Charles University in Prague

Faculty of Social Sciences
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MASTER´S THESIS

Does Financial Development Alleviate Poverty?

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Declaration of Authorship

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Prague, May 3, 2017

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Abstract

The aim of this thesis is to examine the link between financial development and poverty alleviation. Unlike other studies for poverty-finance nexus, Bayesian Model Averaging is employed as it is an efficient tool when dealing with high model uncertainty that is common to these types of regression. Two types of poverty measures are used in the estimation, the relative one represented by income share held by the lowest 20% and the absolute one represented by poverty headcount per $1.9 a day. The traditional measures of the depth of the banking sector and stock markets used in the literature are complemented with the financial indicators that account for efficiency, stability and access to finance from newly developed Global Financial Development Database by World Bank. The results suggest that the efficiency and stability of the banking sector contribute to absolute poverty alleviation. The results are robust to different model specifications and potential presence of endogeneity between the absolute poverty measure and financial development. Moreover, it is suggested that financial development disproportionately helps the rich.

Abstrakt

Cílem této diplomové práce je prozkoumat zda rozvoj finančního sektoru může přispět ke snížení chudoby. Pro testování tohoto vztahu je použita metoda Bayesiánského modelu průměrování, která v sobě zahrnuje nejistotu ohledně snižování chudoby. Vliv finančního sektoru je zde zkoumán jak na snižování relativní chudoby vyjádřené jako určité procento populace s nejnižšími příjmy, tak na snižování absolutní chudoby vyjádřené pomocí hranice 1.9 dolarů na den. Tradiční ukazatele hloubky finančního sektoru a trhu cenných papírů jsou doplněny o ukazatele efektivity, stability a přístupu k finančnímu sektoru z databáze finančního rozvoje Světové banky. Výsledky dokládají, že efektivita a stabilita bankovního sektoru jsou důležitými faktory přispívajícími ke snižování absolutní chudoby. Tyto výsledky jsou robustní vůči různým specifikacím použitého modelu a vůči možné přítomnosti endogenity ve vztahu rozvoje finančního sektoru a snižování chudoby. Dále je naznačeno, že rozvoj finančního sektoru spíše pomáhá bohatým.

Klasifikace	G0, 015, 016,
Klíčová slova	Bayesiánský model průměrování, rozvoj finančního sektoru, chudoba
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Master's Thesis Proposal

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Proposed Topic:

Does Financial Development Alleviate Poverty?

Motivation:

The issue of poverty represents one the most prominent problems, the whole world faces. Many past and recent studies dealt with the issue of poverty from different points of view having in common the desire to estimate the factors that contribute to its reduction. Dát příklady literatury. As not much literature has been devoted to the inspection of relationship between poverty and finance, the subject of this thesis will be the question whether financial development helps to alleviate poverty.

The issue of poverty reduction through financial development can be investigated either directly or indirectly (Jeanneney and Kpodar, 2008). Vysvětlit direct/indirect means of reduction. In addition, the instability of financial development process may undermine the poverty reduction through the negative macroeconomic impacts (volatility of growth, inflation) or the poor traditionally react more to the malfunction of the financial institutions or the negative macroeconomic impacts

This study aims to extend the findings of existing literature by examining the effect of financial development on poverty through Bayesian model averaging. In addition, it will analyze which type of financial sector alleviates the poverty most – the depth, the stability or the effectiveness of financial markets or access to finance.

Hypotheses:

1. Hypothesis #1: The financial sector development prompts economic growth and reduces poverty.
2. Hypothesis #2: Excessive financial development has no effect on reduction of poverty.
3. Hypothesis #3: Financial instability worsens the growth of economy thus deepens poverty levels.
4. Hypothesis #4: The stability, the effectiveness or the depth of financial markets or access to finance is crucial for poverty reduction (jointly or separately).

Methodology:

This study will employ Bayesian model averaging as proposed in Hasan et al. (2015) who investigated the relationship between economic growth and financial development. The Bayesian model averaging is a convenient tool in inspecting the link between financial development and poverty reduction as it allowsto capture the inherent uncertainty which can be found in cross-country regressions. Furthermore, the study will examine whether the depth, stability or efficiency of the financial markets or access to finance has the greatest effect in reducing poverty levels. For this purpose, various financial indicators will be used to reflect the multidimensionality of financial system. Credit to GDP ratio or stock market capitalization will be used for the depth analysis. The set of other variables of the effectiveness, stability of and access to financial markets will be obtained through the Global Financial Development Database. The robustness of results will be examined through model specifications that account for endogeneity

as studies that disregard endogeneity show significantly higher positive relationship between financial development and economic growth (Valickova et al., 2015).

Expected Contribution:

The relationship between financial development and economic growth has interested many development economists and practitioners for a long time. The issue whether finance contributes positively to growth was in the center of the debate even a century ago as Schumpeter (1911) or Lewis (1955) observed in their studies positive link between financial development and economic growth. The attention to this topic has been drawn even more due to the 2007-2008 crisis. Although, many studies, old and new, deal with the question of whether financial development prompts economic growth, the relationship between financial development and poverty reduction has not been the subject of existing literature so much.

The study aims to extend the existing literature on the question whether financial development alleviates poverty. Moreover, it will try to prove that if there is positive link between financial development and economic growth, there should be opposite relationship between financial development and poverty. The study will also analyze which type of financial sector has the most pronounced effect on reduction of poverty – the depth, the stability or the effectiveness of the financial sector or the access to finance using Bayesian model averaging which has not been covered in the literature so far.

Outline:

1. Introduction and motivation
2. Literature review
3. Data
4. Methodology
5. Results
6. Concluding remarks

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Table of Contents

List of tables

List of figures

Acronyms

bd   birth-death sampler

BMA   Bayesian Model Averaging

BRIC   Benchmark prior

GFDD   Global Financial Development Database

IID   Independent Identically Distributed

MC^3 Markov Chain Monte Carlo Model Composition

PMP   Posterior Model Probability

PIP   Posterior Inclusion Probability

rev.jump   reversible-jump

UIP   Unit Information Prior

WB   World Bank

♦   Introduction

„The key to ending extreme poverty is to enable the poorest of the poor to get their foot on the ladder of development. The ladder of development hovers overhead, and the poorest of the poor are stuck beneath it. They lack the minimum amount of capital necessary to get a foothold, and therefore need a boost up to the first rung. "

~ Jeffrey D. Sachs (The End of Poverty, 2005, page 244)

Poverty is considered to be a serious problem that current world faces as high poverty levels are usually associated with high levels of crime in a society, lack of education endeavours, poor sanitation and health facilities or with high probability of occurrence of various food and water-related diseases. Fortunately, there can be seen decreasing trend in poverty levels worldwide as 100 million people escaped extreme poverty from 2012 to 2013, adding to the total number of 1.1 billion people who successfully moved out of extreme poverty since 1990. In addition, in 1990 it could have been said that one out of five people in the world lived in extreme poverty while nowadays one in ten people can be considered to be extremely poor, majority of which come from Sub-Saharan Africa. Despite the progress achieved in alleviating poverty levels, the number of extremely poor people in the world remains high (767 million people lived on less than \$1.9 a day in 2013).[1] It is thus still very important to conduct thorough research on ways how poverty can be alleviated in order to introduce well-designed policies that will be efficient in reducing poverty levels and subsequently will lead to higher shared prosperity in the world.

It is suggested that one of the ways how extreme poverty could be alleviated is to promote greater financial development. Although, there is quite large body of empirical literature devoted to the growth-finance nexus which considers financial development to be beneficial for economic growth, there are not that many empirical studies that deal with the question whether financial development can alleviate poverty. Studies

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[1] The statistics is taken from the World Bank's overview on poverty, see: http://www.worldbank.org /en/topic/poverty/overview.

that deal with finance-poverty nexus usually distinguish between direct channel of financial development in the form of access to financial services and indirect channel of financial development in the form of economic growth through which poverty can be alleviated. Moreover, according to Bourguignon (2004) the reduction in absolute poverty levels can be decomposed into two following effects: 'the growth effect' and 'the distribution effect', thus the impact of finance on poverty is not so clear-cut as the presence of inequality mainly at earlier stage of financial or economic development can undermine the effect of finance on poverty (Greenwood and Jovanovic, 1990).

This thesis aims to examine whether financial development contributes to poverty reduction, beyond its effect on economic growth. For this purpose, two types of poverty measures are employed, the absolute one measured by poverty headcount per $1.9 a day of purchasing power parity and the relative one measured by income share held by the lowest 20% of the population. In addition, the traditional measures of financial development used in the existing literature on finance-poverty nexus are updated by financial indicators taken from newly developed Global Financial Development Database (GFDD) by World Bank (WB). Specifically, private credit and stock market capitalization traditionally used in the existing literature as measures of the depth of financial institutions and financial markets respectively are complemented by proxies that account for efficiency, stability and access of both stock markets and banking sector. The dataset is thus compiled from 7 financial indicators measuring depth, efficiency, stability of financial development and access to it and complemented by additional 33 control variables collected in accordance with what majority of empirical studies on poverty suggest as most relevant determinants of poverty.

As in these types of regression it is quite common to encounter high model uncertainty due to the existence of many poverty determinants that could be potentially used in the regression, Bayesian Model Averaging (BMA) is employed. BMA is beneficial to use in these types of regressions as it allows to include a lot of potential determinants of poverty into the estimation process and thus incorporates the model uncertainty by estimating all possible combinations of the regressors and subsequently weighs the coefficients by model fits. The relevance of the variable in explaining the dependent variable is then given by Posterior Inclusion Probability (PIP) together with its

2

posterior mean and posterior variance. Valickova et al. (2015) suggest that the explanatory variables might be simultaneously determined with the dependent variable and thus such estimations might suffer from positive causality therefore lagged explanatory variables are used to account for possible endogeneity in the estimation.

The contribution to existing literature is done by employing large dataset of poverty determinants with the traditional measures of financial development being complemented by its other characteristics such as access, stability and efficiency. Moreover, the dataset is subject to model uncertainty by using BMA technique as high model uncertainty is quite common in these types of regression. Such analysis has not been done previously in the empirical literature on poverty-finance nexus.

The thesis is structured as follows: chapter 1 gives overview of poverty measures used in this thesis, chapter 2 presents overview of the theoretical concepts on poverty finance-nexus and summarizes up-to-date empirical research devoted to this topic, chapter 3 describes the data used for the estimation, chapter 4 provides the description of BMA methodology and chapter 5 presents and discusses the results of the employed analysis which is followed by conclusion.

1. Poverty and its measures

„Don't ask me what poverty is because you have met it outside my house. Look at the house and count the number of holes. Look at my utensils and the clothes that I am wearing. Look at everything and write what you see. What you see is poverty."

~ A poor man, Kenya, 1997 (Gillis et al., 2000, page 3)

According to the WB, under the term poverty, one can imagine: „*pronounced deprivation in well-being"* (Gillis et al., 2000, page 15). The answer to the question of what being poor means or which states of deprivation in well-being imply the presence of poverty in the world is not straightforward. As the state of deprivation in well-being can manifest itself in various forms in the society such as the possession of insufficient resources, income or lack of basic human needs like enough food, place to live, clean water or having access to adequate healthcare. Other meanings of the word can represent insufficient opportunities, education endeavours or lack of freedom. Furthermore, the state of being poor does not have to be permanent and can change over time or across space.[2] Poverty reduction is the main goal promoted by WB as combating or at least alleviating poverty in the world can bring some of the following benefits: better housing and living conditions, decreasing crime in a society, improvement in education, better management of natural disasters, decrease in the water and food-related diseases, promotion of more inclusive economic growth or the increase of overall well-being in the society.

If the poverty reduction is to be achieved by certain policies or tools, indicators of poverty in society have to be established in order to introduce certain poverty reduction tools, set up the poverty reduction policies or measure the success of the tools or policies in poverty reduction. According to WB (2005), there exist three steps in establishing certain poverty indicator. Firstly, the welfare indicator is usually chosen and defined. The subsequent step that usually follows after that is inherent in setting

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[2] In 2002 nearly 29.1% of population in the region of East Asia and Pacific lived in extreme poverty, the number of poor has decreased sharply since then, for example in 2012 accounting only for 7.2% of the population (see: http://www.worldbank.org/en/region/eap).

up a minimum acceptable benchmark which separates the poor from the rest of the population (such benchmark usually takes the form of a poverty line). The last step lies then in comparing the welfare indicator to the minimum acceptable benchmark and obtaining important statistic about the distribution of the indicator relative to the poverty line. The process ends with the aggregation of statistical information obtained about poverty.

It can be distinguished between two groups of poverty measures. The first group considers the poor to be the ones who do not have enough income or consumption to put them above some adequate minimum threshold while the second one is not associated with income, but other characteristics of standards of living such as the ability of people to obtain a specific type of consumption good and lies in asking whether they have enough food, adequate shelter, healthcare or education. Regarding this division, we can differentiate between monetary measures of poverty and measures not associated with income or consumption. Recently, however there has been some effort made by some researchers (see for example: Alkire and Santos, 2010a or Alkire and Foster, 2007) to form a single index that would measure the several dimensions inherent in the poverty definition such as access to electricity, education, health services, clean water, quality of institutions or the amount of assets held by households.

For the purpose of this thesis, only the first group of poverty measures will be described as they are later used in the empirical analysis designed for inspection of the effect of financial development on poverty. The measures of monetary poverty can be further divided into two groups depending on whether they measure relative poverty or absolute poverty. Among the relative poverty measures, the average income of the poorest quintile of the population can be mentioned while the most common measures that belong to the group of absolute poverty measures are the headcount index, the poverty gap and the poverty gap squared (Kpodar and Singh, 2011).

1.1. Absolute poverty measures

Absolute poverty measures are defined as the minimum amount of resources needed to reach certain standard of living worldwide and thus are fixed over time and space and only after some time period are usually adjusted for price inflation in order to remain

comparable with previous measures. WB nowadays defines absolute extreme poverty as being $1.90 a day of purchasing power parity under which people with such amount of money per day are considered to be poor. The most common indicators used as absolute poverty measures are headcount index, poverty gap and poverty gap squared (for better illustration of these indicators in the measurement of poverty see table 1.1).

Headcount index (=incidence of poverty) is used to measure the proportion of population whose per capita household income (consumption) y is less than some established poverty line z. Thus, it can be seen from equation 1.1 if y_i is less than z, I (.) takes the value of 1 and the household would be considered as poor (WB, 2005). This index, despite being easy to understand, has some limitations as it does not take into account the intensity of poverty and one cannot estimate from inspecting this index how poor the poor actually are (the measure is insensitive to the distribution of the income among the poor). Moreover, this measure violates the transfer principle formulated by Dalton (1920) which states that if the income is transferred from the rich household to the poor one, the poverty measure should change, however the poverty headcount index does not change when the income is transferred from the poor household to the poorer one. It should be also pointed out that the index is normalized by population and could be thus considered as a poverty share in population.

$$P_0 = \frac{1}{N} \sum_{i=1}^{N} I(y_i < z)$$

(1.1)

Poverty gap (=depth of poverty) is used to measure how far off households are from the poverty line and provide the policymakers with an idea about how much resources would be needed to eliminate poverty (the amount needed to get everyone above the poverty line). As with the poverty headcount case, it also does not capture the income distribution of the poor. **Poverty gap squared** (=poverty severity) measures not only the distance from the poverty line but also the inequality among the poor by putting higher weights on the poor that are further from the poverty line and lower weights on those that are just below the line.

Both poverty gap and poverty gap squared measures should complement poverty headcount ratio since it could happen that the headcount ratio is high in some situation but on the other hand the poverty gap is quite low due to the fact that large part of the population is just below the poverty line. The opposite case could be that poverty gap would be quite high in some situations and poverty headcount ratio is low which means that small part of population is just below the poverty line and there exist more severe cases of poverty in the society as the poor fall far below the poverty line.

Table 1.1: Absolute poverty measures in the world

Region	Headcount ratio (%)	Poverty gap	Squared poverty gap $1.9 (PPP/day)	Poor (millions)	
East Asia and Pacific	3.54	0.66	0.22	71.02	(3.55% of population)
Eastern Europe and Central Asia	2.15	0.57	0.27	10.30	(2.15% of population)
Latin America and the Caribbean	5.4	2.60	1.82	33.59	(5.4% of population)
Middle East and North Africa	-	-	-	-	
South Asia	15.09	2.79	0.79	256.24	(15% of population)
Sub-Saharan Africa	40.99	15.95	8.37	388.72	(41% of population)
Total, six regions	**12.55**	**3.80**	**1.80**	**766.01**	**(13% of population)**
Developed Countries	0.34	0.20	0.31	3.99	(0,34% of population)
World	**10.67**	**3.23**	**1.53**	**766.01**	**(10.7% of population)**

Source: Author based on latest estimates using PovcalNet developed by WB, available at: http://iresearch. worldbank.org/PovcalNet/povDuplicateWB.aspx

Notes: World includes data for all six regions (the developing ones) plus industrialized countries. The estimation for Middle East and North Africa is omitted because the data coverage is too low. It can be seen that the highest level of poverty in every 3 categories and then also as a percentage to the whole population is in Sub-Saharan Africa. In Sub-Saharan Africa region 41% of population is considered to be poor (in 1999 the percentage was much higher accounting for 57.12% of the population).

1.2. Relative poverty measures

Sen (1976) came up first with the need to have a different measure of poverty, apart from the absolute one, that would not consider only the incidence of poverty, but also the income distribution within the poor. Thus relative poverty measures were established which measure the poverty of an individual relative to the rules established for poverty in a society he or she lives in. In contrast with the absolute poverty measures, under relative poverty measure, an individual is considered to be poor when he or she falls short of the minimum standard of living that is established in line with habits and standards inherent in his or her country. It also differs from the absolute poverty measures in a way that it does not stay stable over time, but can change with

the average standard of living of the population.[3] The advantage of relative poverty measure is that it is closely linked to inequality and it includes the cost of social inclusion (Sen, 1983). Among the measure of relative poverty, various income distribution measures can be included which distinguish between the poor and the non-poor on the basis of a poverty line that can be represented by mean income or expenditure, median income or expenditure or most often some quantiles of the incomes of the population such as income share held by the lowest 10% or income share held by the lowest 20% as established by the WB and used in this thesis.

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[3] The wealth of a society can increase over time and thus the resources needed to maintain certain standard of living can also increase, as for example in USA in 1963 a family of four members with income less than $3,100 would be considered poor under relative poverty measure, in contrast to year 1992 when the benchmark income for being considered poor increased to $14,228 a year (National Research Council, 1995).

2. Financial sector development

Under the term financial sector one can imagine various institutions in the economy ranging from retail to wholesale, from informal to formal outlets that provide financial services to consumers, businesses and other financial institutions (DFID, 2004).[4] As Levine (1997) points out developed financial systems have several functions such as:

i) Facilitate transactions, provide tools for risk management like hedging, diversification and risk pooling;

ii) help with resource allocation;

iii) function as a monitoring and controlling entity of managers and corporations;

iv) encourage savings mobilization and provide means for exchange of goods and services.

It is argued in the literature that the development of financial sector strongly depends on the quality of institutional framework in a given country. As the quality of institutions strengthens, the exchange of information should become more efficient due to the creation of official registries by either central banks or by private sector that contain information on borrowers. The creation of such registries then leads to reduction in the costs associated with screening borrowers, increase in transparency and in cost of default which should then contribute to greater financial development (Detragiache et al., 2005; McDonald and Schumacher, 2007 and Singh et al., 2009). Moreover, several authors (Acemoglu and Johnson, 2005 or Abiad et al., 2010) suggest that legal systems with stronger creditor rights promote greater financial development since the investors are more willing to finance firms when there is legal certainty about the enforcement and protection of their rights. Moreover, the quality of institutions also determines the success of bank-based system or market-based system in economic

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[4] In its broadest sense, under the term financial sector one can understand banks, stock exchanges and insurers, credit unions, microfinance institutions or money lenders (DFID, 2004).

development as the market-based system gains on importance when the institutional framework in a country improves (Levine, 2005).

2.1. Theory: How can financial sector development contribute to poverty reduction

As Cihak et al. (2012) point out economies with better developed financial sector experience faster economic growth and more rapid declines in poverty levels. There is quite substantial amount of empirical and theoretical evidence in the literature that finance has a positive impact on poverty alleviation. From theoretical point of view, it can be stated that poverty reduction through financial sector development can be achieved by means of two channels, the direct one which works through the increased access to financial services by the poor and the indirect one which works through the impact of growth on poverty reduction (see figure 2.1).
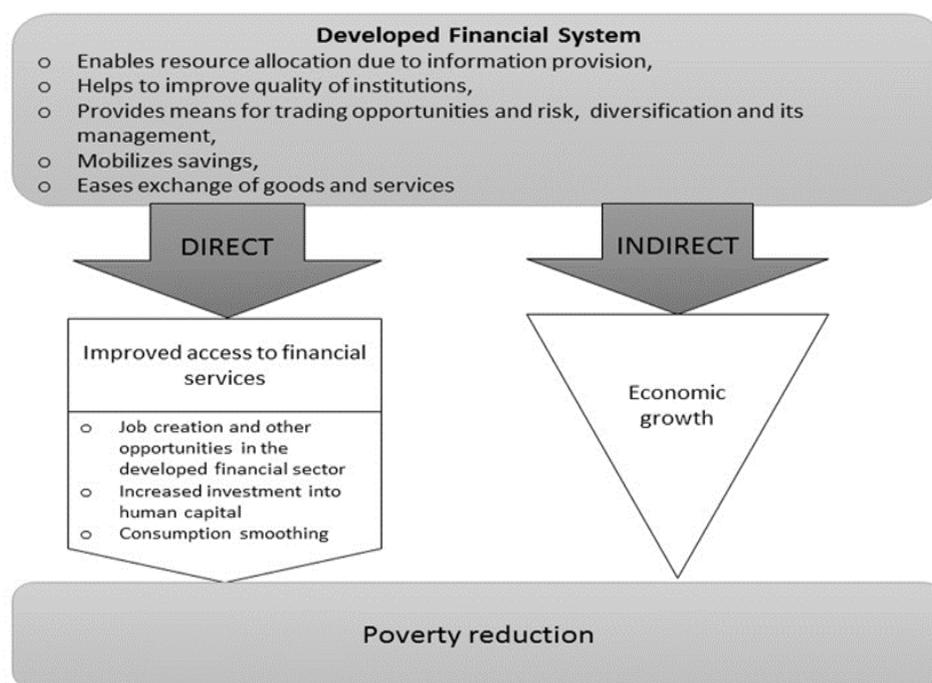
Figure 2.1: Direct and indirect effect of financial development on poverty reduction

Source: Author based on Zhuang et al., 2010

10

Despite all said above, taking into account only the direct and indirect effect of financial sector development on poverty could lead to biased results and the complex nature of poverty in a society would not be taken into account. As at earlier stages of development, either economic or financial, usually some level of inequality between the poor and the rich exists and the effect of development is often translated only into the incomes of the rich, having no effect on poverty reduction. Moreover, financial instability can undermine the effect of financial sector development on poverty reduction.

Considering the explanation provided above, if the researchers ignore existence of inequality, it could lead them to the conclusion that financial development or economic growth have no effect in reduction of poverty, mainly at earlier stages of development. To better illustrate the relationship of financial sector development and poverty reduction and the different channels and factors influencing poverty alleviation, see figure 2.2.
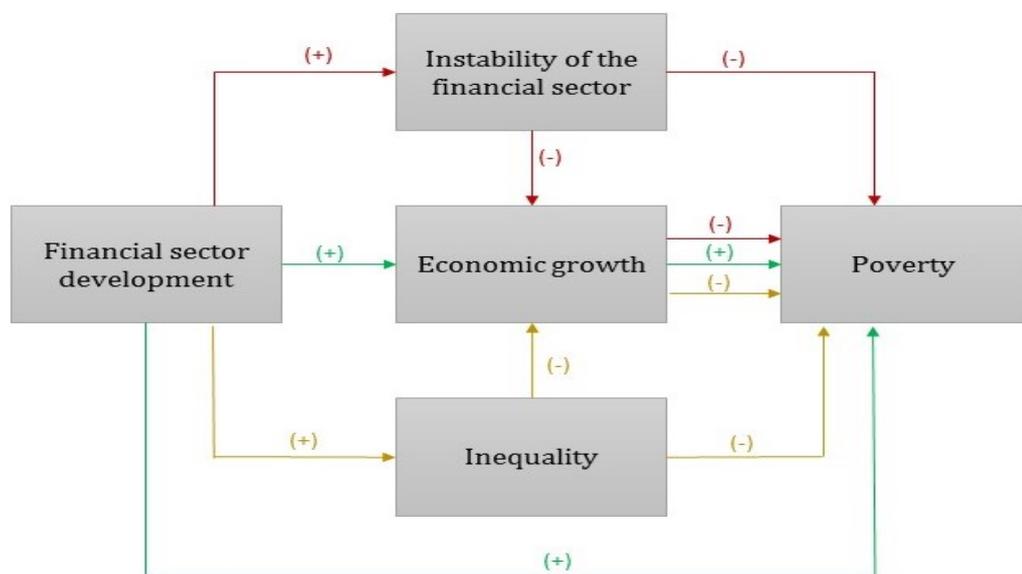
Figure 2.2: The complex nature of the relationship of financial development and poverty

Source: Author

Note: There are two channels of financial sector development that can influence poverty. Firstly, it can be assumed that the development of financial sector has positive effect on economic growth which in turn is beneficial to the poor. Secondly, it can be assumed that financial sector development has direct positive effect on the incomes of the poor. Despite these effects, there are also effects that can undermine

11

the positive effect of financial sector development on poverty reduction such as financial instability which is detrimental to growth and poverty alleviation and the presence of inequality mainly at earlier stages of development.

2.1.1. Direct channel of financial sector development

There can be seen various factors in financial sector development, such as elimination of information asymmetries, credit constraints easing and bearing the high costs of credits by bigger and more powerful financial intermediaries, which improve access to financial services by the poor and their provision to them. The improved access to financial services represents the direct channel through which benefits of the financial sector development can be transferred to the poor. The access to financial services is heavily dependent on the availability of financial products, services and the quality of institutional framework.

The core problem in many developing countries is the presence of market imperfections, especially the existence of high-fixed costs of small-scale lending and asymmetric information. The presence of such market imperfection creates moral hazard and adverse selection in these underdeveloped financial markets and limit the poor in their access to formal finance and thus in subsequent potential, profitable investment (Stiglitz and Weiss, 1981). According to Levine (2008), these factors which result in financial deprivation are the main cause of persistent poverty. According to Beck et al. (2007), the positive effect of financial sector development on poverty reduction can be achieved if the costs associated with market imperfections are reduced. By the ability of financial intermediaries to bear the costs of small-scale lending, the high-fixed costs of lending are reduced for the poor. Furthermore, the reduction in the transaction and information costs[5] thus then improves economic conditions by improving accumulation of capital and the living standards of the poor by enabling them to obtain funds more easily (Zhuang et al., 2009).

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[5] Individuals are limited in their time and capacity when collecting and comparing information about different enterprises, products or market conditions, causing lower investment into products associated with large information costs and thus limiting capital reaching its highest value use (DFID, 2004).

In the presence of asymmetric information, the poor usually do not possess either the means by which they can finance their own projects or the required collateral in order to be able to apply for a loan at a given financial institution. Such credit constraints limit the poor in making productive investments or smoothing their consumption and thus restrict them from improving their welfare (Banerjee and Newman, 1993; Galor and Zeira, 1993 and Aghion and Bolton, 1997). With reduced transaction and information costs and by easing the credit constraints, the poor are equipped with better provision of financial services and have better access to them which in turn enable them to borrow. The increase in funds thus then enables the poor to invest in productivity-enhancing new technologies such as new and better tools, equipment or fertilizers or in income-enhancing assets like education or health which could provide higher income in the future (Jalilian and Kirckpatrick, 2005). Moreover, access to credit and other financial services is likely to cause the decline in the low-risk, low-return asset base held by the poor for protection against adverse shocks (such as jewellery) and prompts them to invest into high-return, but at the same time higher risk assets (such as education) which are supposed to have positive effects on their income in the long-run (Deaton, 1991).

Apart from the facilitation of access to credit, as Keynes (1937) points out developed financial sector can also provide saving opportunities to the poor whose income might be then influenced through so called "conduit effect", first established by McKinnon (1973).[6] As McKinnon (1973) suggested, the availability of savings facilities for the poor can enable them to borrow money for a profitable investment as by mobilising savings and thus increasing the availability of credit, financial intermediation can facilitate opportunities for investing into new technologies which lead to improved

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[6] The financial conduit effect for capital accumulation is increased when the poor want to hold more cash balances thus causing the opportunity cost of saving internally for potential investment into capital goods decline (McKinnon, 1973).

overall productivity.[7] Furthermore, the conduit effect of real money balances represents the main reason why McKinnon, at the beginning of seventies, proposed liberalization of financial systems in developing countries and suggested the removal of constraints set on interest rates in the form of ceilings, high reserve requirements and administrative credit allocation (McKinnon, 1973).

According to MDG (2015), the availability of saving opportunities can also help the poor to overcome bad times like drought, damages or fire as with the increased access to financial sector, they can diversify their savings over deposits, bond markets or stock markets. In addition to this, Zhuang et al. (2009), argue that financial intermediaries help to pool and limit risk and collect information about borrowers. Moreover, having a monitoring system of borrowers enables the small-scale businesses which receive loans to be advised on realistic business plans which eliminates the risk of default on obligations to repay the loans. Furthermore, by broadening the financial sector and by subsequent strengthening of the new player´s position on the market, the competition should be increased in the financial sector. In many developing countries the banking systems are oligopolistic which means that very few banks offer products and face almost no competition. The enhanced competition can thus improve the services and products offered by financial intermediaries and as a result have positive effect on the standard of living of the poor (Godfrey, 2008). Moreover, as Becker (1957) points out financial development could also contribute to increased competition in non-financial sectors by reducing barriers to entry for the newcomers. This could thus lead to more anti-discriminatory approach in hiring workers from which the most disadvantaged groups in population could benefit such as the poor.

The presence of any instability arising out of the financial sector might however undermine the effect of financial sector development on poverty reduction. The poor might be primarily affected by the disruptions of payment systems or foreclosures of

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[7] McKinnon (1973) shows the benefit of increased access to savings facilities on an example with a farmer who has an opportunity to borrow some amount of money which enables him to buy certain equipment which in turn increases his productivity and his overall profits thereafter.

unwarranted banks and when their deposits get frozen due to banking crisis, they are unable to diversify their assets. Moreover, the McKinnon conduit effect might be fully or partially cancelled out in countries where the liquidity of deposits is often at risks due to uncertain perception of the healthiness of the banking system.

Microfinance institutions

The core questions, many economists deal with, is the provision of financial services to the poor on a regular and sustainable basis (Robinson, 2001; Gonzalez-Vega, 2003). There exists belief that this role can be fulfilled by existence of microfinance institutions that can be both sustainable and helpful in reduction of poverty. The poor often cannot bear the high costs established by financial intermediaries in order to access financial services and cannot benefit from services and risk pooling offered by them which causes their further decline in the income distribution (Greenwood and Jovanovic, 1990). The poor can however benefit from services offered by local banks or microfinance institutions which are more available to them and are less costly which is also one of the reasons why international aid is usually directed towards them. Moreover, they have been also promoted as means that can provide direct link between finance and poverty (Zhuang et al., 2009). In addition, Thoma (2009) generally supports the idea of microfinance and small local banks in developing countries as providers of basic services in order to meet the most severe needs but they also argue that more sophisticated services and financial products are needed to promote financial development which subsequently contributes to poverty reduction. Thoma (2009) argues that small local banks and microfinance can be beneficial in providing information about local borrowers and can play important part in removing information asymmetries because of their local knowledge. Furthermore, he points out that even in developing countries the financial needs of agricultural, manufacturing sectors or services does not have to be simple and thus more complex financial services would be needed. Moreover, Honohan and Beck (2007) argue that financial system should be evenly distributed with larger banks, microfinance network organizations or the post office functioning as contract takers (mainly if they are geographically concentrated) and the subcontracting part should be carried out by the rural agencies such as microfinance institutions.

2.1.2. Indirect channel of financial sector development

Besides its direct effect, financial sector development can also reduce poverty by its indirect effect. As firstly, the development of financial sector prompts economic growth and subsequently, the positive effects of enhanced economic growth are translated into poverty reduction. The positive effects of financial sector on economic growth have long been investigated in the literature and there exists a lot of empirical evidence of this relationship (see Schumpeter, 1912; Gurley and Shaw, 1955; Goldsmith, 1969; McKinnon, 1973 or Levine, 2005). [8] In addition to this, many studies suggest that the change in GDP per capita/average income translates by proportionate amount to the change in income levels (see for example: Dollar and Kraay, 2001 or Eastwood and Lipton, 2001) thus implying that economic growth prompts poverty alleviation. The total impact of growth effect on poverty reduction then depends on its translation into the distribution of income as it can cause uneven growth in incomes from which only the rich benefit or causes everyone´s income grow by the same amount thus the total growth effect translates into poverty reduction (Banerjee et al., 2006). It can also cause disproportionate growth in the incomes of the poor thus also causing reduction in poverty.

According to DFID (2004), there exist two channels through which the development of financial sector could affect economic growth in long term which are capital accumulation channel and technological innovation channel as the functions of mobilizing savings, allocating resources and facilitating risk management of the financial sector cause the economy grow thus contributing to enhanced capital accumulation and technological progress. The development of financial sector helps to mobilize funds from inefficient to more efficient purposes in a cheaper way. Moreover,

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[8] The view of financial development contributing to economic growth has not been always accepted in the literature, however, as earlier works from development economic theory suggested that the only drivers of economic growth were technological progress and growth in labour supply (Solow, 1956). This view was changed by the introduction of endogenous growth that implied positive significant effect of financial development on economic growth (Romer, 1986; Aghion and Howitt, 1990).

when the financial intermediaries work more efficiently, they are able to attract more savings which are then channelled into profitable, greater investments that cause the economy to grow (Goldsmith, 1969). In addition, developed financial sector enables better risk diversification, hedging and risk pooling and contributes to facilitation of transactions which leads to larger project undertaking which would not have been gone through without this favourable environment created by financial development. It is also argued that better financial sector leads to increased liquidity as financial intermediaries borrow on a short-term basis from savers and lend this money to long-term lenders which also leads to reduction in information and transaction costs.

It is suggested that if financial development contributes to economic growth and economic growth reduces poverty then indirect effect of financial sector development on poverty alleviation should exist. Several authors estimated the growth effect as a major determinant of poverty reduction (Dollar and Kraay, 2002; Kraay, 2004 and others). Moreover, the poverty levels have been observed to decline in richer countries (WB, 2000). As with financial sector development, growth can also influence poverty by two channels the direct one which contributes to increase in the factors of production and the overall improvement in the living conditions and the indirect one which causes increased government revenues and thus contributes to increase in the transfers received by the poor and the overall increase in their incomes (Arestis and Caner, 2004).

2.1.3. The presence of inequality in the direct and indirect channel of financial sector development

The presence of economic growth in the economy does not automatically imply reduction in poverty levels as the decline in poverty is dependent on the income and consumption distribution. The increase in economic growth can have two effects on poverty reduction. It can either cause increase in everyone's incomes and then it can be said that growth effect translates straight into poverty reduction, or the growth effect can influence only the incomes of the rich as a result causing the income gap between the poor and the rich widen and thus despite the rise in average incomes, economic development has no effect on poverty reduction. This fact was confirmed by Kuznets

(1963) who found out that there was greater inequality in developing countries than in the developed world mainly in the non-agricultural sector. His hypothesis implied that at earlier stages of economic development, the income distribution does not improve, in fact the gap between individual incomes usually widens, and continues to stay this way until countries reach middle-income status. The hypothesis was confirmed by various cross-country studies from the 1970s concluding that with increased economic growth, the income inequality rose in low-income countries and the poverty reduction goal was not reached (Chenery et al., 1974; Adelman and Morris, 1973). The effect of the presence of inequality can be better seen on a real-world example, as in 1990s the overall poverty level in the world fell by a less amount than expected when compared to the relatively significant rates of economic growth at that time for example in India or China. It was mainly caused by increasing inequality and also the fact that the overall growth was caused mainly by increased expansion in high-technology industries (from which usually the rich and well-educated benefit) rather than from the growth in agriculture upon which most poor people rely (Deaton, 2004).

Moreover, poorly functioning and underdeveloped financial system is usually the reason why capital flows do not reach the poor and thus cause further deepening of the existing inequality between the rich and the poor. However, when financial sector develops, this inequality may still persist for some time as at earlier stages of financial sector development, the positive effects on poverty reduction either through indirect growth channel or direct channel translate disproportionately into income distributions in the society in a way that only the rich benefit from the development of the financial sector (for better illustration see figure 2.3). This is also confirmed by Lewis (1983) who argues that the development does not start in every part of the economy at the same time and while the development of financial sector increases the growth rate of the economy on the one hand, on the other hand the gap between the income profiles of the rich and the poor increases.[9] Furthermore, Greenwood and Jovanovic (1990)

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[9] Initially, only those who are in possession of some physical, human or financial capital assets benefit from economic growth while those who lack access to those assets do not benefit from the economic growth at first.

argue that the effect on poverty reduction at initial stage of financial sector development can be offset by the inequality that arises from different opportunities, the poor and wealthy households have in accessing financial intermediaries, since only the wealthy households can afford to pay for the initial costs associated with accessing financial intermediaries. In addition, usually only the rich have the required safeguards in order to be granted loan thus only they are the ones who usually have access to credit and other financial products.
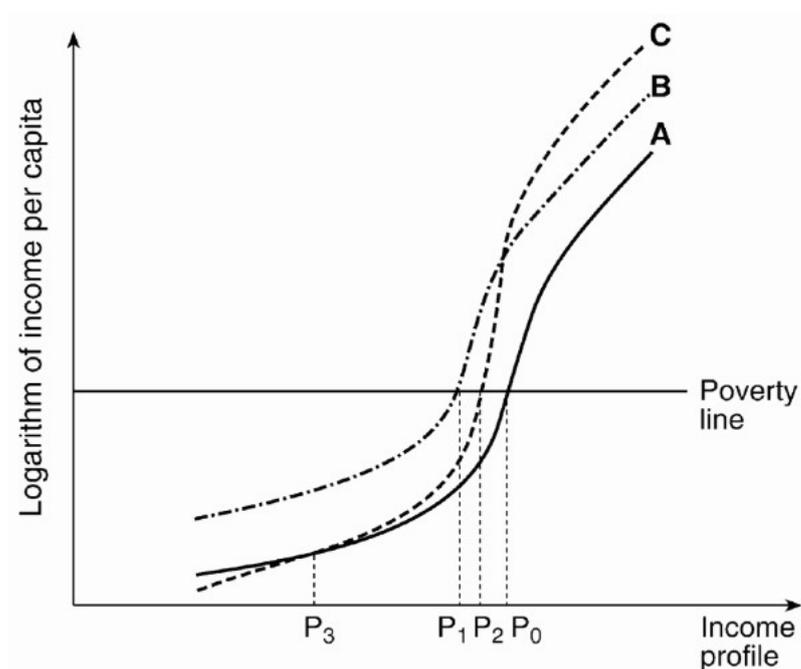
Figure 2.3: Poverty-growth effect-inequality nexus

Source: Jalilian and Kirckpatrick (2005)

Note: In the figure above, different income profiles can be seen, income profile A represents income profile before the impact of economic growth and income profiles B and C include the effect of economic growth on the growth in income. In a case where there is equal share of GDP growth, the distribution in income stays the same (depicted by income profile B) and the poverty level in economy decreases from P_0 to P_1. In a case, where the income distribution changes with economic growth, the income profile moves from A to C (the rich benefit more from the growth) and now it can be seen that the poverty level decreases by smaller proportion than in the first case from P_0 to P_2.

2.2. Empirics: Literature review of poverty-finance nexus

In this section empirical evidence on the poverty-finance nexus will be provided. As the literature on the relationship between financial development and poverty is rather scarce and due to high interconnectedness of the relation of financial sector development and poverty with inequality (mainly at the early stage of financial development) and with growth (poverty, apart from the direct effect of the financial sector development, can be also influenced by indirect effect via growth channel), the empirical part is divided into two following subsections corresponding to the direct and indirect effect of financial sector development on poverty reduction. Firstly, empirical evidence on the growth effect in poverty reduction will be briefly discussed and subsequently the evidence for the overall effect of financial sector development on poverty reduction will be provided, both subsections also covering the influence of initial inequality on poverty reduction.

2.2.1. Growth effect in poverty reduction

There exists a lot of empirical evidence on the positive relationship between poverty and economic growth (see for example: Dollar and Kraay, 2002; Chen and Ravallion, 2008 or Balakrishnan et al., 2013). Roemer and Gugerty (1997) estimate on a sample of 26 developing countries that economic growth proportionately translates into income growth for the poorest 40% of the population in the period 1960-1990. Kraay (2006) argues that between 69 to 97 percent of poverty variation among 49 developing countries is attributable to economic growth. Moreover, Janvry and Sadoulet (2010) find out on a sample of 42 countries (Sub-Saharan Africa countries) that the most significant effect of economic growth on poverty stems from the one originating in agricultural sector while economic growth attributable to other sectors influences poverty levels three times less. This finding is also confirmed by Loayza and Raddatz (2010) who on a sample of 55 developing countries from 1980–1990 found out that growth enhanced by sectors like agriculture, manufacturing or construction is associated with greater levels of poverty reduction. Balakrishnan et al. (2013) conclude

that the main factor in the growth of income shared by the bottom quintile in Brazil, China, India, Indonesia, Russia and Mexico from 1990 to 2010 is the growth of per capita income.

There is also quite substantial empirical evidence on the relationship between financial development and growth (see for example: King and Levine, 1993; Arestis and Demetriades, 1997; Luintel and Khan, 1999 and others). The core representative of empirical studies in this field is the paper introduced by King and Levine (1993) who confirmed that higher levels of financial development contribute to faster and greater economic growth, capital accumulation and to improved efficiency in the capital utilization. Although, many researchers confirm the positive relationship between poverty and growth, some empirical studies emphasize that the effect of economic growth on poverty reduction is not uniform across countries. As Chen and Ravallion (2008) point out the results for growth effect in poverty reduction are influenced by the largest countries in the sample as they found out that for example in China and India increased growth contributed to the decrease in the absolute poverty in the world over the period of 1981–2005 despite the stagnation of poverty levels in other countries. In addition to this, Wieser (2011) argues that economic growth is not the only condition that should be fulfilled in order to see the poverty rates decline.

As discovered in many empirical studies, the size of the effect of economic growth on poverty reduction can be undermined by existing initial inequality in the income distribution in the population (Adams, 2004; Islam, 2004; Balakrishnan, Steinberg and Syed, 2013). Ravallion (1997) argues that higher rates of initial income inequality in some countries might cause economic growth contribute to increased poverty levels. Son and Kakwani (2004) confirmed the finding of Ravallion (1997) that at higher rates of initial inequality, poverty is more insensitive to growth effect. Adams (2004) estimates using data for 60 developing countries that in countries with lower rates of inequality, for a given rate of economic growth, poverty alleviation will be significantly higher than in countries with higher levels of inequality.

2.2.2. Financial development and poverty

The empirical part on finance and poverty nexus can be divided into 2 following parts: cross-country studies and studies that are devoted to country-specific analysis (see tables 2.1 and 2.2 respectively). As can be seen from tables 2.1 and 2.2, the literature on this topic is rather scarce and researchers have only started to investigate this relationship empirically more in recent years which might be mainly due to the data availability and due to the shift of World Bank's primary goal from promoting economic growth to promoting poverty reduction. Moreover, common determinant of majority of the studies listed here is the private credit to GDP as a proxy for measuring financial sector development (more specifically it is used as a proxy for the depth of financial sector) which as most authors admit in their works is not an ideal measure to capture all the dimensions of financial sector and they argue that more measures would be needed to account also for stability or efficiency of the financial sector as they argue that only efficient and stable sectors can serve its purpose properly (Beck et al., 2004). It can also be seen from the respective tables that only in recent years researchers started to use more proxies of financial sector development (this also goes hand in hand with the recent development of GFDD by WB).

Cross-country studies

Several authors tested the direct and indirect effect of financial sector development on poverty reduction using cross-country analysis (Jalilian and Kirkpatrick, 2002 and 2005; Jeanneney and Kpodar, 2011 and Beck et al., 2004 and 2007). Jalilian and Kirkpatrick (2002) tested both the direct and indirect effect of financial sector development on poverty reduction on a sample of 42 countries, using panel data techniques, concluding that financial sector development contributes to poverty reduction. Jalilian and Kirkpatrick (2005) estimated on a sample of developing and developed countries that a unit change in financial development contributes to 0.3 percentage growth in the incomes of the poor. Moreover, quadratic relationship between inequality and financial sector is found in their study which means that at lower levels of financial development, financial development is expected to increase inequality and when it reaches certain threshold, the inequality level should be

decreased. Beck et al. (2007) found out that in the long-run the impact of financial development on poverty reduction is attributable by 40% to the reduction in income inequality and by 60% to growth effect. The positive effect of financial development is confirmed by using both poverty headcount (for period 1980–2005) and income shared for the poorest quintile (for period 1960–2005) as proxies for poverty. Jeanneney and Kpodar (2011) investigate on a sample of developing countries in the period 1966–2000 whether financial sector development helps to alleviate poverty, beyond its indirect effect via economic growth. Their results suggest that the direct effect of financial sector development is more significant than the indirect one and conclude that the development of financial sector is pro-poor. They however argue that the effect can be undermined by the existence of financial instability which as they argue mainly hurts the poor.

Conduit effect proposed by McKinnon was also empirically investigated in the literature (Jeanneney and Kpodar, 2011; Perez-Moreno, 2011 and Akhter et al., 2009). Jeanneney and Kpodar (2011) investigated the McKinnon conduit effect using M3/GDP proxy and concluded that McKinnon conduit effect has the most pronounced impact on poverty reduction when compared with the indirect channel of financial sector development and with the direct one measured by private credit to GDP and show that the poor gain from the ability of financial sector to provide saving opportunities but fail to use the benefits of easier access to credit. Perez-Moreno (2011) investigate both the McKinnon conduit effect using M3/GDP ratio and the depth of financial sector measured as the value of credits granted by financial intermediaries to the private sector as a share of GDP (private credit to GDP) as they argue that private credit is a good proxy for measuring the extent to which agents can access loans or financial intermediation and M3/GDP actually assesses whether financial intermediaries supply the poor with money balances or credits. They found out on a panel of 35 developing countries that between 1970–1980 financial sector development helped to alleviate poverty whereas in the period 1980–1990 no such result is found which they explain by the need to do a thorough analysis of the world economy at that time, of the political situation in developing countries, of the reforms of financial sector or of the national and international implementation of monetary or financial policies.

They also add that financial sector contributes more to the reduction in moderate poverty levels than to the alleviation of extreme poverty (moderate poverty measured as poverty headcount for $2 a day and extreme poverty measured as poverty headcount for $1 a day) which implies that financial development does not primarily help the poorest but it helps poor people who already have some level of income or expenditure. Akhter et al. (2009) estimate on a panel of 54 developing countries that financial development is beneficial for the poor using M3/GDP and private credit to GDP ratios but also state that any instability of financial sector is detrimental to the poor. In addition, they show that the presence of political stability in a country serves as a catalyst for financial development to combat poverty.

Moreover, some authors also investigated the effect of stock markets on the poor, apart from the effect of loan markets, in all cases concluding that the effect of loan markets is more pronounced in alleviating poverty than the effect of stock markets (Kappel, 2010; Ben Naceur and Zhang, 2016; Kpodar and Singh, 2011). Kappel (2010) points out that both stock and loan markets have significant effects on poverty reduction with the loan market effect being greater. They also argue that the development of financial sector reduces inequality in the period 1960–2006 on a sample of 78 developing and developed countries. Moreover, ethnic diversity and distribution of land are found to be significant determinants of poverty. Kpodar and Singh (2011) apart from confirming that poverty is influenced by both stock markets and financial institutions, find out that the quality of institutions plays a role in poverty alleviation on a sample of 47 developing countries in the period from 1984 to 2008. The effects of stock markets and loan markets on poverty reduction are also confirmed by Ben Naceur and Zhang (2016) who use 10 proxies for financial sector development to capture its stability, efficiency, depth and access to it in the period from 1961 to 2011 on a sample of 143 countries.

Despite the positive effect of stock markets on poverty alleviation confirmed in literature, Honohan (2004) fails to confirm this relationship. Moreover, he estimates that a 10 percentage point change in the ratio of private credit should contribute to 2.5 to 3 percentage points reduction in poverty levels (measured by headcount index) even after accounting for mean income and inequality. Furthermore, Dhrifi and Maktouf (2013) investigate the relationship of financial sector development, financial

24

liberalization and poverty. They estimate that the poor benefit from financial liberalization if the financial development is under a certain threshold. Moreover, Kraay (2004) fails to confirm the positive relationship of financial sector development on poverty.

Table 2.1: Overview of cross-country studies

Study	Period	Proxy for financial development	Main findings
Jalilian and Kirkpatrick (2002)	1960—1995	bank deposit money assets over GDP, net foreign assets over GDP	test both the direct and indirect effect of financial sector development, estimate that financial sector development contributes to poverty reduction
Honohan (2004)	1960—2000	private credit to GDP, stock market capitalization, stock market turnover ratio	10 percentage point change in the private credit ratio translates into the reduction of poverty ratios by 2.5 to 3 percentage points, stock market capitalization and stock market turnover ratio found to have no effect in poverty reduction
Beck et al. (2004)	1960—1999	private credit to GDP	financial development prompts poverty levels to decline more rapidly, income inequality reduction and the incomes of the poor to grow faster than the average GDP per capita
Kraay (2004)	since1980s/ 1990s	M2/GDP	no link between financial sector development and poverty reduction
Jalilian and Kirkpatrick (2005)	1960—1995	private credit	find quadratic relationship between financial sector development and inequality, firstly the relationship between them is negative, subsequently after reaching some threshold level the link between them starts to be positive, financial sector development contributes to poverty reduction by growth enhancing effect
Beck et al. (2007)	1960—2005, 1980—2005	private credit to GDP	financial sector development contributes to poverty alleviation
Akhter et al. (2009)	1993—2004	M3/GDP, private credit/GDP	find out that financial development is beneficial to the poor however the effect is mitigated by financial instability, argue that political stability is the key factor in combating poverty via financial sector development
Kappel (2010)	1960—2006	private credit to GDP, stock market capitalization to GDP, stock market total value traded to GDP, stock market turnover ratio	finds that both stock markets and loan markets play a role in poverty alleviation, the effect of loan markets in poverty reduction is however more pronounced
Jeanneney and Kpodar (2011)	1966—2000	private credit to GDP, M3/GDP	financial development is pro-poor, financial instability partially mitigates the effect of financial development on poverty reduction, the McKinnon conduit effect estimated to be the core channel of the benefits of financial sector development for the poor
Perez-Moreno (2011)	1970—1980 and 1980—1990	M3/GDP, private credit/GDP	in the period 1970—1980 development of financial sector helps to reduce poverty levels while in the second period the positive relationship is not confirmed, moreover they show that poor people with a certain level of income or expenditure benefit from the financial sector
Kpodar and Singh (2011)	1984—2008	stock market capitalization, stock market value traded, bank net interest margin, bank overhead cost, private credit	suggest that when the quality of institutions is weak bank-based systems contribute more to poverty reduction when the quality improves however the market-based systems are seen as the key drivers of poverty alleviation
Dhrifi and Maktouf (2013)	1990—2011	private credit to GDP	find out that certain level threshold of financial sector development, once this threshold is satisfied is likely to contribute to reduction of poverty (this threshold estimated to be 56% of private credit to GDP)
Ben Naceur and Zhang (2016)	1961—2011	10 variables for acces, depth, efficiency, stability	banking sector development exerts more significant impact on poverty reduction than stock market development

Source: Author

Country-specific studies

The positive relationship between financial development and poverty is also confirmed by country-specific studies (Odhiambo, 2010; Ellahi, 2011; Inoue and Hamori, 2012; Uddin et al., 2014; Abosedra et al., 2015 and Abdin; 2016). Odhiambo examines finance-poverty nexus in Kenya from 1968 to 2006 using M2/GDP measure as a proxy for financial sector development and concludes that financial sector development is pro-poor and pro-savings. Inoue and Hamori (2011) use unbalanced panel data for 28 Indian states and union territories in order to analyse the effect of financial deepening on poverty in India. Their results suggest that financial deepening reduces poverty levels when accounting for trade openness, inflation rate and economic growth in the estimation. Uddin et al. (2014) use dataset for Bangladesh in the period 1975–2011 and conclude that financial development positively impacts poverty however the relationship is not linear, suggesting that over time the distribution of income becomes unequal causing the rich becoming richer and the poor getting poorer. Abosedra et al. (2015) analyse poverty in Egypt from 1975 to 2011 and confirm both the direct and indirect channel of financial sector development on poverty. They also propose that well-organized and suitable reforms in Egypt focusing on financial sector can contribute to faster reduction in poverty levels. Abdin (2016) also examines povety in Bangladesh and concludes that financial sector contributes to poverty reduction in Bangladesh by greater availability of access to credit and access to saving facilities. It is argued that the presence of micro-credit programs in Bangladesh contributes to the significance of private credit in the estimation. Moreover, indirect channel of financial sector development is confirmed.

Several authors however fail to confirm the positive effect of financial sector development on poverty or only confirm it partially when undertaking country-specific analysis (Quartey, 2005; Bhandari, 2009; Kar et al., 2011; Fowowe and Abidoye, 2012 or Dauda and Makinde, 2014). Quartey (2005) uses time series data from 1970 to 2001 for Ghana to analyse the effect of financial sector development on poverty concluding that the effect is positive but insignificant which as he argues might be due to the fact that the savings were not properly allocated to the poor section of population in Ghana because of government deficit financing, high default rates, lack of collateral and lack

of adequately designed business proposals. Bhandari (2009) estimates that providing banking services to poor people is not the best poverty reduction strategy in India and suggests that building inclusive financial systems should be the priority. Kar et al. (2011) examine poverty in Tukey from the perspective of financial sector development in the period from 1970 to 2007 and find that the indirect channel is the main channel through which poor people benefit from developed financial sector while the direct channel is very limited in helping poor to improve their standards of living in the short-run. In addition, Fowowe and Abidoye (2012) examine whether finance impacts the poor positively on a sample of Sub-Saharan African countries and conclude that private credit does not have significant impact on poverty levels in this region but they suggest that macroeconomic variables such as low inflation and trade openness can be beneficial in reduction of poverty. Dauda and Makinde (2014) argue that private credit has no impact on poverty reduction whereas McKinnon conduit effects seems to be the main channel through which poor people are affected by financial sector development.

Table 2.2: Overview of country-specific studies

Study	Period	Proxy for financial development	Main findings
Quartey (2005)	1970—2001	M2/GDP, private credit to GDP	argues that provision of credit mainly to agricultural and manufacturing sector in Ghana should help with reduction of poverty as the poor mostly work in these respective sectors
Quartey (2008)	1970—2001	private credit to GDP, M2/GDP	financial development as measured by private credit to GDP found to influence poverty levels in Ghana
Bhandari (2009)	1980—2007	bank accounts	providing banking services to poor people is not a good poverty reduction strategy for India
Odhiambo (2010)	1968—2006	M2/GDP	financial development in Kenya is pro-poor and pro-savings
Ellahi (2011)	1975—2010	private credit to GDP	no causality between financial development and growth and poverty reduction and financial development found, finds that economic growth accelerates financial sector development and both are beneficial to poverty alleviation in Pakistan
Huang and Singh (2011)	1992—2006	private credit to GDP	financial deepening reduces inequality and poverty in sub-Saharan Africa, stronger property rights enhance these effects, interest rates and lending liberalization can be detrimental to the poor
Kar et al. (2011)	1970—2007	M2/GDP, private credit to GDP, domestic credit to GDP	the direct link between financial development and poverty reduction is limited in the short-run in Turkey, the indirect link is confirmed
Inoue and Hamori (2012)	seven time periods(1973, 1977,1983,1987, 1993, 1999,2004)	credit amount as a share of the regional output, deposit amount as a share of the regional output	financial deepening significantly alleviates poverty levels in India
Fowowe and Abidoye (2012)	1981—2005	private credit to GDP	private credit to GDP does not significantly influence poverty levels in sub-Saharan African countries
Dauda and Makinde (2014)	1980—2010	M2/GDP, credit to private sector	McKinnon conduit effect most likely channel to contribute to poverty reduction via financial sector development, private credit to GDP no effect on poverty reduction in Nigeria
Uddin et al. (2014)	1975—2011	financial deeping index (not specified)	confirm the positive relationship between financial development and poverty reduction but argue that it is not linear in Bangladesh
Abosedra et al. (2015)	1975—2011	domestic credit to GDP, M2/GDP	direct and indirect link of financial sector development confirmed for Egypt
Abdin (2016)	1974—2013	private credit to GDP, M3/GDP	direct and indirect link of financial sector development confirmed for Bangladesh

Source: Author

2.2.3. Measurement of financial sector development

„Going to a doctor for a health check-up usually involves being weighed. Weight is a useful piece of information that may indicate something about a person's eating habits, exercise, and other behaviours. But it does not provide a sufficient basis to assess a person's health and wellbeing. Doctors thus also measure pulse, temperature, and other examinations to better establish a person's health. "

~ Cihak et al. (voxeu.org, 2013)

As with the assessment of human's health, the health of financial sector and its development has to be assessed through as many channels as possible to capture all its dimensions. Many up-to-date studies that concentrate on the effect of financial development either on growth or on poverty focus only on private credit to GDP ratio

as a proxy for financial depth which is able to capture the size of bank's loans relative to economic output but fails to account for other institutions that are present in the financial sector apart from the banks. In addition, it does not take into account another dimension of financial sector which is represented by stock markets. The private credit to GDP is also not able to capture the quality of financial services, efficiency or stability of the financial sector. Moreover, as Cihak et al. (2012) argue depth of financial development do not necessarily imply provision of greater access to financial services as well as highly efficient financial systems do not automatically ensure their stability therefore it is better to capture as wide characteristics of financial development as possible.

In 2012, GFDD was established by the WB which includes financial sector indicators covering 206 countries with a time span from 1960 till 2014. Cihak et al. (2012) offer a detailed description of the dataset pointing out that these indicators offer a 4x2 dimensional description of the financial sector where 4 stands for the different measures – access, depth, effectiveness and breadth and 2 stands for banking sector and stock market.[10] Although, the development of such database is certainly a step forward, Cihak et al. (2012) point out that researchers when using these proxies have to be aware of their caveats. As for example bank branches per 100 000 adults which should measure the access to financial institutions capture only the access to commercial banks and do not take into account the development of branchless banking or in case of stock market proxies for depth, stock market capitalization does not take into account the private market capitalization, even though it is shown that it forms a great part of total securities market capitalization in a country.

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[10] Cihak et al. (2013) present proxies for each category of the efficiency, stability, depth and access of the financial institutions and financial markets. Specifically, private credit to GDP and stock market capitalization are used as proxies for depth of financial institutions and stock markets, respectively. Bank accounts per 100 000 adults and percent of market capitalization outside of top 10 largest companies for access to financial institutions and stock markets, respectively. Net interest margin and turnover ratio for the efficiency of financial institutions and stock markets, respectively and lastly, z-score and volatility of stock price for the stability of financial institutions and stock markets, respectively.

As Levine (2005) points out the challenge in the measurement of financial sector development remains for most of the empirical studies on this topic to take into account the multidimensional nature of the financial development as some functions of financial sector can be captured only partially such as the risk management, facilitation of transactions or pooling of savings. Recently, Svirydzenka (2016) has tried to address this challenge by forming an aggregate index of financial sector development that is constructed from nine indices that encompass the extent to which the financial institutions and financial markets are developed in terms of their efficiency, stability and depth. Furthermore, it covers 183 countries in the period from 1980 to 2013.

3.   Data

As the aim of this thesis is to investigate whether financial sector development can contribute to poverty alleviation, various measures illustrating the depth, effectiveness, stability of the financial sector and the extent to which individuals can access the financial sector were used. Such indicators can be obtained publicly from GFDD established by WB. As there are various different measures in GFDD describing financial sector development, each having different time and country coverage, only those indicators that offer the richest data coverage are included in the dataset set up for the purpose of this thesis. Namely, the selected indicators are:

Table 3.1: Financial development indicators

		Expected sign in case of poverty alleviation:	
Financial institutions proxies:		**Income share held by lowest 20%**	**Poverty headcount index**
Depth	**Private credit to GDP** – domestic private credit to the real sector by deposit money banks as percentage of local currency GDP, this measure excludes credit issued to governments, government agencies and public enterprises and credit issued by central banks	+	-
Stability	**Bank Z-score** – can be expressed as : $\frac{[ROA+\left(\frac{equity}{assets}\right)]}{standard\ deviation\ of\ ROA}$, this indicator compares the banking system's buffers (returns and capital) with its riskiness (volatility of returns)	+	-
Efficiency	**Net interest margin** – accounting value of banks' net interest revenue as a share of average interest-bearing assets	-	+
Access	**Bank branches per 100 000 adults –** number of commercial bank branches per 100,000 adults	+	-
Financial market proxies			
Depth	**Stock market capitalization** – value of listed shares to GDP	+	-
	Stock market value traded – total number of shares traded multiplied by their respective matching prices	+	-
Efficiency	**Stock market turnover ratio** – stock market value traded to total market capitalization	+	-

Source: Author based on GFDD

To this dataset, various other variables were added encompassing regional, demographic and political determinants of poverty in order to account fully for the socio-economic and cultural environment that might be important for poverty reduction. The variables were chosen in accordance with what majority of empirical studies on finance-poverty nexus suggest as the most relevant determinants of poverty and thus should be included in the poverty reduction regressions (such as: Deininger and Squire,1998; Ghura et al., 2002; Banerjee et al., 2006). For each corresponding group (macroeconomic stability, demographic characteristics, etc.), variables for which the data sources offered the richest data were chosen. The selected variables can be seen in table 3.4.

Besides the control variables, annual GDP per capita growth is used to account for the growth effect in poverty reduction. To illustrate the political and economic environment inflation rate, government consumption to GDP as proxies for macroeconomic stability are used, trade openness characterizing the external environment is included, for the quality of institutions and governance several variables are employed such as rule of law, index of political rights, civil liberties index and political stability index. As Dollar and Kraay (2002), Easterly and Fischer (2001) or Jeanneney and Kpodar (2006) pointed out inflation rate inclusion into the poverty reduction dataset is important as the poor might be influenced more by inflation than the rich since the rich have better access to financial instruments used for hedging purposes and they also have large shares of their incomes indexed to inflation. The trade openness variable was added to the dataset as the easing of trade restrictions is expected to improve the access to goods and services and encourage labour employment (Ghura et al., 2002; Fowowe and Abidoye, 2012).

For the demographic characteristics of countries in the dataset, following variables are used: population growth, urban population share, ethnolinguistic fractionalization and ethnic heterogeneity. Human capital in the dataset is represented by primary school enrolment, secondary school enrolment and public education share (Barro, 1996). Apart from the education variables, life expectancy is included which is also used to express human capital in regressions. To account for physical capital, public investment, private investment and total investment data are used. Public investment

facilitates access to markets and social services if at the same time private investment is enhanced, the impact would be further strengthened (Lipton and Ravallion, 2005). Among other characteristics, unemployment is included as it increases disparity between people and leads to financial crisis which can result in poverty. To account for the sectoral differences in economy, agriculture value added and manufacturing value added are used as majority of poor people work in these sectors (Ghura et al., 2002). Moreover, industry value added is also accounted for as it can contribute to creation of jobs and industrial development is often linked with economic growth and poverty reduction (Kniivilä, 2007). Government expenditure on health is included as strong health systems improve the well-being of the society and usually the concentration of poor health is mainly visible among the poor (O'Donnell et al., 2012). Lastly, M3/GDP is added to the dataset to find out if McKinnon conduit effect holds and is relevant in alleviating poverty levels. Geographic controls are included in order to account for heterogeneity in the dataset, specifically these are dummy variables for Sub-Saharan Africa, East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia and developed countries. Arable land and natural resources exports are used as majority of poor people work in the agricultural sector which allow to measure the sectoral distribution of growth by means of the relative productivity performance of the agricultural sector (Ghura et al., 2002).

The data were then averaged according to their availability across long-term periods, for example the proxies for poverty were averaged from 1981 to 2014 as the data for them were available in this time span.[11] This approach is useful for inspecting long-term trends in the estimation and for searching for common determinants of poverty across countries. After averaging and checking for availability, the baseline sample

[11] The dataset is however not balanced since some observations come from the first half of the period and some from the second half or from the middle. Such formation is far from ideal and shorter periods were also tried. The shorter periods however suffered from the lower number of observations with the results not being altered too much. Moreover, always countries with at least 3 observations in 1981–2014 period were kept. Thus the results are presented in this form and modifications are available upon request.

consists of 85 developed and developing countries for poverty headcount per $1.9 a day and of 91 developed and developing countries for income share held by lowest 20% (see appendix A for the respective lists of countries and tables 3.2 and 3.3 for the descriptive statistics of the financial indicators in respective regressions).

As in these types of regression, the possibility that the dependent variable and the explanatory variables might be determined simultaneously exists, the dataset is adjusted to account for existence of endogeneity as its presence could bias the results. The method used here is the inclusion of the lagged values of explanatory variables X into the estimation in order to 'exogenize' it when analysing the causality of X on Y. It is argued that when such replacement of X_t with X_{t-1} is done, the concerns about possible endogeneity between X and Y are alleviated since X_{t-1} cannot be possibly determined by Y (Reed, 2013). Such method of accounting for endogeneity is used in many relevant empirical studies in top economic and sociological journals as it is quite easy to implement however major pitfalls for this method exist and one has to be careful when applying it. Among the criticism in the literature are such arguments as: loss of precision in some cases since the lagged variables in the regression represent only proxies for the variables of interest. Moreover, there is no way to find out how serious the endogeneity problem is and whether the solution of replacing the explanatory variables with their lags is adequate (no statistical tests exist).

Table 3.2: Descriptive statistics, financial indicators in income share regression

	Min	Max	Mean	Std.dev
Private credit	4.93	245.28	67.36	53.76
Bank Z-score	-1.7	36.52	10.52	6.91
Net interest margin	0.71	11.88	4.48	2.78
Bank branches	1.54	92.72	22.70	19.91
Market capitalization	0.49	219.79	45.05	42.77
Market turnover	0.43	197.30	42.90	50.88
Market value traded	0.02	227.13	26.29	40.66

Table 3.3: Descriptive statistics, financial indicators in poverty headcount regression

	Min	Max	Mean	Std.dev
Private credit	4.93	145.26	42.72	26.86
Bank Z-score	-0.52	35.99	10.11	7.07
Net interest margin	2.39	11.88	5.42	2.23
Bank branches	1.54	81.95	16.86	15.01
Market capitalization	0.49	216.12	34.33	37.08
Market turnover	0.38	169.32	25.88	39.23
Market value traded	0.02	68.98	9.59	17.15

Table 3.4: Control variables

Variable	Source of data	Notes
GDP growth	WB	Annual percentage growth rate of GDP per capita
Human capital		
Life expectancy	WB	Indicates the number of years an infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.
Primary school enrolment	WB	The ratio of children who are enrolled in school to the population of the corresponding official school age.
Secondary school enrolment	WB	The same applied as in case of primary school enrolment
Public education share	WB	General government expenditure on education
Demographic characteristics		
Urban population share	WB	Percentage of population living in urban areas
Population growth	WB	Annual in %, derived from total population
Ethnolinguistic fractionalization	Desmet et al. (2009)	
Ethnic heterogeneity	Desmet et al. (2009	
Physical capital		
Public investment	WEO	Public investment as a share of GDP
Private investment	WEO	Private investment as a share of GDP
Total Investment	WEO	Total investment as a share of GDP
Macroeconomic stability		
Inflation rate	WB + OECD	Consumer price index (2010 = 100), WB database complemented with OECD data for particular countries absent in WB dataset
Government consumption	WB	Government expenditure as share of GDP
Quality of institutional framework		
Civil liberties	Freedom House database	Civil liberties measurement is done on a one-to-seven scale with one expressing the highest degree of freedom and seven the lowest.
Political rights	Freedom House database	The same applied here as in the case of civil liberties index
Rule of law	WB	Higher value indicates stronger rule of law, measure of institutional quality
External environment		
Trade openness	WB	Sum of real exports and imports as a share of GDP
Internal resources		
Arable land	WB	Arable land per capita, in hectares
Natural resource exports to GDP	WB	Natural resources exports as share of GDP
M3/GDP	WB	Broad money (% of GDP) is the sum of currency outside banks, demand deposits outside central government, measure of liquidity
Other characteristics		
GDP fraction in agriculture		Agriculture value added (% of GDP)
GDP fraction in industry	WB	Industry value added (% of GDP)
GDP fraction in manufacturing	WB	Manufacturing value added (% of GDP)
Unemployment	WB	Share of the labour force that is without work but available for and seeking employment.
Health expenditure	WB	Total health expenditure is the sum of public and private health expenditure.

Regional dummies

The division of countries into respective regional variables is done in line with the categorization provided by WB where ECA, SSA, SA, MENA EAP, ECA and LAC consist only of developing countries, see:

LAC dummy	Latin America and Caribbean regional dummy
SSA dummy	Sub-Saharan Africa regional dummy
SA dummy	South Asia regional dummy
MENA dummy	Middle East and North Africa regional dummy
EAP dummy	East Asia and Pacific regional dummy
ECA dummy	Europe and Central Asia regional dummy
Developed countries dummy	

Source: Author

Note 1: Life expectancy is not included as a control variable in the regressions with poverty headcount as the correlation between poverty headcount and life expectancy is quite high (0.8) which is in line with for example Beck et al. (2007) who do not include it in the estimation with poverty headcount either.

Note 2: The dataset was formed in line with microeconomic studies on poverty reduction and empirical research on finance-poverty nexus. Specifically, the dataset was compiled similarly to Ghura et al. (2002) dataset and corresponds with what other important studies suggest as relevant control variables (such as Deininger and Squire, 1998; Dollar and Kraay, 2002; Jeanneney and Kpodar, 2006, 2008 and Beck et al., 2007).

4. Bayesian model averaging

In this section, the basics of Bayesian model averaging (BMA) important for our analysis will be introduced that are based on the research by Zeugner (2011), Moral-Benito (2012) and Montgomery and Nyhan (2010). Poverty regressions are often characterized by high model uncertainty since there are usually a lot of potentially relevant determinants of poverty that could be included into the poverty regressions. The usual solution, many researchers apply in their work when faced with this problem, is to include all the key explanatory variables into the model, however this method is likely to yield imprecise estimates as the large number of regressors usually causes the standard errors being inflated or may indeed prove infeasible due to small number of observations (Zeugner, 2011). The next step that is then employed by the researchers is to sequentially eliminate the least significant variables from the model on the basis of statistical tests. However, as Koop (2003) points out the probability of retaining an irrelevant variable or omitting an important one increases with the number of sequences performed.

Researchers have dealt with the question of how to treat multiple model combinations for a long time now.[12] Leamer (1978) was the first author who set the problem of multiple model combinations into the Bayesian framework and presented the basic ideas for BMA. In the mid-1990s BMA gained on importance in statistics (Madigan and Raftery, 1994, Raftery, 1995, Draper, 1995) and has found its use in various fields like economics, biology, ecology or public health (Montgomery and Nyhan, 2010). BMA represents an efficient tool to deal with model uncertainty when the researcher has a lot of explanatory variables that could be included into the model, but is uncertain

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[12] The first mention of model combination in the literature was Barnard (1963) who studied airline passenger data. Studies that are associated with model averaging techniques appeared in the statistical literature since 1965 (Roberts, 1965) –averaging technique introduced in this work was particularly very similar to BMA.

which combination of explanatory variables would be the best fit in explaining the dependent variable in a particular scenario

In order to briefly explain how BMA works, assume we have a traditional linear model structure

$$y = \propto + X\beta + \varepsilon \quad \varepsilon \sim N(0, \sigma^2 I) \tag{4.1}$$

where we have a dependent variable Y (in the case of poverty regression, Y is represented by some proxy for poverty, in our case: 1. the income share held by the poorest 20%, 2. poverty headcount), j regressors $X_1 \dots X_j$ (in our context various social, cultural and economic determinants of poverty, financial development indicators, indicators for economic growth and inequality), a number of n observations (the number of countries) and ε which is a vector of normally distributed IID error terms with variance σ^2. BMA deals with the model uncertainty problem by estimating all possible combinations of *{X}* and then it creates a weighted average of all the possible combinations. The model weights for the purpose of averaging are derived from posterior model probabilities. If j variables are included in X, 2^j variable combinations will be estimated and as a result 2^j possible model combinations are arrived at. If β is the parameter of interest, its posterior distribution given data D is the average of the posterior distributions under each of the models estimated, posterior model probability then represents its weights and thus the posterior distribution of β can be written as:

$$p(\beta|D) = \sum_{j=1}^{J} p(\beta|M_j, D) p(M_j|D) \tag{4.2}$$

In equation 4.2, j number of models is estimated and thus posterior model probability for model M_j can be written as:

$$p(M_j|D) = \frac{p(D|M_j) p(M_j)}{\sum_{k=1}^{J}(D|M_k) p(M_k)} = \frac{p(y|M_j, X) p(M_j)}{p(y|X)} \tag{4.3}$$

where

$$p(D|M_j) = \int p(D|\theta_j, M_j)p(\theta_j|M_j)\mathrm{d}\theta_j \qquad (4.4)$$

is the integrated likelihood of model M_j, θ_j represents vector of parameters of model M_j, $p(\theta_j|M_j)$ is the prior density of θ_j, $(D|\theta_j, M_j)$ is the likelihood and $p(M_j)$ represents the prior probability that M_j is the true model.

Following sections should provide more detailed description of the important components of BMA framework and also theoretical background for important steps that have to be undertaken by the researcher will be established.

4.1.   Posterior model probability

As explained above BMA lies in averaging across all possible model combinations. The weights for this averaging can be obtained from PMP which arises from Bayes' theorem:

$$p(M_j|D) = \frac{p(y|M_j, X)p(M_j)}{p(y|X)} \qquad (4.5)$$

Here, $p(y|X)$ represents integrated likelihood which is a constant and thus is only a multiplicative term, $p(y|M_j, X)$ is the marginal likelihood of the model which explains how probable the data are given some model M_j, $p(M_j)$ denotes the prior probability of the model (it is the personal belief of the researcher about the probability of some model M_j before inspecting the actual data). Since $p(y|X)$ is only a constant, we can state that PMP $p(M_j|D)$ is proportional to the marginal likelihood of the model times a prior model probability:

$$p(M_j|D) \propto p(y|M_j, X)p(M_i) \qquad (4.6)$$

where proportionality is denoted by the sign $\propto$. If there is a lack of certainty about the true model, the standard practice is to set the prior probability $p(M_j \propto 1)$ in order to reflect the lack of knowledge about the true model. The prior model probabilities will be discussed in section 4.2.1. The sum of all posterior model probabilities across models that include particular regressor then represents posterior inclusion probability (PIP) of that particular regressor:

$$PIP = p(\beta_k \neq 0|D) = \sum_{j=1}^{2^k} p(M_j| \beta_k \neq 0, D) \qquad (4.7)$$

PIP provides information on the probability that a given regressor is relevant in the estimation (that the regressor is included in the true model and thus has some effect on the dependent variable (poverty proxy)).

4.2.   Posterior mean and posterior variance

The estimation of β coefficients is probably the most crucial part in every regression. The inference for β can be constructed on the basis of the posterior distribution:

$$p(\beta|D) = \sum_{j=1}^{2^K} p(\beta_j|M_j, D)p(M_j|D) \qquad (4.8)$$

From the equation 4.2.1 can be seen that the full posterior distribution of β is the weighted average of the posterior distribution under each model, where the weights are proportional to the posterior model probabilities $p(M_j|D)$. Furthermore, the posterior mean of β can be calculated from the posterior distribution in the equation 4.9 as:

$$E(\beta|D) = \sum_{J=1}^{2^K} E(\beta_j|M_j, D)p(M_j|D) \qquad (4.9)$$

According to Moral-Benito (2012), the posterior variance can be written as:

$$Var(\beta|D) = \sum_{j=1}^{2^k} p(M_j|D)Var(\beta_j|M_j,D)$$

$$+ \sum_{j=1}^{2^k} p(M_j|D)(E(\beta_j|M_j,D) - E(\beta,D))^2 \qquad (4.10)$$

Equation 4.2.3 shows that the posterior variance is composed of the estimated variances of the particular models $Var(\beta_j|M_j,D)$ and the variances in the β_j's estimated across different models which is expressed in the second part of equation 4.10 $(\sum_{j=1}^{2^k} p(M_j|D)(E(\beta_j|M_j,D) - E(\beta,D))^2)$.

4.3.   Priors

The specification of suitable priors in the Bayesian framework is one of the preconditions to implement BMA correctly and it is probably the most complex part of the estimation. BMA requires two types of priors to be elicited before the actual estimation takes place, the parameter prior g and the prior *p(M_j)* on the model space since without determination of the respective priors, the estimation of PMPs would not be possible. In a situation, when the researcher is equipped with many potential explanatory variables (e.g. determinants of poverty) and is not sure which ones should be included into the estimation, the prior information about the model and parameters is rare. Thus non-informative prior usage would be preferred in these contexts, but since, it is impossible to calculate PMPs with non-informative improper parameter priors, many researchers tried to create proper priors that could be used in situations when the information about the model and the parameters is lacking (Montgomery and Nyhan, 2010).

4.3.1. Parameter priors

The Bayesian framework requires the specification of prior distribution on parameter priors β_j, α_j and σ^2. In this study, Zellner's g-prior structure (Zellner, 1986) will be implemented which is a common approach in existing literature (see for example: Liang et al., 2008, Fernandez et al., 2001b). The main idea of Zellner's g-prior structure is to let the researcher provide some information about the location parameter of the regression and leave out the specification of the prior correlation structure which represents one of the most difficult aspects of prior specification (Marin and Robert, 2007).

The most important prior is on the β_j coefficients. Under Zellner's g-prior structure, β_j coefficients are assumed to follow normal distribution and assumptions about its mean and variance have to be formulated. It is commonly assumed by many researchers, that β_j coefficients have zero mean and the variance structure given by Zellner's g can be written as: $\sigma^2 \left(g \left(X_j' X_j \right)^{-1} \right)$. Thus we can write the coefficient distribution dependent on the g-prior as:

$$\beta_j | g \sim N \left(0, \sigma^2 \left(g \left(X_j' X_j \right)^{-1} \right) \right) \qquad (4.11)$$

Zeugner (2011) distinguishes between "fixed g-priors" and "model-specific g-priors". Fixed g-priors have their parameter prior set for all the considered models whereas model-specific g-priors allow the researcher to update g-priors for specific models in consideration and limit the unintended consequences on posterior distributions (see tables 4.1 and 4.2 for examples of priors that belong into the respective groups).

Table 4.1: Fixed g-priors

Unit information prior (UIP)	$g = 1$ (sets common g to all the models and thus the prior is provided with approximately the same information as the one that is obtained in one observation)
Benchmark prior (BRIC)	$g = max\{N, K^2\}$ PMPs asymptotically operate as the Bayesian information criterion (when $g = N$) or as the risk inflation criterion (when $g = K^2$)

Source: Author, based on Zeugner, 2011

Table 4.2: Model-specific g-priors

Hyper-g prior (hyper-g)	$\frac{g}{1+g} \sim Beta\left(1, \frac{a}{2} - 1\right)$ where a represents a parameter taking values from the range $a \in (2,4]$ then the shrinkage factor is expected to take the value of $\frac{2}{a}$ $\left(=E\left(\frac{g}{1+g}\right)\right)$. Fieldkircher and Zeugner (2009) prefer this type of prior as it retains some of the characteristics of fixed g-prior while it eliminates adverse effects on the posterior results. When $a = 4$ hyper-g prior is equal to uniform prior distribution of $\frac{g}{1+g}$ over the interval *[1, 2]* while if $a = 2, g \rightarrow \infty$. Furthemore, if there is too much noise in the data, PMPs in the hyper-g framework will be distributed more evenly while with little noise present in the data hyper-g prior framework will have the same effect as fixed g-priors with large g and thus the posterior mass will be more concentrated.
Empirical Bayes g (EBL)	$g_\omega = argmax_g p(y\|M_\omega, X, g)$, Empirical Bayes g uses the information from the data and g is formed using maximum likelihood for model M_ω. Although EBL is quite popular among some researchers, it has some major pitfalls as necessary prerequisite is peeking at the data before estimation and asymptotic consistency of BMA can fail in this case.

Source: Author, based on Zeugner, 2011

4.3.2. Model priors

Another prior that has to be formulated before BMA estimation is performed is the one on the model space. For the purpose of this thesis two model priors will be described, the first one being binomial model prior (whose special case uniform model prior will be used in the baseline estimation) and the second one is the binomial-beta prior proposed by Ley and Steel (2009). Binomial model prior is according to Moral Benito (2012) the most common model prior used in BMA. It is inherent in placing a common and fixed inclusion probability θ on each regressor. Thus, the prior model probability of a model of size k can be written as a product of inclusion and exclusion probabilities:

$$p\left(M_j\right) = \theta^{k_j}(1 - \theta)^{k-k_j}$$

(4.12)

If a model prior size *k=1/2* is chosen, the inclusion probability θ is equal to ½ and the prior obtained is the uniform model prior with $p(M_j) = 2^{-K}$. The binomial model priors are often criticized for its distribution being centred near the prior model size (Ley and Steel, 2009). Binomial-beta priors are thus proposed to be used instead whose parameter θ is drawn from Beta-distribution. Moreover, they are less tight around the prior expected model size and thus should better deal with the uncertainty about the true model.

Apart from the random model prior and uniform model priors, so-called dilution model priors exist that are useful when the researchers want to inspect the effect of interaction terms or the existence of possible nonlinearities in the estimation. For the purpose of this thesis, the dilution prior with strong heredity principle will be described since it is later used for the inspection of nonlinear effects between relative poverty measure and financial development. Cuaresma et al. (2012) suggest to use the dilution prior that complies with the strong heredity principle as suggested by Chipman (1996) for the inspection of nonlinear effects in the estimation. This prior assigns zero probability to models where the interaction term is included but its parent variable is not. In addition, the prior probability mass relates to models where the interaction or square term is included together with the linear or interacted term so that one can properly interpret the results. The dilution prior adapts MC^3 sampler to ensure that whenever the square or interaction terms are included in the estimation, the linear or interacted terms are present as well.

4.4. MCMC Sampler

One of the limiting factors in BMA is its computational difficulty when the number of explanatory variables exceeds some level. Zeugner (2011) considers such level to be 25 explanatory variables. In cases, when the researcher has many potentially relevant variables, which exceed such predetermined level, but he or she still wants to include them in BMA estimation (as in our case with poverty), MCMC sampler represents an

efficient and necessary tool to be implemented in the estimation.[13] MCMC sampler incorporates Metropolis-Hastings algorithm (see: Metropolis et al., 1953; Hastings, 1970; Chib and Greenberg, 1995; and Liu, 2008) to walk through the model space in a following way: Assume, we are now at some current model M_i with posterior model probability $P(M_i|D)$, the MCMC sampler then draws a different model M_j which replaces the current model M_i if its marginal likelihood is superior than that of model M_i. If the model M_j gets rejected, new model M_l is suggested and compared with the current model M_i. With increasing number of iterations performed, the number of times the model is kept converges to the distribution of posterior model probabilities $P(M_i|D)$.

Two types of MCMC sampler can be distinguished according to the way they use to draw the candidate models:

- Birth-death sampler (bd) – Birth-death sampler represents standard and the most used type of MCMC sampler in BMA. The birth-death sampler works in a following way: N random variables are chosen, if they already form a part of model M_i, they are dropped from M_j, which is formed from all the N variables except for the ones already included in model M_i.

- Reversible-jump sampler (rev.jump) – Madigan and York (1995) implemented this type of sampler into BMA. There exists 50% probability that the candidate model will be chosen by birth-death sampler whereas in the other case (with 50% probability) covariate is chosen for model M_j at random from the variables that were not included in the model M_i and randomly drops covariate that was already included in model M_i.

As Zeugner (2011) points out the success for a researcher in approximating the MCMC sampler to the actual posterior distribution lies in the number of draws performed by

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[13] Since it would be infeasible to do BMA estimation with for example 60 explanatory variables within a reasonable time frame as it would make 2^{60} possible model combinations which makes more than one quintillion ($\approx 10^{18}$) models to be estimated.

the researcher. When starting the estimation, it is highly probable that the starting model will not be a good one and thus the first draws of models will not probably be the ones with high PMPs. For this purpose, the researcher should omit the first set of iterations ('burn-ins') from the computation of results and then after some time BMA should gradually converge to a set of models with the highest marginal likelihoods. Practically, the researcher can recognize whether he or she succeeded in approximating the true model on the grounds of correlation between analytical PMP and the one obtained from MCMC sampler. It is estimated that the value of such correlation should be at least above 0.9 to signal good approximation. If the correlation is below that benchmark, the number of iterations should be increased.

5.   Results

In this section, the results for BMA estimation are provided. The section is organized in several subsections as two types of main estimations are carried out to test the effect of financial development on poverty reduction. The first one is performed with absolute poverty measures and the second one is carried out with relative poverty measures. In the baseline estimation, the specification of model prior is used in accordance with Fernandez el al. (2001) who use uniform model prior. In contrast with Fernandez et al. (2001) hyper-g prior as a parameter prior is used in the model specification. Moreover, Feldkircher and Zeugner (2012) point out that estimations with hyper-g priors provide more robust estimates and show that BRIC priors as suggested by Fernandez et al. (2001) skew the posterior model probabilities and thus lead to too small model sizes. Moreover, birth-death MC^3 sampler is used to approximate the PMP distribution. The robustness checks are then performed on respective different measures of poverty from these two groups and with different model and parameter specifications. As in these types of regression, the appearance of endogeneity is quite likely which might bias the results, the dataset is adjusted to account for its existence and the results are also presented.[14] It is suggested in literature that nonlinearities may exist in case of income distribution and financial development thus this relationship is also tested.

The following subsections are thus structured as follows. Firstly, the results with banking sector dimension in the period from 1981–2014 are presented for both absolute poverty and relative poverty measures (for the detailed description of the dataset see section 3 Data). Then robustness checks are performed. In total, three types of robustness checks are employed, different model and parameter prior robustness check, alternative poverty measure robustness check (in this type of robustness check the

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[14] The better way for dealing with the endogeneity issue would be to use the instrumental variable method as it would not cause reduction of observations in the dataset. In addition, it is considered more reliable method to account for endogeneity. Unfortunately, no such reliable method for BMA estimation is available for the purpose of this thesis thus the lagged explanatory variables method for solving the presence of endogeneity in the dataset is relied on.

baseline prior specification is used with the data averaged over 1981–2014) and the last robustness check is performed with the dataset adjusted by lagged explanatory method to account for possible endogeneity (the results are again obtained by using the baseline prior specification). Next set of results accounts for the full dimensional characteristics of financial development as the stock market dimension is added into the estimation. The results for endogeneity are also presented and the robustness checks with different parameter and model priors are presented in the appendix. The results for absolute and relative poverty measures are then put together in section 5.3. and discussed. The purpose of the above division is to go from the largest datasets to the smallest ones as the results can lose on their reliability when the number of observations is reduced.

5.1.　　Results for absolute poverty measures

In this subsection, the effect of financial development on poverty headcount as a measure of absolute poverty is considered. The baseline estimation is carried out with poverty headcount per $1.9 a day which is considered to be a measure of extreme poverty. Firstly, the effect of only banking sector proxies accounting for stability (bank Z-score), efficiency (net interest margin), depth (private credit) and access (bank branches) on poverty headcount is estimated on a sample of 85 developed and developing countries. One might argue that by including only banking sector proxies, the full two dimensional measurement of financial development that is available in GFDD is ignored which could hide some interesting interactions in the poverty-finance estimation. Another set of results is thus presented that takes into account also financial markets dimension of the financial development. The estimation is however carried out with only 60 developing and developed countries which might reduce the reliability of the results as 25 countries had to be dropped from the baseline estimation.

Various modifications to the baseline estimation are then introduced in order to get deeper understanding of potential determinants of poverty alleviation and most importantly of the role, the developed financial sector might play in it. Furthermore, the modifications to the baseline estimation are mainly presented in order to check the robustness of the results. Such modifications to the baseline estimation include

different model and parameter prior specifications and also estimations with different measures of absolute poverty. The estimations with different absolute poverty measures are employed in order to inspect possible differences or similarities with the baseline estimation and thus poverty headcount per $3 a day which is considered to be a measure of moderate poverty and poverty gap per $1.9 a day are employed. In addition, as some of the variables might be endogenous, the dataset is modified to account for potential endogeneity and the results therein can also serve as a robustness check.

The figure 5.1 presents scatter plots between the financial indicators and poverty headcount. The banking sector indicators show positive (in terms of helping to reduce it) and strong link with the poverty headcount. The financial market indicators do not pose significant effect on the poverty headcount.
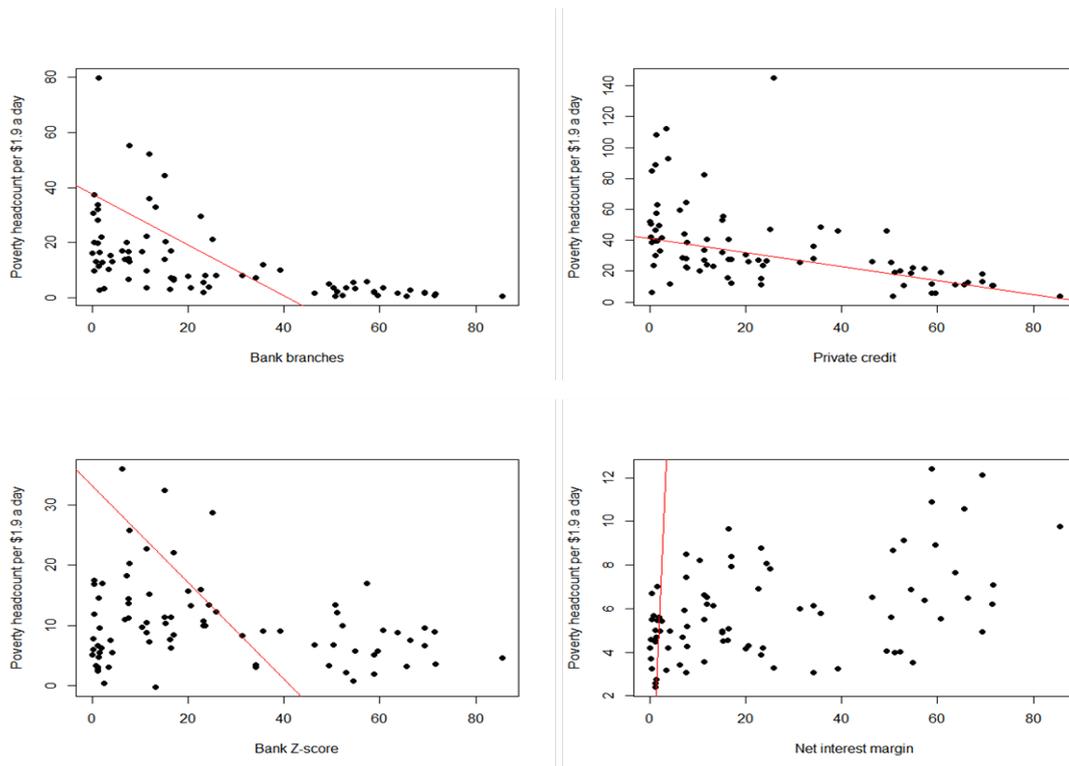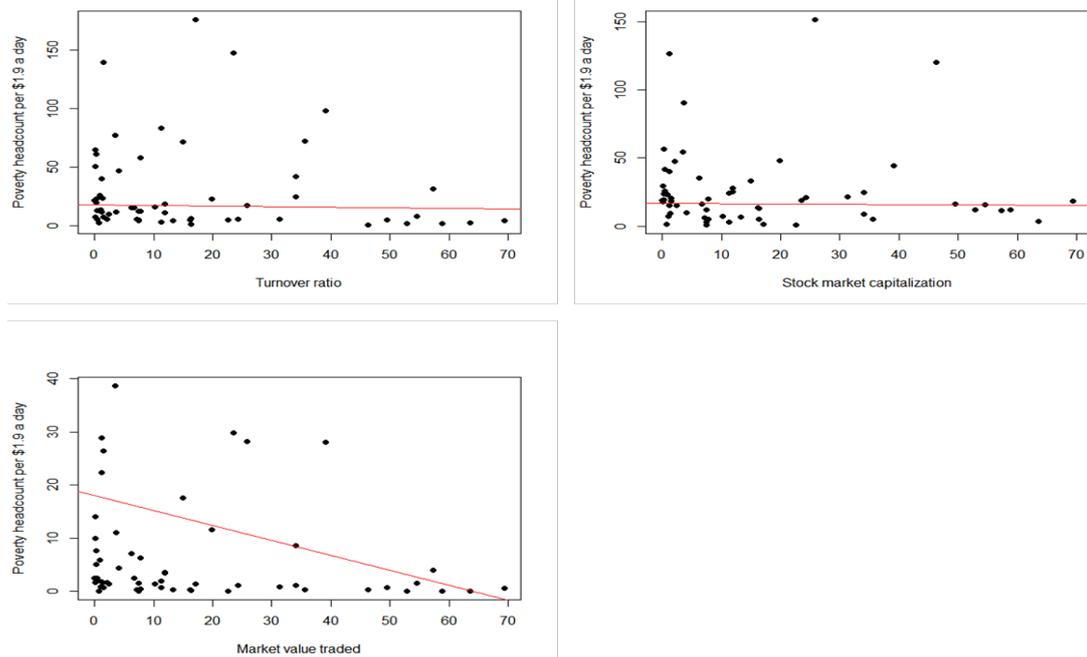
Figure 5.1: Financial indicators and poverty headcount

Source: Author based on Statistical software R

5.1.1. Estimation with banking sector dimension

The estimation summary for poverty headcount per \$1.9 a day is provided in table 5.1. It can be seen that 15 000 000 iterations and 4 000 000 initial burn-ins were specified in the model estimation to ensure that the sampler sufficiently converges to its actual posterior distribution. Moreover, the average number of regressors that are included in the model is 14.82 and the correlation between analytical and sampler PMP is 0.93 which suggests good degree of convergence. The estimation summary also gives further insight into the prior model size, the number of observations, the number of models visited or the size of the whole model space.

Table 5.1: Absolute poverty estimation and banking sector estimation summary

Mean number of regressors	Draws	Burnins
14.82	1.5e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
8421651	6.9e+10	0.93
% visited	**% Topmodels**	**g-Prior**
0.012	1.6	Hyper (a=2.0235)
Number of observations	**Model Prior**	**Shrinkage Stats**
85	Uniform/18	Av=0.9567, Stdev=0.019

Source: Author, based on statistical software R

Table 5.2 offers results for four best models regarding their PMP. For the sake of brevity, the variables that are absent in all of the four models are omitted from the report of the results. It can be seen that the 1st best model with 0.006% model probability includes five following variables: net interest margin, bank Z-score, urban population share, and primary school enrolment rate and population growth. Furthermore, bank Z-score and net interest margin are included in all the top four models.

Table 5.2: 4 best models, absolute poverty estimation

Top 4 model inclusions:	1st model	2nd model	3rd model	4th model
Net interest margin	1	1	1	1
Bank Z-score	1	1	1	1
Urban population share	1	1	1	1
Primary school enrolment	1	1	1	1
Population growth	1	0	1	0
Rule of law	0	0	1	1
EAP	0	1	1	1
SA	0	1	0	0
MENA	0	1	0	0
LAC	0	1	0	1
ECA	0	1	0	1
GDP fraction in manufacturing	0	0	1	1
Political stability	0	0	1	1
Natural resources	0	0	1	1
Developed countries	0	0	1	1
PMP (Exact)	5.996e-05	4.724e-05	4.672e-05	4.048e-05
PMP (MCMC)	5.346e-05	4.940e-05	5.013e-05	3.890e-05

Source: Author, based on Statistical software R

The results for the estimation with banking sector indicators are provided in table 5.3, the variables are sorted according to their PIPs. For better orientation, financial indicators are highlighted. It is found that the financial indicators that are most likely to influence poverty headcount are bank Z-score and net interest margin with 92% and 82% PIP respectively. The other two variables of interest, private credit and bank branches, have 28 % and 19% PIP respectively, with private credit being ranked approximately in the middle on the list of explanatory variables. In addition, all the financial indicators exert negative effect on the poverty headcount, except bank branches indicator that has positive posterior mean implying that greater access to financial services worsens the situation of the poor. Apart from the bank Z-score and net interest margin not much evidence is found that access to finance or its depth represent crucial determinants of poverty alleviation which is quite in contrast with up-

51

to-date theory that considers access to finance and its depth as the main determinants of poverty reduction (Jallilian and Kirckpatrick, 2005; Beck et al., 2007; etc.).[15]

Bank Z-score as a proxy for the stability of the banking sector ranks highest on the list of explanatory variables with PIP of 92% and negative posterior mean which signals that stable banking sector is crucial for poverty alleviation. Moreover, any instability arising out of the banking sector would be particularly detrimental to the poor which is in line with Jeanneney and Kpodar (2005) who suggest that the poor usually do not have the required safeguards to protect themselves against adverse shocks.

Net interest margin as a proxy for efficiency of the banking sector ranked 2nd on the list of explanatory variables with 82% PIP. The posterior mean is positive which is in line with the prior expectation and thus lower difference between borrowing and lending rates of banks should lead to poverty reduction. Moreover, as high interest rates are often considered as poverty penalty, it can be argued that lower discrepancy between the lending and borrowing rates should lead to higher loan affordability for the poor. In general, the increased efficiency of the banking sector can also lead to the reduction of information, monitoring and transaction costs from which the poorer individuals could benefit. The poor might also benefit from more efficient banking sector as it enables them to smooth their consumption, manage their risks, gradually build their asset base, develop their micro enterprises and enhance their income earning assets.

Among the control variables, the variables with highest PIP that could be considered as main determinants of poverty are: EAP dummy, urban population share, primary school enrolment rate and natural resources rents. Urban population share with 81% PIP and negative posterior mean would signify that urbanization helps poverty alleviation. Ravallion (2007) supports this argument by stating that urban areas offer more job opportunities which cause gradual shift from agricultural sector to more

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[15] The researchers that found empirical evidence for depth or access to finance as being crucial for poverty reduction, however, typically include only these proxies into the regression not controlling for other characteristics of the banking sector or even omitting the stock market dimension from the analysis.

remunerating activities by the poor. The significance of natural resource rents in the BMA estimation implies that poverty is high mainly in countries with the greatest natural resource endowments (Ndikumana and Boyce, 2012). Moreover, it is common for oil rents to be collected entirely by the treasury not providing any contribution to the rest of the economy. As the results herein suggest the richness in natural resources in fact worsens the situation of the poor which is in line with the explanation provided above (Ghura et al., 2002). The significance of East Asia and Pacific dummy with negative posterior mean is straightforward as this region experienced rapid economic growth with extreme poverty reduction being faster than in any other region. As evidence shows the decline in poverty levels was remarkably significant in this region as it fell from 80% in 1981 to 4% in 2015 (WB, 2016). One can thus expect financial development to have the most pronounced effect on poverty alleviation in this region.

Table 5.3: Absolute poverty and banking sector

	PIP	Post Mean	Post SD
Bank Z-score	**0.92**	**-0.60697**	**0.286393**
Net interest margin	**0.82**	**1.763492**	**1.136096**
EAP	0.81	-11.6413	8.006866
Urban population share	0.81	-0.24550	0.160799
Primary school	0.77	-0.28361	0.210551
Natural resources	0.76	0.461277	0.350242
ECA	0.64	-9.66939	9.953061
Population growth	0.59	3.012037	3.231034
Secondary school	0.59	-0.11874	0.127996
GDP fraction in manufacturing	0.58	0.309065	0.341228
Developed countries	0.54	-8.28088	10.28659
LAC	0.50	-6.52385	8.823452
MENA	0.50	-7.97509	10.51135
GDP fraction in agriculture	0.44	0.145551	0.218583
GDP growth	0.41	-0.52419	0.846164
Total investment	0.37	0.143967	0.258761
Unemployment	0.36	0.136908	0.255560
Public education share	0.31	0.128470	0.286588
Rule of law	0.30	1.070238	2.657375
Political stability	0.30	0.723816	1.818011
SA	0.29	-1.58947	5.384469
Private credit	**0.28**	**-0.01938**	**0.049573**
Inflation	0.26	-0.01734	0.047197
GDP fraction in industry	0.25	-0.04270	0.163133
Health expenditure	0.24	0.171514	0.620192
Trade openness	0.24	-0.01022	0.035310
Civil rights	0.22	-0.29230	1.289420
Government consumption	0.22	0.018962	0.224188
Public investment	0.20	0.027441	0.216571
Private investment	0.20	0.012111	0.166153
Political rights	0.20	0.034751	0.899523
Bank branches	**0.19**	**0.005953**	**0.056935**
M3/GDP	0.19	0.000568	0.004860
Ethnolinguistic fractionalization	0.19	0.203702	2.717636
Ethnic diversification	0.19	0.362530	2.807792
Arable land	0.18	-0.16345	2.332767

Source: Author, statistical software R

Note: Dummy for Sub-Saharan African countries is used as a reference dummy variable in the estimation with poverty headcount (in order not to end in dummy variable trap). Moreover, hyper-g prior with uniform model prior and bd MCMC sampler is used.

5.1.2. Robustness checks

Different parameter and model priors

In order to assess the robustness of the results from the baseline specification, different structure of model and parameter priors is used. Moreover, the robustness in terms of the choice of MC^3 sampler is also checked by using the 'reversible-jump' sampler. The change in PIPs is examined through 6 model specifications that are displayed in figures 5.2 and 5.3. In figure 5.2, the following specifications of models with uniform model prior are utilized labelled as Model 1 to Model 4: Model 1 and Model 4 are estimated using UIP prior with different MC^3 sampler as birth-death is used in case of Model 1 and reversible-jump is used in case of Model 4, Model 2 represents the baseline model that was estimated in subsection 5.1.1. and Model 3 is specified with the same priors as Model 1 but under reversible-jump sampler. It can be seen that under different specification of the model with reversible-jump sampler, the resulting PIPs change only marginally. In contrast to estimation with hyper-g prior, the resulting PIPs under UIP prior estimation are slightly lower. The results thus signify that the estimations show some sensitivity to the prior selection as the UIP slightly lowers the PIP whereas usage of alternative MC^3 sampler does not alter the PIPs much.
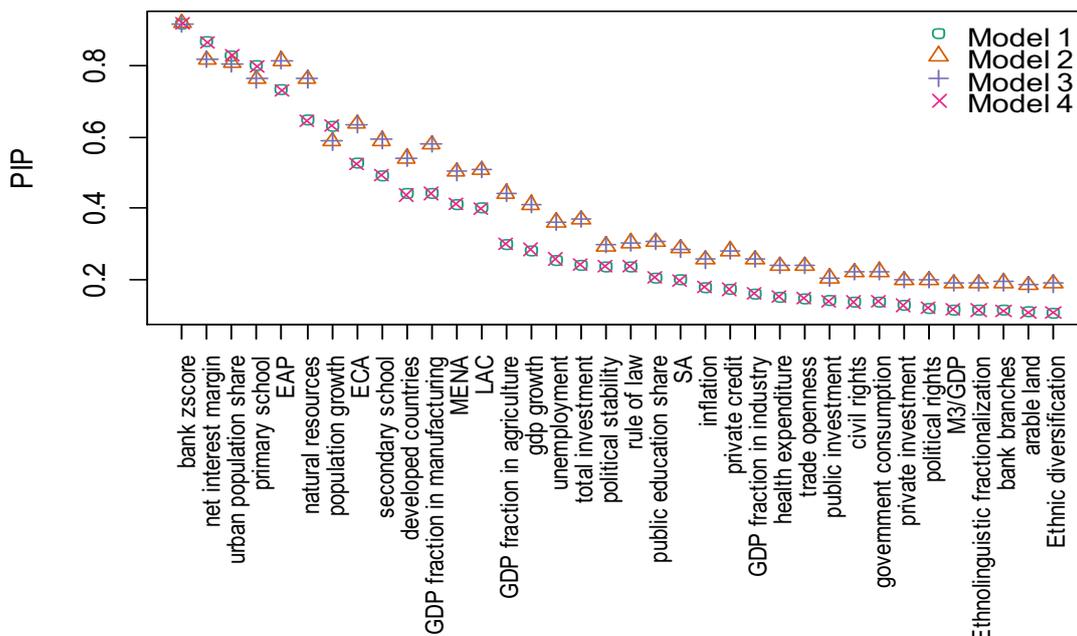
Figure 5.2: Absolute poverty estimation with different parameter prior selection

Ley and Steel (2006) propose to use different prior on posterior model size, random model prior, as it is less sensitive to the selection of prior mean model size than the uniform model prior. It can be seen that the explanatory variables with the highest PIP under baseline estimation retain approximately the same position and magnitude of PIPs under random model prior. However, the PIPs of other variables downgrade significantly (private credit from 25% to 10% and bank branches from 19% to 7%). Moreover, while the posterior model size of Model 1 declines to mean number of 8.4 regressors, the correlation PMP improves to 0.99.
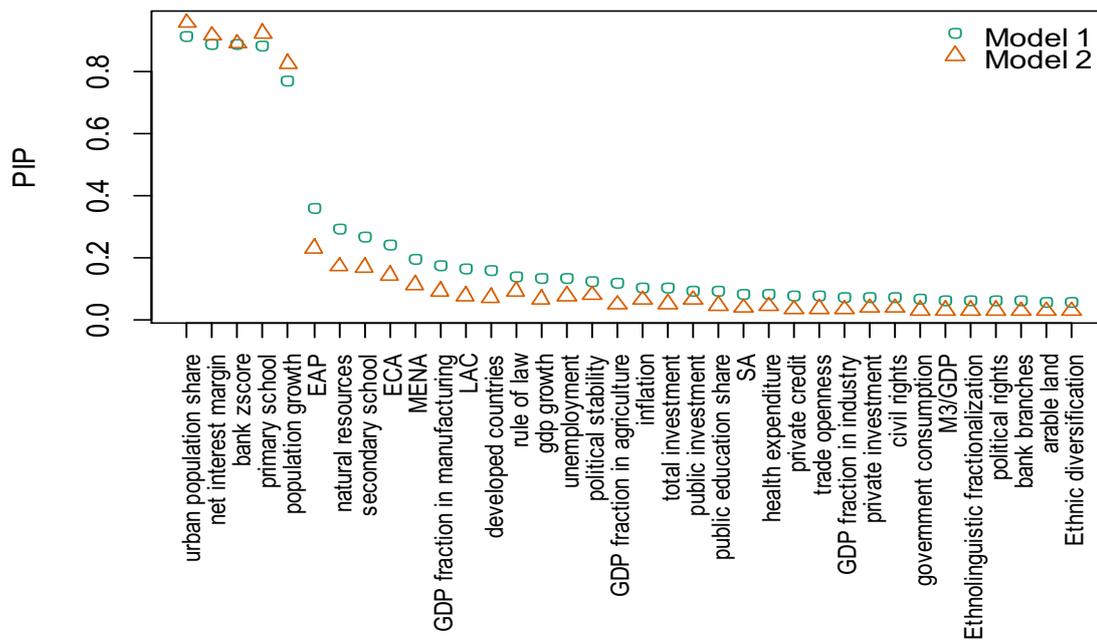
Figure 5.3: Absolute poverty estimation with random model prior

Alternative absolute poverty measures

In addition to different parameter and model prior specifications, alternative measures of absolute poverty were also tried. Perez-Moreno (2011) points out that financial development should contribute more to moderate poverty alleviation when the poor are

already equipped with certain level of income. The effect of banking sector on poverty headcount per $3 a day is thus examined. The results can be found in appendix B, tables B.1 and B.2. Overall, the results are very similar to the ones estimated under the baseline regression however the hypothesis of Perez-Moreno fails to be confirmed as both PIPs of bank Z-score and net interest margin are lower. The relative position of the variables also changed when compared to the baseline estimation. The sign on posterior mean of bank branches variable is now negative implying that greater access to financial services should help the poor. Similar results are also obtained when using poverty gap per $1.9 a day (see appendix B for the results and estimation summary, tables B.3 and B.4).

Endogeneity issues

As some of the explanatory variables might be determined simultaneously with the poverty headcount, the sample is adjusted to alleviate possible concerns about endogeneity that could arise in the estimation. The lagged method is employed to alleviate endogeneity concerns as the dependent variable (poverty headcount) is averaged over 2010–2013 and explanatory variables are taken from year 2005 and earlier and averaged over this period (financial indicators are averaged over period 2000–2005 as their data are richer from 2000 onward and other explanatory variables are averaged over 1981–2005). For better orientation, only the results for financial variables are displayed here, for the full set of results with the estimation summary see appendix B, tables B.5 and B.6. The setback of this method is however reduction of the original sample to 72 countries which could bias the results.

When the endogeneity is accounted for, bank branches indicator remains approximately the same but the sign on the mean changes from positive to negative indicating that greater access to financial services should in fact alleviate poverty. One striking result is that with the adjusted sample private credit gains on importance with PIP increasing from 28% to 64% which is in line with the empirical literature that suggests that depth of financial sector and private credit as its proxy is important for poverty alleviation. Net interest margin's PIP decreases in its magnitude from 82% in the baseline to 65%. Even greater decrease in magnitude of PIP is experienced by bank

Z-score as its PIP declines from initial value of 92% to 52%. Although, the PIPs of the variables declined, they are still ranked in the top half on the list of results. It can be thus concluded that when endogeneity is taken into account, the depth of financial sector, its efficiency and stability seem to matter for poverty alleviation. The results were also examined with different parameter and model priors (see appendix B, figures B.2 and B.3).

Table 5.4: Absolute poverty and banking sector, 2010–2013

	PIP	Post Mean	Post SD
Net interest margin	0.65	1.132408	1.123041
Private credit	0.64	-0.100010	0.101550
Bank Z-score	0.52	-0.226450	0.299220
Bank branches	0.24	-0.002650	0.081013

Source: Author, based on statistical software R

Note: The BMA analysis is run with hyper-g prior, uniform model prior and bd MCMC sampler.

5.1.3. Estimation with stock market and banking sector dimension

Another BMA estimation is carried out in order to take into account the stock market dimension of financial development. Three variables that account for depth and efficiency of stock markets were added into the sample, namely those are: stock market capitalization, stock market turnover ratio and stock market value traded. From the estimation summary that is provided in table 5.5, one can see that the number of observations reduced from 85 countries to 60 countries introducing the risk of decreasing the reliability of the results. The model is estimated with 25 000 000 iterations and 4 000 000 burn-ins to ensure sufficient convergence of the sampler. The correlation PMP is 0.93 which indicates good degree of convergence. The number of mean regressors also increased from 13.8 to 15.2.

Table 5.5: Absolute poverty and banking sector and stock market estimation summary

Mean number of regressors	**Draws**	**Burnins**
15.2	2.5e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
13032596	5.5e+11	0.93
% visited	**% Topmodels**	**g-Prior**
0.0024	0.96	Hyper (a=2.033)
Number of observations	**Model Prior**	**Shrinkage Stats**
60	Uniform/19.5	Av=0.95, Stdev=0.023

Source: Author, based on statistical software R

The results can be seen in table 5.6, the variables are sorted according to their PIPs and the financial indicators are highlighted. It can be seen that after adding additional dimension of financial development in the form of stock markets and after accounting for model uncertainty, the relative position of the financial indicators and their significance changed when compared to the estimation with banking sector indicators. Bank Z-score and bank branches remain approximately the same with 91% and 23% PIP respectively. The posterior mean of bank branches is now negative implying that greater access to finance should help with poverty alleviation. The private credit indicator remains approximately the same with 22% PIP. The inclusion of financial markets indicators of depth and efficiency into BMA yields their PIP around 23% and their position is on the bottom on the list of explanatory variables which confirms the hypothesis by Kpodar and Singh (2011) or Kpodar (2010) that the development of financial institutions is more important for poverty alleviation than the development of stock markets. The striking difference is in the magnitude of net interest margin's PIP which declined quite substantially from 82% to 60% indicating that bank efficiency might not be the primary driver of poverty reduction when the stock market dimension is taken into account. However, it still remains on the top of the list of explanatory variables and one has to bear in mind that the sample examined has been reduced by 25 countries. The results are also robust to different parameter and model specifications (see appendix B, figures B.4 and B.5). Moreover, it can be influenced by the presence of endogeneity, thus the sample is again adjusted for incorporating endogeneity concerns and the results are presented in table 5.7.

Table 5.6: Absolute poverty and banking sector and stock market

	PIP	Post Mean	Post SD
GDP fraction in agriculture	0.97	0.62694	0.229535
Trade openness	0.94	-0.13991	0.062265
Population growth	0.92	6.12581	2.811481
Bank Z-score	**0.91**	**-0.47008**	**0.227310**
Net interest margin	**0.60**	**0.91151**	**1.003346**
Government consumption	0.55	0.39651	0.462605
GDP fraction in manufacturing	0.55	-0.25957	0.306389
Total investment	0.53	0.29264	0.364902
M3/GDP	0.52	0.00827	0.010702
Urban population share	0.51	-0.08160	0.105832
LAC	0.50	-4.44262	6.033721
Political stability	0.50	2.05701	2.728200
ECA	0.49	-3.86772	5.421292
Ethnolinguistic fractionalization	0.48	4.78335	6.615365
Public education share	0.38	0.20336	0.364279
Rule of law	0.33	1.06500	2.325365
Unemployment	0.31	0.07875	0.180842
Primary school enrolment	0.30	0.05606	0.135834
Private investment	0.29	-0.11168	0.327420
MENA	0.29	-2.38743	6.518234
EAP	0.28	-1.23355	3.782887
Secondary school enrolment	0.26	-0.02404	0.088335
Developed countries	0.25	0.28097	3.484188
Public investment	0.25	-0.06952	0.264971
Arable land	0.25	-0.74702	2.965985
Market value traded	**0.23**	**-0.01486**	**0.056247**
SA	0.23	-0.17432	3.555986
Civil rights	0.23	-0.20191	1.125118
Natural resources	0.23	0.03292	0.137227
Bank branches	**0.23**	**-0.00892**	**0.053969**
GDP growth	0.23	0.10920	0.552014
Turnover ratio	**0.22**	**-0.00406**	**0.019151**
GDP fraction in industry	0.22	0.00294	0.111905
Private credit	**0.22**	**0.00197**	**0.028957**
Political rights	0.22	-0.03356	0.812908
Health expenditure	0.22	0.04019	0.516825
Ethnic diversification	0.21	-0.14291	3.078101
Market capitalization	**0.21**	**0.00369**	**0.019130**
Inflation	0.19	-0.00314	0.028729

Source: Author, based on Statistical software R

Note: Dummy for Sub-Saharan African countries is used as a reference dummy variable in the estimation with poverty headcount (in order not to end in the dummy variable trap). The specification is hyper-g prior, uniform model prior and bd MCMC sampler.

Endogeneity issues

The sample is again adjusted to alleviate possible endogeneity concerns in the baseline estimation (the sample is adjusted in the same way as in the section 5.1.2.). The results for financial indicators are displayed in table 5.7, for the full set of results see appendix B, tables B.7 and B.8. It can be seen that when accounting for model uncertainty, stock market dimension of financial development and possible endogeneity, the results suggest that efficiency of both stock markets and banking sector accompanied with the stable banking systems might be crucial determinants for poverty alleviation. The hypothesis that depth might also matter for poverty alleviation is not confirmed as private credit accounts for 29% PIP. The remaining two variables stay almost the same accounting for approximately 26% PIP. The results were also subject to different parameter and model prior specification (see appendix B, figures B.6 and B.7).

Table 5.7: Absolute poverty and banking sector and stock market, 2010–2013

	PIP	Post Mean	Post SD
Net interest margin	0.92	1.797401	0.861373
Bank Z-score	0.68	-0.276770	0.263132
Turnover ratio	0.55	-0.031320	0.043196
Market value traded	0.36	-0.004640	0.085198
Market capitalization	0.33	0.010852	0.027811
Private credit	0.29	-0.01045	0.040964
Bank branches	0.26	-0.00323	0.042398

Source: Author, based on Statistical software

Note: Following specification is used in the estimation: hyper-g prior, uniform model prior and bd MCMC sampler.

5.2. Results for relative poverty measures

In this subsection, the results for the effect of financial development on the income share held by the lowest 20% are presented. Income share held by the lowest 20% is considered to be relative measure of poverty as in this case the poverty line under which one is considered to be poor is set up in line with standards of living inherent in particular country and is different for each country. This type of measure has also close link to income inequality between individuals as it measures the inequality between the proportion of 20% people with lowest income and the rest of the population. In this

case, the analysis is conducted on a sample that includes 91 developed and developing countries.

As with the poverty headcount estimation case, again the effect of both, banking sector and financial markets proxies on income share held by the lowest 20% is estimated. Estimations with different parameter and model specifications are also carried out to check the robustness of the results. As for the different measures of relative poverty, income share held by the lowest 10% is considered and also results for GINI coefficient as the dependent variable are attached since income distribution measures are closely related to income inequality. In addition, the samples are adjusted for endogeneity and the results are again presented. Moreover, Greenwood and Jovanovic (1990) argue that there could exist nonlinear relationship between income distribution and financial development thus nonlinear relationship between finance and income distribution is tested using dilution priors with strong heredity principle as suggested by Cuaresma et al. (2012).

Figure 5.4 presents scatter plots of financial indicators and income share held by lowest 20%. It can be seen that except for bank Z-score, financial indicators and income share held by lowest 20% are not significantly related.
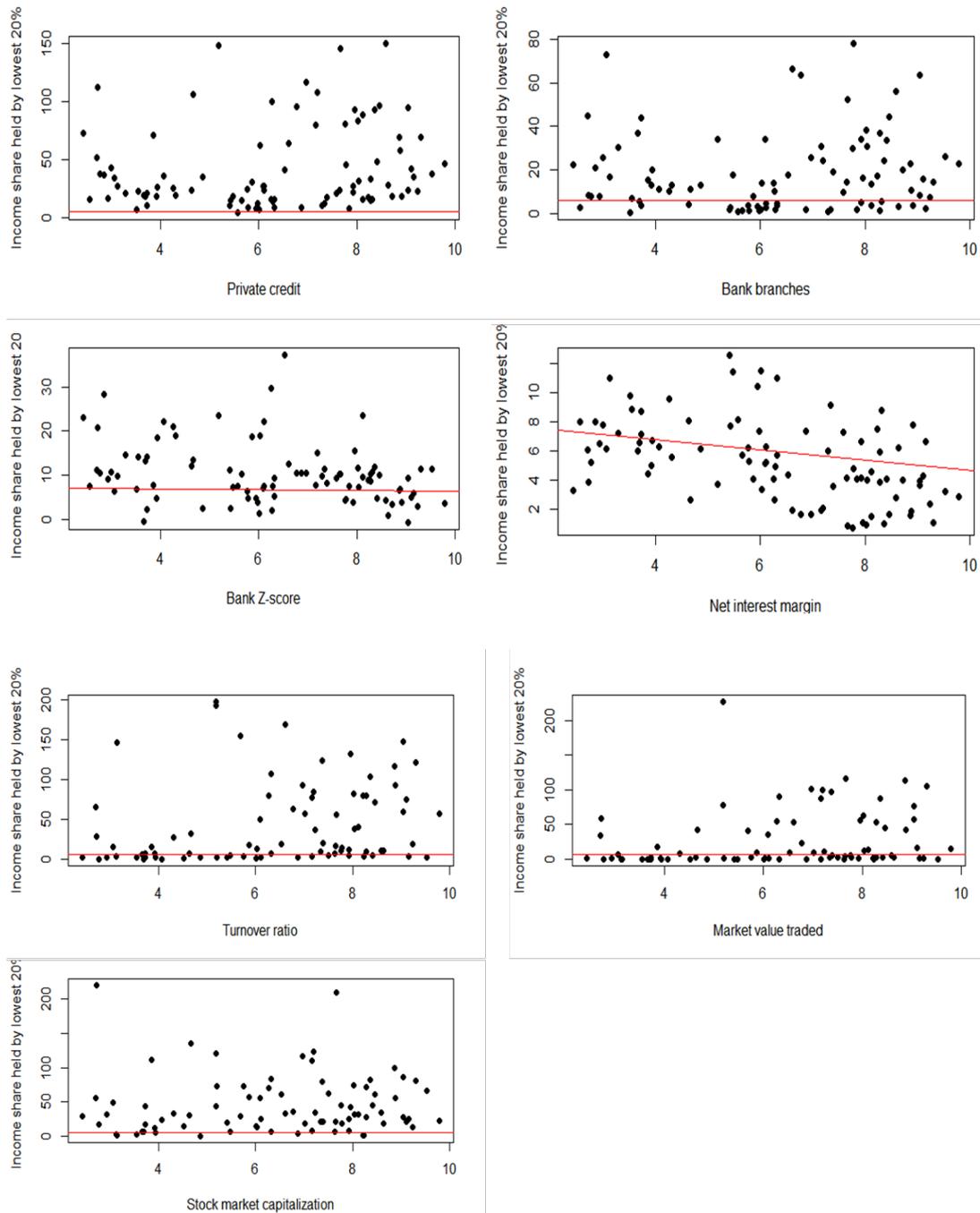
Figure 5.4: Financial indicators and relative poverty
Source: Author, based on Statistical software R

5.2.1. Estimation with banking sector dimension

The estimation summary is provided in table 5.8. The BMA analysis is conducted on 91 developed and developing countries in the baseline estimation. To ensure sufficient

convergence of the sampler 20 000 000 iterations and 4 000 000 burn-ins were specified. The average number of regressors in the model is 16.82 and the correlation PMP is 0.98 which suggests good degree of convergence.

Table 5.8: Relative poverty and banking sector estimation summary

Mean number of regressors	Draws	Burnins
16.82	2e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
9593760	1.4e+11	0.98
% visited	**% Topmodels**	**g-Prior**
0.007	3.3	Hyper (a=2.0220)
Number of observations	**Model Prior**	**Shrinkage Stats**
91	Uniform/18.5	Av=0.9607, Stdev=0.016

Source: Author, based on Statistical software R

The results for four best models regarding their PMP are displayed in table 5.9 where only variables that are included in one of the models are printed. The 1st best model with the posterior model probability 0.014% includes 10 variables among which the net interest margin, bank Z-score and bank branches are present.

Table 5.9: Top 4 model inclusion, relative poverty and banking sector

Top 4 model inclusions:	1st model	2nd model	3rd model	4th model
Bank Z-score	1	0	0	0
Bank branches	1	1	1	0
Net interest margin	0	0	1	1
Health expenditure	1	1	1	1
GDP fraction in agriculture	1	1	1	1
GDP fraction in manufacturing	0	0	1	0
Unemployment	0	0	1	1
Ethnolinguistic fractionalization	1	1	1	1
SA	1	1	1	1
SSA	1	1	1	1
ECA	1	1	1	1
EAP	1	1	1	1
MENA	1	1	1	1
Developed countries	1	1	1	1
Political stability	1	1	0	0
Primary school	1	1	0	0
Total investment	1	1	0	0
PMP (Exact)	0.000139	0.000128	0.00013	0.000124
PMP (MCMC)	0.000139	0.000127	0.00012	0.000114

Source: Author, based on Statistical software R

The estimation results are listed in table 5.10 with the variables ranked according to their PIP. The results provide evidence for significant effect of financial development on income distribution of the lowest 20% as all banking sector indicators rank in the top half of the list of explanatory variables and their PIP is above 40%. However, all

the banking sector indicators have opposite signs than one would have expected except for net interest margin. The negative posterior means indicate that the initial development of financial sector helps mainly the rich as suggested by Greenwood and Jovanovic (1990). The possibility of nonlinear relationship between relative poverty and financial development thus exists as pointed out by some researchers. Among the banking sector indicators, bank branches is the one that has the most pronounced effect on income distribution with 73% PIP accompanied by net interest margin with 66% PIP which means that the depth of financial sector and its efficiency seem to be the most important determinants for the relative poverty measure. Regarding other variables LAC dummy, ethnolinguistic fractionalization, GDP fraction in agriculture, SSA dummy and primary school enrolment rate rank highest.

Table 5.10: Relative poverty and banking sector

	PIP	Post Mean	Post SD
ECA	1.00	4.103406	0.554024
Developed countries	1.00	4.773010	0.544643
SA	1.00	3.025995	0.974334
MENA	0.93	2.387800	1.100598
GDP fraction in agriculture	0.92	0.049479	0.024274
Ethnolinguistic fractionalization	0.83	-0.974710	0.623535
EAP	0.79	1.607791	1.134055
Health expenditure	0.75	-0.138110	0.105792
Bank branches	**0.73**	**-0.013420**	**0.010591**
Net interest margin	**0.66**	**-0.102370**	**0.093933**
Primary school enrolment	0.65	-0.020270	0.019300
Unemployment	0.55	-0.021660	0.025434
Bank Z-score	**0.54**	**-0.018360**	**0.021576**
Total investment	0.54	-0.027680	0.033409
GDP fraction in manufacturing	0.53	0.023128	0.028030
SSA	0.51	0.592203	0.783596
Private credit	**0.44**	**-0.004230**	**0.006304**
Political stability	0.39	0.140857	0.242415
Population growth	0.31	0.082909	0.183861
Secondary school enrolment	0.28	0.002485	0.006953
Life expectancy	0.25	0.007806	0.024511
GDP growth	0.24	0.018048	0.058982
Rule of law	0.22	0.022502	0.157523
Political rights	0.21	-0.019260	0.084701
Ethnic diversification	0.21	-0.007820	0.289572
Inflation	0.21	-0.000790	0.003304
Private investment	0.20	-0.000820	0.013295
Arable land	0.20	-0.026480	0.152611
Public investment	0.19	-0.004040	0.016435
Civil rights	0.19	0.001456	0.096852
Urban population share	0.19	-0.000860	0.004976
Government consumption	0.19	0.000308	0.015527
Trade openness	0.19	-0.000260	0.002025
Natural resources	0.19	0.001109	0.012779
M3/GDP	0.19	-7.50E-05	0.000433
GDP fraction in industry	0.18	-0.001080	0.011955
Public education share	0.17	-0.001420	0.013008

Source: Author, based on Statistical software R

Note: Dummy for Latin American countries is used as a reference dummy variable in the estimation with income distribution (in order not to end in a dummy variable trap). The estimation specification is as follows: hyper-g prior combined with uniform model prior and bd MCMC sampler is used.

5.2.2. Robustness checks

Different parameter and model priors

Again the baseline estimation is modified in terms of different model and parameter structure to check whether the results are (in) sensitive to different prior specification. As with the poverty headcount case, 6 model structures are considered that are

displayed in figure 5.5 and figure 5.6. In figure 5.5, uniform model prior is utilized for all 4 model specifications and the models are altered in terms of prior structure and MC^3 sampler, following model combinations estimated are: Model 1 which represents the baseline estimation from subsection 5.2.1., Model 2 that uses the same model priors as Model 1 but estimates the model by using reversible-jump sampler, Models 3 and 4 are estimated using UIP prior and differ in the MC^3 sampler specification as Model 2 utilizes birth-death sampler and Model 3 is specified using reversible-jump sampler. The different model specifications yield the same results as in the poverty headcount case thus it can be concluded that the estimation is robust to different selection of MC^3 sampler and parameter priors. The results show that the model might be slightly sensitive to the choice of parameter priors as under UIP prior the resulting PIPs are slightly lower.

In figure 5.6, two models are estimated using random model prior as suggested by Ley and Steel (2006). It can be seen that random model prior yields coefficients slightly lower than uniform model prior which might be due to the smaller model size.
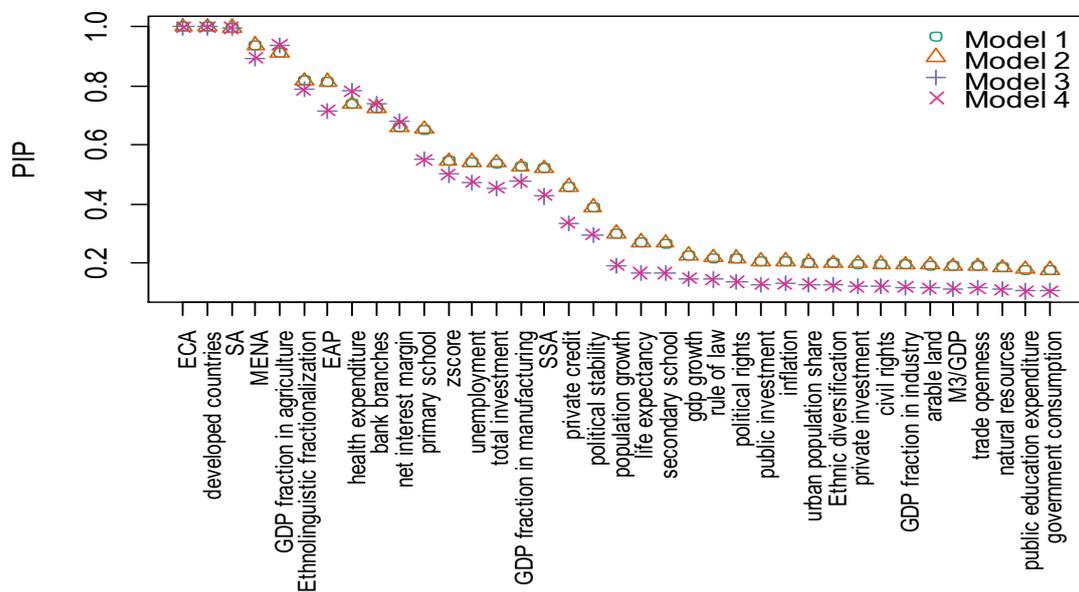
Figure 5.5: Relative poverty and banking sector with different parameter prior selection

Note: Model 1: g=hyper, MCMC=bd, model prior=uniform, Model 2: g=hyper, MCMC=rev.jump, model prior= uniform, Model 3: g=UIP, MCMC=bd, model prior=uniform 4: g=UIP, MCMC=rev.jump, model prior =uniform
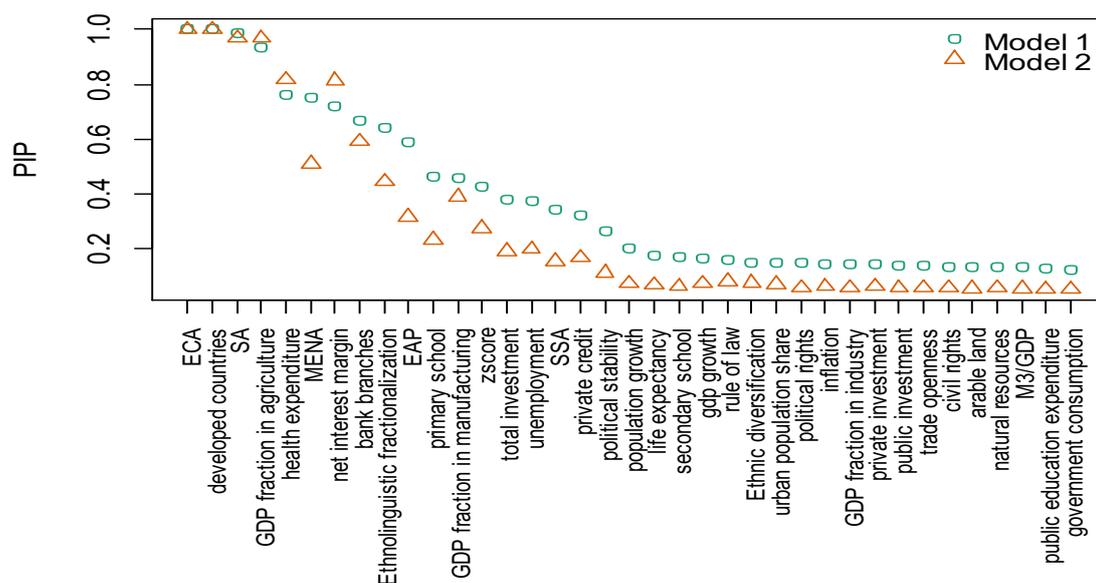
Figure 5.6: Relative poverty and banking sector with random model prior

Note: Model 1: g=hyper, model prior=random, MCMC=bd, Model 2: g=UIP, model prior=random, MCMC=bd

Alternative measures of relative poverty

In addition to different prior and parameter specifications, alternatives to dependent variables in the form of income share held by lowest 10% and GINI coefficient were tried. The results can be seen in appendix B, tables B.9 – B.12. The estimation with income share held by lowest 10% confirms the suspicion that there could be nonlinear relationship between the development of financial sector and income distribution. Greenwood and Jovanovic (1990) suggest that at initial stages of development, some inequality persists between the individuals and thus only the rich benefit from the development of financial sector and only at later stages also the poor begin to benefit. Moreover, the relative position of the variables changed when compared to the baseline estimation as bank branches gained on importance (the PIP of bank branches and net interest margin remained approximately the same with bank branches being slightly lower and accounting for 65% and net interest margin having 62% PIP). The results

for GINI coefficient[16] as a measure of income inequality suggest that access to finance and its depth are major determinants of income inequality. However, the posterior mean sign of the variables remains positive which suggests that only the rich benefit from financial sector which widens the gap between the poor and the rich. Moreover, it confirms the prior suspicion that there could be nonlinear relationship between financial development and poverty due to the presence of inequality at the initial stage of development.

Endogeneity issues

In order to check the robustness of the results to possible endogeneity concerns, the sample is adjusted to account for its presence in a following manner: the income share held by the lowest 20% is averaged over 2012–2013 and the explanatory variables are taken from year 2007 and earlier and averaged over this period. The results for banking sector indicators are presented in table 5.11, for the full set of results see appendix B, tables B.13 and B.14. It can be seen that after controlling for endogeneity, the relevance of all the financial variables, except for bank branches, declined substantially. Bank branches indicator seems to be robust determinant of income distribution as its PIP remained approximately the same (74% from initial 73% PIP). The posterior mean also stayed negative indicating that greater access to financial services deepens the gap between people that hold the bottom 20% of the income distribution and the rest. Other indicator's PIP declined quite substantially in comparison to the baseline estimation, all the PIPs being now around 30%. Moreover, the results were examined with different model and parameter prior specification (see appendix B, figures B.8 and B.9).

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[16] Gini coefficient is measured as the ratio of the area between the Lorenz curve, which illustrates the share of population against the income share received, to the area below diagonal. It can gain values between 0 (perfect equality) and 100 (perfect inequality).

Table 5.11: Relative poverty and banking sector, 2012–2013

	PIP	Post Mean	Post SD
Bank branches	0.74	-0.013680	0.011112
Bank Z-score	0.33	-0.006810	0.015863
Net interest margin	0.32	-0.020900	0.056045
Private credit	0.29	0.000733	0.002987

Source: Author, based on statistical software R

Note: The baseline specification of parameter and model priors is used (hyper-g prior combined with uniform model prior and bd MCMC sampler is used).

5.2.3. Estimation with stock market and banking sector dimension

As in the case of poverty headcount estimation, the financial markets dimension is added into the sample to inspect the full effect of financial development on income distribution. By adding three additional variables that account for depth (stock market capitalization, stock market value traded) and for the efficiency (stock market turnover ratio) of the financial markets, the baseline sample is reduced to 81 developed and developing countries in the period from 1981 to 2014. The estimation summary is provided in table 5.12. The estimated average number of regressors is 19.89 and the correlation PMP is 0.87.

Table 5.12: Relative poverty and banking sector and stock market estimation summary

Mean number of regressors	Draws	Burnins
19.89	2e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
10694522	1.1e+12	0.87
% visited	**% Topmodels**	**g-Prior**
0.001	0.8	Hyper (a=2.0247)
Number of observations	**Model Prior**	**Shrinkage Stats**
81	Uniform/20	Av=0.9437, Stdev=0.022

Source: Author, based on statistical software R

The results of BMA estimation with the stock markets indicators can be seen in table 5.13. It can be seen that when the effect of stock markets is accounted for, private credit remains significant while bank branches and bank Z-score variables lose on significance. Surprisingly, the depth of stock markets and its efficiency seem to matter. Although, some of the financial indicators turned out to have quite significant effect, their posterior mean size is negative indicating that the depth of both stock markets and banking sector decreases the income distribution of the lowest 20% meaning that financial development increases inequality between this share of population and the

rest. The robustness checks with different parameter and model priors are also run (see appendix B, figures B.10 and B.11). The income inequality estimation is also run with the stock market dimension and the results are provided in appendix B, tables B.15 and B.16.

Table 5.13: Relative poverty and banking sector and stock market

	PIP	Post Mean	Post SD
Developed countries	1.00	4.220872	0.583521
ECA	1.00	3.485765	0.611059
SA	1.00	5.082664	0.947675
EAP	1.00	3.041473	0.813236
MENA	0.99	3.292733	0.999310
SSA	0.93	2.199233	1.043911
Unemployment	0.93	-0.085870	0.039397
Primary school enrolment	0.90	-0.036950	0.019161
Urban population share	0.72	0.016174	0.013454
GDP fraction in manufacturing	0.69	0.038278	0.033891
GDP fraction in agriculture	0.62	0.028206	0.029239
Political stability	0.60	0.331382	0.356680
Market value traded	**0.59**	**-0.005850**	**0.006415**
Population growth	0.56	-0.239790	0.282705
Private credit	**0.53**	**-0.003200**	**0.003963**
Health expenditure	0.49	-0.080320	0.110241
Civil rights	0.46	-0.124330	0.201095
GDP fraction in industry	0.44	-0.016730	0.025930
Life expectancy	0.42	0.023277	0.037693
Turnover ratio	**0.42**	**-0.002060**	**0.003351**
Ethnolinguistic fractionalization	0.41	-0.364060	0.617766
M3/GDP	0.38	-0.000490	0.000885
Net interest margin	**0.37**	**0.040852**	**0.076671**
Bank Z-score	**0.33**	**-0.007260**	**0.014950**
Secondary school enrolment	0.32	0.004564	0.010519
Political rights	0.29	-0.003490	0.120972
Public education share	0.29	-0.011280	0.028217
Ethnic diversification	0.29	-0.136980	0.370245
Government consumption	0.28	0.010532	0.028647
Inflation	0.26	-0.001330	0.004130
Rule of law	0.25	-0.045030	0.200135
Trade openness	0.25	0.000452	0.002908
Private investment	0.24	-0.004290	0.017987
Public investment	0.24	-0.004300	0.021666
Natural resources	0.24	-0.001780	0.019269
Bank branches	**0.24**	**-0.000990**	**0.004156**
Market capitalization	**0.23**	**-0.000160**	**0.002202**
Total investment	0.23	-0.002890	0.018063
Arable land	0.23	0.039639	0.170876
GDP growth	0.22	-0.004850	0.052498

Source: Author, based on statistical software R

Note: LAC dummy used as reference dummy variable (in order not to end in a dummy variable trap). Hyper-g prior with uniform model prior and bd MCMC sampler is used.

Endogeneity issues

The sample is again adjusted for possible endogeneity. The results for financial indicators are displayed in table 5.14, for the full set of results see appendix B, tables B.17 and B.18. It can be seen that all the posterior means are negative indicating that finance worsens the position of the poor relative to the rest of population. The stability of the banking sector, bank branches and private credit seem to exert at least some effect, however the strong effect of access to finance as measured by bank branches under the estimation with banking sector dimension fails to be confirmed when stock market dimension is included. Moreover, all the PIPs are under 50% indicating that there might be more important indicators of relative poverty. The results are again tried for different parameter and model specification, see appendix B, figures B.12 and B.13.

Table 5.14: Relative poverty and banking sector and stock market dimension, 2012–2013

	PIP	Post Mean	Post SD
Bank Z-score	0.48	-0.016250	0.024978
Bank branches	0.44	-0.005170	0.008469
Private credit	0.41	-0.002010	0.004102
Market value traded	0.34	-0.001710	0.004457
Net interest margin	0.32	0.022410	0.088779
Turnover ratio	0.30	0.000719	0.002887
Market capitalization	0.26	-0.000150	0.002103

Source: Author, based on Statistical software R

Note: The specification of the model is hyper-g prior, uniform model prior and bd MCMC sampler.

Nonlinear relation between income distribution and financial development

As the majority of resulting coefficients on the posterior mean are negative under all estimations performed, nonlinear relationship between finance and income distribution could exist as suggested by Greenwood and Jovanovic (1990) and tested by many researchers (Perez-Moreno, 2011). BMA estimation is thus performed with the inclusion of square terms of the respective financial indicators. For this purpose dilution prior satisfying the strong heredity principle as suggested by Cuaresma et al. (2012) is used in the model specifications. The results for financial indicators can be seen in table 5.15, for the full results see appendix B, table B.19. It can be seen that the signs on the posterior means of the variables with square terms are now mostly positive indicating that greater financial development is good for the poor. The PIPs of the

square terms are however very low as their values are below 20%. The nonlinear relationship between finance and income distribution is thus not confirmed.

Table 5.15: Nonlinearities between relative poverty and financial indicators

	PIP	Post Mean	Post SD
Private credit	0.60	-0.00506	0.007291
Market value traded	0.57	-0.00529	0.007267
Turnover ratio	0.51	-0.00088	0.005513
Net interest margin	0.41	0.048078	0.110865
Bank Z-score	0.40	-0.01098	0.025217
Bank branches	0.32	-0.00393	0.012413
Private credit sq.	0.17	6.53E-06	2.39E-05
Turnover ratio sq.	0.17	-9.5E-06	3.00E-05
Market value traded sq.	0.12	3.25E-07	1.83E-05
Bank branches sq.	0.11	3.26E-05	0.00013
Market capitalization sq.	0.10	-4.40E-06	1.98E-05
Bank Z-score sq.	0.10	9.80E-05	0.00066
Net interest margin sq.	0.09	-0.00046	0.005839

Source: Author, based on Statistical software R

Note: Hyper-g prior with uniform model prior and bd MCMC sampler is used on the baseline sample with 81 countries in the period from 1981 to 2014.

5.3.   Discussion of the overall results

To sum up, two types of analysis for inspecting the finance-poverty nexus were conducted. The first one was run using the absolute poverty measures where poverty headcount per $1.9 a day was used as the dependent variable in the baseline estimation and the second one was employed with income share of the lowest 20% as a relative poverty measure in the baseline estimation. The analysis was conducted on different samples of developed and developing countries as firstly only depth, access, efficiency and stability of banking sector was taken into account, excluding the stock market dimension and subsequently efficiency and depth of stock markets was included.

The results for the baseline estimation with absolute poverty measure and banking sector dimension indicate that the ability of financial intermediaries (the banks) to channel resources more efficiently as measured by net interest margin together with greater stability of the banking sector as measured by bank Z-score contribute to lower poverty levels. This result was also confirmed by several robustness checks with different parameter and model priors and also with different measures of absolute

73

poverty. The robustness check performed on a sample with lagged explanatory variables also provides some useful insights as the financial indicators remain in the top half on the list of explanatory variables, however their PIPs declined when compared to the baseline estimation (striking difference is between the PIPs of the bank Z-score as it declined from 92% in the baseline to 52%). The inclusion of stock markets dimension into the estimation also confirms the assumption that stability and efficiency of the banking sector might play important role in poverty alleviation as the PIP of net interest margin is 60% and bank Z-score is 91%. The result is also confirmed with lagged explanatory variables but strikingly the PIP of net interest margin rose to 92% while the PIP of bank Z-score declined quite substantially to 68%. The inclusion of financial markets dimension into the estimation with lagged explanatory variables also suggests that efficiency of stock markets as measured by market turnover ratio might have some effect on poverty reduction (55% PIP). One striking result when the stock market dimension is included is however the rise in the PIP of M3/GDP (52% - 95%) which was used to test whether the McKinnon conduit effect holds. McKinnon conduit effect implies that even if the financial institutions do no provide credit to the poor, they might still offer profitable means to save and provide easier access to deposits (Beck et al., 2007). Although, the PIP of M3/GDP is significant, its posterior mean turned out to be positive which could indicate that only the rich benefit from the McKinnon conduit effect. The positive effect of McKinnon conduit effect on absolute poverty alleviation is thus not confirmed.

The results for the absolute poverty measure are quite surprising since the empirical and theoretical literature suggest that access to finance and its depth should be the primary drivers of the poverty alleviation. However, the empirical studies usually include only financial proxies for depth and access and ignore other characteristics of financial sector such as its stability, efficiency or stock markets dimension. The findings herein thus suggest that when the commonly used measures of financial development (private credit and stock market capitalization) are complemented with newly developed financial indicators that account for wider characteristics of financial sector, the traditional measures of financial development used in the literature are not robustly related to poverty reduction. It can be thus concluded that the measurement of

financial development is crucial for determining the finance-poverty relationship and that the quality of finance matters with the quantity being irrelevant for the poverty alleviation.

Moreover, Bourguignon (2004) points out that the reduction in absolute poverty levels can be attributable to the 'growth effect' (as measured by the growth in average income) and 'distribution effect' (as measured by the relative poverty). Several authors investigate these effects in poverty alleviation such as Jalilian and Kirckpatrick (2005), Beck et al. (2007) or Dollar and Kraay (2002). Moreover, they suggest that the reduction in absolute poverty is mainly driven by the growth effect which outperforms the distribution effect. It is thus argued that the results should be somewhere in between the results for growth-finance nexus and income distribution-finance nexus with the possible prevalence of the growth determinants as suggested above. Recent study conducted by Hasan et al. (2016) on growth-finance nexus suggests that efficiency of the banking sector as measured by net interest margin is crucial for economic growth.[17] The results enclosed herein which indicate that the efficiency of the banking sector is important determinant of absolute poverty alleviation thus go hand in hand with the results suggested by Hasan et al. (2016). The results also suggest that stability of the banking sector might play important role in the poverty alleviation which is not supported by either the findings of Hasan et al. (2016) nor the findings for relative poverty measure presented in this thesis as the PIP of the bank Z-score is on average around 40% with negative posterior mean suggesting that financial development in fact deepens the gap between 20% people with the lowest income and the rest of the population. In addition, overall results for relative poverty suggest that financial development might increase poverty in relative terms as majority of the financial indicators have negative posterior means.

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[17] They conduct BMA analysis with financial proxies for both stock markets and financial institutions dimension that account for several characteristics of financial development such as depth, efficiency, stability and access. Their results bring new evidence to the literature as it was previously suggested that financial depth (quantity of finance) matters for economic growth.

To sum up the major findings of the empirical analysis are:

- The quality of finance (stability and efficiency of the banking sector) seems to be the major driver of poverty alleviation even when controlling for the real per capita GDP growth. Moreover, the direct effect of financial development seems to outperform the indirect effect of financial development since the PIP of economic growth is on average only around 30% PIP in the absolute poverty estimation.

- When controlling for the real GDP per capita growth, finance seems to widen the gap between the rich and the poor as the results for relative poverty suggest that only the rich benefit from the stability and efficiency of the banking sector and have access to it. When the stock market dimension is included the primary drivers of the differences between income distributions seem to be the depth of both stock markets and financial institutions. The results are further strengthened by the estimation with income inequality which confirms that financial development widens the gap between the rich and the poor.

- It is found that financial development alleviates poverty, more specifically the results suggest that the efficiency of banking sector is important for reduction of absolute poverty which corresponds to the results of Hasan et al. (2016) who suggest net interest margin to be crucial for economic growth. The growth effect thus seems to be the major component in poverty alleviation. In addition, stability of the banking sector seems to have substantial effect on poverty alleviation, too.

- The findings by Beck et al. (2007), who argue that financial development exerts a disproportionately positive influence on the poor, are not confirmed.

- The traditional measures of financial development such as its depth should be complemented by more proxies to better capture the whole characteristics of the financial development and the possible effects of finance on poverty

♦ Conclusion

Although, nowadays poverty rates experience decreasing trend, the number of extremely poor in the world remains unacceptably high. It is thus still desirable to undertake a thorough research on the ways how to combat poverty as it can bring benefits to the overall safety in the society, lead to improved standards of living and promote more inclusive economic growth. One of the ways suggested to eliminate poverty is through financial development. This thesis thus investigates the links between financial development and poverty alleviation.

For the purpose of this thesis, two measures of poverty are used, the relative one represented by income share held by the lowest 20% and the absolute one represented by poverty headcount per $1.9 a day. The traditional measures of depth of the banking sector and stock markets used in the literature are complemented with financial indicators from newly developed GFDD by WB that should better capture the complex nature of financial development as apart from the depth of financial development, they also account for its stability, efficiency and access to financial services. Moreover, additional 33 variables encompassing regional, economic or political characteristics were employed as control variables. In these types of regression, the model uncertainty is quite high since usually many potential determinants of poverty exist which could lead to misspecified or inconsistent models with omitted variables. The solution to this is to use BMA which represents an efficient tool to deal with model uncertainty as it estimates all possible model combinations and then takes averages of the estimated coefficients according to their model fits. Regarding the limited data availability, firstly only the estimation with the banking sector proxies is run on a sample of 85 and 91 countries for poverty headcount and income share respectively. Subsequently, the stock market dimension is added to better reflect the whole effect of financial development, which however leads to a reduction in the sample to 81 countries in the latter case and 60 countries in the former case. Various robustness checks are run using different parameter and model prior specification and alternative measures of poverty. As the dependent variable might be determined simultaneously with the explanatory

variables, lagged explanatory variables are used to control for possible endogeneity which also serves as another robustness check of the results.

The results for poverty headcount $1.9 a day imply that quality of both banking sector and financial markets might matter for the poverty alleviation. More specifically, it seems that the more efficient the financial intermediation is, as measured by net interest margin with PIP in the range of 60% to 92% across all the model specifications, the more the poor benefit from financial development. Lower interest margins might also imply better loan affordability for the poor as high interest rates usually serve as a penalty for poverty. The assumption that the poor might be mainly affected by any instability arising out of the financial system has been also confirmed since the effect of bank Z-score as a proxy for the banking sector stability is quite substantial across all model specifications (PIP from 52% to 92%). The results for poverty headcount when the model uncertainty is accounted for are quite surprising since it has been always suggested in the literature that mainly access to finance and its depth matter. The results for the income share held by lowest 20% complemented with the regression on income inequality suggest that financial development increases inequality between the poor and the rich and thus the assumption of Beck et al. (2007) that finance disproportionately helps the poor fails to be confirmed. In the baseline specification with the banking sector dimension only, it seems that greater efficiency of financial intermediation can be beneficial for the poor, however this result fails to be confirmed when the endogeneity and stock markets dimension are taken into account.

Bourguignon (2004) argues that poverty reduction in a given country at a specific point of time can be attributed to the growth rate of the mean income of the population and the change in distribution in the income. It is thus argued that the results should be somewhere in between the results on growth-finance nexus and income distribution-finance nexus. The significance of net interest margin corresponds to the result of Hasan et al. (2016) who investigate the growth-finance nexus and argue that efficiency of the banking sector is the primary driver of economic growth. The results on the income distribution and income inequality suggest that finance deepens the inequality between the poor and the rich. Moreover, when the stock market dimension is included, it seems that there are more important determinants of income distribution and income

inequality. The results on poverty headcount thus confirm the assumption of Jalilian and Kirckpatrick (2005) or Beck et al. (2007) that the growth effect might be more pronounced than the distribution effect. Moreover, the absolute poverty alleviation seems to be affected more by the direct channel of financial development rather than by the indirect one that works through increased economic growth.

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Appendix A: List of countries used in the estimation

1) **Income share held by the lowest 20% list of countries:**

**EAP countries**(5): _Cambodia, Laos, Malaysia, Philippines, Thailand,_ _**MENA countries**_(2): _Morocco, Tunisia,_ _**SA**_(5): _Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka,_ _**LAC countries**_(18): _Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Chile, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela,_ _**SSA countries**_(25): _Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Cote d'Ivoire, Ethiopia, Ghana, Guinea-Bissau, Kenya, Lesotho, Guinea, Madagascar, Mali, Malawi, Mauritania, Mozambique, Niger, Rwanda, Senegal, South Africa, Swaziland, Tanzania, Uganda, Zambia,_ _**ECA countries**_(13): _Albania, Armenia, Belarus, Bulgaria, Georgia, Kazakhstan, Moldova, Poland, Romania, Russian Federation, Serbia, Tajikistan, Ukraine,_ _**Developed countries**_(23): _Australia, Austria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Slovak Republic, Sweden, Switzerland, United Kingdom, United States_

2) **Poverty headcount per $1.9 a day list of countries:**

**EAP countries** (10): _Papua New Guinea, Cambodia, Indonesia, Laos, Malaysia, Mongolia, Philippines, Thailand, Tonga, Vanuatu,_ _**MENA countries**_ (4): _Djibouti, Morocco, Tunisia, West Bank and Gaza,_ _**SA countries**_ (5): _Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka,_ _**LAC countries**_ (15): _Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Chile, Mexico, Panama, Paraguay, Peru, Venezuela, Nicaragua,_ _**SSA countries**_ (26): _Benin, Botswana, Burkina Faso, Congo, Cote d'Ivoire, Ethiopia, Guinea, Chad, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mali, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia,_ _**ECA countries**_ (16): _Albania, Armenia, Bosnia and Hercegovina, Bulgaria, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Poland, Russian Federation, Serbia, Tajikistan, Turkey, Ukraine,_ _**Developed countries**_ (7): _Czech Republic, Croatia, Slovenia, Slovakia, Trinidad and Tobago, Estonia, Hungary_

Appendix B: Additional Tables and Figures

The figures are created by author and based on Statistical software R.

Figure B.1: Correlation matrix

Table B.1: Absolute poverty (poverty headcount $3) and banking sector estimation summary

Mean number of regressors	Draws	Burnins
13.3	2e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
10421175	6.9e+10	0.98
% visited	**% Topmodels**	**g-Prior**
0.015	2.3	Hyper (a=2.0235)
Number of observations	**Model Prior**	**Shrinkage Stats**
85	Uniform/18	Av=0.9659, Stdev=0.016

Table B.2: Absolute poverty (headcount $3) and banking sector

	PIP	Post Mean	Post SD
Urban population share	0.83	-0.31536	0.192717
Population growth	0.83	6.516883	3.992772
Bank Z-score	**0.81**	**-0.54607**	**0.356273**
Primary school enrolment	0.77	-0.33183	0.237033
GDP fraction in agriculture	0.67	0.365142	0.332764
Net interest margin	**0.63**	**1.33653**	**1.308479**
Unemployment	0.54	0.349005	0.411041
GDP growth	0.51	-0.92855	1.179069
Secondary school enrolment	0.49	-0.10783	0.141119
MENA	0.46	-8.24793	11.73497
EAP	0.41	-4.54404	7.26888
Developed countries	0.41	-6.74109	11.23964
LAC	0.41	-5.6788	9.397441
SA	0.41	4.924048	7.889982
ECA	0.39	-5.70446	9.780852
GDP fraction in manufacturing	0.37	0.173904	0.300779
Trade openness	0.32	-0.02783	0.057318
Public education share	0.28	0.144083	0.342965
Private credit	**0.26**	**-0.02296**	**0.05847**
Government consumption	0.25	-0.10016	0.314604
Natural resources	0.24	0.072947	0.200498
Total investment	0.24	0.081068	0.223331
GDP fraction in industry	0.24	0.044749	0.168893
Ethnolinguistic fractionalization	0.23	1.555827	4.444441
Health expenditure	0.21	-0.16501	0.677841
Political stability	0.20	0.22929	1.539986
Bank branches	**0.20**	**-0.01992**	**0.078767**
Arable land	0.20	-0.81054	3.206728
Private investment	0.19	0.033085	0.197494
Rule of law	0.19	0.124361	1.999622
Inflation	0.19	-0.01091	0.044255
M3/GDP	0.19	0.00113	0.006004
Political rights	0.17	0.051649	0.857305
Civil rights	0.17	0.006913	1.12653
Ethnic diversification	0.17	0.232903	3.163433
Public investment	0.17	0.022563	0.221804

Table B.3: Absolute poverty (poverty gap) and banking sector estimation summary

Mean number of regressors	**Draws**	**Burnins**
15.63	1.5e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
8713888	6.9e+10	0.96
% visited	**% Topmodels**	**g-Prior**
0.025	2.1	Hyper (a=2.0235)
Number of observations	**Model Prior**	**Shrinkage Stats**
85	Uniform/18	Av=0.9432, Stdev=0.025

Table B.4: Absolute poverty (poverty gap) and banking sector

	PIP	Post Mean	Post SD
Urban population share	0.84	-0.315360	0.192717
Population growth	0.83	6.516883	3.992772
Bank Z-score	**0.81**	**-0.546070**	**0.356273**
Primary school enrolment	0.77	-0.331830	0.237033
GDP fraction in agriculture	0.67	0.365142	0.332764
Net interest margin	**0.63**	**1.336530**	**1.308479**
Unemployment	0.55	0.349005	0.411041
GDP growth	0.54	-0.928550	1.179069
Secondary school enrolment	0.49	-0.107830	0.141119
MENA	0.46	-8.247930	11.73497
EAP	0.41	-4.544040	7.268880
Developed countries	0.41	-6.741090	11.23964
LAC	0.41	-5.678800	9.397441
SA	0.41	4.924048	7.889982
ECA	0.39	-5.704460	9.780852
GDP fraction in manufacturing	0.37	0.173904	0.300779
Trade openness	0.32	-0.027830	0.057318
Public education share	0.28	0.144083	0.342965
Private credit	**0.26**	**-0.022960**	**0.058470**
Government consumption	0.25	-0.100160	0.314604
Natural resources	0.24	0.072947	0.200498
Total investment	0.24	0.081068	0.223331
GDP fraction in industry	0.24	0.044749	0.168893
Ethnolinguistic fractionalization	0.23	1.555827	4.444441
Health expenditure	0.21	-0.165010	0.677841
Political stability	0.20	0.229290	1.539986
Bank branches	**0.20**	**-0.019920**	**0.078767**
Arable land	0.20	-0.810540	3.206728
Private investment	0.19	0.033085	0.197494
Rule of law	0.19	0.124361	1.999622
Inflation	0.19	-0.010910	0.044255
M3/GDP	0.19	0.001130	0.006004
Political rights	0.17	0.051649	0.857305
Civil rights	0.17	0.006913	1.126530
Ethnic diversification	0.17	0.232903	3.163433
Public investment	0.17	0.022563	0.221804

Table B.5: Absolute poverty and banking sector, 2010–2013 estimation summary

Mean number of regressors	Draws	Burnins
15.9	3e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
12875198	6.9e+10	0.80
% visited	**% Topmodels**	**g-Prior**
0.019	0.44	Hyper (a=2.0278)
Number of observations	**Model Prior**	**Shrinkage Stats**
72	Uniform/18	Av=0.9112, Stdev=0.04

Table B.6: Absolute poverty and banking sector, 2010–2013

	PIP	Post Mean	Post SD
ECA	0.90	-19.263	11.23194
EAP	0.89	-18.8276	10.28063
SA	0.83	-17.5724	11.52006
LAC	0.72	-12.6044	11.09802
Urban population share	0.71	-0.23238	0.203401
Ethnolinguistic fractionalization	0.69	10.54923	9.806888
Developed countries	0.68	-12.6598	12.40354
Net interest margin	**0.65**	**1.132408**	**1.123041**
Private credit	**0.64**	**-0.10001**	**0.10155**
Bank Z-score	**0.52**	**-0.22645**	**0.29922**
MENA	0.51	-9.51699	13.69889
M3/GDP	0.48	0.006845	0.009779
Political stability	0.48	2.035728	2.996857
Public investment	0.41	0.243742	0.441026
Trade openness	0.38	-0.03015	0.063058
GDP fraction in industry	0.37	-0.10331	0.221009
Primary school enrolment	0.37	-0.06964	0.155534
Natural resources	0.36	0.112046	0.237071
Government consumption	0.35	-0.13066	0.286894
Secondary school enrolment	0.35	-0.03579	0.085103
Inflation	0.34	-0.02571	0.05744
Ethnic diversification	0.33	-2.65342	6.8549
Population growth	0.33	-0.49849	2.321839
Unemployment	0.33	0.065009	0.216472
Total investment	0.32	0.083575	0.251319
GDP fraction in manufacturing	0.29	0.06351	0.195286
GDP fraction in agriculture	0.29	0.034913	0.152633
Private investment	0.29	-0.06315	0.204697
Rule of law	0.28	0.460565	2.49284
Health expenditure	0.27	-0.18978	0.767022
GDP growth	0.27	-0.13331	0.52724
Public education share	0.27	0.037069	0.193689
Civil rights	0.26	0.170455	1.379428
Political rights	0.26	-0.0479	1.033221
Arable land	0.26	-0.57276	3.574081
Bank branches	**0.24**	**-0.00265**	**0.081013**
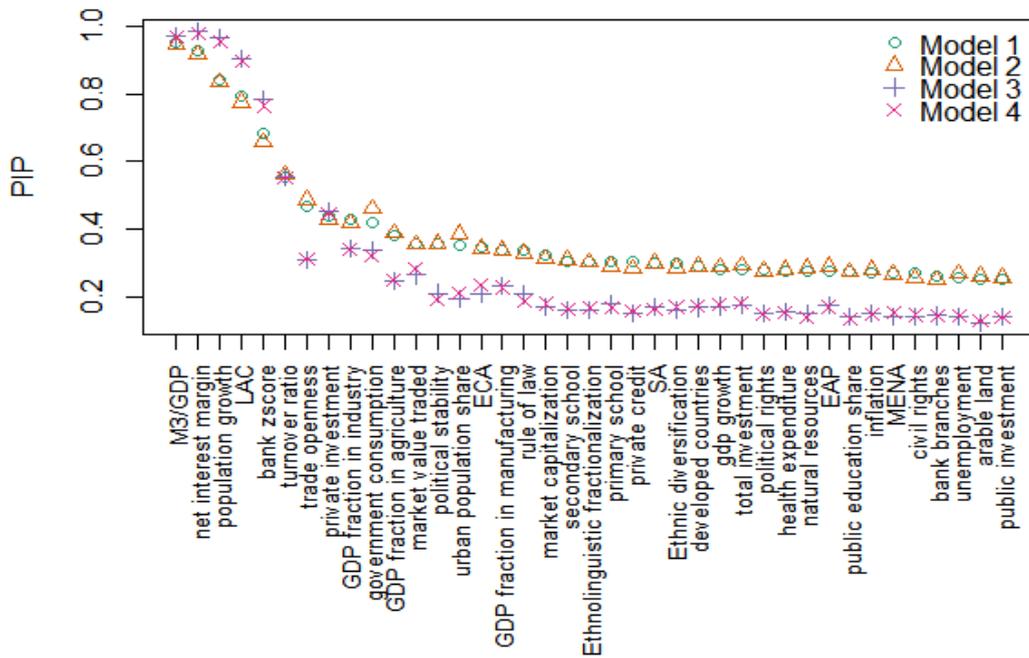
Figure B.2: Absolute poverty and banking sector, 2010–2013

Notes: Model 1: hyper-g prior, uniform model prior, bd MCMC sampler, Model 2: hyper-g prior, uniform model prior, rev.jump MCMC sampler, Model 3: UIP prior, uniform model prior, bd MCMC sampler, Model 4: UIP prior, uniform model prior, rev.jump MCMC sampler
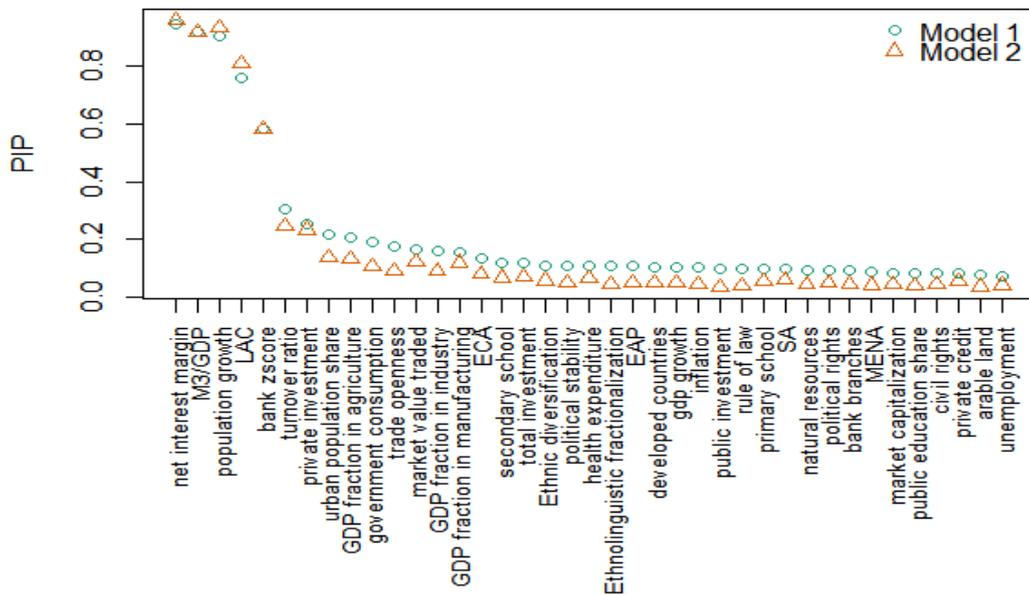
Figure B.3: Absolute poverty and banking sector, 2010–2013

Notes: Model 1: hyper-g prior, random model prior, bd MCMC sampler, Model 2: UIP prior, random model prior, rev.jump MCMC sampler
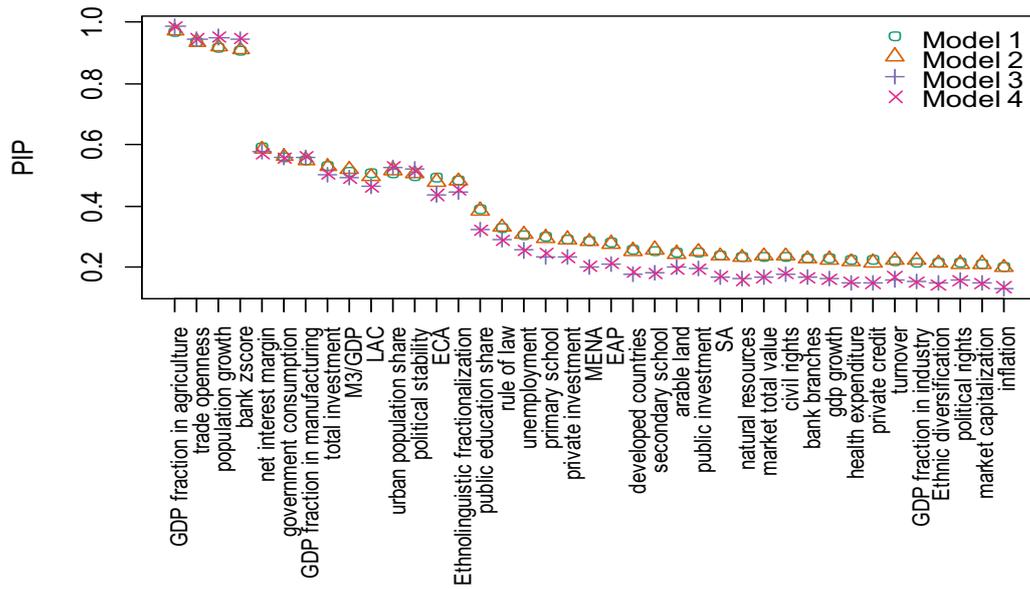
Figure B.4: Absolute poverty and banking sector and stock market estimation with different parameter prior selection

Note: Model 1: g=hyper, model prior=uniform, MCMC=bd, Model 2: g=hyper, model prior=uniform, MCMC=rev.jump, Model 3: g=UIP, model prior=uniform, MCMC=bd, Model 4: g=UIP, model prior=uniform, MCMC=rev.jump
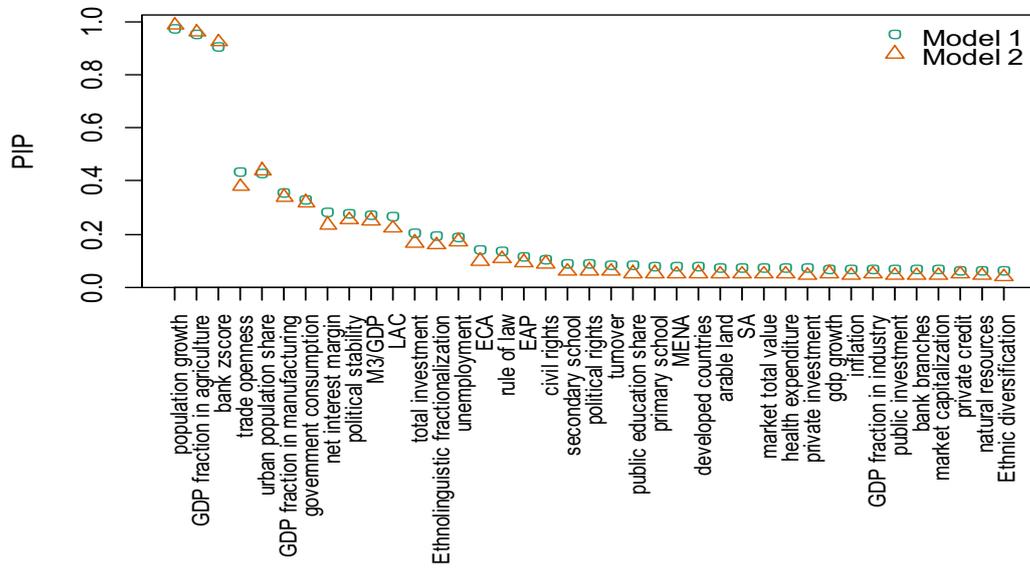
Figure B.5: Absolute poverty and banking sector and stock market estimation with random model prior

Note: Model 1: g=hyper, model prior=random, MCMC=bd, Model 2: g=UIP, model prior=random, MCMC=rev.jump

Table B.7: Absolute poverty and banking sector and stock market estimation summary, 2010–2013

Mean number of regressors	**Draws**	**Burnins**
15.29	2.5e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
1571660	5.5e+11	0.89
% visited	**% Topmodels**	**g-Prior**
0.0029	0.49	Hyper (a=2.034)
Number of observations	**Model Prior**	**Shrinkage Stats**
53	Uniform/19.5	Av=0.8986, Stdev=0.052

Table B.8: Absolute poverty and banking sector and stock market, 2010−2013

	PIP	Post Mean	Post SD
M3/GDP	0.95	0.020867	0.00931
Net interest margin	**0.92**	**1.797401**	**0.861373**
Population growth	0.84	4.930154	3.086973
LAC	0.79	-8.17973	5.955863
Bank Z-score	**0.68**	**-0.27677**	**0.263132**
Turnover ratio	**0.55**	**-0.03132**	**0.043196**
Trade openness	0.47	-0.03793	0.057554
Private investment	0.44	-0.19847	0.331872
Government consumption	0.44	0.220401	0.375303
GDP fraction in industry	0.42	-0.11989	0.213661
GDP fraction in agriculture	0.39	0.091593	0.184927
Urban population share	0.37	-0.04212	0.101024
Market value traded	**0.36**	**-0.00464**	**0.085198**
Political stability	0.35	0.789669	2.01037
ECA	0.35	-1.46553	3.889794
GDP fraction in manufacturing	0.34	-0.1008	0.242619
Rule of law	0.34	-0.34855	1.087656
Market capitalization	**0.33**	**0.010852**	**0.027811**
Secondary school enrolment	0.32	-0.01691	0.090935
Primary school enrolment	0.31	0.030809	0.106614
Ethnolinguistic fractionalization	0.30	0.381019	2.566882
EAP	0.30	-0.0224	0.779147
SA	0.30	0.000473	0.991129
Total investment	0.29	-0.04633	0.258815
GDP growth	0.29	-0.15453	0.507967
Private credit	**0.29**	**-0.01045**	**0.040964**
Ethnic diversification	0.29	0.324794	1.820592
Developed countries	0.29	0.68836	3.21322
Health expenditure	0.29	-0.02074	0.759991
Inflation	0.29	0.011971	0.04789
Natural resources	0.28	0.039198	0.185913
Public education share	0.28	0.041259	0.235332
Civil rights	0.27	0.071515	1.240037
Political rights	0.27	-0.13348	0.942277
MENA	0.27	-1.04681	5.857835
Unemployment	0.27	0.007637	0.151757
Public investment	0.26	0.03677	0.206528
Arable land	0.26	-0.28545	2.584149
Bank branches	**0.26**	**-0.00323**	**0.042398**
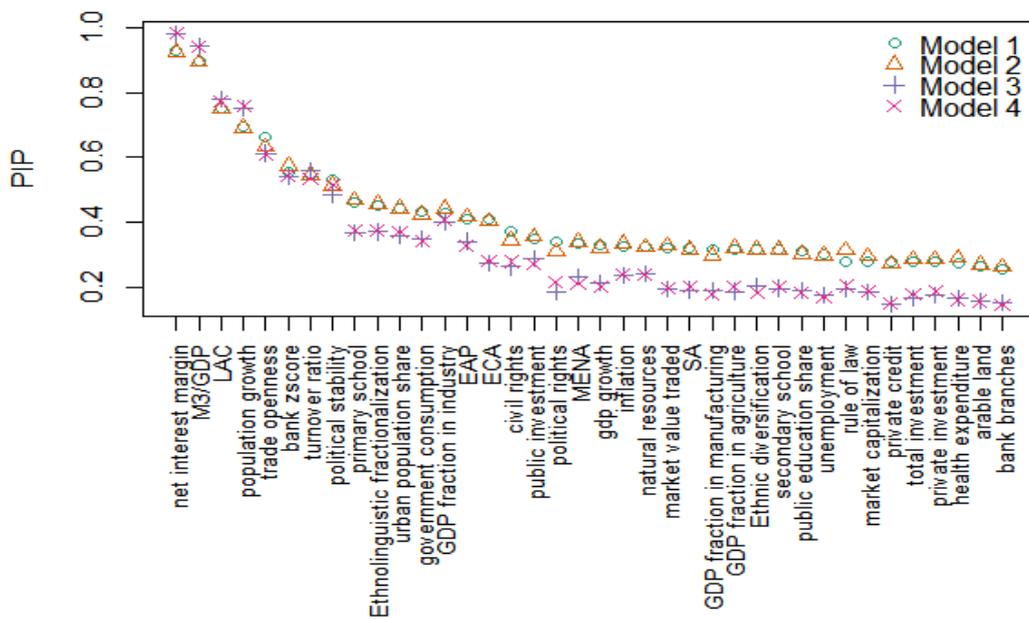
Figure B.6: Absolute poverty and banking sector and stock market dimension, 2010–2013

Note: Model 1: hyper-g prior, uniform model prior, bd MCMC sampler, Model 2: hyper-g prior, uniform model prior, rev.jump MCMC sampler, Model 3: UIP prior, uniform model prior, bd MCMC sampler, Model 4: UIP prior, uniform model prior, rev.jump MCMC sampler
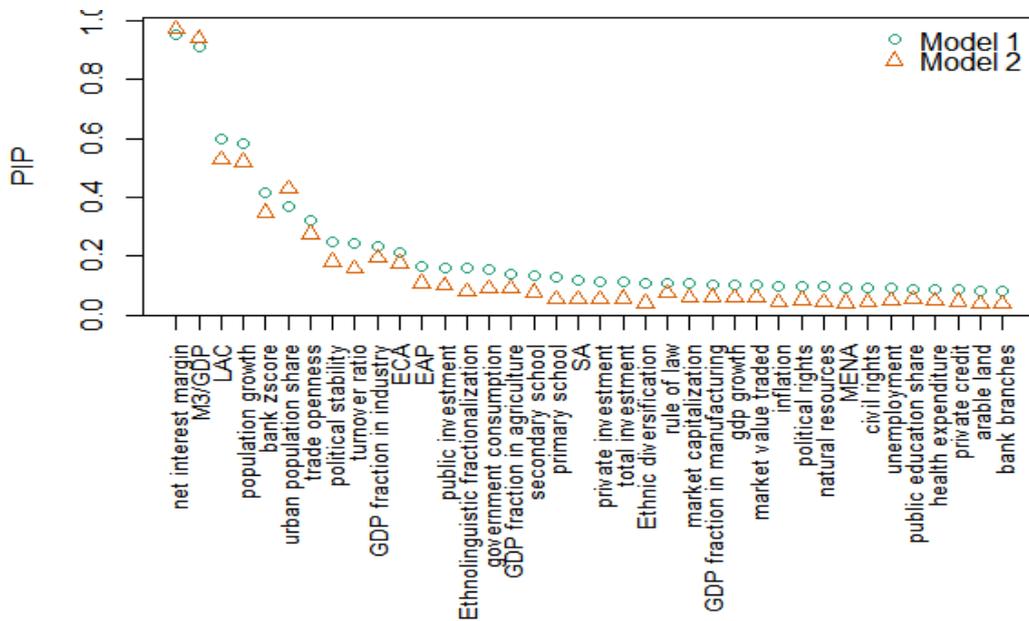
Figure B.7: Absolute poverty and banking sector and stock market, 2010–2013

Note: Model 1: hyper-g prior, random model prior, bd MCMC sampler, Model 2: UIP prior, random model prior, rev.jump MCMC sampler

Table B.9: Relative poverty (income share held by lowest 10%) and banking sector estimation summary

Mean number of regressors	Draws	Burnins
15.83	2e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
15540701	1.4e+11	0.97
% visited	**% Topmodels**	**g-Prior**
0.0078	1.6	Hyper (a=2.0219)
Number of observations	**Model Prior**	**Shrinkage Stats**
91	Uniform/18.5	Av=0.9563, Stdev=0.017

Table B.10: Relative poverty (income share held by lowest 10%) and banking sector

	PIP	Post Mean	Post SD
LAC	1.00	-1.607920	0.455847
Ethnolinguistic fractionalization	0.89	-0.553350	0.300211
GDP fraction in agriculture	0.85	0.019418	0.011738
SSA	0.82	-0.889550	0.572709
Health expenditure	0.67	-0.054300	0.049719
Bank branches	**0.65**	**-0.005270**	**0.004965**
Primary school enrolment	0.65	-0.010210	0.009914
Net interest margin	**0.62**	**-0.040290**	**0.040865**
Unemployment	0.61	-0.012540	0.012814
EAP	0.60	-0.383170	0.420506
GDP fraction in manufacturing	0.57	0.012629	0.014098
Bank Z-score	**0.57**	**-0.009320**	**0.010565**
Total investment	0.52	-0.012210	0.015367
Developed countries	0.51	0.370004	0.507954
Private credit	**0.44**	**-0.001990**	**0.002960**
ECA	0.43	0.285563	0.472318
Secondary school enrolment	0.43	0.002997	0.004740
Political stability	0.41	0.069742	0.115526
SA	0.38	0.150823	0.337157
Life expectancy	0.33	0.007245	0.015040
Private investment	0.28	-0.003820	0.009454
GDP growth	0.27	0.012447	0.032934
Population growth	0.26	0.023250	0.071355
Inflation	0.25	-0.000660	0.001914
Public investment	0.25	-0.003330	0.009570
Political rights	0.24	-0.011080	0.042904
Ethnic diversification	0.23	0.039732	0.163377
Public education share	0.22	-0.002160	0.007802
GDP fraction in industry	0.22	-0.001090	0.006625
Rule of law	0.22	-0.007960	0.075815
Civil rights	0.22	-0.001030	0.049642
Urban population share	0.21	-0.000420	0.002547
Government consumption	0.21	-0.001840	0.008579
M3/GDP	0.21	-5.00E-05	0.000227
Arable land	0.20	-0.000805	0.071559
Trade openness	0.20	-1.10E-05	0.000995
Natural resources	0.20	-0.000680	0.006424

Table B.11: GINI and banking sector estimation summary

Mean number of regressors	Draws	Burnins
15.09	2e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
9612688	1.4e+11	0.97
% visited	**% Topmodels**	**g-Prior**
0.007	3.1	Hyper (a=2.0219)
Number of observations	**Model Prior**	**Shrinkage Stats**
91	Uniform/18.5	Av=0.969, Stdev=0.014

Table B.12: GINI and banking sector

	PIP	Post Mean	Post SD
LAC	1.00	16.18029	3.675437
Private credit	**0.97**	**0.077858**	**0.026887**
Primary school enrolment	0.94	0.177696	0.077982
Life expectancy	0.92	-0.434640	0.205589
SSA	0.84	7.503678	4.666347
Developed countries	0.79	-5.754340	4.308427
Unemployment	0.78	0.182024	0.128563
Ethnolinguistic fractionalization	0.62	2.650140	2.632020
Total investment	0.60	0.144558	0.150829
GDP fraction in agriculture	0.60	-0.092510	0.096803
ECA	0.49	-2.551110	3.683152
Private investment	0.43	0.082498	0.121569
Secondary school enrolment	0.43	-0.027980	0.042021
Political stability	0.43	-0.771700	1.195106
Bank branches	**0.40**	**0.022125**	**0.034883**
EAP	0.38	1.550047	2.752117
Net interest margin	**0.33**	**0.144335**	**0.277014**
Natural resources	0.30	-0.044740	0.095528
GDP fraction in manufacturing	0.28	-0.033230	0.078868
Bank Z-score	**0.26**	**0.021843**	**0.054226**
Rule of law	0.26	0.340312	0.959584
SA	0.25	-0.499560	2.060959
GDP fraction in industry	0.23	0.017315	0.065366
Public investment	0.21	0.023363	0.077307
Ethnic diversification	0.21	0.256487	1.276512
Health expenditure	0.19	0.035638	0.188911
Political rights	0.19	0.052170	0.305293
Urban population share	0.19	-0.004260	0.022444
Government consumption	0.18	0.015762	0.073606
Public education share	0.18	0.012758	0.062380
Population growth	0.18	-0.056920	0.455692
GDP growth	0.18	0.022001	0.205474
Civil rights	0.18	0.022383	0.364549
Trade openness	0.17	-0.000110	0.007882
M3/GDP	0.17	0.000127	0.001747
Inflation	0.16	-0.001300	0.011405
Arable land	0.16	-0.014240	0.553694

Table B.13: Relative poverty and banking sector estimation summary, 2012–2013

Mean number of regressors	Draws	Burnins
17.04	2.5e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
13890372	1.4e+11	0.93
% visited	**% Topmodels**	**g-Prior**
0.01	1.1	Hyper (a=2.0274)
Number of observations	**Model Prior**	**Shrinkage Stats**
73	Uniform/18.5	Av=0.9204, Stdev=0.035

Table B.14: Relative poverty and banking sector, 2012–2013

	PIP	Post Mean	Post SD
Developed countries	1.00	3.682205	0.649449
ECA	1.00	3.248606	0.65154
SA	0.99	3.176112	1.040263
GDP fraction in agriculture	0.99	0.089464	0.029756
GDP fraction in manufacturing	0.92	0.079322	0.038352
EAP	0.91	1.891775	0.98224
Political stability	0.80	0.513279	0.36431
Bank branches	**0.74**	**-0.01368**	**0.011112**
Health expenditure	0.71	-0.14988	0.129532
Urban population share	0.47	0.009593	0.014231
SSA	0.46	0.664679	1.091685
Unemployment	0.46	-0.02116	0.032058
Ethnolinguistic fractionalization	0.42	-0.52124	0.927544
Life expectancy	0.40	0.021386	0.03988
Total investment	0.39	-0.0163	0.031247
MENA	0.39	0.559693	1.014078
Ethnic diversification	0.37	0.38668	0.797143
Primary school enrolment	0.36	-0.0072	0.015138
Civil rights	0.34	-0.12061	0.297855
Political rights	0.34	0.095745	0.236148
Bank Z-score	**0.33**	**-0.00681**	**0.015863**
Net interest margin	**0.32**	**-0.0209**	**0.056045**
Arable land	0.29	0.089567	0.256258
Private credit	**0.29**	**0.000733**	**0.002987**
Private investment	0.28	0.008141	0.024707
GDP fraction in industry	0.28	-0.00474	0.018112
Rule of law	0.27	0.001646	0.245815
Trade openness	0.27	-0.0006	0.003758
Inflation	0.27	0.001417	0.004622
Natural resources	0.26	0.0026	0.020816
M3/GDP	0.26	-0.00011	0.00053
Public investment	0.25	-0.00433	0.024331
Public education share	0.25	-0.00389	0.01749
Secondary school enrolment	0.25	0.000923	0.006098
Population growth	0.24	0.016707	0.165348
GDP growth	0.24	-0.00579	0.042828
Government consumption	0.24	0.002914	0.020438
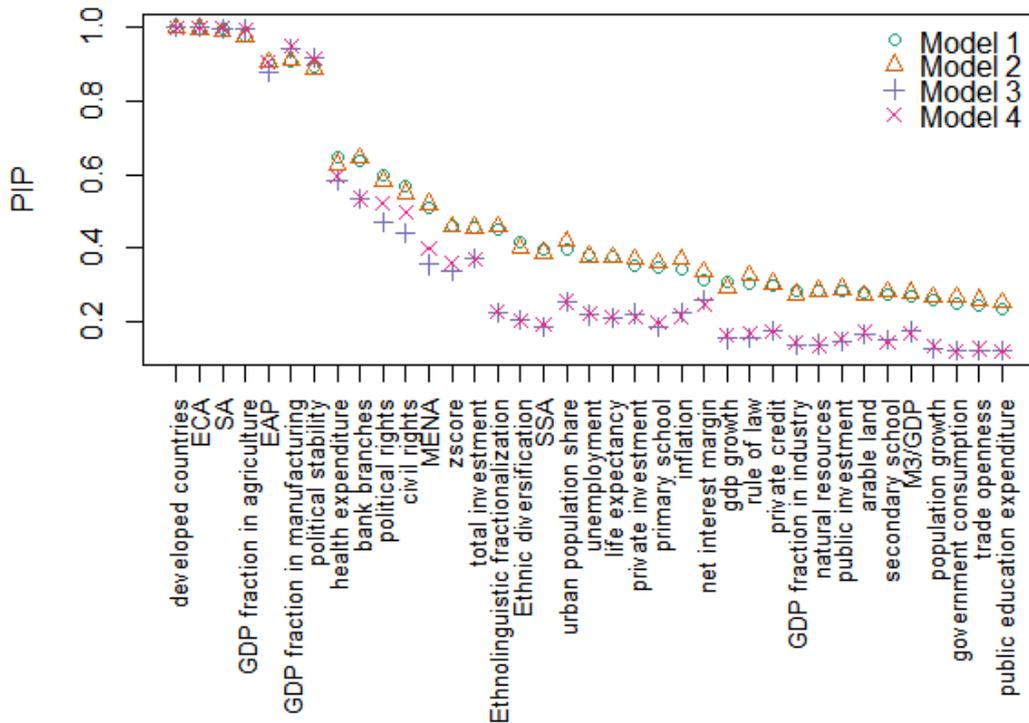
Figure B.8: Relative poverty and banking sector, 2012–2013

Notes: Model 1: hyper-g prior, uniform model prior, bd MCMC sampler, Model 2: hyper-g prior, uniform model prior, rev.jump MCMC sampler, Model 3: UIP prior, uniform model prior, bd MCMC sampler, Model 4: UIP prior, uniform model prior, rev.jump MCMC sampler
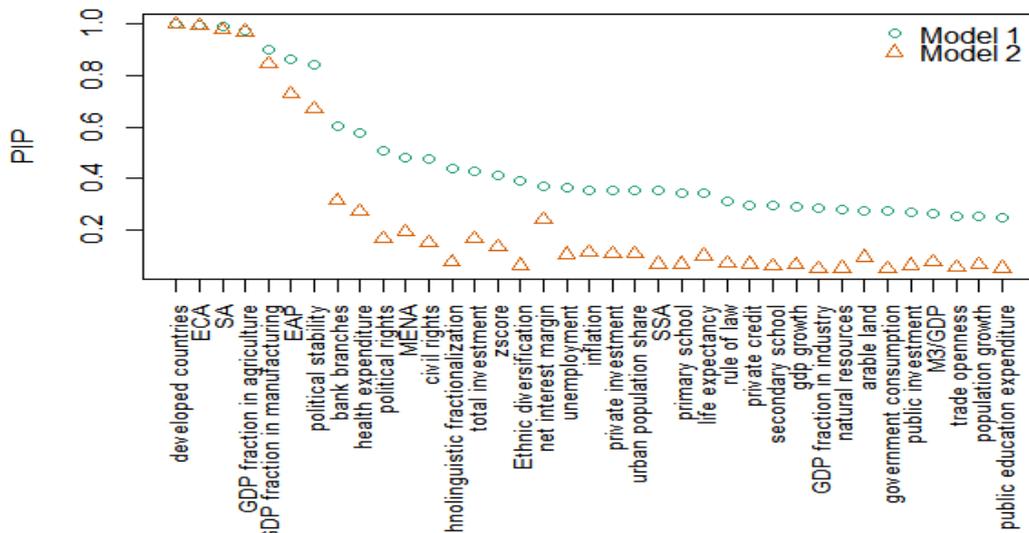
Figure B.9: Relative poverty and banking sector, 2012–2013

Notes: Model 1: hyper-g prior, random model prior, bd MCMC sampler, Model 2: UIP prior, random model prior, bd MCMC sampler
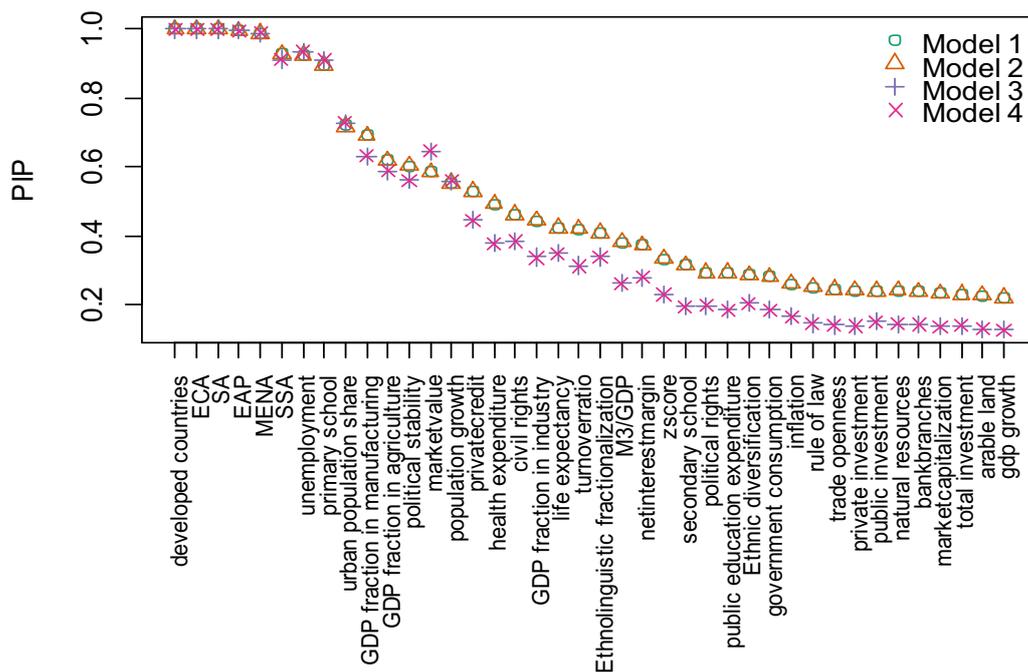
Figure B.10: Relative poverty and stock market and banking sector with different parameter priors

Note: model 1=g=hyper, mprior=uniform, mcmc=bd, model 2: g=hyper, mprior=uniform, mcmc=rev.jump, model 3: g=UIP, mprior=uniform, mcmc=bd, model 4: g=UIP, mprior=uniform, mcmc=rev.jump
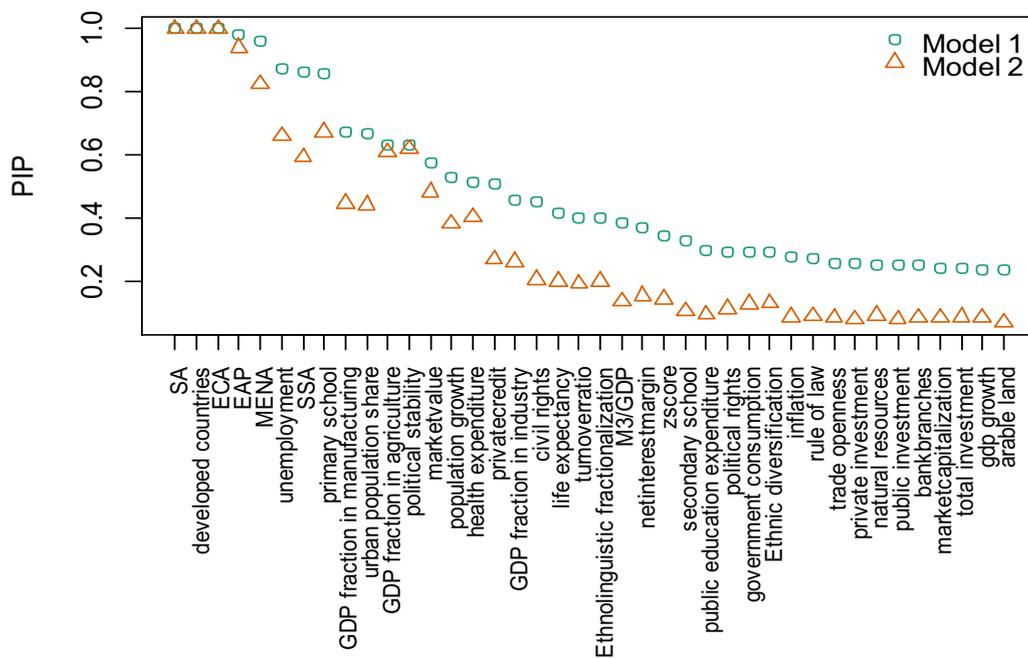
Figure B.11: Relative poverty and stock market and banking sector with random model prior

Note: model 1: g=hyper, mprior=random, mcmc=bd, model 2: g=UIP, mprior=random, mcmc=bd

Table B.15: GINI coefficient and banking sector and stock market dimension estimation summary

Mean number of regressors	**Draws**	**Burnins**
20.77	1.7e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
7608249	1.4e+11	0.97
% visited	**% Topmodels**	**g-Prior**
0.00035	4	Hyper (a=2.0247)
Number of observations	**Model Prior**	**Shrinkage Stats**
81	Uniform/20.5	Av=0.97, Stdev=0.014

Table B.16: GINI coefficient and banking sector and stock market dimension

	PIP	Post Mean	Post SD
Developed countries	1.00	-1.92E+01	2.270344532
ECA	1.00	-1.49E+01	2.430809118
SA	1.00	-1.81E+01	3.54835006
MENA	1.00	-1.57E+01	3.417377439
Unemployment	1.00	5.38E-01	0.123212125
EAP	1.00	-1.18E+01	3.045675924
Primary school enrolment	0.98	1.94E-01	0.064565218
SSA	0.98	-1.08E+01	3.70549445
Urban population share	0.92	-1.02E-01	0.048166177
Population growth	0.89	2.28E+00	1.192895451
GDP fraction in agriculture	0.81	-1.80E-01	0.119086696
Private credit	**0.73**	**2.24E-02**	**0.017778359**
Life expectancy	0.72	-2.41E-01	0.196984047
Civil rights	0.70	1.04E+00	0.996166075
Health expenditure	0.63	4.73E-01	0.47182533
Turnover ratio	**0.59**	**1.44E-02**	**0.01527674**
GDP fraction in manufacturing	0.59	-1.20E-01	0.127858702
Public education share	0.48	1.22E-01	0.162741917
GDP fraction in industry	0.40	6.09E-02	0.101029598
Rule of law	0.39	7.35E-01	1.260831908
Market capitalization	**0.38**	**8.18E-03**	**0.014252009**
Political stability	0.35	-5.89E-01	1.097320491
Ethnolinguistic fractionalization	0.34	1.08E+00	2.082400896
Political rights	0.32	4.87E-03	0.596938051
Market value	**0.29**	**5.44E-03**	**0.0168056**
Ethnic diversification	0.24	4.23E-01	1.254293404
Natural resources	0.24	-2.36E-02	0.089634651
Net interest margin	**0.24**	**-6.62E-02**	**0.218421191**
Trade openness	0.22	-2.32E-03	0.010945183
Secondary school enrolment	0.22	-9.22E-03	0.031472899
Arable land	0.22	-2.07E-01	0.687130034
GDP growth	0.21	-6.69E-02	0.308162784
Inflation	0.20	3.13E-03	0.013355514
M3/GDP	0.20	4.38E-04	0.001953994
Public investment	0.20	1.19E-02	0.075790592
Private investment	0.19	8.11E-03	0.059039491
Total investment	0.19	9.25E-03	0.060102294
Government consumption	0.18	-6.92E-03	0.07557691
Bank branches	**0.18**	**-6.83E-04**	**0.012873902**
Bank Z-score	**0.17**	**2.27E-03**	**0.029675084**

Table B.17: Relative poverty and banking sector and stock market estimation summary, 2012–2013

Mean number of regressors	Draws	Burnins
20.08	2.5e+07	4e+06
Number of models visited	**Modelspace 2^K**	**Corr PMP**
14281803	1.1e+12	0.84
% visited	**% Topmodels**	**g-Prior**
0.0013	0.54	Hyper (a=2.0318)
Number of observations	**Model Prior**	**Shrinkage Stats**
63	Uniform/20	Av=0.9022, Stdev=0.045

Table B.18: Relative poverty and banking sector and stock market, 2012–2013

	PIP	Post Mean	Post SD
Developed countries	0.99	3.112829	0.877055
SA	0.99	3.620389	1.159593
Civil rights	0.96	-1.329150	0.541448
ECA	0.93	2.056030	0.928923
Political rights	0.92	0.874444	0.422304
GDP fraction in agriculture	0.91	0.073517	0.036988
Health expenditure	0.88	-0.280380	0.155176
EAP	0.77	1.491753	1.202852
GDP fraction in manufacturing	0.73	0.055385	0.047005
Political stability	0.71	0.482643	0.426446
Ethnolinguistic fractionalization	0.63	-1.084080	1.221594
MENA	0.60	1.421248	1.630588
Arable land	0.59	0.522176	0.596152
GDP growth	0.57	-0.094000	0.112325
Unemployment	0.49	-0.028350	0.042096
Bank Z-score	**0.48**	**-0.016250**	**0.024978**
Bank branches	**0.44**	**-0.005170**	**0.008469**
Primary school enrolment	0.43	-0.013990	0.024529
Secondary school enrolment	0.42	0.009064	0.016907
M3/GDP	0.41	-0.000530	0.000985
Private credit	**0.41**	**-0.002010**	**0.004102**
Total investment	0.36	0.015072	0.039349
Population growth	0.35	-0.075910	0.312640
Ethnic diversification	0.35	0.114283	0.750608
SSA	0.34	0.287598	0.831941
Market value traded	**0.34**	**-0.001710**	**0.004457**
Rule of law	0.33	-0.036340	0.313938
Net interest margin	**0.32**	**0.022410**	**0.088779**
Government consumption	0.31	0.007978	0.027879
Trade openness	0.30	-0.000700	0.004328
Turnover ratio	**0.30**	**0.000719**	**0.002887**
GDP fraction in industry	0.29	0.003206	0.025430
Life expectancy	0.29	0.005267	0.030748
Natural resources	0.29	-0.001820	0.024348
Private investment	0.28	-0.000970	0.020552
Public investment	0.28	-0.002510	0.028601
Urban population share	0.27	0.000408	0.008160
Inflation	0.26	-4.40E-06	0.005271
Public education share	0.26	0.000985	0.027407
Market capitalization	**0.26**	**-0.000150**	**0.002103**
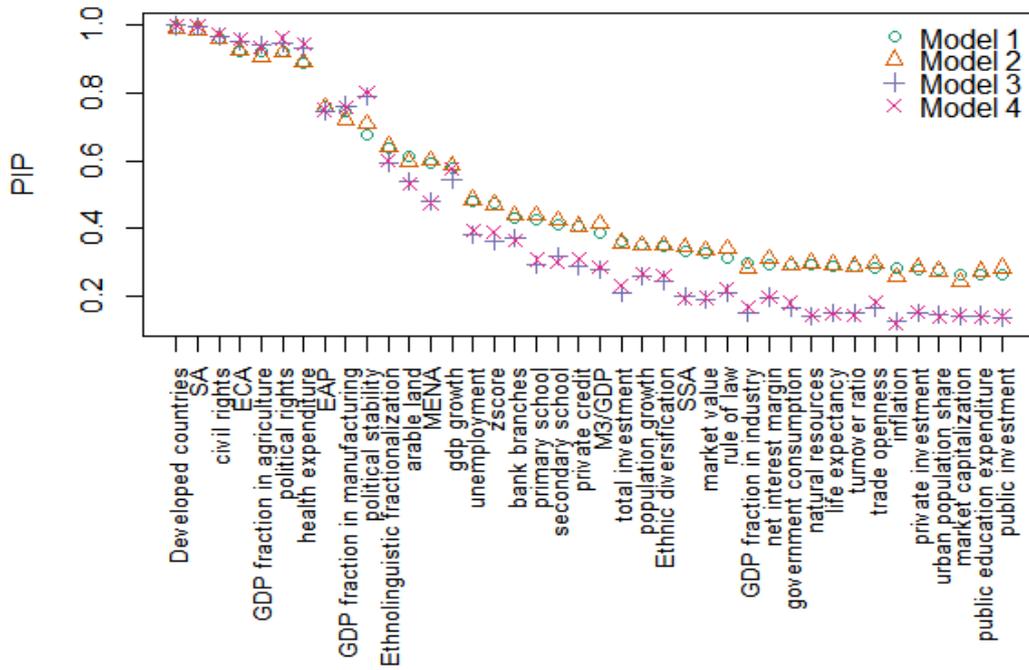
Figure B.12: Relative poverty and banking sector and stock market, 2012–2013

Notes: Model 1: hyper-g prior, uniform model prior, bd MCMC sampler, Model 2: hyper-g prior, uniform model prior, rev.jump MCMC sampler, Model 3: UIP prior, uniform model prior, bd MCMC sampler, Model 4: UIP prior, uniform model prior, rev.jump MCMC sampler
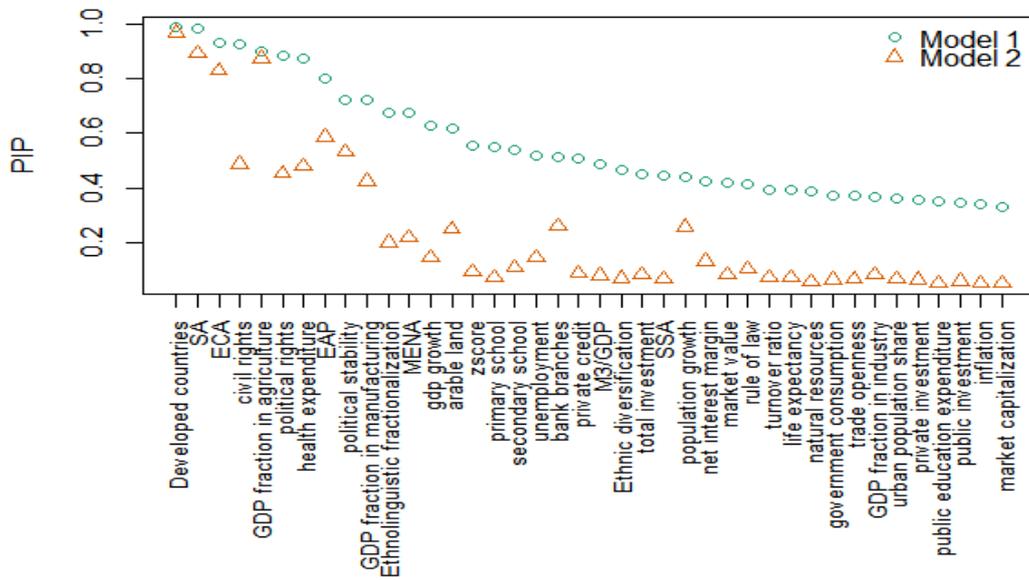
Figure B.13: Relative poverty and banking sector and stock market dimension, 2012–2013

Notes: Model 1: hyper-g prior, random model prior, bd MCMC sampler, Model 2: UIP prior, random model prior, bd MCMC sampler

Table B.19: Nonlinear relationship between relative poverty and financial development

	PIP	Post Mean	Post SD
Developed countries	1.00	4.183177	0.604834
ECA	1.00	3.478178	0.612149
SA	1.00	5.069672	0.957303
EAP	0.99	3.028706	0.819873
MENA	0.99	3.307652	1.040976
SSA	0.93	2.178406	1.045062
Unemployment	0.91	-0.08341	0.040371
Primary school enrolment	0.89	-0.03647	0.019401
GDP fraction in manufacturing	0.72	0.041648	0.034638
Urban population share	0.69	0.015106	0.013515
Political stability	0.63	0.362899	0.372055
Private credit	**0.60**	**-0.00506**	**0.007291**
GDP fraction in agriculture	0.60	0.026944	0.029353
Market value	**0.57**	**-0.00529**	**0.007267**
Population growth	0.53	-0.21892	0.275359
Turnover ratio	**0.51**	**-0.00088**	**0.005513**
GDP fraction in industry	0.48	-0.01892	0.027186
Health expenditure	0.47	-0.07497	0.107844
Civil rights	0.46	-0.12366	0.202279
Life expectancy	0.45	0.025511	0.039281
M3/GDP	0.42	-0.00059	0.000964
Net interest margin	**0.41**	**0.048078**	**0.110865**
Ethnolinguistic fractionalization	0.40	-0.35501	0.621019
Bank Z-score	**0.40**	**-0.01098**	**0.025217**
Secondary school enrolment	0.34	0.005067	0.011027
Bank branches	**0.32**	**-0.00393**	**0.012413**
Market capitalization	**0.32**	**0.000679**	**0.004633**
Public education share	0.30	-0.01184	0.02911
Political rights	0.30	-0.00439	0.122062
Government consumption	0.29	0.011177	0.03001
Ethnic diversification	0.28	-0.1284	0.367439
Rule of law	0.27	-0.0559	0.218373
Private investment	0.26	-0.00573	0.019953
Inflation	0.26	-0.00115	0.00403
Public investment	0.25	-0.00509	0.022947
Trade openness	0.25	0.000428	0.002952
Natural resources	0.25	-0.00114	0.019947
Total investment	0.23	-0.00196	0.018128
GDP growth	0.23	-0.00275	0.054865
Arable land	0.23	0.037096	0.170114
Privatecredit#privatecredit	**0.17**	**6.53E-06**	**2.39E-05**
Turnoverratio#turnoverratio	**0.17**	**-9.5E-06**	**3E-05**
Marketvalue#marketvalue	**0.12**	**3.25E-07**	**1.83E-05**
Bankbranches#bankbranches	**0.11**	**3.26E-05**	**0.00013**
Marketcapitalization#marketcapitalization	**0.10**	**-4.4E-06**	**1.98E-05**
Bankzscore#Bankzscore	**0.10**	**9.8E-05**	**0.00066**
netinterestmargin#netinterestmargin	**0.09**	**-0.00046**	**0.005839**

Note: The specification is hyper-g prior, uniform model prior and MCMC bd sampler.