FINANCIAL SHOCKS AND JOB FLOWS

Neil R. Mehrotra¹  Dmitriy Sergeyev²

¹Brown University, Federal Reserve Bank of Minneapolis
²Bocconi University, CEPR, IGIER

Macro Financial Modeling Winter 2017 Meeting
March 9-10, 2017

The views expressed here are the views of the authors and do not necessarily represent the views of the Federal Reserve Bank of Minneapolis or the Federal Reserve System
JOB FLOWS AND THE GREAT RECESSION

Gross Job Flows Rates

Source: Business Dynamic Statistics

\[ JCR_t = \frac{1}{N_t} \sum_i \max\{0, \Delta N_{i,t}\}, \quad JDR_t = \frac{1}{N_t} \sum_i \max\{0, -\Delta N_{i,t}\} \]
WHAT WE DO?

Model

• Build heterogenous firm dynamics model with financial frictions

• Calibrate shocks to fit job flows in the Great Recession

⇒ firm credit disruption explains 18% decline in employment

Empirics

• Estimate the effects of financial shocks on job flows

⇒ In line with theoretical model predictions
ECONOMIC ENVIRONMENT

• Goods: consumption good

• Assets: capital, riskless bonds

• Technology: \( y_{i,t} = z_t \epsilon_{i,t} \left( k_{i,t}^\alpha n_{i,t}^{1-\alpha} \right)^\phi \)

• Agents: households, intermediaries, firms
FIRMS

\[ V^F(e, a, x) = \max_{k,n,a'} \int \left\{ \sigma A' a' + (1 - \sigma) V^F(e', a', x') \right\} d\Phi(x'|x) dG(e'|e) \]

s.t. \[ a' = z e \left( k^\alpha n^{1-\alpha} \right)^\phi - r_k k - \omega n + (1 + r)a \]

\[ k \leq \chi a, \quad \chi \geq 1 \]

\[ r_k = r + \delta + \omega \]

- \( x = \{z, \chi, \mu, \omega\} \) - aggregate state

- \( \Lambda \) - stochastic discount factor
FIRM LIFE CYCLE

\[ n^*(\epsilon_H) \]

\[ n(0, \chi, \epsilon_H) \]

\[ n^*(\epsilon_L) \]

\[ t \]
COMPARATIVE STATICS: FINANCIAL SHOCK

Proposition

**PE:** $N(\chi_L, w) < N(\chi_H, w), \ JD(\chi_L, w) < JD(\chi_H, w), \ JC(\chi_L, w) < JC(\chi_H, w)$

**GE:** $N(\chi_L) < N(\chi_H), \ JD(\chi_L) < JD(\chi_H), \ JC(\chi_L) < JC(\chi_H)$
STATIONARY EQUILIBRIUM CALIBRATION

Standard calibration
• $r, \alpha, \delta, \varphi$ are chosen to match standard moments

Firm-specific productivity $\epsilon_{i,t} = \bar{\epsilon}_i \tilde{\epsilon}_{i,t}$
• Distribution $f(\bar{\epsilon}_i)$ matches size distribution of mature firms employment in BDS, 2000-2006
• $\tilde{\epsilon}_{i,t}$ is set to match job flows of 15% of employment

Firm exit rates $\sigma$
• Approximate empirical age distribution of firms using BDS averages, 2000-2006

Financial parameter $\chi$ and initial assets $a_0$
• Target distribution of employment by firm age and firm size
AGGREGATE GROSS JOB FLOWS

Financial Shock

% change relative to SS

years after shock

0 5 10 15

Job Destruction
Job Creation

Productivity Shock

% change relative to SS

years after shock

0 5 10 15

Job Destruction
Job Creation
GROSS JOB FLOWS: AGE AND SIZE EFFECTS

<table>
<thead>
<tr>
<th>Job Category</th>
<th>Permanent Financial Shock</th>
<th>Permanent Productivity Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frisch = ∞</td>
<td>Frisch = 1</td>
</tr>
<tr>
<td><strong>Job Creation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Births</td>
<td>-0.12</td>
<td>-0.07</td>
</tr>
<tr>
<td>1-5 years</td>
<td>-0.47</td>
<td>-0.32</td>
</tr>
<tr>
<td>6+ years</td>
<td>-0.23</td>
<td>0.00</td>
</tr>
<tr>
<td>Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-19 emps</td>
<td>-0.07</td>
<td>0.04</td>
</tr>
<tr>
<td>20-99 emps</td>
<td>-0.33</td>
<td>-0.12</td>
</tr>
<tr>
<td>100+ emps</td>
<td>-0.35</td>
<td>-0.10</td>
</tr>
<tr>
<td><strong>Job Destruction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5 years</td>
<td>-0.07</td>
<td>-0.07</td>
</tr>
<tr>
<td>6+ years</td>
<td>-0.04</td>
<td>-0.03</td>
</tr>
<tr>
<td>Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-19 emps</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>20-99 emps</td>
<td>-0.07</td>
<td>-0.07</td>
</tr>
<tr>
<td>100+ emps</td>
<td>-0.05</td>
<td>-0.05</td>
</tr>
</tbody>
</table>
IMPULSE RESPONSE MATCHING

AGGREGATES

Job Creation

\[ \frac{\Delta \chi_t}{\chi_{t-1}} = -0.21, \quad \frac{\Delta a_{0,t}}{a_{0,t-1}} = -0.23, \quad \frac{\Delta Z_t}{Z_{t-1}} = -0.013, \quad \Delta \omega = 0.01 \]

Job Destruction

18% fall in employment is due to the firm credit channel
IMPULSE RESPONSE MATCHING

FIRM AGE CATEGORIES

Model Data (2008–2012)

Change from SS
IMPULSE RESPONSE MATCHING

FIRM SIZE CATEGORIES

Employment (small)

Employment (medium)

Employment (large)

JC (small)

JC (medium)

JC (large)

JD (small)

JD (medium)

JD (large)

change from SS

change from SS

change from SS

0 1 2 3 4 5 6 7 8 9 10

years after shock

years after shock

years after shock
EMPIRICAL STRATEGY

Effect of financial shocks on job creation and destruction?

\[ y_{it} = \beta (L) \Delta hp_{it} + \epsilon_{it} \]
\[ y_{it} \in \{ \log(\text{JobCreation}_{it}), \ \log(\text{Job Destruction}_{it}) \} \]

1. Financial shocks measure?
   - Use housing prices as proxy

2. Sufficient observations?
   - Use MSA-level variation in job flows and housing prices

3. Omitted variables?
   - OLS: time fixed effects, local business cycle measure
   - IV: Bartik approach

4. Parallel channels? [household demand channel]
   - Compare new firms vs. new establishments
### JOB FLOWS

<table>
<thead>
<tr>
<th></th>
<th>Job Creation</th>
<th></th>
<th>Job Destruction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>$\Delta hp_t$</td>
<td>0.34**</td>
<td>0.31**</td>
<td>-0.34**</td>
<td>-0.21</td>
</tr>
<tr>
<td>$\Delta hp_{t-1}$</td>
<td>0.18**</td>
<td>0.06</td>
<td>0.13**</td>
<td>-0.48**</td>
</tr>
<tr>
<td>$\Delta hp_{t-2}$</td>
<td>0.00</td>
<td>0.20**</td>
<td>0.29**</td>
<td>0.64**</td>
</tr>
<tr>
<td>Sum of coefs</td>
<td>0.53**</td>
<td>0.57**</td>
<td>0.09*</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

- Job creation falls on impact after negative shock
- The shock has a persistent effect on job creation
## Job Flows by Firm Age

<table>
<thead>
<tr>
<th>Categories</th>
<th>Job Creation</th>
<th>Job Destruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>Young Firms, 1-5 years</td>
<td>0.48**</td>
<td>0.63**</td>
</tr>
<tr>
<td>Mature Firms, 5+ years</td>
<td>0.33**</td>
<td>0.31**</td>
</tr>
<tr>
<td>H = Young - Mature</td>
<td>0.15**</td>
<td>0.36**</td>
</tr>
</tbody>
</table>

- Job creation by new/young firms falls the most after negative shock.
- Job destruction at young firms falls after a decline in house prices.
## JOB FLOWS BY FIRM SIZE

<table>
<thead>
<tr>
<th>Categories</th>
<th>Job Creation</th>
<th>Job Destruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>Small Firms, 1-19 emps</td>
<td>0.37**</td>
<td>0.25**</td>
</tr>
<tr>
<td>Medium Firms, 20-99 emps</td>
<td>0.75**</td>
<td>0.73**</td>
</tr>
<tr>
<td>H = Medium - Young</td>
<td>0.38**</td>
<td>0.49**</td>
</tr>
</tbody>
</table>

- Job creation falls disproportionately at medium-sized firms
- Job destruction *rises* at small firms consistent with model predictions
CONCLUSION

1. Firm dynamics model

   - Use job flows to decompose sources of fall in employment in US
   - Firm credit channel accounts for 18% of decline in employment

2. Empirics

   - House price changes affect job flows in line with model predictions
   - Strongest effects for young and medium-sized firms
   - New establishments of existing firms do not significantly react to housing price changes while new firms do