# Financial Development and Income Inequality: Evidence from Advanced, Emerging and Developing Economies[a]

CAROLYN CHISADZA
*Corresponding author. Department of Economics, University of Pretoria, Private Bag X20, Hatfield, 0028, South Africa; e-mail:* carolyn.chisadza@up.ac.za

*MDUDUZI BIYASE*
*Director of the Economic Development and Well-being Research Group (EDWRG) and senior lecturer at the School of Economics, University of Johannesburg, PO Box 524 Auckland Park, 2006, Johannesburg, South Africa* mbiyase@uj.ac.za

*In honour of Professor Michael McAleer: "Say not in grief he is no more, but live in thankfulness that he was." (Anon)*

## Abstract

We investigate the effects of financial development on income inequality for a global sample of countries between 1980 and 2019. The study contributes to the current literature by first, making use of a multifaceted index of financial development that captures different aspects of financial developments over time. Second, we compare the effects of financial development on income inequality across economic classifications, namely advanced, emerging and least developed countries. Last, we investigate the non-linear effects of financial development on income inequality across these economic classifications. The findings indicate that in general, financial development reduces inequality across emerging and least developed countries, but is not statistically significant for advanced countries. However, when we disaggregate the financial development index into its sub-components (financial institutions and financial markets), we find different effects on inequality, based on the levels of development. Further investigation on the dimensions under financial institutions and financial markets (depth, access and efficiency) reveals that banking sector development under financial institutions has income inequality-reducing effects in emerging and least developed countries, while stock market development under financial markets widens inequality in least developed countries. We also find heterogeneous non-linear effects between emerging and least developed countries. The findings in our paper firstly highlight the nuances in financial development depending on the level of development in countries, and secondly that policies focussed on financial inclusion of the poor can mitigate inequality.

*Keywords:* financial development, financial markets, inequality, financial institutions
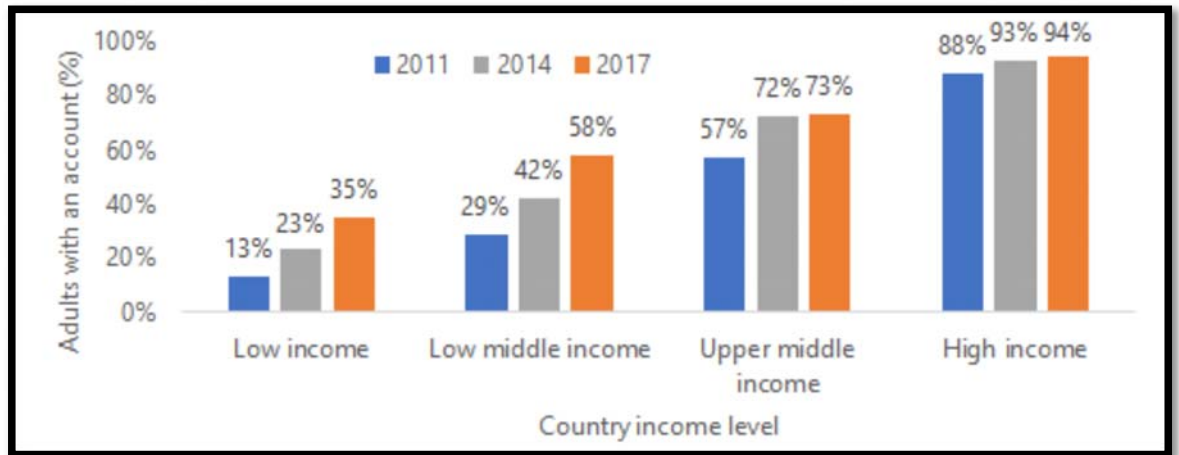*JEL Codes:* C22, D63, G20, O55

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[a] The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## 1. Introduction

Kuznets' hypothesis suggests that the problem of inequality can be resolved with economic growth (Kuznets, 1955). However, this theoretical argument has not necessarily corresponded with reality. Widening income inequality continues to be a challenge for not only emerging and developing countries, but advanced countries as well, with nearly two-thirds of advanced countries facing rising inequality over the past two decades (OECD, 2008; 2015). According to the most recent World Inequality Report "On average, an individual from the top 10% of the global income distribution earns €87,200 (USD122,100) per year, whereas an individual from the poorest half of the global income distribution makes €2,800 (USD3,920) per year" (Chancel et al., 2022). Furthermore, the far-reaching consequences of inequality are quite extensive. Inequality promotes instability and worsens health, education and well-being (Berg and Ostry, 2011; Acemoglu and Robinson, 2001; Pickett and Wilkinson, 2015). Understanding the dynamics of inequality has therefore received a great deal of attention among policy-makers and economists (such as Piketty, 2014; Alvaredo et al., 2017; 2018a; 2018b), particularly because combating inequality is critical for achieving sustainable economic development.

Economists are recognizing the potential of financial sector reform to boost financial development, which, in turn, ameliorates economic growth and reduces the income inequality gap between the rich and poor. Perhaps reassuringly, global estimates on financial access reveal sizable increase for the past number of years. For example, the portion of adults having a bank account increased globally from 51 percent in 2011 to 69 percent in 2017, amounting to an extra 515 million people. The increase in account ownership varied from one income group to another, with low income registering the biggest increase from 13 percent to 35 percent, low middle-income from 29 percent to 58 percent, upper middle income from 57 to 73 percent, and upper income ranging from 88 to 94 percent (see Figure 1), (Demirguc-Kunt et al., (2018). This raises an interesting question about the degree to which the financial sector development can affect income inequality.

**Figure 1**: Account ownership by country income group

The financial development-economic growth nexus has received a great deal of attention in this field (Lucas, 1988; King and Levine, 1993). The most widely held view is that financial development eases access to credit and other financial products that can stimulate economic growth, such as mobilization of savings for physical and human capital accumulation, and provision of capital to businesses that generate employment (Biyase and Chisadza, 2023; Tchamyou and Asongu, 2017; Tchamyou, 2020). Although there are several studies in the literature that discuss the effects of financial development on economic growth, we find limited evidence related to the financial development-income inequality nexus (Adams and Klobodu, 2016). Thus, the primary motive of this study is to offer consistent and dependable evidence regarding the effect of financial development on inequality for a global sample of countries.

Our study contributes to the extant literature in several ways. First, given that inequality trends in countries can be different based on their level of development, we investigate the impact of financial development on inequality across advanced, emerging and least developed countries, which accounts for the varying levels of development. Second, since innovations over the years have seen the financial sector evolve with a wider variety of financial instruments becoming available, we use a relatively novel financial development index that measures multifaceted dimensions of the financial sector from 1980 to 2019. This measure captures financial innovations that have occurred in this sector (Sahay et al., 2015). Most empirical studies tend to rely on one or two measures of financial development such as the ratio of private credit to GDP or broad money to GDP. We explore various sub-dimensions of financial development, such as financial markets' depth, access and efficiency, as well as financial institutions' depth, access and efficiency. The rationale for

exploring the sub-dimensions of financial development is that they may affect income inequality differently. Finally, we explore the quadratic specifications to establish whether there are non-linear effects between financial development and inequality across advanced, emerging and least developed countries. It is our view that this analysis could assist in developing policy measures that can promote a well-developed financial system and bridge the gap between the rich and poor.

The rest of the paper proceeds as follows: Section 2 sheds light on theoretical background and empirical literature review. Section 3 describes the data and empirical methodology. Section 4 discusses the empirical results. Section 5 concludes the analysis.

## 2. Literature review

The association between various aspects of financial development and economic development outcomes is quite established in the literature. For example, evidence by Vo et al. (2019) find that financial inclusion strengthens macroeconomic stability in 22 emerging economies from 2008-2015, while Nguyen et al. (2020) highlight the importance of financial integration for long-run economic growth in a developing country like Vietnam. Moreover, Li et al. (2021) and Yang et al. (2022) establish that financial development negatively affects carbon emissions in China and South Africa. In addition, Rjoub et al. (2022) find that, not only is financial development associated with environmental degradation in Turkey, but that it plays a key moderating role in the relationship between economic growth and carbon emissions, by providing credit channels for investing in climate change' research and development.

Since the pioneering work of Banerjee and Newman (1993), Galor and Zeira (1993) and Greenwood and Jovanovich (1990), various hypotheses concerning financial development and inequality have been offered in this field. The most commonly cited hypotheses of financial development and income inequality are the inequality-widening hypothesis, the inequality-narrowing hypothesis and the inequality inverted U-shaped hypothesis (Shahbaz et al., 2017: 5339).

Crucial to the inequality-widening hypothesis is the assertion that there exists rich-based preferences owing to their alleged credit-worthiness in the financial institutions. Rich-based preferences practiced by financial institutions (such as banks) only serve to widen the gap between the rich and the poor (De-Gregorio, 1996). According to the inequality-narrowing hypothesis, as the financial sector grows, more people (especially the historically excluded or disadvantaged sections of the population) will participate in the financial sector, thereby facilitating financial inclusion and even creating new opportunities for the financial sector (Aghion and Bolton, 1997; Banerjee and Newman, 1993; Galor and Moav, 2004; Galor and Zeira, 1993). The finance–income inequality inverted U-shaped hypothesis proposed by Greenwood and Jovanovich (1990), postulates that the distributional effect of financial development on the low-

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income households depends very much on the level of financial development. At the initial stages of financial development, only the affluent individuals stand to benefit from the financial institutions. At higher levels of development, even the low-income households may gain access to financial institutions and therefore stand to benefit from it, which in turn reduces the gap between the rich and low-income households.

Empirical investigations on the finance-inequality nexus have so far yielded mixed findings, with some studies finding a strong support for inequality-widening hypothesis, while other studies fail to reject the inequality-narrowing hypothesis or the finance–income inequality inverted U-shaped hypothesis. Empirical findings that confirm the inequality-narrowing hypothesis come from Bittencourt (2010) who focuses on Brazil for the period 1985–1994. He employs the M2, M3, credit to private sector and personal credit as measures of financial development and finds evidence to suggest that financial development reduces the inequality gap between the rich and poor in Brazil. Reaching a similar conclusion, Shahbaz and Islam (2011) employed an Auto Regressive Distributed Lag (ARDL) bounds testing approach to cointegration for long-run relationship and the error correction model (ECM) for the short run relationships in Pakistan. The authors find evidence to suggest that financial development (measured by banking credit) also lessens the inequality gap between the rich and poor. Omar and Inaba (2020), using a fixed effects model for the period 2004 to 2016, also show that financial development reduces inequality and poverty in developing countries. Weychert (2020) reaches a similar conclusion for 59 countries with data over the years 2004–2014.[b]

On the other hand, evidence in favour of the inequality-widening hypothesis has been reported in a number of studies. Investigating the relationship between financial development (measured by ratio of private credit to GDP) and inequality for an unbalanced panel of 84 countries from 1975 to 2014, de Haan et al (2021) find a positive relationship between financial development and income inequality. Consistent with de Haan et al (2021), Jauch and Watzka (2016) also find evidence that financial development is positively associated with income inequality in a sample of 138 countries comprising both developed and developing. Similarly, Bolarinwa et al. (2021) observes a similar finding (positive association between financial development and income inequality) across high, middle-low and low-income African countries. Sehrawat and Giri (2015) fail to reject the income inequality-widening hypothesis for India, as well as Dollar and Kraay (2003) for a sample of 92 countries; and Gimet and Lagoarde-Segot (2011) for 49 countries in the European Union.

Support for the finance–income inequality inverted U-shaped hypothesis is established by Lin and Ali (2009) who examine the relationship between financial development

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[b] Other studies with evidence related to the inequality-narrowing hypothesis include Batuo et al. (2010) for a sample of 22 African countries; Li et al. (1998) for a sample of 40 developing and developed countries; Clarke et al. (2006) for 83 developing and developed countries; Liang (2006) for China; Law and Tan (2009) for Malaysia; Ang (2010) for India; and Baligh and Piraee (2013) for Iran.

(measured by overall financial development index, banking sector development index, stock market development index, and bond market development index) and income inequality in Turkey from 1990-2015. Using the Auto Regressive Distributed Lag (ARDL) bounds testing approach to cointegration, the authors confirm an inverted U-shaped association between income inequality and overall financial development and banking sector development. Destek (2020) also observed an inverted U-shaped association between income inequality for overall financial development and banking sector development in Turkey. Biyase and Chisadza (2023) examine the short and long-run symmetric and asymmetric effects of financial deepening on income inequality in South Africa by means of an autoregressive distributed lag and annual data for the period 1980 to 2017. They find evidence that the finance–income inequality inverted U-shaped hypothesis holds for South Africa.

### 3. Materials and Methods
### 3.1 Data

We use the Gini index as our dependent variable ($Y$) for income inequality.[c] The index is obtained from the Standardized World Income Inequality Database (SWIID) and is measured as an estimate of the Gini index of inequality in equivalised (square root scale) disposable (post-tax, post-transfer) household income (Solt, 2020). The Gini index ranges from zero to one, lower values indicating more equal societies while higher values indicate unequal societies. The Gini index is the most widely cited measure of income inequality in the literature (Benczúr and Kvedaras, 2020; Beck et al., 2007; Dabla-Norris et al., 2015; Shahbaz et al., 2015).

The most commonly used indicator of financial development is the ratio of liquid financial liabilities to GDP (King and Levine, 1993), or domestic credit to private sector by banks as a percentage of GDP (Beck et al., 2000; Clark et al., 2006). However, the changes and subsequent developments within the financial sector have necessitated the need to look at multiple indicators to measure financial development. For example, while credit to the private sector still reflects the contributory role of banks in financial sector, this measure falls short of capturing improvements in access to financial institutions, the efficiency of the financial system, nor does it capture the role of stock markets. It is with this in mind that we make our contribution to the existing literature by considering a recently constructed comprehensive index for financial development (Sahay et al., 2015). This index captures elements across both financial institutions and financial markets, using indicators of financial depth, access, and efficiency. The overall index ($findvpt$) is disaggregated into financial institutions ($fininst$) which include banks, insurance companies, mutual funds, pension funds, and other types of nonbank financial institutions,

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[c] Although our study is primarily confined to the commonly used Gini index as a measure of inequality, we acknowledge other measures of inequality such as Poor-Rich Difference Index and stochastic dominance, which have been used in other related fields (Ryu and Slottje, 2020; Ryu and Slottje, 2022; McAleer et al., 2019; Vo et al., 2019; Chan et al., 2018; Valenzuela et al., 2017).

and into financial markets (*finmarket*) which include stock and bond markets. Under financial institutions and financial markets, different dimensions of the financial system are measured, namely depth, access, and efficiency.

The overall financial development index comprises of six sub-indices (i.e. depth, access and efficiency for financial institutions and financial markets), which have been aggregated by using weighted averages of various indicators chosen to measure each sub-index. The weights are obtained from principle component analysis. The sub-indices are then aggregated into two higher indices (i.e. financial institutions and financial markets) using the same procedure. These two indices are also aggregated, resulting in the overall index of financial development (Sahay et al., 2015).[d] Table 1 provides an overview of the financial development index with its sub-indices and the indicators measuring each sub-index. The overall index and its sub-indices are normalised between zero and one, with higher values indicating greater financial development. As indicated earlier, we expect higher values of financial development to be associated with lower income inequality (Clark et al, 2006; Beck et al., 2007; Jeong and Townsend, 2008).

**Table 1:** Financial Development Index

| Financial Development Index | | | | | |
|---|---|---|---|---|---|
| Financial Institutions | | | Financial Markets | | |
| Depth | Access | Efficiency | Depth | Access | Efficiency |
| - Private-sector credit (% of GDP). <br> - Pension fund assets (% of GDP). <br> - Mutual fund assets (% of GDP). <br> - Insurance premiums, life and non-life (% of GDP). | - Branches (commercial banks) per 100,000 adults. <br> - ATMs per 100,000 adults. | - Net interest margin. <br> - Lending-deposits spread. <br> - Non-interest income to total income. <br> - Overhead costs to total assets. <br> - Return on assets. <br> - Return on equity. | - Stock market capitalization to GDP. <br> - Stocks traded to GDP. <br> - International debt securities government (% of GDP). <br> - Total debt securities of nonfinancial corporations (% of GDP). <br> -Total debt securities of financial corporations (% of GDP). | - Percent of market capitalization outside of top 10 largest Companies. <br> - Total number of issuers of debt (domestic and external, nonfinancial corporations, and financial corporations). | -Stock market turnover ratio (stocks traded /capitalization) |

*Source:* Sahay et al. (2015)

[d] See Sahay et al. (2015) for construction of the financial development index and its sub-indices in Annex I.

To avoid omitted variable bias, we include control variables that may also affect inequality, such as income per capita, inflation, government expenditure, openness and quality of institutions. Our choice of control variables is based on empirical evidence in the literature. Income per capita (*Gdpcap*) is measured as the real gross domestic product at constant 2015 US$. *Inflation* is the annual rate of inflation measured by consumer prices. Government Expenditure (*Gvtexp*) is the general government final consumption expenditure as a percentage of GDP, while trade (*openness*) is imports and exports as a percentage of GDP. These variables are taken from the World Development Indicators (WDIs). For quality of institutions, we use the electoral democracy index (*democracy*) from the Varieties of Democracy (Coppedge et al., 2020). The index is scaled from zero to one and captures the freedom of political and civil society organisations to operate in the country, clean elections that are not distorted by fraud or systematic irregularities, and elections that affect the composition of the chief executive of the country. Higher values indicate better quality of institutions.

Most of the variables are logged, except for Gini, financial development and democracy, which are indices. We expect inflation to be positively associated with income inequality. Rising consumer prices tend to adversely affect the poor relatively more than the rich because the latter usually have better access to financial instruments, which can minimize their exposure to inflation (Easterly and Fischer, 2001). We expect income per capita, government expenditure, democracy and openness to be negatively associated with income inequality. Lower income inequality is associated with rising income per capita through reduced poverty (Zhang and Naceur, 2019). Government expenditure captures the redistributive benefits of taxes on income distribution, while openness captures the positive effects of globalization on reducing income inequality by allowing for efficient international allocation of capital and increase in financial wealth (Dabla-Norris et al., 2015). According to Destek et al. (2020), democratic institutions can reduce inequality by facilitating economic opportunities to the lower income groups.

3.2 Methodology

We estimate our model based on the inequality-narrowing hypothesis of financial development, which postulates that countries with larger capital market imperfections, i.e. narrower financial development, should have higher income inequality (Galor and Zeira, 1993; Banerjee and Newman, 1993). Using a global sample of countries between the years 1980 and 2019, and based on previous studies, such as Omar and Inaba (2020), we specify the following fixed effects model:

$$Y_{it} = \alpha_i + \delta_t + \beta_1 findvpt_{it-1} + \beta_i X_{it-1} + \mu_{it}$$

where $Y$ is income inequality in country $i$ in year $t$, $findvpt$ is the financial development index, $X$ is a vector of controls,[e] and $\alpha_i$ and $\delta_t$ are country and year fixed effects. Fixed

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[e] We test for unit root in the panel specification using the Fisher-type (i.e. Augmented Dickey-Fuller and Phillips-Perron) stationarity tests. We reject the null hypothesis that all panels contain unit roots.

effects models are widely used in panel data analysis and have various advantages over cross-sectional methods, such as the classical pooled ordinary least squares (POLS) regressions (Brüderl and Ludwig, 2015). For example, the POLS requires a strong assumption of exogenous independent variables that are not correlated with the error term to obtain unbiased estimates. However, financial development in our case could be correlated with unobserved and time-constant characteristics, such as population's preferences or historical backgrounds. These heterogeneous characteristics can make POLS estimates biased and inconsistent (Collischon and Eberl, 2020). Introducing fixed effects relaxes the strict exogeneity assumption, allows for unobserved heterogeneity and limits potential sources of biases in the estimations.

We note that most standard models, such as probability models or count data models, are also not exempt from unobserved heterogeneity, but the fixed effects model tends to be more robust to biases because the estimates are consistent when the conditional mean is correctly specified (Collischon and Eberl, 2020). In this regard, we conduct the Hausman specification test, which is used to determine whether a fixed effects or random effects model would be more appropriate in panel analysis (Hausman, 1978). The test examines if there is correlation between the error term and the independent variables. The null hypothesis is that there is no correlation between the two, i.e. applying random effects is the appropriate model. However, if there is correlation between the error term and independent variables, the estimates from the random effects model will be inconsistent and the fixed effects model would be more appropriate and robust, especially if there are omitted variables (Sheytanova, 2015; Amini et al., 2012). We obtain a Hausman chi-squared statistic of 137.65, which is statistically significant at a 1% probability. The results from the Hausman test indicate that we reject the null hypothesis for no correlation between the error term and independent variables, suggesting that the fixed effects estimator is more appropriate than the random effects model.

We therefore run Ordinary Least Squares (OLS) linear regressions with multiple levels of fixed effects (including heterogeneous slopes), by implementing the estimator of Correia (2017). The high dimensional fixed effects (HDFE) method has been suggested in the literature for estimating panels that are large in cross section and large in time series. This method allows for unobserved country and time differences through individual specific effects, thus giving estimates that are more efficient. The method pools the time series data for each group and allows the intercepts to differ across the groups. The standard errors are clustered at country and year level. The HDFE method estimates consistent standard errors, even when the observations are correlated within groups. We lag the explanatory variables to allow for delays in the responsiveness of income inequality to its determinants, as well as to minimize the potential bias of economic and statistical endogeneity issues, which can lead to biased estimates and inferences.[f]

We also acknowledge that cross-section dependence may be present in our model through globally common shocks with heterogeneous impact across countries, such as financial

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[f] We check for endogeneity in the main explanatory variable (financial development) and control variables (gdp per capita, inflation, government expenditure, openness and democracy) using the Wu-Hausman F-test and the Durbin-Wu-Hausman chi-square test. We fail to reject the null hypothesis for exogeneity for financial development and inflation, indicating that they are exogenous. We find that Gdp per capita, government expenditure, openness and democracy are endogenous. However, the fixed effects and lagging the variables should be sufficient to minimise the endogeneity issue.

crises. For example, Wong et al. (2004) find that there has been increasing interdependence between developed and emerging markets since the 1987 Stock Market crash, which intensified after the 1997 Asian Financial crisis. We test for cross-sectional dependence and reject the null hypothesis for no cross-sectional dependence, [g] suggesting that there is some level of dependence among our sample of countries. To check the validity of the fixed effects estimates, we use the Pesaran (2006) Common Correlated Effects mean group estimator that allows for heterogeneous slope coefficients and correlation across countries (cross-section dependence).[h]

As a further analysis, we also conduct a non-linear specification where we include the squared term of financial development in the estimation:

$$Y_{it} = \alpha_i + \delta_t + \beta_1 findvpt_{it-1} + \beta_2 findvptsq_{it-1} + \beta_i X_{it-1} + \mu_{it}$$

Evidence from the literature suggests that at early stages of financial development, only the wealthy minority of the population can access financial services as they have the means to offer collateral for bank loans, resulting in higher income inequality. However, as the financial sector becomes more established with services that are inclusive of the poor, income inequality decreases (Greenwood and Jovanovic, 1990).

Tables 2 and 3 report some descriptive statistics. The mean Gini coefficient averages 0.4 for the global sample, which is relatively low indicating reduced income inequality. The financial development index averages 0.3, which is at the lower end of the scale, suggesting narrow financial development. However, bear in mind that this is a global sample of countries and the true size of the financial development may be muted by the inclusion of economies with delayed growth in their financial sectors, such as in developing countries. Such biases motivate our analytical strategy to separate the countries into economic classifications, which account for the different levels of economic development: advanced, emerging and least developed countries.

**Table 2:** Summary of variables

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Gini | 5792 | .382 | .09 | .176 | .688 |
| Findvpt | 4741 | .305 | .224 | 0 | 1 |
| Gdpcap | 5312 | 12006.5 | 16144.03 | 215.747 | 105000 |
| Inflation | 5008 | 21.851 | 176.161 | -18.109 | 7481.664 |

[g] The results for the test are available on request from the authors.
[h] We report the results in the Appendix. The overall conclusions drawn from the mean group results in Table A1 do not differ greatly from the fixed effects estimates for the emerging and least developed economies, while the results for advanced economies are insignificant.

| | | | | | |
|---|---|---|---|---|---|
| Gvtexp | 4335 | 8.04e+10 | 2.55e+11 | 1.78e+07 | 2.80e+12 |
| Openness | 5008 | 78.348 | 54.349 | 1.378 | 442.62 |
| Democracy | 5272 | .539 | .274 | .016 | .919 |

When we split the sample of countries by these classifications in Figure 2, we find that advanced countries have relatively higher financial development than the emerging and least developed countries. At the same time, advanced countries also exhibit lower income inequality than emerging and least developed countries.

**Figure 2:** Income inequality and Financial Development by Economic Classifications
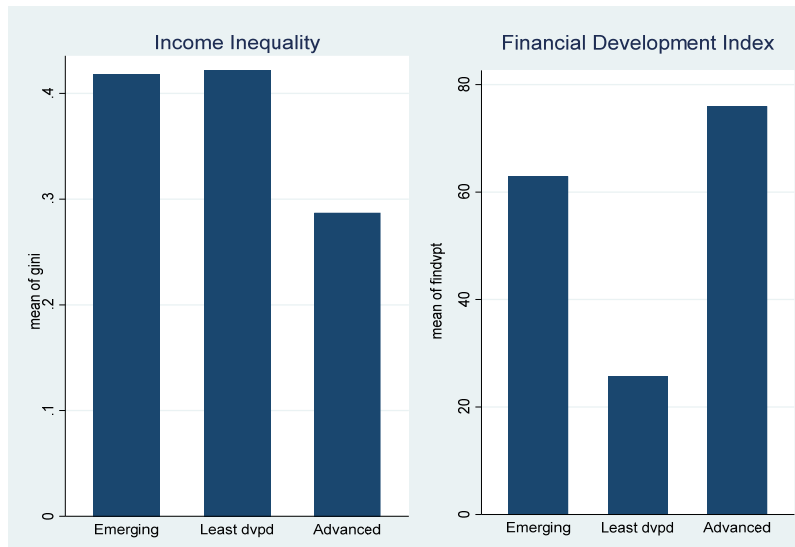


The correlations in Table 3 for all our explanatory variables are in line with expectations. Financial development, income per capita, government expenditure, openness and democracy are negatively associated with income inequality, while inflation increases inequality.

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**Table 3:** Pairwise Correlations

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| (1) Gini | 1.000 | | | | | | |
| (2) Findvpt | -0.376* | 1.000 | | | | | |
| (3) Gdpcap | -0.503* | 0.794* | 1.000 | | | | |
| (4) Inflation | 0.022 | -0.070* | -0.052* | 1.000 | | | |
| (5) Gvtexp | -0.147* | 0.418* | 0.347* | -0.011 | 1.000 | | |
| (6) Openness | -0.158* | 0.238* | 0.289* | -0.039* | -0.177* | 1.000 | |
| (7) Democracy | -0.352* | 0.513* | 0.551* | -0.013 | 0.264* | 0.039* | 1.000 |

\* shows significance at the .05 level.

## 4.  Results and Discussion

We report the results by global sample (*world*) and economic classifications of countries (*advanced, emerging and least developed*). We use the United Nations classification for the advanced[i] and the least developed[j] countries (United Nations, 2020). We use the Morgan Stanley Capital International (MSCI) Emerging Markets Index to classify the emerging countries[k] (Amadeo, 2020). Some of the countries in the global sample are not included in these economic classifications by the organizations.

Advanced countries are usually characterized by developed infrastructure, developed capital markets, exports of value-added goods and higher standards of living. Emerging countries are characterized by rapid economic growth and transitioning from agriculture to industrialization. However, they still have lower incomes per capita, less developed infrastructure and are prone to high market volatility in currency, commodity prices and domestic policies. The least developed countries, on the other hand, are characterized by poor economic growth, poor infrastructure, exports of raw materials, underdeveloped capital markets and low standards of living.

We report the results for the overall financial development index in Table 4. We find statistically insignificant effects of financial development on inequality for the world

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[i] Advanced countries include Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom and United States.

[j] Least developed countries include Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Djibouti, Ethiopia, Gambia, Guinea, Guinea Bissau, Haiti, Laos, Lesotho, Madagascar, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Tanzania, Timor-Leste, Togo, Uganda, Vanuata and Zambia.

[k] Emerging countries include Brazil, Chile, China, Colombia, Egypt, Hong Kong, India, Indonesia, Jordan, Korea, Kuwait, Malaysia, Mexico, Pakistan, Peru, Philippines, Qatar, Russia, Saudi Arabia, Singapore, South Africa, Thailand, Turkey, United Arab Emirates and Vietnam.

sample of countries. As suggested earlier, the results for the world sample of countries may not reflect accurate information on the association between financial development and inequality due to the mix of different countries. We therefore concentrate our interpretation on the economic classifications. We find that financial development decreases income inequality for emerging and least developed countries. These results are in line with the inequality-narrowing hypothesis that increasing financial development can provide poor households and entrepreneurs with better access to finance allowing them to meet their financial needs, such as investing in education, or starting up businesses (Johansson and Wang, 2014; von Ehrlich and Seidel, 2015). The coefficient is also larger for the least developed countries, suggesting a larger inequality-reducing effect from investing in the growth of the financial sector.

**Table 4:** Financial Development

| Income Inequality | (1) World | (2) Advanced | (3) Emerging | (4) Least Developed |
|---|---|---|---|---|
| Findvpt $_{(t-1)}$ | 0.006 | -0.013 | -0.077$^{***}$ | -0.204$^{***}$ |
| | (0.006) | (0.008) | (0.013) | (0.045) |
| ln(Gdpcap $_{(t-1)}$) | 0.019$^{***}$ | 0.001 | 0.050$^{***}$ | 0.043$^{***}$ |
| | (0.003) | (0.006) | (0.005) | (0.007) |
| ln(Inflation $_{(t-1)}$) | 0.002$^{***}$ | 0.001 | 0.005$^{***}$ | -0.000 |
| | (0.000) | (0.001) | (0.001) | (0.001) |
| ln(Gvtexp $_{(t-1)}$) | 0.002 | -0.011$^{*}$ | -0.001 | 0.008$^{**}$ |
| | (0.002) | (0.006) | (0.005) | (0.004) |
| ln(Openness $_{(t-1)}$) | 0.004$^{*}$ | 0.002 | -0.000 | -0.007$^{*}$ |
| | (0.002) | (0.004) | (0.005) | (0.004) |
| Democracy $_{(t-1)}$ | -0.026$^{***}$ | -0.050$^{***}$ | -0.012$^{*}$ | -0.026$^{**}$ |
| | (0.004) | (0.017) | (0.006) | (0.012) |
| Country FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| F-stat | 16.80*** | 3.34*** | 31.12*** | 16.63*** |
| R2 | 0.954 | 0.882 | 0.935 | 0.942 |
| Obs | 3526 | 1088 | 759 | 531 |
| No. of countries | 148 | 35 | 25 | 36 |

Coefficients reported. Robust standard errors in parentheses. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$

Note: Some countries in the world sample are not included in the economic classifications by United Nations (advanced and least developed samples) and MSCI Emerging Markets Index (emerging sample).

Technological innovations have changed the make-up of financial sectors over time. Within financial institutions, while banks remain important, insurance companies, mutual funds, venture capital firms, and other types of non-bank financial institutions now play just as substantive roles (Sahay et al., 2015). In addition, the financial markets today include various financial instruments that allow people and firms to diversify savings, or raise income through bonds, stock markets and foreign exchange markets. For example, Johari et al. (2022) highlight the contributory role that income and asset diversification can play in the performance of financial banks, such as the Islamic Commercial Banks in Indonesia. The novelty of the financial development index is that we can capture these changes in the financial sector. Moreover, we can disaggregate the index to allow us to identify the key players in the development of the financial sector that may contribute to reducing income inequality. We report the results for financial institutions and markets in Table 5.

There appears to be a trade-off between the effects of financial institutions and financial markets on income inequality in the world sample of countries, which may explain the statistically insignificant results in Table 4. Financial institutions reduce income inequality, while the financial markets widen income inequality for the world sample of countries. The financial markets' inequality-widening effects may be driven by those countries that are prone to higher output volatility from exogenous shocks, such as terms of trade shocks and financial crises (Easterly et al., 2001; Alimi and Aflouk, 2016). When we look at the effects by economic classifications of the countries, we find that both financial institutions and markets have mitigating effects on income inequality for emerging countries. The negative effects from financial institutions are also negative and statistically significant for least developed countries. The returns from growing financial sectors should be relatively higher in countries that are still developing as compared to advanced economies that typically already have developed financial sectors and thus any returns from financial development would be marginal. The downside of course is that countries that are growing may also be more vulnerable to economic shocks.

The findings here suggest that increased development in the financial institutions for emerging and least developed countries, such as the banking sector, has a relatively larger income inequality-reducing effect than development in the financial markets. These findings are in line with Suhaimee et al. (2021), Zhang and Naceur (2019) and Paramati and Nguyen (2019) who find that banking sector development had a stronger influence on reducing income inequality than stock market development. Access to banking credit through easing constraints for borrowing, lowering insurance premiums or increasing the availability of ATMs or bank branches in remote areas allows poor people easier access to finance. This increased financial inclusion can help maintain stable inflation and output growth, as shown by Vo et al. (2019) in a sample of emerging economies, further contributing to lower inequality. On the other hand, trading in stocks or international securities may not be as affordable or easy to access for the lower income groups. Therefore, developments in financial institutions may have a stronger effect on income

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distribution because the turnaround is quicker and the positive returns on income are realized in the short to medium term. This may not hold for financial markets where prices are sensitive to macroeconomic instability, which affects the returns from investing in stocks.

**Table 5:** Financial Development Disaggregation into Financial Institutions and Markets

| | (1) World | (2) Advanced | (3) Emerging | (4) Least Developed |
|---|---|---|---|---|
| Fininst $_{(t-1)}$ | -0.042*** | -0.006 | -0.106*** | -0.125*** |
| | (0.007) | (0.007) | (0.020) | (0.026) |
| Finmarket $_{(t-1)}$ | 0.028*** | -0.007 | -0.018** | -0.025 |
| | (0.004) | (0.005) | (0.009) | (0.051) |
| ln(Gdpcap $_{(t-1)}$) | 0.023*** | 0.001 | 0.051*** | 0.042*** |
| | (0.003) | (0.006) | (0.005) | (0.007) |
| ln(Inflation $_{(t-1)}$) | 0.001*** | 0.001 | 0.003*** | -0.000 |
| | (0.000) | (0.001) | (0.001) | (0.001) |
| ln(Gvtexp $_{(t-1)}$) | 0.003 | -0.011* | -0.001 | 0.008** |
| | (0.002) | (0.006) | (0.006) | (0.004) |
| ln(Openness $_{(t-1)}$) | 0.003 | 0.002 | -0.000 | -0.007* |
| | (0.002) | (0.004) | (0.005) | (0.004) |
| Democracy $_{(t-1)}$ | -0.023*** | -0.050*** | -0.007 | -0.024* |
| | (0.004) | (0.017) | (0.006) | (0.012) |
| Country FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| F-stat | 23.87*** | 2.95*** | 28.87*** | 15.27*** |
| R2 | 0.955 | 0.882 | 0.937 | 0.942 |
| Obs | 3526 | 1088 | 759 | 531 |
| No. of countries | 148 | 35 | 25 | 36 |

Coefficients reported. Robust standard errors in parentheses. $^{*} p < .10, ^{**} p < .05, ^{***} p < .01$
Note: Some countries in the world sample are not included in the economic classifications by United Nations (advanced and least developed samples) and MSCI Emerging Markets Index (emerging sample).

To further unpack these results and get a better understanding of financial development-inequality nexus, we separate the index into a higher level of granularity. We investigate the types of characteristics within the financial institutions and markets that contribute to reducing income inequality, namely depth, accessibility or efficiency. We report the results

in Table 6. We find some interesting nuances worth mentioning.

For the advanced countries, accessibility in both financial institutions and markets, as well as efficiency in the financial markets, contributes to lower income inequality, while efficiency in the financial institutions increases income inequality. Advanced countries have sophisticated banking and stock markets, which provides people with the ability to diversify their financial needs (i.e. increased accessibility to a variety of financial instruments) and hedge against financial shocks (i.e. efficiency of financial markets). Figure 3 corroborates our findings that advanced countries perform relatively better in financial depth, access and efficiency compared to the other economic classifications. Empirical evidence in the literature has also shown that higher levels of financial development can benefit the rich more so than the poor as the wealthy usually have disproportionately larger share of access to assets and finance (Claessens and Perotti, 2007).

For the emerging countries, financial depth and accessibility in both financial institutions and markets reduces income inequality, but efficiency in the financial markets has an opposite effect on inequality. Financial deepening, accompanied by more accessible financial systems, in emerging countries creates an inclusive financial sector that can reduce income inequality. However, emerging economies are rapidly growing, which means that high levels of financial development, though not impeding capital accumulation, may lead to a loss of efficiency in allocation of capital. Moreover, resources may be diverted to the financial markets at the expense of other complementary productive sectors, such as education or health (Sahay et al., 2015).

For the least developed countries, financial depth and efficiency in the financial institutions decrease income inequality, while access in the financial markets widens inequality. Financial deepening, complemented by efficient allocation of capital, can provide poor people with equal opportunity to enter the financial sector. However, least developed countries tend to have underdeveloped financial markets. Therefore, development in the financial market may increase income inequality, as only the wealthy will have the means and access to trading in stocks. Additionally, low-income households often face challenges in accessing financial services due to lack of financial knowledge, or limited and costly financial products (Dabla-Norris et al., 2015). Figure 3 clearly shows the underdevelopment of the financial sector with low access to finance being a serious constraint in least developed countries.

The results from some of the control variables are mainly in line with expectations across the economic classifications of the countries. For example, inflation rate adversely affects the poor because they tend to hold more cash relative to other financial assets compared to the rich (Erosa and Ventura, 2002). Strong quality of institutions reduce income inequality. According to Clark et al. (2006) and Chiu and Lee (2019), protection of property rights may protect the poor against expropriation from the rich who have the power to prevent

the poor from accessing external finance. We however find that income per capita increases income inequality. Economic growth is associated with technological changes, which can raise the skill premium by eliminating low-skilled jobs, thus resulting in increased income inequality in the labour market (Acemoglu, 1998). Government expenditure and openness have different effects depending on economic classifications of countries. Government expenditure decreases income inequality for advanced countries, but increases inequality for least developed countries. If redistribution of taxes targets low-income groups, then government consumption can reduce income inequality (Clark et al., 2006; Zhang and Naceur, 2019). Alternatively, misappropriation of public funds or redirecting resources to unproductive activities in the economy can adversely affect income distributions. Openness decreases income inequality for least developed countries. Trade openness can improve living standards through access to cheaper goods, and improved financial transactions, which in turn can reduce income inequality (Dabla-Norris et al., 2015).

**Table 6:** Further Disaggregation of Financial Institutions and Markets

| | (1) World | (2) Advanced | (3) Emerging | (4) Least Developed |
|---|---|---|---|---|
| Fininst_depth $_{(t-1)}$ | -0.017** | 0.003 | -0.075*** | -0.113** |
| | (0.007) | (0.007) | (0.020) | (0.055) |
| Fininst_access $_{(t-1)}$ | -0.027*** | -0.020*** | -0.045*** | -0.037 |
| | (0.006) | (0.006) | (0.012) | (0.056) |
| Fininst_efficiency $_{(t-1)}$ | -0.001 | 0.028*** | 0.007 | -0.035*** |
| | (0.004) | (0.006) | (0.010) | (0.008) |
| Finmarket_depth $_{(t-1)}$ | 0.027*** | 0.007 | -0.028*** | -0.014 |
| | (0.004) | (0.005) | (0.009) | (0.029) |
| Finmarket_access $_{(t-1)}$ | -0.007* | -0.010* | -0.043*** | 0.208*** |
| | (0.004) | (0.005) | (0.009) | (0.044) |
| Finmarket_efficiency $_{(t-1)}$ | 0.004 | -0.006** | 0.017*** | -0.018 |
| | (0.002) | (0.003) | (0.004) | (0.016) |
| ln(Gdpcap $_{(t-1)}$) | 0.023*** | 0.001 | 0.058*** | 0.041*** |
| | (0.003) | (0.006) | (0.004) | (0.007) |
| ln(Inflation $_{(t-1)}$) | 0.001*** | 0.001 | 0.004*** | -0.001 |
| | (0.000) | (0.001) | (0.001) | (0.001) |
| ln(Gvtexp $_{(t-1)}$) | 0.003 | -0.013** | 0.009* | 0.010*** |
| | (0.002) | (0.006) | (0.005) | (0.004) |
| ln(Openness $_{(t-1)}$) | 0.002 | 0.003 | 0.004 | -0.008** |
| | (0.002) | (0.004) | (0.004) | (0.004) |
| Democracy $_{(t-1)}$ | -0.023*** | -0.043** | -0.009* | -0.016 |
| | (0.004) | (0.019) | (0.005) | (0.013) |
| Country FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| F-stat | 19.79*** | 5.34*** | 27.53*** | 14.64*** |

| | | | | |
|---|---|---|---|---|
| R2 | 0.956 | 0.886 | 0.943 | 0.945 |
| Obs | 3526 | 1088 | 759 | 531 |
| No. of countries | 148 | 35 | 25 | 36 |

Coefficients reported. Robust standard errors in parentheses. $^*$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$

Note: Some countries in the world sample are not included in the economic classifications by United Nations (advanced and least developed samples) and MSCI Emerging Markets Index (emerging sample).

**Figure 3:** Dimensions of Financial Development by Economic Classifications
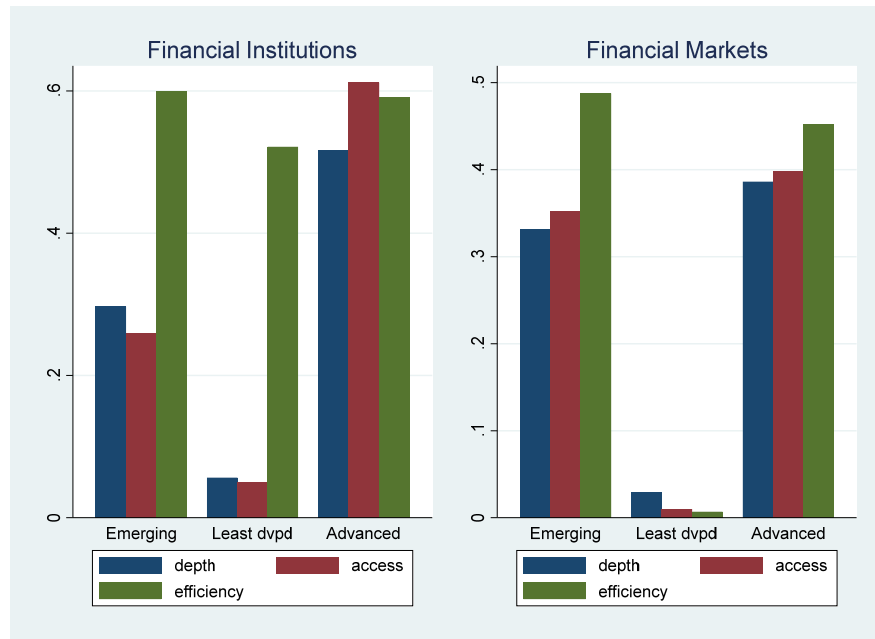


As a final analysis, we check for non-linearity between financial development and income inequality in Table 7. We find statistically significant, but different, non-linear effects between the emerging and least developed countries. The 'u-shaped' results for least developed countries are consistent with findings from Tan and Law (2012) that in the early stages of financial development, the benefits are high enough to reduce income inequality (i.e. increased accessibility to all income groups). However, at higher levels of financial development, inequality starts to widen maybe due to diversion of skills away from productive sectors to the financial sector (Sahay et al., 2015). Moreover, increased financial development can increase the frequency of booms and busts in the financial sector increasing the risk of macroeconomic volatility. On the other hand, the inverted 'u-shaped' effects in emerging countries are in line with Greenwood and Jovanovic (1990). In the initial phases of financial development, the rich benefit more than the poor, thus widening income inequality, but as the financial sector continues to develop, poor people get easier

access to capital, thus reducing income inequality.

**Table 7:** Financial Development Non-linearity Effects

| | (1) World | (2) Advanced | (3) Emerging | (4) Least Developed |
|---|---|---|---|---|
| Findvpt $_{(t-1)}$ | -0.096*** | -0.020 | 0.080** | -0.679*** |
| | (0.015) | (0.018) | (0.034) | (0.148) |
| Findvpt$^2$ $_{(t-1)}$ | 0.097*** | 0.006 | -0.171*** | 2.005*** |
| | (0.013) | (0.014) | (0.036) | (0.607) |
| ln(Gdpcap $_{(t-1)}$) | 0.023*** | 0.002 | 0.056*** | 0.039*** |
| | (0.003) | (0.006) | (0.005) | (0.007) |
| ln(Inflation $_{(t-1)}$) | 0.001*** | 0.001 | 0.005*** | -0.000 |
| | (0.000) | (0.001) | (0.001) | (0.001) |
| ln(Gvtexp $_{(t-1)}$ | 0.003* | -0.011* | 0.004 | 0.009*** |
| | (0.002) | (0.006) | (0.005) | (0.004) |
| ln(Openness $_{(t-1)}$ | 0.004* | 0.002 | -0.004 | -0.007* |
| | (0.002) | (0.004) | (0.005) | (0.004) |
| Democracy$_{(t-1)}$ | -0.023*** | -0.049*** | -0.015** | -0.025** |
| | (0.004) | (0.017) | (0.006) | (0.012) |
| Country FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| F-stat | 23.85*** | 2.88*** | 31.20*** | 16.86*** |
| R2 | 0.955 | 0.882 | 0.938 | 0.944 |
| Obs | 3526 | 1088 | 759 | 531 |
| No. of countries | 148 | 35 | 25 | 36 |

Coefficients reported. Robust standard errors in parentheses. $^*p < .10$, $^{**}p < .05$, $^{***}p < .01$

Note: Some countries in the world sample are not included in the economic classifications by United Nations (advanced and least developed samples) and MSCI Emerging Markets Index (emerging sample).

## 5 Conclusion

Rising inequality is a widespread concern globally. Unequal distribution of income indicates unequal economic opportunities, which can give rise to social instability (Solt, 2015). Therefore understanding the factors that drive income inequality remains an important focus in the theoretical and empirical literature. Theory indicates that financial

development can increase economic growth while simultaneously reducing poverty. The mechanisms identified include improving the efficiency of resource allocation, technological innovation and expanding economic opportunities to the lower-income groups. Given this context, we investigate the effects of financial development on income inequality. Our contribution to the literature comes in the form of a relatively novel measure of financial development that captures various dimensions from the financial institutions and the financial markets, as well as comparing the effects across different levels of development for the sample of countries. This type of analysis allowed us to identify the role players in financial development that contribute to income inequality, as well as distinguish the different effects across the economic classifications of the countries.

We find that overall financial development reduces inequality in emerging and least developed countries. These results are consistent with the disaggregation of financial development into financial institutions and financial markets. The results are also statistically significant for emerging and least developed countries, but not for advanced countries. A plausible explanation could be that in advanced countries with already developed financial sectors, the marginal returns to growth from further financial development diminish at high levels of financial development (Sahay et al., 2015). When we further investigate the three dimensions under financial institutions and financial markets, mainly depth, access and efficiency, we find that banking sector development in the financial institutions has income inequality-reducing effects in emerging and least developed countries, while stock market activity in the financial markets widens inequality in least developed countries. Further analysis also reveals evidence of a 'u-shaped' non-linear effect for financial development on inequality for least developed countries, confirming previous findings that in the early stages of financial development, the benefits are high enough to reduce income inequality compared to advanced stages. On the other hand, emerging countries appear to follow an inverted 'u-shaped' relationship between financial development and income inequality, thus supporting the view that at the initial phases of financial development, inequality worsens, whereas at advanced phases of financial development, income inequality diminishes.

The findings in our paper highlight the nuances in financial development depending on the development characteristics of countries. While advanced countries have highly sophisticated economies, they are also more prone to higher wage inequalities due to technological advancements demanding more labour that is skilled over low-skilled jobs. Alternatively, least developed countries have underdeveloped economies and are therefore prone to financial imperfections arising from informational asymmetries and credit constraints that limit poor people from participating in the financial sector, hence increasing income inequality (Kim and Lin, 2011). The emerging countries have rapidly growing economies, which means they are more prone to growth volatility and macroeconomic instability.

However, having observed the income inequality-reducing effects from financial development, particularly the financial institutions, we recommend that policies in the financial sector should be targeted at expanding financial access in the least developed countries (e.g. relaxing borrowing constraints, improving financial infrastructure), improving financial stability in emerging countries and sustaining efficiency in advanced countries. Least developed countries could also benefit from measures that induce commercial banks to provide low-to-zero-monthly fee bank accounts as well as using bank accounts to make various payments, including government payments (Allen et al., 2016). Finally, good institutional quality can provide an important avenue for ensuring that financial development has the desired income inequality-reducing effect. According to Darsono et al. (2022), political stability and reasonable regulations have contributed to sustainable investment returns in the Asian region.

Although our study may have limitations, such as not accounting for recent inequality measures, which can compare population groups with different income levels (Chan et al., 2018), we maintain that our findings still provide meaningful contribution by exploring how different components of financial development can have heterogeneous effects on inequality across different economic classifications of countries. Future analysis could consider assessing how financial development can affect income mobility over time.

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## Appendix

Table A1 reports the mean group estimator that allows for cross-sectional dependence across countries. The results remain consistent for the emerging and least developed countries, while the results for the advanced countries are statistically insignificant.

**Table A1:** Mean Group Estimator

| Income Inequality | (1) World | (2) Advanced | (3) Emerging | (4) Least Developed |
|---|---|---|---|---|
| Findvpt $_{(t-1)}$ | -0.029$^{**}$ | 0.006 | -0.035$^{**}$ | -0.115$^{*}$ |
| | (0.015) | (0.021) | (0.018) | (0.069) |
| ln(Gdpcap $_{(t-1)}$) | -0.006 | 0.007 | -0.019 | -0.004 |
| | (0.006) | (0.016) | (0.018) | (0.015) |
| ln(Inflation $_{(t-1)}$) | 0.000 | 0.000 | 0.001 | 0.001 |
| | (0.000) | (0.001) | (0.001) | (0.001) |
| ln(Gvtexp $_{(t-1)}$) | 0.003 | -0.002 | -0.003 | 0.001 |
| | (0.005) | (0.013) | (0.011) | (0.014) |
| ln(Openness $_{(t-1)}$) | 0.001 | 0.007 | -0.000 | 0.016$^{*}$ |
| | (0.004) | (0.009) | (0.007) | (0.010) |
| Democracy $_{(t-1)}$ | 0.010 | -0.002 | 0.009 | -0.009 |
| | (0.013) | (0.062) | (0.020) | (0.011) |
| Country FE | Yes | Yes | Yes | Yes |
| Obs | 3556 | 1114 | 769 | 529 |

Coefficients reported. Robust standard errors in parentheses.
$^{*}$ $p < .10$, $^{**}$ $p < .05$, $^{***}$ $p < .01$