Does Financial Development Affect Income Inequality in the U.S. States?

Manoel Bittencourt[*], Shinhye Chang[**], Rangan Gupta[***] and Stephen M. Miller[****]

Abstract

This paper examines the role of financial development on U.S. state-level income inequality in the 50 states from 1976 to 2011, using fixed-effect estimation. We find robust results whereby financial development linearly increases income inequality for the 50 states. When we divide 50 states into two separate groups of higher and lower inequality states than the cross-state average inequality, the effect of financial development on income inequality appears non-linear. When financial development improves, the effect increases at an increasing rate for high income-inequality states, whereas an inverted U-shaped relationship exists for low income-inequality states. To our knowledge, this paper is the first to examine the role of financial development on U.S. state-level inequality.

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[*] Department of Economics, University of Pretoria, Pretoria, 0002, South Africa. Email: manoel.bittencourt@up.ac.za.
[**] Department of Economics, University of Pretoria, Pretoria, 0002, South Africa. Email: c.shin.h@gmail.com.
[***] Department of Economics, University of Pretoria, Pretoria, 0002, South Africa. Email: rangan.gupta@up.ac.za.
[****] Corresponding author. Corresponding author. Department of Economics, University of Nevada, Las Vegas, Las Vegas, Nevada, 89154-6005, USA. Email: stephen.miller@unlv.edu.

1. Introduction

Conventional wisdom identifies the United States as a land of opportunity, where those who work hard can succeed. The past three-and-a-half decades, however, witnessed growing income inequality (Owyang and Shell, 2016; Thompson and Leight, 2012). Some argue that inequality results from individual effort and represents a constructive factor in society. Others argue that inequality emerges from an unfair system, which lifts only a few boats at high tide and, thus, creates a disincentive to hard work (Bivens et al. 2014; Stiglitz, 2012; Levy and Temin 2011).

The current trend in U.S. inequality creates a number of problems. For instance, low-income groups experience much difficulty in accessing financial and credit markets, and these market imperfections can influence the occupational outcomes of low-income individuals. The poor more likely become salary earners and the rich, entrepreneurs. Also, we observe that economic mobility has diminished in recent decades. The children of wealthy parents more likely remain wealthy, and the children of the poor, remain poor (Galor and Zeira, 1993; Corak, 2016). This reduction in mobility across the income distribution can undermine the confidence in the principles of market economies.

A most potent force driving the increase in U.S. income inequality from the 1970s through the early 2000s reflects the trend strength of the stock market (Favilukis, 2013; Hungerford, 2013). Hungerford (2013) shows that capital gains and dividends contributed to a near doubling of income inequality between 1991 and 2006. As stock and other asset prices rise, the gains disproportionately accrue to the rich, since the wealth is more unequally distributed than income. That is, the low-income group holds minuscule wealth and cannot participate in wealth accumulation in any significant way. During the 2001 and 2007 recessions and financial turmoil, top income fell significantly as stock and other asset prices experienced significant declines, but the recovery of losses did occur.

Many studies consider the possible factors which influence changes in income distribution.[1] This paper considers the effect of financial development. The focus of much of financial development theory explores how financial institutions fund new investment. Theoretically and empirically, the research leads to ambiguous findings.

Theoretically, more finance makes it easier for the poor to borrow for viable projects/business, which, in turn, can reduce income inequality (Galor and Moav, 2004). Financial imperfections, such as asymmetric information and moral hazard, can hinder the poor who lack collateral and credit histories, and, therefore, relaxation of credit constraints may benefit the poor (Beck et al., 2007). Theory also provides that finance affects income inequality (i.e., income distribution) in two ways -- the extensive and intensive margins. The extensive margin affects the number of individuals using financial services, adding individuals from the lower end of the income distribution (Becker and Tomes, 1979, 1986; Greenwood and Jovanovic, 1990). Thus, the extensive margin effects reduce inequality by granting low income households to accumulate human capital, reduce liquidity constraints, expand investment opportunities, and manage risk. The intensive margin refers to the improvements in the quality and range of financial services. The intensive margin does not broaden access to financial service but benefits those already using financial services (Greenwood and Jovanovic, 1990). In other words, the benefit of intensive margin effects will likely widen the distribution of income.

Other modeling approaches support a nonlinear relationship between finance and income distribution.[2] Greenwood and Jovanovic (1990) find an inverted U-shaped curve of income inequality and financial intermediary development. At early stages of financial development, only a few wealthy individuals can access financial markets. With economic

[1] See Claessens and Perotti (2007) and Demirgüç-Kunt and Levine (2009) for broad reviews of the literature.
[2] See Greenwood and Jovanovic (1990), Greenwood and Smith (1997), Deidda (2006).

growth, however, more people can join the financial system and more individuals can enjoy the benefits. Thus, income inequality increases initially. As the economy matures, however, income inequality falls.

Clarke et al. (2006) also suggest a non-linear relationship that more (less) developed financial systems tend to associate with less (more) income inequality. That is, a well-functioning financial system more likely reinforces low inequality, while an underdeveloped financial system reinforces high inequality. Moreover, various combinations of financial development and inequality may produce a non-linear relationship.

Empirical evidence on the relationship between financial development and income inequality gives mixed results. Rajan and Zingales (2003) argue that in weak institutional environments, established interests have privileged access to finance. Thus, financial development induced by captured direct controls likely hurts the poor. Haber (2005) maintains that primarily the well-off and politically connected benefit from improvements in the financial system. Van der Weide and Milanovic (2014) discover that high levels of inequality reduce income growth of the poor and boost the income growth of the rich. de Haan and Sturm (2016, 2017) examine how financial development, financial liberalization[3], and banking crises affect within-country income inequality, using cross-country panel data from 1975-2005. The authors find robust results that all financial variables increase income inequality. Also, de Haan et al. (2017) demonstrate that financial development strengthens the inequality-raising effects of financial liberalization.

On the other hand, Bulir (2001), Honohan (2004), Beck et al. (2007), and Naceur and Zhang (2016) show that financial development alleviates inequality and poverty. Dollar and Kraay (2002) report that more access to financial and credit markets helps to reduce inequality.

[3] Financial liberalization refers to a reduction in the role of government and an increase in the role of financial markets, and financial development refers to an increase in the volume of financial activity (Abiad et al., 2008).

Law et al. (2014) say that in the presence of strong institutions, financial development can reduce inequality, allowing the poor to invest in human and physical capital.

U.S. policy has focused more on growth than inequality, since economic growth may ease the inequality problem. Productivity growth, however, has not trickled down to the bottom of the income distribution, and income inequality has not necessarily moved with the business cycle. Furthermore, many studies suggested that too much income inequality might itself be detrimental to long-run economic growth (Alesina and Rodrik, 1994; Birdsall et al., 1995; Deininger and Squire, 1996; Persson and Tabellini, 1992; Sylwester, 2000; Easterly and Fischer, 2001; Easterly, 2007).

With the growing size of the stock market, the financial crises have challenged traditional financial sector policies and leave little doubt that financial development indeed matters for income inequality. Given this theoretical background, we conduct an empirical analysis of the role of financial development on inequality.

Inequality has increased throughout almost every U.S. state between 1970 and the present. For example, New York and Connecticut experienced substantially greater increases in inequality than other states (Partridge et al., 1996; Partridge et al., 1998; Morrill, 2000; Dvorkin and Shell, 2015). Our contribution lies with the usage of cross-state data of the US for the first time in this line of literature dealing with financial development and inequality. We consider the effect of financial development on income inequality across all states and in states with higher and lower inequality than the cross-sectional average of inequality. Even though the U.S. states differ from each other, using cross-state panel data minimizes not only the differences in institutions and political regimes, but also problems associated with data comparability involving the measurement of inequality, and the various variables that drive inequality across countries.

Our analysis employs the fixed-effects model, given the panel data and research purposes. Nevertheless, to check the robustness of the results to the estimation technique, we also employ the dynamic fixed-effects and system-GMM models.

This paper is structured as follows. Section 2 describes the data. Section 3 discusses the model specification. Section 4 reports and analyses the empirical results. Concluding remarks appear in Section 5.

2. Data

The analysis relies on a cross-state panel from 1976 to 2011, which includes the U.S. stock market wealth, human capital measures, the unemployment rate, and three income inequality measures, the Gini coefficient as well as the Top 10%, and the Top 1% income shares (Leigh, 2007).[4] The income inequality measures and human capital measures come from the online data of Professor Mark W. Frank's website.[5] Annual and quarterly per capita nominal state personal income comes from the Bureau of Economic Analysis (BEA). The unemployment rate comes from the Federal Reserve Economic Data (FRED). U.S. (aggregate) Consumer Price Index comes from the Bureau of Labour Statistics (Index 1982-84=100), which we use to deflate the per capita nominal state personal income. As a measure of volatility, we calculate the annual realized volatility by summing the squared quarterly growth rates of real personal per capita state income.

We need a good measure of financial development to answer our question of the effect of financial development on inequality. However, it is difficult to measure financial development since the financial sector comprises a mixture of financial markets, institutions, and banks. In this paper, we adopt the ratio of nominal per capita stock market wealth to

[4] For robustness, we also employ other inequality measures such as Atkinson Index, the Relative Mean Deviation, Theil's entropy Index, the Top 5% income share, the Top 0.5% income share, the Top 0.1% income share and the Top 0.01% income share. We report these results in the Appendix.

[5] See http://www.shsu.edu/eco_mwf/inequality.html. Professor Frank constructed his dataset based on the Internal Revenue Service (IRS), which has a limitation of omission of some individual earning less than a threshold level of gross income. For this reason, we focus more on top income shares as primary indicators of inequality measures.

nominal per capita personal income as our measure of financial development[6]. It captures a component of financial development that relates more closely with production. Quarterly state-level U.S. stock market wealth data come from calculations by Case et al. (2013). We convert quarterly observations to annual data by taking an average, and it is virtually the only data set that has financial wealth (and housing wealth) disaggregated to the state level (including District of Columbia). This dataset approximates per capita consumption at the state level by total retail sales. Further note that Case et al. (2013) restricted the growth rate in household financial wealth solely to the growth rate in households' holdings of mutual funds due to data availability.[7]

Since the U.S. stock market wealth data ended in 2012:Q2, the data range runs from 1976 to 2011 based on data-availability of all the variables under consideration at an annual frequency. Except for the unemployment rate and the measure of volatility, we express the variables as growth rates taking logarithmic differences, which, in turn, ensures stationarity of the variables under investigation, as suggested by standard panel data-based unit-root tests.[8] As noted above, the use of cross-state panel data minimizes the problems associated with data comparability often encountered in cross-country studies related to income inequality. In

[6] According to Gimet and Lagoarde-Segot (2011), who examine specific channels linking banks, capital markets, and income inequality, the effect of financial sector development on income inequality seems to run primarily via the banking sector. We also examine two other ratios: bank deposits to personal income and bank deposits plus saving institutions deposits to personal income from 1976 to 2013 as alternative measures of financial development. With these measures, however, we do not find any significant role for financial development on inequality. The increase in U.S. income inequality from the 1970s was accompanied by strong gains in the stock market (Owyang and Shell, 2016). In addition, stock market participation has increased, irrespective of investor's risk tolerance and financial sophistication. Given this, stock market movements may capture the financial sector better through bigger effects on income than those tracked by deposits and, hence, possibly explaining the insignificant results.

[7] Bampinas et al., (2017) recently use this data set to analyze wealth effects controlling for inequality and demographic factors.

[8] Complete details of the unit-root tests are available on request from the authors. To ensure that our econometric framework is not misspecified when estimated using stationary variables and, hence possibly ignoring a long-run relationship between (the various measures) of inequality and its drivers in their non-stationary form, we also tested for cointegration. Using Westerlund's (2007) test, however, we were unable to detect any evidence of cointegration, which, in turn, suggests that our models in first differences are not misspecified by omitting an error-correction term. In addition, inclusion of time-effects in our econometric models produces qualitatively similar results. Complete details of these additional analyses are available on request from the authors.

addition, it must be pointed out that the choice of the various predictors of inequality is in line with the extant literature (see Balcilar et al., (2018) for a detailed discussion in this regard).

3. Methodology and Model specification

The models are specified as follows[9]:

$$Ineq_{it} = \alpha + \beta FD_{it} + \gamma FD^2{}_{it} + \delta PI_{it} + \eta PI^2{}_{it} + \kappa UE_{it} + \mu HS_{it} + \nu CL_{it} + \rho V_{it} + u_{it} \quad (1)$$

$$Ineq_{it} = \alpha + \beta FD_{it-1} + \gamma FD^2{}_{it-1} + \delta PI_{it-1} + \eta PI^2{}_{it-1} + \kappa UE_{it-1} + \mu HS_{it-1} + \nu CL_{it-1} + \rho V_{it-1} + u_{it} \quad (2)$$

for $i = 1,2, \dots, N$; $t = 1,2, \dots, T$,

where *Ineq* = Income inequality

FD = Financial development

FD^2 = Squared financial development

PI = Real per capita personal income

PI^2 = Squared real per capita personal income

UE = Unemployment rate

HS = High school attainment

CL = College attainment

V = Volatility measure

We include squared variables to capture non-linearities, if any. We also include the measure of volatility according to the study by Fang et al. (2015), where the authors found that larger growth volatility positively and significantly associates with higher income inequality. We note that the explanatory variables can suffer from endogeneity and, therefore, we employ lagged values of the explanatory variables (as instruments) to address the endogeneity issue. As lagged variables do not appear in the respective estimation equation and they sufficiently correlate with the explanatory variables, this approach can prove effective.

[9] The baseline model specification only includes financial development and squared financial development variable as explanatory variable.

4. Empirical Analysis

Table 1 shows the results of the fixed-effect regression of the Top 10%, Top 1%, and the Gini coefficient for all states. The overall causality results show that financial development exerts a positive effect on income inequality with no evidence of non-linearity.[10] Higher real per capita personal income contributes to the rise in income inequality, the Gini coefficient, whereas the Top 1% income group supports the Kuznet curve. Volatility also makes the distribution of income more unequal, which supports the findings in Fang et al. (2015). We do not find that the unemployment rate and the level of education significantly affect income inequality.

To control for endogeneity, we include lagged values of the explanatory variables in the regressions. We do not use second and higher lags to avoid autocorrelation with the current error term. Table 2 reports the results. Our findings of the effect of financial development on income inequality are robust.

Tables 3 and 4 show the results of the fixed-effect regression of the Gini coefficient, the Top 10%, and the Top 1% income inequality measures, when we divide the data into two sets -- states with higher and lower inequality than the cross-sectional average.[11] We list the low and high inequality states in Table A6 and also plotted in Figure A1 in the map of the U.S. The results, for states with higher income inequality, not only show the positive relationship between financial development and income inequality, but also indicate the existence of non-linearity between the two variables, except for the Top 0.5%, 0.1% and 0.01% measures of income inequality, which show a linear relationship.[12] These results indicate that the effect of financial development increases inequality at an increasing rate for those states above the

[10] Our results remain robust to alternative specifications, which incorporates the first lag of the growth of inequality to capture possible persistence (see Table A1 in the Appendix). We also applied system-GMM, which deals with issues of endogeneity and reverse causality. The regression results (see Table A5 in the Appendix) indicate that the fixed-effects and system-GMM estimates are generally similar.

[11] We first compute average cross-sectional inequality for each year and then take the average of the cross-sectional average. We then compare the average of the cross-sectional average with the average inequality for each state.

[12] Please see Table A3 in the Appendix for the results of the Atkinson Index, the Relative Mean Deviation, Theil's entropy Index, and the Top 5, 0.5, 0.1 and 0.01 % income inequality measures.

average income inequality. The threshold level of financial development ($-\beta/2\gamma$) is -0.013 (see Table 3), and, hence, the reduction of inequality can only occur at negative growth rates (contraction) of the financial sector.

For states with lower income inequality, the results indicate an inverted U-shaped non-linear relationship between two variables with the threshold level of financial development ($-\beta/2\gamma$) around 0.015 (see Table 4). This implies that the gap of income distribution increases up to financial development reaches its threshold. After the threshold level, financial development reduces income inequality. Results of fixed effect regressions with other inequality measures - Atkinson Index, the Relative Mean Deviation (Rmeandev), Theil's entropy Index and Top 5, 0.5, 0.1 and 0.01 % income shares – indicate the same results of the role of financial development (See Tables A2, A3 and A4 in the Appendix). We can see volatility matters for inequality. For Top 0.5%, 0.1% and 0.01%, interesting results emerge with contemporaneous variables (see Table A2 in the Appendix). The results indicate an inverted U-shaped non-linear relationship between income inequality and real per capita personal income, which proxies for economic growth. This finding supports the Kuznets curve (Kuznets, 1955).

5. Policy Implication

Using a unique cross-state panel data, we examine the role of financial development on inequality and find that financial development increases income inequality which can hurt equal political representation.

When we divide the states into two group based on their position relative to the average income inequality, a non-linear relationship exists between financial development and income inequality, except for the Top 0.5%, 0.1%, and 0.01% income shares. For higher inequality states, income inequality decreases up to the percentage where financial development reaches its threshold. After the threshold level, a growing financial sector increases income inequality at an increasing rate.

For lower inequality states, a growing financial sector increases income inequality at a slower rate until financial development reaches its threshold level. Once financial development passes the threshold level, income inequality begins to fall.

Economic theory provides that finance affects income distribution in two ways -- the extensive and intensive margins (Greenwood & Jovanovic 1990). Difference between the extensive and intensive margin can explain existing non-linear relationship between financial development and income inequality. For lower inequality states, up to threshold level of financial development, a growing financial sector increases income inequality as the gains accrue to the rich from their wealth is more than extensive margin. In other words, the benefit for the new participants of the financial services cannot yet exceed the gains of the existing ones. Once financial development reaches its threshold, however, income inequality decreases as extensive margin exceeds the concentrated gain for a certain group of individuals.

For higher inequality states income inequality decreases up to the percentage where financial development reaches its threshold. After the threshold level, a growing financial sector increases income inequality at an increasing rate since the wealth is more unequally distributed than income. In other words, the initial inequality gap is too big to be closed by the extensive margin.

The results of fixed effect regression for 50 U.S. states show that, only for Top 1% income share, the coefficient of real per capita personal income (proxy for economic growth) supports the Kuznet curve[13]. This results remain same for states with higher and lower inequality. For lower inequality states, our results support the hypothesis of Greenwood & Jovanovic (1990) while there is some modest support for the Kuznets hypothesis.

[13] The results in appendix show that the relationship between top income shares and real per capita personal income (proxy for economic growth) supports the Kuznet curve.

Based on our results, size of coefficients of real per capita personal income is bigger than the one of financial development variable. This can be interpreted as the impact of economic growth is bigger than the impact of financial development on inequality. As our results for lower inequality states support the hypothesis of Greenwood & Jovanovic (1990) and the Kuznets hypothesis, the government needs to focus on reducing the current high inequality so that states can benefit from financial development as well as economic growth.

In our study, we do not find that the exact impact of unemployment rate on income inequality. However the coefficient of unemployment rate on Top 10% income share is positive for higher inequality states whereas it is negative for lower inequality states. This can be explained by the differences between state specific policies that deal with a job loss such as programs like state food assistance or rent or mortgage support.

College attainment increases only the Gini coefficient for 50 U.S. states and states with higher inequality. Volatility, however, increases inequality with higher impact compare to other control variables and its impact enlarges with the higher income share.

Before the extreme inequality affects adversely on equal political representation, based on these findings, policies need to reduce the gap of inequality and adopt financial deepening as well as financial inclusion. Financial inclusion policies focus on the quality and suitability of financial products to ensure usage and to avoid dominant accounts. Also, policies which can close the gap of inequality such as increasing capital gains tax, expanding earned income credit, and more progressive tax, can be necessary precondition policies for achieving a reduction in income inequality through financial development.

6. Conclusion

The rising income inequality in the United States for the past three-and-a-half decades portrays more than a story of New York City, the hub of the financial sector. While many of the high-

income earners live in states such as New York and Connecticut, IRS data confirm that rising income inequality (e.g., increases in the Top 1% share) affects every state.

In this paper, we implemented the fixed-effect panel regression to test for the existence of causal relationships between financial development and income inequality, using annual data for the 50 U.S. states from 1976-2011.

We find that financial development positively affects income inequality, which supports the findings of van der Weide and Milanovic (2014) and de Haan et al. (2017). A linear relationship exists in 50 U.S. states between financial development and income inequality. Also, the unemployment rate does not significantly affect income inequality.

A general discussion exists about income inequality in the United States across generations. That is, investment in education and human capital, using current generations' resources, will bear fruit in the next generation. For instance, giving children a good education will equip them to succeed and achieve higher incomes (Heinrich and Smeedling, 2014). Although higher education leads to higher lifetime earnings, our paper finds no evidence of a significant effect on income inequality.

When we divide the states into two group based on their position relative to the average income inequality, a non-linear relationship exists between financial development and income inequality, except for the Top 0.5%, 0.1%, and 0.01% income shares. For higher inequality states, income inequality decreases up to the percentage where financial development reaches its threshold. After the threshold level, a growing financial sector increases income inequality at an increasing rate. For lower inequality states, a growing financial sector increases income inequality at a slower rate until financial development reaches its threshold level. Once financial development passes the threshold level, income inequality begins to fall. This finding supports the inverted U-shaped relationship suggested by Greenwood and Jovanovic (1990), but only for lower income inequality states.

A number of cross-country studies examine the role of financial development on income inequality. Denk and Cournède (2015), using data from OECD/developed countries over the past three decades, analyze the relationship between finance and income inequality. The authors found that more finance associate with higher income inequality (see also Rodriguez-Pose and Tselios, 2009; Fournier and Koske, 2013). Some of the cross-country studies also find non-linear relationships. Nikoloski (2013) and Kim and Lin (2011) analyze income inequality data for developed and developing countries, and the authors find robust empirical evidence for the existence of an inverted U-curve relationship between financial sector development and income inequality. Based on our results as well as the existing cross-country studies, whether financial development effect depends on the initial level of income inequality proves an interesting topic for future research.

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Table 1. Results of fixed-effect regression for 50 U.S. states

Contemporaneous variables	Baseline						Baseline+Controls					
	Top10% Coefficient		Top1% Coefficient		Gini Coefficient		Top10% Coefficient		Top1% Coefficient		Gini Coefficient	
Financial development	0.0472	***	0.1225	***	0.0269	***	0.0491	***	0.1218	***	0.0277	***
Financial development^2	-0.0004		-0.0088		-0.0007		-0.0003		-0.0082		-0.0005	
Income							0.2117		1.3525	***	0.1102	***
Income^2							0.6890		-6.5033	***	0.2390	
Unemployment rate							-0.0002		0.0028	**	-0.0002	
High school attainment							0.0394		0.1081		-0.0225	
College attainment							-0.0107		-0.0515		0.0210	**
Volatility							1.2894	***	4.6205	***	0.6394	
Constant	0.0076	***	0.0149	***	0.0058	***	0.0023		-0.0246	**	0.0039	***

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table 2. Results of fixed-effect regression for 50 U.S. states

Lagged variables	Baseline						Baseline + Controls					
	Top10% Coefficient		Top1% Coefficient		Gini Coefficient		Top10% Coefficient		Top1% Coefficient		Gini Coefficient	
Financial development	0.0275	***	0.1032	***	0.0158	**	0.0278	***	0.1059	***	0.0164	**
Financial development^2	0.0006		-0.0036		-0.0014		0.0009		-0.0029		-0.0013	
Income							-0.0098		0.0255		-0.0224	
Income^2							-2.5824	*	-3.2191	*	0.6411	
Unemployment rate							-0.0005		0.0003		-0.0004	
High school attainment							0.0578		0.2316	**	-0.0152	
College attainment							-0.0075		-0.0513		0.0217	**
Volatility							1.1165	*	1.1151		0.3539	**
Constant	0.0083	***	0.0158	***	0.0063	***	0.0107	**	0.0125		0.0073	***

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table 3. Results of fixed-effect regression for states with high inequality

Baseline + Controls	Contemporaneous						Lagged					
	Top10% Coefficient		Top1% Coefficient		Gini Coefficient		Top10% Coefficient		Top1% Coefficient		Gini Coefficient	
Financial development	0.0671	***	0.2082	***	0.0420	***	0.0408	**	0.1330	***	0.0216	**
Financial development^2	0.0264	***	0.0751	***	0.0160	***	0.0136	**	0.0447	***	0.0067	**
Income	0.5890	***	1.4007	**	0.1670	***	-0.2050		0.0134		-0.0027	
Income^2	1.3714		-6.5202	***	1.4176	***	2.4989		-2.1272		1.2813	**
Unemployment rate	0.0024	***	0.0022		0.0000		-0.0005		-0.0006		-0.0002	
High school attainment	-0.0059		0.1249		-0.0442		0.0370		0.0984		-0.0431	
College attainment	0.0260		0.0287		0.0283	**	0.0125		0.0791		0.0316	**
Volatility	1.3879	***	5.3900	***	0.7776	***	-0.6158	**	1.7656	*	0.2280	
Constant	-0.0177	***	-0.0239		0.0017		0.0145	*	0.0182		0.0071	***
Threshold level of development (-$\beta/2\gamma$) (%)	-1.2724		-1.3861		-1.3107		-1.4976		-1.4858		-1.6012	

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table 4. Results of fixed-effect regression for states with low inequality

Baseline + Controls	Contemporaneous						Lagged					
	Top10% Coefficient		Top1% Coefficient		Gini Coefficient		Top10% Coefficient		Top1% Coefficient		Gini Coefficient	
Financial development	0.0706	***	0.1615	***	0.0401	***	0.0372	***	0.1830	***	0.0271	***
Financial development^2	-0.0217	***	-0.0589	***	-0.0128	***	-0.0083	**	-0.0588	***	-0.0094	***
Income	-0.0406		1.3099	***	0.0578		0.0862		0.1657		-0.0314	
Income^2	1.3660		-7.1706	**	0.1452		-4.2044	***	-8.8489	***	0.4438	
Unemployment rate	-0.0018	**	0.0028	***	-0.0005		-0.0008		0.0024	**	-0.0003	
High school attainment	0.0774		0.1338		0.0001		0.0865		0.3871	***	0.0172	
College attainment	-0.0251		-0.0996	**	0.0156		-0.0210		-0.1256	**	0.0137	
Volatility	0.8962	***	3.4529	***	0.5603	*	1.6740	***	0.1597		0.4258	**
Constant	0.0126	*	-0.0256	***	0.0043		0.0091	*	-0.0034		0.0048	
Threshold level of development (-$\beta/2\gamma$) (%)	1.6302		1.3707		1.5641		2.2448		1.5559		1.4385	

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

APPENDIX

Table A1. Results of dynamic fixed-effect regression for 50 U.S. states

Contemporaneous variables	Baseline + Controls																					
	Top10% Coefficient		Top1% Coefficient		Gini Coefficient		Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient	
Dynamic variable	-0.2981	***	-0.4264	***	0.1057	**	-0.0527		0.0057		0.1723	***	-0.3648	***	-0.4369	***	-0.4423	***	-0.4593	***
Financial development	0.0601	***	0.1926	***	0.0263	***	0.0873	***	0.0280	***	0.1242	***	0.0950	***	0.2005	***	0.2597	***	0.2828	***
Financial development^2	-0.0010		-0.0099		-0.0006		-0.0040		-0.0001		-0.0073		-0.0032		-0.0127		-0.0149		-0.0241	
Income	0.3184	**	1.8201	***	0.1052	***	0.4997	***	0.1020	**	0.8873	***	0.7652	***	2.1357	***	2.9519	***	3.5810	***
Income^2	1.4840	*	-5.5854	***	0.1986		-2.0970	**	0.1170		-0.8711		0.5418		-7.2540	***	-12.6313	***	-21.3001	***
Unemployment rate	-0.0009		-0.0002		-0.0001		-0.0015	**	0.0001		0.0000		-0.0006		0.0010		0.0034	*	0.0042	
High school attainment	0.0372		0.0967		-0.0174		0.0344		-0.0191		0.0430		0.1063	*	0.0896		-0.0055		-0.0273	
College attainment	-0.0154		-0.0555	*	0.0207	**	-0.0084		0.0110	**	0.0011		-0.0454	**	-0.0336		-0.0397		-0.0908	
Volatility	1.3662	***	5.7141	***	0.6046	***	0.9779	***	0.4700	**	1.2803	***	1.3669	***	7.8246	***	12.9289	***	20.2393	***
Constant	0.0069		-0.0091		0.0026		0.0106	**	0.0021		-0.0013		0.0030		-0.0189		-0.0379	**	-0.0410	*
Lagged variables	Baseline + Controls																					
	Top10% Coefficient		Top1% Coefficient		Gini Coefficient		Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient	
Dynamic variable	-0.2449	***	-0.3188	***	0.1125	***	-0.0220		0.0182		0.2263	***	-0.2762	***	-0.3379	***	-0.3496	***	-0.4039	***
Financial development	0.0384	***	0.1433	***	0.0136	**	0.0642	***	0.0199	***	0.0503	***	0.0735	***	0.1560	***	0.1904	***	0.1933	***
Financial development^2	0.0006		-0.0063		-0.0011		-0.0019		-0.0012		0.0016		0.0001		-0.0063		-0.0021		0.0029	
Income	-0.0037		0.3021	**	-0.0285		0.1448	***	-0.0392	***	-0.0822		0.1744	**	0.2347	*	0.2725	*	0.7062	***
Income^2	-1.9330		-3.6201	**	0.5393		-0.8272		0.6302		0.9484		-2.4985	*	-4.3877	***	-4.0461	**	-4.3397	
Unemployment rate	-0.0012	*	-0.0009		-0.0003		-0.0009	*	0.0000		-0.0015	*	-0.0004		-0.0011		-0.0002		0.0012	
High school attainment	0.0608		0.2288	**	-0.0102		0.0689		-0.0087		0.1054		0.1476	**	0.2594	**	0.2393		0.2523	
College attainment	-0.0114		-0.0516		0.0213	**	-0.0040		0.0118	*	0.0019		-0.0381		-0.0316		-0.0409	*	-0.0958	
Volatility	1.0122	**	1.3206	**	0.3292	**	-0.2851	*	0.1893		-0.9653	***	0.0485		2.5364	***	4.9557	***	9.7231	***
Constant	0.0165	***	0.0212	**	0.0063	***	0.0137	***	0.0054	***	0.0241	***	0.0143	**	0.0252	**	0.0265	**	0.0215	

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table A2. Results of fixed-effect regression for 50 U.S. states

Contemporaneous variables	Baseline + Controls													
	Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient	
Financial development	0.0853	***	0.0281	***	0.1325	***	0.0665	***	0.1148	***	0.1412	***	0.1194	***
Financial development^2	-0.0039		-0.0001		-0.0081		-0.0016		-0.0099		-0.0130		-0.0194	
Income	0.4782	***	0.1028	**	0.9796	***	0.5531	***	1.6250	***	2.2891	***	2.8774	***
Income^2	-2.2099	**	0.1202		-0.9825		-0.3923		-7.7652	***	-12.6429	***	-20.4211	***
Unemployment rate	-0.0012	**	0.0001		-0.0019	*	0.0010		0.0040	***	0.0064	***	0.0075	***
High school attainment	0.0346		-0.0194		0.0220		0.0735		0.1176		0.0685		0.1402	
College attainment	-0.0079		0.0110	**	-0.0025		-0.0306		-0.0289		-0.0329		-0.0858	
Volatility	0.9527	***	0.4717	**	1.5110	***	1.2424	***	6.3388	***	10.1771	***	14.8796	***
Constant	0.0086	*	0.0021		0.0118		-0.0063		-0.0344	**	-0.0535	***	-0.0595	***
Lagged variables	Baseline + Controls													
	Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient	
Financial development	0.0625	***	0.0204	***	0.0772	***	0.0571	***	0.1172	***	0.1390	***	0.1403	***
Financial development^2	-0.0018		-0.0012		-0.0006		0.0009		-0.0020		0.0040		0.0128	
Income	0.1386	***	-0.0384	***	0.0774		0.0827		-0.1202		-0.2642		-0.1038	
Income^2	-0.8058		0.6438		1.1734		-2.9709	**	-4.1195	**	-3.0806		-0.6130	
Unemployment rate	-0.0008		-0.0001		-0.0030	***	0.0005		-0.0003		-0.0003		0.0000	
High school attainment	0.0684		-0.0095		0.0822		0.1196	*	0.2802	**	0.2997	*	0.4199	*
College attainment	-0.0039		0.0119	*	-0.0012		-0.0277		-0.0312		-0.0405		-0.1005	
Volatility	-0.2860	*	0.1899		-0.9136	***	0.2497		2.1440	***	3.7875	***	6.0735	***
Constant	0.0129	***	0.0056	***	0.0353	***	0.0072		0.0187	*	0.0245		0.0238	

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table A3. Results of fixed-effect regression for states with high inequality

Contemporaneous variables	Baseline + Controls														
	Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient		
Financial development	0.1303	***	0.0438	***	0.1918	***	0.1036	***	0.1055	**	0.1256	**	0.1093	**	
Financial development^2	0.0475	***	0.0168	***	0.0688	***	0.0385	***	-0.0077		-0.0095		-0.0154		
Income	0.5957	***	0.2075	***	1.1830	***	1.1071	***	1.7041	***	2.3449	***	3.2226	***	
Income^2	-1.4846		0.8767		-1.0505		-0.6211		-7.3616	***	-12.6749	***	-19.7251	***	
Unemployment rate	-0.0018	**	-0.0001		-0.0003		0.0034	***	0.0037		0.0056	*	0.0068		
High school attainment	0.1109	**	0.0075		0.0686		0.0408		0.1294		0.0300		0.2646		
College attainment	-0.0139		-0.0006		0.0467		0.0165		0.0347		0.0880		0.0410		
Volatility	1.4844	***	0.8168	***	2.1459	***	1.9678	***	6.5829	***	10.6301	***	16.5490	***	
Constant	0.0074		0.0014		-0.0031		-0.0279	***	-0.0303		-0.0465	*	-0.0588	*	
Lagged variables	Baseline + Controls														
	Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient		
Financial development	0.0773	***	0.0302	***	0.0956	**	0.0809	**	0.0972	**	0.1176	**	0.1107	**	
Financial development^2	0.0261	***	0.0101	***	0.0305	**	0.0279	***	0.0004		0.0072		0.0171		
Income	0.1526	*	-0.0243		0.0910		-0.2568		-0.0761		-0.2194		-0.1788		
Income^2	-2.6582	***	-0.1405		-1.3146		2.6982		-3.3065		-2.4222		0.4155		
Unemployment rate	-0.0016		-0.0004		-0.0028	*	-0.0019		-0.0018		-0.0023		-0.0050		
High school attainment	0.1245	*	0.0206		0.0848		0.0870		0.1713		0.1073		0.4108		
College attainment	-0.0009		0.0026		0.0764		0.0243		0.0664		0.1127		0.0506		
Volatility	-0.0192		0.2468	*	-0.7112	**	-1.0213	**	2.1645	**	4.0180	***	7.2189	***	
Constant	0.0189	**	0.0090	***	0.0364	***	0.0255	**	0.0310	*	0.0393		0.0562		

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table A4. Results of fixed-effect regression for states with low inequality

Contemporaneous variables	Baseline + Controls														
	Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient	
Financial development	0.1312	***	0.0382	***	0.2091	***	0.0814	***	0.1258	***	0.1693	***	0.1168	
Financial development^2	-0.0449	***	-0.0115	***	-0.0739	***	-0.0248	***	-0.9151	***	-1.4813	***	-1.9427	***
Income	0.3597	**	0.0101		0.8174	***	0.1106		1.5377	***	2.2283	***	2.3545	***
Income^2	-1.6506	*	0.2594		0.3660		1.2080		-10.9231	**	-15.9180	**	-26.6249	***
Unemployment rate	-0.0012		0.0004		-0.0031	**	-0.0001		0.0045	***	0.0078	***	0.0085	**
High school attainment	0.0214		-0.0397		0.0422		0.1251		0.0825		0.0856		0.0565	
College attainment	-0.0066		0.0198	**	-0.0308		-0.0540	*	-0.0797		-0.1485		-0.2070	
Volatility	0.5020		0.2280		0.9516		0.2008		5.3746	***	8.2706	***	11.2385	***
Constant	0.0079		0.0004		0.0179		0.0041		-0.0270	**	-0.0439	**	-0.0306	
Lagged variables	Baseline + Controls													
	Atkinson Coefficient		Rmeandev Coefficient		Theil Coefficient		Top5% Coefficient		Top0.5% Coefficient		Top0.1% Coefficient		Top0.01% Coefficient	
Financial development	0.1054	***	0.0296	***	0.1219	***	0.0859	***	0.1775	***	0.2159	***	0.2236	***
Financial development^2	-0.0332	***	-0.0097	***	-0.0344	***	-0.0232	***	-0.8326	***	-1.3660	***	-1.5527	***
Income	0.1482	***	-0.0318	*	0.0975		0.2607	***	-0.1155		-0.2620		0.0007	
Income^2	0.4679		0.8791	*	2.6115	**	-4.7574	***	-8.1571	**	-7.8895	*	-7.1531	
Unemployment rate	0.0003		0.0008		-0.0026	*	0.0017	**	0.0020	*	0.0032	**	0.0050	
High school attainment	0.0701		-0.0260		0.1210		0.1649	*	0.3881	**	0.5258	**	0.4878	
College attainment	-0.0102		0.0196	**	-0.0447		-0.0554	*	-0.0781		-0.1512	*	-0.2098	
Volatility	-0.5533	**	0.1580		-1.1744	***	0.7748		1.4883		2.1650	**	3.0766	**
Constant	0.0029		-0.0012		0.0286	***	-0.0057		0.0101		0.0155		0.0117	

Note: ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

Table A5. Results of system-GMM for 50 U.S. states

sys-GMM	Gini		Top10%		Top1%	
	Coefficient		Coefficient		Coefficient	
Dynamic variable	0.2318	***	-0.3484	***	-0.5230	***
Financial development	0.0384	***	0.1567	***	0.3531	***
Financial development^2	-0.0666		-0.0573		-0.0777	
Income	0.1822	**	0.6501	***	3.7458	***
Income^2	-0.5312		2.6788		-25.8610	*
Unemployment rate	-0.0008	**	-0.0005		0.0034	
College attainment	0.1363	***	-0.0413		-0.1799	
Volatility	0.6886		1.7102	**	12.5126	***
Constant	0.0037		-0.0019		-0.0519	***
P-value						
AR(1)	0.003		0		0	
AR(2)	0.748		0.509		0.796	
Hansen	0.237		0.225		0.22	

Note: As the estimation is two-step sys-GMM, Hansen J statistic is reported (Roodman, 2009). The test statistic has a $\chi 2$ distribution under the null hypothesis that the instruments are valid. ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real per capita personal income and "Income^2 is squared term of real per capita personal income. Except unemployment rate and measure of volatility, the variables are in growth form by taking the difference of its natural logarithm value.

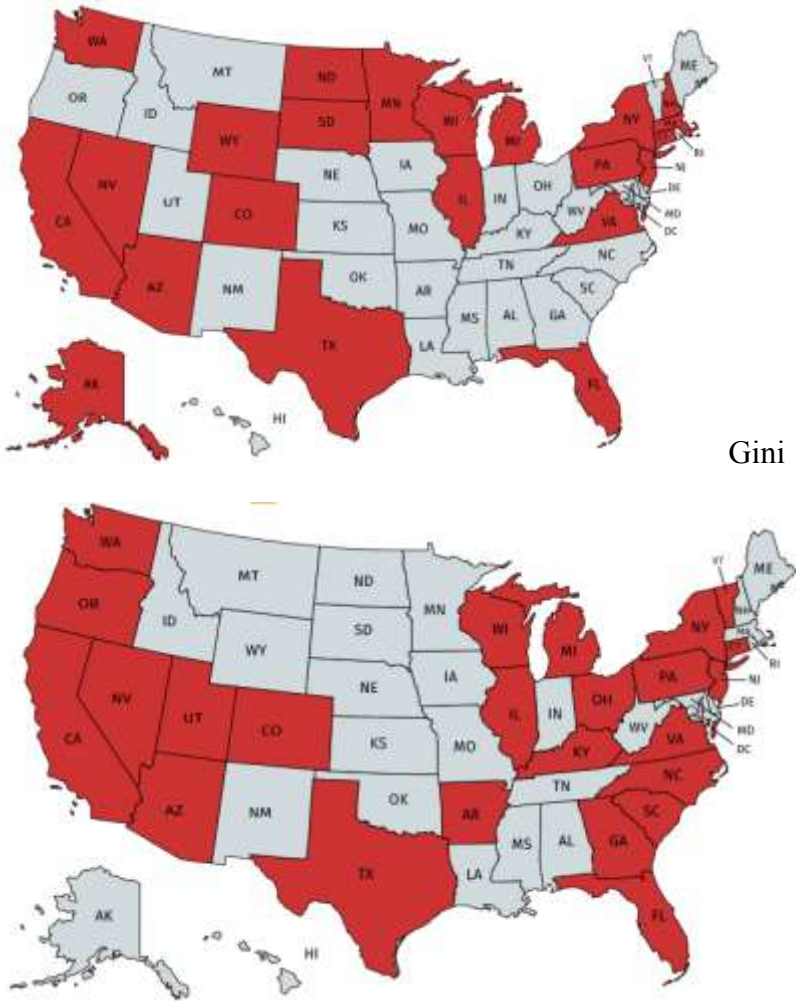
Table A6. List of high and low inequality states

Top 10%	High	AK, AZ,CA, CO, CT, FL, GA, IL, MA, MI, NV, NJ, NY, NC, OH, OR, PA, SC, UT, WI, WY
	Low	AL, AR, DE, HI, ID, IN, IA, KS, KY, LA, ME, MD, MN, MS, MO, MT, NE, NH, NM, ND, OK, RI, SD, TN, TX, VT, VA, WA, WV
Top 1%	High	AK, AZ, CA, CO, CT, FL, IL, MD, MA, MI, MN, NV, NH, NJ, NY, ND, PA, SD, TX, VA, WA, WI, WY
	Low	AL, AR, DE, GA, HI, ID, IN, IA, KS, KY, LA, ME, MS, MO, MT, NE, NM, NC, OH, OK, OR, RI, SC, TN, UT, VT, WV
Gini coefficient	High	AZ, AR, CA, CO, CT, FL, GA, IL, KY, MA, MI, NV, NJ, NY, NC, OH, OR, PA, SC, TX, UT, VT, VA, WA, WY
	low	AL, AK, DE, HI, ID, IN, IA, KS, LA, ME, MD, MN, MS, MO, MT, NE, NH, NM, ND, OK, RI, SD, TN, WV, WI

Figure A1. Low (in Grey) and High (in Red) Inequality States

Top10

Top1



Gini