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Credit, crises and inequality

Jonathan Bridges

Georgina Green

Mark Joy

Motivation

- Macroprudential interventions can have distributional effects, e.g. limiting individual borrowing choices
- Important to weigh these up against the distributional implications of *not* intervening e.g. credit amplified recession or financial crisis
- We explore this counterfactual in this paper



Overview

Approach

- **Panel of 26 advanced economies** (1970-2015) covering 99 recessions and financial crises

Headline results

- The Gini coefficient of **income inequality** rises by an average of **2.7% relative to trend** in the five years following a recession, and for financial crises the increase is larger, at 3.8%
- A one standard deviation increase in **credit growth** in the run-up to a recession is associated with around a **40% amplification** in the subsequent increase in inequality

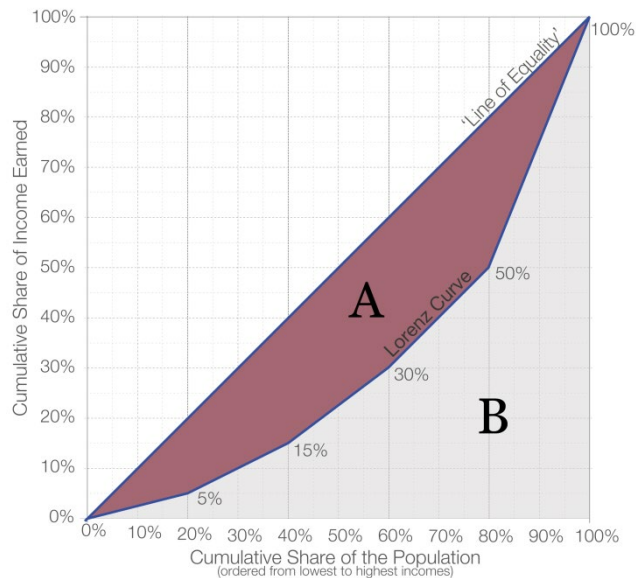
Contributions

- Extend the existing literature to look at the amplifying effect of **credit growth** ahead of downturns on unemployment and **income inequality**
- Examine whether **low bank capital** also plays a role in amplifying inequality effects



Gini coefficients: a reminder

Stylised Lorenz curve and Gini coefficient



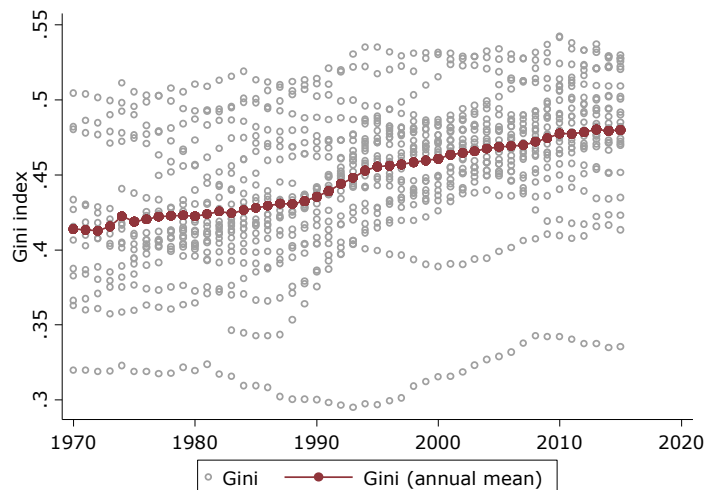
- Gini coefficients are derived from the Lorenz curve
 $= A / (A + B)$
- Disposable vs market (pre-transfer) income
- Other differences in measurement across countries typically require adjustment to harmonise for the purposes of cross-country comparison (expenditure vs income data; tax records vs survey; household treatment)
- Our primary data source: Standardised World Income Inequality Database



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Data: income inequality in advanced economies

Income inequality (Gini index) in advanced economies since 1970



- Income inequality has trended upwards over time and is heterogenous across countries
- Our focus is not on the trend but in variation over the cycle
- Additional data on unemployment, credit, system-wide bank capital (tangible common equity divided by total assets) and to control for macroeconomic conditions



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Data: recessions and financial crises

By region	Count	o/w financial	By decade	Count	o/w financial
Euro area core	20	6	1970s	11	0
Euro area periphery	22	7	1980s	15	0
Europe	25	5	1990s	27	4
North America	8	1	2000s	42	16
Asia	14	3	2010s	4	2
Other	10	0			
Total	99	22		99	22



Year	1	2	3	4	5
All episodes (recessions and non-recessions)					
Cumulative GDP growth (%)	2.1	4.2	6.3	8.3	10.4
Change in Unemployment rate (pp)	0.1	0.3	0.4	0.5	0.7
% Change in Gini index	0.3	0.6	0.9	1.3	1.6



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Non-recession episodes					
Cumulative GDP growth (%)	3.3	6.7	10.0	13.2	16.4
Change in Unemployment rate (pp)	-0.3	-0.5	-0.6	-0.8	-0.9
% Change in Gini index	0.2	0.5	0.7	0.9	1.1



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Recession episodes					
Cumulative GDP growth (%)	-1.3	0.0	2.1	4.0	5.7
Change in Unemployment rate (pp)	1.0	1.7	1.8	1.7	1.7
% Change in Gini index	0.4	1.0	1.5	1.7	2.0



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% Change in Gini index	0.4	1.0	1.5	1.7	2.0
Recession episodes with above average credit growth preceding them					
Cumulative GDP growth (%)	-1.9	-2.0	-1.0	-0.1	1.0
Change in Unemployment rate (pp)	1.1	2.2	2.7	2.9	2.9
% Change in Gini index	0.5	1.4	1.9	2.2	2.8



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Recession episodes with above average credit growth preceding them					
Cumulative GDP growth (%)	-1.9	-2.0	-1.0	-0.1	1.0
Change in Unemployment rate (pp)	1.1	2.2	2.7	2.9	2.9
% Change in Gini index	0.5	1.4	1.9	2.2	2.8
Recession episodes with below average bank capital preceding them					
Cumulative GDP growth (%)	-1.5	-1.3	0.2	1.7	2.7
Change in Unemployment rate (pp)	0.9	1.7	2.0	2.0	2.0
% Change in Gini index	0.5	1.4	1.9	2.3	2.9

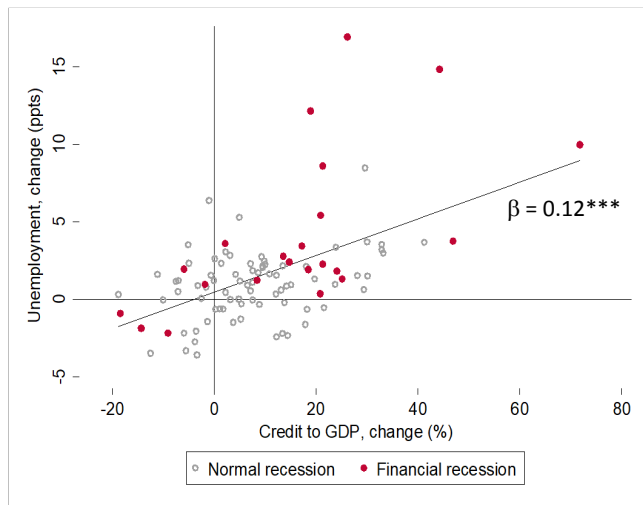


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Financial recession episodes					
Cumulative GDP growth (%)	-3.1	-3.4	-2.3	-2.2	-2.1
Change in Unemployment rate (pp)	1.4	2.8	3.3	3.8	4.1
% Change in Gini index	0.8	1.7	2.3	2.5	3.3

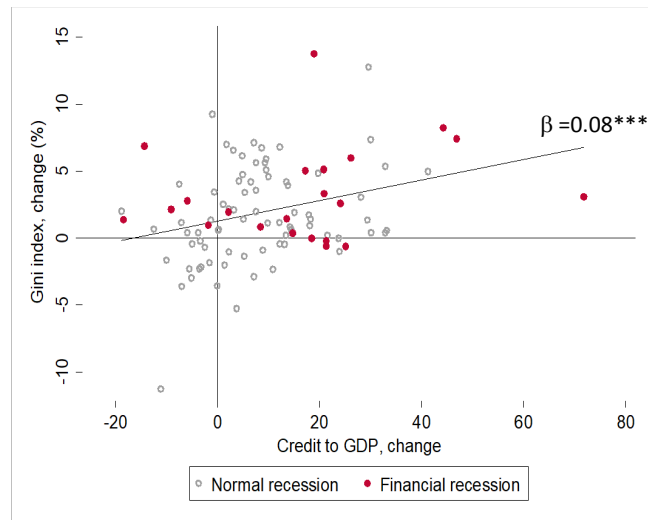


Credit and inequality: unconditional correlations

Unemployment five years after the onset of a recession versus pre-crisis credit growth (credit to GDP, % change)



Inequality (Gini) five years after the onset of a recession versus pre crisis credit growth (credit to GDP, % change)



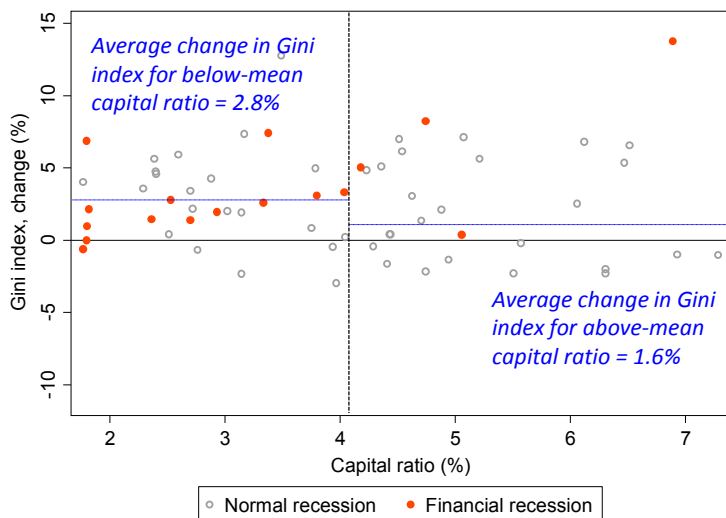
- A more rapid build-up of credit ahead of both normal and financial recessions is associated with larger impacts on both unemployment and income inequality



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Inequality in recessions and bank capital

Income inequality (Gini index) during recessions and the pre-recession capital ratio



- In recessions that were preceded by below-average bank capitalisation, inequality outturns were on average higher
- But stronger links (or weaker ones) may be masked by other factors that need to be controlled for



Empirical strategy

- Local projections method (Jordà, 2005) estimating separately at each forward horizon $t + h$ how the pre-recession starting conditions affect inequality at that horizon
- Define cyclical component of our dependent variable

$$\tilde{Y}_{t(r)+h,j} = Y_{t(r)+h,j} - Y_{trend,h}$$

- Baseline specification

$$\tilde{Y}_{t(r)+h,j} = \bar{\alpha}_R^h + \sum_{j=1}^{J-1} \alpha_j^h + \beta_R^h \cdot Credit\ growth_{j,t} + \zeta^h trend_{j,t} + \theta^h controls_{j,t} + \varepsilon_{j,t} \quad \forall h = 1 \dots 5$$

- Control for inflation, current account, interest rate, output gap



Empirical Strategy

- Introduce a split to distinguish between our results for recessions associated with crises and “normal” recessions:

$$Y_{t(r)+h,j} = \bar{\alpha}_N^h N + \bar{\alpha}_F^h F + \sum_{j=1}^{J-1} \alpha_j^h + \beta_N^h \cdot N.Credit\ growth_{j,t} + \beta_F^h \cdot F.Credit\ growth_{j,t} \\ + \zeta^h trend_{j,t} + \theta^h controls_{j,t} + \varepsilon_{j,t}, \quad \forall h = 1 \dots 5 \quad (1)$$



Results: Recessions, unemployment and inequality

Table: Income inequality (Gini index) and unemployment in the five years following the onset of recessions

	Year 1	Year 2	Year 3	Year 4	Year 5
Specification 1	Change in unemployment (ppts) after onset of recession				
All recessions	1.324*** (0.212)	2.381*** (0.429)	1.873*** (0.671)	1.258 (0.804)	1.602* (0.897)
	Change in Gini (%) after onset of recession				
All recessions	0.420 (0.339)	0.728 (0.502)	1.421** (0.529)	1.455** (0.683)	2.705*** (0.790)
Observations	99	99	99	99	99

Includes controls for country-fixed effects, macroeconomic variables and 10-year trend. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

- Recessions are associated with a statistically and economically meaningful increases in the cyclical component of unemployment and income inequality (over and above their trend change)



Results: Recessions, unemployment and inequality

Table: Income inequality (Gini index) and unemployment following the onset of normal and financial recessions

	Year 1	Year 2	Year 3	Year 4	Year 5
Specification 2	Change in unemployment (ppts) after onset of recession				
Normal recessions	1.205*** (0.221)	2.130*** (0.440)	1.562** (0.736)	0.865 (0.878)	1.167 (0.988)
Financial recessions	1.742*** (0.288)	3.261*** (0.681)	2.967** (1.078)	2.638* (1.299)	3.129** (1.394)
	Change in Gini (%) after onset of recession				
Normal recessions	0.328 (0.349)	0.619 (0.533)	1.280** (0.557)	1.280* (0.724)	2.417** (0.872)
Financial recessions	0.774 (0.494)	1.142* (0.634)	1.961** (0.810)	2.124** (0.858)	3.801*** (0.913)
Observations	99	99	99	99	99

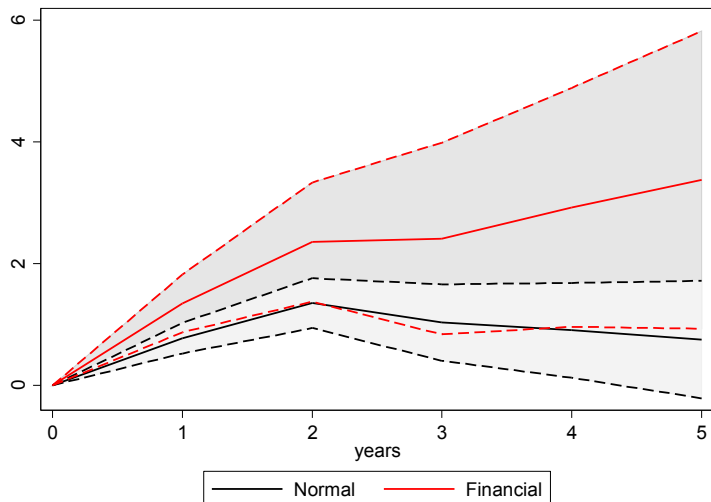
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- Financial recessions are associated with statistically and economically larger increases in the cyclical component of both unemployment and income inequality

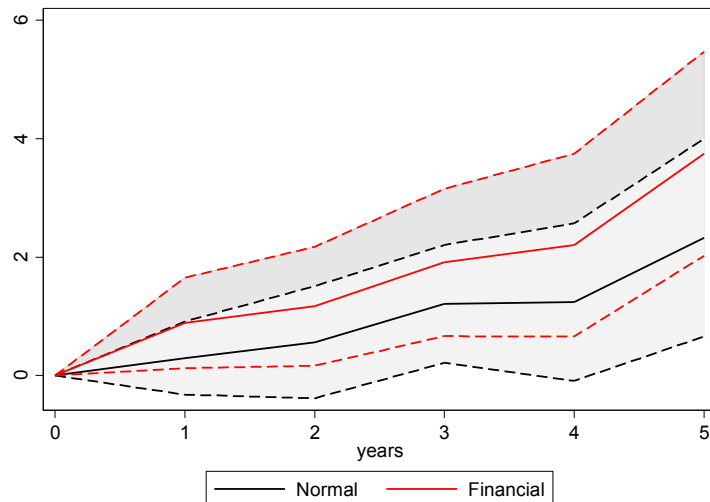


Results: Recessions, unemployment and inequality

Unemployment after the onset of financial and normal recessions (cumulative change, ppts)



Inequality (Gini index) after the onset of financial and normal recessions (cumulative change, %)



- Impulse response of unemployment to financial recessions lies close to two standard deviations above comparable estimates for normal recessions, but for the Gini index, F-tests cannot reject equality

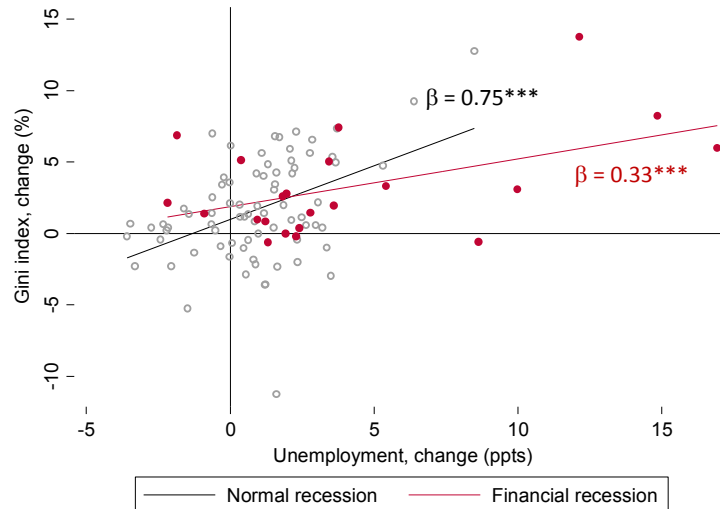


Inequality and unemployment: stylised facts

Unemployment effects on income inequality

- Unemployment creates a group of people with zero income.
- Low income workers face higher probability of becoming unemployed because they are more likely to be less skilled (Hoynes, et al, 2012) and have less secure job contracts (Elsby et al, 2010)
- "Wage Phillips curve" effect: higher unemployment leads to weaker bargaining power, putting particular pressure on wages of lowest paid

Income inequality (Gini index) and unemployment five years after the onset of recessions and financial crises



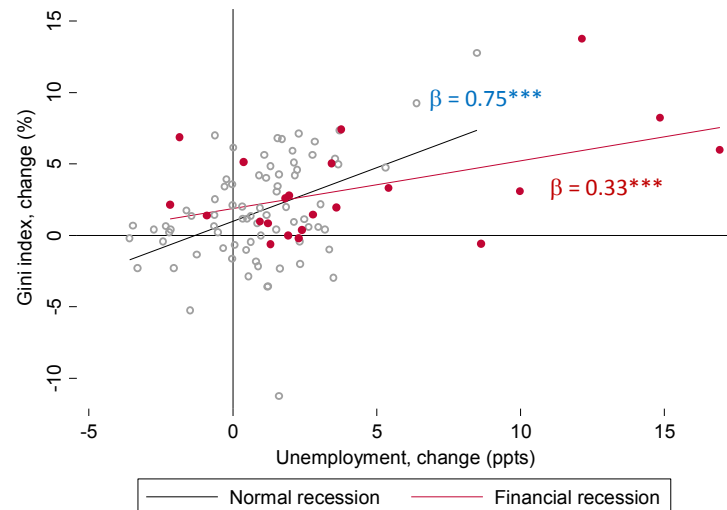
Estimating the non-employment impact on inequality

Non-employment effect on inequality

1. Take the estimated mean change in unemployment in response to recessions and financial crises
2. Multiply this by the mean change in inequality in response to a unit change in unemployment
3. Compare the result with the estimated mean change in inequality in recessions and financial crises

- **Normal recessions:** Unemployment accounts for around $(1.2 \times 0.75 = 0.9\%)$ of the cyclical rise in the Gini in year 5, which is about $(0.9/2.4 = 38\%)$ of the rise in the Gini
- **Financial crises:** Unemployment accounts for around $(3.1 \times 0.33)/3.8 = 27\%$ of the rise in inequality associated with the crises in our sample.

Income inequality (Gini index) and unemployment five years after the onset of recessions and financial crises



Results: Role of pre-recession credit growth

Table: Income inequality (Gini index) and unemployment in recessions and the role of pre-recession credit growth

	Year 1	Year 2	Year 3	Year 4	Year 5	
Specification 3	Change in unemployment (ppts) after onset of recession					
All recessions	1.306*** (0.214)	2.241*** (0.335)	1.600*** (0.505)	0.953 (0.616)	1.296* (0.737)	
Recessions* credit growth	0.00524 (0.00725)	0.0410** (0.0157)	0.0803*** (0.0230)	0.0897*** (0.0268)	0.0899*** (0.0269)	15*0.09 = 1.3
	Change in Gini (%) after onset of recession					
All recessions	0.431 (0.357)	0.795 (0.560)	1.518** (0.564)	1.577** (0.746)	2.849*** (0.823)	
Recessions* credit growth	0.00521 (0.0128)	0.0337 (0.0212)	0.0490** (0.0219)	0.0620* (0.0309)	0.0733* (0.0358)	15*0.07 = 1.1
Observations	99	99	99	99	99	

Includes controls for country-fixed effects, macroeconomic variables and 10-year trend. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

- Pre-recession credit booms amplify the impact of recessions on unemployment (a one standard deviation increase doubling the average effect) and income inequality (amplifying by 40%)



Results: Role of pre-recession credit growth

Table: Unemployment in normal and financial recessions and the role of pre-recession credit growth

	Year 1	Year 2	Year 3	Year 4	Year 5
Specification 4	Change in unemployment (ppts) after onset of recession				
Normal recessions	1.070*** (0.222)	1.675*** (0.300)	0.929 (0.554)	0.135 (0.712)	0.391 (0.863)
Financial recessions	1.525*** (0.269)	2.559*** (0.486)	2.025** (0.766)	1.546 (0.950)	1.962* (1.053)
Normal recession* credit growth	-0.00486 (0.00605)	0.0137 (0.0102)	0.0487** (0.0228)	0.0523* (0.0275)	0.0486 (0.0312)
Financial recession* credit growth	0.0237 (0.0174)	0.0916*** (0.0229)	0.139*** (0.0277)	0.159*** (0.0387)	0.166*** (0.0439)
Observations	99	99	99	99	99

Includes controls for country-fixed effects, macroeconomic variables and 10-year trend. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

- Role for credit growth as an amplifier is strongest (and most statistically significant) for recessions associated with financial crises. Particularly the case for unemployment effects.



Results: Role of pre-recession credit growth

Table: Income inequality (Gini index) in normal and financial recessions and the role of pre-recession credit growth

	Year 1	Year 2	Year 3	Year 4	Year 5
Specification 4	Change in Gini index (%) after onset of recession				
Normal recessions	0.194 (0.412)	0.598 (0.631)	1.226** (0.588)	1.366* (0.778)	2.566** (0.921)
Financial recessions	0.527 (0.486)	0.959 (0.633)	1.656** (0.725)	1.999** (0.801)	3.736*** (0.908)
Normal recession* credit growth	-0.00919 (0.0151)	0.0230 (0.0247)	0.0315 (0.0254)	0.0542 (0.0380)	0.0678 (0.0461)
Financial recession* credit growth	0.0256 (0.0170)	0.0481* (0.0240)	0.0735*** (0.0211)	0.0704*** (0.0249)	0.0753** (0.0300)
Observations	99	99	99	99	99

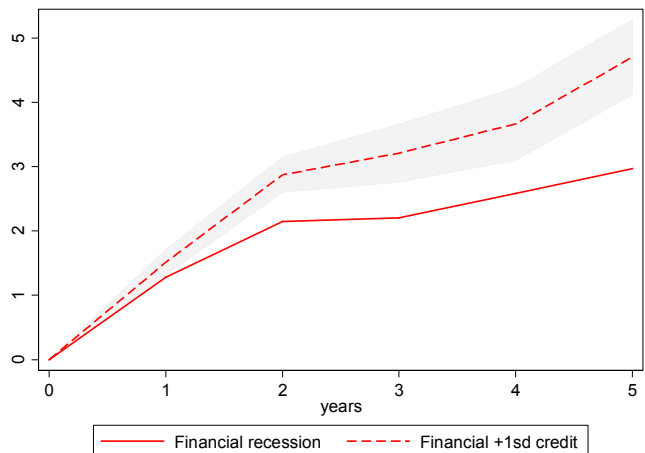
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- Credit amplification effects on income inequality are not materially larger for financial recessions. Similar to that for normal recessions.

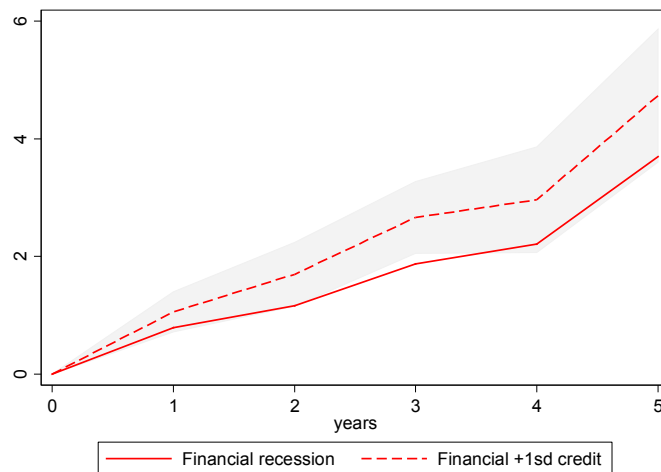


Results: Role of pre-recession credit growth

Unemployment in financial recessions and the role of 1SD higher pre-crisis credit growth (cumulative chg, ppts)



Gini index in financial recessions and the role of 1SD higher pre-crisis credit growth (cumulative chg, ppts)



- Amplification of the impulse response of unemployment and the gini index to recessions by a one standard deviation pre-crisis credit boom



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Extension: Role of pre-recession bank capital

- *Hypothesis:* a fragile banking system may amplify or prolong the macro fallout of a shock and this could have knock on effects to inequality (Jorda et al 2017)
- *Data:* Tangible common equity (TCE) ratio from Aikman et al (forthcoming)
- This is based on individual bank balance sheet data on firms group level tangible common equity (defined as common equity minus preference shares and intangible assets) and total assets
- Obtained from Thomson Reuters Worldscope. This data is aggregated to the country-level using a chain-weighted approach, which accounts for the entry and exit of banks each period.
- *Sample:* Only available for a subset of 16 of our 26 advanced economy sample



Extension: Role of pre-recession bank capital

Table: Income inequality (Gini index) in recessions and the role of pre-recession (TCE) bank capital

	Year 1	Year 2	Year 3	Year 4	Year 5
Specification 5	Change in Gini (%) after onset of recession				
All recessions	0.104 (0.658)	0.374 (0.823)	1.078 (1.005)	1.330 (1.193)	2.550* (1.374)
Recessions* capital	-0.295* (0.157)	-0.570* (0.302)	-0.640* (0.349)	-0.931** (0.373)	-1.098*** (0.367)
Specification 6	Change in Gini (%) after onset of recession				
All recessions	0.0601 (0.702)	0.0243 (0.914)	0.509 (0.943)	0.688 (1.059)	1.835 (1.294)
Recessions* capital	-0.293* (0.149)	-0.551** (0.229)	-0.608** (0.250)	-0.896*** (0.268)	-1.058** (0.375)
Recessions* credit growth	0.00439 (0.0111)	0.0354** (0.0145)	0.0575*** (0.0127)	0.0649*** (0.0134)	0.0723*** (0.0210)
Observations	63	63	63	63	63

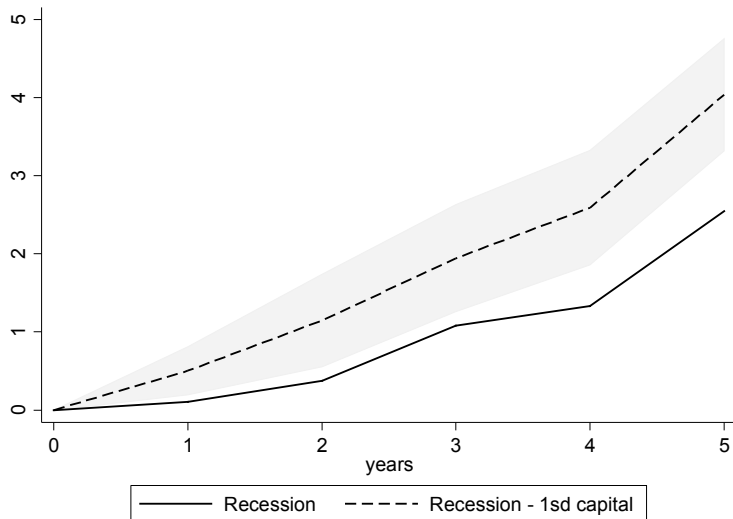
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- Weak bank capital on the eve of a downturn typically amplifies the inequality effect that follows



Extension: Role of pre-recession bank capital

Income inequality (Gini index) following the onset of a recession, and the amplifying role of weak banking sector capital



- One standard deviation weakening in bank capital (1.2pp reduction in the TCE ratio) has an amplifying effect of around 40% on income inequality
- In 2008, the UK TCE ratio was around 2%, nearly two standard deviations below the mean. Our results suggest that this resilience gap amounted not only to a significant vulnerability which could amplify the macroeconomic consequences of the adverse shock which was to come, but also the associated distributional effects



Robustness

- Other measures of income inequality (OECD gini coefficients, income share, average income by income group, labour share of income)
- Treatment of trend change in inequality (Hamilton, 2017)
- Distance between consecutive crises (Harding and Pagan, 2002)
- Controlling for monetary and fiscal policy space (Romer and Romer, 2017)

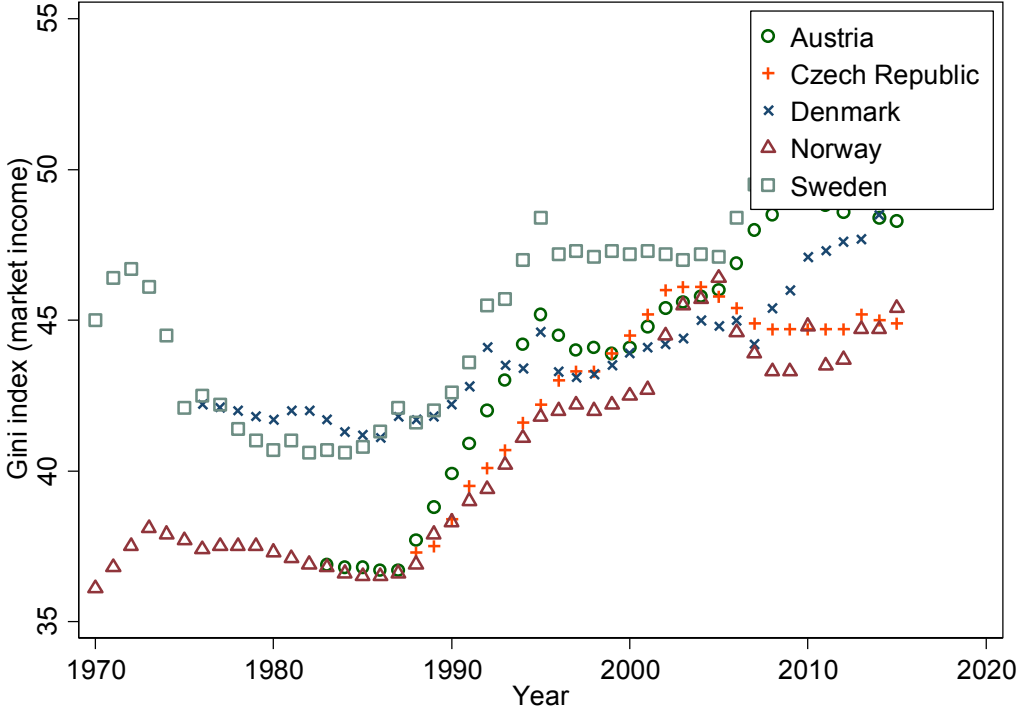


Conclusions

- Income inequality – as measured by the Gini coefficient – rises relative to trend in the five years following a downturn.
- This increase is around 60% larger for recessions associated with financial crises, but is also significantly greater than trend for normal recessions.
- Driven by spike in unemployment and a skewed impact on wages
- Rapid credit growth ahead of the onset of a recession amplifies the cyclical response of income inequality by around 40%
- Weak banking sector capitalisation has a similarly sized amplifying effect

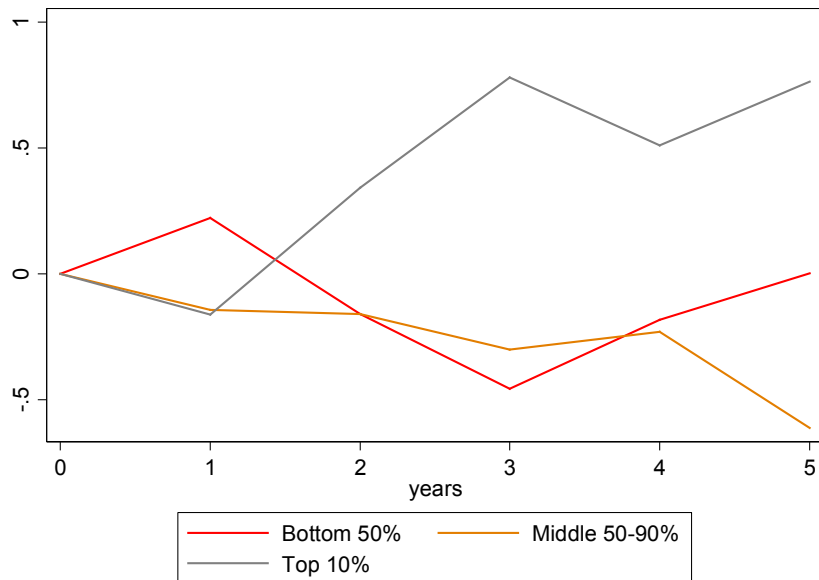


Rise in inequality in early 90s



WID data

Change in income share (ppt) following the onset of a financial recession



Average income by share (%) following the onset of a financial recession

