Graduate Labor Economics

Lecture L12: Joblessness and Job Search

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 Email: brendan.m.price@frb.gov. These notes are adapted from UC Davis course ECN 250A, which I taught in Winter 2018 and Spring 2019. Any views or opinions expressed here are my own and do not necessarily represent the views or policies of the Board of Governors of the Federal Reserve System or its staff. This version: March 21, 2020.

Today's lecture

- Search theory
- Basics of unemployment insurance
- Some stylized facts
- Krueger and Mueller (2011)

Search theory

- Why (re)learn the theory of job search?
  - Comes up a lot in empirical work on unemployment
  - Useful to be comfortable with recursive methods
- We'll work in continuous time
  - Easier to incorporate competing risks
  - Avoids awkward integer problems
  - Problem Set #2 looks at discrete case too
- Focus on partial equilibrium
- See notes for details

The job search problem

- Worker searches until reemployed
  - Flow benefit b, discounted at rate δ
  - Flow of offers s, convex cost $\psi(s)$, Inada conditions
  - Offers drawn from $G(w)$, jobs last forever
- Revealed preference $\implies$ cutoff rule (reservation wage)
- Bellman equation:

$$\delta U = \max_{s, \underline{w}} \; b - \psi(s) + s \int_{\underline{w}}^{\infty} (J(w) - U) dG(w)$$

  where U is value of unemployment, $J(w)$ is value of job
- Stationary problem: U is constant

First-order conditions

- Here's the optimization problem:

$$\max_{s,\underline{w}} \; b - \psi(s) + s \int_{\underline{w}}^{\infty} (J(w) - U) dG(w)$$

- Differentiate w.r.t. s:

$$\begin{aligned} \psi'(s^*) &= \int_{\underline{w}}^{\infty} (J(w) - U) dG(w) \\ &= (1 - G(\underline{w})) \mathbb{E}[J(w) - U \mid J(w) \geq U] \end{aligned}$$

- Differentiate w.r.t. $\underline{w}$ (Leibniz's rule):

$$J(\underline{w}) = U$$

- Value of a job:

$$J(w) = \int_0^{\infty} e^{-\delta t} w \, dt = \frac{w}{\delta} \implies \underline{w} = \delta U$$

The value of unemployment

- Let's simplify: assume all jobs pay the same wage $w > b$

$$\delta U = b - \psi(s^*) + s^*(J - U)$$
$$\implies U = \frac{b - \psi(s^*) + s^* J}{\delta + s^*}$$

- Not fully solved . . . but about to be useful
- Intuition:
  - Receive flow utility $b - \psi(s^*)$ while unemployed
  - Obtain new "asset" J at flow rate s^*
  - Discount future flows at effective rate $\delta + s^*$

Comparative statics and the envelope theorem

- Key question: how does increasing UI benefits affect search?
- Take FOC for job search, apply implicit function theorem:

$$\psi'(s^*) = J - U \implies \frac{ds^*}{db} = -\frac{1}{\psi''(s^*)}\frac{dU}{db}$$

- Use envelope theorem to sign $\frac{dU}{db}$ (i.e., hold s^* constant):

$$U = \frac{b - \psi(s^*) + s^* J}{\delta + s^*}$$

$$\implies \frac{dU}{db} = \frac{1}{\delta + s^*} > 0$$

- Therefore $\frac{ds^*}{db} < 0$: UI discourages search

Competing risks

- Same problem in discrete time:

$$U = \max_{s \in [0,1]} \; b - \psi(s) + \beta(sJ + (1-s)U)$$

- Equally tractable . . . but what if we have competing risks?
  - Directed search effort s_1, s_2 for two jobs valued at J_1, J_2
  - Assume independent draws

- Messy Bellman:

$$U = \max_{s_1, s_2} \; b - \psi(s_1, s_2) + \beta[s_1 s_2 \max\{J_1, J_2\} + s_1(1-s_2)J_1 + \ldots$$
$$\ldots + (1-s_1)s_2 J_2 + (1-s_1)(1-s_2)U]$$

- Continuous time ensures job offers don't arrive simultaneously:

$$\delta U = \max_{s_1, s_2} \; b - \psi(s_1, s_2) + s_1(J_1 - U) + s_2(J_2 - U)$$

Non-stationarity

- Value of unemployment is often non-stationary:
  - Human capital decay
  - Scarring/stigma effects
  - Asset depletion
  - Discouragement
- Two-tiered UI benefits: get $\overline{b}$ for D periods, then get $\underline{b}$
- Let R denote time remaining on first tier
  - Continuous time:

$$\delta U(R) = \max_{s} \; b(R) - \psi(s) + s(J - U) - \dot{U}(R)$$

  - Discrete time:

$$U(R) = \max_{s \in [0,1]} \; b(R) - \psi(s) + \beta(sJ + (1-s)U(\max\{0, R-1\})$$

From theory to empirics

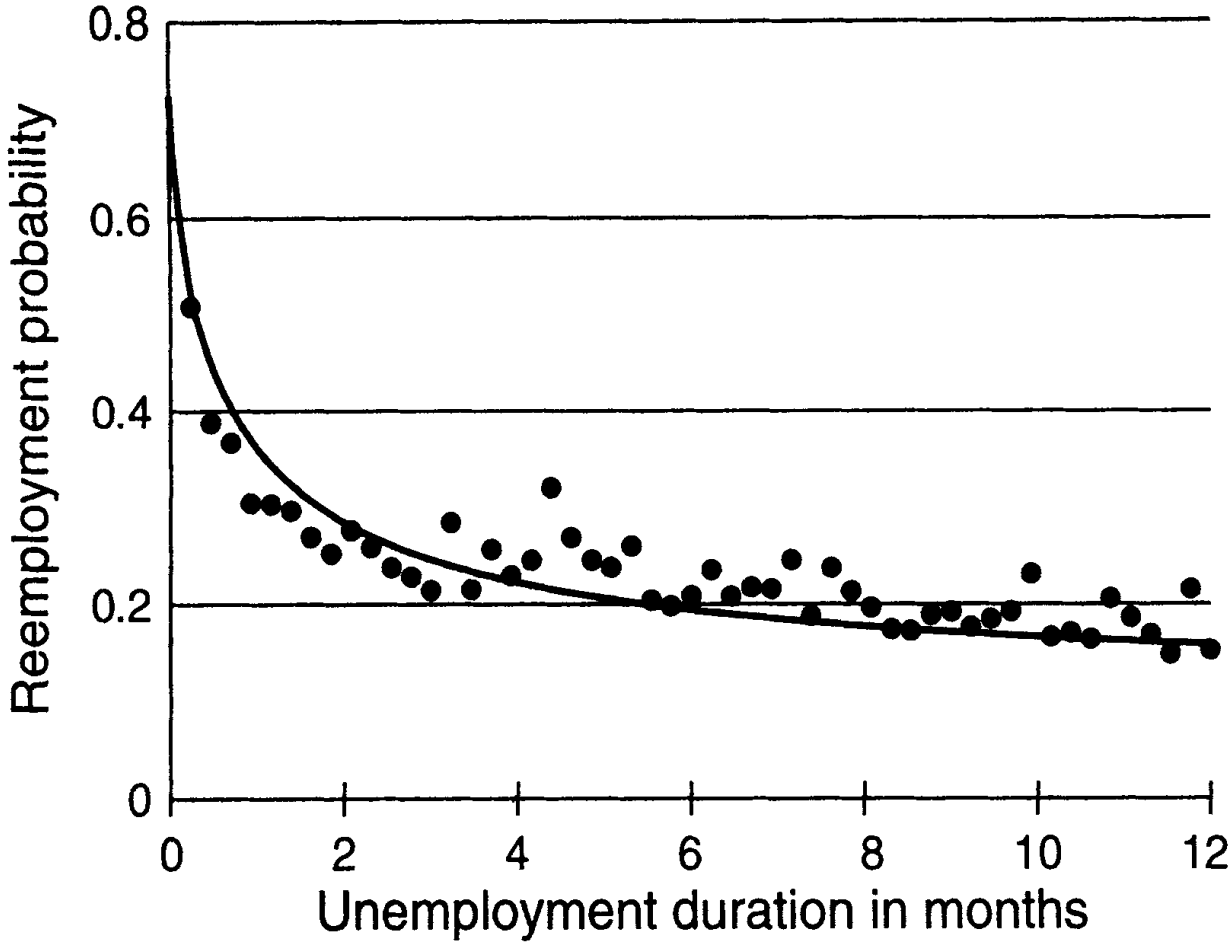
- Today's focus: job search and the experience of joblessness
  - How much time do the unemployed spend searching?
  - What channels do they use to look for jobs?
  - How does search behavior change throughout a jobless spell?
  - Why does the job-finding hazard decline with duration?
  - How do the jobless feel about job search?
- Impossible to discuss this without discussing UI
  - We'll touch on UI a little today
  - But largely defer until next class

Basics of unemployment insurance (UI)

- Insures consumption against temporary job loss
  - Pay into system to establish entitlement
  - Often paired with search requirements
- Cross-country/cross-state variation in program parameters
  - Benefit level (usually indexed to wages)
  - Potential benefit duration (PBD)
  - One-tiered UI vs. two-tiered UI
  - Monitoring intensity, benefit sanctions
  - Earnings disregard
- US only (to my knowledge): experience rating
  - UI benefits are financed through payroll taxes
  - Firms face higher taxes when ex-workers claim more UI
  - Interesting effects on hiring/firing incentives (Johnston 2019)

Negative duration dependence in job-finding

United States: CPS data spanning 1976–2007



Shimer (AER P&P 2008), Figure 1

Competing risks of new jobs vs. recalls to prior job

Austria: administrative records spanning 2004–2013

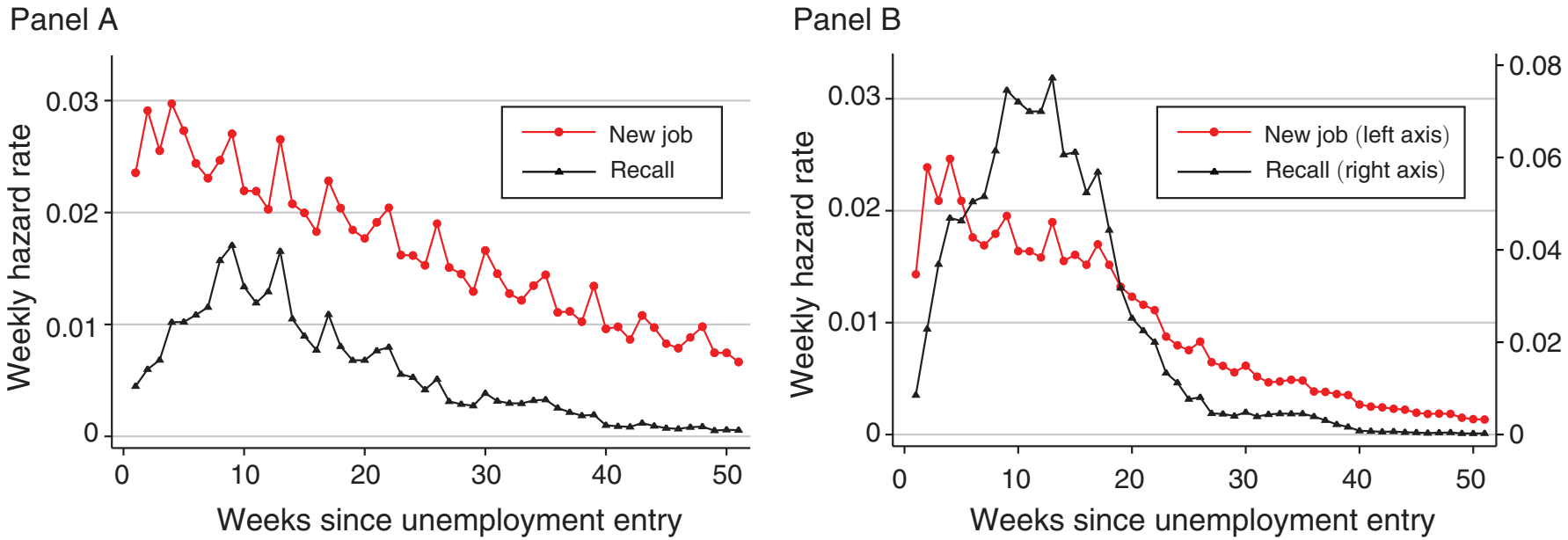
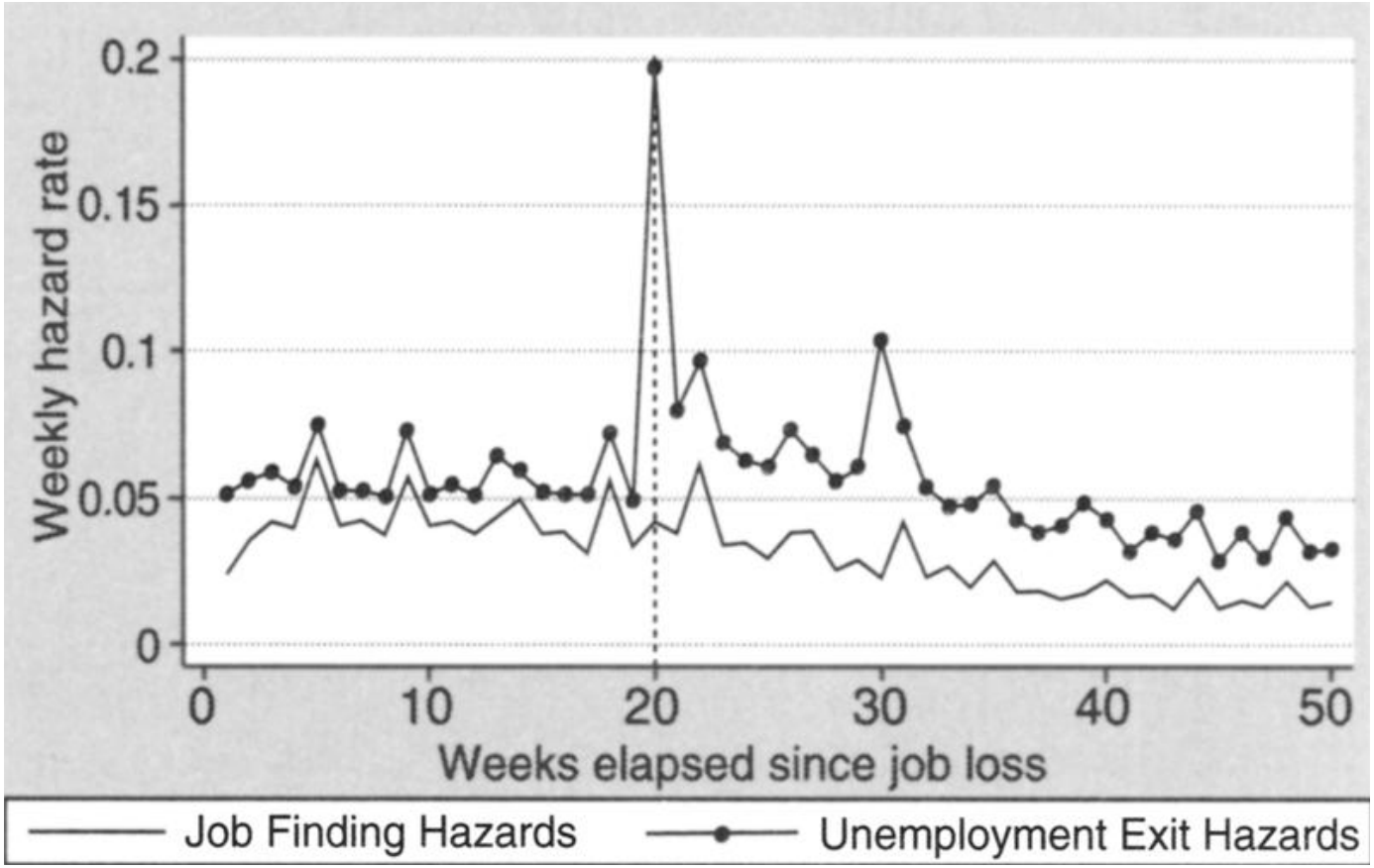


FIGURE 1. HAZARD RATES FOR PERMANENT (*left*) AND TEMPORARY LAYOFFS (*right*)

Nekoei and Weber (2005), Figure 1

Spike in UI exits at exhaustion; spike in job-finding debated

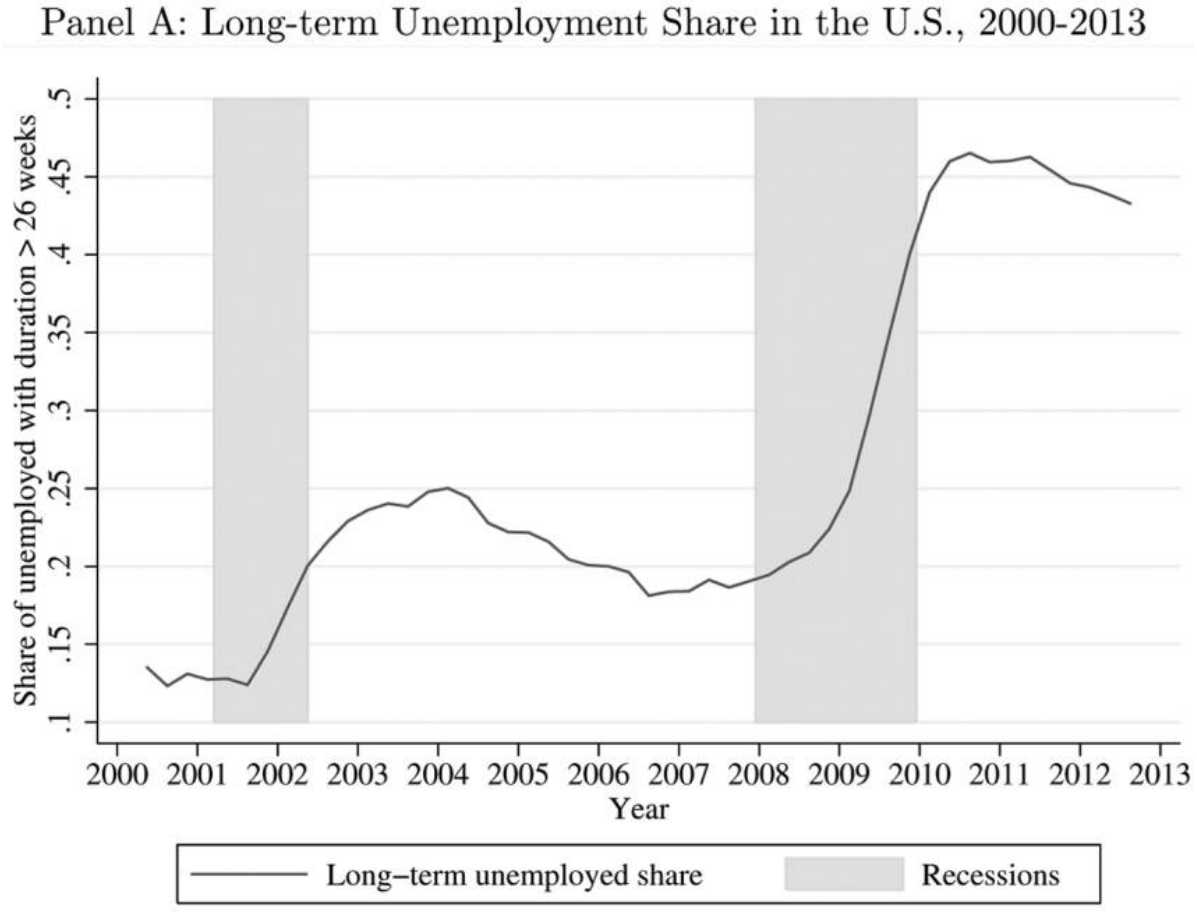
Austria: 1981–2001



Card, Chetty, and Weber (2007), Figure 1A

Long-term unemployment rose during the Great Recession

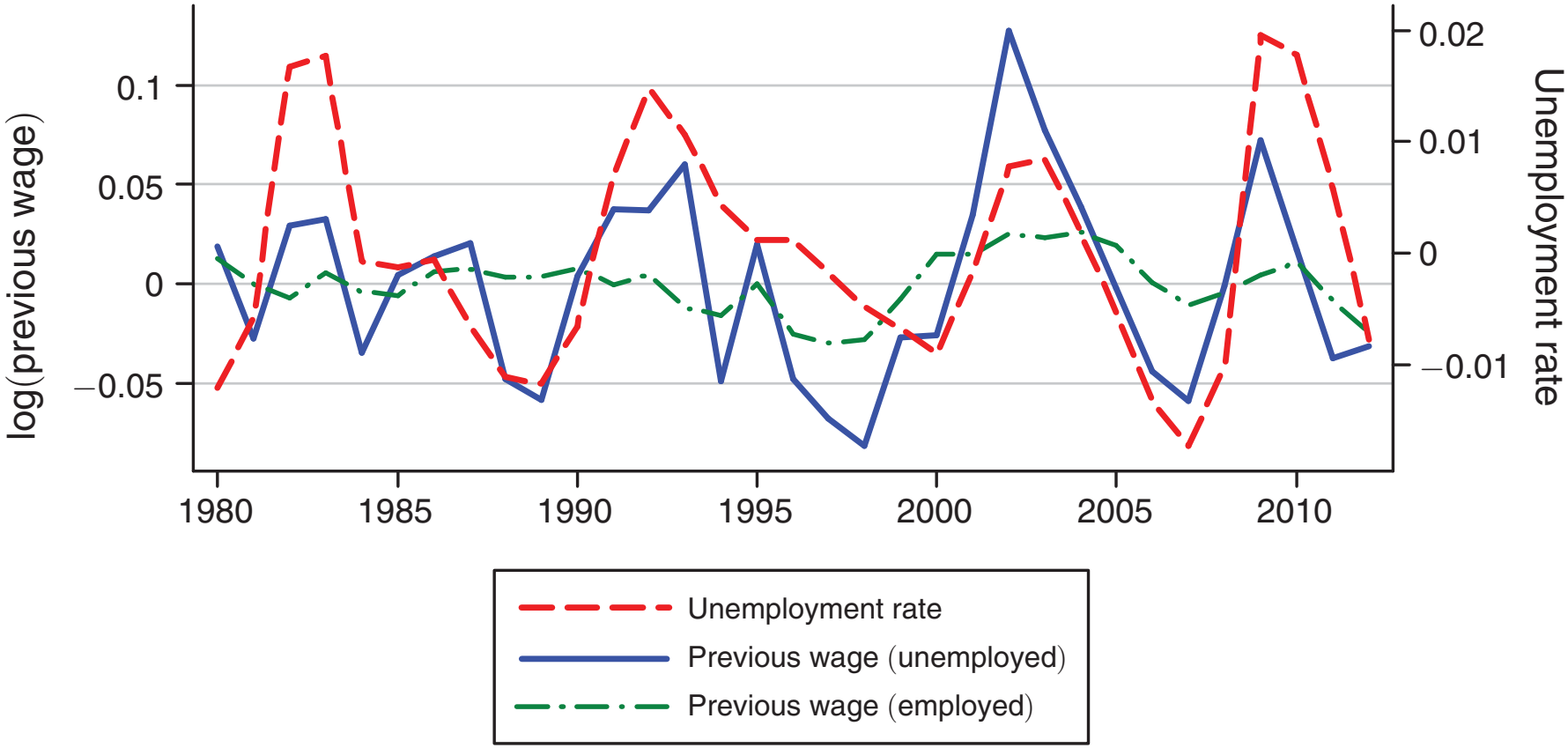
United States: CPS, smoothed and seasonally adjusted



Kroft, Lange, Notowidigdo, and Katz (2015), Figure 2A

Average skill (past wage) of unemployed rises in recessions

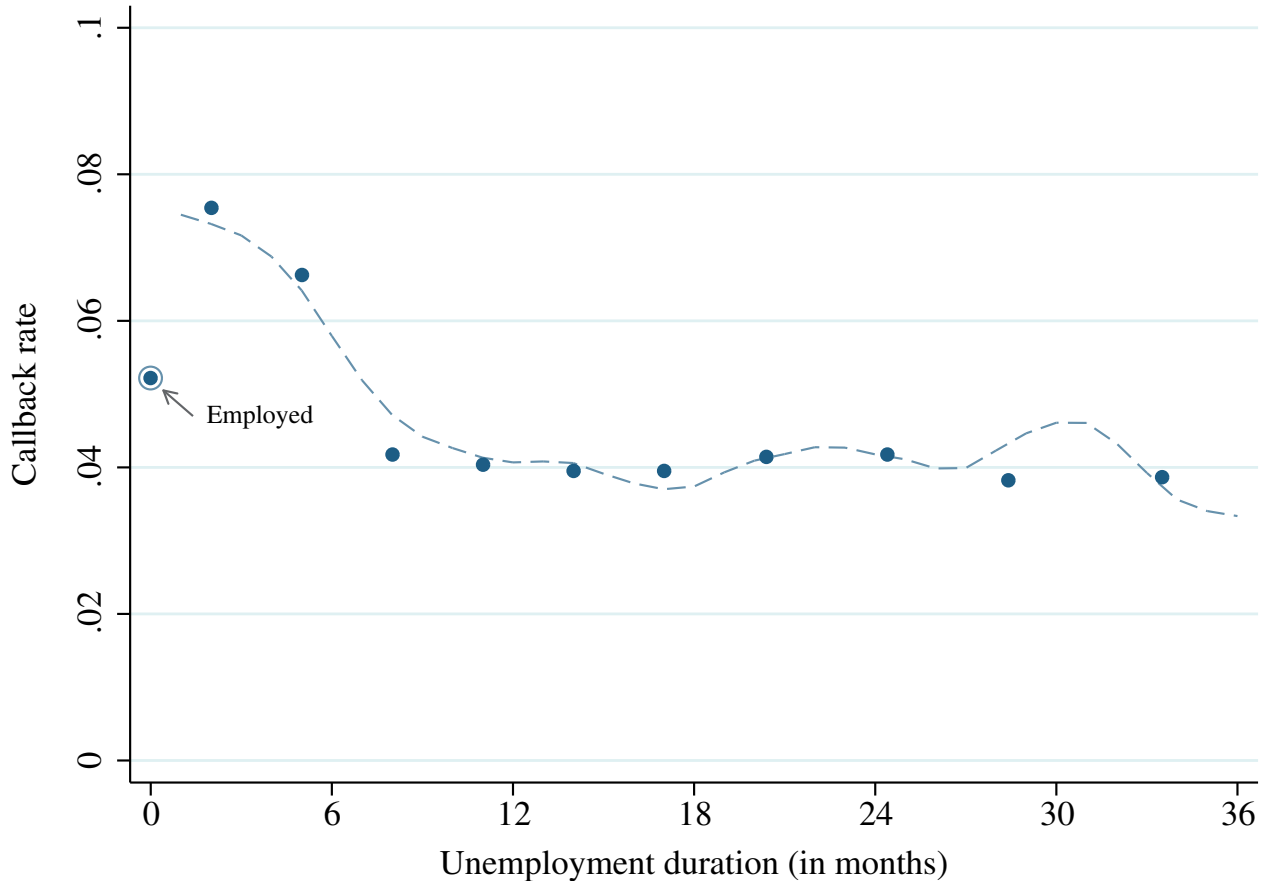
United States: CPS ORGs



Mueller (2017), Figure 3A

Resumes with long employment gaps get fewer callbacks

United States: resume audit study, 2011–2012



Kroft, Lange, and Notowidigdo (2013), Figure 2

Why does the job-finding rate fall with time out of work?

- Dynamic selection:
  - Workers on temporary layoff are called back to work
  - More generally: fastest job-finders exit the risk set
- Changes in search effort:
  - Demotivation/discouragement
  - Exhaust stock of appropriate job openings
  - Learning about own ability
  - Learning about market conditions
  - Reference dependence (DellaVigna et al. 2017)
- Changes in job offers:
  - Scarring (Kroft, Lange, and Notowidigdo 2013)
  - Skill depreciation
- Changes in reservation wage

New data on the lives of the unemployed

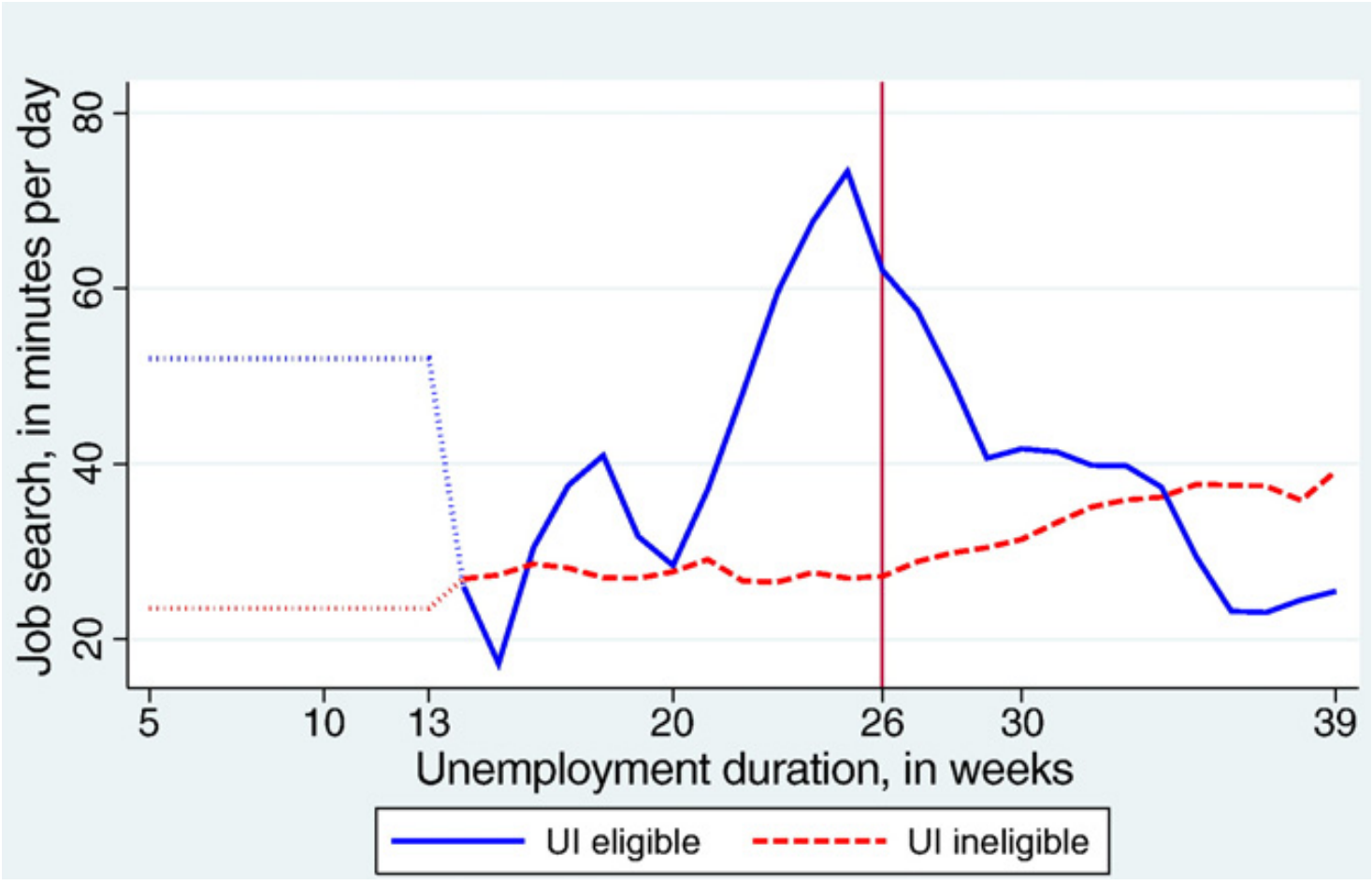
- UI literature has learned a lot from standard datasets
  - Jobless durations, reemployment wages
  - New jobs vs. recalls, match quality
  - Changes in consumption
- Krueger and Mueller bring new measures to bear
  - Time-use data on search behavior
  - Self-reported reservation wages
  - Subjective wellbeing (happiness)
- Several papers in their shared research agenda:
  - JPubEc 2010, JEEA 2012, AER P&P 2012, AEJ:Policy 2016
  - We'll focus (mostly) on BPEA 2011

Time-use data

- American Time Use Survey (ATUS)
  - Drawn from outgoing CPS respondents
  - Detailed diary of previous day's activities
  - Reference: Hamermesh, Frazis, and Stewart (2005)
- Lots of questions enriched by time-use data
  - Division of household labor
  - Time use over the life cycle, business cycle
  - Search behavior of employed/unemployed
- Growing in popularity among economists
  - Aguiar, Hurst, and Karabarbounis (2013)
  - Mukoyama, Patterson, and Sahin (2018)
- Challenges: response rate, sample size, measurement error, cross-sectional (not longitudinal), and multi-tasking

Time spent searching ↑ as workers approach UI exhaustion

United States: ATUS data spanning 2003–2007



Krueger and Mueller (JPubEc 2010), Figure 3

Krueger and Mueller (BPEA 2011): survey design

- Draw a sample of New Jersey UI recipients
  - 360,000 UI recipients September 28, 2009
  - Randomly select ≈64,000 respondents
  - Stratify on duration unemployed × email address available
- Track job search activities for up to 24 weeks
  - Entry survey about demographics, income, and wealth
  - Weekly surveys on job search, reservation wage, and job offers
  - Follow most people for 12 weeks, long-term jobless for 24
- Low response rate (10% for entry survey, more attrition later)
  - Reweight sample to ensure demographically representative
  - Match everyone to administrative data on UI receipt

New Jersey's UI system

- State-level benefit parameters
  - Weekly benefit amt (WBA): $\min\{0.6 \times \text{prior earnings}, \$584\}$
  - Potential duration ranges from 1 to 26 weeks (usually 26)
  - Can hold a part-time job (earnings disregard = 20% of WBA)
- Benefit extensions during the Great Recession
  - Federal Emergency Unemployment Compensation (EUC): June 2008 $\rightarrow$ 13 extra weeks, Nov. 2008 $\rightarrow$ 33 extra weeks
  - American Recovery and Reinvestment Act (ARRA/stimulus): Feb. 2009 $\rightarrow$ extended the EUC, raised WBA by \$25
  - Extended Benefits: March/May 2009 $\rightarrow$ 13–20 extra weeks
- Bottom line: claimants had up to 99 weeks of benefits

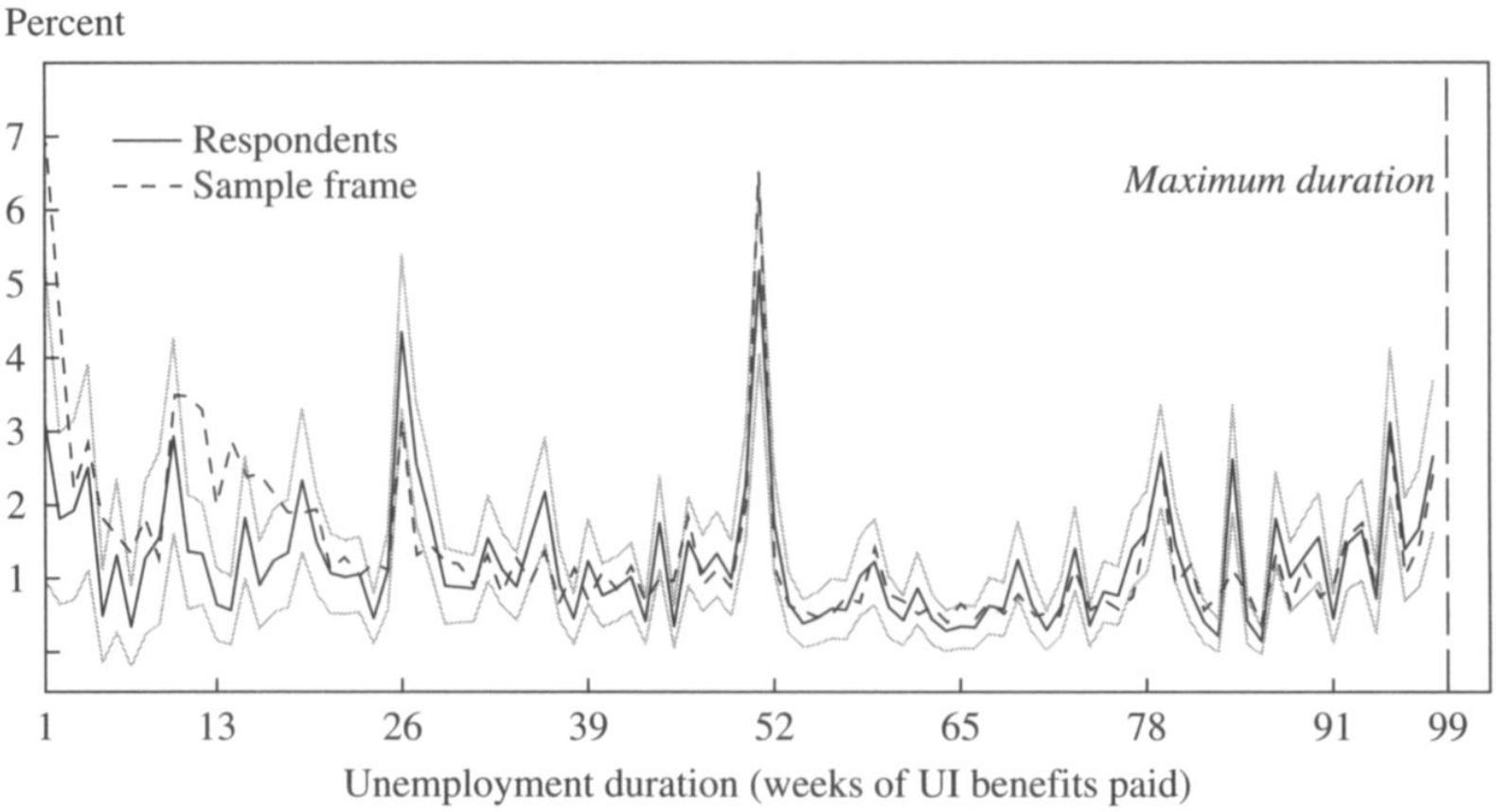
Respondents are quite different: need to reweight

	Unweighted			*Weighted*	
Statistic	*Universe*	*Stratified sample frame*	*Respondents*	*Stratified sample frame*[a]	*Respondents*[b]
No. of observations	362,292	63,813	6,025	63,813	6,025
Previous employment and UI data					
Earnings during base year (dollars)[c]	35,335	36,905	48,994	34,309	37,960
Base weeks worked during base year	41.6	42.0	43.4	41.0	41.2
Weekly UI benefit (dollars)	387	392	442	378	397
No. of employers in base year	2.1	2.1	2.0	2.1	2.3
Industry of previous employment (percent)					
Construction	8.8	7.8	4.2	8.7	5.6
Manufacturing	10.2	9.4	8.2	9.6	8.6
Educational and health care services	9.8	10.8	11.5	10.8	10.8
Retail trade	11.1	11.2	9.9	10.8	12.4
Professional, scientific, and technical services	6.7	7.5	11.6	6.4	7.6
Finance and insurance	4.6	5.9	8.5	4.4	5.7
Administration, support, and remediation services	10.0	9.5	9.4	9.9	10.4
Potential duration of regular UI benefits (weeks)	25.3	25.3	25.4	25.0	24.9
Percent with new unemployment claim since start of study	n.a.	5.2	4.8	7.2	6.9
Weeks of UI benefits paid by September 28, 2009	30.6	41.3	40.7	27.5	27.4
Weeks of UI benefits paid by April 30, 2010	n.a.	63.3	63.2	48.5	49.5
Implied weekly UI exit rate (percent)	n.a.	2.23	2.07	2.57	2.22
Demographic data (percent of total)[d]					
Female	45.4	48.3	52.1	45.5	47.2
Age in years					
24 or less	9.7	9.3	6.8	10.1	10.4
25–34	22.5	23.5	21.3	23.1	25.5
35–44	22.0	22.1	21.1	22.2	21.8
45–54	23.6	23.1	26.8	23.4	23.8
55 or over	22.1	22.0	24.0	21.3	18.5

Krueger and Mueller (BPEA 2011), Table 1

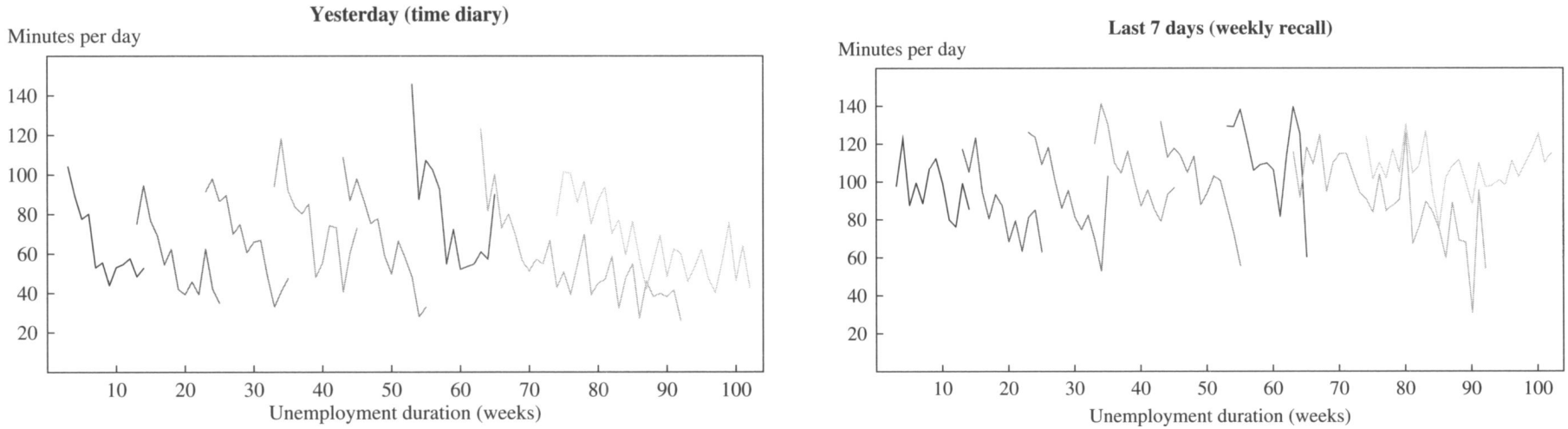
Weighted sample exhibits similar UI-exit hazards

Figure 2. Kaplan-Meier UI Weekly Exit Rate, by Unemployment Duration[a]



Krueger and Mueller (BPEA 2011), Figure 2

Search declines within each UI "cohort"



Krueger and Mueller (BPEA 2011), Figure 3

Discussant critique: is this just respondent fatigue?

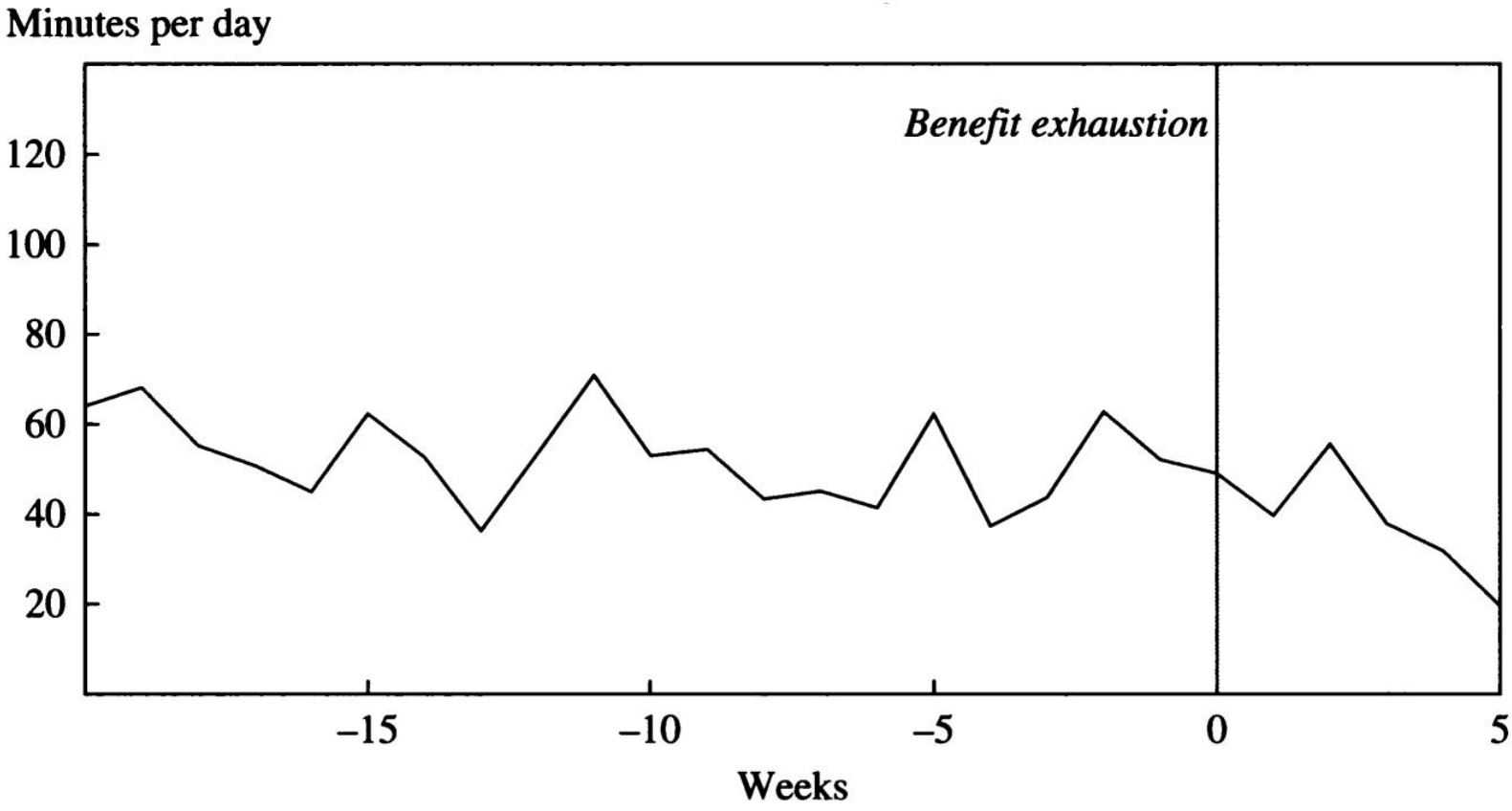
Table 1. Regressions Explaining Job Search Time with Unemployment Spell Duration and the Number of Survey Interviews[a]

	Additional controls		
Regression specification	*None*[b]	*No. of previous interviews*	*Vector of controls for previous interviews*[c]
Dependent variable: time spent on job search yesterday (minutes per day)			
Krueger and Mueller, table 2, fourth column	−2.73 (0.25)	−1.83 (0.75)	−0.44 (0.32)
Krueger and Mueller, table 2, fifth column	−1.62 (0.31)	−0.77 (0.74)	−0.45 (0.36)
Dependent variable: time spent on job search in last 7 days (minutes per day)			
Krueger and Mueller, table 2, fourth column	−2.25 (0.29)	−2.45 (0.85)	−0.96 (0.39)
Krueger and Mueller, table 2, fifth column	−1.54 (0.33)	−1.76 (0.84)	−0.90 (0.40)

Steven Davis comments on Krueger and Mueller (BPEA 2011)

No spike in search activity at benefit exhaustion

(Contrary to Krueger and Mueller's results from the ATUS)

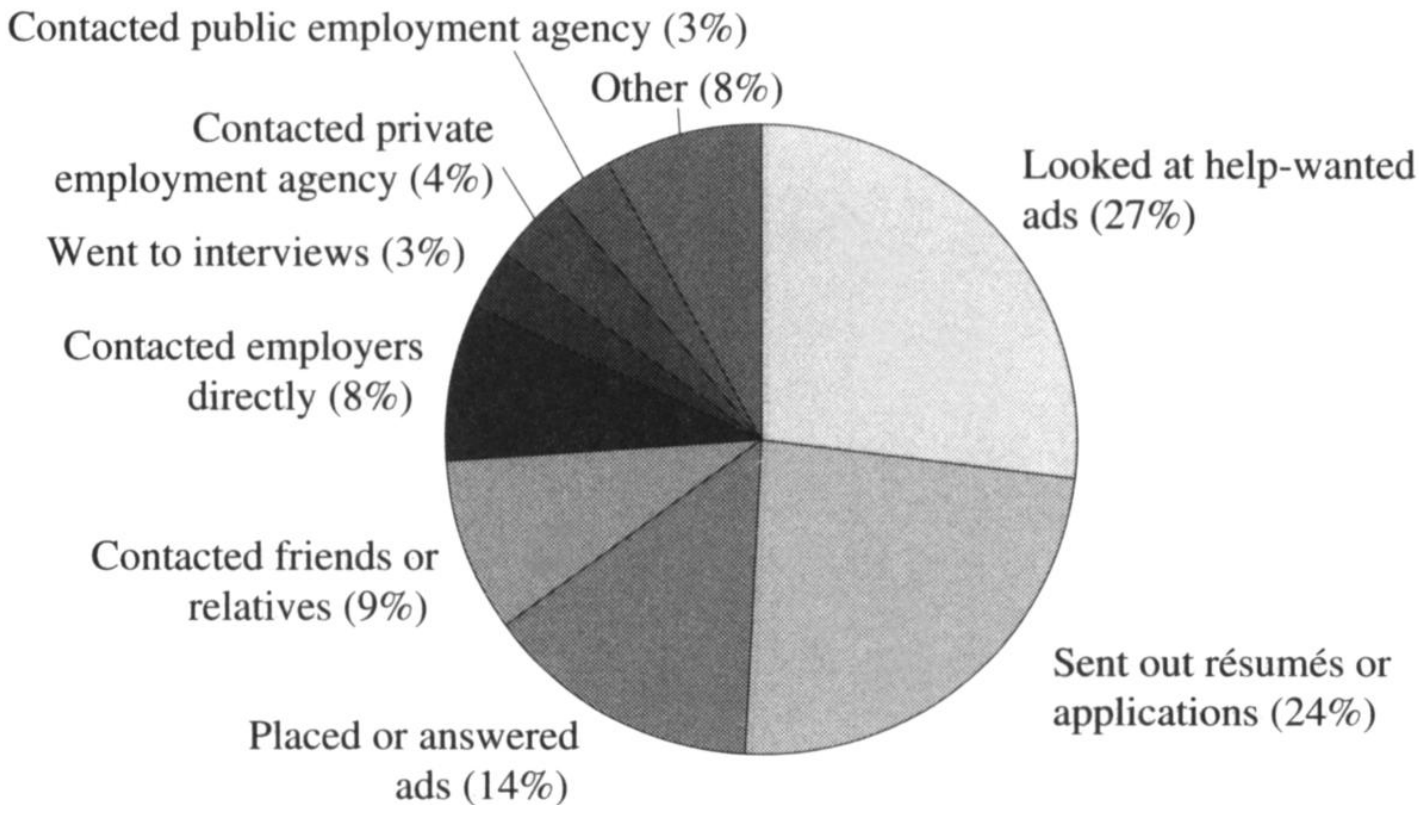


Krueger and Mueller (BPEA 2011), Figure 5

Other results

- Search declines over extensive and intensive margins
  - Fewer claimants search at all
  - Those who do search less
- Decline in search parallels increase in early-morning sleep
- No clear evidence that benefit extensions affect search
- Greater search effort is associated with more job offers
- Interesting patterns on reservation wages
  - Reservation wages are predictive of exit
  - Many workers accept jobs paying less than $\underline{w}$

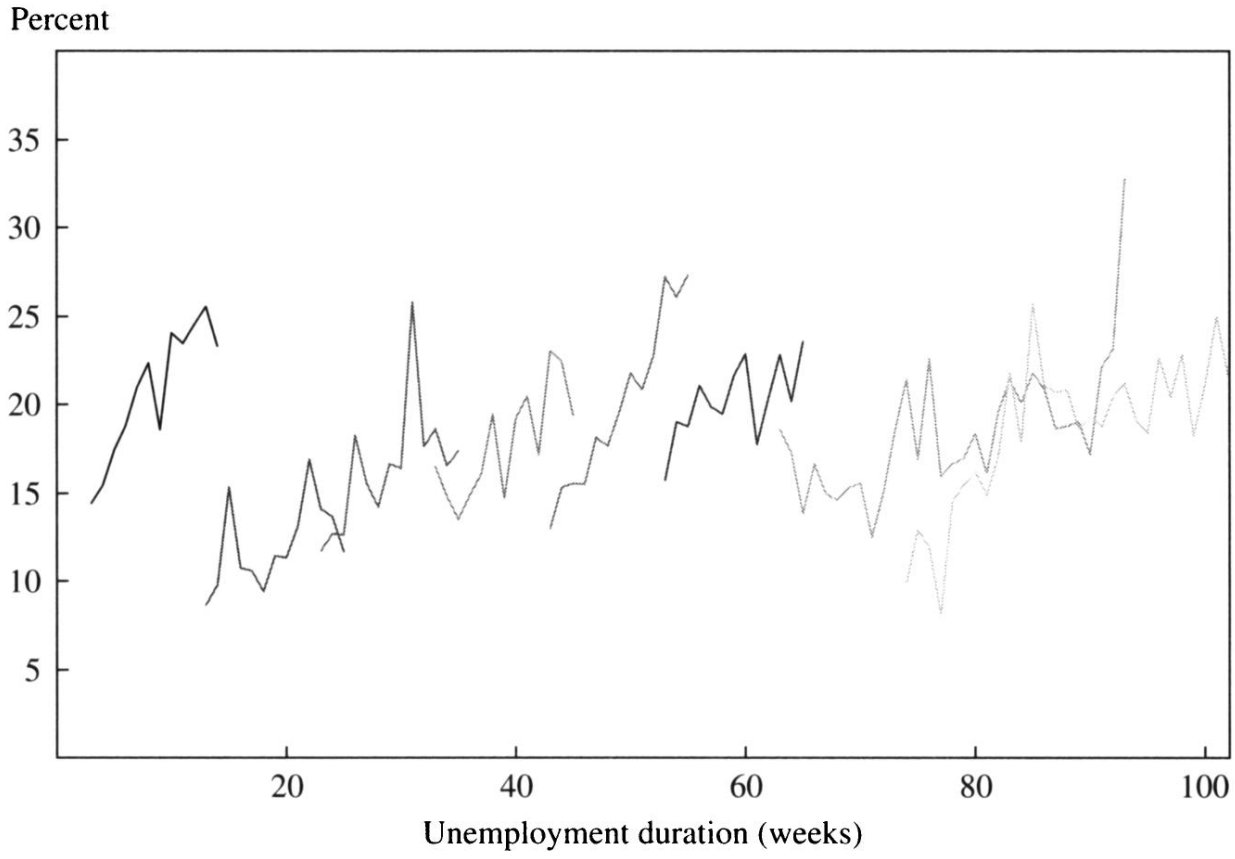
Breakdown of time spent searching



Krueger and Mueller (BPEA 2011), Figure 6

Moods worsen over the course of a jobless spell

Figure 8. Share of Time Spent in a Bad Mood at Home, by Duration of Unemployment and by Cohort[a]



Krueger and Mueller (BPEA 2011), Figure 8

UI recipients are especially unhappy during job search

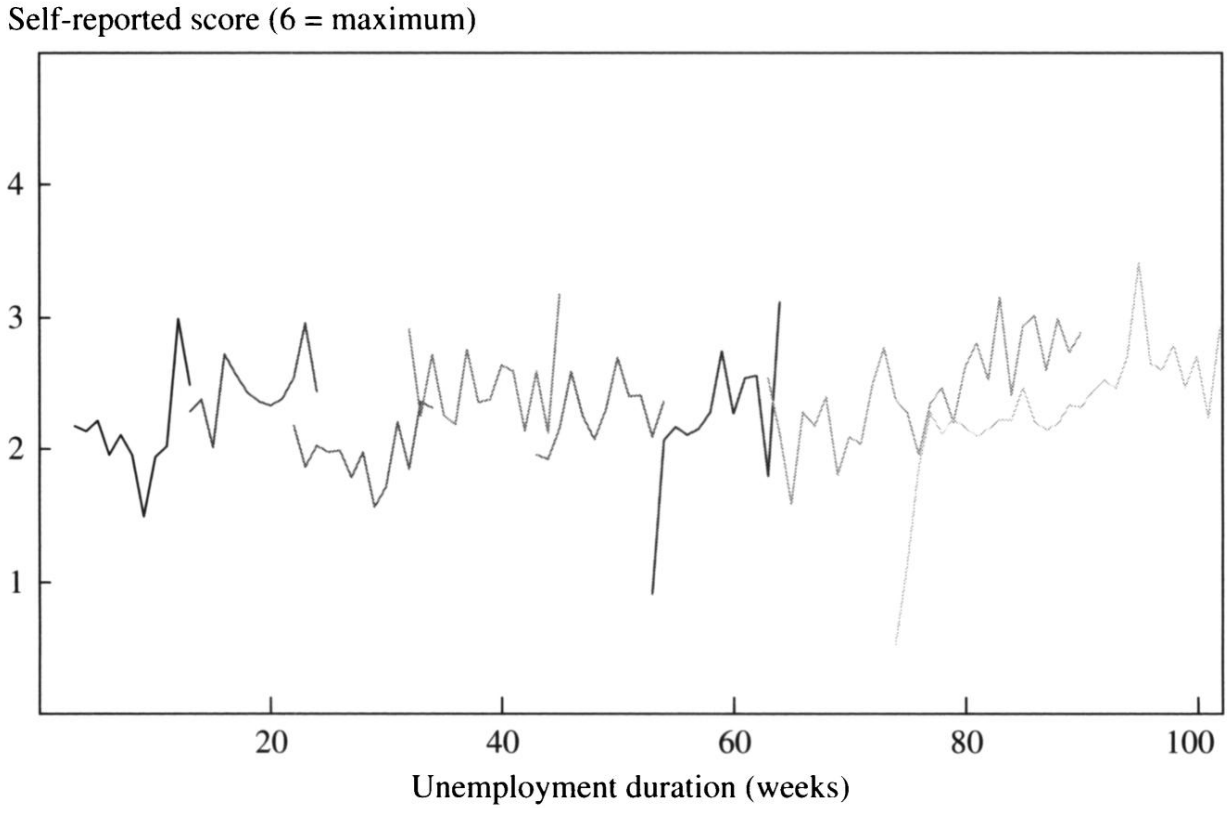
Table 7. Levels of Emotions Experienced, by Activity and Job Search Method[a]
Self-reported scores (6 = maximum)

	Simple averages		
Activity or job search method	*Happy*	*Sad*	*Stressed*
Activities			
Searching for a job	2.39	2.28	3.33
All other activities	3.33	1.27	1.75
Grooming or personal care	3.30	1.30	1.70
Shopping	3.35	1.03	1.66
Commuting or traveling	3.15	1.05	1.77
Working	3.15	1.19	1.91
Attending job training program	3.95	0.95	2.07
Relaxing or resting	3.39	1.29	1.64
Exercising (including sports)	3.98	0.88	1.28
Watching TV	3.27	1.38	1.58
Reading or writing	3.55	1.06	1.45
Socializing	4.08	0.88	1.09
Eating and drinking	3.46	1.14	1.49
Preparing for or taking course	3.51	0.99	2.17
Preparing food	3.42	1.25	1.68
Doing housework	3.06	1.39	1.92
Taking care of family members	3.63	1.14	1.96
Taking care of nonfamily members	3.29	1.17	1.70
On the phone	3.18	1.40	1.93
Using the computer, Internet, or e-mail	2.80	1.71	2.25
Other	3.35	1.21	1.72

Krueger and Mueller (BPEA 2011), Table 7

Sadness during job search rises with jobless duration

Figure 9. Sadness during Job Search Episodes, by Duration of Unemployment and by Cohort[a]



Krueger and Mueller (BPEA 2011), Figure 9