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 $\rightarrow$ 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

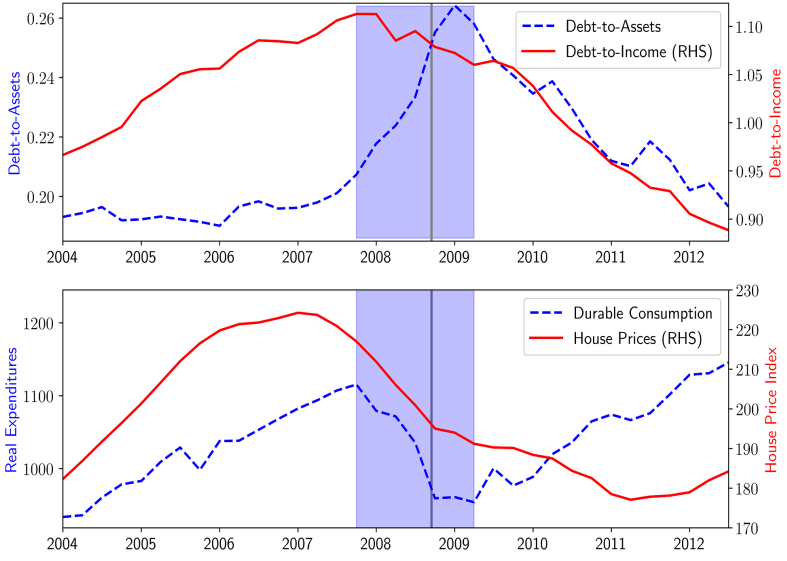
- Cross-sectional studies of Great Recession
  - Mian/Sufi 2014; Kaplan et. al. 2017, Chodorow-Reich 2014, Huber 2018
- Time series studies
  - Christiano/Eichenbaim/Trabandt 2015, Gertler/Gilchrist 2018, Bernanke 2019, Midrigan et. al.
- From micro-evidence to macro effects using models
  - Nakamura/Steinsson (2018), Hurst et. al. (2019), Beraja (2018)
- From micro-evidence to macro effects using time series identification
  - Sarto 2018

Descriptive Evidence From The Great Recession

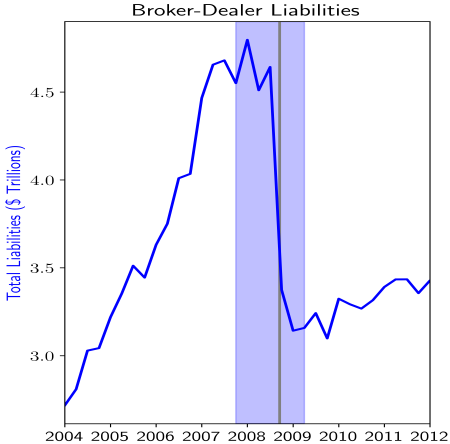
on

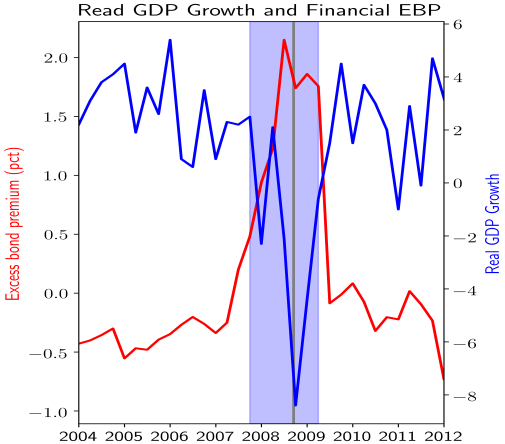
Household Balance Sheet and Banking Distress Channels

Household Balance Sheets, House Prices and Spending



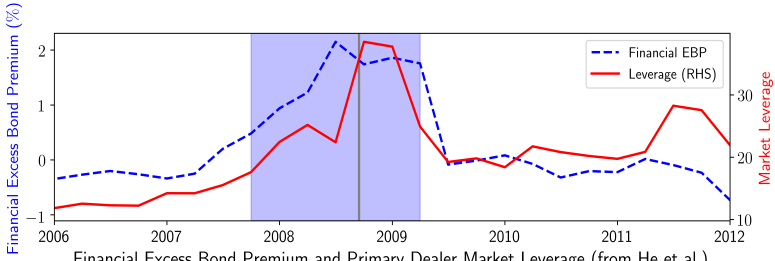
Banking Distress and Real Activity



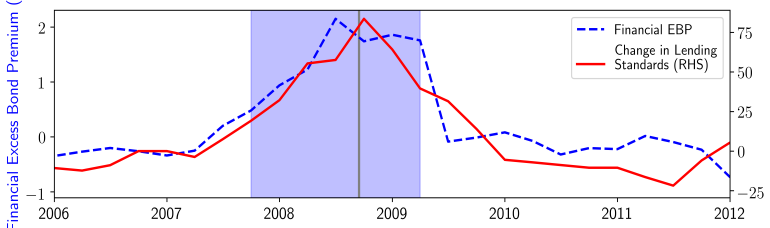


Excess Bond Premium = rate of return on corporate bonds minus return on similar maturity government bonds, with default premium removed.

(Large) Bank Market Leverage, Financial EBP and Lending Standards



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



Financial Excess Bond Premium and Commercial Bank Lending Standards

New Evidence from a Panel of State-Level Data

Starting point: Mian/Sufi (2014)

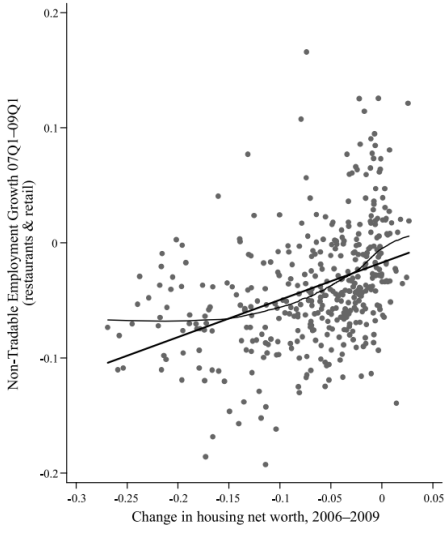
- Micro Evidence on Household Balance Sheet Channel
- Exploits regional variation in mortgage debt (MD) and house prices (HP)
- Motivation: Regions w. large buildup of MD and HP pre-crisis $\rightarrow$ large declines in HP and employment
- M/S (2014): cross-sectional regression over 2007-09

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

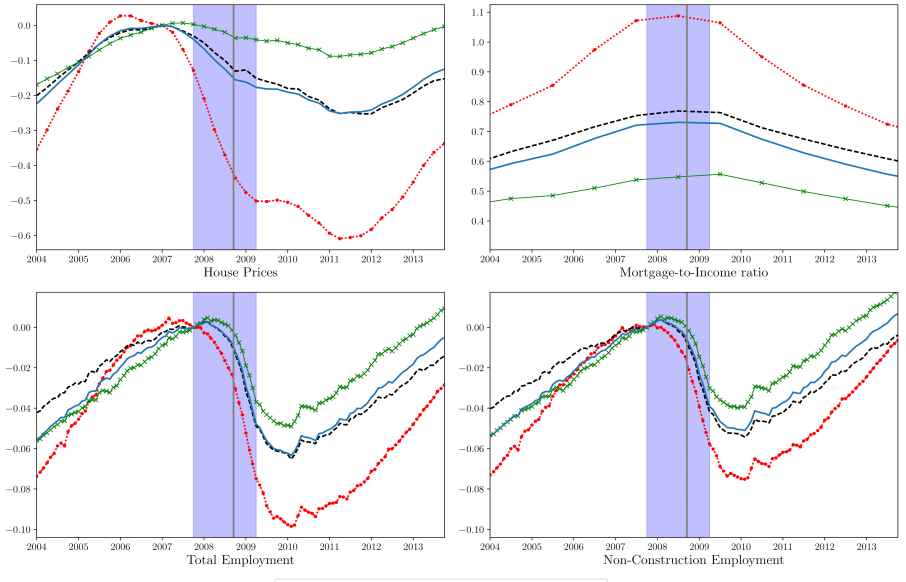
$e_i^{NT} \equiv$ nontradable employment in region i; $\quad p_i^H \equiv$ housing prices

$\frac{p_i^H H_i}{N_i^H} \equiv$ 2006 ratio of housing values to housing equity (measure of HH leverage)

Household Balance Sheet Effects on Employment (Mian/Sufi)



Regional and Temporal Variation



Panel Data VAR

- Quarterly data: 1992 -2014
- Variables
  - State-level employment growth Δe_{jt}
  - State-level house price growth Δp_{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:

$$s_t = \eta_{s0}\Delta e_t + \gamma_{s0}\Delta p_t + \sum_{i=1}^{4}\left(\alpha_{si}s_{t-i} + \eta_{si}\Delta e_{t-i} + \gamma_{si}\Delta p_{t-i}\right) + \varepsilon_t^s$$

- State-level house prices $p_{j,t}$:

$$\Delta p_{jt} = \eta_{p0}\Delta e_{jt} + \sum_{i=1}^{4}\left(\alpha_{pi}s_{t-i} + \alpha_{pi}\Delta e_{jt-i} + \gamma_{pi}\Delta p_{jt-i}\right) + \varepsilon_j^p + \varepsilon_{jt}^p$$

- Structural shocks ε_t^s and ε_{jt}^p identified via timing restrictions
  - s_t depends on $\Delta e_t = \sum \omega_j \Delta e_{jt}$ and $\Delta p_t = \sum \omega_j \Delta p_{jt}$
  - Δp_{jt} depends on Δe_{jt} but NOT s_t
  - Δe_{jt} depends Neither on Δp_{jt} Nor s_t

Aggregate Versus Idiosyncratic House Price Shocks

$\varepsilon^p_{jt} \equiv$ state housing price shock; $\varepsilon^p_t \equiv$ aggregate house price shock

- ε^p_{jt} depends on aggregate $\left(\varepsilon^p_t\right)$ and idiosyncratic $\left(\psi^p_{jt}\right)$ components.

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

with $\sum \omega_j \theta_j = 1$

- Allow for differential sensitivities of ε^p_{jt} to ε^p_t
  - e.g due to differential land supply elasticities, etc.
- ε^p_t corresponds to common factor in ε^p_{jt}
  - θ_j is state j factor loading

State Employment Growth Cond. on House Price + Financial Shocks

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

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

$$E_t\{e_{jt+h} - e_{jt} | \varepsilon^p_{jt}, \varepsilon^p_t, \varepsilon^s_t\} = \{\beta_{ph} + \beta_{mh}[I(Crisis)]M_j\}\varepsilon^p_{jt} + \beta_{sh}\varepsilon^s_t + \lambda_h E_t\{e_{t+h} - e_t | \varepsilon^p_t, \varepsilon^s_t\}$$

- Top right: Local effects of state house price and aggregate financial shocks;
  - Dummy $\rightarrow$ balance sheet effect of housing price decline (as in Mian/Sufi)
- Bottom right: $\rightarrow$ Aggregate spillovers via tradable goods

Conditional Aggregate Employment Growth

$\varepsilon_{jt}^{p} = \theta_j \varepsilon_t^{p} + \psi_{jt}^{p}; \quad \rightarrow \quad \sum_j \omega_j \varepsilon_{jt}^{p} = \varepsilon_t^{p}$ and $\sum_j \omega_j M_j \varepsilon_{jt}^{p} = \overline{M\theta}\varepsilon_t^{p} \rightarrow$

- Aggregating across states

$$E_t\left\{e_{t+h} - e_t | \varepsilon_t^{p}, \varepsilon_t^{s}\right\} = \left\{\beta_{ph} + \beta_{mh}[I(crisis)]\overline{M\theta}\right\}\varepsilon_t^{p} + \beta_{sh}\varepsilon_t^{s}$$

$$+\lambda_h E_t\left\{e_{t+h} - e_t | \varepsilon_t^{p}, \varepsilon_t^{s}\right\}$$

$\rightarrow$

$$E_t\left\{e_{t+h} - e_t | \varepsilon_t^{p}, \varepsilon_t^{s}\right\} = \frac{1}{1-\lambda_h}\left\{\left\{\beta_{ph} + \beta_{mh}[I(\text{crisis})]\overline{M\theta}\right\}\varepsilon_t^{p} + \beta_{sh}\varepsilon_t^{s}\right\}$$

- $\frac{1}{1-\lambda_h}$ is general equilibrium effect.

State Employment Growth: Local vs. Aggregate Variation

- $\widehat{\varepsilon}^{p}_{jt} \equiv$ Local house price shock for state j $\rightarrow$

$$\varepsilon^{p}_{jt} = \theta_j \varepsilon^{p}_{t} + \psi^{p}_{jt} = \varepsilon^{p}_{t} + \widehat{\varepsilon}^{p}_{jt}$$

with

$$\widehat{\varepsilon}^{p}_{jt} = (\theta_j - 1)\, \varepsilon^{p}_{t} + \psi^{p}_{jt}$$

- Conditional state employment growth:

$$E_t \left\{ e_{jt+h} - e_{jt} | \widehat{\varepsilon}^{p}_{jt}, \varepsilon^{p}_{t}, \varepsilon^{s}_{t} \right\} = \{\beta_{ph} + \beta_{mh}[I(crisis)]M_j\}\, \widehat{\varepsilon}^{p}_{jt} + \frac{1}{1-\lambda_h} \left\{ \left\{ \beta_{ph} + \beta_{mh}[I(crisis)]\overline{M\theta} \right\} \varepsilon^{p}_{t} + \beta_{sh}\varepsilon^{s}_{t} \right\}$$

Top right: Local variation; Bottom right: Aggregate variation

Estimation

- State employment growth over horizon h

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

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

- 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:

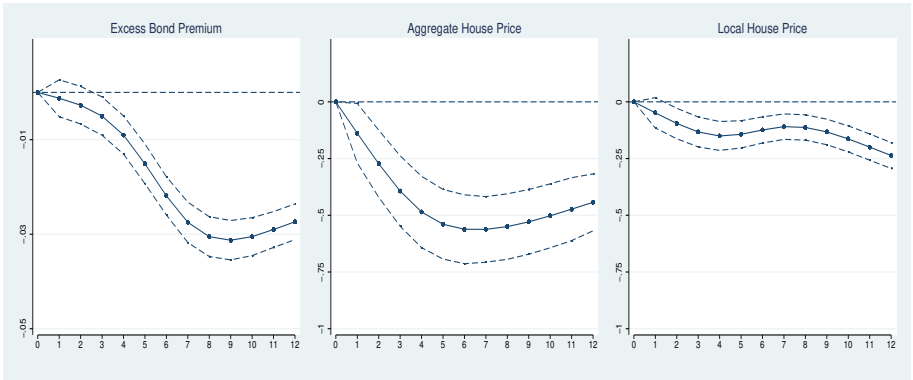
$$e_{jt+12} - e_{jt} = \sum_{h=1}^{12} \left\{ \beta^*_{jph} \widehat{\varepsilon}^p_{jt+12-h} + \frac{\beta^*_{ph}}{1-\lambda_h} \varepsilon^p_{t+12-h} + \frac{\beta_{sh}}{1-\lambda_h} \varepsilon^s_{t+12-h} \right\}$$
$$+ \sum_{i=1}^{4} \delta_i \Delta e_{jt-i} + \varepsilon^e_j + \varphi^e_{jt,t+12}$$

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

- $\{\cdot\}$ gives contribution of $\left\{ \widehat{\varepsilon}^p_{jt+12-h}, \varepsilon^s_{t+12-h}, \varepsilon^p_{t+12-h} \right\}_{h=1}^{12}$ 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 $e_{jt+12} - e_t$

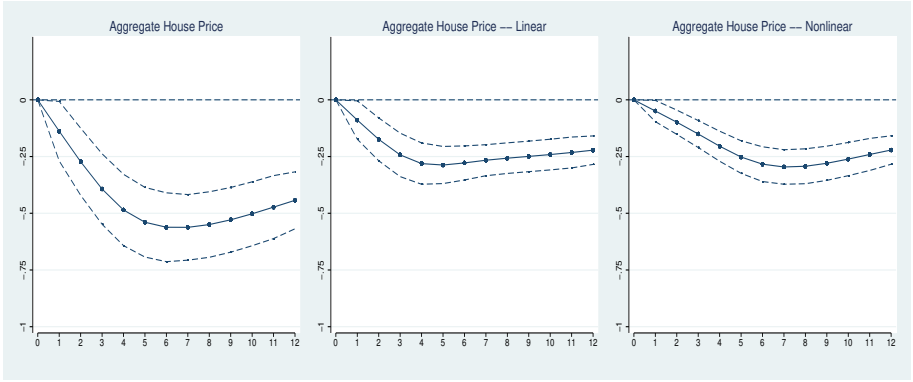
Employment Responses to Financial vs. Housing Price Shocks



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

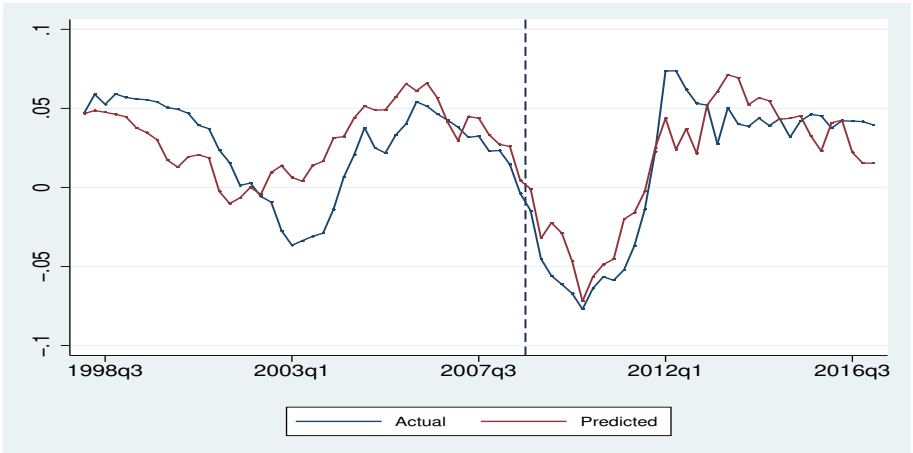
- Aggregating across states:

$$e_{t+12} - e_t = \sum_{h=1}^{12} \left\{ \frac{\beta^*_{ph}}{1-\lambda_h} \varepsilon^p_{t+12-h} + \frac{\beta_{sh}}{1-\lambda_h} \varepsilon^s_{t+12-h} \right\} + \sum_{i=1}^{4} \delta_i \Delta e_{t-i} + \varepsilon^e + \varphi^e_{t,t+12}$$

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

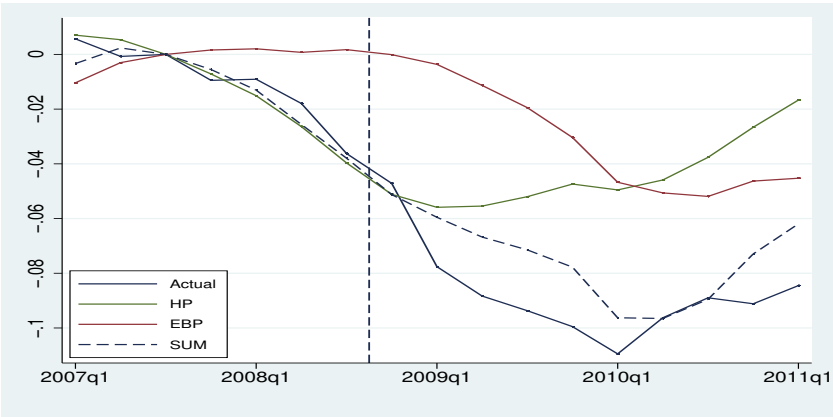
$$\Gamma_{t,t+12} = \sum_{h=1}^{12} \left\{ \frac{\beta^*_{ph}}{1-\lambda_h} \varepsilon^p_{t+12-h} + \frac{\beta_{sh}}{1-\lambda_h} \varepsilon^s_{t+12-h} \right\} + \varphi^e_{t,t+12}$$

Employment: Actual vs. Fitted



Actual: Unexpected 3 year growth
Fitted: Component explained by financial and house price shocks

Contribution of Housing Price vs. Financial Shocks to Employment

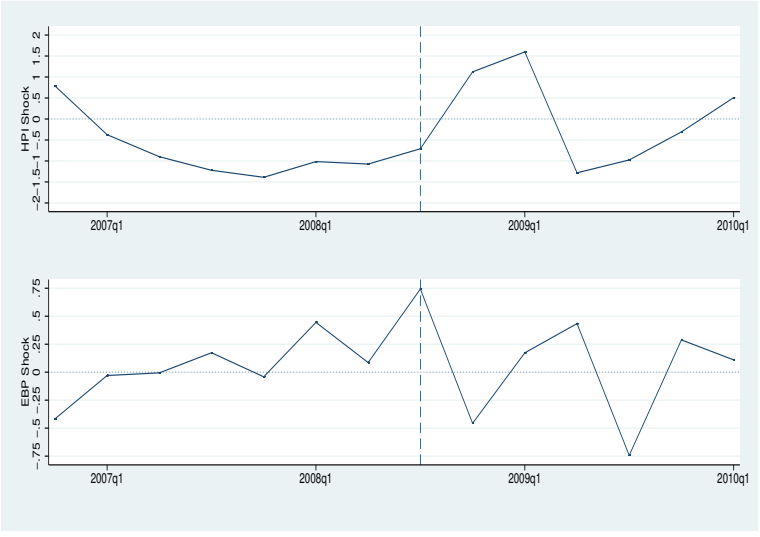


Actual: Unexpected 3 year employment growth

Construction vs. Ex-Construction Employment: House Price vs EBP effect

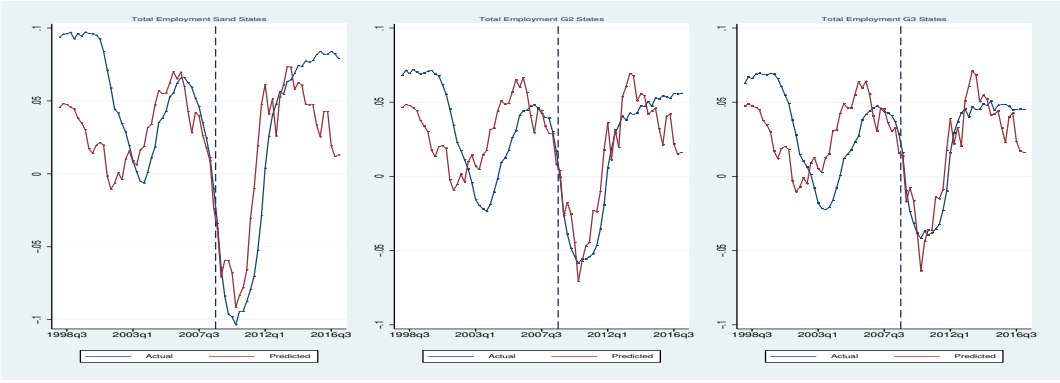
Actual: Unexpected 3 year employment growth

Aggregate Housing Price and Financial Shocks



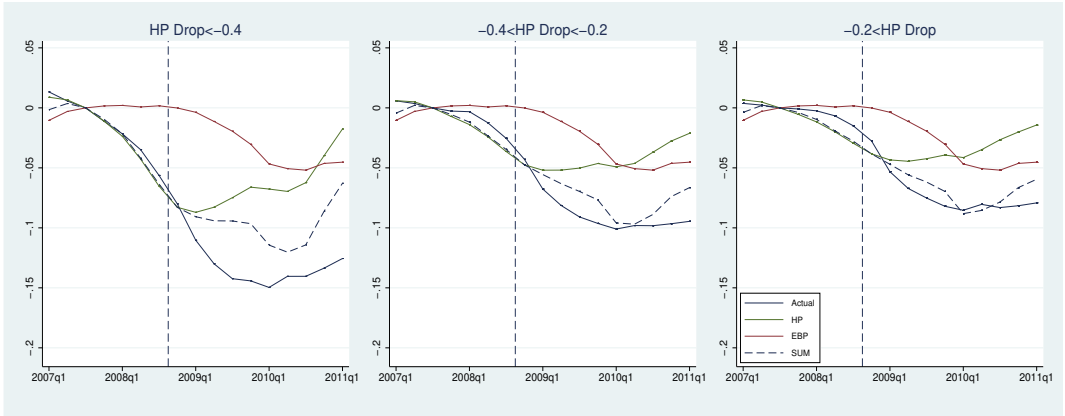
Accounting for Regional Variation

Regional Employment: Actual vs. Fitted



Actual: Unexpected 3 year growth
Fitted: Component explained by financial and house price shocks

House Price vs. Financial Shocks and Regional Employment

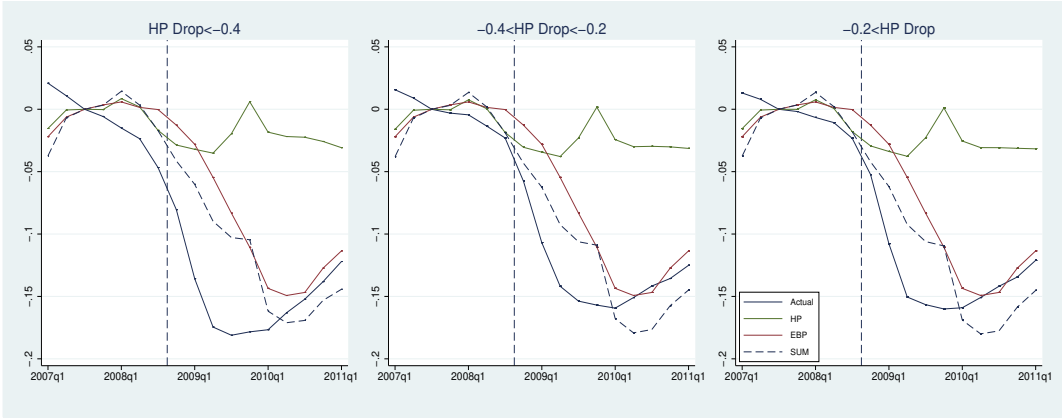


Actual: Unexpected 3 year employment growth

House Price vs. Financial Shocks and Regional Retail Employment

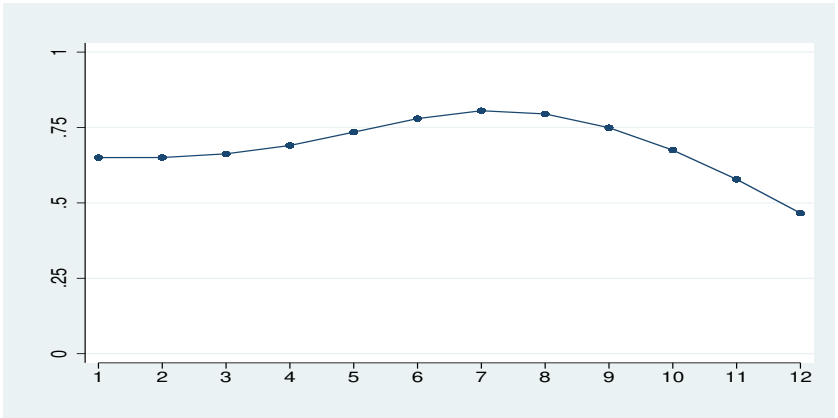
Actual: Unexpected 3 year employment growth

House Price vs Financial Shocks and Regional Manufacturing Employment

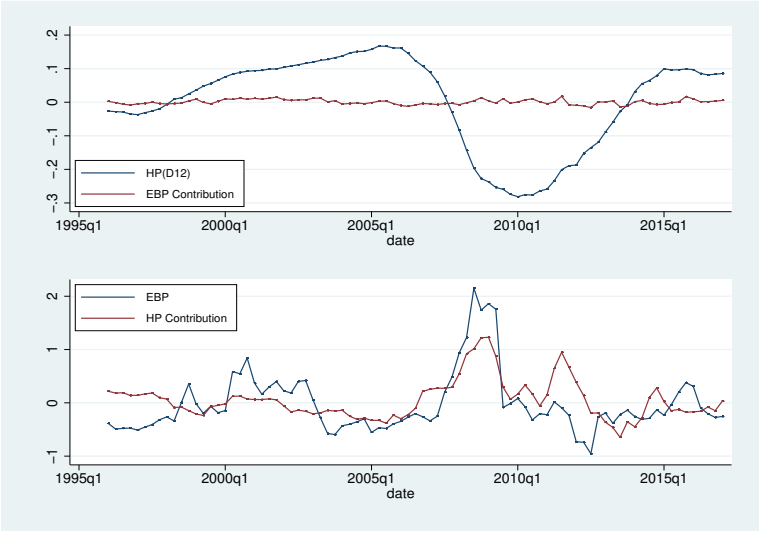


Actual: Unexpected 3 year employment growth

Spillovers



What Drives Housing Prices and the EBP?



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)