# CHARLES UNIVERSITY

FACULTY OF SOCIAL SCIENCES

Institute of Economic Studies

# Does Bank Regulation and Supervision Impact Income Inequality? Cross-Country Evidence

Master's Thesis

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Academic Year: 2023/2024

## Declaration of Authorship

The author hereby declares that she compiled this thesis independently; using only the listed resources and literature, and the thesis has not been used to obtain a different or the same degree.

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Prague, April 30, 2024 Bc. Zuzana Meteláková

# Acknowledgments

I would like to express my gratitude, especially to doc. PhDr. Adam Geršl, Ph.D. for his kind attitude and valuable guidance and suggestions since the beginning of the writing process. I would also like to express my sincere thanks to my family, friends, and partner for providing me with unfailing support and encouragement throughout my years of study.


**Bibliographic Record**

Meteláková, Zuzana: *Does Bank Regulation and Supervision Impact Income Inequality? Cross-Country Evidence.* Master's thesis. Charles University, Faculty of Social Sciences, Institute of Economic Studies, Prague. 2024, pages 113. Advisor: doc. PhDr. Adam Geršl, Ph.D.

# Abstract

This thesis examines how microprudential policy, as captured by bank regulation and supervision practices, affects income inequality and whether and how the effect of macroprudential policy on income inequality depends on the stance of microprudential policy. The dataset covers 70 countries over the period 1996−2013. Using the GMM estimation method, the analysis provides evidence that tighter microprudential policy leads to a reduction in income inequality as measured by the Gini coefficient. However, the effect of an overall tightening of microprudential policy disappears in countries with low levels of economic development. Among the various microprudential policies, the power and independence of supervisory authorities have the most significant negative impact on income inequality. Moreover, the effects of macroprudential policy tightening on income inequality are amplified when it is implemented within a strict microprudential policy framework. In addition, the results suggest that macroprudential policy tightening is effective in reducing income inequality under a strong microprudential policy framework, while the effect is reversed under a weak microprudential policy framework. This paper contributes to the growing literature on the spillover effects of banking regulation and supervision and on the relationship between financial sector policies and income inequality.



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| **JEL Classification** | G21, G28, O15, O16 |
| **Keywords** | Income Inequality, Microprudential Policy, Macroprudential Policy, Crisis Prevention, Panel Data |
| **Title** | Does Bank Regulation and Supervision Impact Income Inequality? Cross-Country Evidence |

# Abstrakt

Tato práce zkoumá, jak mikroobezřetnostní politika měřená nastavením bankovní regulace a dohledu ovlivňuje příjmovou nerovnost a zda a jak závisí dopad makroobezřetnostní politiky na příjmovou nerovnost na postoji mikroobezřetnostní politiky. Data zahrnují 70 států v průběhu let 1996−2013. S využitím ekonometrické metody GMM byly odhadnuty parametry modelů. Výsledky ukazují, že přísnější mikroobezřetnostní politika vede ke snížení příjmové nerovnosti měřené Giniho koeficientem. Účinek celkového zpřísnění mikroobezřetnostní politiky však mizí v zemích s rozvíjející se tržní ekonomikou. Z různých nástrojů mikroobezřetnostní politiky mají nejvýraznější negativní dopad na příjmovou nerovnost pravomoci a nezávislost orgánů dohledu. Dále výsledky naznačují, že se účinky zpřísnění makroobezřetnostní politiky na příjmovou nerovnost zesilují, pokud je prováděno v přísném rámci mikroobezřetnostní politiky. Postoj mikroobezřetnostní politiky také ovlivňuje směr efektu makrobezřetnostního zpřísnění na příjmovou nerovnost. Zpřísnění makroobezřetnostní politiky je účinné při snižování příjmové nerovnosti v silném rámci mikroobezřetnostní politiky, zatímco v slabém rámci mikroobezřetnostní politiky je tento účinek opačný. Tato diplomová práce přispívá k rostoucí literatuře o vedlejších účincích bankovní regulace a dohledu a o vztahu mezi politikami finančního sektoru a příjmovou nerovností.

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|---|---|
| **Klasifikace JEL** | G21, G28, O15, O16 |
| **Klíčová slova** | Příjmová nerovnost, Mikroobezřetnostní politika, Makroobezřetnostní politika, Prevence krizí, Panelová data |
| **Název práce** | Ovlivňuje bankovní dohled a regulace příjmovou nerovnost? Evidence z mezinárodního vzorku zemí |

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# Acronyms

| | |
|---|---|
| **AE** | Advanced Economies |
| **BBM** | Borrower-based Measures |
| **BCBS** | Basel Committee on Banking Supervision |
| **BIS** | Bank for International Settlements |
| **CBM** | Capital-based Measures |
| **CNB** | Czech National Bank |
| **DSTI** | Debt-Service-to-Income |
| **DTI** | Debt-to-Income |
| **EMDE** | Emerging Markets and Developing Economies |
| **FD** | First Difference |
| **GDP** | Gross Domestic Product |
| **GFC** | Global Financial Crisis |
| **GMM** | Generalized Method of Moments |
| **iMaPP** | Integrated Macroprudential Policy |
| **IMF** | International Monetary Fund |
| **IV** | Instrumental Variables |
| **LCR** | Liquidity Coverage Ratio |
| **LTV** | Loan-to-Value |
| **NSFR** | Net Stable Funding Ratio |
| **OLS** | Ordinary Least Squares |
| **OM** | Other Measures |
| **SWIID** | Standardized World Income Inequality Database |
| **WGI** | Worldwide Governance Indicators |
| **WID** | World Inequality Database |

# Master's Thesis Proposal

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| **Author** | Bc. Zuzana Meteláková |
| **Supervisor** | doc. PhDr. Adam Geršl, Ph.D. |
| **Proposed Topic** | Does Bank Regulation and Supervision Impact Income Inequality? Cross-Country Evidence |

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**Motivation** Financial sector policies, such as bank regulation and supervision, have significantly evolved over the past 30 years. The Basel regulatory framework has moved from the rather simple Basel I in the early 1990s to the more complex Basel II in the 2000s up to the current Basel III that has been designed after the Global Financial Crisis 2008/2009 and implemented from 2010 on, in parallel with the newly established macroprudential policy that complements the traditional microprudential focus of the bank regulation. Also, in the conduct of supervision, there have been many improvements and changes over the same years, with most countries moving from compliance-based supervision to more risk-based supervision, in line with the Pillar 2 idea of the Basel II to deepen the supervisory dialogue between the regulator and the banks. Nonetheless, despite the acknowledged benefits of safeguarding the stability of the financial system and individual institutions, there may be unintended consequences of the continuous reforms in the regulatory and supervisory framework in terms of negative spillovers to the real economy both in the overall economic growth and the level of income inequality (Malovaná *et al.,* 2023; Frost & van Stralen, 2018).

Changes in financial sector policies can both increase and decrease income inequality. Tighter loan eligibility criteria or more stringent capital regulation can make banks focus on richer households and large firms, decreasing the access to finance for poorer households and smaller firms and potentially increasing income inequality (Frost & van Stralen, 2018). Financial liberalization and looser policies could increase the income of the lower quantiles of the income distribution while having a negligible impact on income above the 50th quantile (Beck *et al.,* 2010), decreasing income inequality. On the other hand, tighter policies would prevent excesses in financial intermediation and the subsequent financial crises, decreasing income inequality (as during crises, poorer households typically suffer more). Moreover, various regulatory policies can have diverse objectives, leading to potentially contrasting or contradictory effects on income distribution (Delis *et al.,* 2014). Bank regulation and supervision still vary widely across countries in many distinct dimensions (Barth *et al*., 2013),

which provides an opportunity to explore the impact of both macroprudential and microprudential measures on income distribution.

Existing literature investigates primarily the link between macroprudential policy and income and wealth inequality, while research on the relationship between microprudential regulation/supervision (or financial liberalization) and income inequality is scarce. Frost and van Stralen (2018) use country-level data for 2000-2013 to seek whether and how are macroprudential policy tools related to measures of inequality. They suggest that the macroprudential policy tools are positively associated with income inequality. Malovaná, Janků, and Hodula (2023) identify two channels through which macroprudential policy affects income inequality - the prevention channel and the crisis mitigation channel which have different impacts on income inequality. Instead of country-level data, some papers inspect bank-level and household-level data, mainly the Household Finance and Consumption Survey, and China Household Finance Survey (Carpantier *et al.,* 2018; Georescu & Martín, 2021; Park & Kim, 2023; Zhai *et al*., 2023).

With respect to microprudential policies, using state-level data for 1997-2005, Delis et al. (2014) estimate a negative relationship between income inequality and credit and interest rate controls whereas a positive association with the liberalization of securities markets. They conclude that the overall effect of banking regulation is lower income inequality and narrower income distribution. On the contrary, the results of Agnello et al. (2012) and De Haan et al. (2017) imply a positive relationship between income inequality and financial liberalization.

**Hypotheses**

1. Hypothesis#1: Tighter microprudential policies are associated with higher income inequality.
2. Hypothesis#2: The impact of microprudential policies on income inequality depends on the stance of macroprudential policy.
3. Hypothesis#3: The effects of microprudential policies vary across different regulatory instruments.

**Methodology** In the thesis, the effects of the relationship between income inequality and the stringency of bank regulation and supervision are estimated. Using country-level data, both the individual effects of macroprudential and microprudential policy tools and their aggregate effect (capturing the interaction) will be examined. We will also control for other factors and zoom in on an additional potential interaction, namely with monetary policy. Our analysis will also show what concrete policy areas and tools are associated with income inequality and in which direction.

In the research analysis, we will consider using fixed effects or GMM to account for potential endogeneity as in Delis et al. (2014). Given that macroeconomic data are noisy, the levels and multiple-year averages are going to be considered (Delis *et al*., 2014; De Haan & Sturm, 2017).

The measure of income inequality is the Gini coefficient from the Standardized World Income Inequality Database (SWIID) including Gini coefficients before and after government redistribution. The SWIID enhances the comprehensibility and comparability of Gini coefficients by standardizing consumption and wage income, making it the most comprehensive source for such data (Solt, 2016). Analogously, the effects of bank regulation and supervision stringency (microprudential policy tools) will be added to the model in two ways - either as an index representing the financial liberalization based on the Revised and Updated Financial Reform Database by Omori (2023) widening the original dataset by Abiad et al. (2010) or from the Bank Regulation and Supervision Survey conducted by the World Bank. The macroprudential policy measures will be included in the regression in the form of an index based on the Integrated Macroprudential Policy Database (iMaPP) available from the International Monetary Fund.

Other control variables will be included in the model to capture their known effect on income inequality – macro-financial variables, monetary policy stance, demographic variables, and trade and fiscal policy factors. These controls will include government expenditures on cash transfers and subsidies, average years of schooling as a proxy for human capital, unemployment, domestic credit to the private sector to GDP, GDP per capita, and others. I will collect them from public databases of Our World in Data (OWID), World Bank, United Nations, UNESCO Institute for Statistics (UIS), and International Monetary Fund.

The analysis will further distinguish between advanced economies and emerging and developing economies. Finally, since the dataset will be composed based on numerous data sources, the research will try to use the longest possible panel of data to capture the effect on income inequality in an optimal manner.

**Expected Contribution** This thesis is going to contribute to the developing area of research on the effect of financial sector policies on income inequality, with a focus on microprudential regulation and supervision of banks. Specifically, there are only few studies that investigate the impact of other than macroprudential policy tools on inequality, and the existing literature on microprudential policies uses aggregate financial liberalization indexes from the Financial Reform Database constructed by Abiad et al. (2010) covering the years 1973-2005 and 91 economies (Agnello *et al.,* 2012; Delis *et al*., 2014; De Haan *et al.,* 2017). This thesis will use the extended database from the Revised and Updated Financial Reform Database by Sawa Omori ending in 2013, covering 100 economies and including decomposed bank regulation

indexes on three levels which enables the identification of channels of the spillover effect of the microprudential measures on income inequality (Omori, 2022). Also, the World Bank Survey data on bank regulation and supervision will be utilized.

To my knowledge, this thesis would be the first to combine these explore these two data sources to explore the impact of microprudential policies on inequality. The interaction effects between microprudential and macroprudential policy tools, and potentially also with monetary policy, on income inequality might also be investigated. The results of my thesis will offer new insights into the unintended effects of bank regulation and supervision on the real economy and could be interesting for financial regulators, central bankers, and other policymakers.

**Outline**

1. Introduction
2. Literature Review
3. Data Description and Descriptive Statistics
4. Methodology
5. Results
6. Conclusion

**Core Bibliography**

Abiad, A., Detragiache, E., & Tressel, T. (2010). A new database of financial reforms. *IMF Staff Papers*, *57*(2), 281-302.

Agnello, L., Mallick, S. K., & Sousa, R. M. (2012). Financial reforms and income inequality. *Economics Letters*, *116*(3), 583-587.

Anginer, D., Bertay, A. C., Cull, R., Demirgüç-Kunt, A., & Mare, D. S. (2019). Bank regulation and supervision ten years after the global financial crisis. *World Bank Policy Research Working Paper*, (9044).

Barth, J. R., Caprio Jr, G., & Levine, R. (2013). Bank regulation and supervision in 180 countries from 1999 to 2011. *Journal of Financial Economic Policy*, *5*(2), 111-219.

Beck, T., Levine, R., & Levkov, A. (2010). Big bad banks? The winners and losers from bank deregulation in the United States. *The Journal of Finance, 65(5)*, 1637-1667.

Blau, B. M. (2018). Income inequality, poverty, and the liquidity of stock markets. *Journal of Development Economics*, *130*, 113-126.

Bodea, C., Houle, C., & Kim, H. (2021). Do financial crises increase income inequality?. *World Development*, *147*, 105635.

Brei, M., Ferri, G., & Gambacorta, L. (2018). Financial structure and income inequality.

Bumann, S., & Lensink, R. (2016). Capital account liberalization and income inequality. *Journal of International Money and Finance*, *61*, 143-162.

Carpantier, J. F., Olivera, J., & Van Kerm, P. (2018). Macroprudential policy and household wealth inequality. *Journal of International Money and Finance*, *85*, 262-277.

Christopoulos, D., & McAdam, P. (2017). Do financial reforms help stabilize inequality?. *Journal of International Money and Finance*, *70*, 45-61.

ClAEsens, S., & Perotti, E. (2007). Finance and inequality: Channels and evidence. *Journal of comparative Economics*, *35*(4), 748-773.

Colciago, A., Samarina, A., & de Haan, J. (2019). Central bank policies and income and wealth inequality: A survey. *Journal of Economic Surveys*, *33*(4), 1199-1231.

De Haan, J., & Sturm, J. E. (2017). Finance and income inequality: A review and new evidence. *European Journal of Political Economy*, *50*, 171-195.

Delis, M. D., Hasan, I., & Kazakis, P. (2014). Bank regulations and income inequality: Empirical evidence. *Review of Finance*, *18*(5), 1811-1846.

El Said, A., Emara, N., & Pearlman, J. (2019). On the Impact of Financial Inclusion on Financial Stability and Inequality: The Role of Macroprudential Policies. *Department of Economics, Discussion Paper Series*, (20/06).

Frost, J., & van Stralen, R. (2018). Macroprudential policy and income inequality. *Journal of International Money and Finance*, *85*, 278-290.

Georgescu, O. M., & Martín, D. V. (2021). Do macroprudential measures increase inequality? Evidence from the Euro area household survey.

Malovana, S., Janku, J., & Hodula, M. (2023). *Macroprudential Policy and Income Inequality: The Trade-off Between Crisis Prevention and Credit Redistribution* (No. 2023/3).

Oliveira, S. L. G. (2021). (Un) conventional Monetary Policy, Macroprudential Policy, and Inequality.

Omori, S. (2022). Introducing the Revised and Updated Financial Reform Database. Journal of Financial Regulation, 8(2), 230-240.

Park, S., & Kim, Y. H. (2023). The impact of macroprudential policy on inequality and implications for inclusive financial stability. Journal of Banking & Finance, 146, 106716.

Solt, F. (2016). The standardized world income inequality database. Social science quarterly, 97(5), 1267-1281.

Zhai, K., Zhao, G., & Li, D. (2023). Macroprudential policy and household wealth inequality: Evidence from China. Journal of Asian Economics, 86, 101608.

Author Supervisor

# 1 Introduction

In the wake of the Global Financial Crisis (GFC) of 2008/2009, there has been much debate about the benefits and harms of financial sector policies for society. Financial sector policies, including microprudential bank regulation and supervision, have evolved significantly over the last 30 years. The Basel regulatory framework has improved from the relatively simple Basel I in the early 1990s to the more complex Basel II in 2000s and finally to the Basel III in 2010. This refinement has occurred in combination with the development of macroprudential policy to complement the traditional microprudential focus of bank regulation. In addition, there have been many improvements and changes in terms of the supervision of banks in the same years, with most countries moving from compliance-based to more risk-based supervision, which is in line with the Basel II idea of deepening the supervisory dialogue between the regulator and banks. However, despite the acknowledged benefits of protecting the safety of depositors, creditors, and borrowers, as well as the stability of individual institutions and the financial system, the implementation of microprudential supervisory and regulatory policies may have unintended consequences in terms of negative short-term costs to the real economy, both in terms of the level of income inequality and overall economic growth (Malovaná *et al.*, 2023; Frost & van Stralen, 2018). Income inequality remains at the centre of the global economic policy debate as it can have significant social and political consequences as well as adverse effects on economic growth (IMF, 2022; Stiglitz, 2016). A growing body of research suggests that policies related to monetary policy, macroprudential regulation, and financial liberalisation have implications for income distribution (Auclert, 2019; Malovaná *et al.,* 2023; Delis *et al.,* 2014). However, there is a lack of consistent and reliable research on the impact of microprudential regulation and supervision policies on income inequality.

The objective of this thesis is to contribute to existing research on the relationship between financial sector policies and income inequality by assessing the impact of microprudential policy and its regulatory instruments on income inequality. The effects of macroprudential policy conditional on the setting of microprudential policy are also assessed. Our research thus adds to at least two strands of literature. First, the role of microprudential policy has not been explicitly considered in the finance-inequality literature. Second, we contribute to research on the effects of macroprudential policy on income inequality by assessing how it affects income inequality conditional on the stringency of microprudential

policy, rather than focusing on its unconditional effect, which is the common practice in the existing literature.

Consistent with existing research on the relationship between finance and inequality, the relationships are estimated using non-overlapping three-year averages of data from a panel of 70 countries over the period 1996−2013. The dependent variable is the market Gini coefficient. The data on microprudential policies is based on the Financial Reform Database constructed by Omori (2022), while the data on macroprudential policy is based on Alam et al. (2019). The control variables are selected in line with the literature on the determinants of income inequality and include factors such as gross domestic product (GDP) per capita and its square, unemployment rate, trade openness, human capital, and financial development, among others. In addition, differences between advanced economies (AE) and emerging markets and developing economies (EMDE) are assessed, as the effects of financial sector policies may vary based on the development of countries (Malovaná *et al.,* 2023). All models are estimated using a two-step system generalized method of moments (GMM).

We provide evidence that tighter microprudential policies lead to lower levels of income inequality. This result is mainly driven by the effects of greater supervisory power and independence of supervisory authorities. Although in AE, both overall tighter microprudential policy and greater supervisory power reduce income inequality, in EMDE only greater supervisory independence contributes to the reduction in income inequality. Moreover, the effects of macroprudential policy interventions on income inequality are reinforced when they are implemented in a framework of strong microprudential regulation and supervision. Based on our estimates, under a strong microprudential policy framework, a tightening of macroprudential policy, especially through capital-based measures, mitigates financial imbalances and subsequent financial crises, thereby reducing income inequality. The crisis prevention channel is more pronounced in EMDE. However, some of the findings are not fully robust to alternative model specifications, making them suitable for further work in this area.

The thesis is further structured as follows. Chapter 2 is devoted to a description of the main concepts of income inequality and financial sector policies and a review of the existing literature on the effects of financial liberalisation and macroprudential and microprudential policies on income inequality. Chapter 3 presents the data used for the analysis. The methodology used in the analysis and the proposed hypotheses are presented in Chapter 4. Chapter 5 presents and comments on the results. Finally, the thesis is concluded in Chapter 6.

# 2 Main Concepts and Literature Review

This Chapter provides an overview of existing research on income inequality and bank regulation and supervision. Section 2.1 presents the definition, measurements, and possible determinants of income inequality. A summary of financial sector policies is given in section 2.2. The remainder of this Chapter reviews the existing literature on the relationship between income inequality and financial liberalisation and microprudential and macroprudential policies.

## 2.1 Income Inequality and Its Main Determinants

Income inequality is commonly defined as the degree to which there is an uneven distribution of income within a population. Along with other concepts of inequality, such as wealth inequality, inequality of opportunity, and lifetime inequality, it is considered a major component of social stratification. In combination, they provide a comprehensive view of the extent of inequality (Carter & Howard, 2023; De Haan & Strum, 2017; Hassel, 2018; IMF, 2022). The International Monetary Fund (IMF) 2022 report states that income inequality is still the dominant view of inequality used in most analyses. Moreover, given its potential for negative social and political impacts and detrimental effects on economic growth, income inequality is at the centre of the global economic policy debate (IMF, 2022; Stiglitz, 2016).

To quantify income inequality, the Gini coefficient[1], income shares, the Theil index, the Hoover index, the Palma ratio, and the Atkinson index can be used. All these metrics measure income inequality but do so in different ways. There are other metrics for measuring income inequality, but they are hardly used in research. In the empirical literature, the most widely used metric for measuring income inequality is the Gini index (Delis *et al.,* 2014). The Lorenz curve, which plots the cumulative share of total income attainment on the vertical axis and the population percentile by income on the horizontal axis, serves as the basis for its construction. The Gini index is then equal to the ratio of the area between the Lorenz curve and the line of perfect equality to the total area under the line of perfect equality.[2] Thus, the Gini index ranges between 0 (perfect equality) and 1 (perfect inequality) and is usually expressed as a percentage ranging from 0 to 100 (IMF, 2022). However, the Gini index has

[1] In accordance with the literature, we use the terms Gini coefficient and Gini index interchangeably.
[2] Line of perfect equality is the line in the Lorenz curve graph at 45 degrees, i.e., diagonal line from the bottom left to the top right.

some limitations, as it is particularly sensitive to changes in the middle-income bands and less sensitive to changes in the extreme income bands. Given its limited sensitivity to changes in the upper tail of the distribution, the Gini index may not adequately capture significant changes in the income distribution among the highest income individuals. Moreover, the income distribution may have different shapes and asymmetries, but the Gini coefficient assumes that inequality is symmetric (Hassel, 2023).

Unlike the Gini index, the Theil index is part of a class of general measures of entropy. It represents the difference between the maximum entropy, where income groups cannot be distinguished by their sources, and the observed entropy.[3] The Theil index ranges from 0 to positive infinity, where 0 indicates perfect equality and an increasing index indicates increasing income inequality (Theil, 1969). Income shares, which focus on specific quantiles of income distribution, may better capture the source of the dynamics of income inequality and are the main focus of the World Inequality Database (WID). The Hoover index estimates the percentage of total income that must be redistributed from individuals who rank above the average income to those who rank below the average to achieve perfect income equality (Hoover, 1941).[4] The Palma ratio emphasizes the contribution to income of the two extremes of the income distribution – the richest and poorest individuals (Palma, 2011).[5] The Atkinson index helps to determine which end of the income distribution contributed most to income inequality (Atkinson, 1970).[6]

Since income can be defined in different ways, the specifics of income inequality need to be considered when measuring it. More specifically, it can reflect total consumption expenditure per person, the total amount of goods and services that people receive, market (gross) income, net income (after taxes and transfers) or disposable income per person or household.

As a result, either market or net income can be used to construct the Gini coefficient, with the Gini coefficient based on market income typically being higher than the Gini index based on net income (Anderson et al., 2017). In addition, in order to ensure better comparability of Gini indices across countries and to provide extended coverage of years and countries, the Standardized World Income Inequality Database (SWIID) has been recently created. SWIID

[3] The maximum entropy occurs when all outcomes are equally likely, resulting in maximum uncertainty. In contrast, if one outcome is certain (probability = 1) and others have a probability of 0, the entropy is 0 (minimum entropy), indicating no uncertainty.
[4] For a thorough description of the Hoover index, see Hoover (1941).
[5] For a thorough description of the Palma ratio, see Palma (2011).
[6] For a thorough description of the Atkinson index, see Atkinson (1970).

contains data on net (disposable) income and market income inequality, absolute redistribution[7] and relative redistribution[8] (Solt, 2016).

Improved measures of income inequality can contribute to better understanding of the factors that affect income inequality. Income inequality determinants are often classified in the literature as institutional, structural and demographic, and macroeconomic, although the classification is flexible. Recently, more emphasis has been placed on institutional factors than on other determinants of income inequality (Polacko, 2021).

First, the macroeconomic factors behind income inequality are summarized. Economic development is considered the most traditional macroeconomic factor behind income inequality. According to Kuznets (1955), in the initial stage of a country's development, income inequality decreases with greater economic development. In the later stage of development, income inequality tends to increase with further development. However, arguments against Kuznets' theory can also be found in the existing literature. To illustrate, Hailemariam et al. (2015) argue that in EMDE, growth in GDP per capita increases income inequality, while in AE it leads to a decline in income inequality. Either way, economic development as measured by GDP per capita is generally considered to be associated with income inequality. Moreover, some literature suggests that rising inflation may disproportionately affect the poor more than the rich. The vulnerability of low-income households to rising inflation is mainly due to the larger labour productivity gap (Albanesi *et al.,* 2007). Moreover, a greater probability of banking crises may be related to higher income inequality because the poor are most affected. In addition, Malovaná et al. (2023) report that rising policy rate contributes to an increase in income inequality. The main channel through which monetary policy contributes to changes in income inequality is the relatively lower debt levels and interest-earning assets of low-income households, which causes asymmetric changes in income distribution.

Second, the structural and demographic determinants of income inequality are described. Using model averaging techniques, Furceri and Ostry (2019) suggest that higher unemployment, trade and financial globalization, and prominent technological changes are key structural determinants of income inequality. Technological advances themselves are assumed to place higher demands on workers with higher skills, thereby increasing income inequality within the county (Polacko, 2021). Furthermore, trade globalization is believed to affect income inequality through the concentration of foreign assets and liabilities in technology-intensive segments, which, in line with traditional Heckscher-Ohlin trade theory, raises the wages of high-skilled workers (Dabla-Norris *et al.,* 2015). However, most studies suggest that

[7] Market-income inequality minus net-income inequality.
[8] Absolute distribution divided by the market-income inequality.

the relationship between trade openness and income inequality is insignificant (Rione *et al.,* 2009). Moreover, the existing literature suggests that there is a strong correlation between unemployment and income inequality. Unemployment can lead to higher income inequality especially if it persists for several consecutive cycles. Unemployed workers suffer from financial instability, which can lead to a decline in their standard of living. This can further widen the income gap between rich and poor (e.g. Malovaná *et al.,* 2023). Moreover, according to Mincer (1958), there is a positive correlation between income and educational inequality. He argues that higher levels of education increase wage levels, improve access to jobs and serve as an indicator of individuals' fitness and productivity. This relationship is supported by the findings of Rodríguez-Pose and Tselios (2009), Gregorio and Lee (2002) and Checchi (2008). Population growth can also affect income inequality through causing significant demographic changes (Delis *et al.,* 2014).

Third, institutional factors are outlined. For the purposes of this thesis, institutional factors also include the financial determinants of income inequality. Both social transfers and progressive taxes are assumed to affect income inequality (Anderson *et al.,* 2017). In the past, specifically between 1985 and 1995, progressive taxation seemed to reduce income inequality. However, recent studies show that since then redistributive taxation has failed to respond to the continued rise in income inequality (Polacko, 2021). Furthermore, labour market regulations, such as unionization and minimum wage floors, are generally considered to improve the equality of income distribution (Haddow, 2013; Tridico, 2017). In addition, the presence of better institutions can reduce income inequality by enhancing the impact of regulations on income distribution (Delis *et al*., 2014). Political institutions can influence economic institutions, which in turn affect income inequality through economic performance. In theory, higher levels of democracy can lead to a reduction in income inequality because the poor can outvote the rich and demand redistribution. However, Grandstein et al. (2001) do not find robust evidence for this relationship.

Van Velthoven et al. (2018) state that income inequality caused by finance is associated with more income redistribution than inequality caused by other factors. According to Dabla-Norris et al. (2015), financial development can improve income distribution because access to financial resources can increase individuals' investment in education, improve returns to capital, and help them cope with financial shocks. In addition, based on the findings of Rione et al. (2009), the effect of financial deepening, proxied by the credit-to-GDP ratio, on market and net income inequality differs between AE and EMDE. They report that in AE, better access to credit is associated with lower income inequality. However, in EMDE, financial deepening results in a rise in income equality. This may signal that in EMDE there is a greater

concentration of credit among the highest income shares (Dabla-Norris *et al.,* 2015). Effects of financial sector policies on income inequality are described further in sections 2.3–2.5. In conclusion, research on the relationship between income inequality and financial policy and its evolution has intensified in recent years (Alexiou *et al.,* 2022; Delis *et al.,* 2014; Steininger & Sigmund, 2019).

## 2.2 Financial Sector Policies

The financial sector's function of facilitating payments, providing liquidity, pooling savings, enabling risk sharing and credit intermediation between savers and investors, contributes to economic well-being. Contrarily, its distortions lead to great costs to the real economy (White, 2013). Financial sector policies, such as the original financial liberalization policies and the currently widely applied supervisory practices and regulations in line with Basel Accords principles, are presented in this section.

In the literature to date, financial liberalization mostly represents the abolition of entry requirements, easing interest rate controls, alleviating credit controls and reserve requirements, liberalization of the capital account[9], privatization of banks, and liberalization of the securities market (Abiad *et al.,* 2010). Recent studies have relied primarily on financial liberalization indices from the financial reform database by Abiad et al. (2010). The data is based on graded scores covering seven pillars of financial liberalization policies for the period 1973−2005. Financial liberalization policies also cover bank licensing, asset diversification requirements, limits on foreign exchange exposure, provisioning rules, the application of enforcement powers, deposit insurance, and restrictions on nonbank activities (Polizatto, 1990).

Nevertheless, financial sector policies, such as bank regulation and supervision, have evolved significantly in the last 30 years since the Basel I Accord in 1988 by the Basel Committee on Banking Supervision (BCBS). BCBS is the primary global standard setter for the microprudential and macroprudential regulation of banks.

Microprudential policy aims to ensure the safety and soundness of individual financial institutions. The main objective of microprudential policy is to protect depositors (Ekpu, 2016). In general, microprudential policy tools were scarcely applied until the Great Depression, which led to the tightening of financial regulations, especially in the United States. The global use of regulatory measures started with the Basel I Accord as a response to the increasing

[9] External finance from abroad.

concern about internationally active banks (White, 2013). From the rather simple Basel I focusing on capital requirements for credit risk, the Basel regulatory framework moved to a more complex Basel II in 2004. As opposed to Basel I, Basel II covers in its Pillar I minimum capital requirements also for market risk and operational risk. In 2010, Basel III adjusted the restrictions imposed on capital requirements on market, operational, and credit risk. Moreover, in Basel III, the risk-unweighted leverage ratio was introduced to complement the risk-based measures. Compliance with the leverage ratio ensures that banks do not overextend their assets, given their capital base. Furthermore, large exposure restrictions were adopted to reduce the risk of concentration and contagion linked to counterparty default. To add to this, liquidity-based measures, such as the net stable funding ratio (NSFR) and the liquidity coverage ratio (LCR), addressing risks originating from maturity mismatches were introduced (Elsembawy, 2021; Dias *et al*., 2020).

Even though economists have thoroughly examined banking sector regulations and the industry itself, there has been notably less focus on bank supervision as a separate and distinct activity. This disparity may, in part, arise due to the limited information available regarding the nature of bank supervision and the responsibilities of bank supervisors. This can be attributed to the confidentiality surrounding most supervisory activities and their outcomes. The review of bank supervision in this thesis focuses on microprudential supervision, i.e., the supervision of individual banks aiming to assess their financial and operational health (Hitle & Kovner, 2022).

Since the GFC, there have been improvements and changes in bank supervision, even though the supervisory capacity has not risen proportionally to the extent and complexity of new bank regulations (Anginer *et al.,* 2019). Bank supervision includes evaluating banks' risk management practices, evaluating corporate governance and internal controls, identifying potential risks to the banks' continued financial stability and sustainability, and, above all, taking the necessary steps for banks to address deficiencies identified through these evaluations (Hitle & Kovner, 2022). In individual countries, the supervision of the banking sector can vary in the scope of supervision, the structure of supervision (who supervises the banks), and the independence of the supervisory authorities (Barth *et al.,* 2008).

Most countries moved from compliance-based supervision to more risk-based supervision, in line with the principles of Pillar II of Basel II (BIS, 2019). Under compliance-based supervision, supervisory authorities oversee how banks comply with a set of required prudential rules. Risk-based supervision assesses both system and individual firm risk and considers specific exogenous bank risks in the assessment. This assessment of the banks' financial situation, which is part of Pillar II of Basel II and Basel III, is often inspired by the

CAMELS assessment model used in the United States (Ekpu, 2016). The supervisory evaluation process under Pillar II aims to generate an active dialogue between supervisors and banks such that prompt actions can be taken to reduce risk, address deficiencies, and restore capital when needed. Under the supervisory review process, the bank's management is responsible for developing an internal capital assessment process and ensuring that the bank has sufficient capital given its risks beyond the minimum requirements. In addition, under Pillar II, supervisors assess how well banks assess their capital needs in relation to their risk profile and implement corrective measures when deemed necessary (BIS, 2019).

Nonetheless, the GFC demonstrated that the pre-crisis framework consisting of monetary and fiscal policy and microprudential regulation was not fully able to prevent systemic vulnerabilities in the financial sector (Constâncio *et al*., 2019; Kenç, 2016). Monitoring the resilience of individual credit institutions with the traditional microprudential policy was also proven to be rather insufficient in guaranteeing the soundness of the financial system as a whole due to ignoring externalities resulting from macro-financial interlinkages (CNB, 2011). For that reason, in 2010, one of the responses to GFC was the worldwide introduction of macroprudential policy in Basel III. Basel III reacted to the procyclicality of former capital requirements, insufficiency of liquidity regulations, and lack of macroprudential tools that would aim at safeguarding the stability of the financial system (Laeven *et al.*, 2022).

The main tasks of macroprudential policy are the prevention of systemic risk and the mitigation of its adverse consequences on the economy in case it materializes. Systemic risk accumulates in financial upturns and materializes in recessions. Therefore, relevant authorities should apply macroprudential policy tools primarily during financial upswings. Financial upswings are determined by the rise in credit, leverage, and asset prices (CNB, 2011). Consequently, this would moderate the financial cycle, which might otherwise result in an unstable boom (Constâncio *et al*., 2019).

The macroprudential policy tools for the banking sector can be divided into capital-based measures, liquidity-based measures, borrower-based measures, and other measures. Capital-based measures aim to enhance the resilience of institutions to shocks by increasing the level of capital in the banking system so that they have sufficient loss-absorbing capacity on a going concern basis (Constâncio *et al*., 2019; Grace *et al.,* 2015). Borrower-based measures directly target the amount of the borrowed exposure relative to the income of the borrower, such as limits on debt-to-income (DTI) or debt-service-to-income (DSTI), and relative to the underlying collateral, mostly represented by the loan-to-value (LTV) limit (Grace *et al*., 2015). Liquidity-based measures and other measures that were designed as

microprudential tools can also be used for macroprudential policy objectives (Dias *et al*., 2020).

## 2.3 Effect of Financial Liberalization on Income Inequality

Most of the literature on the relationship between finance and income inequality has examined how financial development affects income distribution, with less focus on how financial sector policies affect it. The literature on the relationship between financial liberalization and income inequality is summarized in this section, while the findings of the literature on the relationship between bank regulation and supervision – the financial sector policy that is the subject of this thesis defined as the microprudential bank supervision and regulation within the principles of the Basel Accords – is discussed in the section that follows even though they are primarily presented in studies on the relationship between financial liberalization and income inequality.

As in Abiad et al. (2010) and Delis et al. (2014), the terms financial reforms and financial liberalization are considered synonymous in the studies to be discussed. As a result, in keeping with the body of current research, the terms financial liberalization and reforms are used interchangeably in this section. Even though most studies use the financial reform database by Abiad et al. (2010), literature to date on the effect of financial liberalization on income inequality yields inconsistent and even contradictory results. While some authors provide evidence that, in general, greater financial liberalization is associated with lower income inequality, others have the opposite results. Furthermore, based on the reviewed papers, the effect of financial liberalization policies may be conditioned by the level of financial development, human capital, and quality of political institutions. Financial liberalization is also likely to contribute to a decrease in income inequality in high-income countries as opposed to low-income countries.

In theory, financial liberalization may influence income inequality in different ways. More stringent financial sector regulations could raise barriers to entry, which make access to banking services less inclusive (Manish & O'Reilly, 2019). Thus, financial liberalization may, via the abolition of entry requirements for banks, elimination of interest rate controls, liberalization of the capital account, and the privatization of banks, develop financial intermediation services and increase the efficiency of the banking sector. Consequently, financial liberalization may decrease income inequality by allowing individuals at the bottom of the income distribution to access loans and capital more easily and invest more efficiently and at a lower cost (Delis *et al.,* 2014). Financial liberalization may also decrease income

inequality by ensuring that all profit from risk sharing and consumption smoothing (Furceri & Loungani, 2015). In contrast, since financial liberalization promotes standard procedures and criterion-based lending, banks may create barriers for individuals or companies with little credit history and insufficient collateral and prefer providing credit to the rich. To add to this, opening a capital account may induce capital flow into high-skilled industries and thus increase wages for high-skilled workers relative to low-skilled workers. Capital account liberalization can also change the relative access to financial resources and thus impact the distribution of income (Furceri & Loungani, 2015). Moreover, higher capital requirements may reduce the likelihood of financial crises that hurt primarily the poor (Gomado, 2023).

Firstly, studies that conclude that income inequality increases amid greater financial liberalization are presented. An analysis of de Haan and Sturm (2017) using fixed effects regressions shows that a higher level of financial development, greater financial liberalization, and occurrence of banking crises all lead to an increase in income inequality. Additionally, the effect of financial liberalization is likely to be conditioned by the quality of political institutions and by the level of financial development. Moreover, using interaction terms, de Haan et al. (2018) add that the effect of financial liberalization on income inequality is of greater magnitude in countries where the level of financial development is already high.

Similarly, Manish and O'Reilly (2020) indicate that credit market liberalization is associated with a rise in income inequality. In addition, they suggest that the reregulation of the financial sector, captured in their model using the aggregate bank supervision index by Abiad et al. (2010), shows a more robust correlation with income inequality in comparison with measures of deregulation and liberalization of the financial sector.

Analogously, based on the Heritage Foundation financial freedom index for 51 African countries for the period 1995−2018 Koudalo and Wu (2022) provide statistically significant evidence that income inequality increases amid the increased level of financial liberalization. They suggest that the reason for this result is probably the exclusion of the poor from access to scarce financial resources in Africa. Be that as it may, the magnitude of the effect is relatively subtle. Moreover, they suggest that the relationship is conditional on monetary conditions, the quality of political institutions, and the phase of the business cycle.

By employing the autoregressive distributed lag framework, the analysis of Ang (2010) on the impact of finance on income inequality shows that financial liberalization tends to increase income inequality in India, as opposed to greater financial development, and that this effect is statistically significant. Concretely, they conclude that liberalization of reserve and

liquidity requirements, directed credit programs, and interest rate constraints most contribute to the rise in income inequality.

Gründler et al. (2020) investigate the link between structural reforms and income inequality using market and net income inequality data from 135 countries. Even though their findings indicate that market-oriented structural reforms are not associated with greater income inequality in the full sample of countries, they suggest that trade and financial liberalization lead to an increase in income inequality in high-income countries.

Johansson and Wang (2014) also employ the database by Abiad et al. (2010) but approach the indices differently. As opposed to the previous studies examining the effects of financial liberalization, they investigate the impact of financial repression (more stringent policy) based on data for 90 countries over the period 1981−2005. Their results show that financial repression decreases income inequality, and the effect is statistically significant. The impact of separate repressive policies is analogous to the aggregate effect, while the effects of more stringent interest rate controls, capital account controls, and concentration in the banking sector are the most prominent.

Based on four decades of data from 149 countries, Furceri and Loungani (2015) show that capital account liberalization has a significant positive effect on the annual change of the Gini coefficient, i.e., that capital account liberalization increases income inequality. Moreover, the effect increases in magnitude in the medium term. In addition, the results of their analysis indicate that the effect is muted in countries with a strong level of financial institutions. Moreover, in their later study, Furceri and Loungani (2018) provide evidence that, when followed by a financial crisis, capital account liberalization leads to a greater increase in income inequality. Moreover, they demonstrate that capital account liberalization lowers the labour share of income by altering the relative bargaining power of companies and employees.

Analogously, using dynamic panel fixed effects and the difference-in-differences methodology, Li and Su (2020) find that the liberalization of capital accounts is significantly related to higher income inequality in developing economies, while for developed countries, the effect is statistically insignificant. To add to this, they indicate that inward capital account liberalization has a greater effect than outward capital account liberalization.

Bumann and Lensink (2016) examine the impact of capital account liberalization, proxied by the capital account openness index developed by Chinn and Ito (2008), on income inequality. They implement the GMM methodology using data from 106 countries over the period 1973−2008. They provide statistically significant evidence that the liberalization of

capital accounts leads to a rise in income inequality. However, they suggest that the effect of capital account liberalization is less harmful in countries with greater financial depth.

Contrarily, other authors find that greater financial liberalization leads to a decrease in income inequality. Delis et al. (2014) find a significant negative effect of financial liberalization on the Gini coefficient, both for individual and household income. Concretely, liberalizing interest and credit control seems to decrease income inequality most significantly. They imply that greater credit controls can reduce bank liquidity and consequently disadvantage the poor. According to Delis et al. (2014), the liberalization of security markets appears to increase income inequality, which may be explained by the trade-off between liquidity to fund investments and liquidity going to securities. Moreover, they conclude that the effects of liberalizing the financial sector are much stronger in bank-based economies compared to market-based economies.

Similarly, Agnello et al. (2012) indicate that a more equitable income distribution can be achieved by implementing liberalizing financial reforms, such as eliminating subsidized direct credit and excessive reserve requirements and improving stock market regulations. Yet they state that the effects of other liberalization policies, including bank privatization, reducing entry barriers, and opening a capital account, on income inequality are insignificant.

Analysis by Li and Yu (2014), using data on 18 Asian countries, indicates that financial reforms are effective in decreasing income inequality. According to their results, the effect is stronger in countries with higher human capital. This may signal that the better-educated poor utilize the funding provided more efficiently. They conclude that liberalizing credit controls and security market development significantly decrease income inequality, whereas the effects of lifting interest rate controls, the removal of entry barriers, bank privatization, and capital account liberalization seem to be insignificant in Asia.

Gomado (2023) focuses on the effect of financial reforms on income inequality in 64 emerging and low-income countries. Using the local projection method and the inverse probability weighting estimator, the results show that domestic financial liberalization[10] contributes to the decrease in income inequality. Moreover, this effect seems to be statistically significant, immediate, and persistent over time. The immediate effect of external financial

[10] Credit controls, interest rate controls, privatization, bank supervision, security market development, and barriers to entry.

reforms[11] is insignificant. However, in the medium term, external financial reforms decrease income inequality, and this effect is statistically significant.

Moreover, the findings of the study conducted by Hsieh et al. (2019) provide evidence that a more market-based financial system and financial reforms toward promoting stock market development are associated with a more equitable income distribution. In addition, a less concentrated and more competitive banking sector has been demonstrated to decrease income inequality. The authors analyse data from a panel of 86 countries over the years 1989−2014 using continuously updated estimators. In addition, using the semi-parametric approach, Christopoulos and McAdam (2017) demonstrate that income inequality represented by the net Gini index can be decreased by financial reforms.

A meta-analysis by Liu and Ni (2019) reviews 23 cross-country studies on the relationship between financial liberalization and income inequality. After accounting for publication bias and methodology heterogeneity, they suggest that greater financial liberalization is linked to a decrease in income inequality. Moreover, they justify the inconsistency between the estimated effects in the literature by using distinct measurements of income, income inequality, and financial liberalization, variations in econometric methods applied, and differences in institutional quality.

## 2.4 Effect of Bank Regulation and Supervision on Income Inequality

In the literature, the relationship between income inequality and bank regulation and supervision in line with the Basel Accords has received little attention. Moreover, the studies to date have even produced contradictory results and lack a clear explanation of the relationship. Furthermore, no conclusions have been drawn about the differences between the effects of bank regulation and supervision on income inequality in AE and EMDE.

The main channel through which bank regulation may affect income distribution is the access to credit. Since holding capital is expensive for banks, more stringent capital requirements may incentivize banks to lend to relatively richer and thus safer individuals who can then generate income with the capital (Furceri & Loungani, 2015). Improved access to credit fosters human and physical capital accumulation and, subsequently, may decrease income equality (Baiardi & Morana, 2018). Nonetheless, Jianu (2020) suggests that a rising

[11] Capital account opening.

private credit to GDP (proxy for financial development) leads to more unequal income based on data from 15 European Union member states. Moreover, higher capital requirements may reduce the likelihood of financial crises that hurt primarily the poor (Gomado, 2023).

The economic literature on banking sector supervision mostly deals with the impact of the characteristics of the bank examination process on the bank lending supply. Specifically, the characteristics of the bank examination process can be understood as the criteria and rigour of assessors when evaluating a bank's loan portfolio and its overall safety and stability. These studies show that increased supervisory stringency is related to a reduction in loan origination and slower loan growth (Beck *et al*., 2006; Curry *et al*., 2008). Moreover, according to Passalacqua et al. (2021), the contraction in credit is mainly attributed to decreased lending to underperforming firms as banks tend to optimize their loan portfolio by investing more in healthy and new companies. In addition, a rising number of papers have shown that bank supervision has led to reductions in bank risks (Hirtle & Kovner, 2022). For these reasons, the increased stringency of bank supervision may have different associations with income inequality as it inhibits poorer individuals without sufficient collateral from obtaining bank credit but, on the other hand, mitigates negative effects of financial crises by reducing banking risks.

Eickmeier et al. (2018) estimate the impact of their indicator of aggregate regulatory capital requirement tightening on household income and expenditure inequality in the United States for the period 1980−2008. Using the local projection method, they conclude that tighter capital requirements lead to a decrease in household income inequality. They demonstrate that the income of rich households decreases disproportionally more than the income of households in lower percentiles of income distribution after tightening the capital requirement. The major drive is the decrease in financial income of richer households, which are more exposed to financial markets. Additionally, after capital requirement tightening, expenditure inequality decreases as well, but the effect is more subtle.

Furthermore, to examine the effect of bank regulation and supervision on income inequality, researchers also use the banking supervision index presented by Abiad et al. (2010) within their financial liberalization index. This aggregate index considers the prudential supervisory policies of the banking sector, compliance with the Basel framework, capital regulations, the level of independence and legal power of the supervisors, and their effectiveness in imposing the guidelines. However, since the index aggregates several dimensions, the impact of individual categories on income inequality is not yet estimated. Furthermore, the studies using the aggregate banking supervision index by Abiad et al. (2010) yield inconsistent results.

Delis et al. (2014) provide evidence that greater banking sector supervision contributes to more equal income distribution and that this effect is statistically significant. They suggest that these findings indicate that enhanced screening and monitoring of investment projects directs capital towards more promising projects, offering equitable chances to the poor. Similarly, Johansson and Wang (2014) identify that weak bank supervision leads to an increase in income inequality and that this relationship is statistically significant. In addition, the findings of Li and Yu (2014) signal that greater independence of banking supervision may significantly decrease lending that favours entities associated with political influence or power and consequently reduce income inequality. Christopoulos and McAdam (2017) confirm that a more stringent bank supervision decreases income inequality.

Contrarily, Manish and O'Reilly's (2020) analysis shows a positive relationship between supervisory rigour and the Gini coefficient used as a measure of income inequality. Their results further indicate that supervisory reregulation of the banking sector is relatively more strongly related to higher income inequality in contrast to financial liberalization variables. Analogously, Agnello et al. (2012) find that greater bank supervision increases income inequality, as measured by the Gini index. However, across all model specifications in their study, the effect is statistically insignificant.

## 2.5 Effect of Macroprudential Policy on Income Inequality

The analysis in this thesis also assesses the combined effect of microprudential and macroprudential policy on income inequality. This section outlines the literature on the relationship between macroprudential measures and both income and wealth inequality. We resorted to including the literature commenting on the impact of macroprudential policy measures on wealth inequality due to the lack of research on the relationship between income inequality and macroprudential policies and the fact that part of the income flows originates from real estate wealth. Moreover, we show that the existing literature emphasizes the importance of cooperation between microprudential and macroprudential policies for the effectiveness of macroprudential policy.

Macroprudential regulation aims to limit the distress of the entire financial system and avoid output costs by targeting the aggregate risk arising from the interactions between financial institutions and wider economy. Effective macroprudential policy depends on the judgment and inputs of microprudential supervision, including the power to issue and enforce compliance with macroprudential measures and full and unrestricted access to supervisory information on an individual legal entity basis. Cooperation and better communication on

macroprudential issues between these policies leads to optimal results of macroprudential policy initiatives (Krishnamurti & Carol Lee, 2014).

Mirzarei and Samet (2022) estimate the effect of macroprudential policy on limiting credit growth conditional the quality of bank regulation and supervision. Using interaction terms in their models on country-level data from 91 countries over the period 2001–2013, they provide evidence that macroprudential policy measures are more effective in an environment of strong microprudential supervisory power as well as increased monitoring. Similarly, using the macroprudential policy index by Cerutti et al. (2017) to measure the effectiveness of macroprudential policy tools in preventing the build-up of systemic risk, Ekinci and Özcan (2021) provide robust evidence that tighter microprudential policy measures make macroprudential policy more effective. The authors assessed the combined effect using an interaction term in their models estimated by the system GMM framework. They conclude that strong microprudential policy, especially greater supervisory power, complement the conduct of macroprudential policy.

Despite the acknowledged benefits of safeguarding the stability of the financial system, there may be unintended consequences of macroprudential regulations. These can be negative spillovers to the real economy, both in terms of overall economic growth and the level of income and wealth inequality. The prevailing emphasis in empirical research has primarily centred on examining the benefits of such policies, with relatively less focus on their potential downsides. According to the literature to date on the interlinkages between macroprudential tools and income and wealth inequality, more stringent borrower-based macroprudential policy tools are generally considered to increase both income and wealth inequality. The presence of spillovers to inequality from applying and tightening LTV and DTSI limits appears to be confirmed in most studies, especially in the case of wealth inequality. Nonetheless, there is little consensus on the effect of other macroprudential tools, either in combination or individually. Moreover, it seems to depend on the timing of the introduction of macroprudential tools concerning financial crises, which may affect inequality via different channels. Furthermore, there is little consensus on how the magnitude and sign of the effect of macroprudential policy on income and wealth inequality differ between AE and EMDE.

There may be several channels through which macroprudential policy may affect income inequality. Malovaná et al. (2023) identify the credit redistribution channel and the crisis mitigation and prevention channel. Via the credit redistribution channel, access to credit impacts the borrower’s future income, including investment income. Through the crisis prevention channel, macroprudential policy can mitigate the redistributive effects of financial crises, which affect the poor disproportionally more.

Part of the literature assesses the link between macroprudential instruments and income, or wealth inequality, based on aggregate macroeconomic data. These are mostly country-level panels. The findings of Frost and Van Stralen (2018) confirm that the effect of macroprudential policy on income inequality can be both upward and downward. They conclude that while interbank exposure limits, concentration limits, and reserve requirements increase both the market and the net Gini coefficient, leverage ratios and limits on foreign currency lending lead to a decrease in income inequality. The authors also comment on the redistributive effect of LTV and DTI limits on mortgages. These limits can prevent lower-income households from purchasing a house and using it as collateral for small business investments. Consequently, applying borrower-based tools may restrict lower-income households from increasing their income and benefiting from price increases. For their research, they use the database by Cerutti et al. (2017) on macroprudential policy instruments and inspect the panel of 69 countries over the period 2000−2013.

The analysis of Oliveira (2021) on a panel of Euro Area countries encompasses five measures of income inequality, such as the Theil index, income shares, and the Gini index, and macroprudential instruments from the iMaPP database. Apart from suggesting that the effect of macroprudential tools on income inequality varies across their types and the inequality measure, they conclude that the relationship is greater in periphery countries.

Malovaná et al. (2023) estimate the impact of macroprudential policy on income inequality on country-level data for the period 1990−2019 for 105 countries employing the local projection method. According to their research, tightening borrower-based measures increases income inequality due to depressing credit and house price growth. Nevertheless, more stringent macroprudential regulation during financial booms can decrease income inequality via the crisis mitigation and prevention channel. Moreover, they conclude that the credit distribution channel dominates in AE while the crisis prevention and mitigation channel prevails in EMDE.

Based on data from former transition economies for the 2002−2014 period, Konstantinou et al. (2022) suggest that, in general, the introduction of macroprudential tools leads to an increase in income inequality. Nonetheless, the effect varies based on the degree of financial development and openness. Whereas in an environment with a low level of globalization and an undeveloped financial system, tightening of macroprudential policy can lead to an increase in income inequality, in countries with a high degree of openness and financial development, the effect reverses.

Texeira (2023) examines the impact of LTV and DSTI limits on the Gini wealth coefficient and the wealth share of the top 1%, top 10%, and bottom 50% of the distribution. The author suggests that the DSTI cap estimates are much more prominent than those of the LTV limit. To add to this, the effects on the four dependent variables vary significantly. While the adoption of these borrower-based measures increases the Gini wealth index, the wealth share of the top 1% and top 10% of the distribution, it decreases the wealth share of the bottom 50%. For this reason, Texeira (2023) implies that the LTV and DTSI limit benefits to the upper middle class at the cost of negatively affecting individuals with an intermediate level of wealth. Moreover, similarly to Malovaná et al. (2023), they suggest that the effect of borrower-based instruments is stronger in advanced economies.

Another part of the literature relies on survey data. By applying the regression discontinuity design to survey data from South Korean households over the period 2017−2019, Park and Kim (2023) indicate that LTV ceilings significantly affect the widening household wealth inequality. They conclude that LTV tightening harms the net worth of the poorest-quintile households. Contrarily, the decrease in the LTV ceiling did not affect the net worth of other households.

Carpantier et al. (2018) employ the Gini recentred influence function based on the Eurosystem Household Finance and Consumption Survey of households from 12 Eurozone countries. Their analysis shows that tightening access to mortgages by decreasing the LTV cap is linked to the rise in net wealth inequality.

Based on simulations using United Kingdom survey data, Tarne et al. (2022) show that the effects of restricting the limits on LTV on wealth inequality differ between buy-to-let investors, first-time buyers, and second and subsequent buyers. Specifically, lowering the LTV cap on buy-to-let agents leads to a decrease in total net wealth inequality, but on the contrary, wealth inequality rises when imposing restrictions on access to credit on first-time buyers. Moreover, caps on credit limits for second and subsequent buyers have only a minor impact on overall wealth inequality due to their higher financial wealth from previously sold homes.

Analysis by Georescu and Martin (2021) of Household Finance and Consumption Survey data from Italy, Ireland, the Netherlands, and Portugal suggests that borrower-based measures such as LTV and DTSI limits have a negligible impact on income inequality. Nevertheless, according to their results, caps on LTV and DSTI may raise inequality at introduction while moderating the increase under adverse macroeconomic scenarios. This is in line with the conclusions of Malovaná et al. (2023).

Finally, the findings of Zhai et al. (2023), based on household-level data from China, suggest that a less stringent LTV cap can significantly decrease household wealth inequality. Consistent with the conclusions of Park and Kim (2023), using unconditional quantile regression, Zhai et al. (2023) find that the LTV ceiling affects low-wealth households more than high-income households. Moreover, they emphasize the need for coordination of macroprudential and monetary policy to regulate the real estate market.

There is no literature to date evaluating the combined effect of microprudential and macroprudential policy on income inequality. As noted above, strong and robust microprudential supervision and regulation can enhance the effectiveness of macroprudential policies in mitigating systemic risks and preventing the build-up of financial imbalances. By reducing the likelihood of systemic crises and contagion effects, these measures can protect the incomes and assets of households from the adverse consequences of financial instability, thereby contributing to a more equitable distribution of income (Malovaná *et al*., 2023). Without robust oversight and enforcement mechanisms, macroprudential measures may be less rigorously implemented and enforced, diminishing their effectiveness in preventing financial crises and protecting vulnerable households from economic shocks. Studies generally agree that stricter macroprudential policies aimed at reducing excessive risk-taking, i.e. measures targeting borrowers, are associated with higher levels of income inequality, especially in AE (Carpantier *et al.,* 2018; Malovaná *et al.,* 2023; Park & Kim, 2023). However, it is possible that the negative impact of macroprudential tools will be mitigated in the case of tighter banking supervision, as banks will lend fairly within limits and will not favour more influential individuals.

# 3 Data

This Chapter describes the data used in the analysis. Section 3.1 presents the dataset. Section 3.2 consists of the analysis of the development of dependent variables over our sample period, concretely the Gini coefficient and the income shares held by the top 1%, top 5%, top 10%, and bottom 10% of income distribution, as well as the difference between the income share of the top 10% and bottom 10%. Section 3.3 provides an overview of the included microprudential bank regulation and supervision explanatory variables. In section 3.4, other control variables based on the reviewed literature are presented. The Chapter concludes with descriptive statistics in section 3.5.

## 3.1 Dataset

The dataset contains data annual in frequency and cover 70 countries[12], specifically 41 EMDE and 29 AE based on the IMF country classification. The list of countries is presented in Table A. 2 in the Appendix. In the econometric analysis, three-year non-overlapping averages of the data presented in this Chapter are used.

The panel in the dataset is unbalanced and spans the years 1996–2013. The dataset's end year is the last year for which data on bank regulation and supervision are available, and the dataset's commencement year is determined by the availability of data on the governance indicators used as control variables. The lack of adequate data, particularly at the start of the sample period is the cause for the panel's unbalance. Nevertheless, given that the Basel II Accord was implemented in 2008 in most economies and the Basel II.5 was implemented in 2011, we do not anticipate that these missing data would significantly affect the findings of the analysis (see Figure 6).

[12] The models on the effect of bank regulation and supervision on income shares are based on data from 67 countries due to the absence of the data on income shares for Albania, Chile, and Cote d'Ivoire.

## 3.2 Dependent Variables

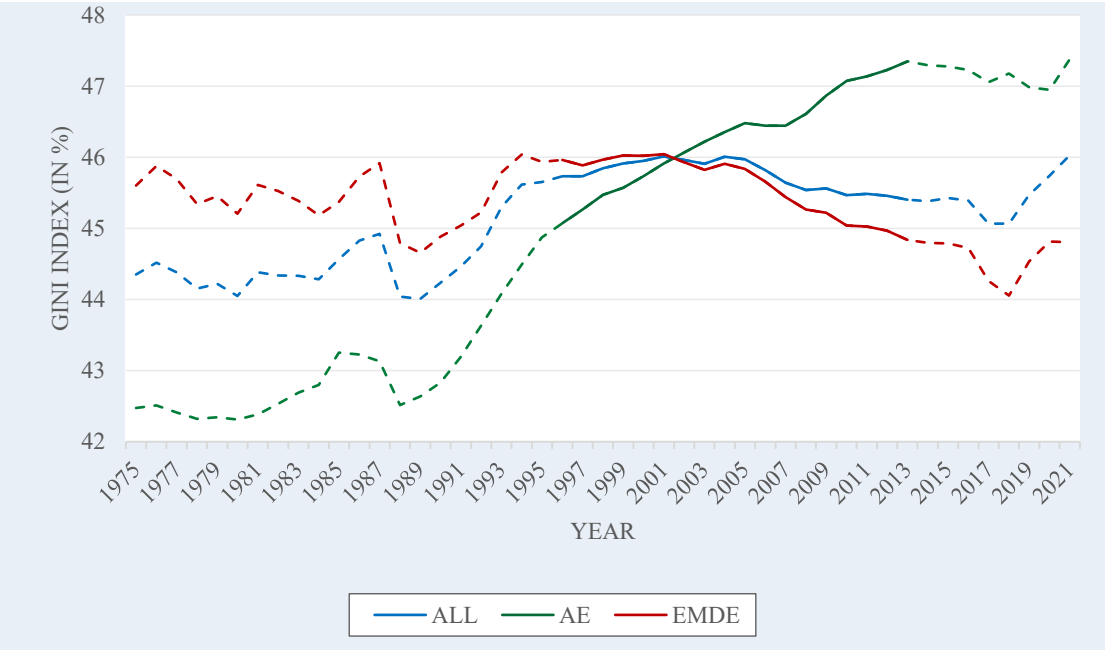
The dependent variable used in the baseline analysis to represent income inequality is the market Gini index[13], which was retrieved from the SWIID compiled by Solt (2016). The SWIID database maximizes the comparability of available data on income inequality. In particular, it gets beyond national variations in the definitions of income inequality as well as in the sampling and frequency of data collection on income inequality. Solt (2016) employs a Bayesian methodology to standardize data gathered from diverse sources, such as national statistical offices, international databases, and other sources.

Because of its cross-country comparability, researchers have recently favoured the SWIID over alternative data sources on income inequality (e.g., Alexiou *et al*., 2022; Malovaná *et al.,* 2023; Manish & O'Reilly, 2020). Moreover, it is believed that the Gini index based on market income – that is, income before taxes and transfers – is more appropriate than the Gini index based on net income in empirical research on the impact of bank regulation on income disparity. The effects of fiscal redistributive policy incorporated in the Gini coefficient based on net income may contaminate the estimates of the relationship between income inequality and bank regulation and supervision due to the strong correlation between fiscal redistributive policies and income inequality (Anderson *et al.,* 2017). The net Gini coefficient would be more appropriate when investigating the link between income inequality and fiscal policies.

Figure 1 presents the evolution of the unweighted average Gini coefficient over the period 1975–2021. The solid line in the figure represents the observed sample; the dashed line shows the unweighted average Gini index development outside of it. Based on the unweighted average Gini index, within-country income inequality has been steadily rising in AE while income inequality is relatively stable or even slightly declining in EMDE. Since 2001, AE have experienced higher levels of income inequality than EMDE, as indicated by the unweighted average Gini index.

[13] The properties and construction of the Gini index is presented in detail in the section *Income Inequality and Its Main Determinants.*

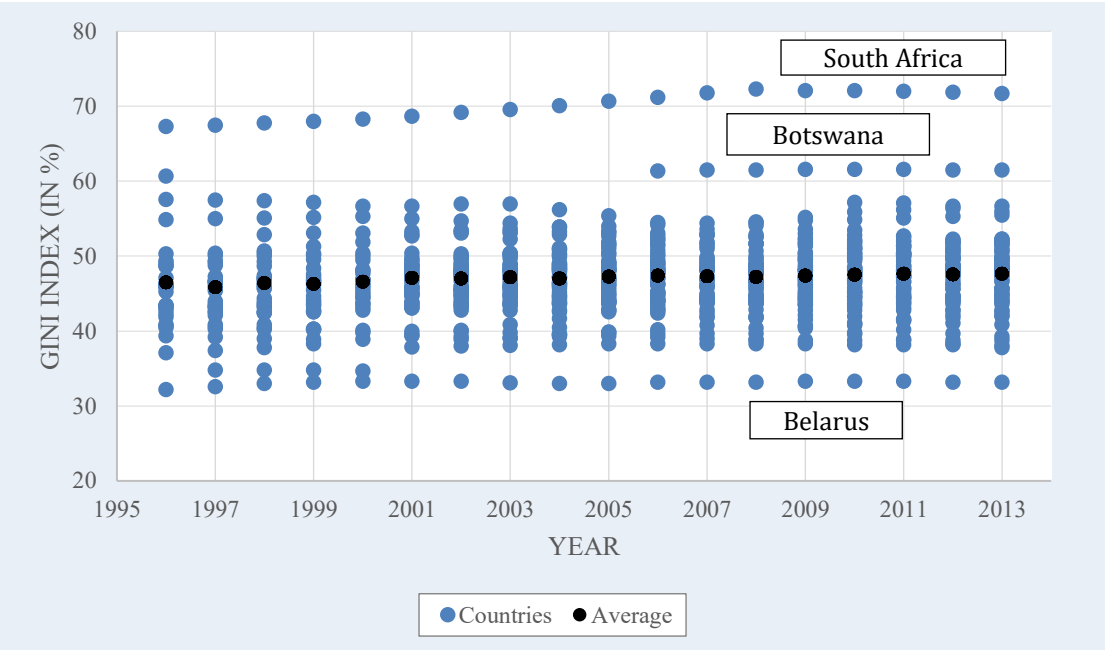
**Figure 1: Gini Coefficient**




Source: Solt (2016), author's calculations
Note: The figure shows the evolution of the unweighted average market Gini coefficient. The dashed line represents the Gini coefficient in years outside the sample period. The solid line represents the Gini coefficient during the sample period.

Additionally, Figure 2 shows the year-by-year heterogeneity of the market Gini coefficients for the sample period 1996–2013, with each point denoting the market Gini index for a particular nation for that year. It is evident that the Gini index's heterogeneity has been rising over time. This is mostly due to three nations, South Africa, Botswana, and Belarus, whose Gini indices differ significantly from those of other nations. The income disparity as indicated by the Gini index is lowest in Belarus, while it is extremely high in the first two mentioned countries. Because so many people in South Africa were excluded from economic opportunities during the policy of apartheid, there was already a significant amount of income inequality in the country as measured by the Gini coefficient in the 1990s. Furthermore, the unemployment rate is significantly higher in South Africa than in other emerging markets (IMF, 2020). In Belarus, rapid economic growth was attributed to convenient energy pricing from Russia and high levels of employment (The World Bank, 2017).

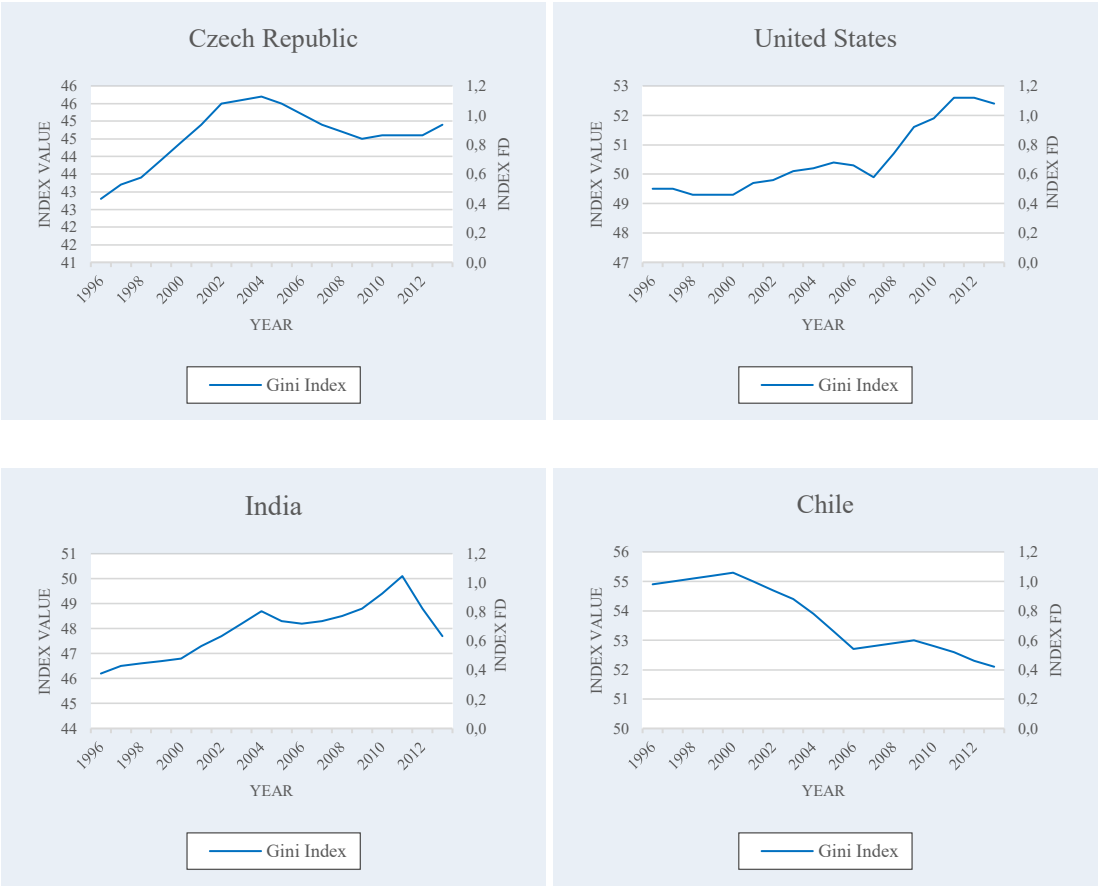
**Figure 2: Heterogeneity of Gini Coefficients**




Source: Solt (2016), author's calculations
Note: The figure shows the market Gini coefficient for each country for the respective years. The heterogeneity of the Gini coefficient among countries is accompanied by the unweighted average of market Gini coefficients across all countries for the respective years.

Figure 3 shows the evolution of the market Gini indices in four selected countries: the Czech Republic (AE), the United States (AE), India (EMDE), and Chile (EMDE). The GFC began in the United States, where between 2007 and 2008 there was a noticeable increase in income inequality. Income inequality in the Czech Republic increased until 2004, at which point it started to decline until 2009 and has rising since then. But compared to the United States, the rise in income inequality in the Czech Republic during the post-crisis period has been far more subdued. In fact, the Czech Republic has the lowest income inequality among the four chosen nations, as indicated by the Gini coefficient. Furthermore, all the years under observation show an increase in income inequality in India, except for 2005 and 2012. In contrast, income inequality in Chile has been declining, apart from the period 2005–2006.

**Figure 3: Gini Coefficient Development**




Source: Solt (2016), author's calculations
Note: The figure shows the market Gini coefficient for each country for the respective years. FD changes represent the first difference in the market Gini coefficient.

Income shares of the population retrieved from WID were used as an alternative measure of income inequality presented as a part of the robustness check. Income shares are apart the Gini coefficient the most frequently used measures of income inequality although their perspective on income inequality differ (Dabla-Norris *et al.,* 2015). As well the Gini coefficient, the income shares are based on market income. Data used are the income shares of the richest 1% of the population, the top 5%, the top 10%, and the bottom 10% of the income distribution. In most of the sample countries, the income shares of the bottom 1% (the poorest) and bottom 5% of the income distribution are rounded to zero. They are therefore not informative, and these income shares are thus not used in the analysis. We also implement the difference between the income share held by the top 10% and the bottom 10% of the income distribution. The developments of the unweighted average income shares of the respective income groups during the period 1990−2022 are presented in Figure 4.

**Figure 4: Income Shares Development**

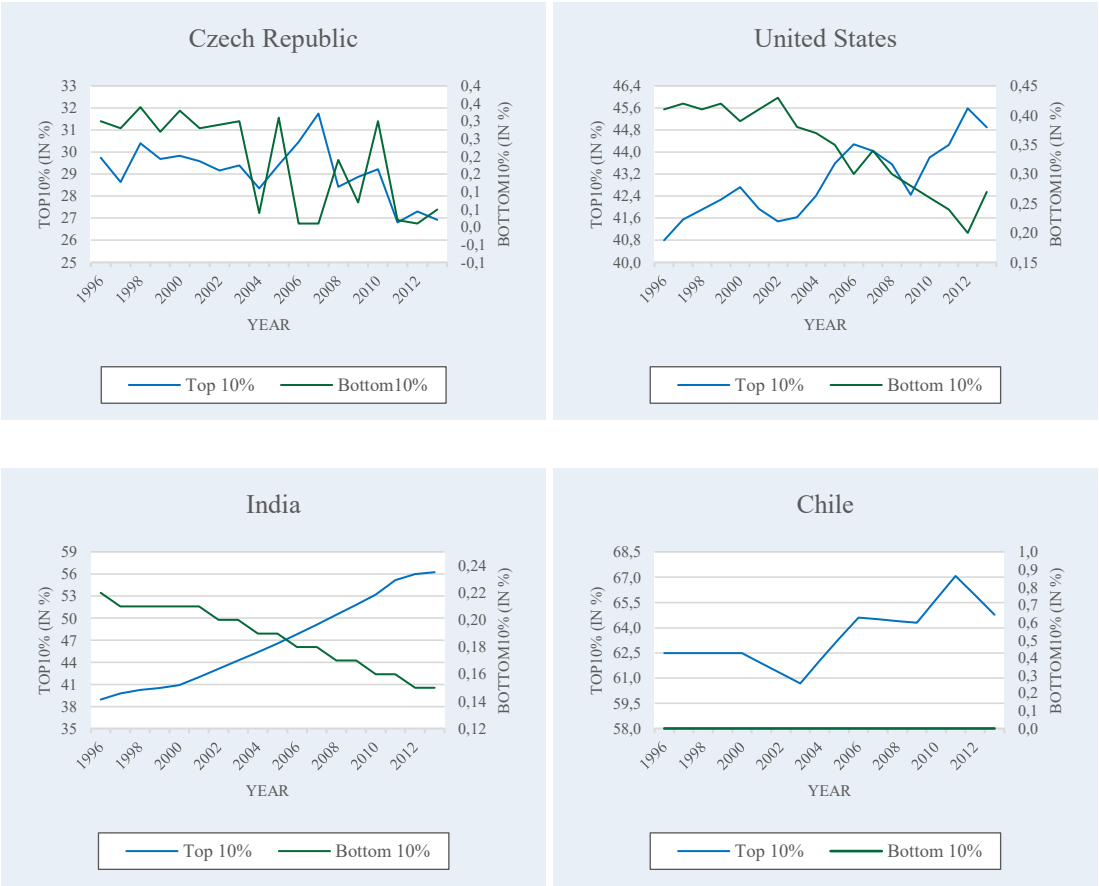

Source: WID, author's calculations
Note: The figure shows the development of the unweighted average market income shares. The dashed line represents income shares in years outside the sample period. The solid line represents income shares during the sample period.

The possible limitations of the Gini coefficient are illustrated by the analysis of income shares. EMDE experience greater income accumulation at the extreme tails of the income distribution than AE, even though the Gini index suggests higher income inequality in AE. The average income share of the top 1% varies between 14.9% and 16.5% during the monitored period. The top 1% share of income in AE ranges from 8.3% to 12.5% and is gradually increasing except for declines in 2008 and 2009. The top 1% share of income in EMDE is

higher than that of AE, while remaining relatively stable at 17 %. The average income share of the top 5% shows a similar trend, increasing from 20.1% in 1980 to 25.2% in 2022. Similarly, the average income share of the top 10% is still relatively constant at 45%, with EMDE having higher values than AE. In addition, the average income share of the bottom 10% is very low, declining slightly from about 0.15% in 1980 to 0.13% in 2022. The average income share of the bottom 10% is even lower in EMDE. In AE, there is a more noticeable trend in the average income share of the bottom 10%, decreasing over time from 0.26% in 1980 to 0.19% in 2022. Due to persistently low levels of the income share held by the bottom 10%, the development of the difference between the average income share of the top 10% and the bottom 10% reflects the trends observed in the average income share of the top 10%.

As Figure 5 shows, there are significant differences when examining the dynamics of income shares across countries. The income share of the top 10% indicates a relatively stable situation in the Czech Republic. On the other hand, the income share of the top 10% has an upward trend in other countries, indicating an increase in income inequality. Compared to other countries, Chile shows the largest percentage of income held by the top 10%, in line with the highest market Gini coefficient. In addition, the income share of the bottom 10% has declined in both India and the United States. A thorough examination of the income trajectory of the bottom 10% in Chile is impossible due to the near-zero income share of this group, which is rounded to zero in the source data set. To conclude the income share analysis, Chile is the most unequal of the four countries, while the Czech Republic shows the most equitable distribution of income.

**Figure 5: Income Shares Development**




Source: WID, author's calculations

## 3.3 Explanatory Variables

The explanatory variables of interest employed in the analysis are indices that reflect the application of instruments of bank regulation and supervision. Other control variables are GDP per capita, human capital index, government spending, trade openness, level of financial development, unemployment rate, population, financial liberalization, and the regulatory quality.

### Bank Regulation and Supervision Variables

Microprudential bank regulation and supervision have developed significantly since the introduction of the Basel I Accord in 1988, when microprudential regulation began to be globally adopted. Furthermore, most countries moved from compliance-based supervision to more risk-based supervision, in line with the principles of Pillar II of Basel II.

Our data on microprudential bank regulation and supervision are based on the revisited and updated Financial Reform Database constructed by Omori (2022). Unlike the original dataset by Abiad et al. (2010), in the update conducted by Omori (2022), the bank regulation and supervision index is further divided into sub-indices. Furthermore, Omori (2022) extends the period covered from 1973−2005 to 1973−2013 and the country coverage from 91 to 100 countries. We thus have at our disposal a larger dataset that also contains information on bank regulation and supervision during the GFC and encodes bank regulation and supervision in detail from several perspectives.

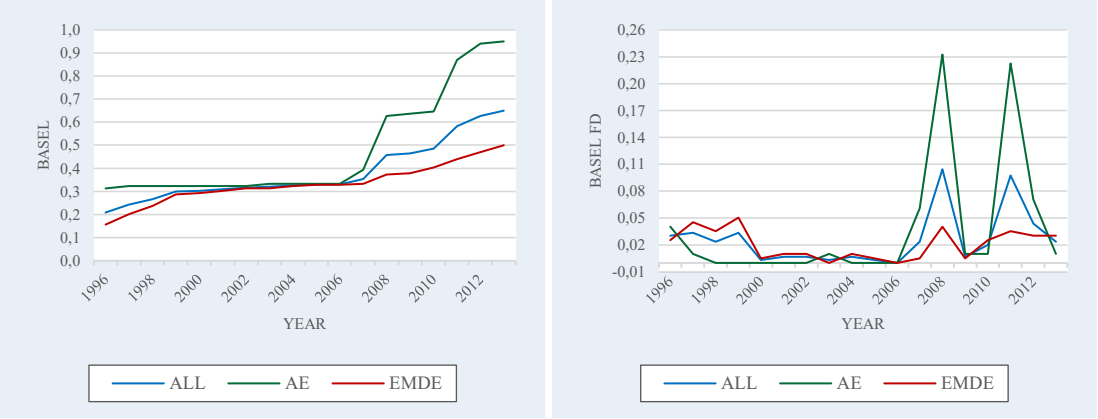
The database captures the intensity and stringency of bank regulation and supervision by ordinal variables that take the value 0, which corresponds to the minimum degree of intensity and stringency of bank regulation and supervision, up to a maximum integer value, which corresponds to the highest degree of intensity and stringency. The aggregate bank regulation and supervision index is further divided into five subdimensions. The coding rule for each variable is based on a set of criteria for policy actions. The concrete coding rules for the five subdimensions of bank regulation and supervision are presented in Table A. 3 in the Appendix. The aggregate bank regulation and supervision index is the sum of the five subindices.

The ordinal sub-indices were normalized into an interval of 0 to 1 by dividing the value of each variable in a respective year and country by the maximum value of the corresponding sub-index. The overall microprudential policy index is constructed as the unweighted average of the normalized sub-indices. This simplification by employing indices rather than a specific value of the Basel capital or supervisory requirements is used due to the availability of the data for a country-level analysis.

The first variable *Basel* is based on the adoption of Basel I, Basel II, and Basel II.5. Basel II.5 is the enhancement of Basel II addressing the market risk framework to improve banks' risk management practices. The variable covers the implementation of the capital adequacy ratio and other regulatory policies for banks' liquidity and risk calculation. For illustration, throughout the observed period 1996−2013, 69 out of 70 countries have adopted at least Basel I, 66 countries have also introduced Basel II, and 65 countries have implemented Basel II.5. Figure 6 presents the development of the unweighted average of the normalized index of Basel Accords adoption and the unweighted average of first differences of the normalized index. The first differences are used to display year-on-year changes in more detail. The figure demonstrates the gradual implementation of Basel I at the beginning of the observed period up to 2000, since when most of the countries had at least Basel I implemented. The significant change in the normalized index in 2008 was caused by a more stringent

microprudential regulation upon the implementation of Basel II in 2008 in major economies. The rise in 2011 demonstrates the adoption and implementation of Basel II.5, especially in AE. In European Union banks, an agreed-upon phased implementation of Basel II began in 2006, while Basel II.5 had a clearly defined start date of December 31, 2011.

**Figure 6: Adoption of Basel Accords**




Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized index of Basel Accords adoption and the unweighted average of the first difference of the normalized index.

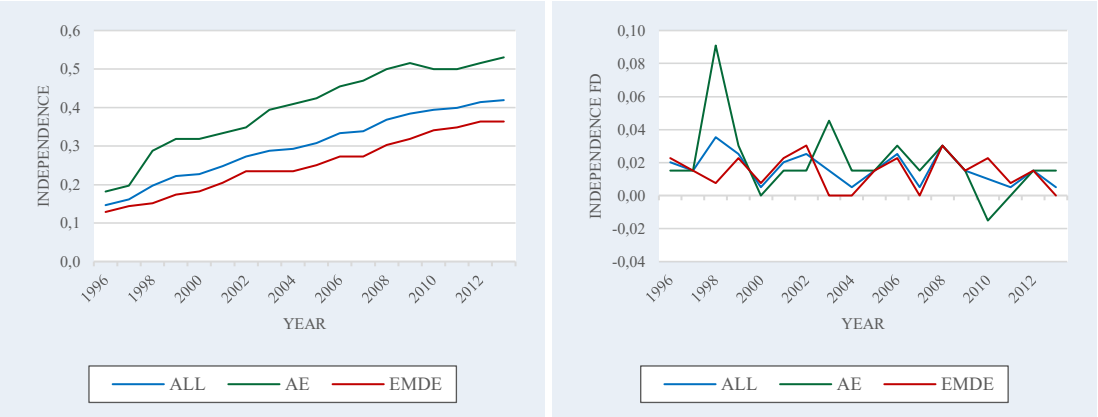
The development of bank supervision is not as straightforward as the development of microprudential bank regulation captured by the adoption of the Basel Accords. The variable *Independence* assesses whether the banking supervisory authority is independent from the government executive[14] and the interests of the financial sector. Specifically, it assesses the structure of the board of directors and the criteria for dismissing the head of banking supervisory authority. As shown in Figure 7, the unweighted average of the normalized index of supervisory independence has been gradually increasing in both EMDE and AE, with volatile changes that are, however, very small in scale. The largest increase in the average intensity of supervisory independence occurred in 1998 in AE.

For illustrative purposes, as stated in Omori (2022), in the Netherlands, under the Bank Act of 1998, the President and the Executive Directors of the Governing Board may be suspended or removed from office only if they no longer fulfil the conditions required for the performance of their duties or if they have been found guilty of serious misconduct. In some countries, however, supervisory independence has intensified. To illustrate, in France, a new supervisory structure, Prudential Supervision Authority, was established in 2010. In the new scheme, the Ministry of Finance partially controlled the authority's resources, legislative limits

[14] Executive branch of the government includes the Ministry of Finance.

on the number of the authority's personnel were established, and the supervisory authority could not independently set any prudential rules or its own sector assessments.

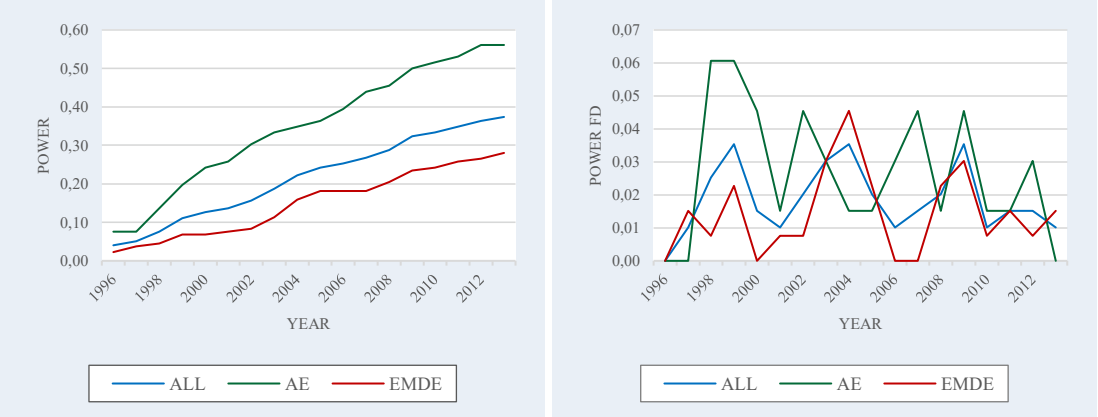
**Figure 7: Supervisory Independence**




Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized index of supervisory authority independence and the unweighted average of the first difference of the normalized index.

The third variable *Power*, the development of which is presented in Figure 8, represents the power of supervision. An authority with intense supervisory power can exercise its main tools, including licensing, sanctioning, off-site monitoring, and on-site inspections without inference. Concretely, the third variable evaluates whether the supervisory authority has legally defined remedial and sectional measures, whether the supervisory authority can proactively intervene and whether supervisory measures can be exercised without interference. The increase in the unweighted average supervisory power index in 1996–2000 demonstrated in Figure 8 is primarily attributed to the establishment of independent superior supervisory authorities and by defining their legal rights.

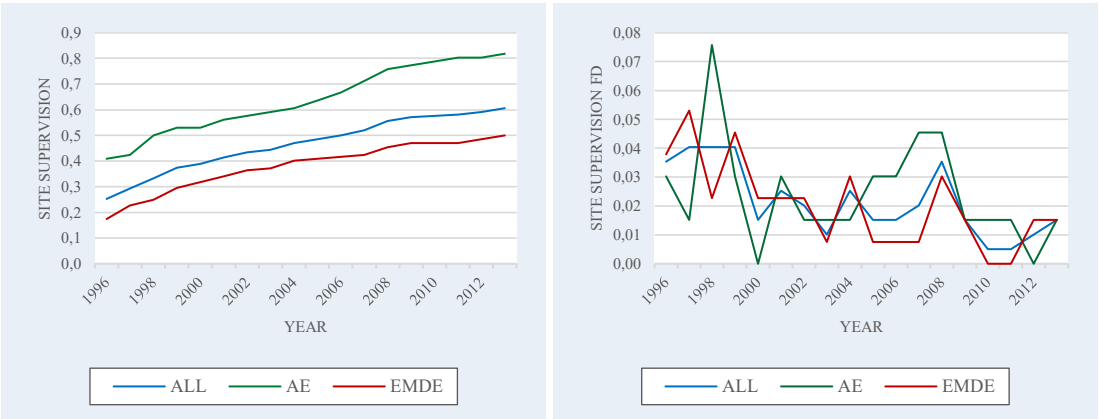
**Figure 8: Supervisory Power**




Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized index of supervisory authority power and the unweighted average of the first difference of the normalized index.

Whether on-site and off-site examinations are risk-based and of high quality is coded in the fourth variable *SiteSup*. As Figure 9 shows, the unweighted average site supervision index increased at the beginning of the sample period because of enhanced on-site supervision as opposed to only relying on external audits and off-site monitoring, integration of off-site and examinations, and implementing risk-oriented approaches to bank supervision. To illustrate, since 2001 the Financial Supervisory Authority of Iceland has carried out targeted on-site inspections of risk management, information technology, collateral valuation and loan loss provisioning standards used in Icelandic banks (Omori, 2022).

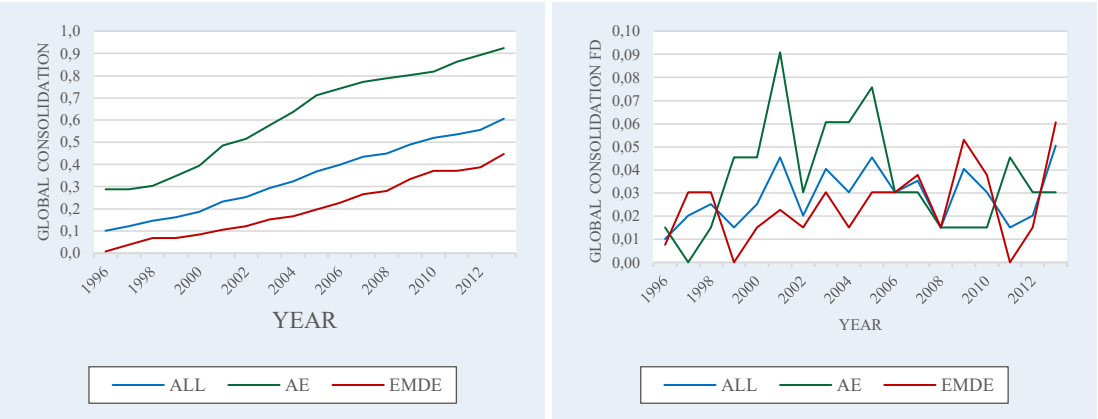
**Figure 9: Site Supervision**




Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized index of site supervision intensity and the unweighted average of the first difference of the normalized index.

Finally, the fifth variable *Global Consolidation* expresses whether the supervisory agent supervises the banking sector without any exceptions and whether it strengthens cross-border supervisory cooperation. As depicted in Figure 10, large changes in the unweighted average index occurred in AE in the period 2003–2005. This period is characterized by the signing of Memoranda of Understanding between individual countries to achieve international cooperation in the field of surveillance. For example, Germany signed a Memorandum of Understanding with the Federal Reserve Bank in 2003 and with Canada in 2004 (Omori, 2022).

**Figure 10: Global Consolidation**

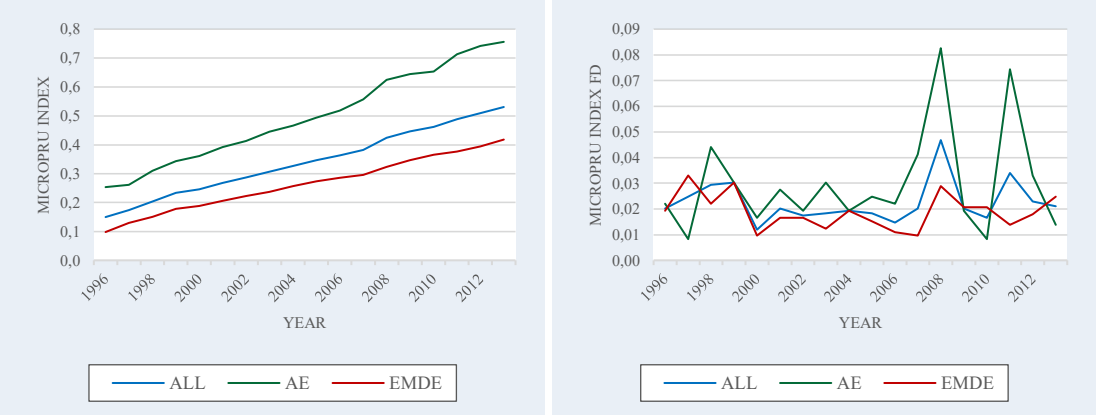



Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized index of no exceptions and global consolidation and the unweighted average of the first difference of the normalized index.

Regarding the aggregate microprudential bank regulation and supervision index, constructed as an unweighted average of the normalized five sub-indices, Figure 11 shows its development over the period 1996−2013. Although microprudential policy tightened over time in both AE and EMDE, throughout the period microprudential policy was more intense in AE.

The high point in the development of the unweighted average of the first differences of the index in 1998 was mainly caused by increased supervisory power and site supervision. The intensified supervisory power during this period is characterized by the establishment of independent supervisory authorities, such as the Federal Office for Banking Supervision in Germany, the Financial Supervision Agency in Japan and the Australian Banking Regulation Authority in Australia, and their statutory rights, including specific sanctions for non-compliance with the legislation. In addition, more countries have launched on-site inspections of bank loans and their market risk systems, consolidated supervision through a combination of on-site supervision and on-site supervision, further in line with international standards. The peaks in 2008 and 2012 are primarily the result of the adoption of the Basel II and Basel II.5 Accords.

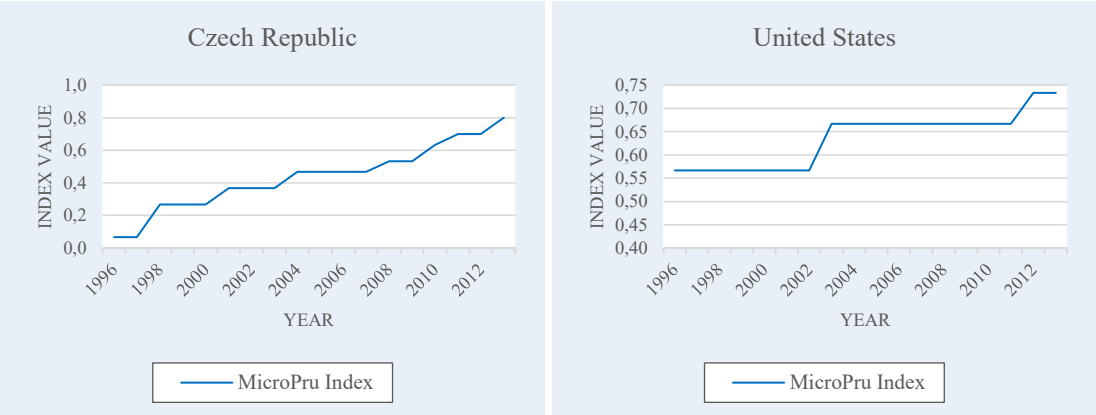
**Figure 11: Microprudential Policy Index**

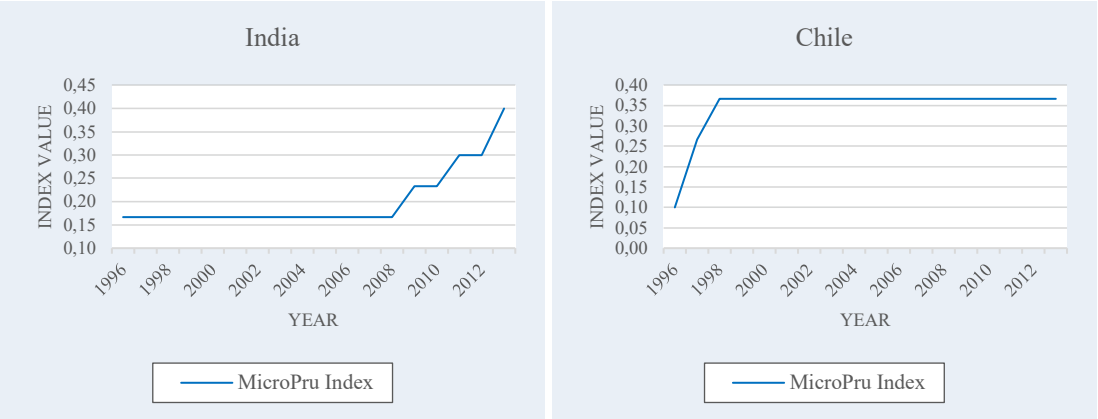



Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized microprudential policy index and the unweighted average of the first difference of the normalized index.

Figure 12 illustrates the evolving dynamics of the microprudential policy index in the four selected countries. In the sample period, an intensification of microprudential policy is evident across all countries. In the Czech Republic in particular, the microprudential policy reaches a maximum value from the four countries of 0.8 at the end of the period, which indicates the strictest banking regulation and supervision, while the changes take place very gradually. While microprudential policy remains tight in the United States, changes are less frequent but more pronounced when they occur. Conversely, in India, microprudential policy has seen a rapid intensification since 2008, having previously maintained persistently low levels. In Chile, microprudential policy has remained stable since 1988, consistent with the country's non-adoption of Basel II.

**Figure 12: Microprudential Policy Index**






Source: Omori (2022), author's calculations
Note: The figure shows the development of the unweighted average of the normalized microprudential policy index.

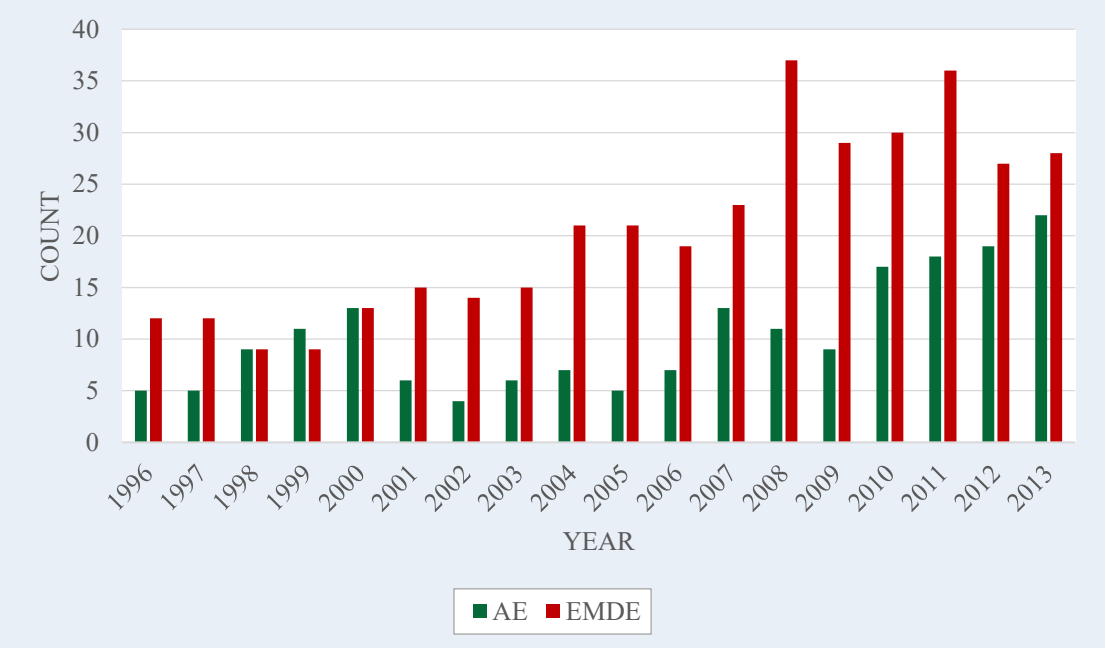
**Macroprudential Policy Tools**

Part of the analysis focuses on the effects of the interaction between microprudential and macroprudential policies on income inequality. Macroprudential policy control variables are based on dummy indicators from the IMF's Integrated Macroprudential Policy (iMaPP) Database originally developed by Alam et al. (2019). The database combines information from five existing databases and the IMF Macroprudential Policy Survey. The iMaPP database contains monthly data on 17 dummy variables representing the application of macroprudential instruments for 134 countries over the period 1990–2021.[15] Each tightening event is coded as +1, each loosening action is coded as −1, and the neutral action is coded as 0. The indices capture the action as of the effective date. Simplification by introducing indices rather than specific values of the change in macroprudential policy measures is used due to the availability of data for country-level analysis.

Figure 13 captures the number of countries implementing macroprudential policy measures (both tightening and easing are considered as one use of macroprudential policy instruments) during the period under review by country. Both EMDE and AE began to implement these tools with greater intensity after the GFC. In addition, AE increased the frequency of macroprudential policy instruments used in the 2000s in response to the Dot-com bubble.

[15] The 17 types of macroprudential policy tools are in detail presented in Table A. 4.

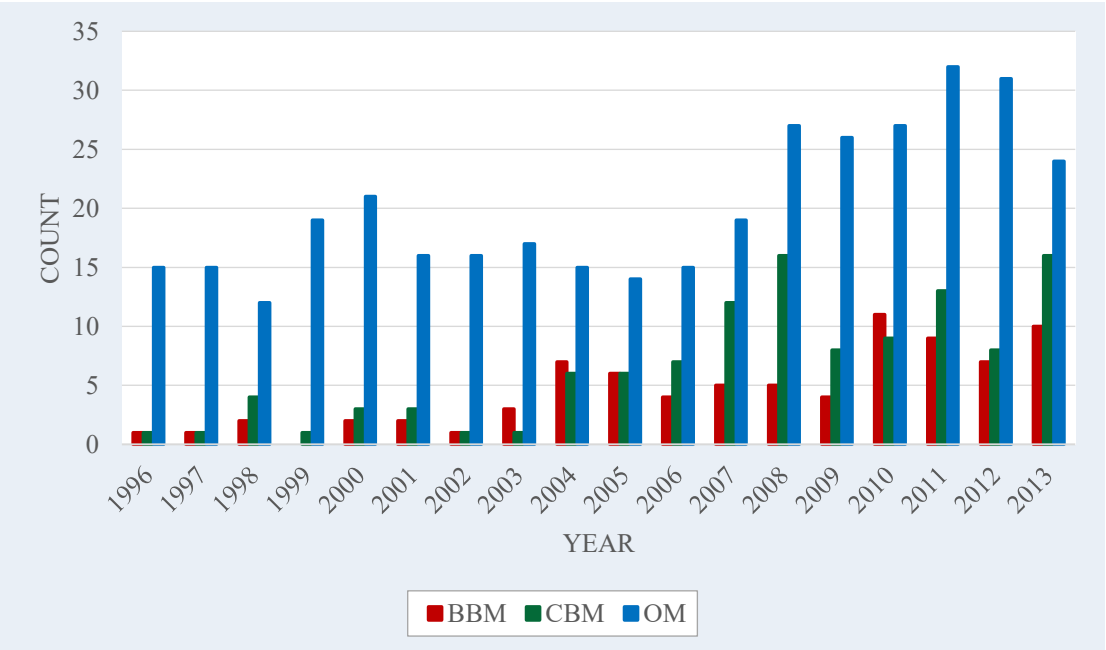
**Figure 13: Macroprudential Policy Tools Usage**




Source: iMaPP database, author's calculations
Note: The figure shows the development of the number of countries implementing macroprudential policy measures over time.

In addition, we decided to consider different groups of macroprudential policy instruments based on their objectives, as they can affect income inequality through different channels (Malovaná *et al.,* 2013). Concretely, three groups of macroprudential policy tools were created – borrower-based measures, capital-based measures, and other measures. Table A. 5 in the Appendix shows the division of individual macroprudential policy instruments into these three groups. Figure 14 illustrates the number of countries using borrower-based measures, capital-based measures, and other measures on a country-year basis. Although all three groups of instruments were used in more countries after the GFC, the increase is more pronounced in the use of capital-based and other measures. This is in line with the introduction of liquidity measures and minimum reserve requirements, which are considered other measures under Basel III.

**Figure 14: Macroprudential Policy Tools Usage**

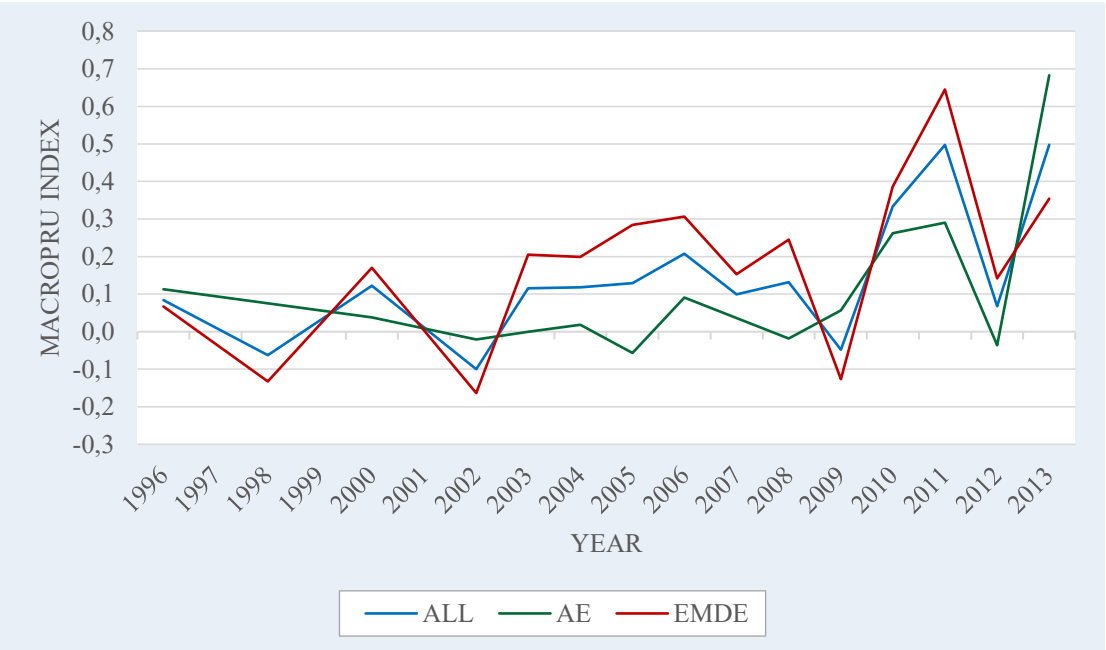



Source: iMaPP database, author's calculations
Note: The figure shows the development of the number of countries implementing different groups of macroprudential policy measures over time.

The original database contains monthly data, that has been aggregated into yearly data and normalized by the dividing the annual sum of loosening and tightening actions by the count of all instruments and the number of months to create a macroprudential policy index ranging from –1 to +1. The minimum value –1 thus represents loosening of all macroprudential policy tools in all 12 months of a year, while the maximum +1 value represents the situation of tightening all macroprudential policy tools in every month of a year. Similarly, indices for specific groups of microprudential policy tools have been created. We are aware of the limitation that the addition of negative and positive monthly dummy indicators can result in the easing and tightening actions cancelling each other out. However, the macroprudential policy index still captures if overall net progress tightens or eases over the year and country.

Figure 15 depicts the dynamics of the unweighted average of the macroprudential policy index over the sample period 1996–2013. The average macroprudential policy index is positive for most years, implying more frequent overall tightening than easing. In addition, the index is higher in EMDE than in AE for most of the observed period, even though after the GFC, AE started to implement macroprudential policy instruments with greater frequency. The overall macroprudential policy index peaked in 2011 and 2013 and declined in 2002 and 2009.

**Figure 15: Macroprudential Policy Index**




Source: iMaPP database, author's calculations, macroprudential index is multiplied by 100 for clarity
Note: The figure shows the development of the unweighted average of the macroprudential policy index.

## 3.4 Other Control Variables

We include standard determinants of income inequality in the set of control variables. These factors are summarized in the section 2.1 *Income Inequality and Its Main Determinants.* The sources and constructs of each variable are shown in Table A. 1 in the Appendix.

Firstly, to control for business cycle fluctuations, we choose to include the natural logarithm of GDP per capita, as done by Delis et al. (2014), Manish and O'Reilly (2020) and Hailemariam (2022). Similar to Manish and O'Reilly (2020), we also include the squared variable in the model to trace the non-linear relationship between economic growth and income inequality based on the Kuznets curve. Malovaná et al. (2023) use a GDP per capita gap constructed based on a Hamiltonian filter.

Secondly, we control for demographic and structural factors. Education is commonly controlled for by including the average years of schooling or the human capital index. The human capital index from the Penn World Table is a metric based both on the average years of schooling and assumed rate of return to education. While Malovaná et al. (2023), Manish and O'Reilly (2020), and Frost and Van Stralen (2018) implement the human capital index, Delis et al. (2014) use the average years of schooling. Since most papers opt for the human capital index, we use this variable in the analysis. The unemployment rate is included based on the

analyses by Frost and Van Stralen (2018), Furceri and Ostry (2019), Alexiou et al. (2019), and Gomado (2023), who conclude that rising unemployment is associated with greater income inequality. The human capital index and the unemployment rate are expected to be strong determinants of wage gaps, leading to income inequality. Furthermore, researchers, including Malovaná et al. (2023) and Delis et al. (2014), also filter out changes in income inequality, which may be driven by changes in population size. Thus, as done by Delis et al. (2014), we include the natural logarithm of the population size in the model. In addition, we account for trade and fiscal policy variables. To express the effect of trade on income inequality, we use the sum of imports and exports relative to the GDP. This metric is widely used in empirical literature even though its effect on income inequality remains inconclusive (e.g., Alexiou *et al.,* 2019; Delis *et al*., 2014; Malovaná *et al.,* 2023; Manish & O'Reilly, 2020). In order to control for the impact of redistributive policies on income inequality through transfers and taxes, we further include central government consumption as a percentage of total GDP, as done by Malovaná et al. (2023), Manish and O'Reilly (2020), and Delis et al. (2014).

Third, we control for political and institutional characteristics by using the regulatory quality variables from the Worldwide Governance Indicators (WGI) database. All indicators from WGI are highly positively correlated and thus only regulatory quality is selected for the analysis to filter out other than bank regulations. Missing years 1997, 1999, and 2001 are linearly interpolated. High-quality institutions are expected to reduce income inequality (Delis *et al.,* 2014). Moreover, Gorus and Ben Ali (2023) report that governance quality can be an important predictor of income inequality in EMDE.

Lastly, since the analysis inspects the finance-inequality relationship, we include the level of financial development proxied by the domestic credit to the private sector by banks as a share of GDP, as in Malovaná et al. (2023) and Manish and O'Reilly (2020). Additionally, we add the normalized aggregate financial liberalization index, which is created from the remaining indicators from the dataset created by Omori (2022) that are not taken into consideration as variables related to bank regulation and supervision to filter out the overall process of financial liberalization as mentioned in Delis et al. (2014).

## 3.5 Descriptive Statistics

This section presents the descriptive statistics of the dependent and independent variables included in the analysis. Table 1 presents the summary statistics of the variables for the main regressions. The summary statistics for AE and EMDE are presented in Table A. 6 and Table A. 7 in the Appendix, respectively.

The mean and median values of the Gini coefficient are very similar, indicating that the Gini index data are not significantly skewed. The analogy applies to income shares. Specifically, the Gini index ranges between 32.2% and 72.3% with a standard deviation of 5.9%. The average share of income held by the top 1% is 15.0%, while the share of income held by the top 5% varies between 16.8% and 57.8% with a mean value of 31.4%. The average share of income held by the top 10% of the income distribution is 42.7% with a standard deviation of 10.0%. The income share of the bottom 10% varies between 0.0% and 0.43%, with an average value of 0.16%.

In addition, the analysis is also conducted separately for the AE and EMDE subsamples of the original sample to assess whether banking regulation and supervision affect income inequality differently depending on the country's economic development. The mean value of the Gini index is 47.03% in EMDE and 47.17% in AE. However, the variation of the Gini indices is greater in EMDE than in AE, as the standard deviations are 7.29% and 3.76%, respectively. Aggregate statistics also confirm a more disproportionate accumulation of income in the extreme tails of the income distribution in EMDE.

Table 1 also shows the microprudential indices of banking regulation and supervision, which all vary between 0 and 1 due to the standardization procedure. The mean of the microprudential policy index is 0.39 and the standard deviation is 0.23. The subindex representing no exceptions and global consolidation is the most volatile, and on average, site supervision is the most strict and intense part of microprudential bank supervision, whereas supervisory power is the least strict on average. In AE, the mean of the microprudential policy index is 0.54, and in EMDE, it is 0.31, which signals that microprudential bank regulation and supervision is more intense in AE.

The macroprudential policy index ranges from −0.034 to 0.049 with a mean of 0.001, indicating more frequent tightening than easing. Among the different groups of macroprudential policy instruments, borrower-based measures tightened with the highest frequency on average in the original sample and in both subsamples based on country developments. However, the average of the macroprudential policy index is higher in EMDE than in AE.

**Table 1: Summary Statistics**

| Variable | Mean | Median | Min | Max | Standard Deviation |
|---|---|---|---|---|---|
| *Gini Index* | 47.290 | 47.200 | 32.200 | 72.300 | 5.896 |
| *Top 1%* | 15.039 | 14.030 | 5.840 | 33.830 | 5.032 |
| *Top 5%* | 31.437 | 29.970 | 16.840 | 57.820 | 8.790 |
| *Top 10%* | 42.694 | 41.940 | 25.900 | 69.440 | 9.980 |
| *Bottom 10%* | 0.162 | 0.160 | 0.000 | 0.430 | 0.096 |
| *Top 10% – Bottom 10%* | 42.530 | 41.720 | 25.560 | 69.390 | 10.056 |
| *Microprudential Index* | 0.391 | 0.367 | 0.000 | 1.000 | 0.231 |
| *Basel Adoption* | 0.422 | 0.333 | 0.000 | 1.000 | 0.220 |
| *Supervisory Independence* | 0.340 | 0.500 | 0.000 | 1.000 | 0.378 |
| *Supervisory Power* | 0.259 | 0.000 | 0.000 | 1.000 | 0.343 |
| *Site Supervision* | 0.528 | 0.500 | 0.000 | 1.000 | 0.296 |
| *Global Consolidation* | 0.404 | 0.500 | 0.000 | 1.000 | 0.398 |
| *Macroprudential Index* | 0.001 | 0.000 | –0.034 | 0.049 | 0.006 |
| *Borrower-based Measures* | 0.002 | 0.000 | –0.083 | 0.167 | 0.015 |
| *Capital-Based Measures* | 0.001 | 0.000 | –0.014 | 0.056 | 0.006 |
| *Other Measures* | 0.001 | 0.000 | –0.056 | 0.065 | 0.009 |
| *Log GDP per Capita* | 9.035 | 9.003 | 6.092 | 11.320 | 1.359 |
| *Human Capital Index* | 2.656 | 2.834 | 0.000 | 3.726 | 0.813 |
| *Log Population* | 2.740 | 2.415 | −1.309 | 7.155 | 1.434 |
| *Trade Openness* | 83.970 | 71.650 | 18.349 | 437.327 | 52.245 |
| *Government Expenditures* | 26.872 | 26.119 | 7.605 | 62.360 | 10.614 |
| *Financial Development* | 61.194 | 50.305 | 0.186 | 304.575 | 43.779 |
| *Unemployment Rate* | 7.798 | 6.980 | 0.250 | 27.470 | 4.351 |
| *Regulatory Quality* | 0.556 | 0.568 | –2.002 | 2.178 | 0.855 |
| *Financial Liberalization* | 0.854 | 0.875 | 0.375 | 1.000 | 0.137 |

# 4 Methodology

This Chapter presents the model and estimation methodology. In section 4.1, the model structure used in the analysis is described. Section 4.2 clarifies the rationale for the choice of estimation method and comments on the results of the tests used in the analysis. Finally, section 4.3 details the hypotheses tested in our analysis.

## 4.1 Model

In the analysis, we estimate the effect of bank regulation and supervision intensity on income inequality using a panel of 70 countries during the period 1996–2013. The baseline empirical model to be estimated takes the following form:

$$Y_{i,t} = \beta_1 \times Y_{i,t-1} + \beta_2 \times MicroPru_{i,t} + \beta_3 \times X_{i,t} + \alpha_i + \varepsilon_{i,t}, \quad (1)$$

where $i$ denotes individual countries and $t$ denotes time. $Y$ represents the dependent variable, i.e., income inequality expressed as the Gini coefficient or income shares. Due to the persistence of income inequality (Beck *et al*., 2007), the model is dynamic which can be seen from the inclusion of the lagged dependent variable in the set of control variables. $MicroPru$ is the aggregate index representing microprudential bank regulation and supervision, $X$ is the vector of control variables,[16] $\alpha$ contains the country-effect, and $\varepsilon$ is the stochastic term. Country-effect is included as due to the large number of countries in the sample it seems likely that there are omitted country-specific characteristics that are time-invariant such as religion or colonial history.

As the aggregate index of microprudential bank regulation and supervision is a combination of five subindices which evaluate different aspects of bank regulation and supervision (see the correlation matrix in Figure B. 1 in the Appendix), this approach may not effectively capture how these measures affect income inequality. For this reason, by replacing

[16] In the baseline model, the control variable for macroprudential policy is the aggregate macroprudential policy index, and the control variable included from the World Governance Indicators is *RegulatoryQuality.* As the World Governance Indicators are highly correlated (correlation >0.85), only one variable is selected to be included in the model. *RegulatoryQuality* seems to be the most appropriate based on the Bayesian Information Criterion and on its nature to inherently control for the effects of regulations other than those of the banking sector.

the variable $MicroPru$ with specific subindices, the equation ( 1 ) was also estimated also for individual bank regulation and supervision policies.

The primary basis for the model specification in the work of Delis et al. (2014) and Brei et al. (2023). They included the lag of income inequality in the set of non-lagged control variables and the country-fixed effects. Using the square of GDP per capita based on the Kuznets theory, which is a common practice in most of the reviewed papers, we depart from the research by Delis et al. (2014). Furthermore, we used the human capital index in place of the average number of years of education, and we used the private credit to GDP as a measure of financial development to purify the relationship between finance and inequality instead of using bank liquidity as Delis et al. (2014) did. Human capital index from the Penn World Table used in our analysis is based both on the average years of schooling and assumed rate of return to education and is more common in research on income inequality. Financial development is preferred due to the extensive literature focused on the relationship between financial development and income inequality. Additionally, to characterize the quality of institutions, we decided to control for regulatory quality because it is inherently accounts for the effects of other than bank regulations.

In addition, we follow the literature and use averages of both the measure of income inequality and the independent variables representing its potential determinants (Delis *et al.,* 2014; Brei *et al.,* 2023; de Haan & Sturm, 2017). In their baseline model, Delis et al. (2014) implement five-year non-overlapping averages given annual macroeconomic data are noisy and subject to fluctuations. Moreover, the regulatory framework is unlikely to have an immediate impact on income inequality. In contrast with the literature, which generally applies non-overlapping five-year averages, we resorted to non-overlapping three-year averages. Owing to the panel's length, employing five-year averages yields four unique time periods, whereas three-year averages yield six unique time periods and thus provide more available observations and greater data variation. Nonetheless, we use non-overlapping five-year averages as a robustness check. Additionally, as commented on in the previous Chapter, the results may be different between AE and EMDE. Therefore, we estimated equation ( 1 ) separately for AE and EMDE.

Finally, as both microprudential and macroprudential bank regulation and supervision may affect income inequality, we further assess their effect on income inequality when combined. Nevertheless, data on microprudential bank regulation and supervision are stock variables whereas data on macroprudential policy are flow variables representing tightening, loosening, or indicating no change. Transforming microprudential bank regulation and supervision data into changes would result in an excessive number of zeros. For this reason,

we estimate whether and how the effect of macroprudential policies changes on income inequality depends on the level of microprudential policy stringency, instead of evaluating changes in the effects of microprudential policies on income inequality conditional on the loosening or tightening of macroprudential policy.

To do so, we add into the equation ( 1 ) both the macroprudential policy index and the interaction term between the macroprudential policy index and the aggregate index of microprudential policy. Regarding macroprudential policy, we also distinguish between different groups of its instruments, as shown in Table A. 5. In addition, the difference between AE and EMDE is inspected. Estimating the effect of macroprudential policy on credit and house price growth conditional on microprudential supervision stringency using interactions is a common practice (e.g., BIS, 2022; Ekinci & Özcan; 2021).

## 4.2 Methods

Estimating equation ( 1 ) by pooled ordinary least squares (OLS) or fixed effects is likely to yield biased results due to the presence of the lagged dependent variable and, in the case of pooled OLS, also due to the unobserved heterogeneity. A simple instrumental variable technique (IV) and GMM can mitigate these issues. GMM relies on a larger set of moment conditions and is less sensitive to instrument relevance compared to IV (Baum *et al*., 2003). It seems unattainable to try to find appropriate external instrumental variables for every variable that could be endogenous. Furthermore, GMM is more efficient than IV in the presence of serial correlation and heteroscedasticity. GMM provides efficient estimates even when the heteroscedasticity form is not known.

For the above reasons, GMM for dynamic panels seems the most appropriate estimation technique for the purpose of our analysis.[17] This approach also mitigates the endogeneity concerns between bank regulatory and supervisory policies and income inequality. As mentioned in Delis et al. (2014), the major concern is not that income inequality affects bank regulation and supervision (reverse causality); the major concern on this front is that factors that influence bank regulation and supervision are also associated with changes in income inequality. To illustrate, the macroeconomic environment's condition may concurrently influence both factors (simultaneity bias).

[17] Although GMM for dynamic panel data is designed for large cross-sections with few time periods (small T, large N panels), our data satisfies the condition that N > T (number of countries (70) and number of time periods (6)). Thus, we still consider GMM for dynamic panel data the most appropriate method.

The combination of endogenous control variables, especially the lagged dependent variable, and country-specific unobserved heterogeneity in our panel data model makes GMM method appropriate for the analysis. Within the empirical growth literature, GMM estimation has garnered significant popularity. Specifically, the Arellano and Bond (1991) estimator (difference GMM) initially gained widespread adoption across various growth-related topics. Subsequently, the related Blundell and Bond (1998) estimator (system GMM) has attracted even greater attention within the empirical growth literature. Difference GMM estimates the model parameters using differences of the variables and addresses the issue endogeneity by using lagged differences of the variables as instruments. Contrarily, system GMM eliminates endogeneity by using orthogonal deviations; instead of using differences, it subtracts the average of all future available observations of all variables and use also lagged levels of the variables as instruments. Nonetheless, both Arellano and Bond estimator and Blundell and Bond estimator were designed for labour and industrial studies with many units. In the context of country-level analyses, the number of countries usually limits to one hundred. However, the Blundell and Bond estimator systematically outperforms the Arellano and Bond estimator in terms of the small sample bias and precision (Soto, 2009). For that reason, we decided to employ system GMM in our analysis, which is also the preferred estimation method by Delis et al. (2014) and Jauch and Watzka (2016). Models with interactions are also estimated by system GMM which is applied in the analysis by Ekinci and Özcan (2021).

Moreover, we prefer to employ two-step system GMM to one-step GMM, because standard errors from one-step estimation may be asymptotically inefficient. Additionally, due to the neglected sampling error in the optimal weighting matrix used in two-step estimator, the standard errors may be downward biased. Therefore, the finite-sample correction proposed by Windmeijer (2005) is applied. It appears adequate to use one lag for each variable in the model as an instrumental variable since we are using non-overlapping three-year averages of the data. In summary, in our model, two-step system GMM with Windmeijer correction for finite sample is used and the second lag of the dependent variable and the first lag of the independent variables are considered instrumental variables.

Numerous tests were applied to assess the specification of the model and the choice of instrumental variables. Breusch-Pagan test for panel data applied on pooled OLS and fixed effects models did not reveal heteroscedasticity in the error terms. Breusch-Godfrey test for panel data showed serial correlation of error terms in the models. Concrete p-values of the tests are available upon request.

With respect to the system GMM models, Arellano and Bond test was applied to inspect the presence of first and second order serial correlation in the differenced error term.

No second-order serial correlation signals that the original error term is serially uncorrelated and that the moment conditions are correctly specified. The null hypothesis that assumes no autocorrelation could not be rejected in any of the models in our analysis which suggests no presence of higher-order serial correlation. Moreover, Sargan-Hansen test was used to assess the joint validity of over-identifying restrictions. The null hypotheses of the overall validity[18] of the used instruments could not be rejected in any of the models. All tests were performed at 5% significance level.

## 4.3 Hypotheses

Using the above methodology, we test the following hypotheses:

**Hypothesis #1:** Tighter microprudential policies are associated with higher income inequality.

**Hypothesis #2:** The effect of tightening of macroprudential policies on income inequality depends on the level of stringency of microprudential policy.

**Hypothesis #3:** The effects of microprudential policies vary across different regulatory instruments.

[18] Valid instruments are correlated with the endogenous variable and uncorrelated with the error term.

# 5 Results

This Chapter presents and interprets the results of the estimated models in relation to existing research and the proposed hypotheses. Section 5.1 comments on the effect of microprudential policy stringency on income inequality as measured by the market Gini coefficient. Sections 5.2 and 5.3 present these results separately AE and EMDE, respectively. Next, section 5.4 describes whether and how the effect of macroprudential tightening on income inequality depends on the level of microprudential policy stringency. Robustness and sensitivity checks are provided in section 5.5. Finally, the hypotheses are evaluated in section 5.6.

## 5.1 Microprudential Policy

Regression results on the effect of microprudential policy on income inequality as measured by the Gini coefficient based on the sample of all 70 countries are provided in Table 2. The first column shows the results for the model including the aggregate microprudential policy index. Results for models with different microprudential regulatory instruments are presented in the remaining columns. The collective term for all microprudential policy variables is *Bank Regulation and Supervision*. Sections 5.1–5.3 follow the same format for presenting the findings.

The aggregate effect of microprudential policy on income inequality is negative and statistically significant at the 1% level of significance. Since this index is present in the dataset of Abiad et al. (2010), this finding can be directly compared with previous literature. Our results are consistent with most of the research showing a negative correlation between income inequality and the stringency of microprudential policies (Christopulos & McAdam, 2017; Delis *et al.,* 2014; Johansson & Wang, 2014; Li & Yu, 2014).

There may be several channels through which microprudential policy can contribute to the reduction in income inequality. Firstly, even though enhanced supervision and regulation of individual banks may not prevent the emergence of financial crisis, it can improve the stability and solvency of banks during the crisis and reduce the likelihood of bank failure. Consequently, the effect of financial crises on economy may be more subtle than in the absence of strong microprudential supervision, for example by reducing the volatility of unemployment (Hirtle & Kovner, 2022). To illustrate, under the less stringent Anglo-Saxon approach to bank

regulation and supervision based on openness, stability, and consistency, Ireland and England have experienced more high-profile bank failures. On the contrary, under more stringent supervision and regulation emphasising stability and risk management, the Austrian banking system has maintained stability even during the GFC and experienced relatively fewer bank collapses.

Secondly, improved supervision and regulation promotes prudent and fair lending practices. Enhanced screening and monitoring of investment projects can direct capital towards more promising projects, offering more equitable chances to the poor (Delis *et al*., 2014).

Thirdly, stricter oversight may discourage banks from the connected party lending which refers to loans extended by a financial institution to individuals or entities that have a pre-existing relationship with the institutions. The preferential treatment can disproportionally benefit affluent individuals or influential entities connected to the financial institution. Consequently, the income gap between outsiders and insiders may widen by hindering economic opportunities for those without insider connections. The misallocation of resources can also divert resources away from productive investments that contribute to broader economic growth and job creation. Moreover, if the loans to connected parties are not adequately assessed for creditworthiness, it can undermine the stability of financial institutions and potentially lead to financial crises further widening the income gap.

The rationale behind the proposed channels through which microprudential policy can affect income inequality has been inspected by assessing the impact of individual regulatory policies on income inequality. However, these channels through which individual bank regulation and supervision can reduce income inequality has not yet been closed by empirical research. Therefore, the effect of individual policies cannot be directly compared to the findings in the peer-reviewed literature.

The effects of all individual microprudential policy instruments on income inequality are negative, i.e. stricter microprudential policy leads to lower levels of income inequality. Be that as it may, the effects of Basel Accords adoption, effective implementation of risk-based controls (site supervision) and cooperation with foreign bank supervisory agencies are not statistically different from zero. However, the effects of the independence of the supervisory authority and its power on income inequality are statistically significant.

Greater supervisory power, i.e. the ability to use a wide range of sanctioning and remedial tools and measures enabling proactive early intervention, can reduce income inequality through the channels of better bank stability and fair lending practices. Enhanced

supervisory power enables enforcement of prudential regulations and ethical standards that encourage banks to adopt responsible lending and investment practices. Supervisors can thus incentivize banks to allocate resources in ways that promote economic stability and fair access to financial services, can intervene early to protect customers from predatory or abusive financial practices, and impose sanctions on banks that violate consumer protections. Furthermore, it can improve the stability and solvency of banks in times of crises and thus reduce the probability of bank failure by timely intervention and the application of corrective measures in the event of deficiencies in the bank's operation.

The statistical significance of the estimated coefficient of supervisory independence is in line with the rationale behind the channel of connected party lending. This finding is consistent with those of Li and Yu (2014), who report that greater independence of bank supervision can reduce lending in favour of entities that have a pre-existing relationship with the institutions, and consequently decrease income inequality. Increased supervisory independence may thus reduce the risk of regulatory capture. When supervisory agency is not controlled by influential parties that would benefit from the connected party lending, it rather makes decisions based on sound regulatory principles in line with broad public interest. Therefore, alleviated connected party lending and associated enhanced transparency and credibility in the financial system, effective allocation of credit, and reduction of the likelihood of financials crises can all lead to a decrease in income inequality.

The effects of other control variables are in accordance with the reviewed literature. In all models, the effect of the lagged Gini coefficient on income inequality is positive and statistically significant, signalling the persistence in income inequality. This result is expected because the persistence in income inequality motivated the model construction (e.g., Delis *et al*., 2014; Rione *et al*., 2009). The signs of the estimated coefficients of both the logarithm of GDP per capita and its square are consistent with the Kuznets theory. The positive correlation between income inequality and the unemployment rate is also consistent with the findings of existing research. The effect of the population size on income inequality possesses similar level of statistical significance, sign, and magnitude as in Delis et al. (2014). Furthermore, there is positive and in half of the cases statistically significant effect of the normalized index of financial liberalization. As outlined in the peer-reviewed literature on the relationship between income inequality and financial liberalization, the sign of their correlation remains inconclusive. Our result aligns with the findings of Johansson and Wang (2014), de Haan and Sturm (2017), Manish and O'Reilly (2020), and Fouceri and Loungani (2018).

**Table 2: Estimation Results for the Gini Coefficient for the Full Sample**

| | *Dependent variable: Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-4.712*** (1.522)** | **-1.262 (1.500)** | **-2.494* (1.292)** | **-3.073 (1.904)** | **-2.695** (1.314)** | **-1.401 (1.164)** |
| Lagged Gini (-1) | 0.738*** (0.151) | 0.884*** (0.170) | 0.780*** (0.149) | 0.804*** (0.199) | 0.683*** (0.176) | 0.907*** (0.162) |
| Population | 0.721* (0.377) | 0.638 (0.478) | 0.630* (0.325) | 0.550 (0.437) | 0.541* (0.326) | 0.209 (0.323) |
| GDP per Capita | 15.880* (9.314) | 4.988 (10.699) | 7.469 (7.121) | 10.870 (7.245) | 7.362 (6.712) | 13.440 (10.968) |
| GDP per Capita sq. | -30.021* (17.923) | -9.794 (20.834) | -14.009 (13.503) | -20.026 (13.803) | -12.989 (13.039) | -25.758 (20.928) |
| Unemployment | 0.318*** (0.113) | 0.252 (0.166) | 0.293** (0.146) | 0.269** (0.127) | 0.352** (0.140) | 0.235 (0.152) |
| Human Capital | -0.176 (0.528) | -0.476 (0.865) | -0.503 (0.518) | -0.490 (0.558) | -0.340 (0.518) | -0.183 (0.678) |
| Trade Openness | 0.011 (0.014) | 0.011 (0.020) | 0.005 (0.008) | -0.0004 (0.012) | -0.001 (0.010) | 0.001 (0.009) |
| Fiscal Policy | 0.007 (0.068) | 0.022 (0.090) | -0.010 (0.068) | 0.036 (0.053) | -0.056 (0.074) | -0.003 (0.070) |
| Financial Development | -0.001 (0.009) | -0.002 (0.015) | 0.003 (0.012) | -0.010 (0.011) | -0.002 (0.013) | -0.010 (0.015) |
| Regulatory Quality | -0.918 (0.857) | 0.746 (1.090) | -0.038 (0.899) | -0.235 (1.018) | -0.216 (0.972) | -0.394 (1.525) |
| Financial Liberalization | 12.535** (4.998) | 4.496 (6.978) | 9.342* (5.093) | 7.570 (6.186) | 12.032** (5.154) | 7.586 (6.041) |
| Observations | 381 | 381 | 381 | 381 | 381 | 381 |
| AR (2) | 0.613 | 0.311 | 0.459 | 0.484 | 0.666 | 0.359 |
| Sargan-Hansen | 0.645 | 0.221 | 0.163 | 0.199 | 0.385 | 0.163 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

## 5.2 Microprudential Policy in Advanced Economies

In Chapter 3, the differences in both income inequality and microprudential policy measures between AE and EMDE are discussed. In the literature on the effect of macroprudential policy on income inequality, it is a common practice to distinguish between countries based on their development. Nonetheless, in research on the effects of microprudential policy stringency on income inequality, differences between AE and EMDE are unrevealed. To assess whether the effect of bank microprudential regulation and supervision differ based on the development of countries, the baseline model ( 1 ) is estimated separately for AE and EMDE.

The relationship between income inequality and microprudential policy in AE is shown in Table 3. The findings regarding the relationship between income inequality and the power of the supervisory agency as well as the overall microprudential policy framework are comparable to those obtained for the entire sample of countries. Stated differently, AE with stricter microprudential policies have lower levels of income inequality, and the power of supervisory authority plays a major role in the effectiveness of these policies. Compared to the full sample of countries, the intensity of supervisory power has a larger effect on income inequality both in its magnitude and statistical significance. In AE, strict microprudential policy thus contributes to the reduction of income inequality by mitigating the negative effects of financial crises by strengthening the stability and solvency of banks, as well as by promoting responsible lending practices.

In comparison to the regression results for the entire sample of countries, the effect of supervisory independence on income inequality does not exhibit statistical significance. Thus, supervisors in AE do not prioritize the interests of influential persons and, on the contrary, exercise their powers responsibly to ensure the overall health of the banks and costumer protection. Moreover, compared to the full sample of countries, there is no statistically significant evidence which would support the Kuznets theory or the impact of the unemployment rate on income inequality in AE. Further, the effects of the financial liberalization index and the lagged Gini index on income inequality are similar to those obtained from the full sample.

**Table 3: Estimation Results for the Gini Coefficient for Advanced Economies**

| | *Dependent variable: Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-3.906**** | **-1.410** | **-2.909***** | **-2.414** | **-1.492** | **-0.598** |
| | **(1.667)** | **(1.207)** | **(1.089)** | **(1.749)** | **(1.125)** | **(1.080)** |
| Lagged Gini (-1) | 0.995*** | 0.859*** | 0.942*** | 0.836*** | 0.740*** | 0.870*** |
| | (0.220) | (0.177) | (0.215) | (0.164) | (0.281) | (0.167) |
| Population | 0.426 | 0.232 | 0.579*** | 0.340 | 0.712 | 0.278 |
| | (0.408) | (0.494) | (0.214) | (0.326) | (0.608) | (0.275) |
| GDP per Capita | 9.465 | 15.569 | 7.507 | 5.449 | 6.994 | 11.497 |
| | (9.442) | (12.041) | (7.661) | (9.469) | (8.494) | (8.337) |
| GDP per Capita sq. | -22.082 | -32.582 | -16.152 | -12.853 | -15.295 | -23.761 |
| | (19.479) | (24.784) | (15.811) | (18.325) | (16.832) | (17.117) |
| Unemployment | 0.128 | 0.256 | 0.224 | 0.304 | 0.146 | 0.118 |
| | (0.203) | (0.208) | (0.266) | (0.193) | (0.249) | (0.182) |
| Human Capital | 2.154 | 0.288 | 0.037 | 0.525 | -0.520 | -0.428 |
| | (2.035) | (2.152) | (0.888) | (1.821) | (2.216) | (1.361) |
| Trade Openness | 0.012 | 0.013 | 0.005 | 0.004 | 0.013 | 0.006 |
| | (0.010) | (0.017) | (0.006) | (0.007) | (0.017) | (0.007) |
| Fiscal Policy | 0.091 | 0.129** | 0.001 | 0.056 | 0.114 | 0.089* |
| | (0.074) | (0.055) | (0.099) | (0.083) | (0.114) | (0.053) |
| Financial Development | 0.006 | -0.006 | 0.012 | 0.001 | -0.004 | -0.002 |
| | (0.009) | (0.010) | (0.013) | (0.012) | (0.010) | (0.007) |
| Regulatory Quality | 2.433 | 3.145 | 0.448 | 3.655* | 2.662 | 0.395 |
| | (2.400) | (2.280) | (2.091) | (1.993) | (3.066) | (2.675) |
| Financial Liberalization | 8.569 | 12.275 | 9.739* | 11.929 | 15.599** | 13.970*** |
| | (9.197) | (8.840) | (5.415) | (8.090) | (7.681) | (4.146) |
| Observations | 147 | 147 | 147 | 147 | 147 | 147 |
| AR (2) | 0.772 | 0.683 | 0.913 | 0.646 | 0.895 | 0.911 |
| Sargan-Hansen | 0.503 | 0.506 | 0.814 | 0.468 | 0.208 | 0.261 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

## 5.3 Microprudential Policy in Emerging Markets and Developing Economies

Regression results for the subgroup of EMDE are presented in Table 4. In EMDE, the overall microprudential policy intensity does not have a statistically significant effect on income inequality. The only microprudential bank regulatory and supervisory measure that leads to lower income inequality is supervisory independence.

Compared to supervisory practices in AE, where there is no statistically significant evidence of the relationship between income inequality and supervisory independence, supervisors in EMDE appear to favour the interests of influential parties or financial institutions over the general public interest which can lead to greater connected party lending. Biased supervisors may yield to the undue influence from competing interests by sacrificing their independence and objectivity. Investor confidence in the integrity of financial markets may decline if the transparency and credibility of the financial system is compromised. As a result, investment may be diverted, economic expansion will slow, unemployment will increase, and the likelihood of financial crises may increase.

The effect of financial sector policies on income inequality is limited in EMDE. In particular, the effects of fiscal policy and financial liberalization are not statistically significant compared to AE. On the other hand, unemployment, and the level of income inequality in the previous period are the main determinants of income inequality in EMDE.

**Table 4: Estimation Results for the Gini Coefficient for Emerging Markets and Developing Economies**

| | *Dependent variable: Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-4.908** **(3.140)** | **-2.336** **(3.053)** | **-3.052** **(2.157)** | **-1.280** **(3.337)** | **-3.726*** **(1.942)** | **-0.143** **(1.354)** |
| Lagged Gini (-1) | 0.737*** (0.142) | 0.628*** (0.232) | 0.598*** (0.218) | 0.843*** (0.127) | 0.583*** (0.174) | 0.805*** (0.122) |
| Population | 0.690** (0.333) | 1.236 (1.346) | 1.125 (0.925) | 0.566* (0.291) | 0.889 (0.780) | 0.449 (0.775) |
| GDP per Capita | 17.447 (17.086) | -25.364 (23.975) | -30.518 (26.309) | 6.677 (15.147) | -36.222 (24.949) | -15.642 (26.458) |
| GDP per Capita sq. | -31.649 (31.457) | 47.124 (44.534) | 56.773 (48.945) | -11.808 (28.345) | 68.098 (45.778) | 29.580 (47.795) |
| Unemployment | 0.350*** (0.133) | 0.590 (0.379) | 0.562* (0.306) | 0.303** (0.118) | 0.546* (0.279) | 0.322 (0.209) |
| Human Capital | 0.217 (0.525) | 2.323 (1.612) | 1.798* (1.075) | 0.035 (0.670) | 1.963 (1.327) | 0.492 (1.410) |
| Trade Openness | 0.018 (0.020) | 0.029 (0.047) | 0.032 (0.038) | 0.018 (0.022) | 0.001 (0.035) | 0.001 (0.031) |
| Fiscal Policy | -0.068 (0.061) | -0.018 (0.126) | -0.025 (0.106) | -0.085 (0.086) | -0.002 (0.109) | -0.020 (0.155) |
| Financial Development | -0.043 (0.037) | -0.025 (0.057) | -0.024 (0.042) | -0.042 (0.031) | -0.020 (0.053) | -0.029 (0.084) |
| Regulatory Quality | 0.735 (1.191) | 1.159 (1.886) | 1.355 (1.354) | 1.137 (1.331) | 1.210 (1.444) | 0.601 (1.396) |
| Financial Liberalization | 8.614 (5.679) | 3.789 (9.296) | 6.718 (7.619) | 3.683 (5.387) | 7.227 (7.106) | 3.731 (7.105) |
| Observations | 234 | 234 | 234 | 234 | 234 | 234 |
| AR (2) | 0.886 | 0.687 | 0.721 | 0.709 | 0.929 | 0.730 |
| Sargan-Hansen | 0.474 | 0.437 | 0.592 | 0.172 | 0.624 | 0.347 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

## 5.4 Interaction between Microprudential and Macroprudential Policy

Section 2.5 reviews the literature on the effect of macroprudential policies on income inequality. However, none of these studies assess the impact of macroprudential policy on income inequality conditional on the stance of microprudential supervision and regulation. This section therefore analyses whether and how the effect of macroprudential policy on income inequality is conditioned by microprudential policy in the entire sample of countries and separately for AE and EMDE.

The results are interpreted primarily with regard to the findings of Malovaná et al. (2023) and Ekinci and Özcan (2021). In their study, Ekinci and Özcan (2021) show that stricter microprudential policy is associated with more effective macroprudential policy. Thus, strengthened microprudential supervision can improve the effectiveness of macroprudential policies in preventing systemic risks and financial imbalances that disproportionately affect the poor (Krishnamurti & Carol Lee, 2014). In addition, the study by Malovaná et al. (2023) is closely related to our analysis, as the authors distinguish the impact of different groups of macroprudential policy instruments on income inequality, estimate their effect separately for AE and EMDE, and identify two channels through which income inequality may be affected.

The regression results for the entire sample of countries are reported in Table 5. The first column serves as a benchmark model without estimating the effect of macroprudential policy on income inequality.[19] The remaining columns present results for models with different types of macroprudential policy measures included separately and in interaction with microprudential policy. Microprudential regulation and supervision is represented by the aggregate index of microprudential policy labelled in the tables as *Bank regulation and supervision*. The separate effect of macroprudential policy on income inequality is named *Macroprudential Policy*. The interaction term is labelled as *Interaction*. This form of presentation of regression results is common to all tables in this section. As the primary focus is on the interaction between microprudential and macroprudential policies, the effects of other control variables are not included in the results but are available upon request. The later mentioned calculated effects of average macroprudential policies tightening on income inequality conditional on different levels of microprudential policy stringency based on Table A. 8 are presented in Table 6 for the full sample, Table 8 for AE, and in Table 10 for EMDE.

[19] The regression results in the first column may differ slightly from those presented in the previous sections due to a smaller sample of countries caused by the restricted availability of macroprudential policy data.

**Table 5: Interactions between Macroprudential Policy and Macroprudential Policy for the Full Sample**

| | *Dependent variable: Gini Coefficient* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -4.231*** | -1.622 | -3.077 | -3.984*** | -2.288 |
| and Supervision | (1.571) | (1.543) | (1.982) | (1.422) | (1.511) |
| Macroprudential | | 234.286*** | 77.754 | 23.951 | 133.674*** |
| Policy | | (84.197) | (74.909) | (57.149) | (45.966) |
| **Interaction** | | **-594.803*** ** | **-338.652*** | **-60.736** | **-343.882*** ** |
| | | **(170.054)** | **(181.390)** | **(113.581)** | **(83.043)** |
| Lagged Gini (-1) | 0.756*** | 0.839*** | 0.645*** | 0.739*** | 0.846*** |
| | (0.144) | (0.180) | (0.187) | (0.145) | (0.168) |
| … | | | | | |
| Observations | 351 | 351 | 351 | 351 | 351 |
| AR (2) | 0.511 | 0.157 | 0.368 | 0.441 | 0.262 |
| Sargan-Hansen | 0.529 | 0.941 | 0.467 | 0.793 | 0.905 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, 10%, and 11% levels is indicated by the ***, **, *, and • symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variable are available upon request.

As can be seen from the results, the interaction effect of microprudential policy and macroprudential policy is statistically significant for the overall macroprudential policy as well as for the capital-based measures and other measures. The effect of overall macroprudential policy tightening on income inequality can be both upward and downward. In the presence of loose microprudential policy, tighter macroprudential policy leads to a rise in income inequality, while in an environment of stringent microprudential policy the effect reverses. To illustrate, assuming macroprudential and microprudential policies get at their average values, the effect on income inequality is –0.003 Gini index points. When the rigor of microprudential policy increases to the level corresponding to the third quartile, the effect on income inequality changes to –0.144 Gini points. However, if the supervisory rigor decreases to its first quartile, income inequality rises by 0.134 Gini index points.

Therefore, the sign and the size of the effect of the implementation of macroprudential policies depends on the stance of microprudential policy. Under strong microprudential policy, macroprudential policy tightening reduces income inequality and the effect amplifies as the microprudential policy intensifies. However, when microprudential policy is loose, the effect reverses. These findings are in line with Ekinci and Özcan (2021), who show that in the

presence of weak microprudential supervision and regulation, the preemptive application of more stringent macroprudential policy measures is less effective or even ineffective, as banks are not sufficiently incentivized to meet the ordained requirements.

The effect of the overall tightening of macroprudential policy is mainly driven by the application of stricter capital-based and other measures. Our results are consistent with Malovaná et al. (2023), who demonstrate that tighter capital-based policies as well as other measures may decrease income inequality by reducing systemic risks and financial imbalances that disproportionately affect the poor.

Tightening of capital-based measures reduces income inequality regardless of the degree of stringency of microprudential policy. Capital-based measures thus appear to be effective in preventing systemic crises. Be that as it may, the magnitude of the effect is again conditioned by the level of supervision and regulation of individual institutions ensuring the fulfilment of mandated requirements. Specifically, the effect of more stringent capital-based measures amplifies at higher levels of microprudential policy stringency. Under the average levels of capital-based measures tightening and microprudential policy stringency, income inequality reduces by 0.183 Gini index points while when the stringency increases to its third quartile, income inequality reduces by 0.261 Gini index points.

The effect of the tightening of other macroprudential policies, including in particular measures in the area of liquidity and credit restrictions, to income inequality is similar to the effect of the overall tightening macroprudential policy. Specifically, the tightening of other measures leads to a reduction in income inequality at higher levels of microprudential policy stringency, and the effect is amplified as the stringency increases. As Table 6 shows, when other measures tightening and microprudential policy reach their averages, income inequality reduces by 0.004 Gini index points while when the stringency increases to its third quartile, income inequality reduces by 0.071 Gini index points. On the contrary, if the supervision and regulation gets loose to its first quartile level, income inequality rises by 0.063 Gini index points. Thus, if individual banks must follow respective macroprudential guidelines, liquidity limits and credit restrictions act as a preventive precaution against systemic problems. As loan restrictions do not directly target lending to individuals based on their level of income (DSTI) or purpose and collateral (LTV), banks are not mandated to differentiate between borrowers. Therefore, as long as banks comply with responsible and fair lending practices, the poor are not negatively affected by the tightening of other macroprudential measures, and rather benefit from them as they prevent the accumulation of financial imbalances. Borrower-based measures tightening does not appear to affect income inequality by itself or in interaction with microprudential regulation and supervision.

In summary, our findings are consistent with those of Malovaná et al. (2023) in terms of the effects of tightening capital-based and other measures on income inequality, Ekinci and Özcan (2021) and Krishnamurti and Carol Lee (2014). Malovaná et al. (2023) conclude that the tightening of capital-based and liquidity-based measures reduces income inequality through the crisis mitigation and prevention channel, while tightening borrower-based instruments lead to a rise in income inequality through the credit redistribution channel. Our results confirm that the tightening of capital-based and liquidity-based instruments reduces income inequality. However, our findings do not provide evidence of the presence of the credit redistribution channel. Moreover, we show that in an environment of weak bank regulation and supervision, the effects of tighter macroprudential regulations on income inequality are reversed except for capital-based measures. Ekinci and Özcan (2021) emphasize the importance of enhanced microprudential supervision in the effectiveness of macroprudential regulation in preventing financial imbalances.

**Table 6: Effects of Macroprudential Policies on Income Inequality Conditional on Microprudential Policy in the Full Sample**

| **Condition** | **Effects of average levels on income inequality** | | | |
|---|---|---|---|---|
| Microprudential Policy | Macroprudential Policy | CBM | BBM | OM |
| *Q1* | 0.134 | –0.107 | 0.000 | 0.063 |
| *Median* | 0.022 | –0.169 | 0.000 | 0.010 |
| *Mean* | –0.003 | –0.183 | 0.000 | –0.004 |
| *Q3* | –0.144 | –0.261 | 0.000 | –0.072 |

Source: author's calculations, only statistically significant effects are included in the calculations

## Advanced Economies

Malovaná et al. (2023) provide empirical evidence that effects related to crisis mitigation and prevention channel are more persistent and pronounced in EMDE, while the credit redistribution channel is dominant in AE. For this reason, we reestimated the models with interactions between macroprudential and microprudential policy separately for AE and EMDE. The regression results for AE are presented in Table 7. Compared to results for the full sample of countries, there is no statistically significant evidence that tightening macroprudential policy as a whole affects income inequality in AE. The only group of macroprudential policy instruments whose tightening impacts income inequality in AE are capital-based measures. Concretely, their tightening leads to an increase in income inequality at almost all levels of microprudential policy stringency. However, as the supervisory and

regulatory stringency increases, the positive effect diminishes and eventually reverses and becomes negative. In specific terms, as shown in Table 8, given both capital-based measures tightening and microprudential policy get at their average levels, income inequality rises by 0.030 Gini index points. When microprudential policy decreases to its first quartile, income inequality rises by 0.163 Gini index point while when it increases to its third quartile, income inequality decreases by 0.100 Gini index points. Therefore, tightening capital-based measures in AE rather restrict the funds banks can provide to public and thus increase inequality while the effect of crisis mitigation and prevention channel is limited and operates only in an environment of the highest levels of supervisory and regulatory stringency.

Since according to Malovaná et al. (2023), the crisis mitigation and prevention channel is typical of EMDE, the effect of tightening capital-based measures alters in AE probably precisely because of the exclusion of these countries. However, our findings do not align with the conclusion of Malovaná et al. (2023), that in AE the application of borrower-based instruments affects income inequality by influencing credit and house price growth through the credit redistribution channel.

**Table 7: Interactions between Macroprudential Policy and Macroprudential Policy for Advanced Economies**

| | *Dependent variable: Gini Coefficient* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -3.717** | -3.938* | -3.158 | -2.976 | -2.548 |
| and Supervision | (1.671) | (2.111) | (2.110) | (2.062) | (1.947) |
| Macroprudential | | **482.880** | **478.893**** | **89.146** | **76.777** |
| Policy Index | | **(384.806)** | **(240.985)** | **(151.467)** | **(88.084)** |
| **Interaction** | | **-670.870** | **-835.373*** | **-127.419** | **-126.556** |
| | | **(584.556)** | **(481.668)** | **(200.225)** | **(131.122)** |
| Lagged Gini (-1) | 0.740*** | 0.873*** | 0.777*** | 0.760*** | 0.728*** |
| | (0.219) | (0.206) | (0.164) | (0.215) | (0.197) |
| … | | | | | |
| Observations | 147 | 147 | 147 | 147 | 147 |
| AR (2) | 0.440 | 0.632 | 0.768 | 0.599 | 0.586 |
| Sargan-Hansen | 0.711 | 0.769 | 0.672 | 0.402 | 0.440 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variable are available upon request.

**Table 8: Effect of Macroprudential Policies Conditional on Microprudential Policy in Advanced Economies**

| Condition | Effects of average levels on income inequality | | | |
|---|---|---|---|---|
| Microprudential Policy | Macroprudential Policy | CBM | BBM | OM |
| *Q1* | 0.000 | 0.163 | 0.000 | 0.000 |
| *Median* | 0.000 | 0.032 | 0.000 | 0.000 |
| *Mean* | 0.000 | 0.030 | 0.000 | 0.000 |
| *Q3* | 0.000 | –0.100 | 0.000 | 0.000 |

Source: author's calculations, only statistically significant effects are included in the calculations

## Emerging Markets and Developing Economies

Similar to AE, we reestimated the models for the EMDE subsample. The regression results are presented in Table 9. The interaction terms for the overall macroprudential policy tightening as well as for the tightening of capital-based and other measures are statistically significant even at the 1% level of significance. Overall macroprudential policy tightening as well as tightening capital-based and other measures lead to a reduction in income inequality at all levels of microprudential policy stringency. Furthermore, their effects on income inequality are again amplified in an environment of intensive supervision and regulation. As for borrower-based measures, there is no significant evidence that they affect income inequality as measured by the Gini coefficient in EMDE.

As Table 10 presents, if microprudential policy and macroprudential policy indices increase to their average levels, income inequality decreases by 0.235 Gini index points whereas when microprudential policy rigor rises to its third quartile level, the effect on the income inequality reduction is 0.295 Gini index points. Tightening capital-based measures are the most prominent in contributing to income inequality decrease in EMDE. Given microprudential policy and capital-based tightening get at their average levels, income inequality decreases by 0.265 Gini index points. Under the same circumstances, for other measures, income inequality reduces by 0.131 Gini index points.

Our results are consistent with the findings of Malovaná et al. (2023) with respect to the predominance of the crisis mitigation and prevention channel in EMDE, through which tightening capital-based and other measures reduce income inequality, while the impact of borrower-based instruments is limited. Nonetheless, we provide evidence that macroprudential policy tightening leads to a greater reduction in income inequality when conducted under strong and thorough supervision and regulation aimed at proper compliance with mandated

guidelines. Conversely, if implemented under weak supervision, the preventive effect of tightening capital-based and other measures may be limited.

**Table 9: Interactions between Macroprudential Policy and Macroprudential Policy for Emerging Markets and Developing Economies**

| | *Dependent variable: Gini Coefficient* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -1.638 | -1.303 | 0.300 | -1.969 | -2.049 |
| and Supervision | (2.690) | (2.278) | (2.306) | (3.020) | (2.225) |
| Macroprudential | | 118.128 | 69.421 | -29.911 | 82.407 |
| Policy Index | | (103.411) | (50.681) | (41.367) | (57.285) |
| **Interaction** | | **-480.369**** | **-535.629***** | **36.938** | **-297.408***** |
| | | **(189.961)** | **(152.658)** | **(84.503)** | **(97.663)** |
| Lagged Gini (-1) | 0.756*** | 0.632*** | 0.755*** | 0.772*** | 0.645*** |
| | (0.137) | (0.112) | (0.099) | (0.142) | (0.094) |
| … | | | | | |
| Observations | 204 | 204 | 204 | 204 | 204 |
| AR (2) | 0.885 | 0.116 | 0.880 | 0.792 | 0.176 |
| Sargan-Hansen | 0.529 | 0.928 | 0.804 | 0.623 | 0.933 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variable are available upon request.

**Table 10: Effect of Macroprudential Policies Conditional on Microprudential Policy in Emerging Markets and Developing Economies**

| **Condition** | **Effects of average levels on income inequality** | | | |
|---|---|---|---|---|
| Microprudential Policy | Macroprudential Policy | CBM | BBM | OM |
| *Q1* | –0.131 | –0.148 | 0.000 | –0.074 |
| *Median* | –0.210 | –0.237 | 0.000 | –0.118 |
| *Mean* | –0.235 | –0.265 | 0.000 | –0.131 |
| *Q3* | –0.295 | –0.333 | 0.000 | –0.165 |

Source: author's calculations, only statistically significant effects are included in the calculations

## 5.5 Robustness Checks

This section presents the results of the robustness checks of the estimation. Models with different sets of control variables are estimated, alternative measures of income inequality are incorporated, macroprudential policy index is divided into loosening and tightening actions, and five-year averages instead of three-year averages are used.

### Set of Control Variables

To verify that alternative sets of control variables do not change the regression results, additional models are estimated as Table 11 presents. Firstly, control variables that were not statistically significant in the original regression are eliminated. Secondly, as the variable of regulatory quality was chosen rather arbitrarily, we replace it with another governance indicator – rule of law. Thirdly, as some literature suggests that inflation, banking crises and policy rate contribute to changes in income inequality, models with each variable individually and together are estimated. Higher inflation, occurrence of banking crisis, and decrease in interest rate may disproportionally more affect the poor (Albanesi *et al.,* 2007, Malovaná *et al.*, 2023).

Table 11 presents the regression results for the aggregate index of microprudential policy for the full sample of countries. The effect of microprudential policy on income inequality remains negative and statistically significant in almost all model specifications. When policy rate is included in model (5), microprudential policy is statistically significant only at 11% level. The magnitude of the effect slightly changes but the difference is not inordinately large. Thus, the results on the effect of microprudential policy on income inequality are robust to different sets of control variables.

**Table 11: Estimation Results with Different Control Variables**

| | *Dependent variable: Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Bank Regulation and Supervision** | **-4.681**$^{***}$ **(1.319)** | **-5.535**$^{**}$ **(2.645)** | **-4.503**$^{***}$ **(1.391)** | **-2.863**$^{**}$ **(1.221)** | **-3.591 (2.201)** | **-4.562**$^{**}$ **(2.265)** |
| Lagged Gini (-1) | 0.795$^{***}$ (0.168) | 0.760$^{***}$ (0.139) | 0.760$^{***}$ (0.139) | 0.687$^{*}$ (0.411) | 0.625$^{**}$ (0.283) | 0.660$^{***}$ (0.212) |
| Financial Liberalization | 17.186$^{***}$ (6.627) | 10.428$^{*}$ (5.658) | 11.664$^{***}$ (4.292) | 10.510 (7.195) | 9.956 (8.956) | 12.173$^{*}$ (6.984) |
| Population | 0.777$^{**}$ (0.329) | 0.704$^{*}$ (0.384) | 0.620$^{*}$ (0.322) | 0.771 (1.122) | 0.914 (0.718) | 0.858$^{***}$ (0.325) |

| | *Dependent variable: Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| GDP per Capita | 11.500** | 22.996 | 15.136* | -4.787 | -6.841 | -5.346 |
| | (4.718) | (19.319) | (9.152) | (21.245) | (17.163) | (15.043) |
| GDP per Capita sq. | -23.563** | -43.499 | -28.602 | 9.587 | 13.998 | 10.808 |
| | (10.033) | (36.600) | (17.685) | (43.130) | (34.212) | (29.943) |
| Unemployment | 0.309* | 0.324** | 0.325*** | 0.299*** | 0.340*** | 0.337*** |
| | (0.158) | (0.126) | (0.114) | (0.099) | (0.103) | (0.104) |
| Fiscal Policy | 0.071 | 0.030 | -0.005 | 0.016 | 0.018 | 0.012 |
| | (0.083) | (0.069) | (0.072) | (0.086) | (0.091) | (0.044) |
| Human Capital | | 0.195 | -0.082 | -1.090 | -1.098 | -1.346 |
| | | (0.549) | (0.471) | (1.917) | (1.415) | (0.943) |
| Trade Openness | | 0.014 | 0.008 | 0.018 | 0.018 | 0.016 |
| | | (0.020) | (0.011) | (0.030) | (0.029) | (0.013) |
| Financial Development | | 0.002 | 0.0002 | 0.011 | 0.013 | 0.011 |
| | | (0.011) | (0.008) | (0.012) | (0.010) | (0.007) |
| Regulatory Quality | | | -0.904 | 0.322 | 0.470 | 0.709 |
| | | | (0.860) | (2.876) | (2.730) | (2.716) |
| Rule of Law | | -1.822 | | | | |
| | | (2.034) | | | | |
| Banking Crisis | | | 0.031 | | | 0.333 |
| | | | (0.769) | | | (0.833) |
| Inflation | | | | -0.054 | | 0.130 |
| | | | | (0.223) | | (0.266) |
| Policy Rate | | | | | -0.069 | -0.197 |
| | | | | | (0.186) | (0.130) |
| Observations | 381 | 381 | 381 | 209 | 209 | 209 |
| AR (2) | 0.577 | 0.551 | 0.579 | 0.637 | 0.544 | 0.602 |
| Sargan-Hansen | 0.963 | 0.587 | 0.688 | 0.623 | 0.486 | 0.388 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

### Income Shares

In addition to assessing the impact of microprudential bank regulation and supervision on income inequality as measured by the Gini index, we also resorted to an alternative measure of income inequality as demonstrated in Chapter 3 – income shares. Specifically, the share of income held by the top 1%, top 5%, top 10%, and bottom 10% of the income distribution as well as the difference between the top 10% and bottom 10% were used as alternative dependent

variables. The bottom 1% and bottom 5% of the income distribution were not used due to the insufficiency of non-zero values in the data. Delis et al. (2014) in their paper suggest using the incomes of individuals at the top and bottom of the income distribution as one potential extension of their work.

The estimation results for the income share held by the top 10% of the income distribution without a difference between EMDE and AE are shown in Table 12. Compared to using the Gini index as the dependent variable, microprudential policy measures do not exhibit any statistically significant relationship with the income share held by the top 10%. One interesting finding emerges in the case of AE as presented in Table A. 9 in the Appendix. Although the overall index of microprudential policy does not have a statistically significant effect on income inequality, separate adoption of Basel Accords does. Specifically, the adoption of the improved (new) version of the Basel Accords results in an increase in the share of income of the top 10% and this effect is statistically significant even at the 1% significance level.[20] Regression results for the subset of EMDE are presented in Table A. 10. Analogously to the findings for the full sample of countries, none of the individual microprudential policy measures or the overall microprudential policy index affect the income share of the top 10% of the income distribution in a statistically significant way.

The models were also reestimated for the top 1% and top 5% of the income distribution. Due to the redundancy of the analysis, the results are only available upon request. When top 10% is replaced by the income share of the top 5%, the results remain practically unchanged. In AE, the magnitude of the effect of Basel Accords adoption decreases although it remains statistically significant. Using the share of income of the top 1% of the income distribution as the dependent variable, none of the microprudential policies significantly affect income inequality even when distinguishing between AE and EMDE.

Whether and how the stringency of microprudential policy affects the incomes of individuals at the lower extreme end of the income distribution is examined using the income share of the bottom 10% of the income distribution as the dependent variable. Regression results for the full sample of countries are shown in Table 13. Similar to the findings for the top 10% of the income distribution, microprudential policy does not have a statistically

[20] One possible rationale may be that Basel Accords impose stricter capital adequacy and risk management requirements on banks, which may act as barriers to entry for smaller financial institutions due to increased compliance costs such as investment in risk management systems, regulatory reporting, and compliance personnel. Larger banks may then consolidate their market share and increase their profitability. The income generated by these big banks may disproportionally benefit top executives and shareholders and contribute to a higher income share of the top 10%.

**Table 12: Estimation Results for the Top 10% for the Full Sample**

| | *Dependent variable: Top 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-3.600** **(6.126)** | **1.327** **(2.607)** | **-3.127** **(3.328)** | **3.549** **(2.275)** | **-5.772** **(3.708)** | **1.117** **(1.830)** |
| Lagged Top 10% (-1) | 0.436 (0.315) | 0.716** (0.312) | 0.499* (0.265) | 0.788*** (0.255) | 0.375* (0.214) | 0.593*** (0.220) |
| Population | 2.371 (1.968) | 0.185 (1.870) | 2.253* (1.351) | 0.162 (1.348) | 2.775** (1.207) | 0.993 (1.282) |
| GDP per Capita | -65.930** (28.494) | -55.651 (37.332) | -77.679*** (27.122) | -42.878 (32.508) | -79.921*** (23.950) | -69.660** (28.952) |
| GDP per Capita sq. | 122.256** (54.278) | 107.072 (69.906) | 143.926*** (50.600) | 81.647 (61.236) | 147.176*** (44.561) | 131.998** (55.687) |
| Unemployment | 0.145 (0.348) | 0.265 (0.250) | 0.058 (0.295) | 0.283 (0.233) | 0.066 (0.287) | 0.265 (0.238) |
| Human Capital | 5.627 (4.053) | 2.525 (3.364) | 6.575* (3.699) | 2.280 (1.947) | 6.299* (3.391) | 3.570* (1.987) |
| Trade Openness | 0.067 (0.077) | -0.003 (0.049) | 0.054 (0.044) | -0.005 (0.035) | 0.080* (0.047) | 0.008 (0.033) |
| Fiscal Policy | -0.151 (0.236) | -0.364** (0.167) | -0.122 (0.198) | -0.213 (0.182) | -0.073 (0.186) | -0.217 (0.201) |
| Financial Development | 0.037 (0.027) | 0.034 (0.030) | 0.041 (0.028) | 0.027 (0.026) | 0.034 (0.024) | 0.031 (0.026) |
| Regulatory Quality | 3.457 (3.613) | 3.212 (2.799) | 4.517 (3.802) | 2.106 (2.425) | 4.413 (3.296) | 3.702 (2.683) |
| Financial Liberalization | 4.046 (14.458) | -4.873 (10.562) | -0.298 (13.044) | -4.569 (11.866) | 8.350 (11.220) | -2.827 (12.688) |
| Observations | 369 | 369 | 369 | 369 | 369 | 369 |
| AR (2) | 0.719 | 0.696 | 0.721 | 0.764 | 0.483 | 0.834 |
| Sargan-Hansen | 0.128 | 0.051 | 0.070 | 0.072 | 0.156 | 0.121 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

**Table 13: Estimation Results for the Bottom 10% for the Full Sample**

| | *Dependent variable: Bottom 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation** | **-0.009** | **-0.004** | **-0.040** | **-0.025** | **-0.009** | **-0.003** |
| **and Supervision** | **(0.050)** | **(0.030)** | **(0.050)** | **(0.049)** | **(0.028)** | **(0.025)** |
| Lagged Bottom | 0.627** | 0.668** | 0.562** | 0.660*** | 0.627** | 0.550* |
| 10% (-1) | (0.276) | (0.269) | (0.281) | (0.255) | (0.273) | (0.328) |
| Population | 0.010 | 0.008 | 0.025 | 0.014 | 0.019 | 0.017 |
| | (0.022) | (0.019) | (0.023) | (0.024) | (0.021) | (0.019) |
| GDP per Capita | 0.427 | 0.475 | 0.682* | 0.364 | 0.563 | 0.419 |
| | (0.377) | (0.364) | (0.378) | (0.336) | (0.383) | (0.382) |
| GDP per Capita sq. | -0.737 | -0.820 | -1.214* | -0.647 | -1.003 | -0.725 |
| | (0.707) | (0.672) | (0.706) | (0.618) | (0.700) | (0.709) |
| Unemployment | -0.0001 | -0.001 | -0.002 | -0.001 | -0.002 | -0.001 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Human Capital | -0.040 | -0.044 | -0.056 | -0.026 | -0.050 | -0.048 |
| | (0.044) | (0.041) | (0.039) | (0.041) | (0.052) | (0.049) |
| Trade Openness | -0.0004 | -0.0005 | -0.0003 | -0.0002 | -0.0003 | -0.0004 |
| | (0.0004) | (0.0005) | (0.001) | (0.0004) | (0.001) | (0.001) |
| Fiscal Policy | -0.0002 | -0.0003 | 0.001 | 0.0003 | 0.001 | 0.001 |
| | (0.002) | (0.002) | (0.002) | (0.003) | (0.002) | (0.002) |
| Financial | -0.0003 | -0.0003 | -0.0003 | -0.0002 | -0.0002 | -0.0002 |
| Development | (0.0004) | (0.0004) | (0.0003) | (0.0003) | (0.0003) | (0.0003) |
| Regulatory Quality | -0.017 | -0.029 | -0.035 | -0.014 | -0.033 | -0.017 |
| | (0.031) | (0.035) | (0.034) | (0.029) | (0.031) | (0.029) |
| Financial | -0.112 | -0.123 | -0.122 | -0.040 | -0.073 | -0.115 |
| Liberalization | (0.140) | (0.133) | (0.154) | (0.132) | (0.150) | (0.143) |
| Observations | 369 | 369 | 369 | 369 | 369 | 369 |
| AR (2) | 0.848 | 0.874 | 0.723 | 0.857 | 0.857 | 0.861 |
| Sargan-Hansen | 0.235 | 0.417 | 0.328 | 0.231 | 0.431 | 0.155 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

significant effect on the income share of the bottom 10% as a whole, and the same is true for its individual instruments.[21] With respect to the income share of the bottom 10% of the income distribution in AE, the situation begins to show a different pattern. Although microprudential policy is shown to reduce income inequality when assessing its impact on the middle of the income distribution, it reduces the income share of low-income individuals. As can be seen in Table A. 11, the overall intensification of microprudential policy as well as better site supervision and greater supervisory power result in a reduction of the income share of the bottom 10%. Table A. 12 illustrates that microprudential policy in EMDE has no discernible impact on low-income people.

To account for factors that directly contribute to the widening of the income gap between high- and low-income individuals, we also reestimated the baseline model (1) with the dependent variable being the difference between the income shares of the top 10% and bottom 10%. Regression results on the effect of microprudential policy stringency are analogous to those found in the models with the income share of the top 10%, according to Table A. 13 through Table A. 15 in the Appendix. In AE, the very adoption of the Basel Accords causes the gap between high- and low-income groups to widen.

Income shares of the top 10% and bottom 10% are also used to inspect the interaction effect between macroprudential and microprudential policies on income inequality. Regression results for the full sample of countries using the income share of the top 10% as a dependent variable are presented in Table 14. Results using the income share of the bottom 10% are provided in Table 15. As evident, both the separate and interaction effects of macroprudential policies are statistically insignificant in all models. Analogously, there is no statistically significant evidence that macroprudential policies both alone and in interaction with microprudential policy affect the share of income of the top 10% and bottom 10% when distinguishing between AE and EMDE. Regressions results for AE and EMDE are presented in Table A. 16–Table A. 19 in the Appendix.

To conclude, analyses based on income shares do not fully support our findings based on the Gini coefficient. Thus, the baseline results may not be considered very robust to changes in dependent variables. However, income shares capture income inequality from a different perspective than the Gini coefficient as they focus on specific quantiles of income distribution.

[21] One potential reason for this finding is that low-income individuals rarely apply for loans for investment opportunities and rather use them for everyday needs such as housing. Furthermore, it is likely that they have a small surplus of funds that can be deposited in a bank. In conclusion, microprudential policy may not have a proper transmission channel to influence the income of the bottom 10%.

Moreover, the coverage of countries and years and the comparability between countries is superior for the Gini coefficient.

**Table 14: Interactions using Top 10% for the Full Sample**

| | *Dependent variable: Top 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation and Supervision | -0.321 | 0.394 | -0.105 | -0.954 | 0.391 |
| | (2.203) | (2.482) | (3.928) | (2.089) | (2.409) |
| Macroprudential Policy Index | | 8.476 | -65.616 | -89.755 | 14.494 |
| | | (156.267) | (219.819) | (73.584) | (96.423) |
| **Interaction** | | **-83.081** | **126.734** | **153.506** | **-85.021** |
| | | **(290.015)** | **(687.512)** | **(127.176)** | **(159.771)** |
| Lagged Top 10% (-1) | 0.768*** | 0.796*** | 0.777*** | 0.755*** | 0.784*** |
| | (0.263) | (0.264) | (0.293) | (0.254) | (0.257) |
| … | | | | | |
| Observations | 339 | 339 | 339 | 339 | 339 |
| AR (2) | 0.735 | 0.602 | 0.601 | 0.936 | 0.556 |
| Sargan-Hansen | 0.113 | 0.132 | 0.118 | 0.131 | 0.140 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

**Table 15: Interactions using Bottom 10% for the Full Sample**

| | *Dependent variable: Bottom 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation and Supervision | -0.012 | 0.002 | 0.018 | -0.016 | 0.000 |
| | (0.028) | (0.033) | (0.032) | (0.038) | (0.029) |
| Macroprudential Policy Index | | -2.377 | 0.0002 | 0.509 | -1.949 |
| | | (3.718) | (3.309) | (0.760) | (1.940) |
| **Interaction** | | **2.410** | **-2.489** | **-0.779** | **1.985** |
| | | **(5.697)** | **(7.006)** | **(1.386)** | **(3.362)** |
| Lagged Bottom 10% (-1) | 0.845*** | 0.689** | 0.854*** | 0.853*** | 0.728*** |
| | (0.247) | (0.286) | (0.260) | (0.254) | (0.268) |
| … | | | | | |
| Observations | 339 | 339 | 339 | 339 | 339 |
| AR (2) | 0.735 | 0.602 | 0.601 | 0.936 | 0.556 |
| Sargan-Hansen | 0.113 | 0.132 | 0.118 | 0.131 | 0.140 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

### Macroprudential Policy Index Definifion

Although research to date focuses primarily on the effect of macroprudential policy tightening, we also assessed the interactions both with macroprudential policy tightening and its loosening. According to BIS (2022), the effects of macroprudential policy on the credit growth are asymmetric. In concrete terms, macroprudential policy easing has a weaker effect on credit growth than a tightening. We thus transformed the three-year averages of the macroprudential policy index into two dummy variables, one for its tightening and one for loosening. The dummy variable on tightening takes value 1 when the three-year average of the index is positive and 0 else, and the dummy variable on loosening takes value 1 if the three-year average of the index is negative and 0 else. The interaction term between macroprudential and microprudential policy, and the macroprudential policy dummy variable were added into the equation ( 1 ) separately for macroprudential policy loosening and tightening.

Regression results for the full sample of countries and Gini coefficient being the dependent variables are presented in Table 16 for macroprudential policy tightening and in Table 17 for its loosening. Interaction effects of the overall macroprudential policy tightening as well as of the tightening of capital-based and other measures on income inequality are negative and statistically significant. Moreover, the effects of the overall macroprudential policy tightening and the tightening of other measures on income inequality can be both upward and downward depending on the stance of microprudential policy rigor; while stringent, macroprudential policy tightening reduces income inequality. Tightening of capital-based measures leads to a reduction in income inequality irrespective of microprudential policy. However, in all instances, more stringent microprudential policy reinforces the effect of macroprudential policy tightening on income inequality. Similar to the baseline results, borrower-based measures tightening does not significantly affect income inequality. Nonetheless, loosening borrower-based measures lead to a reduction in income inequality if supervision and regulation is robust and intensive. On the contrary, if individual banks are poorly regulated and supervised in the course of their easing, borrower-based policies lead to an increase in the Gini coefficient. The effect is again reinforced by microprudential policy stringency.

Therefore, the baseline results on the effect of the interaction between macroprudential and microprudential policies on income inequality are robust to the definition of the index of macroprudential policy tightening. The effect of borrower-based measures loosening is not however supported by the baseline results.

**Table 16: Interaction between Macroprudential Tightening and Microprudential Policy for the Full Sample**

| | *Dependent variable: Gini Coefficient* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -4.231*** | -0.877 | -1.622 | -3.233** | -1.438 |
| and Supervision | (1.571) | (1.748) | (1.905) | (1.518) | (1.602) |
| Macroprudential | | 1.298* | 0.790 | 1.854 | 0.887* |
| Tightening | | (0.702) | (0.524) | (1.724) | (0.516) |
| **Interaction** | | **-4.288**** | **-3.700**** | **-5.272** | **-3.589**** |
| | | **(1.910)** | **(1.729)** | **(4.346)** | **(1.432)** |
| Lagged Gini (-1) | 0.756*** | 0.871*** | 0.799*** | 0.789*** | 0.911*** |
| | (0.144) | (0.197) | (0.149) | (0.134) | (0.151) |
| … | | | | | |
| Observations | 351 | 351 | 351 | 351 | 351 |
| AR (2) | 0.511 | 0.198 | 0.416 | 0.204 | 0.169 |
| Sargan-Hansen | 0.529 | 0.782 | 0.767 | 0.786 | 0.789 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

**Table 17: Interaction between Macroprudential Loosening and Microprudential Policy for the Full Sample**

| | *Dependent variable: Gini Coefficient* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -4.231*** | -4.370*** | -3.612** | -4.347*** | -4.619*** |
| and Supervision | (1.571) | (1.486) | (1.623) | (1.584) | (1.581) |
| Macroprudential | | -1.726 | -3.274 | 2.541* | -1.812 |
| Loosening | | (1.212) | (2.266) | (1.457) | (1.399) |
| **Interaction** | | **3.119** | **6.090** | **-5.147*** | **4.129** |
| | | **(2.626)** | **(5.015)** | **(2.751)** | **(3.478)** |
| Lagged Gini (-1) | 0.756*** | 0.760*** | 0.832*** | 0.712*** | 0.730*** |
| | (0.144) | (0.160) | (0.201) | (0.134) | (0.157) |
| … | | | | | |
| Observations | 351 | 351 | 351 | 351 | 351 |
| AR (2) | 0.511 | 0.641 | 0.414 | 0.442 | 0.543 |
| Sargan-Hansen | 0.529 | 0.650 | 0.539 | 0.511 | 0.908 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

### Five-year Averages

Additionally, models on the effect of microprudential policy and the effect of the interaction between microprudential and macroprudential policies on income inequality were estimated using five-year non-overlapping averages. Using five-year averages instead of three-year averages is a common practice in research on the determinants of income inequality (Delis *et al.,* 2014; Brei *et al.,* 2023; de Haan & Sturm, 2017). In our baseline analysis, three-year averages were used due to the short panel's length.

Regression results on the effect of microprudential policies on income inequality as measured by the Gini index for the full sample of countries are presented in Table 18. Compared to three-year averages, the effect of the aggregate microprudential policy index gets negligibly smaller in magnitude and remains statistically significant. The effect of greater independence of a supervisory authority remains statistically significant and is even larger in magnitude. The effect of supervisory power is larger in magnitude compared to results using three-year averages but becomes insignificant. It would become significant at 14% level of significance which is not far from the reported threshold of 10%.

Furthermore, Table 19 shows the results on the interaction effects for the full sample of countries. Similar to the results based on three-year averages, the effects of a greater macroprudential policy index as well as of the tightening of capital-based and other measures are reinforced by strong individual bank regulation and supervision. In comparison to the baseline results, the sign of the effect of capital-based measures tightening depends on the supervisory and regulatory rigor whereas the effect of overall macroprudential policy tightening does not. Both the individual and interaction effects of borrower-based measures tightening remain statistically insignificant.

In conclusion, the effects of microprudential policies are robust to the change of the interval over which the data are averaged except for the effect of supervisory power, which is considered less robust. Furthermore, the results on the reinforced effect of macroprudential policy tightening on income inequality under more stringent microprudential policy are robust to intervals used for averages. The same applies to the tightening of capital-based measures and other instruments.

**Table 18: Estimation Results using 5-year Averages for the Full Sample**

| | *Dependent variable: Gini coefficient* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation** | **-3.810**** | **-1.062** | **-3.068** | **-2.574** | **-3.643**** | **-1.522** |
| **and Supervision** | **(1.570)** | **(0.751)** | **(2.090)** | **(2.546)** | **(1.430)** | **(1.226)** |
| Lagged Gini (-1) | 0.646*** | 0.632*** | 0.545** | 0.634*** | 0.510*** | 0.581** |
| | (0.227) | (0.222) | (0.213) | (0.214) | (0.171) | (0.275) |
| Population | 0.982* | 0.919** | 1.268*** | 0.934 | 0.782 | 0.873 |
| | (0.536) | (0.442) | (0.464) | (0.580) | (0.478) | (0.561) |
| GDP per Capita | 28.049** | 19.483 | 26.399** | 26.190** | 21.602** | 23.997 |
| | (11.510) | (14.111) | (13.373) | (12.624) | (10.749) | (15.993) |
| GDP per Capita sq. | -52.808** | -36.787 | -50.569** | -49.112** | -39.985* | -44.194 |
| | (21.945) | (27.262) | (25.644) | (23.902) | (20.654) | (30.157) |
| Unemployment | 0.271 | 0.262 | 0.198 | 0.192 | 0.427** | 0.096 |
| | (0.205) | (0.276) | (0.237) | (0.244) | (0.208) | (0.233) |
| Human Capital | -0.814 | -1.025 | -1.149 | -1.096 | -0.673 | -1.273 |
| | (0.822) | (0.876) | (0.813) | (0.877) | (0.679) | (0.974) |
| Trade Openness | 0.009 | 0.005 | 0.011 | 0.006 | -0.007 | 0.006 |
| | (0.011) | (0.014) | (0.009) | (0.012) | (0.013) | (0.012) |
| Fiscal Policy | -0.012 | 0.024 | 0.054 | 0.035 | -0.174 | 0.063 |
| | (0.149) | (0.186) | (0.159) | (0.165) | (0.156) | (0.169) |
| Financial | -0.017 | -0.010 | -0.008 | -0.024 | 0.005 | -0.029 |
| Development | (0.014) | (0.025) | (0.023) | (0.019) | (0.027) | (0.021) |
| Regulatory Quality | -1.666 | -1.517 | -2.359 | -1.800 | -1.532 | -1.815 |
| | (1.408) | (2.478) | (1.781) | (1.549) | (1.504) | (2.207) |
| Financial | 21.125 | 20.254 | 28.712** | 21.264 | 27.860** | 20.137 |
| Liberalization | (13.140) | (17.905) | (11.979) | (15.517) | (13.736) | (16.500) |
| Observations | 261 | 261 | 261 | 261 | 261 | 261 |
| AR (2) | 0.936 | 0.737 | 0.401 | 0.965 | 0.814 | 0.632 |
| Sargan-Hansen | 0.620 | 0.237 | 0.546 | 0.221 | 0.715 | 0.278 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively.

**Table 19: Interaction between Macroprudential and Microprudential Policy on 5-year Averages for the Full Sample**

| | *Dependent variable: Gini Coefficient* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -3.542** | 0.691 | 0.029 | -3.483** | -0.506 |
| and Supervision | (1.579) | (2.005) | (2.125) | (1.767) | (1.704) |
| Macroprudential | | 154.720 | 453.450* | -28.078 | 97.956* |
| Policy Index | | (122.971) | (231.974) | (39.854) | (58.666) |
| **Interaction** | | **-558.465**** | **-1,061.646**** | **42.158** | **-359.693**** |
| | | **(260.442)** | **(418.922)** | **(60.076)** | **(147.623)** |
| Lagged Gini (-1) | 0.751*** | 0.693** | 0.603* | 0.829*** | 0.747*** |
| | (0.283) | (0.280) | (0.356) | (0.225) | (0.224) |
| … | | | | | |
| Observations | 239 | 239 | 239 | 239 | 239 |
| AR (2) | 0.659 | 0.395 | 0.489 | 0.559 | 0.529 |
| Sargan-Hansen | 0.313 | 0.519 | 0.293 | 0.339 | 0.612 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variable are available upon request.

## 5.6 Hypotheses Evaluation

In section 4.3, three hypotheses are proposed based on existing research on the effects of microprudential and macroprudential policies on income inequality. This section discusses the results for each hypothesis.

> **Hypothesis #1:** Tighter microprudential policies are associated with higher income inequality.

Our results do not support the hypothesis that income inequality as measured by the Gini coefficient increases in a tighter microprudential policy environment. The results for individual microprudential policies also reject this hypothesis. Contrarily, we provide evidence that stricter microprudential policies lead to a reduction in income inequality. The results are robust for AE. In EMDE, greater supervisory independence is associated with reduced income inequality, although the effect of overall microprudential policy stringency is insignificant. These results are consistent with most of the existing literature (Christopulos & McAdam, 2017; Delis *et al.,* 2014; Johansson & Wang, 2014; Li & Yu, 2014).

These results are robust to different sets of control variables included in the model and the time interval over which the data for the analysis are averaged. Nevertheless, the results based on the Gini coefficient are not fully robust to alternative measures of income inequality, income shares. However, the coverage of countries and years and the comparability between countries is superior in the case of the Gini coefficient. Furthermore, income shares may not sufficiently capture income inequality due to focusing only on specific quantiles of income distribution.

**Hypothesis # 2:** The effect of tightening of macroprudential policies on income inequality depends on the level of stringency of microprudential policy.

The results reveal that the effects of tightening macroprudential policies on income inequality depend on the stance of microprudential policy. In general, increased stringency of microprudential policy reinforces the effect of macroprudential policy on income inequality. Additionally, we provide evidence that in a strong and stringent microprudential policy environment, the overall tightening of macroprudential policy serves as a precautionary tool to prevent financial imbalances that disproportionally affect the poor. However, the effect is reversed under poor microprudential policy. The same applies for tightening other measures, including primarily liquidity-based measures and credit constraints. Tightening of capital-based instruments, however, results in a decrease in income inequality irrespective of the level of stringency of microprudential policies.

These results are in line with the findings of Ekinci and Özcan (2021), who show that stricter microprudential policy is associated with more effective macroprudential policy. The results are also consistent with the finding of Malovaná et al. (2023) who conclude that the crisis mitigation and prevention channel prevails in EMDE, where the tightening of capital-based measures and other measures reduces income inequality irrespective of microprudential policy rigor. In contrast, in AE, tightening capital-based measures decrease income inequality only under very high supervisory and regulatory stringency.

The results on the reinforced effect of macroprudential policy tightening on income inequality under more stringent microprudential policy are robust to using five-years averages instead of three-year averages of the data. The same applies to the tightening of capital-based measures and other instruments. In addition, the results on the significance of the interaction effect between macroprudential and microprudential policies are robust to the definition of the index of macroprudential policy tightening. Nevertheless, the results are not fully robust to the change in the dependent variable from the Gini coefficient to income shares.

**Hypothesis #3:** The effects of microprudential policies vary across different regulatory instruments.

The estimation results show that the effects of microprudential policies on income inequality differ across regulatory instruments in terms of their size and statistical significance but not their sign. In concrete, greater power of the supervisory agency and its independence have the largest impact on the reduction in income inequality. In AE, supervisory power is prominent in reducing income inequality as measured by the Gini index, while the effect of supervisory independence prevails in EMDE.

These results are not fully robust to alternative measures of income inequality. Nonetheless, the results for the full sample are robust to the change in the interval over which the data are averaged from three to five years. Even though the effect of supervisory power would be statistically significant at the 14% level of significance, it is not far from the commonly reported threshold of 10%.

# 6 Conclusion

This thesis, for the first time, evaluates the link between microprudential regulatory and supervisory policies and income inequality. Financial sector policies, including microprudential and macroprudential policies, have evolved significantly over the last 30 years since the introduction of Basel I up to the current Basel III that has been designed after the GFC. The objective of macroprudential policy established within Basel III is to complement the traditional microprudential focus of the bank regulation and supervision. In addition, there have been many improvements and changes over the same years in the conduct of bank supervision, with most countries moving from compliance-based supervision to more risk-based supervision, in line with the Pillar 2 of the Basel II. However, in the aftermath of the GFC, discussions on both the benefits and possible harms of financial sector policies intensified. Although bank regulation and supervision improve the stability of the financial system and individual institutions and enhance the creditworthiness of banks, several studies show that their spillover effects, including changes in income inequality, may counteract the intended stabilizing effects (e.g. Delis *et al*., 2014). Despite a growing body of literature on the effects of macroprudential and financial liberalization policies on income inequality, the evidence on the impact of microprudential supervision and regulation on income inequality is still very relatively and the findings are inconclusive.

The aim of this thesis is therefore to assess the impact of microprudential policy on income inequality and to evaluate the effect of different groups of macroprudential policies on income inequality depending on the microprudential policy settings. Previous research has focused only on the unconditional impact of macroprudential policies on income inequality. In addition, this analysis estimates the effects of different regulatory instruments of microprudential policy − supervisory powers, supervisory independence, site supervision, adoption of the Basel Accords, and global consolidation and cooperation − on income inequality. Differences between AE and EMDE are also controlled for. Three-year averages of data on 70 countries over the period 1996−2013 were used, using the market Gini coefficient as the dependent variable. The robustness of the results was tested by changing the set of control variables, using income shares as an alternative dependent variable, and changing the time interval over which the data were averaged.

The results of the analyses are as follows: (1) Tighter microprudential policies lead to lower levels of income inequality as measured by the market Gini coefficient. This result also

holds for individual regulatory and supervisory policies, namely greater supervisory power and supervisory independence. In AE, the combined effect of microprudential policies leads to a reduction in income inequality, in contrast to EMDE, where the effect is insignificant. (2) The effects of individual microprudential policies differ and vary between AE and EMDE. Supervisory authority power and its independence significantly reduce income inequality across the entire sample of countries. In AE, supervisory power is the only instrument leading to a reduction in income inequality, while in EMDE, the independence of the supervisor prevails. Thus, microprudential policy in AE reduces income inequality through the channel of mitigating individual bank risks and enhancing financial system stability, while in EMDE the channel of eliminating related party lending contributes to lower levels of income inequality. (3) The effects of macroprudential policy instruments on income inequality are enhanced when they are implemented within a strong microprudential policy framework. In addition, the objective of macroprudential policy to prevent financial imbalances and crises and thereby reduce income inequality may be limited or even eliminated in an environment of weak regulation and supervision of individual banks. These results are mainly affected by capital-based and other measures, which are prominent in the full sample and in EMDE, while the impact of other measures is limited in AE. In our analysis, there is no evidence of either an independent or an interaction effect of the tightening of borrower-based measures on income inequality.

Policy implications are as follows. First, a strict microprudential policy can incentivize banks to increase regulatory discipline to prevent banking risks through increased transparency and bank creditworthiness without harming the relatively poor. However, policymakers should take into account differences between countries based on their economic development. In AE, greater supervisory powers can mitigate the negative effects of financial imbalances and prevent bank failures. However, in EMDE, income distribution can be more evenly distributed by limiting the control of influential parties with pre-existing relationships to banks. Second, countries can benefit from the stabilising effect of tighter macroprudential policy if it is implemented within a framework of strong individual bank regulation and supervision that ensures that banks comply with prescribed requirements. Moreover, microprudential policy reinforces the effect of macroprudential tightening on income inequality. Therefore, it is essential to take the microprudential policy stance into account when introducing macroprudential policy instruments.

Given the lack of research on the relationship between income inequality and microprudential policies, further research is needed. One possible extension may be the use of alternative measures of income inequality that have not been used in this analysis, such as the

Theil or Hoover indices. Further, the interaction between monetary policy and microprudential regulation can be assessed, since, as in the case of macroprudential regulation, the research focuses mainly on the unconditional effect of monetary policy on income inequality. In addition, as the database on financial sector policies grows, data over longer time periods can be used if available. Similarly, more precise measures of microprudential policy can be used to better capture its impact on income inequality.

# Bibliography

Agnello, L., Mallick, S., & Sousa, R. M. (2012). Financial reforms and income inequality. *Economics Letters, 116*(3), 583–587.

Alam, Z., Alter, A., Eiseman, J., Gelos, G., Kang, H., Narita, M., Nier, E., & Wang, N. (2019). Digging Deeper--Evidence on the Effects of Macroprudential Policies from a New Database. *IMF Working Paper, 19*(66), 1.

Albanesi, S. (2007). Inflation and inequality. *Journal of Monetary Economics, 54*(4), 1088-1114.

Alexiou, C., Trachanas, E., & Vogiazas, S. (2021). Income inequality and financialization: a not so straightforward relationship. *Journal of Economic Studies, 49*(1), 95–111.

Ang, J. B. (2010). Finance and inequality: The case of India. *Southern Economic Journal, 76*(3), 738–761.

Anginer, D., Bertay, A. C., Cull, R., Demirgüç-Kunt, A., & Mare, D. S. (2019). Bank Regulation and Supervision Ten Years after the Global Financial Crisis. *In World Bank, Washington, DC eBooks.*

Arakelyan, M., Gersl, A., & Schindler, M. (2023). Macroprudential Policies and Capital Controls Over Financial Cycles*. IMF Working Paper, 2023*(171), 1.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277.

Atkinson, A. B. (1970). On the measurement of inequality. *Journal of Economic Theory, 2*(3), 244–263.

Auclert, A. (2019). Monetary policy and the redistribution channel. *American Economic Review, 109*(6), 2333-2367.

Baiardi, D., & Morana, C. (2018). Financial development and income distribution inequality in the euro area. *Economic Modelling, 70*, 40–55.

Barth, J. R., Caprio, G., & Levine, R. (2005*). Rethinking bank regulation: Till Angels govern.*

Baum, C. F., Schaffer, M. E., & Stillman, S. (2003). Instrumental Variables and GMM: Estimation and testing. The Stata Journal, 3(1), 1–31.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2006). Bank supervision and corruption in lending. *Journal of Monetary Economics, 53*(8), 2131–2163.

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

Bellettini, G., Delbono, F., Karlström, P., & Pastorello, S. (2019). Income inequality and banking crises: Testing the level hypothesis directly. *Journal of Macroeconomics, 62*, 103054.

BIS. (2019). Overview of Pillar 2 supervisory review practices and approaches. https://www.bis.org/bcbs/publ/d465.pdf

BIS. (2022). Measuring the effectiveness of macroprudential policies using supervisory bank-level data. https://www.bis.org/publ/bppdf/bispap110.pdf

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87(1)*, 115–143.

Boar, C., Gambacorta, L., Lombardo, G., & Da Silva, L. a. P. (2017). What are the effects of macroprudential policies on macroeconomic performance. *BIS Quarterly Review.*

Boissay, F., & Cappiello, L. (2014b). Micro- versus Macro-Prudential Supervision: Potential Differences, Tensions and Complementarities. *Financial Stability Review, 1.*

Brei, M., Ferri, G., & Gambacorta, L. (2023). Financial structure and income inequality. *Journal of International Money and Finance*, 131, 102807.

Bumann, S., & Lensink, R. (2016). Capital account liberalization and income inequality. *Journal of International Money and Finance, 61*, 143–162.

Carpantier, J., Olivera, J., & Van Kerm, P. (2018). Macroprudential policy and household wealth inequality. *Journal of International Money and Finance, 85,* 262–277.

Cerutti, E., ClAEsens, S., & Laeven, L. (2017). The use and effectiveness of macroprudential policies: New evidence. Journal of Financial Stability, 28, 203–224.

Checchi, D. (2001). Education, inequality and income inequality. *RePEc: Research Papers in Economics.*

Chen, T., Gözgör, G., & Koo, C. K. (2021). Pandemics and income inequality: What do the data tell for the globalization era? Frontiers in Public Health, 9.

Chinn, M. D., & Ito, H. (2008). A new measure of financial openness. *Journal of Comparative Policy Analysis: Research and Practice, 10*(3), 309–322.

Christopoulos, D., & McAdam, P. (2017). Do financial reforms help stabilize inequality? *Journal of International Money and Finance, 70*, 45–61.

Clarke, G. R. G., Xu, L. C., & Zou, H. (2006). Finance and income inequality: What do the data tell us? *Southern Economic Journal, 72*(3), 578.

CNB. (2011). Financial Stability Report 2010/2011. *Czech National Bank.* https://www.cnb.cz/en/financial-stability/publications-on-financial-stability/Financial-Stability-Report-2010-2011/

Constâncio, V., Cabral, I., Detken, C., Fell, J., Henry, J., Hiebert, P., Kapadia, S., Altimar, S. N., Pires, F., & Salleo, C. (2019). Macroprudential policy at the ECB: institutional framework, strategy, analytical tools and policies. *Social Science Research Network.*

Curry, T. B., Fissel, G. S., & RamíRez, C. (2008). The impact of bank supervision on loan growth. *The North American Journal of Economics and Finance, 19*(2), 113–134.

Dabla-Norris, E., Kochhar, K., Suphaphiphat, N., Ricka, F., & Tsounta, E. (2015). Causes and Consequences of Income Inequality: A Global perspective.

De Haan, J., & Sturm, J. (2017). Finance and income inequality: A review and new evidence. *European Journal of Political Economy, 50*, 171–195.

De Haan, J., Pleninger, R., & Sturm, J. (2017). Does the impact of financial liberalization on income inequality depend on financial development? Some new evidence. *Applied Economics Letters, 25(*5), 313–316. https://doi.org/10.1080/13504851.2017.1319554

Delis, M. D., Hasan, I., & Kazakis, P. (2013). Bank Regulations and income inequality: Empirical evidence. *European Finance Review, 18*(5), 1811–1846.

Dias, C. S. P., Grigaite, K., Magnus, M. (2020). Macroprudential policy toolkit for the banking sector.

Eickmeier, S., Kolb, B., & Prieto, E. (2018). Effects of bank capital requirement tightenings on inequality. *Social Science Research Network.*

Ekinci, M. F., & Özcan, G. (2021). Effectiveness of Macroprudential Policies: Panel Data Evidence on the Role of Institutions, Financial Structure, and Banking Regulations. *Economic Growth and Financial Development: Effects of Capital Flight in Emerging Economies*, 103-114.

Ekpu, V. (2016). Micro-Prudential vs. Macro-Prudential Approaches to Regulation and Supervision. *Lecture Presented at a Regional Course on Advanced Banking Supervision and Financial Stability for members of the College of Supervisors of the West African Monetary Zone (CSWAMZ).*

Elsembawy, Ahmed. (2021). BASEL I, II, III. https://www.researchgate.net/publication/350941732_BASEL_I_II_III

Esseau-Thomas, C., Galárraga, O., & Khalifa, S. (2022). Epidemics, pandemics and income inequality. *Health Economics Review, 12(*1).

Frost, J., & Van Stralen, R. (2018). Macroprudential policy and income inequality. *Journal of International Money and Finance, 85*, 278–290.

Furceri, D., & Loungani, P. (2015). Capital account liberalization and inequality. *IMF Working Paper*, *15*(243), 1.

Furceri, D., & Loungani, P. (2018). The distributional effects of capital account liberalization. *Journal of Development Economics, 130*, 127–144.

Furceri, D., & Ostry, J. D. (2019). Robust determinants of income inequality. *Oxford Review of Economic Policy*, *35*(3), 490-517.

Georgescu, O., & Martín, D. V. (2021). Do Macroprudential Measures Increase Inequality? Evidence from the Euro Area Household *Survey. Social Science Research Network.*

Gomado, K. (2023). Financial reforms and income inequality: evidence from developing countries (No. wp-2023-88). World Institute for Development Economic Research (UNU-WIDER).

Görüş, M. Ş., & Ali, M. S. B. (2023). Do Governance Indicators Predict Inequality? A Panel Non-causality Framework for the Emerging Countries. *In Do Governance Indicators Predict Inequality? A Panel Non-causality Framework for the Emerging Countries* (pp. 43–59).

Grace, T., Hallissey, N., & Woods, M. (2015). The Instruments of macro-prudential policy. Quarterly Bulletin, 1, 91-95.

Gradstein, M., Milanović, B., & Ying, Y. (2001). Democracy and Income In-Equality: An Empirical Analysis. *RePEc: Research Papers in Economics.*

Greenwood, J., & Jovanovic, B. (1990). Financial development, growth, and the distribution of income. *Journal of Political Economy, 98*(5, Part 1), 1076–1107.

Gregorio, J.D., & Lee, J. (2002). Education and income inequality: New evidence from Cross-Country data. *Review of Income and Wealth, 48*(3), 395–416.

Gründler, K., Potrafke, N., & Wochner, T. (2020). Structural Reforms and Income Inequality: Who Benefits from Market-Oriented Reforms? *Social Science Research Network*.

Gyimah-Brempong, K. (2002). Corruption, economic growth, and income inequality in Africa. *Economics of Governance, 3*(3), 183–209.

Haddow, R. (2013). Labour market income transfers and redistribution. *In University of British Columbia Press eBooks* (pp. 381–409).

Hailemariam, A., Sakutukwa, T., & Dzhumashev, R. (2020). Long-term determinants of income inequality: evidence from panel data over 1870–2016. *Empirical Economics, 61(*4), 1935–1958.

Hamori, S., & Hashiguchi, Y. (2012). The effect of financial deepening on inequality: Some international evidence. *Journal of Asian Economics, 23*(4), 353–359.

Hassel, J. (2018). Is income inequality rising around the world? Our World in Data. https://ourworldindata.org/income-inequality-since-1990.

Hasell, J. (2023). Measuring inequality: What is the Gini coefficient? *Our World in Data.* https://ourworldindata.org/what-is-the-gini-coefficient.

Hasell, J. (2024). How has income inequality within countries evolved over the past century? *Our World in Data.* https://ourworldindata.org/how-has-income-inequality-within-countries-evolved-over-the-past-century.

Hirtle, B., & Kovner, A. (2022). Bank Supervision. *Annual Review of Financial Economics, 14, 39-56*.

Hoover, E. M. (1941). Interstate Redistribution of Population, 1850–1940. *The Journal of Economic History, 1*(2), 199–205.

Hsieh, J., Chen, T., & Lin, S. (2019). Financial structure, bank competition and income inequality. *The North American Journal of Economics and Finance, 48*, 450–466.

IMF. (2020). Six charts explain South Africa's inequality. https://www.imf.org/en/News/Articles/2020/01/29/na012820six-charts-on-south-africas-persistent-and-multi-faceted-inequality

IMF. (2022). Introduction to income inequality. https://www.imf.org/en/Topics/Inequality/introduction-to-inequality#Basic%20Facts%20About%20Income%20Inequality

Jauch, S., & Watzka, S. (2015). Financial development and income inequality: a panel data approach. *Empirical Economics, 51*(1), 291–314.

Jianu, I. (2017). The impact of private sector credit on income inequalities in European Union (15 member states). *EconStor Open Access Articles*, 61–74.

Johansson, A. C., & Wang, X. (2014). Financial sector policies and income inequality. *China Economic Review, 31*, 367–378.

Kenç, T. (2016). Macroprudential regulation: history, theory and policy. *BIS Papers Chapters, 86,* 1–15.

Kim, D. H., & Lin, S. (2011). Nonlinearity in the financial development–income inequality nexus. *Journal of Comparative Economics, 39*(3), 310–325.

Koudalo, Y. M. A., & Wu, J. (2022). Does financial liberalization reduce income inequality? Evidence from Africa. *Emerging Markets Review, 53*, 100945.

Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review*, 45(1), 1–28.

Laeven, L., Maddaloni, Á., & Mendicino, C. (2022). Monetary policy, macroprudential policy and financial stability. *Social Science Research Network.*

Laeven, L., & Valencia, F. (2018). Systemic banking crises revisited. IMF Working Paper, 2018(206), 1.

Li, X., & Su, D. (2020). Does capital account liberalization affect income inequality? *Oxford Bulletin of Economics and Statistics, 83*(2), 377–410.

Li, J., & Yu, H. (2014). Income inequality and financial reform in Asia: the role of human capital. *Applied Economics, 46(*24), 2920–2935.

Malovaná, S., Janků, J., & Hodula, M. (2023). Macroprudential policy and income inequality: The trade-off between crisis prevention and credit redistribution. *Czech National Bank, Economic Research Department, Working Paper Series 3/2023*

Manish, G. P., & O'Reilly, C. (2020). Financial regulation and income inequality. *Quarterly Journal of Finance and Accounting, 58*(3), 33-52.

Mincer, J. (1958). Investment in human capital and personal income distribution. *Journal of Political Economy, 66*(4), 281–302.

Mirzaei, A., & Samet, A. (2022). Effectiveness of macroprudential policies: Do stringent bank regulation and supervision matter?. *International Review of Economics & Finance*, *80*, 342-360.

Mookerjee, R., & Kalipioni, P. (2010). Availability of financial services and income inequality: The evidence from many countries. *Emerging Markets Review, 11*(4), 404–408.

Ni, N., & Liu, Y. (2019). Financial liberalization and income inequality: A meta-analysis based on cross-country studies. *China Economic Review, 56*, 101306.

Oliveira, S. L. G. (2021). (Un) conventional Monetary Policy, Macroprudential Policy and Inequality.

Park, S. M., & Kim, Y. (2023). The impact of macroprudential policy on inequality and implications for inclusive financial stability. *Journal of Banking and Finance, 146,* 106716.

Passalacqua, A., Angelini, P., Lotti, F., & Soggia, G. (2021). The Real Effects of Bank Supervision: Evidence from On-Site Bank Inspections. *Social Science Research Network.*

Polacko, M. (2021). Causes and Consequences of income Inequality – An Overview. *Statistics, Politics, and Policy, 12*(2), 341–357.

Polizatto, V. P. (1990). Prudential regulation and banking supervision: building an institutional framework for Banks. *RePEc: Research Papers in Economics,* 1.

Rodríguez-Pose, A., & Tselios, V. (2009). EDUCATION AND INCOME INEQUALITY IN THE REGIONS OF THE EUROPEAN UNION. *Journal of Regional Science, 49(*3), 411–437.

Roine, J., Vlachos, J., & Waldenström, D. (2009). The long-run determinants of inequality: What can we learn from top income data? *Journal of Public Economics, 93*(7–8), 974–988.

Roser, M. (2017). The history of global economic inequality. *Our World in Data*. https://ourworldindata.org/the-history-of-global-economic-inequality.

Soto, M. (2009). System GMM estimation with a small sample. *Barcelona Economics Working Paper Series, Working Paper No. 395.*

Omori, S. (2022). Introducing the revised and updated Financial Reform database. *Journal of Financial Regulation, 8*(2), 230–240.

Palma, J. G. (2011). Homogeneous middles vs. heterogeneous tails, and the end of the 'inverted-U': It's all about the share of the rich. Development and Change, 42(1), 87-153.

Steininger, L., & Sigmund, M. (2019). Reciprocity in bank regulatory reforms and income inequality: first evidence from a panel vector autoregression analysis. *Empirical Economics, 59*(4), 1537–1572.

Stiglitz, J. E. (2016). Inequality and economic growth. *The Political Quarterly, 86*(S1), 134–155.

Tarne, R., Bezemer, D., & Theobald, T. (2022). The effect of borrower-specific loan-to-value policies on household debt, wealth inequality and consumption volatility: An agent-based analysis. *Journal of Economic Dynamics and Control, 144*, 104526.

Teixeira, A. (2023). Does macroprudential policy affect wealth inequality? Evidence from synthetic controls. *Journal of Financial Stability, 67,* 101135.

The Wold Bank. (2017). Poverty Reduction in Belarus. https://www.worldbank.org/en/news/feature/2017/10/17/poverty-reduction-in-belarus.

Theil, H. (1969). Economics and Information Theory. *Econometrica, 37*(3), 551.

Thornton, J., & Di Tommaso, C. (2020). The long-run relationship between finance and income inequality: Evidence from panel data. *Finance Research Letters, 32,* 101180.

Tridico, P. (2017). The determinants of income inequality in OECD countries. *Cambridge Journal of Economics, 42*(4), 1009–1042.

Van Velthoven, A., De Haan, J., & Sturm, J. (2018). Finance, income inequality and income redistribution. *Applied Economics Letters, 26*(14), 1202–1209.

White, W. R. (2013). The Prudential Regulation of Financial Institutions: Why regulatory responses to the crisis might not prove sufficient. *DOAJ (DOAJ: Directory of Open Access Journals).*

Windmeijer, F., 2005. A finite sample correction for the variance of linear efficient two-step GMM estimators. Journal of Econometrics 126(1), 25-51.

Zhai, K., Zhao, G., & Li, D. (2023). Macroprudential policy and household wealth inequality: Evidence from China. *Journal of Asian Economics, 86,* 101608.

# Appendix A: Tables

**Table A. 1: List of Variables and Their Sources**

| Variable | Description | Source |
|---|---|---|
| *Gini index* | Gini index as a measure of market income inequality (%) | Standardized World Inequality Database (Solt, 2016) |
| *Microprudential Index* | Aggregate index of the bank regulation and supervision constructed as the unweighted average of the five normalized subdimensions | Financial Reform Database (Omori, 2022) |
| *Basel* | Index representing adoption of Basel standards | Financial Reform Database (Omori, 2022) |
| *Independence* | Index representing independence of the banking supervisory agency | Financial Reform Database (Omori, 2022) |
| *Power* | Index representing supervisory power of the banking supervisory agency | Financial Reform Database (Omori, 2022) |
| *SiteSup* | Index representing site supervision | Financial Reform Database (Omori, 2022) |
| *Global Consolidation* | Index representing no exceptions and hlobal consolidation of supervision | Financial Reform Database (Omori, 2022) |
| *GDP per Capita* | Gross Domestic Product per capita (constant 2015 U.S. dollars) | World Development Indicators |
| *Human Capital Index* | Human capital index based on average years of schooling and returns on education | Penn World Table 10.01 |
| *Population* | Country population in millions | Penn World Table 10.01 |
| *Trade Openness* | Sum of exports and imports as a share of GDP (%) | Our World in Data |
| *Government Expenditures* | Central Government Spending as a share of GDP (%) | Our World in Data |
| *Financial Development* | Domestic credit to private sector by banks as share of GDP (%) | World Development Indicators |
| *Unemployment Rate* | Unemployment as a share of total labour force (%) | World Development Indicators |
| *Top 1%* | Pre-tax income shares of households in the top 1% of income distribution (%) | World Inequality Database |
| *Top 5%* | Pre-tax income shares of households in the top 5% of income distribution (%) | World Inequality Database |
| *Top 10%* | Pre-tax income shares of households in the top 10% of income distribution (%) | World Inequality Database |
| *Bottom 10%* | Pre-tax income shares of households in the bottom 10% of income distribution (%) | World Inequality Database |

| Variable | Description | Source |
|---|---|---|
| *Macroprudential Index* | Aggregate normalized index the use of macroprudential policy tools | iMaPP Database |
| *Borrower-based measures* | Normalized index of the use of borrower-based macroprudential policy tools | iMaPP Database |
| *Capital-based measures* | Normalized index of the use of capital-based macroprudential policy tools | iMaPP Database |
| *Other measures* | Normalized index of the use of other macroprudential policy tools | iMaPP Database |
| *Regulatory Quality* | Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; ranges from approximately −2.5 (weak) to 2.5 (strong) governance performance | Worldwide Governance Indicators |
| *Financial Liberalization* | Normalized aggregate index of financial liberalization | Financial Reform Database (Omori, 2022) |

Note: The definition of the variable Regulatory Quality is taken from Worldwide Governance Indicators database.

**Table A. 2: List of Countries**

| Advanced Economies | Emerging Markets and Developing Economies |
|---|---|
| Australia | Albania |
| Austria | Armenia |
| Belgium | Azerbaijan |
| Canada | Bangladesh |
| Czech Republic | Belarus |
| Denmark | Botswana |
| Estonia | Brazil |
| Finland | Bulgaria |
| France | Burkina Faso |
| Germany | Colombia |
| Greece | Costa Rica |
| Iceland | Cote d'Ivoire |
| Ireland | Croatia |
| Israel | El Salvador |
| Italy | Georgia |
| Japan | Ghana |
| Latvia | Hungary |
| Lithuania | Chile |
| Netherlands | India |
| New Zealand | Indonesia |
| Norway | Jamaica |
| Portugal | Jordan |
| Singapore | Malaysia |
| Slovak Republic | Mexico |
| Slovenia | Morocco |
| Sweden | Mozambique |
| Switzerland | Nepal |
| United Kingdom | Pakistan |
| United States | Paraguay |
| | Peru |

| Advanced Economies | Emerging Markets and Developing Economies |
|---|---|
| | Philippines |
| | Poland |
| | Romania |
| | Russia |
| | South Africa |
| | Sri Lanka |
| | Thailand |
| | Tunisia |
| | Ukraine |
| | Uruguay |
| | Zambia |

Note: The classification of Advanced Economies and Emerging and Developing Economies is based on IMF's World Economic Outlook 2018.

**Table A. 3: Definitions and Coding Rules of Microprudential Policy Indicators**

| Indicator | Description |
|---|---|
| *Adoption of the Basel Standards* | Coded as 0 if Basel I is not implemented.<br>Coded as 1 if Basel I is implemented.<br>Coded as 2 if Basel II is implemented.<br>Coded as 3 if Basel II.5 is implemented. |
| *Independence of the Banking Supervisory Agency* | Based on the addition of two conditions:<br>(i) *Composition of the board of directors:* if the jurisdiction of banking supervision is under the ministry of finance or if the board of directors includes a member of government agency or a member of a financial institutions, it is coded as 0. Else, it is coded as1.<br>(ii) *Removal conditions:* if the conditions on the removal of the head of a banking supervision is not clearly stated and/or specific circumstances under which the head of the banking supervision agency can be dismissed are not stated, it is coded as 0. Else, it is coded as1.<br>Coded as 0 if the sum of (i) and (ii) is 0.<br>Coded as 1 if the sum of (i) and (ii) is 1.<br>Coded as 2 if the sum of (i) and (ii) is 2. |
| *Supervisory Power of the Banking Supervisory Agency* | Based on the addition of three conditions:<br>(i) A wide range of sanction and remedial measures for the bank supervisory agency is legally given.<br>(ii) Banking supervisory agency has measures enabling proactive early intervention.<br>(iii) Banking supervisory agency is able to use its tools without major problems such as asking for approval from the government.<br>Coded as 0 if none or one of the conditions is met.<br>Coded as 1 if two of the conditions are met.<br>Coded as 2 if all three conditions are met. |
| *Site Supervision* | Coded as 0 if on-site and off-site examinations are not conducted or are conducted in a problematic manner.<br>Coded as 1 if on-site and off-site examinations are conducted but there are still problems of supervision.<br>Coded as 2 if effective risk-based examinations are conducted. |

| Indicator | Description |
|---|---|
| *No Exceptions and Global Consolidation of Supervision* | Based on the addition of two conditions:<br>(i) Banking supervisory agency supervises banks and nonbank financial institutions on a consolidated basis with no exceptions.<br>(ii) Banking supervisory agency cooperates with foreign banking supervisory agencies to establish effective cross-border supervision.<br>Coded as 0 if no condition is met.<br>Coded as 1 if one of the two conditions is met.<br>Coded as 2 if both criteria are met. |

Note: Definitions and Indicators are taken from the Financial Reform Database by Omori (2022).

**Table A. 4: Definitions of Macroprudential Policy Tools**

| Tool | Definition |
|---|---|
| *CCB* | A requirement for banks to maintain a countercyclical capital buffer. Implementations at 0% are not considered as a tightening in dummy-type indicators. |
| *Conservation* | Requirements for banks to maintain a capital conservation buffer, including the one established under Basel III. |
| *Capital* | Capital requirements for banks, which include risk weights, systemic risk buffers, and minimum capital requirements. Countercyclical capital buffers and capital conservation buffers are captured in their sheets respectively and thus not included here. |
| *LVR* | A limit on leverage of banks, calculated by dividing a measure of capital by the bank's non-risk-weighted exposures (e.g., Basel III leverage ratio). |
| *LLP* | Loan loss provision requirements for macroprudential purposes, which include dynamic provisioning and sectoral provisions (e.g. housing loans). |
| *LCG* | Limits on growth or the volume of aggregate credit, the household-sector credit, or the corporate-sector credit, and penalties for high credit growth. |
| *LoanR* | Loan restrictions, that are more tailored than those captured in "LCG". They include loan limits and prohibitions, which may be conditioned on loan characteristics (e.g., the maturity, the size, the LTV ratio and the type of interest rate of loans), lender characteristics (e.g., mortgage banks), and other factors. |
| *LFC* | Limits on foreign currency (FC) lending, and rules or recommendations on FC loans. |
| *LTV* | Limits to the loan-to-value ratios, applied to residential and commercial mortgages but also applicable to other secured loans, such as for automobiles. Other aspects of the LTV regulation are also covered, such as "speed limits" (i.e., a regulation on the percent of new loans that can go above certain LTV limits). |
| *DSTI* | Limits to the debt-service-to-income ratio and the loan-to-income ratio, which restrict the size of debt service payments or the size of a loan relative to income (e.g., household income, net operating income of the company). |
| *Tax* | Taxes and levies applied to specified transactions, assets, or liabilities, which include stamp duties, and capital gain taxes. |
| *Liquidity* | Measures taken to mitigate systemic liquidity and funding risks, including minimum requirements for liquidity coverage ratios, liquid asset ratios, net stable funding ratios, core funding ratios and external debt restrictions that do not distinguish currencies. |

| Tool | Definition |
|---|---|
| *LTD* | Limits to the loan-to-deposit (LTD) ratio and penalties for high LTD ratios. |
| *LFX* | Limits on net or gross open foreign exchange (FX) positions, limits on FX exposures and FX funding, and currency mismatch regulations. |
| *RR* | Reserve requirements (domestic or foreign currency) for macroprudential purposes. Please note that this category may currently include those for monetary policy as distinguishing those for macroprudential or monetary policy purposes is often not clear-cut |
| *SIFI* | Measures taken to mitigate risks from global and domestic systemically important financial institutions (SIFIs), which includes capital and liquidity surcharges. |
| *Other* | Macroprudential measures not captured in the above categories—e.g., stress testing, restrictions on profit distribution, and structural measures (e.g., limits on exposures between financial institutions). |

Note: Definitions and Indicators are taken from iMaPP database by Alam et al. (2019).

**Table A. 5: Grouping of Macroprudential Policy Tools**

| Group | Abbreviation | Type of Tools |
|---|---|---|
| *Borrower-based measures* | *BBM* | LTV, DSTI |
| *Capital-based measures* | *CBM* | CCB, Conservation, Capital, LVR, LLP, SIFI |
| *Other measures* | *OM* | LCG, LoanR, LFC, Tax, Liquidity, LTD, LFX, RR, Other |

Note: Categorization of macroprudential policy tools is based on Arakelyan et al. (2023). LLP is added to Capital-based measures as it includes dynamic (countercyclical) provisioning element on basis of which banks set aside reserves from profits in good times to cover realized losses from borrower defaults in bad times which can be understood as increasing capital.

**Table A. 6: Summary Statistics for Advanced Economies**

| Variable | Mean | Median | Min | Max | Standard Deviation |
|---|---|---|---|---|---|
| *Gini Index* | 47.355 | 47.500 | 37.800 | 56.400 | 3.761 |
| *Top 1%* | 11.583 | 11.070 | 5.840 | 19.580 | 2.741 |
| *Top 5%* | 24.841 | 23.805 | 16.840 | 38.760 | 4.424 |
| *Top 10%* | 35.327 | 34.035 | 25.900 | 51.490 | 5.524 |
| *Bottom 10%* | 0.213 | 0.220 | 0.000 | 0.430 | 0.080 |
| *Top 10% – Bottom 10%* | 35.110 | 33.850 | 25.560 | 51.380 | 5.554 |
| *Microprudential Index* | 0.540 | 0.533 | 0.067 | 1.000 | 0.223 |
| *Basel Adoption* | 0.516 | 0.333 | 0.333 | 1.000 | 0.254 |
| *Supervisory Independence* | 0.425 | 0.500 | 0.000 | 1.000 | 0.412 |
| *Supervisory Power* | 0.406 | 0.500 | 0.000 | 1.000 | 0.386 |
| *Site Supervision* | 0.681 | 0.500 | 0.000 | 1.000 | 0.293 |
| *Global Consolidation* | 0.672 | 0.500 | 0.000 | 1.000 | 0.342 |
| *Macroprudential Index* | 0.001 | 0.000 | –0.015 | 0.049 | 0.005 |

| Variable | Mean | Median | Min | Max | Standard Deviation |
|---|---|---|---|---|---|
| *Borrower-based Measures* | 0.002 | 0.000 | –0.042 | 0.167 | 0.016 |
| *Capital-Based Measures* | 0.001 | 0.000 | –0.014 | 0.056 | 0.005 |
| *Other Measures* | 0.001 | 0.000 | –0.019 | 0.046 | 0.005 |
| *Log GDP per Capita* | 10.488 | 10.592 | 9.302 | 11.320 | 0.453 |
| *Human Capital Index* | 3.274 | 3.329 | 2.230 | 3.726 | 0.318 |
| *Log Population* | 2.426 | 2.199 | −1.309 | 5.757 | 1.501 |
| *Trade Openness* | 95.601 | 75.355 | 18.349 | 437.327 | 70.689 |
| *Government Expenditures* | 33.378 | 34.841 | 12.149 | 62.360 | 10.036 |
| *Financial Development* | 97.370 | 93.957 | 0.186 | 304.575 | 40.474 |
| *Unemployment Rate* | 6.931 | 6.190 | 1.870 | 27.470 | 3.328 |
| *Regulatory Quality* | 1.400 | 1.489 | 0.492 | 2.177 | 0.354 |
| *Financial Liberalization* | 0.953 | 0.958 | 0.667 | 1.000 | 0.064 |

**Table A. 7: Summary Statistics for Emerging Countries and Developing Economies**

| Variable | Mean | Median | Min | Max | Standard Deviation |
|---|---|---|---|---|---|
| *Gini Index* | 47.026 | 46.300 | 32.200 | 72.300 | 7.293 |
| *Top 1%* | 17.606 | 17.700 | 7.240 | 33.830 | 4.806 |
| *Top 5%* | 36.337 | 36.780 | 19.680 | 57.820 | 7.987 |
| *Top 10%* | 48.168 | 48.800 | 28.180 | 69.440 | 8.981 |
| *Bottom 10%* | 0.124 | 0.130 | 0.000 | 0.420 | 0.090 |
| *Top 10% – Bottom 10%* | 48.040 | 48.680 | 27.760 | 69.390 | 9.060 |
| *Microprudential Index* | 0.305 | 0.267 | 0.000 | 0.900 | 0.183 |
| *Basel Adoption* | 0.367 | 0.333 | 0.000 | 1.000 | 0.178 |
| *Supervisory Independence* | 0.304 | 0.000 | 0.000 | 1.000 | 0.352 |
| *Supervisory Power* | 0.158 | 0.000 | 0.000 | 1.000 | 0.268 |
| *Site Supervision* | 0.440 | 0.500 | 0.000 | 1.000 | 0.252 |
| *Global Consolidation* | 0.256 | 0.000 | 0.000 | 1.000 | 0.339 |
| *Macroprudential Index* | 0.002 | 0.000 | –0.034 | 0.039 | 0.007 |
| *Borrower-based Measures* | 0.002 | 0.000 | –0.083 | 0.167 | 0.015 |
| *Capital-Based Measures* | 0.002 | 0.000 | –0.014 | 0.042 | 0.006 |
| *Other Measures* | 0.002 | 0.000 | –0.056 | 0.065 | 0.011 |
| *Log GDP per Capita* | 8.120 | 8.164 | 6.092 | 9.709 | 0.845 |
| *Human Capital Index* | 2.295 | 2.520 | 0.000 | 3.349 | 0.821 |
| *Log Population* | 2.937 | 2.850 | 0.409 | 7.155 | 1.354 |
| *Trade Openness* | 78.191 | 71.760 | 21.929 | 220.407 | 34.865 |
| *Government Expenditures* | 23.448 | 22.752 | 7.605 | 47.758 | 8.585 |

| Variable | Mean | Median | Min | Max | Standard Deviation |
|---|---|---|---|---|---|
| *Financial Development* | 39.249 | 31.948 | 1.166 | 166.504 | 27.558 |
| *Unemployment Rate* | 8.799 | 7.670 | 0.250 | 24.400 | 4.844 |
| *Regulatory Quality* | 0.072 | 0.121 | –1.596 | 1.543 | 0.605 |
| *Financial Liberalization* | 0.783 | 0.833 | 0.375 | 0.958 | 0.131 |

**Table A. 8: Summary Statistics for 3-year Averages of Prudential Policies**

| Variable | Q1 | Mean | Median | Q3 |
|---|---|---|---|---|
| ***All countries*** | | | | |
| *Microprudential Index* | 0.233000 | 0.398000 | 0.367000 | 0.567000 |
| *Macroprudential Index* | 0.000000 | 0.001399 | 0.000000 | 0.001634 |
| *Borrower-based Measures* | 0.000000 | 0.002513 | 0.000000 | 0.000000 |
| *Capital-Based Measures* | 0.000000 | 0.001359 | 0.000000 | 0.000000 |
| *Other Measures* | 0.000000 | 0.001178 | 0.000000 | 0.003086 |
| ***Advanced Economies*** | | | | |
| *Microprudential Index* | 0.366670 | 0.535680 | 0.533330 | 0.700000 |
| *Macroprudential Index* | 0.000000 | 0.001067 | 0.000000 | 0.001634 |
| *Borrower-based Measures* | 0.000000 | 0.002834 | 0.000000 | 0.000000 |
| *Capital-Based Measures* | 0.000000 | 0.000945 | 0.000000 | 0.000000 |
| *Other Measures* | 0.000000 | 0.007559 | 0.000000 | 0.000000 |
| ***Emerging Markets and Developing Economies*** | | | | |
| *Microprudential Index* | 0.166670 | 0.298100 | 0.266700 | 0.375000 |
| *Macroprudential Index* | 0.000000 | 0.001638 | 0.000000 | 0.001838 |
| *Borrower-based Measures* | 0.000000 | 0.002281 | 0.000000 | 0.000000 |
| *Capital-Based Measures* | 0.000000 | 0.001657 | 0.000000 | 0.000000 |
| *Other Measures* | 0.000000 | 0.001483 | 0.000000 | 0.003086 |

**Table A. 9: Estimation Results for the Top 10% for Advanced Economies**

| | *Dependent variable: Top 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation** | **0.631** | **6.500**$^{***}$ | **-2.282** | **0.647** | **-3.797** | **-0.299** |
| **and Supervision** | **(3.642)** | **(2.364)** | **(2.755)** | **(2.715)** | **(2.956)** | **(2.190)** |
| Lagged Top 10% | 0.508$^{***}$ | 0.545$^{***}$ | 0.481$^{***}$ | 0.435$^{**}$ | 0.469$^{***}$ | 0.465$^{***}$ |
| (-1) | (0.170) | (0.126) | (0.178) | (0.176) | (0.158) | (0.154) |
| … | | | | | | |

| | *Dependent variable: Top 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| Observations | 143 | 143 | 143 | 143 | 143 | 143 |
| AR (2) | 0.668 | 0.09 | 0.596 | 0.616 | 0.504 | 0.642 |
| Sargan-Hansen | 0.072 | 0.603 | 0.208 | 0.084 | 0.135 | 0.127 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 10: Estimation Results for the Top 10% for Emerging Markets and Developing Economies**

| | *Dependent variable: Top 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-3.488** **(4.124)** | **-7.165** **(6.166)** | **-2.248** **(4.272)** | **-0.372** **(3.998)** | **-4.169** **(2.878)** | **0.664** **(3.193)** |
| Lagged Top 10% (-1) … | 0.890*** (0.101) | 0.539*** (0.196) | 0.600** (0.242) | 0.941*** (0.113) | 0.654*** (0.165) | 0.584*** (0.220) |
| Observations | 226 | 226 | 226 | 226 | 226 | 226 |
| AR (2) | 0.474 | 0.912 | 0.988 | 0.47 | 0.991 | 0.976 |
| Sargan-Hansen | 0.159 | 0.916 | 0.790 | 0.199 | 0.697 | 0.761 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 11: Estimation Results for the Bottom 10% for Advanced Economies**

| | *Dependent variable: Bottom 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-0.125*** **(0.065)** | **-0.027** **(0.044)** | **-0.084*** **(0.045)** | **-0.079*** **(0.041)** | **-0.036** **(0.042)** | **-0.015** **(0.051)** |
| Lagged Bottom 10% (-1) … | 0.573** (0.256) | 0.680* (0.366) | 0.590*** (0.183) | 0.479 (0.355) | 0.634** (0.289) | 0.682** (0.290) |
| Observations | 143 | 143 | 143 | 143 | 143 | 143 |
| AR (2) | 0.481 | 0.122 | 0.452 | 0.350 | 0.364 | 0.375 |
| Sargan-Hansen | 0.129 | 0.508 | 0.325 | 0.183 | 0.066 | 0.199 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 12: Estimation Results for the Bottom 10% for Emerging Markets and Developing Economies**

| | *Dependent variable: Bottom 10%* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **0.032** **(0.033)** | **0.001** **(0.066)** | **0.038** **(0.042)** | **0.033** **(0.039)** | **0.016** **(0.028)** | **0.017** **(0.026)** |
| Lagged Bottom 10% (-1) | 0.898*** (0.141) | 0.584*** (0.211) | 0.580*** (0.223) | 0.883*** (0.189) | 0.535*** (0.167) | 0.563** (0.234) |
| … | | | | | | |
| Observations | 226 | 226 | 226 | 226 | 226 | 226 |
| AR (2) | 0.097 | 0.122 | 0.105 | 0.105 | 0.111 | 0.099 |
| Sargan-Hansen | 0.613 | 0.508 | 0.581 | 0.686 | 0.679 | 0.586 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 13: Estimation Results for the Top 10%−Bottom 10% for the Full Sample**

| | *Dependent variable: Top 10% − Bottom %* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-3.816** **(6.253)** | **1.205** **(2.685)** | **-3.133** **(3.366)** | **3.539** **(2.309)** | **-5.810** **(3.724)** | **1.143** **(1.840)** |
| Lagged Top 10% − Bottom % (-1) | 0.421 (0.316) | 0.703** (0.315) | 0.492* (0.263) | 0.784*** (0.258) | 0.370* (0.213) | 0.588*** (0.220) |
| … | | | | | | |
| Observations | 369 | 369 | 369 | 369 | 369 | 369 |
| AR (2) | 0.719 | 0.719 | 0.728 | 0.770 | 0.491 | 0.843 |
| Sargan-Hansen | 0.138 | 0.142 | 0.072 | 0.124 | 0.162 | 0.121 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 14: Estimation Results for the Top 10%−Bottom 10% for Advanced Economies**

| | *Dependent variable: Top 10% − Bottom %* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **0.518** **(3.732)** | **6.585*** (2.389)** | **-2.319** **(2.691)** | **0.617** **(2.768)** | **-3.789** **(2.922)** | **-0.338** **(2.222)** |
| Lagged Top 10% − Bottom % (-1) | 0.506*** (0.168) | 0.550*** (0.127) | 0.482*** (0.178) | 0.434** (0.177) | 0.469*** (0.159) | 0.467*** (0.154) |
| … | | | | | | |

| | *Dependent variable: Top 10% − Bottom %* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| Observations | 143 | 143 | 143 | 143 | 143 | 143 |
| AR (2) | 0.666 | 0.087 | 0.599 | 0.611 | 0.505 | 0.603 |
| Sargan-Hansen | 0.069 | 0.603 | 0.204 | 0.080 | 0.137 | 0.123 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 15: Estimation Results for the Top 10%−Bottom 10% for Emerging Markets and Developing Economies**

| | *Dependent variable: Top 10% − Bottom %* | | | | | |
|---|---|---|---|---|---|---|
| | MicroPru | Basel | Power | SiteSup | Independence | Global Cons. |
| **Bank Regulation and Supervision** | **-3.530 (4.188)** | **-7.207 (6.164)** | **-2.280 (4.227)** | **-0.457 (4.080)** | **-4.131 (2.885)** | **0.621 (3.218)** |
| Lagged Top 10% − Bottom % (-1) | 0.890*** (0.101) | 0.537*** (0.196) | 0.601** (0.239) | 0.940*** (0.113) | 0.656*** (0.165) | 0.582*** (0.218) |
| … | | | | | | |
| Observations | 226 | 226 | 226 | 226 | 226 | 226 |
| AR (2) | 0.480 | 0.815 | 0.987 | 0.475 | 0.991 | 0.974 |
| Sargan-Hansen | 0.159 | 0.911 | 0.793 | 0.199 | 0.659 | 0.760 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. Results for remaining control variables are available upon request.

**Table A. 16: Interactions using Top 10% for Advanced Economies**

| | *Dependent variable: Top 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation and Supervision | 0.785 (2.327) | -3.992 (5.582) | -3.873 (4.962) | 0.450 (4.383) | -1.734 (4.521) |
| Macroprudential Policy Index | | 458.119 (474.635) | 698.858 (638.370) | 76.131 (57.333) | 155.264 (296.411) |
| **Interaction** | | **-388.121 (626.080)** | **-516.610 (1,096.934)** | **-34.040 (110.001)** | **-64.425 (372.201)** |
| Lagged Top 10% (-1) | 0.551*** (0.195) | 0.488** (0.215) | 0.435* (0.242) | 0.511* (0.284) | 0.503** (0.211) |
| … | | | | | |
| Observations | 143 | 143 | 143 | 143 | 143 |
| AR (2) | 0.714 | 0.347 | 0.651 | 0.980 | 0.627 |

| | *Dependent variable: Top 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Sargan-Hansen | 0.145 | 0.281 | 0.891 | 0.184 | 0.226 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

**Table A. 17: Interactions using Top 10% for Emerging Markets and Developing Economies**

| | *Dependent variable: Top 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -0.908 | -0.104 | 1.327 | -0.170 | -1.156 |
| and Supervision | (3.710) | (3.875) | (5.661) | (3.903) | (3.680) |
| Macroprudential | | 138.611 | -38.087 | 8.344 | 96.683 |
| Policy Index | | (174.874) | (131.878) | (62.687) | (119.398) |
| **Interaction** | | **-448.775** | **-326.077** | **-57.006** | **-296.335** |
| | | **(328.416)** | **(435.476)** | **(141.194)** | **(195.830)** |
| Lagged Top 10% | 0.841*** | 0.819*** | 0.824*** | 0.826*** | 0.838*** |
| (-1) | (0.125) | (0.121) | (0.120) | (0.111) | (0.126) |
| … | | | | | |
| Observations | 196 | 196 | 196 | 196 | 196 |
| AR (2) | 0.665 | 0.374 | 0.250 | 0.553 | 0.295 |
| Sargan-Hansen | 0.215 | 0.291 | 0.429 | 0.208 | 0.304 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

**Table A. 18: Interactions using Bottom 10% for Advanced Economies**

| | *Dependent variable: Bottom 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | -0.081 | -0.149 | -0.180 | -0.097 | -0.074 |
| and Supervision | (0.082) | (0.124) | (0.181) | (0.085) | (0.109) |
| Macroprudential | | 3.298 | 2.251 | -0.820 | -2.444 |
| Policy Index | | (6.968) | (6.849) | (3.697) | (8.122) |
| **Interaction** | | **-3.369** | **-1.621** | **0.692** | **2.191** |
| | | **(7.952)** | **(10.323)** | **(3.779)** | **(8.820)** |
| Lagged Bottom | 0.561* | 0.555 | 0.414* | 0.535** | 0.685* |
| 10% (-1) | (0.296) | (0.407) | (0.248) | (0.267) | (0.398) |

| | *Dependent variable: Bottom 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| … | | | | | |
| Observations | 143 | 143 | 143 | 143 | 143 |
| AR (2) | 0.487 | 0.503 | 0.587 | 0.701 | 0.547 |
| Sargan-Hansen | 0.924 | 0.998 | 0.998 | 0.998 | 0.996 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

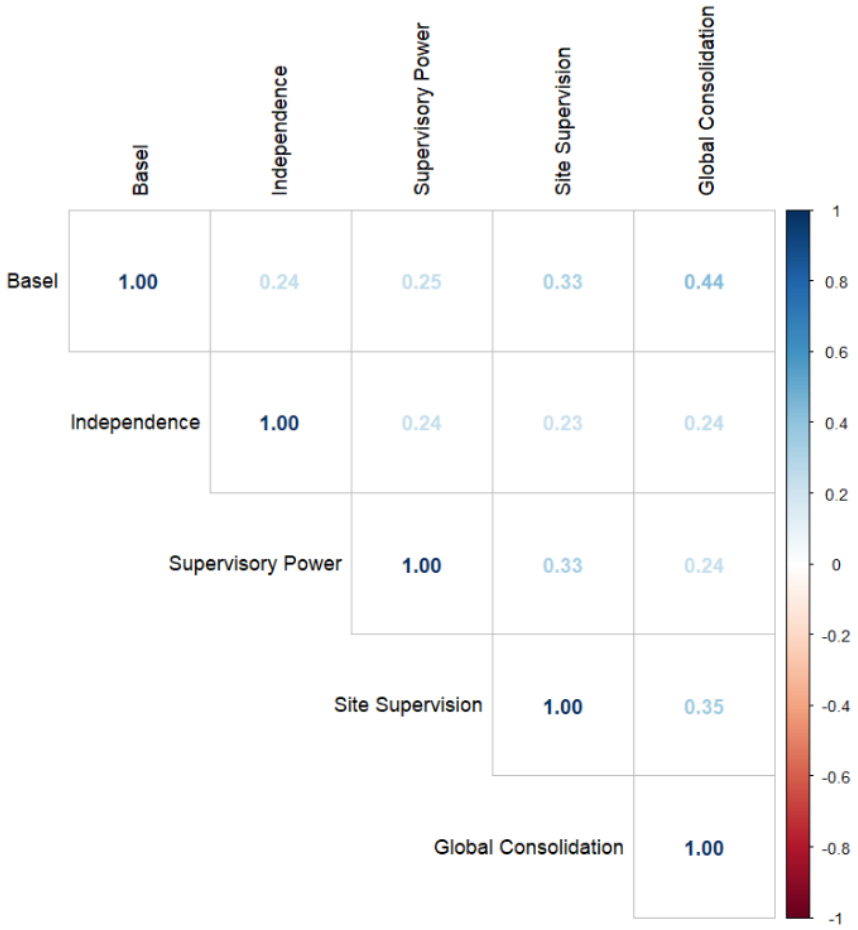
**Table A. 19: Interactions using Bottom 10% for Emerging Markets and Developing Economies**

| | *Dependent variable: Bottom 10%* | | | | |
|---|---|---|---|---|---|
| | No Macropru | Macropru | CBM | BBM | OM |
| Bank Regulation | 0.016 | 0.017 | 0.022 | 0.028 | 0.007 |
| and Supervision | (0.037) | (0.049) | (0.038) | (0.056) | (0.043) |
| Macroprudential | | -2.099 | 0.314 | 1.117 | -2.212 |
| Policy Index | | (3.162) | (2.132) | (1.371) | (1.685) |
| **Interaction** | | **2.842** | **1.091** | **-4.083** | **3.216** |
| | | **(5.958)** | **(5.394)** | **(4.597)** | **(3.062)** |
| Lagged Bottom | 0.799*** | 0.751*** | 0.886*** | 0.773*** | 0.765*** |
| 10% (-1) | (0.180) | (0.161) | (0.150) | (0.252) | (0.171) |
| … | | | | | |
| Observations | 196 | 196 | 196 | 196 | 196 |
| AR (2) | 0.103 | 0.103 | 0.088 | 0.069 | 0.146 |
| Sargan-Hansen | 0.717 | 0.703 | 0.725 | 0.205 | 0.749 |

The table reports coefficient estimates and t-statistics (in parentheses). The explanatory variables are defined in Table A.1. Statistical significance at the 1%, 5%, and 10% levels is indicated by the ***, **, and * symbols, respectively. The column Macropru refers to aggregate macroprudential policy, CBM stands for capital-based measures, BBM for borrower-based measures, and OM for other measures. Instruments included in each group are enlisted in Table A. 5. Results for remaining control variables are available upon request.

# Appendix B: Figures

**Figure B. 1: Correlation of Bank Regulation and Supervision Tools**




Source: Omori (2022), author's calculations