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Curse or blessing? The effect of inequality on financial development

Yin-Fang Zhang,¹ Antonio Savoia,² and Kunal Sen³

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Abstract: An important feature of the process of transformation in developing economies is the depth and outreach of their capital and credit markets, i.e. financial development. As this is often considered crucial to support growth and poverty reduction, it is important to understand what structural factors drive it. The literature so far has assessed the role of historical, political, cultural, and institutional determinants, but has not yet adequately investigated the role of inequality. This paper addresses this lacuna by empirically investigating its effects. Exploiting instrumental variable estimations for a sample of up to 166 economies during 1960–2019, cross-section and panel results find that inequality has a negative effect on credit market development, which works both via the top and bottom parts of the distribution. They also find that, when accounting for its effects on economic development, inequality supports capital market development. The results are robust to a variety of checks, including violation of the exclusion restriction, a rich set of controls, alternative samples, and alternative income inequality data and financial development measures.

Key words: financial development, income inequality, credit markets, capital markets, financial systems, Sustainable Development Goal 10, Sustainable Development Goal 8

JEL classification: D63, O16, P00, C24, C23

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1 Introduction

The belief that financial development, seen as the depth and outreach of capital and credit markets, is a stimulus for economic growth and poverty reduction has gained considerable support.¹ It has also become policy relevant, as illustrated by Sustainable Development Goal (SDG) 8.10 which focuses on strengthening the capacity of domestic financial institutions to expand access to financial services as a condition of sustainable economic development.² But why do some countries develop better financial systems than others? More specifically, what structural factors drive the long-run development and performance of financial systems? The literature on the ‘deeper’ determinants of finance has hitherto assessed the role of legal origins (e.g. La Porta et al. 1998, 1997), politics and political institutions (e.g., Baltagi et al. 2009; Degryse et al. 2018; Girma and Shortland 2008; Pagano and Volpin 2001; Rajan and Zingales 2003), geographical factors (e.g. Beck et al. 2003a), and economic institutions and culture (e.g., Beck et al. 2003b; Djankov et al. 2007; Stulz and Williamson 2003). This debate, however, has not yet adequately investigated the role of inequality. This paper addresses this lacuna to improve our understanding of the structural conditions that underlie financial development.

How does inequality affect financial development? The literature suggests that inequality is beneficial to some aspects of financial development but harmful to others. One can derive three potential explanations. The first is related to the functioning of the credit market. Assuming the existence of asymmetric information between the borrower and the lender and the need to provide collateral to obtain loans, a higher level of inequality will mean a smaller pool of loanable applicants so that a smaller proportion of agents will obtain credit (e.g. Galor and Zeira 1993). Hence inequality is theoretically harmful because it leads to a smaller size of credit markets. In agrarian contexts, often prevalent in less-developed economies, land ownership accounts for a significant portion of total wealth and, because credit markets are subject to asymmetric information between lenders and borrowers, land is required as a form of collateral. Therefore the distribution of land shapes the distribution of credit. High levels of land inequality, in these contexts, will lead to smaller credit markets as landless agents will be unable to provide any collateral, while rich landowners may be able to self-finance their projects (Vollrath 2008; Vollrath and Erickson 2007).

The second explanation is related to the possibility that, while reducing the size of credit markets and hence the dependence on monitored finance, higher inequality may result in more market-oriented financial systems. The classical approach assumes that the marginal propensity to save is higher for

¹ Several studies have found that finance supports economic growth (see Arestis and Demetriades 1997; Levine 2005) and reduces poverty (see Beck et al. 2007; Levine 2008). This still seems to be the prevalent view and, indeed, a financial system supports growth when it can channel savings more efficiently to firms and when it can allocate funds to projects with the highest marginal product of capital. Yet, as Pagano (1993) argue, the effects of financial development on savings are theoretically ambiguous. For example, Jappelli and Pagano (1994) show that financial liberalization during the 1980s led to a reduction in savings and growth in OECD countries. The recent debate following the global financial crisis has warned of the risks of excessive finance, which include rising inequality and a greater danger of financial, economic, and fiscal crises (see Libich and Lenten 2022). Empirically, Arcand et al. (2015) find that the effects of finance may turn from positive to negative when economies move from intermediate to high levels of financial development.

² See Target 8.10 on SDG indicator framework and the targets of the 2030 Agenda for Sustainable Development at <https://unstats.un.org/sdgs/indicators/indicators-list/>.

the rich than for the poor. Hence a higher level of inequality will result in higher aggregate savings and capital accumulation (Kaldor 1956).³ This will, in turn, increase the demand for investments in financial assets and market finance (Chakraborty and Ray 2007). Therefore inequality is expected to have a positive effect on financial development by stimulating capital markets. This is a pattern observed during Western Europe's industrialization, but it is a hypothesis that awaits wider and systematic testing.⁴

The third explanation concerns the political economy of finance. Inequality may harm both capital and credit markets via two channels: the political influence to create and maintain rents that derive from economic inequality; and the possibility of heightened social conflict. In unequal economies the rich may influence the structure of credit and capital markets to gain privileged access to finance (Claessens and Perotti 2007; Stiglitz 2012). Social conflict mechanisms, on the other hand, emphasize that the poor having a lower income share may lead to less-developed financial systems by heightening socio-political instability (Roe and Siegel 2011);⁵ that is, political economy explanations of financial backwardness distinguish between the role of the upper class and the role of the poorer strata of the population. Thus they enable the effects of different parts of the distribution to be disentangled, which is also a hypothesis that has not been empirically investigated to date.

To summarize, the literature suggests the following hypotheses: (i) inequality harms the development of credit markets by limiting the pool of applicants with sufficient collateral for credit; (ii) inequality supports the development of capital markets via increased savings and demand for more sophisticated financial intermediation; and (iii) inequality harms credit and capital markets via increased political influence and social conflict. Considered together, they imply that inequality should have an unambiguously negative effect on credit market development, but its overall effect on capital markets is ambiguous. It may be positive or negative, depending on which effect dominates between (ii) and (iii). On the empirical front little research has gone into investigating the effect of inequality on financial development so far.⁶ We try to address this lacuna by looking at the impact of income inequality, as a proxy for overall economic inequality, on a set of indicators capturing credit and capital market development. Exploiting instrumental variable (IV) estimations and both cross-section and panel methods for a sample of up to 166 economies during 1960-2019, the empirical analysis finds that inequality has a negative effect on credit market development, which works both via the top and bottom parts of the distribution. We also find evidence that, when accounting for its effects on the level of economic development, inequality supports capital market development. The results are

³ Empirical evidence consistent with the view that the rich have a higher propensity to save than the poor is found in Dynan et al. (2004) for the USA, Bozio et al. (2017) for the UK, and Gandelman (2017) for Latin America.

⁴ Historically, according to Popov (2014), rising income inequality, by stimulating savings and investments rates, was at the roots of the development process leading to the rise of the West. Hodgson (2023) explains that, at the early stages of the Industrial Revolution in Britain, finance for industrial development was largely provided by savings or by borrowing from family and friends, i.e. resources accumulated by wealthy individuals.

⁵ Political economy explanations have also investigated the relationship between financial stability and economic inequality with reference to the origins of the 2008 financial crisis. With reference to the USA, while for Rajan (2010) inequality is coincidental, Acemoglu (2011) and Milanovic (2011) see inequality as one of the root causes of the 2008 financial crisis. Atkinson and Morelli (2011) find evidence supporting this view as far as the USA is concerned, but this case is not a general one. Jayadev (2013) and Van Treek (2014) provide excellent reviews of this debate.

⁶ Vollrath and Erickson (2007) and Vollrath (2008) are notable exceptions, focussing on a cross-section of countries and land inequality data. Vollrath (2008) discusses historical evidence supporting the view that land inequality had a negative effect on the formation of financial systems.

robust to a variety of checks, including violation of the exclusion restriction, a rich set of controls, and alternative income inequality data and financial development measures.

In addition to the literature on financial development, this paper contributes to the wider inequality literature. It adds to the debate on the role of economic inequality as a determinant of social and economic development. It has long been recognized that inequality may have significant socio-economic effects, and the finance channel could be an additional mechanism channelling its effects.⁷ Moreover, inequality has also become an important policy objective, as its inclusion in the United Nations SDGs (SDG 10) testify.⁸ Hence studying its effect on financial development may highlight significant interlinkages between SDG Goal 8 and Goal 10. The remainder of paper discusses the methodology (Section 2) and the data (Section 3). Section 4 presents the analysis and Section 5 summarizes the findings and concludes.

2 Empirical strategy

We use cross-section and panel data methods. As we look at the structural conditions under which countries develop their financial systems, regressions based on cross-section methods are a suitable approach as they test relationships whose mechanisms have long-run characteristics. We run such regressions for alternative cross-sectional datasets by taking averages over the whole sample period (as baseline results) and over a certain sub-sample period (as robustness checks).

As a useful complement to cross-section regressions, panel data have important advantages such as addressing endogeneity due to time-invariant unobservables by using fixed effects. Panel regressions with fixed effects are important for checking whether the cross-sectional relationship between the variables of interests still holds *within* statistical units. However, fixed-effects regressions have limited scope in our case, given that the key independent variable—income inequality—evolves slowly over time and most of its variation is cross-sectional (i.e. *between* statistical units). Hence the inclusion of fixed effects, while removing the effects of time-invariant factors, also removes most of the variation in our explanatory variable of interest. Furthermore, if financial development varies substantially over time, fixed-effect regressions could artificially return an effect of inequality on financial development, shoehorning the two variables into a spurious relationship. On the other hand they would become appealing if one could obtain a panel covering an extensive period of time such that inequality has substantial *within* variation. As the effect of inequality is about long-run mechanisms, the structural effect we hope to document is more likely to be picked up in cross-section and panel regressions using *between* variation.⁹ Therefore we resort to random-effect regressions when using panel data,

⁷ On the social consequences of income inequality, see Klasen (2008), Wilkinson and Pickett (2009), and Hirschman (1973). On its links to human development, see Castells-Quintana et al. (2025), Castelló-Climent (2010), and UNDP (2019). On the economic effects, see Ostry et al. (2014).

⁸ SDG Goal 10 aims to reduce inequality within and between countries. Target 10.1 aims to ‘progressively achieve and sustain income growth of the bottom 40 percent of the population at a rate higher than the national average’ and Target 10.2 aims to ‘empower and promote the social, economic, and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion, or economic or other status’. The goal is to achieve shared prosperity and address social inclusion, relative poverty, and inequality. For further details, see the official webpage at <https://sustainabledevelopment.un.org/sdg10/>.

⁹ Indeed the descriptive statistics show that, while our financial development variables vary substantially over time, most of the variation of our inequality variable is between statistical units. See Table A2.

which efficiently use both *within* and *between* variation. Alternative panels are used, with variables in ten-year averages as the baseline analysis, and five- and seven-year averages for robustness checks. Equations (1) and (2) are, respectively, the cross-sectional and panel data specifications, where i indexes country and t time period, FD denotes financial development, I is income inequality, X represents a vector of control variables which will be defined below, and ϵ is the error term. A set of time dummies τ_t is also included in the panel data regressions to control for global common trends that may be correlated with financial development.

$$FD_i = \alpha + \beta I_i + \theta X_i + \epsilon_i \quad (1)$$

$$FD_{it} = \alpha + \beta I_{it} + \theta X_{it} + \tau_t + \epsilon_{it} \quad (2)$$

To study whether and how the coefficient of income inequality changes when conditioning on a rich set of control variables, we include a large set of controls, composed of three groups. The first group of controls relates to exogenous national characteristics which capture structural factors affecting financial development. As Beck et al. (2003a) argue, factor endowments determine colonization strategy and shape institutions for property rights protection, thus affecting financial development. We therefore control for a range of geographic variables which are widely regarded as ‘deep’ determinants of economic and financial outcomes. Following Ang and Fredriksson (2018) and Easterly (2007), we also include continent dummies to address the concern that the core findings may be confounded by unobserved region-specific factors. Advanced by La Porta et al. (1997, 1998), the law and finance literature highlights the role of legal origins in explaining cross-country variations in investor protection and contracting environments, and thus the ability of firms to raise external finance through either debt or equity. We incorporate legal origin dummies in the regressions to account for this as a source of historical variation in financial development. Following Stulz and Williamson (2003), we control for religion as a cultural factor which may affect the degree of investor protection. Finally, we include a measure of ethnic fractionalization, often seen as a significant determinant of development outcomes (Alesina et al. 2003; Easterly and Levine 1997).

The second group of control variables focuses on the role of institutions. It is widely recognized that significant institutional development is needed to build a modern financial system (e.g. for credit markets, a property registry is needed before one can collateralize assets; banking activities and capital markets need regulation).¹⁰ And there is broad agreement that constraints on the executive power, by making governments accountable to the legislative and judiciary powers, are important for financial development. They act as a barrier against political influence and are more likely to guarantee impartial regulation and property rights protection (e.g., Acemoglu and Johnson 2005; Barth et al. 2006). Hence this is our primary measure of institutional quality. We use the index of institutionalized constraints on the decision-making powers of the executive from Polity IV (as in Acemoglu and Johnson 2005). For robustness we employ three alternative indices capturing the overall institutional quality: the World Bank’s World Governance Indicators (World Bank 2023); the Quality of Government Index from the Quality of Government database (Teorell et al. 2023); and the property rights protection index by Ouattara and Standaert (2020). It will be interesting to observe how the estimated effect of inequality changes when introducing institutional variables because they may

¹⁰ See Hodgson (2023) for a discussion on the institutional origins of finance in Britain.

be capturing political economy mechanisms due to political influence on the rules and regulations governing the financial system.

The third group of controls is composed of standard macroeconomic variables which are generally viewed as potential determinants of both income inequality and financial development. We include a measure of inflation because moderate to high inflation may discourage financial intermediation while hitting the poorest the hardest. We also include a measure of trade openness as it may affect financial structure by reducing barriers to entry (Rajan and Zingales 2003) and tends to disproportionately benefit certain income groups (Meschi and Vivarelli 2009; Roser and Cuaresma 2016). Lastly, we control for the level of income, which is one of the most widely researched determinants of both financial development and income inequality.

The level of income deserves particular attention because it is, in theory, affected by income inequality. Although a definitive assessment of effect of inequality on growth remains elusive, there is empirical evidence which shows that income inequality is associated with slower and less durable growth. This can be found in studies which look at growth rates of income in the medium run (e.g. Berg and Ostry 2018) and over long periods of time (e.g., Alesina and Rodrik 1994; Persson and Tabellini 1994), long-term levels of income (e.g. Easterly 2007), and the duration of growth spells (e.g., Berg et al. 2012; Berg et al. 2018). If income inequality impedes economic growth and growth in turn impacts financial development, we will expect a substantial change in the coefficient of inequality with the inclusion of income levels as a control in equations (1) and (2). If so, this will indicate that inequality affects financial development, at least partly, via affecting growth. Furthermore this exercise will allow us to see whether, and to what extent, inequality matters for financial development independent of any effects it may have on growth. Empirically, this may be particularly important because it would give us an initial appreciation of how the impact of inequality is channelled to credit and capital markets. We hypothesize that inequality may exert ‘direct’ effects on credit markets (via limiting the pool of loanable agents) and capital markets (via increased savings), but the effects of political economy explanations, via political influence and social conflict, may manifest themselves ‘indirectly’ through economic growth.

Potential endogeneity concerns arise from three sources. The first is the possibility of reverse causality between financial development and income inequality (see Beck et al. 2007; Blau 2018). Secondly, the possibility of omitted-variable bias cannot be completely ruled out, although we mitigate this risk by including a rich set of controls. Thirdly, cross-national inequality statistics may be subject to measurement error and this may lead to *attenuation bias*. This means that the estimated inequality coefficient may be upward and/or downward biased, depending on which of the above three forces is dominant. We address identification concerns with IV estimations. Our main instrument has an important place in the literature.

Easterly (2007) proposed, and successfully exploited, an instrument for income inequality based on soil suitability for wheat versus sugar cultivation. The argument is that the relative abundance in land suitable for the two crops predicts inequality and in turn affects economic outcomes (Easterly 2007). The exclusion restriction is that the (log) *wheat–sugar ratio* affects financial development only through income distribution. We take several steps to test whether this assumption is violated. A preliminary way is to incorporate into the IV regressions an adequate set of controls which represent alternative non-inequality channels through which the instrument may affect financial development. If such channels are at work, the inclusion of the variables should ‘rob’ the explanatory power of the inequality variable. A second step is to examine the semi-reduced-form specification in which the *wheat–sugar ratio* itself enters the second-stage regression as a regressor whose coefficient, if

insignificant, tests the validity of the instrument. To do so we need additional instruments to be used alongside the wheat–sugar variable. We experiment with two alternative instruments, namely the share of the country’s cultivated land area in tropical climate zones and ethnic fractionalization, which are added separately to the first-stage regression. Having multiple instruments also allows us to run over-identification tests which, although far from definitive, give additional evidence on whether the exclusion restriction can be rejected. A further way to probe the validity of the instrument is to employ the methodology of Conley et al. (2012), which enables estimation of how much violation of the exclusion restriction it would take to invalidate our findings.

3 Data

The analysis uses data from a sample of up to 166 countries over a period from 1960 to 2019, with the exact number of observations varying across regressions depending on the variables included. We use multiple indicators for the key variables as well as some of the control variables. The idea is to see whether our core findings survive the use of the alternative measures.

The dependent variable is financial development, which covers both credit and capital markets. For credit market development, *private credit by deposit money banks and other financial institutions as a share of gross domestic product (GDP)* is used as the main proxy, which captures one of the most important activities of financial intermediation—funnelling savings to investors (Beck et al. 2007). As robustness checks we also use three alternative indicators, namely *private credit by deposit money banks as a share of GDP*, *financial institutions depth index* and the *financial institutions index*. For capital market development we adopt the two most widely used indicators of stock market development: *total stock market capitalization divided by GDP*, as the main proxy, and the *ratio of total value of stocks traded to GDP*, for robustness checks. They have the key advantage of being available for a large number of countries over a relatively long time. It should be noted that both measures have limitations, with the main indicator being criticized as only capturing the amount of equity listed rather than the amount of equity raised. Other plausible proxies include *market capitalization excluding top ten companies*, *value traded excluding top ten companies*, and the *number of publicly traded domestic companies per million of population*, whose usefulness is, however, severely limited by the narrow over-time and cross-country coverage.¹¹ The variables on financial development are from the Global Financial Development Database (GFDD) by the World Bank (2022).

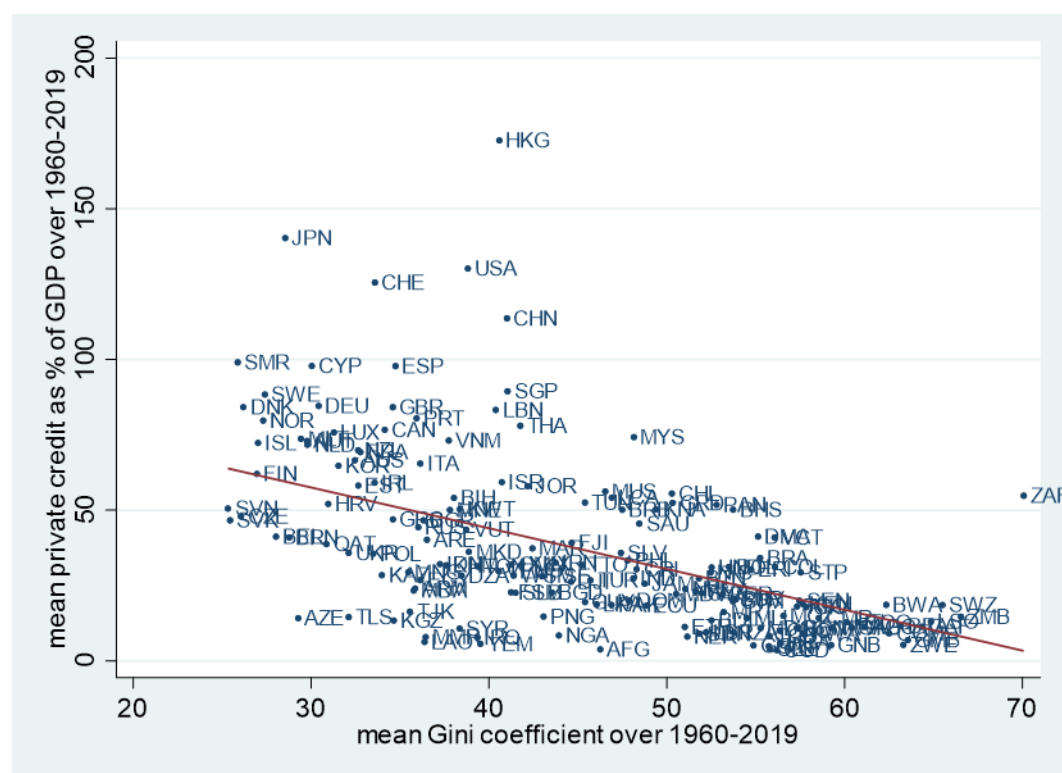
We employ the *Gini index* as the main proxy for income inequality. The most used dataset for this measure is the World Income Inequality Database (WIID) (UNU-WIDER 2021). For robustness we use it in combination with the Standardized World Income Inequality Database (SWIID) (Solt 2020). Cross-national inequality data suffer from well-known comparability problems (see Atkinson and Brandolini 2001). Despite that, the WIID and SWIID are notable in terms of their data coverage, making them useful for research, like ours, which seeks cross-country data for a large set of economies over a long period. Between the two sources there are concerns about the imputation

¹¹ For the same reason an attempt to examine the role of bond market development turned out to be unfruitful and we therefore could not include this aspect of financial development in our empirical analysis, even though the potential impact of income inequality on market-oriented financial systems (as discussed in the earlier part of this paper) also applies to bond markets.

model used in SWIID (Jenkins 2015), which prompts us to adopt the (standardized) Gini index from WIID in the main analysis while using the post-tax post-transfer Gini coefficient from SWIID as a robustness check. Both indicators can be subject to measurement error, which we alleviate via IV estimation. While the Gini index has the advantage of covering the entire spectrum of the income distribution, it is also insightful to look at top and/or bottom income shares, which may impact financial structure and systems via different mechanisms according to political economy explanations of financial development. We use these indicators to provide evidence on such mechanisms.

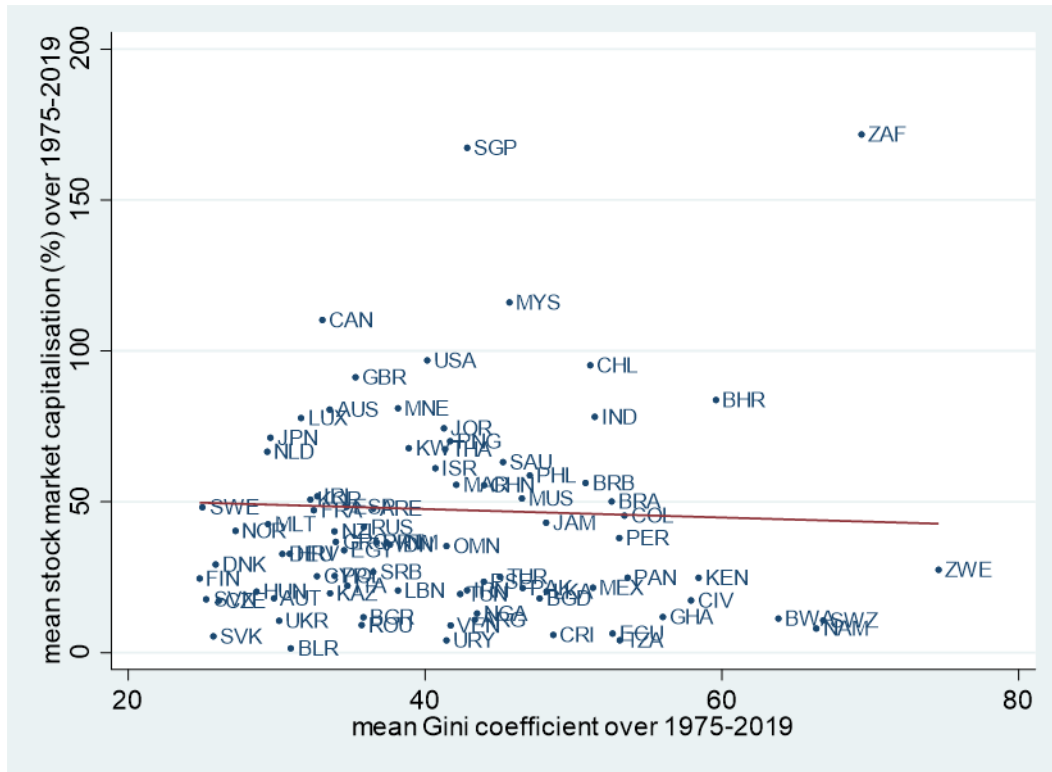
The variables and descriptive statistics are shown in Tables A1 and A2, respectively (in the Appendix). Figures 1–2 provide a preliminary illustration of the association between the variables. They show that more unequal countries tend to have less-developed credit markets, but this is not the case for stock markets as they appear to be weakly correlated with inequality. This suggests that the opposite effects that inequality exerts on capital markets may cancel each other out.

Figure 1: Private credit and Gini coefficient—cross-section, 1960–2019 average



Source: Authors' elaboration.

Figure 2: Stock market capitalization and Gini coefficient—cross-section, 1975–2019 average



Source: Authors' elaboration.

4 Results

We examine the impact of income inequality on the development of both credit and stock markets. For each type of market we present the results from standard cross-sectional and panel data regressions as benchmarks, before focussing on analysis using IVs to address endogeneity concerns. We contrast the results from univariate regressions with those from controlling for confounding variables, with particular interest in the estimates where GDP per capita is included. The intention is to see what impact income inequality has on financial development independent of any effects it may have on economic growth.

4.1 Credit market development

We start the analysis by regressing private credit from banks and other financial institutions on the Gini coefficient, and then add exogenous national characteristics that the literature has suggested as alternative hypotheses for financial development (i.e. the first group of variables as discussed in Section 2). Table 1 presents the results for cross-sectional data over the years 1960–2019 and random-effect panel data estimates using ten-year averages. Each row of the table corresponds to a separate regression. When the Gini index is the only regressor (see rows 1 and 7), its coefficients are negative and statistically significant. In the other rows of the table, we control separately for legal origins (civil law dummy), religions (Muslim dummy), geographic variables, dummies of Africa and South America, and ethnic fractionalization. The Gini index coefficients stay negative and significant,

although the magnitude is relatively smaller when continent dummies are included. It also appears that the coefficients are smaller in the panel random-effect estimations than those obtained from cross-sectional data. We also experimented with distinguishing between German, Scandinavian and French legal origins, adding socialist law as an additional legal origin dummy, using latitude and land area as additional geographic variables, including Catholic and Protestant dummies alongside Muslim, and using alternative continental dummies. All produced similar results to those reported in the table, confirming an overall negative association between income inequality and private credit.

Table 1: Private credit and income inequality—baseline estimates

		Civil law	Muslim	Geography			Continent		Ethnicity	Obs	Adj. R-squared
		Gini index		Land-locked	Island	Ruggedness	Distance to coast	Africa dummy	South America dummy		
Panel A: Cross section over 1960–2019	1	-1.53*** (0.166)								166	0.315
	2	-1.57*** (0.169)	1.35 (3.949)							164	0.326
	3	-1.54*** (0.157)		-15.80*** (3.742)						166	0.368
	4	-1.47*** (0.161)			-9.01 (6.592)	0.95 (4.846)	2.61 (1.605)	-7.76 (6.704)		165	0.364
	5	-1.13*** (0.212)						-13.59*** (4.127)	-7.05 (5.110)	166	0.336
	6	-1.23*** (0.179)								-28.25*** (6.537)	158 0.420
Panel B: 10-year panel, random effects with year dummies	7	-0.97*** (0.161)								602	0.23
	8	-0.99*** (0.162)	3.09 (4.716)							597	0.332
	9	-0.99*** (0.153)		-18.67*** (4.484)						602	0.279
	10	-0.94*** (0.156)			-11.69 (7.740)	3.29 (6.210)	3.46* (1.878)	-11.83 (7.95)		600	0.286
	11	-0.44** (0.180)						-29.42*** (4.679)	-14.18*** (5.338)	602	0.275
	12	-0.74*** (0.183)								-45.95*** (8.852)	583 0.321

Note: The dependent variable is *domestic credit to private sector/GDP*. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for rows 1–6 (cross-sectional data) and standard errors are clustered at the country level for rows 7–12 (panel data).

Source: Authors' elaboration.

Next, we look at other confounding variables which have been widely examined by existing studies as determinants of financial development (as discussed in Section 2). Controlling for them allows us to see whether the negative association between income inequality and private credit still holds. Table 2 presents the results, with each row relating to a separate regression and the figures in the cells reporting the coefficients and standard errors of the variables included. Alternative proxies are used for institutions, namely the (normalized) governance indicator from the World Bank, the *Quality of Government Index*, and the time required to enforce a contract and the index of property right protection. The results confirm that institutions are important determinants of financial development, and they also corroborate the findings of Acemoglu and Johnson (2005) that institutions for the protection of property rights matter for private credit while contracting institutions do not. No matter which institution indicators are used, the coefficients of the Gini index stay negative and significant, but the magnitude is smaller than those obtained from the Gini index being used as the only regressor (see rows 1 and 7 of Table 2). This implies that part of the negative association between income inequality and private credit is due to a potential negative relationship between inequality and

institutions. This can be seen as evidence supporting the political economy mechanism, as institutional quality measures capture the extent of political influence, which may explain why the effect of inequality attenuates when these variables are introduced.

In rows 4 and 11 of Table 2, the control variable refers to the institutionalized constraints on the decision-making powers of chief executives, which registers positive coefficients although insignificant in the case of panel data with random effects. The Gini index coefficients remain negative. When conditional separately on inflation and the sum of exports and imports as a percentage of GDP, the regressions yield results on the inequality indicator that are similar to those obtained from the univariate regressions. We also experimented with controlling for the geographic openness of a country, as constructed by Frankel and Romer (1999), to address endogeneity of the above trade openness proxy. In addition, following Vollrath and Erickson (2007) and Vollrath (2008) who document inequality in land ownership as a determinant of financial outcomes, we control for the land Gini index in the year around 1960 obtained from Frankema (2010). We also tried to include as a control the Chinn-Ito Index for financial openness. The results on the three variables, which are not reported in the table but are available upon request, confirm the negative association between credit market development and income inequality.

The most important confounding variable is economic growth, which is proxied here by (log) GDP per capita. As discussed earlier, while being a determinant of financial development, the variable is itself endogenous and may affect, and be affected by, income inequality. Therefore caution is needed when interpreting the results. Nonetheless, including the variable in the regression allows us to shed light on an important issue, i.e. whether and to what extent inequality matters for financial development independent of any effects it may have on income levels.

It can be seen from rows 7 and 14 of Table 2 that controlling for GDP per capita substantially reduces the magnitude of the coefficients of the Gini, which even turn insignificant when panel data are estimated with random effects. This implies that the strong negative association between private credit and the Gini documented so far may partly reflect a negative growth–inequality relationship. We carry out robustness analysis by adding, one by one, all the other control variables except institutions to the regression to see whether the results remain similar. By controlling for variables which potentially confound both the finance–inequality relationship and the finance–growth association, this exercise can, to some extent, reduce the aforementioned concern that income levels are endogenous. We do not control for institutions as they are highly correlated with GDP per capita. The results, which are not reported but are available upon request, show that the Gini index stays negative in all the regressions except the panel regression which controls for the regional dummies. The coefficients of inequality are not statistically significant in panel data analysis, which, as revealed later, turn largely significant when IVs are used. We also tried to control for the growth rates of GDP per capita, government expenditure as a percentage of GDP, and education. The variables themselves are largely insignificant when included alongside income levels, while the main results still hold.

Table 2: Private credit and income inequality—introducing confounding variables

		Gini index	World Governance Indicators	Institutions Quality of government	Protection of property rights	Executive constraints	CPI	Trade	(log) GDP per capita	Obs	Adj. R-squared
Panel A: Cross section, 1960–2019	1	-1.53*** (0.167)								166	0.31
	2	-0.61*** (0.139)	110.77*** (11.456)							166	0.61
	3	-0.48*** (0.174)		94.70*** (10.739)						123	0.63
	4	-0.68*** (0.128)			4.77*** (0.469)					161	0.63
	5	-1.15*** (0.174)				4.79*** (1.201)				146	0.42
	6	-1.51*** (0.165)					-0.05* (0.031)			165	0.33
	7	-1.43*** (0.191)						0.11 (0.069)		159	0.35
	8	-0.51*** (0.165)							13.00*** (1.621)	163	0.56
Panel B: 10-year panel, random effects with year dummies	9	-0.97*** (0.161)								602	0.23
	10	-0.44*** (0.130)	155.39*** (11.782)							429	0.61
	11	-0.51*** (0.171)		90.63*** (10.132)						399	0.54
	12	-0.44*** (0.126)			7.65*** (0.563)					412	0.64
	13	-0.98*** (0.169)				1.18 (0.803)				555	0.27
	14	-1.03*** (0.172)					-0.14** (0.007)			577	0.23
	15	-0.93*** (0.177)						0.16*** (0.054)		562	0.26
	16	-0.08 (0.138)							18.53*** (1.481)	589	0.54

Note: The dependent variable is *domestic credit to private sector/GDP*. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for rows 1–7 (cross-sectional data) and standard errors are clustered at the country level for rows 8–14 (panel data). ‘CPI’ stands for ‘consumer price index’.

Source: Authors’ elaboration.

Various robustness checks are undertaken using alternative samples and alternative indicators for credit market development and income inequality. Table A3 in the Appendix presents the results. To save space we only report the coefficients and standard errors of the inequality variable, with each cell corresponding to a separate regression. In Panels A, B, and C, we restrict the sample to countries with data on the main instrument, developing countries, and non-socialist countries, respectively. When GDP per capita is not included, the Gini index has negative coefficients which are significant in all but three regressions that control for regional dummies. Compared to the results for the full sample (in Tables 1 and 2), the coefficients appear smaller for the developing-country sample and larger for non-socialist countries. When conditional on income levels, a statistically significant negative association between the Gini index and private credit is still present for cross-sectional data analysis but not for panel regressions. In Panel D we experiment with cross-sectional datasets which cover shorter time spans, and the results are qualitatively similar to those of the full sample period. Panel E reports the results for panel data constructed using five-year and seven-year averages, and they confirm the observations obtained from the ten-year panel. In Panels F, G, and H, we use three alternative indicators of financial development and obtain results which qualitatively resemble those when using the main indicator. The last panel of the table proxies income inequality with the SWIID’s

Gini index, and the main results still hold. We conducted more robustness analyses than reported, such as examining the sub-sample of non-commodity countries, combining some of the aforementioned sub-samples, alternative cross-section and panel datasets with alternative indicators of the key variables. Our main findings largely survive.

The results presented and discussed so far, albeit robust, indicate (conditional) correlation because income inequality may well be endogenous. To address identification concerns we estimate Equations (1) and (2) using IVs by two-stage least squares (TSLS). The main instrument is the *wheat–sugar ratio* obtained from Easterly (2007). Table 3 reports the results, where each column corresponds to a particular regression. To save space only the second-stage results on the Gini index and first-stage results on the instrument and F statistics are reported. For all regressions there is a strong first-stage correlation between the endogenous variable and the instrument, and the F statistics all exceed 10. Panels A and B of the table relate, respectively, to cross-sectional and ten-year panel regressions in which the Gini index is included alone and alongside each of the control variables except GDP per capita. The magnitude of the coefficients of income inequality is larger in the IV analysis than in the regressions where endogeneity is not addressed.¹² The Gini index has negative and significant coefficients across the board, indicating that income inequality leads to less-developed credit markets and the detrimental effect is robust to controlling for various other potential determinants of financial outcomes. How much does inequality hinder the development of credit markets? Taking as an example the point estimate -2.52 obtained from the univariate regression for the cross-sectional data, one standard deviation increase in the Gini (11.2 percentage points) reduces private credit by nearly 0.94 ($2.52 \times 11.2 / 30.02$) standard deviations. Even with the much-reduced point coefficient after controlling for institutions in the panel data, one standard deviation increase in the Gini index decreases credit market development by over half of a standard deviation, which is still economically meaningful.

In Panels C and D we regress private credit on the Gini index and income levels, alone and conditional on the other controls except institutions, due to multicollinearity. The coefficients of the Gini index are smaller when conditioning on (log) GDP per capita than in the regressions when this variable is not controlled for, implying that part of inequality's negative impact on private credit is via its adverse impact on economic growth, which in turn affects financial development. Nonetheless, the coefficients are all negative and statistically significant, even in the estimations using panel data, which produced insignificant results when the issue of endogeneity was not addressed. This evidence indicates that inequality has negative causal effects on private credit independent of its effects on growth. In other words income inequality is a double curse for credit markets. It reduces private credit by hindering economic growth and is, on its own, bad for the development of credit markets. Conditional on income levels, one standard deviation increase in the Gini reduces private credit by nearly one-third of a standard deviation, even if we take the smallest point coefficient as shown in the table (i.e. -1.03). We also produced estimates that add as regressors growth rates of GDP per capita, government expenditure, and education, all of which yield similar results. In Table A4 in the Appendix we report the robustness checks for the IV results using alternative samples and alternative indicators

¹² There may be two explanations for this. Firstly, the measurement error in the inequality variable is likely to downwardly bias the non-IV estimates. Secondly, while ordinary least squares (OLS) and random-effect estimates describe the average difference in unequal societies and the rest, the IV estimates measure the effect of inequality only for societies whose level of inequality is affected by the instrument (i.e. the local average treatment effect). This may be relevant, as there may be societies for which the choice of growing wheat or sugarcane is dictated by their availability (rather than just soil suitability for cultivation). Which of these two explanations is at work here is an empirical matter.

for the key variables. The main finding that inequality has an overall negative impact on credit market, which is independent of economic development, survives.

Table 3: Private credit and income inequality—TOLS estimates

Panel A: Gini index and other determinants of financial development (1960–2019 cross section)										
Controls:	No controls	Legal origins	Religions	Geographical variables	Regional dummies	Ethnicity	Institutions	Executive constraints	CPI	Trade
Second-stage regression										
Gini index	-2.52*** (0.402)	-2.59*** (0.397)	-2.49*** (0.398)	-2.35*** (0.381)	-2.97*** (0.686)	-2.59*** (0.616)	-1.35*** (0.474)	-2.16*** (0.512)	-2.49*** (0.395)	-2.59*** (0.415)
First-stage regression										
Wheat–sugar ratio	-33.82*** (3.170)	-33.81*** (3.248)	-33.70*** (3.122)	-36.06*** (3.216)	-22.45*** (2.768)	-25.29*** (3.180)	-23.13*** (3.658)	-27.03*** (3.377)	-33.90*** (3.229)	-32.80 (3.126)
F statistic	113.88	108.37	116.58	125.71	65.79	63.24	39.99	64.05	110.27	110.13
Panel B: Gini index and other determinants of financial development (10-year panel, random effects)										
Second-stage regression										
Gini index	-2.78*** (0.479)	-2.80*** (0.477)	-2.73*** (0.472)	-2.63*** (0.456)	-3.11*** (0.726)	-2.93*** (0.795)	-1.53** (0.656)	-2.59*** (0.546)	-2.79*** (0.491)	-2.75*** (0.482)
First-stage regression										
Wheat–sugar ratio	-33.45*** (3.084)	-33.56*** (3.112)	-33.21*** (3.022)	-36.05*** (2.885)	-24.12*** (2.752)	-24.32*** (3.500)	-23.50*** (3.597)	-29.44*** (3.147)	-32.96*** (3.011)	-33.59*** (2.998)
F statistic	117.61	116.34	120.79	156.20	76.83	48.29	31.17	87.51	119.79	125.55
Panel C: adding GDP per capita (GDPPC) (1960–2019 cross section)										
Controls:	GDPPC	GDPPC & legal origins	GDPPC & religions	GDPPC & geography	GDPPC & regional dummies	GDPPC & ethnicity	GDPPC & executive constraints	GDPPC & trade, CPI		
Second-stage regression										
Gini index	-1.55*** (0.520)	-1.69*** (0.579)	-1.65*** (0.589)	-1.46*** (0.483)	-1.50** (0.614)	-1.58** (0.624)	-1.50*** (0.552)	-1.45*** (0.491)		
First-stage regression										
Wheat–sugar ratio	-20.10*** (3.620)	-18.81*** (3.399)	-19.31*** (3.792)	-23.03*** (3.808)	-17.84*** (3.341)	-17.66*** (3.244)	-20.43*** (3.749)	-20.21*** (3.698)		
F statistic	30.81	30.62	25.94	36.56	28.51	29.64	29.70	29.87		
Panel D: Gini index and other determinants of financial development (10-year panel, random effects)										
Second-stage regression										
Gini index	-1.37** (0.647)	-1.39** (0.688)	-1.41** (0.714)	-1.48** (0.629)	-1.32* (0.725)	-1.41* (0.792)	-1.41** (0.681)	-1.03* (0.585)		
First-stage regression										
Wheat–sugar ratio	-19.31*** (3.543)	-18.65*** (3.393)	-18.72*** (3.629)	-21.91*** (3.782)	-17.80*** (3.351)	-16.71*** (3.346)	-19.43*** (3.768)	-20.79*** (3.584)		
F statistic	28.66	29.05	24.99	33.55	28.11	23.24	26.60	30.20		

Note: The dependent variable is *domestic credit to private sector/GDP*. In each panel each column corresponds to a separate regression where the second-stage regression results on the inequality variable and the first-stage regression results on the excluded instrument and F statistics are reported. The instrument is the (log) wheat–sugar ratio (Easterly 2007). The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

The results from controlling for income levels should be taken with caution. This is due to at least three concerns, namely the variable itself being endogenous, it potentially being affected by inequality, and it, in theory, affecting inequality. Using IVs for inequality can, to a great extent, mitigate the concern that the Gini index is affected by GDP per capita (or any other controls) in that the *wheat-sugar ratio* is arguably able to pick out exogenous variation in income inequality. Adding other determinants to the regressions, as done in the columns other than the first one of Panel B in Table 3, controls for factors which potentially co-determine inequality, income levels, and private credit. It thus reduces, to some extent, the endogeneity of income levels arising from such sources. Nonetheless we conduct further analysis in order to mitigate the issue of endogeneity due to reverse causality and the concern that income levels are affected by inequality. Specifically, instead of using GDP per capita averaged over the years when there are data for private credit, we use initial income levels for cross-sectional data analysis, i.e. the income levels before the first year when data are available for private credit. For panel data of ten-year averages, we use the income level at the first year of each ten-year interval and the average GDP per capita in the previous ten-year period.

The results are given in Table 4, where only the coefficients of the Gini index and income levels are shown for the sake of brevity. We also report the results from using the 'current' period income levels for ease of comparison. If there is positive reverse causality, we can expect that using initial or lagged GDP per capita will return a smaller coefficient for the variable. If there is a negative impact of inequality on current-period income levels, we can expect that the coefficients of the Gini index will be larger when conditional on initial or lagged GDP per capita. The results indeed confirm these predictions. Across the board, income levels show reduced coefficients when the variable is in its initial terms for the cross-sectional data, and they even become insignificant in some cases. For the panel data sample the size of the coefficients of GDP per capita decreases when using its initial terms and it drops further when lagged income is regressed upon. It should be noted that the positive coefficients of initial or lagged GDP per capita are indicative (rather than definitive) of the impact of income levels on private credit, because there may be other sources of endogeneity which have not been adequately addressed. Nonetheless the growth-finance nexus is outside of the scope of this paper.

When it comes to the focus of our research, the coefficients of inequality remain negative when conditional on initial and/or lagged income levels, indicative of the negative impact of inequality on credit market development after addressing the concern about reverse causality of GDP per capita and mitigating the concern about income levels being affected by inequality. For the cross-sectional data the coefficients are expectedly larger in the regressions with initial income levels than those with current-period ones. For the panel data samples the size of the coefficients nicely increases when initial income is used, which rises a bit further with the use of lagged GDP per capita.

These results suggest that the Gini index has a larger negative impact on private credit if its potential adverse effects on income levels is (partly) controlled for. Conversely, the comparison of the results here gives more confidence in our main findings; that is, after taking account of the effects it may have on (current-period) GDP per capita, inequality still has its own impact on credit market development, which is negative (albeit smaller).

Table 4: Private credit and income inequality—TOLS estimates with initial or lagged GDP per capita (GDPPC)

	Controls:	GDPPC	GDPPC & legal origins	GDPPC & religions	GDPPC & geography	GDPPC & regional dummies	GDPPC & ethnicity	GDPPC & executive constraints	GDPPC & trade, CPI
Panel A: 1960–2019 cross section									
Using current (log) GDPPC	Gini	-1.55*** (0.520)	-1.69*** (0.579)	-1.65*** (0.589)	-1.46*** (0.483)	-1.50** (0.614)	-1.58** (0.624)	-1.50*** (0.552)	-1.45*** (0.491)
	(log) GDPPC	8.46*** (2.348)	7.52*** (2.708)	7.36** (3.039)	8.02*** (2.309)	10.41*** (2.042)	8.60*** (2.217)	8.54*** (2.767)	9.65*** (2.319)
Using initial (log) GDPPC	Gini	-1.90*** (0.493)	-2.08*** (0.538)	-2.05*** (0.550)	-1.86*** (0.473)	-2.06*** (0.641)	-1.96*** (0.613)	-1.76*** (0.555)	-1.82*** (0.453)
	(log) GDPPC	5.54** (2.387)	4.21 (2.665)	3.63 (2.916)	4.81* (2.489)	6.42** (2.532)	5.68** (2.426)	4.11 (2.671)	6.80*** (2.288)
Panel B: 10-year panel with year dummies, random effects									
Using current (log) GDPPC	Gini	-1.37** (0.647)	-1.40** (0.688)	-1.41** (0.714)	-1.48** (0.629)	-1.32* (0.725)	-1.41* (0.792)	-1.41** (0.681)	-1.03* (0.585)
	(log) GDPPC	11.67*** (2.960)	11.44*** (3.279)	11.09*** (3.698)	10.11*** (2.970)	12.99*** (2.595)	12.11*** (2.774)	11.92*** (3.295)	14.41*** (2.629)
Using initial (log) GDPPC	Gini	-1.56** (0.657)	-1.55** (0.692)	-1.66** (0.742)	-1.61*** (0.620)	-1.50** (0.733)	-1.69** (0.844)	-1.54** (0.681)	-1.29** (0.610)
	(log) GDPPC	10.81*** (3.008)	10.86*** (3.305)	9.67*** (3.863)	9.62*** (2.943)	12.20*** (2.668)	11.04*** (2.878)	11.21*** (3.259)	12.69*** (2.839)
Using previous (log) GDPPC	Gini	-1.92*** (0.629)	-1.91*** (0.648)	-2.00*** (0.678)	-1.89*** (0.591)	-1.97*** (0.743)	-2.04** (0.840)	-1.92*** (0.672)	-1.67*** (0.607)
	(log) GDPPC	8.89*** (2.593)	8.97*** (2.778)	7.94** (3.088)	8.17*** (2.479)	9.64*** (2.415)	9.04*** (2.525)	9.12*** (2.663)	10.69*** (2.643)

Note: The dependent variable is *domestic credit to private sector/GDP*. Only the results on Gini and income levels are reported. The IV is the (log) wheat–sugar ratio. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

So far the analysis has used the Gini index to proxy economic inequality. While this indicator has the advantage of covering the entire spectrum of the income distribution, we argue that it may be interesting to examine the profile of the income distribution as well. More specifically, we look at the income shares of the top 5%, top 20%, the third (i.e. the middle) quintile, and the bottom 20%. Given that the mechanisms through which the elite and the poor impact financial development may be different (i.e. the political economy explanations), comparing the results of the top and low-income shares has the potential to shed light on whether different forces are at play when it comes to the effects of different brackets of income distribution. Table 5 reports the analysis results using TOLS with the wheat–sugar ratio as the instrument.

For ease of comparison, in the first two rows, we reproduce the coefficients obtained from using the Gini index as the proxy. Each cell of the table corresponds to a separate estimation and presents the coefficient and standard error of the respective inequality indicator. For each of the two types of data, the number of observations for the different indicators is the same, making it possible to compare the magnitude of their coefficients. It appears that the top 5% and top 20% income shares both have a negative impact on private credit. They both have more negative coefficients than those of the Gini index, indicating that a more concentrated distribution of income towards high earners tends to be more damaging for credit market development. The coefficients of the top 20% income share are relatively larger than those of the top 5% income share, suggesting that the detrimental effect on private credit is more pronounced for the proportion of income that goes to the high and upper-medium classes than that of the extremely rich. In contrast, positive coefficients are registered with the middle 20% and bottom 20% income shares, with the magnitude being larger for the latter. This

indicates that credit market development benefits from the improved conditions of the non-rich, particularly the lowest income group. In general the positive coefficients of these two indicators and the negative coefficients of the top income shares provide confirmation that unequal income distribution leads to financial backwardness. Specifically, the existence of wealthier upper classes and/or poorer low-income groups hinders the depth of credit markets.

Table 5: Private credit and income shares—TSLS estimates

	Controls:	No controls	Legal origins	Religions	Geographical variables	Regional dummies	Ethnicity	Institutions	Executive constraints	GDP per capita
Gini index	1960–2019 cross section	-2.52*** (0.402)	-2.59*** (0.397)	-2.49*** (0.398)	-2.35*** (0.381)	-2.97*** (0.686)	-2.59*** (0.616)	-1.35*** (0.474)	-2.16*** (0.512)	-1.55*** (0.520)
	10-year panel, random-effect	-2.78*** (0.479)	-2.80*** (0.477)	-2.73*** (0.472)	-2.63*** (0.456)	-3.11*** (0.726)	-2.93*** (0.795)	-1.53** (0.656)	-2.59*** (0.546)	-1.37** (0.647)
Top 5	1960–2019 cross section	-3.85*** (0.599)	-3.96*** (0.588)	-3.79*** (0.591)	-3.63*** (0.590)	-4.89*** (1.107)	-4.08*** (0.950)	-2.14*** (0.719)	-3.69*** (0.885)	-2.77*** (0.969)
	10-year panel, random-effect	-4.29*** (0.715)	-4.35*** (0.713)	-4.22*** (0.707)	-4.07*** (0.695)	-5.01*** (1.122)	-4.51*** (1.126)	-1.54 (1.069)	-4.32*** (0.921)	-1.44 (1.040)
Top 20	1960–2019 cross section	-6.06*** (0.993)	-6.18*** (0.981)	-5.95*** (0.978)	-5.71*** (0.935)	-6.34*** (1.446)	-5.86*** (1.420)	-2.98*** (1.042)	-4.73*** (1.111)	-3.20*** (1.052)
	10-year panel, random-effect	-6.66*** (1.206)	-6.71*** (1.201)	-6.51*** (1.178)	-6.35*** (1.152)	-6.65*** (1.552)	-6.42*** (1.740)	-2.16 (1.481)	-6.01*** (1.339)	-1.67 (1.331)
Bottom 20	1960–2019 cross section	12.84*** (2.248)	13.16*** (2.227)	12.62*** (2.259)	11.85*** (2.049)	15.25*** (3.904)	13.52*** (3.568)	6.87** (2.673)	10.10*** (2.481)	7.35*** (2.676)
	10-year panel, random-effect	13.66*** (2.821)	14.11*** (2.768)	13.39*** (2.807)	12.58*** (2.488)	15.49*** (4.627)	13.59*** (4.331)	7.17* (3.779)	14.01*** (3.079)	3.18 (3.305)
Middle 20	1960–2019 cross section	10.28*** (1.625)	10.55*** (1.601)	10.13*** (1.399)	9.79*** (1.603)	12.04*** (2.736)	10.53*** (2.476)	5.36*** (1.793)	9.25*** (2.194)	6.72*** (2.295)
	10-year panel, random-effect	10.62*** (1.945)	10.99*** (1.862)	10.40*** (1.900)	10.01*** (1.849)	12.10*** (3.163)	10.28*** (2.890)	5.27** (2.451)	12.01*** (2.343)	2.52 (2.478)

Note: The dependent variable is *domestic credit to private sector/GDP*. Each cell reports the results on the inequality variable from a separate regression. The instrument adopted is the (log) wheat–sugar ratio. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

In addition to using the main instrument, we experiment with two alternative instrumentation strategies by adding to the *wheat–sugar ratio* some other national characteristics which have been linked to income inequality by past studies. One such variable is *ethnic fractionalization*, which, as one of the most common polarizing forces, is associated with a small middle class and thus low levels of equality (Easterly 2001). The other variable is a *tropics* dummy which Easterly (2001) found to predict income inequality. It should be noted that *tropics* and the *wheat–sugar ratio* are correlated, with a correlation coefficient just below 0.7 in our sample. Nonetheless the first-stage F-test statistics are all above the rule-of-thumb threshold of 10 when the two instruments are used together, as is the case when we use *ethnic fractionalization* and the *wheat–sugar ratio* as the instruments. Table 6 presents the estimates obtained from the second-stage regression and the respective over-identification test results. The results stay similar to those obtained using the main instrument; that is, the Gini index has negative coefficients whose magnitude is smaller when income levels are controlled for.

Next, the concern is how plausible it is that the *wheat–sugar ratio* does not affect financial development other than through its effect on inequality. One way to test for the validity of the instrument is to include in the regressions those variables that represent alternative non-inequality channels. The results of Tables 3 to 5 already constitute such a test, where we control for various exogenous national characteristics and macroeconomic variables. The second-stage coefficients obtained for the Gini when income is not controlled for stay negative throughout, as do the smaller but

still statistically significant coefficients of the inequality variable when GDP per capita is included alongside. Another approach is to run over-identification tests, which require having more than one instrument. We take advantage of the estimations which combine *ethnic fractionalization* or *tropics* with our main instrument. The p-values of such tests are shown in Table 6. The results do fail to reject the exclusion restriction by a considerable margin across the board, providing no evidence that the wheat–sugar endowment affects private credit by channels other than through inequality.

Given the usual criticism that over-identification tests have weak power, we undertake further analyses to verify the validity of our main instrument. Following Acemoglu and Johnson (2005) and Vollrath (2008), semi-reduced-form specifications are examined. This requires additional instrument(s) for this exercise to explore the excludability of the *wheat–sugar ratio*. Specifically, inequality is instrumented by the additional instrument and the wheat–sugar endowment variable enters the second-stage regression directly (and is naturally also included in the first-stage regression). Here we use ethnic fractionalization as the additional instrument and the exercise produces negative coefficients on the Gini of about the same order of magnitude as those reported in Table 3. In Panel A of Table A5 in the Appendix, we report the second-stage coefficients of the *wheat–sugar ratio*, which are statistically insignificant across the various estimation specifications. This indicates that our main instrument has no direct impact on private credit. Rather, its effect on the dependent variable is through affecting income inequality. As another extra instrument, *tropics* is correlated with the main instrument (with a correlation coefficient just below 0.7). This causes no problem when the two variables are used jointly as the excluded instruments but does lead to poor first-stage regression F-test statistics in the exercise of semi-reduced forms. Therefore we do not report the related results. Nonetheless the second-stage coefficients of the *wheat–sugar ratio* are still highly insignificant in all the specifications, suggesting no evidence of the variable having a direct impact on credit market development.

Table 6: Private credit and income inequality—alternative instruments

IVs:	1960–2019 cross section				10-year panel, random effects with year dummy			
	Wheat–sugar ratio + ethnic fractionalization		Wheat–sugar ratio + tropics		Wheat–sugar ratio + ethnic fractionalization		Wheat–sugar ratio + tropics	
	Gini index	p-value of over-ident. test	Gini index	p-value of over-ident. test	Gini index	p-value of over-ident. test	Gini index	p-value of over-ident. test
No controls	-2.47*** (0.304)	0.816	-2.49*** (0.384)	0.663	-2.67*** (0.350)	0.691	-2.75*** (0.458)	0.663
Controlling for legal origins	-2.47*** (0.292)	0.612	-2.56*** (0.378)	0.659	-2.64*** (0.342)	0.541	-2.77*** (0.456)	0.656
Controlling for religions	-2.37*** (0.295)	0.626	-2.49*** (0.385)	0.946	-2.58*** (0.342)	0.580	-2.74*** (0.457)	0.965
Controlling for geography	-2.21*** (0.299)	0.472	-2.35*** (0.352)	0.972	-2.40*** (0.347)	0.346	-2.61*** (0.416)	0.841
Controlling for regional dummies	-3.04*** (0.619)	0.785	-2.87*** (0.631)	0.610	-3.08*** (0.608)	0.901	-3.02*** (0.679)	0.625
Controlling for ethnicity			-2.57*** (0.608)	0.684			-2.92*** (0.791)	0.729
Controlling for institutions	-1.34*** (0.390)	0.969	-1.31*** (0.452)	0.729	-1.55*** (0.512)	0.974	-1.44*** (0.625)	0.558
Controlling for executive constraints	-2.13*** (0.427)	0.917	-2.13*** (0.488)	0.766	-2.43*** (0.420)	0.662	-2.53*** (0.515)	0.632
Controlling for CPI	-2.43*** (0.300)	0.802	-2.46*** (0.378)	0.691	-2.66*** (0.361)	0.654	-2.75*** (0.470)	0.609
Controlling for trade	-2.54*** (0.321)	0.815	-2.55*** (0.398)	0.626	-2.66*** (0.371)	0.748	-2.70*** (0.460)	0.585
Controlling for GDPPC	-1.44*** (0.428)	0.802	-1.46*** (0.493)	0.526	-1.18** (0.526)	0.640	-1.27** (0.626)	0.456

Controlling for GDPPC & legal origins	-1.48*** (0.456)	0.673	-1.58*** (0.547)	0.524	-1.17** (0.543)	0.607	-1.28* (0.665)	0.456
Controlling for GDPPC & religions	-1.46*** (0.446)	0.689	-1.62*** (0.582)	0.767	-1.20** (0.560)	0.596	-1.35* (0.716)	0.629
Controlling for GDPPC & geography	-1.21*** (0.421)	0.464	-1.39*** (0.465)	0.547	-1.05** (0.522)	0.305	-1.36** (0.603)	0.411
Controlling for GDPPC & regional dummies	-1.55*** (0.574)	0.857	-1.30** (0.564)	0.436	-1.24* (0.664)	0.806	-1.09 (0.681)	0.381
Controlling for GDPPC & ethnicity			-1.53** (0.607)	0.528			-1.36* (0.779)	0.484
Controlling for GDPPC & executive constraints	-1.42*** (0.449)	0.854	-1.41*** (0.524)	0.544	-1.15** (0.533)	0.620	-1.27* (0.648)	0.404
Controlling for GDPPC & trade +CPI	-1.34*** (0.413)	0.778	-1.35*** (0.473)	0.478	-0.99** (0.497)	0.872	-0.92 (0.564)	0.453

Note: The dependent variable is *domestic credit to private sector/GDP*. For each regression, only the results on the Gini index are reported. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

Finally, we employ the plausible exogeneity test developed by Conley et al. (2012) to examine the sensitivity of our main IV estimates to potential violations from the exclusion restriction. This strategy allows for instruments which deviate from perfect exogeneity. We adopt their union of confidence intervals (UCI) approach, in which we first estimate Equations (3) and (4) for cross-sectional and panel data, respectively:

$$FD_i = \alpha + \beta I_i + \gamma Z + \theta X_i + \varepsilon_i \quad (3)$$

$$FD_{it} = \alpha + \beta I_{it} + \gamma Z + \theta X_{it} + r_t + \varepsilon_{it} \quad (4)$$

Z is the main instrument—the *wheat–sugar ratio* and all the other denotations are the same as in Equations (1) and (2). Following Conley et al. (2012), γ is assumed to be uniformly distributed in an interval $[-\delta; +\delta]$. In the implementation of the test, we take δ as the coefficient of the instrument estimated from the above equations and then compute the lower and upper bounds for the effect of the Gini on private credit. Table 7 reports the bounds estimated at the 90% confidence interval for all specifications in which the estimated coefficient of Z is statistically significant (therefore deviating from strict exogeneity). The cells which contain 'N.A.' relate to the specifications in which the estimated direct effect of the *wheat–sugar ratio* $\hat{\gamma}$ (as reported in columns 1 and 4) is statistically insignificant, meaning that the instrument in these regressions is exogenous and thus there is no need to undertake the test. For all the specifications with significant $\hat{\gamma}$, the computed lower and upper bounds are both negative. This indicates that the second-stage coefficient of income inequality is bounded away from zero, providing strong evidence in favour of a negative impact of the Gini index on credit market development.

Table 7: Bounds for the effects of Gini index—Conley et al. (2012)’s plausibly exogenous test (UCI)

	Panel A: 1960–2019 cross section			Panel B: 10-year panel, random effects with year dummy		
	Direct effect of wheat–sugar ratio ($\hat{\gamma}$) estimated from Equation (3)	Lower bound (β)	Upper bound (β)	Direct effect of wheat–sugar ratio ($\hat{\gamma}$) estimated from Equation (4)	Lower bound (β)	Upper bound (β)
	1	2	3	4	5	6
No controls	47.48*** (15.522)	-4.70	-0.51	67.59*** (18.025)	-5.37	-0.36
Controlling for legal origins	49.66*** (15.600)	-4.77	-0.45	70.76*** (17.800)	-5.47	-0.26
Controlling for religions	47.12*** (14.80)	-4.69	-0.52	66.14*** (17.180)	-5.33	-0.40
Controlling for geography	52.37*** (16.928)	-4.86	-0.37	72.67*** (18.934)	-5.53	-0.21
Controlling for regional dummies	58.17*** (15.756)	-5.05	-0.20	69.30*** (17.257)	-5.43	-0.31
Controlling for ethnicity	44.63*** (15.891)	-4.60	-0.59	57.15*** (18.703)	-5.05	-0.67
Controlling for institutions	18.09 (11.127)	N.A.	N.A.	29.28** (14.501)	-4.18	-1.48
Controlling for executive constraints	36.77*** (13.620)	-4.35	-0.82	70.55*** (18.388)	-5.46	-0.27
Controlling for CPI	46.13*** (15.351)	-4.65	-0.55	67.29*** (18.339)	-5.36	-0.37
Controlling for trade	47.49*** (15.573)	-4.70	-0.51	71.87*** (19.083)	-5.51	-0.23
Controlling for GDPPC	24.64** (10.566)	-3.96	-1.17	20.57 (12.773)	N.A.	N.A.
Controlling for GDPPC & legal origins	25.45** (10.940)	-3.99	-1.15	21.18 (13.194)	N.A.	N.A.
Controlling for GDPPC & religions	25.26** (10.780)	-3.98	-1.15	20.69 (13.004)	N.A.	N.A.
Controlling for GDPPC & geography	27.64** (12.530)	-4.06	-1.08	24.77* (14.361)	-4.24	-1.42
Controlling for GDPPC & Regional dummies	28.25** (10.885)	-4.08	-1.07	18.76 (13.399)	N.A.	N.A.
Controlling for GDPPC & ethnicity	24.29** (10.858)	-3.95	-1.18	19.11 (12.885)	N.A.	N.A.
Controlling for GDPPC & Executive constraints	24.12** (11.145)	-3.95	-1.18	23.09 (13.94)	N.A.	N.A.
Controlling for GDPPC & trade +CPI	22.00** (10.342)	-3.88	-1.24	20.88 (13.178)	N.A.	N.A.

Note: The dependent variable is *domestic credit to private sector/GDP*. The Gini index is from WIID. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors’ elaboration.

To summarize, the IV evidence presented here suggests that the effect of income inequality is causal. The results are robust to controlling for variables that capture alternative hypotheses of financial development and are robust to alternative instruments. They hold when using alternative samples and alternative indicators of credit markets and inequality. The main instrument passes standard statistical tests as well as various exercises that test for its validity. We conclude that inequality hinders the development of credit markets and that it has detrimental effects on private credit, independent of any impact it may have via affecting economic growth.

4.2 Stock market development

The main indicator used for stock market development is *total stock market capitalization as a % of GDP*, with data available from 1975 on. The baseline results (without IVs) are presented in Table 8, where we contrast the coefficients of the Gini index between the estimations in which (log) GDP per capita is conditional and those in which (log) GDP per capita is controlled for. In each panel of the table, the odd rows relate to regressions without the inclusion of income, and the coefficients of the Gini are reported. The even rows show the coefficients of both the Gini and GDP per capita from estimations that control for income levels. For instance row 3 corresponds to the regressions in which the dependent variable is regressed upon the Gini and legal origins, and row 4 relates to the specifications where the regressors are the Gini, income levels, and legal origins. We do not report the results on other variables for the sake of brevity. When GDP per capita is not included, the Gini index is generally insignificant. However, the coefficients of income inequality turn positive and significant when income is included. This indicates an overall insignificant association between the Gini and stock market capitalization but a positive relationship between the two variables when conditional on GDP per capita. Income registers with positive coefficients across the board, which is in line with most existing empirical evidence of positive association between economic growth and stock market development. The last row reports the results for the regressions in which institutions are controlled for, and the coefficients of inequality are positive and significant at the 10% level. Due to potential multicollinearity, we do not run regressions in which the variable is included alongside income levels.

Table 8: Stock market development and income inequality—baseline results

		Panel A: 1975–2019 cross section, OLS		Panel B: 10-year panel with year dummies, random effects	
		Gini	(log) GDP per capita	Gini	(log) GDP per capita
Controls:		I	II	V	VI
No (other) controls	1	0.06 (0.453)		0.20 (0.543)	
	2	1.30** (0.550)	20.47*** (6.234)	2.08** (0.914)	30.56*** (11.219)
Legal origins	3	-0.04 (0.482)		0.10 (0.532)	
	4	1.27** (0.559)	22.45*** (7.151)	2.10** (0.901)	33.08*** (12.292)
Religions	5	0.09 (0.460)		0.26 (0.552)	
	6	1.30** (0.545)	20.52*** (5.957)	2.09** (0.907)	30.71*** (11.064)
Geography	7	0.01 (0.440)		0.09 (0.534)	
	8	1.20** (0.539)	19.82*** (6.345)	1.93** (0.873)	29.93*** (11.181)
Regional dummies	9	0.89* (0.465)		1.06 (0.728)	
	10	1.76*** (0.633)	19.52*** (6.343)	2.22** (0.968)	30.73*** (11.031)
Ethnicity	11	0.12 (0.448)		0.06 (0.331)	
	12	0.97** (0.486)	16.91*** (4.119)	0.72** (0.294)	17.25*** (2.818)
Executive constraints	13	0.35 (0.512)		0.05 (0.351)	
	14	1.13** (0.564)	15.03 (4.116)	0.78** (0.333)	17.00*** (2.835)

CPI and trade	15	0.63 (0.587)		0.81 (0.765)	
	16	1.35* (0.685)	13.02*** (4.176)	2.05** (0.939)	21.34*** (5.632)
Institutions	17	1.15* (0.580)		1.80* (0.978)	

Note: The dependent variable is *stock market capitalization/GDP*. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

Next we address endogeneity concerns, using the *wheat–sugar ratio* as the main instrument and TSLS estimation. The first-stage regression results can be found in Table A6 in the Appendix. The second-stage regression results are shown in Table 9, which is constructed in the same way as Table 8. The odd rows above the last one relate to the regressions without controlling for GDP per capita, and the Gini has insignificant coefficients in all cases. The even rows relate to estimations that control for income, and the coefficients of inequality are positive and significant in all the regressions except those conditional on geographic variables and which including ethnic fractionalization. The coefficients are larger than their non-IV estimation counterparts. The positive and largely significant coefficients indicate that inequality has a positive impact on stock market development, either on its own or independent of any impact it may have on income levels. However, inequality does not appear to have a discernible impact as long as GDP per capita is not considered in the analysis. In the previous sub-section we found (although without any definitive evidence) that inequality negatively affects credit markets by reducing income levels. Similarly, if inequality has an adverse impact on GDP per capita, which in turn reduces stock market development, this force will cancel out the positive impact of inequality on market capitalization. It leaves an overall effect of the Gini index being statistically no different from zero, as reflected in the results reported in the odd rows. The estimated coefficients of the Gini index shown in the last row of the table are obtained when we control for institutions. They are positive and significant, indicating that inequality is conducive to stock market development after accounting for the confounding variable which the existing literature considers to be a fundamental determinant of economic and financial outcomes.

Table 9: Stock market development and income inequality—TSLS estimates

		1975–2019 cross section		10-year panel with year dummies: random effect	
		Gini index	(log) GDP per capita	Gini index	(log) GDP per capita
Controls:		I	II	V	VI
No (other) controls	1	0.49 (0.530)		-0.02 (0.656)	
	2	2.82** (1.182)	24.71*** (7.719)	2.68* (1.381)	25.94*** (8.410)
Legal origins	3	0.50 (0.525)		-0.04 (0.646)	
	4	3.29*** (1.171)	29.79*** (7.805)	3.01** (1.299)	29.68*** (8.092)
Religions	5	0.58 (0.519)		0.08 (0.629)	
	6	2.79** (1.108)	26.66*** (8.300)	2.66** (1.274)	28.00*** (8.980)
Geography	7	-0.08 (0.492)		-0.56 (0.684)	
	8	1.49 (1.008)	16.53** (6.684)	1.49 (1.354)	19.10** (8.013)

Regional dummies	9	0.99 (0.740)		0.08 (0.939)	
	10	2.84*** (1.087)	18.77*** (5.107)	2.68** (1.309)	23.16*** (5.431)
Ethnicity	11	0.60 (0.877)		-0.61 (1.284)	
	12	2.70** (1.372)	24.658*** (7.595)	2.16 (1.765)	25.31*** (8.305)
Executive constraints	13	1.14 (0.677)		0.57 (0.753)	
	14	2.73** (1.225)	21.41** (9.622)	2.64* (1.387)	26.12*** (9.993)
CPI and trade	15	0.45 (0.475)		0.04 (0.650)	
	16	1.90** (0.920)	15.27** (5.668)	2.44* (1.250)	23.97*** (7.582)
Institutions	17	2.29** (1.018)		1.77* (0.905)	

Note: The dependent variable is *stock market capitalization/GDP*. The instrument adopted is the (log) wheat–sugar ratio. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

To address the concerns about the results obtained from controlling for income levels, we conduct the same analyses as in the previous sub-section. In Table 10 we reproduce the coefficients of the Gini index and income obtained from regressions conditional on current-period GDP per capita and compare them with the results from the estimations in which initial and/or lagged income levels are controlled for. When initial incomes are conditional on the cross-sectional data, the variable coefficients are smaller than their current-period counterparts, implying the reduction of reverse causality from this exercise. Moreover, in this exercise, the positive coefficients of the Gini index become smaller in all cases except the one with the inclusion of regional dummies. For the panel data, the inequality coefficients are uniformly smaller when controlling for initial GDP per capita, and they decrease further when reverse causality of income levels is mitigated by using lagged incomes in the regressions.

Two things are worth noting from these results. Firstly, the reduced coefficients of the Gini index confirm the earlier indication that inequality has a negative impact on economic growth, which in turn impedes financial development. With this channel at play, inequality's positive impact on stock markets appears smaller when this mechanism is reduced or excluded by controlling for initial or lagged income levels. Secondly and more importantly, the coefficients of the Gini remain positive and largely significant when conditional on initial or lagged GDP per capita. This indicates that inequality has a positive impact on the development of stock markets after addressing the concern about reverse causality of income levels and mitigating the concern that the obtained coefficient of inequality picks up the effects it may have on economic growth. In short, inequality has a positive impact on stock markets which is independent of its potential effects on GDP per capita.

We conduct a series of robustness checks by using a cross-sectional dataset covering the years 1985–2019, an alternative panel data based on five-year and seven-year averages, and an alternative Gini index from SWIID. The results are, in all cases, similar to the main ones. The regressions based on the developing-country sample confirm that the Gini has positive and largely significant coefficients when conditional on GDP per capita. However, it turns out that the first-stage regression for non-socialist countries performs poorly and therefore no meaningful second-stage results can be obtained for such a sample.

Table 10: Stock market development and income inequality—TSLS estimates with initial or lagged GDP per capita (GDPPC)

		Controlling for GDPPC	Controlling for GDPPC & legal origins	Controlling for GDPPC & religions	Controlling for GDPPC & geography	Controlling for GDPPC & regional dummies	Controlling for GDPPC & ethnicity	Controlling for GDPPC & executive constraints	Controlling for GDPPC & trade CPI
Panel A: 1975–2019 cross section									
Using current (log) GDPPC	Gini index	2.82** (1.182)	3.29*** (1.171)	2.79** (1.108)	1.49 (1.008)	2.21* (1.154)	2.70** (1.372)	2.73** (1.225)	1.90** (0.920)
	(log) GDPPC	24.71*** (7.719)	29.79*** (7.805)	26.66*** (8.300)	16.53** (6.684)	18.33*** (5.453)	24.658*** (7.595)	21.41** (9.622)	15.27** (5.668)
Using initial (log) GDPPC	Gini index	2.46** (1.098)	2.88** (1.162)	2.45** (1.048)	1.22 (0.927)	2.62** (1.112)	2.50* (1.343)	2.30** (1.137)	1.67** (0.823)
	(log) GDPPC	21.07*** (6.899)	25.72*** (7.626)	22.92*** (7.803)	13.93** (5.921)	16.17*** (5.220)	21.10*** (6.963)	15.59* (8.389)	13.30*** (4.926)
Panel B: 10-year panel with year dummies, random effects									
Using current (log) GDPPC	Gini index	2.68* (1.381)	3.01** (1.299)	2.66** (1.274)	1.49 (1.354)	2.68** (1.309)	2.16 (1.765)	2.64* (1.387)	2.44* (1.250)
	(log) GDPPC	25.94*** (8.410)	29.68*** (8.092)	28.00*** (8.980)	19.10** (8.013)	23.16*** (5.431)	25.31*** (8.305)	26.12*** (9.993)	23.97*** (7.582)
Using initial (log) GDPPC	Gini index	2.56* (1.350)	2.91** (1.306)	2.57** (1.271)	1.39 (1.350)	2.59* (1.332)	2.15 (1.775)	2.57* (1.405)	2.39* (1.258)
	(log) GDPPC	24.48*** (7.870)	28.27*** (7.862)	26.43*** (8.611)	18.05** (7.592)	21.74*** (5.353)	23.92*** (7.988)	24.70** (9.691)	22.99*** (7.341)
Using previous (log) GDPPC	Gini index	2.45* (1.435)	2.74** (1.373)	2.48* (1.372)	1.24 (1.350)	2.47* (1.414)	2.09 (2.021)	2.44 (1.492)	2.27* (1.349)
	(log) GDPPC	23.27*** (8.120)	26.69*** (7.965)	25.19*** (8.973)	16.73** (7.312)	20.58*** (5.550)	22.62*** (8.623)	23.19** (9.898)	21.79*** (7.544)

Note: The dependent variable is *stock market capitalization/GDP*. Only the results on the Gini and income levels are reported. The instrument adopted is the (log) wheat–sugar ratio. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

We also run regressions using alternative instrumentation strategies, i.e. adding *ethnic fractionalization* and *tropics* to the *wheat–sugar ratio* as instruments. The odd columns of Table 11 report the coefficients on the Gini index, which largely resemble those from the estimations using our main instrument. When income levels are not controlled for, the Gini index registers with insignificant effects in all the cases except the cross-section regression, where executive constraints are controlled for and ethnic fractionalization is used as the extra instrument. When GDP per capita is included as a regressor, the estimations yield positive coefficients of the Gini, which are all significant except the cases that control for geographic variables and instrumenting inequality by *tropics* and the *wheat–sugar ratio*.

When it comes to the issue of exclusion restriction, we subject the main instrument to the same tests as those undertaken for credit market development. Over-identification tests are carried out for the regressions which use *ethnic fractionalization* or *tropics* together with the *wheat–sugar ratio* as instruments. The even columns in Table 11 present the *p*-values of the tests, which indicate that the null hypothesis of no over-identification cannot be rejected for all but a handful of estimations using *tropics* as the additional instrument. Panel B of Table A5 in the Appendix reports the coefficients of the *wheat–sugar ratio* obtained from the semi-reduced form regressions where the ratio enters the second-stage regression directly and ethnic fractionalization is used as the additional instrument. The variable is statistically insignificant in all the specifications, suggesting that it has no direct impact on stock market capitalization. In the attempt to apply the plausible exogeneity test of Conley et al. (2012), it turns out that the estimated direct effect of the *wheat–sugar ratio* from Equations (3) and (4)

is statistically insignificant across the board. This provides further evidence that the main instrument is exogenous in the analysis on stock markets.

Table 11: Stock market development and income inequality—alternative instruments

	1975–2019 cross section				10-year panel, random effects with year dummy			
	IVs = wheat–sugar ratio + ethnic fractionalization		IVs = wheat–sugar ratio + tropics		IVs = wheat–sugar ratio + ethnic fractionalization		IVs = wheat–sugar ratio + tropics	
	Gini index	p-value of over-identification test	Gini index	p-value of over-identification test	Gini index	p-value of over-identification test	Gini index	p-value of over-identification test
Controls:	1	2	3	4	5	6	7	8
No controls	0.42 (0.553)	0.845	0.31 (0.539)	0.110	0.31 (0.746)	0.526	-0.33 (0.661)	0.119
Legal origins	0.37 (0.534)	0.681	0.32 (0.660)	0.106	0.13 (0.685)	0.696	-0.35 (0.650)	0.103
Religions	0.51 (0.541)	0.839	0.39 (0.521)	0.105	0.40 (0.742)	0.525	-0.26 (0.629)	0.119
Geography	0.03 (0.514)	0.738	-0.27 (0.503)	0.082	-0.13 (0.757)	0.393	-0.88 (0.686)	0.145
Regional dummies	1.07 (0.727)	0.790	0.71 (0.785)	0.077	0.51 (0.932)	0.397	-0.32 (1.031)	0.122
Ethnicity			0.59 (0.878)	0.189			-0.91 (1.412)	0.133
Institutions	2.39** (1.006)	0.866	2.27** (1.017)	0.519	2.14** (0.929)	0.459	1.59* (0.903)	0.224
Executive constraints	1.10* (0.651)	0.909	0.96 (0.669)	0.147	0.85 (0.806)	0.601	0.15 (0.737)	0.082
CPI	0.72 (0.533)	0.536	0.29 (0.487)	0.171	0.36 (0.746)	0.503	-0.40 (0.665)	0.098
Trade	0.39 (0.584)	0.811	0.29 (0.566)	0.112	0.30 (0.755)	0.530	-0.33 (0.640)	0.119
GDPPC	2.99** (1.230)	0.808	2.80** (1.095)	0.961	3.31** (1.387)	0.493	2.77** (1.318)	0.669
GDPPC & legal origins	3.17*** (1.149)	0.870	3.20*** (1.130)	0.844	3.02** (1.193)	0.993	3.07** (1.247)	0.743
GDPPC & religions	2.99*** (1.152)	0.768	2.52** (0.991)	0.719	3.32** (1.335)	0.470	2.72** (1.133)	0.932
GDPPC & geography	1.81* (1.029)	0.546	1.53 (0.985)	0.616	2.29* (1.219)	0.387	1.49 (1.357)	0.528
GDPPC & Regional dummies	3.13*** (1.173)	0.400	2.85*** (1.068)	0.809	3.42** (1.509)	0.264	2.60* (1.344)	0.573
GDPPC & ethnicity			2.71** (1.247)	0.989			2.67* (1.497)	0.580
GDPPC & Executive constraints	2.88** (1.237)	0.826	2.77** (1.137)	0.940	3.28** (1.419)	0.479	2.80** (1.270)	0.687
GDPPC & trade +CPI	2.41** (1.047)	0.372	1.88** (0.927)	0.616	3.11** (1.343)	0.420	2.40* (1.262)	0.446

Note: The dependent variable is *stock market capitalization/GDP*. For each regression only the results on the Gini are reported. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: authors' elaboration.

Finally, we produce estimates examining the effects of different income shares. In the odd rows, Table 12 presents the second-stage regression coefficients of these variables when GDP per capita is not included. They are statistically insignificant. This suggests that, largely, the overall effects of these income share indicators are statistically no different from zero. The even rows in the table report the results on the indicators alongside those on income levels obtained from estimations that control for

GDP per capita. The coefficients of the inequality-related variables are significant in all the regressions, except the ones that are conditional on geographic variables. The sign of the coefficients is positive for the top 5% and top 20% income shares and negative for the bottom 20% and mid 20%. This is confirmative of the main findings obtained when using the Gini index, i.e. inequality has a positive impact on stock market capitalization independent of the effects it may have on income. Moreover top income shares seem to facilitate stock market development, and the effect appears a bit larger from the income share held by the high and upper-middle classes as a whole than that accumulated by the extremely rich. However, this positive effect may be cancelled out by the countervailing force in which top income shares affect stock markets via reducing economic growth, thus leading to an overall impact that is largely insignificant. Likewise, the income shares of the non-rich, particularly the bottom 20% income group, have a hindering effect on stock markets, which is, however, balanced by their potential positive impact on economic growth, which in turn promotes stock market development.

Table 12: Stock markets development and income shares: TSLS estimates

Panel A: 1975–2019 cross section									
		Top 5%		Top 20%		Bottom 20%		Mid 20%	
		Top 5%	(log) GDP per capita	Top 20%	(log) GDP per capita	Bottom 20%	(log) GDP per capita	Mid 20%	(log) GDP per capita
No (other) controls	1	0.76 (0.821)		1.19 (1.291)		-2.45 (2.658)		-2.01 (2.183)	
	2	4.71** (1.959)	27.20*** (8.765)	6.08** (2.574)	20.98*** (6.251)	-13.53** (6.179)	23.39*** (7.721)	-11.32** (4.623)	23.92*** (7.271)
Controlling for legal origins	3	0.77 (0.813)		1.22 (1.278)		-2.50 (2.632)		-2.05 (2.160)	
	4	5.55*** (1.989)	33.17*** (9.038)	7.09*** (2.558)	25.42*** (6.444)	-15.78** (6.207)	28.23*** (7.883)	-13.23*** (4.592)	28.94*** (7.428)
Controlling for religions	5	0.90 (0.809)		1.41 (1.266)		-2.86 (2.563)		-2.40 (2.151)	
	6	4.65** (1.847)	29.29*** (9.400)	6.04** (2.435)	22.48*** (6.813)	-13.38** (5.728)	25.63*** (8.377)	-11.22** (4.383)	25.61*** (7.874)
Controlling for geography	7	-0.11 (0.730)		-0.20 (1.272)		0.39 (2.546)		0.31 (2.005)	
	8	2.24 (1.492)	16.78** (6.821)	3.67 (2.547)	15.57** (6.179)	-7.70 (5.446)	16.49** (6.878)	-5.84 (3.912)	15.85** (6.254)
Controlling for regional dummies	9	1.62 (1.211)		2.20 (1.672)		-4.72 (3.585)		-4.09 (3.075)	
	10	4.69*** (1.769)	18.97*** (5.263)	6.17** (2.432)	17.80*** (4.859)	-13.75** (5.703)	19.16*** (5.507)	-11.02** (4.557)	18.52*** (5.391)
Controlling for ethnicity	11	0.92 (1.347)		1.43 (2.096)		-3.06 (4.461)		-2.41 (3.529)	
	12	4.41** (2.234)	26.97*** (8.547)	5.81* (2.961)	21.10*** (6.087)	-13.23* (7.391)	23.39*** (7.627)	-10.61** (5.217)	23.90*** (7.081)
Controlling for executive constraints	13	1.78* (1.048)		2.70* (1.614)		-5.78 (3.512)		-4.59* (2.697)	
	14	4.59** (2.043)	24.70*** (11.174)	5.88** (2.667)	17.62** (7.929)	-12.93** (6.334)	18.86** (9.080)	-11.08** (4.826)	21.80*** (9.547)
Controlling for CPI and trade	15	0.70 (0.747)		1.07 (1.120)		-2.22 (2.348)		-1.84 (1.955)	
	16	3.15** (1.566)	16.50** (6.475)	4.04** (1.925)	13.14*** (4.654)	-9.23** (4.635)	14.90*** (5.581)	-7.54** (3.671)	14.59*** (5.481)

Panel B: 10-year panel with year dummies, random effects									
		Top 5%		Top 20%		Bottom 20%		Mid 20%	
		Top 5%	(log) GDP per capita	Top 20%	(log) GDP per capita	Bottom 20%	(log) GDP per capita	Mid 20%	(log) GDP per capita
No (other) controls	1	-0.13 (1.088)		-0.03 (1.427)		0.06 (2.961)		0.05 (2.427)	
	2	4.45** (2.027)	28.15*** (8.244)	5.59** (2.533)	22.84*** (5.845)	-12.89** (6.033)	25.19*** (6.768)	-10.65** (4.733)	25.51*** (6.936)
Controlling for legal origins	3	-0.14 (1.071)		-0.02 (1.535)		0.04		0.04	
	4	5.19** (2.121)	32.69*** (8.919)	6.34** (2.554)	25.84*** (6.177)	-14.52** (6.172)	28.33*** (7.179)	-12.15** (4.827)	29.04*** (7.376)
Controlling for religions	5	-0.01 (1.026)		0.24 (1.380)		-0.49 (2.828)		-0.40 (2.346)	
	6	4.42** (1.878)	30.59*** (8.906)	5.57** (2.367)	24.57*** (6.466)	-12.67** (5.492)	27.20*** (7.360)	-10.57** (4.406)	27.53*** (7.583)
Controlling for geography	7	-0.99 (1.100)		-1.13 (1.458)		2.31 (2.983)		-6.54 (4.332)	
	8	2.49 (1.763)	20.36*** (7.195)	3.79 (2.724)	18.86*** (6.168)	-8.75 (5.957)	20.60*** (6.768)	-6.37 (4.447)	19.48*** (6.477)
Controlling for regional dummies	9	0.28 (1.590)		0.47 (1.918)		-1.03 (4.156)		-0.89 (3.592)	
	10	4.65** (2.041)	23.65*** (5.581)	5.82** (2.559)	22.20*** (4.865)	-13.59** (6.106)	23.95*** (5.286)	-11.05** (4.812)	22.46*** (5.040)
Controlling for ethnicity	11	-0.57 (1.864)		-0.49 (2.362)		1.05 (5.093)		0.83 (3.984)	
	12	3.75 (2.319)	27.42*** (8.053)	4.76 (2.938)	22.95*** (5.596)	-11.47 (7.295)	25.02*** (6.609)	-8.02* (5.356)	25.19*** (6.695)
Controlling for executive constraints	15	0.85 (1.342)		-0.01 (1.507)		0.07 (3.231)		0.03 (2.616)	
	16	4.46** (2.055)	28.65*** (8.594)	5.65** (2.496)	24.68*** (6.445)	-12.95** (5.979)	26.54*** (6.946)	-10.73** (4.679)	27.12*** (7.318)
Controlling for CPI and trade	17	-0.01 (1.005)		-0.02 (1.500)		0.03 (3.150)		0.02 (2.612)	
	18	4.21** (1.978)	26.43*** (7.652)	5.34** (2.450)	22.05*** (5.467)	-11.78** (5.660)	23.22*** (6.060)	-10.13** (4.590)	24.21*** (6.401)

Note: The dependent variable is *stock market capitalization/GDP*. The IV is the (log) *wheat-sugar ratio*. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for cross-section regressions, and standard errors are clustered at country level for panel regressions.

Source: authors' elaboration.

5 Conclusions

This paper provides a systematic empirical analysis on the impact of inequality on financial development. We find clear evidence to support the hypothesis that income inequality harms the development of credit markets. We also find that, when accounting for its effect on economic development, inequality has a positive effect on stock market development. The results are robust to controlling for variables that capture alternative hypotheses of financial development, and our main instrument passes standard statistical tests as well as various exercises that assess its validity. They also hold when using alternative samples and alternative indicators of financial development and inequality.

Our findings imply that there are significant interlinkages between SDGs 10 and 8. In particular, the goal of reducing inequality within countries (SDG Goal 10) may support that of strengthening the capacity of domestic financial institutions, because SDG 8 Target 10 explicitly refers to expanding access to banking services. Hence the inclusion of inequality reduction in the development goals may

help to support credit market development in less-developed economies, offering further justification for this choice.

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Appendix

Table A1: Variables and data sources

Variable	Description	Source
Financial development		
Domestic credit to private sector/GDP	Private credit by deposit money banks and other financial institutions as a % of GDP. For years 1960–2019.	Global Financial Development Database (GFDD), World Bank (2022)
Bank credit/GDP	Credit to the private sector by domestic money banks as a % of GDP. For years 1960–2019.	GFDD, World Bank (2022)
Financial institutions depth index	An index which compiles data on bank credit to the private sector in % of GDP, pension fund assets to GDP, mutual fund assets to GDP, and insurance premiums (life and non-life) to GDP. For years 1980–2019.	Financial Development Index Database, IMF (2021)
Financial institutions index	An index which aggregates the indices of financial institutions' depth, access, and efficiency. For years 1980–2019.	Financial Development Index Database, IMF (2021)
Stock market capitalization/GDP	Total stock market capitalization as a % of GDP. For years 1975–2019.	GFDD, World Bank (2022)
Stock traded/GDP	Total value of all traded shares in a stock market exchange as a % of GDP. For years 1975–2019.	GFDD, World Bank (2022)
Income inequality		
Gini index, standardized	Reported values of Gini which are standardized and adjusted for the sake of comparability over time and across countries. For years 1960–2019.	WIID, UNU-WIDER (2021)
Top 5 income share	Income share of the top 5% (between percentile 96 and 100). For years 1960–2019.	WIID, UNU-WIDER (2021)
Top 20 income share	Income share of the top 20%. For years 1960–2019.	WIID, UNU-WIDER (2021)
Bottom 20 income share	Income share of the bottom 20%. For years 1960–2019.	WIID, UNU-WIDER (2021)
Mid 20 income share	Income share of the middle 20% (the third quintile). For years 1960–2019.	WIID, UNU-WIDER (2021)
Gini index from SWIID	Estimate of Gini index of inequality in equivalized (square root scale) household disposable (post-tax, post-transfer) income. For years 1960–2019.	SWIID dataset, Solt (2020)
Instruments and control variables		
(log) wheat–sugar ratio	$\text{Log} [(1 + \text{share of arable land suitable for wheat}) / (1 + \text{share of arable land suitable for sugarcane})]$.	Easterly (2007)
Tropics	The share of a country's cultivated land area in tropical climate zones.	Teorell et al. (2023)
Legal origin	Dummy variables to code countries according to their legal origins.	Teorell et al. (2023)
Religion	Dummy variable which takes the value 1 for countries with Muslim as the dominant religion (the religion with the largest population share) in 1980 or 1990–95 for countries formed more recently.	Teorell et al. (2023)
Landlocked	Dummy variable that equals 1 if a country is fully enclosed by land and 0 otherwise.	Authors' classification
Island	Dummy variable that equals 1 if a country is an island and 0 otherwise.	Authors' classification
Distance to coast	Average distance to the nearest ice-free coast (1,000km).	Teorell et al. (2023)
Ruggedness	An index that quantifies small-scale terrain irregularities in a country.	Teorell et al. (2023)
Africa dummy	Dummy variable which equals 1 for African countries.	Authors' classification
South America dummy	Dummy variable which equals 1 for South American countries.	Authors' classification
Ethnicity	Ethnic fractionalization measured as an index ranging from 0 (perfectly homogeneous) to 1 (highly fragmented).	Teorell et al. (2023)
World Bank Governance Indicator	The mean value of six governance indices, normalized between 0 and 1. Higher values indicate better governance. For years 1996–2019.	World Bank (2023)

Quality of government	The mean value of the ICRG variables 'Corruption', 'Law and Order' and 'Bureaucracy Quality', scaled 0–1. Higher values indicate higher quality of government. For years 1984–2019.	Teorell et al. (2023)
Protection of property rights	Index of (the perception of) the security of property rights. For years 1994–2015.	Teorell et al. (2023)
GDP per capita	Log of GDP per capita (constant 2015 USD). For years 1960–2019.	World Development Indicators, World Bank (2024)
Executive constraints	Executive Constraints (Decision Rules): an index of seven-category scale to indicate the extent of institutionalized constraints on the decision-making powers of chief executives. Higher values indicate more substantial limitations on executive authority. For years 1960–2019.	Teorell et al. (2023)
Land Gini	Gini coefficients of land distribution constructed by Frankema (2010). For the year around 1960 for most countries and the earliest available observation for the others.	Frankema (2010)
CPI	Consumer price index. For years 1960–2019.	World Development Indicators, World Bank (2024)
Trade	Trade openness measured as the sum of exports and imports as a % of GDP. For years 1960–2019.	World Development Indicators, World Bank (2024)
Constructed trade share	Index measuring natural geographic openness of a country, constructed by Frankel and Romer (1999).	Teorell et al. (2023)

Source: Authors' elaboration.

Table A2: Descriptive statistics for the main variables

Panel A: Cross Section, 1960–2019						
Variable		Mean	Standard Deviation	Min.	Max.	No. of Observations
Domestic credit to private sector/GDP (%)		37.65	29.71	1.31	172.69	168
Bank credit/GDP (%)		35.62	28.00	1.31	172.69	168
Stock market capitalization/GDP (%)		46.65	47.51	0.07	496.62	92
Stock traded/GDP (%)		19.45	34.18	0.01	277.67	93
Gini index, standardized		44.78	10.88	25.31	70.07	166
Gini index from SWIID		39.48	8.09	23.32	61.50	168
(log) wheat–sugar ratio		0.08	0.19	-0.39	0.54	108
(log) GDP per capita		8.21	1.42	5.62	11.15	165
World Bank Governance Indicator (normalized)		0.61	0.17	0.29	0.98	168
Executive constraints		4.33	1.89	1	7	148
Ethnic fractionalization		0.44	0.26	0	0.93	159
Tropics		42.82	45.58	0	100	167
CPI		25.73	71.75	1.37	675.85	166
Trade		81.29	49.99	19.73	328.92	162
Panel B: 10-year Panel						
Variable		Mean	Standard Deviation	Min.	Max.	No. of Observations
Domestic credit to private sector/GDP (%)	Overall	43.07	38.09	0.24	214.59	602
	Between		31.72	3.13	169.83	
	Within		20.49	-24.39	139.00	
Bank credit/GDP (%)	Overall	40.41	35.48	0.17	214.59	602
	Between		30.17	3.13	169.83	
	Within		19.31	-25.45	136.34	
Stock market capitalization/GDP (%)	Overall	51.78	85.49	0.07	1111.19	266
	Between		51.81	0.07	429.67	
	Within		57.57	-296.35	733.30	
Stock traded/GDP (%)	Overall	23.06	47.85	0.0003	538.70	274
	Between		28.67	0.01	214.75	
	Within		34.77	-187.91	347.01	
Gini index, standardized	Overall	44.07	11.24	17.19	75.5	602
	Between		10.85	25.01	70.51	
	Within		3.15	31.44	58.39	
Gini index from SWIID	Overall	38.87	8.52	20.78	63.06	549
	Between		8.08	23.42	61.38	
	Within		1.59	30.81	46.64	
(log) GDP per capita	Overall	8.37	1.47	5.29	11.52	589
	Between		1.42	5.62	11.22	
	Within		0.33	6.63	9.73	
World Bank Governance Indicator (normalized)	Overall	0.62	0.17	0.30	0.99	429
	Between		0.17	0.32	0.97	
	Within		0.02	0.54	0.72	
Executive constraints	Overall	4.89	2.02	1	7	555
	Between		1.80	1	7	
	Within		1.04	0.76	7.92	
CPI	Overall	19.81	93.39	-0.26	1383.16	577
	Between		47.80	0.29	302.62	
	Within		79.48	-276.99	1121.12	
Trade	Overall	77.72	54.19	9.74	399.45	563
	Between		53.97	19.52	339.78	
	Within		17.43	-4.12	197.28	

Note: Descriptive statistics for stock market capitalization and *stock traded* are over the years 1975–2019.

Source: Authors' elaboration.

Table A3: Private credit and income inequality—robustness checks

	Controls:	No controls	Legal origins	Religions	Geographic variables	Regional dummies	Ethnicity	Institutions	Executive constraints	GDP per capita
Panel A: alternative sample—countries with data on the wheat–sugar ratio	1960–2019 cross section	-1.58*** (0.213)	-1.60*** (0.216)	-1.55*** (0.202)	-1.43*** (0.205)	-1.11*** (0.284)	-1.23*** (0.248)	-0.69*** (0.186)	-1.09*** (0.214)	-0.49** (0.210)
	10-year panel, random effects	-0.98*** (0.193)	-0.99*** (0.188)	0.96*** (0.182)	-0.86*** (0.187)	-0.34 (0.219)	-0.59** (0.237)	-0.44*** (0.130)	-0.98*** (0.169)	0.06 (0.170)
Panel B: alternative sample—developing countries	1960–2019 cross section	-0.77*** (0.165)	-0.77*** (0.179)	-0.83*** (0.171)	-0.68*** (0.152)	-0.27 (0.211)	-0.62*** (0.172)	-0.60*** (0.138)	-0.69*** (0.176)	-0.42** (0.162)
	10-year panel, random effects	-0.44*** (0.153)	-0.44*** (0.161)	-0.47*** (0.150)	-0.40*** (0.150)	-0.09 (0.170)	-0.35** (0.171)	-0.35*** (0.123)	-0.42*** (0.153)	-0.14 (0.123)
Panel C: alternative sample—non-socialist countries	1960–2019 cross section	-1.92*** (0.188)	-1.94*** (0.187)	-1.94*** (0.175)	-1.83*** (0.201)	-1.53*** (0.226)	-1.63*** (0.203)	-0.77*** (0.175)	-1.52*** (0.198)	-0.75*** (0.221)
	10-year panel, random effects	-1.35*** (0.179)	-1.37*** (0.179)	-1.41*** (0.167)	-1.27*** (0.192)	-0.76*** (0.190)	-1.14*** (0.202)	-0.67*** (0.164)	-1.40*** (0.194)	-0.25 (0.169)
Panel D: alternative cross sections	1970–2019	-1.62*** (0.177)	-1.67*** (0.179)	-1.63*** (0.167)	-1.55*** (0.172)	-1.22*** (0.226)	-1.32*** (0.192)	-0.61*** (0.147)	-1.17*** (0.181)	-0.49*** (0.173)
	1980–2019	-1.74*** (0.191)	-1.79*** (0.192)	-1.75*** (0.181)	-1.67*** (0.188)	-1.29*** (0.241)	-1.41*** (0.210)	-0.61*** (0.153)	-1.28*** (0.190)	-0.45** (0.180)
	1990–2019	-1.88*** (0.216)	-1.93*** (0.217)	-1.90*** (0.204)	-1.80*** (0.212)	-1.33*** (0.276)	-1.50*** (0.236)	-0.60*** (0.161)	-1.49*** (0.207)	-0.42** (0.194)
Panel E: alternative panels	5-year panel, random effects	-0.71*** (0.169)	-0.73*** (0.171)	-0.75*** (0.163)	-0.69*** (0.167)	-0.18 (0.197)	-0.51*** (0.197)	-0.47*** (0.139)	-0.76*** (0.176)	0.01 (0.140)
	7-year panel, random effects	-0.88*** (0.165)	-0.89*** (0.168)	-0.91*** (0.157)	-0.84*** (0.161)	-0.31 (0.191)	-0.65*** (0.193)	-0.51*** (0.130)	-0.91*** (0.177)	-0.06 (0.150)
Panel F: alternative financial development indicator—credit from deposit money banks	1960–2019 cross section	-1.44*** (0.157)	-1.48*** (0.161)	-1.45*** (0.149)	-1.38*** (0.152)	-1.07*** (0.203)	-1.15*** (0.170)	-0.58*** (0.136)	-1.08*** (0.169)	-0.51*** (0.163)
	10-year panel, random effects	-0.93*** (0.161)	-0.96*** (0.163)	-0.96*** (0.153)	-0.91*** (0.155)	-0.44** (0.180)	-0.72*** (0.179)	-0.44*** (0.129)	-0.95*** (0.164)	-0.10 (0.135)
Panel G: alternative financial development indicator—financial institutions depth index	1980–2019 cross section	-0.009*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.009*** (0.002)	-0.007*** (0.002)	-0.008*** (0.002)	-0.0005 (0.001)	-0.005*** (0.002)	0.0001 (0.002)
	10-year panel, random effects	-0.003*** (0.001)	-0.003** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.0008 (0.001)	-0.002 (0.001)	-0.0006 (0.001)	-0.004*** (0.001)	0.0002 (0.001)

Panel H: alternative financial development indicator—financial institutions index	1980–2019 cross section	-0.01*** (0.001)	-0.01*** (0.001)	-0.01*** (0.001)	-0.007*** (0.002)	-0.007*** (0.002)	-0.009*** (0.001)	-0.003*** (0.001)	-0.007*** (0.001)	-0.002** (0.001)
	10-year panel, random effects	-0.005*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)	-0.002** (0.001)	-0.004*** (0.001)	-0.003*** (0.001)	-0.005*** (0.001)	-0.001 (0.001)
Panel I: alternative inequality indicator—Gini index from SWIID	1960–2019 cross section	-1.78*** (0.242)	-1.78*** (0.245)	-1.79*** (0.227)	-1.81*** (0.244)	-1.14*** (0.270)	-1.42*** (0.251)	-0.55*** (0.188)	-1.28*** (0.228)	-0.63*** (0.194)
	10-year panel, random effects	-1.04*** (0.264)	-1.04*** (0.266)	-1.11*** (0.248)	-1.15*** (0.253)	-0.36 (0.293)	-0.86*** (0.287)	-0.56*** (0.195)	-1.14*** (0.257)	-0.11 (0.216)

Note: Each cell reports the results on the inequality variable from a separate regression. The proxy for institutions is the normalized governance indicator from the World Bank. Data on financial institutions depth index and financial institutions index are available from 1980 on. For seven-year panel data the data are averaged every seven years for the period 1964–2019. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

Table A4: Private credit and income inequality, 2SLS estimates—robustness checks

Controls:		No controls	Legal origins	Religions	Geographic variables	Regional dummies	Ethnicity	Institutions	Executive constraints	GDP per capita
Panel A: alternative sample—developing countries	1960–2019 cross section	-1.34*** (0.513)	-1.59** (0.717)	-1.58** (0.664)	-0.87** (0.377)	-1.47** (0.624)	-1.16* (0.612)	-1.18** (0.506)	-1.13** (0.558)	-1.23** (0.505)
	10-year panel, random-effect	-1.32 (0.931)	-1.59 (1.167)	-1.77 (1.459)	-0.50 (0.614)	-1.47* (0.866)	-1.07 (1.118)	-1.01 (0.719)	-1.22 (1.020)	-0.84 (0.658)
	1960–2019 cross section	-3.09*** (0.465)	-3.11*** (0.467)	-3.06*** (0.462)	-2.84*** (0.428)	-3.43*** (0.682)	-3.57*** (0.852)	-2.53** (1.074)	-3.04*** (0.685)	-3.00*** (1.016)
Panel B: alternative sample—non-socialist countries	10-year panel, random-effect	-3.35*** (0.526)	-3.39*** (0.524)	-3.31*** (0.524)	-3.15*** (0.474)	-3.59*** (0.738)	-3.88*** (1.007)	-3.69*** (1.377)	-3.35*** (0.642)	-2.18** (0.900)
	1970–2019	-2.71*** (0.442)	-2.78*** (0.435)	-2.66*** (0.438)	-2.54*** (0.427)	-3.22*** (0.765)	-2.79*** (0.677)	-1.30** (0.521)	-2.21*** (0.565)	-1.56*** (0.588)
	1980–2019	-3.00*** (0.512)	-3.08*** (0.500)	-2.96*** (0.507)	-2.85*** (0.501)	-3.61*** (0.903)	-3.10*** (0.775)	-1.26** (0.599)	-2.42*** (0.616)	-1.66** (0.733)
Panel C: alternative cross sections and panels	1990–2019	-3.31*** (0.582)	-3.38*** (0.565)	-3.25*** (0.576)	-3.18*** (0.578)	-3.94*** (1.008)	-3.41*** (0.872)	-1.13* (0.667)	-2.70*** (0.648)	-1.66** (0.843)
	5-year panel, random-effect	-2.91*** (0.511)	-2.93*** (0.508)	-2.84*** (0.503)	-2.77*** (0.496)	-3.32*** (0.777)	-3.16*** (0.851)	-1.45** (0.684)	-2.74*** (0.571)	-1.01* (0.581)
	7-year panel, random-effect	-2.89*** (0.496)	-2.91*** (0.491)	-2.82*** (0.487)	-2.75*** (0.483)	-3.25*** (0.750)	-3.04*** (0.794)	-1.56** (0.649)	-2.72*** (0.558)	-0.97* (0.570)
Panel E: alternative financial development indicator—credit from deposit money banks	1960–2019 cross section	-2.29*** (0.347)	-2.36*** (0.340)	-2.26*** (0.344)	-2.10*** (0.315)	-2.64*** (0.602)	-2.29*** (0.533)	-1.25*** (0.430)	-2.00*** (0.468)	-1.42*** (0.475)
	10-year panel, random-effect	-2.48*** (0.396)	-2.50*** (0.388)	-2.44*** (0.391)	-2.31*** (0.360)	-2.73*** (0.613)	-2.53*** (0.653)	-1.15*** (0.593)	-2.31*** (0.467)	-1.16** (0.571)
	1980–2019 cross section	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.03*** (0.006)	-0.02*** (0.005)	-0.003 (0.003)	-0.02*** (0.004)	-0.009* (0.005)
Panel F: alternative financial development indicator—financial institutions depth index	10-year panel, random-effect	-0.02*** (0.004)	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.03*** (0.007)	-0.02*** (0.006)	-0.006 (0.004)	-0.02*** (0.004)	-0.008* (0.004)
	1980–2019 cross section	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.03*** (0.005)	-0.02*** (0.004)	-0.01*** (0.003)	-0.02*** (0.003)	-0.01*** (0.004)
	10-year panel, random-effect	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.02*** (0.003)	-0.03*** (0.006)	-0.02*** (0.005)	-0.01*** (0.004)	-0.02*** (0.003)	-0.01*** (0.004)
Panel G: alternative financial development indicator – financial institutions index	1960–2019 cross section	-3.12*** (0.515)	-3.19*** (0.512)	-3.04*** (0.516)	-2.90*** (0.469)	-3.33*** (0.770)	-2.82*** (0.686)	-1.50*** (0.566)	-2.28*** (0.548)	-1.51*** (0.538)
	10-year panel, random-effect	-3.49*** (0.627)	-3.53*** (0.622)	-3.35*** (0.603)	-3.30*** (0.592)	-3.70*** (0.885)	-3.22*** (0.866)	-1.74** (0.687)	-3.00*** (0.652)	-1.13* (0.604)

Note: Each cell reports the results on the inequality variable from a separate regression. The instrument is the (log) wheat–sugar ratio. The proxy for institutions is the normalized governance indicator from the World Bank. Data on financial institutions depth index and financial institutions index are available from 1980 on. For 7-year panel data, the data are averaged every seven years

for the period 1964–2019. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

Table A5: Second-stage coefficient of the *wheat–sugar ratio*—semi-reduced form specifications

	Panel A: Credit markets development (dependent variable=domestic credit to private sector/GDP)		Panel B: Stock market development (dependent variable=stock market capitalization/GDP)	
	1960–2019 cross section	10-year panel, random effect with year dummy	1975–2019 cross section	10-year panel, random effect with year dummy
No controls	6.32 (26.512)	13.25 (32.125)	-8.61 (44.105)	29.87 (45.982)
Controlling for legal origins	13.83 (26.043)	20.11 (31.177)	-18.74 (44.916)	16.99 (43.760)
Controlling for religions	13.43 (26.248)	18.49 (31.490)	-8.78 (43.171)	29.26 (45.222)
Controlling for geography	20.78 (27.197)	32.17 (31.454)	16.84 (48.859)	43.08 (46.291)
Controlling for regional dummies	-14.21 (57.075)	6.78 (53.380)	18.42 (72.446)	54.14 (67.427)
Controlling for ethnicity				
Controlling for institutions	0.81 (20.930)	-0.76 (25.579)		34.67 (52.285)
Controlling for executive constraints	2.70 (25.555)	14.06 (30.732)	-4.54 (39.566)	20.36 (38.460)
Controlling for CPI	6.65 (25.961)	14.87 (31.855)	31.03 (51.698)	30.83 (44.859)
Controlling for trade	6.32 (26.370)	10.94 (33.242)	-10.65 (44.458)	30.57 (48.144)
Controlling for GDPPC	5.50 (21.193)	11.38 (22.918)	12.67 (56.000)	22.07 (34.520)
Controlling for GDPPC & legal origins	8.84 (20.01)	11.63 (21.510)	-9.66 (34.129)	0.27 (31.266)
Controlling for GDPPC & religions	8.59 (20.362)	12.68 (22.356)	16.36 (60.883)	23.74 (35.583)
Controlling for GDPPC & geography	15.14 (19.078)	23.38 (20.191)	27.67 (47.669)	27.82 (31.284)
Controlling for GDPPC & regional dummies	-7.55 (44.814)	9.98 (38.824)	92.96 (210.807)	66.10 (91.697)
Controlling for GDPPC & executive constraints	4.16 (22.045)	12.31 (23.284)	11.27 (55.025)	23.63 (36.76)
Controlling for GDPPC & trade + CPI	5.80 (19.875)	5.15 (23.722)	44.20 (63.241)	26.99 (35.709)

Note: Each cell corresponds to a separate regression and reports the second-stage coefficient on the wheat–sugar ratio while inequality is instrumented by ethnic fractionalization. The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.

Table A6: Stock markets development and income inequality—first-stage regression from TSLS estimates

Panel A: Gini index and other determinants of financial development (1975–2019 cross section)									
Controls:	No controls	Legal origins	Religions	Geographical variables	Regional dummies	Ethnicity	Institutions	Executive constraints	CPI & trade
First-stage regression									
Wheat–sugar	-29.92*** (4.582)	-30.08*** (5.003)	-30.31*** (4.904)	-34.62*** (5.735)	-21.88*** (3.028)	-21.62*** (5.328)	-20.05*** (4.974)	-26.41*** (4.500)	-29.08*** (3.854)
F statistic	42.63	36.15	38.21	36.44	52.20	16.46	16.24	34.45	56.93
Panel B: Gini index and other determinants of financial development (10-year panel, random effects)									
First-stage regression									
Wheat–sugar	-29.88*** (4.268)	-29.73*** (4.459)	-30.14*** (4.631)	-32.32*** (4.643)	-22.04*** (3.524)	-18.78*** (4.680)	-22.85*** (4.605)	-27.21*** (4.718)	-30.23*** (4.095)
F statistic	49.02	44.46	42.36	48.46	39.11	16.10	23.98	33.27	54.52
Panel C: adding GDP per capita (GDPPC) (1975–2019 cross section)									
Controls:	GDPPC	GDPPC & legal origins	GDPPC & religions	GDPPC & geography	GDPPC & regional dummies	GDPPC & ethnicity	GDPPC & executive constraints	GDPPC & trade, CPI	
First-stage regression									
Wheat–sugar	-16.54*** (4.593)	-16.45*** (4.536)	-16.71*** (4.779)	-20.14*** (5.990)	-16.54*** (3.460)	-14.25*** (4.906)	-16.17*** (4.817)	-17.51*** (4.137)	
F statistic	12.98	13.16	12.22	11.30	22.85	8.43	11.27	17.91	
Panel D: Gini index and other determinants of financial development (10-year panel, random effects)									
First-stage regression									
Wheat–sugar	-15.82*** (4.340)	-15.93*** (4.299)	-15.89*** (4.512)	-17.22*** (5.296)	-16.49*** (3.951)	-11.55** (4.528)	-15.82*** (4.621)	-16.74*** (4.165)	
F statistic	13.28	13.73	12.40	10.58	17.43	6.50	11.71	16.16	

Note: The dependent variable is *stock market capitalization/GDP*. In each panel each column corresponds to a separate regression, where the first-stage regression results on the excluded instrument and F statistics are reported. The instrument is the (log) wheat–sugar ratio (Easterly 2007). The proxy for institutions is the normalized governance indicator from the World Bank. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Figures in parentheses are robust standard errors for regressions using cross-sectional data, and standard errors are clustered at country level for panel regressions with random effects.

Source: Authors' elaboration.