The Active Search Premium

Sebastian Graves[1] and Christopher Huckfeldt[2]

[1]University of Cambridge
[2]Federal Reserve Board

Minneapolis Fed

November 20, 2026

The views expressed in this paper/presentation are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or any other person associated with the Federal Reserve System.

Two ways to find a job

1. Search for the job: active search (e.g., via unsolicited application)
2. Let the job search for you: passive search (e.g., via referral)

Two ways to find a job

1. Search for the job: active search (e.g., via unsolicited application)
2. Let the job search for you: passive search (e.g., via referral)

- *Active search premium* (ASP): job-finding rate of active relative to passive searchers:

$$\text{ASP}_t = f_{A,t}/f_{P,t} - 1$$

- **Question:** How big is the ASP for the non-employed, and how does it move with active search over the cycle?

Two ways to find a job

1. Search for the job: active search (e.g., via unsolicited application)
2. Let the job search for you: passive search (e.g., via referral)

- *Active search premium* (ASP): job-finding rate of active relative to passive searchers:

$$\text{ASP}_t = f_{A,t}/f_{P,t} - 1$$

- **Question:** How big is the ASP for the non-employed, and how does it move with active search over the cycle?
- **We show:** ASP embeds a time-varying relative return to active search
  - Use to characterize crowding-out of active search and implications for UI

The Active Search Premium: what we find

- Use CPS to compute active search premium from unemployed & nonparticipants who want a job and are available to work

The Active Search Premium: what we find

- Use CPS to compute active search premium from unemployed & nonparticipants who want a job and are available to work

1. The ASP is small: only $\approx 40\%$ on average
2. The ASP is procyclical: it fell to ≈ 0 in the Great Recession
3. The ASP falls when aggregate active search rises
   - Fraction searching actively and intensity of search both $\uparrow$ in recessions

Is This Consistent With A Matching Framework?

- Standard approach: active and passive search are perfect substitutes
  - Implies a constant relative return to active search: strongly rejected
  - ASP falls when active search rises: suggests diminishing returns
- Rather than impose an elasticity of substitution of ∞, we estimate it:
  - CES aggregator fits the data, with elasticity ≈ 0.2
  - Implies crowding-out of active search in recessions

Is This Consistent With A Matching Framework?

- Standard approach: active and passive search are perfect substitutes
  - Implies a constant relative return to active search: strongly rejected
  - ASP falls when active search rises: suggests diminishing returns
- Rather than impose an elasticity of substitution of ∞, we estimate it:
  - CES aggregator fits the data, with elasticity ≈ 0.2
  - Implies crowding-out of active search in recessions
- First pass on UI: Baily–Chetty with passive search requires additional sufficient statistic
  - The share of hires due to active search: measurable, procyclical
  - More generous benefits in recessions: when active search is crowded out, discouraging it costs less

CES Aggregator in a Business Cycle Model

- Equilibrium business cycle model with endogenous active search
  - Active search $\uparrow$ in recessions despite ASP $\downarrow$ (opp. cost of CRK 2016)
- Crowding-out $\Rightarrow$ macro elasticity of active search $<$ micro elasticity
  - Economy-wide UI lowers active search
    $\Rightarrow$ relative return to active search rises $\Rightarrow$ active search partially recovers

CES Aggregator in a Business Cycle Model

- Equilibrium business cycle model with endogenous active search
  - Active search ↑ in recessions despite ASP ↓ (opp. cost of CRK 2016)
- Crowding-out ⇒ macro elasticity of active search < micro elasticity
  - Economy-wide UI lowers active search
    ⇒ relative return to active search rises ⇒ active search partially recovers
- Two sufficient statistics bound it below 0.15, for any micro elasticity
- UI expansions: unemployment response dampened by roughly a third

Measurement

Data: U.S. Current Population Survey (CPS), 1995-2019

- Since the 1994 redesign, jobless respondents to CPS report
  - whether they want a job
  - which of nine active search methods they have used
  - if none and want job: why not (e.g. family responsibilities, ill health)
- Non-employed worker willing to accept a job is
  - Active searcher: # search methods > 0 & not on temp. layoff
  - Passive searcher: # search methods $= 0$ & want (+ able) to work

Data: U.S. Current Population Survey (CPS), 1995-2019

- Since the 1994 redesign, jobless respondents to CPS report
  - whether they want a job
  - which of nine active search methods they have used
  - if none and want job: why not (e.g. family responsibilities, ill health)
- Non-employed worker willing to accept a job is
  - Active searcher: # search methods > 0 & not on temp. layoff
  - Passive searcher: # search methods $= 0$ & want (+ able) to work
- The two groups are close in gender, education and prior wages Details
  - Results robust to reweighting on observables

CPS Search Methods

Job-finding rates of the active and passive non-employed

	Active (f_A) probability	Passive (f_P) probability	Ratio (f_A/f_P)
mean(x)	0.218	0.153	1.430
std(x)/std(Y)	8.218	7.655	8.032
corr(x, Y)	0.846	0.421	0.461

Note: Monthly transition probabilities to employment from active and passive non-employment, CPS 1996-2019 (paper, Table 1). Y indicates quarterly real GDP. For second and third row, series are taken as (1) quarterly averages of seasonally adjusted monthly series, (2) logged, then (3) HP-filtered with smoothing parameter of 1600

- Fact 1: the ASP is about 40% on average

▸ Statistics by passive definition ▸ Cyclicality under each adjustment

Job-finding rates of the active and passive non-employed

	Active (f_A) probability	Passive (f_P) probability	Ratio (f_A/f_P)
mean(x)	0.218	0.153	1.430
std(x)/std(Y)	8.218	7.655	8.032
corr(x, Y)	0.846	0.421	0.461

Note: Monthly transition probabilities to employment from active and passive non-employment, CPS 1996-2019 (paper, Table 1). Y indicates quarterly real GDP. For second and third row, series are taken as (1) quarterly averages of seasonally adjusted monthly series, (2) logged, then (3) HP-filtered with smoothing parameter of 1600

- Fact 1: the ASP is about 40% on average
- Fact 2: it is procyclical: active job-finding far more cyclical than passive

▸ Statistics by passive definition ▸ Cyclicality under each adjustment

Job-finding rates of the active and passive non-employed

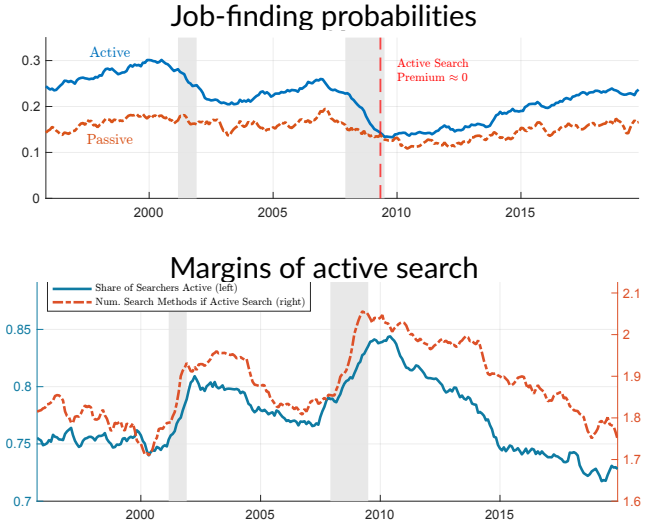
	Active (f_A) probability	Passive (f_P) probability	Ratio (f_A/f_P)
mean(x)	0.218	0.153	1.430
std(x)/std(Y)	8.218	7.655	8.032
corr(x, Y)	0.846	0.421	0.461

Note: Monthly transition probabilities to employment from active and passive non-employment, CPS 1996-2019 (paper, Table 1). Y indicates quarterly real GDP. For second and third row, series are taken as (1) quarterly averages of seasonally adjusted monthly series, (2) logged, then (3) HP-filtered with smoothing parameter of 1600

- Fact 1: the ASP is about 40% on average
- Fact 2: it is procyclical: active job-finding far more cyclical than passive
- Fact 3: it comoves negatively with active search…

▸ Statistics by passive definition ▸ Cyclicality under each adjustment

Job-finding and active search over the cycle



Job-finding: ▸ Alternative measures ▸ Fixed composition

Active search: ▸ Alternative measures ▸ Time use

Matching framework

Active and passive search

- CRS matching function m_t over effective search and vacancies
- Effective search is composite of active and passive search
- Non-employed inelastically provide one unit of passive search
- Non-employed choose $e_{A,i,t}$ units of active search
- Flexible to different notions of active search:
  - Intensive & extensive margin: $e_{A,i,t} \in \mathbb{R}_+$ (FMST 2022)
  - Extensive margin only: $e_{A,i,t} \in \{0, 1\}$ (KMRS 2017)

The standard framework: Perfect Substitutes

- Job-finding rate of individual i: search efficiency $\times$ aggregate rate

$$f_{i,t} = s_{i,t} \cdot \frac{m_t(\bar{s}_t, v_t)}{\bar{s}_t}$$

- Search efficiency of individual i:

$$s_{i,t} = \omega \cdot e_{A,i,t} + (1 - \omega) \cdot 1$$

where ω is the weight on active search

The standard framework: Perfect Substitutes

- Job-finding rate of individual i: search efficiency $\times$ aggregate rate

$$f_{i,t} = s_{i,t} \cdot \frac{m_t(\bar{s}_t, v_t)}{\bar{s}_t}$$

- Search efficiency of individual i:

$$s_{i,t} = \omega \cdot e_{A,i,t} + (1 - \omega) \cdot 1$$

  where ω is the weight on active search

- Aggregating over active and passive searchers (ne_t of them):

$$\bar{s}_{A,t} = \int_i e_{A,i,t}\, di, \qquad \bar{s}_{P,t} = ne_t, \qquad \bar{s}_t = \omega\, \bar{s}_{A,t} + (1 - \omega)\, \bar{s}_{P,t}$$

- Perfect substitutes $\Leftrightarrow$ relative return to active search fixed at $\omega/(1 - \omega)$

A restriction on the ASP

- Average (active) effort among active searchers is $\bar{e}^*_{A,t}$
- The active search premium is then:

$$\frac{f_{A,t}}{f_{P,t}} - 1 = \frac{\left(\omega\, \bar{e}^*_{A,t} + (1-\omega)\right)\frac{m_t}{\bar{s}_t}}{(1-\omega)\frac{m_t}{\bar{s}_t}} - 1 = \frac{\omega}{1-\omega} \cdot \bar{e}^*_{A,t}$$

A restriction on the ASP

- Average (active) effort among active searchers is $\bar{e}^*_{A,t}$
- The active search premium is then:

$$\frac{f_{A,t}}{f_{P,t}} - 1 = \frac{\left(\omega\, \bar{e}^*_{A,t} + (1-\omega)\right)\frac{m_t}{\bar{s}_t}}{(1-\omega)\frac{m_t}{\bar{s}_t}} - 1 = \frac{\omega}{1-\omega} \cdot \bar{e}^*_{A,t}$$

- Key features:
  1. Tightness and match efficiency differenced out
  2. ASP has unit elasticity in average active effort

A restriction on the ASP

- Average (active) effort among active searchers is $\bar{e}^*_{A,t}$
- The active search premium is then:

$$\frac{f_{A,t}}{f_{P,t}} - 1 = \frac{\left(\omega\, \bar{e}^*_{A,t} + (1-\omega)\right)\frac{m_t}{\bar{s}_t}}{(1-\omega)\frac{m_t}{\bar{s}_t}} - 1 = \frac{\omega}{1-\omega} \cdot \bar{e}^*_{A,t}$$

- Key features:
  1. Tightness and match efficiency differenced out
  2. ASP has unit elasticity in average active effort

Test: regress $\log(f_{A,t}/f_{P,t} - 1)$ on $\log \bar{e}^*_{A,t}$ (and a trend to absorb drift in ω)

$$\log\left(\frac{f_{A,t}}{f_{P,t}} - 1\right) = \beta_0 + \beta_T\, t + \beta_{ASP} \cdot \log \bar{e}^*_{A,t} + \epsilon_t$$

Restriction: $\beta_{ASP} = 1$

Perfect Substitutes is strongly rejected

Dependent variable: Log active search premium			
	(1)	(2)	(3)
β_{ASP}	-7.655^{***}	-5.642^{***}	-3.488^{***}
	(1.023)	(0.435)	(0.144)
β_T	$-1.7e\text{-}3^{***}$	$-1.1e\text{-}3^{***}$	$-4.5e\text{-}4^{***}$
	(4.2e-4)	(1.8e-4)	(7.2e-5)
Constant	3.820^{***}	3.096^{***}	3.511^{***}
	(0.632)	(0.268)	(0.090)
$Pr(H_0 : \beta_{ASP} = 1)$	0.000	0.000	0.000
Observations	287	292	292
Passive searchers:	*N* + want job + available	*N* + want job	All nonparticipants (*N*)

Note: OLS, CPS 1995m9–2019m12; robust s.e. in parentheses; constant and linear trend included.

- Baseline: $\beta_{ASP} = -7.66$
- 1% rise in average active effort $\Rightarrow \approx 8\%$ fall in the ASP
- Rejection *strongest* for the most comparable passive group (col. 1)

▷ Not driven by composition or selection: ▸ Composition ▸ Unobserved heterogeneity

▷ Other robustness: ▸ Time aggregation and duration ▸ Cyclicality of components

An unrestricted
CES search aggregator

CES aggregator for search effort

- Aggregate effective search $\bar{s}_t$ given by CES aggregator over $\bar{s}_{A,t}$ and $\bar{s}_{P,t}$

$$\bar{s}_t = \left(\omega \, \bar{s}_{A,t}^{\frac{\nu-1}{\nu}} + (1-\omega) \bar{s}_{P,t}^{\frac{\nu-1}{\nu}} \right)^{\frac{\nu}{\nu-1}}$$

- Aggregate active & passive search satisfy

$$\bar{s}_{A,t} = \int_i e_{A,i,t} \, di = \check{\mathcal{G}}_t \cdot ne_t \cdot \bar{e}^*_{A,t} \quad \& \quad \bar{s}_{P,t} = \int_i di = ne_t$$

CES aggregator for search effort

- Aggregate effective search $\bar{s}_t$ given by CES aggregator over $\bar{s}_{A,t}$ and $\bar{s}_{P,t}$

$$\bar{s}_t = \left(\omega \, \bar{s}_{A,t}^{\frac{\nu-1}{\nu}} + (1-\omega) \bar{s}_{P,t}^{\frac{\nu-1}{\nu}} \right)^{\frac{\nu}{\nu-1}}$$

- Aggregate active & passive search satisfy

$$\bar{s}_{A,t} = \int_i e_{A,i,t} \, di = \check{g}_t \cdot ne_t \cdot \bar{e}^*_{A,t} \quad \& \quad \bar{s}_{P,t} = \int_i di = ne_t$$

- $ME_{A,t}$ and $ME_{P,t}$ are marginal efficiencies of active and passive search

$$ME_{A,t} = \frac{\partial \bar{s}_t}{\partial \bar{s}_{A,t}} = \omega \cdot \left(\frac{\bar{s}_t}{\bar{s}_{A,t}} \right)^{\frac{1}{\nu}}, \quad ME_{P,t} = \frac{\partial \bar{s}_t}{\partial \bar{s}_{P,t}} = (1-\omega) \cdot \left(\frac{\bar{s}_t}{\bar{s}_{P,t}} \right)^{\frac{1}{\nu}}$$

- As before, $f_{i,t} = s_{i,t} \cdot m_t / \bar{s}_t$, but now $s_{i,t} = ME_{A,t} \cdot e_{A,i,t} + ME_{P,t}$ Details

A new restriction

- Solve for the active search premium:

$$\frac{f_{A,t}}{f_{P,t}} - 1 = \frac{ME_{A,t}}{ME_{P,t}} \cdot \bar{e}^*_{A,t} = \left(\frac{\omega}{1-\omega}\right)\left(\frac{\bar{s}_{P,t}}{\bar{s}_{A,t}}\right)^{\frac{1}{\nu}} \cdot \bar{e}^*_{A,t}$$

A new restriction

- Solve for the active search premium:

$$\frac{f_{A,t}}{f_{P,t}} - 1 = \frac{ME_{A,t}}{ME_{P,t}} \cdot \bar{e}^*_{A,t} = \left(\frac{\omega}{1-\omega}\right)\left(\frac{1}{\check{g}_t \cdot \bar{e}^*_{A,t}}\right)^{\frac{1}{\nu}} \cdot \bar{e}^*_{A,t}$$

A new restriction

- Solve for the active search premium:

$$\frac{f_{A,t}}{f_{P,t}} - 1 = \frac{ME_{A,t}}{ME_{P,t}} \cdot \bar{e}^*_{A,t} = \left(\frac{\omega}{1-\omega}\right)\left(\frac{1}{\check{\mathcal{G}}_t \cdot \bar{e}^*_{A,t}}\right)^{\frac{1}{\nu}} \cdot \bar{e}^*_{A,t}$$

- Taking logs:

$$\log\left(\frac{f_{A,t}}{f_{P,t}} - 1\right) = \log\left(\frac{\omega}{1-\omega}\right) - \left(\frac{1}{\nu}\right) \cdot \log \check{\mathcal{G}}_t + \left(1 - \frac{1}{\nu}\right) \cdot \log \bar{e}^*_{A,t}$$

- Three testable implications:
  1. Elasticity to average effort is now $1 - 1/\nu$ (no longer one)
  2. Fraction searching now enters, with elasticity $-1/\nu$
  3. The two elasticities differ by exactly one: an over-identifying restriction

Estimates of the CES aggregator

	(1) Unrestricted	(2) Restricted	(3) Extensive only
$\beta_{\breve{g}}$ (fraction searching)	−5.244***	−4.976***	−8.721***
	(1.394)	(0.555)	(1.096)
β_e (average effort)	−3.738***	−3.976***	–
	(1.338)	(0.555)	
p-value: $\beta_e = \beta_{\breve{g}} + 1$	0.840	–	–
p-value: $\nu = \infty$	–	0.000	0.000
Implied ν	–	0.201	0.115
		(0.022)	(0.014)

- Unrestricted (1): Cannot reject $\beta_e = \beta_{\breve{g}} + 1$
- Restricted (2): $\hat{\nu} = 0.20$ and $\nu = \infty$ rejected
- Extensive margin only (3): $\hat{\nu} = 0.12$

Note: Dependent variable: log active search premium. All columns include a constant and linear trend. Baseline passive group (want job + available). CPS 1995m9–2019m12, $N = 287$.

▸ N + want ▸ All N ▸ Composition ▸ Measurement error + GMM ▸ Implied ASP

Interpreting the CES Aggregator under $\nu < 1$

- Relative return to search effort declines in aggregate active search
  - Falls by more than effort rises $\Rightarrow$ ASP falls in recessions
  - Perfect substitutes: relative return is constant $\Rightarrow$ ASP *rises* with effort
- For the worker: crowding-out
  - Relative return to active search is higher when others search less
  - Still search more in recessions: surplus from finding a job is higher
- For the firm: consistent with a quality margin in the applicant pool
  - Quality of marginal application declines as workers apply to more jobs
  - Firms tilt recruiting toward referrals and internal channels ▸ Evidence from the SCE

Application: Simple Baily–Chetty Formula

- Can use Baily-Chetty formula to isolate role of time-varying elasticity
- Optimal replacement rate R (Baily 1978; Chetty 2006):

$$\underbrace{\frac{1}{1-u}\cdot\frac{d\log u}{d\log R}}_{\text{increasing in } R} = \underbrace{\frac{U'(c^u)}{U'(c^e)}-1}_{\text{decreasing in } R} \qquad \text{(BC)}$$

Application: Simple Baily–Chetty Formula

- Can use Baily-Chetty formula to isolate role of time-varying elasticity
- Optimal replacement rate R (Baily 1978; Chetty 2006):

$$\underbrace{\frac{1}{1-u}\cdot\frac{d\log u}{d\log R}}_{\text{increasing in } R} = \underbrace{\frac{U'(c^u)}{U'(c^e)}-1}_{\text{decreasing in } R} \qquad \text{(BC)}$$

- Can write elasticity of unemployment w.r.t. replacement rate:

$$\frac{d\log u}{d\log R} = \underbrace{\frac{d\log u}{d\log f}}_{\approx -(1-u)}\cdot\underbrace{\frac{d\log f}{d\log \bar{s}_t}}_{\text{match elas.}}\cdot\underbrace{\frac{d\log \bar{s}_t}{d\log \bar{s}_{A,t}}}_{=\alpha_{A,t}}\cdot\underbrace{\frac{d\log \bar{s}_{A,t}}{d\log R}}_{\text{behav. response}}$$

Application: Simple Baily–Chetty Formula

- Can use Baily-Chetty formula to isolate role of time-varying elasticity
- Optimal replacement rate R (Baily 1978; Chetty 2006):

$$\underbrace{\frac{1}{1-u}\cdot\frac{d\log u}{d\log R}}_{\text{increasing in } R} = \underbrace{\frac{U'(c^u)}{U'(c^e)}-1}_{\text{decreasing in } R} \qquad \text{(BC)}$$

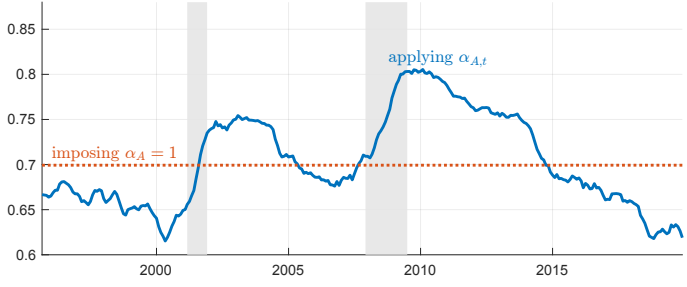
- Can write elasticity of unemployment w.r.t. replacement rate:

$$\frac{d\log u}{d\log R} = \underbrace{\frac{d\log u}{d\log f}}_{\approx -(1-u)}\cdot\underbrace{\frac{d\log f}{d\log \bar{s}_t}}_{\text{match elas.}}\cdot\underbrace{\frac{d\log \bar{s}_t}{d\log \bar{s}_{A,t}}}_{=\alpha_{A,t}}\cdot\underbrace{\frac{d\log \bar{s}_{A,t}}{d\log R}}_{\text{behav. response}}$$

- Standard formula abstracts from passive search: $\alpha_{A,t} = 1$
- We show $\alpha_{A,t}$ = active share of hires: measurable, procyclical

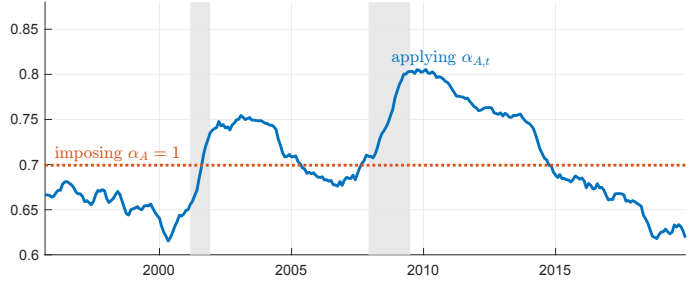
▸ Details

Optimal consumption gap over the cycle



- Set average $\frac{d \log f}{d \log R}$ to -0.43 (micro evidence: Cohen & Ganong 2026)
- Let $\alpha_{A,t}$ vary over time and assume log utility
- Optimal c^u/c^e gap: $>$ 30% before 2009, $\approx$ 20% after

Optimal consumption gap over the cycle



- Set average $\frac{d \log f}{d \log R}$ to -0.43 (micro evidence: Cohen & Ganong 2026)
- Let $\alpha_{A,t}$ vary over time and assume log utility
- Optimal c^u/c^e gap: $>$ 30% before 2009, $\approx$ 20% after

Next: consider in a business cycle model of equilibrium unemployment

General Equilibrium Model

Model: Summary

- DMP + RBC w/ representative family (Merz 1995, Andolfatto 1996)
  - Staggered wage bargaining a la Gertler & Trigari (2009) ▸ Firms and wages
  - Procyclical opportunity cost of employment (CRK 2016)
- Two additions:
  1. Endogenous active search along both margins
  2. CES search aggregator, ν calibrated to match our estimate of β_{ASP}

Model: Summary

- DMP + RBC w/ representative family (Merz 1995, Andolfatto 1996)
  - Staggered wage bargaining a la Gertler & Trigari (2009) ▸ Firms and wages
  - Procyclical opportunity cost of employment (CRK 2016)
- Two additions:
  1. Endogenous active search along both margins
  2. CES search aggregator, ν calibrated to match our estimate of β_{ASP}
- We use the model to:
  - Rationalize empirical findings: search $\uparrow$ in recessions *despite* ASP $\downarrow$
    - Procyclical opportunity cost of employment $\Rightarrow$ countercyclical search
  - Characterize how crowding-out changes response of search and unemployment to economy-wide change in UI benefits
- Focus here: the problem of the non-employed

Problem of non-employed

Non-employed draw fixed search cost γ and choose whether to participate:

$$\mathcal{V}_{NE,t}(\gamma) = \max\{\mathcal{V}^{s}_{NE,t}(\gamma),\ \mathcal{V}^{ns}_{NE,t}\}, \qquad \text{where } \mathcal{V}^{s}_{NE,t}(\gamma) > \mathcal{V}^{ns}_{NE,t} \text{ for all } \gamma < \gamma^{*}_{t}.$$

Problem of non-employed

Non-employed draw fixed search cost γ and choose whether to participate:

$$\mathcal{V}_{NE,t}(\gamma) = \max\{\mathcal{V}^{s}_{NE,t}(\gamma),\ \mathcal{V}^{ns}_{NE,t}\}, \qquad \text{where } \mathcal{V}^{s}_{NE,t}(\gamma) > \mathcal{V}^{ns}_{NE,t} \text{ for all } \gamma < \gamma^{*}_{t}.$$

Per-worker job-finding rates:

$$f_{A,t}(e_A) \equiv (ME_{A,t}\, e_A + ME_{P,t})\, f_t, \qquad f_{P,t} \equiv ME_{P,t}\, f_t, \qquad f_t = m(\bar{s}_t, \bar{v}_t)/\bar{s}_t$$

Passive search value $\mathcal{V}^{ns}_{NE,t}$:

$$\mathcal{V}^{ns}_{NE,t} = b + \frac{\xi^{I}}{\mu_t} + \beta\, \mathbb{E}_t\Big[\Lambda_{t,t+1}\Big\{ f_{P,t}\, \bar{V}_{E,t+1} + (1 - f_{P,t})\, V_{NE,t+1}\Big\}\Big].$$

Problem of non-employed

Non-employed draw fixed search cost γ and choose whether to participate:

$$\mathcal{V}_{NE,t}(\gamma) = \max\{\mathcal{V}^{s}_{NE,t}(\gamma),\ \mathcal{V}^{ns}_{NE,t}\}, \qquad \text{where } \mathcal{V}^{s}_{NE,t}(\gamma) > \mathcal{V}^{ns}_{NE,t} \text{ for all } \gamma < \gamma^{*}_{t}.$$

Per-worker job-finding rates:

$$f_{A,t}(e_A) \equiv (ME_{A,t}\, e_A + ME_{P,t})\, f_t, \qquad f_{P,t} \equiv ME_{P,t}\, f_t, \qquad f_t = m(\bar{s}_t, \bar{v}_t)/\bar{s}_t$$

Passive search value $\mathcal{V}^{ns}_{NE,t}$:

$$\mathcal{V}^{ns}_{NE,t} = b + \frac{\xi^{l}}{\mu_t} + \beta\, \mathbb{E}_t\Big[\Lambda_{t,t+1}\Big\{f_{P,t}\, \bar{V}_{E,t+1} + (1 - f_{P,t})\, V_{NE,t+1}\Big\}\Big].$$

Active search value $\mathcal{V}^{s}_{NE,t}(\gamma)$, w/ convex effort cost $\psi(e_{A,t})$:

$$\mathcal{V}^{s}_{NE,t}(\gamma) = \max_{e_{A,t}}\left\{b + \frac{\xi^{l}}{\mu_t} - \frac{\psi(e_{A,t}) + \gamma}{\mu_t} + \beta\, \mathbb{E}_t\Big[\Lambda_{t,t+1}\Big\{f_{A,t}(e_{A,t})\, \bar{V}_{E,t+1} + (1 - f_{A,t}(e_{A,t}))\, V_{NE,t+1}\Big\}\Big]\right\}.$$

Search Solution: $e^*_{A,t}$ and γ^*_t

- **Intensive margin**: Optimal intensity $e^*_{A,t}$ satisfies FOC:

$$\psi'(e^*_{A,t}) = \beta\, \mathbb{E}_t\left[\mu_{t+1} \cdot ME_{A,t} \cdot f_t \cdot (\bar{V}_{E,t+1} - V_{NE,t+1})\right]$$

Search Solution: $e^*_{A,t}$ and γ^*_t

- **Intensive margin**: Optimal intensity $e^*_{A,t}$ satisfies FOC:

$$\psi'(e^*_{A,t}) = \beta\,\mathbb{E}_t\left[\mu_{t+1} \cdot ME_{A,t} \cdot f_t \cdot (\bar{V}_{E,t+1} - V_{NE,t+1})\right]$$

- **Extensive margin**: Participation cutoff γ^*_t satisfies $\mathcal{V}^s_{NE,t}(\gamma^*_t) = \mathcal{V}^{ns}_{NE,t}$:

$$\gamma^*_t = \beta\,\mathbb{E}_t\left[\mu_{t+1} \cdot e^*_{A,t} \cdot ME_{A,t} \cdot f_t \cdot (\bar{V}_{E,t+1} - V_{NE,t+1})\right] - \psi(e^*_{A,t})$$

Search Solution: $e^*_{A,t}$ and γ^*_t

- **Intensive margin**: Optimal intensity $e^*_{A,t}$ satisfies FOC:

$$\psi'(e^*_{A,t}) = \beta\,\mathbb{E}_t\big[\mu_{t+1} \cdot ME_{A,t} \cdot f_t \cdot (\bar{V}_{E,t+1} - V_{NE,t+1})\big]$$

- **Extensive margin**: Participation cutoff γ^*_t satisfies $\mathcal{V}^s_{NE,t}(\gamma^*_t) = \mathcal{V}^{ns}_{NE,t}$:

$$\gamma^*_t = \beta\,\mathbb{E}_t\big[\mu_{t+1} \cdot e^*_{A,t} \cdot ME_{A,t} \cdot f_t \cdot (\bar{V}_{E,t+1} - V_{NE,t+1})\big] - \psi(e^*_{A,t})$$

- **Combine equations:**

$$\gamma^*_t \;=\; e^*_{A,t}\,\psi'(e^*_{A,t}) - \psi(e^*_{A,t})$$

Calibration

- Monthly. 13 parameters assigned, 3 from steady state, 5 fit jointly
- Two key parameters, among the five fit jointly:
  - Search-cost elasticity ε_s: duration elasticity of unemployment to UI, 0.43 (Cohen & Ganong 2026) $\Rightarrow \varepsilon_s = 0.53$
  - CES parameter ν: identified from the ASP slope,

    $$\beta_{ASP} = 1 - \frac{1+g}{\nu}, \qquad g = \text{relative elasticity of fraction searching and effort}$$

    Matching $\beta_{ASP} = -7.66$ recovers $\nu = 0.196$, close to the direct estimate of 0.201

▸ Full calibration details ▸ Business-cycle moments ▸ Search moments

Calibration

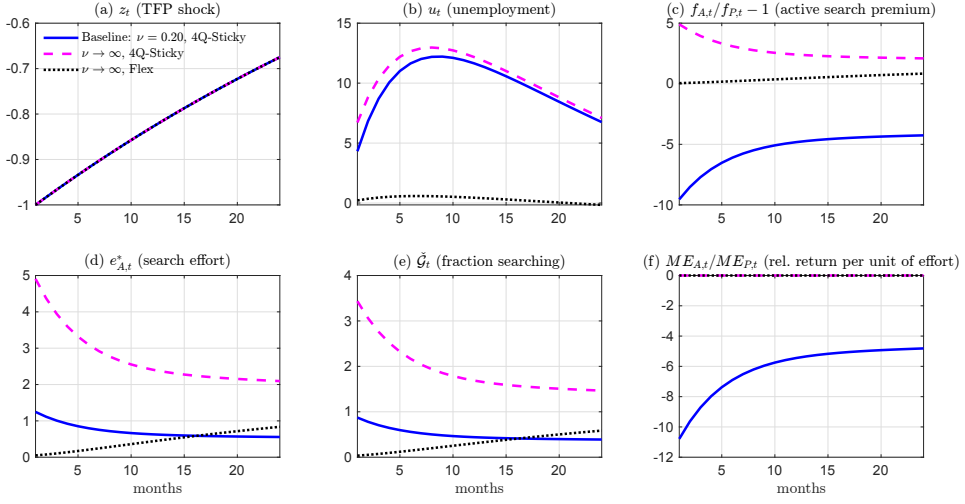
- Monthly. 13 parameters assigned, 3 from steady state, 5 fit jointly
- Two key parameters, among the five fit jointly:
  - Search-cost elasticity ε_s: duration elasticity of unemployment to UI, 0.43 (Cohen & Ganong 2026) $\Rightarrow \varepsilon_s = 0.53$
  - CES parameter ν: identified from the ASP slope,

    $$\beta_{ASP} = 1 - \frac{1+g}{\nu}, \qquad g = \text{relative elasticity of fraction searching and effort}$$

    Matching $\beta_{ASP} = -7.66$ recovers $\nu = 0.196$, close to the direct estimate of 0.201
- Calibrated model matches standard business cycle moments

▸ Full calibration details ▸ Business-cycle moments ▸ Search moments

IRFs to −1pp TFP shock

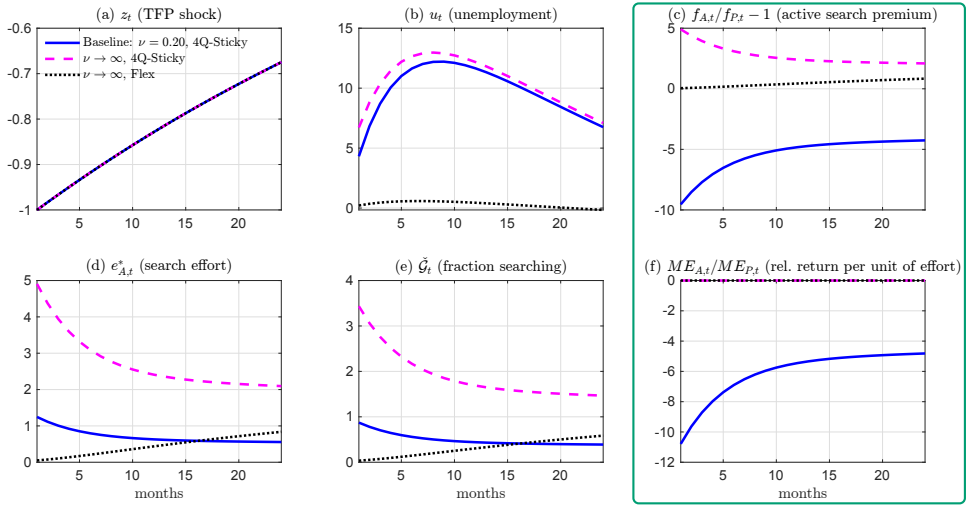


Notes: Solid: baseline ($\nu = 0.20$, staggered wages). Dashed: perfect substitutes ($\nu \to \infty$), staggered wages.

Dotted: perfect substitutes, flexible wages.

▸ More variables

IRFs to −1pp TFP shock

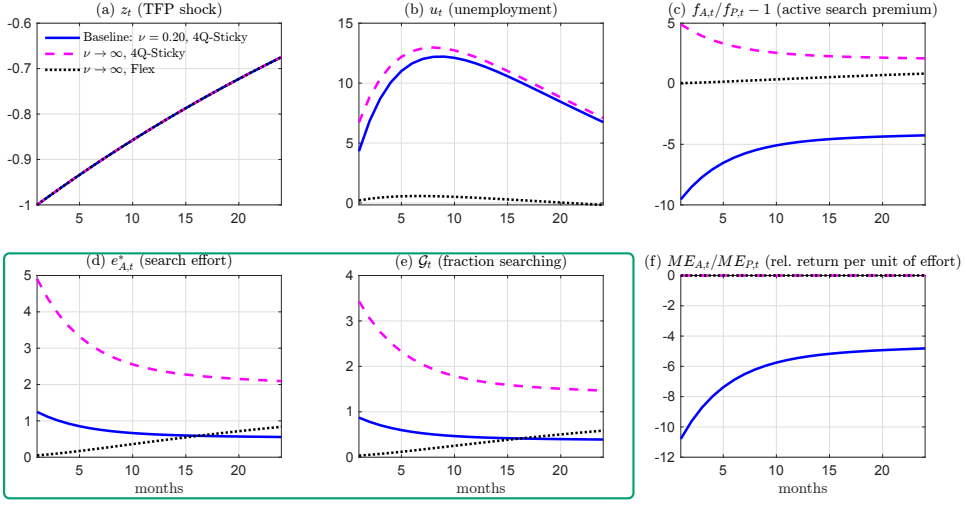


Notes: Solid: baseline ($\nu = 0.20$, staggered wages). Dashed: perfect substitutes ($\nu \to \infty$), staggered wages.

Dotted: perfect substitutes, flexible wages.

More variables

IRFs to −1pp TFP shock



Notes: Solid: baseline ($\nu = 0.20$, staggered wages). Dashed: perfect substitutes ($\nu \to \infty$), staggered wages.

Dotted: perfect substitutes, flexible wages.

▸ More variables

Crowding-Out and Macro Effects of UI

- $b \uparrow$ for one worker: surplus from a job falls $\Rightarrow e_A^* \downarrow$
- $b \uparrow$ for everyone: same fall in surplus, but aggregate active search $\bar{s}_A \downarrow$
  - return to active search $ME_A \uparrow \Rightarrow e_A^* \downarrow$ by less

Crowding-Out and Macro Effects of UI

- $b \uparrow$ for one worker: surplus from a job falls $\Rightarrow e_A^* \downarrow$
- $b \uparrow$ for everyone: same fall in surplus, but aggregate active search $\bar{s}_A \downarrow$
  - return to active search $ME_A \uparrow \Rightarrow e_A^* \downarrow$ by less
- Proposition (tightness, wages, μ fixed):

$$\frac{d \ln e_A^*}{d \ln b} = \begin{cases} -\sigma_b \varepsilon_s & \text{micro: one worker} \\ -\sigma_b \varepsilon_s^{\text{eff}} & \text{macro: all workers} \end{cases} \qquad \varepsilon_s^{\text{eff}} = \frac{\varepsilon_s}{1 + (1 - \alpha_A)(1 - \beta_{ASP})\,\varepsilon_s}$$

Crowding-Out and Macro Effects of UI

- $b \uparrow$ for one worker: surplus from a job falls $\Rightarrow e_A^* \downarrow$
- $b \uparrow$ for everyone: same fall in surplus, but aggregate active search $\bar{s}_A \downarrow$
  - return to active search $ME_A \uparrow \Rightarrow e_A^* \downarrow$ by less
- Proposition (tightness, wages, μ fixed):

$$\frac{d \ln e_A^*}{d \ln b} = \begin{cases} -\sigma_b \varepsilon_s & \text{micro: one worker} \\ -\sigma_b \varepsilon_s^{\text{eff}} & \text{macro: all workers} \end{cases} \qquad \varepsilon_s^{\text{eff}} = \frac{\varepsilon_s}{1 + (1-\alpha_A)(1-\beta_{ASP})\,\varepsilon_s}$$

- Bound, for any ε_s:

$$\varepsilon_s^{\text{eff}} < \frac{1}{(1-\alpha_A)(1-\beta_{ASP})} = 0.15$$

  - At our calibrated ε_s: $\varepsilon_s^{\text{eff}} = 0.12$, about one-quarter of the micro elasticity

General Equilibrium: K-month benefit expansions

- Experiment: UI benefits rise for K months, announced at date 0
- Elasticity of the unemployment rate to benefits at month K

K (months)	Baseline	Perfect subs.	Diff.
3	0.047	0.075	−37%
6	0.147	0.216	−32%
9	0.247	0.351	−30%
12	0.334	0.466	−28%

- Crowding-out dampens the unemployment response by 28–37%

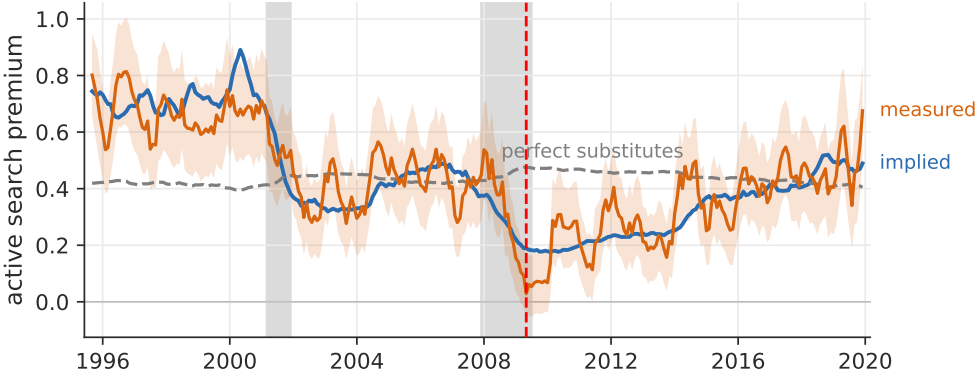
Conclusion

Conclusion

- Crowding-out of active search: during recession,
  - Active search goes up
  - Active search premium goes down
- Inconsistent with perfect substitutability of active and passive search
- Generalized search aggregator fits data and implies low elasticity of substitution ($\approx 1/5$) between active and passive search
- **Implications:**
  - Baily–Chetty with passive search $\Rightarrow$ more generous UI in recessions
  - Macro elasticity of active search $<$ micro elasticity: bounded below 0.15
  - Unemployment response to UI expansions dampened by roughly a third

Extra slides

Estimated Aggregator: Implied Active Search Premium



- Active search premium implied by CES aggregator lies close to time series
- Perfect subs. $\Rightarrow$ countercyclical ASP $\Rightarrow$ Inconsistent with data

▸ Estimated $ME_{A,t}$

The Active Shares of Matching and Search

- Active share of matching: share of matches attributable to active search

$$m_{A,t} = \frac{(f_{A,t} - f_{P,t})\,\check{\mathcal{G}}_t\, ne_t}{\underbrace{(f_{A,t} - f_{P,t})\,\check{\mathcal{G}}_t\, ne_t}_{\text{matches from active search}} + \underbrace{f_{P,t}\, ne_t}_{\text{matches from passive search}}} = \frac{ASP_t\,\check{\mathcal{G}}_t}{ASP_t\,\check{\mathcal{G}}_t + 1}$$

  - Measured directly from the data

- Active share of search: active search's share of total effective search

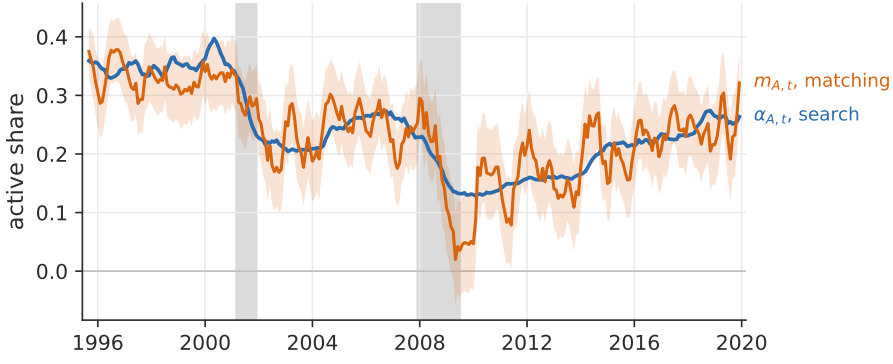
$$\alpha_{A,t} = \frac{ME_{A,t} \cdot \bar{s}_{A,t}}{\bar{s}_t} = \frac{d \log \bar{s}_t}{d \log \bar{s}_{A,t}}$$

  - Calculated from estimates of CES aggregator
  - Equal to elasticity of effective search w.r.t. active search

- These are equivalent under CES: $m_{A,t} = \alpha_{A,t}$

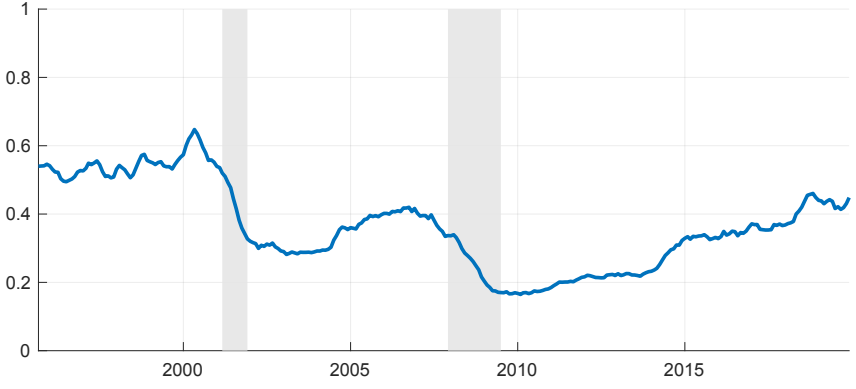
*NB: The active share of matching—like the ASP—depends on the choice of the reference group

Active Share of Matching and Active Share of Search



- Active share of matching ($m_{A,t}$): data only, from ASP_t and $\check{\mathcal{G}}_t$
- Active share of search ($\alpha_{A,t}$): estimated CES aggregator $(\hat{\nu}, \hat{\omega})$ evaluated at observed $\bar{e}_{A,t}$ and $\check{\mathcal{G}}_t$
- Implies elast. of effective search to active search is procyclical

Time Series of the Marginal Efficiency of Active Search



Share of jobs found through active search (SCE)

	(1) No FE	(2) Start-year FE
Jobs begun in survey year ($N = 477$)		
State unemp. rate	-3.664^{***}	-5.876^{**}
	(1.419)	(2.478)
…or the year before ($N = 712$)		
State unemp. rate	-3.070^{***}	-5.872^{***}
	(0.952)	(1.945)

- Hires from non-employment: share found through active search is lower where unemployment is higher
- Perfect substitutes predicts the opposite
- $+5$pp unemployment $\Rightarrow$ share falls by a third to a half of its level

Note: Linear probability models; dependent variable is $100\times$ an indicator that the respondent found the current job through an active channel. SCE Job Search Supplement, 2013–2024 waves; wage and salary earners not employed immediately before their current job, excluding jobs that began in 2020 or 2021. Standard errors clustered by state.

What is a CES search aggregator?

- Equivalence: separate submarkets for active and passive search

$$m_t(\bar{s}_t, v_t) = m_t\left(ME_{A,t} \cdot \bar{s}_{A,t}, \alpha_{A,t} \cdot v_t\right) + m_t\left(ME_{P,t} \cdot \bar{s}_{P,t}, (1 - \alpha_{A,t}) \cdot v_t\right)$$

$$\text{with} \quad \alpha_{A,t} = \frac{ME_{A,t} \cdot \bar{s}_{A,t}}{\bar{s}_t}$$

- (Obtains through constant returns)
- $\nu < 1 \Rightarrow$ As if submarket for active search intermediates smaller share of vacancies in recessions

Time spent searching (MPS 2018)

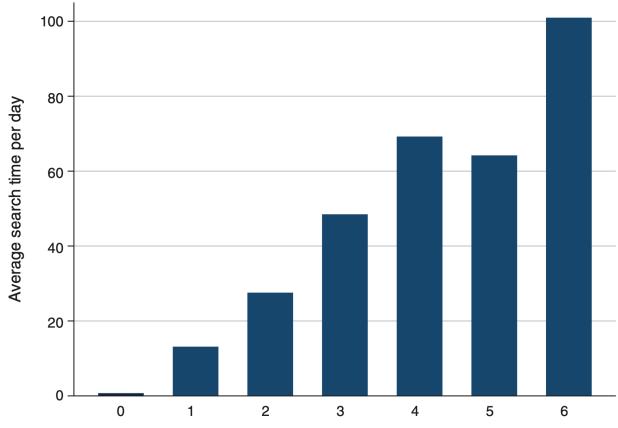


FIGURE 1. THE AVERAGE MINUTES (*per day*) SPENT ON JOB SEARCH ACTIVITIES BY THE NUMBER OF SEARCH METHODS

Notes: Each bin reflects the average search time in minutes per day by the number of search methods that the individual reports using in the previous month. Data is pooled from 2003–2014 and observations are weighted by the individual sample weight.

Returns to search

- The job-finding probability $f_{i,t}$ of a worker with search efficiency $s_{i,t}$ is

$$f_{i,t} = s_{i,t} \cdot \frac{m_t\left(\bar{s}_t, v_t\right)}{\bar{s}_t}$$

- The search efficiency $s_{i,t}$ of a worker supplying $e_{A,i,t}$

$$s_{i,t} = ME_{A,t} \cdot e_{A,i,t} + ME_{P,t} \cdot 1$$

by linear homogeneity of the CES search aggregator, so individual search efficiencies aggregate up:

$$\int_i s_{i,t}\, di = ME_{A,t}\, \bar{s}_{A,t} + ME_{P,t}\, \bar{s}_{P,t} = \bar{s}_t$$

- Nests prior case when $\nu = \infty$:

$$s_{i,t} = \omega \cdot e_{A,i,t} + (1 - \omega) \cdot 1$$

Job search methods in the CPS

Active methods (nine)

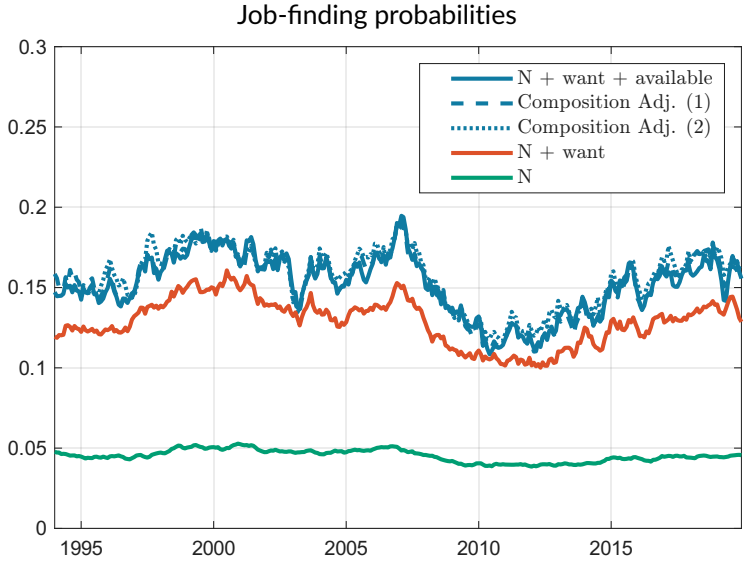
1. Contacting an employer directly or having a job interview
2. Contacting a public employment agency
3. Contacting a private employment agency
4. Contacting friends or relatives
5. Contacting a school or university employment center
6. Checking union or professional registers
7. Sending out resumes or filling out applications
8. Placing or answering advertisements
9. Other means of active job search

Passive methods (three)

1. Reading about job openings (newspapers, internet)
2. Attending a job training program or course
3. Other means of passive job search

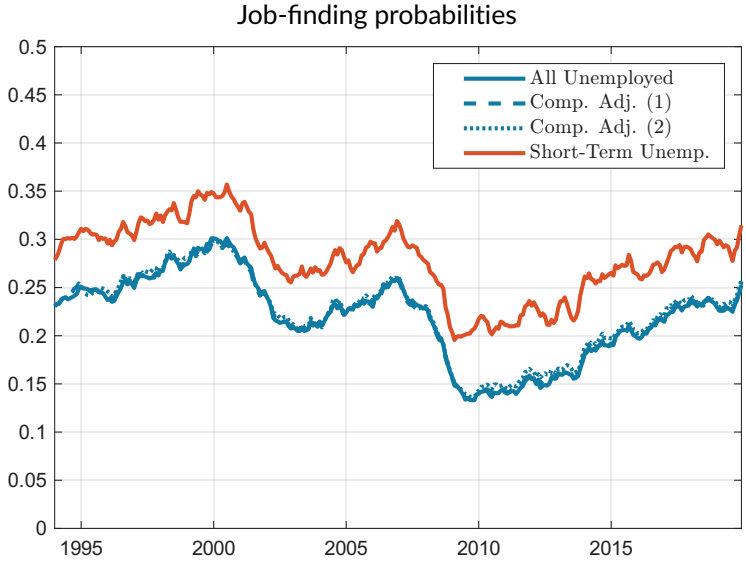
Note: Classification of methods as in the CPS; list follows Mukoyama, Patterson & Şahin (2018, Table 2). Active searchers report at least one active method; # of search methods counts active methods only.

Alternative measures of passive searchers



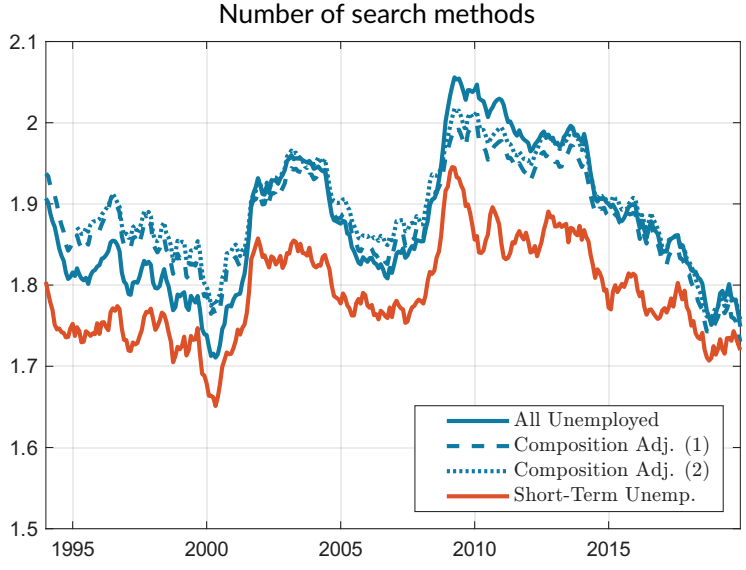
▸ Passive: job-finding ▸ Active: job-finding ▸ Active: search methods

Alternative measures of active searchers



▸ Passive: job-finding ▸ Active: job-finding ▸ Active: search methods

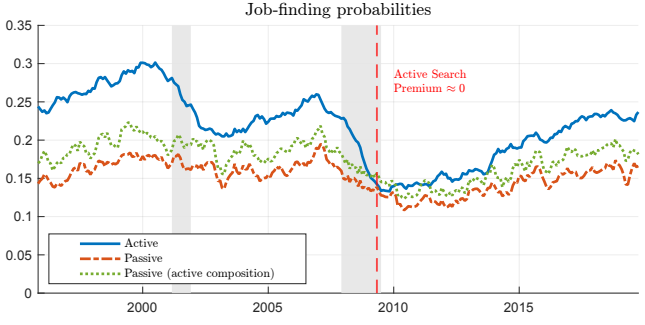
Alternative measures of active searchers



▸ Passive: job-finding ▸ Active: job-finding ▸ Active: search methods

Passive with Composition of Active

	Monthly job-finding probability		
	Active (f_A)	Passive (active composition, $\tilde{f}_P$)	Ratio ($f_A/\tilde{f}_P$)
mean(x)	0.218	0.175	1.250
std(x)/std(Y)	8.218	8.024	8.514
corr(x, Y)	0.846	0.351	0.488



Notes: Passive rate reweighted each month to the unemployed's sex × age × education composition (72 cells). Rows as in Table 1: quarterly averages, HP-1600, 1996–2019. Figure: 5-month centered moving averages.

Who searches passively? Characteristics and transitions

Non-employed group:	Active searchers	*N* + want job + available	*N* + want job	All nonparticipants (*N*)
	(1)	(2)	(3)	(4)
A. Characteristics (shares of person-months)				
Female	0.46	0.46	0.55	0.61
Age 16–24	0.33	0.25	0.33	0.18
Age 25–54	0.56	0.44	0.43	0.27
Age 55+	0.12	0.31	0.24	0.55
Less than high school	0.24	0.25	0.30	0.28
High school	0.34	0.34	0.30	0.32
Some college	0.26	0.23	0.24	0.23
College or more	0.16	0.19	0.15	0.17
Wants a job	—	1.00	1.00	0.06
not looking: job-market reasons	—	0.49	0.23	0.01
not looking: health, family, school	—	0.00	0.53	0.03
not looking: other reasons	—	0.51	0.24	0.01
Person-months	910,772	267,639	565,864	10,363,329
B. Monthly transition probabilities				
To employment	0.218	0.152	0.129	0.045
passive rate at the active searchers' composition	—	0.173	0.147	0.080
To unemployment	—	0.171	0.150	0.023
To passive search	0.047	—	—	—
To other nonparticipation	0.207	0.477	0.458	—

Note: Baseline passive group matches active searchers on sex and education, but is older. At active searchers' composition, passive job-finding rises from 0.152 to 0.173: composition makes the premium smaller. CPS 1995m9–2019m12.

▸ Wages ▸ Three definitions over time

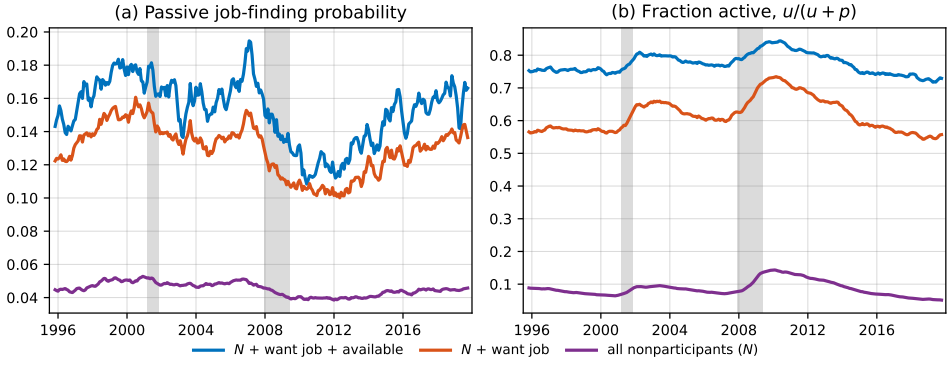
Who searches passively? Wages before and after the spell

Non-employed group:	Active searchers	*N* + want job + available	*N* + want job	All nonparticipants (*N*)
	(1)	(2)	(3)	(4)
A. Prior-job real hourly wage, 2019 dollars (employed at the month-4 interview)				
Mean	15.13	15.43	14.39	14.64
Median	12.43	12.44	11.67	11.76
Log gap vs. active	—	0.017	−0.043	−0.038
		(0.005)	(0.004)	(0.003)
with controls	—	0.009	−0.003	−0.003
		(0.004)	(0.003)	(0.002)
Residual sd, with controls	0.337	0.365	0.347	0.352
Person-months	83,409	17,464	34,194	282,097
B. Log change in the real hourly wage across the spell (employed at months 4 and 8)				
Mean	−0.012	0.026	0.018	0.023
Median	−0.012	0.010	0.008	0.012
Log gap vs. active	—	0.038	0.029	0.034
		(0.012)	(0.009)	(0.005)
with controls	—	0.041	0.025	0.035
		(0.012)	(0.009)	(0.006)
Residual sd, with controls	0.398	0.426	0.402	0.407
Workers	10,665	2,310	4,360	26,391

Note: Gaps: regression on the group indicator and year dummies, then adding sex × age × education and prior industry and occupation; s.e. clustered by person. Prior wages differ by under one log point with controls; passive searchers' wage growth across the spell is 2.5–4 log points higher, under a tenth of the within-group dispersion. CPS 1995m9–2019m12.

▸ Characteristics ▸ Three definitions over time

Passive search under the three definitions



Note: Seasonally adjusted monthly series, centered five-month moving average; NBER recessions shaded. Panel (b): active over active plus passive, with passive searchers as defined in each line. CPS 1995m9–2019m12.

▸ Characteristics ▸ Wages

Cyclicality of ASP and Search Effort: Robustness

	f_A/f_P		$\bar{e}^*_A$		$\check{\mathcal{G}}$	
	sd	corr	sd	corr	sd	corr
Baseline	8.03	0.46	2.23	−0.85	1.56	−0.76
Continuous-time rates	8.87	0.44	2.23	−0.85	1.56	−0.76
Nonparticipant at $t-1$	16.79	0.29	2.23	−0.85	1.56	−0.76
Fixed composition (72 subgroups)	7.62	0.44	1.66	−0.76	1.72	−0.72
Fixed composition (360 subgroups)	7.25	0.43	1.65	−0.76	1.72	−0.72
Active searchers' composition (72 subgroups)	8.33	0.42	1.66	−0.76	1.72	−0.72
Active searchers' composition (360 subgroups)	7.50	0.43	1.65	−0.76	1.72	−0.72
Short-term unemployed	7.70	0.25	1.98	−0.74	1.56	−0.76

Note: The active search premium ratio f_A/f_P, average active search effort $\bar{e}^*_A$ (average number of search methods), and the fraction of the non-employed actively searching $\check{\mathcal{G}}$, each constructed as in the corresponding robustness specification (baseline definition of the passive non-employed throughout). Quarterly averages of monthly series, logged and HP(1600)-filtered; sd is the standard deviation relative to GDP, corr the correlation with GDP.

Summary statistics, passive searchers: baseline

	mean(x)	std(x)/std(Y)	corr(x, Y)	corr(x, x_{-1})
Active job-finding (f_A)	0.218	8.22	0.85	0.82
Passive job-finding (f_P)	0.152	7.66	0.42	0.22
Ratio (f_A/f_P)	1.435	8.03	0.46	0.17
Active non-employed (%)	5.01	10.88	−0.89	0.94
Passive non-employed (%)	1.41	5.51	−0.71	0.73
Fraction active	0.773	1.56	−0.76	0.77
Avg. # of search methods	1.88	2.23	−0.85	0.79

Note: Quarterly averages of monthly series, logged and HP(1600)-filtered; volatilities relative to GDP (Y). Stocks in percent of the population base implied by each definition. f_A and the number of search methods do not depend on the definition of passive search. CPS, 1996–2019.

▸ Baseline: want job, available ▸ Want job ▸ All nonparticipants

Summary statistics, passive searchers: want job

	mean(x)	std(x)/std(Y)	corr(x, Y)	corr(x, x_{-1})
Active job-finding (f_A)	0.218	8.22	0.85	0.82
Passive job-finding (f_P)	0.129	5.36	0.53	0.32
Ratio (f_A/f_P)	1.679	6.69	0.62	0.40
Active non-employed (%)	4.93	10.86	−0.89	0.94
Passive non-employed (%)	2.95	3.80	−0.64	0.75
Fraction active	0.615	3.08	−0.83	0.89
Avg. # of search methods	1.88	2.23	−0.85	0.79

Note: Quarterly averages of monthly series, logged and HP(1600)-filtered; volatilities relative to GDP (Y). Stocks in percent of the population base implied by each definition. f_A and the number of search methods do not depend on the definition of passive search. CPS, 1996–2019.

▸ Baseline: want job, available ▸ Want job ▸ All nonparticipants

Summary statistics, passive searchers: all nonparticipants

	mean(x)	std(x)/std(Y)	corr(x, Y)	corr(x, x_{-1})
Active job-finding (f_A)	0.218	8.22	0.85	0.82
Passive job-finding (f_P)	0.045	3.27	0.60	0.57
Ratio (f_A/f_P)	4.788	6.62	0.76	0.64
Active non-employed (%)	3.31	10.82	−0.89	0.94
Passive non-employed (%)	34.82	0.47	−0.41	0.90
Fraction active	0.086	9.56	−0.90	0.94
Avg. # of search methods	1.88	2.23	−0.85	0.79

Note: Quarterly averages of monthly series, logged and HP(1600)-filtered; volatilities relative to GDP (Y). Stocks in percent of the population base implied by each definition. f_A and the number of search methods do not depend on the definition of passive search. CPS, 1996–2019.

▸ Baseline: want job, available ▸ Want job ▸ All nonparticipants

Rejection of perfect substitutes: time aggregation and duration

Slope of the log active search premium on log # of search methods (β_{ASP})

Passive searchers:	Want job, available	Want job	All nonparticipants
Baseline	-7.655^{***} (1.023)	-5.642^{***} (0.435)	-3.488^{***} (0.144)
Continuous-time hazard rates	-7.705^{***} (0.974)	-6.857^{***} (0.688)	-3.633^{***} (0.150)
Passive = nonparticipant at $t-1$	-5.518^{***} (0.934)	-4.566^{***} (0.504)	-2.731^{***} (0.170)
Short-term unemployed only*	-1.793^{***} (0.516)	-1.515^{***} (0.326)	-1.966^{***} (0.175)

Note: OLS; robust s.e. in parentheses. Continuous-time hazard rates: adjusted for time aggregation. Passive = nonparticipant at $t-1$: passive searchers who were also nonparticipants in the previous month. $\beta_{ASP}=1$ is rejected at the 0.1 percent level in every cell. CPS, 1995m9–2019m12.
* Active searchers unemployed 8 weeks or less; the passive rate cannot be adjusted for duration, which biases this slope toward zero.

Rejection of perfect substitutes: composition

Slope of the log active search premium on log # of search methods (β_{ASP})

Passive searchers:	Want job, available	Want job	All nonparticipants
Baseline	-7.655^{***} (1.023)	-5.642^{***} (0.435)	-3.488^{***} (0.144)
Fixed composition (shift-share)			
72 subgroups	-7.159^{***} (0.936)	-5.497^{***} (0.475)	-3.403^{***} (0.178)
360 subgroups	-8.119^{***} (1.216)	-5.220^{***} (0.468)	-3.310^{***} (0.174)
Passive rate at the active searchers' composition			
72 subgroups	-8.490^{***} (1.567)	-7.833^{***} (0.707)	-3.820^{***} (0.246)
360 subgroups	-9.891^{***} (1.587)	-8.050^{***} (0.806)	-4.391^{***} (0.288)

Note: OLS; robust s.e. in parentheses. Fixed composition: shift-share reweighted series with 72 or 360 subgroups held at time-average weights. Passive rate at the active searchers' composition: passive job-finding probability aggregated with the active pool's time-average weights. $\beta_{ASP} = 1$ is rejected at the 0.1 percent level in every cell. CPS, 1995m9–2019m12.

Rejection of perfect substitutes: unobserved quality

	A. Raw previous wage		*B. Residual previous wage*	
	Low	High	Low	High
Active searchers				
Relative to pool mean	1.052	0.905	1.002	0.997
Cyclicality	−0.72	−0.98	−0.81	−0.84
	(0.08)	(0.17)	(0.12)	(0.09)
Passive: N + want job + available				
Relative to pool mean	1.002	0.996	1.006	0.992
Cyclicality	−0.48	−0.28	−0.43	−0.45
	(0.13)	(0.17)	(0.14)	(0.15)
Passive: N + want job				
Relative to pool mean	0.979	1.057	0.975	1.037
Cyclicality	−0.30	−0.34	−0.27	−0.41
	(0.10)	(0.17)	(0.10)	(0.17)
All nonparticipants (N)				
Relative to pool mean	1.002	0.995	0.975	1.040
Cyclicality	−0.14	−0.18	−0.11	−0.22
	(0.08)	(0.08)	(0.07)	(0.09)

Note: Each pool split at the median previous wage (Mueller 2017); Panel B residualizes on year, demographics, race, marital status, prior industry and occupation. Cyclicality: HP-filtered log job-finding on log unemployment, Newey–West s.e. High- and low-wage halves find jobs at the same rate and with the same cyclicality in every pool. CPS, 1995m9–2019m12.

Rejection of perfect substitutes: cyclicality of components

The two facts behind the rejection hold under every adjustment

	f_A/f_P		$\bar{e}^*_A$		$\check{\mathcal{G}}$	
	sd	corr	sd	corr	sd	corr
Baseline	8.03	0.46	2.23	−0.85	1.56	−0.76
Continuous-time rates	8.87	0.44	2.23	−0.85	1.56	−0.76
Nonparticipant at $t-1$	16.79	0.29	2.23	−0.85	1.56	−0.76
Fixed composition (72 subgroups)	7.62	0.44	1.66	−0.76	1.72	−0.72
Fixed composition (360 subgroups)	7.25	0.43	1.65	−0.76	1.72	−0.72
Active searchers' composition (72 subgroups)	8.33	0.42	1.66	−0.76	1.72	−0.72
Active searchers' composition (360 subgroups)	7.50	0.43	1.65	−0.76	1.72	−0.72
Short-term unemployed	7.70	0.25	1.98	−0.74	1.56	−0.76

Note: f_A/f_P: active search premium; $\bar{e}^*_A$: average number of search methods among active searchers; $\check{\mathcal{G}}$: fraction of the non-employed actively searching. Quarterly averages, logged, HP(1600)-filtered; sd relative to GDP, corr with GDP. Baseline definition of the passive non-employed. The premium is procyclical and search effort countercyclical in every row. CPS, 1996Q1–2019Q4.

Estimates of the CES aggregator: N + want job

	(1) Unrestricted	(2) Restricted	(3) Extensive only
$\beta_{\breve{\mathcal{G}}}$ (fraction searching)	-2.531^{***}	-2.552^{***}	-3.297^{***}
	(0.389)	(0.155)	(0.236)
β_e (average effort)	-1.590^{***}	-1.552^{***}	–
	(0.605)	(0.155)	
p-value: $\beta_e = \beta_{\breve{\mathcal{G}}} + 1$	0.950	–	–
p-value: $\nu = \infty$	–	0.000	0.000
Implied ν	–	0.392	0.303
		(0.024)	(0.022)

- Unrestricted (1): Cannot reject $\beta_e = \beta_{\breve{\mathcal{G}}} + 1$
- Restricted (2): $\hat{\nu} = 0.39$ and $\nu = \infty$ rejected
- Extensive margin only (3): $\hat{\nu} = 0.30$

Note: Dependent variable: log active search premium. All columns include a constant and linear trend. Passive group: nonparticipants who want a job. CPS 1995m9–2019m12, $N = 292$.

Estimates of the CES aggregator: all nonparticipants

	(1) Unrestricted	(2) Restricted	(3) Extensive only
$\beta_{\breve{g}}$ (fraction searching)	-0.549^{***}	–	-0.662^{***}
	(0.046)		(0.020)
β_e (average effort)	-0.710^{***}	–	–
	(0.250)		
p-value: $\beta_e = \beta_{\breve{g}} + 1$	0.000	–	–
Implied ν	–	–	1.510
			(0.045)

- Unrestricted (1): $\beta_e = \beta_{\breve{g}} + 1$ is rejected
- Restricted (2): omitted, as the CES restriction is rejected
- Extensive margin only (3): $\hat{\nu} = 1.51$

Note: Dependent variable: log active search premium. All columns include a constant and linear trend. Passive group: all nonparticipants. CPS 1995m9–2019m12, $N = 292$.

Estimates of ν holding composition fixed

Passive searchers:	*N* + want job + available		*N* + want job		All nonparticipants	
	$\hat{\nu}$ (s.e.)	*J* [*p*]	$\hat{\nu}$ (s.e.)	*J* [*p*]	$\hat{\nu}$ (s.e.)	*J* [*p*]
Unadjusted	0.201 (0.022)	0.04 [0.84]	0.392 (0.023)	0.00 [0.95]	—	13.16 [0.00]
Own composition held fixed						
72 subgroups	0.229 (0.025)	0.00 [0.99]	0.423 (0.029)	0.04 [0.84]	—	15.68 [0.00]
360 subgroups	0.212 (0.031)	0.62 [0.43]	0.445 (0.031)	0.01 [0.93]	—	18.16 [0.00]
*Passive searchers at the active searchers' composition**						
72 subgroups	0.187 (0.029)	0.26 [0.61]	0.313 (0.022)	0.15 [0.70]	—	8.66 [0.00]
360 subgroups	0.168 (0.024)	0.05 [0.83]	0.307 (0.025)	0.90 [0.34]	—	7.94 [0.00]

Note: Two-step GMM estimates of ν under the CES restriction; delta-method s.e.; *J*: test of the CES restriction, with $\hat{\nu}$ omitted where it is rejected at 5 percent. Shift-share composition-adjusted series. CPS, 1995m9–2019m12.

* Re-weighting the passive pool to the active pool's composition raises the passive job-finding rate and lowers the active search premium; the change in point estimates reflects this change in the premium.

Measurement error and GMM estimates of ν

Estimator	$\hat{\nu}$ (s.e.)
IV, instrument: average effort	0.202 (0.023)
IV, instrument: fraction searching	0.200 (0.022)
Restricted OLS	0.201 (0.022)
Two-step GMM, both instruments	0.201 (0.022)
Hansen J (1 d.o.f.)	0.04 $[p = 0.84]$

- Instrument total active search with each margin alone: consistent under classical measurement error in the other margin
- All four estimates within 0.01 of $\hat{\nu} = 0.20$
- J equivalent to F-test for overidentifying restriction

Note: Estimates of the restricted equation $\log(f_{A,t}/f_{P,t} - 1) - \log \bar{e}^*_{A,t} = c + \beta_T t - \frac{1}{\nu}(\log \breve{\mathcal{G}}_t + \log \bar{e}^*_{A,t}) + \epsilon_t$. Baseline passive group. Robust standard errors. CPS 1995m9–2019m12, $N = 287$.

Firms and Wages

Firm block follows Gertler & Trigari (2009):

- Cobb-Douglas technology in capital and labor
- Convex hiring costs
- Firm wage renegotiated with probability $1 - \lambda$ each period
  - Workers hired between renegotiations receive the firm's prevailing wage

▸ Full Firm Problem

Firm Problem

Firm value J_t with convex hiring cost $\frac{\kappa_t}{2}x_t^2$:

$$J_t(w_t) = \max_{x_t, \check{k}_t} \left\{ z_t \check{k}_t^{\alpha} - r_t \check{k}_t - w_t - \tfrac{\kappa_t}{2}x_t^2 + (\rho + x_t)\beta \mathbb{E}_t \Lambda_{t,t+1} J_{t+1}(w_{t+1}) \right\}$$

Hiring FOC:

$$\kappa_t x_t = \beta \mathbb{E}_t \Lambda_{t,t+1} J_{t+1}(w_{t+1})$$

Contract wage w^* (Nash with staggered renegotiation à la GT 2009):

$$\max_{w^*} H(w^*)^{\eta} J(w^*)^{1-\eta} \qquad \text{subject to} \qquad w' = \begin{cases} w & \text{w.p. } \lambda \\ w^{*\prime} & \text{w.p. } 1-\lambda \end{cases}$$

- Hiring costs have fixed and vacancy-dependent components: $\kappa_t = \kappa(\bar{v}_t/\bar{v})^{\gamma_v}$ (Sala, Söderström & Trigari 2013)
- λ controls wage stickiness
- Bargaining occurs before search costs, γ, are drawn

Aggregate business-cycle moments

	y	w	u	v	θ	c	i
	U.S. Data						
Relative St. Dev.	1.00	0.44	7.89	8.98	16.63	0.80	4.51
Autocorrelation	0.87	0.91	0.93	0.93	0.93	0.88	0.84
Correlation with y	1.00	0.35	−0.86	0.90	0.90	0.87	0.90
	Model, $\lambda = 11/12$ (4Q-Sticky)						
Relative St. Dev.	1.00	0.25	8.41	12.07	19.73	0.23	3.40
Autocorrelation	0.88	0.96	0.91	0.82	0.88	0.82	0.89
Correlation with y	1.00	0.41	−0.88	0.92	0.97	0.96	1.00
	Model, Flex wages						
Relative St. Dev.	1.00	0.92	0.92	1.25	2.12	0.29	3.30
Autocorrelation	0.80	0.80	0.94	0.89	0.93	0.81	0.80
Correlation with y	1.00	1.00	−0.73	0.66	0.71	0.98	1.00

- Staggered contracts deliver unemployment volatility, as in Gertler & Trigari (2009)
- Model preserves this while adding both search margins, CES aggregator, and procyclical opportunity cost

▸ Search Moments

Full calibration

A. Assigned parameters

Parameter	Value	Source / interpretation
β	0.9967	Monthly discount factor
σ_c	4.0	CRRA curvature
ρ	0.965	3.5% monthly separation
λ	11/12	One year average duration
γ_v	0.50	Vacancy share of hiring costs
α	1/3	Capital share
δ	0.0083	2.5% quarterly
ρ_z	0.983	0.95 quarterly
σ_z	0.0075	St. dev. of monthly TFP innovation
η	0.50	Nash bargaining weight
b	0.16	Statutory 0.40$\times$ take-up 0.40
ω	0.554	CES weight on active search
σ_m	1.0	Matching-function constant
κ	38.4	Scale, hiring costs
ψ_0	0.013$\times$MPL	Scale, search costs
e^{μ_γ}	0.007$\times$MPL	Scale, participation costs

B. Jointly fitted parameters and targets

Par.	Value	Target	Data	Model
ε_s	0.532	Duration elas. to UI	0.43	0.43
σ_γ	1.599	$\mathrm{sd}\log\check{\mathcal{G}}/\mathrm{sd}\log e_A^*$	0.70	0.70
ν	0.196	β_{ASP}	-7.66	-7.65
σ	0.525	Matching elasticity	0.50	0.50
ξ^I	0.013	Opp. cost / MPL	0.86	0.86

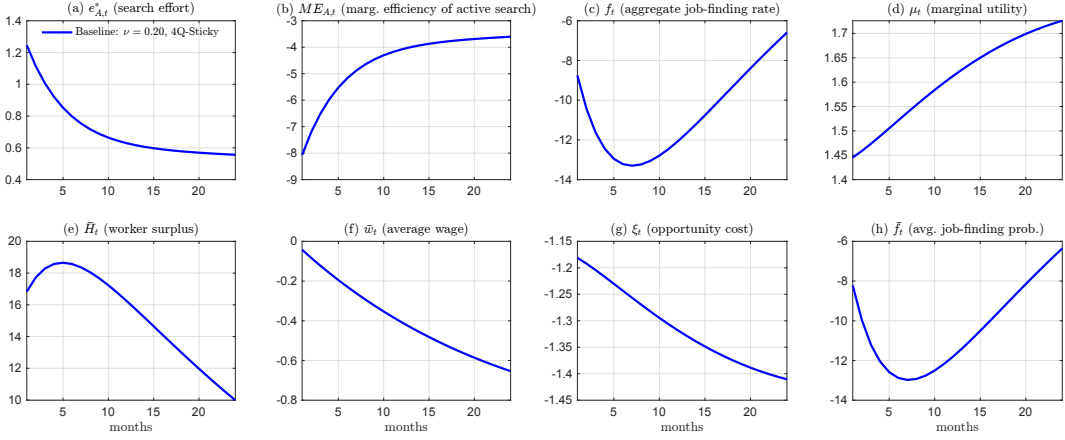
- 13 parameters set directly
- 3 more implied by SS restrictions
- Remaining 5 calibrated jointly

Search Moments: Data and Model

	e_A^*		$\check{\mathcal{G}}$		f_A/f_P	
	s.d.	corr	s.d.	corr	s.d.	corr
U.S. Data	2.23	−0.85	1.56	−0.76	8.03	0.46
Baseline	0.52	−0.84	0.36	−0.84	1.20	0.84
No crowding ($\beta_{ASP} = 1$)	2.07	−0.84	1.45	−0.84	0.63	−0.84
Volatile μ_t ($\zeta = 3.98$)	2.23	−0.94	1.56	−0.94	5.18	0.94

Note: Standard deviations relative to output; correlations with output. Quarterly averages of monthly series, logged and HP(1600)-filtered. Data: CPS, 1996–2019. Model rows, all under staggered wages: the baseline; perfect substitutes ($\nu \to \infty$: $\beta_{ASP} = +1$ imposed in place of the premium-elasticity target, with the remaining targets re-fit), which removes the cyclical crowding of active search; and the volatile-μ experiment, in which ζ is chosen to match the volatility of e_A^* alone.

IRFs to −1pp TFP shock: Other Variables



Note: Responses to a negative one percentage point TFP innovation. Top row: search effort $e^*_{A,t}$ and the objects of the search first-order condition —the marginal efficiency of active search $ME_{A,t}$, the job-finding probability f_t, and the marginal utility of consumption μ_t. Bottom row: the surplus $\bar{H}_t$, the average wage $\bar{w}_t$, the opportunity cost ξ^o_t, and the job-finding rate from non-employment $\bar{f}_t$.