Revisiting the Relationship Between Unemployment and Wages

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Introduction

- **How do wages respond to labor market conditions?**
  - Do past labor market conditions matter? If so, why?
  - Long-standing debate, different views of dynamic wage process.

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- We examine **wages processes for different jobs** and show that:
  - wage dynamics differ significantly across occupations
  - match quality does influence wages, but in different ways depending on job type
  - contractual arrangements are key (performance pay schemes shape wage dynamics)

Context

- Standard wage-unemployment regression (as in Bils, 1985):

$$\ln w_{i,t+s,t} = \beta_0 X_{i,t+s} + \beta_1 U_{t+s} + \varepsilon_{i,t+s}$$

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- Beaudry and DiNardo (1991):
  - Risk-aversion and limited commitment on workers' side, risk-neutral firms $\Rightarrow$ firms insure workers (Harris and Holmstrom, 1982)
  - Implication: ***minimum*** **unemployment matters,** ***current*** **does not**

$$\ln w_{i,t+s,t} = \beta_0 X_{i,t+s} + \beta_1 U_{t+s} + \beta_2 u^{\min}_{i,t+s,t} + \varepsilon_{i,t+s}$$

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- Hagedorn and Manovskii (2013): selection on match quality
  - Past unemployment effects due to selection
  - Implication: **minimum unemployment has no effect after controlling for match quality**

$$\ln w_{i,t+s,t} = \beta_0 X_{i,t+s} + \beta_1 U_{t+s} + \beta_2 u^{\min}_{i,t+s,t} + \gamma q_{i,t} + \varepsilon_{i,t+s}$$

Questions

1. How does match quality affect wages? **Perform a match quality decomposition.**

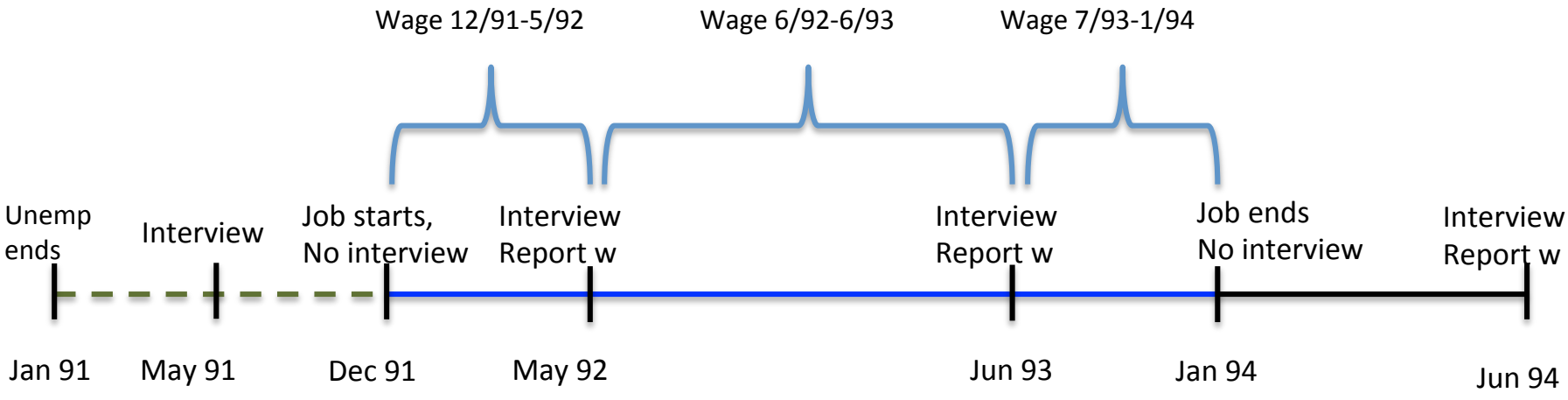
2. How general are existing results? **Different jobs, different wage processes!**

3. Why different wage processes? **Contractual arrangements are very important.**

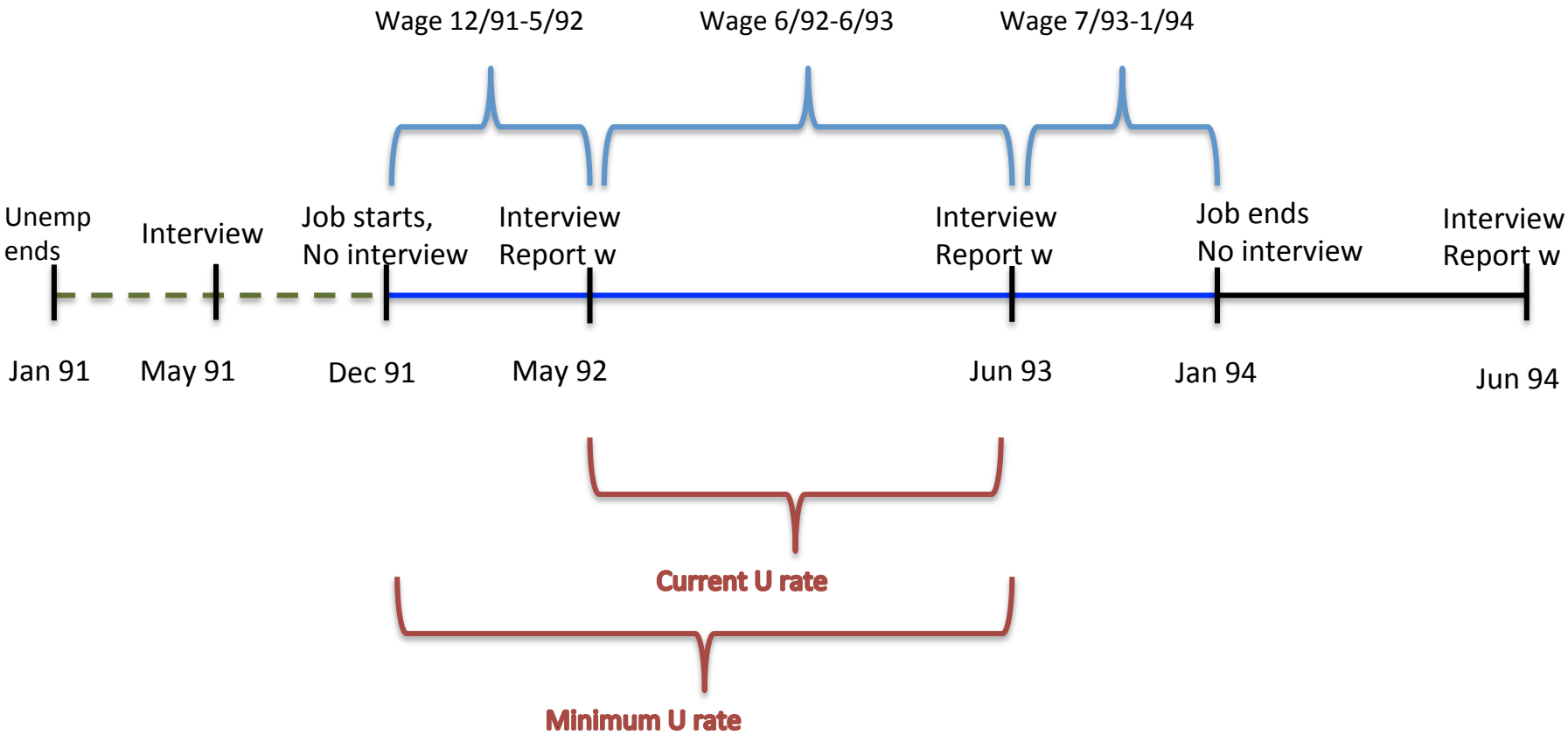
Data Structure: "employment cycles" (Wolpin, 1992)

Definition of employment cycle
a continuous spell of employment, possibly entailing a sequence of jobs

Data Structure: assigning wages



Data Structure: relevant unemployment measures



Match Quality Measures

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- Proxy for number of offers: cumulative labor market tightness (Hagedorn and Manovskii, 2013)
  1. preceding current job: $q^{EH} = \sum_{Jan91}^{Nov91} \left(\frac{v_t}{u_t} \right)$
  2. during current job: $q^{HM} = \sum_{Dec91}^{Jan94} \left(\frac{v_t}{u_t} \right)$

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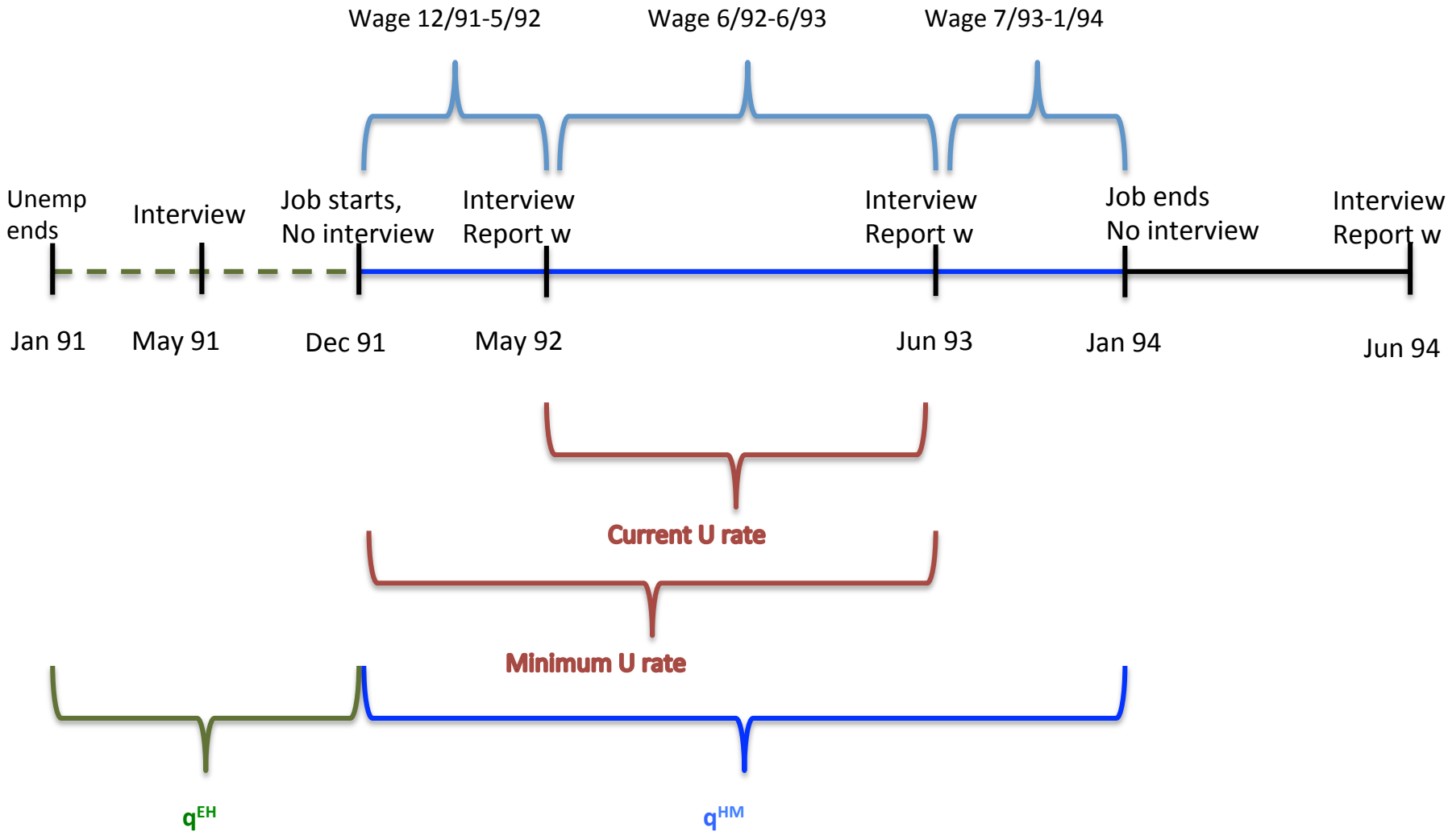
- Recast these measures as the product of duration and average tightness :

$$q = \sum_{t=T_1}^{T_2} \left(\frac{v_t}{u_t}\right) = \Delta T \times \frac{\sum_{t=T_1}^{T_2} \left(\frac{v_t}{u_t}\right)}{\Delta T} \quad \Rightarrow$$

$$\ln q = \ln(dur) + \ln(\bar{q})$$

Data Structure: adding match quality controls



Specification and Data

$$\begin{aligned}\ln w_{i,t+s,t} &= \beta_0 X_{i,t+s} + \beta_1 U_{t+s} + \beta_2 u^{\min}_{i,t+s,t} \\ &\quad + \gamma_1 \ln \bar{q}^{eh}_{i,t} + \gamma_2 \ln T^{beg}_{1,(i,t)} + \gamma_3 \ln \bar{q}^{hm}_{i,t} + \gamma_2 \ln T^{end}_{beg,(i,t)} + \varepsilon_{i,t+s}\end{aligned}$$

- Work histories from NLSY79: weekly data, men 16 and older, completed jobs. Real hourly wages (CPI).
- Unemployment: CPS.
- Vacancies. Composite Help Wanted Index (Barnichon, 2010).
- Controls: individual FE, dummies for age, employer tenure, marital status, industry, union status, SMSA, region; polynomials for year and education.

Pooled Sample Results

Specification		BdN (1991)	HM (2013)	Flex Controls
U	-2.26^{***}	-0.74^{*}	-0.93^{**}	-1.31^{***}
	[0.35]	[0.43]	[0.41]	[0.40]
$u^{\min}$	–	-3.02^{***}	-0.24	-0.90
		[0.59]	[0.57]	[0.68]
$\ln q^{eh}$	–	–	5.20^{***}	–
			[0.55]	
$\ln q^{hm}$	–	–	6.61^{***}	–
			[0.45]	
$\ln \bar{q}^{eh}$	–	–	–	6.11^{***}
				[2.23]
$\ln \mathrm{dur}(q^{eh})$	–	–	–	4.22^{***}
				[0.31]
$\ln \bar{q}^{hm}$	–	–	–	-0.236
				[1.84]
$\ln \mathrm{dur}(q^{hm})$	–	–	–	6.84^{***}
				[0.48]
# of obs.	30,585	30,585	29,872	29,872
R^2	0.587	0.587	0.593	0.596

Estimated coefficients and standard errors are multiplied by 100.
Standard errors clustered by observation start and end date.
Significance: *** 1%, ** 5%, * 10%.

Results by Occupation: Cognitive vs. Manual

Specification	Pooled	Cognitive	Manual	Non-Routine	Routine
U	-1.31^{***}	-1.63^{**}	-0.93^{*}		
	[0.40]	[0.76]	[0.52]		
$u^{\min}$	-0.90	0.69	-2.11^{**}		
	[0.68]	[1.25]	[0.90]		
$\ln \bar{q}^{eh}$	6.11^{***}	12.8^{***}	-2.57		
	[2.23]	[4.30]	[2.90]		
$\ln \mathrm{dur}(q^{eh})$	4.22^{***}	3.18^{***}	3.63^{***}		
	[0.31]	[0.57]	[0.38]		
$\ln \bar{q}^{hm}$	-0.236	3.36	-5.79^{***}		
	[1.84]	[3.19]	[2.60]		
$\ln \mathrm{dur}(q^{hm})$	6.84^{***}	7.20^{***}	8.66^{***}		
	[0.48]	[0.88]	[0.63]		
# of obs.	29,872	12,254	12,617		
R^2	0.596	0.610	0.605		

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Results by Occupation: Routine vs. Non-routine

Specification	Pooled	Cognitive	Manual	Non-Routine	Routine
U	-1.31^{***}	-1.63^{**}	-0.93^{*}	-1.38^{*}	-1.36^{**}
	[0.40]	[0.76]	[0.52]	[0.76]	[0.54]
$u^{\min}$	-0.90	0.69	-2.11^{**}	0.26	-1.91^{**}
	[0.68]	[1.25]	[0.90]	[1.24]	[0.94]
$\ln \bar{q}^{eh}$	6.11^{***}	12.8^{***}	-2.57	9.61^{**}	0.56
	[2.23]	[4.30]	[2.90]	[4.63]	[2.82]
$\ln \mathrm{dur}(q^{eh})$	4.22^{***}	3.18^{***}	3.63^{***}	3.74^{***}	3.43^{***}
	[0.31]	[0.57]	[0.38]	[0.62]	[0.39]
$\ln \bar{q}^{hm}$	-0.236	3.36	-5.79^{***}	2.50	-4.33
	[1.84]	[3.19]	[2.60]	[3.57]	[2.64]
$\ln \mathrm{dur}(q^{hm})$	6.84^{***}	7.20^{***}	8.66^{***}	7.88^{***}	7.12^{***}
	[0.48]	[0.88]	[0.63]	[0.87]	[0.67]
# of obs.	29,872	12,254	12,617	11,494	13,377
R^2	0.596	0.610	0.605	0.642	0.622

Estimated coefficients and standard errors are multiplied by 100.
Standard errors clustered by observation start and end date.
Significance: *** 1%, ** 5%, * 10%.

Results by Education

Specification	Pooled	HS dropouts	HS graduates	College graduates
U	-1.31^{***}	-1.28	-0.77	-2.25^{***}
	[0.40]	[0.92]	[0.47]	[0.83]
$u^{\min}$	-0.90	-1.55	-1.40^{*}	-0.48
	[0.68]	[1.34]	[0.82]	[1.45]
$\ln \bar{q}^{eh}$	6.11^{***}	10.2^{**}	-0.70	17.3^{**}
	[2.23]	[4.29]	[2.22]	[4.79]
$\ln \mathrm{dur}(q^{eh})$	4.22^{***}	3.84^{***}	2.98^{***}	4.25^{***}
	[0.31]	[0.56]	[0.35]	[0.67]
$\ln \bar{q}^{hm}$	-0.236	-5.80	-0.04	1.96
	[1.84]	[4.02]	[2.20]	[3.68]
$\ln \mathrm{dur}(q^{hm})$	6.84^{***}	5.15^{***}	5.15^{***}	8.68^{***}
	[0.48]	[1.07]	[0.55]	[0.97]
# of obs.	29,872	5,228	17,751	9,009
R^2	0.596	0.518	0.551	0.577

Estimated coefficients and standard errors are multiplied by 100.
Standard errors clustered by observation start and end date.
Significance: *** 1%, ** 5%, * 10%.

Investigating the mechanism: Performance Pay Jobs (PPJ)

- Significant differences in the way labor is remunerated across occupations
  wage growth regressions

- **New evidence highlighting role of performance-related pay (PPJ)**

  1. wages in PPJ respond strongly to current unemployment (in contrast to non-PPJ)

  2. cognitive occupations have highest incidence of performance pay.
     - Performance pay jobs (PPJ) frequent at high end of wage distribution.

  3. PP jobs entail longer durations, and wages respond more strongly to match quality
     - $\Rightarrow$ performance-related pay may be used to retain good matches in high end occupations (Oyer, 2004).

(1) Wage Dynamics and Performance Pay

Specification	Pooled	Not PPJ	PPJ	PPJ not union	PPJ union
U	-1.31^{***}	-1.18	-1.591^{***}	-1.88^{**}	-0.22
	[0.40]	[0.80]	[0.586]	[0.75]	[1.26]
$u^{\min}$	-0.90	-0.66	-3.290^{**}	-1.73	-9.37^{***}
	[0.68]	[1.20]	[1.297]	[1.51]	[3.24]
$\ln \bar{q}^{eh}$	6.11^{***}	5.28	27.0^{***}	32.1^{***}	-2.36
	[2.23]	[3.70]	[5.77]	[6.23]	[26.6]
$\ln \text{dur}(q^{eh})$	4.22^{***}	4.08^{***}	5.04^{***}	3.87^{***}	21.5^{***}
	[0.31]	[0.54]	[0.866]	[0.99]	[4.37]
$\ln \bar{q}^{hm}$	-0.236	2.49	9.33^{*}	11.1^{*}	13.0
	[1.84]	[4.03]	[5.27]	[5.87]	[26.6]
$\ln \text{dur}(q^{hm})$	6.84^{***}	6.05^{***}	7.97^{***}	8.31^{***}	13.2^{**}
	[0.48]	[0.818]	[1.33]	[1.41]	[5.89]
# of obs.	29,872	11,568	7,888	6,493	1,395
R^2	0.596	0.619	0.719	0.73	0.712

Estimated coefficients and standard errors are multiplied by 100.
Standard errors clustered by observation start and end date.
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(2) Incidence of PPJ and Unionization

Occupation	Cognitive	Manual	Non-routine	Routine
PPJ share	45%	30%	39%	35%
Union share	21%	28%	23%	26%

Education	College graduates	HS graduates	HS dropouts
PPJ share	49%	38%	31%
Union share	20%	29%	18%

Shares are from NLSY79 data, for years in which data on PPJ and Union status is available

PP schemes and workers retention

- Performance pay may serve different purposes
- One objective: **to retain good workers in periods when labor market conditions are tighter** ('profit-sharing', see work by Lazear or Oyer)
  - Retention motive has immediate implication: job durations should increase with PP
- Evidence? **Significant and positive relationship between PP and job durations in NLSY data**

Job durations (in quarters)

	Mean	Standard Deviation	Observations
PPJ=1	49.9	34.0	7,888
PPJ=0	38.6	31.3	11,568
COG	40.9	31.0	8,329
MAN	32.4	29.2	6,988
NONROU	41.0	31.0	7,709
ROU	32.8	29.4	7,518

Summary of findings

- **Heterogeneous sensitivity of wages to labor market conditions**
  - Cognitive occupations: wages respond to current unemployment
  - Manual and routine occupations: wages respond to minimum unemployment

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  - Responsiveness of wages to average labor market tightness varies with occupation
  - Labor market tightness affects wages only when *min U* does not. Some occupations exhibit genuine dependence on best labor market conditions

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  - Responsiveness of wages to average labor market tightness varies with occupation
  - Labor market tightness affects wages only when *min U* does not. Some occupations exhibit genuine dependence on best labor market conditions
- **'Performance pay' is key**
  - In non-union jobs, pay schemes help retain valuable employees. Wage dynamics in these jobs exhibit strong tightness gradients and sensitivity to current labor market conditions
  - Same phenomenon is apparent when looking at skilled occupations, where retention through profit-sharing is common

Wage Growth Regressions

Specification	Pooled	Cognitive	Manual	Non-Routine	Routine
ΔU	-1.22^{***}	-2.45^{**}	-0.80^{*}	-2.91^{***}	-0.54
	[0.43]	[1.06]	[0.47]	[0.97]	[0.46]
$\Delta u^{\min}$	-2.86^{***}	-0.60	-4.64^{***}	0.22	-5.16^{***}
	[0.84]	[1.57]	[1.09]	[1.64]	[1.08]
# of obs.	27,741	10,067	11,887	9,567	12,387
R^2	0.006	0.007	0.008	0.007	0.009

Estimated coefficients and standard errors are multiplied by 100.
Standard errors clustered by observation start and end date.
Significance: *** 1%, ** 5%, * 10%.

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