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Does Financial Development Affect Income Inequality in the U.S. States? A Panel Data Analysis

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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 where by 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.

JEL classification code: C33, D31, D63

Keywords: Income inequality, Panel data, Personal Income

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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 it represents a constructive factor in society. Others argue that inequality results 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 has created a number of problems. For instance, low-income groups experience much difficulty in accessing financial and credit markets, and these market imperfections can influence 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 was the trend strength of the stock market (Favilukis, 2013; Hungerford, 2013). Hungerford (2013) showed 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. It is true that in the 2001 and 2007 financial crises, 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 influencing changes in the 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 bind the poor who lack collateral and credit histories, and, therefore, relaxation of credit constraints may benefit the poor (Beck et al., 2007). In the study by Demirgüç-Kunt and Levine (2009), 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. Thus, the extensive margin effects reduce inequality. 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 (Demirgüç-Kunt and Levine, 2009). 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) showed an inverted U-shaped curve of income inequality and financial intermediary development. At early stages of financial development, only a few wealthy individuals have access to financial markets. With economic growth, however, more people can afford to join the financial system and more individuals can enjoy the benefit. Thus, income inequality increases initially. Once the economy matures, however, income inequality falls.

[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), and Townsend and Ueda (2006).

Empirical evidence on the relationship between financial development and income inequality gives mixed results. Haber (2005) argued that primarily the well-off and politically connected benefit from improvements in the financial system. Van der Weide and Milanovic (2014) found that high levels of inequality reduce income growth of the poor and boost the income growth of the rich. De Haan and Sturm (2016) examined how financial development, financial liberalization, and banking crises affected within-country income inequality, using cross-country panel data from 1975-2005. The authors found robust results that all financial variables increase income inequality. Also, de Haan et al. (2017) found that financial development strengthens the inequality-raising effects of financial liberalization.

On the other hand, Bulir (2001), Honohan (2004), and Beck et al. (2007) showed that financial development alleviates inequality and poverty. Dollar and Kraay (2002) and Clark et al. (2003) reported that more access to financial and credit markets helps to reduce inequality. Law et al. (2014) said, 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 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).[3] The income inequality measures and human capital measures come from the online

[3] 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 0.1% income share and the Top 0.01% income share. We report these results in the Appendix.

data of Professor Mark W. Frank's website.[4] 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 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. A poor measure leads to a poor answer. 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 nominal per capita personal income as our measure of financial development[5]. 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. This 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)

[4] 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.

[5] We also examined 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, we could not find any significant role of 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 been increasing, irrespective of one's risk tolerance and the 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.

restricted the growth rate in household financial wealth solely to the growth rate in households' holdings of mutual funds due to data availability.[6]

Since the U.S. stock market wealth data ends 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.[7] 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 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:

$$Ineq_{it} = \alpha_i + \beta_{it}FD_{it} + \gamma_{it}FD^2{}_{it} + u_{it} \quad (1)$$

$$Ineq_{it} = \alpha_i + \beta_{it}FD_{it} + \gamma_{it}FD^2{}_{it} + \delta_{it}PI_{it} + \eta_{it}PI^2{}_{it} + \kappa_{it}UE_{it} + \mu_{it}HS_{it} + \nu_{it}CL_{it} + \rho_{it}V_{it} + u_{it} \quad (2)$$

$$Ineq_{it} = \alpha_i + \beta_{it}FD_{it-1} + \gamma_{it}FD^2{}_{it-1} + u_{it} \quad (3)$$

$$Ineq_{it} = \alpha_i + \beta_{it}FD_{it-1} + \gamma_{it}FD^2{}_{it-1} + \delta_{it}PI_{it-1} + \eta_{it}PI^2{}_{it-1} + \kappa_{it}UE_{it-1} + \mu_{it}HS_{it-1} + \nu_{it}CL_{it-1} + \rho_{it}V_{it-1} + u_{it} \quad (4)$$

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

where $Ineq$ = Income inequality

[6] This data set has also been used recently by Bampinas et al., (2017) to analyze wealth effects controlling for inequality and demographic factors.

[7] Complete details of the unit-root tests are available upon 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, suggested 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 upon request from the authors.

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

RV = 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.

4. Empirical Analysis

Table 1 shows the results of the fixed-effect regression of the Top 10%, Top 1%, and 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.[8] Higher real per capita personal income contributes to the rise in income inequality, especially for the Top 1% income group. Volatility also makes the distribution of income more unequal, which supports

[8] 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.

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.[9] 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 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.[10] These results indicate that the effect of financial development increases inequality at an increasing rate for those states above the 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 threshold level of financial development ($-\beta/2\gamma$) around 0.015 (see Table 4). This implies that 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

[9] 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.

[10] 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.

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 Kuznets curve (Kuznets, 1955).

5. 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 next generation. For instance, giving children good education will equip them to succeed and achieve higher incomes (Heinrich and Smeedling, 2014).

Although more 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 income 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 income 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, analyse 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 cross-country studies also find non-linear relationships. Nikoloski (2013) and Kim and Lin (2011) analyze income inequality data for developed and developing countries, 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.

Reference

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *The Quarterly Journal of Economics*, *109*(2), 465-490.

Balcilar, M., Chang, S., Gupta, R., and Miller, S.M. (2018). The relationship between the inflation rate and inequality across U.S. states: a semiparametric approach. *Quality and Quantity*, https://doi.org/10.1007/s11135-017-0676-3.

Bampinas G. Konstantinou P, Panagiotidis T. (2017). Inequality, demographics, and the housing wealth effect: panel quantile regression evidence for the US. *Finance Research Letters, 23*(C), 19-22.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth*, *12*(1), 27-49.

Birdsall, N., Ross, D., & Sabot, R. (1995). Inequality and growth reconsidered: lessons from East Asia. *The World Bank Economic Review*, *9*(3), 477-508.

Bivens, J., Gould, E., Mishel, L. R., & Shierholz, H. (2014). *Raising America's Pay: Why It's Our Central Economic Policy Challenge*. Economic Policy Institute. Available at http://www.epi.org/publication/raising-americas-pay/

Bulir, A. (2001). Income inequality: Does inflation matter? *IMF Staff Papers*, *48*(1).

Case, K. E., Quigley, J. M., & Shiller, R. J. (2013). Wealth Effects Revisited 1975–2012. *Critical Finance Review*, *2*(1), 101-128.

Clarke, G. R., Zou, H. F., & Xu, L. C. (2003). *Finance and income inequality: test of alternative theories* (Vol. 2984). World Bank Publications.

Claessens, S., Perotti, E. (2007). Finance and Inequality: Channels and Evidence. *Journal of Comparative Economics*, 35(4), 748–773.

Corak, M. (2016). *Inequality from Generation to Generation: The United States in Comparison* (No. 9929). Institute for the Study of Labor (IZA).

de Haan, J., Pleninger, R., & Sturm, J. E. (2017). Does the impact of financial liberalization on income inequality depend on financial development? Some new evidence. *Applied Economics Letters*, 1-4.

de Haan, J. D. & Sturm, J. E., (2016). How Development and Liberalisation of the Financal Sector is Related to Income Inequality: Some New Evidence. *Central Banking and Monetary Policy: what will be the post-crisis new normal? 2016*(4), 145-154.

Deidda, L. G. (2006). Interaction between economic and financial development. *Journal of Monetary Economics*, *53*(2), 233-248.

Deininger, K., & Squire, L. (1996). A new data set measuring income inequality. *The World Bank Economic Review*, *10*(3), 565-591.

Demirgüç-Kunt, A., Levine, R. (2009). Finance and Inequality: Theory and Evidence. *Annual Review of Financial Economics*, 1(1), 287–318.

Denk, O., & Cournède, B. (2015). *Finance and income inequality in OECD countries* (No. 1224). OECD Publishing.

Dollar, D., & Kraay, A. (2002). Growth is Good for the Poor. *Journal of Economic Growth*, *7*(3), 195-225.

Dvorkin, M., & Shell, H. (2015). District Overview: Income Inequality Is Growing in the District, but Not as Fast as in the Nation. *The Regional Economist*, (Jan). Available at: https://www.stlouisfed.org/~/media/Publications/Regional-Economist/2015/January/PDFs/district_overview.pdf.

Easterly, W. (2007). Inequality does cause underdevelopment: Insights from a new instrument. *Journal of Development Economics*, *84*(2), 755-776.

Easterly, W., & Fischer, S. (2001). Inflation and the Poor. *Journal of Money, Credit and Banking*, 160-178.

Fang, W., Miller, S. M., & Yeh, C. C. (2015). The effect of growth volatility on income inequality. *Economic Modelling*, *45*, 212-222.

Favilukis, J. (2013). Inequality, stock market participation, and the equity premium. *Journal of Financial Economics*, *107*(3), 740-759.

Fournier, J. M., & Koske, I. (2013). The determinants of earnings inequality. *OECD Journal: Economic Studies*, *2012*(1), 7-36.

Galor, O., & Moav, O. (2004). From physical to human capital accumulation: Inequality and the process of development. *The Review of Economic Studies, 71*(4), 1001–1026.

Galor, O., & Zeira, J. (1993). Income distribution and macroeconomics. *The 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, Part 1), 1076-1107.

Greenwood, J., & Smith, B. D. (1997). Financial markets in development, and the development of financial markets. *Journal of Economic Dynamics and Control*, *21*(1), 145-181.

Haber, S. (2005). Mexico's experiments with bank privatization and liberalization, 1991–2003. *Journal of Banking and Finance*, *29*(8), 2325-2353.

Heinrich, C., & Smeeding, T. (2014). Building human capital and economic potential. *Fast Focus*, (21), Institute for Research on Poverty, University of Wisconsin–Madison.

Honohan, P. (2004). Financial Development, Growth and Poverty: How Close are the Links? In *Financial Development and Economic Growth* (pp. 1-37). Palgrave Macmillan UK.

Hungerford, T. L. (2013). Changes in income inequality among US tax filers between 1991 and 2006: *The role of wages, capital income, and taxes.* (January 23, 2013). Available at SSRN: https://ssrn.com/abstract=2207372.

Kim, D. H., & Lin, S. C. (2011). Nonlinearity in the financial development–income inequality nexus. *Journal of Comparative Economics*, *39*(3), 310-325.

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 1-28.

Law, S. H., Tan, H. B., & Azman-Saini, W. N. W. (2014). Financial development and income inequality at different levels of institutional quality. *Emerging Markets Finance and Trade*, *50*(sup1), 21-33.

Leigh, A. (2007). How closely do top income shares track other measures of inequality? *The Economic Journal*, *117*(524).

Levy, F., & Temin, P. (2011). Inequality and Institutions in Twentieth-Century America. *Economic Evolution and Revolution in Historical Time*, 357.

Morrill, R. (2000). Geographic variation in change in income inequality among US states, 1970–1990. *The Annals of Regional Science*, *34*(1), 109-130.

Nikoloski, Z. (2013). Financial sector development and inequality: is there a financial Kuznets curve? *Journal of International Development*, *25*(7), 897-911.

Owyang, M. T., & Shell, H. G. (2016). Measuring Trends in Income Inequality. Federal Reserve Bank of St. Louis *The Regional Economist*, *24*(2), 4-5.

Partridge, J. S., Partridge, M. D., & Rickman, D. S. (1998). State patterns in family income inequality. *Contemporary Economic Policy*, *16*(3), 277-294.

Partridge, M. D., Rickman, D. S., & Levernier, W. (1996). Trends in US income inequality: evidence from a panel of states. *The Quarterly Review of Economics and Finance*, *36*(1), 17-37.

Persson, T., & Tabellini, G. (1992). Growth, distribution and politics. *European Economic Review*, 36(2), 593-602.

Rodríguez-Pose, A., & Tselios, V. (2009). Mapping regional personal income distribution in Western Europe: income per capita and inequality. *Czech Journal of Economics and Finance*, *59*(1), 41-70.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. Stata Journal, 9, 86-136.

Stiglitz, J. E. (2012). *The Price of Inequality: How Today's Divided Society Endangers Our Future*. WW Norton & Company.

Sylwester, K. (2000). Income inequality, education expenditures, and growth. *Journal of Development Economics*, *63*(2), 379-398.

Thompson, J. P., & Leight, E. (2012). Do rising top income shares affect the incomes or earnings of low and middle-income families? *The BE Journal of Economic Analysis & Policy*, *12*(1).

Townsend, R. M., & Ueda, K. (2006). Financial deepening, inequality, and growth: a model-based quantitative evaluation. *The Review of Economic Studies*, *73*(1), 251-293.

van der Weide, R., & Milanovic, B. (2014). *Inequality is bad for growth of the poor (but not for that of the rich)* (No. 6963). The World Bank.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and statistics*, *69*(6), 709-748.

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 (-β/2γ) (%)	-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 (-β/2γ) (%)	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	

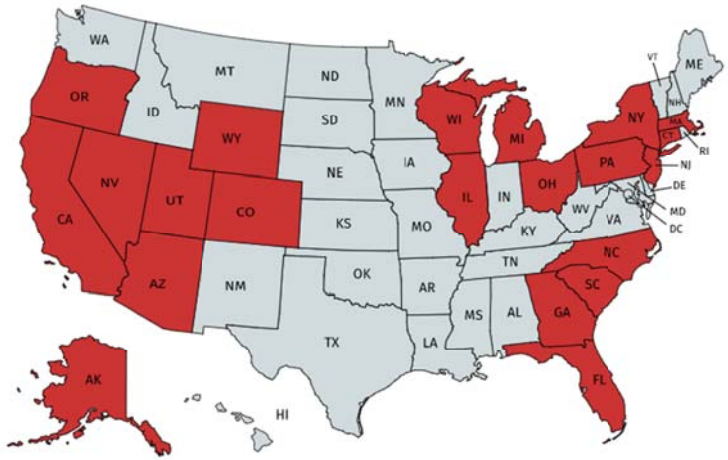
Note: As the estimation is two-step sys-GMM, Hansen J statistic is reported (Roodman, 2009). The test statistic has a $\chi 2$ distribution under the null hypothesis that the instruments are valid. ***, **, and * indicate significance at the 1-, 5-, and 10-percent levels, respectively. "Income" is real 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

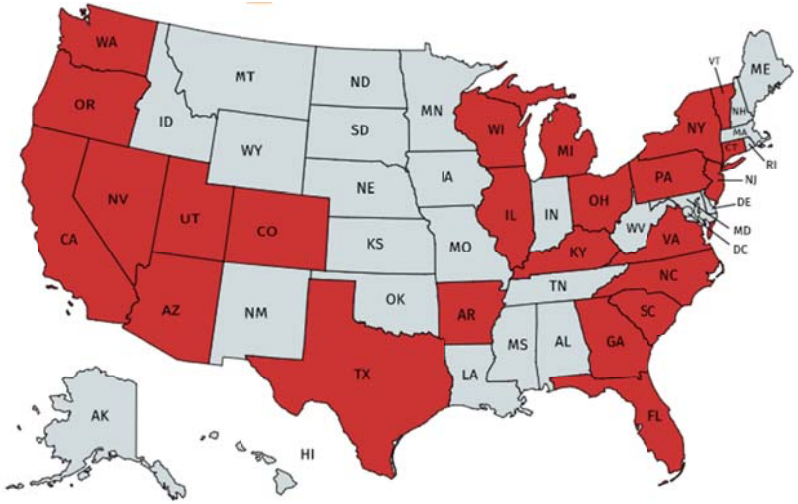
Top 10%	High	AK, AZ,CA, CO, CT, FL, GA, IL, MA, MI, NV, NJ, NY, NC, OH, OR, PA, SC, UT, WI, WY
	Low	AL, AR, DE, HI, ID, IN, IA, KS, KY, LA, ME, MD, MN, MS, MO, MT, NE, NH, NM, ND, OK, RI, SD, TN, TX, VT, VA, WA, WV
Top 1%	High	AK, AZ, CA, CO, CT, FL, IL, MD, MA, MI, MN, NV, NH, NJ, NY, ND, PA, SD, TX,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



Gini



Top1