

Why Do Union Jobs Pay More?

Evidence from Matched Employer-Employee Data

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Motivation

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- Limited work on this topic since Card (1996) and Lemieux (1998).
- But we still don't have a clear understanding of *why* unions raise wages.

Why an Union Pay Premium?

- Increasingly accepted view in labor economics: differences in productivity across firms “spill-over” into wages.

Van Reenen 1996; Card et al. 2018.

- How these differences map into wages identifies the extent of rent-sharing

Guiso et al. 2005; Kline et al. 2019; Lamadon et al. 2020.

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- So why a “union premium”?
 1. Firm Selection: Unions are present in highly productive firms where there is potentially a high surplus to be shared with workers.
 2. Rent-Extraction: Unions help extract a higher share from a given surplus.

Existing Evidence on Union Premium

- Panel data regressions based on workers switching b/w non-union/union job Card 1996; Lemieux 1998; Angrist and Newey 2012

- Akin to literature of industry wage premium.

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- Aggregating moves in either non-union / union sector misses within-union firms pay heterogeneity → bias estimates of union wage premiums.

Card-Rothstein-Yi, 2023

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 - “Locality” of the RD is crucial here...
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 - “Locality” of the RD is crucial here...
 - Frandsen (2021) finds evidence of manipulation in RDs based on union elections.
- Lee and Mas (2012): event-study of winning/losing elections → large effects on equity values of firms.
 - No direct evidence on wages + based on firm-level data.
 - Can only focus on recent unionization events. Freeman and Kleiner 1990; Baker et al. 2024

This Paper

- Universe of Canadian matched employer-employee tax records from the 2001-2019
 - Worker-level information on union status from tax files.
 - Financial records of firms.
- Use job transitions to infer average pay policies of firms via AKM framework.
- Union premium: → Difference in avg firm effect b/w union vs. non-union firms.
- Decompose union pay premium into:
 1. Firm Selection.
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- Decompose union pay premium into:
 1. Firm Selection.
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- Extension to AKM to capture unions' heterogeneous effects on pay across skill distribution.

Preview of the Findings

- Difference in firm effects b/w unionized and non-unionized workplaces: 15.5 log points.

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- Difference in firm effects b/w unionized and non-unionized workplaces: 15.5 log points.
 - Firm selection: 38%.
 - Rent extraction: 62%.
- Resulting ATT of unionization about 9.5 log points.
- Extending AKM model to allow for union-specific worker effect → ATT of ≈ 11.4 log points.

Unions in Canada

4 Unionization in Canada and the United States: A Tale of Two Countries

W. Craig Riddell

It was the best of times, it was the worst of times.
Charles Dickens, *A Tale of Two Cities*

“Similar but different” provides a succinct yet reasonably accurate summary of many dimensions of life in Canada and the United States. This description certainly applies to the role played by unions and collective bargaining in the two societies.

Unions in Canada

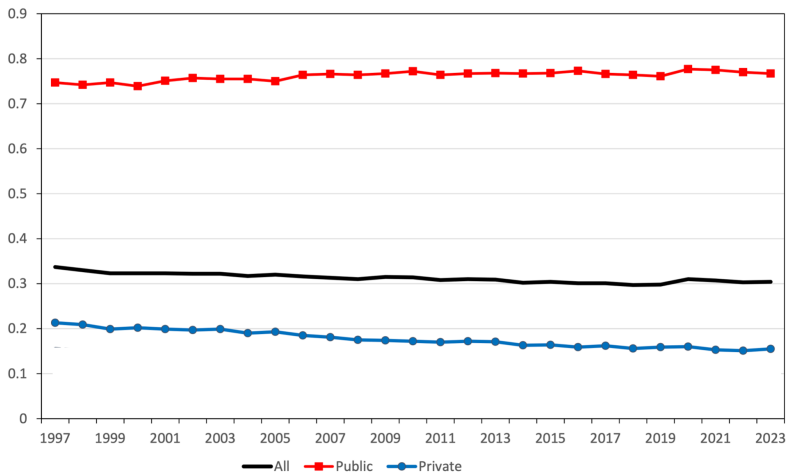
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- Collective bargaining is similar in Canada and the United States → firm-based system.
- “Wagner Act” type laws were adopted at the federal and provincial level during and shortly after WWII.
- An important difference is the 1946 Rand formula which stands in sharp contrast to U.S. Right-to-Work Laws.
- Under the Rand formula:
 - “Where a trade union so requests, employers have to deduct [union dues] from the wages of each employee in the unit affected by the collective agreement, whether or not the employee is a member of the union”
- Since unions always make such requests having information on union dues deduction is an excellent measure of collective bargaining coverage (and therefore of union coverage)

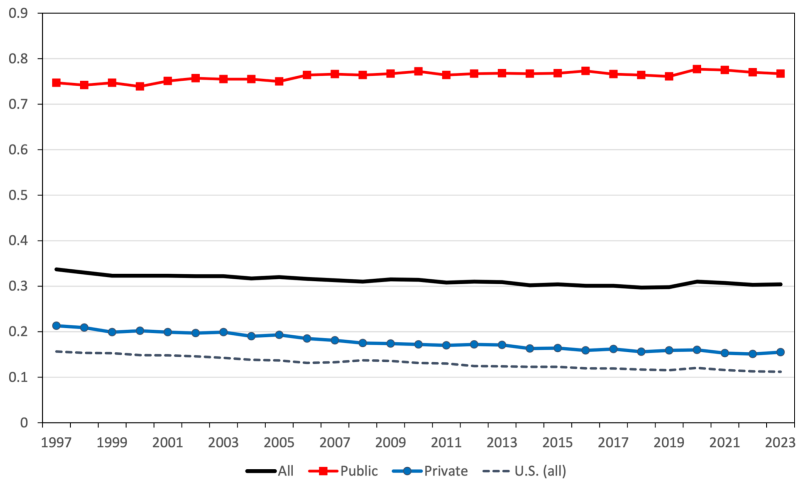
Union coverage (Canadian CPS)

Fraction of workers covered by a collective bargaining agreement



Adding U.S.A...

Fraction of workers covered by a collective bargaining agreement



- BEAM: universe of workers based on tax data 2001-2019.
- Earnings based on T4 tax slips (no hours).
- Employers are “tax units” and could be multi-establishments.
- Value added per worker from corporate tax filing.

Union Dues on Tax Slips

Canada Revenue Agency / Agence du revenu du Canada

T4 Statement of Remuneration Paid / État de la rémunération payée

Year / Année: _____

Employer's name - Nom de l'employeur: _____

Employer's account number / Numéro de compte de l'employeur: _____

Social insurance number / Numéro d'assurance sociale: _____

Province of employment / Province d'emploi: _____

Employee's name and address - Nom et adresse de l'employé:
 Last name (in capital letters) - Nom de famille (en lettres majuscules): _____
 First name - Prénom: _____
 Initial - Initiale: _____

Employment income - line 101 / Revenus d'emploi - ligne 101: 14

Income tax deducted - line 437 / Impôt sur le revenu retenu - ligne 437: 22

Employee's CPP contributions - line 308 / Cotisations de l'employé au RPC - ligne 308: 16

EI insurable earnings / Gains assurables d'AE: 24

Employee's OPP contributions - line 308 / Cotisations de l'employé au RRC - ligne 308: 17

CPP/QPP pensionable earnings / Gains ouvrant droit à pension - RPC/RRC: 26

Employee's EI premiums - line 312 / Cotisations de l'employé à l'AE - ligne 312: 18

Union dues - line 212 / Cotisations syndicales - ligne 212: 44

RPP contributions - line 207 / Cotisations à un RPA - ligne 207: 20

Charitable donations - line 349 / Dons de bienfaisance - ligne 349: 46

Pension adjustment - line 206 / Facteur d'équivalence - ligne 206: 52

RPP or DPSP registration number / N° d'agrément d'un RPA ou d'un RPOB: 50

Employee's PPIP premiums - see over / Cotisations de l'employé au RPAP - voir au verso: 55

PPIP insurable earnings / Gains assurables du RPAP: 56

Other information (see over): Box - Case, Amount - Montant

Autres renseignements: Box - Case, Amount - Montant

(14) Protected B when completed / Protégé B une fois rempli

- Box for union dues (withheld by the employer) on T4 slips.
- Appears on T4 because union dues are tax deductible.
- Union dues → collective bargaining agreement coverage → part of the worker's salary has been negotiated by a union.

Analysis Sample

- Sample period: 2001-2019.
- Earnings from the main job in a given year.
- Same sample restrictions as Dostie, Lee, Card and Parent (2023).
 - Trim earnings at the FTFY value of the minimum wage (about \$14k in 2012 dollars)
 - Age restricted to be: 25-59
- We will use the public sector to maximize connectivity when fitting AKM.
- Decomposition of union premium in the private sector w/ non-missing info on VA/L.

Estimating the Union Pay Premium

- Panel data regression from union premium lits of the 90's

Card 1996; Lemieux 1998

$$y_{it} = \alpha_i + \theta \text{Union}_{it} + x'_{it} \beta + r_{it} \quad (1)$$

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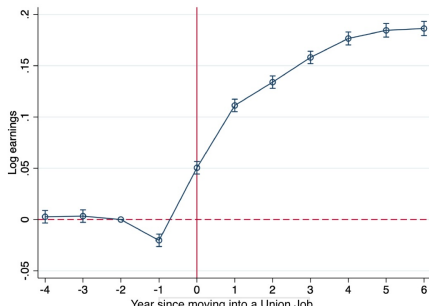
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$$y_{it} = \alpha_i + \lambda_{s(t),t} + \sum_{k=-6}^6 \beta_k \mathbf{1}\{t = t_i^* + k\} + \sum_{k=-6}^6 \theta_k (\mathbf{1}\{t = t_i^* + k\} \times \text{Union}_i) + r_{it}$$



Getting Nerdy

- Union switcher design might not identify the “Average Union Effect” if
 - Union effect is heterogeneous across firms.
 - Movers non-randomly selected with respect to the hierarchy components of their origin or destination firm.
 - Ex: movers tend to sort into “below-average” union firms.
 - Card-Rothstein-Yi (2023) make this point for industry-switchers design.

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- Solution → “ground up” procedure
 1. First estimate the returns of working for a given employer.
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- Solution → “ground up” procedure
 1. First estimate the returns of working for a given employer.
 2. Average these returns within unionized vs. non-unionized workplaces and take difference.
- Assess the “union-attribute” in driving variability in pay across firms and decompose it into

Abowd et al. 2012; Card, Cardoso, and Kline, 2016; Sorkin 2018; Bloom et al. 2018; Bassier, Dube, and Naidu, 2022;

- Productivity/Selection channel.
- Rent-Extraction channel.

Estimating Firms Pay Premiums

- Returns of working for firm j estimated via AKM

$$y_{it} = \underbrace{\alpha_j}_{\text{Portable Component}} + \underbrace{\psi_{j(i,t),u(i,t)}}_{\text{Pay Premium of Firm } j(i,t)} + \underbrace{x'_{it}\beta}_{\text{Yr Effs+Cubic in Age}} + \underbrace{r_{it}}_{\text{Match Effs + Drifts in Pay}} \quad (2)$$

- $j(i, t) \in [1, \dots, J]$ dominant employer of worker i in period t .
- $u(i, t) \in [U, NU, M] \rightarrow$ indicator of whether dominant job is:
 - $U \equiv$ unionized
 - $NU \equiv$ not unionized
 - $M \equiv$ not unionized but firm has some unionized workers.
- Today: focus on contrast b/w U and NU jobs.
- Variance components adjusted via leave-out procedure of Kline, Saggio and Solvsten (2020).
- We assume log additive structure of eq (2) + exogenous mobility \rightarrow later we are going to relax these assumptions (a bit).

About 20 Log Points Raw Gap in Earnings

Table 2: Variance Decomposition

	Unionized Job	Non-Unionized Job (in a Non-Union Firm)
Panel A: Summary Statistics on Leave-Out Connected Set		
Number of Workers	6,867,345	9,988,055
Number of Firms	74,940	1,058,685
Number of Person-Year Observations	57,178,420	72,029,255
Mean Log Earnings	10.95	10.76
Variance Log Earnings	0.24	0.36
Panel B: Variance Components		
Std of Firm Effects	0.16	0.20
Std of Person Effects	0.37	0.44
Correlation of Person, Firm Effects	0.18	0.32
Panel C: Share of Variance Explained by		
Var of Firm Effects	0.10	0.11
Var of Person Effects	0.58	0.53
Cov of Firm, Person Effects (2x)	0.09	0.16

Note: Column 1 refers to all jobs that are unionized (i.e. where the worker paid some union dues according to their T4). Column 2 refers to all jobs where the job is not unionized and the firm-level share of union jobs is equal to zero. Each column then reports the variance decomposition based on an AKM model where all variance components are weighted by the number of person-year observations present in the leave-out connected set defined by Kline-Saggio-Sølvsten (2020-KSS henceforth) and are bias-corrected for limited mobility biases using the leave-out approach of KSS.

Std in Firm Effects across unionized jobs → 16 Log Points

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Almost as high as the one found in the Non-Union Sector!

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Positive Sorting in non-Union Sector

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Correlation is about half in Unionized Jobs!

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Starting Point: \approx 20 Log Points Gap

Table 3: Decomposing The Union Pay Premium

	Unionized Jobs	Non-Unionized Jobs (at Non-Union Firm)	Difference
	[1]	[2]	[3]
Log Earnings	10.95	10.76	0.192

Shrinks to about 15 after controlling for age effects

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Log Earnings (Net of Year, Age Effects)	0.035	-0.113	0.148

Very little role in differences in average person effects!

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Person Effects	-0.072	-0.064	-0.008

All driven by differences in firm effects!

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15.5 log points difference \approx 80% of the total std of firm effects in Canada!

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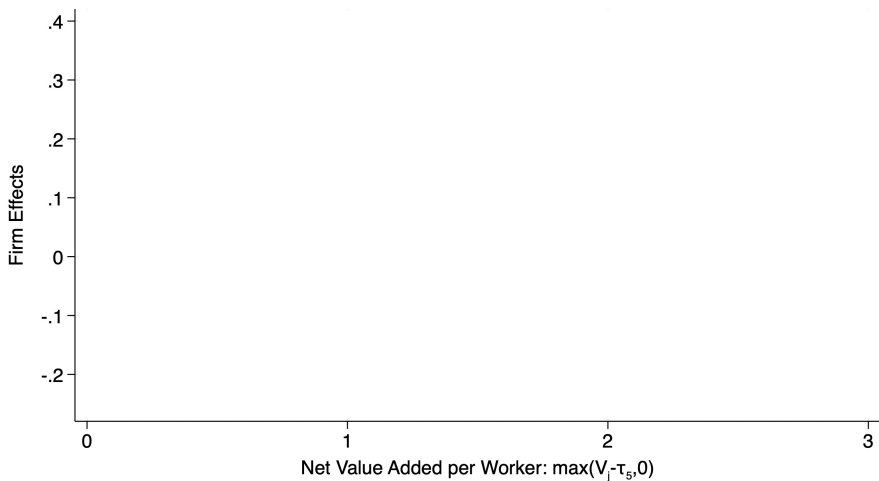
Do unionized firms pay more simply because they are more productive?

Benchmark with the Literature

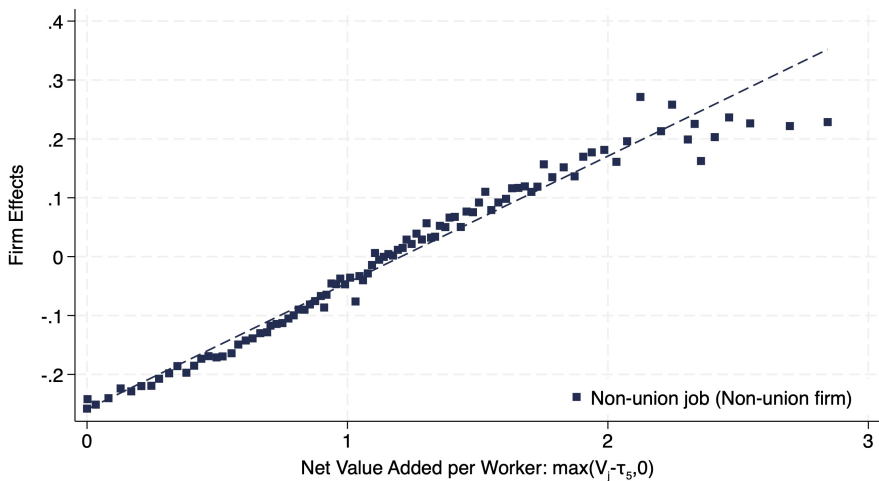
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Log Value Added per Worker	1.259	0.981	0.278

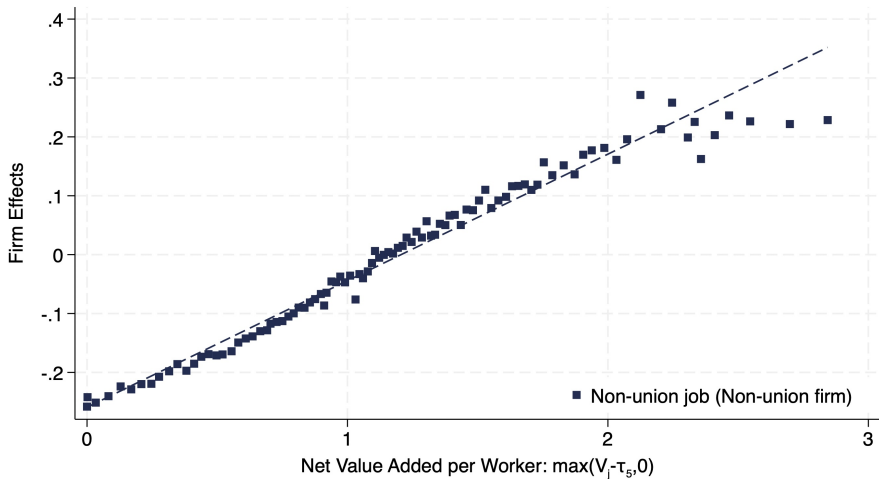
Plotting the relationship b/w Firm Premia and Productivity



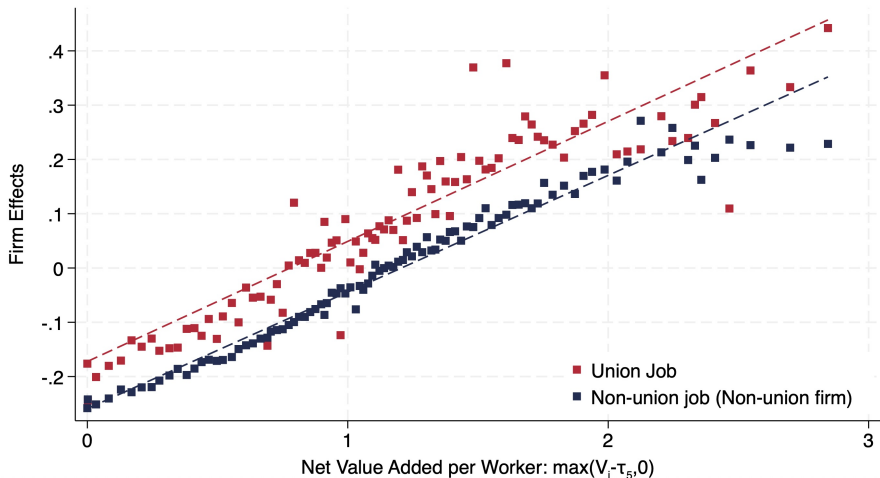
More Productive Firms Pay More (in Non-Union Jobs)...



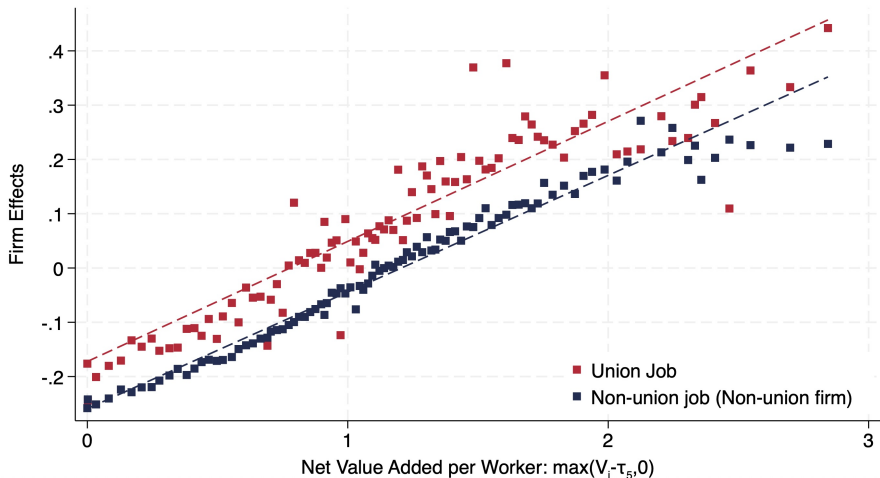
But what about Union Firms?



Firm effects in Unionized Job ≈ 9 log points higher almost uniformly across productivity distribution



Unionization status + VA/L + interaction explain 60% of the variability of firm effects



Assessing The Role of Firm-Selection...

- Consider the BLP of firms premia into observed log value added per worker estimated separately across U and NU workplaces

$$\psi_{j(i,t),u(i,t)} = \theta_{u(i,t)} + \pi_{u(i,t)} V_{j(i,t)} + \chi_{j(i,t),u(i,t)} \quad u(i,t) \in [U, NU] \quad (3)$$

- Oaxaca decomposition of the union pay premium:

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- Oaxaca decomposition of the union pay premium:

$$E[\psi_{j(i,t),u(i,t)}|u(i,t) = U] - E[\psi_{j(i,t),u(i,t)}|u(i,t) = NU] =$$

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- Oaxaca decomposition of the union pay premium:

$$E[\psi_{j(i,t),u(i,t)} | u(i,t) = U] - E[\psi_{j(i,t),u(i,t)} | u(i,t) = NU] = \underbrace{\theta_U - \theta_{NU}}_{\text{Rent Extraction (Intercepts)}}$$

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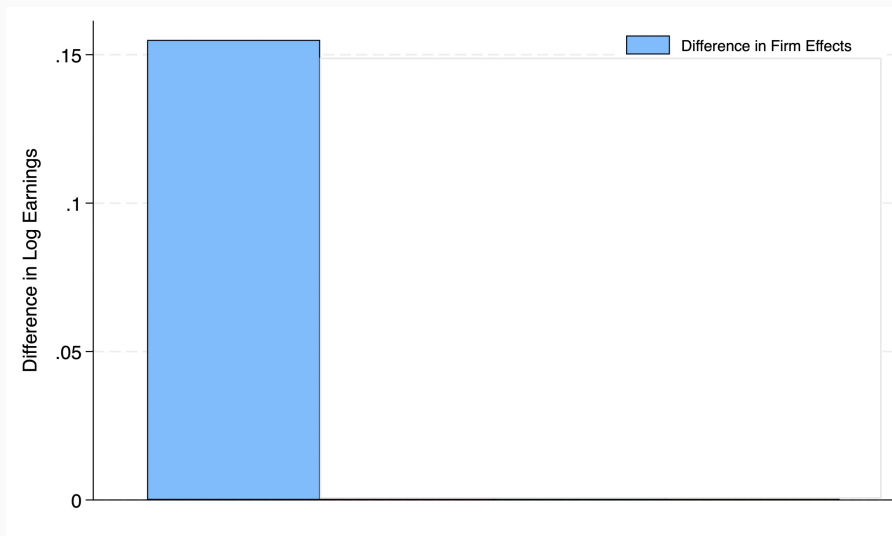
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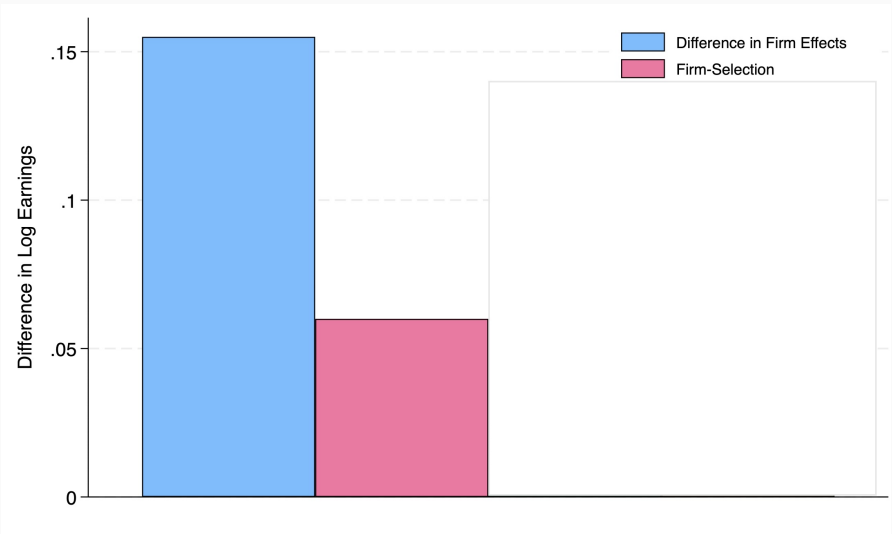
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(4)

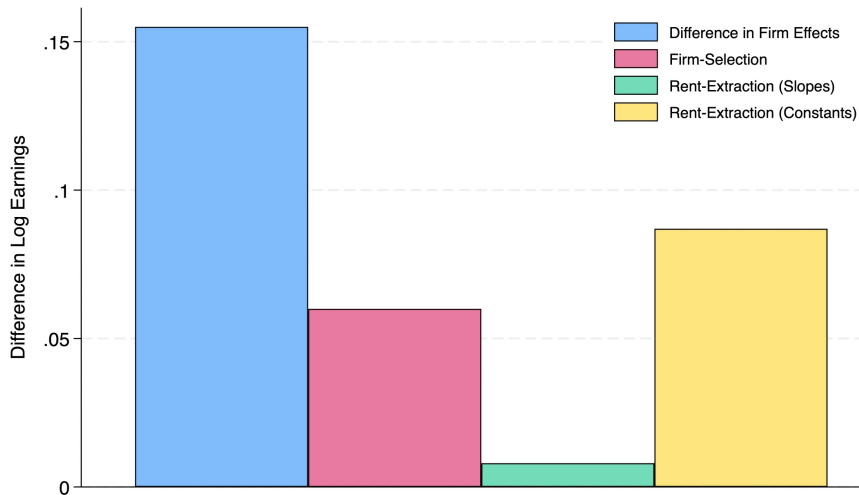
Gap in firm effects b/w unionized and non-unionized firms: 15.5 log points



38% of this gap explained by union firm having higher value added per worker



62% explained by rent-extraction channel



Computing the ATT

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- Key assumption: unions do not impact the “size of the pie”. Kuhn (1998); DiNardo and

Lee (2004); Sojourner et al. (2015); Hart and Sojourner (2015) and Dube et al. (2016); Barth et al., (2020);

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- Unions → institution that shrinks within-employer dispersion of pay.
- Next: extend AKM framework to allow selection on individual-specific returns of being covered by the union.

Going Beyond AKM

- Suppose a worker is endowed by a set of skills + bargaining proneness $z_i \in \mathcal{R}^P$.
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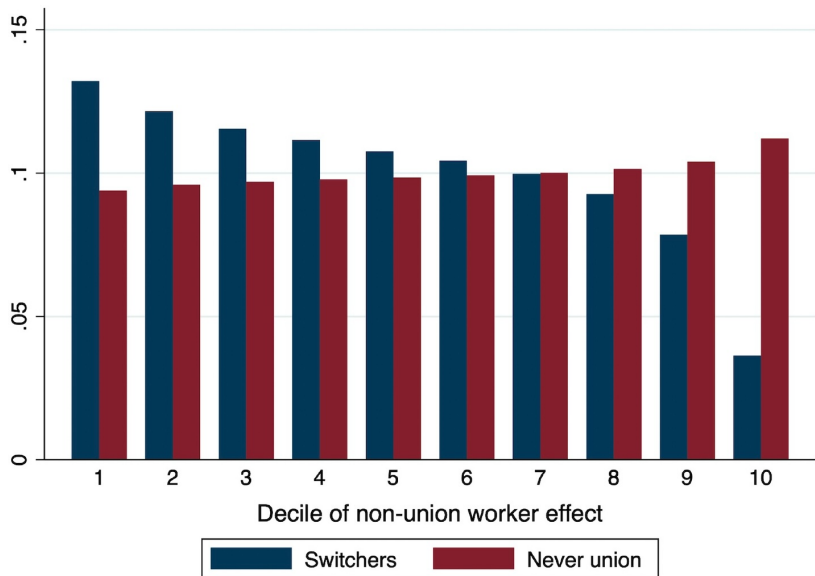
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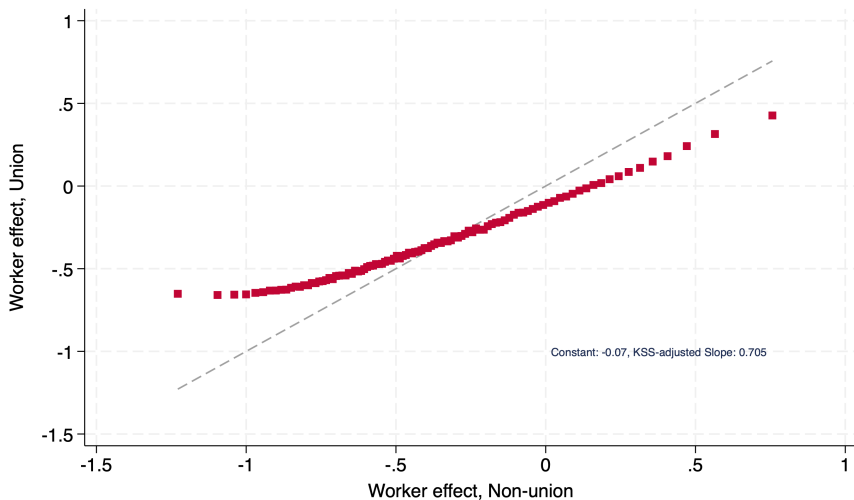
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- Δ_i is point-identified for *switchers* \rightarrow workers who moved in or out of a union job.

Switchers more likely to be “less skilled”



Unions appear to shrink non-union worker effects at the right and expand those at the left?



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 - First show the “Local” ATT (using switchers only).
 - Then use DFL tricks + CIA to impute $E[\eta_{i,NU}]$ among the non-switchers

$$E[\omega(X_i)\eta_i^{NU} | u(i, t) = U, S_i = 1] = E[\eta_i^{NU} | u(i, t) = U, S_i = 0] \quad (7)$$

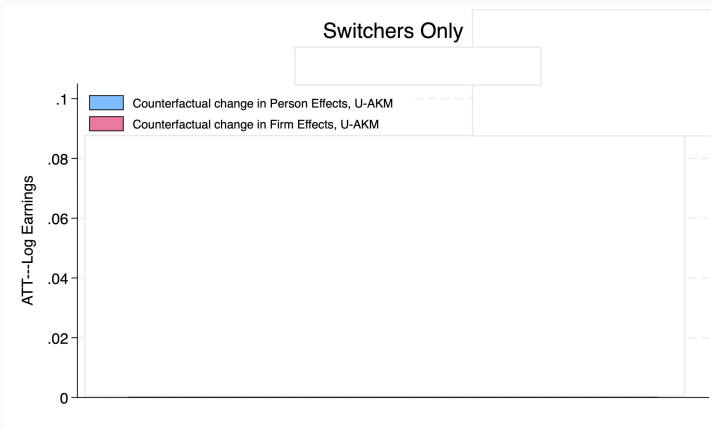
where $S_i = 1$ if worker i is a switcher.

Computing the ATT (among switchers)

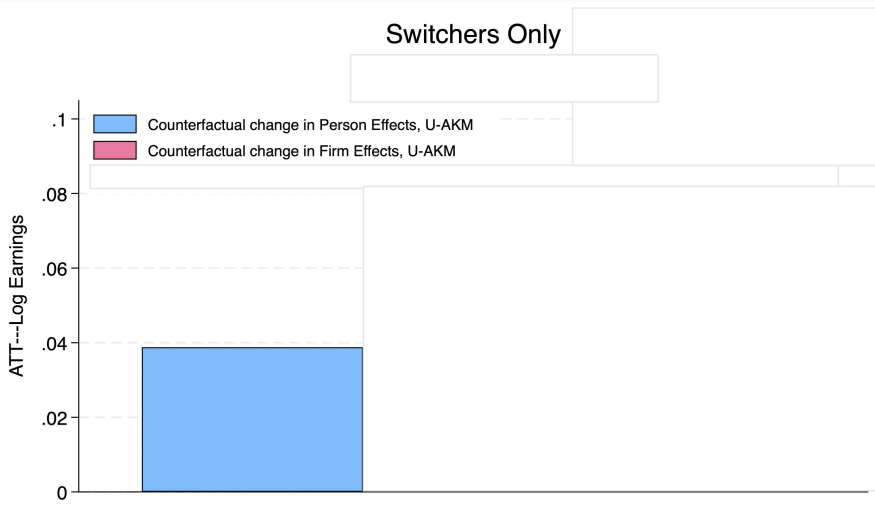
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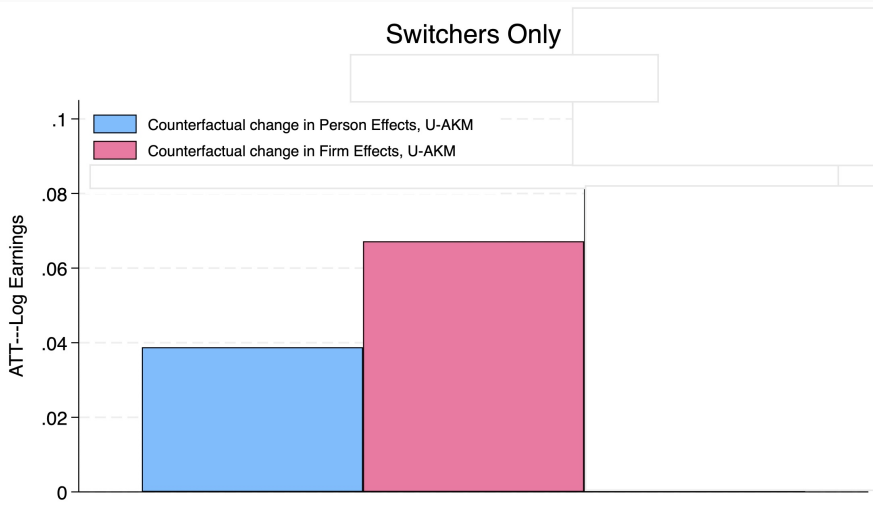
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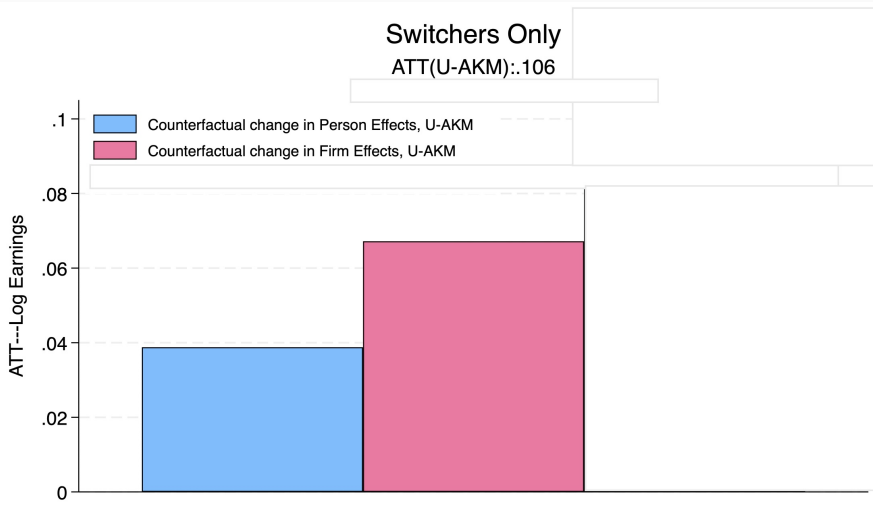
≈ 4 log points from changes in returns to skills



Another \uparrow of 6.5 log points from changes in rent-extraction



Leads to an ATT of 10.5 log points



U-AKM and AKM → similar estimates!

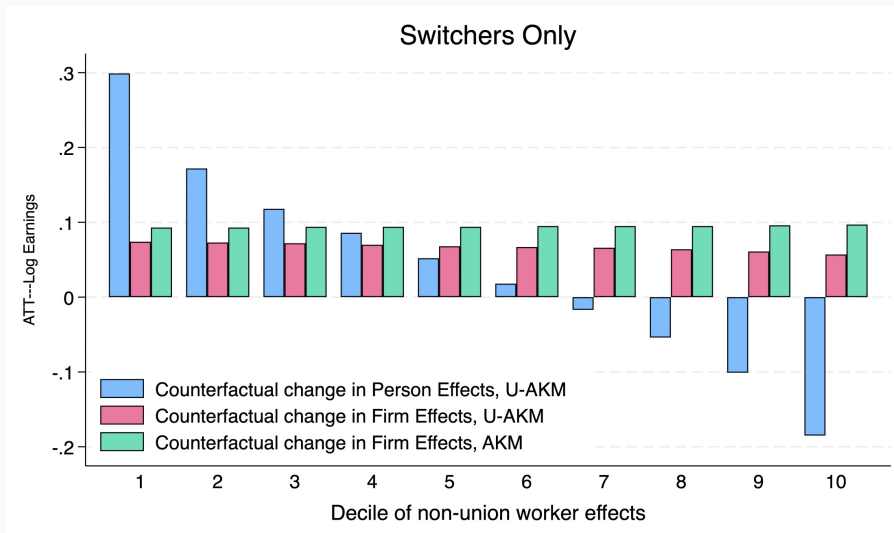
Switchers Only

ATT(U-AKM):.106

ATT(AKM):.095

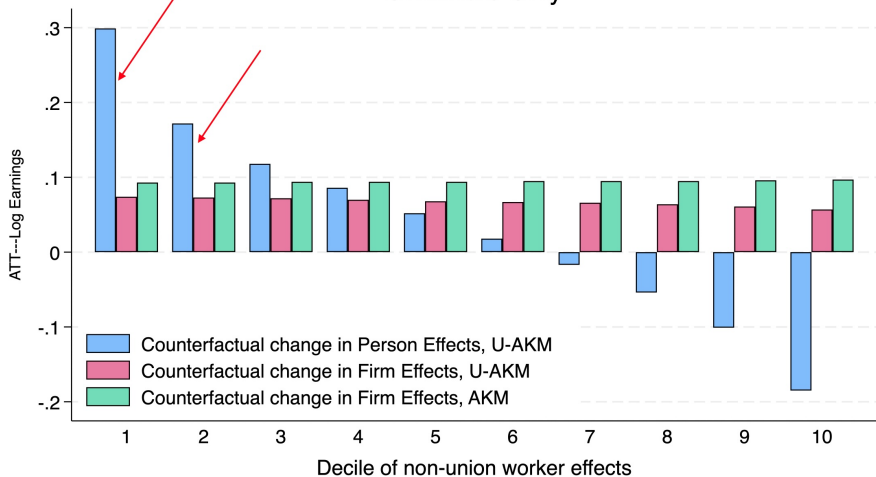


But with U-AKM we can assess heterogeneity!

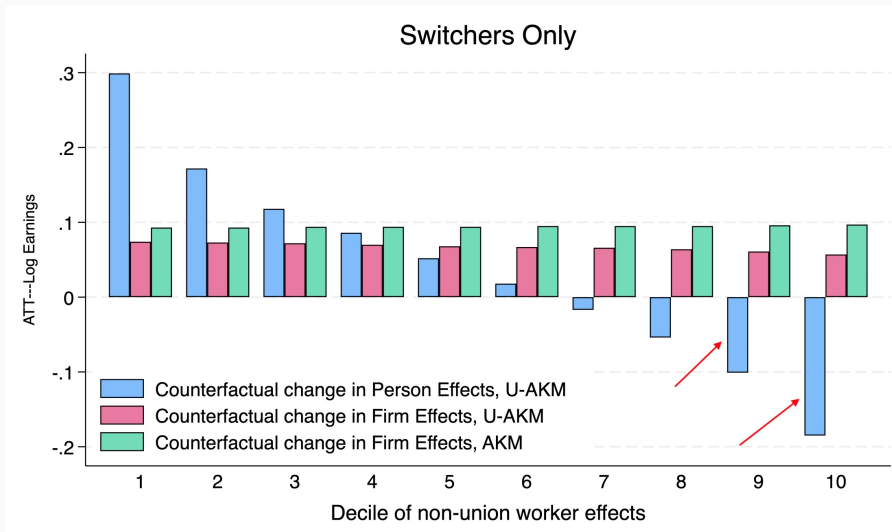


Larger returns among workers at the bottom of the skill distribution

Switchers Only

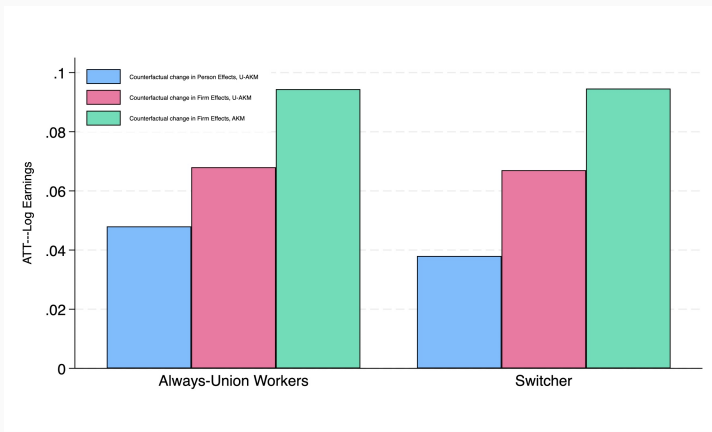


For workers on top 2 deciles → negative ATT!



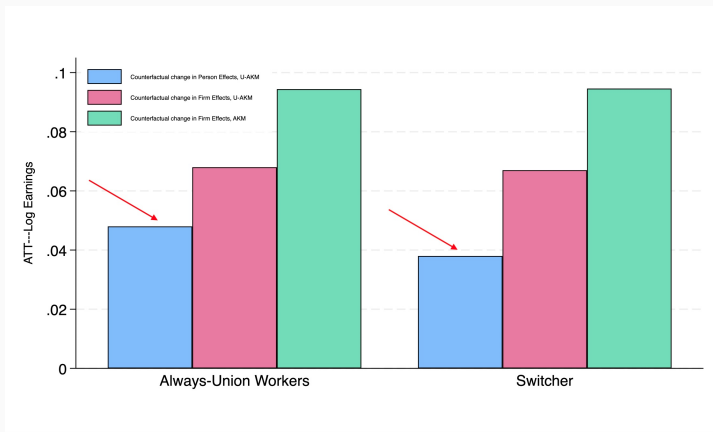
Getting ambitious: now imputing η_i^{NU} for always union workers

$$ATT = E [\eta_{i,NU} - \eta_{i,U} | u(i, t) = U] + E [\lambda_{j(i,t),NU} - \lambda_{j(i,t),U} | u(i, t) = U]$$



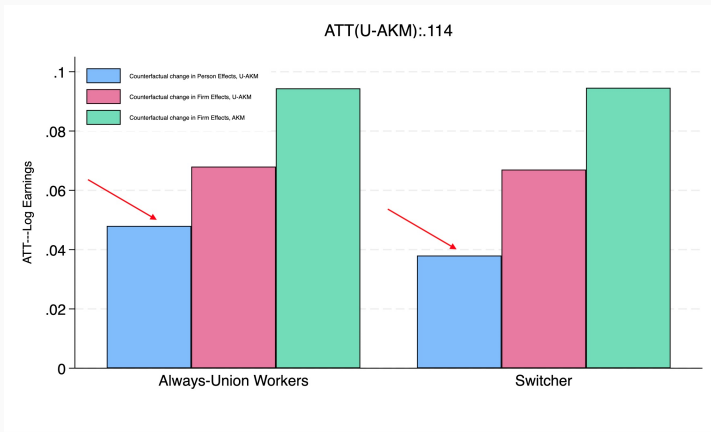
Returns on skills about 1 log point higher for always-union workers...

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ATT (when including the always unions) is 11.4 log points

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Conclusions

- Canada: unique laboratory to unpack the role of unions on pay
 - CBA coverage applies to non-union members.
 - Union coverage can be measured in MEE linked w/ balance data on firms.
- Differences in firm-productivity across union and non-union jobs explains 38% of the “union pay premium”.
- AKM spec suggests that ATT of unions \approx 9.5 log points in pay.
- Extension to AKM shows to capture selection on individual-specific gains/losses of being unionized
 - (local) ATT of \approx 10.6 log points (switchers only).
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Next: assess validity of overidentifying restrictions + reconcile AKM w/ event-study of unionization.

Thank you!

APPENDIX

Measurement Framework

- Assume $T = 2$. Ignore additional covariates (think of earnings being pre-adjusted for observed covariates such as time and age effects).
- Define $y_{it}(d_1, d_2)$ as the potential log earnings of individual i at time t if this worker was employed by employer d_1 in period 1 and was employed by employer d_2 in period 2.
- Important: “employer” indexes represent unique combination b/w firm ids and unionization status.
- Now we impose 4 assumptions under which mobility between firms returns the treatment effect of working for firm j .

Exclusion

- Assumption 1: Exclusion

$$y_{it}(d_1, d_2) = y_{it}(d_t) \quad (8)$$

- Interpretation: your pay today does not depend on the employer where you were yesterday.
- Violated in “sequential models” of the labor market (Postel-Vinay, Robin, 2002)
- Di Addario-Kline-Saggio-Sølvsten (2023) provide evidence that “origin” effects have basically no role in explaining wages (once controlling for worker/current employer effects).

- Assumption 2: Parallel Trends

$$E[y_{i2}(k) - y_{i1}(k) | j(i, 1) = k, j(i, 2) = \ell] = 0 \quad \forall \ell \neq k \quad (9)$$

- Interpretation: take all the movers that left employer k in period 2. Their earnings in period 2 would have been, on average, the same as the earnings observed in period 1 if they would have remained w/ employer k .
- Violated in “learning models” of the labor market Gibbons et al. (2005)

Stationarity of ATTs

- Assumption 3: Stationarity of ATTs

$$E[y_{i2}(\ell) - y_{i2}(k) | j(i, 1) = k, j(i, 2) = \ell] = E[y_{i1}(\ell) - y_{i1}(k) | j(i, 1) = k, j(i, 2) = \ell] \quad \forall \ell \neq k$$

- Interpretation: the average treatment effect (among the treated) of working for employer ℓ instead of employer k is the same regardless of whether one looks at period 1 or 2.
- Lachowska, Mas, Saggio, and Woodbury (2023) and Engbom, Moser, and Sauermann (2023) provide evidence that firm effects are quite stable over 5-6 years period.

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- Easy to assess this by estimating model over shorter time horizons.

No Selection on Gains

- Assumption 4: No Selection on Gains

$$D_{i2}, D_{i1} \perp y_{it}(\ell) - y_{it}(k) \quad \forall \ell \neq k \quad (10)$$

- Interpretation: a worker cannot select their employers (D_{i1}, D_{i2}) based on comparative advantage.
- As we are about to see, this assumption takes a very important meaning when estimating the average unions pay premium from firm effects.

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$$D_{i2}, D_{i1} \perp y_{it}(\ell) - y_{it}(k) \quad \forall \ell \neq k \quad (10)$$

- Interpretation: a worker cannot select their employers (D_{i1}, D_{i2}) based on comparative advantage.
- As we are about to see, this assumption takes a very important meaning when estimating the average unions pay premium from firm effects.
- Later we are going to relax this assumption.

Job Changes Identifies ATEs!

- Consider wage changes among job switchers

$$\begin{aligned} E[y_{i2} - y_{i1} | j(i, 2) = \ell, j(i, 1) = k] &= E[y_{i2}(\ell, k) - y_{i1}(\ell, k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i1}(k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i2}(k) + y_{i2}(k) - y_{i1}(k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i2}(k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i2}(k)] \\ &\equiv \psi_\ell - \psi_k \end{aligned}$$

- Thus wage changes among movers identify the ATE of working for firm ℓ relative to firm k .
- But why fitting AKM identifies ATEs? Note that realized wage changes can be written as

$$\begin{aligned} \Delta y_i &\equiv y_{i2} - y_{i1} = [y_{i2}(j(i, 2)) - y_{i1}(j(i, 1))] \\ &= \Delta D_i' \psi + \underbrace{(y_{i2}(j(i, 2)) - \psi_{j(i, 2)}) - (y_{i1}(j(i, 1)) - \psi_{j(i, 1)})}_{\text{Unobserved "Idiosyncratic" Treatment Effects Heterogeneity} \equiv \Delta r_i} \end{aligned} \tag{11}$$

- Fitting OLS on equation (11) identifies the ATEs of firms (up to a normalizing constant): $\{\psi_1, \psi_2, \dots, \psi_J\}$ under Assumptions 1-4.

Job Changes Identifies ATEs!

- Consider wage changes among job switchers

$$\begin{aligned} E[y_{i2} - y_{i1} | j(i, 2) = \ell, j(i, 1) = k] &= E[y_{i2}(\ell, k) - y_{i1}(\ell, k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i1}(k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i2}(k) + y_{i2}(k) - y_{i1}(k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i2}(k) | j(i, 2) = \ell, j(i, 1) = k] \\ &= E[y_{i2}(\ell) - y_{i2}(k)] \\ &\equiv \psi_\ell - \psi_k \end{aligned}$$

- Thus wage changes among movers identify the ATE of working for firm ℓ relative to firm k .
- But why fitting AKM identifies ATEs? Note that realized wage changes can be written as

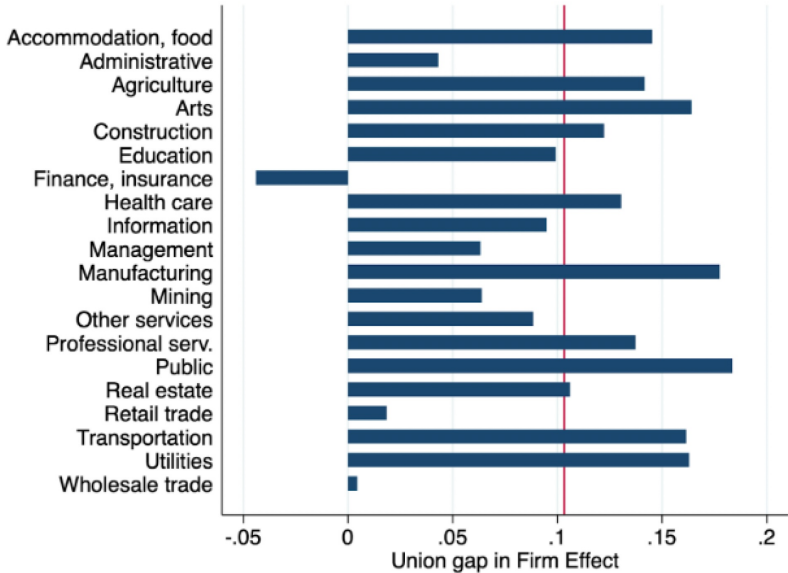
$$\begin{aligned} \Delta y_i &\equiv y_{i2} - y_{i1} = [y_{i2}(j(i, 2)) - y_{i1}(j(i, 1))] \\ &= \Delta D_i' \psi + \underbrace{(y_{i2}(j(i, 2)) - \psi_{j(i, 2)}) - (y_{i1}(j(i, 1)) - \psi_{j(i, 1)})}_{\text{Unobserved "Idiosyncratic" Treatment Effects Heterogeneity} \equiv \Delta r_i} \end{aligned} \quad (11)$$

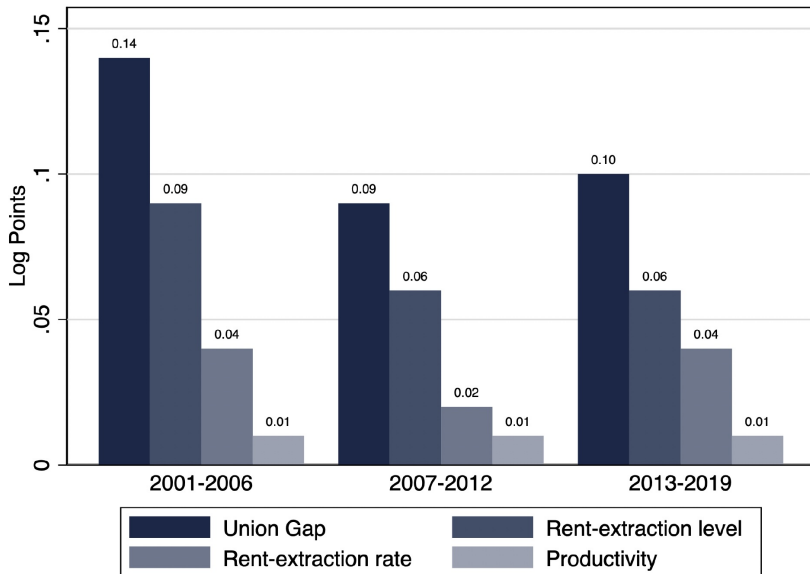
- Fitting OLS on equation (11) identifies the ATEs of firms (up to a normalizing constant): $\{\psi_1, \psi_2, \dots, \psi_J\}$ under Assumptions 1-4.
- OLS in first differences = OLS in levels w/ worker fixed effects (i.e. AKM) when $T = 2$.

$$y_{it} = \alpha_i + \psi_{j(i,t)} + r_{it} \quad (12)$$

Appendix Table 3: Decomposing The Union Pay Premium with Industry Controls

	Unionized Jobs	Non-Unionized Jobs (at Non-Union Firm)	Difference
	[1]	[2]	[3]
Avg Log Earnings (Residualized)	0.04	-0.11	0.15
Avg Person Effects	-0.07	-0.06	-0.01
Avg Firm Effects	0.16	0.06	0.10
Avg Log Value Added per Worker	1.35	1.18	0.16
<u>Regression of Firm Effects on Observables</u>			
Constant Coefficient	-0.08 (0.00)	-0.16 (0.00)	0.08 (0.00)
Rent-Sharing Coefficient	0.18 (0.00)	0.19 (0.00)	-0.01 (0.00)
<u>Oaxaca Decomposition</u>			
Rent-Sharing Rate Component	0.24	0.25	-0.01
Productivity Component	0.25	0.22	0.03





AKM relies on 3 assumptions

- Origin effects do not matter
(Postel-Vinay Robin, 2002; Di Addario-Kline-Saggio-Sølvsten, 2023)

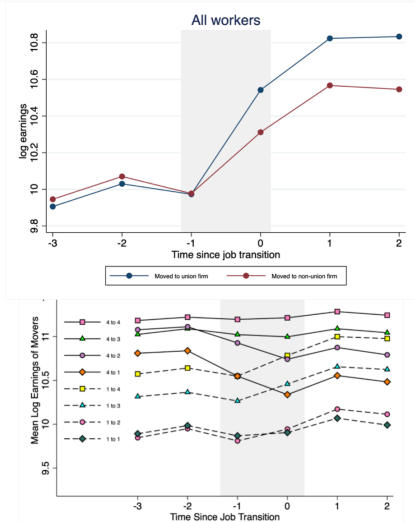
Table 5
DWL variance decomposition of hiring wages among job movers.

	Pooled	Men	Women
Std Dev of log hiring wages	0.5286	0.4706	0.5623
Mean $\lambda_{ji,(m-1)}$ among displaced workers	0.0414	0.0536	0.0687
Mean $\lambda_{ji,(m-1)}$ among poached workers	0.0508	0.0543	0.0690
Origin effect when hired from non-employment (λ_{ij})	0.0163	0.0136	0.0220
Bias-Corrected variance components			
Std Dev of worker effects	0.2823	0.2479	0.2798
Std Dev of destination firm effects	0.2580	0.2434	0.2828
Std Dev of origin effects	0.0439	0.0454	0.0431
Std Dev of origin effects (among poached workers)	0.0761	0.0782	0.0798
Correlation of worker, destination firm effects	0.3157	0.2351	0.3441
Correlation of worker, origin effects	0.1200	0.1629	0.0757
Correlation of destination firm, origin effects	0.0316	0.0308	0.0000
Percent of Total Variance Explained by			
Worker effects	28.52%	27.75%	24.77%
Destination firm effects	23.81%	26.74%	25.29%
Origin effects	0.69%	0.93%	0.59%
Covariance of worker, destination	16.46%	12.81%	17.23%
Covariance of worker, origin	1.06%	1.66%	0.58%
Covariance of destination, origin	0.26%	0.31%	0.00%
X ² and associated covariances	1.66%	3.51%	0.09%
Residual	27.55%	26.30%	31.46%

Note: This table reports a DWL variance decomposition using the person-job observations described in Table 1b. The top panel reports the average of the origin effects for individuals that were poached as well as the estimated origin effect when hired from non-employment. All origin effects are normalized relative to λ_{ij} which we set to zero, within each sample. Variance components are estimated using the bias correction of Kline et al. (2020) via leaving a worker-firm match out. Model includes controls for a cubic in age at hiring and year of hiring fixed effects.

AKM relies on 3 assumptions

- **Origin effects do not matter**
(Postel-Vinay Robin, 2002; Di Addario-Kline-Saggio-Sølvsten, 2023)
- **“Parallel Trends”**
(Gibbons et al. 2005)



AKM relies on 3 assumptions

- **Origin effects do not matter**

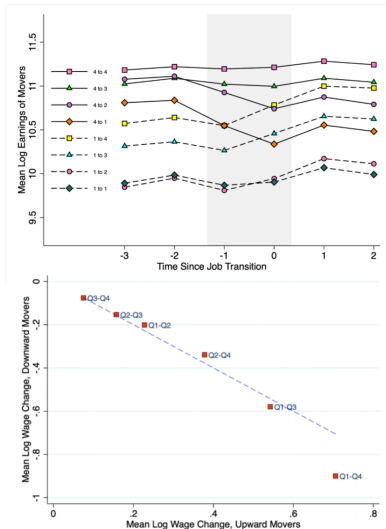
(Postel-Vinay Robin, 2002; Di Addario-Kline-Saggio-Sølvsten, 2023)

- **“Parallel Trends”**

(Gibbons et al. 2005)

- **No Selection on Gains**

(Roy, 1951; Card-Heining-Kline, 2013)



Union Coverage in BEAM

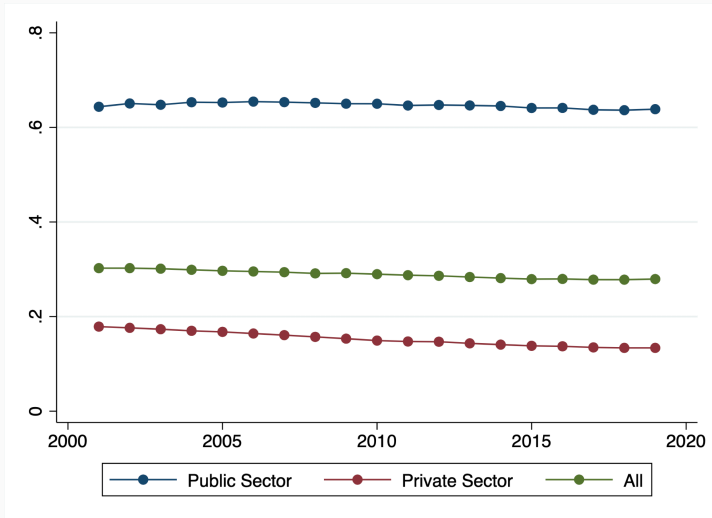


Table 1: Summary

	Initial Sample	
	Union	Non-Union
	[1]	[2]
<u>Panel A: Sample Characteristics</u>		
Number of Workers	9,405,235	21,026,630
Number of Firms	118,165	2,857,010
Number of Person-Year Observations	71,791,455	174,723,745
Earnings	59,149 (33,006)	51,832 (44,690)
Log Earnings	10.75 (0.87)	10.36 (1.28)
Age	42.7 (9.7)	41.1 (9.9)
Women	0.53	0.47

Table 1: Summary

	<u>Initial Sample</u>		<u>Trimming at 14K</u>		<u>Non-Missing Info on VA/L + No Public</u>	
	Union	Non-Union	Union	Non-Union	Union	Non-Union
	[1]	[2]	[3]	[4]	[5]	[6]
<u>Panel B: Industry composition</u>						
Agriculture, forestry	0.002	0.021	0.002	0.018	0.005	0.020
Mining	0.008	0.017	0.008	0.020	0.023	0.024
Utilities	0.019	0.004	0.020	0.004	0.049	0.005
Construction	0.042	0.074	0.042	0.078	0.118	0.091
Manufacturing	0.111	0.134	0.112	0.147	0.318	0.181
Wholesale trade	0.013	0.067	0.012	0.073	0.035	0.090
Retail trade	0.039	0.114	0.034	0.107	0.083	0.128
Transportation	0.055	0.041	0.056	0.043	0.155	0.050
Information and cultural ind	0.019	0.025	0.020	0.028	0.056	0.034
Finance and insurance	0.007	0.060	0.007	0.069	0.015	0.077
Real estate	0.005	0.020	0.004	0.020	0.009	0.022
Professional services	0.007	0.080	0.007	0.087	0.017	0.094
Management of companies	0.002	0.007	0.002	0.008	0.006	0.009
Administrative and support	0.021	0.063	0.018	0.053	0.049	0.060
Educational services	0.210	0.025	0.203	0.020	0.000	0.000
Health care	0.166	0.067	0.167	0.067	0.000	0.000
Arts, entertainment	0.007	0.014	0.006	0.012	0.012	0.013
Accommodation food services	0.013	0.068	0.011	0.051	0.028	0.059
Other services (except public)	0.012	0.050	0.012	0.047	0.021	0.042
Public administration	0.243	0.040	0.254	0.040	0.000	0.000

Firm selection explains about 38% of the difference in firm effects

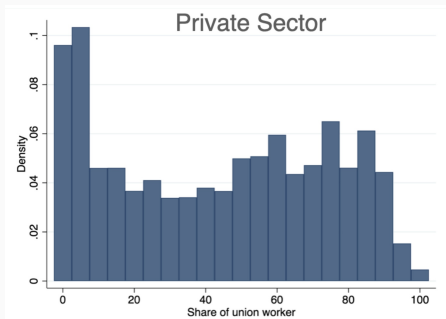
Table 3: Decomposing The Union Pay Premium

	Unionized Jobs	Non-Unionized Jobs (at Non-Union Firm)	Difference
	[1]	[2]	[3]
Log Earnings	10.95	10.76	0.192
Log Earnings (Net of Year, Age Effects)	0.035	-0.113	0.148
Person Effects	-0.072	-0.064	-0.008
Firm Effects	0.106	-0.048	0.155
Log Value Added per Worker	1.259	0.981	0.278
<u>Regression of Firm Effects on Log Value Added per Worker</u>			
Constant	-0.172	-0.259	0.087
	(0.00)	(0.00)	(0.00)
Slope	0.221	0.215	0.006
	(0.00)	(0.00)	(0.00)
<u>Oaxaca Decomposition</u>			
Rent-Extraction (Levels)	-0.172	-0.259	0.087
Rent-Extraction (Rate)	0.279	0.271	0.008
Firm-Selection	0.271	0.211	0.060

Table 4: Spillovers on Non-Union Workers

	<u>Panel (a): Union jobs in Union Firms vs. Non-Union Jobs in Union Firms</u>			<u>Panel (b): Non-Union jobs in Union Firms vs. Non-Union Jobs in Union Firms</u>		
	Union Job (at Union Firm)	Non Union Job (at Union Firm)	Difference	Non Union Job (at Union Firm)	Non Union Job (at Non-Union Firm)	Difference
	[1]	[2]	[3]	[4]	[5]	[6]
Avg Log Earnings (Residualized)	0.04	0.11	-0.08	0.11	-0.11	0.22
Avg Person Effects	-0.07	0.04	-0.11	0.04	-0.06	0.10
Avg Firm Effects	0.11	0.08	0.03	0.08	-0.05	0.12
Avg Log Value Added per Worker	1.26	1.41	-0.15	1.41	0.98	0.43
<u>Regression of Firm Effects on Log Value Added Per Worker</u>						
Constant	-0.17	-0.17	0.00	-0.17	-0.26	0.09
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Slope	0.22	0.17	0.05	0.17	0.22	-0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
<u>Oaxaca Decomposition</u>						
Rent-Extraction (Levels)	-0.17	-0.17	0.00	-0.17	-0.26	0.09
Rent-Extraction (Rate)	0.28	0.22	0.06	0.25	0.30	-0.06
Firm-Selection	0.22	0.25	-0.03	0.30	0.21	0.09

Within-Firm Unionization Rates



- Why not 100%?
 - Management is not unionized.
 - Temp/PT workers might not be unionized.
 - Only some establishments may be unionized in multi-establishment firms.

Young 2023

Table 4: Spillovers on Non-Union Workers

	<u>Panel (a): Union jobs in Union Firms vs. Non-Union Jobs in Union Firms</u>			<u>Panel (b): Non-Union jobs in Union Firms vs. Non-Union Jobs in Union Firms</u>		
	Union Job (at Union Firm)	Non Union Job (at Union Firm)	Difference	Non Union Job (at Union Firm)	Non Union Job (at Non-Union Firm)	Difference
	[1]	[2]	[3]	[4]	[5]	[6]
Avg Log Earnings (Residualized)	0.04	0.11	-0.08	0.11	-0.11	0.22
Avg Person Effects	-0.07	0.04	-0.11	0.04	-0.06	0.10
Avg Firm Effects	0.11	0.08	0.03	0.08	-0.05	0.12
Avg Log Value Added per Worker	1.26	1.41	-0.15	1.41	0.98	0.43
<u>Regression of Firm Effects on Log Value Added Per Worker</u>						
Constant	-0.17	-0.17	0.00	-0.17	-0.26	0.09
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Slope	0.22	0.17	0.05	0.17	0.22	-0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
<u>Oaxaca Decomposition</u>						
Rent-Extraction (Levels)	-0.17	-0.17	0.00	-0.17	-0.26	0.09
Rent-Extraction (Rate)	0.28	0.22	0.06	0.25	0.30	-0.06
Firm-Selection	0.22	0.25	-0.03	0.30	0.21	0.09

Propensity Score Reweighting

- Let U_i be a dummy equal to 1 if the worker at some point at a union job in their career.
- Let S_i be a dummy equal to 1 if the worker is a switcher, i.e. someone who in their career had both a union and a non-union job.
- In the S-AKM model, $\eta_{i,NU}$ is not observed among non-switchers unionized workers.
- We reweight the distribution of switchers to match that of non-switchers so that

$$E[\omega(X_i)\eta_{i,NU}|U_i = 1, S_i = 1] = E[\eta_{i,NU}|U_i = 1, S_i = 0] \quad (13)$$

where $\omega(X_i) = \frac{1 - e(X_i)}{e(X_i)} \frac{\Pr(S_i = 1|U_i = U)}{\Pr(S_i = 0|U_i = U)}$ and $e(X_i) = \Pr(S_i = 1|X_i, U_i = 1)$

- Propensity score of being a switcher use information on worker-level information on VA/L, log firm size, (dominant) sector of worker i (all computed as averages while being in the union sector) gender, age at entry, birth cohort, estimated separately for deciles of $\eta_{i,U}$.
- Equality in equation (13) holds under a CIA/exogenous mobility assumption.

Variance Decomposition SAKM

Table: Variance Decomposition from SAKM specification

Panel A: Summary Statistics on Leave-Out Connected Set

Number of Workers
Number of Firms
Number of Person-Year Observations
Number of Switchers

Mean Log Earnings
Variance Log Earnings

Panel B: Variance Components

Std of Firm Effects	0.21
Std of Person Effects	0.39
Correlation of Person, Firm Effects	0.30

Panel C: Mean and Std of Person Effects for Switchers

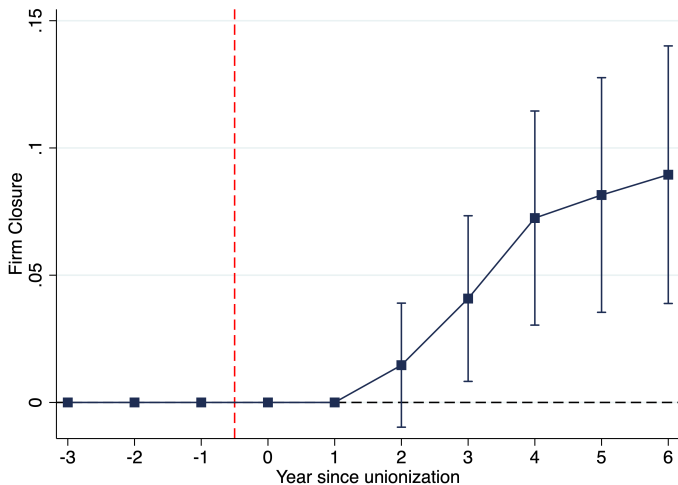
Average of Person Effects while on Union	-0.3
Average of Person Effects while on Non-Union	-0.34
Std of Person Effects while on Union	0.35
Std of Person Effects while on Non-Union	0.36

Rent-Sharing Estimates based on Firm Effects from SAKM

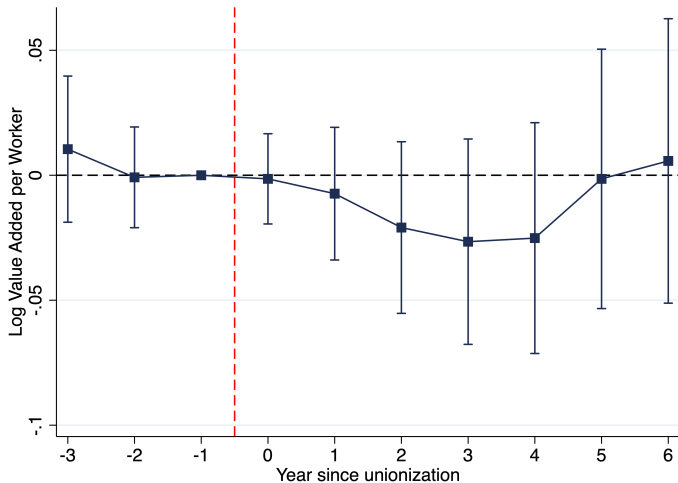
Table: Decomposing The Union Wage Premia using S-AKM

	Unionized Jobs (with avg unionization rate of at least 10%)	Non-Unionized Jobs (with avg unionization rate = 0%)	Difference
	[1]	[2]	[3]
Avg Log Earnings (Residualized)	0.036	-0.089	0.125
Avg Person Effects	-0.252	-0.258	0.006
Avg Firm Effects	0.289	0.169	0.12
Avg Log Value Added per Worker	1.305	1.074	0.231
Regression of Firm Effects on Observables			
Constant Coefficient	0.025 (0.00)	-0.081 (0.00)	0.106 (0.00)
Rent-Sharing Coefficient	0.202	0.233	-0.031

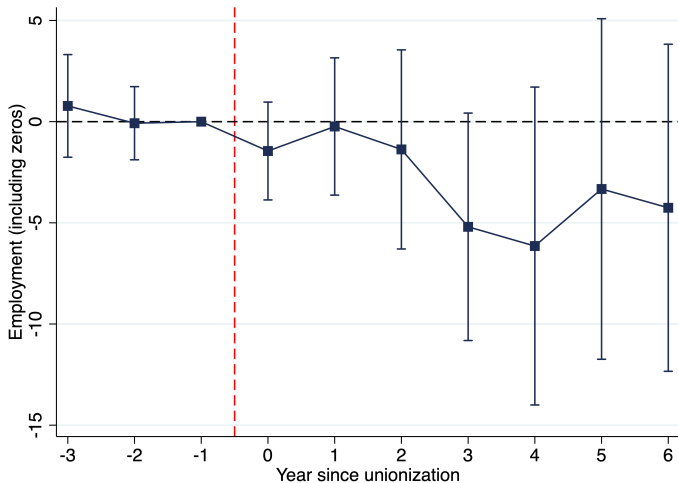
Event-study of unionization at the firm level



Event-study of unionization at the firm level



Event-study of unionization at the firm level



Estimates of Union Pay Premium

