



# **Job Search and Unemployment Insurance: Theory and Evidence**

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**IGIER**

# Outline

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Search Theory and Unemployment Insurance

Predictions for Hazard Rate

Econometric Findings and Problems

Optimal Benefits

New Directions

# Dale Mortensen, “Unemployment Insurance and Job Search Decisions,” *ILRR*, 1977

*Bellman Equation for Eligible Unemployed Workers*

$$V(t, b) = \frac{1}{1 + rh} \max_{0 \leq s_t \leq 1, w_t \geq 0} \left[ hu(b, 1 - s_t) + V(t - h, b) + \alpha s_t h \int_{w_t}^{\bar{w}} [U(x) - V(t - h, b)] dF(x) \right]$$

First Order Conditions:

$$(s_t) : u_2(b, 1 - s_t) = \alpha \int_{w_t}^{\bar{w}} [U(x) - V(t - h, b)] dF(x)$$

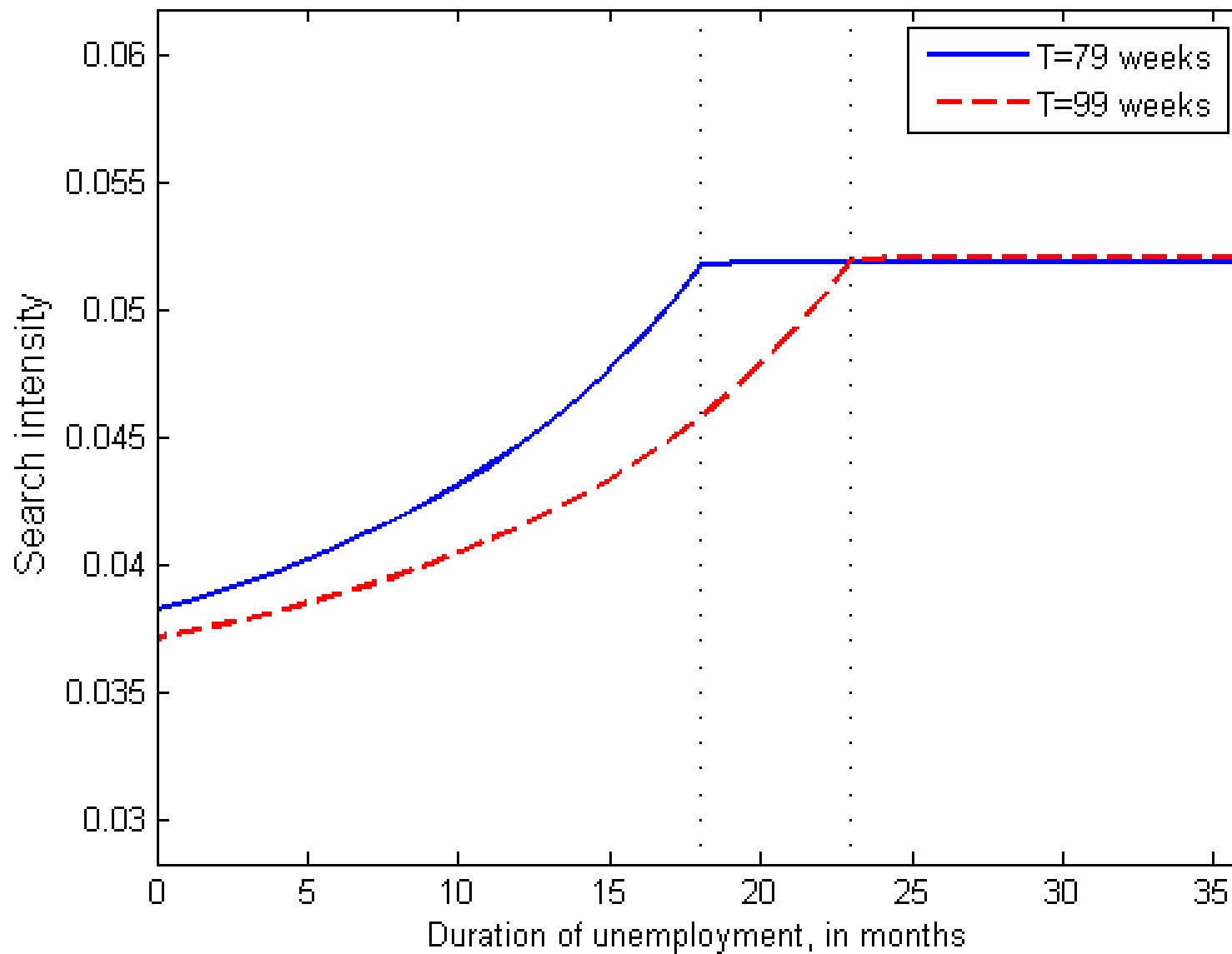
$$(w_t) : U(w_t) = V(t - h, b)$$

s=search,  $w_t$ =reservation wage, b=UI benefit, t=weeks of UI left; no saving,

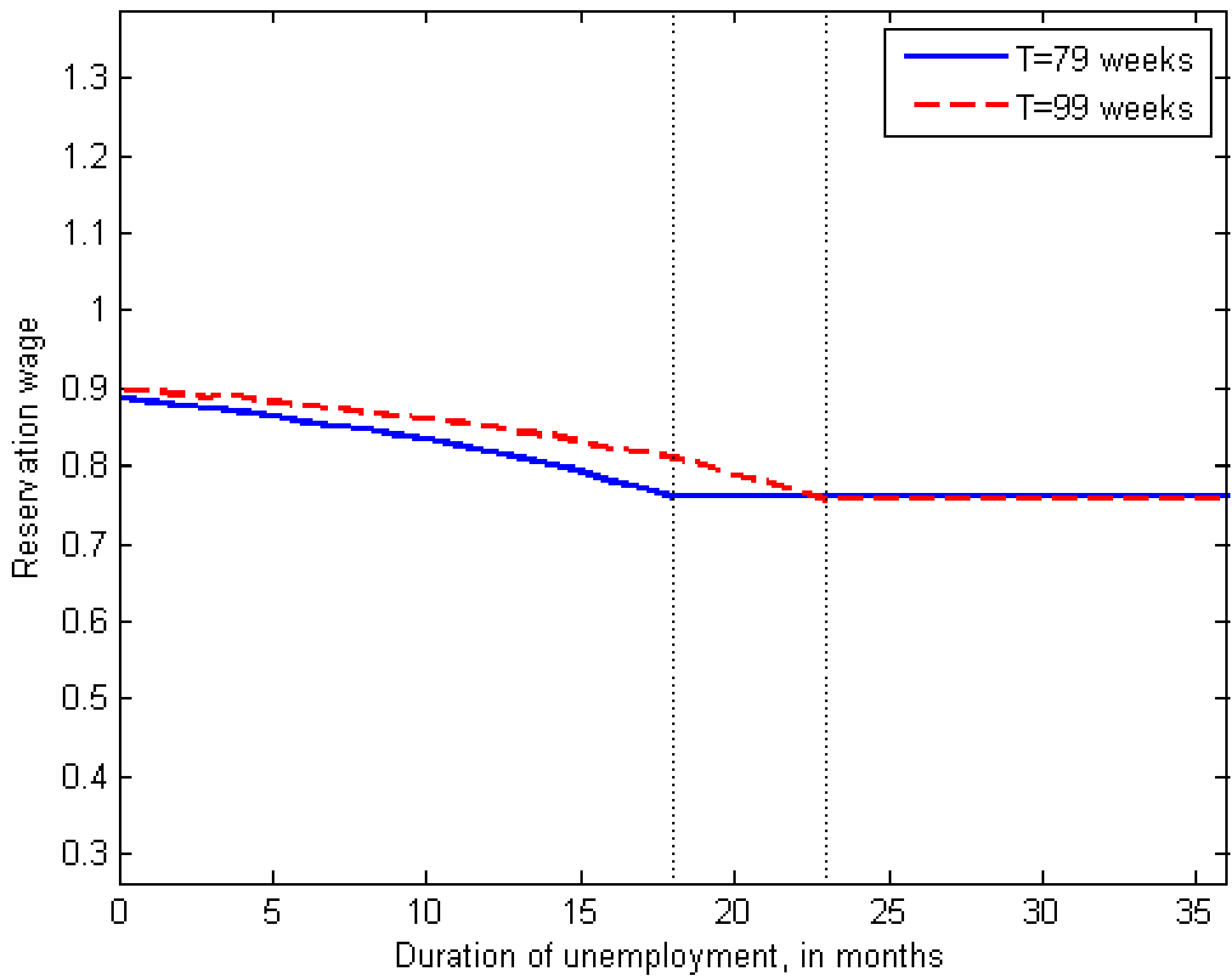
# Summary of Predictions of Mortensen's Model

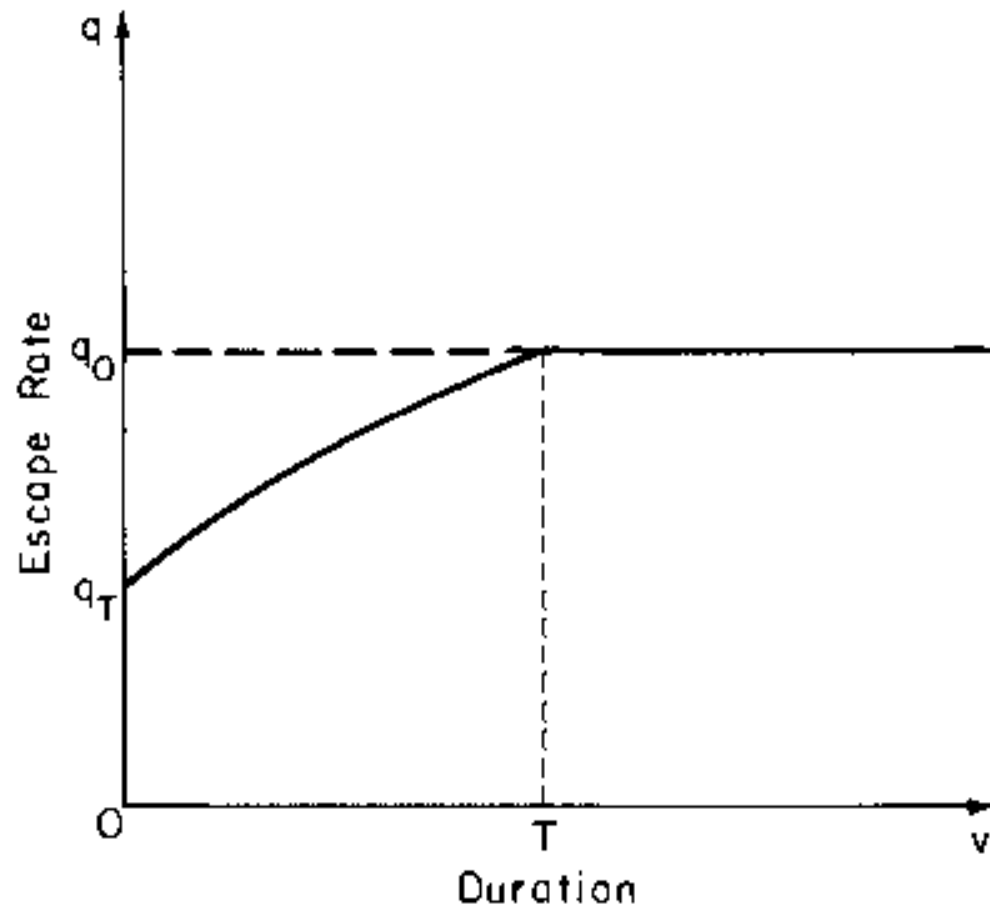
1. As  $t \rightarrow 0$ ,  $s \uparrow$  for UI Eligible and then stays constant after exhaustion
2.  $b \uparrow \rightarrow s \downarrow$  for UI Eligible
3.  $s \downarrow$  if expect recall (Feldstein, 1976, Katz, 1986)
4. As  $t \rightarrow 0$ ,  $w^R \downarrow$  for UI Eligible and then stays constant
5. If  $t \uparrow$  (benefit extension) then  $s \downarrow$  and  $w^R \uparrow$

## Search intensity by duration of unemployment



# Reservation wage by duration of unemployment





*Figure 1.* The Relationship of the Escape Rate and Duration of Unemployment.

# Summary of Evidence

- Early literature looked at:
  - 1) Are more generous UI benefits associated with longer spells of unemployment? (Yes)
  - 2) Does the chance of finding a job jump when benefits are close to being exhausted? (Maybe)
  - 3) Does the hazard rate (job finding rate) slope up or remain flat with duration of unemployment (Unlikely)
- More recent literature looks directly at  $s$  and  $w^R$  and finds more puzzling results, and tries to separate out labor supply distortion from liquidity effect.



# Estimation Strategy: Benefit Effect

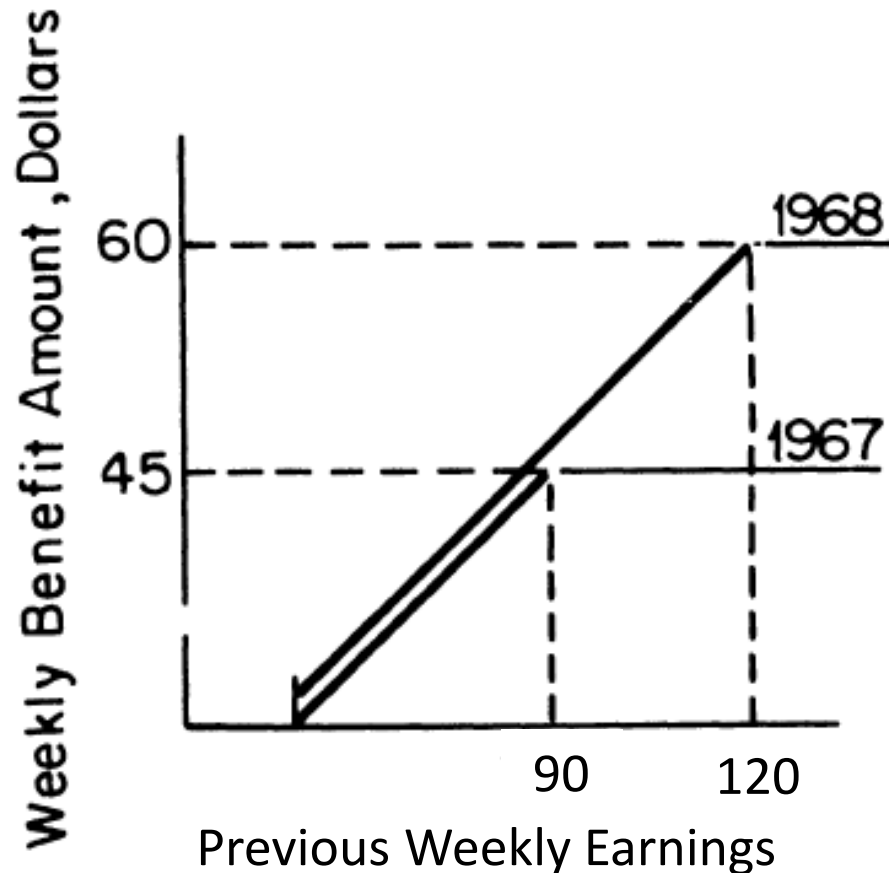


Figure 1. Change in Weekly UI Benefit Schedules for Pennsylvania, 1967 and 1968.

Duration of UI claims increased by 0.5 weeks for those earning above \$120/wk in 1968 vs. 1967, while the duration fell for the “control group” that earned less than \$90/wk → elas. of about 0.40 .

.....

Conventional wisdom is that a 10% increase in benefits is associated with a 4-8 percent increase in unemployment duration.

# Lancaster, *Ecma* (1979)

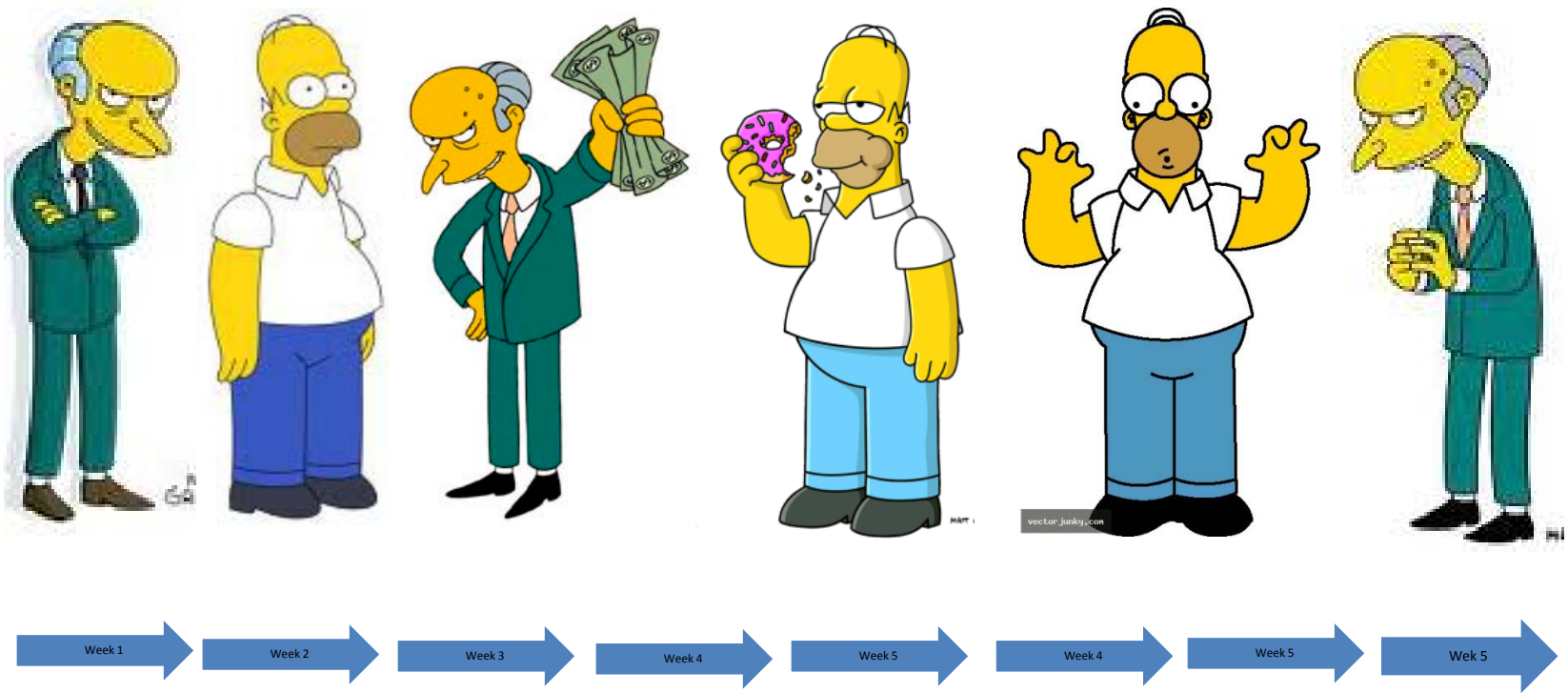
Estimates Cox-proportional Weibull duration model for sample of 479 unskilled, unemployed British workers. Key parameter is  $\alpha$ :  $\alpha = 1 \rightarrow$  flat hazard;  $\alpha > 1 \rightarrow$  rising hazard;  $\alpha < 1 \rightarrow$  puzzle.

Controls	$\alpha$
None	0.67
Age	0.74
Age, UR	0.77
Age, UR, B/W	0.77

$L_2 = \prod_{i=1}^{N_U} \left\{ \frac{1 - G_i(t_i + h)}{1 - G_i(t_i)} \right\} \prod_{i=1}^{N_E} \frac{g_i(t_i + s_i)}{1 - G_i(t_i)}$

**Problem: Unobserved Heterogeneity Bias**

# Heterogeneity Bias: The Pool of the Unemployed Changes Over Time



# Strategies for Heterogeneity Bias

- Control for  $X$ 's
- Assume a distribution of unobserved heterogeneity and add to the likelihood function
- Use repeated spells of unemployment
- Use longitudinal data on search activity and reservation wages

# Lancaster, *Ecma* (1979)

Estimates Cox-proportional Weibull duration model for sample of 479 unskilled, unemployed British workers. Key parameter is  $\alpha$ :  $\alpha = 1 \rightarrow$  flat hazard;  $\alpha > 1 \rightarrow$  rising hazard;  $\alpha < 1 \rightarrow$  puzzle.

Controls	<u><math>\alpha</math></u>
None	0.67
Age	0.74
Age, UR	0.77
Age, UR, B/W	0.77
Age, UR, B/W, $\gamma$	0.90

FYI: Benefit/Wage elasticity was 0.60.

# Katz and Meyer, *QJE* (1990)

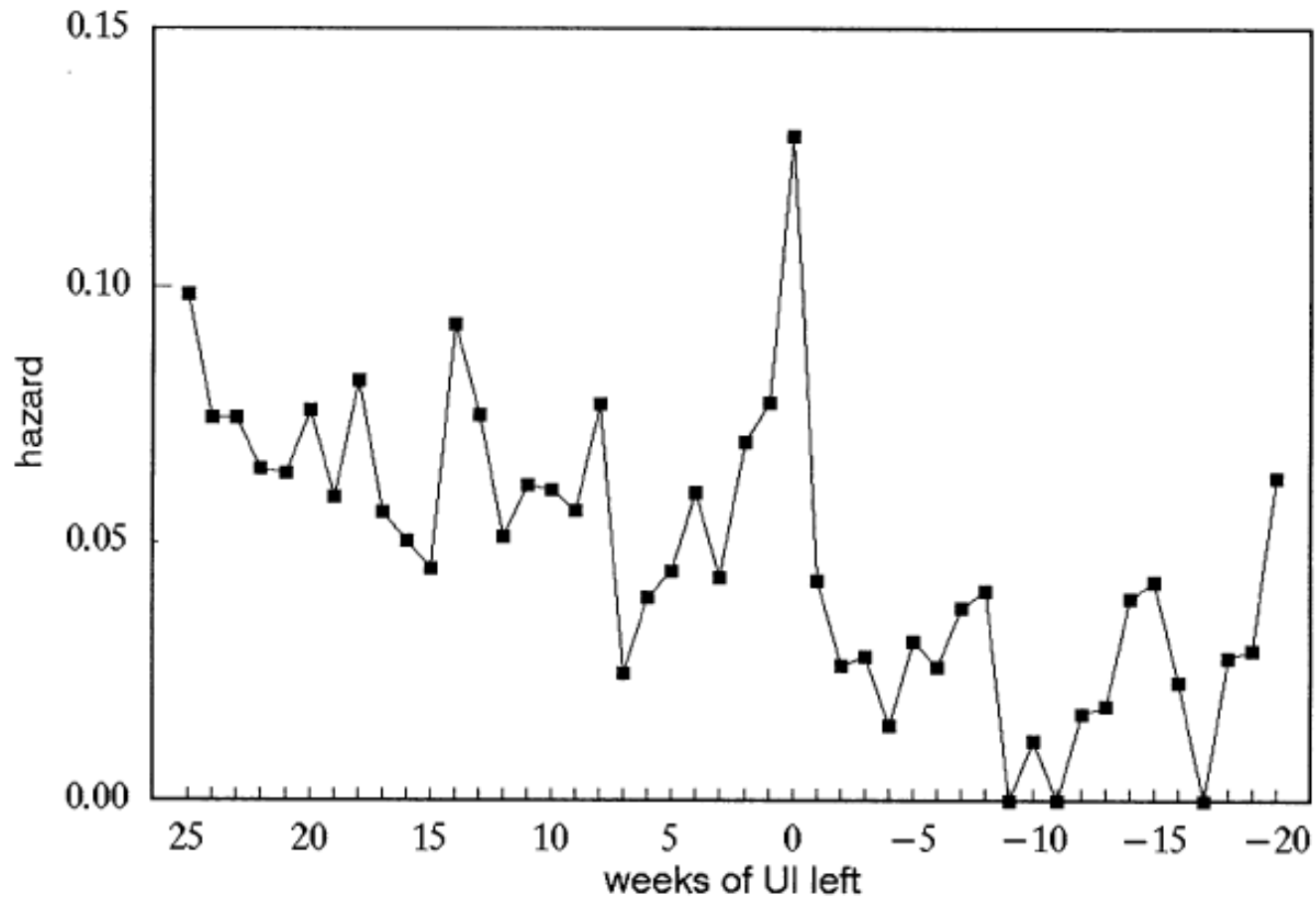


FIGURE III  
Total Time Until Exhaustion Hazard

# Katz and Meyer, *QJE* (1990)

*UNEMPLOYMENT INSURANCE AND RECALL EXPECTATIONS 991*

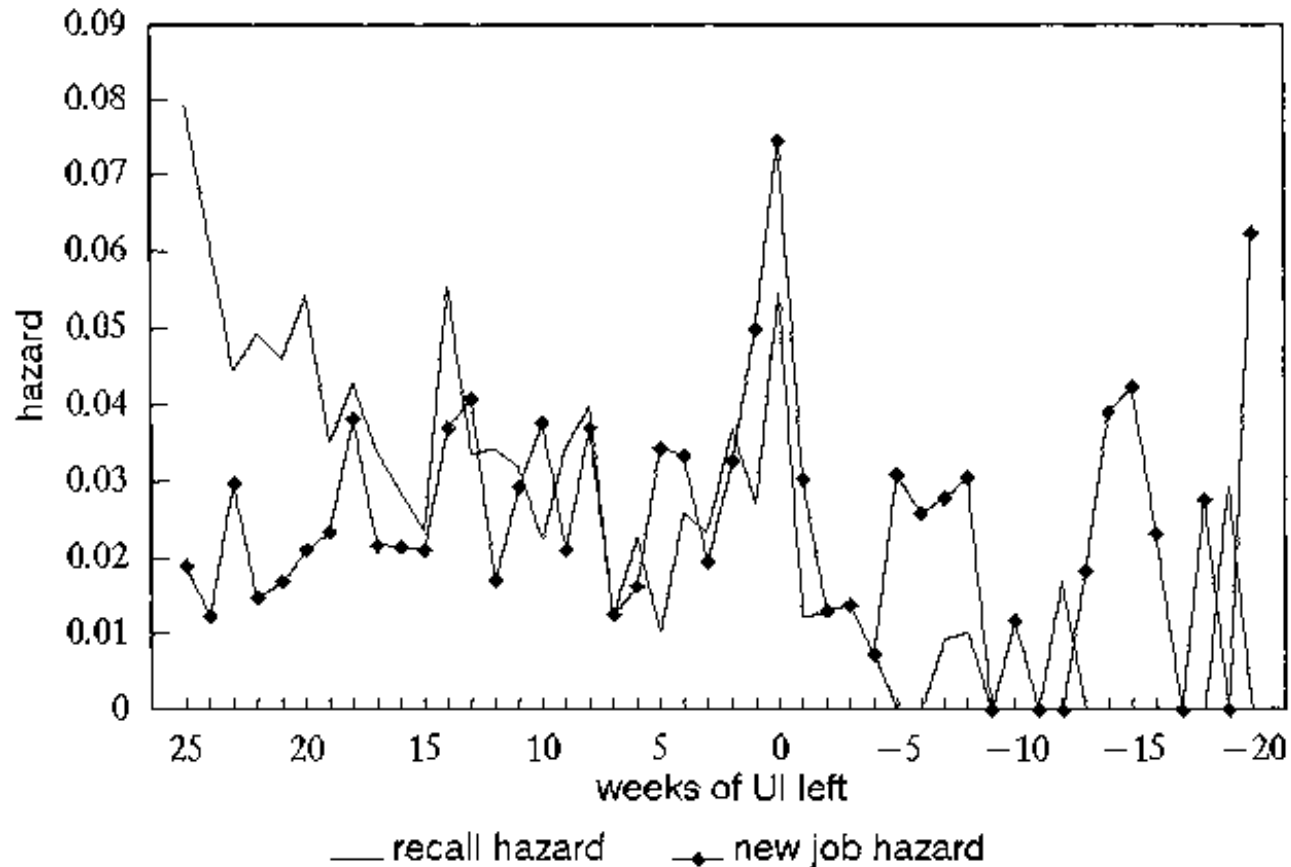
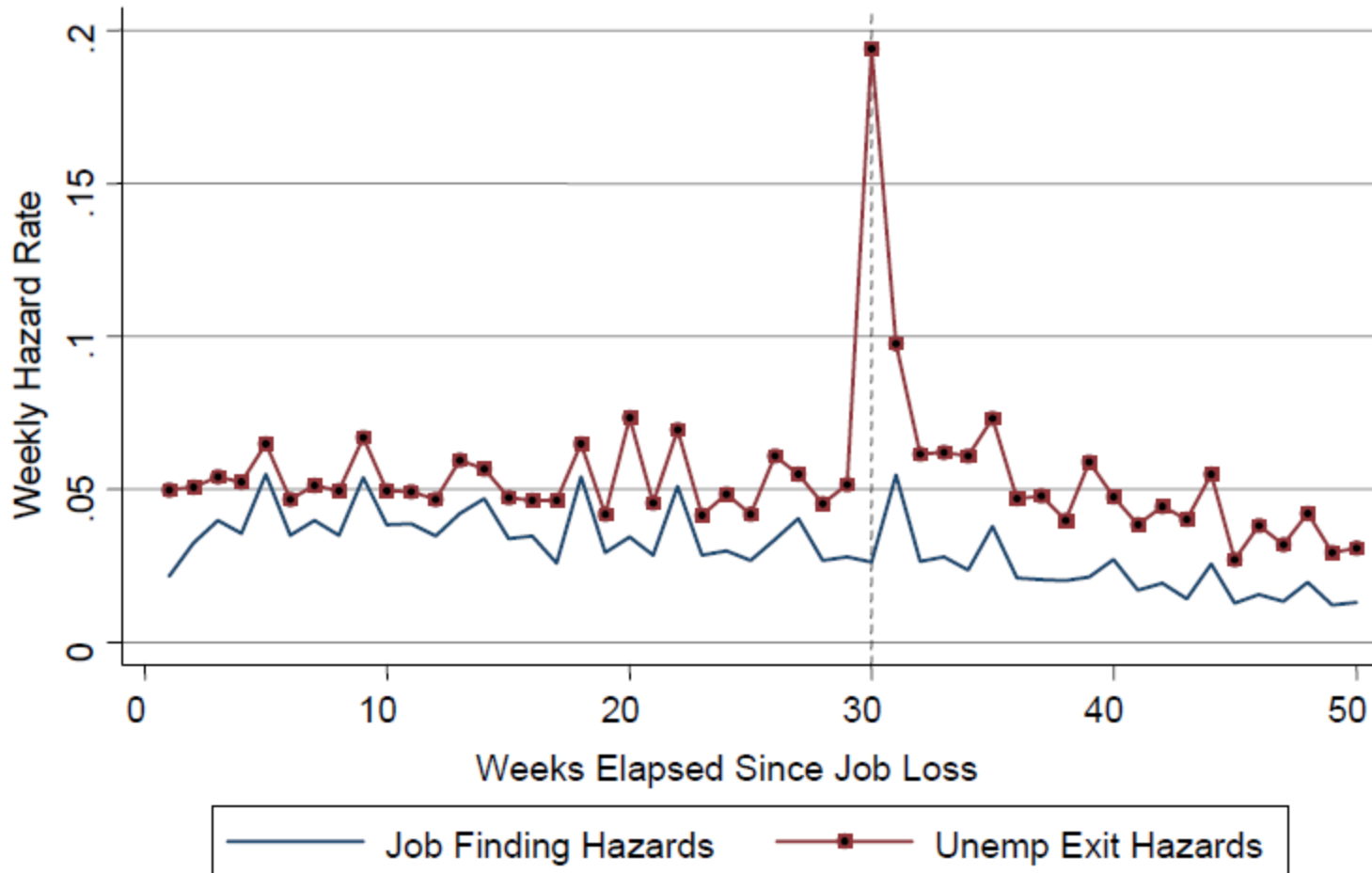


FIGURE IV  
Time Until Exhaustion Recall and New Job Hazards

# Card, Chetty and Weber (2007)

Figure 1b

Job Finding vs. Unemployment Exit Hazards: 30 Week UI





- Effect of benefits on durations:

$$\partial s_t / \partial b_t = -u'(c_t^u) / \psi''(s_t)$$

- Benefit effect can be decomposed into two conceptually distinct terms:

$$\partial s_t / \partial A_t = \{v'(c_t^e) - u'(c_t^u)\} / \psi''(s_t) \leq 0$$

$$\partial s_t / \partial w_t = v'(c_t^e) / \psi''(s_t) > 0$$

$$\Rightarrow \partial s_t / \partial b_t = \partial s_t / \partial A_t - \partial s_t / \partial w_t$$

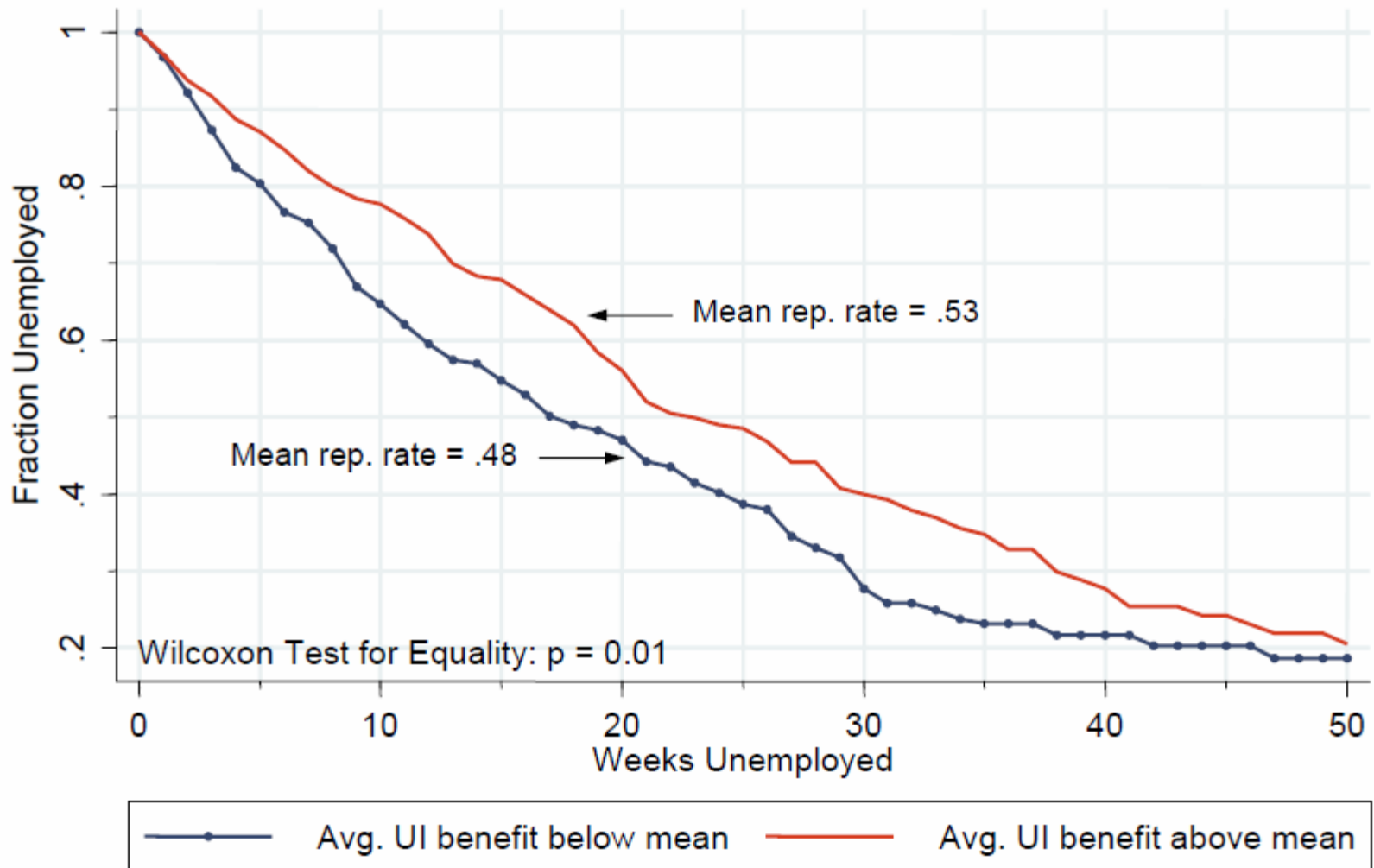
Liquidity

Moral Hazard (subst. effect)

- No liq. effect for agents who smooth perfectly; negligible liq. effect for those who are not credit constrained because unemp. shocks small
- Liquidity and total benefit effects large for agents who cannot smooth relative to permanent income (e.g. low asset, credit constrained)

Figure 3a

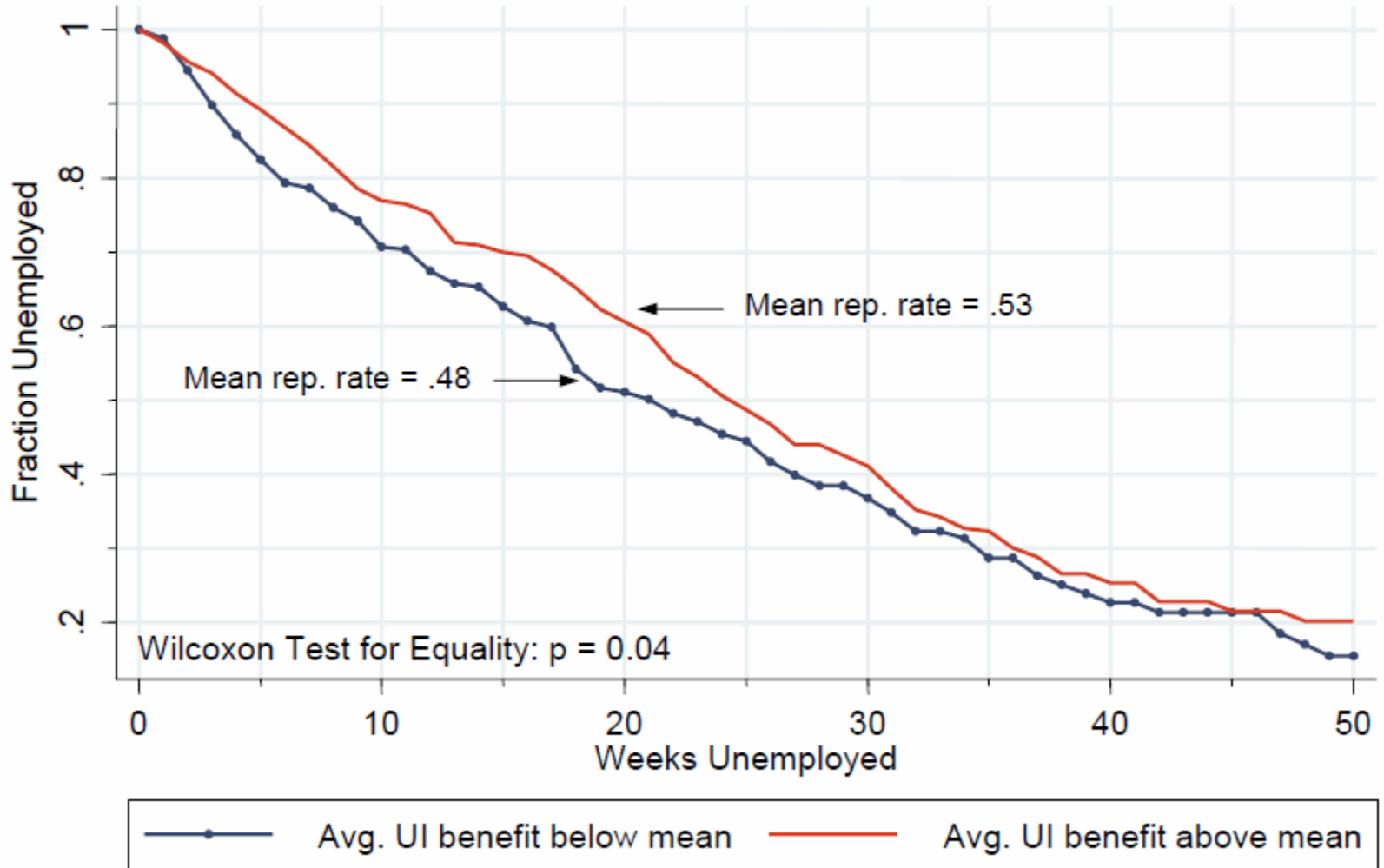
Effect of UI Benefits on Durations: Lowest Quartile of Net Wealth



Source: Chetty (2008).

Figure 3b

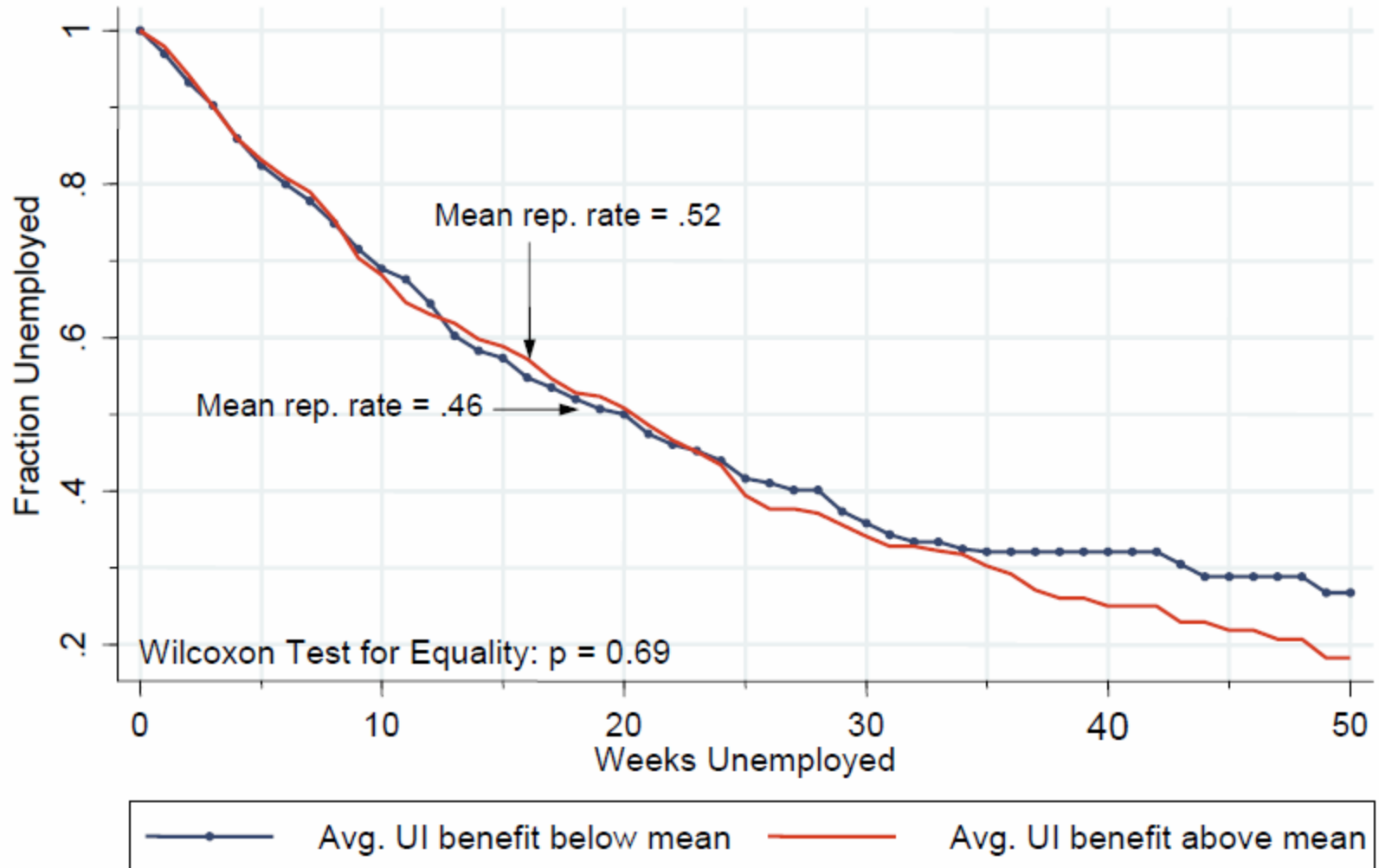
Effect of UI Benefits on Durations: Second Quartile of Net Wealth



Source: Chetty (2008).

Figure 3c

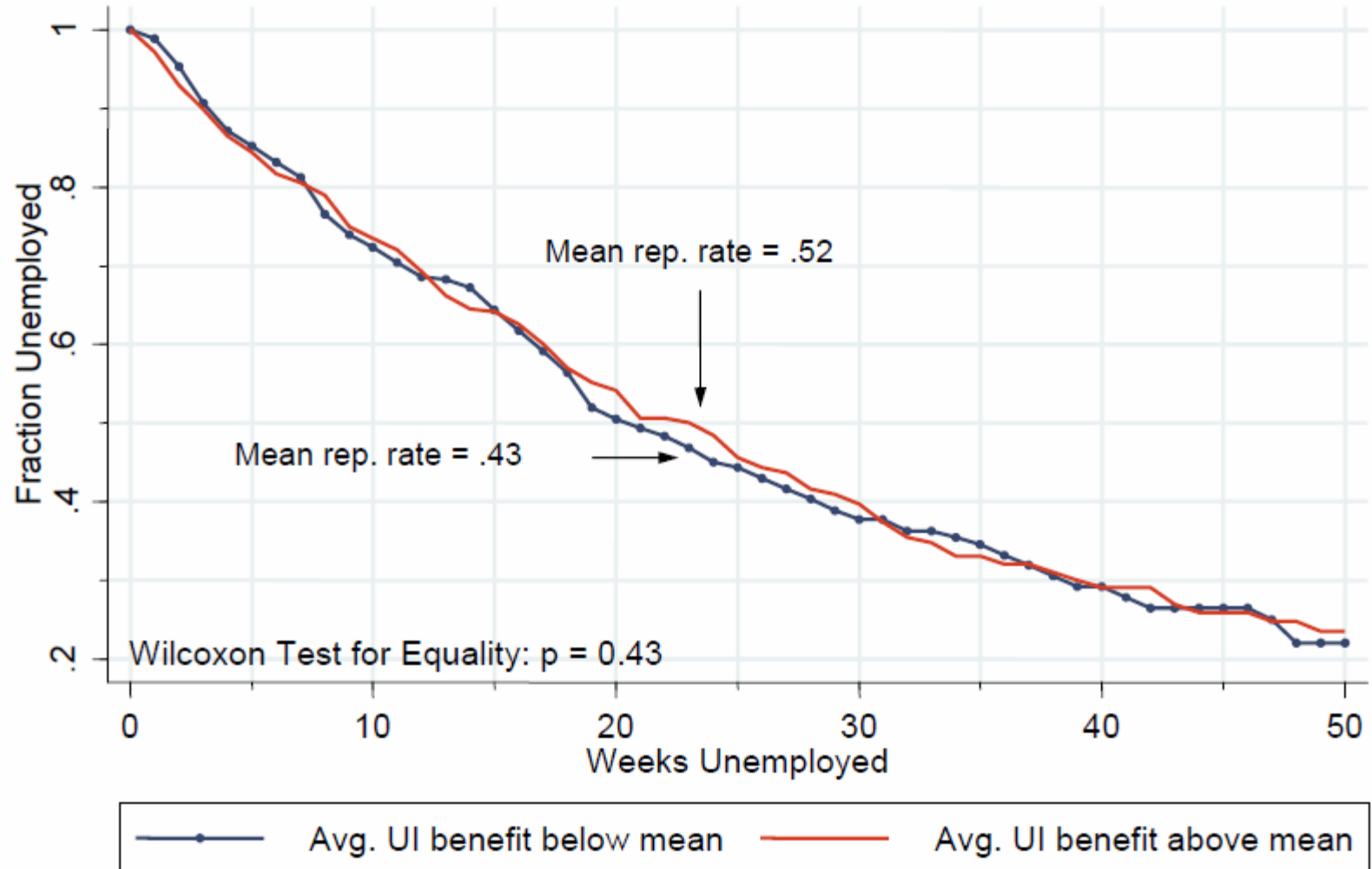
Effect of UI Benefits on Durations: Third Quartile of Net Wealth



Source: Chetty (2008).

Figure 3d

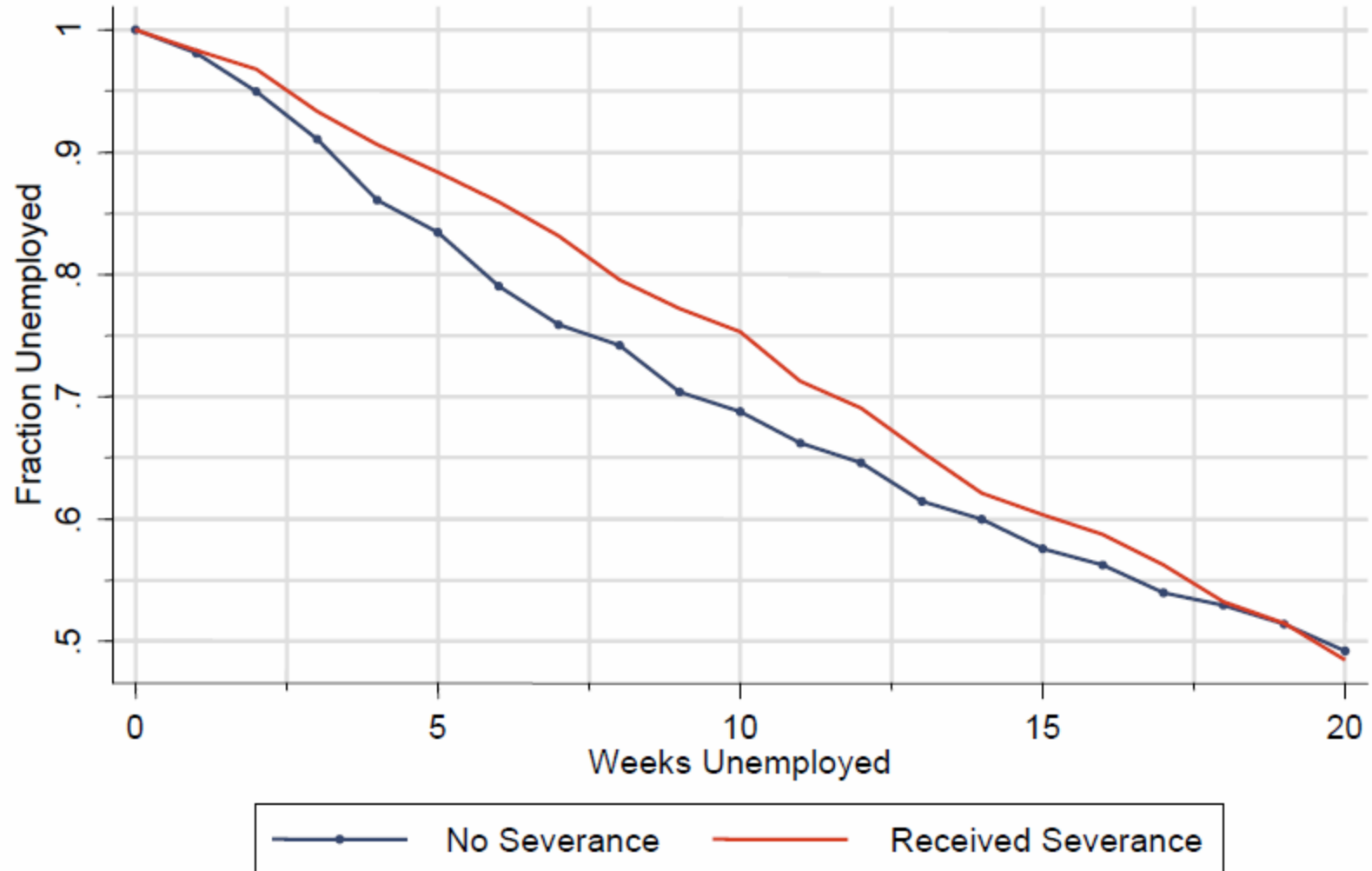
Effect of UI Benefits on Durations: Highest Quartile of Net Wealth



Source: Chetty (2008).

Figure 5

Effect of Severance Pay on Durations



Source: Chetty (2008).

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**Job Search and Job Finding in a Period of Mass Unemployment:  
Evidence from High-Frequency Longitudinal Data**

Alan B. Krueger  
Princeton University

and

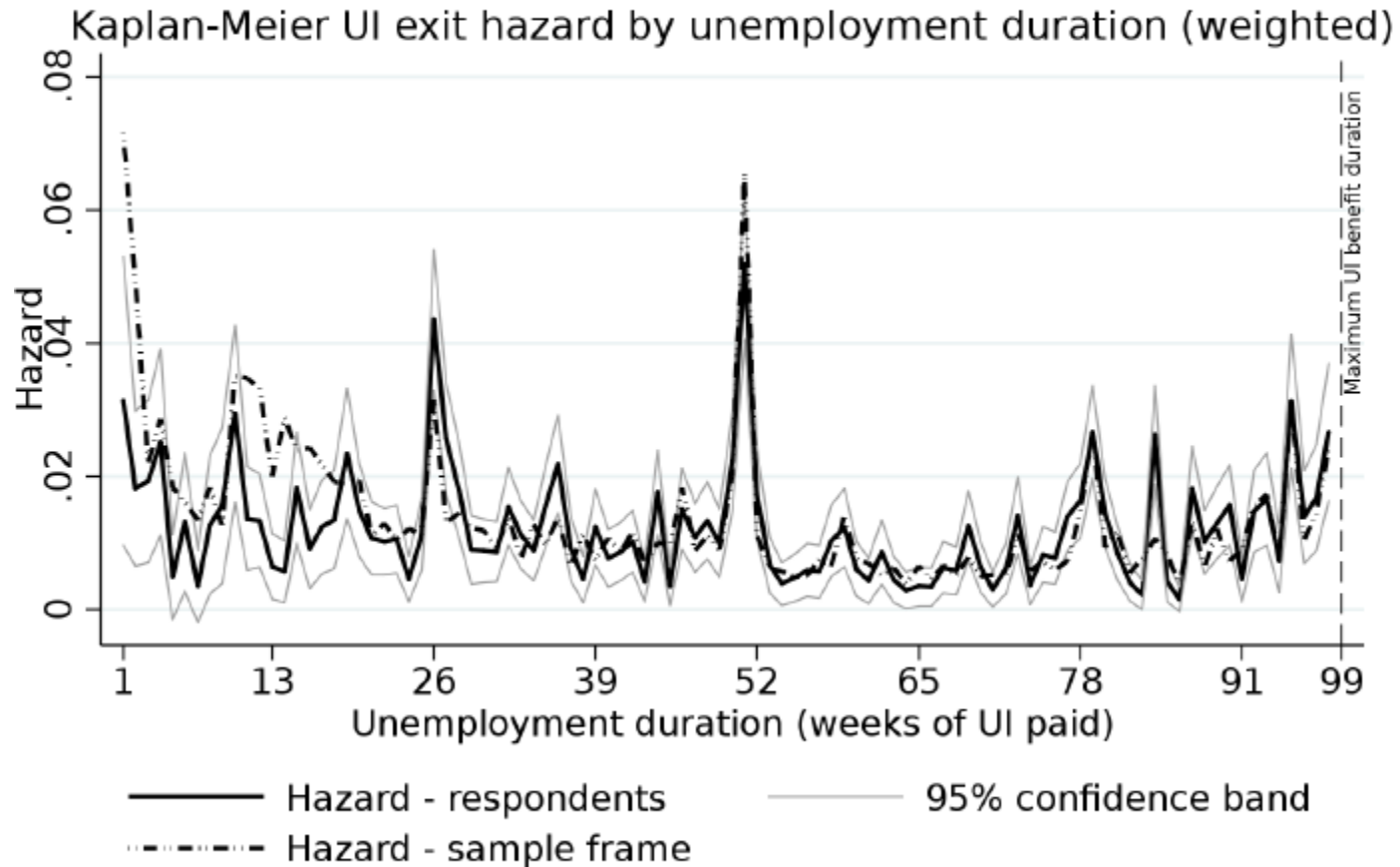
Andreas Mueller  
Stockholm University

## Survey Design

- Start with universe of UI recipients in NJ in late September 2009
- Stratified random sample (n=63,813)
  - Over sampled long term unemployed
  - Paid \$20 or \$40 for participation
- Web survey
- 12 weekly surveys, starting w/ week of entry survey (s,  $w^R$ , job offers, etc.)
- Additional 12 weeks of interviews for those with 60 weeks of unemployment to start
- Low response rate (10% on entry; 40% thereafter), but create weights from administrative data and compare sample to universe



Figure 2.1: UI weekly exit rate by UI duration



Notes: For respondents the hazards are weighted with survey weights and for the sample frame with strata weights. The confidence bands for the sample frame are not shown because the standard errors are usually small (around 0.001, but higher for less than 20 weeks of unemployment duration).



## Yesterday

Start time - End time

What were you doing?

7:00 AM - 7:59 AM

[Select activities](#)

8:00 AM - 8:59 AM

[Select activities](#)

Please select up to two activities that best describe what you were doing:

[close window](#)

[<<< previous](#)

- |   |  |
|---|--|
| <input type="checkbox"/> Grooming/Personal care                                 | <input type="checkbox"/> Shopping                          |
| <input type="checkbox"/> Commuting/Traveling                                    | <input type="checkbox"/> Socializing                       |
| <input type="checkbox"/> Working  | <input type="checkbox"/> Exercising (including sports)     |
| <input type="checkbox"/> Searching for a job                                    | <input type="checkbox"/> Sleeping/Nap                      |
| <input type="checkbox"/> Attending job training program                         | <input type="checkbox"/> Relaxing/resting                  |
| <input type="checkbox"/> Preparing for/taking course                            | <input type="checkbox"/> Watching TV                       |
| <input type="checkbox"/> Preparing food   | <input type="checkbox"/> Reading/Writing                   |
| <input type="checkbox"/> Doing housework  | <input type="checkbox"/> On the phone                      |
| <input type="checkbox"/> Taking care of family members (Children, Spouse, etc.) | <input type="checkbox"/> Using the Computer/Internet/Email |
| <input type="checkbox"/> Taking care of non-family members                      | <input type="checkbox"/> Other                             |
| <input type="checkbox"/> Eating and drinking                                    |  |

[next >>>](#)

9:00 AM - 9:59 AM

10:00 AM - 10:59 AM

[Select activities](#)

11:00 AM - 11:59 AM

[Select activities](#)

12:00 PM - 12:59 PM

[Select activities](#)



#### 4. Type of work and lowest acceptable salary

[q7] Please describe in a few words the type of work you are looking for (for example: Electrical engineer, stock clerk, typist, farmer, ...). If you have already found a job, you do not need to answer.

Assuming you could find suitable work, how many hours per week would you prefer to work on this new job?

[q7e] hours per week

Suppose someone offered you a job today. What is the lowest wage or salary you would accept (before deductions) for the type of work you are looking for?

[q7a1] dollars

[q7a2] per

- year
- month
- week
- hour

[q7d] How many minutes a day would you be willing to commute if you were offered a job at that salary?

- 15 minutes or less
- 16 to 30 minutes
- 31 to 45 minutes
- 46 to 60 minutes
- 61 to 75 minutes
- 76 to 90 minutes
- 91 to 120 minutes

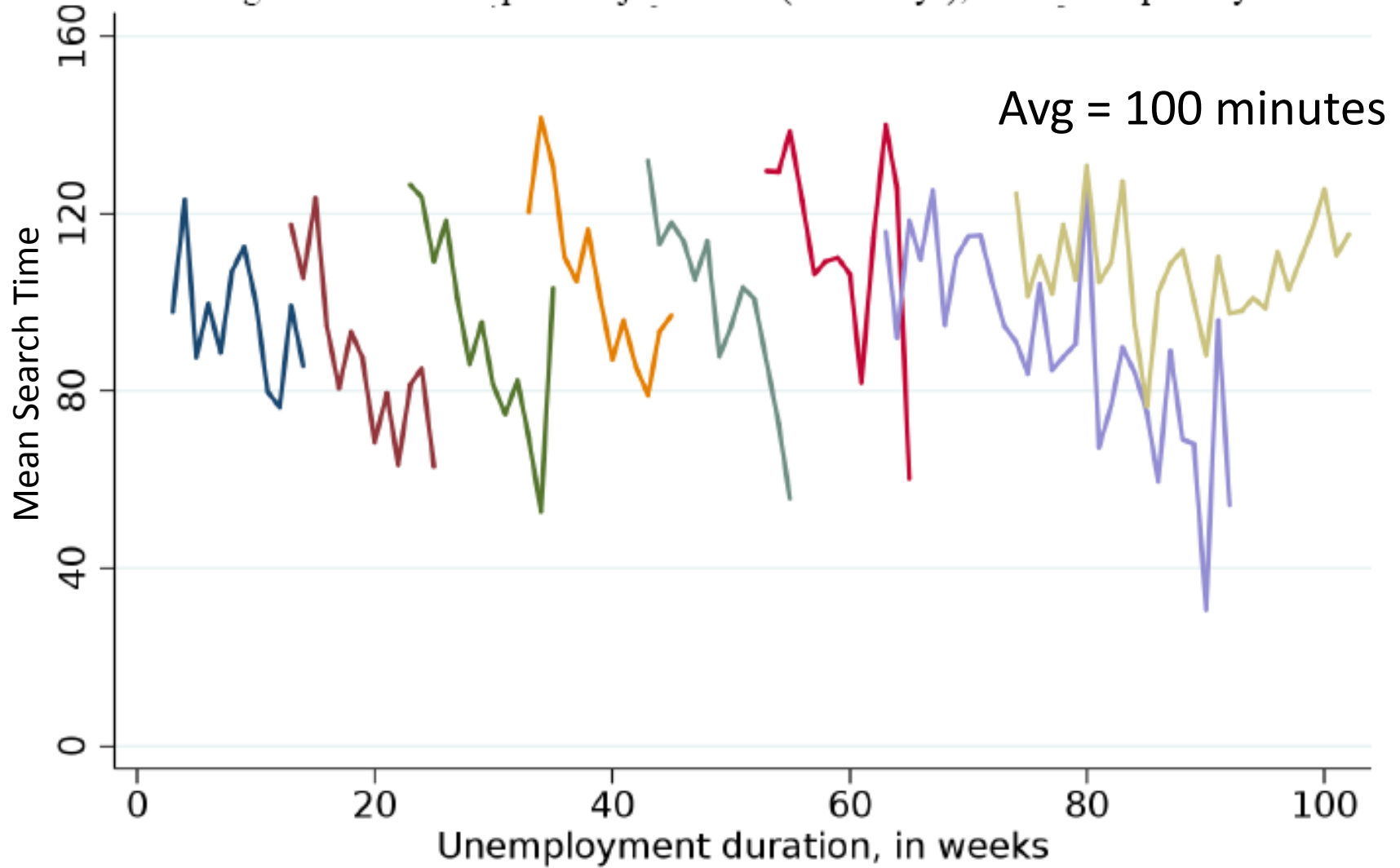


### 5. Job search activities and job offers (continued)

On the previous page you indicated what kind of methods you used to find work. In the last 7 days, about how many hours and minutes did you spend on each of those methods? Your best guess is okay.

<b>Method</b>	<b>Hours</b>	<b>Minutes</b>
Contacted employer directly:	[q10a1_1] <input type="text"/>	[q10a2_1] <input type="text"/>
Contacted public employment agency:	[q10a1_2] <input type="text"/>	[q10a2_2] <input type="text"/>
Contacted private employment agency:	[q10a1_3] <input type="text"/>	[q10a2_3] <input type="text"/>
Contacted friends or relatives:	[q10a1_4] <input type="text"/>	[q10a2_4] <input type="text"/>
Contacted school/university employment center:	[q10a1_5] <input type="text"/>	[q10a2_5] <input type="text"/>
Checked union/professional registers:	[q10a1_6] <input type="text"/>	[q10a2_6] <input type="text"/>
Attended job training programs/courses:	[q10a1_7] <input type="text"/>	[q10a2_7] <input type="text"/>
Placed or answered ads:	[q10a1_8] <input type="text"/>	[q10a2_8] <input type="text"/>
Went to interview:	[q10a1_9] <input type="text"/>	[q10a2_9] <input type="text"/>
Sent out resumes/filled out applications:	[q10a1_10] <input type="text"/>	[q10a2_10] <input type="text"/>
Looked at ads:	[q10a1_11] <input type="text"/>	[q10a2_11] <input type="text"/>
Other:	[q10a1_12] <input type="text"/>	[q10a2_12] <input type="text"/>

Figure 3.1b: Time spent on job search (last 7 days), in minutes per day



**Table 3.1b Linear regressions of time spent on job search (last 7 days), with and without fixed effects**

<b>Dependent variable: time spent on job search, in mins. per day</b>	<b><u>Week 1</u></b>	<b><u>Pooled cross-section</u></b>	<b><u>Cohort effects</u></b>	<b><u>Fixed effects</u></b>	<b><u>Fixed effects</u></b>
Unemployment duration, in weeks	0.093 (0.130)	0.059 (0.134)	-2.109 (0.395)***	-2.245 (0.288)***	-1.538 (0.331)***
Lapse (before November 8)					-1.096 (7.994)
Exhausted UI					-1.415 (13.978)
After extension of November 8					-11.788 (3.651)***
Log(weekly benefit amount)	-2.921 (16.950)	-28.141 (15.924)*	-26.129 (15.755)*		
Log(weekly previous wage)	18.855 (10.931)*	38.659 (10.370)***	37.806 (10.384)***		
Controlling for age, education, sex, race and ethnicity	x	x	x		
Cohort effects			x		
Individual fixed effects				x	x
Mean of dependent variable	117.5	98.3	98.3	97.6	97.6
Min	0	0	0	0	0
Max	685.7	685.7	685.7	685.7	685.7
N	3,983	24,638	24,638	25,449	25,449
R-squared	0.04	0.05	0.06	0.77	0.77

Robust standard errors in parentheses (clustered at individual level); \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

Notes: Survey weights are used. Universe: Unemployed; no job offer yet accepted; age 20-65.

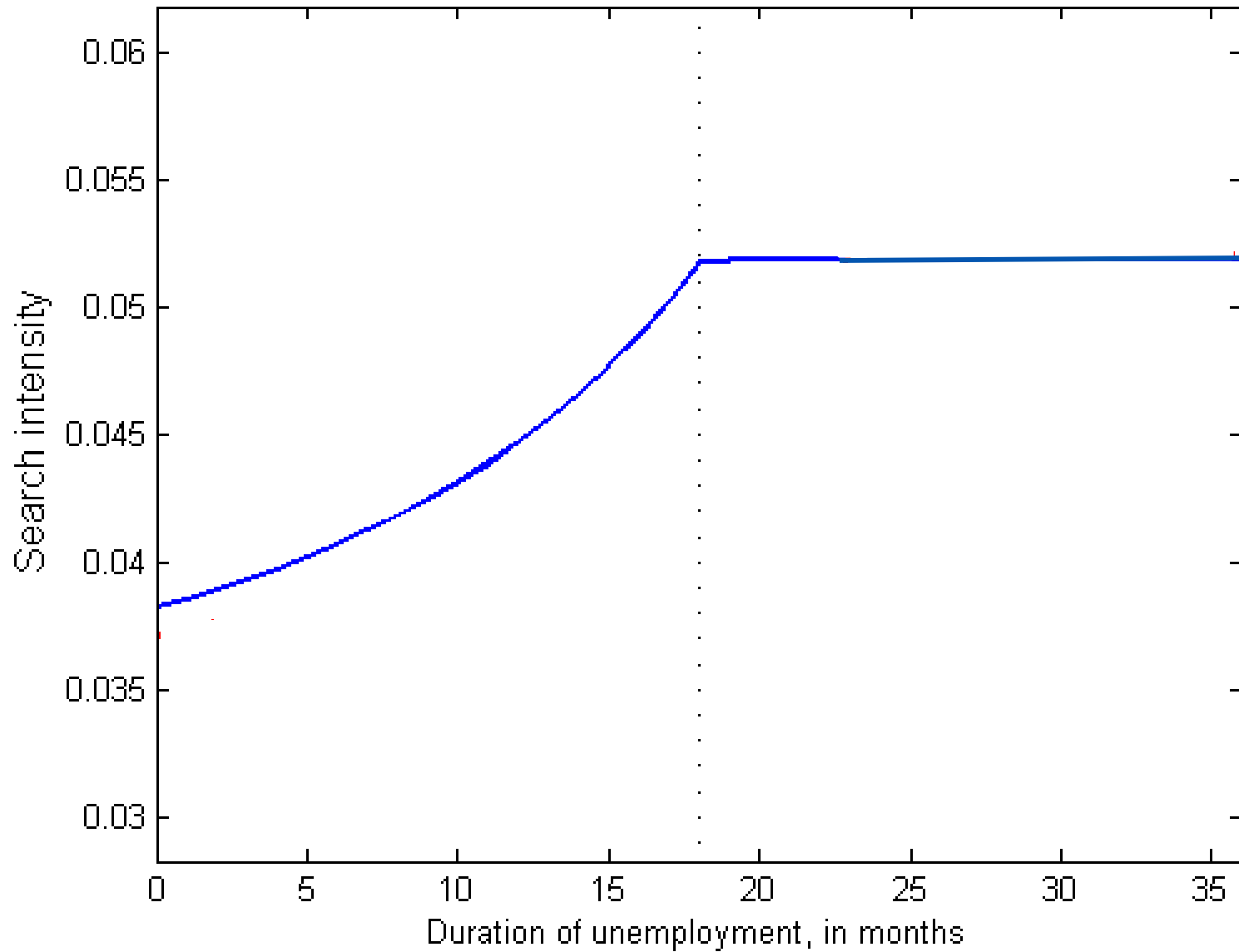
# Time spent on job search (last 7 days), in min per day



Universe: Unemployed; no job offer yet accepted; age 20-65.

t=0

## Search intensity by duration of unemployment

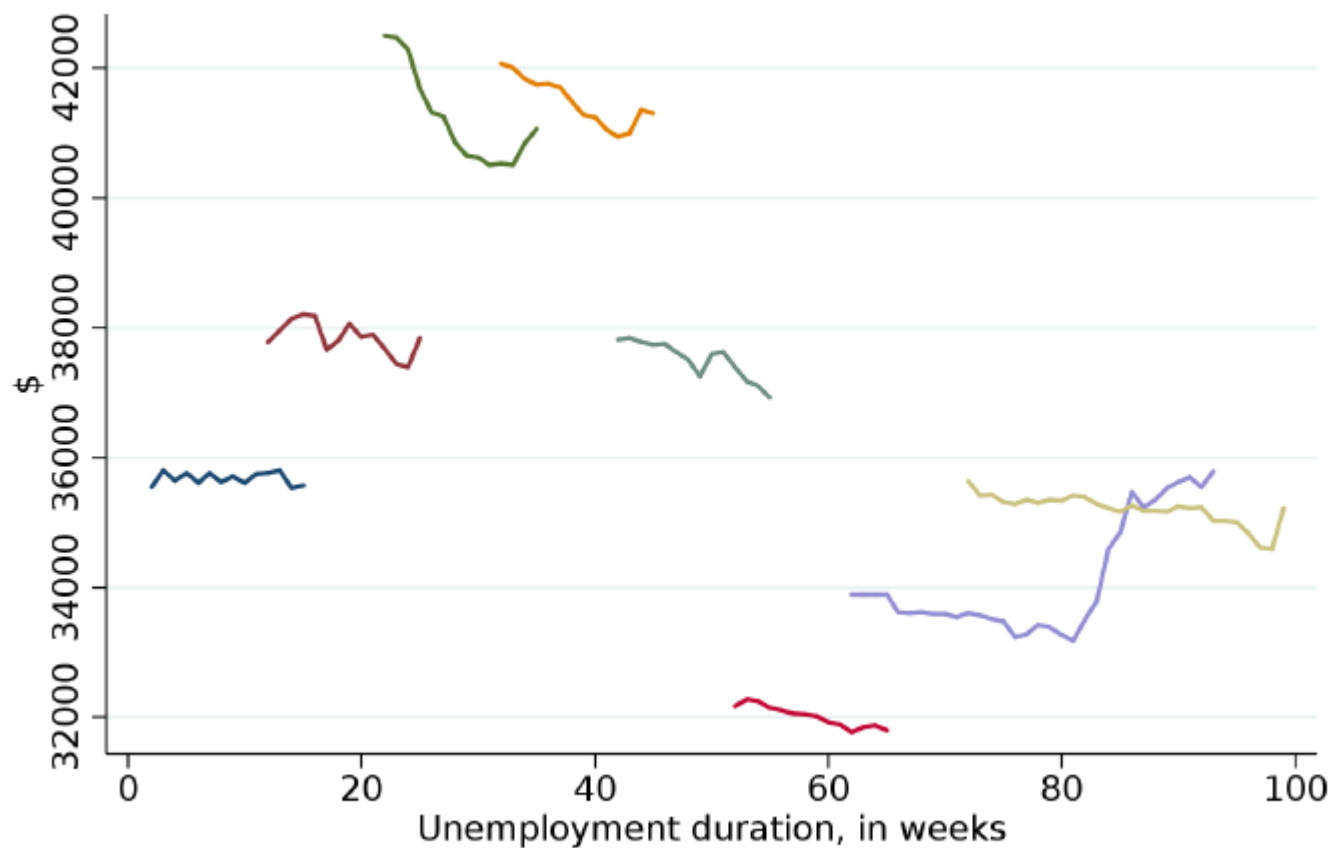




# Cohort, Time and Duration Effects // Reporting Bias

- Can't distinguish between unemployment duration and calendar time effects for given cohort.
- Holidays: Drop last two weeks of November and December; same pattern
- Look only at nonseasonal industries (education/health care) and same pattern
- Cohorts are different
- Diary hard to fake
- Control for number of interviews and duration of unemployment, and latter matters.

Figure 3.3: Average Earnings in Base Year, by Cohort and Duration of Unemployment



Notes: Survey weights are used. Universe: UI recipients; age 20-65.

# Reservation Wage

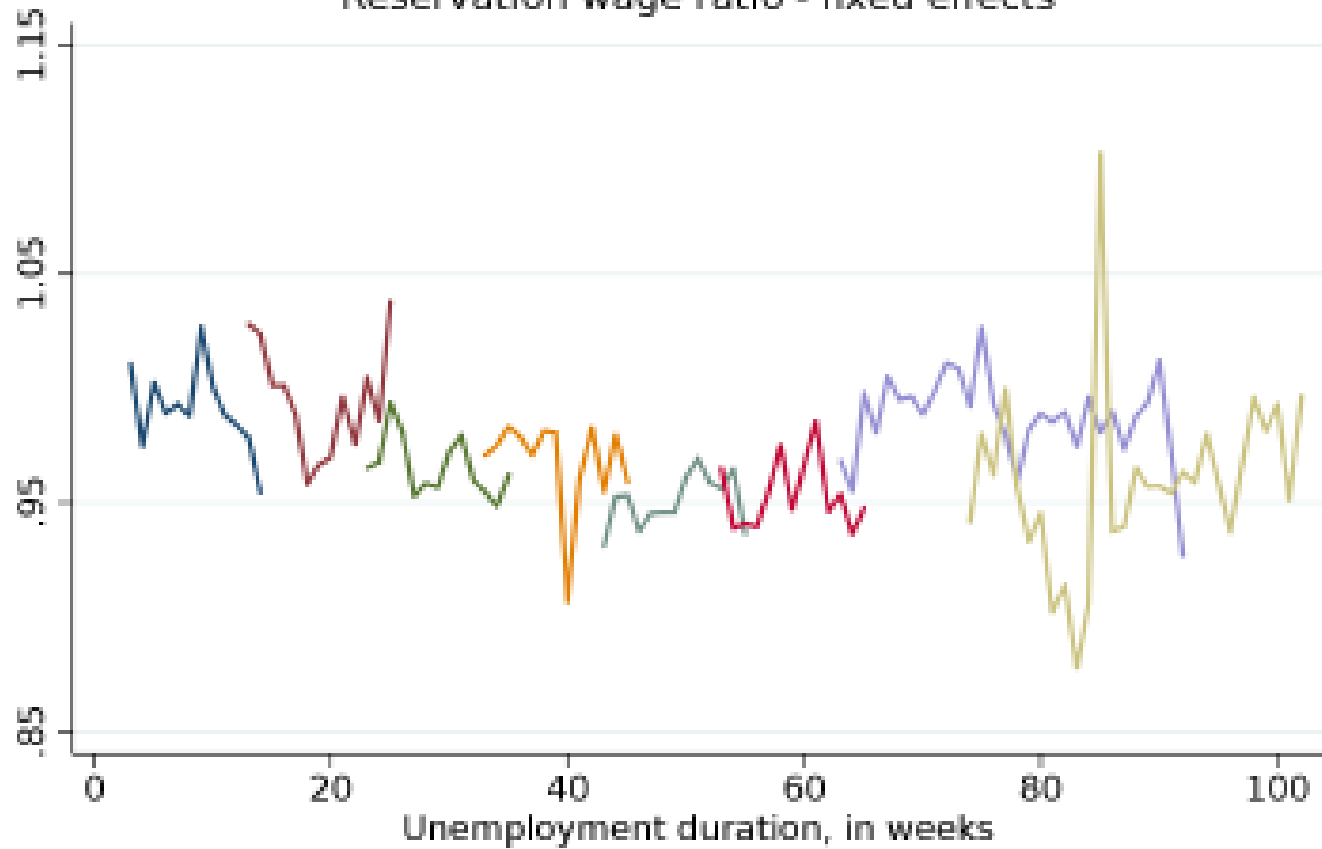
Table 4.1 Reservation wage ratio by duration of unemployment

	<u>All durations</u>	<u>Less than 5 weeks</u>	<u>5 - 9 weeks</u>	<u>10 - 14 weeks</u>	<u>15 - 19 weeks</u>	<u>20 - 24 weeks</u>	<u>25 - 49 weeks</u>	<u>50 + weeks</u>
<u>Feldstein &amp; Poterba (1984):</u> All Job Losers and Leavers	1.07	1.11	1.09	1.04	1.06	1.04	1.02	0.99
<u>Feldstein &amp; Poterba (1984):</u> Job Losers	1.03	1.06	1.05	1.03	1.06	1.00	0.99	0.97
<u>Krueger &amp; Mueller:</u> Cross-section (1st week)	0.99	1.04	1.02	1.01	1.00	1.06	0.95	0.94
<u>Krueger &amp; Mueller:</u> Longitudinal estimate	0.99	1.00	1.00	1.00	0.99	0.99	0.98	0.97

Note: Survey weights are used. Universe: Unemployed; no job offer yet accepted; age 20-65.

Feldstein and Poterba's (1984) estimates are from a sample of 2,228 unemployed from the May 1976 Current Population Survey.

### Reservation wage ratio - fixed effects



Notes: Survey weights are used. Cells with less than 50 observations are dropped from the graph.  
Universe: Unemployed; no job offer yet accepted; age 20-65.

## Table 4.2 Cont. - Log Reservation Wage Models for Various Subgroups

Dependent variable: log(reservation wage ratio)	<u>Savings</u> < \$10,000	<u>Savings</u> ≥ \$10,000	<u>Age 20-50</u>	<u>Age 51-65</u>	<u>Savings</u> ≥ \$10,000 (age 20-50)	<u>Savings</u> ≥ \$10,000 (age 51-65)
Unemployment duration, in weeks	0.00014 (0.00065)	-0.00309 (0.00114)***	0.00045 (0.00072)	-0.0026 (0.00073)***	-0.00182 (0.00159)	-0.00423 (0.00159)***
Lapse (before November 8)						
Exhausted UI						
After extension of November 8						
Log(weekly benefit amount)						
Log(weekly previous wage)						
Controlling for age, education, sex, race, and ethnicity						
Dummies for unit of reported reservation wage	x	x	x	x	x	x
Individual fixed effects	x	x	x	x	x	x
Mean of dependent variable	-0.057	-0.276	-0.054	-0.249	-0.225	-0.339
Min	-1.107	-1.107	-1.107	-1.107	-1.107	-1.077
Max	1.099	1.087	1.099	1.094	1.087	1.084
N	16,057	6,796	13,565	10,909	2,655	4,141
R-squared	0.94	0.95	0.94	0.93	0.96	0.92
Robust standard errors in parentheses						

**Table 6.1b Hourly offered wage below and above hourly reservation wage (full time offers only)**

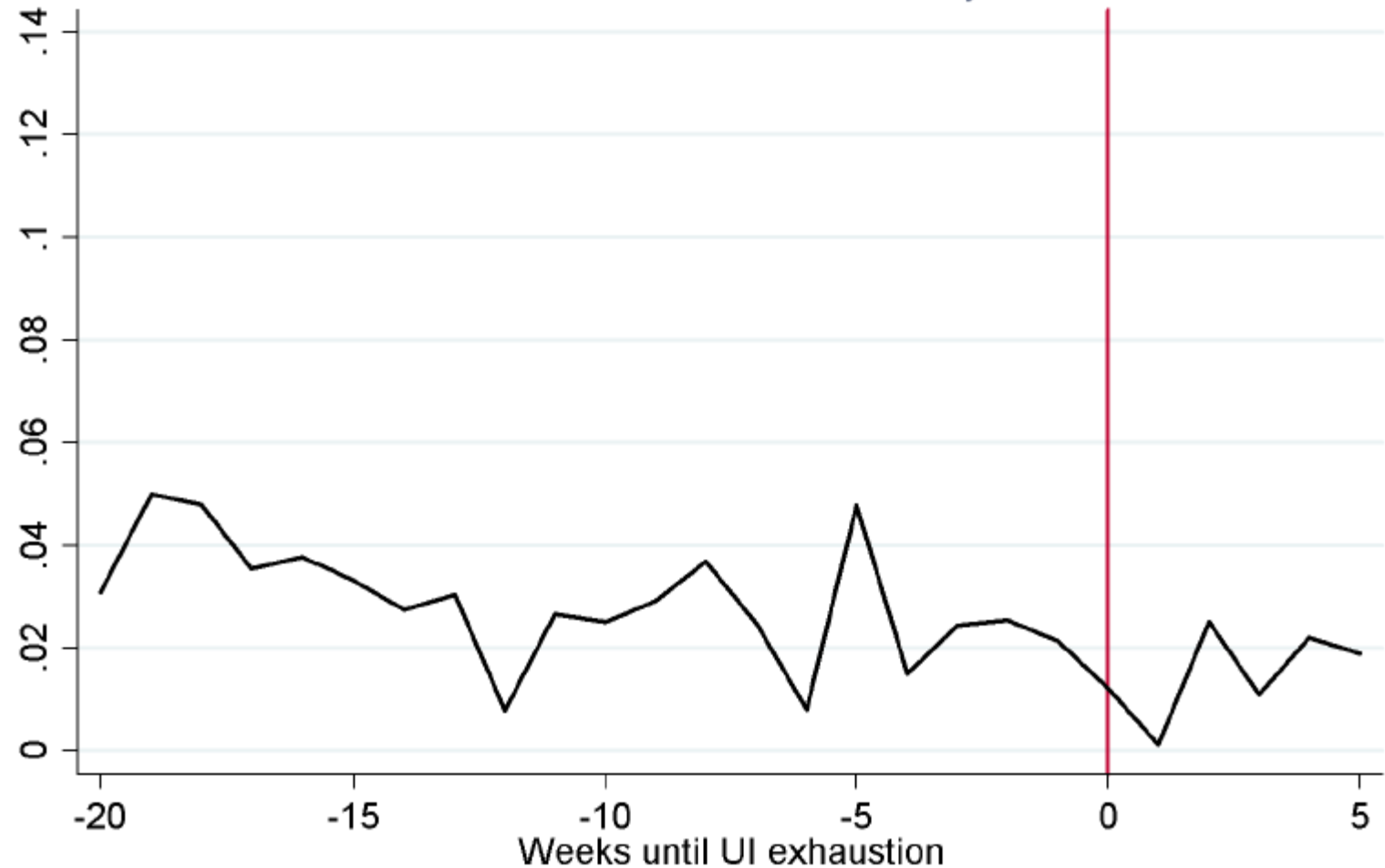
	Hourly offered wage < hourly reservation wage	Hourly offered wage >= hourly reservation wage
Accepted	44.4%	73.8%
Not accepted	24.2%	11.4%
Undecided	31.4%	14.8%
N	361	417

NB: Lagged reservation wage.

**Table 5.2 Probit models (marginal effects) for leaving UI early and receiving a job offer**

Explanatory Variables:	Dependent Variable:					
	Left UI early (before March 14, 2010)			Received job offer		
	(1)	(2)	(3)	(4)	(5)	(6)
Time spent on job search, in hours per week	0.0018 (0.0006)***	0.0018 (0.0005)***	0.0017 (0.0005)***	-0.0002 (0.0007)	-0.0002 (0.0006)	-0.0002 (0.0006)
Log(reservation wage ratio)	-0.0492 (0.0255)*	-0.0485 (0.0246)**	-0.0517 (0.0252)**			
Cohort 2		0.05 (0.0352)	0.0284 (0.0331)		0.0372 (0.0375)	0.0388 (0.0386)
Cohort 3		-0.0122 (0.0277)	-0.0155 (0.0271)		-0.0181 (0.0301)	-0.0112 (0.0303)
Cohort 4		-0.0352 (0.0276)	-0.0393 (0.0275)		-0.0119 (0.0313)	-0.0135 (0.0312)
Cohort 5		-0.0966 (0.0202)***	-0.0912 (0.0202)***		0.0343 (0.0371)	0.0394 (0.0371)
Cohort 6		-0.0593 (0.0285)**	-0.0544 (0.0287)*		0.0015 (0.0373)	-0.0044 (0.0358)
Cohort 7		-0.0991 (0.0204)***	-0.0958 (0.0204)***		-0.0795 (0.0227)***	-0.0767 (0.0240)***
Cohort 8		-0.0872 (0.0196)***	-0.0784 (0.0207)***		-0.0189 (0.0283)	-0.0078 (0.0300)
Recall expectation			0.0003 (0.0322)			0.0508 (0.0407)
With recall date			0.3872 (0.1533)**			0.0633 (0.1196)

# Job offered in last 7 days



Universe: no job offer yet accepted.



# Subjective Well-Being

**Table 4.4** Descriptive statistics: emotions happy, sad and stressed by activity and job search method

<u>Emotions by activity</u>	<i>Averages</i>			<i>Fixed effect estimates</i>		
	<u>Happy</u>	<u>Sad</u>	<u>Stressed</u>	<u>Happy</u>	<u>Sad</u>	<u>Stressed</u>
Searching for a job	2.39	2.28	3.33	2.39	2.28	3.33
<b>Other activities:</b>	<b>3.33</b>	<b>1.27</b>	<b>1.75</b>			
Grooming/personal care	3.30	1.30	1.70	3.06	1.61	2.03
Shopping	3.35	1.03	1.66	3.08	1.55	2.27
Commuting/traveling	3.15	1.05	1.77	2.89	1.62	2.33
Working	3.15	1.19	1.91	3.04	1.49	2.36
Attending job training program	3.95	0.95	2.07	3.36	1.35	2.41
Relaxing/resting	3.39	1.29	1.64	3.12	1.64	2.02
Exercising (including sports)	3.98	0.88	1.28	3.82	1.33	1.77
Watching TV	3.27	1.38	1.58	3.12	1.64	1.96
Reading/writing	3.55	1.06	1.45	3.23	1.53	1.99
Socializing	4.08	0.88	1.09	3.60	1.43	1.75
Eating and drinking	3.46	1.14	1.49	3.15	1.55	1.99
Preparing for/taking course	3.51	0.99	2.17	3.06	1.58	2.60
Preparing food	3.42	1.25	1.68	3.16	1.58	2.04
Doing housework	3.06	1.39	1.92	2.87	1.67	2.20
Taking care of family members	3.63	1.14	1.96	3.30	1.51	2.13
Taking care of non-family members	3.29	1.17	1.70	3.19	1.62	1.99
On the phone	3.18	1.40	1.93	2.89	1.76	2.41
Using the computer/internet/email	2.80	1.71	2.25	2.81	1.82	2.45
Other	3.35	1.21	1.72	3.06	1.66	2.21

# Subjective Well-Being

- Happiness declines over spell of unemployment and sadness and stress rise.
- Sadness rises twice as fast during episodes of job search.

Table 4.5 Linear regressions of emotions happy, sad and stressed during three random episodes of the day on duration of unemployment (excluding episodes of job search)

Explanatory Variable	Dependent Variable:					
	<u>Happy</u>		<u>Sad</u>		<u>Stressed</u>	
Unemployment duration, in weeks	-0.013 (0.005)***	-0.006 (0.006)	0.020 (0.004)***	0.016 (0.005)***	0.001 (0.004)	0.003 (0.004)
Lapse (before November 8)		-0.261 (0.124)**		-0.052 (0.103)		-0.014 (0.121)
Exhausted UI		-0.179 (0.122)		0.016 (0.115)		0.046 (0.147)
After extension of November 8		-0.122 (0.059)**		0.072 (0.043)*		-0.040 (0.047)
Dummies for day of the week	x	x	x	x	x	x
Individual fixed effects	x	x	x	x	x	x
Mean of dependent variable	3.33	3.33	1.27	1.27	1.76	1.76
Min	0	0	0	0	0	0
Max	6	6	6	6	6	6
Number of episodes	64,419	64,419	64,419	64,419	64,419	64,419
R-squared	0.59	0.59	0.62	0.62	0.58	0.58

Robust standard errors in parentheses (clustered at individual level); \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

# Conclusions

- Search time and reservation wage affect UI exits in expected way
- Reservation wage predicts job acceptance/rejection
- Longitudinal data yield different and new insights
  
- Contrary to stationary job search model, search time declines with duration of unemployment for given individuals
- Also, reservation wage is stable when it is expected to decline
- Results consistent with: (1) finite job offer distribution; (2) discouragement; and/or (3) increased efficiency of search over time.

## Future

- Behavioral economics search models
- Need to better understand how search activity relates to job offers
- Need to understand if behavioral responses to UI are muted in a deep recession, and model optimal benefit extensions as well as levels.