What Shifts the Beveridge Curve?

Recruitment Effort and Financial Shocks

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AEA Meetings – Philadelphia, January 3rd, 2014
Fact: shift in the Beveridge Curve
The Beveridge Curve

• Pairs \((u, v)\) consistent with stationary equilibrium in labor market

\[
\delta (1 - u) = Av^\alpha u^{1-\alpha}
\]

separations \quad \text{hires}
The Beveridge Curve

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\delta(1 - u) = \underbrace{Av^\alpha u^{1-\alpha}}_{\text{separations}} \quad \underbrace{A}_{\text{hires}}
\]

• Spike in separation rate \(\delta\) was short-lived
The Beveridge Curve

- Pairs \((u, v)\) consistent with stationary equilibrium in labor market

\[ \delta(1 - u) = A v^{\alpha} u^{1-\alpha} \]

separations \hspace{1cm} hires

- Spike in separation rate \(\delta\) was short-lived

- Shift in the BC ↔ persistent fall in aggregate matching efficiency \(A\)
  1. Mismatch ↑
  2. Worker’s search effort ↓
  3. Firm’s recruitment effort ↓
Firm’s recruitment effort

\[ n_{i,t+1} - n_{it} = (qt \cdot e_{it}) \cdot v_{it} \]

- \( v \): open positions ready to be staffed and costly to create

- \( e \in (0, 1) \): probability of filling an open position –an outcome of costly recruitment activities
  - advertisement, networking, screening, outsourcing, onboarding
Firm’s recruitment effort

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- \( e \in (0, 1) \): probability of filling an open position – an outcome of costly recruitment activities
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- Generalized matching function (Davis-Haltiwanger-Faberman)

\[ h_t = \left( \int e_{it} v_{it} di \right)^{\alpha} u_t^{1-\alpha} = A_t \cdot v_t^\alpha u_t^{1-\alpha} \]

\[ A_t = \left[ \int e_{it} \left( \frac{v_{it}}{v_t} \right) di \right]^{\alpha} \]
Mechanism

• “Fact”: bulk of job creation & recruitment effort is in young firms

![Graph showing jobs created by old and young firms from 1999 to 2012. The graph indicates a decline in jobs created by old firms and an increase in jobs created by young firms between 2008 and 2012.]

Gavazza-Mongey-Violante, "What Shifts the Beveridge Curve?"
Mechanism

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  - Indirect evidence: job-filling rate is steeply increasing with growth rate & young firms grow fastest
Mechanism

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  ▶ Indirect evidence: job-filling rate is steeply increasing with growth rate & young firms grow fastest

• Financial shock: hits start-ups and young firms the most and curbs their growth
  ▶ Reduces recruitment effort \( e_i \) at young firms
  ▶ Shifts distribution of \( v_i \) towards older firms with lower effort

• Aggregate matching efficiency \( A = \int e_i \left( \frac{v_i}{v} \right) di \) falls
Mechanism

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• TFP shock more neutral across firms, so less of an impact on $A$
Consistency with micro-level evidence

Fact (DHF): job-filling rate \( f_{it} = q_t e_{it} \) increasing in growth rate \( g_{it} \)
Consistency with micro-level evidence

Fact (DHF): job-filling rate \((f_{it} = q_t e_{it})\) increasing in growth rate \((g_{it})\)

\[
\log f_{it} = -4.2 + 0.82 \log g_{it}
\]
Firm’s problem

- Problem of hiring incumbent or entrant (after paying entry cost)

\[ v(n, z) = \max_{n', v, e} z \int F(n') - w(n', z) n' - \chi - \kappa(n, v) - c(e) + \beta \mathbb{E}[v(n', z')] \]

s.t.
\[ n' = n + q e \cdot v \]
\[ n' \geq n, \quad v \geq 0, \quad e \in [0, 1] \]
\[ z' \sim G(z', z) \]
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z' \sim G(z', z)
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- Two-stage problem:

1. Stage I: Choose target employment level \(n'\)
2. Stage II: Choose positions to open \(v\), and recruitment effort \(e\)
Firm’s problem: stage II

How to best achieve target employment $n'$ through $(e, v)$

\[
\min_{e,v} \kappa(n, v) + c(e)
\]

s.t.

\[
n' = n + qev \quad (\lambda)
\]
Firm’s problem: stage II

How to best achieve target employment \( n' \) through \((e,v)\)

\[
\min_{e,v} \quad \kappa(n,v) + c(e)
\]

\[s.t.
\]

\[n' = n + qev \quad (\lambda)
\]

\[FOC'(e) : \quad c_e(e) = \lambda \cdot qv
\]

\[FOC'(v) : \quad \kappa_v(n,v) = \lambda \cdot qe
\]

Combining FOCs:

\[
\frac{c_e(e)e^2}{\kappa_v(n,v)} = \frac{n' - n}{q}
\]
Reverse engineering

\[
\frac{c_e(e)e^2}{\kappa_v(n,v)} = \frac{n' - n}{q}
\]
Reverse engineering

\[
\frac{c_e(e) e^2}{\kappa_y(n, v)} = \frac{n' - n}{q}
\]

Assume functional forms:

(i) \[ c(e) = c_0 \cdot \frac{e^\gamma}{\gamma} \quad \rightarrow \text{problem convex at solution also if } \gamma < 1 \]

(ii) \[ \kappa(n, v) = \kappa_0 \cdot \frac{v}{n} \]
Reverse engineering

\[
\frac{c_e(e)e^2}{\kappa_v(n,v)} = \frac{n' - n}{q}
\]

Assume functional forms:

\((i)\) \quad c(e) = c_0 \cdot \frac{e^\gamma}{\gamma} \quad \rightarrow \text{problem convex at solution also if } \gamma < 1

\((ii)\) \quad \kappa(n,v) = \kappa_0 \cdot \frac{v}{n}

\[
e = \left( \frac{\kappa_0}{c_0 \cdot q} \right)^{\frac{1}{1+\gamma}} \left( \frac{n' - n}{n} \right)^{\frac{1}{1+\gamma}}
\]

Hence: \(\log f_{it} \equiv \log(q_t e_{it}) = \text{const} + \frac{1}{1 + \gamma} \cdot \log g_{it} \quad \rightarrow \quad \gamma = 0.2 \)
Consistency with micro-level evidence II

**Fact (DHF):** vacancy rate \( \frac{v_{it}}{n_{it}} \) increasing with growth rate \( g_{it} \)
Consistency with micro-level evidence II

Fact (DHF): vacancy rate \( \frac{v_{it}}{n_{it}} \) increasing with growth rate \( g_{it} \)

Model: \[ \log \left( \frac{v_{it}}{n_{it}} \right) = \text{const.} + \frac{\gamma}{1 + \frac{\gamma}{y}} \log g_{it} \]

\[ \frac{0.2}{1.2} = 0.17 \]
Discussion of cost structure

\[
\min_{e,v} \kappa(n, v) + c(e, v)
\]

\[
s.t.
\]

\[
n' = n + qev
\]

1. \(\kappa(n, v) = \kappa_0 \left( \frac{v}{n} \right) \quad c(e, v) = c_0 \left( \frac{e^\gamma}{\gamma} \right)\)

• Cost of expanding rising in \(g\), effort cost independent of \(v\)
Discussion of cost structure

\[
\begin{align*}
\min_{e,v} & \quad \kappa(n, v) + c(e, v) \\
\text{s.t.} & \quad n' = n + qev
\end{align*}
\]

1. \(\kappa(n, v) = \kappa_0 \left( \frac{v}{n} \right)\) \(\quad c(e, v) = c_0 \left( \frac{e\gamma}{\gamma} \right)\)
   
   • Cost of expanding rising in \(g\), effort cost independent of \(v\)

2. \(\kappa(n, v) = \kappa_0 \left( \frac{v}{n} \right) v\) \(\quad c(e, v) = c_0 \left( \frac{e\gamma}{\gamma} \right) v\)
   
   • Cost (per \(v\)) of expanding rising in \(g\), effort cost linear in \(v\)
Discussion of cost structure

\[
\min_{e,v} \kappa(n,v) + c(e,v)
\]
\[
s.t.
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n' = n + qev
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1. \(\kappa(n,v) = \kappa_0 \left( \frac{v}{n} \right) \quad c(e,v) = c_0 \left( \frac{e^\gamma}{\gamma} \right)\)

   • Cost of expanding rising in \(g\), effort cost independent of \(v\)

2. \(\kappa(n,v) = \kappa_0 \left( \frac{v}{n} \right) v \quad c(e,v) = c_0 \left( \frac{e^\gamma}{\gamma} \right) v\)

   • Cost (per \(v\)) of expanding rising in \(g\), effort cost linear in \(v\)

**Difference:** employment dynamics \((n' - n)\) more sluggish under (2)
Relation to Kaas-Kircher

- Kaas-Kircher (2011 version)
  - Wage-posting with directed search, and DRS technology
  - Model’s job-filling rate flat with respect to growth rate
  - $\kappa(n, v) = \kappa_0 v^2$ (independent of $n$)
Relation to Kaas-Kircher

- Kaas-Kircher (2011 version)
  - Wage-posting with directed search, and DRS technology
  - Model’s job-filling rate flat with respect to growth rate
  - \( \kappa(n, v) = \kappa_0 v^2 \) (independent of \( n \))

- Kaas-Kircher (new version)
  - Model’s job-filling rate increasing with respect to growth rate
  - Now: \( \kappa(n, v) = \kappa_0 \left( \frac{v}{n} \right)^\gamma v \)

- Lesson: key is cost structure, not how firms attract labor (\( w \) vs \( e \))
Policy functions

\[ e(n,z) \]

\[ v(n,z) \]

\[ n'(n,z) \]

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