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

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Background

▶ Since Great Recession (GR): explosion of research on financial crises
  ▶ Now a broad understanding of forces at work during GR

▶ 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

▶ Evidence for both (1) and (2) being operative during GR
  ▶ Typically based on cross-sectional data (e.g. Mian/Sufi, Chodorow-Reich)
  ▶ But largely silent on relative importance for aggregate activity
What We Do

- Present evidence on aggregate employment effects of each channel

- Use quarterly panel of state level data

- Identification exploits both panel data and time series methods
  - Cross-state variation identifies household balance sheet channel (as in M/S)
  - Time series methods identify orthogonal shocks to:
    - House prices (both aggregate and local)
    - Banking distress (aggregate)

- Econometric framework and shocks → historical decomposition
  - Both for aggregate times series and cross-state variation
Main Findings

- Both channels important; but banking distress key in turning recession into GR
  - Absent banking distress, recession would have resembled 90-91 or 01-02
  - Banking distress accounts for enhanced, protracted decline

- House price shocks account for cross state variation (as in M/S)
  - Household balance sheet channel important for regional variation

- Aggregate house price shocks have stronger effects than local ones
  - Consistent with theory (traded employment affected as well as nontraded).
Literature

- Cross-sectional studies of Great Recession
  - Mian/Sufi 2014; Kaplan et. al. 2017, Chodorow-Reich 2014, Huber 2018

- Time series studies
  - Christiano/Eichenbaim/Trabandt 2015, Gertler/Gilchrist 2018, Bernanke 2019, Midrigan et. al.

- From micro-evidence to macro effects using models

- From micro-evidence to macro effects using time series identification
  - Sarto 2018
Descriptive Evidence From The Great Recession on Household Balance Sheet and Banking Distress Channels
Household Balance Sheets, House Prices and Spending

[Graph showing trends in Debt-to-Assets and Debt-to-Income from 2004 to 2012, with shaded areas indicating specific periods.]

[Graph showing trends in Real Expenditures and House Prices Index from 2004 to 2012, with shaded areas indicating specific periods.]
Excess Bond Premium = rate of return on corporate bonds minus return on similar maturity government bonds, with default premium removed.
(Large) Bank Market Leverage, Financial EBP and Lending Standards
New Evidence from a Panel of State-Level Data
Starting point: Mian/Sufi (2014)

- Micro Evidence on Household Balance Sheet Channel

- Exploits regional variation in mortgage debt (MD) and house prices (HP)

- Motivation: Regions w. large buildup of MD and HP pre-crisis \(\rightarrow\) large declines in HP and employment


\[
\Delta e_{NT}^i = \alpha + \eta \left( \frac{p_i^H H_i}{N_i^H} \cdot \Delta p_i^H \right) + \epsilon_i
\]

\(e_{NT}^i\) \equiv nontradable employment in region \(i\); \(p_i^H\) \equiv housing prices

\(\frac{p_i^H H_i}{N_i^H}\) \equiv 2006 ratio of housing values to housing equity (measure of HH leverage)
Household Balance Sheet Effects on Employment (Mian/Sufi)
Regional and Temporal Variation

- House Prices
- Mortgage-to-Income Ratio
- Total Employment
- Non-Construction Employment
Panel Data VAR

- Quarterly data: 1992 - 2014

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

- 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 House Price Shocks

- Aggregate financial conditions $s_t$:
  \[
  s_t = \eta s_0 \Delta e_t + \gamma s_0 \Delta p_t + \sum_{i=1}^{4} \left( \alpha_{si}s_{t-i} + \eta_{si}\Delta e_{t-i} + \gamma_{si}\Delta p_{t-i} \right) + \varepsilon^s_t
  \]

- State-level house prices $p_{j,t}$:
  \[
  \Delta p_{jt} = \eta p_0 \Delta e_{jt} + \sum_{i=1}^{4} \left( \alpha_{pi}s_{t-i} + \alpha_{pi}\Delta e_{jt-i} + \gamma_{pi}\Delta p_{jt-i} \right) + \varepsilon^p_j + \varepsilon^p_{jt}
  \]

- Structural shocks $\varepsilon^s_t$ and $\varepsilon^p_{jt}$ identified via timing restrictions
  - $s_t$ depends on $\Delta e_t = \sum \omega_j \Delta e_{jt}$ and $\Delta p_t = \sum \omega_j \Delta p_{jt}$
  - $\Delta p_{jt}$ depends on $\Delta e_{jt}$ but NOT $s_t$
  - $\Delta e_{jt}$ depends Neither on $\Delta p_{jt}$ Nor $s_t$
Aggregate Versus Idiosyncratic House Price Shocks

\[ \varepsilon_{jt} \equiv \text{state housing price shock}; \quad \varepsilon^p_t \equiv \text{aggregate house price shock} \]

\[ \varepsilon_{jt} \text{ depends on aggregate } (\varepsilon^p_t) \text{ and idiosyncratic } (\psi^p_{jt}) \text{ components.} \]

\[ \varepsilon^p_{jt} = \theta_j \varepsilon^p_t + \psi^p_{jt} \]

with \( \sum \omega_j \theta_j = 1 \)

\[ \Rightarrow \text{Allow for differential sensitivities of } \varepsilon^p_{jt} \text{ to } \varepsilon^p_t \]

\[ \Rightarrow \text{e.g due to differential land supply elasticities, etc.} \]

\[ \Rightarrow \varepsilon^p_t \text{ corresponds to common factor in } \varepsilon^p_{jt} \]

\[ \Rightarrow \theta_j \text{ is state } j \text{ factor loading} \]
State Employment Growth Conditional on House Price + Financial Shocks

\( M_j \equiv \text{mortgage debt/income, state } j \text{ 2006; } I(Crisis) \equiv \text{crisis dummy (2007:1-09:4)} \)

- Employment growth in state \( j \) over horizon \( h \geq 1 \)

\[
E_t\{e_{jt+h} - e_{jt} | e_{jt}^P, e_t^P, e_t^s\} = \{\beta_{ph} + \beta_{mh}[I(Crisis)]M_j\}e_{jt}^P + \beta_{sh}e_t^s
\]

\[+ \lambda_h E_t\{e_{t+h} - e_t | e_t^P, e_t^s\}\]

- Top right: Local effects of state house price and aggregate financial shocks;
  - Dummy \( \rightarrow \text{balance sheet effect of housing price decline (as in Mian/Sufi)} \)

- Bottom right: \( \rightarrow \text{Aggregate spillovers via tradable goods} \)
Conditional Aggregate Employment Growth

\[
\varepsilon^p_{jt} = \theta_j \varepsilon^p_t + \psi^p_{jt}; \quad \rightarrow \quad \sum_j \omega_j \varepsilon^p_{jt} = \varepsilon^p_t \quad \text{and} \quad \sum_j \omega_j M_j \varepsilon^p_{jt} = \bar{M} \theta \varepsilon^p_t \rightarrow
\]

- Aggregating across states

\[
E_t \{ e_{t+h} - e_t | \varepsilon^p_t, \varepsilon^s_t \} = \left\{ \beta_{ph} + \beta_{mh} \left[ I(\text{crisis}) \right] \bar{M} \theta \right\} \varepsilon^p_t + \beta_{sh} \varepsilon^s_t
\]

\[
+ \lambda_h E_t \{ e_{t+h} - e_t | \varepsilon^p_t, \varepsilon^s_t \}
\]

\[
\rightarrow \quad E_t \{ e_{t+h} - e_t | \varepsilon^p_t, \varepsilon^s_t \} = \frac{1}{1 - \lambda_h} \left\{ \left\{ \beta_{ph} + \beta_{mh} \left[ I(\text{crisis}) \right] \bar{M} \theta \right\} \varepsilon^p_t + \beta_{sh} \varepsilon^s_t \right\}
\]

- \(\frac{1}{1 - \lambda_h}\) is general equilibrium effect.
State Employment Growth: Local vs. Aggregate Variation

- $\hat{e}_{jt}^p \equiv$ Local house price shock for state $j$ →

$$e_{jt}^p = \theta_j e_t^p + \psi_{jt}^p = e_t^p + \hat{e}_{jt}^p$$

with

$$\hat{e}_{jt}^p = (\theta_j - 1) e_t^p + \psi_{jt}^p$$

- Conditional state employment growth:

$$E_t \left\{ e_{jt+h} - e_{jt} | \hat{e}_{jt}^p, e_t^p, e_s^t \right\} = \{ \beta_{ph} + \beta_{mh}[I(crisis)]M_j \} \hat{e}_{jt}^p +$$

$$\frac{1}{1 - \lambda_h} \left\{ \{ \beta_{ph} + \beta_{mh}[I(crisis)]M \theta \} e_t^p + \beta_{sh} e_s^t \right\}$$

Top right: Local variation; Bottom right: Aggregate variation
Estimation

- State employment growth over horizon $h$

$$e_{jt+h} - e_{jt} = \beta_{ph} \hat{\varepsilon}_{jt}^p + \beta_{mh} [I(\text{crisis})] M_j \hat{\varepsilon}_{jt} +$$

$$\frac{\beta_{ph}}{1 - \lambda_h} \varepsilon_t^p + \frac{\beta_{mh}}{1 - \lambda_h} [I(\text{crisis})] \overline{M}\theta \varepsilon_t^p + \frac{\beta_{sh}}{1 - \lambda_h} \varepsilon_t^s + \varphi_j + \varphi_{jht}$$

- RHS variables are orthogonal shocks $\rightarrow$ can estimate using OLS (Jorda)

- Generalization of Mian/Sufi to panel VAR setting
  - Captures cross state effects of house price decline (top right)
  - Differences:
    - Identify aggregate effects of house price shocks (bottom right)
    - Also identifies aggregate effects of financial shocks (bottom right)
Estimation and Historical Decomposition: Implementation

- 12 quarter state $j$ employment growth:

$$e_{jt+12} - e_{jt} = \sum_{h=1}^{12} \left\{ \beta_{jph}^* \hat{\epsilon}_{jt+12-h}^p + \frac{\beta_{ph}^*}{1 - \lambda_h} \epsilon_{t+12-h}^p + \frac{\beta_{sh}}{1 - \lambda_h} \epsilon_{t+12-h}^s \right\}$$

$$+ \sum_{i=1}^{4} \delta_i \Delta e_{jt-i} + \epsilon^e_j + \varphi_{jt,t+12}$$

$$\beta_{jph}^* \equiv \beta_{ph} + \beta_{mh}[I(\text{crisis})] M_j; \quad \beta_{ph}^* = \beta_{ph} + \beta_{mh}[I(\text{crisis})] M_\theta$$

- $\{ \cdot \}$ gives contribution of $\left\{ \hat{\epsilon}_{jt+12-h}^p, \epsilon_{t+12-h}^s, \epsilon_{t+12-h}^p \right\}_{h=1}^{12}$ to $e_{jt+12} - e_t$

- $\sum_{i=1}^{4} \delta_i \Delta e_{jt-i}$ controls for effect of shocks prior to $t$ on $e_{jt+12} - e_t$
Employment Responses to Financial vs. Housing Price Shocks

Left panel: shock is 100bp in Financial EBP; Middle and Right: 100bp decrease in house price
Decomposing Employment Response to Aggregate Housing Price Shock:
Linear vs. Nonlinear (Balance Sheet) Effects
Historical Decomposition of Aggregate Employment

- Aggregating across states:

\[
e_{t+12} - e_t = \sum_{h=1}^{12} \left\{ \frac{\beta_{ph}^*}{1 - \lambda_h} \varepsilon_{t+12-h}^p + \frac{\beta_{sh}}{1 - \lambda_h} \varepsilon_{t+12-h}^s \right\} \\
+ \sum_{i=1}^{4} \delta_i \Delta e_{t-i} + \varepsilon^e + \varphi_{t,t+12}^e
\]

- \( \Gamma_{t,t+12} \equiv (e_{t+12} - e_t) - \left( \sum_{i=1}^{4} \delta_i \Delta e_{t-i} + \varepsilon^e \right) \equiv \) unexpected 3 year employment growth

\[
\Gamma_{t,t+12} = \sum_{h=1}^{12} \left\{ \frac{\beta_{ph}^*}{1 - \lambda_h} \varepsilon_{t+12-h}^p + \frac{\beta_{sh}}{1 - \lambda_h} \varepsilon_{t+12-h}^s \right\} + \varphi_{t,t+12}^e
\]
Actual: Unexpected 3 year growth
Fitted: Component explained by financial and house price shocks
Contribution of Housing Price vs. Financial Shocks to Employment

Actual: Unexpected 3 year employment growth
Construction vs. Ex-Construction Employment: House Price vs EBP effect

Actual: Unexpected 3 year employment growth
Accounting for Regional Variation
Regional Employment: Actual vs. Fitted

Actual: Unexpected 3 year growth
Fitted: Component explained by financial and house price shocks
Actual: Unexpected 3 year employment growth
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Spillovers
What Drives Housing Prices and the EBP?

![Graphs showing Housing Prices and EBP contributions over time.](image-url)
Summary Remarks

- Present evidence on channels of financial distress to real activity during GR
- Combine cross-sectional and time series methods
  - Identify local effects of house price shocks off cross-section
  - Times series methods to identify general equilibrium effects of house price and financial shocks.
- Key findings
  - Both house price and financial shocks important in the aggregate
  - But financial shocks turned “normal” recession into GR
  - Household price channel important for regional variation
- Extensions
  - Allowing for regional heterogeneity of financial shocks
  - Structural modeling (to account better for propagation)