Inequality, Leverage and Crises

Michael Kumhof, International Monetary Fund

Romain Ranciere, International Monetary Fund and Paris School of Economics

Pablo Winant, Paris School of Economics

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1 Introduction

- **Empirical Motivation: Similarities of pre-1929 and pre-2008 <u>decades</u>:**

  Focus is on United States.

  – Sharply increasing income inequality.

  – Sharply increasing debt leverage among low-/middle-income households.

  – High debt leverage eventually triggered a large financial and real crash.

- **Plan of the Presentation:**

  1. *Literature*

  2. *Stylized Facts*

  3. *Discussion of the Model*

  4. *Simulation of the Model: Crises or Reversal of Inequality*

  5. *Inequality and Current Accounts*

2 Literature Review (U.S.)

2.1 Literature on Income and Wealth Distribution

- **Objective:** Description of long-run changes in income/wealth distribution.

- **Findings:**
  - Changes in top income shares have been very large.
  - Changes in Gini coefficients have been less pronounced.

- **Consequences for Models:**
  - Two-agent models (top earners, bottom earners) are very useful.
  - Continuum-of-agents models (complicated) are unnecessary.

2.2   Literature on Financial Fragility and Financial Crises

- **Literature 1:** Inequality explanations for high debt and crises.
  - Rajan (2010), Reich (2010).
  - Stylized facts that offer a similar explanation to our paper.
  - But no general equilibrium model.
  - Model advantages:

    1. Quantifying the relative importance of the inequality channel.
    2. Quantifying the relative importance of credit demand and supply.

- **Literature 2:** Alternative explanations for high debt and crises.
  We look at these in the paper.
  1. Global saving glut.
  2. Financial innovation.

2.3   Literature on Preferences for Wealth

- **Objective:** Accounting for the saving behavior of the richest households.

- **Consequence:** Two additional parameters.
  - Utility weight on wealth: φ.
  - Utility curvature with respect to wealth: η.
  - Together these determine the marginal propensity to save (MPS).

- **Calibration:** Dynan et al. (2004) on MPS of different income groups:
  - MPS steeply increasing in permanent income.
  - MPS near zero for bottom income groups.
  - MPS reach 0.5 - 0.6 for the top income groups.
  - This can be mapped into a calibration of the two new parameters.

2.4 Literature on Endogenous, Rational Default

- **Objective of Sovereign Default Literature:** Default $=$ optimal decision.

- **Our Model:** Related to sovereign default literature.

- **Differences of our Model:**

  1. Our lenders are risk-averse, not risk-neutral.
  2. Default is only on a fixed fraction of debt, not all debt.
  3. Two types of costs of default:
     - Non-stochastic output costs $\Longrightarrow$ crisis accompanied by deep recession.
     - Stochastic utility costs $\Longrightarrow$ single-digit default probabilities.
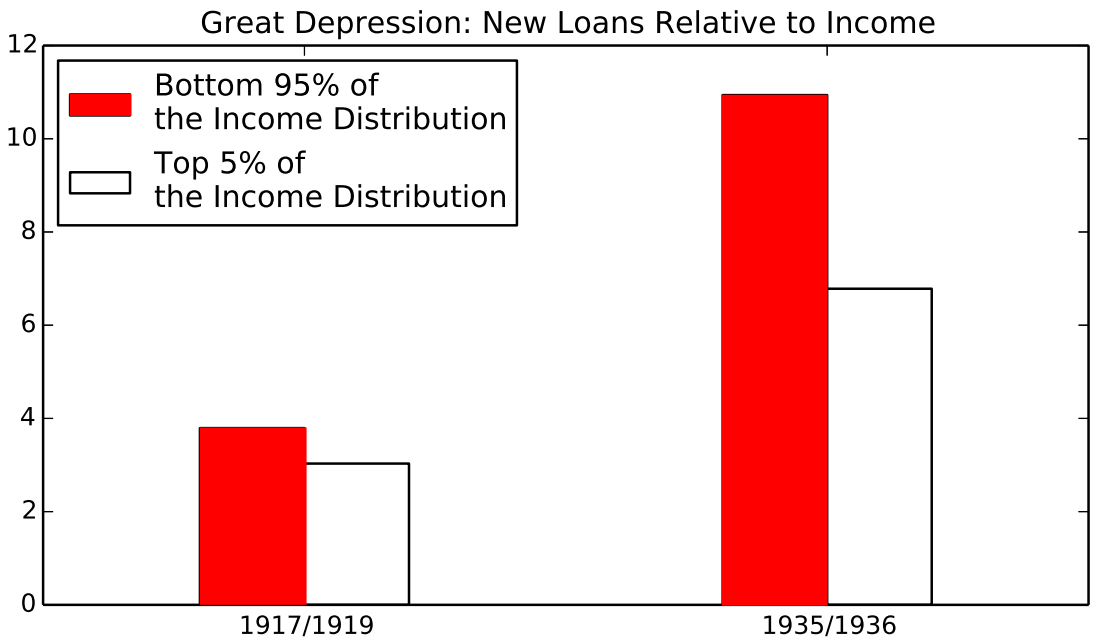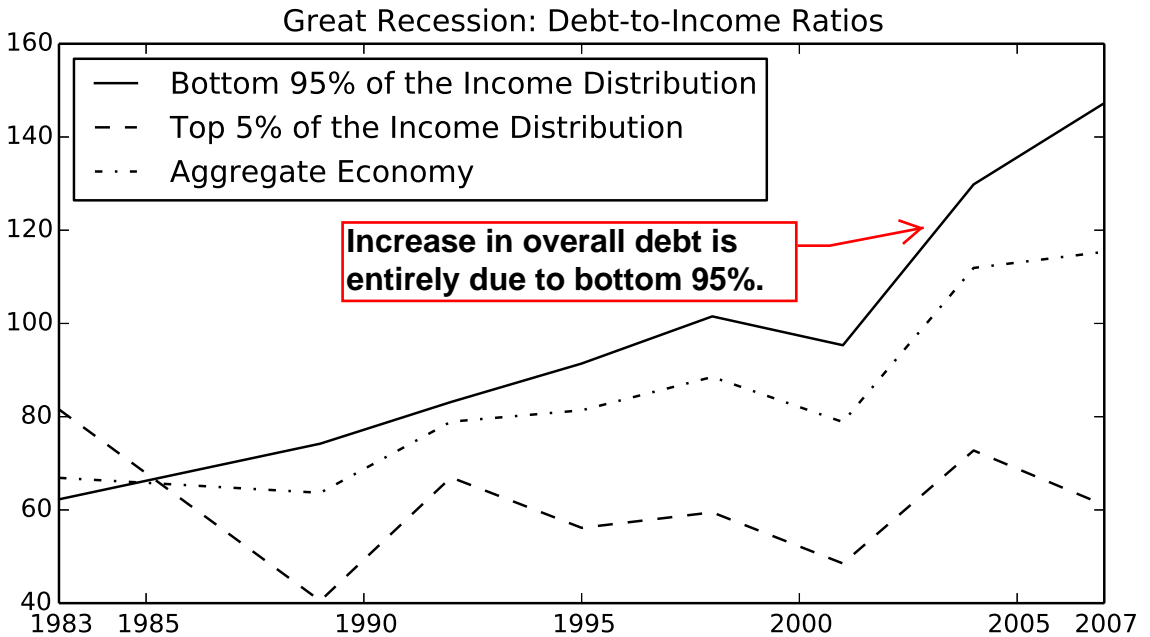 4. High level of debt can be sustained in equilibrium.

3 Stylized Facts (U.S.)

A. Income Inequality and Aggregate Household Debt
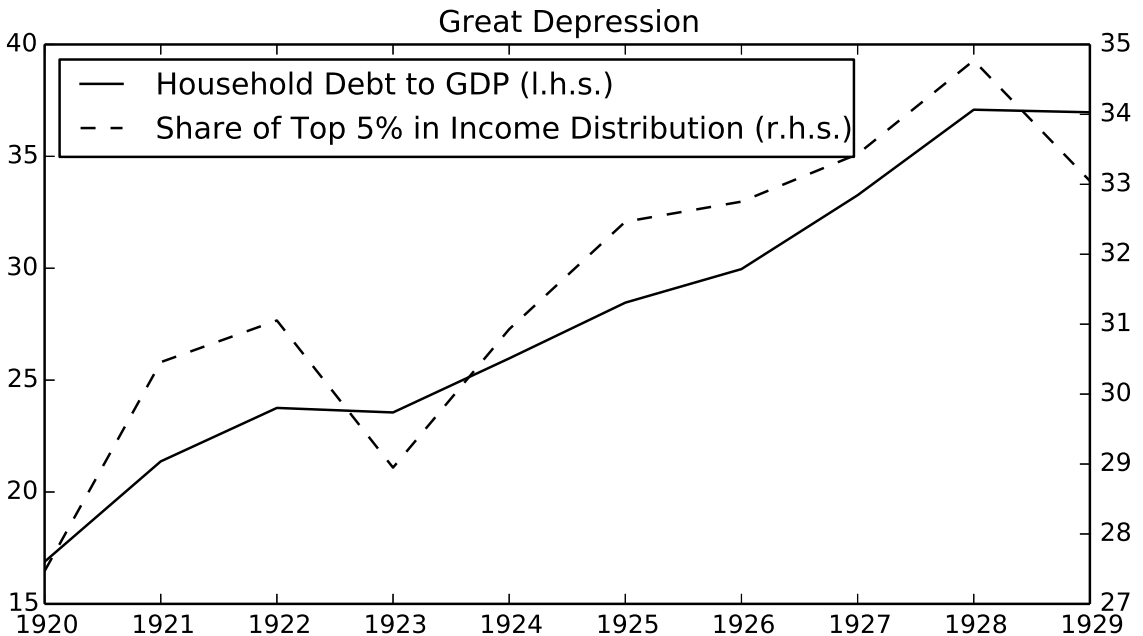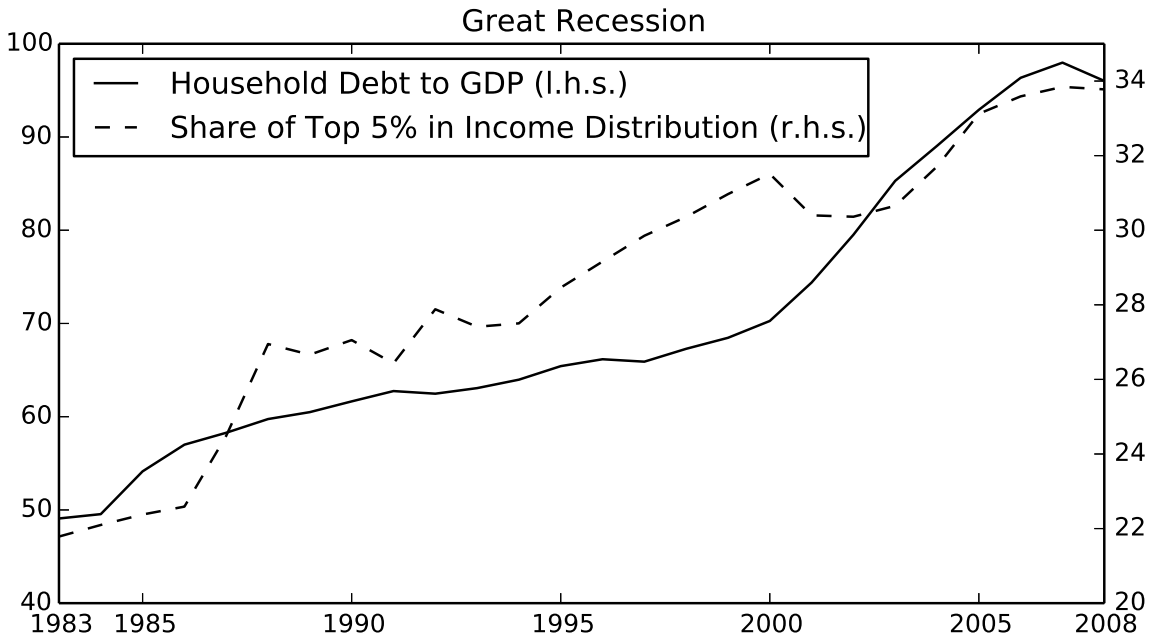
Income Inequality and Household Leverage:
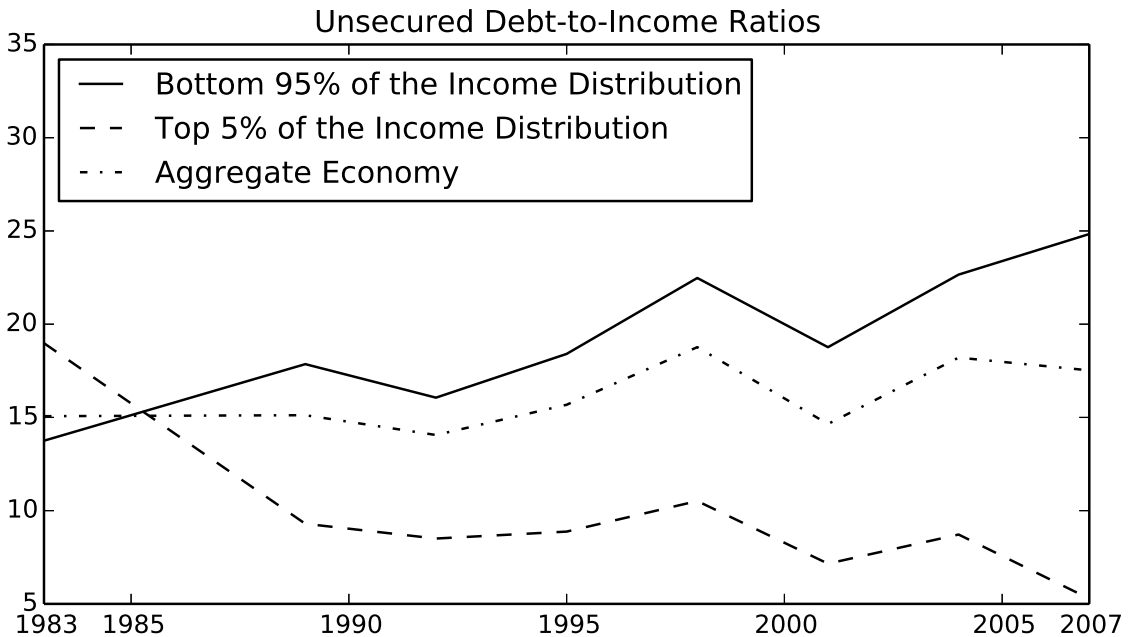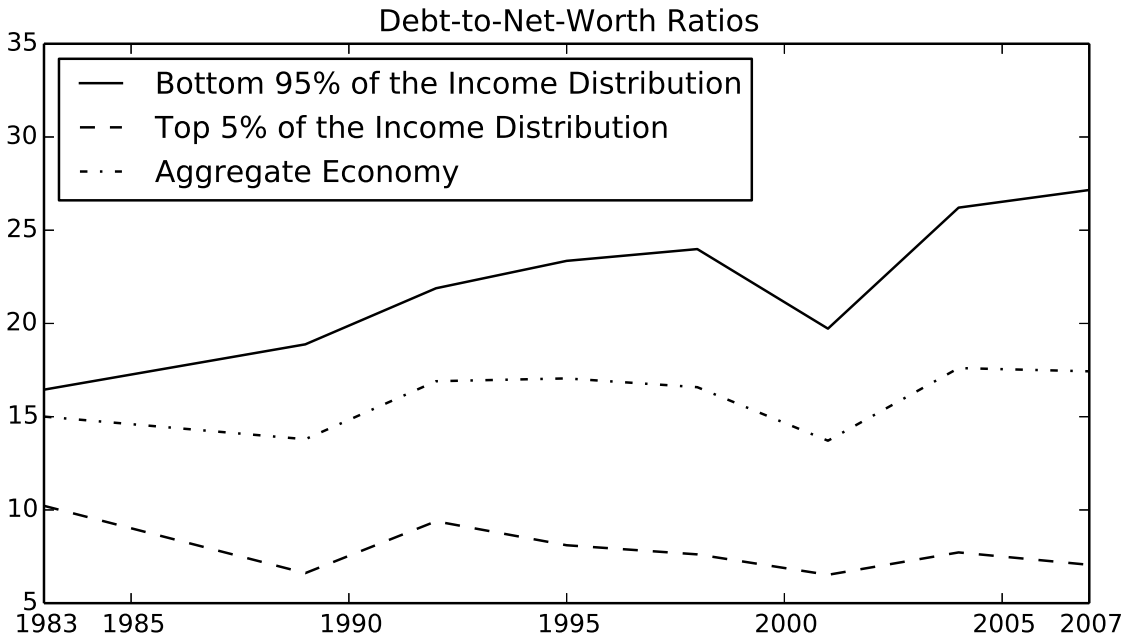(i) Moved up together pre-crisis.
(ii) Both pre-1929 and pre-2007.

B. Debt by Income Group

Great Recession: Debt-to-Income Ratios

Legend:
- —— Bottom 95% of the Income Distribution
- – – Top 5% of the Income Distribution
- –·– Aggregate Economy

Increase in overall debt is entirely due to bottom 95%.

(x-axis: 1983, 1985, 1990, 1995, 2000, 2005, 2007)
(y-axis: 40, 60, 80, 100, 120, 140, 160)

Great Depression: New Loans Relative to Income

Legend:
- ▮ (red) Bottom 95% of the Income Distribution
- ▯ Top 5% of the Income Distribution

(x-axis: 1917/1919, 1935/1936)
(y-axis: 0, 2, 4, 6, 8, 10, 12)

Debt to Income Ratios by Income Group:
(i) Lower or flat for the rich.
(ii) Sharply higher for the remainder.

Alternative Debt Ratios

Debt-to-Net-Worth Ratios

Legend:
— Bottom 95% of the Income Distribution
– – Top 5% of the Income Distribution
· – · Aggregate Economy

Unsecured Debt-to-Income Ratios

Legend:
— Bottom 95% of the Income Distribution
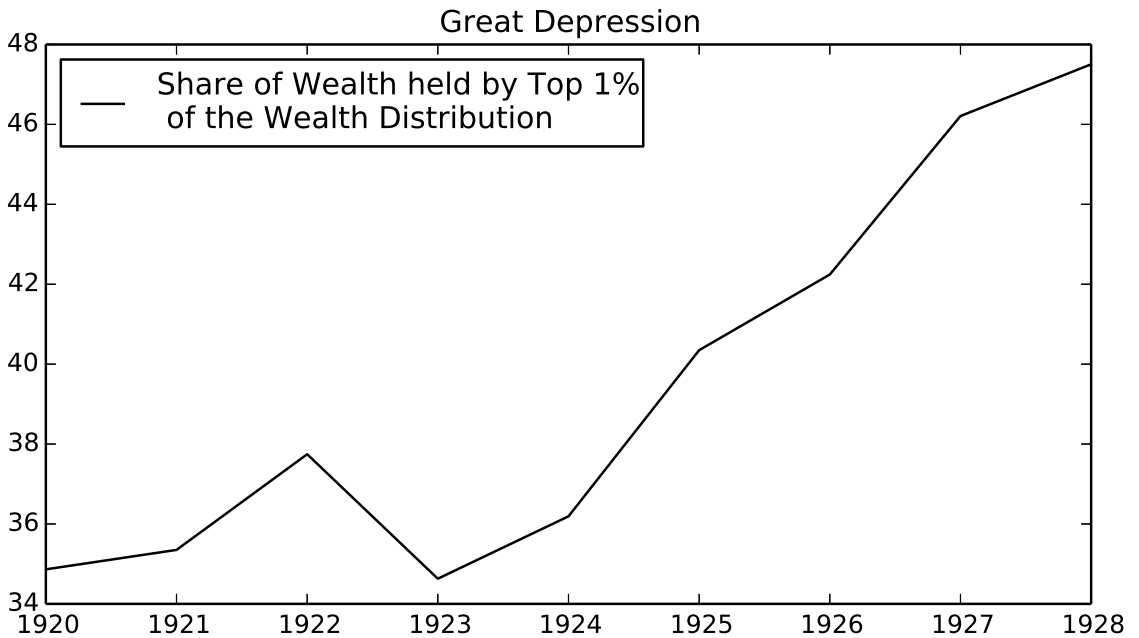– – Top 5% of the Income Distribution
· – · Aggregate Economy
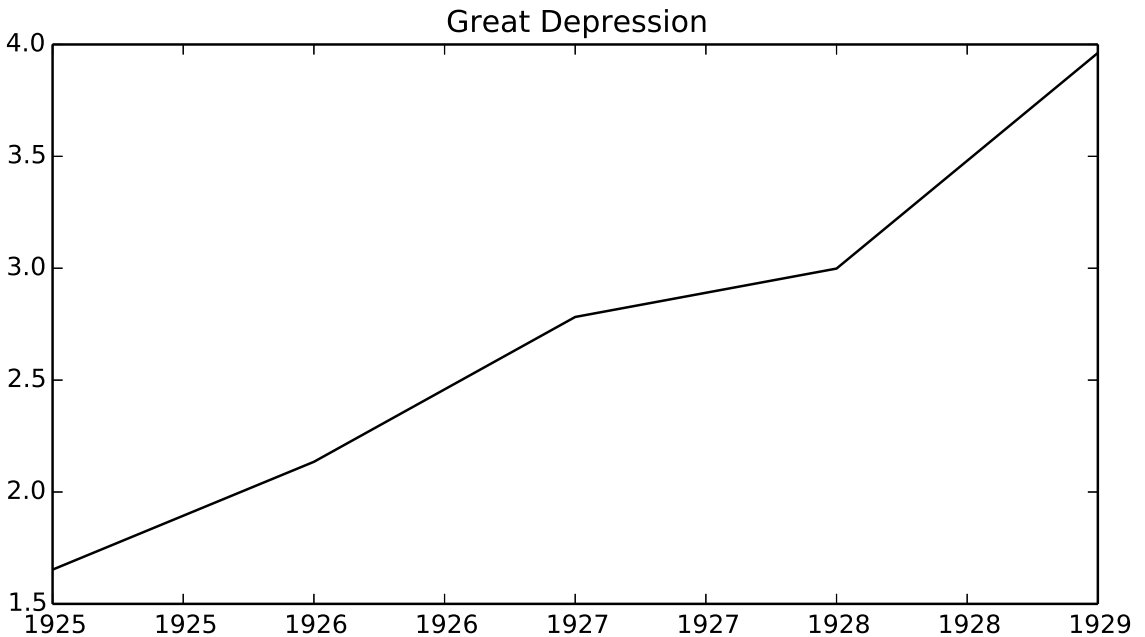
Alternative Debt Ratios Show the Same Pattern:
(i) Debt-to-Net-Worth:
    Increasing Only for Bottom 95%.
(ii) Unsecured Debt-to-Income:
    Increasing Only for Bottom 95%.

C. Wealth by Income Group

Great Recession

Share of Wealth held by Top 5% of the Income Distribution

Great Depression

Share of Wealth held by Top 1% of the Wealth Distribution

Wealth Inequality Increased with Income Inequality

D. Leverage and Crisis Probability
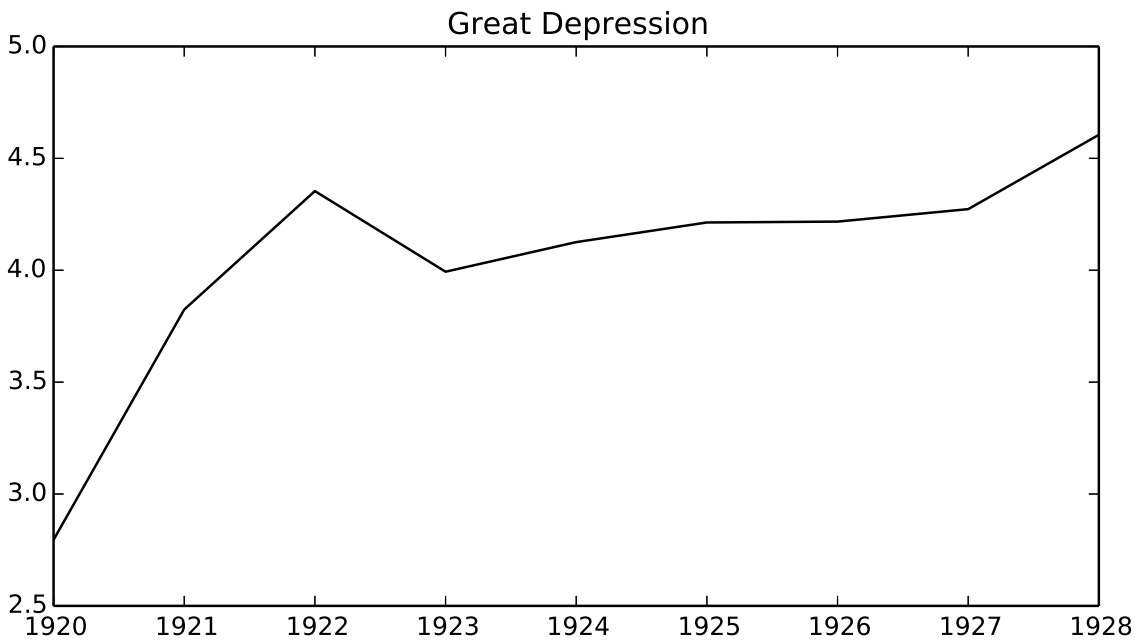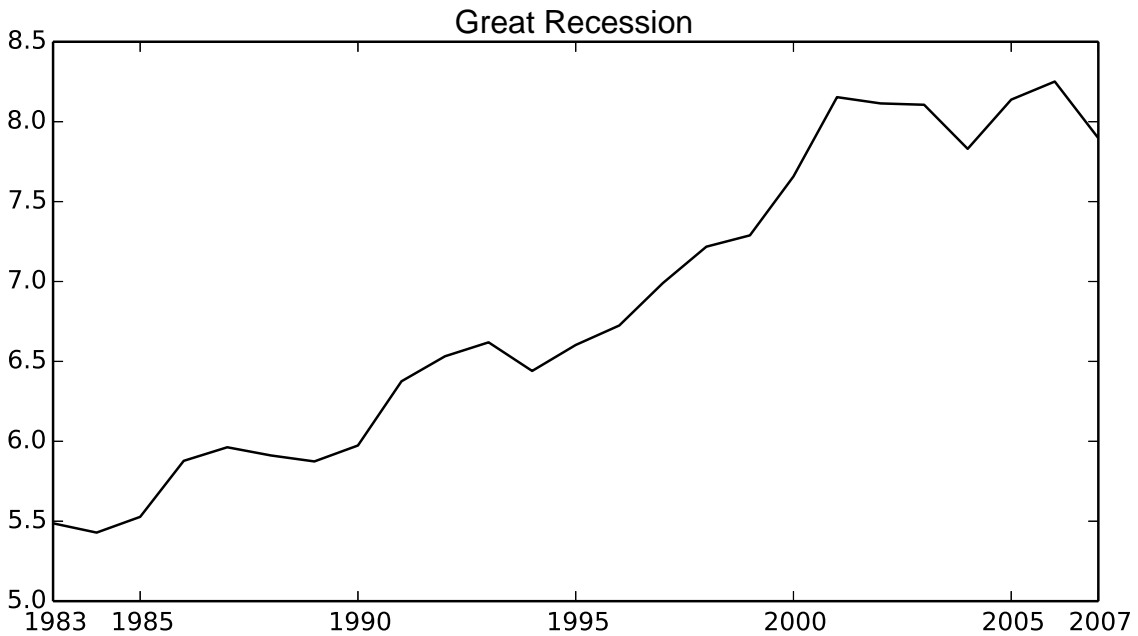
Great Recession

Great Depression

Schularick and Taylor (2012)
Crisis Probabilities Increased Dramatically:
(i) From 2% to 5% prior to the Great Recession.
(ii) From 1.5% to 4% prior to the Great Depression.

E. Size of the Financial Sector

Great Recession

Great Depression

The Size of the Financial System Increased Dramatically:
(i) From 5.5% to 8.0% of GDP pre-Great-Recession.
(ii) From 2.8% to 4.6% of GDP pre-Great-Depression.

4   The Model - Overview

- Economy consists of two separate household groups, top earners (top 5% of incomes) and bottom earners (everyone else).
- Economy experiences successive and permanent drops in the income share of bottom earners.
- Response of top earners:
  1. Higher consumption.
  2. Higher financial wealth accumulation = loans to bottom earners:

     Why? Wealth in utility $\implies$ positive marginal propensity to save.

- Response of bottom earners:
  1. Lower consumption.
  2. Much higher borrowing from top earners = higher risk of financial crisis.

     Why? Rational default decision $\implies$ growing benefits of default.

- Crisis: Debt default (10%) + output contraction.

5   The Model - Details

5.1   Preferences of Top and Bottom Earners

$$\text{Utility}^{top} = \text{Present Discounted Value of Consumption}^{top} \text{ and Wealth}^{top}$$

$$\text{Utility}^{bottom} = \text{Present Discounted Value of Consumption}^{bottom}$$

- Difference justified by different empirical MPS of top and bottom earners.

5.2 Budget Constraints of Top and Bottom Earners

$$\text{Consumption}^{top} = \text{Income}^{top}$$

$$\text{- Net New Lending to Bottom Earners}$$

$$\text{Consumption}^{bottom} = \text{Income}^{bottom} \text{ - Default Costs}$$

$$\text{+ Net New Borrowing from Top Earners}$$

5.3   Endogenous Default

- **Bottom Earners:** In each period decide whether to default or not.
    - *Benefits of Default:* Reduced debt service.

    - *Costs of Default:*
        1. <u>Output costs</u> of default = recession that mostly hits bottom earners.
        2. Random <u>utility costs</u> of default:
            * Prohibitive costs in 85% of cases: No crisis.
            * Random costs in 15% of cases: Single-digit crisis probability.

        Parameters of 1 and 2 are calibrated to match Schularick and Taylor (2012) probability of crises: Always in single digits for U.S.

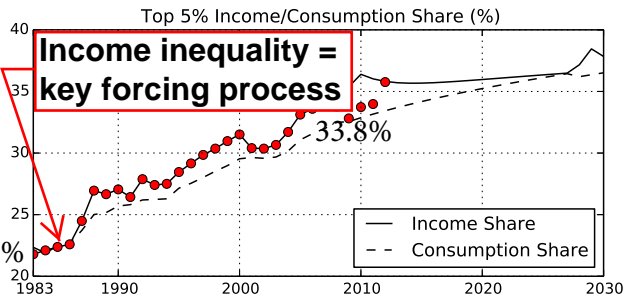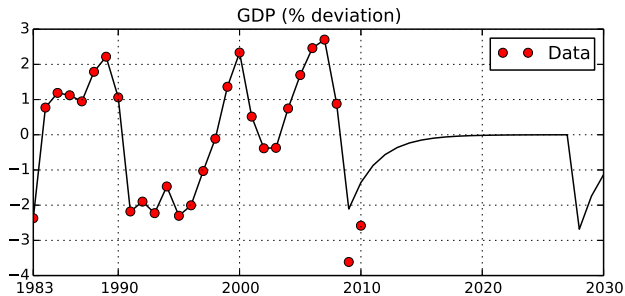- **Top Earners:** Know crisis risk and price loans accordingly.

6 Results

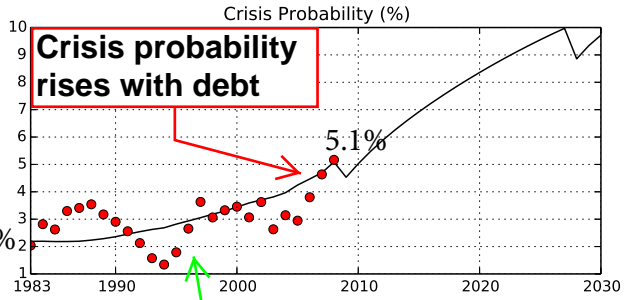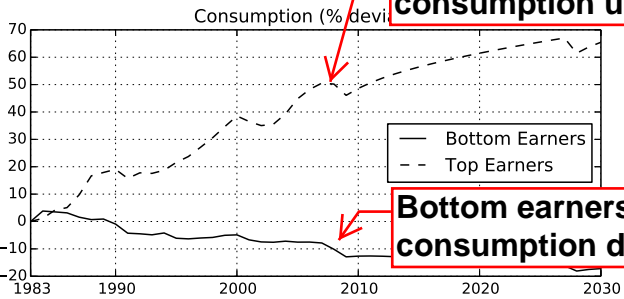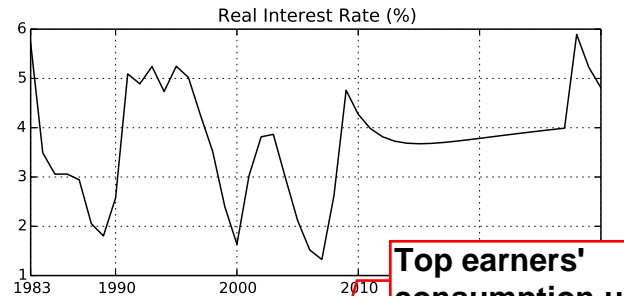## 6.1 Design of Baseline Scenario

- Assumed exogenous processes 1983 − 2008 (pre-crisis):
  - Data for GDP.
  - Data for top 5% income share.

- Assumed crisis shock in 2009.

- 2009 − 2030:
  - No further realizations of output or output share shocks.
  - Random sequence of utility cost shocks continues.

6.2   Empirical Performance of the Model

- Debt-to-income ratios and crisis probabilities at different MPS:
  - Baseline tracks the data very well.
  - Except for around 25% - 30% of debt growth in the 2000s.

    Explanation for the 2000s: Global saving glut.

- In other words:
  - Income inequality explains very large share of post-1983 debt growth.
  - Debt growth in turn explains growth in crisis probability.
  - **Conclusion: Income inequality $=$ fundamental driver of the 2008 crisis.**

GDP (% deviation)

- Data

Real Interest Rate (%)

Top 5% Income/Consumption Share (%)

Income inequality = key forcing process

21.8%

33.8%

Income Share
Consumption Share

Consumption (% deviation)

Top earners' consumption up 50%

Bottom Earners
Top Earners

Bottom earners' consumption down 10%

Bottom 95% Debt-to-Income Ratio (%)

Top earners save = bottom earners borrow

62.3%

138.8%
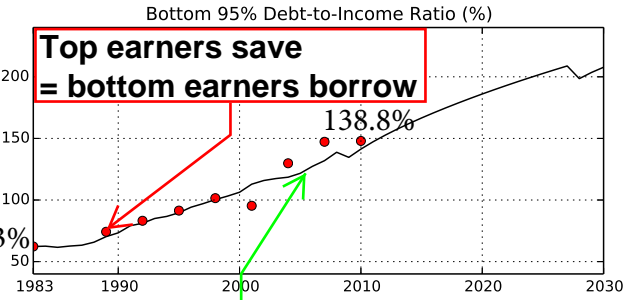
Debt evolution closely matches the data

Crisis Probability (%)

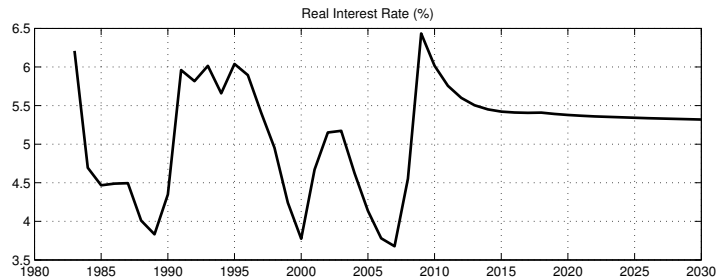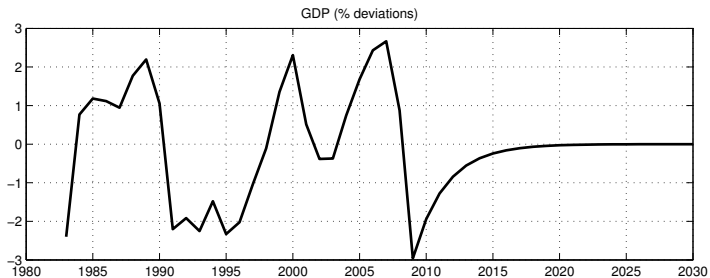Crisis probability rises with debt

2.2%

5.1%
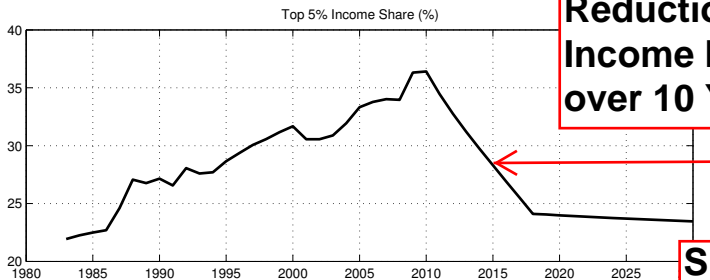
Crisis probability also matches the data

Baseline Scenario

7 Alternative Scenario: Gradual Reduction in Income Inequality Reduces Crisis Probability
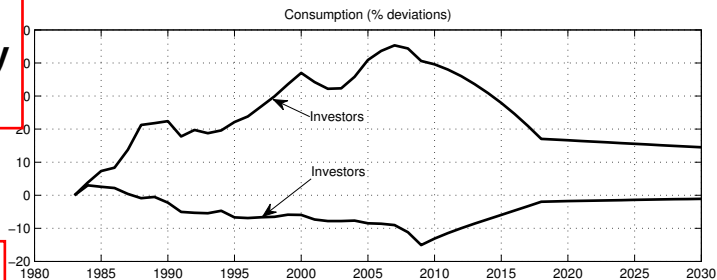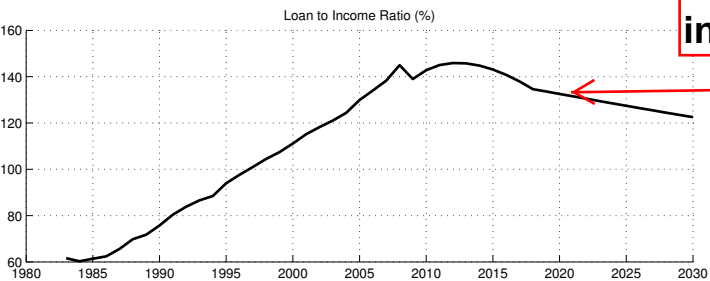
- **Roosevelt 1936-1944:**
  - Top 5% income share reversed the 1920s increase.
  - Household debt reversed the 1920s increase.
  - This started well before the war.

- **Scenario:** Bottom earner output share returns to 1983 value over 10 years.

- **Debt Level Reductions:**
  - <u>Crisis Alone:</u> Only very short-lived effects.
  - <u>Reduced Income Inequality:</u> Sustained and large effects.
  - Bottom earners now have the means to pay down their debt over time.
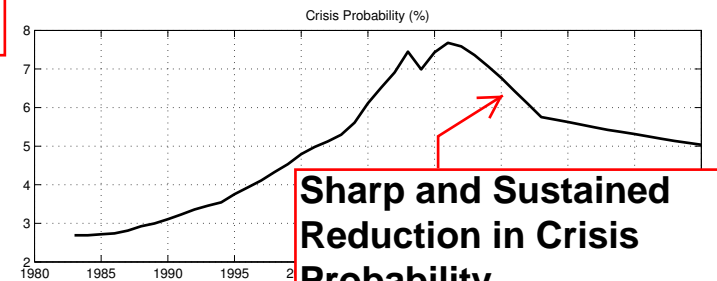 - This also reduces crisis probability in a major way.

GDP (% deviations)

Real Interest Rate (%)

Top 5% Income Share (%)

Consumption (% deviations)

Reduction in Income Inequality over 10 Years

Investors

Investors

Sustained Reduction in Debt

Loan to Income Ratio (%)

Crisis Probability (%)

Sharp and Sustained Reduction in Crisis Probability

8   Summary

- **Empirical Link in 1929 and 2008**:

  Higher income inequality $\Rightarrow$ higher leverage $\Rightarrow$ large crises.

- **Theoretical Model**:
  - Key Shock: Permanent drop in bottom earners' income share.
  - Key Feature: Top earner preferences for wealth.
      Calibrated using a new methodology.
  - Key Mechanism:
    * Recycling of top earners' gains back to bottom earners as loans.
    * Growing loans lead to growing crisis probability.

- **Conclusions:**
  - Higher income inequality = main driver of higher household debt.
 - Higher household debt in turn makes large crises more likely.
  - Crises only reduce debt by little, and not for long.
  - Only lower income inequality durably reduces crisis probability.

9   The Open Economy Dimension: Foreign Debt

- Empirical regularities for major economies:
  - More inequality almost always accompanied by CA deterioration.
  - But there are major exceptions: China, Germany.

- Explanation for CA Deficits (this is work in progress):
  - Higher inequality means higher returns to investors (top earners).
  - This includes **foreign investors**.
  - They may buy more domestic assets or loans.
  - The resulting capital account surplus implies a CA deficit.

- Explanations for CA Surpluses (this is work in progress):
  - **Domestic investors** face a thin domestic lending market.
  - So when their income rises they lend a lot to foreigners.
  - The resulting capital account deficit implies a CA surplus.

- Every economy will exhibit different combinations of the above effects.
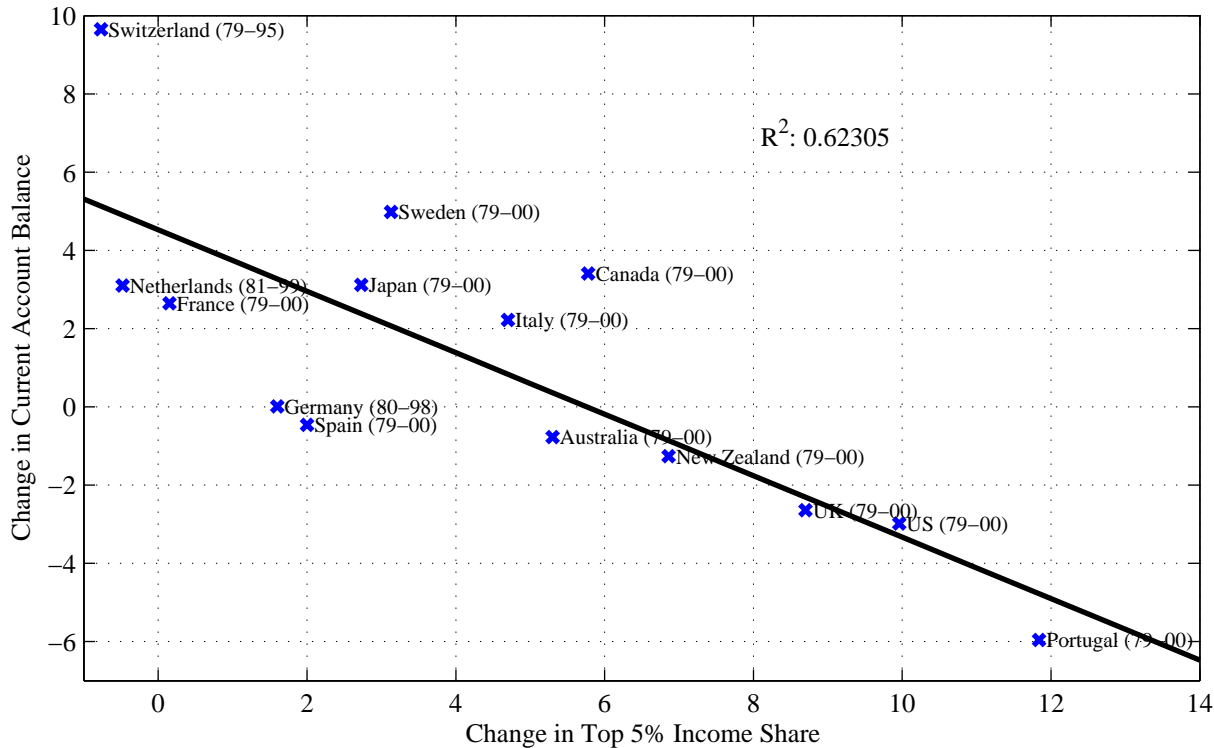
Changes in Current Accounts and Top Income Shares, 1980-2000 (percent)