The Channels of Financial Distress During the Great Recession: Some Evidence on the Aggregate Effects

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Background

- Since Great Recession: explosion of research on financial crises
- Considerable research pre-crisis - emphasis on non-financial firms
- Post-crisis:
  - Extension to households and banks
  - Advances in modeling (nonlinear crisis, credit booms, heterogeneity, etc)
  - Creative new empirical work using micro-data
- Now a broad understanding of forces at work during GR
  - Still an incomplete understanding of various channels and relative importance
This Presentation

- Exposit theory and present descriptive evidence from Great Recession
- Review microeconometric evidence on various channels
  - Literature emphasizes two main channels:
    - (1) Impact of house price bust on household balance sheets and spending
    - (2) Transmission of banking distress to real activity
- Present new evidence on contribution of (1) vs. (2) to overall employment decline
  - Quarterly panel of state level data
    - Identification exploits both panel data and time series methods
  - Key finding: both channels important
Theory and Basic Concepts:

A Brief Description
Macro Models with Frictionless Financial Markets

- Aggregate spending varies inversely with cost of capital $\mathbb{E}_t\{R^k_{t+1}\}$ (ceteris par.)

- Arbitrage with riskless real rate $R_{t+1}$

  $$\mathbb{E}_t\{m_{t+1}(R^k_{t+1} - R_{t+1})\} = 0$$

- To first order, $\mathbb{E}_t\{R^k_{t+1}\}$ varies one for one with $R_{t+1}$

  $$\mathbb{E}_t\{R^k_{t+1}\} \approx R_{t+1}$$

- Financial structure irrelevant
Modeling Financial Crisis: Basic Idea

- Generate fluctuations in $\mathbb{E}_t\{R_{kt+1}\}$ due to changing financial conditions

- Introduce limits to arbitrage (LTA) \rightarrow

\[ \mathbb{E}_t\{m_{t+1}(R_{kt+1} - R_{t+1})\} \geq 0 \]

- Financial crisis: sharp tightening of LTA \rightarrow sharp increase in $\mathbb{E}_t\{R_{kt+1} - R_{t+1}\}$
  - Rise in $E_t\{R_{kt+1}\}$ \rightarrow contraction in real activity
  - Challenge: modeling LTA and endogenous tightening
Adding Banks and Banking Crises

\( R^b_{t+1} \equiv \) banks’ marginal cost of funds.

- LTA →

\[
E_t\{m_{t+1} R^k_{t+1}\} \geq E_t\{m_{t+1} R^b_{t+1}\} \geq E_t\{m_{t+1} R_{t+1}\}
\]

- Banking crisis:

  - Sharp rise in \( E_t\{R^k_{t+1} - R_{t+1}\} \) due to rise in \( E_t\{R^b_{t+1} - R_{t+1}\} \)

  - Recent crisis fits this pattern for excess returns (with credit spreads as proxies)
Gilchrist-Zakrasjek excess bond premium

EBP: rate of return on corporate bonds minus that on similar maturity government debt, with default premium removed.
Modeling Limits to Arbitrage: A Sketch

Two key modeling features:

1. Equity costly to issue;  
2. Restrictions on leverage (due to agency problems)

Borrower balance sheet:

\[ Q_t K_t = N_t + D_t \]

Leverage constraint:

\[ Q_t K_t \leq \phi_t N_t \]

- Financial crises: sharp contractions in either \( N_t \) or \( \phi_t \rightarrow \) constraint tightens
  - \( N_t \downarrow \): Bernanke/Gertler, BGG, Kiyotaki/Moore, He/Krishnamurthy.
  - \( \phi_t \downarrow \): Geanakoplos, Brunnermeier/Sannikov, Kehoe et al., Di Tella.
Financial Accelerator Mechanism

Leverage constraint:

\[ Q_t K_t^b \leq \phi_t N_t \]

\( N_t \) dynamics:

\[ N_t = [(R_{kt} - R_t)\phi_{t-1} + R_t]N_{t-1} - Div_t \]

\[ \phi_{t-1} \equiv \frac{Q_{t-1}K_{t-1}}{N_{t-1}} \]

- **Crisis**: Sharp negative asset return: \( R_{kt} = \frac{Z_t + Q_t}{Q_{t-1}} \downarrow \rightarrow N_t \downarrow 

  \rightarrow \text{constraint tightens} \rightarrow \mathbb{E}_t\{R_{t+1}^k - R_{t+1}\} \uparrow \rightarrow \text{economy weakens}

- **Mechanism strength increasing in leverage** \( \phi_{t-1} \)
Modeling Banking Crises

- Financial accelerator (FA) mechanism applies to banks
  - Face (i) costly equity issuance and (ii) leverage constraints

- Distinctive features of (large) banks
  - Highly leveraged: \( \rightarrow \) vulnerable to swings in asset values
  - Heavy reliance on uninsured short term debt: \( \rightarrow \) vulnerable to panic runs

- FA mechanism can incorporate panic runs (Gertler/Kiyotaki)
  - Weakening of bank balance sheets raises likelihood of “self-fulfilling” panic (e.g., Diamond/Dybvig)
    - High leverage makes conditions for panic equilibrium more likely.
    - Panic amplifies rise in credit costs for non-financial borrowers
Descriptive Evidence From The Great Recession
Household Balance Sheets, House Prices and Spending

[Graph showing trends in Debt-to-Assets, Debt-to-Income, Durable Consumption, and House Prices over time from 2004 to 2012. The graph highlights the period from 2008 to 2009 with shaded areas.]
(Large) Bank Market Leverage, Financial EBP and Lending Standards

Financial Excess Bond Premium and Primary Dealer Market Leverage (from He et al.)

Financial Excess Bond Premium and Commercial Bank Lending Standards

Financial EBP
Change in Lending
Standards (RHS)

Net Tightening (%)
The Role of Banking Panics
Formal Microeconometric Evidence:

A Brief Review
Micro Evidence on Banking Distress Transmission

- Huge lit. (e.g. Bernanke/Lown, Peek/Rosen, Chowdorow-Reich)

- Approach:
  - Isolate variation in bank net worth \( N_t \perp \) borrowers’ economic prospects
  - Estimate impact on borrowing and real activity
    - Exploit variation across banks

- Recent example: Huber 2018
  - “Orthogonal” variation in \( N_t \) of Commerzbank, large German bank
    - Source: losses from U.S. mortgage-backed securities during 2008
    - Independent of Cmzbnk borrower prospects: No German real estate crisis
  - Finds large significant effects of \( N_t \) contraction lending and on employment
Effect of Commerzbank Dependency on Employment (Huber)

Figure 4. Firm Employment Effects

Notes: This figure plots the time series of the mean ln employment of firms with and without Commerzbank as one of their relationship banks. The time series are divided by their 2006 value. The data are from the firm panel.
Micro Evidence on Household Balance Sheet Channel

- Huge lit., pioneered by Mian and Sufi (M/S)
- Exploits regional variation in mortgage debt (MD) and house prices (HP)
- Regions w. large buildup of MD and HP pre-crisis → large declines in HP and employment

$$\Delta e_i^{NT} = \alpha + \eta \left( \frac{p_i^H H_i}{N_i^H} \cdot \Delta p_i^H \right) + \epsilon_i$$

- $e_i^{NT}$ ≡ nontradable employment in region $i$; $p_i^H$ ≡ housing prices
- $\frac{p_i^H H_i}{N_i^H}$ ≡ 2006 ratio of housing values to housing equity (measure of HH leverage)
Household Balance Sheet Effects on Employment (Mian/Sufi)
Some Observations on Mian/Sufi Evidence

- Persuasive evidence of household balance sheet channel

- Silent on aggregate effects
  - Since evidence based on cross-sectional variation
  - Same issues with evidence on bank balance sheet channel

- Important to distinguish between aggregate vs. local house prices shocks
  - Local shocks affect only non-traded goods
  - Aggregate affect both non-traded and traded
New Evidence from State-Level Data

(with Simon Gilchrist)
Regional and Temporal Variation

House Prices vs. Year:
- Top 20%
- Next 30%
- Bottom 50%
- All

Mortgage-to-Income ratio vs. Year:
- Top 20%
- Next 30%
- Bottom 50%
- All

Total Employment vs. Year:
- Top 20%
- Next 30%
- Bottom 50%
- All

Non-Construction Employment vs. Year:
- Top 20%
- Next 30%
- Bottom 50%
- All
Panel Data VAR

- Quarterly data: 1992 - 2014

- Variables
  - State-level employment growth $\Delta e_{jt}$
  - State-level house price growth $\Delta p_{jt}$
  - Measure of aggregate financial conditions (financial excess bond premium) $s_t$.

- Allow for effects of housing prices via household balance sheets (as in Mian/Sufi)

- Compare the aggregate effects of housing price versus financial shocks.
  - Employ time series methods to identify aggregate shocks

- Distinguish between the effects of local versus aggregate house price shocks
Financial and Housing Price Shocks

- Aggregate financial condition $s_t$:

$$s_t = \omega_s \Delta e_t + \gamma_s \Delta p_t + \sum_{i=1}^{4} (\alpha_s s_{t-i} + \omega_s \Delta e_{t-i} + \gamma_s \Delta p_{t-i}) + \varepsilon^s_t$$

- State-level housing prices:

$$\Delta p_{jt} = \omega_p \Delta e_{jt} + \sum_{i=1}^{4} (\alpha_p s_{t-i} + \omega_p \Delta e_{jt-i} + \gamma_p \Delta p_{jt-i}) + \varepsilon^p_j + \varepsilon^p_{jt}$$

- Shocks $\varepsilon^s_t$ and $\varepsilon^p_{jt}$ identified via timing restrictions

  - Aggregate house price shock $\varepsilon^p_t$ obtained as weighted sum of state-level shocks.
  - $\iff$ Panel VAR Cholesky decomposition with ordering $\varepsilon^e_t, \varepsilon^p_t, \varepsilon^s_t$
State Level Employment Growth

\[ \varepsilon^s_t, \varepsilon^p_t \equiv \text{aggregate financial and house price shocks}; \quad \hat{\varepsilon}^p_{jt} \equiv \text{local house price shock} \]

\[ M_j \equiv \text{mortgage debt/income, state } j \text{ 2006}; \quad [\text{Crisis } = 1] \equiv \text{crisis dummy (2007-10)} \]

- Employment growth in state \( j \) over horizon \( h \)

\[
e_{jt+h} - e_{jt} = \beta_{sh} \varepsilon^s_t + \{\beta_{ph} + \beta_{mh}[\text{Crisis } = 1]M_j\} \varepsilon^p_t + \{\hat{\beta}_{ph} + \hat{\beta}_{mh}[\text{Crisis } = 1]M_j\} \hat{\varepsilon}^p_{jt} + \varepsilon^e_{jh} + \varepsilon^e_{jht}
\]

- Dummy \( \rightarrow \) nonlinear balance sheet effect of housing price decline (as in Mian/Sufi)

- RHS variables are orthogonal shocks \( \rightarrow \) can estimate via OLS (Jorda).
State Level Employment Growth (con’t)

\[ e_{jt+h} - e_{jt} = \beta_{sh}\varepsilon^s_t + \{\beta_{ph} + \beta_{mh}[Crisis = 1]M_j\}\varepsilon^p_t + \{\hat{\beta}_{ph} + \hat{\beta}_{mh}[Crisis = 1]M_j\}\varepsilon^p_t + \varepsilon^e_{jh} + \varepsilon^e_{jht} \]

- Generalization of Mian/Sufi to panel data setting
  - Captures cross state variation in effects of house price decline
  - House price decline effect enhanced via balance sheets

- Differences with M/S
  - Allows for aggregate financial shocks along with housing price shocks
  - Distinguishes between aggregate versus local hp shocks, as theory suggests
Historical decomposition:

- $e_{st} \equiv$ component of log employment $e_t$ due to financial shocks

$$e_{st} = \sum_h \beta_{sh} \varepsilon^s_{t-h}$$

- $e_{pt} \equiv$ component due to aggregate house price shocks

$$e_{pt} = \sum_h [\beta_{ph} + \beta_{mh} (\sum_j \omega_i M_j)] \varepsilon^p_{t-h}$$

- Note: local state house shocks $\hat{\varepsilon}^p_{jt}$ do not have aggregate effects
Total Employment

Actual vs Predicted (All shocks)
Total Employment

Housing Price vs EBP Effect
## Construction and Ex-Construction:

### Housing Price vs EBP Effect

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Retail vs Manufacturing

Housing Price vs EBP Effect

![Graph showing Housing Price vs EBP Effect for Retail and Manufacturing industries from 2006q1 to 2010q1. The graphs display actual, housing price (HP), EBP, and SUM effects over time.]
State Level Variation in Employment from House Price Shocks

\[ e_{pjt} \equiv \text{component of log employment in state } j \text{ due to housing price shocks} \]

- Cross state employment dispersion due to house price shocks

\[
e_{pjt} - e_{pt} = \sum_h \beta_{mh} \{[\text{Crisis} = 1][M_j - (\sum_j \omega_i M_j)]\} \varepsilon_{t-h}^p
\]

\[
+ \sum_h \{\hat{\beta}_{ph} + \hat{\beta}_{mh}[\text{Crisis} = 1]M_j\} \varepsilon_{jt-h}^p
\]
Total Employment by Region

Housing Price vs EBP Effect
Retail Employment by Region

Housing Price vs EBP Effect

The diagrams show the comparison of Actual (green), HP (blue), EBP (red), and SUM (black) over different housing price drop ranges: -0.4 to -0.2 and -0.2 to 0. The x-axis represents the quarters from 2006q1 to 2010q4, and the y-axis represents the drop in housing prices ranging from -2 to -0.2.
Manufacturing Employment by Region

Housing Price vs EBP Effect
Effect of Aggregate vs Local House Price Shocks on Regional Differences

(HP Drop<-0.4 versus -0.2<HP Drop)
Summary Remarks

- As with Great Depression, financial distress in Great Recession was broad-based
  - Present in household, banking and non-financial firm sectors
- Household balance sheet channel important to employment contraction
  - But without disruption of banking, recession would have been relatively mild
- Looking forward:
  - Accounting for credit boom prior to crisis
    - e.g. Lax regulation, accommodative monetary policy, optimism waves
  - Accounting for the slow recovery
    - Reinhart/Rogoff: recoveries from financial crises take longer
    - Broad-based measures suggest normalization of credit markets
    - But evidence of persistent tightness for households and small businesses
Sectoral Balance Sheets

Households
- House
- Financial Assets

Banks
- HH Loans
- Net Worth

Firms
- Capital
- Equity

- HH Loans
- Deposits
- Equity