

Does Inequality Lead to Financial Crisis? Evidence from U.S. States

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I. Introduction

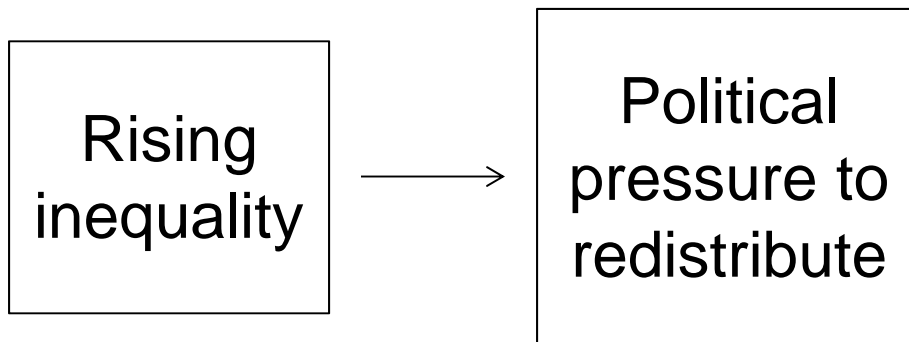
- The recent financial crisis in the U.S. has been attributed to many potential factors: (i) failures in financial regulation, (ii) lack of risk management and an ethical culture in Wall Street, (iii) excessive borrowing by households, (iv) securitization of mortgages, (v) housing policy, and (vi) ultra-easy monetary policy.

I. Introduction

- In his widely-discussed book *Fault Lines* (2010), then IMF Chief Economist and now current Governor of the Reserve Bank of India Raghuram Rajan added another potential source:
(vi) U.S. income inequality

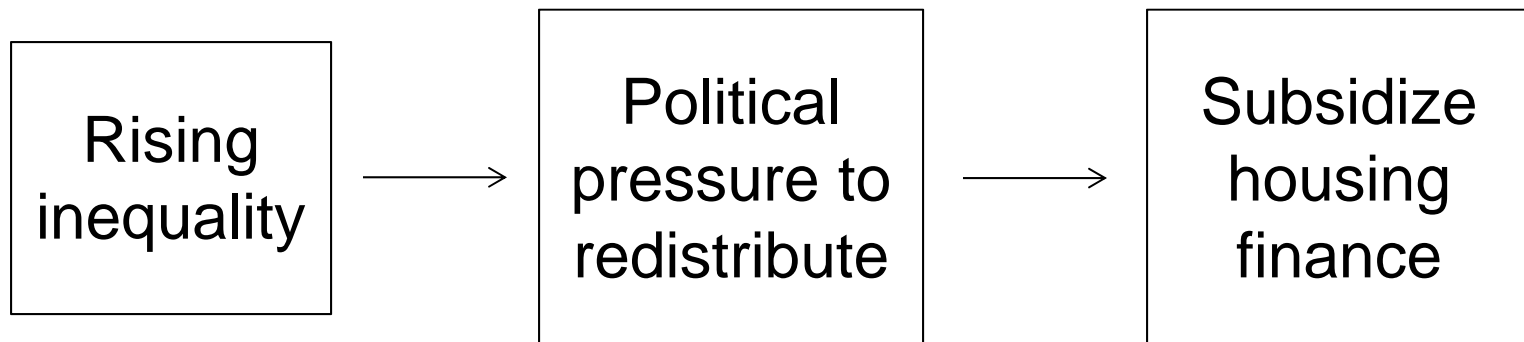
I. Introduction

- Rajan argued that in the past three decades rising income inequality in the U.S. has led to political pressure for redistribution.



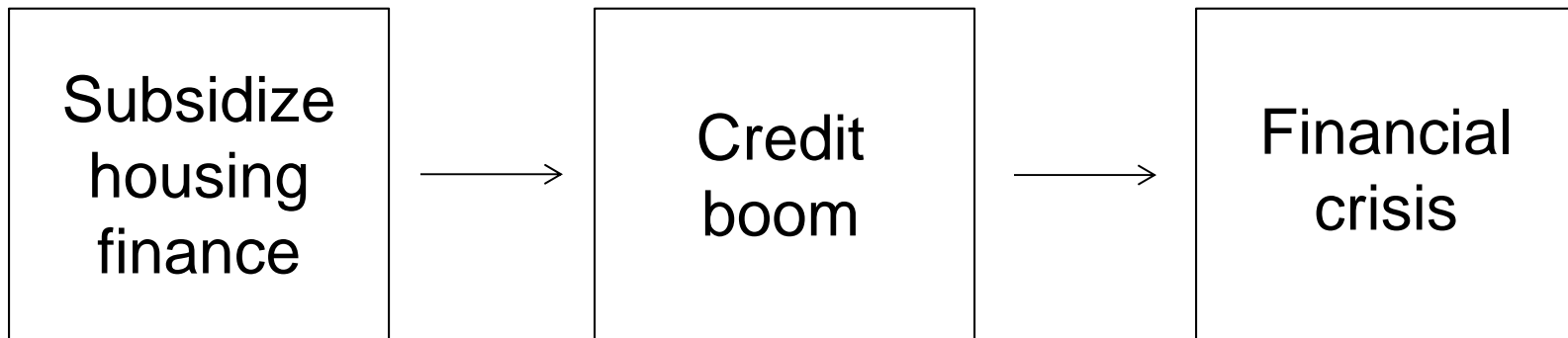
I. Introduction

- U.S. politicians responded by subsidized housing finance so that low income households who otherwise would not have qualified received mortgage credit.



I. Introduction

- The resulting lending boom created a massive run-up in housing prices which eventually led to the banking and financial crisis of 2008-09.



I. Introduction

- The Rajan hypothesis has triggered a lively debate about inequality in the United States.
- Republican members of the U.S. government's *Financial Crisis Inquiry Commission* (2011) heavily cited his hypothesis in their dissenting statement.
- Many Democrats and leading economists like Paul Krugman and Daron Acemoglu are critical of Rajan's argument.

I. Introduction

- This paper uses state-level data to test the Rajan hypothesis.
- U.S. states provide a natural laboratory for this test for three reasons.

State data is more uniform in its collection and granular in its coverage.

State regulators determine disclosure, max lending rates, bankruptcy and other laws.

States have similar institutional backgrounds.



I. Introduction

- We use a panel pooled mean group (PMG) estimator and find that rising inequality has a positive impact on state lending, especially for real estate lending.
- Our results therefore provide tentative support for the Rajan hypothesis that rising inequality leads to increased lending.



II. Past Studies

- Kumhof and Ranciere (2010) provide a theoretical foundation for the hypothesis.
- They develop a DSGE model in which rising income inequality leads to increased leverage, heightening the possibility of a financial crisis.

II. Past Studies

- They model economy consists of two types of households: investors who own capital and workers who do own any capital.
- Investors save, invest, and consume.
- Workers earn wages and consume their wages plus the proceeds of any borrowing.

II. Past Studies

- The key mechanism is that investors, rather than using all of their increased income for higher consumption and more investment, purchase additional financial assets backed by loans to workers.
- By doing so, workers are able to limit the drop in their consumption following the decline in their relative income



II. Past Studies

- However, the large and persistent rise of workers' debt-to-income ratios generates financial fragility which eventually makes a financial crisis more likely.

II. Past Studies

- There have been only a handful of empirical tests of the Rajan Hypothesis.
- Bordo and Meisner (2012); Gu and Huang (2012); Malinen (2013); and Perugini, Hölscher and Collie (2013) use cross-country data to estimate the effects of income inequality (mainly the top 1%) on the ratio of total credit to GDP.



II. Past Studies

- The vastly different institutional, regulatory and political regimes suggest that a common relationship may not exist.
- Not surprisingly, the results from these studies are mixed with some finding positive effects, others negative and still others no effect.

III. Empirical Specification

- Past studies estimate one or both of the following two relationships:

$$\Pr(\textit{crisis}_{it}) = f \left\{ \sum_{\rho=1}^P \Delta \textit{credit}_{it}(\rho) + \mu_i + t_t + \varepsilon_{it} \right\}$$

$$\Delta \textit{credit}_{it} = X_{it}\beta + \alpha \Delta \textit{inequality}_{it} + \mu_i + t_t + v_{it}$$

- This paper estimates the credit equation.

III. Empirical Specification

- We use fixed effects (FE) and pooled mean group (PMG) to estimate the credit equation.
- The FE estimator removes state-specific means from the data to control for unobserved state effects μ_i .

III. Empirical Specification

- There are 3 potential problems with the FE estimator in our context:

The presence of a lagged dependent variable can bias the estimates.

The short-run and long-run effects cannot be separated out.

There may be parameter heterogeneity.

III. Empirical Specification

- To address the previous concerns, PMG estimates both SR and LR effects where there is a common LR relationship and heterogeneous SR dynamics.

III. Empirical Specification

- The PMG estimator is based on a panel error correction (EC) model.

$$\Delta credit_{it} = \phi_i [credit_{it-1} - X_{it}\theta_i - \theta_i inequality_{it} - \mu_i] \\ - \lambda_i \Delta credit_{it-1} - \Delta X_{it-1} \delta_i - \delta_i \Delta inequality_{it-1} + u_{it}$$

where ϕ_i is the error-correction term

θ_i 's are the LR coefficients

δ_i 's are the SR coefficients

III. Empirical Specification

- The dynamic fixed effects (DFE) assumes that all coefficients are constant across states (θ, δ, ϕ) .
- The mean group (MG) estimator assumes that all coefficients are heterogeneous across states $(\theta_i, \delta_i, \phi_i)$.
- The pooled mean group (PMG) estimator assumes that the LR coefficients are constant, but the SR are not $(\theta, \delta_i, \phi_i)$.

III. Empirical Specification

- The Hausman test results indicate that we can use the more efficient PMG estimator.
- We include either (i) national GDP, money growth and interest rate or (ii) state-specific time trend and four-year state election-cycle time dummies to control for time effects

III. Empirical Specification

- We use data for the 50 U.S. states for 1977-2011.
- We measure *credit* as the ratio of total lending, consumer lending, or real estate lending to personal income.
- These data were compiled from the FDIC Call Reports for individual banks and thrifts.

III. Empirical Specification

- We measure *inequality* as top-10 income, the Gini coefficient, or the Theil index.
- These data were provided by Mark Frank who used individual IRS data.
- We use the log of real wages and earnings as our control variable X
- These data are obtained from the BEA Regional Economic Accounts.



IV. Results

- Summary Statistics
- FE Results for total lending, consumer lending and real estate lending.
- PMG Results for total lending, consumer lending and real estate lending

Variable		Mean	Std. Dev.	Min	Max	Observations
totloan	overall	.3796813	.1335975	.1468134	1.206519	N = 1600
	between		.0878856	.2121609	.6606381	n = 50
	within		.1013615	.1339984	1.02587	T = 32
consloan	overall	.0650507	.0527886	.0048806	.5617435	N = 1600
	between		.0444331	.0245975	.3423969	n = 50
	within		.0291653	-.1844588	.2843973	T = 32
realloan	overall	.1805313	.1016366	.0375031	1.094948	N = 1600
	between		.0485627	.1061373	.3426681	n = 50
	within		.0895398	-.0717043	.9328111	T = 32
top10	overall	.3834213	.0506393	.2824231	.570197	N = 1600
	between		.0235029	.3425262	.4472691	n = 50
	within		.044974	.2654126	.5084532	T = 32
gini	overall	.5799019	.0718273	.4463237	.877755	N = 1600
	between		.0214645	.5480419	.6216339	n = 50
	within		.0686103	.4395812	.8590224	T = 32
theil	overall	.7311929	.2016247	.3470449	1.625831	N = 1600
	between		.121858	.5478988	1.080907	n = 50
	within		.1615272	.1009739	1.276117	T = 32
Lwage	overall	10.91651	1.089653	8.602005	13.53033	N = 1600
	between		1.078191	8.993736	13.2455	n = 50
	within		.2176797	10.20368	11.52758	T = 32

Table 1: FE Results for Total Loans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
D.Lagged Total Loans	0.3542*** (0.0248)	0.3489*** (0.0248)	0.3517*** (0.0249)	0.2908*** (0.0254)	0.2899*** (0.0254)	0.2901*** (0.0254)
D.Log Wages & Earnings	0.0713*** (0.0267)	0.1064*** (0.0246)	0.0870*** (0.0256)	0.1042*** (0.0317)	0.1084*** (0.0312)	0.0953*** (0.0325)
D.Lagged Top-10	0.2252*** (0.0542)			0.0659 (0.0784)		
D.Lagged Gini		0.1339*** (0.0246)			-0.0487 (0.0491)	
D.Lagged Theil			0.0290*** (0.0073)			0.0234 (0.0155)
R-squared	0.150	0.156	0.149	0.291	0.291	0.291
Observations	1,600	1,600	1,600	1,600	1,600	1,600
Number of states	50	50	50	50	50	50
Time Period	1979-10	1979-10	1979-10	1979-10	1979-10	1979-10
State Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	nation	nation	nation	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 2: FE Results for Consumer Loans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
D.Lagged Consumer Loans	0.1854*** (0.0249)	0.1864*** (0.0250)	0.1854*** (0.0249)	0.1653*** (0.0256)	0.1647*** (0.0256)	0.1651*** (0.0256)
D.Log Wages & Earnings	0.0347*** (0.0094)	0.0417*** (0.0087)	0.0371*** (0.0090)	0.0224* (0.0117)	0.0229** (0.0116)	0.0230* (0.0120)
D.Lagged Top-10	0.0403** (0.0191)			0.0093 (0.0291)		
D.Lagged Gini		0.0090 (0.0087)			-0.0143 (0.0182)	
D.Lagged Theil			0.0055** (0.0025)			0.0000 (0.0058)
R-squared	0.073	0.071	0.073	0.139	0.139	0.139
Observations	1,600	1,600	1,600	1,600	1,600	1,600
Number of states	50	50	50	50	50	50
Time Period	1979-10	1979-10	1979-10	1979-10	1979-10	1979-10
State Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	nation	nation	nation	YES	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Table 3: FE Results for Real Estate Loans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
D.Lagged Real Estate Loans	0.4979*** (0.0244)	0.4896*** (0.0243)	0.5005*** (0.0245)	0.4589*** (0.0248)	0.4575*** (0.0248)	0.4574*** (0.0248)
D.Log Wages & Earnings	0.0000 (0.0154)	0.0263* (0.0141)	0.0185 (0.0148)	0.0379** (0.0181)	0.0426** (0.0178)	0.0296 (0.0185)
D.Lagged Top-10	0.1689*** (0.0313)			0.0654 (0.0449)		
D.Lagged Gini		0.0958*** (0.0142)			0.0220 (0.0281)	
D.Lagged Theil			0.0143*** (0.0042)			0.0222** (0.0089)
R-squared	0.237	0.245	0.229	0.376	0.376	0.378
Observations	1,600	1,600	1,600	1,600	1,600	1,600
Number of states	50	50	50	50	50	50
Time Period	1979-10	1979-10	1979-10	1979-10	1979-10	1979-10
State Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	nation	nation	nation	YES	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.10

Table 4: PMG Results for Total Loans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
<i>Long-Run Coefficients:</i>						
Log Wages & Earnings	0.1452*** (0.0256)	0.1992*** (0.0227)	0.1586*** (0.0320)	0.3575*** (0.0395)	0.2629*** (0.0311)	0.3405*** (0.0364)
Top-10	0.0454 (0.1140)			0.3387*** (0.1115)		
Gini		0.3714*** (0.0472)			0.3300*** (0.0329)	
Theil			0.1382*** (0.0213)			0.1210*** (0.0206)
<i>Short-Run Coefficients:</i>						
Error Correction Term	-0.2128*** (0.0212)	-0.2264*** (0.0198)	-0.2193*** (0.0194)	-0.2854*** (0.0281)	-0.3143*** (0.0267)	-0.2954*** (0.0259)
ΔTop-10	-0.0563 (0.0506)			0.0037 (0.0522)		
ΔGini		0.0281 (0.0248)			-0.0021 (0.0273)	
ΔTheil			0.0050 (0.0056)			0.0053 (0.0055)
Observations	1,600	1,600	1,600	1,600	1,600	1,600
Number of states	50	50	50	50	50	50
Time Period	1979-10	1979-10	1979-10	1979-10	1979-10	1979-10
State Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	trend	trend	trend	YES	YES	YES

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.10

Table 5: PMG Results for Consumer Loans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
<i>Long-Run Coefficients:</i>						
Log Wages & Earnings	-0.0050 (0.0051)	0.0029 (0.0047)	-0.0028 (0.0046)	-0.0075 (0.0064)	0.0029 (0.0042)	0.0160*** (0.0047)
Top-10	0.0410* (0.0215)			0.0256 (0.0217)		
Gini		-0.0050 (0.0055)			-0.0062 (0.0055)	
Theil			0.0182*** (0.0030)			0.0145*** (0.0026)
<i>Short-Run Coefficients:</i>						
Error Correction Term	-0.3269*** (0.0237)	-0.3308*** (0.0221)	-0.3265*** (0.0225)	-0.3389*** (0.0270)	-0.5406*** (0.0345)	-0.5253*** (0.0334)
ΔTop-10	-0.0481*** (0.0147)			-0.0522*** (0.0135)		
ΔGini		-0.0002 (0.0055)			0.0020 (0.0067)	
ΔTheil			-0.0046*** (0.0015)			-0.0053*** (0.0013)
Observations	1,600	1,600	1,600	1,600	1,600	1,600
Number of states	50	50	50	50	50	50
Time Period	1979-10	1979-10	1979-10	1979-10	1979-10	1979-10
State Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	trend	trend	trend	YES	YES	YES

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.10

Table 6: PMG Results for Real Estate Loans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
<i>Long-Run Coefficients:</i>						
Log Wages & Earnings	0.2462*** (0.0184)	0.2544*** (0.0196)	0.2602*** (0.0224)	0.2915*** (0.0217)	0.1567*** (0.0286)	0.2992*** (0.0273)
Top-10	-0.0498 (0.0662)			0.2830*** (0.0902)		
Gini		0.1821*** (0.0239)			0.5559*** (0.0404)	
Theil			0.0785*** (0.0138)			0.1269*** (0.0213)
<i>Short-Run Coefficients:</i>						
Error Correction Term	-0.2068*** (0.0192)	-0.2055*** (0.0155)	-0.1942*** (0.0141)	-0.1827*** (0.0247)	-0.1858*** (0.0216)	-0.1789*** (0.0193)
ΔTop-10	-0.0155 (0.0322)			-0.0358 (0.0334)		
ΔGini		0.0348*** (0.0132)			-0.0274* (0.0160)	
ΔTheil			0.0026 (0.0038)			-0.0017 (0.0041)
Observations	1,600	1,600	1,600	1,600	1,600	1,600
Number of states	50	50	50	50	50	50
Time Period	1979-10	1979-10	1979-10	1979-10	1979-10	1979-10
State Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects	trend	trend	trend	YES	YES	YES

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.10



V. Conclusion

- We used state-level lending and inequality data to test the Rajan hypothesis.
- We found evidence that increases in inequality led to greater bank lending, especially real estate across states.



V. Conclusion

- Conceptually, we plan to extend the analysis to test whether inequality has a direct impact on state banking policy.
- Empirically, we plan to test and control for endogeneity and cross-sectional dependence in our PMG estimator.