Measurement of Nominal Wages and Payroll Schedules in Administrative Earnings Data

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Today's talk

Methods for administrative earnings records that identify:

- Persistent wage changes
- Payroll schedules

Evidence of distinct adjustment patterns for nominal wage raises and cuts

- Nominal wage raises follow a Taylor-style annual adjustment pattern
- Pattern of nominal wage cuts is consistent with a Calvo-style random arrival of opportunities to cut nominal wages

Longitudinal Employer-Household Dynamics (LEHD) Dataset

U.S. Census Bureau employer-employee linked dataset

Key LEHD features

- Quarterly earnings from administrative UI records
- Covers $\approx$ 96% of employment in any state

Sample Used:

- 10% random sample of firms from 30 states from 1998:Q1 to 2017:Q1

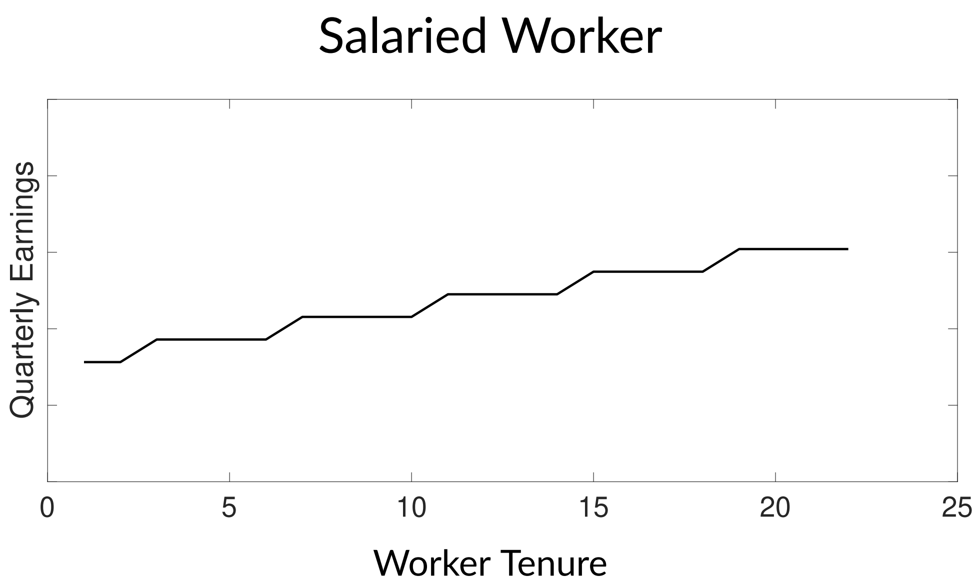
Measuring Wage Changes

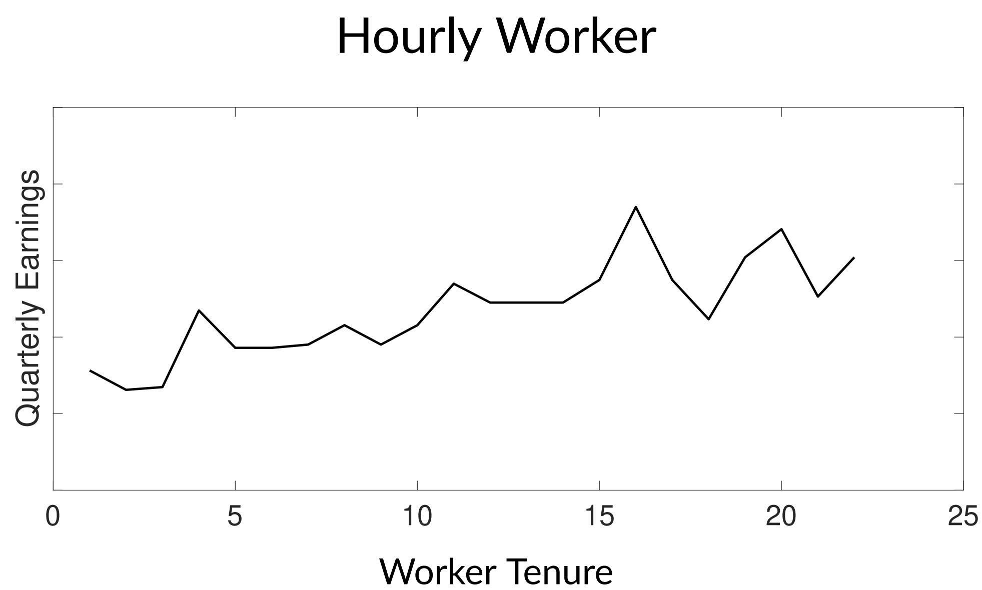
from

Quarterly Earnings Data

Quarterly earnings includes base wage + hours paid

$$y_{ikt} = w_{ikt} + h_{ikt}$$

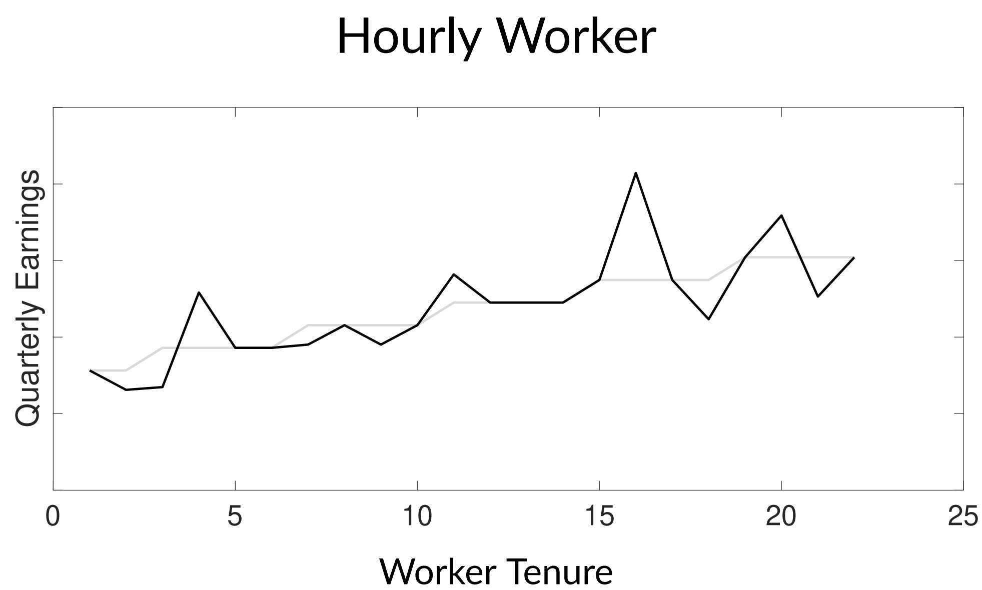




y = log quarterly earnings $\quad$ w = log nominal wage $\quad$ h = log hours

Quarterly earnings includes variable compensation

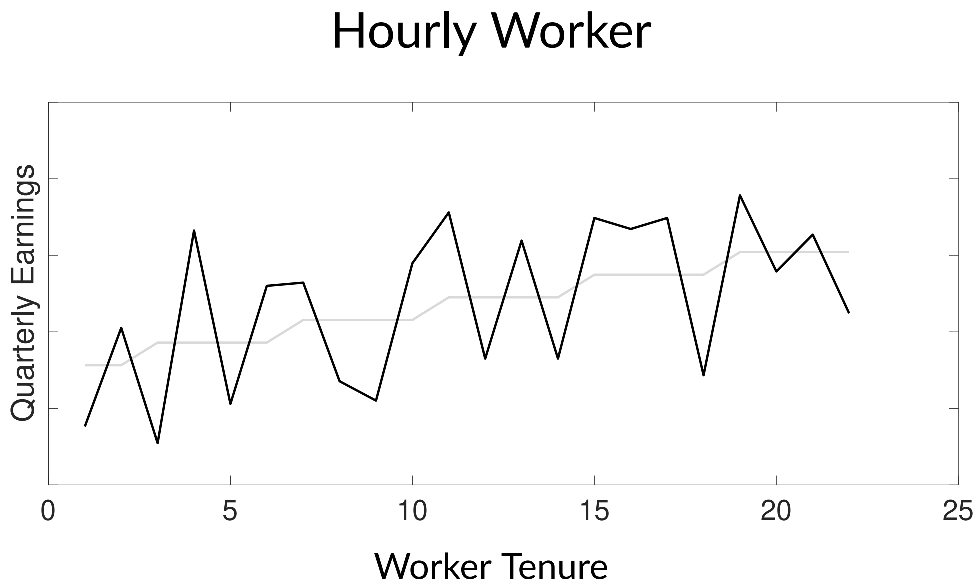
$$y_{ikt} = w_{ikt} + h_{ikt} + v_{ikt}$$



y = log quarterly earnings
w = log nominal wage
h = log hours
v = log variable compensation

Quarterly earnings includes payday weeks

$$y_{ikt} = h_{ikt} + w_{ikt} + v_{ikt} + p_{ikt}$$



y = log quarterly earnings
v = log variable compensation
w = log nominal wage
p = log payday weeks
h = log hours

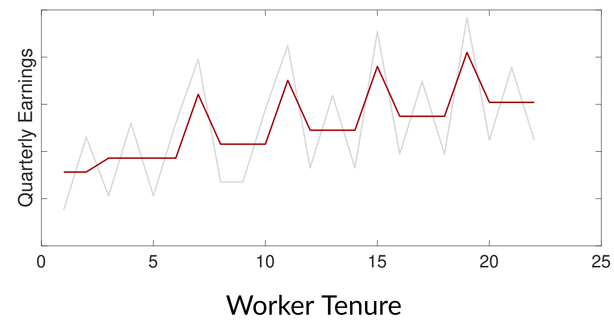
Estimating payday weeks

$$y_{ikt} - p_t^{SX} = w_{ikt} + h_{ikt} + v_{ikt} + p_{ikt} - p_t^{SX}$$

1. Limited set of potential payday schedules (S1-S22)

2. Each potential payday schedule has a known number of payday weeks in each quarter (p_t^{S1}-p_t^{S22})

⇒ For each worker, analyze all 22 potential payday schedules to identify the payday schedule that minimizes $Var(y_{ik} - p^{SX})$



Estimating payday weeks

$$y_{ikt} - p_t^{SX} = w_{ikt} + h_{ikt} + v_{ikt} + p_{ikt} - p_t^{SX}$$

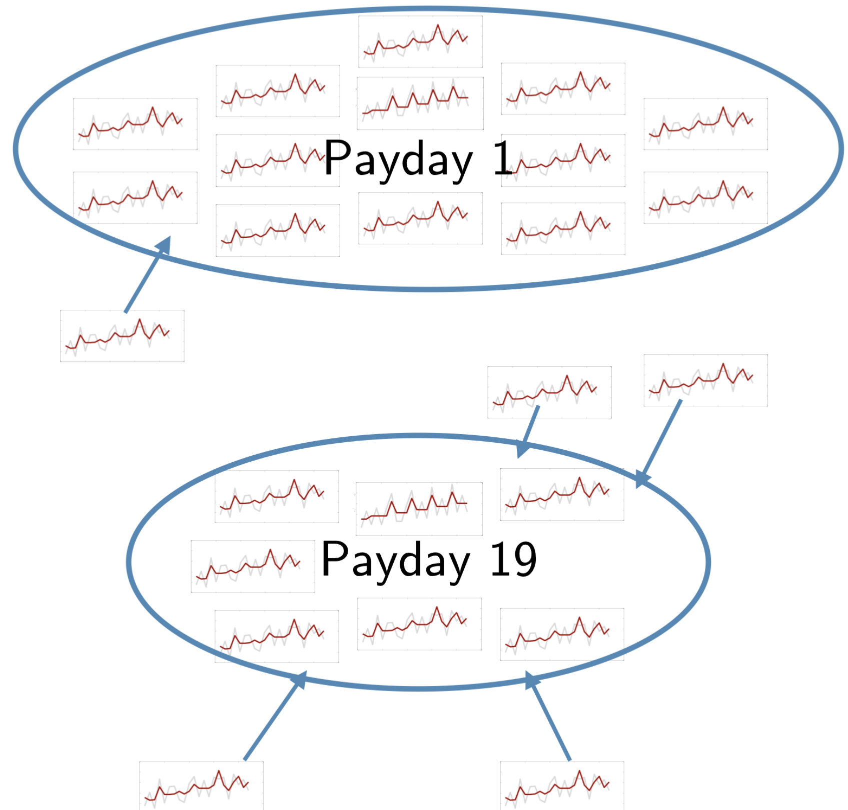
1. Limited set of potential payday schedules (S1-S22)

2. Each potential payday schedule has a known number of payday weeks in each quarter (p_t^{S1}-p_t^{S22})

⇒ For each worker, analyze all 22 potential payday schedules to identify the payday schedule that minimizes $Var(y_{ik} - p^{SX})$

3. A firm has a small number of payday schedules that are common to many workers

⇒ Clustering algorithm selects the payday(s) that minimizes this objective function for the most workers at the firm



Estimating persistent wage changes

$$\underbrace{y_{ikt} - \hat{p}_{ikt}}_{\tilde{y}_{ikt}} = w_{ikt} + \underbrace{h_{ikt} + v_{ikt} + p_{ikt} - \hat{p}_{ikt}}_{\epsilon_{ikt}}$$

Salaried Worker

Hourly Worker

y = log quarterly earnings
v = log variable comp

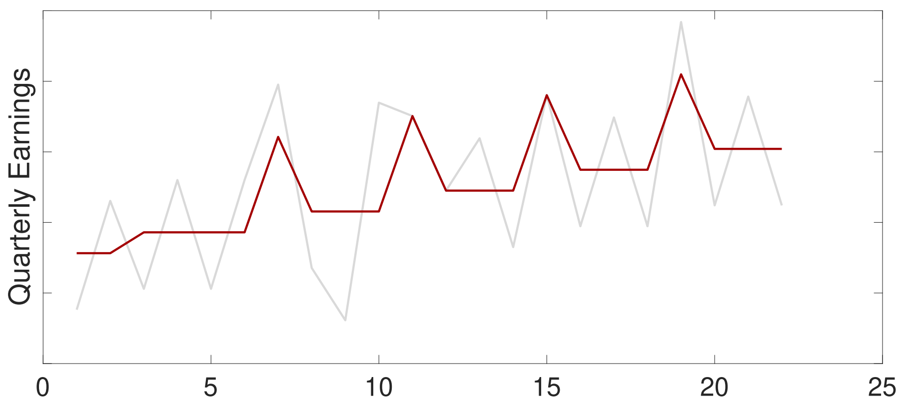
w_t = log wage in t
p = log payday weeks

h = log weekly hours worked
$\hat{p}$ = estimated log payday weeks

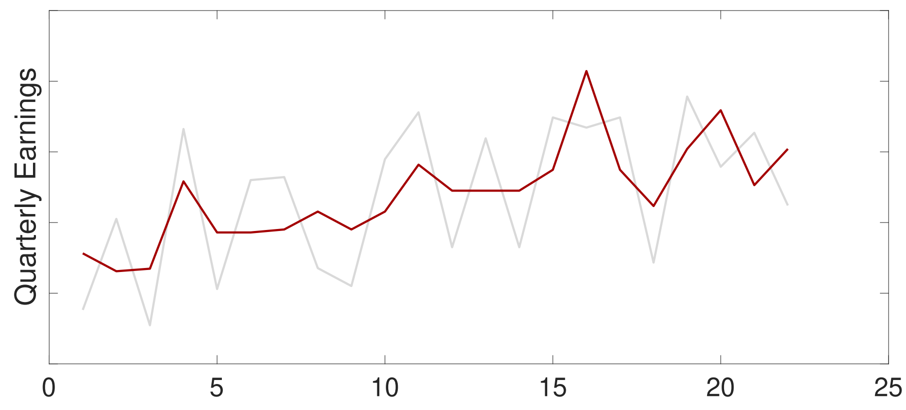
Estimating persistent wage changes

$$\tilde{y}_{ikt} = \underbrace{w_{ik1} + \sum_{s=2}^{t} \Delta^w_{iks}}_{w_{ikt}} + \epsilon_{ikt}$$

Salaried Worker



Hourly Worker



$\tilde{y}$ = payday-adjusted log earnings

ϵ = error: hours, variable comp

w_1 = log starting wage

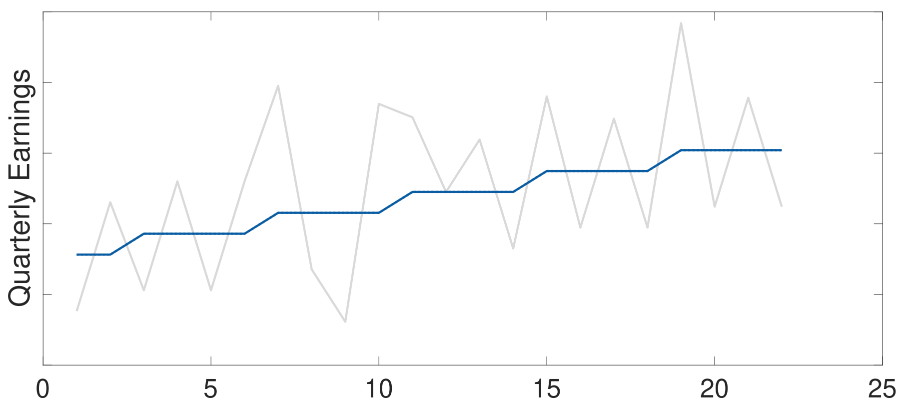
w_t = log wage in t

Δ^w_s = log wage change in s

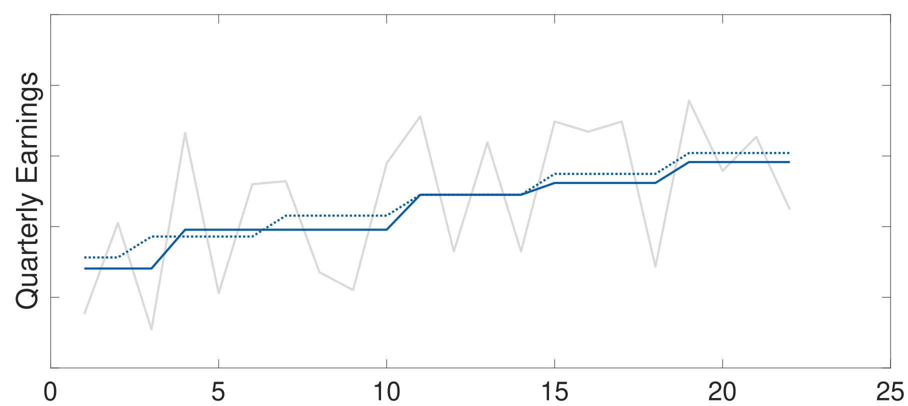
Estimating persistent wage changes

$$\tilde{y}_{ikt} = \underbrace{\beta^1_{ik}}_{w_{ik1}} d^1_{ikt} + \sum_{s=2}^{T} \underbrace{\beta^s_{ik}}_{\Delta^w_{iks}} d^s_{ikt} + \epsilon_{ikt}$$

Salaried Worker



Hourly Worker



Lasso estimation: $$\min_{\hat{\beta}^1_{ik},\ldots,\hat{\beta}^T_{ik}} \left(\sum_{t=1}^{T} \tilde{y}_{ikt} - \sum_{s=1}^{T} \hat{\beta}^s_{ik} d^s_{ikt} \right)^2 + \lambda_{ik} \left(\sum_{s=1}^{T} ||\hat{\beta}^s_{ik}|| \right)$$

$\tilde{y}$ = payday-adjusted log earnings

ϵ = error: hours, variable comp

$w_1 = \beta^1$ log starting wage

$d^s_{ikt} = 1$ if $s \leq t$

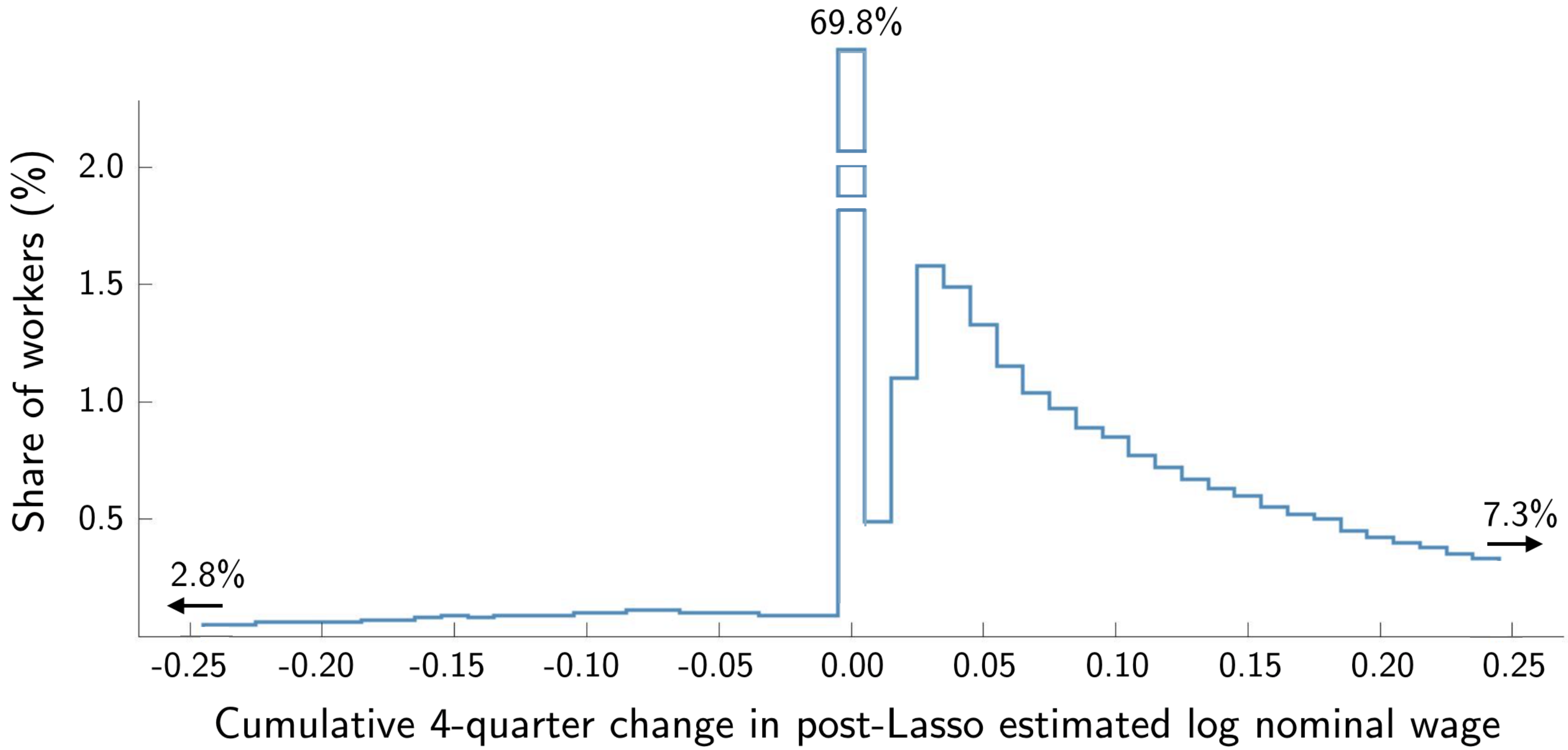
$\Delta^w_s = \beta^s$ log wage change in s

Comparison of QoQ nominal wage change measures

	Source Data	Raise	Freeze	Cut
Barattieri Basu Gottschalk (2014)	SIPP		78.4-84.8%	
Grigsby Hurst Yildirmaz (2019)	**ADP 50+**	**18.5%**	**80.6%**	**0.9%**
Persistent base wage (Payday Adjusted Post-Lasso Estimate)	**LEHD30**	**13.6%**	**84.9%**	**1.6%**

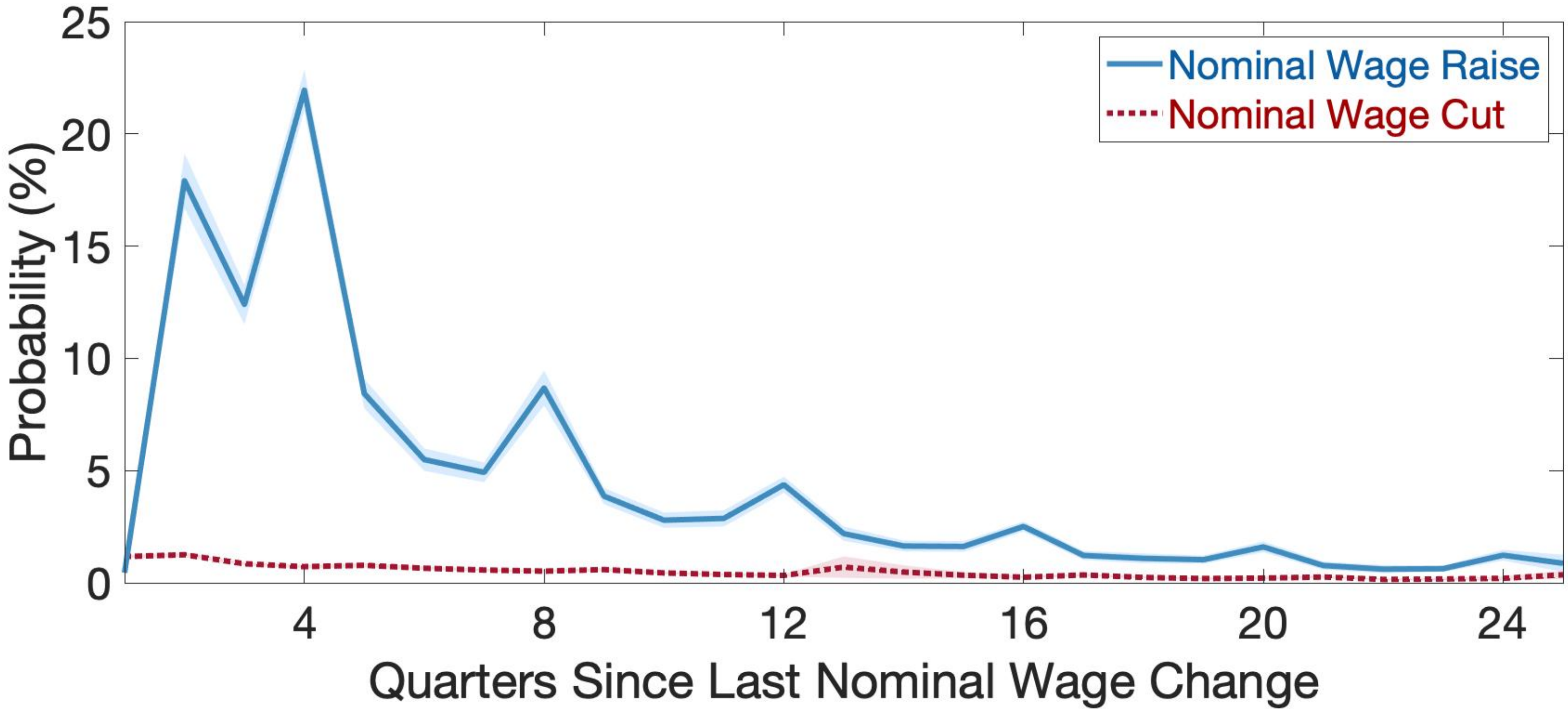
Evidence on Taylor- and Calvo-style Wage Adjustment

Nominal wages exhibit downward rigidity



Source: U.S. Census Bureau LEHD, 10% random sample of firms from 30 states between 1998:Q1 and 2017:Q1

Nominal wage change probability by wage spell duration



Probability of a nominal wage change in the persistent base wage given the wage spell age. Shaded areas correspond to 95% confidence intervals using robust standard errors clustered at the SEIN level.

Implications for macro modeling of wage adjustment

Evidence on Wage Adjustment Patterns

	Taylor-style Annual Staggering	Calvo-style Random Arrival
Nominal Cuts	None	**Strong**
Nominal Raises	**Strong**	Weak

- Consider models with **distinct wage adjustment regimes** if an optimal real wage change requires a nominal cut (Calvo) versus nominal raise (Taylor)
  - ⇒ State-dependent wage adjustment: the incidence of nominal wage cuts and nominal wage freezes rise during downturns
  - ⇒ Asymmetric persistence of positive versus negative shocks: persistence of shocks is higher in Calvo models

Thank you

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