Monetary Policy and Resource Mobility
200th Anniversary of the Bank of Finland

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Understanding costly resource mobility is important:

- In U.S. – for understanding whether recent high unemployment is structural in nature because of the inability of labor resources to shift quickly between uses.
- In EU – for understanding how the flow of resources among member countries affects EU-wide developments and inflation.

DSGE policy models:

- Costly to adjust prices but labor and capital can move between firms without cost.
  - Perfectly integrated financial markets, perfect mobility of labor within members but absolute immobility across member states.
Figure: Employment shares in construction, manufacturing, professional and business services, educational and health services, leisure and hospitality services, and government (1985:1 = 1). These sectors account for just under 70% of U.S. total employment. Shaded regions denote NBER business cycle recessions.
Key questions

1. How important is resource mobility for the transmission mechanism of monetary policy?

2. How important is resource mobility for the objectives of monetary policy?

- Resource mobility will matter for both.
- Focus will be on labor mobility to illustrate this conclusion.
Outline of talk

- Evidence on sectoral reallocation and unemployment:
  - Revisit Lilien (1982), Abraham and Katz (1986);
  - JOLTS data on vacancies.

- Role of costly labor adjustment in four illustrative models:
  - Quadratic costs;
  - Search model with one sector;
  - Search with skill heterogeneity;
  - Search model with two sectors.

- Implications for policy.
Sectoral dispersion and unemployment

- Does increased sectoral dispersion lead to a raise in average unemployment?
- If it does, does this mean some of the rise in U.S. unemployment represents a rise in structural unemployment – i.e., a rise in the natural rate?
- Or, does a cyclical rise in unemployment lead to an increase in sectoral dispersion?
Sectoral dispersion and unemployment was a topic of debate in the 1980s.

- Lilien (1982)
- Abraham and Katz (1986)

Lilien’s index of dispersion:

\[ \sigma_t = \left[ \sum_{i=1}^{K} \left( \frac{e_{i,t}}{e_t} \right) (\Delta \log e_{i,t} - \Delta \log e_t)^2 \right]^{1/2}. \]
Figure: The civilian unemployment rate, the vacancy rate, and sectorial dispersion (right scale); monthly, U.S. data, 1985:1-2010:1. The dispersion measure is a 12-month moving average.
Sectoral dispersion, unemployment, and vacancies
Abraham and Katz (1986) regressions

Table 1A
U.S.: Monthly 2000:12-2010:09

<table>
<thead>
<tr>
<th></th>
<th>Unemployment rate</th>
<th>Vacancy rate</th>
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</thead>
<tbody>
<tr>
<td>$a_0$</td>
<td>0.31**</td>
<td>-0.16</td>
</tr>
<tr>
<td>$a_1$</td>
<td>-0.29**</td>
<td>0.09</td>
</tr>
<tr>
<td>$b_1$</td>
<td>1.01**</td>
<td>0.82**</td>
</tr>
<tr>
<td>$\sum_{i=1}^{4} c_i$</td>
<td>0.01</td>
<td>-0.00</td>
</tr>
</tbody>
</table>

** Significant at the 5% level; * Significant at the 10% level.
### Sectoral dispersion, unemployment and vacancies

**Abraham and Katz (1986) regressions**

#### μ = α0 + α1σ + Σciπ_i

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coefficient</th>
<th><em>Significance</em></th>
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</thead>
<tbody>
<tr>
<td>a0</td>
<td>0.24**</td>
<td></td>
</tr>
<tr>
<td>a1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Σci</td>
<td>-0.17**</td>
<td>0.06*</td>
</tr>
</tbody>
</table>

**Significant at the 5% level; * Significant at the 10% level.**
Using JOLTS data, sectoral dispersion is associated with higher unemployment, consistent with Lilien’s earlier findings.

Vacancies are negatively (but not statistically significantly) related to sectoral dispersion;

- This is evidence that the sectoral dispersion index is just reflecting cyclical factors;
- But, weaker evidence against Lillien’s hypothesis than found by Abraham and Katz.
Models of costly labor allocation

- Role of costly labor adjustment in four illustrative models:
  1. Quadratic costs of adjusting employment;
  2. Search model with one sector;
  3. Search with skill heterogeneity – composition effects;
  4. Search model with two sectors – costly sectoral reallocation.
Example 1: Quadratic costs of adjusting labor
Lechthaler and Snower (2011)

- Costs of employment adjustment:

\[
\frac{\Psi}{2} \left( \frac{L_t}{L_{t-1}} - 1 \right)^2 Y_t
\]

- Inflation is

\[
\pi_t = \beta E_t \pi_{t+1} + \left( \frac{\sigma + \varphi}{\Phi} \right) x_t + \left( \frac{\Psi}{\Phi} \right) (\Delta x_t - \beta E_t \Delta x_{t+1}) + \left( \frac{1}{\Phi} \right) \mu_t;
\]

where \( q_t \) is real marginal cost, \( \mu_t \) is a markup shock, \( \Phi \) measures the cost of price adjustment, and \( \Psi \) is the cost of adjusting employment.

- Welfare is maximized if the central bank minimizes

\[
L_t \equiv \pi_t^2 + \left( \frac{\sigma + \varphi}{\Phi} \right) x_t^2 + \left( \frac{\Psi}{\Phi} \right) \Delta l_t^2
\]
Response to a markup shock: optimal commitment

**Figure:** Optimal response under commitment to a markup shock in the quadratic costs of adjustment model.
Outcomes under Taylor rule and optimal policy

Table 3: Effects of $\Psi$: Welfare loss

<table>
<thead>
<tr>
<th>$\Psi$</th>
<th>$\sigma_x$</th>
<th>$\sigma_\pi$</th>
<th>$\sigma_x$</th>
<th>$\sigma_\pi$</th>
<th>$\sigma_x$</th>
<th>$\sigma_\pi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.57</td>
<td>1.73</td>
<td>3.44</td>
<td>3.44</td>
<td>4.74</td>
<td>0.49</td>
</tr>
<tr>
<td>1.85</td>
<td>2.35</td>
<td>0.89</td>
<td>2.21</td>
<td>1.18</td>
<td>2.37</td>
<td>0.17</td>
</tr>
<tr>
<td>4.0</td>
<td>1.50</td>
<td>0.56</td>
<td>1.47</td>
<td>0.46</td>
<td>1.49</td>
<td>0.09</td>
</tr>
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</table>

- More costly labor adjustment reduces output and inflation volatility, but inflation volatility declines more.
Example 2: Costly labor market search
Ravenna and Walsh (2011)

- Mortensen and Pissarides search and matching model.
- Phillips curve takes the form

\[ \pi_t = \beta E_t \pi_{t+1} - \alpha_1 \tilde{u}_t + \alpha_2 \tilde{r}_t + \epsilon_t. \]

  - Interest rate channel because labor costs depend on the PDV of a match.
- Social loss is

\[ L_t = \pi_t^2 + \lambda_0 \tilde{x}_t^2 + \lambda_1 \tilde{\theta}_t^2 \]

  where \( \tilde{\theta} \) is labor market tightness (all variables expressed relative to their efficient levels).
- Weight on labor market tightness is smaller when labor market is characterized by less turnover.
Shifting Beveridge curve

The Beveridge Curve shifted out in the Great Recession

Figure: The U. S. Beveridge Curve
Decline in vacancy yield

Figure: The U.S. unemployment rate, the vacancy rate, and the hiring yield (right scale).
Decline in vacancy yield

![Graph showing decline in vacancy yield](image)

**Figure:** The hiring yield and forecasted yield based on labor market tightness (V/U). Forecast obtained from an OLS regression of the yield on a constant and V/U, 2000:12 - 2009:12.
Example 3: Skill heterogeneity

Ravenna and Walsh (2010)

- Low skill and high skill workers.
- Low skill worker more likely to experience job separation.
- In a recessions, the skill mix of the unemployed shifts towards low skill workers:
  - Reduces the vacancy yield rate as firms see more job applicants they don’t want to hire.
  - Reduces incentive for firms to post vacancies.
Example 4: Sector heterogeneity

- Two sectors, hiring costs are higher if worker previously employed in the other sector.
- Matches depend on composition of unemployed:
  \[ M_t^s = (v_t^s)^a u_t^{1-a} g(\lambda_t^s); \ g' \geq 0 \]
  where \( \lambda_t^s \) is the fraction of the unemployment who last worked in sector \( s \).
- Hiring costs also depend on \( \lambda_t^s \).
Sector heterogeneity and costly labor search
A common productivity shock

Figure: Impulse responses to a serially correlated productivity shock to both sectors.
Sector heterogeneity and costly labor search

A sector specific productivity shock

Figure: Impulse responses of hours and employment to a negative productivity shock only to sector 1.
Summary and implications:

- Current DSGE policy models minimize costs of labor reallocation.
- The Great Recession in the U.S. does not overturn earlier conclusions about the link between sectoral dispersion and unemployment.
  - Evidence from Beveridge Curve and decline in vacancy yield suggests mismatch of workers and job openings may have increased.
- When labor reallocation is costly, the economy’s dynamics and the cost of fluctuations are affected.
  - Role for labor market objectives.
  - Low turnover in labor markets can raise the importance of inflation stability.
- Composition effects may be important for macro dynamics and therefore for policy objectives and for designing monetary policy.
- These general conclusions will apply to other factors of production and to other situations in which there are costs of adjustment that reflect the imperfect mobility of resources.
Figure: Optimal response under discretion to a markup shock in the quadratic costs of adjustment model
Outcomes with loss function fixed

Table 2: Effects of $\Psi$: Fixed loss

<table>
<thead>
<tr>
<th>$\Psi$</th>
<th>$\sigma_x$</th>
<th>$\sigma_\pi$</th>
<th>$\sigma_x$</th>
<th>$\sigma_\pi$</th>
<th>$\sigma_x$</th>
<th>$\sigma_\pi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.57</td>
<td>1.73</td>
<td>3.44</td>
<td>3.44</td>
<td>4.74</td>
<td>0.49</td>
</tr>
<tr>
<td>1.85</td>
<td>2.35</td>
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<tr>
<td>4.0</td>
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<td>0.56</td>
<td>1.44</td>
<td>0.80</td>
<td>1.50</td>
<td>0.08</td>
</tr>
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</table>
Figure: Responses to a one standard deviation bargaining shock for U.S. (solid line) and EU (dotted line) calibrations. (π and θ scaled in percentage point deviations from steady state; unemployment scaled as percentage points of total labor force).
Figure: Skill heterogeneity: response to a negative productivity shock: Job finding and screening rates