Fiscal Multipliers and Financial Crises

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Fiscal policy response to the 2008 financial crisis

- "Conventional" fiscal stimulus
  1. Govt purchases (Drautzburg & Uhlig '11; Conley & Dupor '13)
  2. Transfers to households (Oh & Reis '12; Parker et al. '13; Kaplan & Violante '14)
- Financial sector interventions
  3. Equity injections (Blinder & Zandi '10; Philippon & Schnabl '13)
  4. Credit guarantees (Philippon & Skreta '12; Lucas '16)

Large debate on the effectiveness and composition of the response

This paper:

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Approach and Results

1. Structural model of fiscal policy
    - Potential stabilization roles for each of the tools
    - State dependent effects of shocks and policies
2. Quantitative Exercise
    - Calibrated model + data on fiscal policy response
    - Estimate structural shocks *given* policy response
    - Study counterfactuals
        - Crisis and Great Recession without fiscal response
3. Results:
    - Aggregate consumption falls by **50% more** without policy response
    - Transfers and equity injections most important
    - Fiscal multipliers extremely *state dependent*
    - New transmission channels for fiscal policy

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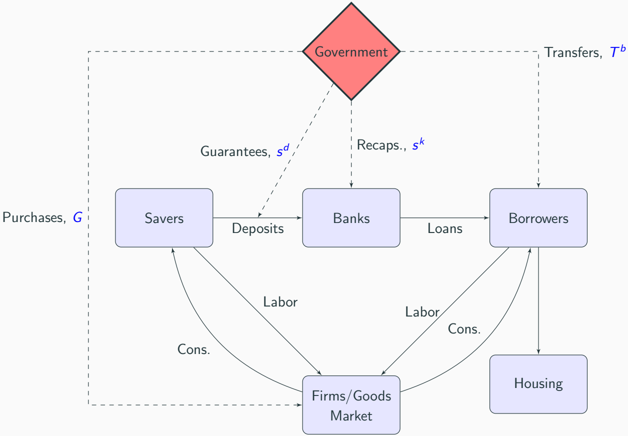
Model

Nominal Rigidities $\Longrightarrow$ Government purchases

Incomplete Markets $\Longrightarrow$ Transfers

(Frictional) Financial Sector $\Longrightarrow$ Bank Recaps.

Credit Risk & Default $\Longrightarrow$ Credit Guarantees



Impulse and Propagation

- Aggregate shocks:
  1. TFP A_t
  2. Financial shock σ_t

$$\text{Household Default Rate}_t = f(\overset{+}{\text{LTV}}_t, \overset{+}{\sigma}_t)$$

- Financial shock: defaults ↑
  1. Bank equity ↓
  2. If bank constraint binds ⇒ spreads rise, lending falls
  3. Disposable income for borrowers ↓
  4. If borrower constraint binds ⇒ aggregate consumption ↓

Shock transmission depends on bank leverage and household leverage

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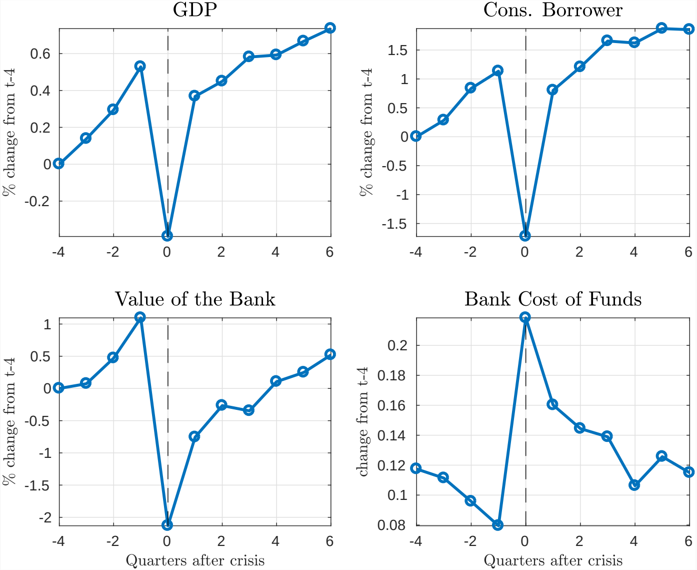
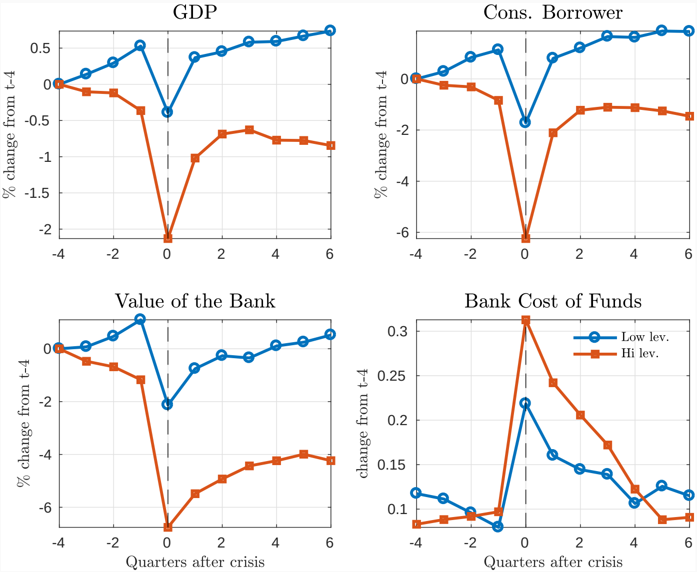
State Dependence: Financial Shock with Low Leverage



State Dependence: Financial Shock with High Leverage



Quantitative Exercise

1. Calibrate model to U.S. pre-crisis
   - Match moments on household and bank balance sheets ▸ Calibration
2. Use data to estimate sequences of structural shocks

$$\{A_t, \sigma_t\}_{t=2000Q1}^{T=2015Q4}$$

   - $Y^T \equiv \text{Observed Macro Variables}^T = \{C_t, \text{spread}_t\}_t^T$
   - $\Omega^T \equiv \text{Observed Fiscal Policy Response}^T = \left\{G_t, T_t^b, s_t^k, s_t^d\right\}_t^T$
3. What $\left\{\hat{A}_t, \hat{\sigma}_t\right\}_t^T$ make the model match Y^T given Ω^T?
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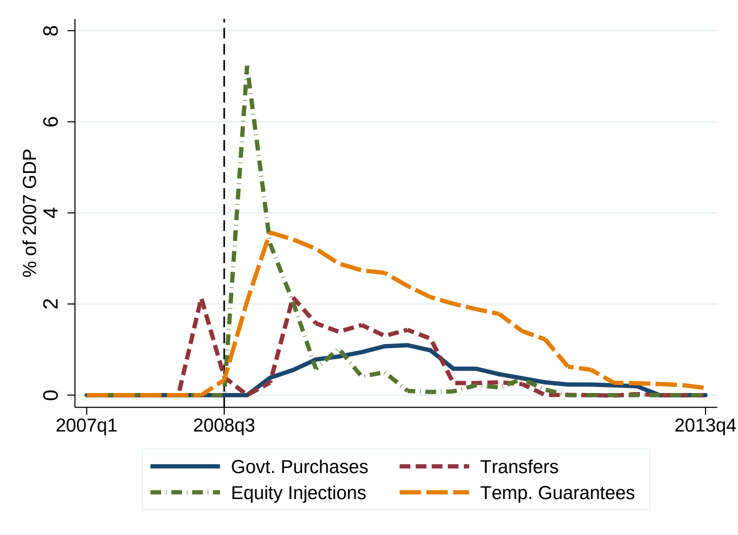
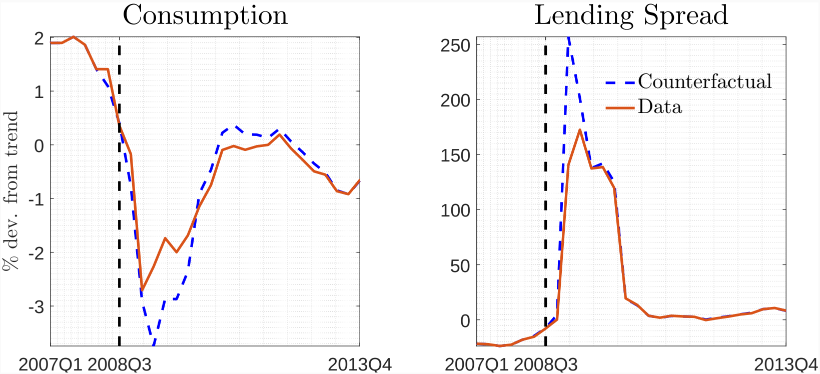
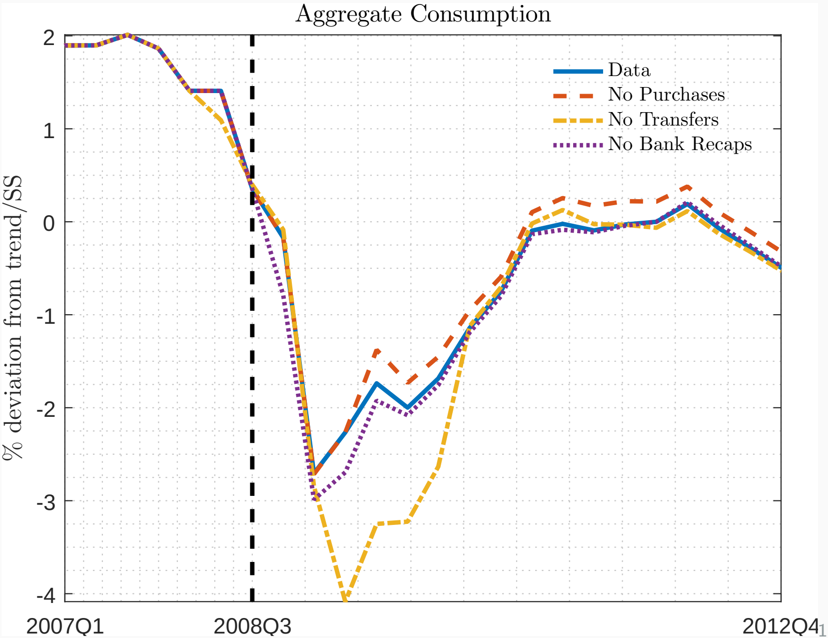
Fiscal Policy Response Data



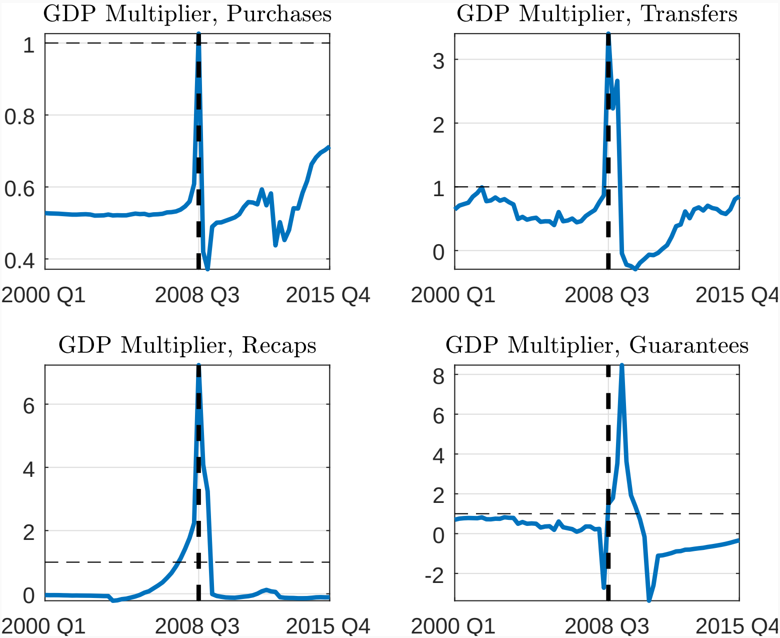
Main Counterfactual: No Fiscal Policy



Policy Decomposition



Time Series for Fiscal Multipliers



State Dependent Multipliers: Mechanism

Two channels:

1. Borrower Constraint $\Rightarrow$ standard MPC channel
2. Borrower Const. + Bank Const. $\Rightarrow$ *new channel*
    - Transfers $\Rightarrow$ house prices $\uparrow$ (only when borrowers are constrained)
    - Default rates fall, banks post fewer losses
    - Lending $\uparrow$, spreads $\downarrow$ (only when banks are constrained)
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New channel active when both constraints bind

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This Paper

- Analysis of fiscal policy response to the Great Recession
- Structural Model + Data

Contribution

- Conventional stimulus and financial sector interventions
  - Important for normative analysis
  - Quantitative evaluation
- New transmission channels for fiscal policy
  - Household-bank balance sheet interactions
  - State dependent effects

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Appendix

Borrowers: Debt and Default

- Face value B^b_{t-1},
- Fraction γ matures every period
- Family construct (Landvoigt, 2015)

1. Borrower enters period with states

$$h_{t-1}, B^b_{t-1}$$

2. Continuum of members $i \in [0,1]$, each with

$$h_{t-1}, B^b_{t-1}, \nu_t(i)$$

   where $\nu_t(i) \sim F^b_t \in [0, \infty)$

3. Each member i can:
   3.1 Repay maturing debt γB^b_{t-1}, and keep houses worth $\nu_t(i) p_t h_{t-1}$

   <u>or</u>

   3.2 Default on maturing debt, lose collateral

Back

Borrower Family Problem

$$V_t^b(B_{t-1}^b, h_{t-1}) = \max_{c_t^b, n_t^b, h_t, B_t^b, \iota(\nu)} \left\{ u(c_t^b, n_t^b) + \xi^b \log(h_t) + \beta \mathbb{E}_t V_{t+1}^b \right\}$$

subject to budget constraint

$$c_t^b + \underbrace{\gamma \frac{B_{t-1}^b}{\Pi_t} \int [1 - \iota(\nu)] \mathrm{d}F_t^b(\nu)}_{\text{debt repayment}} + \underbrace{p_t h_t}_{\text{house purchase}} \leq$$

$$(1-\tau) w_t n_t^b + \underbrace{Q_t^b B_t^{b,\text{new}}}_{\text{new debt}} + \underbrace{p_t h_{t-1} \int \nu [1 - \gamma \iota(\nu)] \mathrm{d}F_t^b(\nu)}_{\text{sale of non-forecl. houses}} - T_t + \underbrace{T_t^b}_{\text{Transfers}}$$

and borrowing constraint

$$B_t^{b,\text{new}} \leq \underline{m} p_t h_t$$

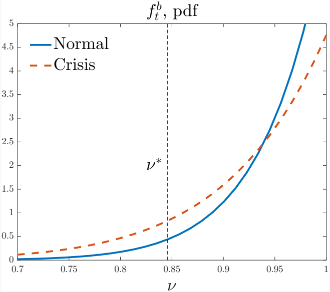
Back

Borrower Default

Default iff $\nu \leq \nu_t^*$,

$$\nu_t^* = \frac{B_{t-1}^b}{\Pi_t p_t h_{t-1}} \simeq \text{Loan-to-Value}$$

- $F_t^b = \text{Beta}(1, \sigma_t^b)$
- $\sigma_t^b \sim$ two-state Markov
- Mean preserving spread



Lenders earn (per unit of debt)

$$Z_t^{\text{loans}} = \underbrace{(1-\gamma)Q_t^b}_{\text{not matured}} + \gamma \left\{ \underbrace{1 - F_t^b(\nu_t^*)}_{\text{repaid}} + \overbrace{(1-\lambda^b)}^{\text{Resource Cost}} \int_0^{\nu_t^*} \nu \frac{p_t h_{t-1}}{B_{t-1}^b / \Pi_t} \mathrm{d}F_t^b \right\}$$

Financial Intermediaries

- Fixed income portfolios, maturity transformation, risky deposits
- Fraction $1-\theta$ of earnings paid out as dividends every period
- Invest in loan securities b_t, raise deposits d_t

Problem for intermediary $j \in [0,1]$ with current earnings $e_{j,t}$

$$\underbrace{V_t^k(e_{j,t})}_{\text{current mkt value}} = \max_{b_{j,t},d_{j,t}} \left\{ \underbrace{(1-\theta)e_{j,t}}_{\text{dividend}} + \underbrace{\mathbb{E}_t\left[\Lambda_{t,t+1}^s \max\left\{0, V_{t+1}^k(e_{j,t+1})\right\}\right]}_{\text{ex-dividend value}} \right\}$$

subject to

$$\text{flow of funds}: Q_t^b b_{j,t} = \theta e_{j,t}(1+s_t^k) + Q_t^d d_{j,t}$$

$$\text{capital req.}: \kappa Q_t^b b_{j,t} \leq \mathbb{E}_t\left[\Lambda_{t,t+1}^s \max\left\{0, V_{t+1}^k(e_{j,t+1})\right\}\right]$$

$$\text{LoM earnings}: e_{j,t+1} = u_{j,t+1} Z_{t+1}^{\text{loans}} \frac{b_{j,t}}{\Pi_{t+1}} - \frac{d_{j,t}}{\Pi_{t+1}}$$

Back

Financial Intermediaries

- $u_{j,t} \sim F^d \subseteq [\underline{u}, \bar{u}]$
- Default iff

$$u_{j,t} < u_t^* \equiv \frac{d_{j,t-1}}{Z_t^{\text{loans}} b_{j,t-1}} \simeq \text{Leverage}$$

- Aggregation $\Rightarrow$ representative bank

$$\int_{[0,1]} \mathbb{E}_t \left[\frac{\Lambda^s_{t,t+1}}{\Pi_{t+1}} \max\left\{0, V^k_{t+1}(e_{j,t+1})\right\} \right] \mathrm{d}j \equiv \Phi_t \theta E_t$$

- Spreads reflect Credit Risk + Current + Future binding constraints
- Long-term debt $\Rightarrow$ Pecuniary Externalities $\Rightarrow$ Financial Accelerator
- Payoff per unit of deposits,

$$Z_t^{\text{deposits}} = \underbrace{s_t^d}_{\text{guaranteed}} + (1 - s_t^d) \left\{ \underbrace{1 - F^d(u_t^*)}_{\text{repaid}} + \underbrace{(1 - \lambda^d) \int_0^{u_t^*} u \frac{Z_t^{\text{loans}} B^b_{t-1}}{D_{t-1}} \mathrm{d}F^d}_{\text{liquidated}} \right\}$$

Back

Closing the Model

Standard DSGE model w/ nominal rigidities

- Producers → Phillips Curve producers
- Savers → Euler Equation (IS) savers
- Housing in fixed supply,

$$h_t = 1$$

- Central Bank → Taylor Rule

$$\frac{1}{Q_t} = \frac{1}{\bar{Q}} \left[\frac{\Pi_t}{\Pi}\right]^{\phi_\pi} \left[\frac{Y_t}{Y}\right]^{\phi_y}$$

- Aggregate resource constraint,

$$C_t + G_t + \text{DWL Default}_t = \underbrace{A_t N_t}_{=Y_t} \underbrace{[1 - d(\Pi_t)]}_{\text{Menu Costs}}$$

Back

Fiscal Authority

Budget constraint,

$$\underbrace{\tau Y_t + T_t + Q_t B_t^g - \bar{G} - \frac{B_{t-1}^g}{\Pi_t}}_{\text{Standard Surplus}} = \text{Net Cost from Discretionary Measures}_t$$

Fiscal rule for taxes,

$$T_t = \phi_\tau \log\left(\frac{B_{t-1}^g}{\bar{B}^g}\right)$$

Net Cost from Discretionary Measures,

$$(G_t - \bar{G}) + \chi T_t^b + s_t^k \theta E_t + s_t^d \frac{D_{t-1}}{\Pi_t} \times (1 - \text{Recovery Rate}_t)$$

Back

Calibration

1. *Crises*

$$\sigma_t^b = [\sigma_t^{b,\text{normal}}, \sigma_t^{b,\text{crisis}}]^T \qquad \text{and} \qquad \mathbf{P}^\sigma = \begin{bmatrix} .995 & .005 \\ .2 & .8 \end{bmatrix}$$

2. *Households*

Target	Target	Parameter
Fraction Borrowers	Parker et al. (2013)	$\chi = 0.475$
Avg. Maturity	5 years	$\gamma = 1/20$
Max LTV Ratio	80%	$\underline{m} = 0.0383$
Debt/GDP	80%	$\xi = 0.1565$
Avg. Delinquency Rate	2%	$\sigma^{b,\text{normal}} = 8.205$

3. *Banks*

$$F^d(u) = \frac{u^\sigma - \underline{u}^\sigma}{\bar{u}^\sigma - \underline{u}^\sigma}$$

Target	Target	Parameter
Book Leverage	10	$\kappa = 0.1$
Payout Rate	15%	$\theta = 0.85$
Avg. Lending Spread	2%	$\varpi = 0.0105$
CDS-Implied Def. Prob.	2% in recessions	$\underline{u} = 0.88, \sigma^d = 1.5$

Smoothed Shocks