Incidence and Evolution of Nominal Wage Rigidity in the US

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UT Austin Macro Writing Seminar

Motivation

"*Monopsony power has probably always existed in labor markets, but the forces that traditionally counterbalanced monopsony power and boosted worker bargaining power have eroded in recent decades...There has been a proliferation of practices that* **enhance monopsony power** *and* **weaken worker bargaining power**."

- Alan Krueger, 2018 (Jackson Hole Symposium)

$\uparrow$ firm concentration, $\downarrow$ worker bargaining power $\Longrightarrow$
firm specific risks passed on to workers:

- $\uparrow$ demand for flexible labor (Kalleberg, 2009; Katz and Krueger, 2019)
- $\uparrow$ volatility in intensive and extensive labor margin relative to output (Galí and Van Rens, 2014)

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Implications on nominal wage setting?

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Research Questions

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1. Has nominal rigidity in wage-setting process become a less binding constraint overtime?
2. During the Great Recession, conditional on receiving a wage change, was there a higher incidence of receiving a wage cut?

Preview

- Use Survey of Income and Program Participation (SIPP)
- Follow empirical framework of Barattieri, Basu and Gottschalk (2014) who use SIPP 1996-00
- Estimate distribution and frequency of wage adjustment among job-stayers in SIPP 2008-13

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Robustness:

- Consistent across hourly and non-hourly workers.

Outline

Existing literature and contribution

1. ↑ **in wage volatility overtime**
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   - Survey-based data: Elsby, Shin, and Solon (2016); Daly, Hobijn, Lucking, et al. (2012); Daly and Hobijn (2014); Jo (2019)

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   How has wage rigidity changed overtime?

Data

Why SIPP over CPS?

- Tri-annually collected panel
- Provides job IDs

	1996:03-2000:02	2008:08-2013:11
SIPP # waves	12	16
Individuals between 15 to 64 years (first wave)	39,095	66,672
Hourly workers	17,148	21,547
Individuals between 15 to 64 years (last wave)	29,975	30,566
Hourly workers	12,574	9,495
Mean age	38	39.8
Mean wage (hourly workers)	$10.03	$13.3

Within-job Wage Rigidity

Methodology

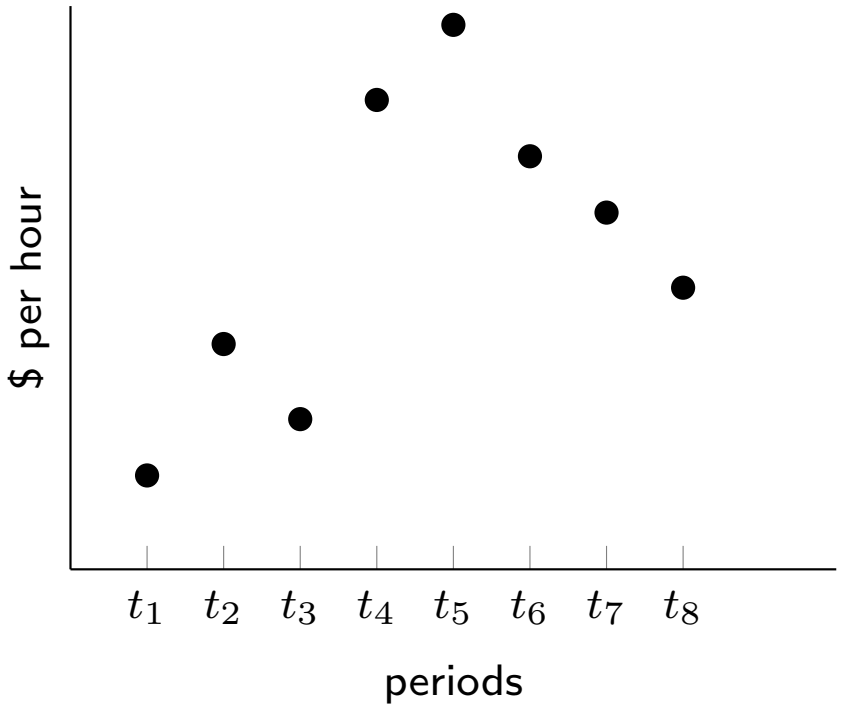
Goal: Purge measurement error from self-reported wages
Assume: True wages change in discrete steps and remains constant otherwise
Suppose an individual's within-in job wages can be represented as:

$$\begin{aligned} y_t &= \bar{y}_1 + u_t \quad t = 1 \dots T_1 \\ &= \bar{y}_2 + u_t \quad t = T_1 + 1 \dots T_2 \\ &= \dots \\ &= \bar{y}_{m+1} + u_t \quad t = T_m + 1 \dots T \end{aligned}$$

NTK:

1. m break dates, $\{T_1, ..., T_m\}$
2. constant wages in between m breaks, $\{\bar{y}_1, ..., \bar{y}_{m+1}\}$

Methodology



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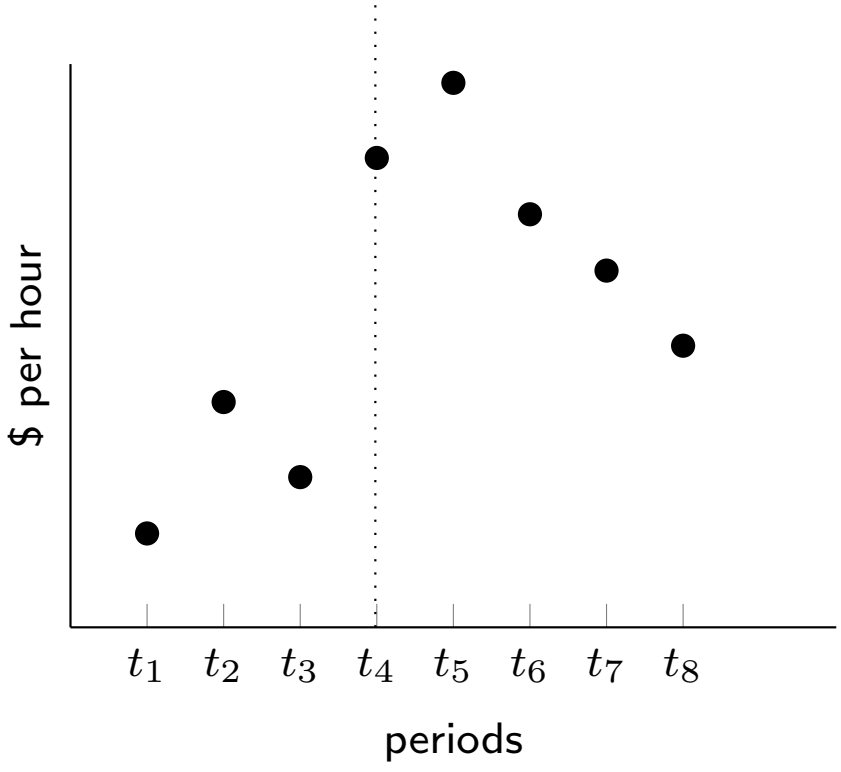

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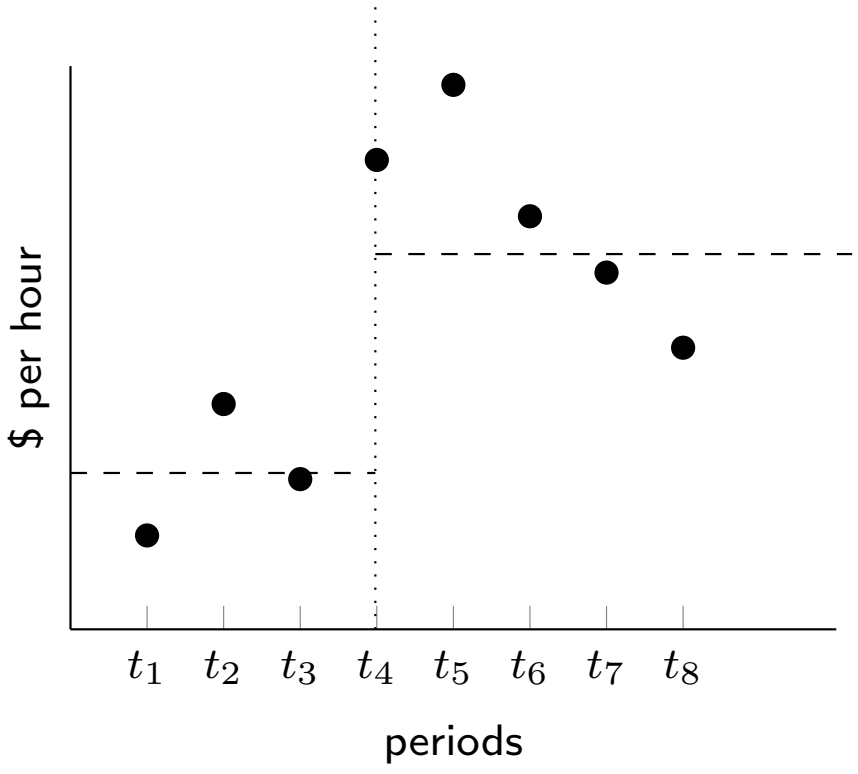

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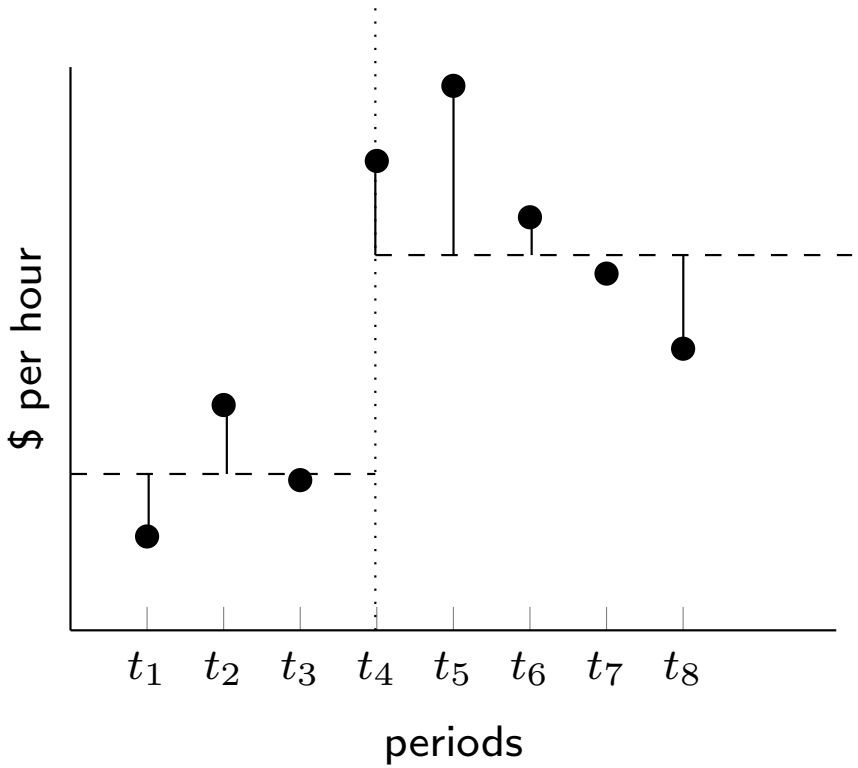

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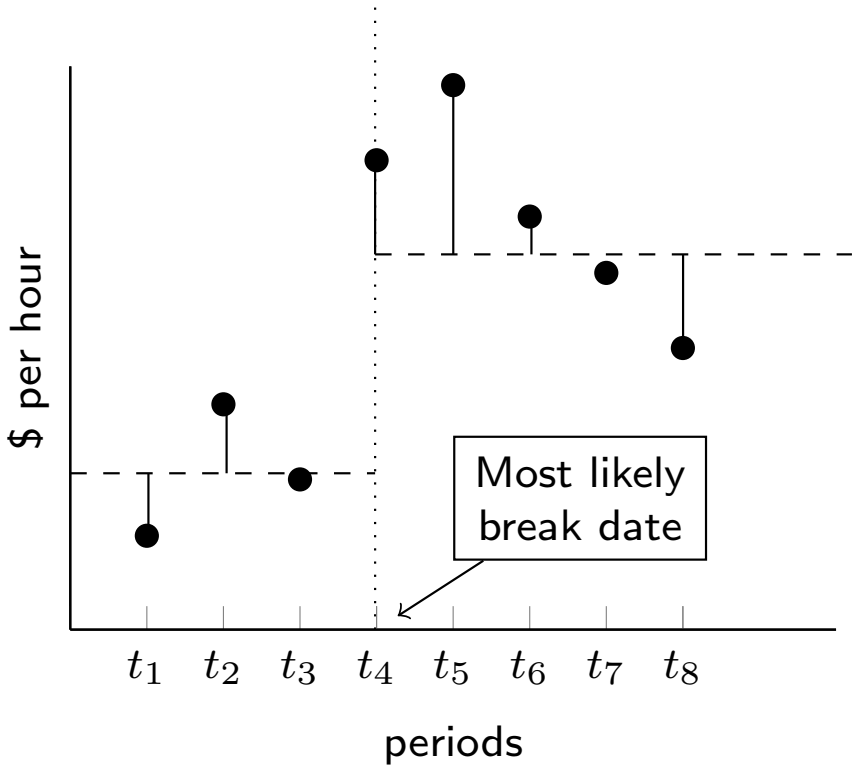

- Date with min SSR or max F is most likely break date

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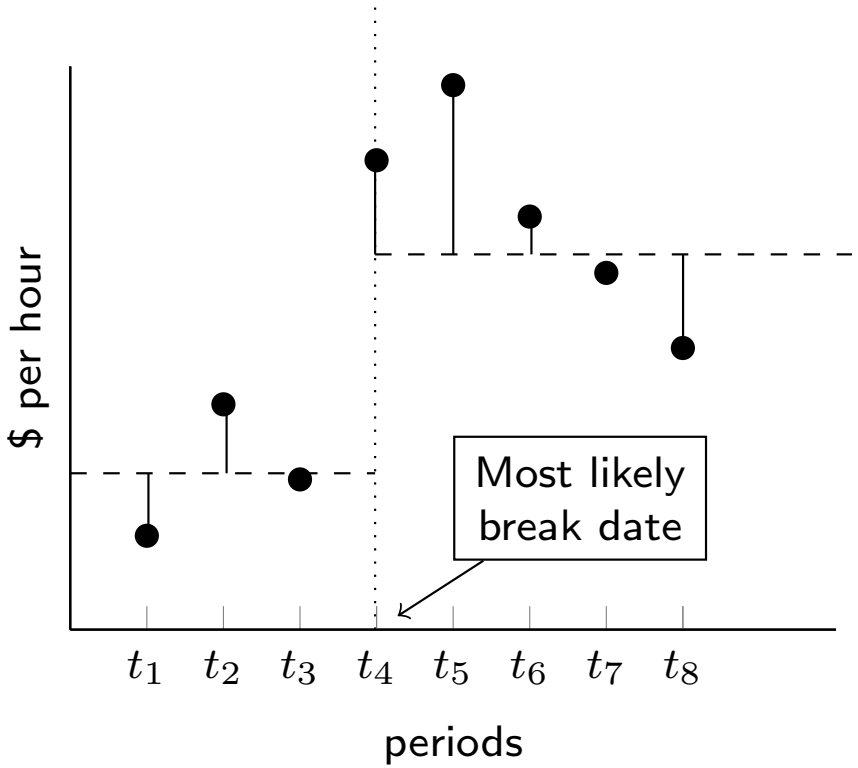

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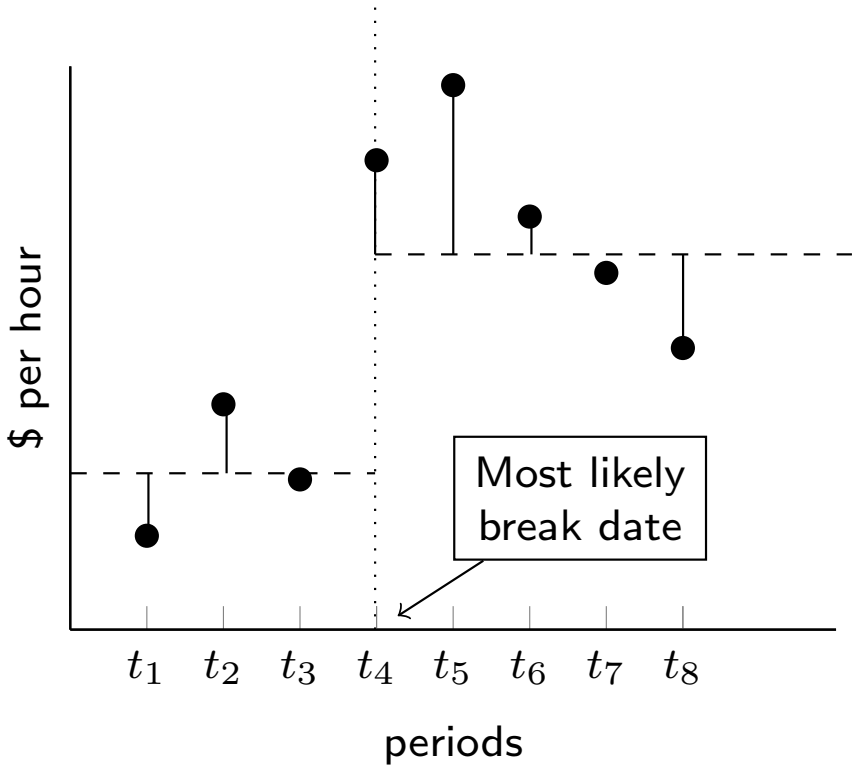

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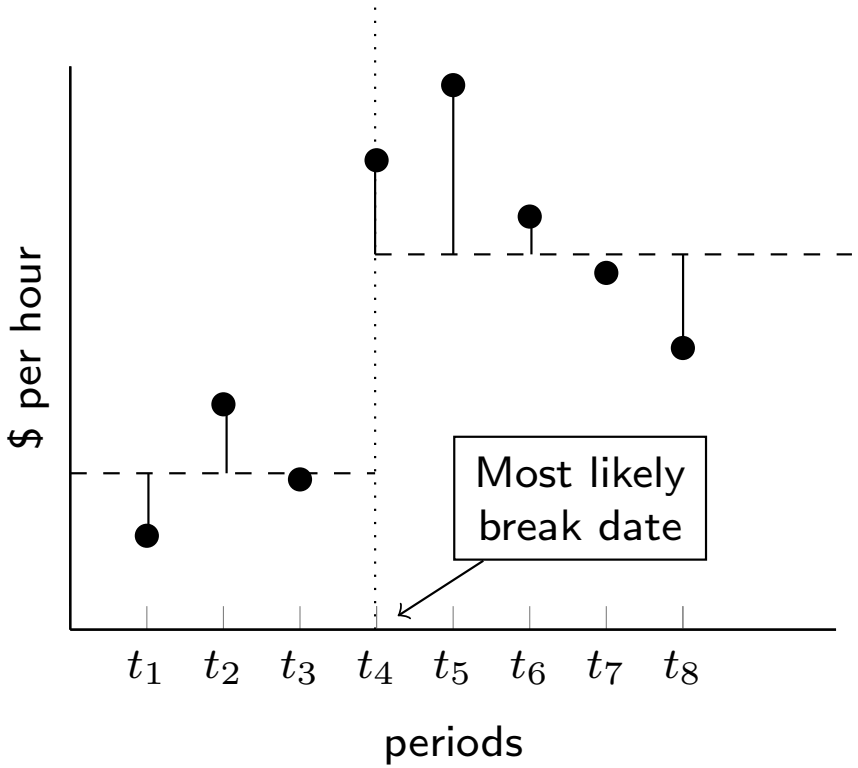

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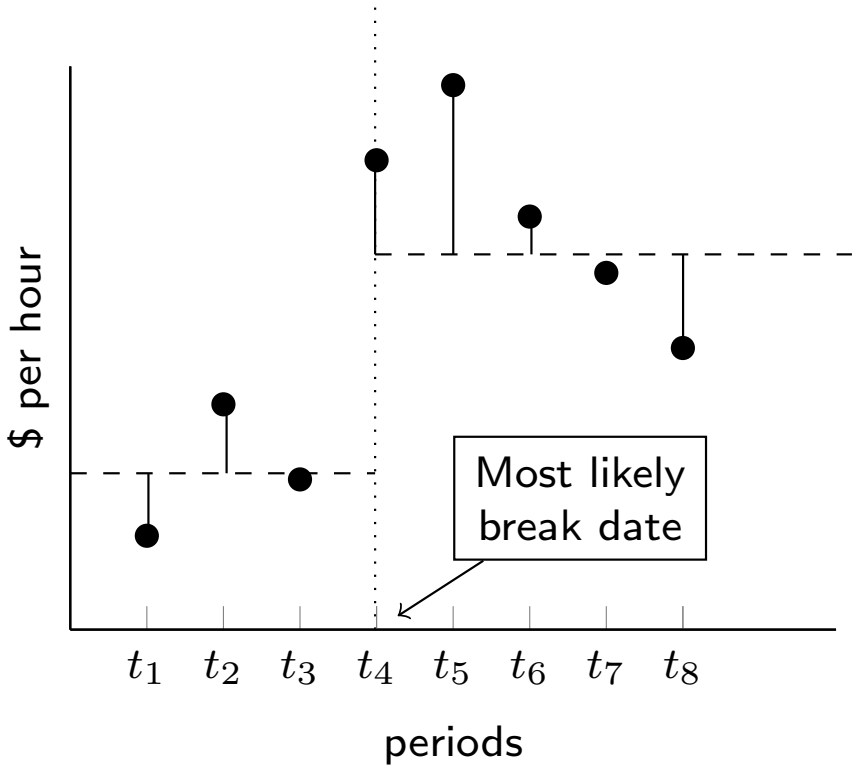

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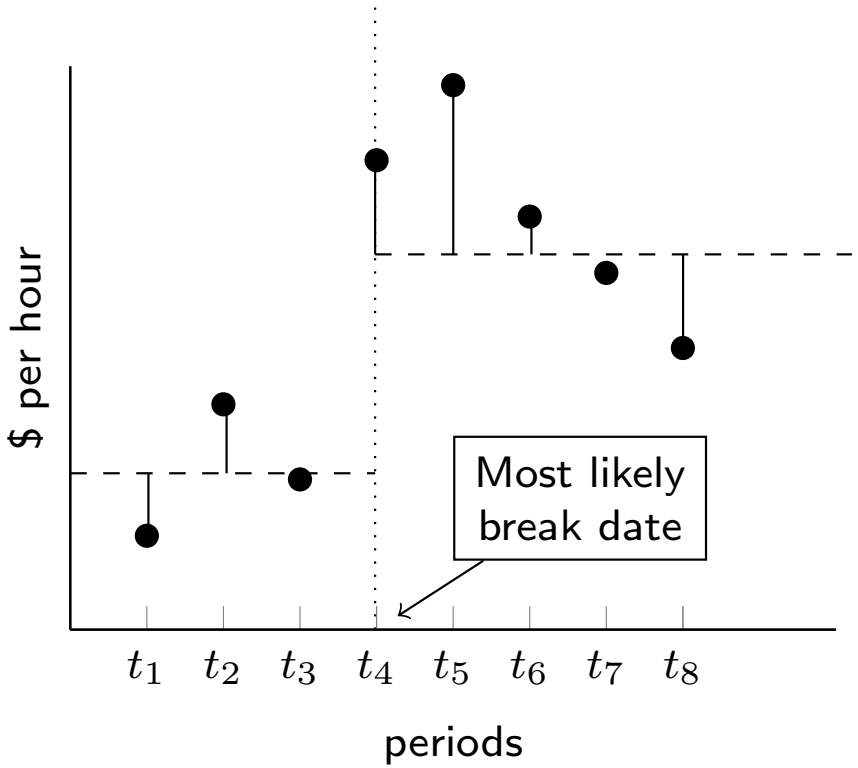

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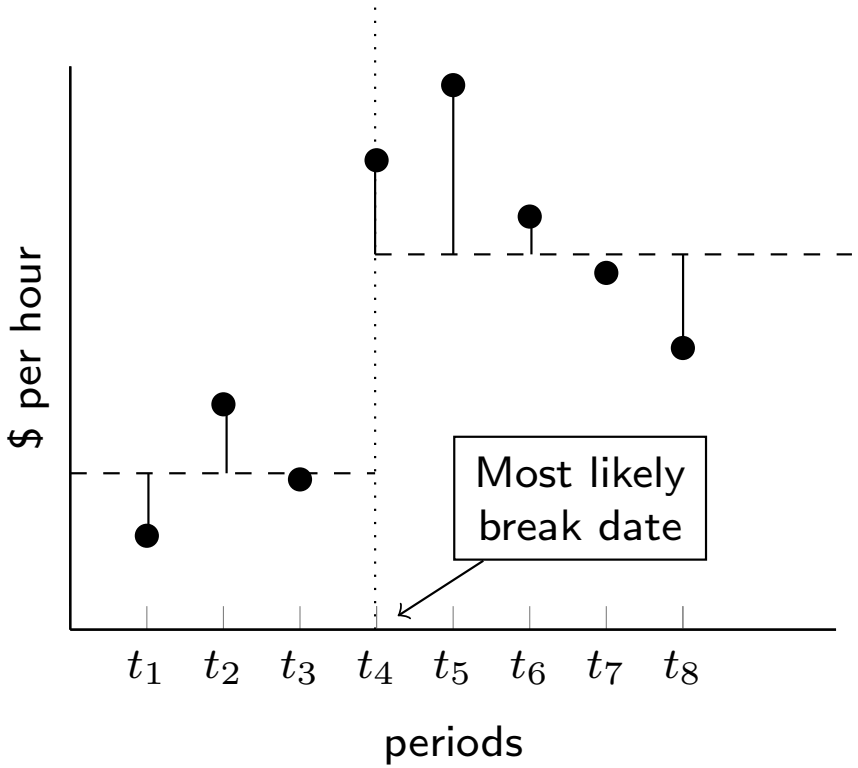

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  - Pr(type I error) $= \alpha$

Methodology

(a) Most likely break insignificant

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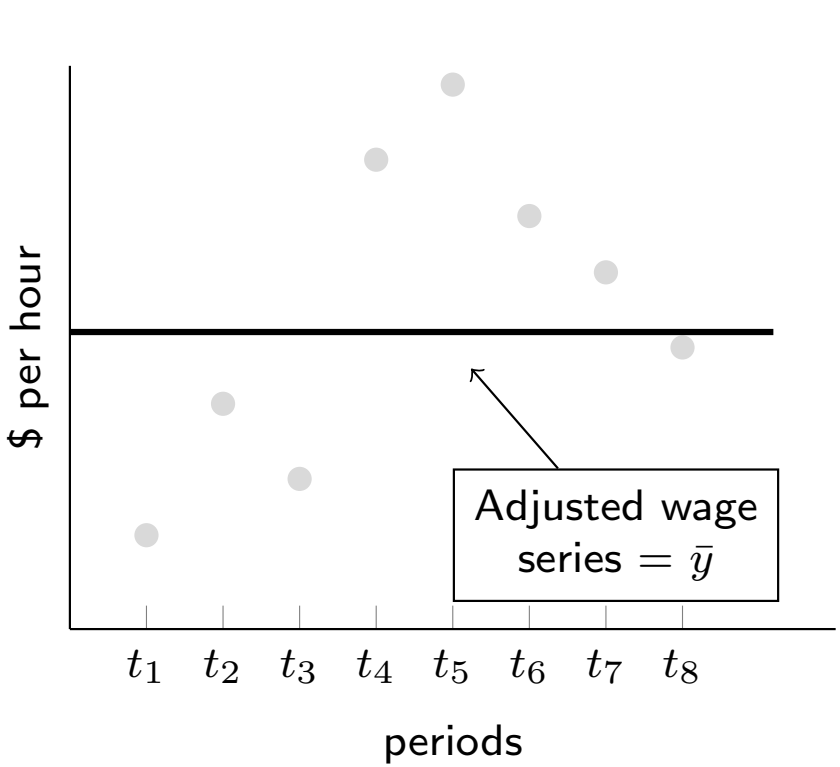

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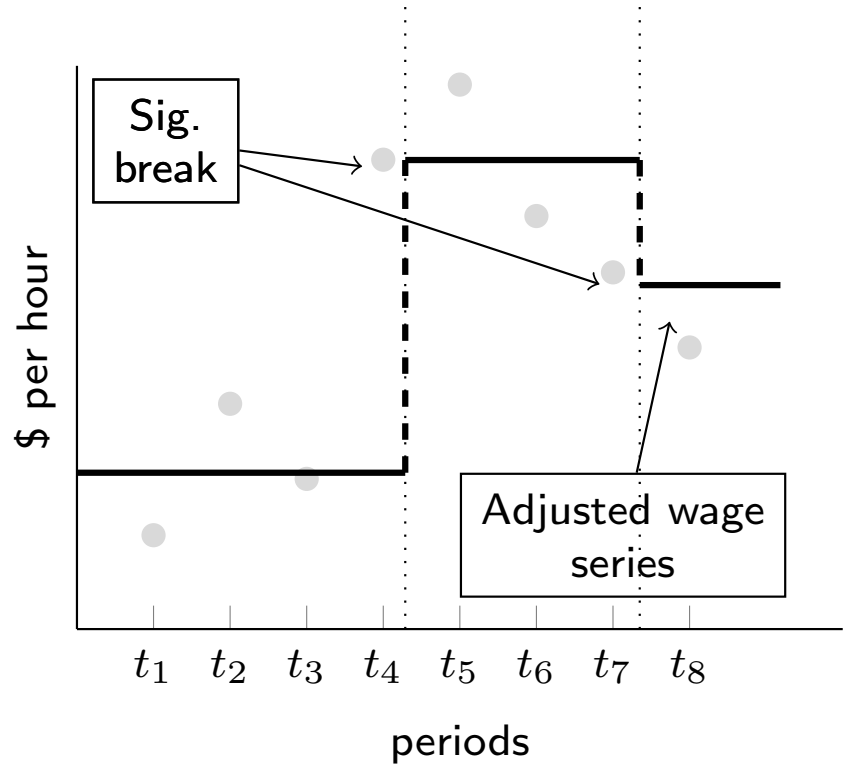
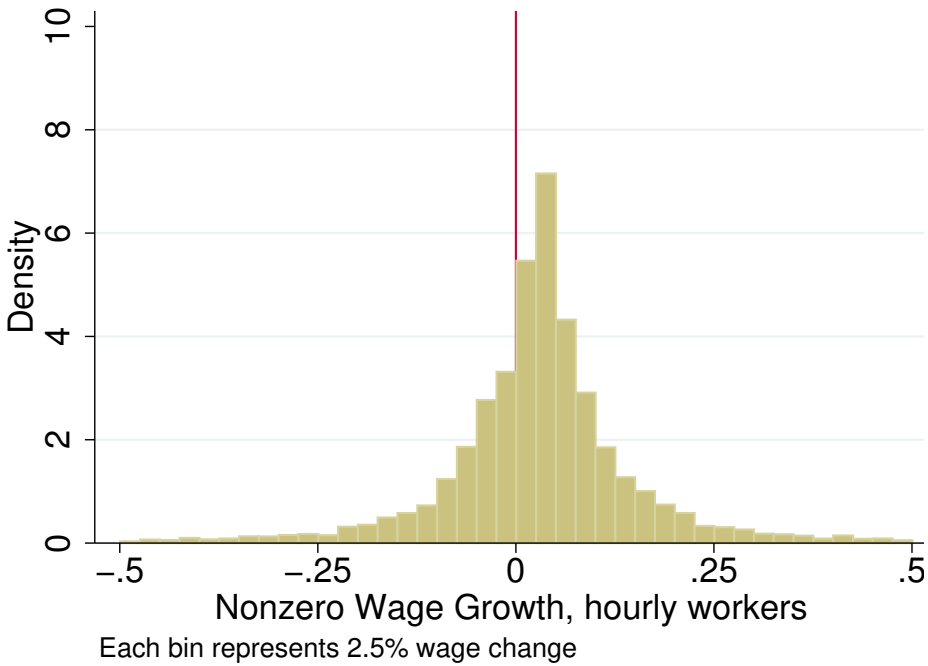
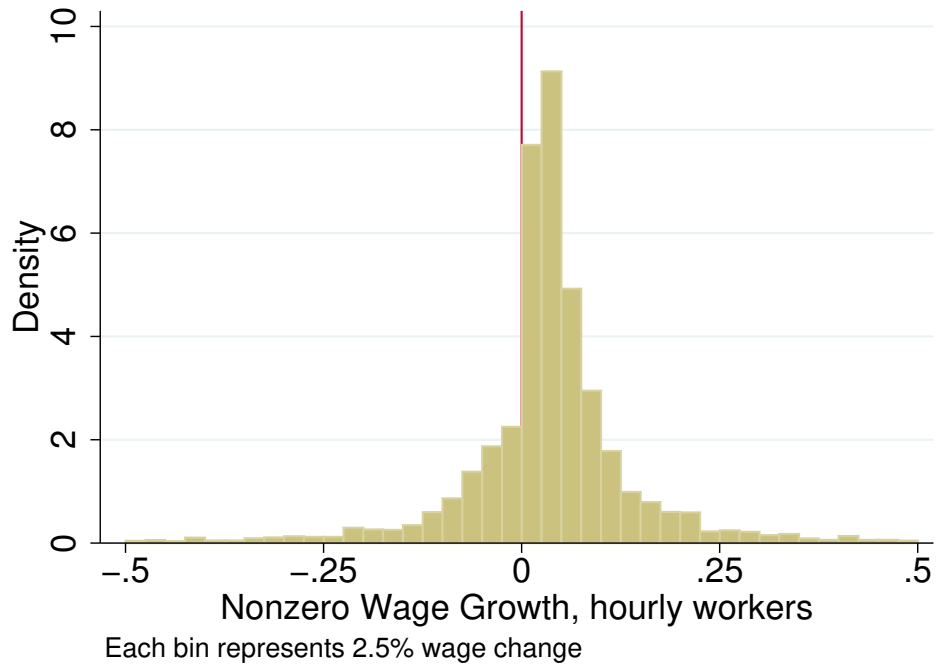


(b) Most likely break significant

Self-reported wage changes (including measurement error)

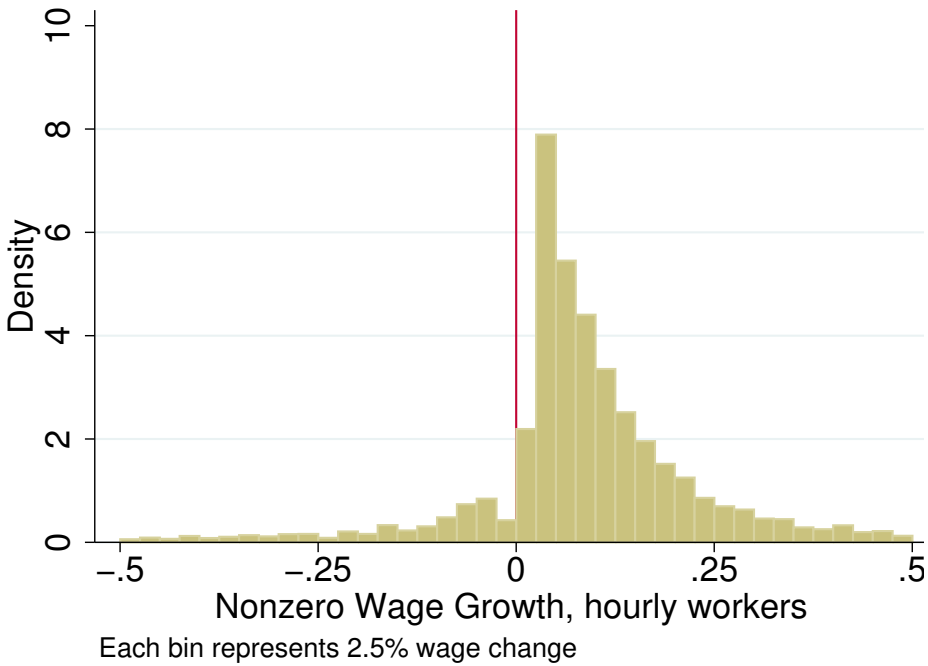


SIPP 1996-00



SIPP 2008-13

Adjusted wage changes (after applying structural breaks test)



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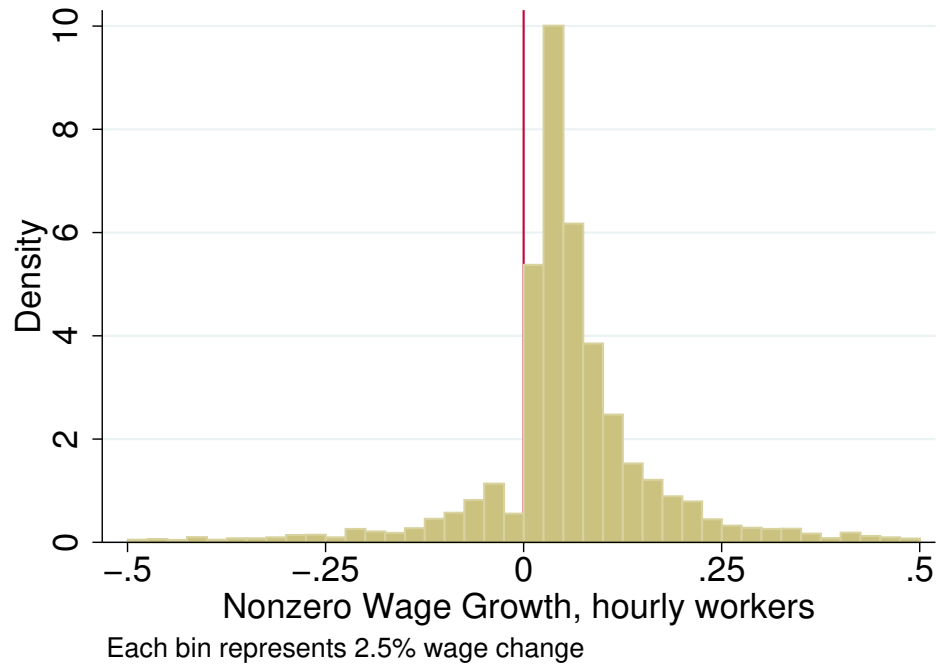

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Source: Barattieri et al. (2014)

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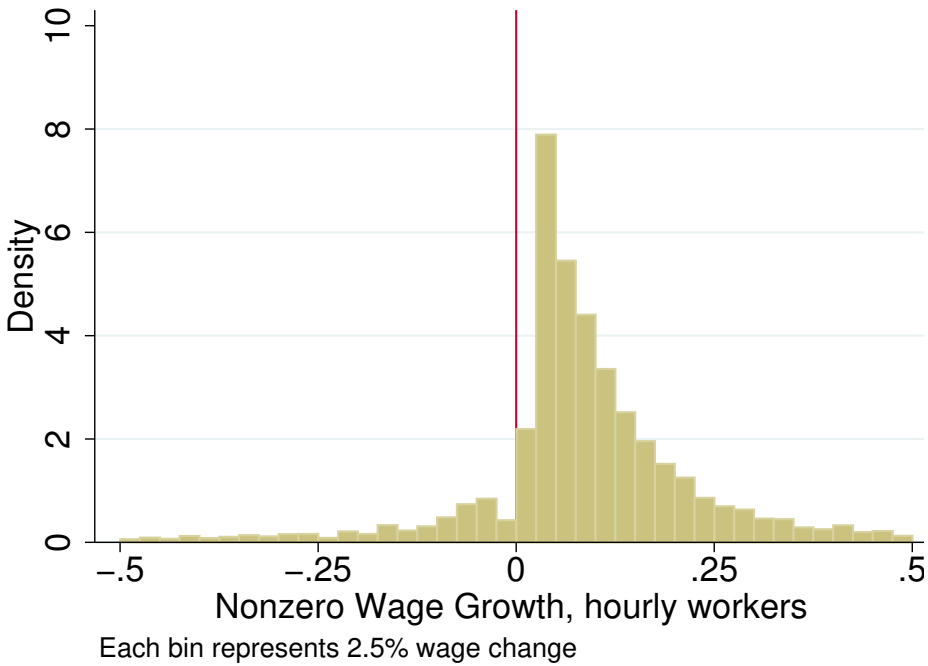

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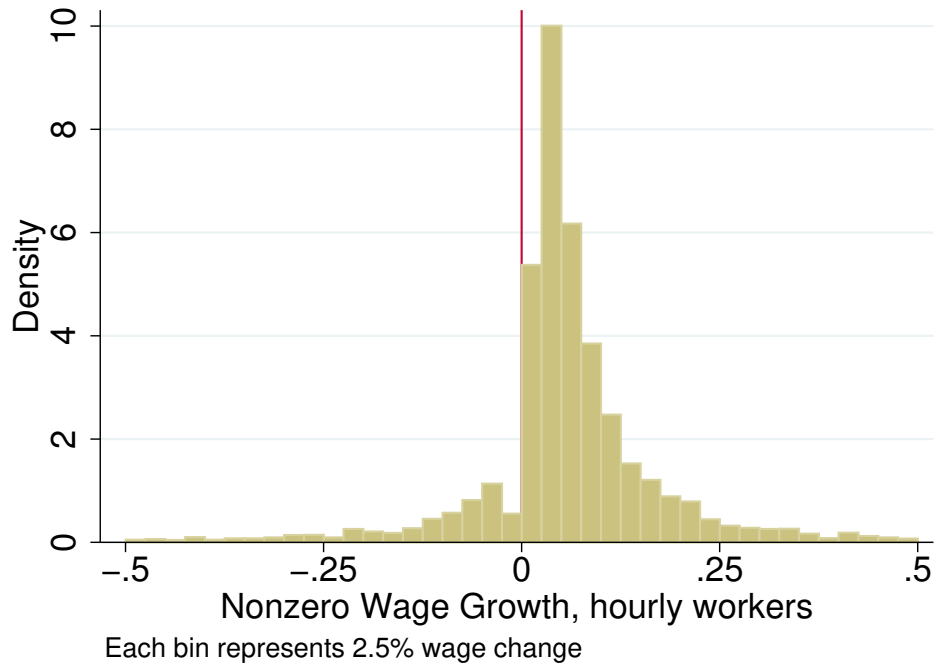

SIPP 2008-13

Source: Barattieri et al. (2014)

- Distn of 2008 panel tighter than 1996 panel
- Relatively lower mass right next to zero

Non-Hourly workers

Cyclical variation over 2008 panel

Recession < 2009:08; Recovery > 2009:08. Each bin represents 2.5% wage change.

Non-Hourly workers

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$$\text{p lim} \underbrace{\left(\frac{\hat{\pi} - \alpha}{\gamma - \alpha}\right)}_{\equiv \tilde{\pi}(\text{Adjusted+Corrected})} = \pi \implies \text{p lim}(\tilde{\pi}) = \pi$$

Computing γ

Quarterly frequency of wage adjustment (%)

	(a) Within Job			
	Reported	Adjusted ($\hat{\pi}$) Total	Adjusted ($\hat{\pi}$) $\frac{\Delta w<0}{\Delta w\neq 0}$	Adjusted +Corrected ($\tilde{\pi}$)
	(i) 1996-2000			
Hourly	53.1			
	(ii) 2008-2013			
Hourly	30.6			
Recession	32.1			
Recovery	28.9			

Standard error in parenthesis.

1996-2000 estimates based on Barattieri, Basu, and Gottschalk (2014).

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Hourly	53.1	8.4	12.3	
		(0.0020)	(0.0052)	
	(ii) 2008-2013			
Hourly	30.6	14.6	14.2	
		(0.0022)	(0.0023)	
Recession	32.1	14.8	21.4	
		(0.0022)	(0.0030)	
Recovery	28.9	13.9	12.3	
		(0.0000)	(0.0018)	

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Hourly	53.1	8.4	12.3	16.3
		(0.0020)	(0.0052)	(0.0010)
	(ii) 2008-2013			
Hourly	30.6	14.6	14.2	24.9
		(0.0022)	(0.0023)	(0.0031)
Recession	32.1	14.8	21.4	25.4
		(0.0022)	(0.0030)	(0.0028)
Recovery	28.9	13.9	12.3	23.1
		(0.0000)	(0.0018)	(0.0000)

Standard error in parenthesis.

1996-2000 estimates based on Barattieri, Basu, and Gottschalk (2014).

Non-Hourly workers Other panels of SIPP

Validating results using simulated data

- Fix $\pi = 0.15, N = 500, l = \{3, \ldots, 16\}, \alpha = 0.05$. Vary Δw.
- Assign ME to all individual wage series and a random break of size Δw to πN individuals.

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		$\pi = 0.15$				
$l \downarrow$	$\Delta w \rightarrow$	0.25	0.5	1	1.5	2
3	Adjusted $\hat{\pi}$	0.04	0.04	0.05	0.06	0.06
	Corrected $\tilde{\pi}$	0.40	0.18	0.14	0.12	0.11
	Power γ	0.05	0.06	0.08	0.12	0.14
6	Adjusted $\hat{\pi}$	0.05	0.05	0.06	0.08	0.13
	Corrected $\tilde{\pi}$	0.40	0.09	0.08	0.09	0.15
	Power γ	0.06	0.10	0.18	0.37	0.58
12	Adjusted $\hat{\pi}$	0.06	0.07	0.13	0.17	0.19
	Corrected $\tilde{\pi}$	0.62	0.26	0.18	0.16	0.16
	Power γ	0.07	0.14	0.49	0.80	0.97
15	Adjusted $\hat{\pi}$	0.06	0.07	0.11	0.18	0.19
	Corrected $\tilde{\pi}$	0.33	0.15	0.14	0.15	0.15
	Power γ	0.08	0.18	0.52	0.88	0.99

- Final statistic of wage flexibility: $\hat{\pi} = 0.11; \tilde{\pi} = 0.17$

But is there still evidence wage flexibility?

$$\text{p lim}\hat{\pi} = \alpha + (\gamma - \alpha)\pi$$

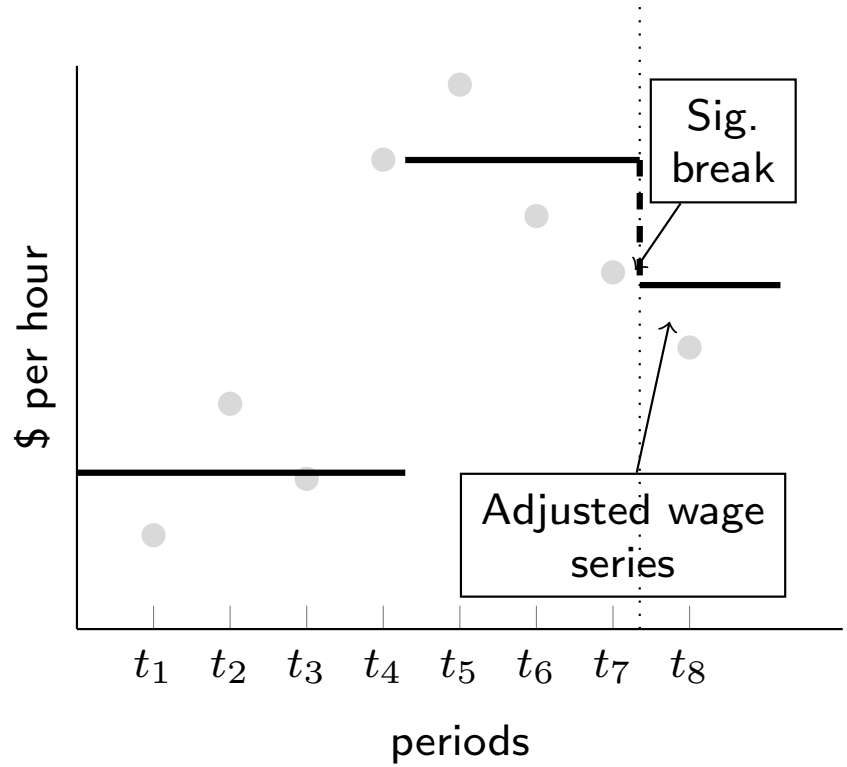
Assuming p lim$\hat{\pi}_t \approx \hat{\pi}_t$ and given $\gamma > \alpha$,

$$\underbrace{\hat{\pi}_{2008}}_{=14.6} > \underbrace{\hat{\pi}_{1996}}_{=8.4} \implies \text{p lim}\hat{\pi}_{2008} > \text{p lim}\hat{\pi}_{1996} \implies \pi_{2008} > \pi_{1996}$$

Between-job Wage Rigidity

Methodology

Methodology



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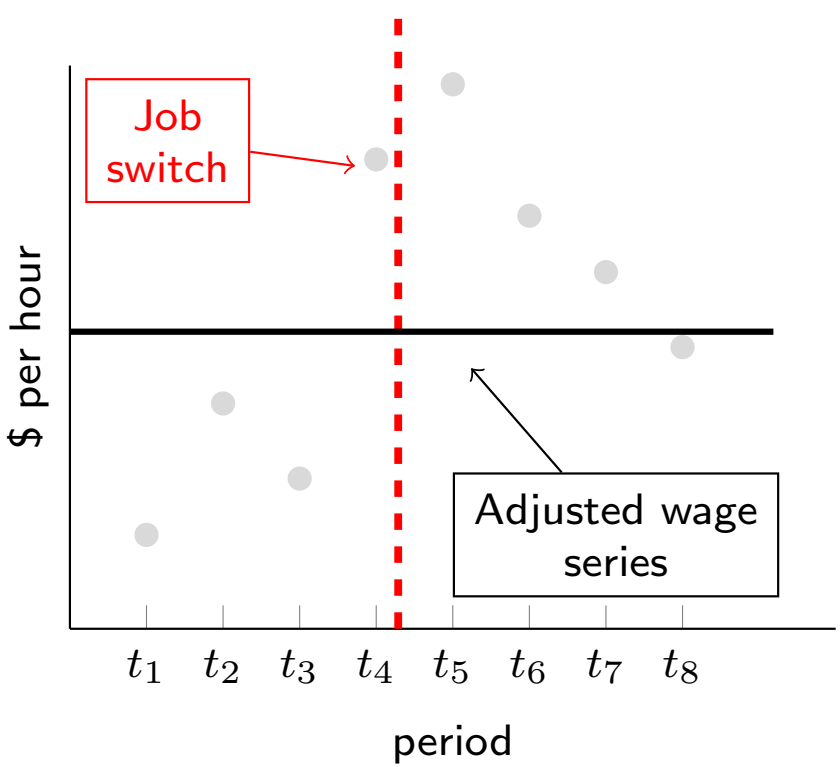
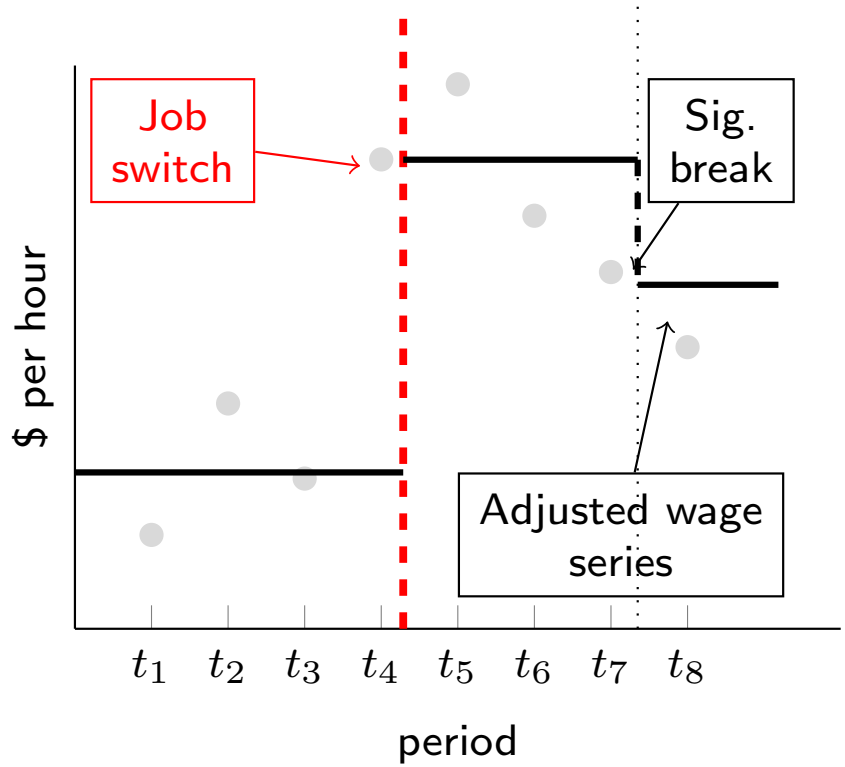
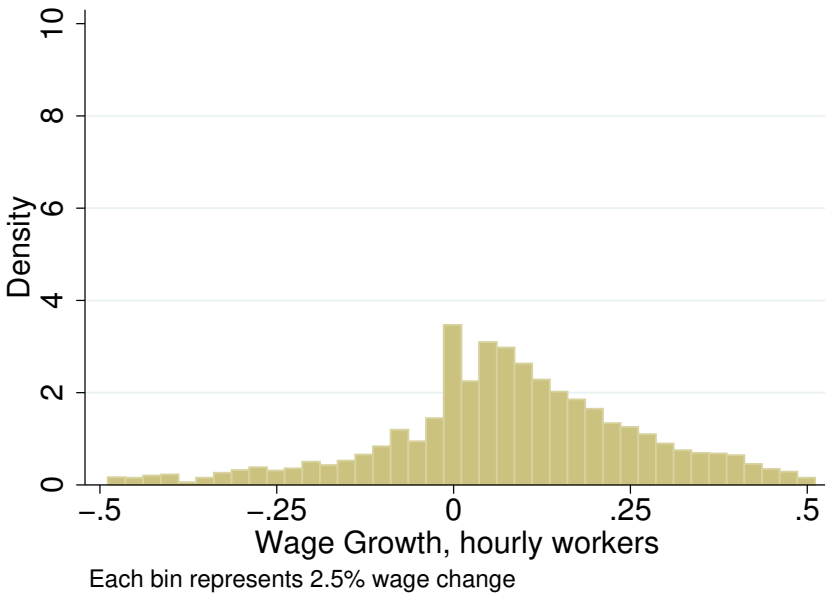


Between job $\Delta w = 0$

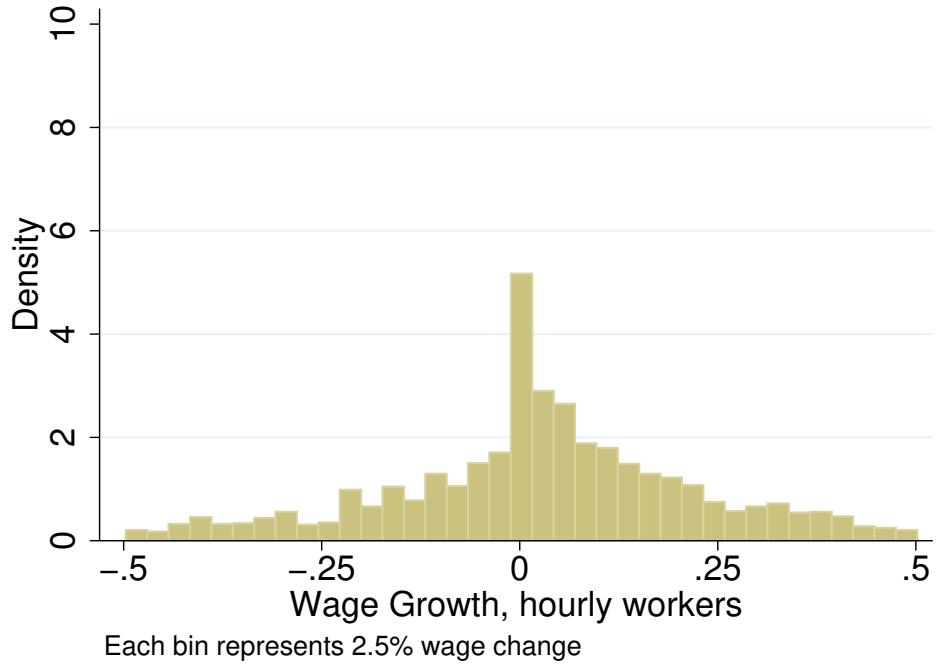


Between job $\Delta w \neq 0$

Adjusted wage changes, between jobs



SIPP 1996-00



SIPP 2008-13

Frequency of wage adjustment (%)

	Between Jobs		
	Reported	Adjusted	
		Total	$\frac{\Delta w<0}{\Delta w\neq 0}$
	(i) 1996-2000		
Hourly	87.7	96.4	26.5
		(0.0025)	(0.0019)
	(ii) 2008-2013		
Hourly	84.9	90.1	36.9
		(0.0015)	(0.0009)
Recession	83.5	87.6	45.7
		(0.0019)	(0.0016)
Recovery	85.0	90.2	36.4
		(0.0014)	(0.0009)

Non-hourly

Conclusion

- Even though overall, within-job wages are still more rigid than flexible, there has been an increase in freq of wage change from 1996-00 to 2008-13.
- Conditional on wage changes taking place, propensity of nominal wage cut was higher during the Great Recession than the subsequent recovery.
- Both these findings are robust for hourly and non-hourly workers.

Thank You

Structure of Nonclassical Measurement Error

Let measurement error be denoted by v. Let us assume it follows an AR(1) process, with ρ expressing the autocorrelation, and e_t being noise:

$$v_t = \rho v_{t-1} + e_t$$

s.t. $e_t \sim N(0, \sigma_e^2)$ & $v_0 \sim N(0, \sigma_v^2)$. Then can show that,

$$\sigma_v^2 = \frac{\sigma_e^2}{1-\rho^2} \implies \sigma_e^2 = \sigma_v^2(1-\rho^2)$$

Given σ_v^2 and ρ from Gottschalk and Huynh (2010), can back out v_t.

back

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Frequency of wage adjustment (%)

	(a) Within Job				(b) Between Jobs		
	Reported	Adjusted Total	Adjusted $\frac{\Delta w<0}{\Delta w\neq 0}$	Adjusted +Corrected	Reported	Adjusted Total	Adjusted $\frac{\Delta w<0}{\Delta w\neq 0}$
(i) 1996-2000							
Hourly	53.1	8.4	12.3	16.3	87.7	96.4	26.5
		(0.0020)	(0.0052)	(0.0010)		(0.0025)	(0.0019)
Salaried	65.4	3.0	24.5	14.0	96.4	99.7	33.8
		(0.0009)	(0.0059)	(0.0494)		(0.0002)	(0.0008)
(ii) 2008-2013							
Hourly	30.6	14.6	14.2	24.9	84.9	90.1	36.9
		(0.0022)	(0.0023)	(0.0031)		(0.0015)	(0.0009)
Recession	32.1	14.8	21.4	25.4	83.5	87.6	45.7
		(0.0022)	(0.0030)	(0.0028)		(0.0019)	(0.0016)
Recovery	28.9	13.9	12.3	23.1	85.0	90.2	36.4
		(0.0000)	(0.0018)	(0.0000)		(0.0014)	(0.0009)
Salaried	34.7	10.1	26.2	21.1	94.4	96.8	39.2
		(0.0017)	(0.0018)	(0.0047)		(0.0003)	(0.0006)
Recession	36.4	10.4	42.1	22.4	93.8	96.5	45.6
		(0.0017)	(0.0020)	(0.0067)		(0.0009)	(0.0025)
Recovery	32.5	9.6	21.2	18.8	94.4	96.8	39.0
		(0.0017)	(0.0012)	(0.0052)		(0.0003)	(0.0007)

Frequency of wage adjustment (%)

	(b) Between Jobs		
	Reported	Adjusted	
		Total	$\frac{\Delta w<0}{\Delta w\neq 0}$
	(i) 1996-2000		
Hourly	87.7	96.4	26.5
		(0.0025)	(0.0019)
Salaried	96.4	99.7	33.8
		(0.0002)	(0.0008)
	(ii) 2008-2013		
Hourly	84.9	90.1	36.9
		(0.0015)	(0.0009)
Recession	83.5	87.6	45.7
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Recovery	85.0	90.2	36.4
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Salaried	94.4	96.8	39.2
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Recession	93.8	96.5	45.6
		(0.0009)	(0.0025)
Recovery	94.4	96.8	39.0
		(0.0003)	(0.0007)

Frequency of wage adjustment (%)

	(a) Within Job			
	Reported	Adjusted Total	Adjusted $\frac{\Delta w<0}{\Delta w\neq 0}$	Adjusted +Corrected
	(i) 1996-2000			
Hourly	53.1	8.4	12.3	16.3
		(0.0020)	(0.0052)	(0.0010)
Salaried	65.4	3.0	24.5	14.0
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	(ii) 2008-2013			
Hourly	30.6	14.6	14.2	24.9
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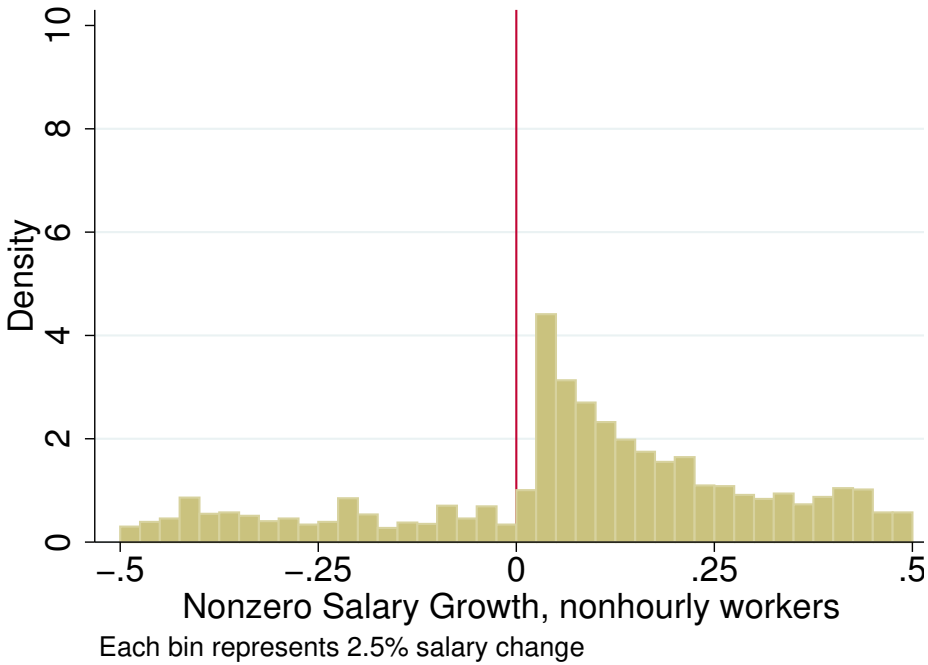
		(0.0017)	(0.0020)	(0.0067)
Recovery	32.5	9.6	21.2	18.8
		(0.0017)	(0.0012)	(0.0052)

Overestimation of statistic of wage flexibility

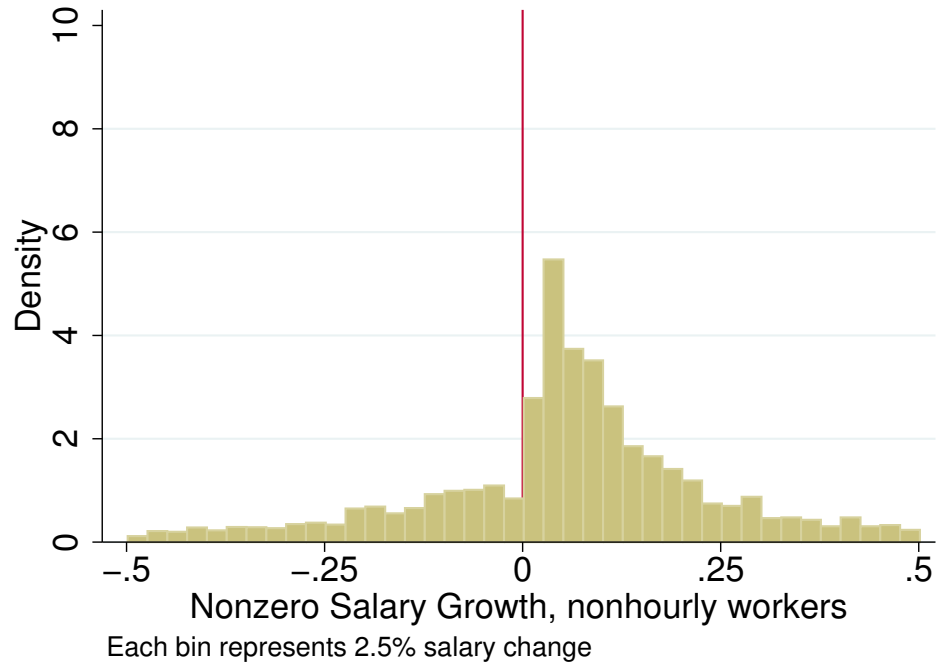
- Fix $\pi = 0.15, N = 500, l = \{3, \ldots, 16\}, \alpha = 0.05$. Vary Δw.
- Assign ME to all individual wage series and a random break of size Δw to πN individuals.

		$\pi = 0.15$				
$l \downarrow$	$\Delta w \rightarrow$	0.25	0.5	1	1.5	2
3	Adjusted $\hat{\pi}$	0.04	0.04	0.05	0.06	0.06
	Corrected $\tilde{\pi}$	0.40	0.18	0.14	0.12	0.11
	Power γ	0.05	0.06	0.08	0.12	0.14
6	Adjusted $\hat{\pi}$	0.05	0.05	0.06	0.08	0.13
	Corrected $\tilde{\pi}$	0.40	0.09	0.08	0.09	0.15
	Power γ	0.06	0.10	0.18	0.37	0.58
12	Adjusted $\hat{\pi}$	0.06	0.07	0.13	0.17	0.19
	Corrected $\tilde{\pi}$	0.62	0.26	0.18	0.16	0.16
	Power γ	0.07	0.14	0.49	0.80	0.97
15	Adjusted $\hat{\pi}$	0.06	0.07	0.11	0.18	0.19
	Corrected $\tilde{\pi}$	0.33	0.15	0.14	0.15	0.15
	Power γ	0.08	0.18	0.52	0.88	0.99

Adjusted wage changes for Non-Hourly Workers (after applying structural breaks test)



SIPP 1996-00



SIPP 2008-13

back

Cyclical variation over 2008 panel for Non-Hourly Workers

Recession < 2009:08; Recovery > 2009:08. Each bin represents 2.5% salary change

back

Computing $\gamma \equiv$ power of a test

- Fix number of periods $l = \{3, \ldots, 16\}$ & $\alpha = 0.05$
- Simulate a wage series **with breaks** for N individuals:
  - Simulate a wage series w/ ME and no breaks
  - Assign to each series a randomly selected break date
  - To each break date assign break of a certain size:
    - break size = median wage change of actual adjusted wage change distribution for each quintile
- Apply structural breaks test algorithm
- Note: null is in fact false for simulated series with breaks
- Pr(Type II error) = avg number of times max F is insig $\implies$ γ = avg number of times max F is significant.

$\therefore$ power of a test $= \gamma(\alpha, l, \text{quintile of the size of } \Delta w)$

back

Quarterly frequency of wage adjustment for Non-Hourly workers (%)

	(a) Within Job			
	Reported	Adjusted Total	Adjusted $\frac{\Delta w<0}{\Delta w\neq 0}$	Adjusted +Corrected
	(i) 1996-2000			
Salaried	65.4	3.0	24.5	14.0
		(0.0009)	(0.0059)	(0.0494)
	(ii) 2008-2013			
Salaried	34.7	10.1	26.2	21.1
		(0.0017)	(0.0018)	(0.0047)
Recession	36.4	10.4	42.1	22.4
		(0.0017)	(0.0020)	(0.0067)
Recovery	32.5	9.6	21.2	18.8
		(0.0017)	(0.0012)	(0.0052)

Standard error in parenthesis.

back

Overestimation of statistic of wage flexibility

- Fix $\pi = 0.15, N = 500, l = \{3, \ldots, 16\}, \alpha = 0.05$. Vary Δw.
- Assign ME to all individual wage series and a random break of size Δw to πN individuals.

Overestimation of statistic of wage flexibility

- Fix $\pi = 0.15, N = 500, l = \{3, \ldots, 16\}, \alpha = 0.05$. Vary Δw.
- Assign ME to all individual wage series and a random break of size Δw to πN individuals.

		$\pi = 0.15$				
$l \downarrow$	$\Delta w \rightarrow$	0.25	0.5	1	1.5	2
3	Adjusted $\hat{\pi}$	0.04	0.04	0.05	0.06	0.06
	Corrected $\tilde{\pi}$	0.40	0.18	0.14	0.12	0.11
6	Adjusted $\hat{\pi}$	0.05	0.05	0.06	0.08	0.13
	Corrected $\tilde{\pi}$	0.40	0.09	0.08	0.09	0.15
12	Adjusted $\hat{\pi}$	0.06	0.07	0.13	0.17	0.19
	Corrected $\tilde{\pi}$	0.62	0.26	0.18	0.16	0.16
15	Adjusted $\hat{\pi}$	0.06	0.07	0.11	0.18	0.19
	Corrected $\tilde{\pi}$	0.33	0.15	0.14	0.15	0.15

- Final statistic of wage flexibility: $\hat{\pi} = 0.11; \tilde{\pi} = 0.17$

Smaller Δw sizes in 2008 panel

Wage Adjustment in other panels of the SIPP

Table 1: Quarterly frequency of within-job hourly wage adjustment(%)

Panel	Period	No. of waves	Self-Reported	Adjusted	Adjusted & Corrected
1990	1990:2-1992:9	8	51.9	5.2	14.6
1991	1991:2-1993:9	8	50.7	5.0	17.4
1992	1992:2-1995:1	9	50.9	5.4	10.7
1993	1993:2-1996:1	9	50.3	5.5	7.4
1996	1995:12-2000:2	12	53.1	8.4	16.3
	1995:12-1998:1	6	54.1	8.6	15.6
	1998:2-2000:2	6	51.9	7.6	14.0
2001	2001:2-2004:1	9	52.7	6.6	10.5
2004	2004:2-2006:9	8	37.8	11.2	28.2

back

Wage change sizes across SIPP panels

Quintile	1996-00	2008-13
1	0.03	0.02
2	0.06	0.03
3	0.09	0.06
4	0.15	0.1
5	0.29	0.24

back

Frequency of wage adjustment (%)

	Between Jobs		
	Reported	Adjusted	
		Total	$\frac{\Delta w<0}{\Delta w\neq 0}$
	(i) 1996-2000		
Salaried	96.4	99.7	33.8
		(0.0002)	(0.0008)
	(ii) 2008-2013		
Salaried	94.4	96.8	39.2
		(0.0003)	(0.0006)
Recession	93.8	96.5	45.6
		(0.0009)	(0.0025)
Recovery	94.4	96.8	39.0
		(0.0003)	(0.0007)

back