

Financial structure and income inequality^{*}

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Abstract

This paper empirically investigates the link between financial structure and income inequality. Using data for a panel of 97 economies over the period 1989-2012, we find that the relationship is not monotonic. Up to a point, more finance reduces income inequality. Beyond that point, inequality rises if finance is expanded via market-based financing, while it does not when finance grows via bank lending. These findings concur with a well-established literature indicating that deeper financial systems help reduce poverty and inequality in developing countries, but also with recent evidence of rising inequality in various financially advanced economies.

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1. Introduction

This paper tries to answer four specific questions: i) does financial development affect inequality?; ii) does the financial structure (the mix of bank- vs market-provided funds) change the finance-inequality relationship?; iii) is the relationship non-linear (below vs beyond a certain threshold)?; and iv) does this non-linearity differ for bank- vs market-provided finance?

Answering these questions is particularly relevant because inequality is gaining attention in the public policy debate. Growing income and wealth disparity, especially within major advanced economies, has raised concerns about its economic and social consequences (Piketty, 2014; Atkinson, 2015). In principle, financial development should enhance growth by improving the efficiency of capital allocation and by relaxing borrowing constraints (Levine, 2005). However, this disregards the issue of which part of society benefits from the growth enabled by financial development. Moreover, very little is known about the link between different types of financial development and inequality.

Finance-induced growth may be pro-poor by expanding employment opportunities, but it may also favour entrepreneurs and their profit margin. The relationship between inequality and development was pioneered by Kuznets (1955), who established the inverted U-shaped path of income inequality along economic development (Kuznets curve). At the industrial take-off, Kuznets argued, mean incomes and their dispersion are lower in rural vis-à-vis urban areas. So, urbanization raises inequality. But, as new generations of rural people migrate to cities, they can profit from urban opportunities. The wages of lower-income groups rise, narrowing overall inequality. Kuznets' argument of urban opportunities requires financial development, enabling formerly poor migrants to finance their education and build their own businesses – regardless of inherited wealth or lack of it.

Three theoretical landmark papers explaining the finance-inequality nexus are Banerjee and Newman (1993), Galor and Zeira (1993), and Greenwood and Jovanovic (1990). Whereas the first two predict that better developed financial markets will reduce income inequality, the latter foresees an inverted-U-shaped relationship between financial development and inequality. In other words, in the early stages of financial development – when only a small part of society benefits – income inequality increases. However, after a certain stage of financial development is reached, more finance helps reducing income inequality. While the theoretical channels are not thus clear, the key reason why higher financial development – at least after a certain stage –

reduces income inequality is always that better credit availability allows more household choices and decisions to be based on better allocation of spending over time, free from inherited wealth.

More recently, instead, some theoretical models started addressing ways in which financiers may help to increase income inequality by enlarging rent extraction. Rent may be extracted in various ways. Among them, Korinek and Kreamer (2014) develop a model by which financial deregulation raises inequality. Various models tackle the issue of harmful or inefficient financial innovation (Gennaioli et al., 2012; Thakor, 2012; Bolton et al., 2016b) which determines rent extraction by agents and induces more unequal income distribution.

In turn, the empirical studies tended to find that financial development improves the income of the poor, especially in developing countries (see, amongst others, Demirgüç-Kunt and Levine (2009) for an extensive review and Burgess and Pande (2005) for the Indian case). Using information on a large number of countries, Clarke et al. (2006) and Beck et al. (2007) test the different theories and support the prediction of a linear inequality-reducing influence of financial development. However, in line with the theoretical model of Greenwood and Jovanovic (1990), Kim and Lin (2011) find that the benefits of financial depth only manifest if the country has reached a threshold level of financial development.

Yet recent empirical works, such as Jaumotte et al. (2013), Jauch and Watzka (2016) and de Haan and Sturm (2017) find that more finance increases income inequality, especially if one expands the database also to advanced economies and more recent data.¹ The idea is gaining support that, above a certain threshold, financial development could benefit higher wage classes more extensively. In particular, inequality could rise also due to the booming remuneration of senior executives (Kay, 2016). Rajan (2010) indicates that wage stagnation and rising income inequality in the United States prior to the Global Financial Crisis encouraged low/middle-income households to increase their indebtedness as a way of maintaining their consumption levels. Higher indebtedness, in turn, increased income transfers from constrained households to the wealthier, i.e. the funds providers, further exacerbating inequality.

As for the first question – does financial development affect inequality? – Section 4 expands the discussion of the existent theoretical predictions and empirical findings. Since a consensus is lacking among the various theoretical contributions on the shape of the financial development-inequality relationship, empirical explorations become essential. That is why we augment the

¹ De Haan et al (2018) also find that financial development strengthens the inequality-raising impact of financial liberalization.

empirical investigation by considering a long-run span and by including almost one hundred developed and emerging countries.

Next, to answer the second question – does the financial structure (the mix of bank- vs market-provided funds) change the finance-inequality relationship? – we move beyond a single measure of financial development by allowing different types of finance to affect the finance-inequality nexus differently. Indeed, reliance on bank- vs market- financing may have different implications here in view of, eg: limited capital market participation vs universal participation in banking, varying degrees of competition in financial market services vs banking, the fact that financial markets (mostly) trade on public information while banks rely (also) on private information, and the fact that formal contracting usually prevails for financial market services, while banks may employ (also) informal contracts – such as in relationship lending. For this reason, we investigate the link between financial development and income inequality distinguishing bank- vs market-financing.

To tackle the third question – is the relationship between finance and inequality non-linear? – we consider a more general set up that allows the possibility for the finance-inequality nexus to change below vs beyond a certain threshold.² As already hinted above and further discussed in Section 4, some theories predict a linear (monotonic) shape of the link, while others envisage a non-linear shape whose sign changes at certain thresholds. Also, among the latter theories, some foresee that more finance reduces (raises) inequality before (after) the threshold – a beneficial-to-detrimental pattern – while others expect that more finance, especially at the very early stage of development, raises (reduces) inequality before (after) the threshold – a detrimental-to-beneficial pattern.

To answer the fourth question – does this non-linearity differ for bank- vs market-provided finance? – we allow the shape of the finance-inequality relationship to differ for bank- vs market-financing. A relevant consideration here is the way in which credit intermediation is moving away from the banking sector to the debt securities market. However, most of the experience with macroprudential tools to date has come from banking. For instance, if the beneficial-to-detrimental pattern applies to market- finance but not to bank- finance, this would call for a better knowledge by policy makers as to which measures could be taken to address the build-up of financial excesses that originate from outside the banking system (Cizel et al., 2016).

² On different grounds, Arcand et al (2015) find that finance starts having a negative effect on output growth when credit to the private sector reaches 100% of GDP. See also Cecchetti and Kharroubi (2012).

The main result of the paper is that more finance (both bank- and market-based) reduces income inequality but only up to a point. Beyond that point, income disparity rises if finance is expanded via market-based financing, while it doesn't rise significantly when finance grows via bank lending. Thus, our findings support the view that the beneficial-to-detrimental pattern applies only to financial market-financing but not to banks. Even though this result withstood various robustness checks, further analyses are needed.

The remainder of the paper is organised as follows. Section 2 presents cross-country information of our main variables of interest, while Sections 3 and 4 summarize the existing literature on the determinants of financial development and its relationship with inequality. The econometric results are presented in Section 5. Robustness tests are discussed in Section 6 and the final section concludes.

2. Data

As an aggregate measure of financial development, we use the index provided by Svirydzenka (2016). This study creates nine indices that summarize how developed financial institutions and financial markets are in terms of depth, access and efficiency. These indices are then aggregated into an overall index of financial development (FD). The evolution of the FD index over the sample period show that financial development has progressed quite noticeably in both in advanced economies and emerging markets. However, the gap between the two groups of countries widened significantly between the mid-1990s and early 2000s (see Graph 1). As indicated by Svirydzenka (2016), this gap reflects a period of rapid credit growth in the advanced economies financial systems.

Unfortunately, the coverage of the FD index by Svirydzenka (2016) is limited in the eighties and nineties and it is not clear how one should treat missing values of particular subcategories when constructing the index (e.g. the financial access index only started to be collected in 2004, see Table 3 in Svirydzenka (2016)). For this reason, when it comes to distinguishing between the intermediation services that banks and financial markets provide, we rely on more standard indicators that approximate different aspects of the two intermediation channels: bank credit, equity and bond market capitalization (Beck et al, 2000; Levine, 2005). This allows us to pass from 228 to 341 country*(5-year average) observations.

Graph 2 depicts the financial structure for 97 countries and two years: 1989 (or the first non-missing observation in our database) and 2012. It plots the ratio of bank credit to the sum of bank credit plus total equity and bond market capitalization – a proxy for the relative importance of

banks and markets. The higher this ratio, the greater is the importance of banks and, consequently, the smaller that of markets in a financial system.

Two patterns emerge. First, financial structure differs considerably across countries. The relative importance of banking ranges from 16% in Papua New Guinea to almost 100% of GDP in Uruguay. Empirically, the origin of a country's legal framework has been shown to affect the composition of its business financing. Firms in common law countries tend to rely more on traded equity and have a more diffuse shareholder base than firms in countries that follow the French civil law tradition. Moreover, a correlation emerges between a country's legal origin and its overall financial development. Common law countries outperform civil law ones with more developed financial systems (La Porta et al., 1997; Beck et al., 2001).

Second, financial structure is dynamic. Market-based intermediation gained ground between 1989 and 2012. Indeed, most countries lie below the 45-degree line that identifies shifts of the financial structure from bank- to market-based, mostly reflecting changes in emerging market economies.

Another interesting stylized fact shown in Graph 2 is the positive trend in income inequality among high-income countries prior to the Global Financial Crisis. Instead, inequality is more stable, albeit on a higher level, in the low- and middle-income countries, where income structures have converged as evidenced by the decrease of inequality dispersion over time.³

3. Financial development, financial structure and country characteristics

What accounts for the differences in countries' financial development and their evolution through time? What drives cross-country variability in financial structure? What is the influence of real sector characteristics, such as the level of economic development or the sectoral composition of economic activity? And what is the role of institutional factors such as the legal framework? We discuss these issues by drawing on the literature and using cross-country sectoral information.

There is a general tendency for more economic affluent countries to also show higher degrees of financial development. However, the variability of the financial development indicators among nations is relatively large even after accounting for their diverse levels of economic

³ As Bourguignon (2016) points out, globalization and skill-biased technological progress coupled with stagnant wages and employment of unskilled labour can partly explain the rise in the capital share of total income in advanced countries. In developing countries, the expansion of North-South trade should instead benefit labour and hurt capital, thus contributing to less inequality.

development. Moreover, the development of banks and markets is quite heterogeneous across countries.

Generally, higher per capita GDP tends to coincide with more market-based financial intermediation.⁴ Several economic factors may explain this. One is that the financial literacy of households and firms improves with economic development, leading to higher demand for services linked to market-traded securities (Allen and Gale, 2000; Boyd and Smith, 1998). For instance, insurance companies, pension funds and mutual funds are larger in richer countries as a share of GDP. Another may be that more developed countries have stronger institutions. Better enforcement of property rights and effective investor protection through a reliable legal and judicial framework tend to favour market-based financial development (see discussion below).

But differences in financial structure also reflect the sectoral composition of output. Some productive sectors are more likely to rely on bank loans as a source of external funds. By their very nature, different lines of business are more suited to different types of intermediation. Sectors with tangible and transferable capital (such as agriculture), as well as those where output is easier to pledge as collateral (such as construction), are more amenable to bank debt finance. By contrast, sectors that rely heavily on human capital (eg professional services) or whose output is hard to collateralise (eg intellectual property rights) will tend to rely more on equity or bonds. In the empirical part, when we analyse the link between inequality and financial structure, we need therefore to control for the share of industrial production.

Turning to countries' institutional characteristics, the ability to design effective financial contracts depends on the quality of the legal framework and the enforcement of contracts and property rights. Investors are more likely to part with their money if they are more confident they will be able to claim it back. The literature on the interaction between law and finance has highlighted a number of regularities.⁵ First, legal systems originating in the common law tradition tend to offer higher protection to holders of equity and debt securities (La Porta et al., 1998). Common law systems afford the highest legal shareholder protection to the extent that shareholders have more direct rights to participate in the decision-making process of firms compared to civil law systems (eg vote by mail, unrestricted share sale and special minority laws). Second, common law systems also support a better creditor protection, which is essential for debt finance. In particular, creditors have more rights to avoid an automatic stay on assets,

⁴ See Levine and Zervos (1998) and Demirgüç-Kunt and Levine (2001).

⁵ See La Porta et al (1998), Giannetti (2003), Bancel and Mittoo (2004), DeJong et al. (2008) and Fan et al. (2010).

enjoy greater priority when their claims are secured, and face managements that have less freedom to seek court protection.

As a result of higher shareholder and creditor protection, common law systems foster the development of market-based finance (bonds and stocks), as it depends on the efficiency of arm's length relationships between issuers of securities and investors. By contrast, through banks' repeated interaction with clients and closer screening and monitoring of borrowers, bank-based finance would be favoured in civil law systems since the acquired information compensates the lower creditor protection. Legal systems in German and Scandinavian civil law tradition fall between common law and French civil law in the ranking of creditor and shareholder protection (La Porta et al., 1998).

Another strand of the law and finance literature has emphasized that legal systems and traditions differ in the way (i) they favour private property over the rights of governments and (ii) they are formalized and adaptable to changing environments (Hayek, 1960). Since common law systems are more flexible than their civil law counterparts with more limits on government intervention, financial development would tend to be higher (Merryman, 1985; La Porta et al., 1999; Mahony, 2001). Bank-based financial development would again be favoured in civil law countries where banks can acquire relationship advantages that compensate for lower creditor protection.

Empirically, there is a strong association between the origin of the legal framework in a country and the composition of business financing. Firms in common law countries tend to rely more on traded equity and have a more diffuse shareholder base than firms in countries that follow the French civil law tradition (magenta and blue bars in Graph 4). In addition, there is a correlation between the origin of the legal system in the country and the overall development of the financial system. As shown by the yellow bars in Graph 4, common law countries tend to have more developed financial systems than countries with legal systems based on the French civil law.

4. How could financial development affect inequality?

There is considerable evidence that financial deepening contributes to less poverty and inequality, even though theoretical work provides conflicting predictions (Claessens and Perotti, 2007). A number of models imply that financial development enhances growth and reduces inequality. It has been argued that financial imperfections, such as information and transactions costs, affect particularly the poor who lack collateral and credit histories. Thus, it is likely that

abating credit constraints will benefit the less-privileged, enhance the efficient allocation of capital and reduce income inequality through increased credit availability of poor individuals with productive investments (Galor and Zeira, 1993; Aghion and Bolton, 1997; Galor and Moav, 2004). In other words, financial development should benefit the poor both by improving the efficiency of capital, and thus economic, allocation and by alleviating credit constraints which disproportionately restrain the poorer parts of society, thereby reducing income inequality.

Conversely, other theories predict that financial development primarily benefits the wealthier parts of society. This view is based on the idea that poorer individuals rely on informal (family) connections for fund raising, which means that a larger formal financial sector more extensively benefits the privileged. For instance, the model developed by Greenwood and Jovanovic (1990) predicts a nonlinear relationship between financial development and income inequality that depends on the level of economic advancement. In their model, financial development helps improve the allocation of capital, generates economic growth, and thus helps the poor – independent of the stage of economic development. The distributional effect of financial development, however, depends on the level of economic development. At low levels of prosperity, only the wealthier parts of society can afford to access and directly benefit from financial development. Only after a certain threshold of economic development, more individuals can access financial markets and thus a larger proportion of society benefits from financial deepening. It is worth stressing that the positive correlation between finance and inequality for very low level of income is difficult to detect in our database, which has very limited coverage of countries at the early stage of financial development.

More recently, alternative theoretical justifications help to understand the link between finance and inequality in more advanced and financially developed economies. Stiglitz (2015) argues that the excessive remuneration of management and lenders' rent extraction may have been at the centre of the recent increase in inequality observed in a number of developed financial systems. This theory seems to postulate that any link between more finance leading to more inequality might have asymmetric underpinnings across the financial structure and the distribution of income. First, market finance more than bank finance might be the culprit. Second, the derived increase in inequality could lie in the increased share at the top of the income distribution.

4.1 Rent seeking and top incomes

There is mounting evidence that a major driver of the recent increase in income inequality has been the high growth in the top incomes and rents of the financial sector. As evidenced by Philippon and Reshef (2012) compensations have surged in the financial industry prior to the 1930s and during 1993-2006. The authors argue that financial deregulation is the main determinant of both demand for skill and the high wages in the US financial sector, along with other factors including technology, non-financial corporate activity, and financial globalization, which play a secondary role.⁶ The results thus suggest that the increase in relative wages in finance is neither driven by faster growth in the cost of skilled labour, increased relative skill-intensity, nor by compositional changes within the group of skilled workers. Greenwood and Scharfstein (2013) show that fee income has been a major driver of modern finance, particularly raising asset management fees and fees associated with the expansion in household credit. It should be noted, however, that increasing wage gaps have also been observed in the non-financial industry. In the United States, for example, the CEO-to-worker compensation ratio increased from roughly 20-to-1 in 1965 to beyond 400-to-1 at its peak in 2000 (Mishel and Sabadish, 2012).

The increasing income share of finance has also been attributed to other factors. Korinek and Kremer (2014) develop a model by which financial deregulation raises inequality: deregulation boosts financial sector profits in expectation but hurts the real economy via higher volatility and a greater incidence of credit crunches. Various models tackle the issue of harmful or inefficient financial innovation when investors are led to neglect certain unlikely risks (Gennaioli et al., 2012) or could build positive profits for intermediaries at the cost of heightening the risk of future liquidity crises (Thakor, 2012). In turn, this type of financial innovation could lead to rent extraction and more unequal income distribution. Axelson and Bond (2015) argue that many finance jobs entail the risk of large losses, and hard-to-monitor effort. Using a model with optimal dynamic contracting, they show that finance jobs feature high compensation, up-or-out promotion, and long work hours. Bolton et al (2016b) argue that the financial industry extracts excessive rents because it acquires costly information to purchase good assets in opaque (OTC) markets. In such environments, uninformed investors only have access to a restricted pool of

⁶ Tannal and Waldenström (2018) find that the “Big Bang” financial deregulations in the UK in 1986 and in Japan in 1997-1999 both expanded top income shares. On the contrary, Manish and O’Reilly (2018) find that banking supervision regulation is associated with greater income inequality. They argue that this is consistent with the economic theory of regulation and interpret it as evidence of regulatory capture in the banking and finance industry.

assets and, for a given quality composition of assets for sale, there is too much information acquisition and the financial industry extracts excessive rents. In a similar vein, Kalyta (2009) suggests that more opaque forms of compensation, such as pensions, are most vulnerable to managerial rent extraction. Focussing on wage differences across bankers and traders, Glode and Lowery (2016) propose a labour market model in which financial firms compete for a scarce supply of workers who can be employed as bankers or traders. While hiring bankers helps create a surplus that can be split between a firm and its trading counterparties, hiring traders helps the firm appropriate a greater share of that surplus away from its counterparties. As a result, traders earn more than bankers. In Glode et al. (2012), an “arms’ race” can occur as agents try to protect themselves from opportunistic behaviour by (over)-investing in financial expertise.

Another strand of the literature focuses on the impact of the too-big-to-fail status of some major banks. To the extent that such banks enjoy an implicit state guarantee, they are in effect subsidised by taxpayers which allows them to extract larger rents than observed in non-financial corporations of similar size (Baker and Mc Arthur, 2009; Santos, 2014).

4.2 The increase in rents

More generally, the developments in financial markets might have contributed to widen the divide between the well-off and the others by helping the former to extract more rents. Although, strictly speaking, this refers more to wealth inequality than income inequality, there is evidence that the two are typically related with wealth being more unequally distributed than income (Heathcote et al., 2010; Kopczuk, 2015; Saez and Zucman, 2016).

Namely, Stiglitz (2016) proposes that much of the debate around inequality is biased by theoretical failures to capture new forms of income appropriation related to wealth as a measure of control over resources. Specifically, Stiglitz identifies a series of factors that might explain what he labels “wealth residuals” (the component of the wealth-income ratio that cannot be explained by savings). The list of factors potentially raising rent-originated incomes and wealth include: (i) rents on scarce land and other non-produced assets (partly due to rising urbanization); (ii) market power and exploitation (rents related to market manipulation, insider trading, and other predatory and discriminatory practices); (iii) other forms of exploitation of consumers (by having corporations exploit consumers’ behavioural irrationalities); (iv) rent-seeking in transfers from the public to the private sector (referring to the implicit subsidy of too-big-to-fail banks); (v) knowledge and informational rents (like insider trading and market manipulation due to differential access to information); (vi) intellectual property shares (in part due to the

phenomenon of “enclosure of the knowledge commons”, see Boyle (2003)); and (vii) sensitivity to discount rate and risk management (lower interest rates and higher certainty equivalents). While financial development is directly ingrained with factors (ii), (iv) and (v), it likely impinges on most of the other factors as well. Therefore, Stiglitz’s argument suggests that financial development might boost rents and, through that, also income inequality.

There are good reasons to believe that such forms of income appropriation are more likely to occur with the development of financial markets than with financial development based on banks. This view is grounded on a few considerations differentiating banks and financial markets. First, even though deregulation and changes in business models pushed many banks to move towards transactional or arm’s length banking, relationship banking seems to still play an important role. This is supported by both theory (eg Boot and Thakor, 2000) and empirical evidence (Mester, 2007; Beck et al., 2017; Bolton et al., 2016a). In turn, relationship banking may directly reduce rent-seeking incentives and financial exclusion (Beck et al., 2009), which complex financial market-based services do not (Beaverstock et al., 2013). Second, relationship banking is often adopted by stakeholder-oriented banks (e.g., savings banks, cooperative banks, credit unions, ethical banks), which typically are subject to less profit- and rent-seeking behaviour (eg Cornée and Szafarz, 2014). And third, (some of the) financial innovations boosting financial market development have proved exploitative and predatory in nature (eg Allen, 2012). Overall, we might thus expect that, beyond a certain level, financial development might more severely favour income inequality when it is market based.

4.3 The role of institutions

The way financial development affects inequality depends as well on the quality of institutions that shape the structural characteristics of financial systems. In countries where political participation is skewed, established incumbents may seek to protect their rents by limiting financial access and competition (Claessens and Perotti, 2007). Distinguishing between civil and common law countries is important at this juncture. A huge strand of literature has, in fact, argued and documented that financial markets tend to develop more in the countries having a common law legal origin than in those with a civil law background (La Porta et al., 1997; 1998). As discussed above, to the extent that a common law system provides stronger shareholder and creditor protection, it usually promotes market-based development more than a civil law set-up, where banks through their repeated interaction can compensate for the reduced creditor protection. We will need to control for these aspects in the econometric set up.

5. Empirical analysis

Our primary measure of inequality is the Gini coefficient defined on disposable income, including cash transfers (such as remittances). Depending on the country, it can either be equivalized or per capita for a given household (the latter tends to be used in African, Asian, Middle East and Post-Soviet countries). The term “equivalized” hereby refers to the fact that household income has been made equivalent to that of a single adult. It differs from disposable income per capita by applying a weighting scheme that takes into account that n adults living together do not need as much as n isolated persons (Bourguignon, 2016). Moreover, in some countries (mainly from Africa and Asia) the calculations are applied to consumption expenditures instead of income depending on how the population surveys have been conducted.⁷ Including country-fixed effects to account for any time-invariant differences across the inequality measures is therefore crucial in the econometric analysis.⁸

In a first step, we analyse the link between inequality and the aggregate financial development index (FD) using a panel of advanced and emerging market economies during the period 1989–2012:⁹

$$Gini_{i,t} = \rho Gini_{i,t-1} + \alpha y_{i,t} + \alpha^* y_{i,t}^2 + \vartheta FD_{i,t} + \vartheta^* FD_{i,t}^2 + \delta' X_{i,t} + \psi_i + \varepsilon_{i,t} \quad (1)$$

where $Gini_{i,t}$ is the logarithm of the Gini coefficient,¹⁰ $X_{i,t}$ represents a set of control variables, and i and t indicate countries and time periods, respectively. The key variables are $y_{i,t}$, the

⁷ As noted by Bourguignon (2016), the concept using consumption might be preferable as it corrects from income volatility which could introduce a measurement error. However, to the extent that we use five-year averages, the potential measurement bias in the estimations should be minimized.

⁸ Our work is somewhat related to that of Seven and Coskun (2016) who also examine the relationship between finance and inequality (and also poverty) for a large panel of countries that, like ours distinguishes between bank credit and market finance and also allow the link between GDP and inequality to be non-linear as suggested by some theories. However, there are some differences compared with our study. First, they use 45 countries, less than half of our sample. Second, they do not consider the possible non-linearity in the finance-inequality relationship. Third, they estimate the (only linear) impact on inequality of bank credit or market finance as separate regressions rather than including both bank credit and market finance in the same regression. Tan and Law (2012) come close to our approach – eg allowing for a non-linear relationship between financial development and inequality and also splitting financial development between bank credit and market financing – but differences remain. First, they consider only 35 developing economies over 1980-2000. Second, they estimate the impact on inequality of bank credit or market finance as separate regressions rather than including both bank credit and market finance in the same regression. Third, they do not allow the link between GDP and inequality to be also non-linear as suggested by some theories.

⁹ As discussed above, the coverage of the FD index for the eighties and nineties is limited, particularly for the financial access category. We decided to use this index, as it is reported by Svirydzhenka (2016), i.e. assuming that for missing data the subcategories are zero.

¹⁰ The primary data on the Gini coefficient comes from the World Income Inequality Database (UNO-Wider WIID3.3), a collection of country-specific information from many sources. To maximize consistency over

logarithm of GDP per capita. We use the aggregate financial development measure ($FD_{i,t}$) constructed by Svirydzienka (2016) and we complement the analysis by considering the impact of its main components (Financial Depth, Access to Finance and Efficiency of Finance) one at the time. We calculated averages of the components across financial institutions and markets, weighted by their relative importance.

In a second step we investigate the link between inequality and financial structure (banks vs markets) using a panel of 97 economies during the period 1989–2012:

$$Gini_{i,t} = \rho Gini_{i,t-1} + \alpha y_{i,t} + \alpha^* y_{i,t}^2 + \beta B_{i,t} + \beta^* B_{i,t}^2 + \gamma M_{i,t} + \gamma^* M_{i,t}^2 + \delta' X_{i,t} + \psi_i + \varepsilon_{i,t} \quad (2)$$

where the two indicators of financial structure are as follows: $B_{i,t}$ is defined as the logarithm of the ratio of bank credit to GDP and $M_{i,t}$ indicates the logarithm of the ratio of stock market capitalization to GDP.¹¹ We estimate the regression (1) and (2), using non-overlapping five-year averages, by system GMM to tackle endogeneity problems and other potential biases.

To check for the existence of a non-linear relationship between financial development and inequality, we insert quadratic terms both in equation (1) for $FD_{i,t}$ and in equation (2) for the logarithm of the ratio of bank credit to GDP and the logarithm of the ratio of stock market capitalization to GDP. We also tried to insert cubic terms in both equations but these turned out to be never significant. The non-significance could be related to the short time dimension of our sample of 5-year averages and the high collinearity of squared and cubic terms of development (the correlation coefficient between the two is above 0.97 for all of our development measures).

Empirical studies on the inequality-development relationship could suffer from endogeneity and reverse-causality problems (Demirgüç-Kunt and Levine, 2009; Bazillier and Hericourt, 2017). On the one hand, simultaneity issues are a concern as factors that influence financial development might also be correlated with income inequality (eg changes in bank regulation). But there are as well reverse-causality issues. For example, in Kumhof et al. (2015) the impact of higher inequality on bank lending may be caused by an increase in the income of the rich (by

time, we used those sources for which the quality rating is high and for which the income concept, equivalence scale and coverage of area, population and age are comparable for a given country. For five countries, we complemented the data with information from the Standardized Income Inequality Database. We also tested if the results changed depending on whether the estimate of inequality is for consumption or income. The results didn't change, possibly because only 12% of the sample use consumption.

¹¹ We use the stock market capitalization-to-GDP ratio as a measure for market-based financial development rather than the turnover ratio, because in several financially developed countries, e.g. Hong Kong, the turnover ratio is low due to the fact that a large proportion of listed companies is either held by families or strategic investors even though financial markets are highly developed.

increasing loan supply), or it could be associated with a decrease in the income of the poor (by increasing loan demand). Following the literature, we use as controls for economic and financial development their initial values, as well as legal origin, ethnic and religious fractionalization, and the absolute value of latitude (Levine et al., 2000; Beck et al., 2003; Clarke et al., 2006).¹²

In addition to our measures on economic and financial development, we include the logarithm of industrial value added to GDP, average years of primary and secondary schooling, and inflation (Clarke et al., 2006; Beck et al., 2007).¹³ Finally, country-fixed effects are included to control for any differences in the calculation of the Gini coefficient and other unobserved time-invariant differences across countries. A statistical summary of all the variables used in the regressions are reported in Table 1.¹⁴

In the hypothesis that more finance continues to reduce inequality in a linear way, β and γ should be negative and significant, with insignificant β^* and γ^* . Along the inverted U-shaped hypothesis, β and γ should be significant and positive, with β^* and γ^* negative and significant. Instead, for the U-shaped hypothesis, ϑ , β and γ should be negative and significant, with ϑ^* , β^* and γ^* positive and significant. As for the coefficients on *GDP per capita* and its squared term, the Kuznets curve predicts that α should be positive and significant, and α^* negative and significant.

The results in the first columns of Tables 2 and 3 consider a simplified version of, respectively, equations 1 and 2, where the quadratic terms are set to zero ($\alpha^* = \beta^* = \gamma^* = \vartheta^* = 0$). All the coefficients associated with the variable of interest are not significant indicating that a linear set up does not produces an adequate fit of the models.

The results of the complete non-monotonic specification in the second columns of Tables 2 and 3 produce more significant results. In particular, the relationship between economic development and inequality has the predicted reverse U-shaped Kuznets curve (see also panel

¹² Common law countries offer higher creditor and shareholder protection and thus tend to support more financial development (see discussion above). Ethnic and religious heterogeneity may have an effect on the quality of institutions, economic growth, and corruption (La Porta et al, 1999; Alesina et al., 2003; Dincer, 2008). The absolute value of latitude identifies tropical environments which tend to have lower initial endowment, economic development and quality of institutions (Easterly and Levine, 2003).

¹³ Average years of schooling are included as a proxy for the stock of human capital, inflation for macroeconomic instability, and industrial value added for the sectoral structure of an economy.

¹⁴ GDP per capita, bank credit to the private sector, market capitalization for listed companies, and inflation are taken from the World Development Indicators, average years of schooling from the Barro-Lee Educational Attainment Dataset, ethnic fractionalization and religious composition from Alesina et al. (2003), average latitude from the CIA World Factbook, and legal origin from the CEPII gravity database.

(a) in Graph 5). Regarding the index of financial development, as in equation (1), we show that Financial Depth and the Overall Financial Development index are estimated to have a non-monotonic effect on inequality. This is consistent with a beneficial-to-detrimental pattern: up to a threshold, more finance is associated with less inequality, while the reverse happens beyond the threshold. Based on the overall index in column (II) of Table 2, the threshold above which inequality increases is 0.38 measured in levels (as can be seen in Graph 1, the advanced economies are on average above this threshold).¹⁵ The other indicators for Access to Finance and Efficiency of Finance turn out insignificant (Table 2, columns (III) and (IV)).

From Table 3 we can see that both higher bank and higher market activity also relate to lower inequality but only up to a threshold. Both indicators are statistically significant, suggesting that banks and financial markets provide different and complementary services (Allen and Gale, 2000). The limits of financial deepening on inequality are also depicted in Graph 5. The horizontal axis indicates both the credit-to-GDP (panel (b)) and the market capitalization-to-GDP variable (panel (c)), while the vertical axis measures income inequality. Income inequality drops as the ratio of bank credit to GDP rises until the level of 41%. The corresponding minimum for market capitalization is 10%. Based on these thresholds, 48 of the 97 countries are above the threshold for bank credit and 74 are above the threshold for market financing (43 countries exceed both thresholds).¹⁶ These results concur with Delis et al. (2014) showing that securities market liberalization substantially increases income inequality. It is worth noticing that, on the contrary, a higher level of banking activity is not significantly associated with an increase of income inequality.

Splitting the sample into common and civil law countries, the non-linear effect of market-based financial development emerges in both groupings and is not too dissimilar. In common law countries, the threshold above which inequality starts increasing is somewhat higher (19% vis-à-vis 12% in civil law countries). Moreover, we find a significant U-shaped relationship between bank-based financial development and inequality in civil law countries. In common law countries, on the contrary, banks seem to provide their traditional services in a way that does not influence the distribution of incomes. Finally, another interesting finding is that the Kuznets relationship between economic development and inequality is only significant in civil law

¹⁵ The threshold for the level of the index is transformed according to $\exp\left(-\frac{\theta}{2\theta^*}\right) - 1$, since the dependent variable enters in logarithm and the FD index in the logarithm of one plus the FD index.

¹⁶ The results are qualitatively very similar in a simpler model that omits the lagged dependent variable.

countries. It thus appears that market-based financial development has been the main driver of inequality in the advanced financial systems of the common law countries, whereas all three types of economic and financial development have influenced inequality in the civil law countries.

6. Robustness checks

The robustness of the above results has been checked in several ways.

First, we checked whether the relationship between financial development and inequality is confirmed by considering the top 10 per cent income share instead of the Gini coefficient. The results do confirm our previous findings. Namely, the linear term shows a negative effect while the quadratic term exhibits a positive sign, so that the latter effect will overturn the former one beyond a certain threshold (Table 4). This turns out to be the case for the Financial Depth and the Overall Financial Development index as in the case of Table 2. This confirms the “beneficial-to-detrimental” pattern also with respect to the top of the income distribution.

Second, similar to splitting the sample across common and civil law systems, we divided the sample into countries that have a high-to-medium degree of economic freedom versus those that have a low score.¹⁷ To some extent high economic freedom is determined by the law system, however, having a common law system in place does not imply that economic freedom is high as well (out of the 34 common law countries, 10 are classified as having low economic freedom and 24 as high). The results reported in Table 5 indicate that, while for low economic freedom countries there is a positive and significant correlation between inequality and high values of both financial development indicators – for higher freedom countries this correlation is significant only with respect to the financial market development indicator.

Third, we have checked if the results are different for those countries that have been more active in the use of macroprudential policies, whose main aim is to reduce systemic risk and the occurrence of a financial crisis. We have therefore split the sample in two, based on an index of macroprudential activism. The index has been constructed using the indicator developed in Altunbas et al (2017) and counting the number of changes in macroprudential tools in each country in the period under investigation. The results reported in Table 6 indicate that the link

¹⁷ The index, compiled by the Heritage Foundation since 1995, is an average score that assesses the quality of rule of law, regulatory efficiency, open markets and the extent to which governments intervene in the economy. High to medium economic freedom countries are those for which the country-specific mean of the score is above the 25th percentile of the distribution, whereas those with a low score are those countries that rank below the 25th percentile.

between financial structure and inequality is present in both groups of countries, but it is slightly stronger in countries which made more use of macroprudential policies, in line with Frost and van Stralen (2018). The Kuznets curve is more pronounced for countries that have actively used macroprudential policies.

Last, we investigated whether the link between financial development and inequality depends on the transparency of bank financial statements to the extent that banks appear to charge higher interest margins in more opaque banking systems (Birchwood et al., 2017). By increasing information asymmetries between bank insiders and outsiders, low financial transparency can have a negative effect on private sector monitoring of banks and therewith on their pricing and wage policies. As before, we thus split the sample into those countries with low and high informational barriers based on the database compiled by Barth et al. (2013).¹⁸ The results reported in Table 7 suggest that bank-based financial development is not significantly related to inequality in countries where financial statement transparency of banks is high. The finding could be an indication of positive market discipline effects through improvements in effective private monitoring of banks associated with higher transparency.

7. Conclusions

This paper empirically investigates the link between financial development and income inequality accounting for financial structure (bank vs market) and allowing the finance-inequality link to be non-linear. Hence, we ask four key questions: i) does financial development affect inequality?; ii) does financial structure matter?; iii) is there a non-linear relationship (with sign change at a certain threshold)?; and iv) does this non-linear relationship differ for bank- vs market- finance?

Using data for a panel of 97 advanced and emerging market economies, we find the following. First, financial development does have a link with income inequality. Second, the link is different for bank- vs market- financing. Third, effectively, the relationship is not monotonic. Contrary to the predictions of Greenwood and Jovanovic (1990), but concurring with more recent evidence of rising income inequality in financially advanced economies (Piketty, 2014), we find evidence of a U-shaped relationship between financial development and inequality. In other words, a beneficial-to-detrimental pattern emerges: more financial development is associated

¹⁸ Reporting transparency is an index on a scale from 0 to 6 (higher value indicates higher financial statement transparency of banks). Countries with high transparency have an average index (over 1999-2013) above the median and countries with low transparency have an average index equal to or below the median.

with reductions in income inequality below a certain threshold. Up to a point, more finance is associated with lower income inequality. Beyond that point, further financial development correlates with higher income inequality. Fourth, the beneficial-to-detrimental pattern applies only to market-based financial development and not significantly to bank- finance. We also provide evidence that this inequality-enhancing mechanism works through expanding the top part of the income distribution. The evidence is robust to controlling for country-specific institutional designs, alternative financial development measures, different levels of macroprudential policy activism, and financial transparency.

References

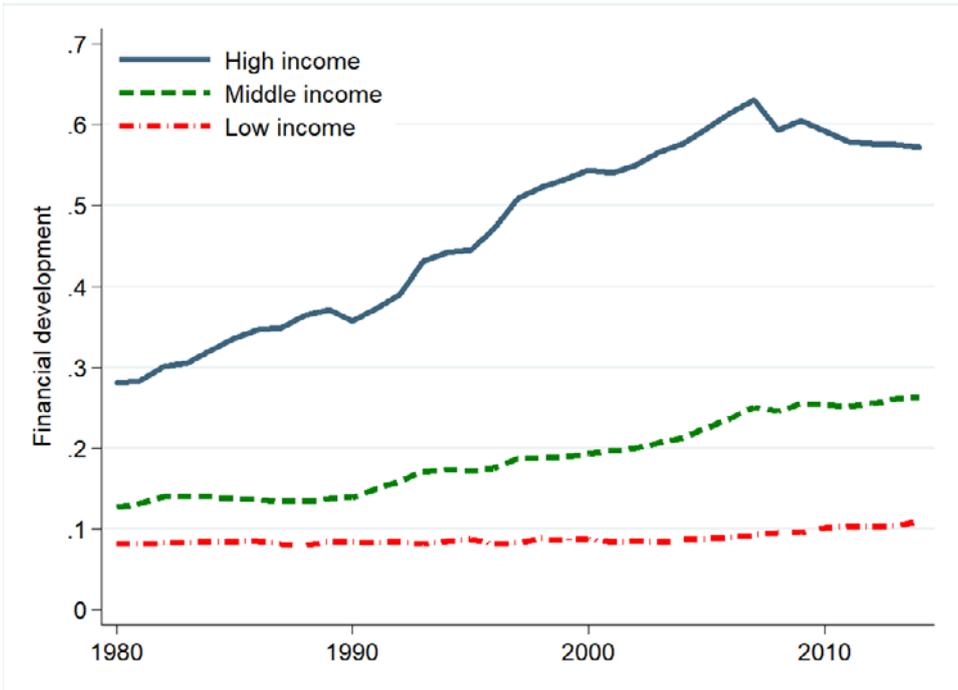
- Acemoglu, D (1998), “Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality”, *The Quarterly Journal of Economics*, 113(4): 1055-1089.
- Aghion, P and P Bolton (1997). A theory of trickle-down growth and development. *Review of Economic Studies*, 64: 151–172.
- Alesina, A, A Devleeschauwer, W Easterly, S Kurlat, and R Wacziarg (2003), “Fractionalization”, *Journal of Economic Growth*, 8: 155–194.
- Allen F (2012), “Trends in financial innovation and their welfare impact: an overview”, *European Financial Management*, 18(4): 493-514.
- Allen, F and D Gale (2000), “Comparing Financial Systems”, Cambridge, MA: *MIT Press*.
- Altunbas Y, M Binici and L Gambacorta (2017), “Macroprudential policy and bank risk”, *Journal of International Money and Finance*, forthcoming.
- Arcand, J L, E Berkes and U Panizza (2015), “Too much finance?”, *Journal of Economic Growth*, 20(2): 105-148.
- Atkinson, A B (2015), “Inequality: What can be done?”, Cambridge, MA: Harvard University Press.
- Axelson, U and P Bond (2015), “Wall street occupations”, *The Journal of Finance*, 70 (5): 1949-1996.
- Baker, D and T McArthur (2009), “The Value of the “Too Big to Fail” Big Bank Subsidy”, CEPR Reports and Issue Briefs, Center for Economic and Policy Research.
- Bancel, F and U Mittoo (2004), “Cross-country determinants of capital structure choice: a survey of European firms”, *Financial Management*, 33(4): 103–32.
- Banerjee, A V and A Newman (1993), “Occupational Choice and the Process of Development”, *Journal of Political Economy*, 101(2): 274-98.
- Barth, J R , G Caprio Jr and R Levine (2013), “Bank regulation and supervision in 180 countries from 1999 to 2011”, *Journal of Financial and Economic Policy*, 5(2): 111–219 .
- Bazillier, R and J. Hericourt (2017), “The Circular Relationship between Inequality, Leverage, and Financial Crises”, *Journal of Economic Surveys*, 31: 463-96.
- Beaverstock J V, S Hall and T Wainwright (2013), “Servicing the super-rich: New financial elites and the rise of the private wealth management retail ecology”, *Regional Studies*, 47(6): 834-849.
- Beck, T, A Demirgüç-Kunt, and R Levine (2000), “A New Database on the Structure and Development of the Financial Sector”, *World Bank Economic Review*, 14(3): 597-605.
- (2001), “Legal theories of financial development”, *Oxford Review of Economic Policy*, 17: 483-501.
- (2003), “Law and finance. Why does legal origin matter?”, *Journal of Comparative Economics*, 31: 653-675.
- (2007), “Finance, Inequality, and the Poor”, *Journal of Economic Growth*, 12(1): 27–49.
- Beck, T, A Demirgüç-Kunt and P Honohan (2009), “Access to financial services: Measurement, impact, and policies”, *The World Bank Research Observer* 24(1): 119-145.
- Beck, T, H Degryse, R De Haas and N Van Horen (2017), “When arm's length is too far. Relationship banking over the business cycle”, *Journal of Financial Economics*, forthcoming.

- Beck, T and R Levine (2005), “Legal Institutions and Financial Development”, Handbook for New Institutional Economics, Menard, C and M M Shirley (eds.), Kluwer Academic Publishers.
- Birchwood, A, M Brei and D M Noel (2017), “Interest margins and bank regulation in Central America and the Caribbean”, *Journal of Banking and Finance*, 85: 56-68.
- Bolton P, X Freixas, L Gambacorta and P E Mistrulli (2016a), “Relationship and transaction lending in a crisis.” *The Review of Financial Studies*, 29: 2643-2676.
- Bolton, P, T Santos and J A Scheinkman (2016b), “Cream-Skimming in Financial Markets”, *The Journal of Finance*, 71:709-736.
- Boot A W A and A V Thakor (2000), “Can relationship banking survive competition?”, *The Journal of Finance*, 55: 679-713.
- Bourguignon, F (2017), “World Changes in Inequality: An Overview of Facts, Causes, Consequences and Policies”, *BIS Working Paper*, 654.
- Boyd, J H and B D Smith (1998), “The evolution of debt and equity markets in economic development”, *Economic Theory*, 12: 519–60.
- Boyle J (2003), “The second enclosure movement and the construction of the public domain”, *Law and contemporary problems*, 66 (1): 33-74.
- Burgess, R, Pande, R (2005), “Can rural banks reduce poverty? Evidence from the Indian social banking experiment”, *American Economic Review*, 953(3): 1-35.
- Cecchetti, SG and E Kharroubi (2012), “Reassessing the Impact of Finance on Growth”, *BIS Working Paper* 381.
- Choudhary M and A Jain (2017), “Finance and inequality: The distributional impact of bank credit rationing”, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, 1211.
- Cizel, J, J Frost, A Houben and PJ Wierds (2016), “Effective Macroprudential Policy: Cross-Sector Substitution from Price and Quantity Measures”, IMF Working Paper No. 16/94.
- Claessens, S and E Perotti (2007), “Finance and Inequality: Channels and Evidence,” *Journal of Comparative Economics*, 35: 748-773.
- Clarke, G, LC Xu, and HF Zou (2006), “Finance and income inequality: What do the data tell us?”, *Southern Economic Journal*, 72(3): 578–96.
- Cornée S and A Szafarz (2014), “Vive la différence: Social banks and reciprocity in the credit market”, *Journal of Business Ethics* 125: 361-380.
- De Haan J and JE Sturm (2017), “Finance and income inequality: A review and new evidence”, *European Journal of Political Economy*, 50: 171–195.
- De Haan J, R Pleninger and JE Sturm (2018), “Does the impact of financial liberalization on income inequality depend on financial development? Some new evidence”, *Applied Economics Letters*, 25(5): 313-316
- De Jong, A, R Kabir and T Nguyen (2008), “Capital structure around the world: the roles of firm- and country-specific determinants”, *Journal of Banking and Finance*, 32(9): 1954–69.
- Delis M. D., I. Hasan and P. Kazakis (2014), “Bank Regulations and Income Inequality: Empirical Evidence”, *Review of Finance*, 18: 1811-46.
- Demirgüç-Kunt, A and R Levine (2001), “Financial structures and economic growth: a cross-country comparison of banks, markets, and development”, Cambridge, MIT Press.

- Demirgüç-Kunt, A and R Levine (2009), “Finance and inequality: Theory and evidence”, *Annual Review of Financial Economics*, 1.
- Dincer, O (2008), “Ethnic and religious diversity and corruption”, *Economics Letters* 99(1): 98-102.
- Domanski D., M Scatigna and A Zabai (2016), “Wealth inequality and monetary policy”, *BIS Quarterly Review*, March 45-64.
- Easterly, W and R Levine (2003), “Tropics, germs, and crops: How endowments influence economic development”, *Journal of Monetary Economics*, 50: 3-40.
- Fan, J, S Titman and G Twite J (2010), “An international comparison of capital structure and debt maturity choices”, NBER Working Papers, 16445.
- Frost J, and R van Stralen (2018), “Macroprudential policy and income inequality”, *Journal of International Money and Finance*, 85: 278-290.
- Galor, O. and O Moav (2004), “From physical to human capital accumulation: Inequality and the process of development”, *Review of Economic Studies*, 71: 1001–1026.
- Galor, O and J Zeira (1993), “Income Distribution and Macroeconomics”, *Review of Economic Studies*, 60(1): 35-52.
- Gambacorta, L, J Yang and K Tsatsaronis (2014), “Financial structure and growth”, *BIS Quarterly Review*, March.
- Gennaioli, N, A Shleifer and R Vishny (2012), “Neglected risks, financial innovation and financial fragility”, *The Journal of Financial Economics*, 104(3): 452-468.
- Giannetti, M (2003), “Do better institutions mitigate agency problems? Evidence from corporate finance choices”, *The Journal of Financial and Quantitative Analysis*, 38(1): 185–212.
- Globe, V, R C Green and R Lowery (2012), “Financial expertise as an arms race”, *Journal of Finance*, 67.
- Globe, V and R Lowery (2016), “Compensating Financial Experts”, *The Journal of Finance*, 71 (6): 2781-2808.
- Greenwood, J and B Jovanovic (1990), “Financial Development, Growth, and the Distribution of Income”, *Journal of Political Economy*, 98(5): 1076-1107.
- Greenwood, R and D Scharfstein (2013), “The growth of modern finance”, *Journal of Economic Perspectives*, 27(2): 3-28.
- Heathcote, J, F Perri and G L Violante (2010), “Unequal we stand: An empirical analysis of economic inequality in the United States, 1967–2006”, *Review of Economic Dynamics*, 13: 15-51.
- Hayek, F (1960), “The Constitution of Liberty”. The University of Chicago Press, Chicago, IL.
- Jauch S and S Watzka (2016), “Financial Development and Income Inequality: A Panel Data Approach”, *Empirical Economics*, 51(1): 291–314.
- Jaumotte, F, C Papageorgiou and S Lall (2013), “Rising Income Inequality: Technology, or Trade and Financial Globalization?” *IMF Economic Review*, 61(2): 271–309.
- Kalyta, P (2009): “Compensation transparency and managerial opportunism: a study of supplemental retirement plans”, *Strategic Management Journal*, 30(4): 405–23.
- Kay, J. (2015): “Rise in US and UK inequality principally due to financialisation and executive pay”, *Financial Times*, January 21.
- Kim D H and SC Lin (2011), “Nonlinearity in the financial development-income inequality nexus”, *Journal of Comparative Economics*, 39:310-25.

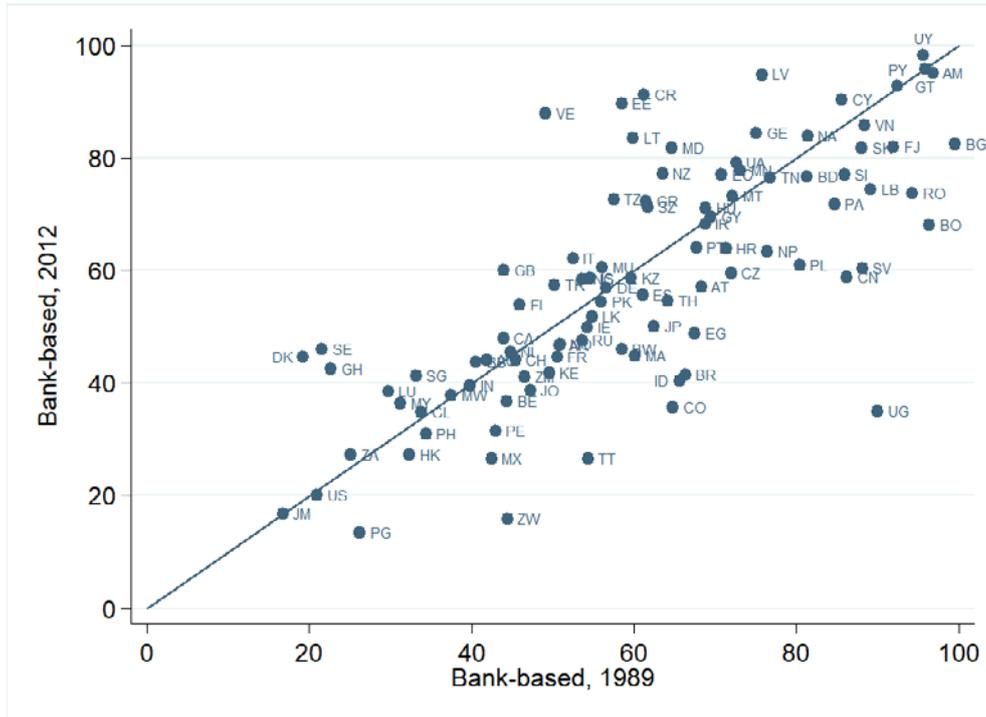
- Kopczuk, W (2015): “What do we know about the evolution of top wealth shares in the United States?”, *The Journal of Economic Perspectives*, 29: 47-66.
- Korinek, A and J Kreamer (2014), “The redistributive effects of financial deregulation”, *Journal of Monetary Economics*, 68: S55-S67.
- Kumhof, M, R Rancière and P Winant (2015), “Inequality, Leverage, and Crises.” *American Economic Review*, 105(3): 1217-45.
- Kuznets, S (1955), “Economic Growth and Income Inequality”, *American Economic Review*, 45(1): 1-28.
- La Porta, R, F Lopez-de-Silanes, A Shleifer, and RW Vishny (1997), “Legal Determinants of External Finance”, *Journal of Finance*, 52: 1131-50.
- La Porta, R, F Lopez-de-Silanes, A Shleifer, and RW Vishny (1998), “Law and finance”, *Journal of Political Economy*, 106(6): 1113–55.
- La Porta, R, F Lopez-de-Silanes, A Shleifer, and RW Vishny (1999), “The Quality of Government”, *Journal of Law and Economic Organization*, 15: 222-79.
- Levine, R (2005), “Finance and Growth: Theory and Evidence”, in P Aghion and S Durlauf (eds), *Handbook of Economic Growth*, Elsevier, 1: 865–934.
- Levine, R, N Loayza, and T Beck (2000), “Financial Intermediation and Growth: Causality and Causes”, *Journal of Monetary Economics*, 46: 31-77.
- Levine, R and S Zervos (1998), “Stock markets, banks and economic growth”. *American Economic Review*, 88: 537–58.
- Mahoney, P (2001), “The Common Law and Economic Growth: Hayek Might Be Right”, *Journal of Legal Studies*, 503.
- Manish, GP and C O’Reilly (2018), “Banking regulation, regulatory capture and inequality”, *Public Choice*: 1-20.
- Merryman, JH (1985), “The Civil Law Tradition: An Introduction to the Legal Systems of Western Europe and Latin America”, Stanford University Press, Stanford, CA.
- Mester L J (2007), “Some thoughts on the evolution of the banking system and the process of financial intermediation”, *Economic Review-Federal Reserve Bank of Atlanta*, 92: 67-75.
- Mishel, L and N Sabadish (2012), “CEO Pay and the Top 1 %: How executive compensation and financial sector pay have fueled income inequality”, Economic Policy Institute, Issue Brief 331.
- Piketty, T (2014), *Capital in the Twenty-First Century*, Cambridge: Belknap Press.
- Philippon, T (2015), “Has the US Finance Industry Become Less Efficient? On the Theory and Measurement of Financial Intermediation”, *American Economic Review*, 105(4): 1408-38.
- Philippon, T and A Reshef (2012), “Wages and Human Capital in the U.S. Finance Industry: 1909–2006”, *The Quarterly Journal of Economics*, 127(4): 1551–1609.
- Rajan, R (2010), “Fault Lines: How Hidden Fractures Still Threaten the World Economy”, *Princeton University Press*.
- Saez, E and G Zucman (2016), “Wealth inequality in the United States since 1913: Evidence from capitalized income tax data”, *The Quarterly Journal of Economics*, 131: 519-578.
- Santos, J (2014), “Evidence from the Bond Market in Banks' “Too-Big-To-Fail” Subsidy”, FRBNY Economic Policy Review, December.
- Seven, U and Y Coskun (2016), “Does financial development reduce income inequality and poverty? Evidence from emerging countries”, *Emerging Markets Review*, 26: 34-63.

- Svirydzenka, K (2016), “Introducing a New Broad-based Index of Financial Development”, IMF Working Paper, 5.
- Stiglitz, J E (2015), “Inequality and economic growth”, *The Political Quarterly*, 86: 134–155.
- Stiglitz, J E (2016), “New theoretical perspectives on the distribution of income and wealth among individuals”, *Inequality and Growth: Patterns and Policy*. Palgrave Macmillan UK, 1-71.
- Tan, H B and S H Law (2012), “Nonlinear dynamics of the finance-inequality nexus in developing countries”, *The Journal of Economic Inequality*, 10(4): 551-563.
- Tanndal, J and D Waldenström (2018), “Does financial deregulation boost top incomes? Evidence from the big bang”, *Economica*, 85: 232-265.
- Thakor, A V (2012), “Incentives to innovate and financial crises”, *Journal of Financial Economics*, 103(1): 130-148.



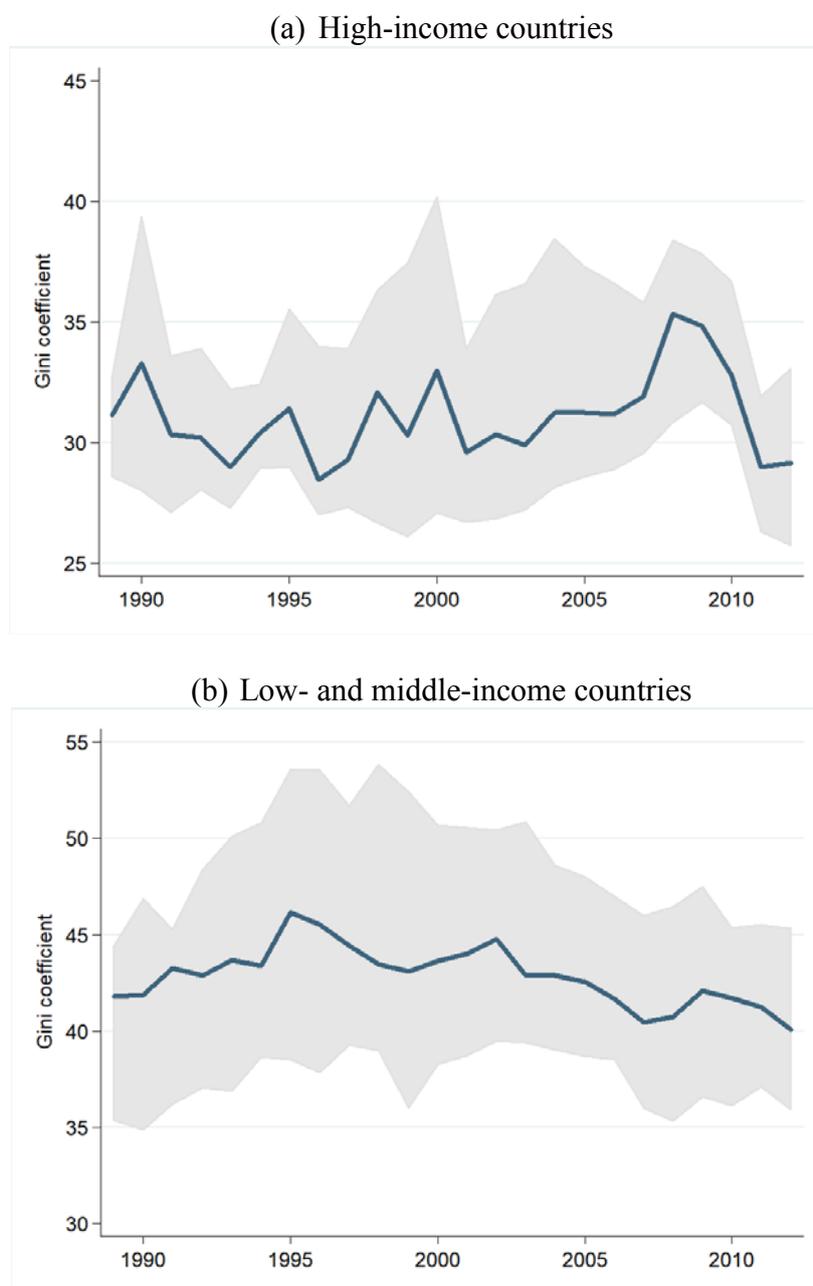
Note: The graph shows unweighted averages of the Financial Development Indicator across high income, middle-income and low-income countries.

Sources: Svirydenka (2016); authors' calculations.



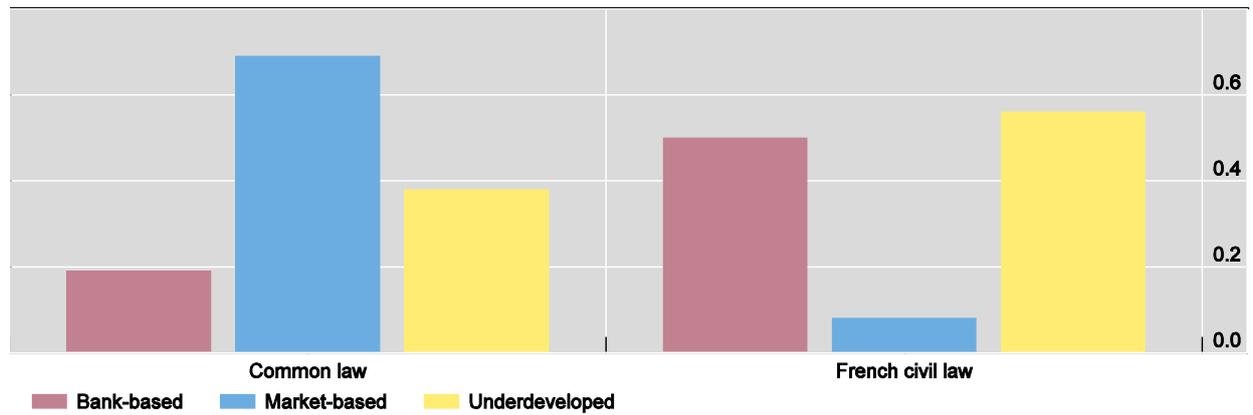
Note: The ratio of bank credit is expressed as a percentage of the sum of bank credit plus bond and equity market capitalisation. A higher value of the indicator suggests financial structure that is more bank-oriented. For a number of countries data for outstanding bonds issued by the private sector are not available. In this case, we assumed that bond issuance is zero. A dot that is below (above) the 45 degree line indicates that a particular system became more (less) market-oriented in 2012 compared to the initial value in 1989.

Sources: World Bank World Development Indicators; authors' calculations.



Note: Median, 25 and 75 percentile values are shown. A high-income country is defined according to the World Bank classification as of 2012 with a gross national income per capita above US\$12,476 calculated using the Atlas method. Low- and middle-income countries are the remaining countries.

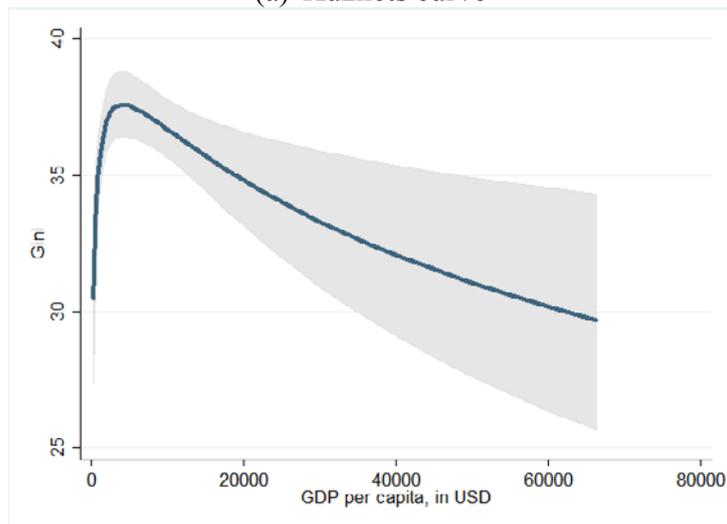
Source: UNO-Wider WIID3.3, Standardized Income Inequality Database. Authors' calculations.



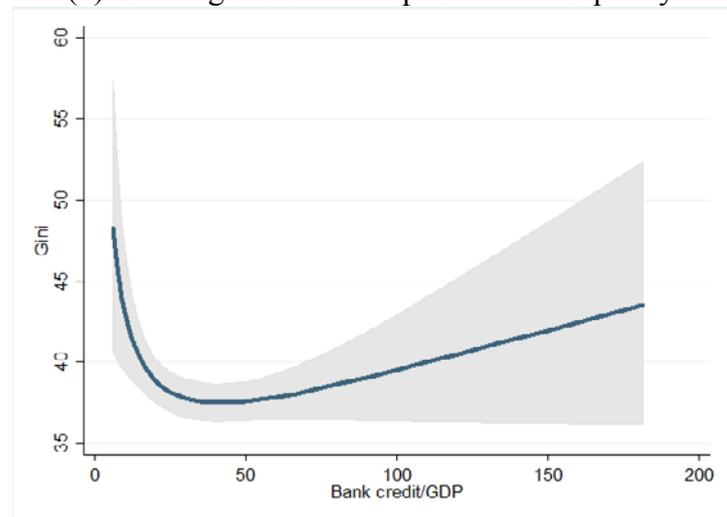
¹ The figures are computed using the information in Table 3.13 in Demirgüç-Kunt and Levine (2001). The height of each bar represents the share of countries within each category (underdeveloped, bank-based and market-based financial system) that corresponds to countries with the specific legal origin. Financial structure in each country is classified as underdeveloped when it scores below the cross-country median in terms of both bank and market development indicators. Countries are classified as bank-based or market-based if they are respectively below or above the mean value of a financial market structure indicator. The latter is constructed as a simple average of three ratios: capitalisation/bank assets, trading/bank credit, and trading/overhead cost. Higher values of the financial market structure index mean a higher degree of stock market development relative to the development of the banking system. Countries are divided into three groups depending on the origins of their legal system: common law, French civil law and other civil law (not shown).

Source: Demirgüç-Kunt and Levine (2001).

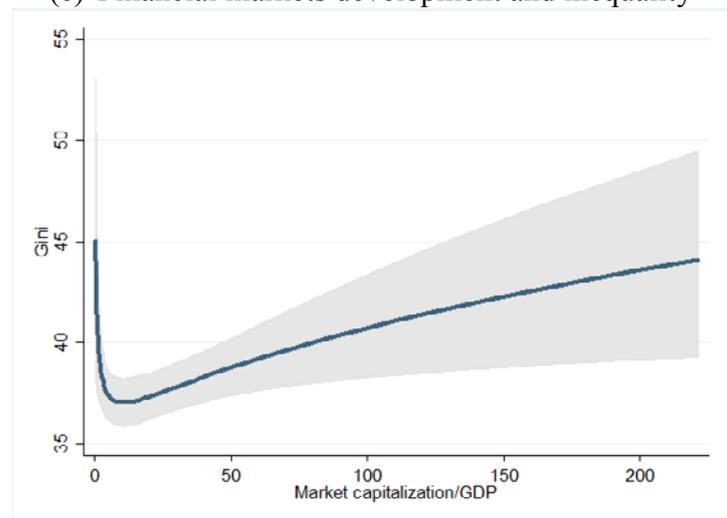
(a) Kuznets curve



(b) Banking sector development and inequality



(c) Financial markets development and inequality



Note: The non-linear effect is calculated from the regression in column (II) of Table 3. The marginal effects are calculated at average values of the regression variables. The shaded area shows 95% confidence bands.

Summary statistics of the variables used in the regressions Table 1

		Obs.	Mean	Std. dev.	Min.	Max.
Gini coefficient	Ln(Gini coefficient)	341	3.64	0.23	3.01	4.19
Top 10 income share	Ln(Top10)	228	3.40	0.23	2.98	4.05
FD index	Ln(1+FD)	228	0.31	0.16	0.07	0.69
FD index - Depth	Ln(1+FDD)	228	0.26	0.18	0.02	0.68
FD index – Access	Ln(1+FDA)	228	0.31	0.17	0.01	0.68
FD index - Efficiency	Ln(1+FDE)	228	0.43	0.12	0.14	0.64
Income per capita	Ln(GDP per capita)	341	8.62	1.49	5.37	11.31
Bank credit	Ln(Bank credit to private sector/GDP)	341	3.76	0.83	1.52	5.46
Market capitalization	Ln(Market capitalization/GDP)	341	3.15	1.37	-2.49	6.11
Industrial production	Ln(Industrial production/GDP)	341	3.37	0.27	1.96	4.06
Av. years of schooling	Ln(Average years of schooling)	341	2.04	0.38	0.79	2.56
Inflation rate	Ln(100 + CPI inflation)	341	4.68	0.10	4.58	5.33

Sources: UNO-Wider WIID3.3, Standardized Income Inequality Database, Svirydzenka (2016), World Development Indicators, Barro-Lee Educational Attainment Dataset, Alesina et al (2003), CIA World Factbook, CEPII gravity database.

Income inequality and financial development Table 2

Regressors	Linear model Aggregate FD index (I)	Non-linear model Aggregate FD index (II)	Depth index (III)	Access index (IV)	Efficiency index (V)
Lagged dependent variable	0.825*** (0.048)	0.664*** (0.113)	0.733*** (0.101)	0.858*** (0.058)	0.830*** (0.056)
Income per capita	-0.005 (0.009)	0.475* (0.259)	1.099** (0.506)	0.269 (0.294)	-0.069 (0.165)
Income per capita squared		-0.030* (0.016)	-0.065** (0.031)	-0.015 (0.016)	0.005 (0.010)
FD index	-0.038 (0.082)	-1.662** (0.826)	-2.206** (0.907)	-0.376 (0.706)	1.348 (1.422)
FD index squared		2.564** (1.304)	3.736** (1.627)	0.348 (0.904)	-2.032 (1.828)
Industrial production	-0.013 (0.031)	-0.014 (0.033)	-0.062 (0.066)	-0.021 (0.035)	0.027 (0.045)
Average years of schooling	-0.021 (0.032)	-0.050 (0.038)	-0.156*** (0.056)	-0.032 (0.034)	-0.056* (0.032)
Inflation rate	0.267*** (0.088)	0.115 (0.132)	-0.049 (0.143)	0.213 (0.174)	0.196 (0.126)
Observations	228	228	228	228	228
Number of countries	79	79	79	79	79
Serial correlation test, AR(2) ¹	0.001	0.004	0.145	0.021	0.100
Hansen test ²	0.048	0.298	0.692	0.129	0.663

The estimations use five-year averages over the period 1989-2012. The dependent variable is the logarithm of the Gini coefficient on net income. The FD index is compiled by Sviryzdenka (2016). Columns (I) and (II) report the results for the aggregate index. Columns (III) to (V) show the effects of development of financial institutions and markets along three dimensions: depth, access, and efficiency (weighted average across financial institutions and markets). All estimations are based on the system GMM estimator. Robust standard errors are in parentheses. The constant is not reported. *, **, *** indicate significance at the 10%, 5% and 1% level.

¹ Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. ² Reports p-values for the null hypothesis that the instruments are valid.

Income inequality, financial structure and legal system					Table 3
Regressors	Linear model (I)	Non-linear model (II)	Common law countries (III)	Civil law countries (IV)	Test of difference between (III) and (IV)
Lagged dependent variable	0.442*** (0.117)	0.711*** (0.061)	0.764*** (0.139)	0.728*** (0.094)	0.036 (0.132)
Income per capita	-0.031* (0.018)	0.508*** (0.184)	-0.129 (0.238)	0.673* (0.404)	-0.802 (0.571)
Income per capita squared		-0.030*** (0.011)	0.008 (0.014)	-0.039* (0.023)	0.047 (0.033)
Bank credit	-0.020 (0.016)	-0.509** (0.258)	0.412 (0.246)	-0.403* (0.246)	0.815** (0.349)
Bank credit squared		0.068* (0.037)	-0.062 (0.040)	0.053* (0.032)	-0.115** (0.049)
Market capitalization	0.017 (0.012)	-0.087* (0.045)	-0.140* (0.080)	-0.099** (0.045)	-0.041 (0.063)
Market capitalization squared		0.019** (0.009)	0.023** (0.012)	0.020** (0.009)	0.003 (0.013)
Industrial production	-0.021 (0.039)	-0.043 (0.043)	0.019 (0.070)	-0.068 (0.056)	0.087 (0.079)
Average years of schooling	-0.047 (0.032)	-0.097*** (0.025)	0.038 (0.057)	-0.124*** (0.037)	0.162*** (0.053)
Inflation rate	0.083 (0.085)	-0.111 (0.106)	-0.020 (0.305)	-0.070 (0.143)	0.050 (0.203)
Observations	341	341	112	229	
Number of countries	97	97	34	63	
Serial correlation test, AR(2) ¹	0.583	0.507	0.681	0.138	
Hansen test ²	0.558	0.992	0.334	0.269	

The estimations are done for five-year averages over the period 1989-2012. The dependent variable is the logarithm of the Gini coefficient on net income. The variable “bank credit” is the logarithm of the ratio bank credit over GDP. “Market capitalization” is the logarithm of the ratio stock market capitalization over GDP. All estimations are based on the system GMM estimator. Robust standard errors are in parentheses. The constant is not reported. *, **, *** indicate significance at 10%, 5% and 1% level.

¹ Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. ² Reports p-values for the null hypothesis that the instruments are valid.

Using top 10 percent of income distribution

Table 4

Regressors	Non-linear model Aggregate FD index (II)	Depth index (III)	Access index (IV)	Efficiency index (V)
Lagged dependent variable	0.682*** (0.109)	0.733*** (0.101)	0.870*** (0.061)	0.837*** (0.073)
Income per capita	0.907** (0.455)	1.099** (0.506)	0.414 (0.298)	-0.031 (0.182)
Income per capita squared	-0.054* (0.028)	-0.065** (0.031)	-0.023 (0.017)	0.003 (0.011)
FD index	-3.106*** (1.094)	-2.206** (0.907)	-0.902 (0.856)	1.779 (1.851)
FD index squared	4.639** (1.839)	3.736** (1.627)	1.091 (1.117)	-2.491 (2.317)
Industrial production	-0.013 (0.057)	-0.062 (0.066)	-0.023 (0.038)	0.028 (0.042)
Average years of schooling	-0.122** (0.056)	-0.156*** (0.056)	-0.024 (0.036)	-0.065 (0.043)
Inflation rate	-0.108 (0.156)	-0.049 (0.143)	0.141 (0.166)	0.197 (0.122)
Observations	228	228	228	228
Number of countries	79	79	79	79
Serial correlation test, AR(2) ¹	0.401	0.692	0.091	0.674
Hansen test ²	0.119	0.145	0.008	0.059

The estimations use five-year averages over the period 1989-2012. The dependent variable is the logarithm of the Top 10 per cent of income distribution taken from the World Bank. The FD index is compiled by Sviryzdenka (2016). Column I reports the result for the aggregate financial development index. Columns (II) to (IV) reports the effects of development of financial institutions and markets along three dimensions: depth, access, and efficiency (weighted average across financial institutions and markets). All estimations are based on the system GMM estimator. Robust standard errors are in parentheses. The constant is not reported. *, **, *** indicate significance at 10%, 5% and 1% level.

¹ Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. ² Reports p-values for the null hypothesis that the instruments are valid.

Income inequality, financial structure and economic freedom Table 5

Regressors	Linear model (I)	Non-linear model (II)	High/medium economic freedom countries (III)	Low economic freedom countries (IV)	Test of difference between (III) and (IV)
Lagged dependent variable	0.442*** (0.117)	0.711*** (0.061)	0.765*** (0.089)	0.600*** (0.222)	0.165 (0.314)
Income per capita	-0.031* (0.018)	0.508*** (0.184)	-0.103 (0.509)	1.950*** (0.592)	-2.053** (0.837)
Income per capita squared		-0.030*** (0.011)	0.005 (0.030)	-0.127*** (0.038)	0.132** (0.054)
Bank credit	-0.020 (0.016)	-0.509** (0.258)	0.216 (0.447)	-0.560*** (0.179)	0.776*** (0.254)
Bank credit squared		0.068* (0.037)	-0.034 (0.062)	0.072*** (0.028)	-0.106*** (0.039)
Market capitalization	0.017 (0.012)	-0.087* (0.045)	-0.151** (0.063)	-0.202* (0.109)	0.051 (0.154)
Market capitalization squared		0.019** (0.009)	0.030** (0.012)	0.046* (0.024)	-0.016 (0.033)
Industrial production	-0.021 (0.039)	-0.043 (0.043)	0.001 (0.042)	-0.196** (0.097)	0.195 (0.136)
Average years of schooling	-0.047 (0.032)	-0.097*** (0.025)	-0.066** (0.0306)	-0.142* (0.077)	0.076 (0.109)
Inflation rate	0.083 (0.085)	-0.111 (0.106)	-0.219 (0.178)	-0.305 (0.424)	0.086 (0.599)
Observations	341	341	262	79	
Number of countries	97	97	73	24	
Serial correlation test, AR(2) ¹	0.583	0.507	0.498	0.698	
Hansen test ²	0.558	0.992	0.394	0.183	

The estimations are done for five-year averages over the period 1989-2012. The dependent variable is the logarithm of the Gini coefficient on net income. The variable “bank credit” is the logarithm of the ratio bank credit over GDP. “Market capitalization” is the logarithm of the ratio stock market capitalization over GDP. All estimations are based on the system GMM estimator. Robust standard errors are in parentheses. The constant is not reported. *, **, *** indicate significance at 10%, 5% and 1% level.

¹ Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. ² Reports p-values for the null hypothesis that the instruments are valid.

Income inequality, financial structure and macroprudential policy					Table 6
Regressors	Linear model (I)	Non-linear model (II)	High macroprud. policy (III)	Low macroprud. policy (IV)	Test of difference between (III) and (IV)
Lagged dependent variable	0.442*** (0.117)	0.711*** (0.061)	0.594*** (0.110)	0.761*** (0.087)	-0.167 (0.122)
Income per capita	-0.031* (0.018)	0.508*** (0.184)	1.084** (0.494)	0.439** (0.182)	0.645** (0.257)
Income per capita squared		-0.030*** (0.011)	-0.064** (0.029)	-0.026** (0.011)	-0.038** (0.016)
Bank credit	-0.020 (0.016)	-0.509** (0.258)	-0.529** (0.211)	-0.571* (0.315)	0.042 (0.446)
Bank credit squared		0.068* (0.037)	0.072** (0.031)	0.078* (0.045)	-0.006 (0.063)
Market capitalization	0.017 (0.012)	-0.087* (0.045)	-0.083** (0.039)	-0.003 (0.072)	-0.080 (0.102)
Market capitalization squared		0.019** (0.009)	0.017*** (0.006)	0.003 (0.013)	0.014 (0.018)
Industrial production	-0.021 (0.039)	-0.043 (0.043)	-0.034 (0.077)	-0.037 (0.036)	0.003 (0.051)
Average years of schooling	-0.047 (0.032)	-0.097*** (0.025)	-0.224*** (0.081)	-0.062* (0.032)	-0.162*** (0.045)
Inflation rate	0.083 (0.085)	-0.111 (0.106)	-0.202 (0.176)	-0.087 (0.176)	-0.115 (0.249)
Observations	341	341	111	230	
Number of countries	97	97	29	68	
Serial correlation test, AR(2) ¹	0.583	0.507	0.581	0.768	
Hansen test ²	0.558	0.992	0.231	0.062	

The estimations are done for five-year averages over the period 1989-2012. The dependent variable is the logarithm of the Gini coefficient on net income. The variable “bank credit” is the logarithm of the ratio bank credit over GDP. “Market capitalization” is the logarithm of the ratio stock market capitalization over GDP. All estimations are based on the system GMM estimator. Robust standard errors are in parentheses. The constant is not reported. *, **, *** indicate significance at 10%, 5% and 1% level.

¹ Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. ² Reports p-values for the null hypothesis that the instruments are valid.

Income inequality, financial structure and bank transparency Table 7

Regressors	Linear model (I)	Non-linear model (II)	High bank transparency (III)	Low bank transparency (IV)	Test of difference between (III) and (IV)
Lagged dependent variable	0.442*** (0.117)	0.711*** (0.061)	0.846*** (0.108)	0.676*** (0.072)	0.170* (0.102)
Income per capita	-0.031* (0.018)	0.508*** (0.184)	0.003 (0.206)	0.608** (0.244)	-0.605* (0.345)
Income per capita squared		-0.030*** (0.011)	-0.000 (0.012)	-0.037** (0.015)	0.036* (0.021)
Bank credit	-0.020 (0.016)	-0.509** (0.258)	0.041 (0.191)	-0.503* (0.286)	0.544 (0.405)
Bank credit squared		0.068* (0.037)	-0.007 (0.028)	0.070* (0.041)	-0.077 (0.059)
Market capitalization	0.017 (0.012)	-0.087* (0.045)	-0.081** (0.041)	-0.050 (0.102)	-0.031 (0.144)
Market capitalization squared		0.019** (0.009)	0.017* (0.010)	0.009 (0.023)	0.007 (0.033)
Industrial production	-0.021 (0.039)	-0.043 (0.043)	-0.048 (0.049)	-0.091* (0.049)	0.044 (0.069)
Average years of schooling	-0.047 (0.032)	-0.097*** (0.025)	-0.038 (0.036)	-0.100** (0.045)	0.062 (0.063)
Inflation rate	0.083 (0.085)	-0.111 (0.106)	0.145 (0.252)	-0.043 (0.243)	0.188 (0.344)
Observations	341	341	142	180	
Number of countries	97	97	40	51	
Serial correlation test, AR(2) ¹	0.583	0.507	0.389	0.787	
Hansen test ²	0.558	0.992	0.077	0.978	

The estimations are done for five-year averages over the period 1989-2012. The dependent variable is the logarithm of the Gini coefficient on net income. The variable “bank credit” is the logarithm of the ratio bank credit over GDP. “Market capitalization” is the logarithm of the ratio stock market capitalization over GDP. All estimations are based on the system GMM estimator. Robust standard errors are in parentheses. The constant is not reported. *, **, *** indicate significance at 10%, 5% and 1% level.

¹ Reports p-values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. ² Reports p-values for the null hypothesis that the instruments are valid.