Unemployment (Fears), Precautionary Savings, and Aggregate Demand

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What we do

Show that the interaction between

1. One friction in financial markets: incomplete risk sharing

2. Two frictions in labor markets:
   - sticky nominal wages: \( \frac{dW}{dP} < 1 \)
   - matching

   can

   - give rise to "aggregate demand" like propagation from supply shocks

   - lead to novel policy implication regarding unemployment insurance (UI)
Interaction of two frictions key

- Complete risk sharing $\implies$ Sticky nominal wages **dampen** effect shocks

- Flexible nominal wages $\implies$ Incomplete risk sharing **dampens** effect shocks

- Both shocks **magnify** effect shocks
Key components behind these results

- Aggregate risk
  - UI policy implications different without aggregate risk

- Asset price volatility

- Portfolio rebalancing towards liquid/unproductive asset during recession

- Nonlinearities induced by standard matching framework
Four cases

1. Complete markets and flexible wages
2. Complete markets and sticky wages
3. Incomplete markets and flexible wages
4. **Benchmark:** Incomplete markets and sticky wages
Case 1: flexible wages & complete markets

usual matching stuff:

- productivity $\downarrow \implies$
- expected future productivity $\downarrow \implies$
- job creation $\downarrow \implies$
- employment rate $\downarrow \implies$
- unemployment rate $\uparrow \implies$
- expected duration unemployment $\uparrow$
Case 2: Sticky nominal wages & complete markets

- productivity $\downarrow \implies$
- **Upward** pressure on prices $\implies$
  - downward pressure on *real* wages $\implies$
  - nominal wage rigidity **dampens** shocks!
Case 3: Flexible nominal wages & incomplete markets

- productivity ↓  ⟺
- investment in job creation ↓  ⟺
- unemployment ↑  ⟺
- idiosyncratic risk ↑  ⟺
- precautionary savings ↑  ⟺
- reduction in job creation is smaller  ⟺
- incomplete markets **dampens** shocks
Case 4: Sticky nominal wages & incomplete markets

- Incomplete markets: Precautionary savings $\uparrow$ when unemp $\uparrow$ $\implies$
- precautionary demand for money $\uparrow$ $\implies$
- **downward** pressure on $P \implies W/P \uparrow$ (sticky $W$) $\implies$
- job creation investment $\downarrow$ **by more not by less!** $\implies$
- unemployment rate $\uparrow$ $\implies$
- precautionary savings $\uparrow$ $\implies$ etc.
- $\implies$ **deflationary spiral**

Risk for unemployed $\implies$ procyclical $W/P \implies$ volatile asset prices
Main results

1. Incomplete markets together with sticky wages amplify shocks, but on their own repress shocks.

2. Increase in unemployment insurance from 50% to 55% \( \implies \) everybody better off

   - not true in economy without aggregate risk
Model: Key ingredients

1. Heterogeneous households and incomplete markets
2. Nominal wages do not respond 1-for-1 with $P$
3. Search frictions in the labor market
4. \# jobs = \# firms = \# shares
Existing firms

- One-worker firms

- Profits are given by

\[ D_t = P_t \exp(z_t) - W_t \]
\[ W_t = \omega_0 \left( \frac{z_t}{\bar{z}} \right)^{\omega_z} \bar{z} \left( \frac{P_t}{\bar{P}} \right)^{\omega_p} \bar{P} \]

- Key parameter is \( \omega_p \leq 1 \)
- Active firms do not make decisions
Individual households

- one-worker households

- employed workers earn nominal wage \((1 - \tau_t) W_t\)

- unemployed earn \(\mu (1 - \tau_t) W_t\) & search for jobs

- idiosyncratic risk
  - exogenous job loss probability, \(\delta\)
  - lower chance of getting a job in a recession

- agents can save/invest in
  - unproductive asset: money, \(M_{i,t}\)
  - productive asset: equity, \(q_{i,t} \geq 0\) (i.e., firm ownership/jobs)
Individual households

\[
\max \mathbb{E}_t \left[ \sum_{j=0}^{\infty} \beta^j \left( \left( \frac{1 - \gamma}{c_{i,t+j} - 1} \right) + \chi \left( \frac{M_{i,t+1+j}}{P_{t+j}} \right)^{1 - \zeta} - 1 \right) \right]
\]

with respect to

\[
P_t c_{i,t} + J_t (q_{i,t+1} - (1 - \delta) q_{i,t}) + M_{i,t+1} = (1 - \tau_t) W_t e_{i,t} + \mu (1 - \tau_t) W_t (1 - e_{i,t}) + D_t q_{i,t} + M_{i,t}
\]

and

\[q_{i,t+1} \geq 0\]
First-order conditions

\[
\frac{J_t}{P_t} = \beta \mathbb{E}_t \left[ \left( \frac{c_{i,t+1}}{c_{i,t}} \right)^{-\gamma} \left( \frac{D_{t+1}}{P_{t+1}} + (1 - \delta) \frac{J_{t+1}}{P_{t+1}} \right) \right]
\]

\[
c_{i,t}^{-\gamma} = \beta \mathbb{E}_t \left[ \frac{P_t}{P_{t+1}} c_{i,t+1}^{-\gamma} \right] + \chi \left( \frac{M_{i,t}}{P_t} \right)^{-\zeta}
\]

- Marked departure from literature: Individual MRS is used in both Euler equations
- Inequality constraints ignored here
Equity market equilibrium

\[ h_t + \int_{i \in A_-} ((1 - \delta) q_i - q(e_i, q_i, M_i; s_t)) dF_t(e_i, q_i, M_i) \]

Equity creation

\[ = \int_{i \in A_+} (q(e_i, q_i, M_i; s_t) - (1 - \delta) q_i) dF_t(e_i, q_i, M_i) \]

Equity sold

Equity bought

with

\[ A_- = \{ i : q(e_i, q_i, M_i; s_t) - (1 - \delta)q_i \leq 0 \}, \]

\[ A_+ = \{ i : q(e_i, q_i, M_i; s_t) - (1 - \delta)q_i \geq 0 \}, \]

"go to equity supply derivation"
Employment

\[ q_t = \int_{i \in A^+} q(e_i, q_i, M_i; s_t) \, dF_t(e_i, q_i, M_i) + \int_{i \in A^-} q(e_i, q_i, M_i; s_t) \, dF_t(e_i, q_i, M_i) \]

\[ = (1 - \delta) q_{t-1} + h_t \]
Money market equilibrium

- Equilibrium

\[
\int_{i \in B^-} (M_i - M(e_i, q_i, M_i; s_t)) \, dF_t (e_i, q_i, M_i) \quad \text{Money sold}
\]

\[
= \int_{i \in B^+} (M(e_i, q_i, M_i; s_t) - M_i) \, dF_t (e_i, q_i, M_i) \quad \text{Money bought}
\]

- Money supply, \(\bar{M}\), is constant in the benchmark economy.
Government

\[ \tau_t q_t W_t = (1 - q_t) \mu (1 - \tau_t) W_t \]

\[ \tau_t = \mu \frac{(1 - q_t)}{q_t + \mu (1 - q_t)} \]
Calibration

- $\omega_P$ : range of values

$$W_t = \omega_0 \left( \frac{z_t}{\bar{z}} \right)^{\omega_z} \bar{z} \left( \frac{P_t}{\bar{P}} \right)^{\omega_P} \bar{P}$$

- One-year post-displacement consumption drop is 34% (Kolsrud, Landais, Nilsson, & Spinnewijn 2015; Sweden)

- Expected unemployment duration 3.57 quarters
MODEL PROPERTIES
Money holdings upon displacement
Amount invested in liquid asset
BUSINESS CYCLES
IRFs with sticky nominal wages

Output and productivity (dashed line)

Employment

Asset prices

Price level
IRFs with flexible nominal wages

Output and productivity (dashed line)

Employment

Asset prices

Price level
UNEMPLOYMENT INSURANCE
Unemployment Insurance

Two unemployment insurance (UI) experiments

1. Compare economies with different replacement rates
2. Unexpectedly increase replacement rate and take into account transition

Two ways to deal with effect on wages

1. Wage rule not affected
2. Wage rule is adjusted to keep same implied Nash bargaining weights
Unemployment insurance

**Mechanism emphasized in the literature**

Replacement rate $\uparrow \implies$

1. Agents better insured $\implies$ savings $\downarrow$ $\implies$ employment $\downarrow$

2. Through bargaining wage $\uparrow \implies$ employment $\downarrow$

**This also happens in our model too, but ...**
Mean employment rate and higher UI

... there is a strong countervailing effect arising from aggregate uncertainty:

Replacement rate $\uparrow \implies$

1. Asset prices less volatile $\implies$ demand equity $\uparrow \implies$ employment $\uparrow$

2. Employment is concave in equity prices, $J \implies$
   $\mathbb{E} \left[ \text{employment} \right] \uparrow$ when $\text{SD} [J] \downarrow$
UI and employment

\( \omega_P = 0.7, \mu \) does not affect wages

\( \omega_P = 1, \mu \) affects wages

Without aggregate risk

Expansion

Recession

Unconditional
Switch to alternative UI policy

1. Replacement rate increases from 0.5 to 0.55
2. Switch is unexpected
3. Switch is permanent
4. Agents take transition into account
Average welfare effect of change in UI

$\omega_p = 0.7$, $\mu$ affects wages

Without aggregate risk
Beginning of expansion
Beginning of recession
Who likes/dislikes higher UI?

$\mu = 0.55, \omega_0$ unchanged

$\mu = 0.55, \omega_0$ increases
Concluding comments

• With incomplete markets and sticky nominal wages, a decline in productivity sets off a self-reinforcing aggregate demand effect.

• This happens despite the fact that both incomplete markets as well as sticky nominal wages – in isolation – repress propagation.

• One of the core components of this mechanism is the missing market for unemployment insurance.

• A rise in UI generosity can therefore increase average employment and raise welfare for all agents – even the asset-rich employed.
Creation of new jobs/firms/equity

- number of new firms created:

\[ h_t = \psi \nu_t^\eta u_t^{1-\eta} \]

- vacancy yield:

\[ \frac{h_t}{\nu_t} = \psi \left( \frac{\nu_t}{u_t} \right)^{\eta-1} \]
Supply of new equity

- Matching function
- zero-profit condition

\[ h_t = \psi \left( \frac{\psi J_t}{\kappa P_t} \right)^{\eta/(1-\eta)} u_t \]
Creation of new jobs/firms/equity

- zero-profit condition $\implies$ vacancies as a function of $J_t/P_t$:

$$\kappa = \psi \left( \frac{v_t}{u_t} \right)^{\eta-1} \frac{J_t}{P_t}$$

- supply of new equity (job/firm creation):

$$h_t = \psi \left( \frac{\psi J_t}{\kappa P_t} \right)^{\eta/(1-\eta)} u_t$$

"back to main"
Euro Area

A: Price level (*)

B: Price level (*) and nominal wage (+)

C: Price level (*) and nominal unit labor cost (o)
Euro Area

B: Price level (*) and nominal wage (+)

C: Price level (*) and nominal unit labor cost (o)
Unemployment duration

The diagram shows the distribution of unemployment durations. The x-axis represents the duration of unemployment spell in quarters, ranging from 0 to 20 quarters. The y-axis represents the frequency, ranging from 0 to 0.4. Two conditions are considered:

- **Cond. on expansion**: Black bars
- **Cond. on recession**: Grey bars

The chart indicates that unemployment durations are more frequent in the first few quarters and decrease as the duration increases. There is a higher frequency of shorter durations under both conditions, with a slight difference in the frequency of longer durations between expansion and recession conditions.
Equity holdings upon displacement

![Equity holdings upon displacement](attachment:image.png)
Portfolio choice: fraction in liquid asset
Technical challenges

- Even rep-agent version not trivial to solve accurately
  - non-linearity matching function matters
  - sufficiently volatile employment \(\Rightarrow\)
    - volatile surplus
    - volatile equity prices
  - "go to accuracy graph rep-agent model"

- Adding moderate aggregate uncertainty to model is *not* a small change
  - substantial changes in means
  - volatile surplus and asset prices
  - multiplicity
Log employment level

"back to main"
Increase in UI & transition dynamics

- Increase in UI first period of recession

- No change in wage rule \(\Rightarrow\)
  - equity less risky \(\Rightarrow\) average employment \(\uparrow\)
  - less deflationary spiral \(\Rightarrow\) recession less deep
    \(\Rightarrow\) employment \(\uparrow\)

- Change in wage rule \(\Rightarrow\)
  - the same as above \(\uparrow\)
  - profits \(\downarrow\) \(\Rightarrow\) average employment \(\downarrow\)
Switch to higher level of unemployment benefits

\[ \mu = 0.5, \quad \mu = 0.55, \quad \text{and} \quad \omega_0 \text{ increases} \]