Finance and Income Inequality - panel BMA approach[*]

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Abstract

We investigate the impact of financial development on income inequality differentiating between depth, efficiency and access to financial markets and institutions. We apply panel Bayesian model averaging framework to address model uncertainty to reveal that financial development has complex influence on the income distribution within countries. The access to and efficiency of banking decrease income inequality. The size of the markets has no influence on overall income inequality, but contributes to the increasing top income shares. Moreover, unemployment along with investment into non-tangible assets increase income inequality while higher redistribution and physical capital investment imply lower levels of inequality.

Keywords:	Income inequality, finance, Bayesian model averaging
JEL Codes:	D31, E21

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1 Introduction

Finance captures the capacity of financial intermediaries and markets to screen investment opportunities, monitor the debtors who were provided funding, as well as pooling and management of risk. With inequality, we focus in the paper on the inequality in the distribution of income. Arguably, the literature discusses other concepts of inequality, e.g. intergenerational persistence of relative income differences or equality of opportunity (Demirgüç-Kunt and Levine, 2009).

Claessens and Perotti (2007) argue that although deeper financial systems generally provide better opportunities of access to finance, the relationship is not universal.

The average income inequality rose across Organisation for Co-operation and Development (OECD) by 1.4 percentage points (OECD, 2013).

2 Related literature

The research in the area of financial development and income inequality is well established. Demirgüç-Kunt and Levine (2009), Claessens and Perotti (2007), and more recently de Haan and Sturm (2017) provide extensive reviews of the topic. A similar theme emerges in all three papers. The implications from theoretical contributions provide conflicting predictions about the relationship and empirical results bring evidence for both positive and negative effect. Although majority of the papers point towards finance tightening the distribution of income this results is not universal with some papers suggesting the opposite while other stress potential non-linearities.

A key divide appears between the effect of financial development on extensive and intensive margin. The extensive margin captures the extend to which individuals, who had not been using financial services before, gain access. On the other hand, the intensive margin describes growing use of finance by the agents who had already been using it before (Demirgüç-Kunt and Levine, 2009). Financial development on the extensive margin might lead to more equal opportunities and outcomes. Access to credit by previously disadvantaged groups allows human capital accumulation (Galor and Zeira, 1993; Galor and Moav, 2004; Braun et al., 2019), formation and growth of new firms (Evans and Jovanovic, 1989; Banerjee and Newman, 1993), with more evenly distributed economic opportunities as a result[1].

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[1]Having similar economic opportunities might decrease the cross-generational inequality, by diminishing the effect of e.g. parental wealth. Depending on the innate abilities and talents of the individuals, however, it may increase the inequality of income within every generation at the same time.

On the contrary, intensive margin of financial development might disproportionately benefit the rich who may leverage financial services for their further benefit or to protect their existing rents. Greenwood and Jovanovic (1990) present a model where the finance is the key driver of inequality and the welfare gains accrued by the incumbents - primarily the rich - in the initial development stage. With time, more agents meet the fixed costs of joining the financial intermediaries and they enjoy higher returns. Consequently, the efficiency of resource allocation also increases, which enhances growth and reduces inequality. Perotti and Volpin (2007) present a framework based on political economy. They argument depends on a lobby for lower investor protection to prevent entrance of the new competitors. The politicians require higher bribe from the lobbyist the greater is their accountability for policy decisions. Thus, with increasing accountability, investor protection strengthens and spurs market entry and competition. The authors examine their prediction in a cross-section and show that better investor protection correlates with larger entry rates and higher firm density in more financially intensive sectors[2].

Financial development may also have indirect effect on income inequality through economic growth. Townsend and Ueda (2006) model how finance interacts with production and allocation of credit. If increased use of finance increases the demand for low-relatively to the high-skilled workers, then it may have equalizing consequences for income distribution. Empirical evidence by Beck et al. (2010) show that bank deregulation and increased competition in loan provision in the United States (US) primarily benefited the workers with income below the median. Similarly, Delis et al. (2014) provide evidence of bank deregulation and liberalization tightening the income distribution, although this effect is only present in countries with high-quality institutions. They attribute the effect to the changes in labour market conditions and relatively higher wages and working hours of the low-skilled workers following the reforms.

A set of distinct papers explores the relationship between inequality and growth while stressing financial markets imperfections driving the outcomes. Income inequality and growth may intersect through varying channels. Accumulation of savings, unobservable effort, and investment project size favor the prediction of growth inducing inequality. Negative impact of inequality on human capital accumulation, entrepreneurial activity provide argument for the opposing view. Van der Weide and Milanovic (2018) report how income inequality in the US has different implications for the future income growth

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[2]In addition, they show that the most important factor of accountability is not the formal measure of democratic institutions, but newspaper readership which they interpret as broad awareness of policy choices and their outcomes.

of the rich and the poor. High inequality seems to hurt the prospects of the poor while the top of the distribution is unaffected. The rich thus disproportionately benefit from higher inequality as their subsequent income exhibit faster growth. The authors attribute this effect to the political channel the rich use to lobby in favor of the policies which support their economic interests. Preferences of the rich are ultimately more likely to determine public policy than the preferences of the majority (Gilens and Page, 2014). High inequality together with a credit constraint and rich driving the political process results in low government spending and lasting inequality.

The literature does not converge on the conclusions even in the empirical cross-country and panel data studies. The papers link higher levels of financial development with lower levels of inequality (Beck et al., 2007; Hamori and Hashiguchi, 2012; Gimet and Lagoarde-Segot, 2011; Kunieda et al., 2014)[3]. On the other hand, several other estimate a growth inducing effect of finance (Jaumotte et al., 2013; Jauch and Watzka, 2016; de Haan and Sturm, 2017). Finally, some authors claim there the relationship might be non-linear, conditional on a threshold value of financial development (Kim and Lin, 2011; Tan and Law, 2012) or institutional quality (Law and Singh, 2014; Delis et al., 2014).

Three papers are the closest to ours, each in a different respect. First, de Haan and Sturm (2017) examine different dimensions of finance on income inequality. Their results suggest that financial development, financial liberalization, and banking crises all increase pre-tax income inequality within countries. Additionally, they show that the effect of financial liberalization is conditional on democratic accountability. Higher accountability mitigates the impact of liberalization on inequality. On the contrary, the financial development, proxied by the credit to GDP ratio, has inequality increasing effect irrespective of the institutional background. Second, Naceur and Zhang (2016) take similar approach in considering multiple dimensions — the access, efficiency, and stability of the financial sector, although not examining the indicators simultaneously. Third, Furceri and Ostry (2019) apply Weighted-average Least Squares (WALS) to identify robust determinants of income inequality. Their approach mirrors ours in accounting for model uncertainty in the estimation. Their focus is more general rather than focused primarily on finance. We provide synthesis and extension to these papers in providing more detailed view on the link between finance in shaping income inequality and examining multiple measures of inequality while specifically identifying the determinants of top income shares along with the determinants of the overall income distribution[4].

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[3]For an extended list, we refer to de Haan and Sturm (2017).

[4]Captured by income Gini index

3 Data

The key variable in the paper is the measure of income inequality. We want to examine how financial development affects income inequality and whether the effect might by different at the top quantiles of income distribution. As the overall measure of income inequality, we rely the after-tax Gini coefficient from Standardized World Income Inequality Database (SWIID) by Solt (2019), which is a standard resource in the literature[5]. Its critical advantage lies in the widespread coverage across countries and time and a unified methodology which provides a reasonable level of comparability. It typically takes values in the interval between 0 and 100 where the former suggests perfect equality (everyone in the economy enjoys the same income) and the latter perfect inequality (all the income goes to only a single unit). We depart from existing papers slightly in considering the after-tax rather than the before-tax income distribution as a dependent variable.

To explore the relationship in the top part of the distribution, we choose top income share from World Inequality Database (WID)[6]. The surveys suffer from well-known issues of underrepresentation of the top income earners and the distortions resulting from self-reported character of the data. This can influence not only the top income shares resulting from survey data, but also distortions in the overall measures of inequality. The data in WID make use of income tax records in individual countries and the derived shares obtained using consistent methodology of Distributional National Accounts (DINA) are arguably more reliable relative to the survey-based measures which are the primary source of majority estimates of income distributions.

The data spans from 2000 to 2014. We follow the literature (Dabla-Norris et al., 2015; de Haan and Sturm, 2017) and average both the inequality measure (dependent variable) and the potential determinants (independent variables) across three year intervals. There are important reasons for looking at the averages than observation in individual years. Annual macroeconomic data are subject to fluctuations and the data on income inequality is noisy Delis et al. (2014). Averaging should diminish the level of noise. On the top of that, the variables at the center of our analysis, e.g. stock market capitalization or credit to Gross Domestic Product (GDP), are likely to be affected by the business cycles and volatile on the yearly basis. Similar argument holds for top income shares, as they depend, among other things, on the bonuses paid out each year and

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[5]There are alternative sources of for Gini coefficient, e.g. World Income Inequality Database (WIID) or Luxembourg Income Study (LIS), but each of them brings limitations in terms of comparability or coverage.

[6]The methodology and guidelines to database are provided by Alvaredo et al. (2016).

capital income. We want to explore the long-term rather than the short-term relationship and that guides the choice of averaged data. Faced against the trade-off between length of the averaging periods and available observations in the time dimension, we take a compromise of three years in contrast to the literature, where generally the 5-year intervals apply. The availability of financial development indicators limits the analysis to a period from 2000 onward and we prefer to keep at least 5 unique time periods to just three under the case of 5-year average[7].

Table 1 report the summary statistics and correlations between the income inequality variables.

Table 1: Summary statistics of inequality variables

Variable	Mean	St. Dev.	Min	Max
After-tax Gini index				
Top 10% income share				
Top 1% income share				

We obtain the financial development indicators from Global Financial Development Database (GFDD). The database offers detailed indicators along four dimensions of financial systems and allows to estimate the affect of changes in access, size, efficiency, and stability of financial markets. Furthermore, we can distinguish between banking sector and financial markets in all these dimensions. The data in for access and stability of stock markets remains sparse in the concerned period we must leave them out of analysis. We use the version of financial indicators from Svirydzenka (2016). The authors make use of principal component analysis in order to construct aggregate indicators in each characteristic of financial sector. In summary, we have indicators of financial institutions depth (FID), financial markets depth (FMD), access to financial institutions (FIA), efficiency of financial markets (FME), and institutions (FIE)[8]. We report the composition of each indicator in Table A2.

Figure 1 shows the scatter plots of all the available observations after averaging between Gini coefficient and selected financial indicators. Although the data is noisy, it suggest negative correlation between the variables. Figure 2 then shows the corresponding scatter plots of the data which was demeaned using the within country averages over time. The relationship between Gini and financial indicators appears considerably

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[7]Nevertheless, we run the estimation with 5-year averages of data as a robustness check and find no critical qualitative differences compared to the baseline.

[8]Svirydzenka (2016) extrapolate the indicators from top to bottom if the original variables are unavailable, we make sure that that at least one variable is available for the construction of the index and no artificial correlation introduced to the data.

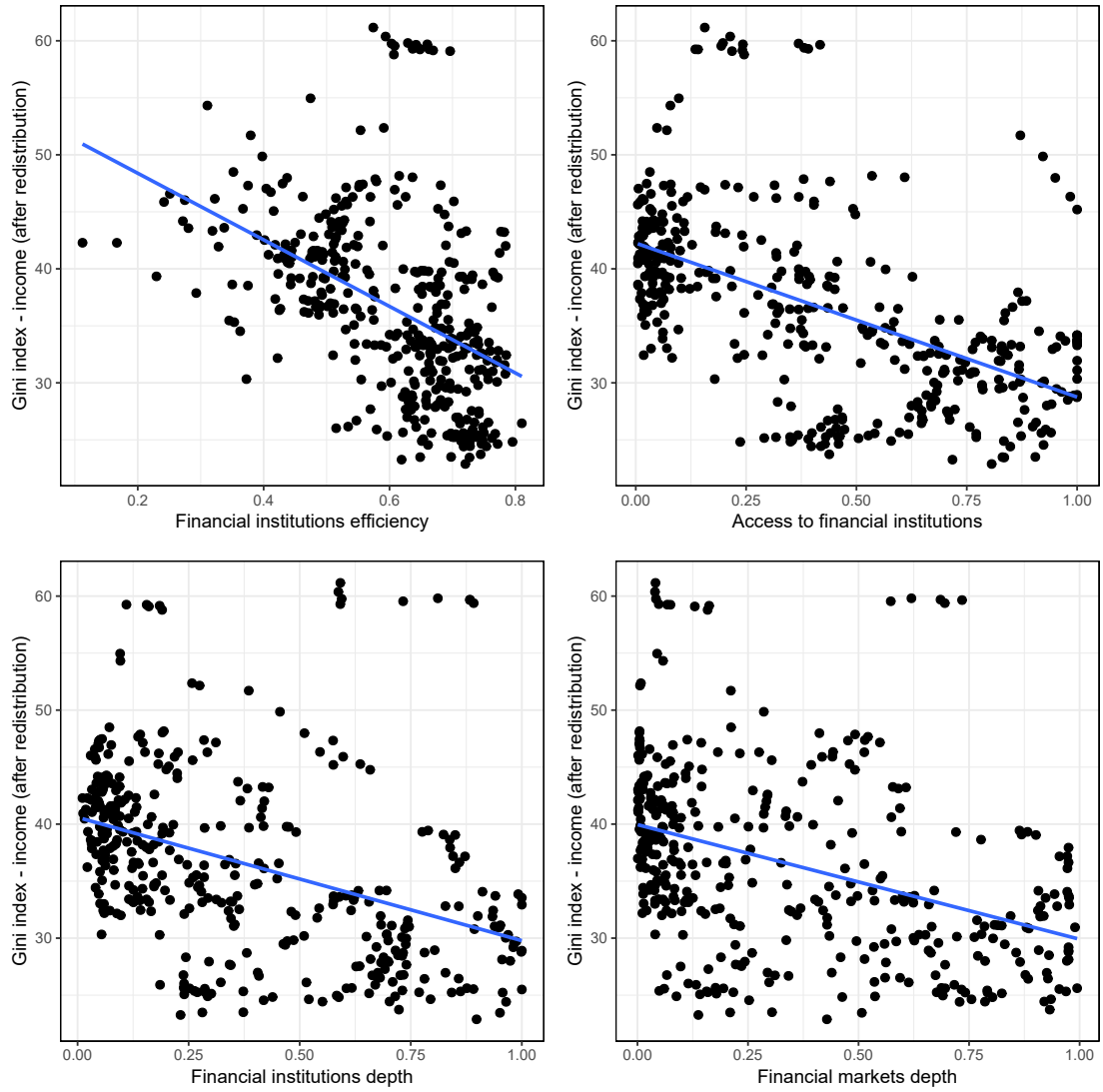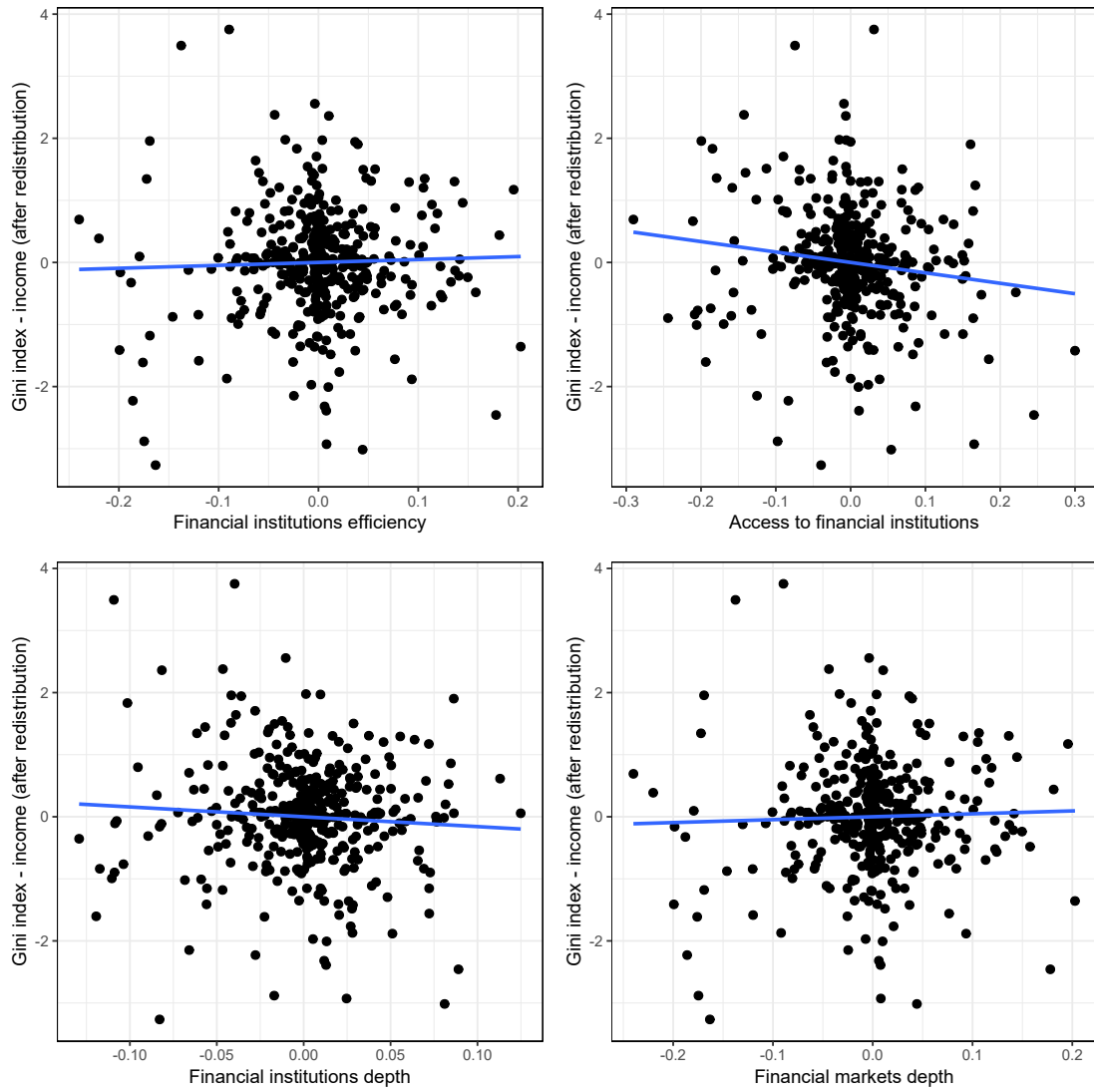Figure 1: Gini Coefficient and Financial Development Indicators

Figure 2: Gini Coefficient and Financial Development Indicators

weaker following the transformation, with the exception of access to financial institutions where visual inspection allows pointing to a negative correlation.

We build the choice of other explanatory variables on a reviews of income inequality drivers (Roine et al., 2009; Nolan et al., 2019), related study of finance-inequality nexus (de Haan and Sturm, 2017), and a more general inquiry into the robust determinants of income inequality (Furceri and Ostry, 2019). The potential regressors could be categorized in several groups. They control for economic and financial development, demographics, globalization, and institutional background. Table A3 reports all the control variables and their sources.

4 Methodology

5 Results

The benefits of capital markets liberalization seem to be concentrated to the top of the income distribution. Top quintile of the distribution accrues nearly all of the income growth following the liberalization while the share of middle three quantiles decreases and the bottom remains unaffected (Das and Mohapatra, 2003).

Kroszner et al. (2007) show that financial crises have relative more severe impact on the sectors which depend more on external financing. The consequences of crises on firms relate to institutional environment and materialize through lower production capacity and competition.

6 Conclusion

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7 Appendix

The composition of financial indicators

Table A2: Underlying Components of Financial Development Indicators

INDICATOR	MEASURE
Financial institutions	
Access	Bank branches per 100,000 adults
	ATMs per 100,000 adults
Efficiency	Net interest margin
	Lending-deposits spread
	Noninterest income to total income
	Overhead costs to total assets
	Return on assets
	Return on equity
Depth	Domestic private credit to the real sector to the GDP
	Pension fund assets/GDP
	Mutual fund assets/GDP
	Insurance premiums life and nonlife/GDP
Financial markets	
Depth	Stock market capitalization/GDP
	Stocks traded/GDP
	International debt securities of government/GDP
	Total debt securities of financial corporations/GDP
	Total debt securities of nonfinancial corporations/GDP
Efficiency	Stock market turnover ratio (stocks traded/capitalization)

Dataset description

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Table A3: List of variables

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Variable	Definition (+ optional comments)	Source
GiniNet	Aftertax Gini index based on distribution of income (The Standardized World Income Inequality Database).	Solt (2019)
GiniMarket	Before-tax Gini index based on distribution of income (The Standardized World Income Inequality Database).	Solt (2019)
Top10share	Share of income going top decile of the distribution.	WID
Top1share	Share of income going top percentile of the distribution.	WID
FIA	Access to financial institutions	Svirydzenka (2016)
FID	Financial institutions depth	Svirydzenka (2016)
FIE	Financial institutions efficiency	Svirydzenka (2016)
FMD	Financial markets depth	Svirydzenka (2016)
FME	Financial markets efficiency	Svirydzenka (2016)
GDPpc	Level of GDP per capita	WB
NatRes	Total natural resource rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	WB
PopGrowth	Annual population growth 1980-2009	WB
GovExp	General government final consumption expenditure (formerly general government consumption).	WB
NNSavings	Net national savings (gross national savings less the value of consumption of fixed capital, % GNI).	WB
EducExp	Education expenditure refers to the current operating expenditures in education, including wages and salaries and excluding capital investments in buildings and equipment..	WB
Infl	Inflation as measured by the consumer price index.	WB
VAA	Agriculture, forestry, and fishing value added (% GDP).	WB
VAI	Industry value added (% GDP).	WB
GFCF	Gross fixed capital formation (% of GDP).	WB
NetFDI	Foreign direct investment, net inflows (% of GDP).	WB
GDPgrowth	Annual growth of GDP.	WB
LifeExp	Life expectancy at birth.	WB

LabForce	Total labor force comprises people ages 15 and older who meet the International Labor Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. Labor force total.	WB
RuleOfLaw	Rule of law estimate	WB
CLandPR	Average of index for civil liberties and political rights	Freedom House
ChinnIto	Chinn-Ito index of financial openness.	Chinn-Ito
LeftWing	Dummy equal to 1 when left oriented party lead the country.	DPI
ActivRestrict	Activity restrictions. Regulatory restrictions on bank activities and the mixing of banking and commerce.	Barth et al. (2013)
CapitalReg	Capital Regulatory index.	Barth et al. (2013)
DiversIndex	Whether there are explicit, verifiable, quantifiable guidelines for asset diversification and banks are allowed to make loans abroad.	Barth et al. (2013)
EducIndex	Calculated using mean years of schooling and expected years of schooling	UN
NetInterestMargin	Accounting value of banks' net interest revenue as a share of average interest-bearing assets; a measure of the efficiency of the banking sector.	GFDD
BankZScore	return on banks' assets plus the ratio of banks' equity and assets, divided by the standard deviation of the return on assets (ROA+equity/assets)/sd(ROA); a measure of stability of the banking sector	GFDD
Privatecredit	Domestic private credit to the real sector to GDP; a measure of the depth of the banking sector	GFDD
MarketCap	Value of listed shares to GDP; a measure of the depth of stock markets.	GFDD
MarketTurn	Stock market value traded to total market capitalization; a measure of the efficiency of stock markets.	GFDD
BankBranches	Number of bank branches per 100,000 adults	GFDD
Loan2Deposits	Loan-to-deposit ratio.	GFDD
Redist	Difference between market (pre-tax) and net (after-tax0 Gini index based on distribution of income (The Standardized World Income Inequality Database).	Solt (2016)
FinLib	Averaged components of Economic Freedom of the World index 3D (freedom to own foreign currency accounts), 4C (black-market exchange rates), 4D (controls of the movement of capital and people), and 5A (credit market regulations).	Gwartney et al. (2017)