Motivation

Reduced-Form

Model

Transitory/Permanent

Estimation

Estimating Labor Market Rigidities with Heterogeneous Firms

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Outline

1. Motivation
2. Reduced-Form
3. Model
4. Transitory/Permanent
5. Estimation
Motivation

The analysis of panel data on individual firms reveals:

- Importance of idiosyncratic shocks

  over 10% of existing jobs are destroyed (created) each year
  
  (Davis and Haltiwanger (1999))
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- Importance of idiosyncratic shocks
  over 10% of existing jobs are destroyed (created) each year
  *(Davis and Haltiwanger (1999))*

- Enormous amount of heterogeneity in firm-level productivity
  *In the typical 4-digit industry, the 1st-decile producer is more than 2 times less productive than the last decile producer*
The analysis of panel data on individual firms reveals:

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  \[ \begin{align*}
  \text{(Davis and Haltiwanger (1999))}
  \end{align*} \]

- Enormous amount of heterogeneity in firm-level productivity
  In the typical 4-digit industry, the 1st-decile producer is more than 2 times less productive than the last decile producer

- Benefits to Reallocation are Large
  equalizing marginal productivity of labor and capital across plants would boost aggregate total factor productivity by around 30 – 40% in the U.S. manufacturing sector and even more in China and India \( \text{(Hsieh and Klenow (2009, QJE))} \)
Important Impediments to the Reallocation of Labor:

1. Adjustment Costs to Labor
   - institutional, e.g. employment protection legislation
   - technological, e.g. reduced efficiency during adjustment

2. Wages Flexibility
   - reduces the incentives to adjust the workforce
Employment and Wages Flexibility

Why modelling both?
- Intensity of labor reallocation is remarkably similar in France and in the US

Surprising? NO
(intuition from Bertola and Rogerson (1997))
- Employment Protection Reduces Labor Reallocation
- Wage Rigidities Increase Labor Reallocation
Firms face both Permanent and Transitory Shocks to Business Conditions

- How are Employment and Wages Reacting to these Shocks?
- firm dynamics literature typically assumed an $AR(1)$ process
My Contributions:

- **Reduced-Form Analysis:**
  1. Transitory shocks to output have a strong effect on wages
  2. Permanent shocks have a small effect on wages

- Simple structural model of the firm that can explain these dynamics
  1. Decreasing return to labor / imperfect competition
  2. Labor adjustment costs
  3. Surplus sharing between the firm and its workers

- Estimation by Indirect Inference
Estimation Results:

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- Adjustment Costs are Estimated to be Relatively Modest (about 1 month of wages)
- Worker Bargaining Power is 45%
- Adjustment Costs alone cannot explain the high dispersion of labor productivity
- Differences in Technology and Market Power across firms can
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Data

Panel of French Firms
- accounting data for the manufacturing sector
- 7 Years of Observations: 1994 - 2000
- over 2500 firms of more than 100 employees

Important Variables
- Value-Added
- Employment
- Labor Costs
Joint dynamics of Output and Wages

\[ \Delta y_{it} = \zeta_{it} + \Delta \nu^y_{it} + \Delta r^y_{it} \]
\[ \Delta w_{it} = \tau \zeta_{it} + \phi \Delta \nu^y_{it} + \Delta r^w_{it} + \zeta^w_{it} \]

- \( \zeta \): permanent shock
- \( \nu \): transitory shock
- \( r \): measurement error
- \( \tau \): transmission of permanent sales shock to wages
- \( \phi \): transmission of transitory sales shock to wages
Estimation Results

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$\tau$</td>
<td>$\phi$ (lower bound)</td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>0.0076</td>
<td>0.5708</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0101)</td>
<td>(0.0713)</td>
<td></td>
</tr>
<tr>
<td>EWMD</td>
<td>0.0073</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0106)</td>
<td></td>
<td></td>
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</tbody>
</table>

Variance Decomposition

\[
\begin{array}{l|lll}
\tau^2 \sigma^2_{\zeta y} & \phi^2 \sigma^2_{\nu y} + \sigma^2_{r w} & \sigma^2_{\zeta w} \\
0.15\% & 86.38\% & 13.47\% \\
\end{array}
\]

Table: Estimation using Minimum Distance with Identity Matrix
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\[ \pi = \left( e^{\varepsilon^T A} \right)^{1-\alpha} (n_t + d_t)^{\alpha} - w(A, \varepsilon^T, n + d)(n_t + d_t) - c|d_t| \]

- \( A \): exogenous profitability follows a random walk
- \( \varepsilon^T \): transitory shock
- \( n_t \): Employment
- \( d_t \): job creation and destruction
- \( \alpha \): decreasing returns and/or market power
- \( w \): wage
- \( c \): constant cost of creating and destroying jobs
Figure: Optimal Decision rule conditional on Shocks
Nash bargaining with multiple workers (Stole and Zwiebel (1996))

- Costless renegotiation every period - no long term contract
- Sequence of bilateral negotiations between the firm and its employees where each is regarded as the marginal worker
- Worker outside option is unemployment benefits
- Firm outside option is producing with one worker less

Surplus Sharing rule:

\[
(1 - \gamma) \left[ w(A, \epsilon^T, n) - b \right] = \gamma \pi_n(A, n)
\]
The wage function writes:

\[
\begin{align*}
    w(A, \epsilon^T, n) & = (1 - \gamma) b + \frac{\gamma \alpha}{1 - \gamma (1 - \alpha)} \left( e^{\epsilon^T A} \right)^{1-\alpha} n^{\alpha-1}
\end{align*}
\]
<table>
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<tr>
<td>5</td>
<td>Estimation</td>
</tr>
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</table>
Figure: Response to Shocks - Baseline Calibration
Intuition:

- A transitory shock only changes today’s profits while a permanent shock changes both today’s profits and expected future profits.
- Because of adjustment costs, the firm then decides to not create or destroy much jobs following a transitory shock labor productivity remains high and so wages increase.
- Permanent shocks lead to more employment changes. Since there are decreasing returns to labor, the variations of labor productivity and thus the variations of wages are smaller.
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<tr>
<th>Parameters</th>
<th>Homogeneous Model</th>
<th>3-Types Model</th>
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</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>0.1964 (0.0020)</td>
<td></td>
</tr>
<tr>
<td>$b$</td>
<td>0.0420 (0.0034)</td>
<td></td>
</tr>
<tr>
<td>$\alpha_1$</td>
<td></td>
<td>0.1682 (0.0187)</td>
</tr>
<tr>
<td>$\alpha_2$</td>
<td></td>
<td>0.2303 (0.0106)</td>
</tr>
<tr>
<td>$\alpha_3$</td>
<td></td>
<td>0.2660 (0.0142)</td>
</tr>
<tr>
<td>$b_1$</td>
<td></td>
<td>0.0449 (0.0036)</td>
</tr>
<tr>
<td>$b_2$</td>
<td></td>
<td>0.0377 (0.0034)</td>
</tr>
<tr>
<td>$b_3$</td>
<td></td>
<td>0.0337 (0.0037)</td>
</tr>
</tbody>
</table>

**Table:** Structural Parameters Estimates
\( \alpha \) is estimated lower than typical values in production function estimation

\( \alpha \) is not the labor share

implied labor share: 0.51

If \( c = 0 \), labor share is:

\[
\frac{\alpha}{1 - \gamma(1 - \alpha)}
\]
• \( \alpha \) is estimated lower than typical values in production function estimation

• \( \alpha \) is not the labor share
  implied labor share: 0.51

If \( c = 0 \), labor share is:

\[
\frac{\alpha}{1 - \gamma(1 - \alpha)}
\]

• value of unemployment: 500 - 713 euros per months
  minimum wage is about 900 euros over the period 1994-2000
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<th>3-Types Model</th>
</tr>
</thead>
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<tr>
<td>$c$</td>
<td>0.0094 (0.0031)</td>
<td>0.0087 (0.0010)</td>
</tr>
<tr>
<td>($\sim$1 month of wages)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\gamma$</td>
<td>0.4469 (0.0346)</td>
<td>0.4509 (0.0122)</td>
</tr>
<tr>
<td>$\sigma_{\epsilon P}$</td>
<td>0.1759 (0.0025)</td>
<td>0.1727 (0.0029)</td>
</tr>
<tr>
<td>$\sigma_{\epsilon T}$</td>
<td>0.0805 (0.0026)</td>
<td>0.0867 (0.0031)</td>
</tr>
<tr>
<td>$\sigma_{MRN}$</td>
<td>0.0183 (0.0081)</td>
<td>0.0268 (0.0016)</td>
</tr>
<tr>
<td>$\sigma_{MRO}$</td>
<td>0.0531 (0.0022)</td>
<td>0.0561 (0.0028)</td>
</tr>
<tr>
<td>$\sigma_{MRW}$</td>
<td>0.0446 (0.0025)</td>
<td>0.0452 (0.0017)</td>
</tr>
</tbody>
</table>

**Table:** Structural Parameters Estimates (std. dev)
### Interpretation

<table>
<thead>
<tr>
<th>Motivation for Exiting Employment</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of a Short-Term Contract</td>
<td>57.2%</td>
</tr>
<tr>
<td>Voluntary Quit</td>
<td>17.3%</td>
</tr>
<tr>
<td>Layoff for Non-Economic Motives</td>
<td>5.5%</td>
</tr>
<tr>
<td>Layoff for Economic Motives</td>
<td>0.9%</td>
</tr>
<tr>
<td>End Essay-Period</td>
<td>3.63%</td>
</tr>
<tr>
<td>Retirement</td>
<td>2.7%</td>
</tr>
<tr>
<td>Other</td>
<td>12.7%</td>
</tr>
</tbody>
</table>

**Table:** Source: DARES - September 2008
Firm Heterogeneity

\[
\log p_{it} = \mu + \varphi_t + \eta_i + \nu_{it}
\]

<table>
<thead>
<tr>
<th>Log-Productivity</th>
<th>Data</th>
<th>Homogeneous</th>
<th>3-Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Firm Variance</td>
<td>0.1291</td>
<td>&lt; 0.0001</td>
<td>0.1104</td>
</tr>
<tr>
<td>Within-Firm Variance</td>
<td>0.0372</td>
<td>0.0301</td>
<td>0.0305</td>
</tr>
</tbody>
</table>
Conclusion

- Permanent Shocks to Output are the most important one, very small impact on wages, affect employment
- Transitory Shocks to Output transmit to Wage, impact less employment
- A Model of both Employment and Wages Dynamics that can account for these dynamics
- Adjustment are relatively modest (about one month of wages)
- Productivity dispersion can be explained by technology differences and not adjustment costs
THANK YOU !