Monopsony power in labor markets across Texas school districts

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Motivation

- How are wages determined?
- How much wage setting power do employers have?

- Teachers and school districts
- Limited number of employers & few outside options
- Similar labor characteristics
- Monopsony power across school districts?

Motivation

- **Research Question**

- How much wage setting power (monopsony power) school districts have for employees?

- How does it vary across different job positions?
  - Teachers, nurses, counselors, librarians...

New Monopsony

- Where does wage setting power come from?
  - Inability (or unwillingness) to move to jobs with higher pay
  - Search friction, mobility, differentiated market...
- How do we measure it?
  - Labor supply elasticity **for individual firms**
  - Is a firm facing an **upward sloping** labor supply curve?
- How do we estimate labor supply elasticity?
  - Using Burdett-Mortensen-Manning model (Manning 2003), estimating elasticity of separation & recruitment is equivalent.
  - Theoretical model further simplifies the restriction.
- Approach widely used in recent empirical literature

Contribution

- Very rich literature on monopsony power in labor markets
- Some focus on more specialized, institutionalized markets
  - Teacher, nurse, online task ...
- **Ransom and Sims (2010)** : Public schools in Missouri
- **Falch (2010, 2011, 2017)** : Norwegian school teachers
- **Matsudaira (2014)** : Mandatory nurse employment law
- ...

- Use of exogenous wage shock to employees
- Heterogeneity across job positions within employers

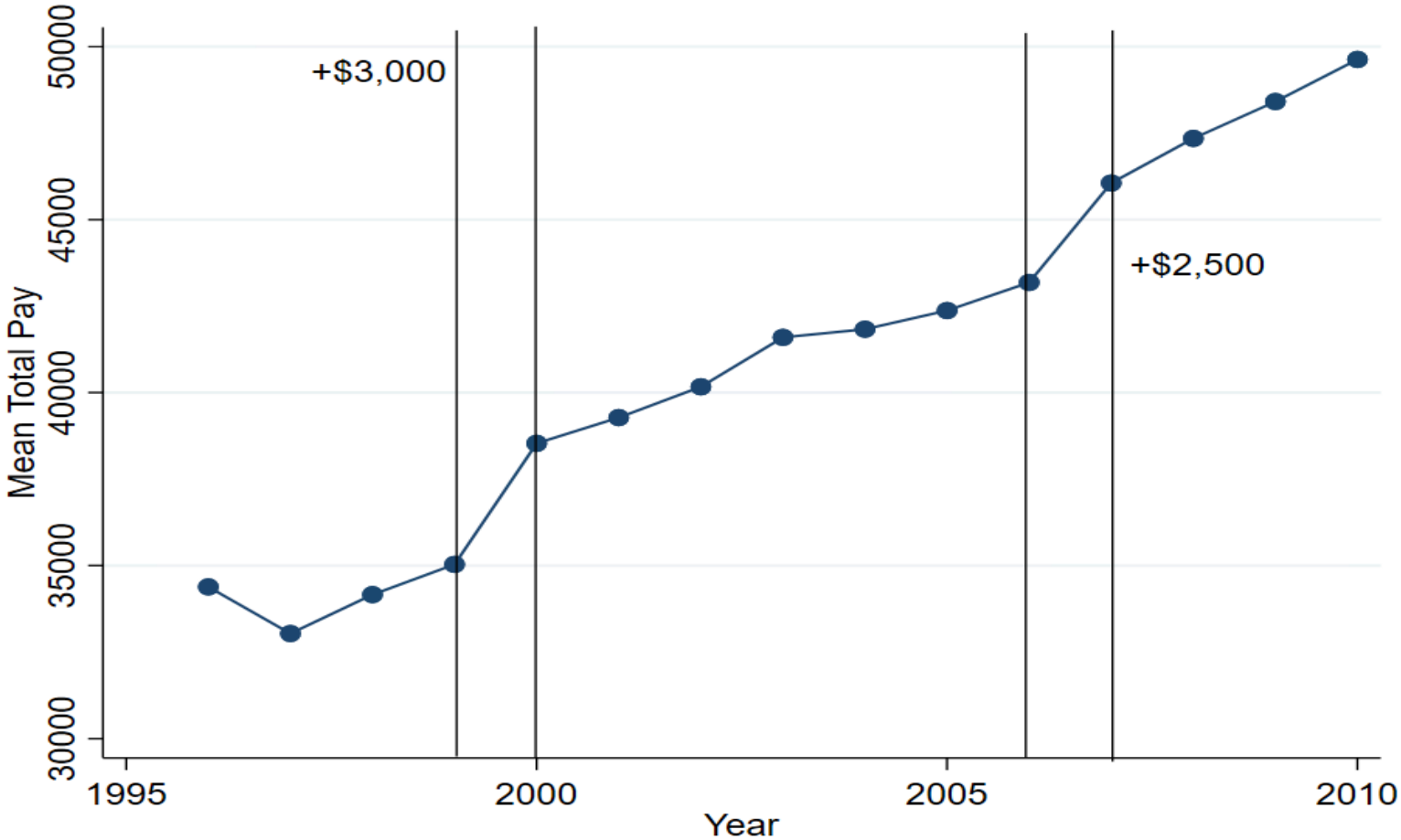
Exogenous Wage Shock

- Each school district directly hires their employees and determine wage schemes each year.
- No collective bargaining in Texas school districts.

- State legislation occasionally gave raise to school employees
  - Full-time teachers, counselors, school nurses, librarians
  - 1999-2000: \$3,000 / 2006-2007: \$2,500 / 2019-2020: \$5,000
- Permanent increases with funding from the state government

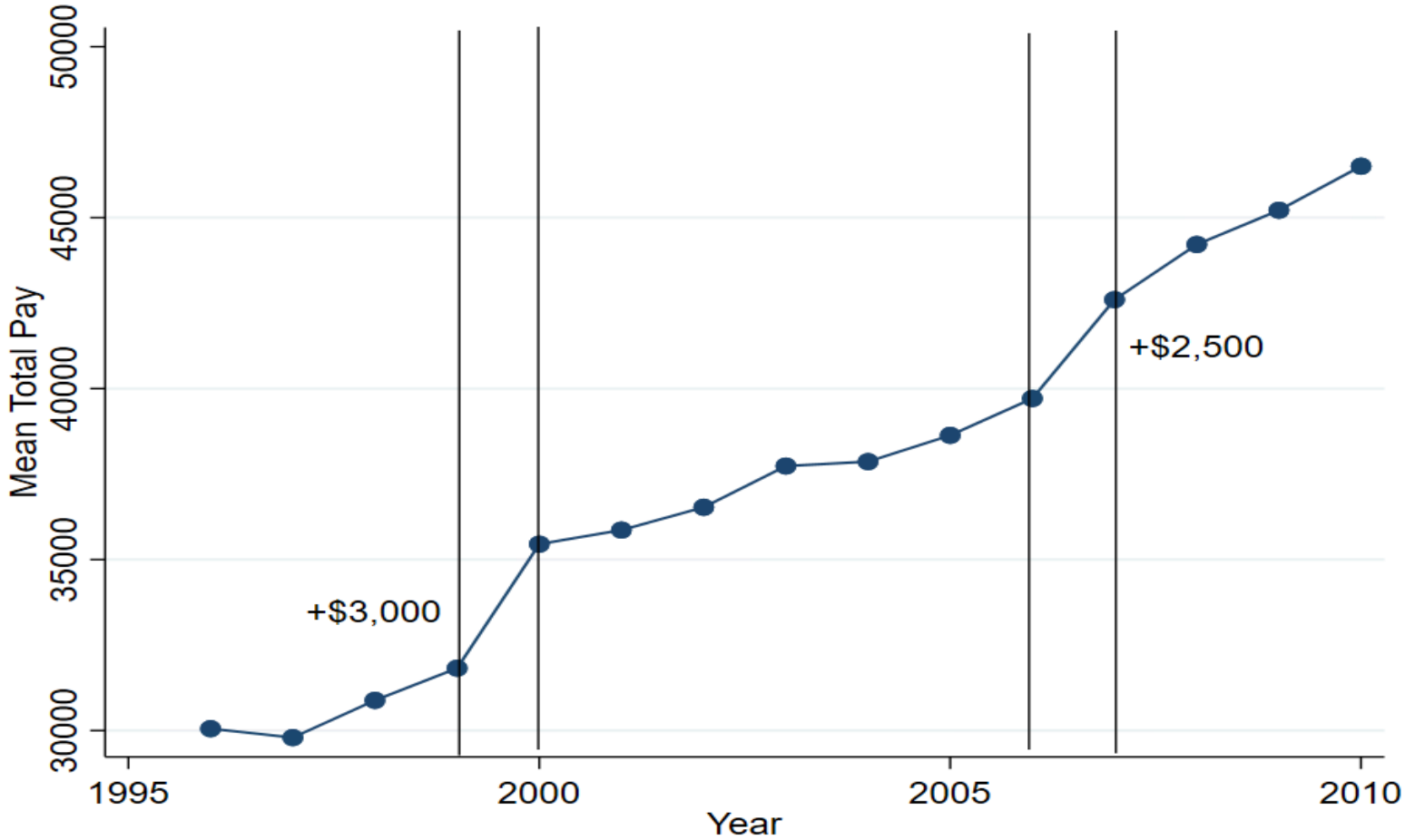
Exogenous Wage Shock

- Trend of annual pay for full-time teachers in Texas



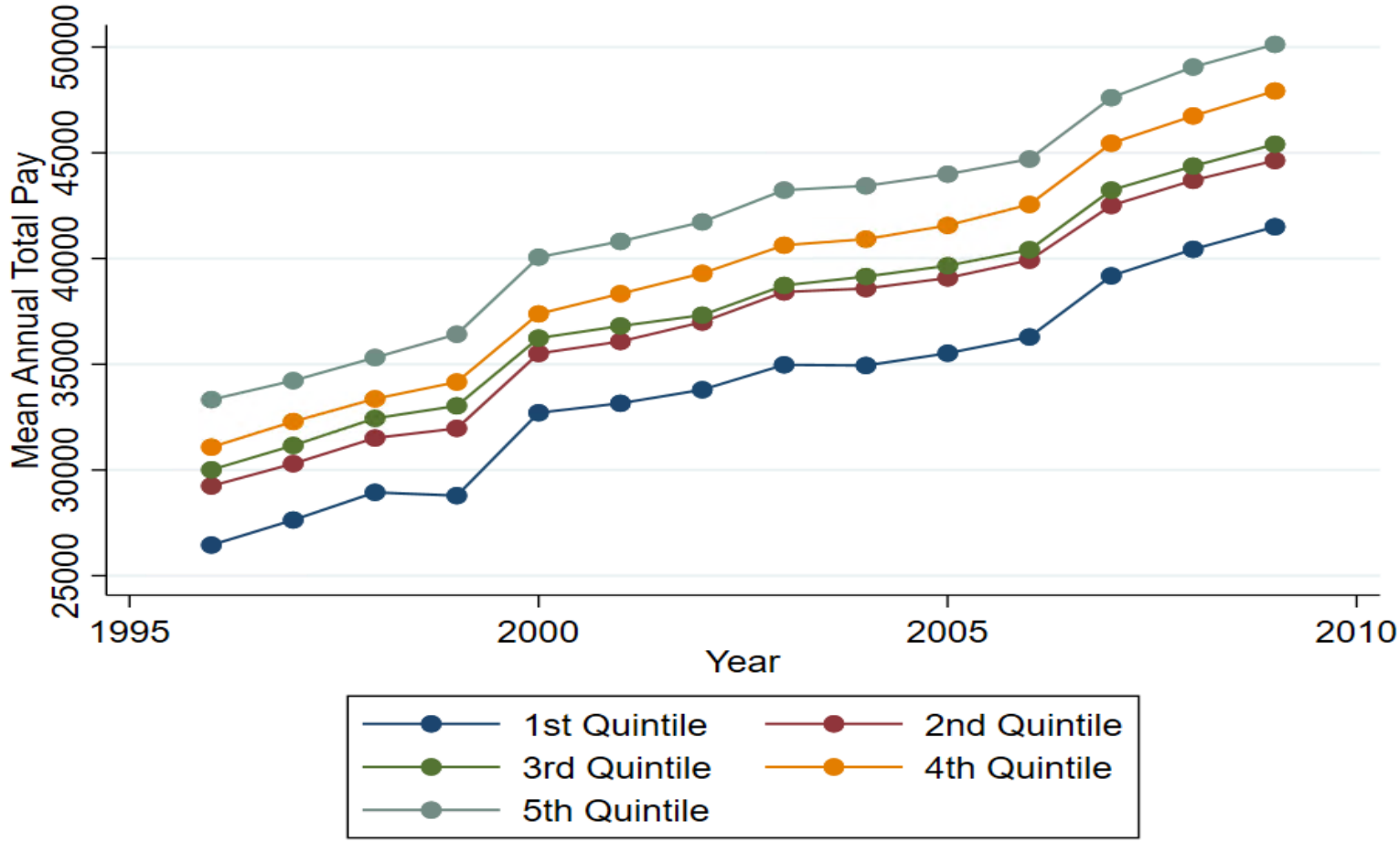
Exogenous Wage Shock

- Trend of annual pay for full-time school nurses in Texas

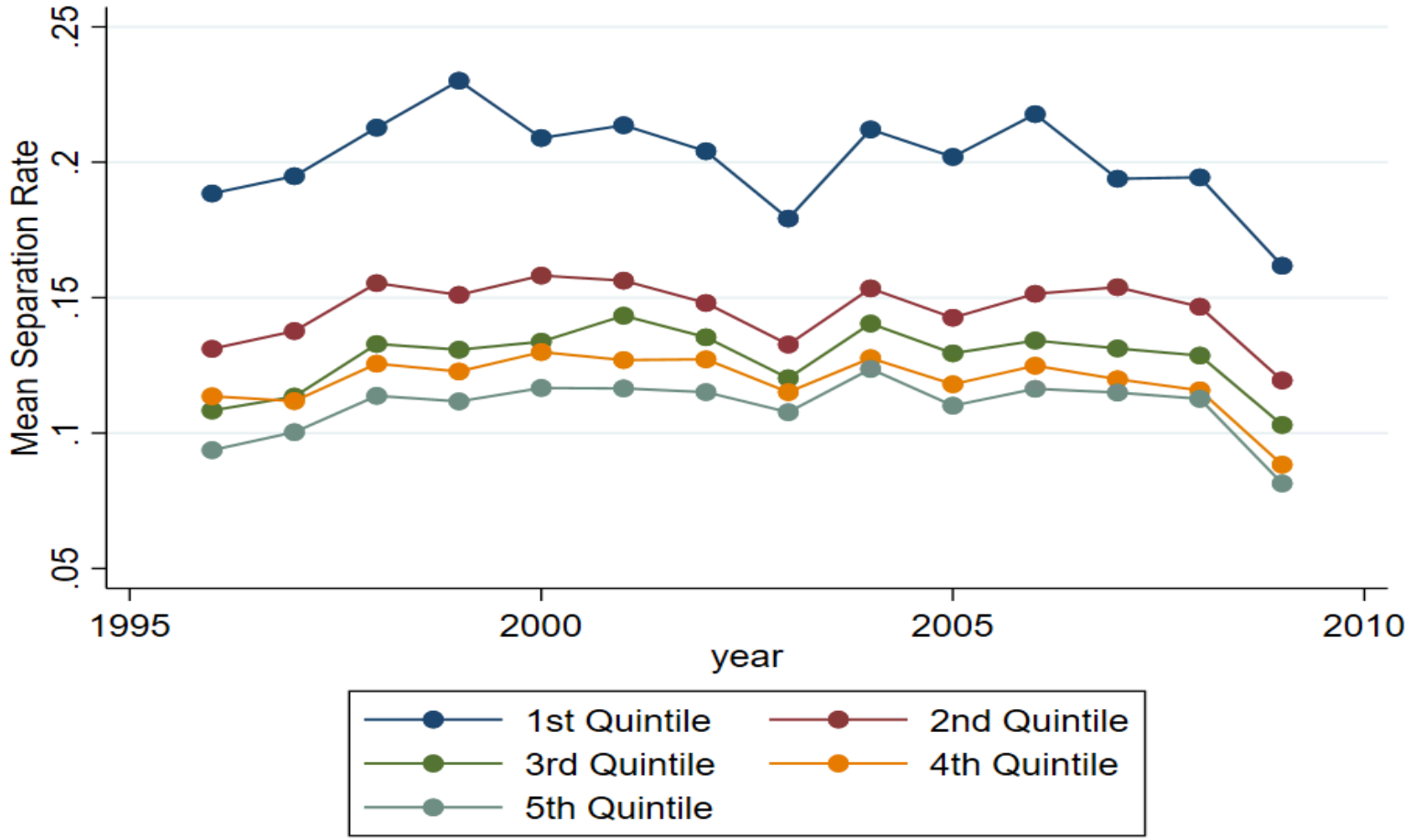


Teachers' Wage Variation Across Districts

- Quintiles defined by district-level average pay level in 1999



Teachers' Separation Rate Trends Across Districts



- Seemingly little impact in 1999-2000 & 2006-2007
- except 1st quintile districts

Identification Strategy

- What variations can be used?
- Job positions that benefited vs. that did not
  - Most para-professional positions did not benefited from the raises
  - e.g.) Educational aides
- **Initial salary levels**
  - Same $3,000 pay raise is equivalent to:
    10% increase for teachers with $30,000 salary
    5% increase for teachers with $60,000 salary
  - Variations in initial salary levels come from:
    Districts, tenure, experience, degree...
  - Threat to identification?

Estimation Strategy

- District level IV (1996 $\sim$ 2009)
- 2SLS with instruments of two wage jumps in 1999-2000 & 2006-2007

- Previous specification

$$\Delta log(s_{dt}) = \beta \Delta log(w_{dt}) + f(X_{dt}) + \tau_t + \delta_d + \epsilon_{dt}$$

$$\Delta log(w_{dt}) = \gamma w_d^{t-1} + f(X_{dt}) + \tau_t + \delta_d + v_{dt}$$

  - $\Delta log(s_{dt})$: Difference of log average separation rates between year t and $t-1$
  - $\Delta log(w_{dt})$: Difference of log average wage levels between year t and $t-1$
  - w_d^{t-1}: Total log salary level in 1999 or 2006
    - $= 0$ in years other than 2000 & 2007
  - Unreasonable specification (γ is the instrument!)

Estimation Strategy

- IV regression that makes sense

$$\Delta log(s_{dt}) = \beta \Delta log(w_{dt}) + f(X_{dt}) + \tau_t + \delta_d + \epsilon_{dt}$$

$$\Delta log(w_{dt}) = \gamma pctinc_{dt} + f(X_{dt}) + \tau_t + \delta_d + v_{dt}$$

- $pctinc_t = log(w_{dt-1} + 3000) - log(w_{dt-1})$ if $t = 2000$
  $pctinc_t = log(w_{dt-1} + 2500) - log(w_{dt-1})$ if $t = 2007$
  - $= 0$ in years other than 2000 & 2007
- Measures percentage-wise increases intended by the legislative raises given w_{dt-1}
- γ : How much of actual wage changes in 2000 & 2007 is attributable to $pctinc_t$?
  - Given relationship between wages and time-varying controls of other years

Results

- Base IV results

	Teacher	Librarian	Counselor	School Nurse
Log totalpay	–6.5833**	–18.1131	–2.9366	–17.3484
	(2.6557)	(30.2820)	(19.9410)	(14.9203)
Master	0.3738	2.0119	1.1632	–1.4601
	(0.9860)	(2.4083)	(0.8434)	(3.7996)
Doctor	–11.2572	5.4118	1.4075	–6.5148
	(7.1859)	(7.8917)	(0.8101)	(13.0217)
Experience	0.0887	0.1986	0.1152	0.1419
	(0.0589)	(0.2237)	(0.1731)	(0.1909)
Tenure	–0.0074	0.2116**	0.2753***	0.4083**
	(0.0418)	(0.0984)	(0.0567)	(0.1768)
N	12,974	2,463	4,433	2,438
Adj. R^2	0.1269	–0.0555	–0.0522	–0.0648

- Much larger separation elasticity than expected for teachers
  - $\epsilon = 13$, where Ransom & Sims (2010) estimated around 3.5
- Other 3 job positions are not precisely estimated
  - Very small number of employees within a district

Results

- Comparisons between different specifications

	Baseline	Previous IV	Large Districts	FTE payment	With Charter
Teacher	–6.5833**	–5.3387**	–5.7669**	–5.5679**	–0.3708
	(2.6557)	(2.5243)	(2.8929)	(2.6580)	(0.5756)
Librarian	–18.1131	–1.4628	–21.9352	–15.8014	–1.829
	(30.2820)	(20.5484)	(32.9103)	(18.2837)	(3.9767)
Counselor	–2.9366	–6.0969	10.2486	–4.5280	1.1648
	(19.9410)	(12.7433)	(28.1502)	(14.6738)	(3.8066)
School Nurse	–17.3484	–25.8982**	–8.1289	–14.5905	–11.6195*
	(14.9203)	(11.4313)	(17.1742)	(9.8506)	(6.4551)

- Teachers' estimates are relatively stable.
- Other 3 minor roles are highly unstable.
- Still, school nurses' estimates seem to be larger than teachers'.
- Individual level regression is expected to solve this issue.

Results

- First stage results

$$\Delta log(w_{dt}) = \gamma pctinc_{dt} + f(X_{dt}) + \tau_t + \delta_d + v_{dt}$$

	Teacher	Librarian	Counselor	School Nurse
PctInc	1.4744***	1.6587***	1.2781***	1.2608***
	(0.3458)	(0.4458)	(0.4965)	(0.2998)
Master	0.1023***	0.0683***	0.0219***	0.1338*
	(0.3429)	(0.0166)	(0.0076)	(0.0756)
Doctor	0.1745	0.1289**	0.0222***	–0.0360
	(0.1149)	(0.0605)	(0.0079)	(0.1726)
Experience	0.0181***	0.0065***	0.0080***	0.0109***
	0.0018	(0.0014)	(0.0008)	(0.0023)
Tenure	–0.0038	0.0016	0.0002	0.0083**
	(0.0024)	(0.0012)	(0.0006)	(0.0033)
N	12,974	2,463	4,433	2,438
				.
Adj. R^2	0.6314	0.4984	0.3002	0.4094

- Would be best if γ is estimated around (or lower than) 1
- \$3,000 raise led to \$4,200 increase in actual wage?
- May need to add extra regional control to better predict wage trends...

Replicating Ransom & Sims (2010)

- IV regression using base salary schedules of school districts
- Use base payment observed in the data
- Calculate average salary slope with actual base payment & tenure info of districts

$$s_{dt} = \beta log(w_{dt}) + f(X_{dt}) + \tau_t + \delta_d + \epsilon_{dt}$$

$$log(w_{dt}) = \gamma_1 base_{dt} + \gamma_2 slope_{dt} + f(X_{dt}) + \tau_t + \delta_d + v_{dt}$$

- Unlike the original estimation, I included:
  - Multiple years of observations with year fixed effects
  - District fixed effects, which partially replace district-level controls (cost of living, ...) included in the original paper

Replicating Ransom & Sims (2010)

- Comparisons between the replication and original results

	Replication with Texas ERC		Ransom and Sims 2010	
	Basepay	Basepay + Slope	Basepay	Basepay + Slope
Log salary	–0.183***	–0.182***	–0.251**	–0.248**
	(0.022)	(0.022)	(0.079)	(0.063)
Implied labor supply ϵ	2.472	2.458	3.691	3.758
N	14,345	14,223	451	438
Adj R^2	0.584	0.584	0.32	0.32

- Some differences in estimation strategies...
- Smaller estimates compared to Ransom & Sims (2010), but still comparable results
- Does the IV result show teachers' labor supply is actually more elastic?

Individual-level Estimation

- District-level estimation using yearly differentials was straightforward
  - Wage increase legislation could directly instrument yearly wage differentials.
- No possible with individual level observations
- Could do something similar to Ransom & Sims (2010)

$$s_{idt} = \beta log(w_{idt}) + f(X_{idt}) + \tau_t + \delta_d + \epsilon_{idt}$$

- How do I formulate first-stage relationship between wage increase and $log(w_{idt})$?

$$log(w_{idt}) = \gamma pctinc_{idt} + f(X_{idt}) + \tau_t + \delta_d + \epsilon_{idt}$$