The Marginal Efficiency of Active Search

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Motivation

- Consider non-employed workers willing to accept a job... (as in CPS)
  - Active non-employed: e.g., contacts an employer about a position
  - Passive non-employed: e.g., waits for an employer to contact them

  Key margin for participation, UI, etc.

- During a recession,
  - Fraction of non-employed engaged in active search increases
  - Active search of the active non-employed increases
  - Active-passive ratio in job-finding probabilities decreases

  Consistent with decline in premium from active search

- Cyclicality of active-passive ratio *not* driven by cyclical heterogeneity

- Instead, symptomatic of "crowding-out" of active search

Motivation, cont'd

- Theory à la DMP typically abstracts from OLF & passive non-empl.
- But OLF and "passive non-empl." important for labor market flows…
  - 1/2 of new hires from non-employment come from OLF
  - Passive non-employed improve fit of matching function
  - $OLF \rightarrow U$ flows generate recessionary increase in unemployment
- Contemporary literature incorporates non-participation into DMP
  - e.g. Krusell et al (2017), Faberman et al (2022)
- Key restriction: active and passive search as perfect substitutes
  - Implies constant active-passive ratio of job-finding probabilities
  - Goes back to Blanchard and Diamond (1990)
- Restriction violated by recessionary decline in active-passive ratio
  - Workhorse models preclude crowding-out of active search

What I do

- Document crowding-out of active search during recessions:
  - More active searchers among non-employed who want work
  - But active-passive ratio in job-finding rates falls

  Not driven by cyclical composition
- Show formally: violation of perfect substitution
- Rejection of DMP w/ active & passive as perfect subst's
- Incorporate diminishing marginal efficiency of active search into three-state DMP, test/estimate, and explore implications:
  1. Active search less important during a recession
  2. Bailey-Chetty formula prescribes recessionary increase in UI
  3. Decentralized allocation not efficient under Hosios condition

A general model

Goal

Write down labor supply block of DMP model:

- Extensive and intensive margins of active search
- Procyclical opportunity cost of employment $\Rightarrow$ countercyclical search
- Job-finding probabilities depend on search efficiency
- Search efficiency is a composite of active and passive search
- Derive theoretical restriction relating
  - Active-passive ratio in job-finding probabilities
  - Average quantity of active search
- Then take restriction to data

Setting

- Representative family à la Andolfatto (1995) and Merz (1996)
  - Unit measure of workers indexed by i within each family
  - ne_t workers are non-employed, $1 - ne_t$ are employed

  Perfect consumption insurance within family
- Concave utility over consumption
- Workers must sacrifice leisure to work or search
- Contacts generated through CRS matching function m_t
- Large measure of firms post v_t vacancies search
- Search of non-employed can be passive and/or active

Active and passive search

- CRS matching function m_t over search efficiency and vacancies
- Search efficiency is composite of active and passive search
- Non-employed inelastically provide one unit of passive search
- Non-employed workers choose $s_{A,i,t}$ units of active search, subject to
  - Fixed costs, $\varsigma_{i,t} \sim \Gamma$ drawn *iid* w/ probability λ
  - Convex costs, $c\left(s_{A,i,t}\right)$
- Flexible to different notions of active search:
  - Intensive & extensive margin: $s_{A,i,t} \in \mathbb{R}_+$ (FMST 2022)
  - Extensive margin only: $s_{A,i,t} \in \{0, 1\}$ (KMRS 2017)

Matching function and job-finding probabilities

- Job-finding rate, $f_{i,t}$

$$f_{i,t} = s_{i,t} \cdot \left(\frac{m_t(s_t, v_t)}{s_t} \right) \tag{$*$}$$

- Search efficiency, $s_{i,t}$

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

- Aggregate active search, $s_{A,t}$

$$s_{A,t} = \int_i s_{A,i,t} d\Gamma_t^{ne}$$

- Aggregate search efficiency, s_t

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

- Fraction of non-employed engaged in active search, $\Gamma_t^{ne}(\bar{\check{\varsigma}}_t)$

$$\Gamma_t^{ne}(\bar{\check{\varsigma}}_t) \equiv \int \mathbb{I}\{s_A(x, \varsigma) > 0\} d\Gamma_t^{ne}(x, \varsigma)$$

Problem of the unemployed

$$U_{i,t} = \max_{s_{A,i,t}} \left\{ \frac{1}{\mu_t} \left(\psi - \varsigma_{i,t} \cdot \mathbb{I}\left\{ s_{A,i,t} > 0 \right\} - \chi \cdot \frac{{s_{A,i,t}}^{1+\kappa}}{1+\kappa} \right) + \mathbb{E}_{t+1|t} \left\{ \Lambda_{t,t+1} \cdot \left(f_{i,t} U_{i,t+1} + (1 - f_{i,t}) V_{i,t+1} \right) \right\} \right\}$$

with

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

- $V_{i,t}$ ($U_{i,t}$) is consumption-equivalent value of (un)employment
- Flow value of leisure ψ and search cost normalized by marginal utility of consumption μ_t, with $\Lambda_{t,t+1} \equiv \beta \cdot (\mu_{t+1}/\mu_t)$

Solution

$$\frac{\chi}{\mu_t}\left(s^*_{A,i,t}\right)^{\kappa} = \mathbb{E}_{t+1|t}\left\{\Lambda_{t,t+1}\cdot\omega\cdot f_t\left[V_{i,t+1} - U_{i,t+1}\right]\right\} \quad \text{if } \varsigma_{it} \leq \check{\varsigma}_t(x_i)$$

where

$$\check{\varsigma}_t(x_i) = \left(\omega\cdot s^*_{A,i,t}\cdot f_t\right)\cdot\mathbb{E}_{t+1|t}\left\{\Lambda_{t+1,t}\left[V_{i,t+1} - U_{i,t+1}\right]\right\} - \frac{1}{\mu_t}\left[\chi\left(\frac{\left(s^*_{A,i,t}\right)^{1+\kappa}}{1+\kappa}\right)\right]$$

- MC $=$ MB when net value of active search is positive
- Active search ($s_{A,i,t}$ & $\check{\varsigma}_t$) can be
  - Procyclical, from f_t (substitution effect)
  - Countercyclical, from μ_t (income effect)

Income effect dominates in data.

Restriction: active-passive ratio and average active search

- Restriction in active-passive ratio: $\bar{f}_{A,t}/\bar{f}_{P,t}$ and $\bar{s}_A^*$

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

  from eqn's $(*)$ and $(**)$

- Unit elasticity in $\bar{s}_{A,t}^*$ – all other quantities drop out!
  - Match efficiency differenced out
  - Unobserved heterogeneity of non-employed enters through $\bar{s}_{A,t}^*$
  - Where is $\Gamma_t^{ne}(\check{\varsigma}_t)$? (Fraction of non-employed actively searching)

- Similar restr'n appears in KMRS (2017, AER) & FMST (2022, ECTA) & …

Bringing the restriction to the data

CPS, 1996-2019

- Starting in 1994, CPS records following for jobless respondents:
  - Whether the respondent would be willing to accept a job
  - Whether the worker is engaged in nine methods of active search
  - If # search methods $= 0$, why no active search?

  Consistent monthly merges available 1996+
- Non-employed worker willing to accept a job is
  - Active searcher if # search methods > 0
  - Passive searcher: if # search methods $= 0$ & "able" to accept work
- Time spent searching near linear in # of search methods (Mukoyama, Patterson, and Sahin 2018) $\Rightarrow$ measure of search effort
- Note: exclude temporary-layoff for practical and conceptual reasons

The active and passive non-employed

	Active non-employed	Passive non-employed	$\frac{A\text{-}NE}{A\text{-}NE+P\text{-}NE}$	Avg. # of search methods
mean(x)	4.9	1.3	0.79	1.85
std(x)/std(Y)	11.0	5.7	1.50	2.65
corr(x, Y)	−0.89	−0.70	−0.75	−0.64

Note: Data from CPS, 1996-2019. *A-NE* and *P-NE* refer to active and passive non-employed Y indicates quarterly 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

- Both frac. searching & # of search methods is countercyclical
- See also Osberg (1993), Shimer (2004), Faberman and Kudlyak (2016), Elsby, Hobijn and Sahin (2015), Mukoyama, Patterson, and Sahin (2018)

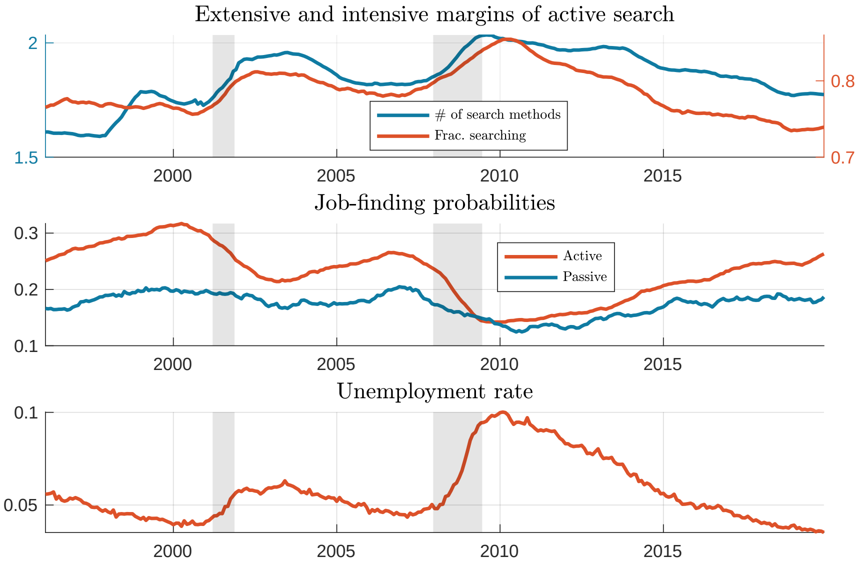
Job-finding rates of the active and passive non-employed

	$A\text{-}NE \to E$ probability	$P\text{-}NE \to E$ probability	$A\text{-}P$ ratio
mean(x)	0.23	0.17	1/1.32
std(x)/std(Y)	8.67	8.87	9.53
corr(x, Y)	0.85	0.32	0.48

Note: Data from CPS, 1996-2019. *A-NE* and *P-NE* refer to active and passive non-employed, "*A-P* ratio" refers to active-passive ratio of job-finding probabilities, *Y* indicates quarterly 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

- Mildly procyclical job-finding probability of passive non-employed
- Highly procyclical job-finding probability of active non-employed
- Thus, procyclical active-passive ratio in job-finding probabilities

Search and job-finding probabilities



Testing the restriction

- Recall restriction:

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

  Theory predicts unit elasticity

- Estimated elasticity from data: -5.85 (SE$=$ 0.873)
- Robust to:
  - Inclusion of time trend, cyclical indicator
  - Restricting active searchers to low duration of unemployment
  - Controls for cyclical composition along observable dimensions ...
  - Time-varying ω (introduces upward bias into estimated elasticity)
- Rejection of DMP with active and passive as perfect substitutes

Micro Estimates

An unrestricted
CES search aggregator

CES aggregator for search effort

- Aggregate search effort s_t given by CES aggregator over $s_{A,t}$ and $s_{P,t}$

$$s_t = \left(\omega\left(z_t \cdot s_{A,t}\right)^{\rho} + (1-\omega)s_{P,t}^{\rho}\right)^{\frac{1}{\rho}}$$

  w/ exogenous z_t

- Aggregate active & passive search satisfy

$$s_{A,t} = \int s_{A,i,t} d\Gamma_t^{ne} = \left(\Gamma_t^{ne}(\bar{\check{\varsigma}}_t) ne_t\right) \cdot \bar{s}_{A,t}^{*}, \quad s_{P,t} = \int d\Gamma_t^{ne} = ne_t$$

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

$$ME_{A,t} = \frac{\partial s_t}{\partial s_{A,t}} = \omega \cdot z_t^{\rho} \cdot \left(\frac{s_t}{s_{A,t}}\right)^{1-\rho}, \quad ME_{P,t} = \frac{\partial s_t}{\partial s_{P,t}} = (1-\omega) \cdot \left(\frac{s_t}{s_{P,t}}\right)^{1-\rho}$$

Returns to search

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

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

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

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

  by linear homogeneity of the CES search aggregator

- Nests prior case when $\rho = 1$ & $z_t = 1$:

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

Restriction from theory, redux

- Relative job-finding probabilities, active vs. passive search

$$\frac{\bar{f}_{A,t}}{\bar{f}_{P,t}} - 1 = \frac{\left(ME_{A,t} \cdot \bar{s}^*_{A,t} + ME_{P,t}\right)\left(\frac{m_t(s_t, v_t)}{s_t}\right)}{ME_{P,t}\left(\frac{m_t(s_t, v_t)}{s_t}\right)} - 1$$

$$= z_t^{\rho} \cdot \left(\frac{\omega}{1-\omega}\right)\left(\frac{1}{\Gamma_t^{ne}(\check{\varsigma}_t)\bar{s}^*_{A,t}}\right)^{1-\rho} \cdot \bar{s}^*_{A,t}$$

- Thus,

$$\log\left(\frac{\bar{f}_{A,t}}{\bar{f}_{P,t}} - 1\right) = \rho \cdot \log z_t + \log\left(\frac{\omega}{1-\omega}\right) + (\rho - 1) \cdot \log \Gamma_t^{ne}(\check{\varsigma}_t) + \rho \cdot \log \bar{s}^*_{A,t}$$

- Return to data: test restriction in ρ, estimate ω and ρ

Regression estimates

	(1)	(2)	(3)	(4)	(5)	(6)
β_{Frac}	-4.785^{**}	-4.118^{***}	-8.142^{***}	-0.381	-2.986^{***}	-4.211^{*}
	(2.0448)	(0.4892)	(1.6186)	(2.5928)	(0.6375)	(2.2981)
$\beta_{\#}$	-2.727^{**}	-3.118^{***}	–	-2.884^{**}	-1.986^{***}	–
	(1.1464)	(0.4892)		(1.1334)	(0.6375)	
β_0	0.705	0.995^{***}	-1.052^{**}	2.233^{*}	1.201^{***}	0.281
	(0.8636)	(0.2773)	(0.4448)	(1.1453)	(0.3315)	(0.8902)
Additional controls	Time trend			Time trend + unempl. rate		
Constrain $\beta_{\text{Frac}} + 1 = \beta_{\#}$?	No	Yes	–	No	Yes	–
F-test	$p(\beta_{\text{Frac}} + 1 = \beta_{\#})$	$p(\rho = 1)$	$p(\rho = 1)$	$p(\beta_{\text{Frac}} + 1 = \beta_{\#})$	$p(\rho = 1)$	$p(\rho = 1)$
	$= 0.719$	$= 0.000$	$= 0.000$	$= 0.297$	$= 0.000$	$= 0.070$
N	264	264	264	264	264	264
Implied ρ	–	-3.118	-9.142	–	-1.986	-5.211
Implied ω		0.730	0.259		0.769	0.570

Note: CPS, 1996-20019

Regression estimates, Pt. 1

	(1)	(2)	(3)
β_{Frac}	-4.785^{**}	-4.118^{***}	-8.142^{***}
	(2.0448)	(0.4892)	(1.6186)
$\beta_{\#}$	-2.727^{**}	-3.118^{***}	–
	(1.1464)	(0.4892)	
β_0	0.705	0.995^{***}	-1.052^{**}
	(0.8636)	(0.2773)	(0.4448)
Additional controls		Time trend	
Constrain $\beta_{\text{Frac}} + 1 = \beta_{\#}$?	No	Yes	–
F-test	$p(\beta_{\text{Frac}} + 1 = \beta_{\#})$	$p(\rho = 1)$	$p(\rho = 1)$
	$= 0.719$	$= 0.000$	$= 0.000$
N	264	264	264
Implied ρ	–	-3.118	-9.142
Implied ω		0.730	0.259

Note: CPS, 1996-20019

Regression estimates, Pt. 2

	(4)	(5)	(6)
β_{Frac}	-0.381	-2.986^{***}	-4.211^{*}
	(2.5928)	(0.6375)	(2.2981)
$\beta_{\#}$	-2.884^{**}	-1.986^{***}	–
	(1.1334)	(0.6375)	
β_0	2.233^{*}	1.201^{***}	0.281
	(1.1453)	(0.3315)	(0.8902)
Additional controls	Time trend + unempl. rate		
Constrain $\beta_{\text{Frac}} + 1 = \beta_{\#}$?	No	Yes	–
F-test	$p(\beta_{\text{Frac}} + 1 = \beta_{\#})$	$p(\rho = 1)$	$p(\rho = 1)$
	$= 0.297$	$= 0.000$	$= 0.070$
N	264	264	264
Implied ρ	–	-1.986	-5.211
Implied ω		0.769	0.570

Note: CPS, 1996-20019

Takeaway

$$\log\left(\frac{\bar{f}_t^A}{\bar{f}_t^P} - 1\right) = \rho \cdot \log z_t + \log\left(\frac{\omega}{1-\omega}\right) + (\rho - 1) \cdot \log \Gamma_t^{ne}(\check{\varsigma}_t) + \rho \cdot \log \bar{s}_t^{A,*}$$

- Reject restriction $\rho = 1$ (i.e., existing framework)
- Fail to reject restriction $\beta_{\text{Frac}} + 1 = \beta_{\#}$ (i.e., unrestricted framework)
- Elasticity of substitution $\frac{1}{1-\rho}$ is $1/4$ (*int. + ext.*) or $1/10$ (*ext. only*)
- Quick interpretation (*more later*):
  - For the worker: active search as a strategic substitute
  - For the firm: stable ratio of hires from referrals to outside applications

Application 1:

The marginal efficiency of active search over the business cycle

What is a CES search aggregator?

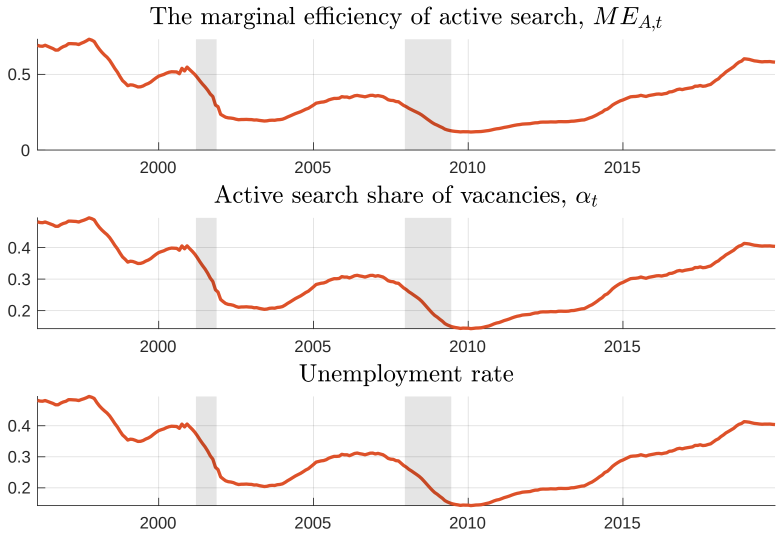
- Equivalence: separate submarkets for active and passive search

$$m_t(s_t, v_t) = m_t\left(ME_{A,t} \cdot s_{A,t}, \alpha_t \cdot v_t\right) + m_t\left(ME_{P,t} \cdot s_{P,t}, (1-\alpha_t) \cdot v_t\right)$$

$$\text{with} \quad \alpha_t = \frac{ME_{A,t} \cdot s_{A,t}}{s_t} = \frac{s_{A,t}^{\rho}}{s_{A,t}^{\rho} + s_{P,t}^{\rho}}, \qquad \rho \leq 1$$

- (Obtains through constant returns)
- Vacancy share of active search α_t analogous to factor share
    - $\rho < 0 \Rightarrow \alpha_t$ decreasing in $(s_{A,t}/s_{P,t})$
    - Countercyclical $(s_{A,t}/s_{P,t}) \Rightarrow$ Procyclical α_t
- $ME_{A,t}$ and α_t both fall during recessions

Backing out the marginal efficiency of active search



▸ Extensive and intensive margins of active search

Application 2:
Baily-Chetty Formula

Appl. 2) Baily-Chetty Formula

- Optimal UI described by Baily-Chetty formula:

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

  where u is unemployment and R is the replacement rate

- Landais et al. (2018): if wages are perfectly rigid (+ other conditions), (BC) describes optimal replacement rate R
- Micro-elasticity $\frac{d\log u}{d\log R}$ typically taken as constant $\Rightarrow$ R constant
- But $\frac{d\log u}{d\log R}$ is proportional to the marginal efficiency of active search...

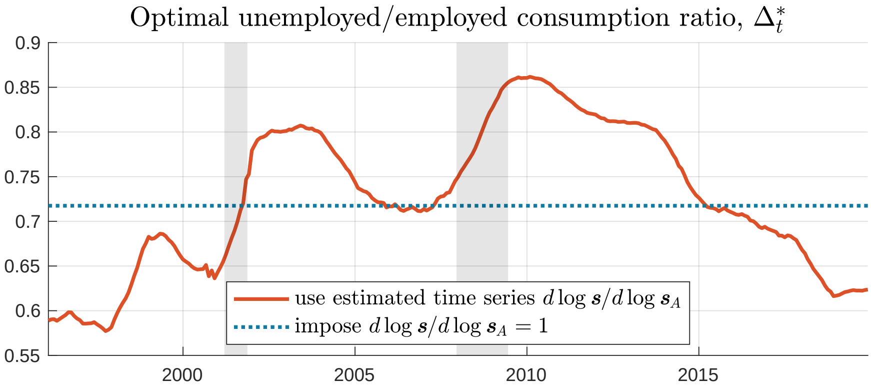
Appl. 2) Baily-Chetty Formula, cont'd

- Write micro-elasticity as

$$\frac{d\log u}{d\log R} = \frac{d\log u}{d\log f} \cdot \frac{d\log f}{d\log R}$$
$$\approx -(1-\tilde{u}) \cdot \frac{d\log f}{d\log s} \cdot \frac{d\log s}{d\log s_A} \cdot \frac{d\log s_A}{d\log R}$$
$$= -(1-\tilde{u}) \cdot \sigma \cdot \left[\omega \cdot \left(\frac{s_A}{s}\right)^{\rho}\right] \cdot \frac{d\log s_A}{d\log R}$$

- Note, $\rho < 0$, so the elasticity is not constant!
- Next, (*i*) take avg. $-\frac{d\log f}{d\log R}$ to be equal to 0.42 (Katz and Meyer, 1990), (*ii*) compute average $\frac{d\log s}{d\log s_A}$, and (*iii*) solve for $\frac{d\log s_A}{d\log R}$
- Use to obtain time series for $\frac{d\log u}{d\log R}$

Appl. 2) Baily-Chetty Formula, cont'd



- Define *unemployed/employed consumption ratio*: $\Delta_t = (c_t^u/c_t^e) - 1$
- Assume $U(c) = \log c$. Then, (BC) $\Rightarrow \Delta_t^* = (1 + \frac{d\log u}{d\log R})^{-1}$
- Δ_t^* higher during recessions due to marginal efficiency of active search

Application 3:
Failure of Hosios condition

Appl. 3) Failure of Hosios condition

$$U_i = \max_{s_{A,i}} \left\{ \frac{1}{\mu} \left(\psi - \varsigma_i \cdot \mathbb{I}\left\{ s_{A,i} > 0 \right\} - \chi \cdot \frac{{s_{A,i}}^{1+\kappa}}{1+\kappa} \right) + \beta \mathbb{E}\left\{ f_i U_i' + (1 - f_i) V_i' \mid \varsigma \right\} \right\}$$

$$\text{with} \quad f_i = (ME_A \cdot s_{A,i} + ME_P)\, f(\theta)$$

- Congestion externality: searchers fail to internalize how $s_{A,i}$ affects f
- Here: searchers also fail to internalize how $s_{A,i}$ affects ME_A and ME_P
- $s^*_{A,i} \uparrow \Rightarrow ME_A \downarrow$ and $ME_P \uparrow$

Appl. 3) Failure of Hosios condition, cont'd

- Optimal search, worker's problem:

$$\frac{\chi}{\mu}\left(s^{*}_{A,i}\right)^{\kappa} = \beta\mathbb{E}_i\left\{ME_A \cdot f(\theta) \cdot \psi'_i\right\}$$

  where ψ_i is the marginal value to the HH of having agent i employed

- Optimal search, Planner's problem:

$$\frac{\chi}{\mu}\left(s^{SP}_{A,i}\right)^{\kappa} = \beta\mathbb{E}_i\Big\{ME^{SP}_A \cdot f(\theta^{SP}) \cdot \psi^{SP,\prime}_i + \underbrace{\frac{\partial ME^{SP}_A}{\partial s_A} \cdot cov\left(s^{SP}_{A,i}, \psi^{SP,\prime}_i\right)}_{<0}\Big\}$$

  where ψ^{SP}_i is the marginal social value of having agent i employed

- CE=SP only under constant marginal efficiency of active search, ME_A

Conclusion

Conclusion

- Crowding-out of active search: during recession,
  - Active search goes up
  - Active-passive ratio in job-finding probabilities goes down

  Inconsistent with perfect substitutability of active and passive search
- Novel implications from three-state DMP w/ imperfect subst.
- Reinforces importance of participation margin for understanding unemployment dynamics and policy

Extra slides

Time spent searching (MPS 2018)

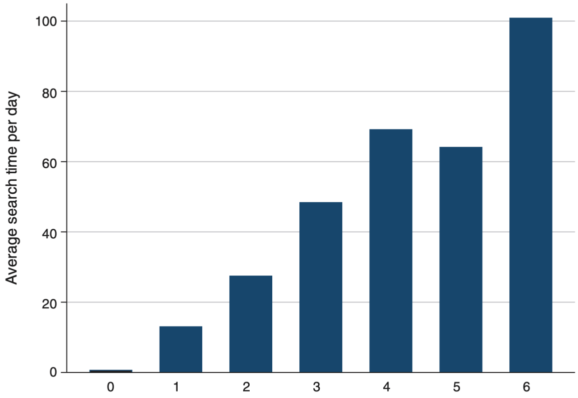


FIGURE 1. THE AVERAGE MINUTES (*per day*) SPENT ON JOB SEARCH ACTIVITIES BY THE NUMBER OF SEARCH METHODS

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.

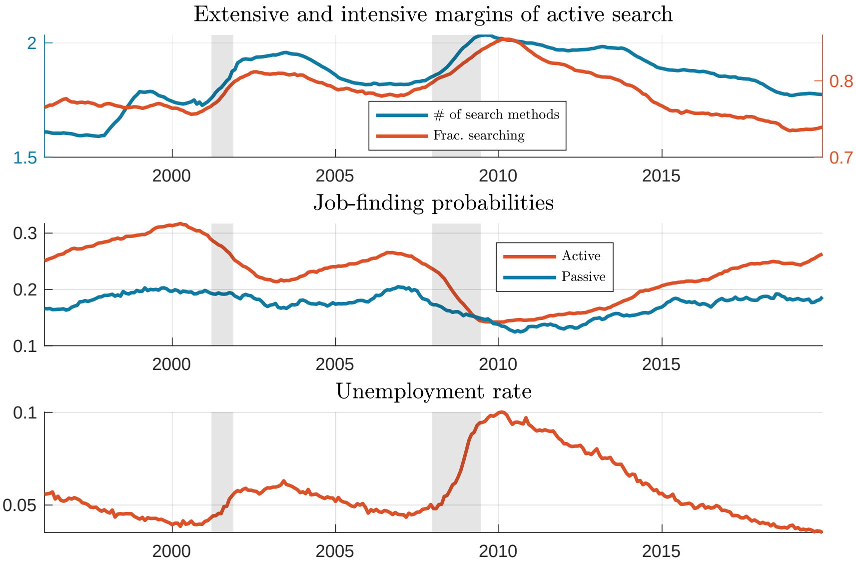
Definitions of job search (MPS 2018)

TABLE 2—DEFINITIONS OF JOB SEARCH METHODS IN CPS AND ATUS

Contacting an employer directly or having a job interview
Contacting a public employment agency
Contacting a private employment agency
Contacting friends or relatives
Contacting a school or university employment center
Checking union or professional registers
Sending out resumes or filling out applications
Placing or answering advertisements
Other means of active job search
Reading about job openings that are posted in newspapers or on the internet
Attending job training program or course
Other means of passive job search

Note: The first nine are active, the last three are passive.

Search and job-finding probabilities



Elasticity of active-passive ratio in job-finding probabilities

	Dependent variable: Log active-passive ratio in in job-finding probabilities (minus one)		
	(1)	(2)	(3)
Log # of search methods	-5.854^{***}	-5.017^{***}	-2.977^{***}
	(0.8729)	(0.9411)	(0.9620)
Additional controls	None	Time trend	Time trend + unempl. rate
$p(\beta_{\#} = 0)$	0.000	0.000	0.003
$p(\beta_{\#} = 1)$	0.000	0.000	0.000
N	264	264	264

CPS, 1996-2019

Elasticity of the active-passive ratio: duration dependence

	Dependent variable: Log active-passive ratio in in job-finding probabilities (minus one)		
	(1)	(2)	(3)
Log # of search methods	-2.410^{***}	-2.259^{***}	-2.431^{***}
	(0.5178)	(0.6372)	(0.7242)
Additional controls	None	Time trend	Time trend + unempl. rate
$p(\beta_{\#} = 0)$	0.000	0.001	0.001
$p(\beta_{\#} = 1)$	0.000	0.000	0.000
N	287	287	287

CPS, 1996-2019

Cyclical composition: groups

1. *Gender*
   - *a)* Female
   - *b)* Male
2. *Race*
   - *a)* Black
   - *b)* White
   - *c)* Other non-white
3. *Age*
   - *a)* 16-24
   - *b)* 25-55
   - *c)* 56-64
   - *d)* 64+
4. *Martial status (male/female)*
   - *a)* Married
   - *b)* Previously married
   - *c)* Never married
5. *Education*
   - *a)* Less than high school diploma (or equivalent)
   - *b)* High school diploma (or equivalent)
   - *c)* Some college
   - *d)* BA/ Four years of college
   - *e)* BA+/ More than four years of college
6. *Region*
   - *a)* Northeast
   - *b)* Midwest
   - *c)* South
   - *d)* West

Elasticity of active-passive ratio: cyclical composition

	Dependent variable: Log active-passive ratio in job-finding probabilities (minus one)		
	None	Time trend	Time trend + unempl. rate
		1. Gender	
Log # of search methods	-6.447^{***}	-5.760^{***}	-3.004^{***}
	(0.9040)	(1.0593)	(0.9476)
$p(\beta_{\log\#} = 1)$	0.000	0.000	0.000
N	266	266	266
		2. Race	
Log # of search methods	-6.150^{***}	-5.355^{***}	-3.439^{***}
	(0.7947)	(0.9732)	(1.0255)
$p(\beta_{\log\#} = 1)$	0.000	0.000	0.000
N	265	265	265
		3. Age	
Log # of search methods	-6.211^{***}	-4.998^{***}	-2.117^{***}
	(0.8260)	(0.9519)	(0.7850)
$p(\beta_{\log\#} = 1)$	0.000	0.000	0.000
N	267	267	267

	Dependent variable: Log active-passive ratio in job-finding probabilities (minus one)		
	None	Time trend	Time trend + unempl. rate
		4. Martial status (by gender)	
Log # of search methods	-6.126^{***}	-5.465^{***}	-2.520^{***}
	(0.7903)	(0.9173)	(0.8010)
$p(\beta_{\log\#} = 1)$	0.000	0.000	0.000
N	265	265	265
		5. Education	
Log # of search methods	-5.744^{***}	-4.961^{***}	-3.458^{***}
	(0.9564)	(1.0153)	(1.1548)
$p(\beta_{\log\#} = 1)$	0.000	0.000	0.000
N	223	223	223
		6. Region	
Log # of search methods	-5.870^{***}	-4.910^{***}	-2.659^{***}
	(0.8166)	(0.9365)	(0.9044)
$p(\beta_{\log\#} = 1)$	0.000	0.000	0.000
N	265	265	265

Random marginal efficiency of active search

- Assume that the true DGP is

$$\log\left(\frac{\bar{f}_t^A}{\bar{f}_t^P}-1\right)=\log\left(\frac{\omega_t}{1-\omega_t}\right)+1\cdot\log\bar{s}_{i,t}^{A,*}+\varepsilon_t$$

with

$$\omega_t=\omega+v_t,\quad v_t\ \&\ \varepsilon_t\ iid$$

- Then,

$$\tilde{\beta}_{\#}=\frac{cov\left(\log\bar{s}_t^{A,*},\log\left(\frac{\bar{f}_t^A}{\bar{f}_t^P}-1\right)\right)}{}=1+\frac{cov\left(\log\bar{s}_t^{A,*},\log\left(\frac{\omega_t}{1-\omega_t}\right)\right)}{var\left(\log\bar{s}_t^{A,*}\right)}$$

$$>1$$

When is active search most effective?

- Question: is job-finding probability increasing in active search effort?
  - Not an obvious question given evidence from aggregate data!
- Next, look at individual-level data and introduce
  - Time fixed effects
  - Rich individual controls
- Will show that when aggregate active search is high,
  - Active search effort is less effective
  - Penalty from purely passive search is lower

  Suggestive of crowding-out via diminishing returns

When is active search most effective? (cont'd)

	Dependent variable: Indicator for moving to employment in subsequent period		
	(1)	(2)	(3)
$s^A_{i,t}$	0.006^{***}	-0.002^{***}	0.028^{***}
	(0.0003)	(0.0004)	(0.0048)
$s^A_{i,t} \times$ relative quantity of active search in aggr.	–	–	-0.003^{***}
			(0.0005)
$\mathbb{I}\{s^A_{i,t} \neq 0\}$	–	0.040^{***}	0.202^{***}
		(0.0013)	(0.0125)
$\mathbb{I}\{s^A_{i,t} \neq 0\} \times$ relative quantity of active search in aggr.	–	–	-0.016^{***}
			(0.0012)
N	$865,079$	$865,079$	$865,079$
Time fixed effects?	Yes	Yes	Yes
Region fixed effects?	Yes	Yes	Yes

Note: Sample of active and passive non-employed, 1996-2019. Includes controls for education, gender, race, marital status, a quartic for age, and fixed-effects for time and region.