

# Financial Development and Income Inequality: A Panel Data Approach

August 7, 2012

Sebastian Jauch and Sebastian Watzka

## **Contact information**

*Sebastian Jauch*

Seminar for Macroeconomics, Ludwig-Maximilians-Universität Munich,  
Ludwigstr. 28  
80539 München  
Germany

Email: [sebastian.jauch@lrz.uni-muenchen.de](mailto:sebastian.jauch@lrz.uni-muenchen.de)

Phone: +49 89 2180 3460

Fax: +49 89 2180 13521

*Sebastian Watzka*

Seminar for Macroeconomics, Ludwig-Maximilians-Universität Munich,  
Ludwigstr. 28  
80539 München  
Germany

Email: [sebastian.watzka@lrz.uni-muenchen.de](mailto:sebastian.watzka@lrz.uni-muenchen.de)

Phone: +49 89 2180 2128

Fax: +49 89 2180 13521

## **Abstract**

We analyze the link between financial development and income inequality for a broad unbalanced dataset of up to 138 developed and developing countries over the years 1960 to 2008. Using credit-to-GDP as measure of financial development, our results reject theoretical models predicting a negative impact of financial development on income inequality measured by the Gini coefficient. Controlling for country fixed effects and GDP per capita, we find that financial development has a positive effect on income inequality. These results are robust to different measures of financial development, econometric specifications, and control variables.

## **Keywords**

Financial Development, Income Inequality, Global, Panel Analysis

## **Acknowledgements**

We thank Gerhard Illing, Mathias Hoffmann, Carsten Sprenger, Mark Gradstein and the participants of seminars at the University of Munich, the DIW Macroeconometric Workshop 2011 in Berlin, the CESifo Macro Money and Finance Conference 2012 in Munich, the Fiscal Policy Conference Barcelona 2012, and the National Bank of Serbia Young Economists Conference 2012 for their helpful comments. All errors are our own.

## 1 INTRODUCTION

In the aftermath of the economic crisis of 2008-09 many public commentators argued about the benefits and harms of the financial sector for the rest of society. The privatization of profits and socialization of losses of banks is a common bon mot in political debates in many developed countries. Together with widening income gaps and social inequality in the United States, United Kingdom, Germany and many other countries the question of the contribution of the financial system to the economy and more generally to society arises. The merits of efficient financial systems fall short in being acknowledged by the public as bankers are recognized as highly paid individuals who serve only their own interest. In the view of many economists there exists a more benign point of view of the financial sector: Financial markets boost economic growth, enable wealthy as well as poor people to borrow and finance investments, and thereby ensure capital is distributed most efficiently – and in particular unrelated to inherited wealth. Generally, so the story goes, the more efficient and well developed financial markets are, the more a specific borrower can borrow with a given amount of collateral. The success of micro credits for the poor in developing countries is just one example of what banks are able to do for society.<sup>1</sup> There are parts of society that were not able to borrow and can now build their own businesses, increase income and climb the social ladder. Remaining income inequality would then be optimal or justified in the sense of being independent of inherited wealth. But there are also more critical voices being raised recently. In particular banks and financial markets are much criticized for being ruthless in developed countries where almost everybody is supposed to have access to finance and where income inequality is a phenomenon that was thought to be part of the past. Anecdotal evidence appears to give arguments in favor of and against an inequality reducing effect of financial development.

We therefore aim to empirically assess the link between financial development and the distribution of income in a society. Does financial development always reduce income inequality in society? Are there important differences across and within countries based on their stage of economic development or is the influence the same around the world independent of country characteristics and the time we live in? We analyze the link of financial development and income inequality using standard proxies in the financial development literature, the ratio of private credit over GDP and the Gini coefficient of income distribution within countries.

We extend the existing literature by using a larger database covering a longer time horizon and more countries. We further control for year effects and time-invariant country characteristics. Finally, we carry out various robustness checks to our benchmark specification. These include a sample split of the dataset in subsamples according to income levels. In contrast to previous empirical work on this topic we reject theories that predict an income inequality reducing effect of financial development. This is a robust finding over most specifications. Because of these more general and robust findings we believe our work is of importance to the literature and the profession.

While investigating the link of financial development and income inequality we do not judge or examine whether there is an optimal or fair level of inequality. On the one hand, higher levels of inequality can have boosting effects on an economy from an incentive point of view. If everybody was receiving the same final incomes, independent of effort, of course nobody would have an incentive to incur extra efforts for the production of goods and services and the economy would suffer. On the other hand, excessive inequality can lead to social unrest and political instability.

The remainder of the paper is structured as follows: Section two of the paper gives an overview of related literature and what we contribute to the literature. Section three describes the data used in our work. In section four we conduct the econometric analysis, section five presents our robustness tests, and section six concludes.

## **2 LITERATURE**

Our work adds to the literature on financial development, income inequality, and economic development. There is an extensive literature on the link of financial development and growth. A good overview of theoretical as well as empirical work in this regard is given by Levine (2005). In general financial development is expected to enhance growth by enabling the efficient allocation of capital and reducing borrowing and financing constraints. But this literature does not address the issue of which part of society benefits from the growth enabled by financial development. Growth could benefit the poor by creating more employment opportunities, but it could also favor the entrepreneurs and their profit margin. The relationship between the distribution of income and economic development was initially investigated by Kuznets (1955), who established the inverted U-shape path of income inequality along economic development – the well known Kuznets curve. Kuznets' argument was that rural areas are more equal and with lower average income than urban areas in the beginning of industrialization and thus by the process of urbanization a society becomes more unequal. When a new generation of former poor rural people who moved to cities is born, they are able to profit from the urban possibilities. Wages of lower-income groups rise and overall income inequality narrows. One factor backing Kuznets argument of the urban possibilities is financial development, which allows formerly poor migrants to choose the education they desire and to build their own businesses – irrespective of

their inherited wealth. This is the basic reasoning why economic theories predict a negative impact of financial development on income inequality. Financial development fosters the free choice regarding education and the founding of businesses. As both lead to growth and growth is associated with more jobs, average income will rise and inequality fall.

The three major theoretical papers explaining the financial development and income inequality nexus are by Banerjee and Newman (1993), Galor and Zeira (1993) and Greenwood and Jovanovic (1990). Whilst the first two predict that better developed financial markets lead to a reduction in income inequality, the latter predicts an inverted-U shaped relation between financial development and income inequality. In other words, in the early stages of financial development – during which only a small part of society benefits from this development – income inequality increases. But after a certain stage of financial and economic development is reached, more financial development starts reducing income inequality.

Whilst the specific economic mechanisms behind these predictions differ, the key reason why better developed financial markets – at least after some stage – reduce income inequality is always that better credit availability allows household choices and decisions to be made based more on economic optimality, and less on inherited wealth. The relevant choices differ according to each study, but they all have to do with the individual's future income possibilities and whether these are optimal for the individual. To that end Banerjee and Newman (1993) model households' occupational choice which depends on credit availability. Alternatively, Galor and Zeira (1993) model human capital investment which again depends on credit. Finally, Greenwood and Jovanovic (1990) model household portfolio selection where the use of financial intermediaries generally improves household capital incomes but comes at a small fixed costs. Initially, poor households cannot afford using banks for their savings and thus inequality rises

with financial development as only wealthy born households can use bank finance. As the economy, however, develops and grows over time, poorer households become richer and can also start using bank finance. Thus inequality after some point falls with financial and economic development.

These models theoretically motivate the use of the ratio of private credit over GDP as proxy for financial development. On the one hand, better developed financial markets lead to either more investment in occupational choice or human capital and this requires financing by credit. Hence, financial development and private credit growth should consequently go hand in hand. On the other hand, better developed financial markets allow more households in society to benefit from better use of investment possibilities through the financial sector. This should thus increase bank deposits and overall savings in the economy, as well as being funneled into more credit in the economy.

Those theories are subjected to empirical research that uses cross-country datasets on income inequality to test for the negative and inverted U-shaped relationships of financial development and income distribution. Clarke, Xu, and Zou (2003) test these different theories. Using a dataset of 91 countries over the period from 1960 to 1995 and averaging the data over five-year periods they confirm the theories of Kuznets (1955), Banerjee and Newman (1993), and Galor and Zeira (1993) and reject the Greenwood and Jovanovic (1990) model. As a measure of financial development they use both, private credit over GDP and bank deposits over GDP. Control variables are GDP per capita and its squared term in order to follow Kuznets curve. Further control variables include risk of expropriation, ethno-linguistic fractionalization, government consumption, inflation and the share of the modern sector. Besides the linear negative impact of

financial development on income inequality, the maximum of Kuznets curve is calculated – depending on the econometric specification – as about 1,400 USD and 2,350 USD.

Beck, Demirgüç-Kunt, and Levine (2004) also test the three theories about the impact of financial development. They use private credit over GDP as proxy for financial development and in contrast to Clarke et al. use not 5-year averages but the average over the whole time horizon covered per country with a between estimator. Their 52-country sample from 1960 to 1999 also confirms the linear negative influence of financial development on income inequality. Li, Squire, and Zou (1998) explain variations in income inequality across countries and time. They approximate financial development as M2 over GDP, which has a significantly negative effect on inequality in their sample of 49 countries. They also distinguish between the effect of financial development on poor and rich and find that it helps both groups. Further research that backs Galor and Zeira and Banerjee and Newman is for example Kappel (2010), who uses a sample of 59 countries for a cross-country analysis and 78 countries for a panel analysis over the period 1960 to 2006. Kappel also distinguishes between high and low income countries. While credit over GDP is still significant and negative for high income countries, it does not show any influence for low income countries. Jaumotte, Lall, and Papageorgiou (2008) investigate income inequality with a focus on trade and financial globalization. In their sample of 51 countries from 1981 to 2003 they have the measure of private credit over GDP only as control variable. In contrast to Beck et al. and Clarke et al. they get a positive and significant coefficient for financial development in all different econometric specifications of their estimation. Without explicitly stating it they thus reject the theories explained above and contradict work which just focuses on the financial development inequality link. All the described studies have in common that they look at a broad set of countries, development over time, and the theories we described in detail. Furthermore they start with simple OLS estimations and pursue with two stage least squares

estimation to tackle eventual omitted variable biases. Both, random effect and between models are used but no study compared fixed effect estimations with their results. Further empirical research (natural experiments, household studies, firm- and industry-level analyses, and case studies) on the link between financial development and income inequality is summarized in Demirgüç-Kunt and Levine (2009).

Finally, there is a new and growing strand of the literature that emphasizes the political dimension in the inequality and finance nexus. Rajan (2010), a leading proponent of this view, argues that the increased credit given to US American households was a direct consequence to the rising inequality trend over the last two decades. Together with the political inability to use traditional forms of redistributive taxation it seemed better and by far easier for politicians to improve access to credit for poorer American households. This way credit to GDP, or the literature's traditional measure of financial development, is influenced to a large part by politics and depends on increased inequality. Kumhof and Ranciere (2010) set up a theoretical model that endogenously explains how high credit growth and financial crises can result as a consequence of rising income inequality. They argue that the periods 1920-1929 and 1983-2008 exhibited this kind of pattern. However, the hypothesis that rising inequality generally leads to a credit boom is empirically rejected in a recent study by Bordo and Meissner (2012) which uses a much larger dataset than Kumhof and Ranciere (2010) and concludes that there is no evidence that rising inequality leads to credit booms. This is of course very important for our study because we ideally want to treat financial development as a variable that is reasonably independent from income inequality. But to be very sure we add relevant robustness tests which also specifically allow for endogeneity of financial development.

Our research adds value to the afore mentioned literature especially in the scope of analysis. The basic sample consists of 138 countries with observations covering the years 1960 to 2008. In total we use 3228 country-year observations and 802 observations for the estimation with five-year averages. The large sample also allows us to distinguish between the effect of financial development in different country groups regarding income and region. This is to the best of our knowledge the largest dataset for an analysis of financial development and income inequality in terms of years as well as countries. This paper further controls for year effects with year dummies and country characteristics in order to isolate the effect of financial development and to reduce the omitted variable bias. Finally, we carry out various robustness checks which support our key result that the data generally rejects the theoretical models.

### **3 DATA**

#### *(a) Description of dataset*

We combine different datasets to derive the to the best of our knowledge the largest dataset for the analysis of financial development and income inequality. Income inequality is measured both as gross income before redistribution and net income after redistribution using the Gini coefficient. Redistributive policies might blur the theoretical relation between financial development and income inequality which is modeled without an explicit role for redistribution. Hence we use both gross and net Gini coefficients in our empirical analysis. The underlying source is Solt's Standardized World Income Inequality Database (SWIID) (2009), which "is the most comprehensive attempt at developing a cross-nationally comparable database of Gini indices across time" [Ortiz and Cummins (2011), p. 17]. The SWIID uses the World Income

Inequality Database by the United Nations University, which is the successor of Deininger and Squire's (1996) database, data from the Luxembourg Income Studies (LIS), Branko Milanovic's World Income Distribution data, the Socio-Economic Database for Latin America, and the ILO's Household Income and Expenditure Statistics. The total coverage is at 171 countries with 4285 country-year observations and 802 observations for five-year averages.

The other important source for our research is the updated 2010 version of the Financial Structure Database by Beck, Demirgüç-Kunt, and Levine (2009). They collected data on both of our measures for financial development – private credit divided by GDP and bank deposits divided by GDP. Private credit is calculated based on the IMF's International Financial Statistics and consists of credit provided by deposit money banks and other financial institutions to the private sector. It does not include credit provided to the state or by central banks. Bank deposits is also based on the IMF's International Financial Statistics and consists of demand, time and saving deposits in deposit money banks. Both variables are standard measures of financial development and used in the empirical literature described above.

Finally, we control for a host of other variables that have traditionally been used to explain inequality. GDP per capita is used in constant USD and taken from the World Development Indicators of the World Bank. Table 1 provides an overview of the definitions and sources of all variables used in this paper.<sup>2</sup>

*Table 1: Overview of variables and sources*

<i>Variable</i>	<i>Definition</i>	<i>Source</i>
Gini (gross) and Gini (net)	Gini coefficient of gross and net income	Solt (2009)
Financial Development (1) – Private Credit/GDP	Private credit divided by GDP; claims on the private sector by deposit money banks and other financial institutions	Beck, Demirgüç-Kunt, and Levine (2009)
Financial Development (2) – Bank deposits/GDP	Bank deposits divided by GDP; demand, time and saving deposits in deposit money banks	Beck, Demirgüç-Kunt, and Levine (2009)
GDP per capita	Constant 2000 USD; Country groups based on four income categories (High, upper middle, lower middle, and low income)	World Development Indicators, World Bank (2011)
Legal origin	Dummy variable regarding the origin of the legal system (UK, France, German, Scandinavian, Socialist)	La Porta, Lopez-de-Silanes, Vishny (2008)
Inflation	Consumer price index; change on previous year	World Development Indicators, World Bank (2011)
Agricultural Sector	Value-added by the agricultural sector as a share of GDP	World Development Indicators, World Bank (2011)
Government Consumption	Government share in total expenditure	World Development Indicators, World Bank (2011)
Access to Finance	Different measures for the access to finance, e.g. number of ATMs per 100.000 inhabitants, minimum amount required to borrow as ratio over GDP p.c.	Financial Access Survey, International Monetary Fund (2011)
Ethnolinguistic Fractionalization (ELF)	Degree of the fractionalization of the population in 1985 with lower values indicating lower fractionalization	Roeder (2001)

*Note:* Tables 8a and 8b show the correlation coefficients for the variables used in this paper.

Private credit over GDP can be used as proxy for financial development as it reflects the ease to get credit for households and corporations. The more credit is provided to the private sector, the easier it was for private institutions to signal their creditworthiness at the respective lending rate

and the more private individuals were able to have access to credit markets. This argumentation does not always hold as can be seen with real estate credits and the subprime crisis in the United States in 2007-08 but it is fairly robust over our entire sample. Furthermore we do not have micro level data regarding the distribution of credit in the population and among businesses and can consequently not assess how different groups in the population benefit from increasing credit provision and how those credits are used. Still we do believe that it is a good proxy for financial development as there is a high correlation between private credit over GDP and the access to finance measured by other measures like the number of ATMs or number of bank branches per population or per square mile.<sup>3</sup> The alternative measure we use, bank deposits over GDP, serves as a proxy as it describes again the access to finance. Without or with less financial development, less people have access to bank accounts. Lower values of bank deposits over GDP also reflect the lack of trust of creditors in their financial system and their banks. There are again some caveats as we do not know the distribution of bank deposits among the population and businesses and we have no data on the turnover rate of the deposits. Overall and most importantly, both measures explain how well the financial system performs its inherent task – channeling funds and intermediating between creditors and debtors.

***(b) Income inequality over time and around the world***

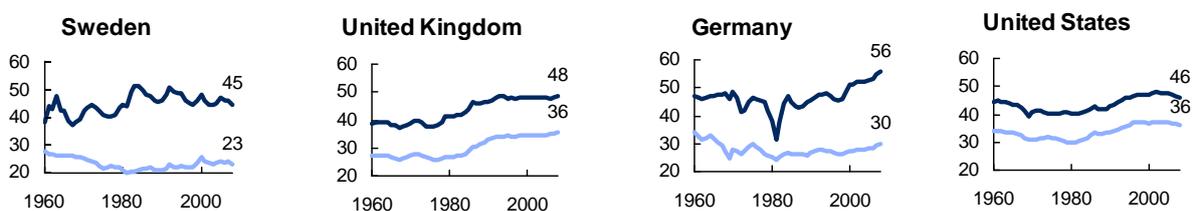
Income inequality can be measured on a gross and on a net basis. Gross income excludes all income from non-private sources, i.e. it excludes pensions provided by the state to pensioners, all kind of social transfers to economically poor people and it also abstains from subtracting taxes as well as social contributions. Net income in contrast includes all kinds of public transfers and deductions. Net income measures the amount an individual possesses and can use for consumption and saving. Neither gross nor net income are the right instruments to measure the

market outcome when individuals decide about following a career opportunity or not, as gross income does not reflect which amount an individual can spend and save today and net income does take into account that individuals earn entitlements on pensions and other social benefits. This paper consequently uses both measures of income inequality and investigates how gross and net income inequalities are affected by financial development and other explanatory factors.

Income inequality (gross and net) is measured with Gini coefficients. The Gini for gross (net) income inequality is normally distributed for the whole pooled sample with a mean of 44.3 (38.4), standard deviation of 9.6 (10.1), skewness of .36 (.41) and kurtosis of 3.0 (2.5).<sup>4</sup> Income inequality generally changes only slowly over time. Splitting the sample in observations by year, the Gini becomes more normally distributed over time with lower standard deviations. This process is accompanied by higher means. Figures 2a and 2b in the appendix show the distribution of gross and net inequality around the world measured as average over the years 2000 to 2004. Inequality is highest in Latin America and Sub-Saharan Africa. Very high and increasing levels of gross income inequality can also be observed in developed countries like Germany, the United Kingdom, and the United States. However the level of net income inequality, i.e. after redistribution, is much lower than gross income inequality in developed countries as shown in figure 1a. Even countries that are considered as being very equal, like Sweden, have a high level of gross income inequality. These examples show that in discussing equality aspects one has to be explicit whether equality before or after redistribution is considered. In Germany and Sweden net inequality is relatively constant compared to gross inequality in contrary to the United Kingdom and the United States, where net and gross inequality move in parallel. Redistribution in those countries does not change when gross inequality increases or decreases. This is a very interesting result on its own as it demonstrates how different societies deal with the issue of unequal income distribution.

A correlation analysis of gross and net Ginis with the other explanatory variables used shows that net income inequality has higher correlations with most variables than gross income inequality. From a theoretical point of view and with respect to the economic theories we outlined above, we should point out that the theoretical case for financial development decreasing gross inequality might in fact be weaker than for financial development decreasing net inequality. Financial development might encourage risk taking and this could increase the gross Gini; at the same time financial development might allow households and countries to share their risks, thus reducing net Ginis. For all these reasons we will describe and interpret mostly the results of the estimations with net income inequality, but we will nevertheless report all results for gross income inequality throughout this paper.

*Figure 1a: Inequality over time*



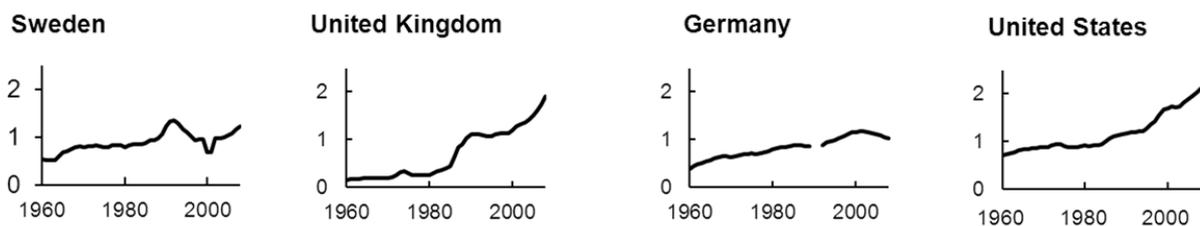
*Note:* The dark blue line shows gross income inequality. The light blue line shows net income inequality.

***(c) Financial development over time and around the world***

Financial development defined by private credit over GDP is increasing over time. Figure 1b shows our measure of financial development for a selection of developed countries. The process of financial development is generally more monotone than the development of gross inequality. The mean for the whole sample is .45 with a standard deviation of .39. Figure 3 shows the stage of financial development for the countries in our sample for the years 2000 to 2004. As expected, financial development is especially high in OECD countries with the highest levels in countries

of Anglo-Saxon origin. The countries with the highest values are Iceland, Luxembourg, and the United States. The distribution of financial development across countries and time is not as normal as it is for inequality so that we transform the variable with logs for all estimations. This changes the skewness from 1.5 to -.3 and the kurtosis from 5.0 to 2.8. In contrast to inequality, credit over GDP becomes more uniformly distributed across countries over time when looking at different income country groups. So we do not observe a convergence to one level but rather that some countries keep lower levels while other countries increase their credit provision more quickly. The second measure for financial development is bank deposits, which is used as robustness check for credit over GDP. The development of bank deposits is similar to private credit (the mean is .42 and the standard deviation is .38). However, we point out that these measures are not determining each other equally. While bank deposits are a prerequisite for the provision of credit and can be viewed as a main determinant of credit, this relation does not hold in the other direction. Financial intermediaries pool deposits and provide credit. Debtors use those credits to invest or consume but do not put this money in their bank account. A reverse causality can thus be excluded. This is important when we deal with potential endogeneity issues in the empirical part of this paper.

*Figure 1b: Financial development over time*



## 4 ECONOMETRIC ESTIMATION

### (a) *Basic estimation - Comparison with previous research*

We test the hypotheses of Galor and Zeira (1993) and Banerjee and Newman (1993), namely that financial development has a negative impact on income inequality and the hypothesis of Greenwood and Jovanovic (1990) that the influence follows an inverted U-shape. In what follows we label these hypotheses as GZ, BN, and GJ. Our basic estimation therefore allows for nonlinearities due to Kuznets' curve as well as first increasing and then decreasing influence of financial development. Equation (1) allows a comparison of our dataset with Gini coefficients that are suited for cross-country research with the results from other research.

$$(1) \text{ Gini}_{i,t} = \alpha + \beta_1 FD_{i,t} + \beta_2 FD_{i,t}^2 + \beta_3 GDP \text{ p.c.}_{i,t} + \beta_4 GDP \text{ p.c.}_{i,t}^2 + \beta_j X_{i,t} + \varepsilon_{i,t}$$

Following the hypothesis of a linear negative influence,  $\beta_1$  should be negative and significant and  $\beta_2$  should be insignificant. According to the inverted U-shape hypothesis,  $\beta_1$  should be significant and positive and  $\beta_2$  should be significant and negative. We add *GDP per capita* and its squared term to control for Kuznets' curve. Therefore  $\beta_3$  should be positive and significant and  $\beta_4$  should be negative and significant. *Gini* is normally distributed and rather stable and consequently not transformed into logs. Both *FD* (financial development) and *GDP p.c.* are transformed into logs, as both variables have a skewed distribution. The square of the variables is taken from the log.  $X_{i,t}$  represents the control variables used. Following Clarke et al. (2003) we include ethnolinguistic fractionalization (*ELF*), inflation, the share of government expenditure in GDP and the share of the agricultural sector in total value added.<sup>5</sup> All measures but *ELF* are transformed in logs. Our second proxy for *FD* is *bank deposits* which is also log-linearized and treated like *credit*. We estimate the model with ordinary least squares (OLS). One impediment to

our estimation is heteroskedasticity which we handle by using heteroskedasticity robust standard errors. Furthermore there are different approaches on how to proceed with yearly data.<sup>6</sup> Yearly data may represent cyclical movements while using five-year averages yields a more balanced panel but at the same time means a loss in the number of observations. To compare the results of this larger and more suitable dataset with previous work we focus on five year averages. Most variables do only change little from one year to another so that there is also a larger variation with five year averages.

*Table 2: Basic estimation*

	Model				
	Gini (gross)		Gini (net)		
	(1a)	(1b)	(2a)	(2b')	(2b)
FD	-3.17	-0.83	-6.83***	-4.17**	-2.33
FD <sup>2</sup>	0.58*	0.25	1.17***	0.72**	0.44
GDP p.c.	13.39***	13.11***	22.42***	21.83***	21.85***
GDP p.c. <sup>2</sup>	-0.93***	-0.87***	-1.68***	-1.62***	-1.63***
ELF		6.57***		9.25***	9.08***
Inflation		-0.46			-0.20
Gov. expendit.		1.66*		-1.26	-0.96
Agriculture		0.33		-1.57***	-1.56***
Constant	3.90	-9.79	-20.82***	-20.99**	-24.27***
N	802	637	802	666	637
R <sup>2</sup>	0.07	0.10	0.38	0.45	0.44
Max/Min of:					
FD (priv. credit)	strictl. positive	not significant	18.48%	18.11%	not significant
GDP (in USD)	1,376	1,933	784	832	828

\*\*\*, \*\*, \* denote statistical significance levels at 1%, 5%, and 10%

*Note:* Income inequality measured as Gini coefficient is the dependent variable for all models. Model 1 is using the Gini coefficient of gross income and model 2 is using the Gini coefficient of net income. All data are five year averages and the models are estimated with default heteroskedasticity robust standard errors. Model *a* is estimated without control variables, model *b* includes control variables. Model 2b' includes all control variables except inflation, as omitting inflation increases the adjusted R<sup>2</sup>. Max/Min of FD (financial development) and GDP indicate at which level the sign of the explanatory variable changes. Neither country fixed effects nor time dummies are included in order to make the results comparable to previous research. We also abstain from using cluster robust

standard errors to compare these results with previous research. The estimation results with bank deposits as proxy for financial development are in table 10 in the Appendix.

Using the approach of previous research, not correcting for clusters in the sample and not including a time trend or time dummies, this dataset confirms some of the earlier results. Pooling all observations in disregard of time invariant country characteristics shows that *GDP per capita* is positive and significant in its linear form and negative and significant in its quadratic form. Thus the influence of *GDP per capita* mirrors an inverted U-shape – Kuznets' curve. Kuznets' hypothesis on the development of income inequality during the process of economic development seems to be true and the values for gross income inequality are in line with Clarke et al. (2003) who estimated the maximum of the Kuznets' curve between 1,250 and 2,350 USD. The maximum net income inequality is reached earlier at around 800 USD. This means that societies start to redistribute income before the peak in gross income inequality is reached.

The effect of financial development on income inequality is not so clear. Controlling for other factors, there is no significant effect of financial development on gross income inequality, which does not support the above theories. Estimating the effect on net income inequality, financial development seems to generate a U-shaped response in inequality which is contradictory to the theories. BN and GZ are backed only until a certain degree of development, while GJ can reasonably be rejected. Up to the provision of private credit over GDP of about 18%, financial development lowers net income inequality, however it increases inequality afterwards. A robustness check with the second proxy for financial development indicates that financial development does not have a significant effect on net income inequality and only a small negative effect on gross income inequality (cf. Table 10 in the Appendix). The results on the effect of financial development are consequently inconclusive, but we cannot fully confirm any of the theoretical models described above. In a second step we correct the default standard errors

in the pooled OLS estimation for clustered data.<sup>7</sup> Kuznets' curve remains apparent but the link of financial development and income inequality disappears.

To sum up, using the approach of former papers with an advanced dataset confirms the results for the effect of GDP but backs the theoretical and known empirical effects of financial development only to a certain degree.

### ***(b) Econometric hurdles***

Former research took endogeneity into account and used an instrumental variable approach to estimate the impact of financial development allowing for the possibility that inequality influences financial development or for an omitted variable bias. Results did not differ much from the OLS approach. Instruments for financial development were in line with the literature on financial development the origin of a country's legal system. Following the same approach and using *legal origin* dummies as exogenous instruments leads to a  $R^2$  of 57% in the first stage regression in our sample when we include *GDP p.c.* the other exogenous explanatory variables of the second stage regression and the time dummies. The fitted values for *FD* have a correlation of 76% with the original values and can consequently be viewed as having a good fit.

However, legal origin might not be a good instrument for financial development when one is investigating the inequality nexus. The famous French slogan "liberté, égalité, fraternité" of course includes equality. This shows that the origin of the legal system is not independent of inequality and consequently not suited as an instrument. To be sure that reverse causality is still not a problem we conduct estimations with lagged explanatory variables, two stage least square estimations and GMM estimation in our robustness section (please see section 5 below).

An endogeneity problem might however also occur because of omitted variables. We address this issue by using a fixed effects regression including time dummies, which is also the main difference in our econometric approach from previous research. Country dummies are included to control for country specific characteristics that do not change over time but are potentially influential regarding income inequality. These can be cultural factors, religion, colonial background and others. Time dummies are included to control for common shocks for all countries like major international political events or large business cycle fluctuations. Finally, we allow for a linear time trend as we expect *Credit* and *GDP p.c.* to grow over time as countries become more developed and richer.

Another problem often occurring in estimations is multicollinearity. Multicollinearity reduces the power of the OLS-estimator but the estimator is still unbiased and efficient. The Variance Inflation Factor (VIF) shows a high degree of multicollinearity which is due to the structure of our base estimation with linear and squared terms of financial and economic development. Estimating the influence of financial and economic development on income inequality with either linear or squared terms only reveals a low result for the VIF and confirms that multicollinearity is not an issue in the estimation.

The estimations in table 2 might face an omitted variable bias since there are no country specific effects included besides ethnolinguistic fractionalization that explain income inequality. Thus, as a next step we control for country specific effects by conducting a fixed effect estimation. Fixed effects are not a cure for all omitted variable problems as time variant country characteristics are not included, but it is a good first approach to tackle a potential omitted variable bias (cf. Acemoglu et al. (2008)). A further potential critique regarding the estimation process is

endogeneity caused by reverse causality. An option to solve reverse causality is to use a two stage least squares (2SLS) estimation, which is done in the next section.

**(c) Fixed effect estimation**

Key to this paper is the explanation of the influence of financial development on income inequality within and not between countries. So the results are not to be used to compare the levels of income inequality across countries. The estimation results answer the question how financial development in the countries included in this broad dataset influences the income distribution. To estimate this influence we use the fixed-effect estimator, also known as within estimator. The within estimator has the advantage of controlling for country characteristics and in contrast to the between estimator using all observations of the dataset and developments over time. Amending the basic estimation (1) by time dummies  $\gamma_t$  and country specific time invariant effects  $\alpha_i$  leads to the new estimation equation (2).

$$(2) \text{Gini}_{i,t} = \alpha + \beta_1 \text{FD}_{i,t} + \beta_2 \text{FD}_{i,t}^2 + \beta_3 \text{GDP p.c.}_{i,t} + \beta_4 \text{GDP p.c.}_{i,t}^2 + \beta_j X_{i,t} + \gamma_t + \alpha_i + \varepsilon_{i,t}$$

The fixed effect estimator subtracts the country specific mean from each variable, so that all time invariant factors drop out. Table 3 shows the results of the fixed effect estimation. To make sure that reverse causality does not disturb the estimation, results of a two stage least squares estimation (2SLS) with bank deposits taken as exogenous variable are included in table 3. As before, yearly data and five year averages lead to similar coefficients and we report five year averages.

Table 3: Fixed effect and 2SLS estimation

	Model					
	Gini (gross)			Gini (net)		
	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)
FD	2.57***	2.75***		1.76***	1.89***	
FD - fitted			2.82***			2.13***
FD <sup>2</sup>		not significant <sup>1</sup>			not significant <sup>1</sup>	
GDP p.c.	-24.10***	-21.90***	-21.86***	-6.88	-9.04**	-9.31**
GDP p.c. <sup>2</sup>	1.56***	1.40***	1.39***	0.43	0.56*	0.57*
Inflation		-0.53*	-0.55**		-0.35*	-0.34*
Govern. exp.		1.38	1.20		0.84	0.68
Agriculture		0.13	0.07		-0.05	-.08*
Constant	133.95***	123.39***	124.10***	61.15***	64.00***	65.69***
N	802	668	669	802	668	669
R <sup>2</sup> (within)	0.25	0.26	0.23	0.08	0.12	0.10
Max/Min of:						
FD (priv. credit)	strictl. pos.	strictl. pos.	strictl. pos.	strictl. pos.	strictl. pos.	strictl. pos.
GDP (USD)	2,240	2,547	2,659	not signif.	3,090	3,797

\*\*\*, \*\*, \* denote statistical significance levels at 1%, 5%, and 10%

<sup>1</sup>Both terms for *FD* are insignificant in a quadratic estimation so that *FD* only enters linearly in the model

*Note:* Model 3 is estimated with Gini coefficients of gross income as dependent variable, model 4 uses Gini coefficients of net income. Model a is a fixed effect estimation without further control variables, model b is a fixed effect estimation with control variables and model c is a 2SLS estimation, where the first stage results are shown in table 9 in the Appendix. All models use data averaged over five year periods and are estimated with heteroskedasticity robust standard errors. Max/Min of *FD* (Financial development) and *GDP p.c.* indicate at which level the sign of the explanatory variable changes. Both models include time dummies. The estimations with bank deposits as proxy for financial development are in table 10.

We proceed in several steps and each step gives similar results for the influence of financial development on income inequality. Independent of the inclusion of control variables, of the investigation of gross or net income, and of a fixed effects or 2SLS-fixed effects model, financial development has a significantly positive effect on income inequality. In other words, our findings somewhat surprisingly suggest that financial development increases income inequality. The distribution of gross income reacts stronger to financial development than the distribution of net income. For the normal fixed effect models the impact is about 45% larger and for the 2SLS the

magnitude of the effect is 1/3 larger. The influence is statistically highly significant and its economic consequences are also considerable. An increase of financial development by ten percent increases the net Gini by about 0.2 points.

Equally surprising are our results for the effects of GDP per capita or economic growth on inequality. In contrast to Kuznets' inverted U-shaped hypothesis, income inequality first decreases with the process of development and increases after surpassing a threshold of roughly 2,500 USD for gross income and more than 3,000 USD for net income. A possible explanation for this behavior is that Kuznets was looking at the time of industrialization in the 19<sup>th</sup> and early 20<sup>th</sup> century. The time period covered in this paper starts much later. The earliest observations in our dataset are from the 1960s so that an initial decreasing inequality is still in line with Kuznets. However, when a country reaches a certain development level – which was not yet reached when Kuznets wrote his work – a small fraction of the population might be better able to extract rents from using their abilities, thus increasing inequality again. Nevertheless this does not exclude the possibility that the absolute income level of the poor also rises and they benefit from economic and financial development.

Inflation is the only control variable that is constantly significant. Considering inflation as an indicator of macroeconomic stability, the estimation results indicate that higher levels of uncertainty tighten the income distribution. Still, the small coefficient of inflation signals that the effect is economically minor. The explanatory power of the fixed effect estimation differs from gross to net income. The within-R<sup>2</sup> for gross income is more than twice the size of that for net income so that the estimation works better in explaining the development of gross income inequality over time.

To sum up, both measures of financial development, private credit over GDP and bank deposits over GDP, support the idea of the first part of GJ that the use of financial intermediation does not hamper poor but favor rich people. This is supported by our empirical analysis. In contrast, the predictions of BN and GZ are rejected by the estimation results. Since our results stand in contrast to theoretical models and some earlier empirical work, the next section will provide several robustness checks.

## **5 ROBUSTNESS CHECKS**

The robustness checks include estimations for subsamples of countries (cf. table 5), additional estimations with a lagged dependent variable and lagged explanatory variables (cf. table 6) and correlation analyses to further support the ratio of private credit over GDP as measure for financial development (cf. table 7).

First, we investigate whether the effects on income inequality hold for different country groups. This estimation requires the use of yearly data, as five year averages would provide an insufficient number of observations. We split the sample into four groups according to the income categories defined by the World Bank. The high income group consists of 1035 country-year observations, the upper middle income group of 633, the lower middle income group of 637, and the low income group of 349. All estimations are performed with fixed effect-estimators and yearly data, including time dummies to identify the influence of financial and economic development on the variation of income inequality independent of a time factor and country specific characteristics. We include the same control variables as before. Robust standard errors

are used when necessary. Splitting the sample in country groups, we expect the signs of the coefficients for economic and financial development as follows:

*Table 4: Financial Development and Kuznets' curve in different income groups*

	Low Inc.	Lower Middle Inc.		Upper Middle Inc.		High Income		Rational
GDP	positive	positive	positive	negative	positive	negative		
GDP <sup>2</sup>	insig.	insig.	or negative	insig.	or negative	insig.		Kuznets
FD	positive	positive	positive	positive	positive	positive	negative	Greenw. &
FD <sup>2</sup>	insig.	insig.	or negative	insig.	or negative	negative	or insig.	Jovan.

Depending on the exact turning point in the models of Kuznets and Greenwood and Jovanovic the squared terms of GDP per capita and financial development in the lower and upper middle income group might be insignificant and we expect different signs of the linear terms for the high and low income groups. Table 5 shows that splitting the countries in subsamples backs the results of the previous section.

*Table 5: Fixed effect estimation by income group*

Income level	Model							
	Gini (gross)				Gini (net)			
	Low	Lower Middle	Upper Middle	High	Low	Lower Middle	Upper Middle	High
FD	4.80**	2.81***	5.89*	15.87***	2.72**	2.26**	1.77***	1.75*
FD <sup>2</sup>	not significant <sup>1</sup>		-0.72	-1.70**	not significant <sup>1</sup>			
GDP p.c.	-0.18	18.39	34.41	-36.69*	-99.39*	23.38*	8.94	-16.46
GDP p.c. <sup>2</sup>	-0.16	-1.51	-2.43	1.67	9.32*	-1.90*	-0.55	0.61
Inflation	0.17	0.22	0.04	0.08	0.62*	-0.04	-0.04	-0.02
Govern. exp	-2.44	0.76	0.13	1.39	-0.56	-0.41	0.61	-0.64
Agriculture	-3.48	0.63	1.91***	-2.21*	-0.88	0.27	2.60***	-1.42
Constant	58.46	-15.69	-77.04	202.37**	302.04**	-32.74	-13.73	126.93**
N	349	633	637	1,035	349	633	637	1,035
R <sup>2</sup> (within)	0.39	0.27	0.45	0.29	0.29	0.15	0.24	0.29

Max/Min of:								
FD (credit)	Strictly positive	Strictly positive	Strictly positive	107%	Strictly positive	Strictly positive	Strictly positive	Strictly positive
GDP (USD)	not signif.	not signif.	not signif.	Strictly. neg	200	457	not signif.	not signif.

\*\*\*, \*\*, \* denote statistical significance levels at 1%, 5%, and 10%

<sup>1</sup>both terms for *FD* are insignificant in a quadratic estimation so that the *FD* only enters linearly in the model

*Note:* All estimations are fixed effect estimations with time dummies and robust standard errors. Max/Min of *FD* and *GDP* indicate at which level the sign of the explanatory variable changes. All data are yearly data as there are too few observations for this robustness check using five year averages. The correlation coefficients for income inequality, financial development and GDP per capita are provided in table 8a.

The estimation by country sample reveals that financial development has a positive effect on net income inequality for all country groups, which leads to the rejection of BN and GZ and confirms the part of GJ that explains rising inequality. For the gross income inequality we do find the inverted u-shaped influence. Up to financial development that is reflected by a ratio of private credit over GDP of 107%, increasing financial development leads to increasing income inequality. Only after surpassing this level income inequality is reduced. For the influence of GDP we do only observe significant effects on gross income inequality in high income countries, where increasing income leads to a reduction of the income discrepancy. For net income there are only significant effects in the lower two income country groups. For very low incomes, i.e. below 200 USD inequality is reduced before it rises. In the lower middle income group inequality first increases and is reduced after reaching 457 USD. This means that Kuznets' curve can be observed for the lower middle income countries, however the p-values are close to 0.1. Furthermore, GDP is of no significant influence for upper middle income and high income countries. As before, the control variables are mostly without a significant influence.

Second, we adjust the fixed effect estimations to take into account that income inequality changes slowly over time. Therefore we include a lagged dependent variable which represents the long-

term effects on income inequality. The variable is highly significant and shows that about half of the gross income inequality is determined by its level of the previous five year term. The coefficient for net income inequality is smaller at about one third. Net income inequality thus reacts more to short term factors and policy action than gross income inequality. Governments are consequently not as active (or as possible to act) on gross income inequality than on redistributing income and influencing the distribution of net incomes. Regarding the influence of financial development the results are in line with our main fixed effect estimation: More financial development is associated with a more unequal distribution of income, which is stronger for gross than for net income. For economic development there is again an inverted Kuznets' curve. Including the lagged dependent variable increases the explanatory power of the estimations a lot; the within-R<sup>2</sup> for the net Gini triples.

Third, we do control for potential reverse causality by taking lags of the explanatory variables. Addressing the arguments that the explanatory factors need time to influence income inequality and that there could be a simultaneity bias, this estimation measures the influence of financial and economic development on the income distribution in five years. The explanatory power on gross income inequality is reduced but stays about the same for net income inequality. The sign of financial development stays positive and the coefficient increase by 107% for the gross Gini and 70% for the net Gini. The medium-term influence of financial development on income inequality is a lot more profound than the short-term influence. Furthermore there is again the inverted Kuznets' curve for gross income at the same GDP per capita level as without lagged variables. The influence of GDP per capita on net income inequality becomes negative. Higher levels of income, combined with increasing gross income inequality therefore lead to a higher redistribution and lower net income inequality. But GDP per capita is just significant at 10% with a p-value of 0.094.

As a fourth step, the difference in difference estimator and GMM estimators are taken as further approaches to exclude potential endogeneity problems. As discussed above in the literature review there is an important recent view that growing inequality – at least in the US – was in fact the driving cause behind the recent credit boom and subsequent financial crisis (see e.g. Rajan (2010) or Kumhof and Ranciere (2010)). Whilst the issue seems empirically settled by Bordo and Meissner (2012) who use a large panel dataset and find that this view is incorrect, we nevertheless want to check how robust our results are to treating financial development as possibly endogenous variable and using a GMM estimator. The GMM estimator used tackles potential endogeneity problems by instrumenting the questionable variable with their own lags. A test on endogeneity of the financial development and GDP per capita variables following the GMM estimation states that the variables can be treated as exogenous and confirms the validity of our main fixed effect estimation. The GMM estimation also results in an inverted Kuznets' curve for gross and net income inequality, however the levels of GDP per capita when the influence of economic development on income equality change are a lot higher. Regarding financial development the projection of Greenwood and Jovanovic (1990) is supported. Up to a provision of private credit to GDP of 127% for gross income and 140% of net income, more financial development leads to higher inequality. Thereafter financial development reduces inequality. The predictable power of this result should be treated with caution as only very few OECD countries reached this high level of credit provision in the five years averaging 2000-04 (cf. figure 3).

Table 6: Difference in Difference and Lagged Variables

	Model							
	Gini (gross)				Gini (net)			
	(1) Lagged dependent	(2) Lagged explanatory	(3) Diff. in Diff.	(4) GMM	(1) Lagged dependent	(2) Lagged explanatory	(3) Diff. in Diff.	(4) GMM
Gini-lagged	0.48***				0.35***			
FD	4.35**	5.69**	1.39***	16.58***	3.61**	3.22**	1.34***	11.51***
FD <sup>2</sup>	-0.34	-0.61	0.43	-1.71*	-0.28	-0.30	0.56	-1.17**
GDP p.c.	-15.05***	-25.40***	-0.96	-38.51***	-8.40**	-7.89*	-2.86**	-16.54**
GDP p.c. <sup>2</sup>	0.85**	1.62***	4.43	2.06***	0.45*	0.48	10.33**	0.81*
Inflation	-0.12	-0.15	-0.37*	-0.23	-1.50	-0.44	-0.04	-0.25
Gov. exp	0.83	1.35	0.48	0.35	1.44	1.57	1.53	0.16
Agriculture	-0.06	-0.21	-1.18	-1.37	0.24	-0.10	-0.18	-0.71
Constant	76.64***	130.08***	-3.14		49.44***	60.62***	-0.64	
N	605	532	524	552	605	532	524	552
R <sup>2</sup> (within)	0.45	0.18			0.30	0.14		
Max/Min of:								
FD (credit)	strict. pos.	strict. pos.	strict. pos.	127%	strict. pos.	strict. pos.	strict. pos.	140%
GDP (USD)	6,836	2,530	not sig.	11,409	10,500	strict. neg.		26,372

\*\*\*, \*\*, \* denote statistical significance levels at 1%, 5%, and 10%

*Note:* All estimations are done for gross and net income inequality. The first model includes the lagged Gini coefficient and is estimated as fixed effect model. The second model uses the first lag of all explanatory variables and is estimated as fixed effect model. The third model is a difference in difference model as estimates the effect of changes in the explanatory variables on changes of the dependent variable. The fourth model is a 2-step GMM estimation (stata command xtivreg2) using lagged variables of financial development and GDP per capita as instruments. All data are five year averages and all models except GMM which uses a time variable, are calculated with time dummies and robust standard errors.

Another possible criticism to our approach might concern our measure of financial development. Does the magnitude of credit provision really indicate financial development? We strongly believe yes. First, the amount of credit over GDP indicates the level of financial intermediation. If financial intermediaries were not able to assess credit risk, to overcome a maturity mismatch and to pool savings, they would provide less credit to households and enterprises. Second, the amount of credit could be biased towards few borrowers with high amounts outstanding and many borrowers with low amounts of credit and even more potential borrowers with no access to finance at all. We address this criticism which essentially asks whether the amount of credit does

in fact measure access to finance by investigating the empirical link between our measures of financial development and other maybe more direct measures of access to finance. The IMF's Financial Access Survey (2011) and Demirgüç-Kunt and Beck (2007) provide different measures for the access to financial intermediaries. Correlations of these measures with *credit* are shown in table 7.

*Table 7: Access to finance and the provision of credit*

Correlation coefficients	Access to finance				
	ATMs per 100,000 inhabitants (2004)	Loans per 1,000 people <sup>1</sup>	Bank branches per 100,000 people <sup>1</sup>	Minimum loan volume to SMEs as % of GDP p.c. <sup>1</sup>	Share of adult population with access to an account with a financial intermediary <sup>1</sup>
Credit over GDP	0.74	0.61	0.57	-0.29	0.69
# countries	71	39	86	48	80

<sup>1</sup>Year may differ by country, credit over GDP is taken as average from 1999 to 2003

*Note:* The number of ATMs is taken from the IMF's Financial Access Survey. The other measures are taken from the World bank.

The measures for access to finance are only available as cross section and not as panel data and differ with regards to the number of countries covered. So a replication of the previous fixed effect panel estimations is not feasible and a cross-country analyses remains as best option to investigate the appropriateness of the credit measure for financial development. The first out of five ratios under consideration is the number of ATMs per 100,000 inhabitants, which indicates how many people use bank accounts. If credit and bank access were only relevant for few, there were less ATMs. The correlation of 0.74 for a set of 71 countries backs our use of credit as proxy for financial development. The number of loans and number of bank branches point in the same direction. If only a small proportion of the population would use financial intermediaries for the provision of credit, there were fewer banks and fewer loans. Financial development in the sense

of Banerjee and Newman (1993) means that funding for small and medium enterprises gets easier. Especially small loans would help start a business or grow a small business. The minimum loan volume should also be lower in better developed financial markets as credit evaluation and provision processes should be more efficient and worthwhile for banks even for relatively lower amounts of credit. The negative correlation of minimum loan volume with total credits confirms this. The lower the minimum credit volumes are the higher is the provision of credit. The fifth indicator we use is based on survey data and measures the overall access of the adult population to a bank account. Even developed countries in the European Union have values below 100% as some people abstain from banking voluntarily or involuntarily due to discrimination or the fee structure. Again, more people using financial services are correlated with higher amounts of credit. All these correlations over different measures and different sets of countries legitimate in our view the use of the private credit over GDP ratio as proxy for financial development.

## **6 CONCLUSION**

Two phenomena can be observed over the last five decades around the world – increasing financial development and increasing gross income inequality in many countries, especially in the developed world. We discussed theoretical models which explain the link of financial development and income inequality and predict that better developed financial markets lead to decreasing levels of income inequality regarding labor and entrepreneurial income and first increasing and then decreasing levels regarding capital income. Earlier empirical research focusing on this financial development versus income inequality nexus broadly confirmed the decreasing effect of financial development. This research is either built upon a pure cross-country

perspective that cannot account for the many country inherent characteristics, or used panel data approaches but again neglecting country characteristics.

Using a broader data set and time-invariant country specifics in our panel estimation, we reach a different conclusion in the analysis of this nexus and reject those earlier theories and previous empirical research. Integrating time-invariant country characteristics we find a positive relation between financial development and income inequality within countries. Better developed financial markets lead to higher gross income inequality. This holds for several robustness checks, e.g. for subsamples by different income groups, neglecting country characteristics and including further control variables, as well as bank deposits as an alternative measure for financial development. The positive relation is highly significant but only of small magnitude. An increase of the provision of credit by ten percent leads to an increase in the Gini coefficient by 0.23 for the within estimation.<sup>8</sup>

We do not exclude the possibility that all income groups within a country benefit from more financial development, but we do find that those who are already better off benefit more because income inequality is increasing. These results add to the existing literature on financial development and income inequality by using new estimation techniques and a dataset with more countries for a longer time horizon compared to previous research. Our results should, at the very least, allow researchers to remain somewhat skeptical when confronted with the supposedly beneficial effects of financial development. It seems instead to be very important to target financial development to the poorest in society. Only then can we hope that inefficient and excessive inequality can be reduced. Still, the relationship between finance, financial development and income inequality offers more research opportunities and deserves more resources and effort.

## References

- Acemoglu, D., Johnson, S., Robinson, J. A., & Yared, P. (2008). Income and Democracy. *American Economic Review*, 98(3), 808–842.
- Atkinson, A. B., Piketty, T., & Saez, E. (2011). Top Incomes in the Long Run of History. *Journal of Economic Literature*, 49(1), 3–71.
- Banerjee, A. V., & Newman, A. F. (1993). Occupational Choice and the Process of Development. *Journal of Political Economy*, 101(2), 274–298.
- Beck, T., Demirguc-Kunt, A., & Levine, R. (2004). *Finance, Inequality, and Poverty: Cross-Country Evidence* (No. 10979).
- Beck, T., Demirguc-Kunt, A., & Levine, R. (2010). Financial Institutions and Markets across Countries and over Time: The Updated Financial Development and Structure Database. *World Bank Economic Review*, 24(1), 77–92.
- Bordo, M. D., & Meissner, C. M. (2012). Does Inequality Lead to a Financial Crisis? *National Bureau of Economic Research Working Paper Series*, 17896.
- Clarke, G., Xu, L. C., & Zou, H.-f. (2003). *Finance and income inequality: Test of alternative theories* (No. 2984).
- Clarke, G. R. G., Xu, L. C., & Zou, H.-f. (2006). Finance and Income Inequality: What Do the Data Tell Us? *Southern Economic Journal*, 72(3), 578–596.
- Deininger, K., & Squire, L. (1996). A New Data Set Measuring Income Inequality. *World Bank Economic Review*, 10(3), 565–591.
- Demirgüç-Kunt, A., Beck, T., & Honohan, P. (2008). *Finance for all?: Policies and pitfalls in expanding access* (No. urn:nbn:nl:ui:12-3508393).
- Demirgüç-Kunt, A., & Levine, R. (2009). Finance and Inequality: Theory and Evidence. *Annual Review of Financial Economics*, 1(1), 287–318.

- Galor, O., & Zeira, J. (1993). Income Distribution and Macroeconomics. *Review of Economic Studies*, 60(1), 35–52.
- Greenwood, J., & Jovanovic, B. (1990). Financial Development, Growth, and the Distribution of Income. *Journal of Political Economy*, 98(5), 1076–1107.
- International Monetary Fund. (2011). *Financial Access Survey*.
- Kappel, V. (2010). *The Effects of Financial Development on Income Inequality and Poverty* (No. 10/127).
- Kumhof, M. & Ranciere, R. (2010). *Inequality, Leverage and Crises* (No. 10/268).
- Kuznets, S. Economic Growth and Income Inequality. *The American Economic Review*, 1955(45), 1–28.
- La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2008). The Economic Consequences of Legal Origins. *Journal of Economic Literature*, 46(2), 285–332.
- Levine, R. (2005). Finance and Growth: Theory and Evidence: 12. In Philippe Aghion & Steven Durlauf (Eds.), *Handbook of Economic Growth. Handbook of Economic Growth* (pp. 865–934). Elsevier.
- Li, H., Squire, L., & Zou, H.-f. (1998). Explaining International and Intertemporal Variations in Income Inequality. *Economic Journal*, 108(446), 26–43.
- Ortiz, I. & Cummins, M. (2011). *Global Inequality: Beyond the Bottom Billion – A Rapid Review of Income Distribution in 141 Countries* (No. 1102).
- Papageorgiou, C., Lall, S., & Jaumotte, F. (2008). *Rising Income Inequality: Technology, or Trade and Financial Globalization?* (No. 08/185).
- Philippe Aghion, & Steven Durlauf (Eds.). (2005). *Handbook of Economic Growth. Handbook of Economic Growth*: Elsevier.
- Rajan, R. G. (2010). *Fault Lines*. Princeton, NJ: Princeton University Press

Roeder, P. G. (2001). *Ethnolinguistic Fractionalization (ELF) Indices, 1961 and 1985*.

Romer, C. D., & Romer, D. H. (1999). Monetary policy and the well-being of the poor. *Economic Review*, (Q I), 21–49.

Solt, F. Standardizing the World Income Inequality Database. *Social Science Quarterly*, 90(2), 231–242.

World Bank. (2011). *World Development Indicators*. Washington D.C.

## Endnotes

---

<sup>1</sup> Demirgüç-Kunt and Levine (2009) give a brief overview of the relation of microfinance and income inequality and also cite studies that do not confirm that microfinance lowers inequality.

<sup>2</sup> Table 11 in the Appendix provides an overview of our measures for financial development and income inequality for all countries in our sample. Figure 4 in the Appendix gives a 3-D chart of income inequality against GDP p.c. and financial development.

<sup>3</sup> Cf. table 7 for correlations between different measures of financial development.

<sup>4</sup> A normal distribution has a skewness of 0 and a kurtosis of 3.

<sup>5</sup> Clarke et al. used the share of the modern sector (industry and services), which is equivalent to one minus the agricultural share.

<sup>6</sup> Romer and Romer (1999) and Papageorgiou et al. (2008) use yearly data. Five year averages are taken by Clarke et al. (2003), Li et al. (1998), and Kappel (2010). Beck et al. (2004) and Kappel (2010) do not use information provided by yearly data or averages over several years and estimate the effect of financial development on income inequality with country means.

<sup>7</sup> Clarke et al. (2003) and Kappel (2010) do not report what kind of standard errors they use. So we compare heteroskedasticity robust as well as cluster robust estimations with their results.

<sup>8</sup> This value ranges from 0.17 to 0.26 depending on the subsample and specification.

## APPENDIX

### Tables

Table 8a: Correlation analysis

Complete Dataset (N=3228)								
	Gini (gross)	Gini (net)	FD	GDP p.c.				
Gini (gross)	1.000							
Gini (net)	.7852***	1.000						
FD	-.089***	-.397***	1.000					
GDP p.c.	-.145***	-.537***	.753***	1.000				
High Income (N=1285)				Upper Middle Income (N=739)				
	Gini(g.)	Gini (n.)	FD	GDP p.c.	Gini (g.)	Gini (n.)	FD	GDP p.c.
Gini (gr.)	1.000				1.000			
Gini (net)	.525***	1.000			.825***	1.000		
FD	.142***	.063**	1.000		.298***	.301***	1.000	
GDP p.c.	.048***	-.231***	.642***	1.000	.054	.206***	.235***	1.000
Lower Middle Income (N=765)				Low Income (N=439)				
Gini (gr.)	1.000				1.000			
Gini (net)	.826***	1.000			.903***	1.000		
FD	-.083**	-.049	1.000		.048	-.001	1.000	
GDP p.c.	.242***	.350***	.511***	1.000	.256***	.254***	.259***	1.000

\*, \*\*, \*\*\* represent the significance level of the correlation coefficient (10%, 5%, and 1%);

Notes: Correlation of Gini coefficients with financial development (credit over GDP) and GDP per capita for the full sample and for subsamples along income groups. Correlations and significance levels were calculated in Stata by *pwcorr, sig*; FD (Financial Development, i.e. private credit over GDP) and GDP p.c. are in logs.

Table 8b: Correlation analysis

	Gini (gross)	Gini (net)	FD (credit)	FD (depos.)	GDP p.c.	Inflation	Share of Govern. Expenditure	Share of Agricult. in GDP	Ethno-Ling. Fractionalization (ELF)	Leg. org. UK	Leg. org. FR	Leg. org. GE
Gini (gross)	<b>1.00</b>											
Gini (net)	<b>0.71</b>	<b>1.00</b>										
FD (credit)	<b>-0.04</b>	<b>-0.38</b>	1.00									
FD (deposits)	<b>-0.14</b>	<b>-0.40</b>	0.86	1.00								
GDP p.c.	<b>-0.12</b>	<b>-0.53</b>	0.74	0.68	1.00							
Inflation	<b>0.08</b>	<b>0.23</b>	-0.41	-0.40	-0.29	1.00						
Gov exp.	<b>-0.02</b>	<b>-0.31</b>	0.37	0.37	0.43	-0.21	1.00					
Agriculture	<b>0.08</b>	<b>0.42</b>	-0.69	-0.66	-0.87	0.35	-0.41	1.00				
ELF	<b>0.20</b>	<b>0.45</b>	-0.34	-0.35	-0.52	0.11	-0.24	0.36	1.00			
Legal org. UK	<b>0.13</b>	<b>0.12</b>	-0.02	0.04	-0.13	-0.01	0.02	0.03	0.30	1.00		
Legal org. FR	<b>0.04</b>	<b>0.27</b>	-0.19	-0.18	-0.16	0.12	-0.22	0.19	0.06	-0.69	1.00	
Legal org. GE	<b>-0.22</b>	<b>-0.31</b>	0.17	0.15	0.20	-0.09	0.09	-0.19	-0.31	-0.25	-0.37	1.00

Notes: Correlation of Gini coefficients, measures for financial development (both, private credit over GDP and bank deposits over GDP), GDP per capita and the control variables used in the analyses (N = 2,565).

Table 9: First stage regression – Financial development

Dep. var: FD (credit)	Coefficient	p-Value
Bank deposits	0.8145	0.000
GDP p.c.	0.3381	0.435
GDP p.c. <sup>2</sup>	0.0057	0.845
Inflation	-0.0071	0.676
Government expenditure	0.1208	0.205
Agriculture	-0.0699	0.443
Constant	-2.3159	0.145
N	668	
R <sup>2</sup> - within	0.67	

Notes: The first stage regression yields the fitted values of financial development (private credit over GDP) for the second stage regression for the Gini coefficients. The estimation is a fixed effects estimation with robust standard errors and time dummies.

Table 10: Robustness check with Bank deposits as proxy for financial development

	Model					
	Gini (gross)			Gini (net)		
	(1) Pooled OLS	(2) Pooled OLS-Cluster	(3) Fixed effects	(1) Pooled OLS	(2) Pooled OLS-Cluster	(3) Fixed effects
FD	-1.01*	-1.01	2.34***	-0.67	-0.67	1.72***
FD <sup>2</sup>	not signif. <sup>1</sup>	not signif.	not signif. <sup>1</sup>	not signif.	not signif.	not signif. <sup>1</sup>
GDP p.c.	12.05***	12.05***	-21.49***	20.38***	20.38***	-9.08**
GDP p.c. <sup>2</sup>	-0.81***	-0.81***	1.49***	-1.51***	-1.51***	0.67**
ELF	5.72***	5.72*	time invariant	9.23***	9.23***	time invariant
Inflation	-0.60*	-0.60	-0.52*	-0.37	-0.37	-0.31
Gov. exp	2.24**	2.24	1.78	-0.84	-0.84	1.04
Agriculture	-1.04*	-1.04	0.01	-1.81***	-1.81*	0.03
Constant	9.84	9.84	115.73***	-22.78**	-22.78	57.84***
N	638	638	638	638	638	638
R <sup>2</sup> (within)			0.25			0.12
Max/Min of:						
FD (deposits)	strict. neg.	not signif.	strict. pos.	not signif.	not signif.	strict. pos.
GDP (USD)	1,726	1,726	1,377	854	854	843

\*\*\*, \*\*, \* denote statistical significance levels at 1%, 5%, and 10%

<sup>1</sup> Both terms of FD (bank deposits) in the quadratic form are insignificant, but FD is significant in its linear form

Notes: Bank deposits are used as proxy for financial development. Model 1 is a pooled OLS estimation with heteroskedasticity robust standard errors. Model 2 uses cluster robust standard errors. Model 3 is a fixed effect model with robust standard errors. All data are five year averages and models are estimated with time dummies.

*Table 11: Income inequality and financial development by country*

Country	N	Gini (gross)			Credit		
		Mean	Min	Max	Mean	Min	Max
<b>High Income</b>	<b>1285</b>	<b>42.84</b>	<b>25.01</b>	<b>64.37</b>	<b>74.57</b>	<b>7.04</b>	<b>269.76</b>
Australia	44	39.76	31.29	43.96	50.24	19.31	121.43
Austria	33	42.85	33.08	51.81	80.59	38.14	111.58
Bahamas, The	32	54.05	48.20	61.43	50.96	31.85	69.94
Barbados	28	45.56	40.46	52.16	40.93	31.01	49.94
Belgium	36	34.01	25.01	51.29	45.82	11.23	93.70
Canada	46	39.46	35.82	43.82	78.13	17.73	183.83
Croatia	14	34.87	32.40	38.21	42.67	24.98	67.32
Cyprus	19	42.59	37.00	47.44	140.18	91.21	200.80
Czech Republic	15	35.50	33.58	36.81	48.72	29.21	69.25
Denmark	47	48.70	45.43	54.55	54.76	22.02	209.82
Estonia	16	48.79	43.93	51.56	41.50	9.47	99.25
Finland	44	42.96	36.38	64.37	55.73	37.18	93.26
France	35	42.22	31.28	54.70	73.82	22.36	106.75
Germany	37	46.36	31.43	55.95	91.10	63.09	116.93
Greece	41	44.67	38.55	55.23	37.04	13.48	91.66
Hong Kong	16	54.37	47.17	59.54	146.53	124.36	176.76
Hungary	26	41.00	28.16	48.28	33.78	16.18	64.21
Iceland	4	41.65	40.31	43.01	181.12	116.44	269.76
Ireland	44	44.45	38.87	47.43	70.71	30.42	205.77
Israel	30	41.29	30.67	45.08	57.34	31.66	88.39
Italy	42	45.23	38.18	51.12	64.67	47.56	103.33
Japan	45	37.87	34.26	41.70	126.38	51.27	200.61
Korea, Rep.	38	39.69	35.16	45.97	84.09	36.41	144.59
Latvia	15	47.19	42.15	53.20	34.42	7.04	94.72
Luxembourg	31	36.39	27.55	43.96	102.30	56.07	211.42
Malta	8	45.75	43.65	48.62	106.02	101.81	112.37
Netherlands	43	41.48	37.54	53.74	101.34	41.61	192.60
New Zealand	45	40.03	33.07	47.00	60.55	23.76	140.14
Norway	42	42.32	37.74	48.13	85.28	58.16	113.89
Poland	19	41.13	34.01	47.97	23.70	14.87	40.55
Portugal	32	53.44	46.42	61.05	90.08	47.99	171.69
Singapore	44	46.98	42.30	53.13	87.45	35.03	135.74
Slovak Republic	15	33.98	29.75	36.83	40.90	29.60	52.87
Slovenia	17	33.55	29.20	35.35	38.03	19.45	80.95
Spain	35	38.81	32.93	46.65	87.25	63.67	188.49
Sweden	49	44.60	36.94	51.09	89.64	51.37	134.88
Switzerland	26	42.29	39.17	56.64	146.44	100.84	162.99
Trinidad a. Tobago	34	44.69	37.83	64.06	39.84	12.28	62.16
United Kingdom	49	43.30	37.30	48.78	70.33	16.05	189.56
United States	49	43.50	39.33	47.93	116.43	70.53	210.73

Country	N	Gini (gross)			Credit		
		Mean	Min	Max	Mean	Min	Max
<b>Upper Middle Income</b>	<b>739</b>	<b>49.49</b>	<b>27.52</b>	<b>77.28</b>	<b>32.31</b>	<b>2.80</b>	<b>155.25</b>
Albania	10	32.27	30.62	35.13	5.46	2.80	11.81
Algeria	23	37.71	35.28	40.75	26.11	4.14	68.29
Argentina	22	46.20	43.04	50.38	16.17	9.77	25.18
Botswana	24	55.86	52.60	59.64	12.68	6.54	19.65
Brazil	17	56.45	52.66	58.53	35.26	27.03	54.49
Bulgaria	17	32.62	27.52	38.39	34.22	8.94	68.19
Chile	30	52.76	50.91	54.45	52.84	11.08	74.34
Colombia	41	58.53	48.86	67.50	25.34	16.83	35.65
Costa Rica	38	48.55	43.30	60.89	22.45	10.47	51.96
Dominica	1	41.41	41.41	41.41	63.30	63.30	63.30
Dominican Republic	22	48.86	45.91	50.44	22.20	14.80	30.75
Fiji	17	52.46	50.30	54.29	26.51	18.04	38.25
Gabon	8	57.68	42.74	70.66	12.82	7.89	16.37
Grenada	1	53.19	53.19	53.19	67.08	67.08	67.08
Iran	35	47.26	42.95	53.25	28.16	18.64	43.62
Jamaica	37	59.57	47.56	77.28	22.95	13.15	30.66
Kazakhstan	13	37.11	34.01	41.94	14.72	4.97	36.83
Lithuania	15	47.83	47.07	48.71	23.30	10.22	61.23
Macedonia, FYR	14	32.88	29.72	38.94	23.66	17.38	37.01
Malaysia	38	51.85	40.32	67.17	75.53	7.10	155.25
Mauritius	31	47.98	39.73	56.62	38.34	20.63	72.35
Mexico	42	51.49	46.72	68.75	20.36	8.69	37.10
Panama	44	52.22	47.97	57.37	51.24	10.51	97.32
Peru	20	47.65	44.34	51.01	16.94	3.16	27.89
Romania	12	43.19	40.46	49.79	14.45	6.43	36.87
Russian Federation	16	47.48	43.48	51.34	18.78	6.78	48.54
Serbia	6	41.13	40.29	41.77	22.01	16.31	27.98
Seychelles	1	57.59	57.59	57.59	22.45	22.45	22.45
South Africa	38	65.45	61.70	70.24	80.68	43.44	132.56
St. Lucia	2	49.75	40.25	59.26	67.72	58.26	77.19
St. Vincent and the Gren.	1	66.41	66.41	66.41	43.94	43.94	43.94
Suriname	7	50.28	50.05	50.51	14.33	7.27	21.88
Turkey	25	45.36	41.75	50.84	14.67	10.91	18.79
Uruguay	28	41.39	40.10	43.00	33.56	19.99	67.05
Venezuela, RB	43	43.98	41.28	58.27	28.83	8.13	66.17

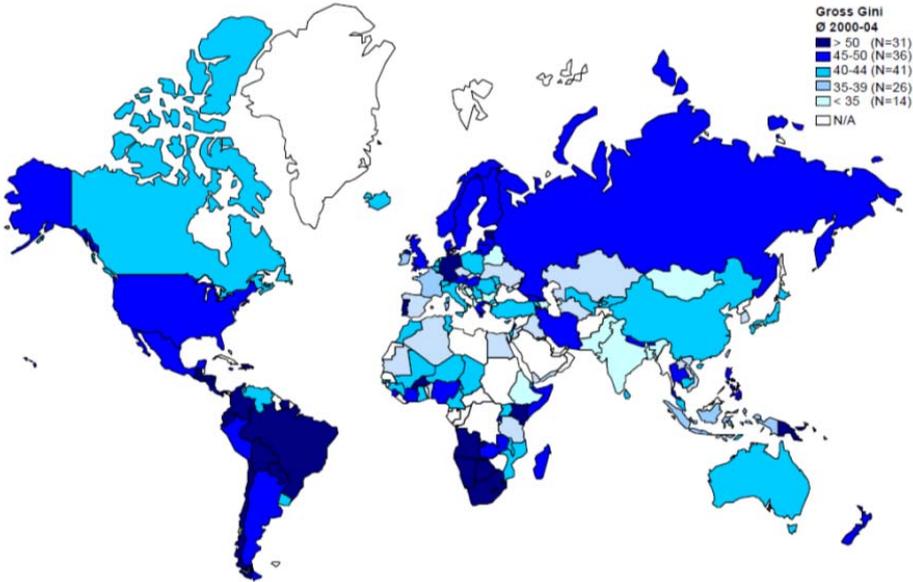
Country	N	Gini (gross)			Credit		
		Mean	Min	Max	Mean	Min	Max
<b>Lower Middle Income</b>	<b>765</b>	<b>46.64</b>	<b>30.43</b>	<b>77.36</b>	<b>27.48</b>	<b>1.14</b>	<b>165.96</b>
Angola	6	60.34	60.06	60.61	3.12	1.14	4.45
Armenia	15	45.68	39.59	54.42	7.86	3.09	23.42
Belize	7	55.57	50.58	59.07	41.33	37.26	46.80
Bhutan	3	48.17	48.07	48.27	14.60	11.48	18.08
Bolivia	22	53.61	44.10	58.26	38.22	4.47	63.04
Cameroon	19	47.69	43.96	49.51	16.93	6.66	28.14
Cape Verde	17	50.06	42.35	55.89	24.15	3.02	41.13
Cote d'Ivoire	32	48.89	38.20	59.84	28.93	14.91	41.22
Ecuador	28	50.59	42.81	61.64	21.63	12.91	40.67
Egypt, Arab Rep.	41	36.32	32.71	51.35	25.89	11.43	53.38
El Salvador	42	51.16	47.46	63.71	28.01	16.82	43.53
Georgia	10	45.44	43.14	47.55	6.45	3.31	11.31
Guatemala	29	54.27	42.14	57.89	17.43	11.25	29.04
Guyana	5	44.62	43.94	45.60	41.49	23.17	54.89
Honduras	24	55.94	52.46	72.79	31.34	13.84	46.60
India	46	35.35	31.99	44.51	19.46	7.84	36.37
Indonesia	29	34.98	32.19	38.59	28.29	9.04	53.53
Jordan	30	39.88	35.08	48.67	63.62	32.15	83.50
Lesotho	18	59.67	51.95	64.54	13.78	5.60	20.05
Moldova	13	41.22	37.24	44.46	14.78	4.45	29.68
Mongolia	11	35.69	34.15	38.72	13.49	6.25	32.63
Morocco	38	47.48	37.71	69.06	31.34	11.74	60.91
Nigeria	35	50.80	43.40	65.16	11.20	3.33	18.93
Pakistan	43	39.05	30.43	44.15	21.92	12.83	27.57
Papua New Guinea	11	49.05	40.62	52.56	15.07	12.37	17.95
Paraguay	19	50.98	37.51	55.35	22.09	13.18	29.03
Philippines	45	55.42	45.83	61.30	30.64	16.94	54.06
Senegal	17	44.93	39.50	58.56	18.13	14.51	26.10
Sri Lanka	27	45.33	32.52	57.22	18.55	7.74	28.71
Swaziland	13	55.25	49.07	77.36	14.14	10.92	18.83
Thailand	36	50.18	43.98	60.27	68.38	15.07	165.96
Tunisia	18	41.01	39.03	42.02	60.64	48.67	66.60
Vietnam	11	37.60	36.34	38.64	36.33	17.23	64.37
Yemen, Rep.	5	36.51	32.24	39.03	5.64	4.67	6.47

Country	N	Gini (gross)			Credit		
		Mean	Min	Max	Mean	Min	Max
<b>Low Income</b>	<b>439</b>	<b>46.91</b>	<b>29.70</b>	<b>75.08</b>	<b>12.23</b>	<b>1.10</b>	<b>41.41</b>
Bangladesh	10	34.08	33.16	35.75	24.41	15.12	31.14
Benin	4	37.43	36.89	37.97	13.59	12.05	15.11
Burkina Faso	10	50.79	44.77	54.31	9.40	5.73	12.84
Burundi	15	37.40	34.17	41.02	19.81	14.25	27.95
Cambodia	10	44.64	43.77	45.73	5.52	3.14	7.64
Central African Rep.	2	61.41	60.96	61.86	5.14	4.50	5.78
Chad	4	40.85	40.75	40.92	3.35	2.77	3.96
Congo, Dem. Rep.	2	44.70	44.52	44.88	1.88	1.58	2.19
Ethiopia	25	37.64	30.39	44.22	18.45	9.90	30.20
Gambia, The	12	52.54	48.15	59.91	13.55	8.88	26.07
Ghana	25	38.69	35.59	42.79	6.98	1.40	15.52
Guinea-Bissau	15	43.72	36.30	54.61	4.08	1.49	7.62
Haiti	11	54.06	53.61	56.05	12.74	10.26	13.99
Kenya	39	61.34	49.80	75.08	25.82	12.19	34.96
Kyrgyz Republic	12	42.60	39.00	47.30	5.97	3.74	11.29
Lao PDR	11	34.88	31.10	37.16	7.14	3.63	9.19
Madagascar	30	45.24	40.00	46.88	13.86	7.88	21.24
Malawi	25	58.57	39.45	72.33	11.14	4.95	20.12
Mali	18	44.17	37.51	53.00	13.48	8.13	17.11
Mauritania	14	43.66	38.79	47.50	25.61	16.53	41.41
Mozambique	10	42.82	40.15	46.01	11.27	8.31	15.39
Nepal	29	42.59	29.70	63.98	14.55	3.72	28.31
Niger	14	45.95	40.58	50.51	6.06	3.54	11.79
Rwanda	6	46.96	45.85	48.08	10.60	10.16	11.04
Sierra Leone	32	58.14	45.31	67.51	3.98	1.89	7.78
Tanzania	12	39.55	36.06	44.50	7.97	3.08	15.09
Togo	2	35.13	35.13	35.14	16.52	16.48	16.57
Uganda	20	41.82	37.01	46.09	3.94	1.10	5.87
Zambia	20	53.90	46.48	57.71	6.35	3.69	8.69

*Notes:* Only country-year observations with information on income inequality (Gini), financial development (credit), and GDP per capita are included in the table, as other information were not used for the basic estimation.

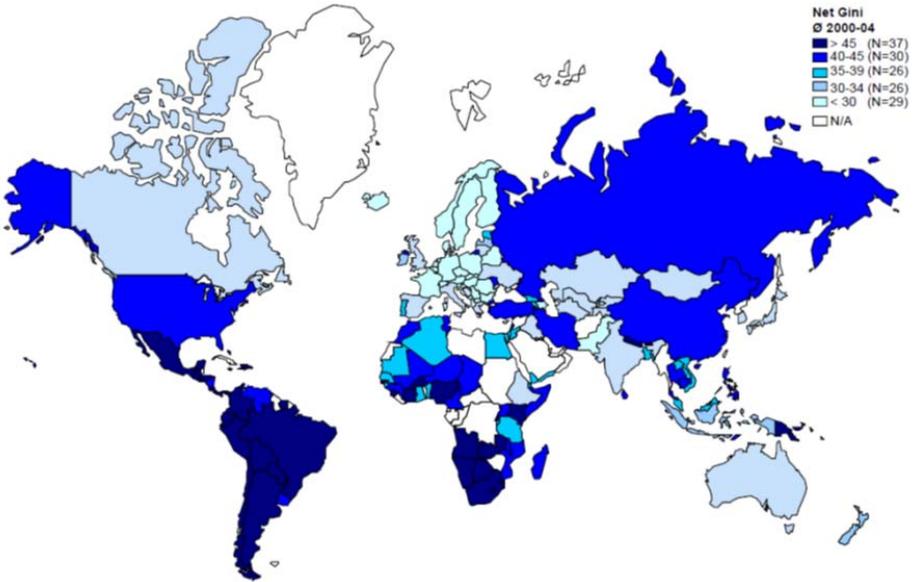
**Figures**

*Figure 2a: Gross Income Inequality around the world*



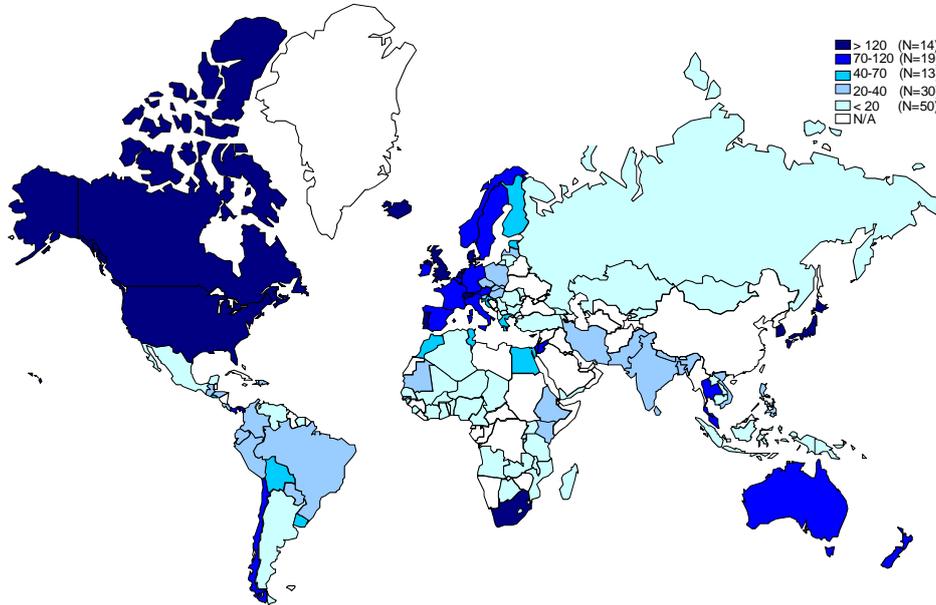
Notes: Income inequality measured by the Gini coefficient of gross income. Data is based on averages from 2000 to 2004.

*Figure 2b: Net Income Inequality around the world*



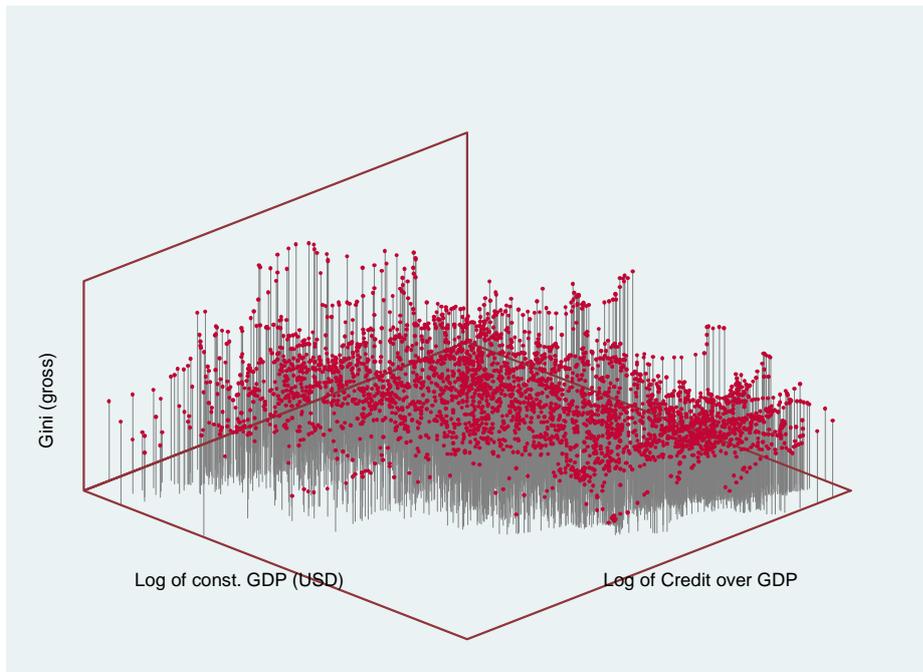
Notes: Income inequality measured by the Gini coefficient of net income. Data is based on averages from 2000 to 2004.

Figure 3: Financial Development around the world



Notes: Financial development measured by the average volume of private credit over GDP from 2000 to 2004

Figure 4: Financial Development, Economic Development, and Income Inequality



Notes: 3D-graph for the relation of Gini, economic and financial development with all country-year observations