Assessing the Welfare Effects of UI Using the Regression Kink Design

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NBER SI
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Motivation:

- What is the welfare impact of variation in UI?
- PF Holy Graal: **Baily-Chetty formula**

$$\frac{u'(c^u) - u'(c^e)}{u'(c^e)} = \varepsilon$$

- But how do we estimate consumption-smoothing benefits?

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- **But how do we estimate consumption-smoothing (CS) benefits?**

Contributions:

- New method to assess welfare effects of UI
  - Circumvent (partly) issues with estimation of CS benefits
  - Estimate liquidity effects of UI from behavioral responses
  - Calibrate Baily-Chetty formulae
- Provide credible non-parametric estimates of labor supply effects of both level and duration of UI
  - Use Regression Kink Design
  - Assess validity / provide practical guide to RKD

Estimating CS benefits: method 1

- Route 1: Consumption survey data (Gruber ['97])
  - CS benefits = risk aversion × consumption drop
  - Estimate consumption drop at unemployment
  - Issue 1: data availability / sample size / partial consumption measures
  - Issue 2: noisy unemployment and UI measures
  - Issue 3: problematic for timely and local use for Baily formula calibration

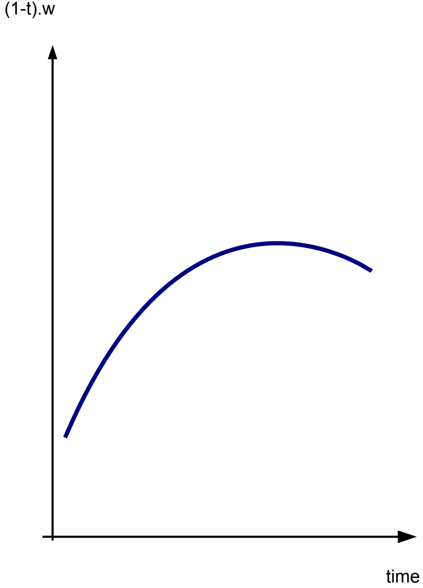
Estimating CS benefits: method 2-a

- Route 2: variation in liquidity (Chetty ['08])
  - Liquidity effect = effect on search effort of variation in liquid assets
  - CS benefits proportional to liquidity effect
  - Rewrite Baily-Chetty with only liquidity effects and moral hazard effects of UI
  - Estimate liquidity effects from variations in severance payments

Estimating CS benefits: method 2-b

- Variation in time profile of benefits (Landais ['13])
  - Chetty ['08] $\equiv$ a MaCurdy critique
    - Liquidity effect $\approx$ wealth effect
    - Moral hazard effect $\approx$ Frisch elasticity
  - Standard dynamic labor supply literature:
    - Use variations in wage profiles to estimate Frisch elasticity (MaCurdy ['81])
  - Dynamic UI model (this paper):
    - Use variations in time profile of benefits coming from **variations in both benefit level and benefit duration**
    - Take into account state-dependance

Figure 1 : Standard dynamic labor supply



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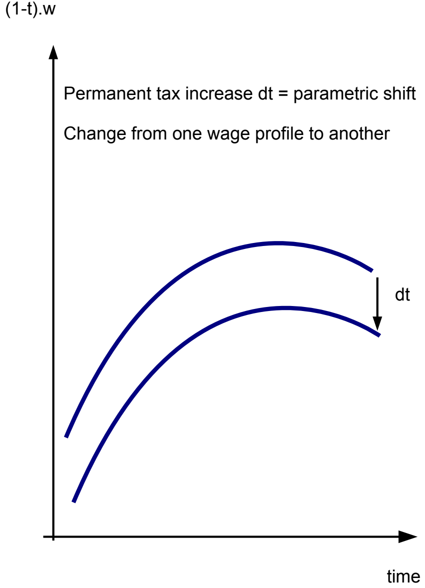

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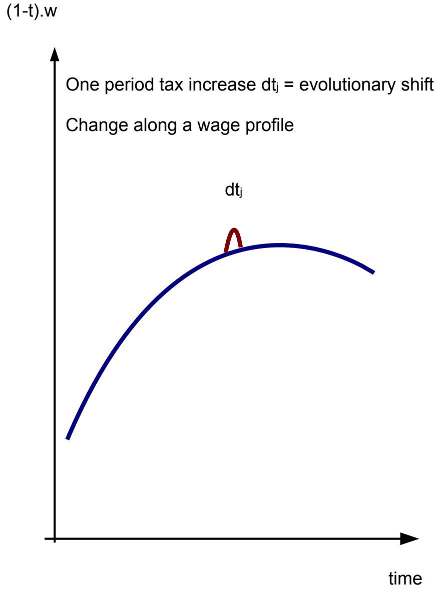

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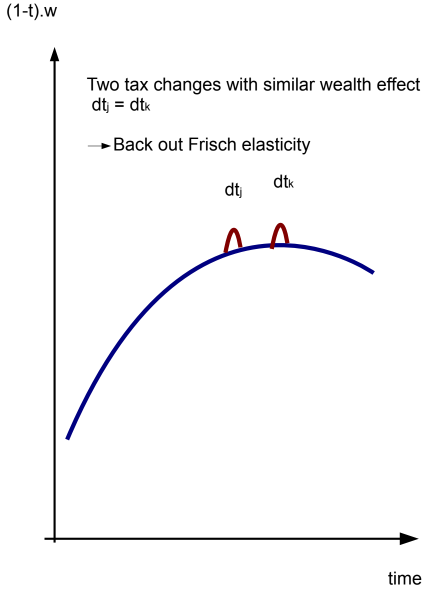
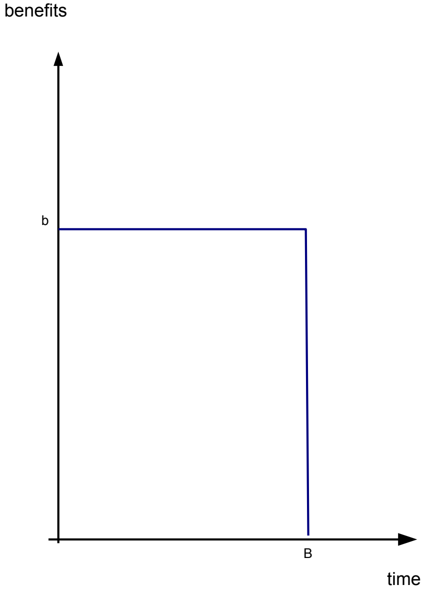


Figure 2 : Dynamic UI model



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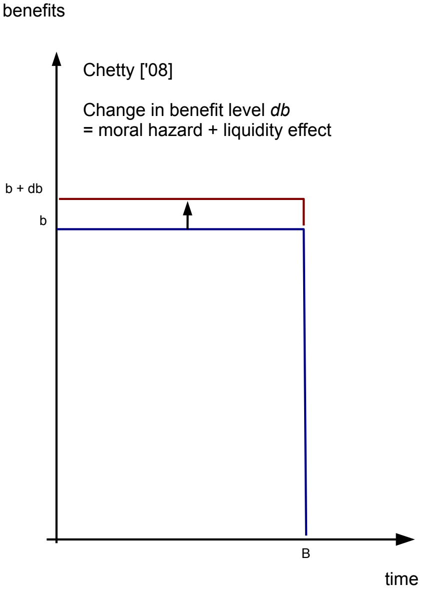

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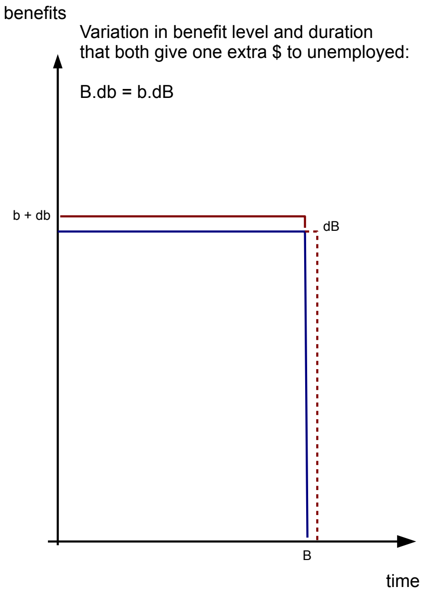

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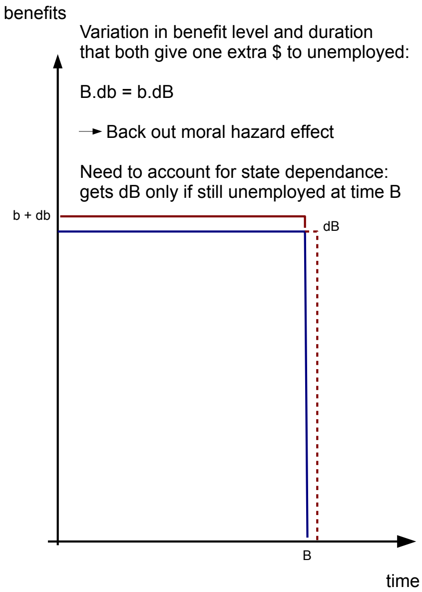


Identifying moral hazard

Proposition 1:

- If borrowing constraint does not hit after B periods

$$\Theta_1 = \Phi_1 \cdot \left(\frac{1}{B} \left.\frac{\partial s_0}{\partial b}\right|_B - \frac{1}{b}\frac{\partial s_0}{\partial B}\right) \tag{1}$$

- Θ_1 : moral hazard effect of benefits b for B periods
- $\left.\frac{\partial s_0}{\partial b}\right|_B$: effect of increase in benefit level
- $\frac{\partial s_0}{\partial B}$: effect of increase in duration
- Φ_1 : function of average duration and survival rate

Method 2-b:

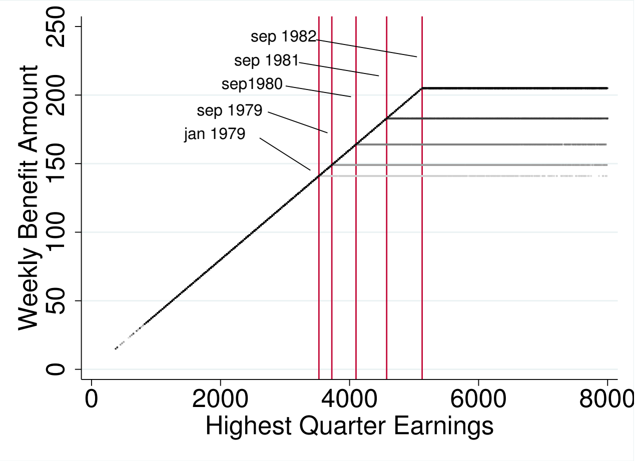
- Requirements:
  - Need variation in benefit level and duration for seemingly identical individuals
  - These variations exist in the US due to kinks in schedule of both b and B
- Advantages:
  - Estimate moral hazard effects only from labor supply responses to benefit variation
  - No need for data on consumption or severance
  - Can assess welfare effects of variations in b and B from admin data in timely manner

Data: CWBH

- Exhaustive Administrative UI data for ID, LA, MO, NM, WA
- Records from late 1970s to 1984
- Precise info on benefit level, potential duration, previous earnings, some demographics
- Outcome: duration UI paid, duration UI claimed, duration of initial spell, non-employment duration (for WA)

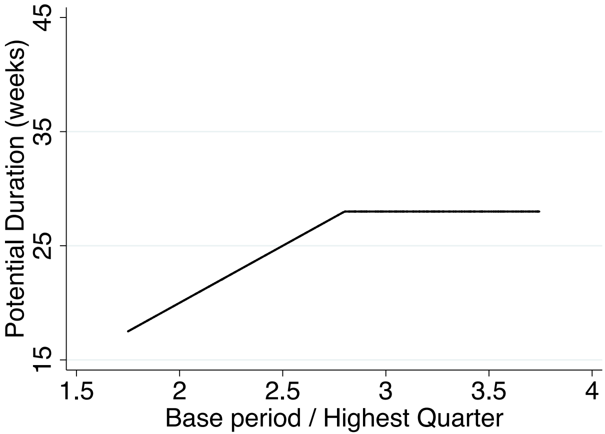
Descriptive statistics

Figure 3 : Louisiana: Schedule of UI Weekly Benefit Amount, jan1979-Dec1983



schedule wba

Figure 4 : Louisiana: Schedule of UI Potential Duration, jan1979-Dec1983



schedule duration

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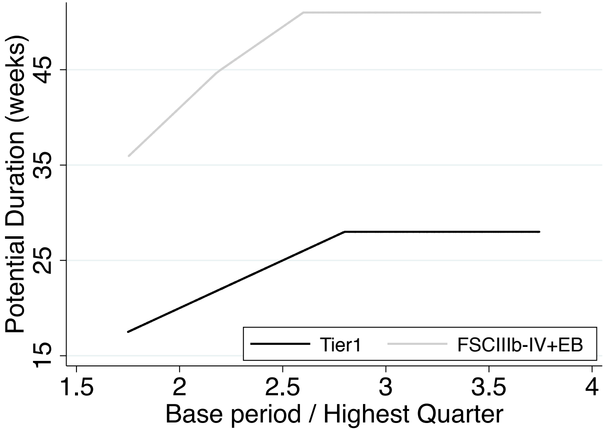


▸ schedule duration

Figure 5 : Louisiana: effect of benefit level on U duration

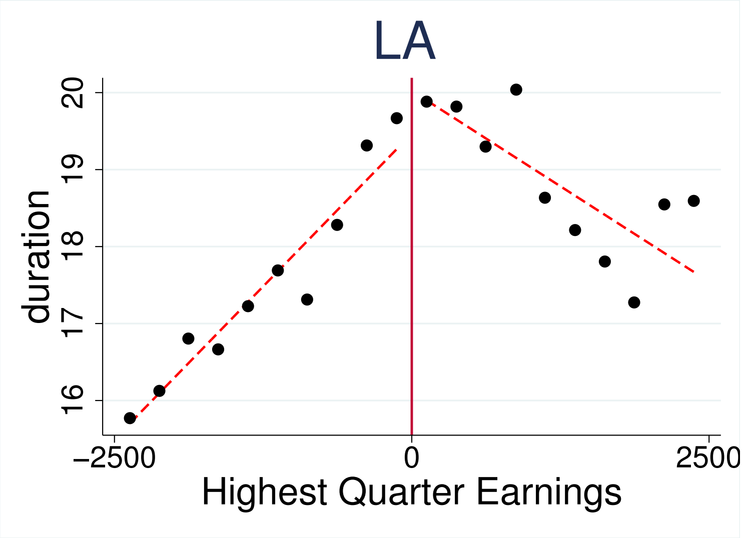


Figure 6 : RKD for the Effect of Benefit Level: Duration UI Claimed vs Highest Quarter Earnings for All 5 States

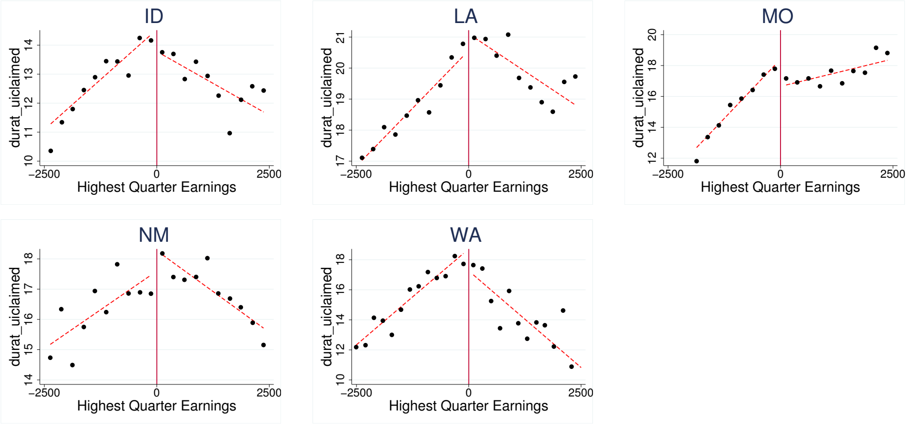


Table 1 : Louisiana: RK Estimates of the Effect of Benefit Level

	Duration Initial Spell	Duration UI Claimed	Duration UI Paid
		Bandwith=2500	
α	.036	.041	.038
	(.009)	(.009)	(.009)
$\varepsilon_b = \frac{dY}{db} \cdot \frac{b}{Y}$	.382	.421	.366
	(.095)	(.095)	(.087)
p-value	[.968]	[.917]	[.948]

Figure 7 : Louisiana: effect of benefit duration

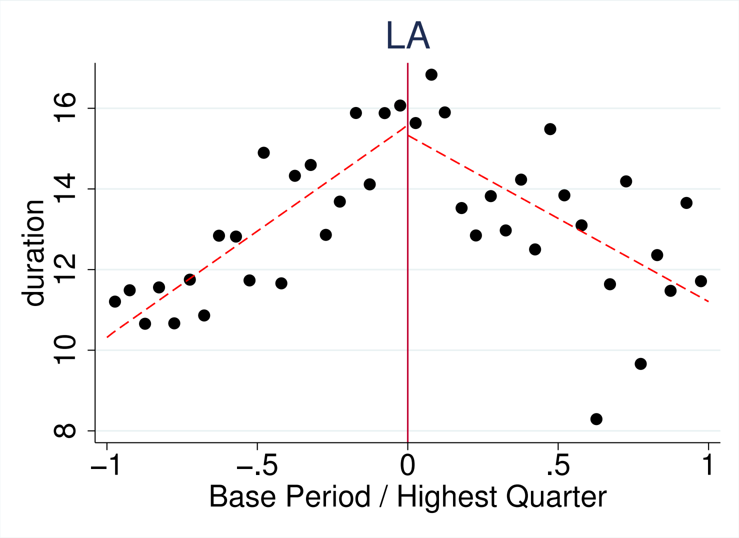


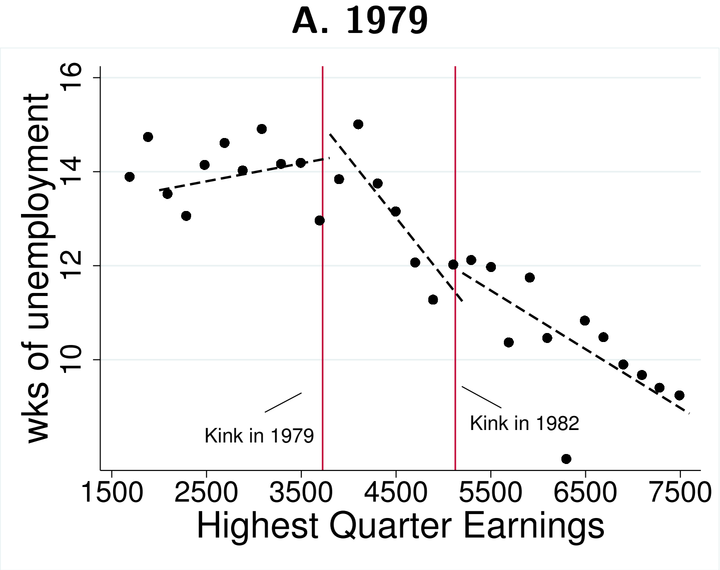
Table 2 : Lousiana: RK Estimates of the effect of potential duration

	(1) Duration of Initial Spell	(2) Duration UI Claimed	(3) Duration UI Paid
β	.3	.299	.272
	(.103)	(.099)	(.099)
p-value	.593	.546	.488
N	2659	2659	2659
Opt. Poly	1	1	1

Testing robustness of the RK design

- Smooth density assumptions:
  - Density based tests on the forcing variable
  - Covariate tests
- Specification tests:
  - Bandwith & polynomial order sensitivity
- Diff-in-Diff RKD: exploits variation in kink location
  - DD RKD
- Non parametric tests for location of the kink:
  - Bai & Perron test

Figure 8 : RKD in Double-Difference, Louisiana, 1979 vs 1982



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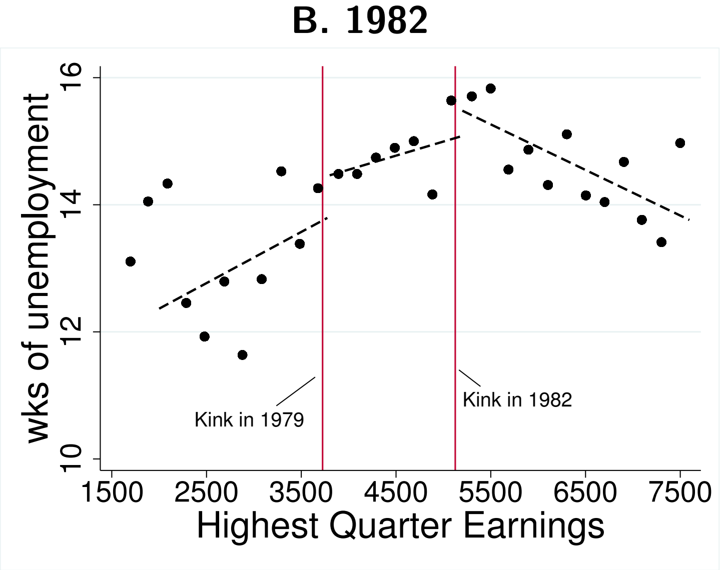
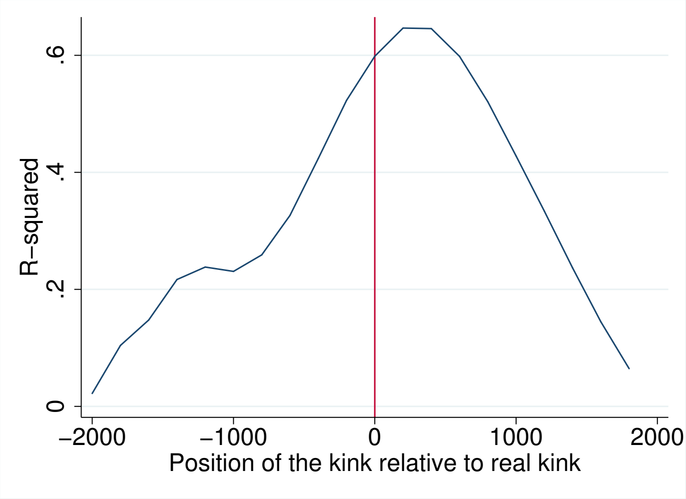


Figure 9 : R-squared as a function of the location of the kink point, Louisiana



Notes: The graph shows the value of the R-squared as a function of the location of the kink point. The assignment variable is centered at the actual kink point in the benefit schedule so that virtual kink points are expressed relative to the real kink point in the schedule.

Table 3 : Liquidity effect estimates, Washington, Jul 1980 - Jul 1981

	(1)	(2)	(3)
	Effect of benefit level	**Effect of potential duration**	**Liquidity effect estimates**
ε_{D_B}	.689	1.361	
	(.114)	(.685)	
	[.842]	[.382]	
ε_D	.356	.446	
	(.076)	(.434)	
	[.893]	[.163]	
Liquidity to Moral Hazard:			.440
ρ_1			(.018)
N	5772	2047	7819

Notes: P-values are reported between brackets and are from a test of joint significance of the coefficients of bin dummies in a model where bin dummies are added to the polynomial specification. The optimal polynomial order is chosen based on the minimization of the AIC. The bandwidth for the RK estimate of benefit level is 2500 (assignment variable: highest quarter of earnings) and .75 for the RK estimate of the potential duration (assignment variable: ratio of base period to highest quarter of earnings). For column (3), bootstrapped s.e. with 50 replications are in parentheses. See text for additional details.

Calibrations & policy implications

- $\approx$ half of effect of increase in benefits on search effort $=$ non-distortionary liquidity effects
- Baily-Chetty implications
  - Welfare increasing to increase b for given B
  - Welfare increasing to increase B for given b

Conclusion

- Identification of liquidity vs moral hazard effects from UI admin data only
- But Baily-Chetty = local policy recommendation
- Ill-equipped to deal with more drastic changes in structure of benefits
- Next step: optimal timing of benefits (Landais & Spinnewijn ['13])

BACK-UP SLIDES

UI benefit schedule

- Weekly Benefits:

$$b = \begin{cases} \tau_1 \cdot hqw & \\ b_{max} & \text{if } \tau_1 \cdot hqw > b_{max} \end{cases}$$

- Total Benefits (for a given benefit year)

$$B = min(D_{max} \cdot b, \tau_2 \cdot bpw)$$

- Duration of benefits (for a given benefit year)

$$D = \frac{B}{b}$$

Return

UI benefit schedule

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Kinks in Potential Duration

$$D = \begin{cases} D_{max} \\ \tau_2 \cdot \frac{bpw}{min(\tau_1.hqw, b_{max})} & \text{if } \frac{bpw}{min(hqw, \frac{b_{max}}{\tau_1})} \leq D_{max} \cdot \frac{\tau_1}{\tau_2} \end{cases}$$

- If $b = b_{max}$
  - **kink in potential duration at** $bpw = D_{max} \cdot \frac{b_{max}}{\tau_2}$
- If $b < b_{max}$,
  - **kink in potential duration at** $\frac{bpw}{hqw} = D_{max} \cdot \frac{\tau_1}{\tau_2}$

Return

Kinks in Potential Duration

$$D = \begin{cases} D_{max} & \\ \frac{\tau_2}{\mathbf{b_{max}}} \cdot \mathbf{bpw} & \text{if } bpw \leq D_{max} \cdot \frac{b_{max}}{\tau_2} \end{cases}$$

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Kinks in Potential Duration

$$D = \begin{cases} D_{max} & \\ \frac{\tau_2}{\tau_1} \cdot \frac{\mathbf{bpw}}{\mathbf{hqw}} & \text{if } \frac{bpw}{hqw} \leq D_{max} \cdot \frac{\tau_1}{\tau_2} \end{cases}$$

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- If $b < b_{max}$,
  - **kink in potential duration at** $\frac{bpw}{hqw} = D_{max} \cdot \frac{\tau_1}{\tau_2}$

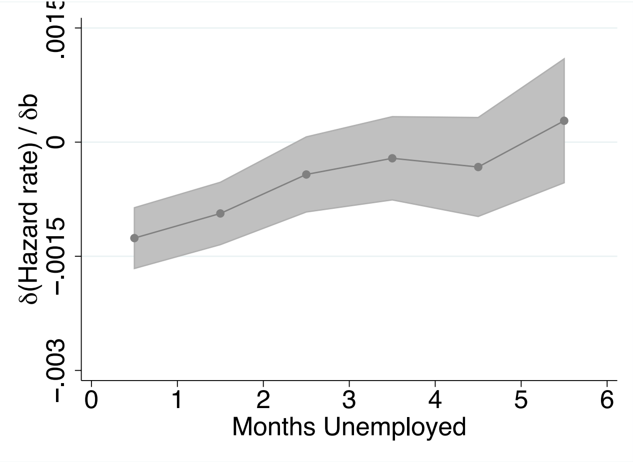
Return

Table 4 : Descriptive Statistics: Louisiana

	Mean	s.d.	N
	Duration Outcomes (wks)		
Initial spell	14	10.6	34077
UI paid	13.8	10.4	34077
UI claim	15.1	10.4	34077
	Earnings and Benefits ($2010)		
bpw	26993	19446	34077
hqw	9581	6441	34077
wba	304.8	117.1	34077
pot. dur.	25	4.4	34077
	Covariates		
age	34.6	12.7	33850
male	.683	.465	33624
educ. (yrs)	11.4	2.7	31272
dependents	2	1.6	17325
censored	.128	.323	34077

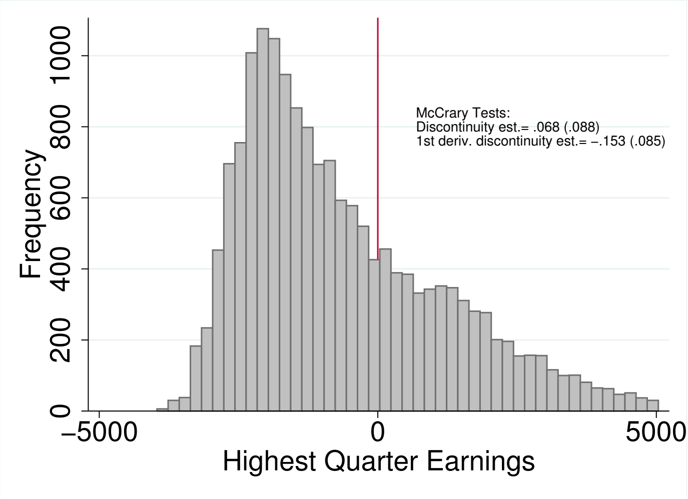
Return

Figure 10 : RKD estimates of the effect of benefit level on the hazard rate, Louisiana, 1979-1983



Return

Figure 11 : Louisiana: Number of Observations in Each Bin of Highest Quarter Earnings, Jan 1979 - Sept 1981



return

Figure 12 : Covariates vs Highest Quarter Earnings

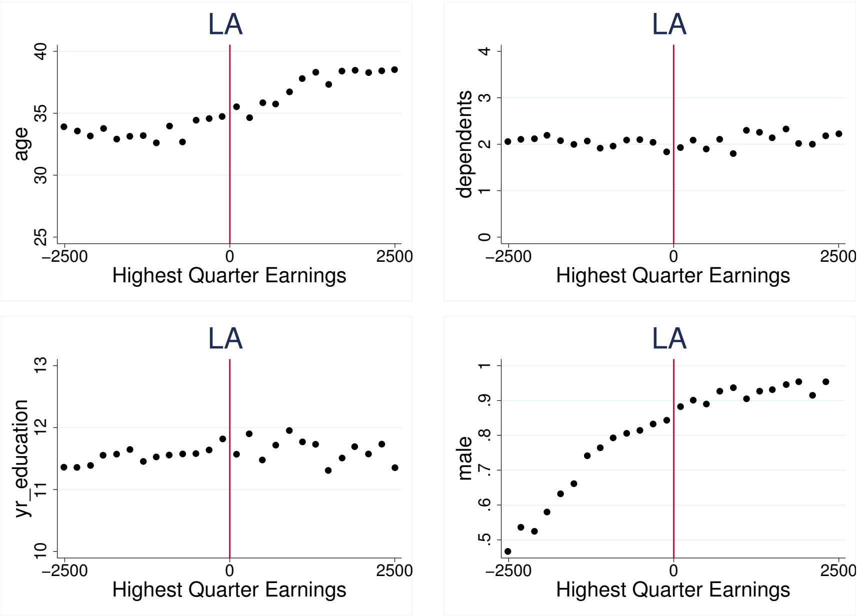


Table 5 : Sensitivity analysis, RKD Estimates for Benefit Level, Louisiana Sept 81- Dec 83

	A. Sensitivity to Poly Order				B. Sensitivity to Bandwidth		
	Duration Initial Spell	Duration UI Claimed	Duration UI Paid		Duration Initial Spell	Duration UI Claimed	Duration UI Paid
	Poly Order=1				**Bandwidth=1500**		
α	.053	.047	.048	α	.063	.05	.162
	(.01)	(.01)	(.01)		(.022)	(.021)	(.224)
p-value	.396	.706	.442	p-value	.405	.61	.277
AIC	53847.4	53323.4	53555.8	Opt. poly	1	1	3
N	6899	6899	6899	N	3972	3972	3972
	Poly Order=2				**Bandwidth=2500**		
α	.092	.075	.091	α	.063	.047	.072
	(.041)	(.039)	(.04)		(.104)	(.01)	(.102)
p-value	.478	.729	.549	p-value	.291	.706	.38
AIC	53849.5	53326.5	53558.1	Opt. poly	3	1	3
N	6899	6899	6899	N	6899	6899	6899
	Poly Order=3				**Bandwidth=4500**		
α	.063	.074	.072	α	.099	.076	.094
	(.104)	(.1)	(.102)		(.047)	(.046)	(.046)
p-value	.291	.551	.38	p-value	.2	.363	.208
AIC	53845.1	53324.0	53554.0	Opt. poly	3	3	3
N	6899	6899	6899	N	10024	10024	10024

return

Table 6 : Louisiana: Robustness Estimates of the Effect of Benefit Level

	Duration of Initial Spell	Duration UI Claimed	Duration UI Paid	Age
	Baseline			
ε_b	.714	.554	.764	.1
	(1.182)	(.115)	(1.084)	(.56)
Opt. Poly Order	3	1	3	3
p-value	[.602]	[.807]	[.575]	[.218]
	Specification with covariates			
ε_b	.564	.498	.531	
	(.167)	(.166)	(.152)	
Opt. Poly Order	1	1	1	
p-value	[.539]	[.554]	[.38]	
	Spec. with discrete jump at the kink			
ε_b	.715	.553	.765	.104
	(1.181)	(.115)	(1.086)	(.556)
$W \geq k$	-.361	.16	-.083	-1.408
	(1.223)	(.575)	(1.203)	(1.137)
p-value	[.294]	[.667]	[.379]	[.464]

Table 7 : Semi-Parametric Estimates of Hazard Rates

	(1) Meyer90	(2)	(3)	(4)	(5)	(6)
log(UI)	-0.587***	-0.274***	-0.320***	-0.341***	-0.323***	
	(0.0394)	(0.0365)	(0.0368)	(0.0374)	(0.0370)	
State unemployment rate	-0.0550***	-0.0552***	-0.0207	-0.0226	-0.0251	-0.105***
	(0.00518)	(0.00519)	(0.0142)	(0.0143)	(0.0153)	(0.0209)
log(UI)× (u>median)				0.0248**		
				(0.00812)		
log(UI)×(u> .08)					0.00527	
					(0.00685)	
log(UI)×(u<p25)						-0.363***
						(0.0376)
log(UI)×(p25<u<median)						-0.353***
						(0.0371)
log(UI)×(median<u<p75)						-0.292***
						(0.0371)
log(UI)×(u>p75)						-0.274***
						(0.0378)
Non-param controls for previous wage & experience		×	×	×	×	×
Year×state F-E			×	×	×	×
# Spells	39852	39852	39852	39852	39852	39852
Log-likelihood	-136305.0	-136364.8	-135976.0	-135971.4	-135975.7	-135946.2

Standard errors clustered at the year*state level in parentheses. All specif. include year and state F-E.

Testing for liquidity constraints

Effect of benefit at time B on search at time $B+1$:

$$\frac{\partial s_{B+1}}{\partial b_B} = \frac{u''(c_B^u)}{u'(c_{B+1}^u) - v'(c_{B+1}^e)} \leq 0$$

- $\frac{\partial s_{B+1}}{\partial b_B} \propto \frac{\partial s}{\partial A}$
- $\frac{\partial s_{B+1}}{\partial b_B}$ decreases in abs. value with liquidity constraint
- $\frac{\partial s_{B+1}}{\partial b_B} = 0$ if Euler equation does not hold

Implementation

- Estimate effect of an additional week of UI on exit rate after exhaustion
- RK design to identify effect of additional week of UI
- Assumption on $s_t(\{b_t\}_{t=0}^{B}, \theta)$
  - Selection on unobservable independent of benefit at time B $\Leftrightarrow \frac{\partial^2 s_B}{\partial b_B \partial \theta} = 0$
  - $\frac{\partial^2 s_B}{\partial b_B \partial \theta} < 0 \Leftrightarrow$ estimate is lower bound

Table 8 : Washington: RKD Estimates of the effect of an additional week of UI before week 39 on exit rate between week 40 to 50

	(1)	(2)
	Period 1: Jul 1980 - Jul 1981	**Period 2: Jul 1981 - Apr 1982**
$b \cdot \frac{\partial s}{\partial b_B}$	-.315	-.140
	(.135)	(.091)
p-value	[.337]	[.544]
N	529	531
Opt. Poly	1	1
U	8.4%	10.8%

Observations reweighted to control for changes in observable characteristics at the kink over time.