

IMF STAFF DISCUSSION NOTE

Finance and Inequality

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in collaboration with

Adolfo Barajas, Shiyuan Chen, Armand Fouejieu, and Peichu Xie

DISCLAIMER: Staff Discussion Notes showcase policy-related analysis and research being developed by IMF staff members and are published to elicit comments and to encourage debate. The views expressed in Staff Discussion Notes are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Finance and Inequality

Monetary and Capital Markets Department
with input from other departments¹

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Authorized for distribution by Ratna Sahay

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EXECUTIVE SUMMARY

Global income inequality has fallen in the past two decades, in large part due to major strides in emerging market and developing economies to raise economic growth rates and reduce poverty. Financial sector policies and advances in financial technology are enabling financial inclusion, particularly in large economies such as China and India, allowing an increasing number of low-income households and small businesses to participate productively in the formal economy.

At the same time, we observe rising or high disparities in income and wealth within many countries. New data also show that economic mobility—the ability of the less well-off to improve their economic status—has stalled in recent decades. No wonder then that inequality of income, wealth, and opportunities is giving rise to populism and anti-globalization sentiments in some countries.

Can the financial sector play a role in reducing inequality? This study makes the case that it can, complementing redistributive fiscal policy in mitigating inequality. By expanding the provision of financial services to low-income households and small businesses, it can serve as a powerful lever in helping create a more inclusive society but—if not well managed—it can also amplify inequalities.

Our study examines empirical relationships between income inequality and three features of finance: depth (financial sector size relative to the economy), inclusion (access to and use of financial services by individuals and firms), and stability (absence of financial distress). We ask three questions.

First, does greater financial depth mean lower or higher inequality within countries? Building on new data sets, our analysis suggests that initially financial depth is associated with lower inequality, but only up to a point, after which inequality rises.

Second, does greater financial inclusion mean lower inequality within countries? We find that greater financial inclusion is associated with reductions in inequality. For payment services, we find evidence that benefits from inclusion are greater for those at the low end of the income distribution, reducing inequality. Both men and women benefit from financial inclusion, but inequality falls more when women have greater access. As regards access to and use of credit, the results are mixed.

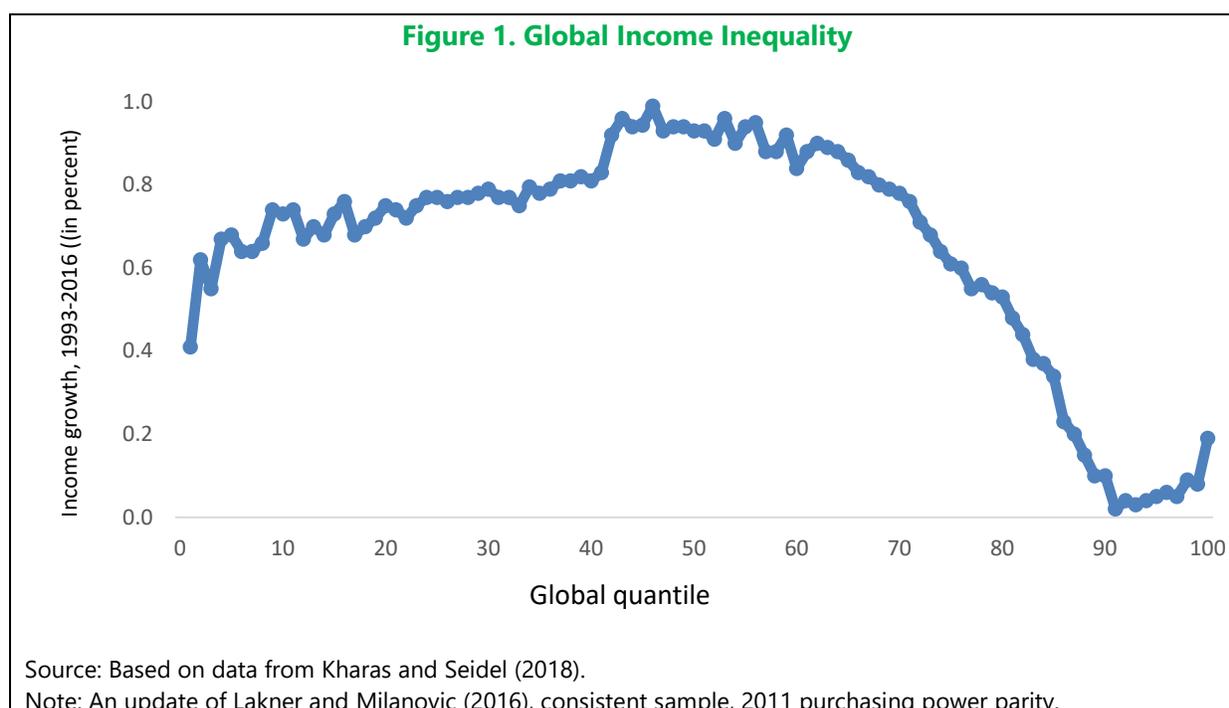
Third, is there a relationship between stability and inequality within countries? Our study finds that higher inequality is associated with greater financial risks. Increases in inequality tend to be accompanied by higher growth in credit. For example, in the United States, too much credit, including to lower-income households, contributed to the 2008 crisis. Crises, in turn, lead to higher default rates, making lower-income households worse off and increasing inequality after a crisis.

Our key takeaway is that finance can help reduce inequality but is also associated with greater inequality if the financial system is not well managed. Our findings have five policy implications. First, financial inclusion policies help reduce inequality. Second, there is a case for promoting women's financial inclusion, as inequality falls even more when policies are inclusive of women. Third, regulatory policies have a role to play in reining in excessive growth of the financial sector. Fourth, provided quality of regulation and supervision is high, financial inclusion and stability can be pursued simultaneously. Fifth, financial sector policies are a complement, not a substitute, for other policy tools—fiscal and macro-structural policies are still needed to help address inequality.

INEQUALITY AND THE POWER OF FINANCE

"...too often we overlook the financial sector, which can also have a profound and long-lasting positive or negative effect on inequality" (Kristalina Georgieva, IMF Managing Director, January 17, 2020)"

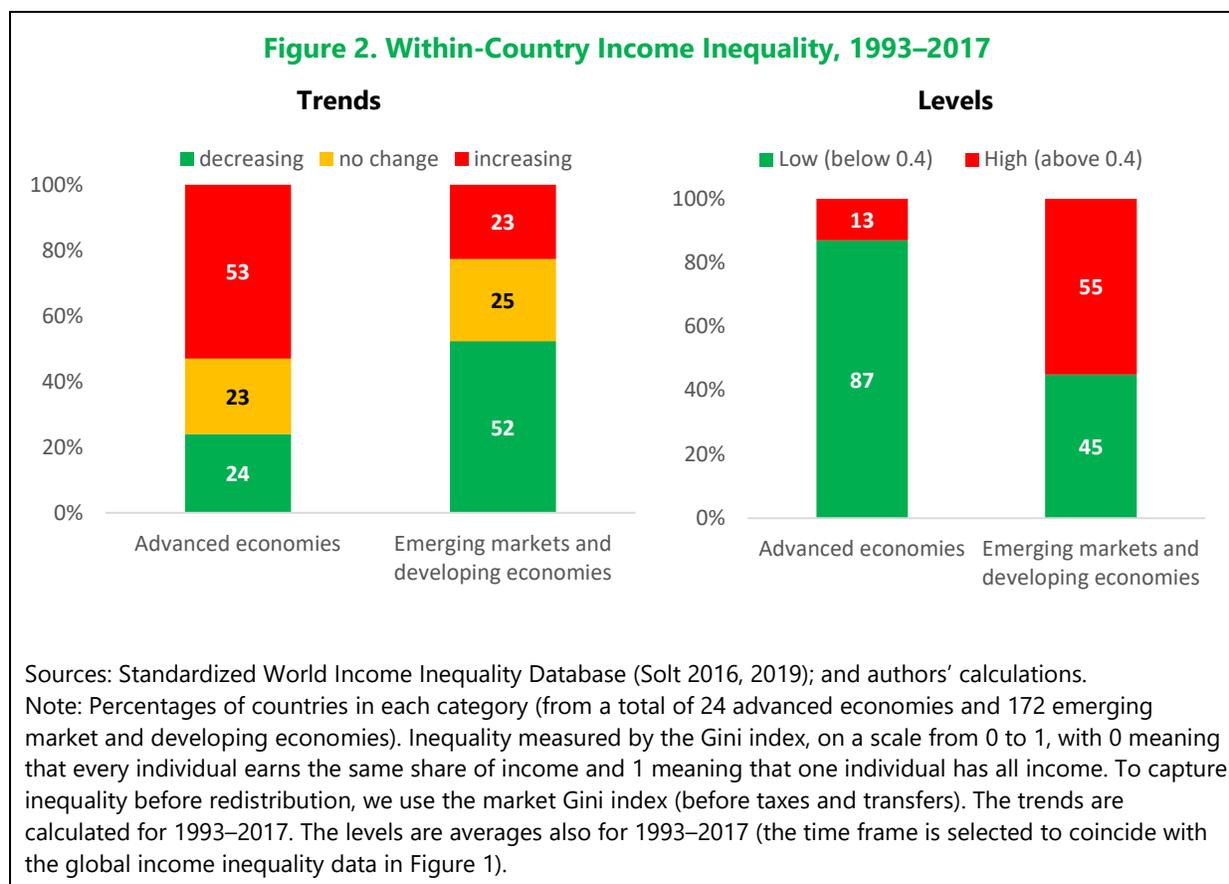
1. Global income inequality has fallen in the past two decades, in large part due to high economic growth and poverty reduction in emerging market and developing economies. The updated "elephant chart" (originally introduced by Lakner and Milanovic, 2016), shown in Figure 1, illustrates this point: incomes for those at the bottom of the global distribution have grown substantially since the early 1990s, but less so for those at the 80th–90th percentiles of the distribution. In large part, the falling global income inequality is due to rapid economic growth in emerging market and developing economies. Financial sector policies and advances in financial technology are enabling financial inclusion, particularly in large economies such as China and India, allowing an increasing number of low-income households and small businesses to participate productively in the formal economy and escape the poverty trap.



2. On the other hand, inequality within countries is rising in many economies and remains high in several others. Since the early 1990s, inequality has been rising in over 50 percent of advanced economies; in a majority of emerging market and developing economies, inequality remains high, but has been falling (Figure 2).² The emergence of populism and anti-globalization sentiment has been attributed, in part, to rising and high inequality, attracting considerable attention and calls for action. For example, Stiglitz (2013) and Ostry, Loungani, and Berg (2019) have

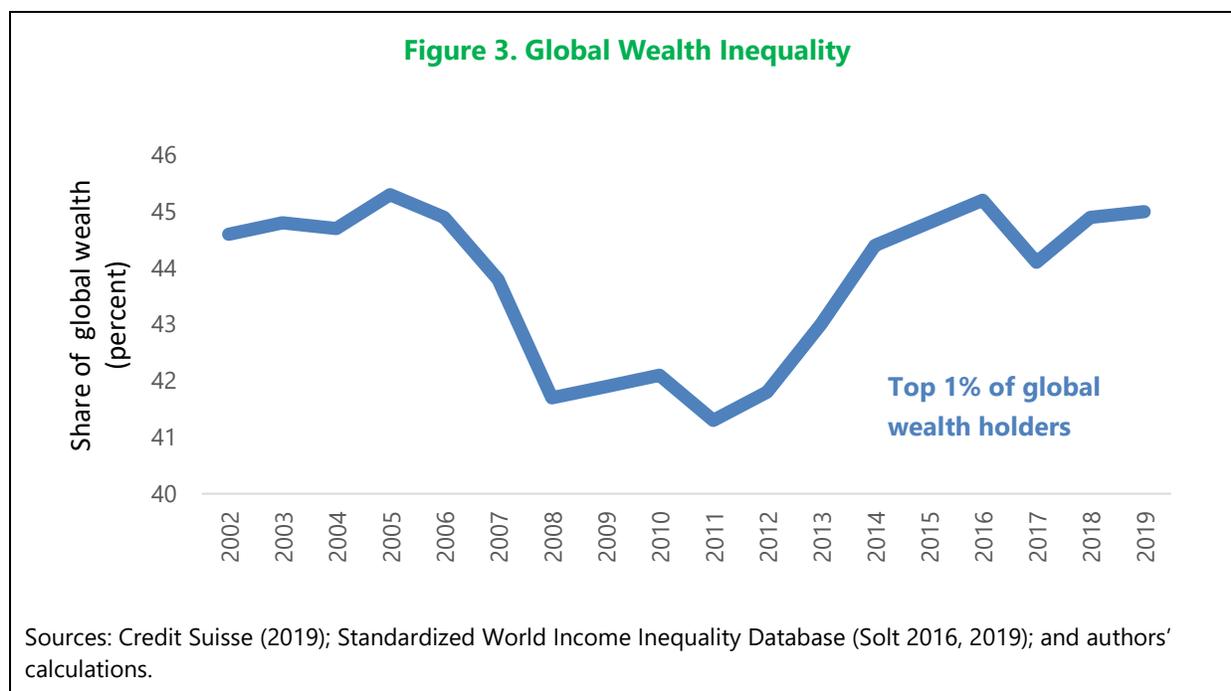
² There are no standard definitions in the literature for "high" or "low" inequality. We take a cutoff of 40 percent of the Gini coefficient as a reasonable measure to distinguish between high and low inequality.

pointed out that growing inequality means slower growth, lower GDP, and greater instability. Piketty (2013) has warned that growing inequality may lead to broad-based discontent and undermine democratic values. Reflecting these types of concerns, the United Nations Sustainable Development Goals (SDGs) have highlighted reducing inequality (Goal 10) as an important priority.

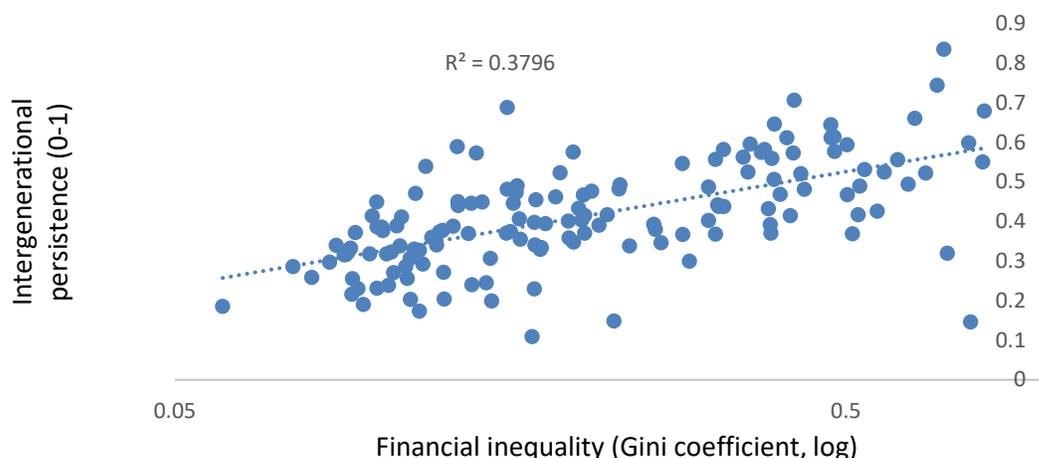


3. Moreover, wealth remains highly concentrated globally. In mid-2019, aggregate global wealth was estimated at US\$360 trillion (Credit Suisse 2019), or about 420 percent of GDP. An equivalent of 190 percent of GDP was in the hands of the wealthiest 1 percent. Global wealth inequality fell during the global financial crisis but rose soon thereafter (Figure 3). Oxfam (2019) estimates that in 2018, the wealth of 26 people was the same as that of the 3.8 billion who make up the poorest half of humanity, down from 43 people in 2017.³

³ Bhalla (2017) introduces a measure of wealth capturing human capital accumulation. He points out that global wealth is more equally distributed if measured in terms of education levels rather than financial wealth.

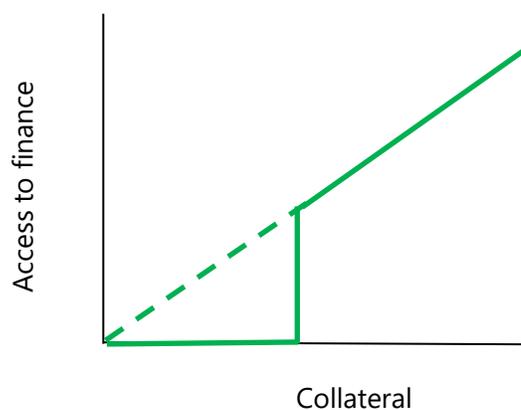


4. Theory provides seemingly conflicting predictions about the relationship between finance and inequality. For instance, financial development might operate on the extensive margin, increasing the availability and use of financial services by individuals who had not been employing those services because of price or other impediments. Thus, financial development might expand the economic opportunities of disadvantaged groups and reduce the intergenerational persistence of relative incomes (Becker and Tomes 1986; Greenwood and Jovanovic 1990). Finance can also operate on the intensive margin, enhancing the financial services of those already accessing the financial system, which are frequently high-income individuals and well-established firms. Thus, the direct effect from improving the quality of financial services could fall disproportionately on the rich, widening inequality and perpetuating cross-dynasty differences in economic opportunity (Greenwood and Jovanovic 1990). At the same time, improving the quality of financial services for the rich could increase growth and benefit the poor through a positive income effect. Theory also indicates that finance can affect inequality through other indirect mechanisms. Changes in the financial system can influence both aggregate production and the allocation of credit, each of which may alter the demand for low- and high-skilled workers with concomitant ramifications on the distribution of income (Townsend and Ueda 2006). For example, improvements in finance that boost the demand for low-skilled workers will tend to tighten the distribution of income, expanding and equalizing economic opportunities. Thus, the relationship between finance and inequality is an empirical question.

Figure 4. Intergenerational Persistence, Financial Inclusion, and the Role of Collateral**(a) Intergenerational Persistence and Financial Inclusion**

Source: Authors' calculations based on GDIM and Global Findex.

Note: Intergenerational persistence of wealth differences across families. The indicator correlates children's wealth with that of their parents, with 0 and 1 representing the lowest and highest persistence, respectively. Comprehensive data on this aspect of inequality have become recently available with the GDIM, covering intergenerational economic mobility in 96 percent of the world's population over the past 50 years.

(b) Access to Finance and Collateral

Source: Authors (a conceptual model).

Note: Collateral plays a key role in managing financial institutions' exposures to credit risk. At the same time, collateral-based lending reinforces existing inequalities. Limitations on collateral (for example, lack of reliable registries for movable collateral) can even exacerbate inequalities by restricting access at the low end of the wealth spectrum. Putting relatively higher weight on financial institutions' lending decisions on future cash flows requires better understanding of risk, but can allow putting lower weight on collateral and can help reduce inequality. In principle, lending that is based more on capacity to repay and less on collateral is a sign of a developed financial system. In practice, many advanced economy financial systems rely on mortgage lending.

5. The potentially large impact of financial sector policies on inequality has received relatively limited attention in economics. Major studies of income inequality, such as those covered in the *Handbook of Income Distribution*, do not cover connections between inequality and financial sector policies. Our meta-analysis of inequality literature (Annex I) finds that only about 1 in

10 studies on inequality has an explicit discussion of the financial sector. Piketty (2013) does note that “systems of financial intermediation have played a central and irreplaceable role in the history of economic development” in affecting inequality; however, the book’s policy lessons concentrate on other issues, such as progressive taxation. Some researchers (for example, Becker and Tomes 1986; Galor and Zeira 1993; Mookherjee and Ray 2003) acknowledge the role of finance in persistent inequality, but they take the state of financial sector and financial market imperfections as given and proceed to analyze how fertility decisions, education, and other factors shape inequality. Demirgüç-Kunt and Levine (2009) identify this approach to finance as a weakness of the existing literature. Indeed, in reality, the provision of financial services depends on financial sector developments and innovations, as well as policies. Consequently, financial sector policies deserve a more prominent position in the study of inequality.

6. The contribution of our study is to examine, at the macroeconomic level, empirical relationships between income inequality and three features of finance: depth (size of the financial sector relative to the economy), inclusion (access to and use of financial services by individuals and firms), and stability (absence of financial distress such as financial crises). For clarity, in Box 1, we define the three concepts and how we measure them. We ask three questions:

- **First, does greater financial depth mean lower or higher income inequality within countries?** Building on new data sets, the analysis suggests that initially financial depth is associated with lower inequality, but only up to a point, after which inequality rises. As other researchers have pointed out, at high levels of development, deeper financial systems are associated with a surge in top incomes and financial sector rents. Explanations in the literature include rising fees associated with asset management, higher compensation in the financial industry, the proliferation of financial products with high risk but also high return that are accessible mostly to the well-off, the size of banks, the lobbying power of big business to access finance more easily, and “easy credit” policies.
- **Second, does greater financial inclusion mean lower income inequality within countries?** We find that greater financial inclusion tends to be associated with reductions in inequality. For access to and use of payment services, we find strong evidence that benefits are greater for those at the low end of the income distribution, reducing inequality. Interestingly, we find that both men and women benefit from financial inclusion, but for women, the association with inequality is larger. With regard to credit extension, the results are mixed.
- **Third, is there a relationship between stability and income inequality within countries?** Our study finds that higher inequality is associated with greater financial risks. When inequality increases, credit tends to rise. For example, in the United States, too much credit, including to lower-income households, contributed to the 2007–08 crisis. The crisis led to higher default rates, which made the lower-income households worse off after the crisis.

7. Our analysis has some limitations. First, we focus on within-country inequality and not on global or between-country inequality. Second, determining the direction of causality between macroeconomic and macrofinancial variables is a long-standing challenge in the literature. There

could be deep underlying factors that we could not capture. There is also a possibility of reverse causation. The econometric methods described in Annex II control for other factors and for the possibility of reverse causation. While the approaches are in line with the literature, they face data and methodological constraints (Annexes I and II). Third, the precision of some commonly used inequality indicators has become a subject of public debate (Auten and Splinter 2019; Bhalla 2017; *Economist* 2019). Fourth, the financial sector indicators employed in the analysis—while reflecting comprehensive sources of information on financial sectors around the world—only approximate the true depth and scope of finance. In particular, the analysis focuses on access to payments and credit. And fifth, the analysis may not fully capture new aspects related to financial technology (fintech). Fintech holds enormous promise for reducing inequality by providing access to groups that have traditionally been financially excluded, but it can also deepen the rift between the rich and poor by disproportionately benefiting the former. It is too early to draw lessons on the net benefits of fintech for inequality.

8. The rest of the note discusses three topics related to the interplay between financial services and inequality, followed by policy implications. The next section examines the relationship between financial depth and income inequality. The section that follows focuses on financial inclusion and income inequality. The penultimate section looks at financial stability and its linkages with financial inclusion and income inequality. The final section concludes and discusses policy takeaways. Annexes to the note provide additional information on data (Annex I) and methodologies (Annex II).

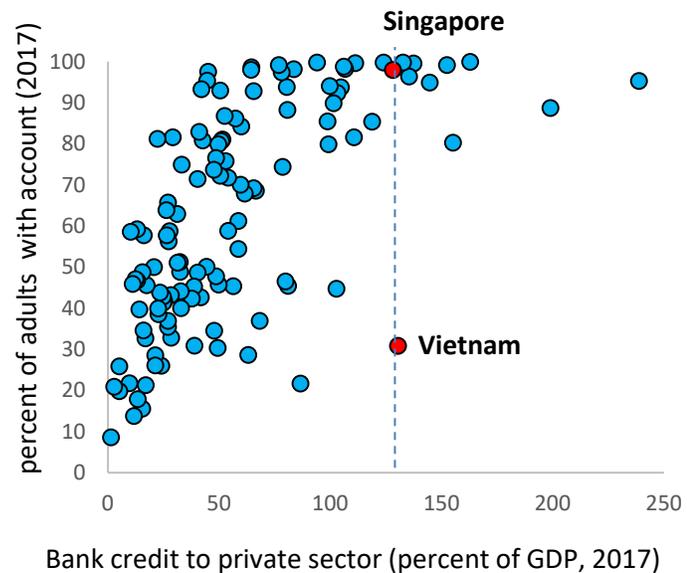
Box 1. Financial Depth, Inclusion, and Instability: Measurement

Financial depth refers to the size of the financial sector relative to the economy. Traditional proxies for financial deepening are the ratio of bank loans to GDP and stock market capitalization. Recent approaches take a more comprehensive view of financial depth, to capture the volume of financial services provided not only by banks, but also by nonbank financial institutions, as well as the depth of financial markets. We use the financial depth index developed in Sahay and others (2015a), with 0 and 1 corresponding to the least and most deep financial system in terms of financial institutions and markets. For financial institutions, the depth index combines (1) private sector credit to GDP, (2) pension fund assets to GDP, (3) mutual fund assets to GDP, and (4) insurance premiums to GDP. For financial markets, the index combines (1) stock market capitalization to GDP, (2) stocks traded to GDP, (3) international debt securities of government to GDP, (4) total debt securities of financial corporations to GDP, and (5) total debt securities of nonfinancial corporations to GDP. Each series is converted to a 0–1 scale, using a min-max procedure, to facilitate comparison and aggregation of variables expressed in different measurement units. To prevent extreme values from distorting the indicators, each indicator is winsorized, with 5th and 95th percentiles set at the cutoff levels. Global distribution—across countries and time—is assessed to determine the cutoff levels.

Financial inclusion is commonly defined as “access to and use of formal financial services.” It captures a range of financial services (transactions, savings, credit, insurance, and so on) for individuals and firms (Sahay and others 2015b). A basic source of data used in this study is the IMF’s Financial Access Survey (<http://data.imf.org/fas>), which contains 121 time series and 64 indicators for 189 jurisdictions spanning 2004–18. A key feature of the data set is that it is based on administrative sources, such as national central bank and other statistical authorities, and it is derived from provider-side information. A complementary source of financial inclusion data used in this study is the Global Findex (<https://globalfindex.worldbank.org>), published every three years since 2011 and covering about 150,000 adults in 144 economies (Annex I). We use different measures of financial inclusion in this study and they are defined in the relevant sections. Annex I discusses the features and limitations of the available data.

Box 1. Financial Depth, Inclusion, and Instability: Measurement (concluded)

Financial depth and financial inclusion are fundamentally different concepts. Financial depth refers to the size of the financial sector relative to the economy, while financial inclusion refers to the proportion of the population that has access to financial services. While financial depth and financial inclusion could proceed together, countries at the same level of financial depth can have different levels of financial inclusion, as illustrated in the figure. Real-world financial systems are far from inclusive. For example, according to the Global Findex, about 1.7 billion adults (31 percent) remained unbanked in 2017. In the same year, there were about 1.4 accounts per adult with financial institutions globally (as reported in the IMF’s Financial Access Survey), meaning that those banked had two accounts on average, while the rest had zero. Use of financial services is even more uneven for other services, such as loans. For example, small- and medium-size companies—which account for about 40 percent of the world’s GDP and 50 percent of employment—receive only about 10 percent of corporate loans.



Financial instability is the potential downside risk of expanding financial services. Financial booms are frequently followed by financial distress, characterized by asset price declines, increasing nonperforming loans, declining or depleted capital buffers, and so on. The distress feeds back into the real economy: vulnerable financial firms are forced to reduce debt when asset prices fall, which leads to further declines in asset prices, employment, and economic growth. When financial firms reduce disproportionately loans and other financial services to small firms and poorer individuals (with higher risk profiles and less collateral), it puts equal opportunity at risk, potentially leading to an increase in inequality. Financial services can promote greater risk taking and leverage, leading to financial distress and—in extreme cases—to crises. This can be especially sizable when incentives in the financial sector are misaligned and the system is poorly regulated and supervised. We define two empirical proxies for financial instability: (1) z-score, or distance-to-distress, defined as capital to assets + return on assets / standard deviation of return on assets (the buffers that banks have against shocks to earnings); and (2) data on presence and absence of banking crises. Annex I discusses the features and limitations of the available data.

FINANCIAL DEPTH AND INCOME INEQUALITY

A. Literature Review

9. Finance-induced growth may be pro-poor by expanding employment opportunities, but it may also favor entrepreneurs and their profit margin. Kuznets (1955) pioneered the study of the inequality-development relationship, suggesting an inverted U-shaped path of income inequality along economic development.

10. Deeper financial systems may reduce income inequality, especially at lower levels of development. Banerjee and Newman (1993); Galor and Zeira (1993); and Greenwood and Jovanovic

(1990) provide theoretical underpinnings. The models differ in the theoretical channels and shape of the relationships, but their common explanation is that better credit availability allows more household choices and decisions to be based on better allocation of spending over time, free from inherited wealth, thereby reducing income inequality.

11. At high levels of development, deepening financial systems can lead to a surge in top incomes and financial sector rents. Philippon and Reshef (2012) found high compensation in the financial sector in times when the financial industry was flourishing, both in the early 20th century and in the decades preceding the global financial crisis. Explanations for this phenomenon include rising fees associated with asset management and expanding household credit (Greenwood and Scharfstein 2013), higher compensation in the “risky” financial industry (Axelson and Bond 2015), information advantages that magnify rent extraction (Bolton, Santos, and Scheinkman 2016), higher market power associated with opaqueness and size of banks, which boost managerial rent extraction (Kalyta 2009; Stiglitz 2016), and “easy credit” policies that heighten medium-term risks and allow financial sector compensation to increase while being politically expedient due to large and widely distributed short-term benefits (Rajan 2010).

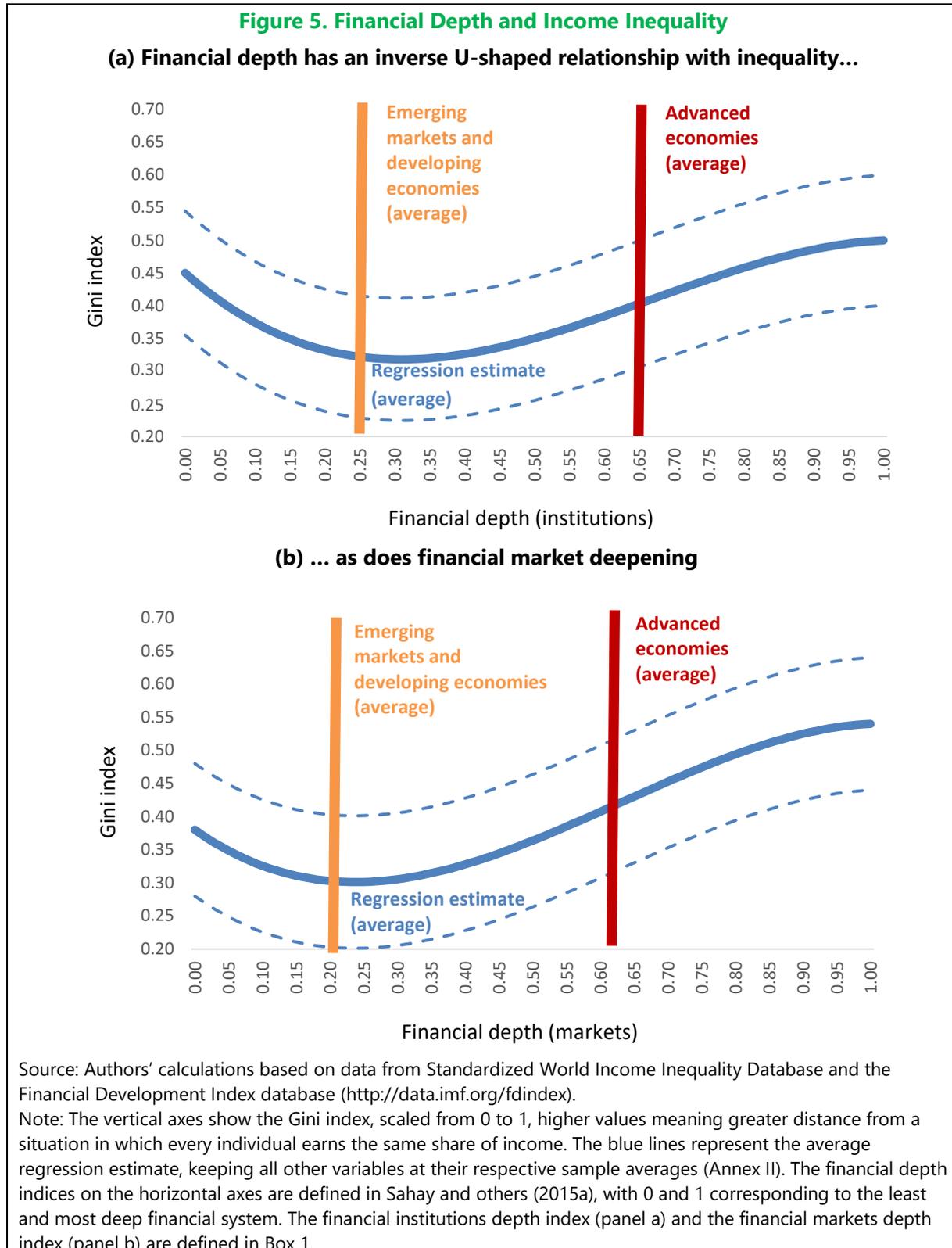
12. Empirical literature on income inequality covers financial deepening primarily from the perspective of capital account opening and financial globalization. Dabla-Norris and others (2015) provide a global perspective on causes and consequences of income inequality. Furceri and Loungani (2018) examine distributional effects of capital account liberalization, while Furceri, Loungani, and Ostry (forthcoming) use macro and sectoral data to examine effects of financial globalization, and Jaumotte, Lall, and Papageorgiou (2013) examine the role of technology, trade, and financial globalization in the rising income inequality.

B. New Data and Findings

13. Using new data, we find that financial deepening reduces within-country income inequality up to a point, after which inequality starts rising (Figure 5). This analysis builds on updated and expanded data from <http://data.imf.org/fdindex>, using the financial depth subindices of the financial development index (FDI) for a panel of more than 180 advanced and emerging market and developing economies.⁴ Income inequality is approximated by the Gini coefficient in the baseline estimates (we use other proxies—including the first quintile income share, the Palma ratio, and the quintile ratio—in robustness checks). Following the literature (Demirgüç-Kunt and Levine 2009; Kumhof and others 2015; Bazillier and Hericourt 2017; Levine and others 2000, Clarke, Xu, and Zou 2006; Beck and others 2007), the analyses control for initial values of economic and financial development, as well as legal origin, ethnic and religious fractionalization, and geographical latitude. We also include the logarithm of industrial value added to GDP, average years of primary and secondary schooling, and inflation. To check for nonlinearity, quadratic and higher polynomial terms are included. The regressions (instrumental variable generalized method of moments) include country fixed effects to capture differences across countries in calculations of inequality and other

⁴ In an earlier paper, Sahay and others (2015a) find that growth rises during the early stages of financial development, and after a point begins to decline. The weakening of such benefits at higher levels of financial development stems from financial deepening (not higher access or efficiency).

time-invariant differences across countries. Annex I discusses the data and Annex II summarizes the methodology and regression results.



14. The increase in inequality beyond the turning point is not only statistically significant, but also quantitatively meaningful. The empirical analysis shows that increases in inequality are associated with high levels of financial deepening both for financial institutions and financial markets. The effect of financial markets is relatively stronger. These findings are in line with Brei, Ferri, and Gambacorta (2018), who observe similar nonlinearities and attribute them to the changing structure of finance from banks to financial markets. The analysis holds across economies at all levels of development, although the effects are more visible in advanced economies as the financial sectors are larger. Quantitatively, as financial depth index increases from the emerging market and developing economy average to the advanced economy average (a difference of about 0.4), Gini increases by about 0.1 (keeping all other variables at their sample averages), which is economically meaningful, considering that the Gini observations in our sample range from about 0.2 to about 0.7.

FINANCIAL INCLUSION AND INCOME INEQUALITY

A. Literature Review

15. Theoretical literature provides important insights on the impact of financial inclusion on inequality. They illustrate how financial exclusion and, in particular, lack of access to finance can lead to poverty traps and inequality (Aghion and Bolton 1997; Banerjee and Newman 1993; Galor and Zeira 1993). For example, in the model of Galor and Zeira (1993), it is because of financial market frictions that poor people cannot invest in their education, despite their high marginal productivity of investment. In Banerjee and Newman's model (1993), the occupational choices of individuals (between becoming entrepreneurs or remaining wage earners) are limited by the initial endowments. These models show that lack of access to finance can be critical for generating persistent income inequality or poverty traps, as well as lower growth.

16. Field experiments provide direct evidence about the causal linkages and positive relationship between access to savings and payment services and an increase in income of the lower-income households. Randomized controlled experiments find that providing individuals with access to savings accounts or simple informal saving technologies increases savings, women's empowerment, productive investment, consumption, investment in preventive health, productivity, and income (Ashraf, Karlan, and Yin 2010; Dupas and Robinson 2013), with effects generally higher at the lower end of the income spectrum. Similarly, an in-depth examination of the impact of removing obstacles to banks opening branches across US states (signed into law in September 1994) shows that greater financial inclusion accelerated economic growth, intensified competition, and boosted the demand for labor, with relatively bigger benefits to people at the lower end of the income distribution (Beck, Levine, and Levkov 2010).

17. Cross-country analyses of the link between access to financial services and inequality have been limited, a main reason being paucity of data—at least until recently—on measures of financial inclusion. Based on cross-sectional data for 2000–05, Mookerjee and Kalipioni (2010) find that access to financial services (bank branch density) reduces income inequality. Kim (2015) reaches a similar conclusion, using data from 40 Organisation for Economic Co-operation and

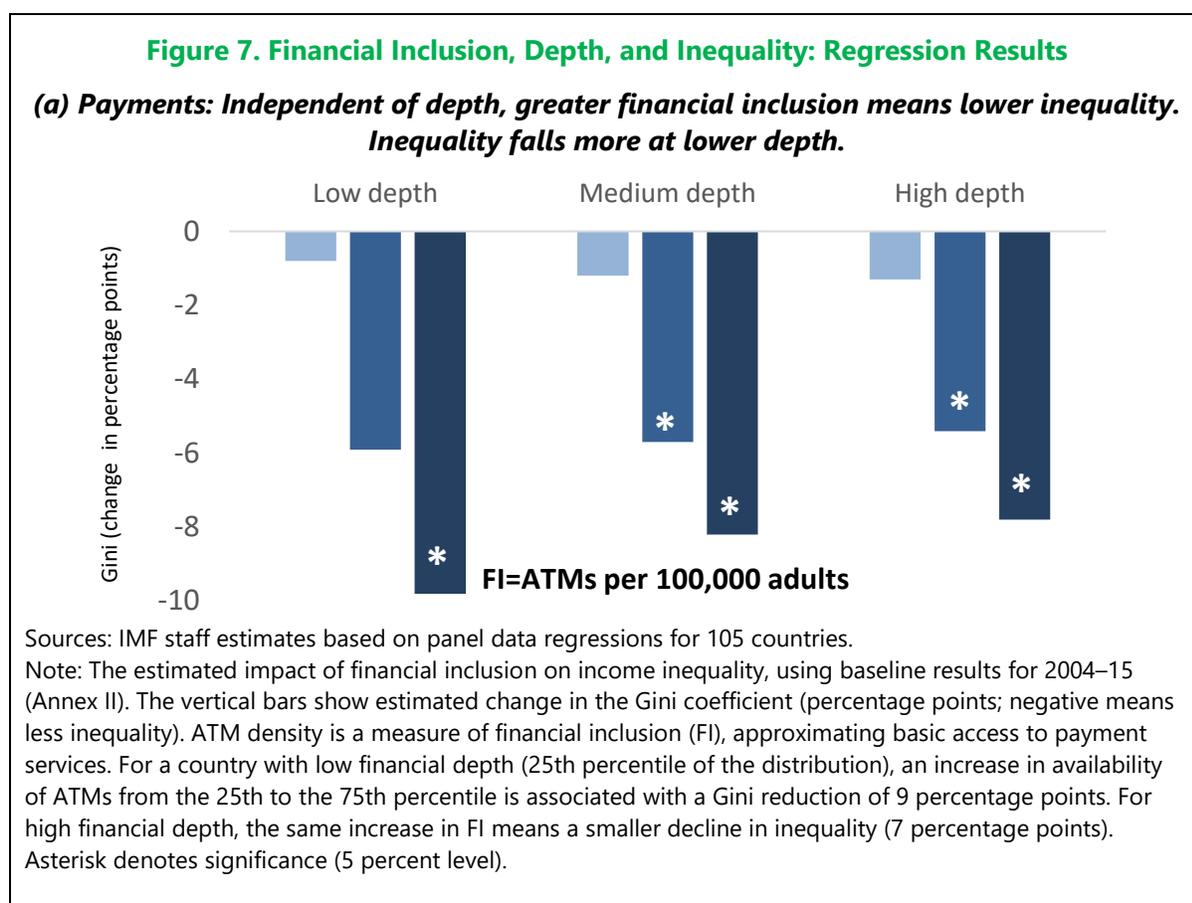
Development and European Union countries for 2004–11 and a financial inclusion index. Sahay and others (2015a) use longer time series for more countries and a broader set of financial institutions to examine the links of financial inclusion to macroeconomic variables, but the focus is on economic growth and financial stability. Aslan and others (2019) investigate the links among financial inclusion, gender, and income inequality, with a focus on African countries, finding that inequality in financial access is related to income inequality.

B. New Data and Findings

18. Newly available global data point to a strong correlation between income inequality and inequality in the use of bank accounts (Figure 6). For example, in Sweden, a country with one of the most even income distributions in the world (an average Gini coefficient of 28 for the past decade), the share of people having bank accounts is the same for the rich and the poor. In contrast, for example, in Indonesia, income inequality is higher (with Gini coefficient of 37 in the past decade), and the richest 20 percent are about twice as likely to have a bank account as the poorest 20 percent. Across a broad spectrum of countries, this measure of inequality in account penetration (financial inequality) is closely correlated with income inequality (the correlation coefficient is significant at 0.33). It thus appears that financial inequality and income inequality go hand in hand. The strong relationship holds even when controlling for the level of national income. These correlations are only suggestive that financial and economic inequality are closely associated, not necessarily that one causes the other.



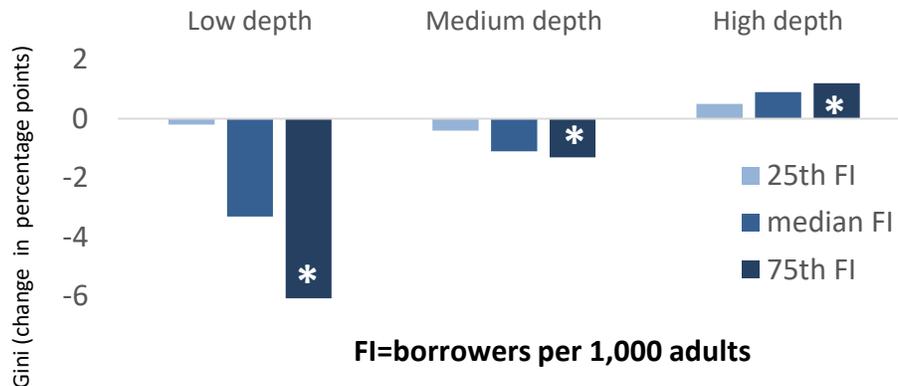
19. Our new estimations show that financial inclusion is strongly associated with lower inequality.⁵ The baseline results for the full sample and the sample of developing economies (Annex Table 3) also suggest that the effect of financial inclusion on inequality is higher when economic growth is higher and when the financial system is more stable. These findings hold for advanced economies as well as emerging market and developing economies. The findings withstand a wide range of robustness checks, including with respect to the sample data, alternative measures of inequality, and alternative estimation methods (Annex II). We find that financial inclusion is associated with lower income inequality across a broad range of economies, and that the relationship between financial inclusion and inequality depends on financial depth (Figure 7). For payments, we find that independent of depth, greater financial inclusion is associated with lower inequality and that inequality falls more at lower depth. In contrast, for credit, at low and medium depth, greater access reduces inequality, while at high depth, inequality increases with credit expansion. The results are not only statistically significant, but also economically relevant: for example, if a country with low financial depth (25th percentile of the global distribution) manages to increase financial inclusion from the 25th to the 75th percentile, we can expect its inequality to go down markedly (a decline in the Gini index by about 9 percentage points).



⁵ See Sahay and others (forthcoming).

Figure 7. Financial Inclusion, Depth, and Inequality: Regression Results (concluded)

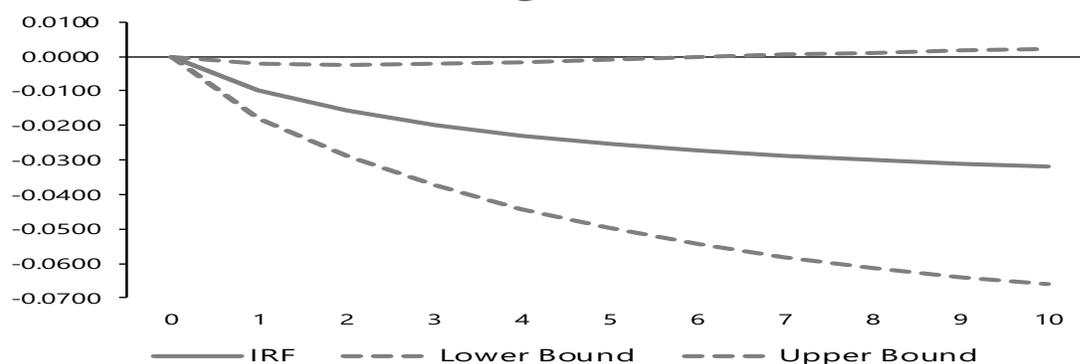
(b) Credit: At low and medium depth, greater access reduces inequality. At high depth, inequality increases with credit expansion.



Sources: IMF staff estimates based on panel data regressions for 105 countries.

Note: Same as for panel a. The figure uses the number of borrowers per 1,000 adults as the FI proxy. At high depth, the relationship between FI and inequality becomes inverted.

(c) Longer time series analyses confirm that inequality falls as financial inclusion rises (U.S. data, 1940–2014).



Sources: Authors' calculations based on US Federal Reserve data.

Note: The cumulative response of income inequality (income of top 1 percent) to a 1 percentage point increase in financial inclusion (branches per 100,000 people), controlling for income taxation, based on a vector autoregression estimated using 1940–2014 data for the United States. IRF = impulse-response function. Horizontal axis shows years since the increase; vertical axis shows change in income share of top 1 percent.

20. Our study takes steps to address concerns about endogeneity and reverse causality.

There may be other factors, such as governance, that are driving both financial inclusion and inequality. To address these concerns, the regressions use instruments for institutional characteristics in instrumental variable regressions. Following Mookerjee and Kalipioni (2010) and Beck and others (2007), the estimates use the existence of private credit bureaus and public credit registries as well as initial endowments (wealth) as instruments. We have used a local projection method à la Jordà (2005) to examine the impulse-response behavior of inequality and inclusion. As a robustness check, we used the adoption of a national financial inclusion strategy to identify changes in inclusion and employed synthetic matching to examine the impact of changes in inclusion.

21. Turning to the role of gender, we find that financial inclusion of women has a stronger link to reducing inequality (Annex Table 5). This analysis builds on the earlier work by Sahay and others (2015a, 2015b, 2018), using a range of estimates with instrumental variables. In line with the results from panel data estimates, all indicators of financial inclusion are negatively and significantly correlated with the Gini index, confirming the previous conclusion that financial inclusion is associated with lower income inequality. Both men and women benefit from financial inclusion, but the effect for women’s financial inclusion is quantitatively larger. The analysis thus confirms that women’s financial inclusion has a stronger association with lower income inequality.

FINANCIAL INSTABILITY AND INCOME INEQUALITY

A. Literature Review

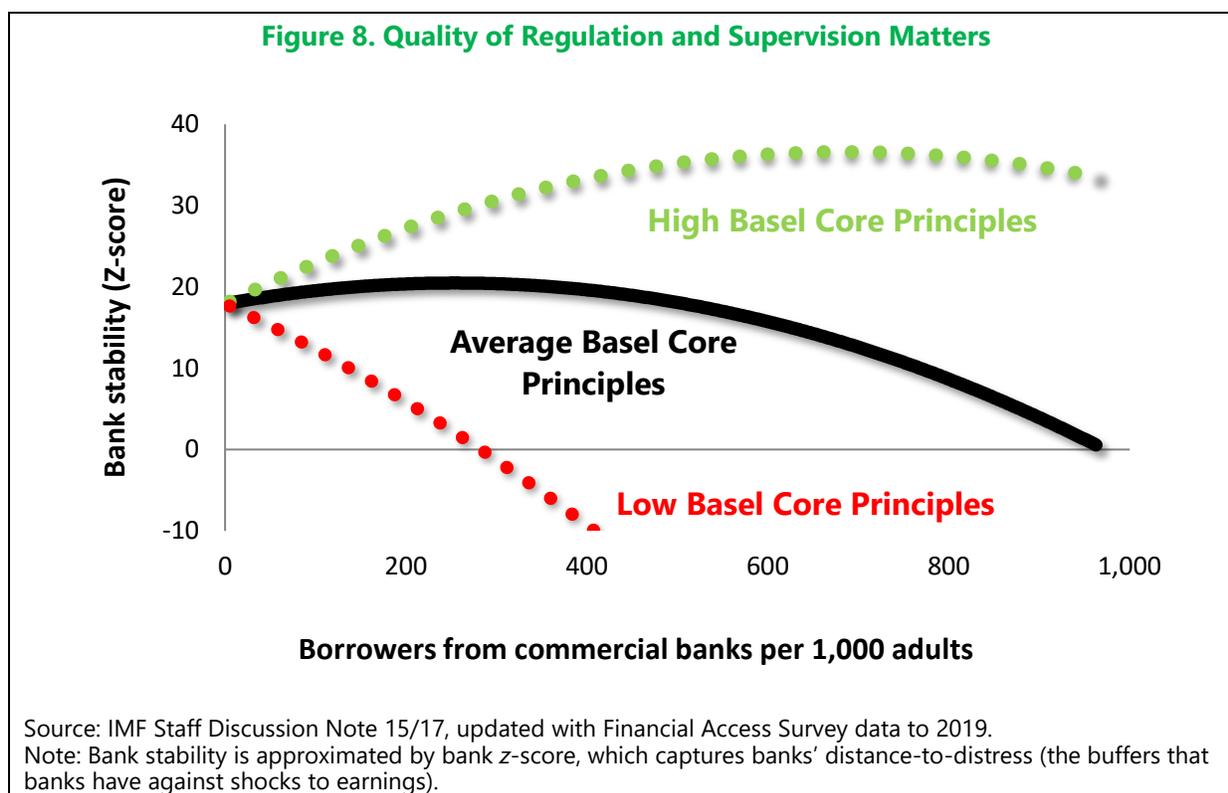
22. Economic theory identifies a circle of causation whereby higher inequality poses greater macro-financial risks whose realization can, in turn, engender greater inequality (Annex Figure 1).

- *Leverage* plays a central role in this transmission: inequality may compromise financial stability because of its implications for leverage in the economy. Inequality is a factor behind credit bubbles, increasing the odds of financial crises (Bazillier and Hericourt 2017). Attempts to address inequality by increasing lending to lower-income households can backfire if the financial sector is not well regulated or supervised. Extension of mortgages to low-income households, combined with lax regulation, had a major role in the US subprime crisis of 2007–08. Rajan (2010) discusses how rising income inequality incentivized low- and middle-income households to increase indebtedness to maintain consumption levels in the face of falling real income levels.⁶
- *Policies* can affect income inequality as well as leverage. For example, loosening of financial regulations may ease credit supply and contribute to higher leverage and financial vulnerability, while capital market imperfections limiting access to credit markets may exaggerate income and wealth inequalities (Acemoglu 2011). History, unfortunately, provides many examples of instability stemming from policy efforts to increase inclusion. In 2004–06, several emerging markets experienced financial problems when banks and credit card companies rapidly expanded consumer credit (credit card, vehicle, personal loans) to lower-income and underserved households. Many households were not able to repay the loans, causing instability in the banking systems. The microcredit crisis in India’s Andhra Pradesh in 2010 provides another case study in weak regulatory policy allowing excessive lending.

⁶ Recent studies also suggest that an increase in income inequality is linked to current account deficits, and that financial liberalization can interact with income inequality to amplify the effect of inequality on the current account (Kumhof and others 2012; Belabed, Theobald, and van Treeck 2017). To the extent that this widening of the current account deficit occurs in tandem with rising leverage induced by higher levels of income inequality, this reinforces the negative implications of inequality for financial stability.

23. Empirical literature points to credit growth and asset prices as important predictors for crises. For example, Schularick and Taylor (2012) examine long-term behavior of money, credit, and macroeconomic indicators for 14 countries from 1870 to 2008, emphasizing the role of credit growth as a powerful predictor of financial crises. Borio and Drehmann (2009), for 18 advanced economies in 1980–2013, document that unusually strong increases in credit and asset prices have tended to precede banking crises.

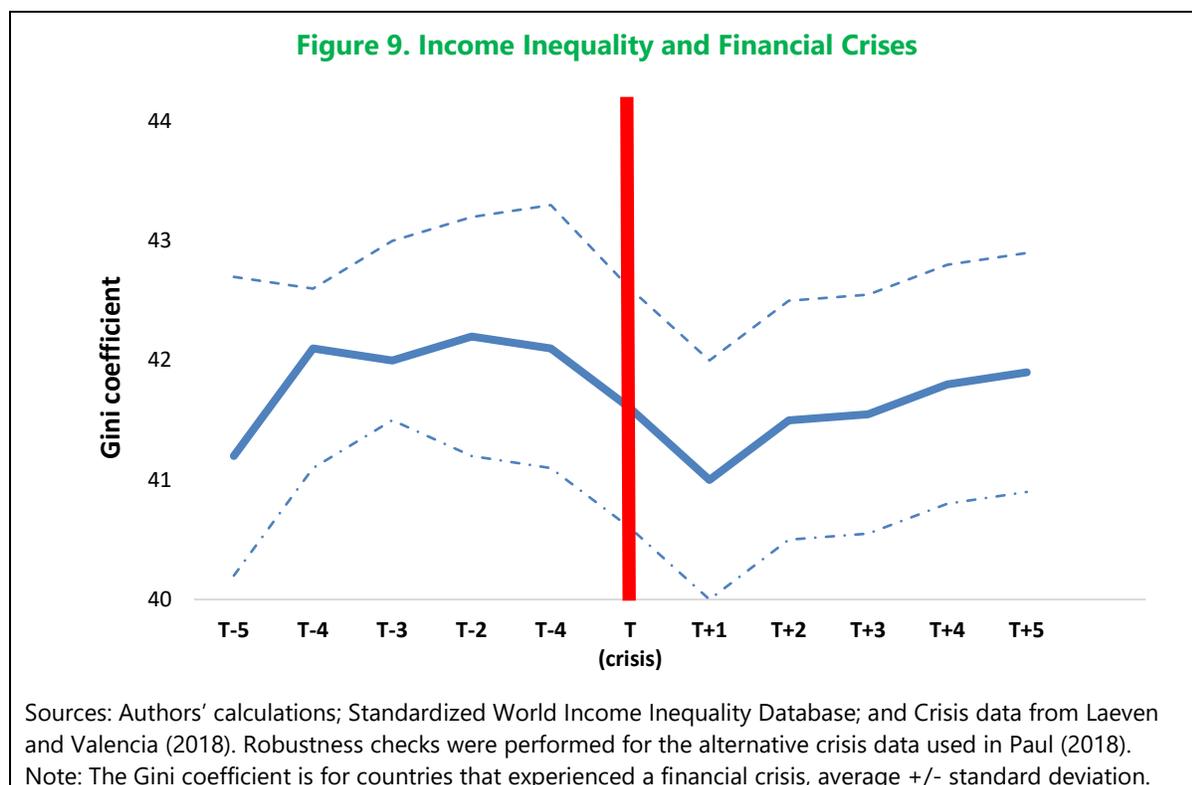
24. Empirical studies also emphasize the relationship between financial inclusion and financial stability and the role of institutions in managing inclusion-stability trade-offs. Han and Melecky (2015) find that banking systems with broader access to deposits were less prone to large deposit outflows in times of stress, suggesting that financial inclusion—at least in some of its forms—can have synergies with financial stability. Čihák, Mare, and Melecky (2016) dig deeper into the trade-offs and synergies between financial inclusion and stability. For a sample of about 150 countries, they find the relationship between inclusion and stability is systematically influenced by country characteristics such as financial openness, tax rates, education, and the depth of credit information systems. Sahay and others (2015b), using a sample of about 160 countries, uncover a nonmonotonic relationship between financial inclusion (number of commercial bank borrowers) and financial stability (the banking system’s distance-to-distress). The key conditioning factor is the quality of banking supervision; if high, then there would be minimal cost of expanding financial inclusion in terms of greater instability. The opposite is true for low quality of supervision: an increase in financial inclusion would inevitably result in greater instability. Figure 8 provides an updated version of the analysis with data up to 2019.



B. New Data and Findings

25. Our analysis of new data suggests that inequality increases before a financial crisis. We combine updated and expanded crisis data (Laeven and Valencia 2018) with cross-country data sets on inequality in both advanced and emerging market economies (Figure 9). The comparison highlights that precrisis periods are associated with heightened inequality. To examine this more rigorously, we have estimated logit models regressing the binary financial crisis indicator on the inequality measure (change in Gini), credit growth, and country fixed effects. The inequality measure was statistically significant in the logit regressions. This is in line with Paul’s (2018) observation that income inequality is among crisis predictors.

26. Inequality falls temporarily during the crisis and begins to rise after the crisis. During the onset and early part of a crisis, inequality tends to dip, reflecting primarily that richer households tend to be relatively more exposed to bursts of asset prices. The postcrisis years are associated with increased inequality, as lower-income households tend to disproportionately experience a loss in income (due to the economic contraction), constraints on consumption smoothing (due to deleveraging by banks and other lenders), and a dent in net wealth (due to the mark-to-market hit on retirement accounts and increase in mortgage debt due to falling home values).

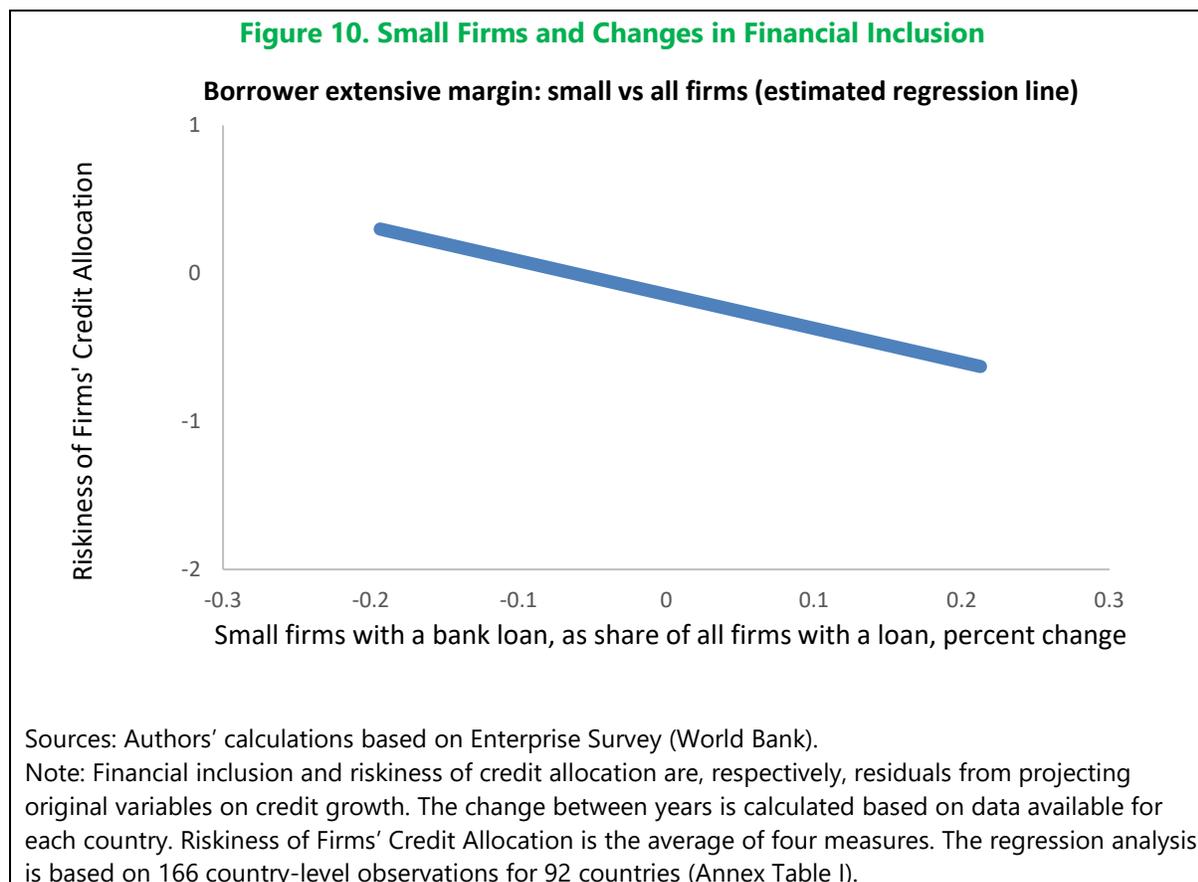


27. These new findings are in line with studies that show that the benefits of finance for economic growth start declining—and can disappear—when aggregate leverage is high. Sahay and others (2015a) and IMF (2017) indicate that increases in private sector credit may raise the likelihood of a financial crisis. The findings point to a trade-off between the short-term benefits of

rising debt for increasing economic activity and its medium-term costs to macroeconomic and financial stability, as well as inequality. Moreover, higher growth in debt is associated with a greater probability of banking crises, contributing to an increase in inequality. These adverse effects are stronger when debt is higher and are therefore more pronounced for advanced than for emerging market economies where household debt and credit market participation are lower. However, institutional characteristics—such as higher quality of regulation and supervision in a country—can mitigate the risks associated with rising debt (Sahay and others 2015a).

28. The links between inequality, financial inclusion, and financial risks are further explored by analyzing microlevel data on firms’ access to finance.⁷ Most previous empirical studies on macroeconomic effects of financial inclusion have focused on the cross-country variation in financial inclusion. An accompanying paper by Barajas and Xie (forthcoming) draws on microlevel longitudinal data at the firm level. The main data source is the World Bank’s Enterprise Survey, conducted since 2002 for a sample covering more than 135,000 firms in 140 countries (Annex I).

29. Strikingly, we find that expansions in credit-related aspects of inclusion that favor small firms lower the overall risk of credit allocation. A pro–small-firm bias in expanding financial inclusion is beneficial for financial stability: the greater the increase in inclusion of small relative to larger firms, the smaller the change in riskiness (Figure 10).



⁷ For a technical discussion, see Barajas and Xie (2019).

30. The analysis also points to a key role of regulation and supervision in the relationship between financial stability and inequality. Increases in financial inclusion of firms are often—two-thirds of the time—accompanied by improvements in income equality. Regarding financial stability, expansions in the use of bank credit by firms were associated with increases in the riskiness of credit allocation. However, an expansion that was biased in favor of small firms would be less likely to entail greater risk. Moreover, the results suggest that countries with higher-quality supervision and regulation (approximated by data from the World Bank’s Bank Regulation and Supervision Survey) are less likely to pay the price of expanding financial inclusion in terms of greater credit risk.

TAKEAWAYS

31. Our key takeaway is that financial services can help reduce inequality but are also associated with greater inequality if the financial system is not well managed. This study expands on previous research on macroeconomic dimensions of financial deepening and financial inclusion, suggesting that financial services are inextricably linked not only with financial stability and economic growth, but also with economic inequality.

32. Building on new data sets, the current study finds that financial deepening has a nonlinear relationship with inequality. The analysis suggests that initially financial depth is associated with lower inequality, but only up to a point, after which inequality rises. As other researchers have pointed out, at high levels of development, deeper financial systems are associated with a surge in top incomes and financial sector rents. Explanations in the literature include rising fees associated with asset management, higher compensation in the financial industry, the proliferation of financial products with high risk but also high return that is accessible mostly to the well-off, the size of banks, the lobbying power of big business to access finance more easily, and “easy credit” policies.

33. Greater financial inclusion tends to be associated with reductions in inequality. For access to and use of payments services, we find strong evidence that benefits are greater for the poorer households, reducing inequality. Interestingly, we find that both men and women benefit from financial inclusion, but for women, the association with inequality is larger. As regards access to credit, its relationship to inequality is mixed, depending on the quality of regulation and supervision.

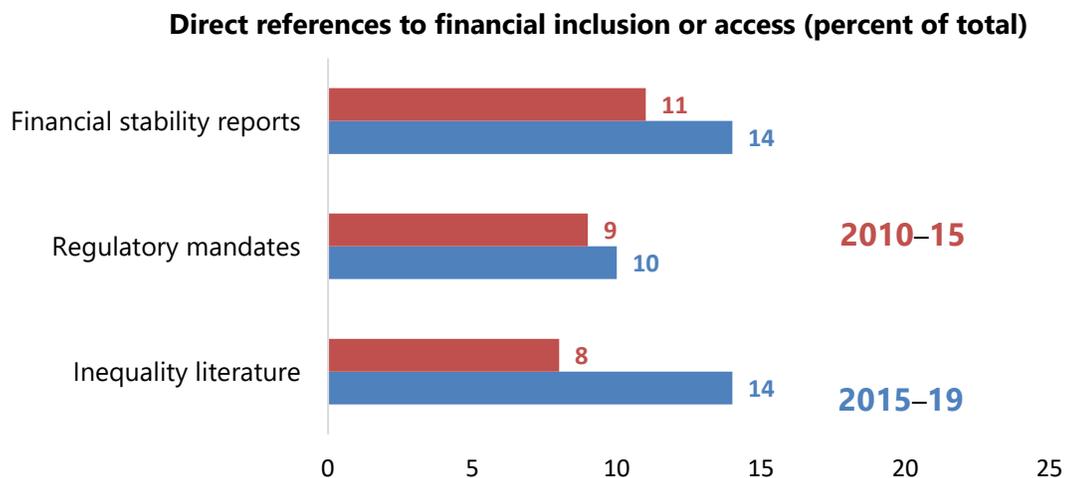
34. There is a virtuous relationship between income equality and financial stability. Our study finds that higher inequality is associated with greater financial risks. When inequality increases, credit tends to rise. Too much credit increases the likelihood of crisis. The crisis, in turn, leads to higher default rates, which makes the lower-income households worse off after the crisis. Measures supporting inclusive growth would be desirable from not only the perspective of equitable distribution but also that of enhancing macro-financial stability, provided quality of regulation and supervision is high.

35. When the financial system works to expand opportunities for individuals and firms, it can help prevent persistent inequality, reducing the fiscal burden. This may be welcome, in part, due to the limitations of redistributive policies such as taxes and transfers: if they get too large, they

can adversely affect the underlying incentives, leading to efficiency leaks and “the big trade-off between equality and efficiency” (Okun 1975). In contrast, a better-functioning, more inclusive financial sector can reduce financial frictions, improving overall economic efficiency.

36. The study raises awareness of the potential role financial services can and do play in increasing or decreasing inequality of incomes, wealth, and opportunity. The United Nations sustainable development agenda recognizes that reducing inequality (SDG goal 10) requires—among other things—to “improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations” (SDG target 10.5). Our meta-analysis of the inequality literature suggests that financial sector policies are cited much less frequently than redistributive fiscal policies, labor market policies and institutions, education policies, product market regulations, and policies that foster the integration of immigrants and fight discrimination. In legal mandates of central banks and other financial supervisors, about 1 in 10 contain an explicit financial inclusion mandate. Income inequality is mentioned infrequently in country authorities’ financial stability reports (fewer than 5 percent). The frequency of references to financial inclusion in those reports is also low although it has been increasing (Figure 11). If finance has a first-order impact on inequality, ignoring or underestimating the impact of financial sector policies can result in subpar policymaking. At the very least, in highly unequal economies, it would be useful to address the channels through which changes in financial sector policies can increase economic opportunities for low-income groups.

Figure 11. Coverage of Inclusion in Financial Stability Reports and Other Documents



Sources: Authors’ calculations using information from central bank websites; Bank Regulation and Supervision Survey; EconLit; RePEc; World Bank eLibrary; Scopus; Web of Science; SSRN; ResearchGate; and Google Scholar. Note: The analysis of financial stability reports is an update of Čihák and others (2012), covering the same 74 countries that published financial stability reports in 2000–09. The analysis of regulatory mandates uses data from the Bank Regulation and Supervision Survey (<https://www.worldbank.org/en/research/brief/BRSS>). The meta-analysis of inequality literature is based on searches of EconLit and the other databases listed above.

37. Our findings have five main policy implications. Policymakers should look to financial sector policies’ impact on inequality when formulating policies. Financial sectors can amplify inequalities when inherited wealth, race, gender, and other barriers drive access to and use of financial services. In contrast, a well-functioning financial sector can compensate for differences in

“starting positions.” It can reduce inequality, lowering the need for fiscal redistribution and creating room for other policies, such as infrastructure spending.

- **First, financial inclusion policies are important for reducing inequality.** This note is not proposing to add inequality to the mandates of regulators and supervisors. But it strengthens the case for promoting financial inclusion policies. These include greater financial literacy, stronger consumer protection, reducing biases in data collection, protection of private data, and, more generally, policies to enhance access of lower-income households and small businesses to financial services, while minimizing financial risks. An initial step for regulators and supervisors to promote financial inclusion would be to increase the coverage and discussion of this topic in financial stability reports and mandates of financial sector regulators.
- **Second, there is a case for promoting women’s financial inclusion.** Inequality falls even more when policies are inclusive of women.
- **Third, regulatory and supervisory policies have a role to play in reining in excessive growth of the financial sector.** We are not suggesting that regulators should explicitly target a specific point beyond which all financial deepening would be prohibited. But policymakers and regulators need to be aware that at high levels of financial depth, further financial deepening can come with challenges not only in terms of economic growth and financial stability, but also inequality.
- **Fourth, provided quality of regulation and supervision is high, financial inclusion and financial stability can be pursued simultaneously.** Our study finds that there is no substitute for high-quality regulation and supervision for achieving greater financial inclusion and ensuring financial stability at the same time. Notably, this paper provides evidence that a pro–small-firm bias in expanding financial inclusion is beneficial for financial stability.
- **And fifth, fiscal and competition policy tools will still be needed to fully address inequality.** Financial sector policies are a complement, not a substitute for, other policy tools, such as fiscal and competition policies.

38. We need more data and research to examine the channels through which finance affects inequality. Lack of granular data on access to and use of financial services has limited the degree to which we and other researchers can assess the channels through which finance affects inequality. This is starting to change with the emergence of new data sets that could help us better understand the transmission between financial depth and inequality during the initial stages of financial development: is it credit strengthening the macroeconomy or inclusion boosting the previously excluded? This is also true during the late stages when the relationship becomes the inverse: there may be different channels at play in different countries, and understanding those channels would be important for country-specific policy implications. More data and research are needed to examine the effects of fintech. Further research is also needed on how financial sector policies—including nonbank regulation, supervision, and oversight; macroprudential policies; financial market infrastructures; and financial safety nets—affect economic opportunities and the distribution of income and wealth.

ANNEX I. DATA

Text Analysis

The meta-analysis of inequality literature is based on searches on EconLit, RePEc, World Bank eLibrary, Scopus, Web of Science, SSRN, ResearchGate, and Google Scholar.

For the text analysis of financial stability reports, authors started with the data from Čihák and others (2012), covering the same 74 countries that published financial stability reports in 2000–09, updating it with information from central bank websites.

For the text analysis of central bank and regulatory mandates, the authors used the World Bank's Bank Regulation and Supervision Survey (<https://www.worldbank.org/en/research/brief/BRSS>) and the IMF's Central Bank Legislation Database.

Inequality

For purposes of measuring income inequality, we use the most commonly used measure in the literature to proxy for income inequality—the Gini index, measuring deviations from a perfectly equal distribution of income on a scale from 0 to 1. In checking for robustness, the analysis also employs alternative measures of inequality, including the first quintile income share, the Palma ratio, and the quintile ratio. The Palma ratio is the ratio of the richest 10 percent of the population's share of total gross national income, divided by the poorest 40 percent's income share. The quintile ratio is defined as the ratio of the richest 20 percent of the population's share of income, divided by the income share of the poorest 20 percent. As an additional check, the analysis also examines the share of top 1 percent in income and wealth and introduces a measure of extreme inequality based on wealth instead of income data.

A basic source of comparable cross-country data is the Standardized World Income Inequality Database (SWIID; Solt 2016, 2019), which aims to maximize the comparability of income inequality data while maintaining the widest possible coverage across countries and over time. The database contains thousands of reported Gini indices from hundreds of published sources, including the Organisation for Economic Co-operation and Development Income Distribution Database; the Socio-Economic Database for Latin America and the Caribbean generated by the Center for Distributive, Labor and Social Studies (CEDLAS) and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, national statistical offices around the world, and academic studies. It minimizes reliance on problematic assumptions by using as much information as possible from proximate years within the same country. The data collected and harmonized by the Luxembourg Income Study are employed as the standard. The database currently incorporates comparable Gini indices of disposable and market income inequality for 196 jurisdictions for as many years as possible from 1960 to the present; it also includes information on absolute and relative redistribution.

In addition to the Standardized World Income Inequality Database, we have also used, as a robustness check, data from the *Fiscal Monitor* October 2017 Gini coefficients on a five-year basis starting in 1980; Atkinson and Morelli (2012), covering 25 countries from 1911 to 2010; and Atkinson, Piketty, and Saez (2011) and subsequent updates of the wealth and income inequality database (WID) for 30 countries.

The main source for measuring equality of opportunities used in this note is the Global Database on Intergenerational Mobility (GDIM) (<https://openknowledge.worldbank.org/handle/10986/28428>). The GDIM covers intergenerational economic mobility in 96 percent of the world's population over 50 years.

Recently, the precision of the “top 1 percent of income” calculations has become a subject of intense public debate and scrutiny, including in the *Economist* survey article (*Economist* 2019). In particular, Auten and Splinter (2019) use US data to examine the sensitivity of the estimated top 1 percent income shares to researchers' choices about which sources of income to include, how to allocate income missing from tax returns, and how to account for changes in family structure and changes in tax laws. Their analysis suggests that accounting for these factors may result in lower levels of and smaller (although still positive) increases in top income shares in the United States. The analysis in this note is not dependent on the “top 1 percent of income” calculations. Also, it covers many countries and is robust with respect to changes in country sample (so the results would hold even if, for example, the US data are dropped). Separately, Bhalla (2017) introduces a measure of wealth capturing human capital accumulation, pointing out that global wealth is more equally distributed if measured in terms of education levels rather than financial wealth.

Two data sources are used to construct the proxy for extreme inequality: *Forbes'* list of billionaires (by country) and their associated net wealth and the *Global Wealth Databook* published by Credit Suisse. Both publications are produced annually. The *Global Wealth Databook* provides estimates of aggregate countries' wealth, and wealth per adult.⁸ Based on those two data sources, two indicators of extreme inequality are constructed, covering the period 2004–15:

- The *per capita wealth index*, which measures the gap between the richest individual in a given country and the aggregate wealth per adult in the same country. This is calculated as the ratio of the richest billionaire's stock of wealth to the country's wealth per adult.
- The *average per capita wealth index*, which measures the gap between the average wealth at the top of the distribution and the aggregate (country-level) wealth per adult. This indicator is computed as the average wealth per billionaire (total billionaires' wealth divided by the number of billionaires) divided by the aggregate wealth per adult in the country.

Annex Figure 4 provides an overview of the evolution of the two indices at the global level, as well as for high-income and developing countries separately. The data indicate that the increase in extreme inequality has been more marked compared with what standard measures of income

⁸ From household balance sheet data or regression estimates following Davies and others (2011).

inequality (such as the Gini index) may suggest. The gap between the top richest individuals and the country-level average is larger in the developing world than in high-income countries. In fact, while the Gini index indicates a relatively stable trend in the evolution of income inequality in developing economies, extreme inequality appears to have increased significantly. A first look at the full-sample data set suggests a negative correlation between access to financial services and the proxy for extreme inequality. This points to a potential for financial inclusion to contribute to reducing wealth gaps across countries.

Financial Depth

Data on financial depth are drawn from the Financial Development Index (FDI) database. The database was introduced in Sahay and others (2015a). It has been updated multiple times since its introduction and is available at <http://data.imf.org/fdindex>. The data cover more than 180 advanced and emerging market and developing economies with annual frequency from 1980 onward.

We use two indicators of financial depth:

- *Financial institutions depth index*: The index combines four underlying series from the data set: (1) private sector credit to GDP, (2) pension fund assets to GDP, (3) mutual fund assets to GDP, and (4) insurance (life and nonlife) premiums to GDP.
- *Financial markets depth index*: The index combines five underlying variables: (1) stock market capitalization to GDP, (2) stocks traded to GDP, (3) international debt securities of government to GDP, (4) total debt securities of financial corporations to GDP, and (5) total debt securities of nonfinancial corporations to GDP.

Each series in the database is converted to a 0–1 scale, using a min-max procedure, to facilitate comparison and aggregation of variables expressed in different measurement units. To prevent extreme values from distorting the 0–1 indicators, each indicator is winsorized, with 5th and 95th percentiles set at the cutoff levels, so as not to lose data. Global distribution—across countries and time—is assessed to determine the cutoff levels. The min-max procedure normalizes indicators to have an identical range [0,1] by subtracting the minimum value and dividing by the range of the indicator values. It relates country performance on an indicator to the global minimum and maximum across all countries and years. Thus, the highest (lowest) value of a given variable across time and countries is equal to 1 (zero), and all other values are measured relative to these maximum (minimum) values.

Financial Inclusion

The main source of the financial inclusion data in this study is the IMF's Financial Access Survey, or FAS (<http://data.imf.org/fas>). The FAS collects and disseminates comparable time-series data on the geographical outreach and use of basic financial services provided by resident financial corporations to resident customers in a country. Outreach of financial services is approximated by evaluating financial institutions' branch network and nonbranch agents, the availability of ATMs, and the

number of agent outlets for mobile money providers. Use is measured for three key financial services: deposits, loans, and insurance. The FAS provides data for households—including disaggregation by gender—and small and medium enterprises. It contains 121 time series and 64 indicators for 189 jurisdictions spanning 2004–18. A key feature of the data set is that it is based on administrative sources, such as national central bank and other statistical authorities, and it is derived from provider-side information.

A complementary source of financial inclusion data used in this study is the Global Findex database (<https://globalfindex.worldbank.org>). The Global Findex compiles demand-side data on how adults save, borrow, make payments, and manage risk. Launched with funding from the Bill & Melinda Gates Foundation, the database has been published every three years since 2011. The data are collected by the World Bank in partnership with Gallup, Inc., through nationally representative surveys of about 150,000 adults in 144 economies. The latest survey was carried out in 2017 as part of the Gallup World Poll, which since 2005 has annually conducted surveys of approximately 1,000 people in each of more than 160 economies and in more than 150 languages, using randomly selected, nationally representative samples. The target population is the entire civilian, noninstitutionalized population ages 15 and older. The Global Findex offers decompositions by individual characteristics, including gender, age, income, employment, living area, and education level (Demirgüç-Kunt and others, 2018).

For financial inclusion of firms, the main data source is the World Bank Enterprise Survey. The survey has been conducted since 2002 for a broad cross-country sample, covering over 135,000 firms in 140 countries. For the regression analysis in the study, we have been able to use 110–166 country-level observations for 66–92 countries (Annex Table 1).

Annex Table 1. Financial Inclusion Indicators (Enterprise Surveys) and Inequality

	Percentage of firms using banks to finance:		Share of spending below financed by bank credit:		Firms identifying access to finance as a major constraint (%)	Percentage of firms with a bank loan or line of credit	
	Investment	Working capital	Investment	Working capital		All firms	Small firms
Variable names:	<i>fbankinv1</i>	<i>fbankw1</i>	<i>fbankinv2</i>	<i>fbankwk2</i>	<i>fcredobst</i>	<i>fbankln</i>	<i>fsmbankln</i>
Number of observations	166	121	164	121	166	110	110
Number of countries	91	92	90	92	89	66	66
Correlation with change in Gini	0.04	0.15	0.10	0.18	-0.11	0.10	0.16
Number of increases in financial inclusion/Total observations (%)	64.5	61.2	57.3	59.5	61.4	44.5	42.7
Number of common observations of change in financial inclusion and Gini	89	53	89	53	89	57	57
	Share in total common observations (%)						
Number of increases in financial inclusion with declines in Gini	41.6	39.6	36.0	39.6	39.3	29.8	28.1
Number of decreases in financial inclusion with increases in Gini	14.6	9.4	19.1	11.3	12.4	15.8	19.3
	Share in total number of increases or decreases in financial inclusion (%)						
Increases in financial inclusion with declines in Gini	66.1	65.6	68.1	65.6	63.6	65.4	69.6
Decreases in financial inclusion with increases in Gini	39.4	23.8	40.5	28.6	32.4	29.0	32.4

Source: World Bank Enterprise Survey; World Bank World Development Indicators; OECD; and authors' calculations

Financial Stability

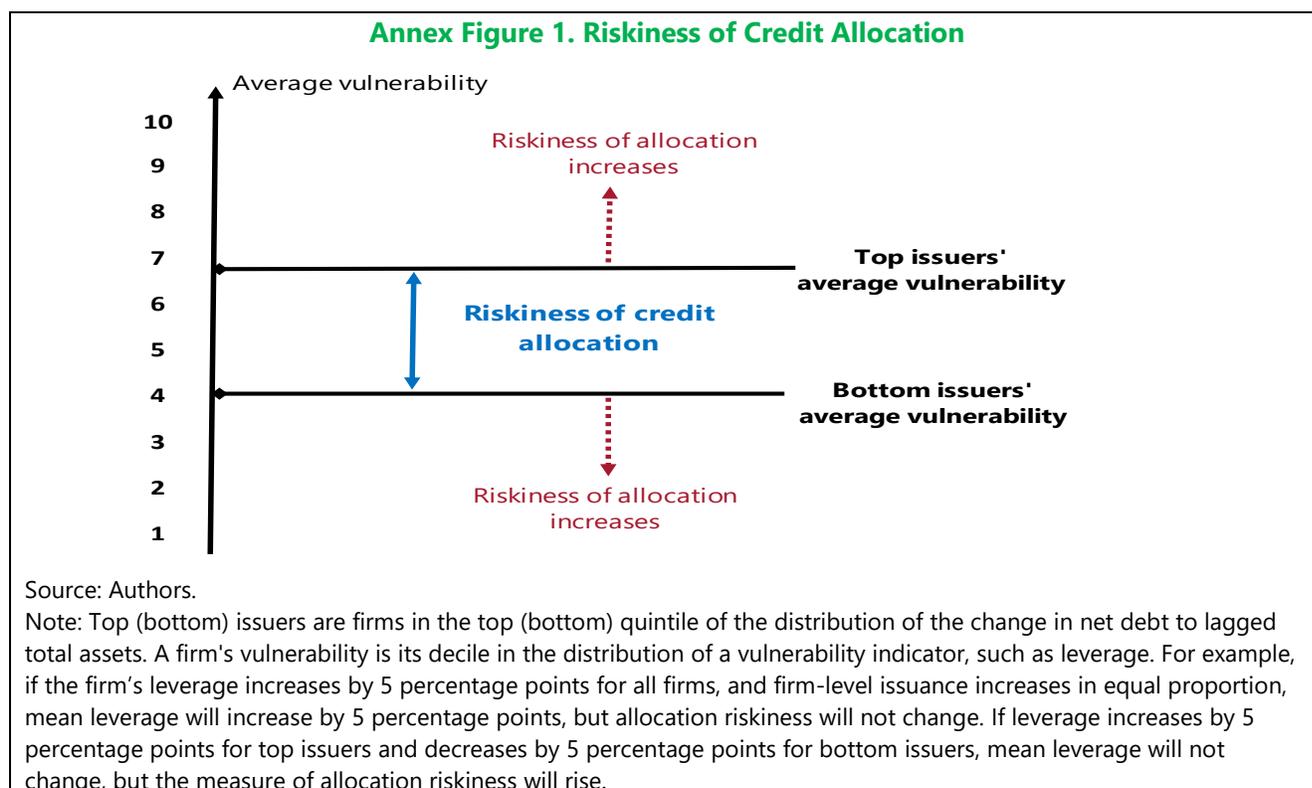
The financial stability analysis relies on three main data sources:

- Financial crises (Laeven and Valencia 2018, database).
- Household and corporate leverage (database for Chapter 2 of the October 2017 *Global Financial Stability Report* and ORBIS-Worldscope).
- Financial sector and macroeconomic variables of interest (Bloomberg, L.P., Haver Analytics, IMF databases).

One measure of instability used in the note is the presence and absence of banking crises.

An alternative measure of instability also used in the note is the z-score, or distance-to-distress, defined as capital to assets + return on assets / standard deviation of return on assets (the buffers that banks have against shocks to earnings). The measure can be interpreted as the number of standard deviations a shock would have to be to deplete a banking system's buffers. It is an accounting-based measure that has been widely used in the literature, especially in cases where it is difficult to obtain the market-based measures for a sufficiently large sample of countries. Examples of papers that have used the z-score include Boyd and Runkle (1993); Beck, Demirgüç-Kunt, and Levine (2007); Demirgüç-Kunt, Detragiache, and Tressel (2008); and Laeven and Levine (2009).

Another important indicator for the financial stability analysis is the measure of riskiness of credit allocation. The indicator, based on an approach proposed by Greenwood and Hanson (2013), is constructed for four firm-level vulnerability indicators: leverage, debt overhang, interest coverage ratio, and expected default frequency. Changes in the indicator capture the evolution of the vulnerability profile of firms that are accumulating debt relative to firms that are reducing debt. For some indicators the sign of the measure is switched so that it rises when the vulnerability of firms whose total debt issuance is the largest is increasing. Annex Figure 1 summarizes this computation, showing that the vertical distance between the average vulnerability of top and bottom issuers constitutes the riskiness measure. The distributions of the four indicators have a bell curve shape and a standard deviation of about 1. Recent work (Brandão-Marques and others 2019) shows that this measure provides early warning of financial crises and sharp real downturns. It behaves cyclically, increasing with looseness of monetary conditions and lending standards. It is related to effective macroprudential policies, which affect the likelihood that a credit expansion will be accompanied by an increase in riskiness of credit allocation. For the number of observations and country sample, see Annex Table 1.



ANNEX II. METHODOLOGIES AND RESULTS

Financial Depth and Inequality

Question: Does greater financial depth mean lower or higher inequality within countries?

Theory: One school of financial theory suggests that deeper financial systems tend to reduce income inequality. Examples of theoretical papers in this vein are Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1990). The models differ in the theoretical channels and shape of the relationship, but their common explanation is that better credit availability allows more household choices and decisions to be based on better allocation of spending over time, free from inherited wealth, thereby reducing income inequality.

A different group of theoretical models gained prominence recently, describing ways in which the financial sector may increase income inequality through rent extraction. For example, Korinek and Kreamer (2014) develop a model in which financial deregulation raises inequality. Gennaioli, Shleifer, and Vishny (2012); Thakor (2012); and Bolton, Santos, and Scheinkman (2016) introduce models explaining how inefficient or harmful financial innovations can translate to more finance being accompanied by greater rent extraction and less equal income distribution.

These models may be complementary: the first group of theories may be more relevant for developing economies, while the second one may be more relevant for advanced economies. If so, one would expect a U-shaped relationship between inequality and financial depth.

Recent empirical studies focused on developing economies tended to find that financial depth improves the income of the poor (Burgess and Pande 2005, for example, provide a case study for India), while studies that include advanced economies tend to find that more finance increases income inequality (Jaumotte, Lall, and Papageorgiou 2013; Jauch and Watzka 2016; de Haan and Sturm 2017). Brei, Ferri, and Gambacorta (2018) explicitly examine the nonlinearities and attribute them to the changing structure of finance from banks to financial markets. We further augment the empirical investigation by expanding the number of countries and years covered.

Estimated equation: The baseline estimation equation is

$$\text{Gini}_{it} = \alpha + \beta_0 \text{Gini}_{it-1} + \beta_1 \text{FD}_{it} + \beta_2 \text{FD}_{it}^2 + \beta_3 (\text{FD}_{it} \times \text{Interact}_i) + \beta_4 X_{it} + \varepsilon_{it}.$$

Thus, the Gini coefficient was regressed on the respective financial depth index (FD, or a subcomponent for financial institutions and financial markets) and its square, possible additional interactions, and a set of controls X described below, with ε being the error term. In all equations i stands for country and t for year. The FD is based on the database of Sahay and others (2015), updated at <http://data.imf.org/fdindex>. A quadratic functional form was chosen due to its performance in previous studies (including Arcand, Berkes, and Panizza 2012 and Sahay and

others 2015, in the context of economic growth, and Brei, Ferri, and Gambacorta 2018 in the context of inequality). In an additional exercise, we conduct an estimation in which no functional form is imposed a priori, and we still obtain a similar turning point.

We draw from the existing literature for the selection of the main determinants of income inequality, while expanding those common determinants to include other factors that may be relevant based on theory.

Following the literature (Levine and others 2000; Beck and Levine 2004; Clarke, Xu, and Zou 2006; Demirgüç-Kunt and Levine 2009; Sahay and others 2015a; Kumhof and others 2015; Beck and others 2007; Bazillier and Hericourt 2017), a standard set of control variables was used, controlling for initial values of economic and financial development, as well as legal origin, ethnic and religious fractionalization, and geographical latitude. We also include the logarithm of industrial value added to GDP, average years of primary and secondary schooling, trade-to-GDP, consumer price index inflation, government-consumption-to-GDP ratio, and foreign-direct-investment-to-GDP ratio. A “banking crisis” dummy variable (Laeven and Valencia 2018) was also included to control for changes in the incidence of banking crises. Finally, the regressions include country fixed effects to capture differences in calculations of inequality and other time-invariant differences across countries.

Country sample and years: We use panel data for 128 economies during 1980–2015 (exact years vary across regressions). In the baseline estimation, we use nonoverlapping five-year periods.

Regression approach: The estimation procedure relies on three alternative approaches:

- Ordinary least squares (OLS) panel fixed effects—This method has the advantage of controlling for countries’ specific time-invariant characteristics not taken into account by the control variables included in the model.
- Generalized least squares (GLS) with panel-wide AR(1) correction—to take account of the fact that income inequality data may display strong autocorrelation.
- Dynamic panel generalized method of moments (GMM) (Arellano and Bond 1991)—while considering a dynamic specification, the GMM estimator aims at addressing potential endogeneity bias surrounding the two first approaches. Besides the bias due to the introduction of the lagged dependent variable among the regressors, reverse causality and measurement errors may be other sources of endogeneity. Depending on the source of the bias, this can lead to over- or underestimation of the impact of financial inclusion. Given limited availability of external instruments for all potential endogenous variables, the Arellano and Bond estimator relies on an internal instrumentation procedure in which the lags of the regressors are used as instruments.

Baseline results: Annex Table 2 provides baseline results. The key variable of interest is the financial depth index. It has a negative sign in the quadratic form both for financial institutions and for financial markets.

Annex Table 2. Inequality and Financial Depth: Baseline Results				
Dependent variable: log of Gini index (market)				
Regressors	(1) Financial Institutions	(2) Financial Institutions	(3) Financial Markets	(4) Financial Markets
Financial depth index	-0.368 (0.917)	-2.103** (0.907)	-0.368 (0.917)	-1.782** (0.819)
Financial depth index squared		3.728** (1.245)		2.587** (1.183)
Observations	573	567	567	567
Number of countries	128	126	126	126
Serial correlation (<i>p</i> -value)	0.001	0.008	0.023	0.038
Hansen <i>J</i> test (<i>p</i> -value)	0.158	0.263	0.147	0.179
<p>Source: Authors' calculations, based on data described in Annex I. Note: Generalized method of moments (GMM) estimations, 1980–2010 (five-year averages). Control variables: initial values of economic and financial development, legal origin, ethnic and religious fractionalization, geographical latitude, logarithm of industrial value added to GDP, average years of primary and secondary schooling, trade-to-GDP, consumer price index inflation, government-consumption-to-GDP ratio, and foreign-direct-investment-to-GDP ratio, and a "banking crisis" dummy variable. Robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Country fixed effects are included. The constant is not reported. The serial correlation test reports <i>p</i>-values for the null hypothesis that the errors exhibit no serial correlation. The Hansen <i>J</i> test of overidentifying restrictions tests the null hypothesis that the instruments are valid.</p>				

Robustness checks

We performed a range of robustness checks, including

- Changing the sample of countries
- Changing the sample years
- Removal of outliers—the 5 percent highest and lowest observations of the financial development variable—to ensure that the results were not driven by these observations
- Replacing the market Gini index by disposable income Gini
- Replacing the Gini index by other proxies for inequality, such as the first quintile income share, the Palma ratio, and the quintile ratio

In all cases, the results were similar to the baseline estimate.

Financial Inclusion and Inequality

Question/hypothesis: We ask whether greater financial inclusion means lower inequality within countries.

Equation estimated: The baseline empirical analysis aims at estimating the following equation:

$$INE_{it} = \alpha + \beta FI_{it} + \Theta X_{it} + \eta_i + \varepsilon_{it},$$

in which *INE* and *FI* stand for income inequality and financial inclusion, respectively. *X* is a vector of control variables; η indicates country fixed effects; ε is the error term; *i* and *t* indicate the country and time dimensions, respectively; and α , β , and Θ , are parameters to be estimated. We draw from the existing literature for the selection of the main determinants of income inequality. The vector *X* is similar to the previous section and includes

- *Inflation* – (percent change in consumption price index) as a proxy for macroeconomic instability.
- *Trade* – (imports plus exports, in percent of GDP) as a proxy for trade openness.
- *Telephone* – (fixed telephone subscriptions per 100 people) as a proxy for infrastructure.
- *Population* – (growth rate of total population) to capture changes in demography.
- *Remittances* – (remittance inflows, in percent of GDP).
- *Education* – (enrollment rate in primary school) to capture heterogeneity in human capital.
- *Rule of law* – (an indicator of the perception of confidence in the rules of society) as a proxy for institutional quality.
- *Dummy variables for country grouping* – high income (*dhi*), upper middle income (*dumi*), lower middle income (*dumi*), low income (*dli*).

As discussed in the main text, the analysis also explores the extent to which some macro-financial factors could affect the impact of financial inclusion on inequality. To that end, the following nonlinear equation is estimated:

$$INE_{it} = \alpha + \beta FI_{it} + \delta FI_{it} * \tilde{Z}_{it} + \lambda Z_{it} + \Theta X_{it} + \eta_i + \varepsilon_{it},$$

in which *Z* is the conditional variable (with \tilde{Z} the difference between Z_{it} and its sample mean). The analysis investigates whether the effect of financial inclusion on inequality depends on the macroeconomic performance (*GDP growth*), the degree of financial development (index of *financial market development*), money market conditions (*deviations of the short-term interest rate from its fundamental value*),⁹ and financial stability (aggregate banking system *Z-score*). In such a framework, the effect of financial inclusion on inequality is derived as

$$\frac{\partial INE_{it}}{\partial FI_{it}} = \beta + \delta \tilde{Z}_{it}.$$

⁹ The deviations—differences between actual interest rates and a trend—approximate unexpected changes in the policy interest rate.

Estimation: As in the previous section, the estimation procedure uses three main approaches: OLS panel fixed effects, GLS with panel-wide AR(1) correction, and dynamic panel GMM.

Baseline results: Annex Table 3 presents the baseline results. The key variable of interest—the financial inclusion proxy—has the expected sign.¹⁰ Annex Table 3 shows negative and statistically significant coefficients, suggesting a negative correlation between financial inclusion and income inequality. Furthermore, the impact of financial inclusion on inequality seems to be stronger in the developing world (especially, the coefficient associated with *atm* is twice as large for the sample of lower- and middle-income countries, compared with the full sample). Most of the control variables are statistically significant. The inflation rate is not found to have a clear effect on inequality, as the associated coefficient is positive or negative depending on the specification under consideration. This is in line with the mixed results in previous empirical studies (for example, Kim 2015 provides evidence of a positive impact of inflation on income inequality for “high-fragility” countries, while Park and Mercado 2015 show a negative impact for developing Asia). Telephone (a proxy for infrastructure) has a negative and significant effect on inequality in emerging markets and low-income countries, while the negative impact of education holds for both samples. Trade openness and population growth are positively correlated with income inequality. The impact of remittances and rule of law is mixed.

¹⁰ Two variables are used as proxies: the number of ATMs per 100,000 adults (*atm*), and the number of branches of commercial banks per 100,000 adults (*branch*). The choice reflects other indicators’ more limited sample coverage in a panel setup.

Annex Table 3. Financial Inclusion and Inequality: Baseline Results

	Full Sample						Emerging Market and Developing Economies					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS	OLS	GLS	GLS	GMM	GMM	OLS	OLS	GLS	GLS	GMM	GMM
atm	-0.027 (0.016)		-0.023*** (0.005)		-0.022** (0.009)		-0.045** (0.019)		-0.040*** (0.006)		-0.060*** (0.012)	
branch		-0.022** (0.010)		-0.014*** (0.004)		-0.016** (0.006)		-0.025** (0.012)		-0.017*** (0.005)		-0.004 (0.006)
inflation	0.014 (0.023)	0.039 (0.033)	-0.005 (0.013)	0.016 (0.013)	-0.107*** (0.030)	-0.019 (0.020)	0.013 (0.030)	0.040 (0.039)	-0.006 (0.015)	0.037*** (0.010)	-0.033 (0.036)	-0.070*** (0.022)
telephone	0.006 (0.054)	-0.009 (0.048)	-0.007 (0.012)	-0.010 (0.010)	0.013 (0.020)	0.006 (0.018)	-0.045 (0.105)	-0.106 (0.122)	-0.031 (0.037)	-0.054* (0.033)	-0.173* (0.099)	-0.111 (0.120)
trade	0.012 (0.014)	0.005 (0.017)	0.013*** (0.005)	0.006** (0.003)	0.014 (0.010)	0.020* (0.011)	0.017 (0.024)	0.007 (0.027)	0.016*** (0.006)	0.008** (0.003)	-0.021* (0.012)	0.039*** (0.009)
population	0.034 (0.584)	0.279 (0.561)	0.443*** (0.176)	0.438*** (0.167)	0.913*** (0.345)	0.697** (0.346)	0.324 (1.170)	1.335 (1.340)	1.341*** (0.307)	1.518*** (0.193)	2.983*** (0.737)	2.821*** (0.823)
remittance	-0.070 (0.176)	-0.104 (0.098)	0.001 (0.038)	-0.058*** (0.021)	0.133** (0.065)	0.001 (0.045)	-0.067 (0.184)	-0.116 (0.105)	-0.004 (0.042)	-0.081*** (0.021)	0.363*** (0.111)	-0.002 (0.121)
education	-0.056 (0.078)	-0.141 (0.086)	-0.080*** (0.027)	-0.119*** (0.027)	-0.126*** (0.045)	-0.210*** (0.052)	-0.029 (0.088)	-0.147 (0.097)	-0.085*** (0.029)	-0.152*** (0.027)	-0.105 (0.076)	-0.131 (0.082)
rule_of_law	1.103 (1.114)	-1.013 (1.180)	-0.172 (0.530)	-1.497*** (0.468)	4.326*** (1.232)	4.793*** (0.818)	1.506 (1.438)	-1.599 (1.538)	-0.491 (0.678)	-2.574*** (0.419)	4.901*** (1.541)	-0.247 (1.854)
Lwdigini					0.703*** (0.056)	0.751*** (0.056)					0.638*** (0.071)	0.757*** (0.081)
dhi	-3.769*** (1.384)	-4.623*** (1.385)	-3.328*** (0.612)	-4.251*** (0.439)	-4.375** (1.960)	-2.123 (1.527)						
dumi	-2.687** (1.334)	-3.212*** (1.223)	-2.115*** (0.557)	-2.899*** (0.396)	-3.745* (1.912)	-0.957 (1.361)	-2.136 (1.357)	-3.192** (1.262)	-2.027*** (0.570)	-3.180*** (0.276)	-6.284*** (2.069)	-0.731 (2.437)
dlmi	-0.834 (1.036)	-0.831 (0.834)	-0.847* (0.505)	-1.025*** (0.377)	-2.719* (1.512)	0.009 (0.963)	-0.750 (0.996)	-1.032 (0.750)	-0.933* (0.506)	-1.242*** (0.247)	-5.300*** (1.674)	-1.096 (1.838)
Constant	44.882*** (6.830)	53.964*** (8.071)	58.002*** (3.518)	60.483*** (3.390)			45.985*** (8.409)	56.040*** (9.018)	0.000 (0.000)	31.501*** (4.557)		
Observations	497	516	470	489	295	298	311	324	284	297	158	161
Number of countries	104	107	77	80	56	56	80	83	53	56	33	33
Adjusted R-squared	0.112	0.130					0.155	0.160				
F test / wald chi2 test p-value	0.003	0.000	0.000	0.000			0.006	0.006	0.000	0.000		
Hansen J test p-value					0.866	0.939					0.983	0.963

Source: authors, based on data described in Annex I.

Note: Robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively. Country fixed effect included but not reported. GLS estimates with panel-wide AR(1) correction. The list of instruments for GMM is limited to the maximum of first two lags, to avoid the risk of "too many instruments". The p-values of F-test, Wald chi2 test and Hansen J test are reported. The F-test and Wald chi2 test are the tests of the null hypothesis that all the coefficients, except the constant, are jointly equal to zero. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid.

Annex Table 4 provides the results of the assessment of the effect of financial inclusion on income inequality, conditional on growth performance and the degree of financial development. While the impact of *atm* and *branch* on the Gini index remains negative and statistically significant in both cases, the coefficients associated with the interaction terms also show a negative sign. This suggests that financial inclusion is likely to have a stronger impact on inequality in countries that grow faster (compared with the sample average). The results on financial development are also in line with the previous section's discussion. Two estimation procedures are used: OLS as the baseline approach and an instrumental variable (IV) approach to overcome potential endogeneity of the financial inclusion indicators. Following Mookerjee and Kalipioni (2010) and Beck and others (2007), the existence of private credit bureaus and public credit registries, and initial endowment, are used as instruments. Initial endowment is measured as the absolute latitude of the location of the country's capital city.

Annex Table 4. Inequality and Financial Inclusion vs. Growth and Financial Depth

	Full Sample						Emerging Market and Developing Economies					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS	OLS	GLS	GLS	GMM	GMM	OLS	OLS	GLS	GLS	GMM	GMM
GDP growth												
atm	-0.025 (0.017)		-0.021*** (0.005)		-0.029*** (0.009)		-0.046** (0.020)		-0.037*** (0.006)		-0.049*** (0.012)	
atm*GDP growth	-0.002** (0.001)		-0.001*** (0.000)		-0.003*** (0.001)		-0.002 (0.002)		-0.002*** (0.000)		-0.001 (0.002)	
branch		-0.021** (0.010)		-0.013*** (0.004)		-0.008** (0.003)		-0.025* (0.013)		-0.016*** (0.005)		-0.010 (0.009)
branch*GDP growth		-0.003*** (0.001)		-0.003*** (0.001)		-0.001 (0.001)		-0.002 (0.001)		-0.003*** (0.001)		0.001 (0.002)
GDP growth	0.042 (0.030)	0.047* (0.024)	0.035*** (0.012)	0.032*** (0.011)	0.136*** (0.035)	0.043*** (0.010)	-0.001 (0.028)	0.043 (0.032)	0.004 (0.018)	0.028** (0.013)	0.181*** (0.053)	0.078* (0.042)
Constant	44.042*** (7.035)	53.012*** (8.195)	40.394*** (3.445)	29.346*** (5.388)			46.198*** (8.417)	55.278*** (9.057)	0.000 (0.000)	35.622*** (2.348)		
Observations	497	516	470	489	295	298	311	324	284	297	158	161
Number of countries	104	107	77	80	56	56	80	83	53	56	33	33
Adjusted R-squared	0.119	0.144					0.157	0.164				
F test / wald chi2 test p-value	0.003	0.000	0.000	0.000			0.015	0.015	0.000	0.000		
Hansen J test p-value					0.966	0.915					0.973	0.916
Financial depth												
atm	-0.029* (0.015)		-0.024*** (0.005)		-0.026*** (0.010)		-0.042** (0.018)		-0.040*** (0.006)		-0.076*** (0.015)	
atm*FM	-0.014 (0.029)		-0.010 (0.015)		-0.080*** (0.025)		0.039 (0.059)		0.020 (0.029)		-0.107 (0.071)	
branch		-0.038*** (0.013)		-0.026*** (0.007)		-0.052*** (0.016)		-0.076 (0.059)		-0.045** (0.018)		-0.111** (0.051)
branch*FM		-0.091* (0.053)		-0.067** (0.034)		-0.226*** (0.085)		-0.275 (0.294)		-0.148 (0.093)		-0.535** (0.272)
FM	6.243* (3.428)	5.413* (3.083)	0.969 (1.114)	1.228 (1.308)	2.111 (3.348)	1.719 (4.139)	9.545 (5.789)	4.259 (4.606)	1.621 (1.766)	1.239 (1.647)	23.528*** (5.672)	12.461 (10.303)
Constant	42.359*** (6.915)	51.520*** (8.582)	58.433*** (3.533)	39.356*** (2.682)			41.824*** (8.374)	53.923*** (9.813)	0.000 (0.000)	0.000 (0.000)		
Observations	497	516	470	489	295	298	311	324	284	297	158	161
Number of countries	104	107	77	80	56	56	80	83	53	56	33	33
Adjusted R-squared	0.126	0.138					0.176	0.172				
F test / wald chi2 test p-value	0.001	0.000	0.000	0.000			0.003	0.001	0.000	0.000		
Hansen J test p-value					0.967	0.940					0.970	0.953

Source: authors' calculations based on data described in Annex I.

Control variables included but not reported. Robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively.

Country fixed effect included but not reported. GLS estimates with panel-wide AR(1) correction. The list of instruments for GMM is limited to the maximum of first two lags, to avoid the risk of "too many instruments". The p-values of F-test, Wald chi2 test and Hansen J test are reported. The F-test and Wald chi2 test are the tests of the null hypothesis that all the coefficients, except the constant, are jointly equal to zero. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid.

Inequality and gender gaps in financial inclusion: To explore the existence of gender gaps in the relationship between financial inclusion and income inequality, we estimated

$$INE_i = \alpha + \beta FI_i + \Theta X_i + \eta_i + \varepsilon_i,$$

in which FI (the measure of financial inclusion) captures the use of financial services: the percentage of individuals with an account at a financial institution (*account*), the percentage of individuals who have borrowed money from a financial institution over the past 12 months (*borrow*), the percentage of individuals who reported having a credit card (*credit card*), and the percentage of individual who reported having a debit card (*debit card*). The first specification uses the aggregate value of the indicator, while the two others use the value of FI for "male" and "female" separately (indicated by $_m$ and $_f$, respectively). The three estimated coefficients are

then compared. Annex Table 5 provides the results. In line with the baseline results, all four indicators of financial inclusion are negatively and significantly correlated with the Gini index, confirming that access to financial services reduces income inequality. In the top half of the table, the coefficients of *account_f* and *borrow_f* are negative and statistically significant, while the coefficients of *account_m* and *borrow_m* are not. This suggests that the impact of financial inclusion on inequality is stronger (and significant) when access to financial services improves for women (compared with men). In the bottom half of the table, gender gaps do not seem to make a difference regarding the use of *credit card*. The IV estimates show that all three coefficients are negative and statistically significant, with no apparent difference between men and women. Using *debit card* as in the regressions, the results suggest that for both men and women financial inclusion contributes to lower income inequality. Nonetheless, the magnitude of the coefficient is higher when focusing on women, suggesting that the contribution from women may be stronger. Overall, the analysis finds supportive evidence that financial inclusion of women matters more in reducing in income inequality.

Annex Table 5. Inequality and Financial Inclusion Gender Gap

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) IV	(7) OLS	(8) OLS	(9) OLS	(10) IV	(11) IV	(12) IV
account	-0.099* (0.051)			-0.497*** (0.136)								
account_f		-0.108** (0.049)			-0.624*** (0.186)							
account_m			-0.079 (0.051)			-1.324 (0.864)						
borrow							-0.247** (0.118)			-3.135 (2.022)		
borrow_f								-0.289** (0.120)			-2.804* (1.541)	
borrow_m									-0.186 (0.112)			-3.611 (2.947)
telephone	-0.088 (0.069)	-0.080 (0.066)	-0.101 (0.071)	0.072 (0.114)	0.154 (0.157)	0.537 (0.425)	-0.140** (0.064)	-0.136** (0.063)	-0.144** (0.065)	-0.067 (0.245)	-0.021 (0.208)	-0.123 (0.306)
trade	-0.027 (0.017)	-0.025 (0.017)	-0.029 (0.017)	-0.015 (0.017)	-0.000 (0.020)	-0.021 (0.035)	-0.028 (0.017)	-0.027 (0.016)	-0.029 (0.018)	-0.015 (0.040)	-0.011 (0.035)	-0.024 (0.048)
population	1.670* (0.915)	1.572* (0.920)	1.780* (0.915)	1.522 (1.187)	0.720 (1.407)	0.303 (2.883)	2.193** (0.922)	2.210** (0.910)	2.143** (0.928)	8.036** (3.385)	7.229*** (2.572)	9.058* (5.032)
remittance	-0.305** (0.141)	-0.304** (0.136)	-0.295** (0.145)	-0.685*** (0.178)	-0.725*** (0.212)	-1.365* (0.792)	-0.276** (0.136)	-0.284** (0.136)	-0.264* (0.135)	-1.086* (0.584)	-0.978* (0.504)	-1.217 (0.767)
education	0.286** (0.125)	0.288** (0.125)	0.277** (0.125)	0.578*** (0.174)	0.622*** (0.197)	1.078* (0.568)	0.309** (0.129)	0.325** (0.132)	0.287** (0.125)	1.390* (0.711)	1.284** (0.553)	1.532 (1.011)
rule_of_law	-0.335 (1.406)	-0.188 (1.397)	-0.645 (1.418)	5.212** (2.282)	7.169** (2.907)	16.392 (13.112)	-1.468 (1.245)	-1.643 (1.245)	-1.376 (1.257)	-1.514 (3.337)	-3.728 (3.055)	1.819 (4.868)
dli	-5.923* (3.138)	-5.814* (3.127)	-5.913* (3.118)	-13.398*** (4.092)	-13.732*** (4.483)	-17.924 (12.814)	-6.349** (2.816)	-6.300** (2.765)	-6.256** (2.869)	-27.478** (12.885)	-23.489** (9.861)	-32.539* (19.148)
Constant	20.386* (12.036)	20.223* (12.096)	20.608* (11.966)	12.756 (15.110)	11.587 (16.828)	6.333 (25.314)	16.727 (12.426)	15.257 (12.589)	18.351 (12.212)	-50.855 (48.699)	-49.022 (40.571)	-52.742 (62.924)
Observations	80	80	80	67	67	77	80	80	80	67	67	67
Adjusted R-squared	0.294	0.302	0.283	0.124			0.296	0.307	0.284			
F-test / Wald chi2 p-value	0.000	0.000	0.000	0.008	0.002	0.001	0.000	0.000	0.000	0.102	0.121	0.080
Hansen J test p-value				0.126	0.500	0.742				0.257	0.122	0.412

Source: authors' calculations based on data described in Annex I.

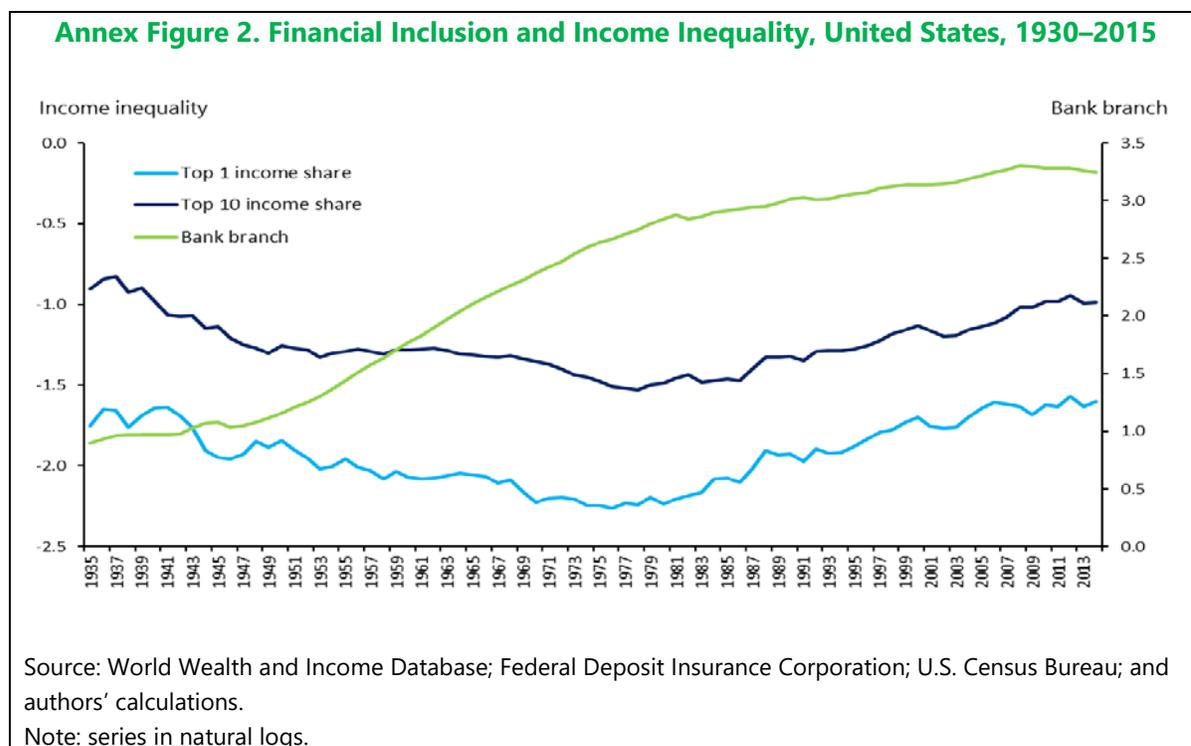
Note: Robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively. The p-values of F-test, Wald chi2 test and Hansen J test are reported. The F-test and Wald chi2 test are the tests of the null hypothesis that all the coefficients, except the constant, are jointly equal to zero. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid.

Robustness checks: The baseline estimates rely on the Gini coefficient as the default measure of income inequality. As a robustness check, the baseline regressions were estimated using alternative measures of income inequality, including the percentage of total income that accrues to the bottom 20 percent of the population, the Palma ratio, and the quintile ratio. The exercise is unchanged in substance, except for the definition of the dependent variable.

An important issue in the empirical exercise discussed so far is the identification strategy, specifically how to ensure that the potential endogeneity bias has been addressed properly. A dynamic GMM approach with panel data (Arellano and Bond 1991) is a well-established strategy to address endogeneity bias while taking into account the persistence of inequality over time. Nonetheless, using lagged values of endogenous variables as instruments may carry some limitations, especially if the financial inclusion variables also show some persistence. To complement the Arellano and Bond estimator for the panel regressions, the standard two-stage least squares (2SLS) estimator is applied. The 2SLS approach uses the existence of private credit bureaus and public credit registries as instruments for the financial inclusion variables.

Credit bureaus and registries collect information on borrowers in the financial system and help facilitate the exchange of information among banks. As such, the number of years of existence of credit bureaus and credit registries can be expected to be positively correlated with the degree of financial development and broader availability of financial services. At the same time, there is no a priori link with inequality. Results of the 2SLS estimator confirm the baseline results, with the instruments proving to be valid. Across all specifications, using alternative measures of financial inclusion and inequality, the results are also consistent with this study's main conclusion.

Longitudinal analysis: Longer time series can provide further insight into the transmission mechanisms by capturing various dynamics of both financial services and economic inequality. Such longer time series are not available for most countries. The longitudinal analysis presented in the main text is based on US data from 1935 to 2014 as a case study. The data suggest that the large increase in financial services infrastructure (commercial bank branches per 100,000 people) between the early 1930s and late 1970s was associated with a significant decline in income and wealth inequality. Inequality has reverted since then, while availability of financial services has continued to increase, albeit at a much lower pace (Annex Figure 2).



The tests are based on two econometric methods: time series OLS regressions, and vector autoregression (VAR). The OLS regressions follow a similar approach as in this study’s panel data analysis, although the set of control variables is constrained by data availability. The estimated equation takes the form of:

$$INE_t = \alpha + \beta FI_t + \Theta X_t + \varepsilon_t \quad .$$

The control variables include the income tax rate, private credit to GDP, and school enrollment. Inequality measures are based on income and wealth distribution, and financial inclusion is captured by the number of commercial bank branches per 100,000 people. All variables are in first difference of natural log, to ensure stationarity. The results suggest that an increase in the number of bank branches is associated with a decline in income and wealth inequality.

The VAR approach aims at further assessing a potential causal relationship between financial inclusion and inequality. The baseline model takes the form of

$$Y_t = A + B(L)Y_t + e_t ,$$

in which Y is the vector containing the variables included in the model; A is the vector of intercept terms; $B(L)$ is the matrix of coefficients associated with the right-side variables, with L the lag operator; and e is the vector of error terms. The optimal number of lags, as determined

by the Bayesian Information Criterion is 1. Our identification strategy applies the Cholesky decomposition to ensure that financial inclusion shocks are orthogonal. The baseline estimates include income inequality and financial inclusion (bank branches). The model is then expanded by controlling for the income tax rate, private credit to GDP, or school enrollment. First differences of natural logs of the variables are used, to ensure stationarity.

The tests suggest that the financial inclusion measure Granger causes income inequality at the 5 percent significance level. Impulse response functions confirm the negative relationship between the number of bank branches and income inequality. A positive financial inclusion shock is associated with lower income inequality, and the effect is statistically significant and persistent over time. These results also hold in specifications that control for the third factors listed above and in specifications that use proxies for wealth inequality instead of income inequality.

Extreme inequality: As an additional robustness check, also consider extreme inequality. For the purpose of the study, extreme inequality was approximated as the gap between the average wealth in a country and the level of wealth at the top of the distribution. According to Oxfam (2019), just 26 people own the same wealth as the poorest half of the world. The analysis provides a quantitative approach to capture these “extremes” in the distribution of wealth at the country level.

The analysis empirically investigated whether access to financial services could have an impact on extreme inequality. The main transmission channels were expected to be similar to those discussed in the main text. The empirical analysis follows the framework discussed in this annex, with the dependent variable being the proxies for extreme inequality (either the *per capita wealth index* or the *average per capita wealth index*). The three estimation techniques (that is, OLS, GLS, and GMM) are also applied, with data for 2004–15. The results (Sahay, Cihak, Fouejieu, and Chen, forthcoming) suggest that improving access to financial services can contribute to reducing extreme inequality. This conclusion holds for both subsamples of advanced economies and developing economies.

Financial Stability and Inequality

Question/hypothesis: We ask whether there is a relationship between stability and inequality within countries.

Country and period covered: The coverage of this part of the analysis is driven by the coverage of the Laeven and Valencia (2018) data set on systemic banking crises presented. It covers 151 systemic banking crisis episodes around the globe during 1970–2017.

Estimated equation: We estimate a logit function, modeling the probability of a banking crisis as a function of change in Gini index, change in financial depth, and other control variables. The dependent variable is defined using the Laeven and Valencia (2018) data set. Control variables include initial values of economic and financial development, legal origin, ethnic and religious fractionalization, geographical latitude, logarithm of industrial value added to GDP, average years of primary and secondary schooling, trade-to-GDP, consumer price index inflation, government-consumption-to-GDP ratio, and foreign-direct-investment-to-GDP ratio. The regression includes country fixed effects.

Results: The baseline results (Annex Table 6) suggest that the change in the Gini index has a predictive power in addition to the change in financial depth.

Annex Table 6. Crisis Likelihood: Baseline Results

Dependent variable: Log of crisis probability			
	(1)	(2)	(3)
Change in financial depth	0.819** (0.298)		0.822** (0.367)
Change in Gini index		0.695** (0.238)	0.725** (0.238)
Number of crises	151	151	151
Number of observations	573	573	573
Pseudo <i>R</i> squared	0.144	0.210	0.247

Source: Authors' calculations based on data described in Annex I.

Note: Control variables are initial values of economic and financial development, legal origin, ethnic and religious fractionalization, geographical latitude, logarithm of industrial value added to GDP, average years of primary and secondary schooling, trade-to-GDP, consumer price index inflation, government-consumption-to-GDP ratio, and foreign-direct-investment-to-GDP ratio. Robust standard errors are in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Country fixed effects are included. The constant is not reported. The serial correlation test reports *p*-values for the null hypothesis that the errors exhibit no serial correlation. The Hansen *J* test of overidentifying restrictions tests the null hypothesis that the instruments are valid.

Robustness checks and additional analysis

As in the previous sections, we carried out robustness checks, including for the sample of countries and years, using different definitions of Gini (disposable income), replacing the Gini index by other proxies for inequality, such as the first quintile income share, the Palma ratio, and the quintile ratio. To further expand on the baseline estimate, we performed additional analyses.

Household credit growth: Following Perugini, Hölscher, and Collie (2016), the main specification to test the first hypothesis reads as follows:

$$\text{HouseholdCredit}_{i,t} = \rho_1 \text{HouseholdCredit}_{i,t-1} + \beta_1 \text{Inequality}_{i,t-1} + \beta_2 \text{Others}_{i,t-1} + \alpha_i + \gamma_t + \epsilon_{it}$$

Since the real household credit (to GDP ratio) is a highly persistent variable, this specification includes a lagged dependent variable. The sensitivity of private credit to the variable of interest (inequality level) is captured by β_1 . In addition, controls such as market deregulation, interest rates, GDP growth, and macroprudential policy, among others, are incorporated (*Others*). Finally, country and time fixed effects capture country time-invariant characteristics, such as legal systems and the effects of global financial conditions, global liquidity, and commodity prices, respectively. Dealing with endogeneity, reverse causality, and coincident factors is challenging. Therefore, the dynamic equation above was estimated using the generalized method of moments (GMM) approach (Arellano and Bover 1995; Blundell and Bond 1998, with instruments for income inequality to help address endogeneity).

Credit growth volatility and inequality: A cross-section of country-specific credit growth volatilities was estimated as follows:

$$\sigma_i = \beta_1 \text{Inequality}_i + \text{Others}_i + \epsilon_i$$

in which σ_i is the country-specific volatility or credit cycle quality (amplitude, degree of asymmetry between up- and downswings) computed over a period (for example, past 30 years or more, depending on credit data availability). The inequality is the average Gini coefficient in the baseline estimate (and other measures in the robustness checks). The specification includes other controls such as macroeconomic controls, capital account openness, exchange rate flexibility, and institutional characteristics.

The effects of systemic banking crises on inequality: In this analysis, the effects of financial crises on inequality were explored further:

$$\Delta \text{Inequality}_{i,t+5} = \beta_1 \text{Recession}_{i,t} + \beta_2 \text{Recession}_{i,t} * \text{Crisis}_{i,t} + \beta_3 \text{Others}_{i,t} + \alpha_i + \epsilon_{it},$$

in which *Recession* and *Crisis* are dummy variables for recessions and systemic banking crises (Laeven and Valencia 2018). Controls include country characteristics and other factors such as taxation and capital flows.

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