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**Effects of Financial Sector Development on Income
Inequality**

P.h.D. Dissertation in Economics

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1. Research Background

Increasing income inequality is generally referred to as rising income differences, where the rich get richer faster than the poor. Economic inequality, which refers to monetary inequality, can be analyzed from the perspective of wealth and or income inequality. At the same time, inequality of outcome can also be measured by income, wealth, and expenditure. Inequality of opportunities refers to the unfair distribution of opportunities and, thus, outcome, as household circumstances are beyond individuals' control. Examples of inequality of opportunity include gender, ethnicity, place of birth, and family background. All the types of inequality are related and provide different information on the phenomenal. In this thesis, the focus is solely on income inequality and how it is affected by financial sector development. This is because income has direct effects on households' consumption and is often a concern of policymakers.

The Gini coefficient is the most widely used measure of monetary income inequality (Batuo, Guidi and Mlambo 2010; Brie, Ferri and Gambacorta 2018; Demirgüç-Kunt, Beck and Honohan 2008; Dabla-Norris et al.,2015). The Gini coefficient tracks changes in the income share of individuals and ranges from zero (same income for all) to one (one person takes all income). The Standardised World Income Inequality Database (SWIID) is used in this thesis. Of the 120 countries investigated in Chapter 2 of the thesis, we see that between the years 2004 to 2019, the after-tax Gini index of advanced economies remained below 0.4. In Europe, countries like Denmark, Spain, Croatia, and Romania recorded an increase in after-tax Gini between 2019 and 2004. However, the after-tax inequality of these countries remains below 0.4. Over the same period, the after-tax Gini coefficients for emerging market economies and low-income countries fluctuated mostly below 0.5, with countries like Brazil, Colombia, Panama, and Peru moving away from above 0.5 Gini points to below 0.5. However, on average, income inequality remains stubbornly high in Sub-Saharan Africa, with Namibia and South Africa having the highest Gini coefficient hovering around 0.67 and 0.63, respectively. Inequality in Namibia and South Africa is persistently high over the 2004 to 2019 period. Inequalities of Rwanda, Zambia, and Côte d'Ivoire also remained above 0.5 but below 0.6 over the same period.

Literature suggests income inequality is mainly driven by wage income associated with skills premium (Francese and Granados 2015). While progressive tax policy, labour market institutions, and transfers are praised for their contribution to reducing income inequality (Park and Shin, 2009; Dabla-Norris et al.,2015). Technology changes, increases in foreign direct investment (FDI), and financial sector development (FSD) can also increase income inequality (Banerjee and Newman, 1993; Galor and Zeira, 1993; Dabla–Norris et al.,2015).

Increases in FDI, FSD, and technological advancement of nations tend to drive up the demand for skilled labour, resulting in a bigger income gap between skilled and unskilled labour, especially in countries where skilled labor is relatively smaller than unskilled. However, the empirical literature on FSD and income inequality is ambiguous and lacks consensus, with grounds for assuming both beneficial and harmful effects of FSD on inequality.

2. Significance of the Study

The concept of financial sector development (FSD) is compounded mainly in terms of structure and regulatory framework. However, we can decompose FSD first into two broad components, namely; financial institutions (FI) and financial markets (FM). Financial institutions and markets are developed if they are characterised by increased depth, access, efficiency, and stability.

Globally, financial sector development has been on the rise, growing in terms of credit, volumes of trade, and geographical presence. In addition, the UN Secretary-General's high-level panel on the post-2015 Millennium Development Goals (MDGs) recommended bank accounts for females and increased access to financial services as an enabling target for economic growth, poverty, and inequality alleviation. As such, FSD and financial inclusion are key tools for addressing the UN SGD goals: poverty (SDG-1), gender equality (SDG-5), and reducing inequality (SGD-10).

Borderless banks seen in the present era continue to prosper; it is natural to study their effects on income distribution as FSD. In addition, FSD affects income inequality through the composition of labour demand, access to finance human capital, and rent from capita. Theoretical and empirical literature on FSD and income inequality provides inconclusive findings. Most of these studies focused only on one indicator of FSD, namely the depth of financial institutions (domestic credit), and owing to the dynamic nature of this variable with income and inequality, the literature findings lack consensus. As such, this thesis argues that census can be brought about in the FSD-inequality literature by first looking at aggregated FSD effects on inequality and secondly by detangling the components of FSD and empirically analyzing their effects on income inequality. Subsequently, this thesis attempts to conclude the effects of aggregated FSD and alternative FSD indicators on income inequality. This is because conclusions on the relationship between FSD indicators and inequality are important for examining the direct and indirect effects of FSD beyond economic growth.

The literature on financial sector development (FSD) and income inequality lacks consensus. Some say FSD reduces income inequality through increased access to the sector. Others suggest that FSD increases inequality due to institutions and imperfect credit markets. Subsequently, the debate on testing the nonlinear relationship between FSD and income inequality endures. Park

and Shin (2015) also proposed the inclusion of a nonlinear FSD term in the model and argued that since FSD has a nonlinear relationship with economic growth, the inclusion of FSD nonlinear term can tell us about the benefits and harmful effects of FSD on income inequality.

Some argue that FSD is beneficial, but up until a threshold beyond which FSD has an increasing effect on income distribution (Tan and Law, 2012; Park and Shin, 2015). Another strand of the literature says inequality increases in the early stages of FSD, which are characterized by an unorganized market, and once FSD increases reaches the threshold, increases in FSD reduce inequality (Greenwood and Jovanovic, 1990). By testing both the linear and nonlinear models, the thesis captured complex patterns in the data and captured threshold effects in the non-linear models.

Secondly, this thesis contributes to the literature towards finding a global effect size between FSD and income inequality by using quantitative meta-analysis. Thirdly, this thesis also takes into account the inclusion in both the formal and informal financial sector especially for developing countries. Specifically, the study looked at the determinants of using both the formal vs the informal financial sector to save and borrow in the BRICS nations.

2.1. Aim

This thesis aims to address seven research questions on the effects of FSD on income inequality. The goal of this thesis is to first empirically test the effects of FSD dimensions on income inequality. Secondly, the thesis aims to bring consensus in the literature by finding the global effect size of financial institution depth (domestic credit) on income inequality. Thirdly, the thesis aims to look at individual factors driving financial inclusion (the use of both formal and informal financial services).

2.2. Objectives

In the empirical literature, it is common to use one component of FSD (depth) as a proxy of aggregated FSD, this thesis first addresses this by, providing a clear description and definitions of FSD, and available proxies to measure the FSD indicators. This is important for precision, consistency, measurement feasibility, validity, and comparability of results. Thereafter, the thesis objectives are to conduct a series of empirical analyses on the effects of aggregated FSD, and FSD dimensions on income inequality. The objectives are to compare and contrast the estimated effects of FSD and alternative FSD indicators on income inequality of 120 countries and subgroups. In addition, since the majority of the empirical literature focused on the effects of financial institution depth on income inequality, this thesis's second objective is to find a global effect size using a quantitative meta-analysis approach. Finally, this thesis also uses 2021 data on financial inclusion, to investigate the impact of individual factors on the use of financial services.

The objective is to analyse and compare how individual characteristics shape the use of formal vs informal financial services in the BRICS nations.

2.3. Problem Statement

The empirical literature on FSD and income inequality is ambiguous and lacks consensus, with grounds for assuming both beneficial and harmful effects of FSD on inequality. As [Demirguc-Kunt and Levine \(2009\)](#) highlighted, the literature lacks a consensus, and to close the gap, they state that further empirical evidence is needed. The grounds for further research lie in finding precise measures or rules of thumb for the impact of FSD on inequality. This is because the theory mirrors a skeleton of inequality trends due to imperfect credit markets. In addition, previous empirical studies on the FSD-inequality nexus focused on one broader measure of FSD, the depth and analysis of other components of FSD on inequality is limited. Adding to this, most of the literature relies on macro-level data and literature using micro-level data is limited. Also, the literature on the informal financial sector has been limited, with larger literature focusing on the formal financial sector due to data availability. The findings of this thesis can be useful for policy recommendations on financial sector development reforms and policies on income distribution.

2.4. Research Questions

Table 1. Research Questions, and Empirical Methods.

Research Question	Empirical Research Method
1. What are the effects of aggregated FSD on income inequality?	Generalized Methods of Moments (GMM)
2. How does increased access to financial services and an increase in financial depth affect income inequality?	Generalized Methods of Moments (GMM)
3. What is the magnitude of the effect of financial institution depth on income inequality?	The Partial Correlation Coefficient under Quantitative meta-analysis methods is used.
4. Does financial institution depth increase or decrease income inequality?	The Partial Correlation Coefficient under Quantitative meta-analysis methods is used.

5. What are the causes of the mixed empirical results in the literature and does the financial depth-inequality nexus have publication bias?	Multivariate meta-regression is used. For publication bias, the funnel plot and Egger test are used.
6. What are the factors determining financial inclusion in BRICS nations?	The classification tree algorithm is the method used to address this question.
7. What are the factors determining the choice of using either formal or informal financial services to save or borrow in BRICS?	Probit model is estimated to address this question.

2.5. Overview of Chapters in Thesis

Chapter 1: Lays the introduction of the thesis. This chapter of the first introduces and links the three central articles forming this dissertation on Financial Sector Development (FSD) and income inequality. Its goal is to describe the research problem, define the research questions, and highlight the significance of the study. Chapter 2: Focuses on Article 1, the effects of overall FSD on income inequality. As such, Furthermore, the main theoretical and empirical literature summary on the theme of financial sector development and income inequality is presented. The goal of section 2 is to familiarise the reader briefly with the central theories and literature of this thesis (mainly Chapters 2 and 3).

Chapter 3: Presents Article 2, where the focus is drawn on one measure of FSD using quantitative meta-analysis methods to find the global effect size of FSD on inequality. Chapter 4 of the thesis is based on Article 3, which dives into the financial inclusion component of FSD. Chapter 5 presents the thesis conclusions. Chapter 6 lists of publications of the discussed articles forming this thesis.

3. Methodology

This thesis addresses seven research questions using a list of methods and different datasets. The thesis used data from early research (literature review), and both macro-data and micro-data levels. Subsequently, this section first discusses the methodology used in Chapter 2 of the thesis; thereafter, the methods used in Chapter 3 of the thesis are discussed. Finally, this section ends with a discussion of the methodology used in chapter 4 of the thesis.

Chapter 2 of the thesis investigated the effects of aggregated FSD and alternative FSD indicators on both before and after-tax income inequality measured as the Gini index. Chapter 2 of the thesis relied on macro-level data from 120 countries, with SWIID, International Monetary Fund (IMF), World Bank, and Pen world tables as the data sources. Both the system and first difference generalized methods of moments (GMM) are used to investigate the effects of FSD on income inequality. The GMM of Blundell and Bond (1998) and Roodman (2009) is designed for estimates of larger panels and smaller T and can also be applied to a single time series (i and $t=1$). GMM is a dynamic estimator used for panel data that uses instrumental variables and tries to correct for endogeneity. The first difference is that GMM attempts to remove endogeneity by transforming the data to remove fixed effects and instrumenting with variables that are uncorrelated with the fixed effects (Roodman, 2009). As such, the full sample is analyzed using both the system and the first difference GMM. This is because the unit root test of the dependent and independent variables is only stationary at the first difference, not in levels. The first difference, GMM, is a dynamic estimator that begins with the first differencing data.

The GMM estimation techniques provide the following diagnostic tests: the serial correlation AR (2), the Sargan test, and the Hansen test. The null hypothesis for serial correlation is AR (2) zero autocorrelation in the first-differenced errors. Where the null hypothesis for the Sargan and Hansen test is that instruments are valid for the model. The Sargan and Hansen test investigates the validity of the chosen instruments of the model. The Sargan test of overidentifying restrictions is a special case of the Hansen test, as it assumes homoskedasticity and no serial correlation in the error terms, while the Hansen test does not rely on these strong assumptions (Roodman, 2007). The Hansen test of overidentifying restrictions depends on the estimate of an optimal or robust weighting matrix, while the Sargan test does not (Roodman, 2007). Thus, the Hansen and Sargan test results have different p-values.

In the GMM estimation, the log of the after-tax Gini index on its first lag was regressed. Corruption variables are entered as an exogenous instrumental variable- this variable serves as a proxy for institutional quality. Initial GDP per capita and first-lagged after-tax Gini are used as endogenous instruments. The average years of schooling, a proxy for education, consumer price index (CPI), government spending, and trade openness all enter the models as control variables. Subsequently, the

models considering the before-tax Gini are set up in the same manner as the after-tax Gini models. The choice of instruments and control variables is guided by the literature (Park and Shin, 2015; Cihak and Sahay, 2020). The collapse instrument option applied in the GMM also helps to reduce the number of instruments. Subsequently, all the estimated GMM results have a lesser number of instruments than the number of observations (N). Finally, the linear model and nonlinear model are estimated using Equations (1) and (2), respectively.

$$\text{Log_Gini}_{it} = \alpha_i + \beta_0 \text{Log_Gini}_{it-1} + \beta_1 \text{FSD}_{it} + \beta_2 X_{it} + \varepsilon_{it} \dots \dots \dots 1$$

$$\text{Log_Gini}_{it} = \alpha_i + \beta_0 \text{Log_Gini}_{it-1} + \beta_1 \text{FSD}_{it} + \beta_2 \text{FSD}^2_{it} + \beta_3 X_{it} + \varepsilon_{it} \dots \dots \dots 2$$

Where “i” and “t” represent countries and time, respectively, while FSD represents the FSD dimensions investigated, X is a set of control variables, and ε is the error term.

In Chapter 3 of the thesis, the data used is from the empirical literature, and the quantitative meta-analysis method is used. Meta-analysis is used to quantify the mixed findings in the empirical literature on FSD and inequality. Chapter 3 of the thesis followed the seven steps for conducting a quantitative meta-analysis. Where in step 1 of the method, the research question is clearly defined, and the study eligibility criteria are identified (which studies should be included in the search) in step 2. The third step is to conduct the search using keywords; the fourth step is to collect the data. In the fifth step, the effect size is calculated, and in step six, the multivariate regression is estimated. Finally, the last step of this method is to test for publication bias in the topic.

Subsequently, the meta-analysis data is based on the literature of 24 studies from the year 2004 to the year 2021. Thus, the study looked at studies over 17 years on the impact of domestic credit (FSD) on income inequality (Gini). The magnitude of the impact size of financial sector depth on income inequality is calculated using partial correlation coefficients (PCC). The standardized PCC method is the most used in economic meta-analysis. The PCC method is used rather than the average (mean) of the estimated coefficients from the selected studies because different studies use different units of measurement (e.g., log of domestic credit or domestic credit), making the estimates presented not directly comparable (Heimberger, 2020). Since I consider studies based on time series, cross-sectional and panel studies, the PCC is an attractive method for meta-analysis. PCC is a standardized method for comparing and summarising effect size across various studies (Heimberger, 2020; Havranek et al., 2013). The PCC method relies on the t-statistics of the regression estimates and their respective degrees of freedom (df).

In Chapter 3 of the thesis, three models were considered under PCC modelling: Random, Common, and Fixed effect models. These three PCC models differ in their underlying assumptions, mainly the weights assigned. The Common Effect (CE) model assumes that different empirical studies employ the same underlying parameters and have the same effect sizes- implying variability in studies stems from

sampling errors. The Fixed Effects (FE) model assumes mixed and different effect sizes from the collected studies. FE only bases the inference on collected studies, thus assuming these studies define the whole population of interest. The effect sizes are weighted with the inverse variance in the CE and FE model.

The Random Effect (RE) model assumes different effect sizes and studies are collected from a large population randomly and thus, shows inference for a population of studies from the randomly collected studies. RE model goes beyond the sampling variability by estimating heterogeneity parameters (between-study variance) among the collected studies. This study used the restricted maximum likelihood (REML) method to estimate the heterogeneous parameter. REML is an iterative method and assumes that the distribution of random effects is normal. RE model weights are calculated as the inverse of the total variance (which includes the heterogeneity parameter). Lastly, in Chapter 3, the funnel plot and Egger (1997) test are used as methods of testing for publication bias in the topic.

Finally, the thesis connects the use of formal and informal financial sectors in Chapter 4 by answering the following questions: What are the factors determining financial inclusion in BRICS countries? What are the factors determining the choice of either formal or informal financial services in the BRICS countries for savings and borrowing?

The analysis uses 2021 individual-level data of BRICS nations from the Global Findex database of the World Bank surveys. The analysis uses two methods to identify individual factors behind the levels of formal vs informal financial inclusion. First, the Conditional Inference Tree – the 'Ctree' – algorithm is applied, which estimates a regression relationship by binary recursive partitioning response variable in a conditional inference framework (Hothorn et al., 2006; Kuhn and Johnson, 2018). In this procedure, the dataset is randomly partitioned into two subsamples, a test and a training sample, with 7486 and 2981 observations, respectively. The regression tree method is particularly important as it reveals that a different behaviour often accompanies certain characteristics. Ctree models can handle different types of data, and unlike linear models, with trees, you do not need to set the form of the predictor relationship with the response (Hothorn et al., 2006; Kuhn and Johnson, 2018). From the initial results of the regression tree, a probit model is specified to quantify the importance and significance of each explanatory variable.

4. Findings

The findings of the thesis, which attempts to address seven research questions, are presented in the below bullet points, where the findings of Chapter 2 on the empirical analysis using the GMM model and macro-level data are presented first. Thereafter, the findings of Chapter 3, using quantitative-meta-analysis methods, are presented, and finally, the findings of Chapter 4, based on 2021 Global Findex data and C-tree and probit model, are discussed.

Chapter 2 of the thesis offers empirical analysis and results answering two research questions: Firstly, what are the effects of overall (aggregated) financial sector development on income inequality? Secondly, how do increased access to financial services and an increase in financial sector depth affect income inequality?

- The empirical results of the full sample of 120 countries show a negative and significant effect of the aggregated financial development index (FD), aggregated financial institution development index (FI), and aggregated financial market development index (FM) on after-tax income inequality between 2004 to 2019. The results also reveal a significant and more pronounced reducing effect of the FD index and FI index on after-tax inequality of emerging markets economies (EME).
- On the other hand, the results from the full sample of 120 countries using before-tax income inequality as the dependent variable suggest that increases in FD, FI, and FM indices widen inequality. In terms of the subsample results, growth in the FD index increased the before-tax inequality of advanced markets (AM) and simultaneously reduced the before-tax inequality of low-income countries (LIC).
- Intuitively, the levels of FD index in LIC are far smaller than those of the AM group. As such, in advanced economies, increases in FD produce higher returns on capital, which disproportionately benefits individuals with high incomes. Secondly, since the FD index of advanced economies is already high further increases in FD can lead to increased market concentration, leading to higher executive earnings, which can widen the before-tax income inequality. The smaller levels of the FD index suggest the LIC has a less developed financial sector in terms of financial depth, access, and efficiency.
- The observed paradox on the effects of the FD index on the before and after-tax Gini was expected, as the after-tax Gini index represents the net basis of inequality. Secondly, an increase in FSD tends to demand highly skilled individuals, which pushes up their respective wages and increases before-tax inequality. The narrowing effect of the FD index on after-tax inequality suggests that progressive taxation, social transfers, and public sector investment associated with the developed financial sector can narrow inequality.

- The results of one of the main components of financial sector development (access) were as follows: access to financial institutions measured as FIA index and ATMs per adult narrowed after-tax income inequality in the full sample of 120 countries. The effects of increased access to financial institutions (FIA index) reduce after-tax inequality of LIC and EM groups.
- The linear model results also suggest that an increase in the number of ATMs reduces the inequality of EM and LIC by 0.02 and 0.010 Gini points. Kapingura (2017) also confirmed a narrowing effect of ATM on inequality in South Africa (ATM reduces inequality by 0.03 Gini points).
- On the contrary, in the nonlinear model, ATM has a U-shaped relationship with the after-tax inequality of the LIC group. These results reflect the levels of maintenance of ATMs, especially near rural and less economically developed cities; thus, the number of ATMs per adult may be increasing, but the number of actual functioning ATMs may be less. This is one of the limitations of this thesis, as macro data does not provide such details.
- The narrowing hypothesis of financial access on inequality is evident in the literature, especially in the case of India, where the national bank used a policy mandate to broaden access to finance in rural areas.
- The finding of the effects of FIA on before-tax income inequality also suggests a narrowing hypothesis. This means an increase in access to financial institutions reduces both the before and after-tax inequality. The FIA index also significantly narrows the before-tax income inequality of the LIC group while widening an inverted U-shaped relationship between the before-tax inequality of AM.
- Access to the financial sector fosters the inclusion of poor households in the formal economy, allowing them to save and invest; it also gives informal workers such as street vendors an opportunity to bank their income and thus start building credit for future loans.
- As such, access to financial institution services is the most important component of FSD when it comes to income inequality.
- Contrary to other indicators of FSD, the FMA index results from this chapter demonstrate a U-shaped effect on both before and after-tax Gini. Suggesting the effects of FMA are not much affected by tax policies. Moreover, the effects of FMA on inequality reflect how the well-off benefit from the stock market, compared to the other income groups. This reflects the use of financial products (stock) as collateral for borrowing while the individuals are not paying taxes on unsold stocks.
- The results of other main components of financial sector development (depth) were as follows: The full sample 120 countries result for financial institutions, and markets depth suggests a narrowing effect in the linear model, while the nonlinear model suggests a simple U-shaped relationship with after-tax income inequality.

- When financial institution depth is measured as the domestic credit ratio of GDP, we find a significant and reducing effect on after-tax income inequality of EME.
- When depth is measured using the financial institution depth index (FID), we find a negative and significant reducing effect on after-tax income inequality of LIC.
- Of the other explanatory variables, education proxied as average school years in the population aged 25 and older had a negative and significant effect on both before and after-tax Gini. Consumer Price Index (CPI) was positive and significant, suggesting inflation widens both before and after-tax income inequality. Trade openness was also found to reduce after-tax income inequality. GDP per capita and government spending appear to have an increasing effect on before-tax income inequality.

Chapter 3 of the thesis uses meta-analysis and multivariate meta-regression methods to quantify the mixed and large literature on financial institution depth and income inequality. The goal of Chapter 3 is to find the magnitude and impact of financial institution depth on income inequality and the factors behind the mixed empirical findings seen in the literature.

- The RE and FE models are employed to estimate the common component of the PCCs derived from individual estimates. The meta-summary analysis results show that financial institution depth positively impacts income inequality, but the magnitude of the impact is very small.
- Thus, the results suggest that growth in financial institution depth increases income inequality by a small amount. This is because a positive correlation exists between domestic credit and income, as a household's income is used as a signal for credit application decisions. In Vietnam, when the credit market triggers speculative investment, domestic credit increases income inequality (Le and Nguyen, 2020). Easy access to credit, especially for the rich with collateral, can allow them to grow their investments by increasing the funds they borrow from financial institutions.
- Iacoviello (2008) argues that economic cycles influence credit demand, which leads to an increase in the indebtedness of households and further widens inequality. The meta-analysis findings of a positive and small effect of domestic credit on income inequality suggest that financial reforms on credit policies can have harmful effects on income inequality.
- Using the Egger test for small-study effects, the chapter concludes that there is no evidence of publication bias on the topic of domestic credit and income inequality.
- Multivariate meta-regression results show strong evidence of high heterogeneity in past studies on financial institution deepening and income inequality. The results of the multivariate regression suggest that the different signs and magnitude of financial sector depth coefficients reported in the literature come from different methodologies applied in past papers.

Subsequently, studies focussing on developed countries tend to agree and confirm the narrowing relationship between domestic credit and income inequality.

Chapter 4 of the thesis dives into financial inclusion by looking at the use of financial services to save and borrow in both informal and formal financial channels. The chapter identifies and quantifies the factors driving the use of the formal or informal financial sectors in BRICS nations-Brazil (BRA), Russia (RUS), India (IND), China (CHN), and South Africa (ZAF).

- The decision tree method provides graphic information on how individual factors influence financial transactions (financial inclusion). The tree shows that the majority of the sample prefers the formal financial sector, and the informal sector is less widespread in the BRICS nations. The tree also demonstrates that individuals who did not receive wages in the past 12 months are excluded in both the formal and informal sector transactions.
- The probit model results of the full sample of the 5 BRICS nations confirm the life cycle hypothesis on age and financial inclusion. The inverted U-shaped nonlinear relationship between age and financial inclusion is also confirmed in the individual country results of India, China, and South Africa. In contrast, for Brazil and Russia, there exists a U-shaped relation between age and the decision to save in either sector. The results for Brazil and Russia only confirm the life cycle hypothesis when it comes to credit in both formal and informal sectors.
- Across all the BRICS nations, education is a determining factor in financial inclusion. Individuals with primary education are more associated with informal credit. While people with tertiary education and higher income save more and tend to use the formal financial sector to save and borrow.
- Within the BRICS nation, the marginal effect of the poorest individuals is negative when it comes to saving in both sectors.
- In China, individuals in the poorest income group have a positive and significant probability of using both the formal and informal sectors for credit. This highlights the increased access to credit in China through microcredit programs.
- In SA, individuals in the poorest income quantile are mostly excluded from access to credit in both the formal and informal channels. This is because around 70% of the SA sample reported having financial difficulties in the past year, suggesting higher credit demands in SA.
- Finally, in the full sample results of BRICS, the male gender had a negative probability of saving in the informal sector but a positive probability of using the formal sector to save and borrow in both sectors. In Brazil, males also prefer to save and borrow in the formal sector; in India and South Africa, the association of male individuals saving through informal channels was negative.

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6. List of own publications related to the topic

This thesis links three articles with a common theme on FSD and income inequality. In essence, each of the three articles consisting of this article-based thesis addresses its research questions, which are, in the end, interlinked to the paradigm of FSD and income distribution. As such the three articles are related to the central theme because they explore FSD and income distribution and are different in the sense that they individually explore different data and different empirical methodologies.

Article 1: titled "The impacts of overall financial development, access, depth on income inequality" and was published in the *Economies* journal, which is an open access. This paper is accessible here: <https://www.mdpi.com/2227-7099/10/5/118>.

Article 2: titled "Financial deepening on income inequality: A quantitative meta-analysis study" and was published in the *Economy and Society Journal* and can be found here: <https://doi.org/10.1556/204.2023.00026>.

Article 3: titled "Determinants of using formal vs informal financial sector in BRICS group", was published with the *Finance Research Letters*, and the article can be accessed here: <https://doi.org/10.1016/j.frl.2023.103956>.