1						
	-52.8062	43.51288	43.24109	566.0341	-----						
	0	0	0	0	-----						
LAGRC	0.535249	-0.64402	-0.65318	-0.88026	-0.88109	1					
	35.04092	-46.5536	-47.7026	-102.59	-103.019	-----					
	0	0	0	0	0	-----					
LCONS	-0.26903	0.313806	0.293286	0.376007	0.381028	-0.33265	1				
	-15.4464	18.2764	16.9645	22.43955	22.78972	-19.5063	-----				
	0	0	0	0	0	0	-----				
LPOP	-0.04913	-0.05628	-0.06526	-0.13085	-0.12191	0.08242	-0.32523	1			
	-2.72021	-3.11696	-3.61638	-7.29874	-6.79225	4.573301	-19.0188	-----			
	0.0066	0.0018	0.0003	0	0	0	0	-----			
LEDUC	-0.55526	0.525631	0.505716	0.731845	0.704102	-0.65877	0.282076	-0.03444	1		
	-36.9201	34.16782	32.41646	59.38689	54.83216	-48.4208	16.25882	-1.9058	-----		