Collusion Among Employers in India

Garima Sharma

December, 2025

Motivation

"We rarely hear, it has been said, of the combinations of masters... But whoever imagines, upon this account, that masters rarely combine, is as ignorant of the world as of the subject. Masters are everywhere in a tacit agreement not to raise the wages of labour above its value."
- Adam Smith (1776)

Motivation

"We rarely hear, it has been said, of the combinations of masters... But whoever imagines, upon this account, that masters rarely combine, is as ignorant of the world as of the subject. Masters are everywhere in a tacit agreement not to raise the wages of labour above its value."
- Adam Smith (1776)

- Yet, very little empirical evidence of employer collusion
- Policy: Role for anti-trust in the labor market

Context: Textile and Clothing Manufacturing Industry in India

90 million workers in developing countries, 6 million in India (ILO 2018)

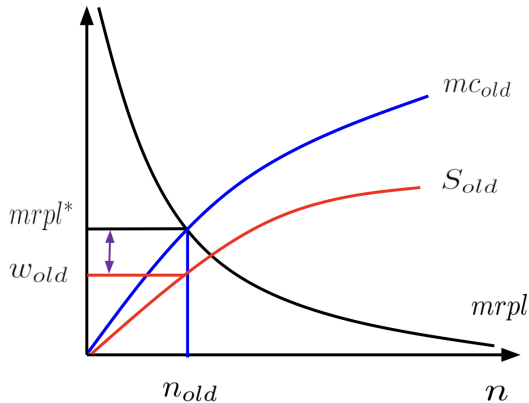
This Paper: Theory

Key empirical challenge: Hard to distinguish from perfect or imperfect competition

This Paper: Theory

- **New test**: oligopsony/monopsony vs. breakdown of collusion

Oligopsony/monopsony



This Paper: Theory

- **New test**: oligopsony/monopsony vs. breakdown of collusion

  Spillovers from firm-specific demand shocks predict opposite employment effects at unshocked competitors

  - Oligopsony: $\uparrow w$, $\downarrow n$
  - Collusion (breakdown): $\uparrow w$, $\uparrow n$
  - General labor supply, production structures

This Paper: Theory

- **New test**: oligopsony/monopsony vs. breakdown of collusion

  Spillovers from firm-specific demand shocks predict opposite employment effects at unshocked competitors

  - Oligopsony: $\uparrow w$, $\downarrow n$
  - Collusion (breakdown): $\uparrow w$, $\uparrow n$
  - General labor supply, production structures (downward demand, left rotation of supply)

This Paper: Theory

- **New test**: oligopsony/monopsony vs. breakdown of collusion

  Spillovers from firm-specific demand shocks predict opposite employment effects at unshocked competitors

  - Oligopsony: $\uparrow w$, $\downarrow n$
  - Collusion (breakdown): $\uparrow w$, $\uparrow n$
  - General labor supply, production structures (downward demand, left rotation of supply)

- **Contribution:** Reduced form test of collusion
  - Structural: Porter 1983, Ellison 1994, Backus, Conlon & Sinkinson 2021, Miller & Weinberg 2017, Duarte et al. 2020, Delabastita & Rubens 2023, Roussille & Scuderi 2024, and others

This Paper: Theory

- **New test**: oligopsony/monopsony vs. breakdown of collusion

  Spillovers from firm-specific demand shocks predict opposite employment effects at unshocked competitors

  - Oligopsony: $\uparrow w$, $\downarrow n$
  - Collusion (breakdown): $\uparrow w$, $\uparrow n$
  - General labor supply, production structures (downward demand, left rotation of supply)

- **Contribution:** Reduced form test of collusion
  - Structural: Porter 1983, Ellison 1994, Backus, Conlon & Sinkinson 2021, Miller & Weinberg 2017, Duarte et al. 2020, Delabastita & Rubens 2023, Roussille & Scuderi 2024, and others

- + **Full IO approach**: Quantify fit of models of conduct (BCS 2021)
  - Specific labor supply, production structures

Two Institutional Features Govern Coordination

- Industry associations
  - Large employers: half of labor market
  - Organize product market activities: lobbying, trade fairs
  - Eg, Tirupur Exporters' Association; Noida Garment Manufacturers' Association
- Minimum wages: State - industry - specific

Two Institutional Features Govern Coordination

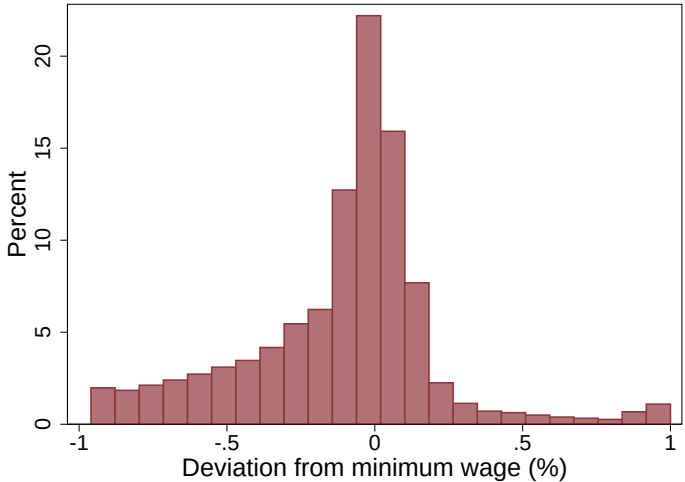
- Industry associations
  - Large employers: half of labor market
  - Organize product market activities: lobbying, trade fairs
  - Eg, Tirupur Exporters' Association; Noida Garment Manufacturers' Association
- Minimum wages: State - industry - specific

Contention: Industry associations collude to pay the minimum wage

This Paper: Empirics

1. **Motivation, bunching:** Industry association members bunch from above at local minimum wages. Track w/o reducing employment.

Bunching from above at the minimum wage



Source: Social security records of India

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

2. **Spillovers:** Firm-specific demand shocks (importer identity: Zara vs. Forever 21)

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

2. **Spillovers:** Firm-specific demand shocks (importer identity: Zara vs. Forever 21)
   - Small: Members forego to stick to minimum wage

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

2. **Spillovers:** Firm-specific demand shocks (importer identity: Zara vs. Forever 21)
   - Small: Members forego to stick to minimum wage
   - Large: when members deviate, unaffected non-members respond like oligopsony ($\uparrow$ wage, $\downarrow$ employment); members respond as if dismantles collusion ($\uparrow$ wage, $\uparrow$ employment)

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

2. **Spillovers:** Firm-specific demand shocks (importer identity: Zara vs. Forever 21)
   - Small: Members forego to stick to minimum wage
   - Large: when members deviate, unaffected non-members respond like oligopsony ($\uparrow$ wage, $\downarrow$ employment); members respond as if dismantles collusion ($\uparrow$ wage, $\uparrow$ employment)

3. **Quantification**: Loss from collusion

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

2. **Spillovers:** Firm-specific demand shocks (importer identity: Zara vs. Forever 21)
   - Small: Members forego to stick to minimum wage
   - Large: when members deviate, unaffected non-members respond like oligopsony ($\uparrow$ wage, $\downarrow$ employment); members respond as if dismantles collusion ($\uparrow$ wage, $\uparrow$ employment)

3. **Quantification**: Loss from collusion
   - Cournot oligopsony: avg. wage: 9.6%; employment: 17%

This Paper: Empirics

1. **Motivation, bunching:** Members of industry associations bunch from above at local industry-specific minimum wage. Track w/o reducing employment

2. **Spillovers:** Firm-specific demand shocks (importer identity: Zara vs. Forever 21)
   - Small: Members forego to stick to minimum wage
   - Large: when members deviate, unaffected non-members respond like oligopsony ($\uparrow$ wage, $\downarrow$ employment); members respond as if dismantles collusion ($\uparrow$ wage, $\uparrow$ employment)

3. **Quantification**: Loss from collusion
   - Cournot oligopsony: avg. wage: 9.6%; employment: 17%

4. **Policy**: Minimum wage as tool of anti-trust

Why do we care?

Bangladesh hikes minimum wage for garment workers after protests

Reuters

November 7, 2023 8:10 PM EST · Updated 4 days ago

File photo: Employees work between polythene sheets, as a safety measure to reduce the spread of coronavirus disease (COVID-19), at The Civil Engineering Limited garment factory in Dhaka, Bangladesh, August 17, 2021. REUTERS/Mohammad Ponir Hossain/File photo *Acquire Licensing Rights*

H&M Group

Modern Slavery Statement 2022

Roadmap

1. Setting
2. Test
3. Spillovers
4. Quantification
5. Policy

Roadmap

1. **Setting**
2. Test
3. Spillovers
4. Quantification
5. Policy

Data Sources

1. **Worker outcomes:** Employer-employee linked social security records from 2014-2018 (EPFO)
2. **Industry association membership:** Websites of largest association in five main garment manufacturing centers Picture
3. **Minimum wages:** State government announcements
4. **Demand Shocks:** Establishment-level customs records

Minimum wage

- **State-specific minimum wage for garment industry**
- **Rate:** Living expenses, 2400 calories, rent, fuel, clothes, etc. Picture
  - $236 - $531
- **Revisions:**
  - Legal: every five years, inflation-adjusted every six months
  - Practice: infrequent, 4x in five years

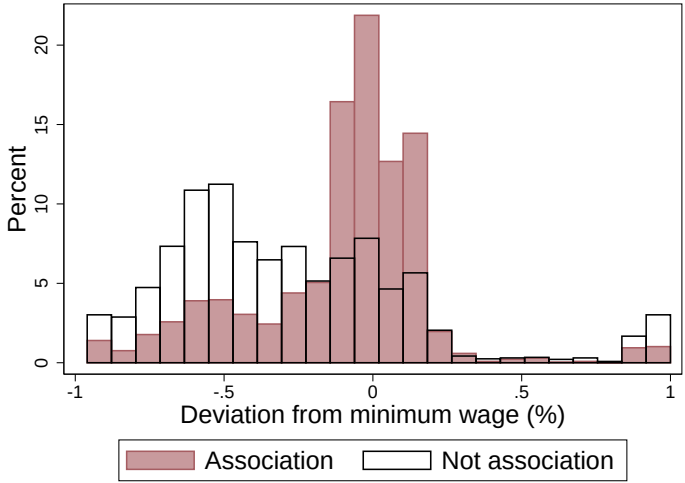
Industry associations

	Association	Not association
Size	152	101
Exporter	71%	52%
Value of exports (USD, million)	3.034	2.605
Products exported	2.2	2.1
Avg. wage (USD, PPP)	300	257
Share of labor market	46%	54%

- Large and productive

Membership

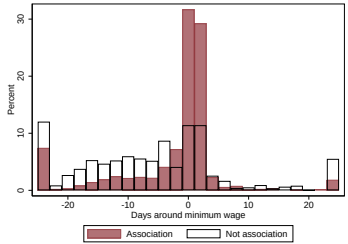
Fact 1: Industry associations bunch from above at minimum wage



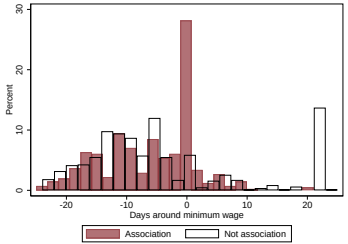
- Modal wage at establishment.

True across locations

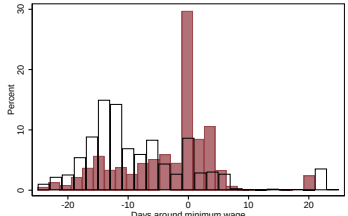
Karnataka



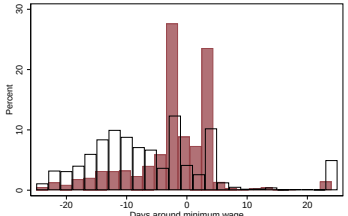
Tamil Nadu



Haryana



Uttar Pradesh



Fact 2: Expelled from association for deviating above minimum wage

- Probationary member for two years before full member (TEA)

	Full member
Probation×deviate	-0.384***
	(0.038)
Baseline rate	0.74
Observations	489

- Tirupur: 30% of garment workers, 60% of exports

Fact 3: Wages posted outside factories

Factory 1

Factory 2

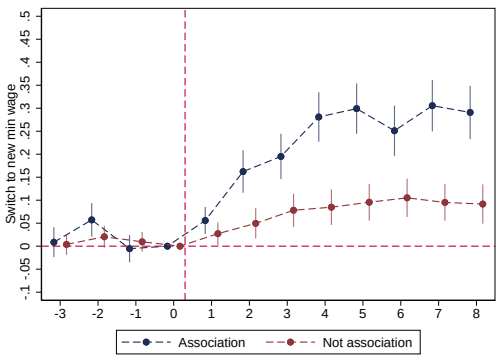
Fact 4: Associations track increases in minimum wage, without reducing employment (imperfect competition)

9 large events: min wage increase $>$ 2 days

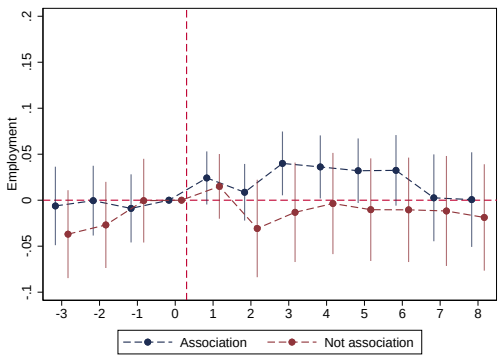
Fact 4: Associations track increases in minimum wage, without reducing employment (imperfect competition)

9 large events: min wage increase > 2 days

Shift to new minimum wage



Log employment



- Stacked DiD event studies: compare employers in treated to untreated states

Roadmap

1. Setting
2. **Test**
3. Spillovers
4. Quantification
5. Policy

Goal: Spillovers from firm-specific demand shocks predict opposite employment responses under monopsony/oligopsony ($\downarrow n$ at unshocked firms) vs. collusion breakdown ($\uparrow n$ at unshocked firms).

Goal: Spillovers from firm-specific demand shocks predict opposite employment responses under monopsony/oligopsony ($\downarrow n$ at unshocked firms) vs. collusion breakdown ($\uparrow n$ at unshocked firms).

Assumptions

1. Diminishing marginal revenue product of labor (weakly)
2. Invertible labor supply: employers not perfect substitutes
3. Connected substitutes: Weak substitutes; all else equal, an increase in w_j weakly lowers labor supply to all other employers j', + sufficient strict substitution to treat employers in a single supply system (Berry, Gandhi, Haile 2013)

Goal: Spillovers from firm-specific demand shocks predict opposite employment responses under monopsony/oligopsony ($\downarrow n$ at unshocked firms) vs. collusion breakdown ($\uparrow n$ at unshocked firms).

Assumptions

1. Diminishing marginal revenue product of labor (weakly)
2. Invertible labor supply: employers not perfect substitutes
3. Connected substitutes: Weak substitutes; all else equal, an increase in w_j weakly lowers labor supply to all other employers j', + sufficient strict substitution to treat employers in a single supply system (Berry, Gandhi, Haile 2013)

General:

- Cournot oligopsony, Bertrand oligopsony, monopsony
- Nested logit, nested CES, mixed logit w/ connected substitutes

Goal: Spillovers from firm-specific demand shocks predict opposite employment responses under monopsony/oligopsony ($\downarrow n$ at unshocked firms) vs. collusion breakdown ($\uparrow n$ at unshocked firms).

Assumptions

1. Diminishing marginal revenue product of labor (weakly)
2. Invertible labor supply: employers not perfect substitutes
3. Connected substitutes: Weak substitutes; all else equal, an increase in w_j weakly lowers labor supply to all other employers j', + sufficient strict substitution to treat employers in a single supply system (Berry, Gandhi, Haile 2013)

General:

- Cournot oligopsony, Bertrand oligopsony, monopsony
- Nested logit, nested CES, mixed logit w/ connected substitutes

Violations: downward demand (external economies of scale), left-rotation of supply (non-homothetic preferences)

Oligopsony/monopsony

Proposition 1

Spillovers from a positive demand shock to firm j lead its unshocked competitors j' to **increase** their wage and **reduce** employment.

Oligopsony/monopsony

Proposition 1

Spillovers from a positive demand shock to firm j lead its unshocked competitors j' to **increase** their wage and **reduce** employment.

Intuition, first-order condition,

$$w_{jt} = mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

Oligopsony/monopsony

Proposition 1

Spillovers from a positive demand shock to firm j lead its unshocked competitors j' to **increase** their wage and **reduce** employment.

Intuition, first-order condition, Own shock (P ↑)

$$\uparrow w_{jt} = \uparrow mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

$$\uparrow \mathrm{n}_{jt}$$

Oligopsony/monopsony

Proposition 1

Spillovers from a positive demand shock to firm j lead its unshocked competitors j' to **increase** their wage and **reduce** employment.

Intuition, first-order condition, Spillover

$$\uparrow w_{jt} = \uparrow mrpl_{jt} \uparrow \frac{e_{jt}}{1 + e_{jt}}$$
$$\downarrow n_{jt}$$

- E.g. Nested CES, elasticity falls with size, which depends on wage, $s_{j't} = \frac{(w_{j't})^{1+\eta}}{\sum_{j'' \in k} (w_{j''t})^{1+\eta}}$

Toy model

Breakdown of collusion

Proposition 2

Spillovers from a firm-specific demand shock that cause collusion to dismantle, will lead least one unshocked employer $j' \in \textit{cartel} \setminus j$ to **increase** both wages and employment.

- Collusion: Some firms earn higher profits with than without collusion (e.g., focal point, internalize others' profits)

Breakdown of collusion

Proposition 2

Spillovers from a firm-specific demand shock that cause collusion to dismantle, will lead least one unshocked employer $j' \in cartel \setminus j$ to **increase** both wages and employment.

- Collusion: Some firms earn higher profits with than without collusion (e.g., focal point, internalize others' profits)
- Intuition: Firms depress wages and employment to collude (e.g., joint profit maximization)

Breakdown of collusion

Proposition 2

Spillovers from a firm-specific demand shock that cause collusion to dismantle, will lead least one unshocked employer $j' \in cartel \setminus j$ to **increase** both wages and employment.

- Collusion: Some firms earn higher profits with than without collusion (e.g., focal point, internalize others' profits)
- Intuition: Firms depress wages and employment to collude (e.g., joint profit maximization)
- Punishment strategy: Requires breakdown, which may never occur (Folk Theorem)

Breakdown of collusion

Proposition 2

Spillovers from a firm-specific demand shock that cause collusion to dismantle, will lead least one unshocked employer $j' \in cartel \setminus j$ to **increase** both wages and employment.

- Collusion: Some firms earn higher profits with than without collusion (e.g., focal point, internalize others' profits)
- Intuition: Firms depress wages and employment to collude (e.g., joint profit maximization)
- Punishment strategy: Requires breakdown, which may never occur (Folk Theorem)
- Interpretation: non-cooperative competition **never** predicts $\uparrow$ employment, but breakdown of collusion can

In sum: spillovers reveal oligopsony vs. breakdown of collusion

Oligopsony:

- Unshocked: Increase wage, $\downarrow$ employment

Breakdown of collusion (at one wage, or by internalizing others' profits):

- Unshocked: Increase wage, $\uparrow$ employment

Roadmap

1. Setting
2. Test
3. **Spillovers**
4. Quantification
5. Policy

Firm-specific demand shock

- **Importer identity:** Zara USA vs Forever 21

Firm-specific demand shock

- **Importer identity:** Zara USA vs Forever 21
- **Small shock:** Chief importer price increases by 5-15% between two export seasons (leaving state out)

Firm-specific demand shock

- **Importer identity:** Zara USA vs Forever 21
- **Small shock:** Chief importer price increases by 5-15% between two export seasons (leaving state out)
- **Large shock**: Labor audits in Vietnam led prominent brands to temporarily relocate production to India in 2017, increased prices by 24.5%

Firm-specific demand shock

- **Importer identity:** Zara USA vs Forever 21
- **Small shock:** Chief importer price increases by 5-15% between two export seasons (leaving state out)
- **Large shock**: Labor audits in Vietnam led prominent brands to temporarily relocate production to India in 2017, increased prices by 24.5%
- **Focus:** Tirupur Exporters' Association
  - 30% of garment workers, most garment exports

Empirical strategy

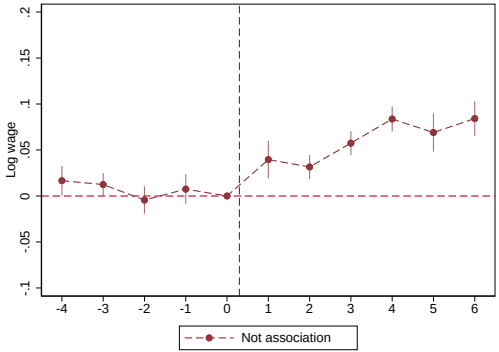
DiD comparing establishment to itself in unshocked seasons:

$$Y_{jt} = \alpha_{jt} + \sum_{t=-4}^{t=6} \beta_t Shock_{jk} 1_t + \epsilon_{jt}$$

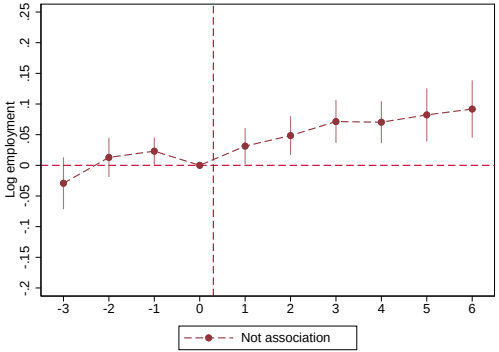
- j = establishment, k = season, t = time relative to start of season
- Because interested in spillovers, cannot compare shocked to unshocked firms
- $t = 0 :=$ 3 months prior to export season
- Identifying assumption: parallel evolution

Small shocks: non-members raise wages and employment

Log wage



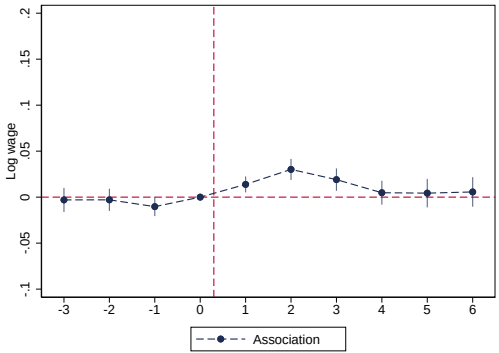
Log employment



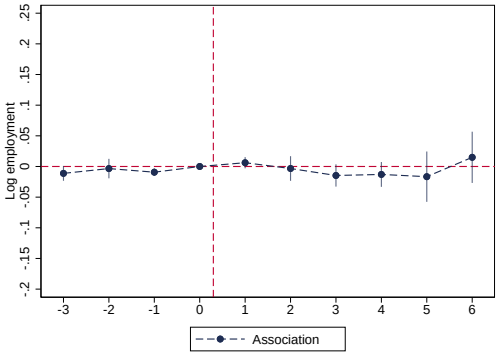
Exports

Small shocks: members forego export opportunity to stick to minimum

Log wage



Log employment



- Consistent with, deviate if $\Pi_{deviation} + \sum_{t=1}^{p} \delta^t \Pi_{punishment} > \sum_{t=0}^{p} \delta^t \Pi_{mw^*}$

Exports

Large shock: Labor audits led prominent brands to temporarily relocate production from Vietnam to India

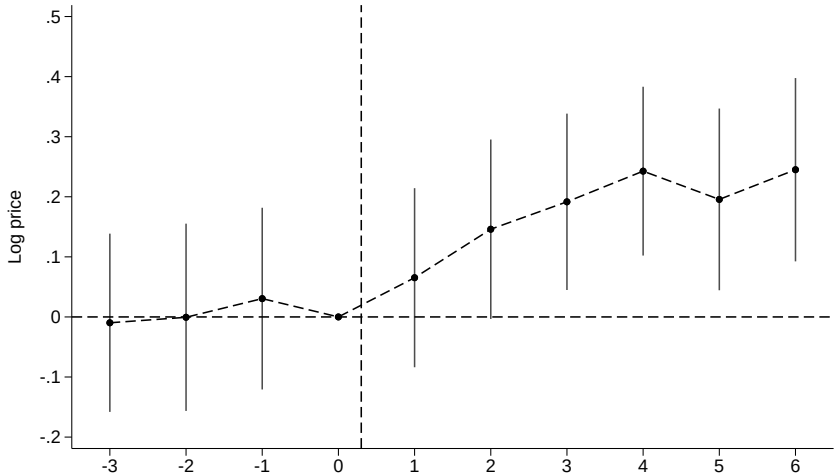
Audits uncover rights violations

- Wage theft
- Pregnancy discrimination
- Forced overtime
- Illegal restrictions on access to toilets
- Illegal recruitment fees
- Health and safety violations

Affected brands

Audit Number	Buyer (Brand or Retailer)
1.	Pink/VSS/VSD
2.	Costco buyer
3.	Canadian buyer
4.	Hanes
5.	The Children's Place
6.	MGF
7.	Amazon
8.	Express
9.	Macy's
10.	Polo
11.	Hanes
12.	Nike
13.	Polo
14.	Kohl's
15.	Zara/Inditex
16.	Aero
17.	JC Penny
18.	Nike
19.	Gap, Nike, Target, Walmart
20.	Gap
21.	Canadian buyer
22.	Kasper
23.	Gill
24.	Express
25.	J.Crew

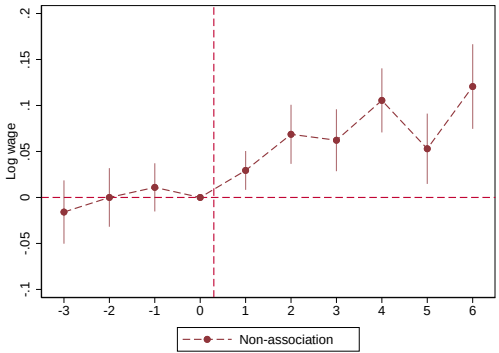
Prices at affected vs. unaffected exporters increase 24%



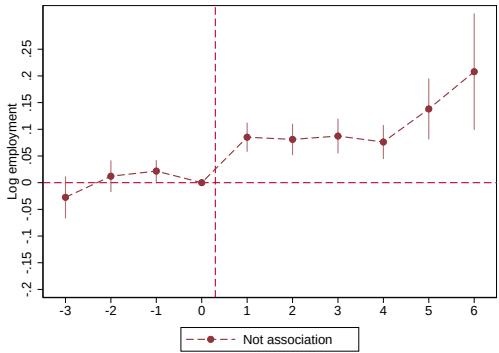
Affects 13% of association members, 15% of non-members.

Large shock: Affected non-members increase wages and employment

Log wage

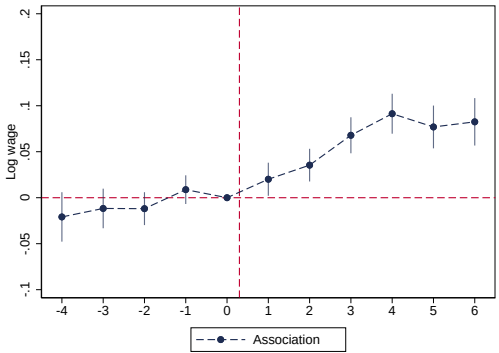


Log employment

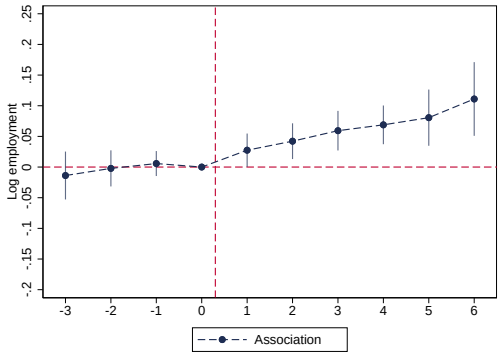


Large shock: Affected members also increase wages and employment (deviate above minimum wage)

Log wage



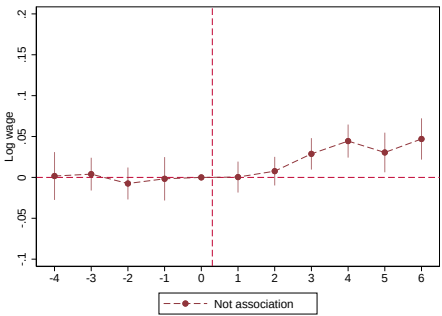
Log employment



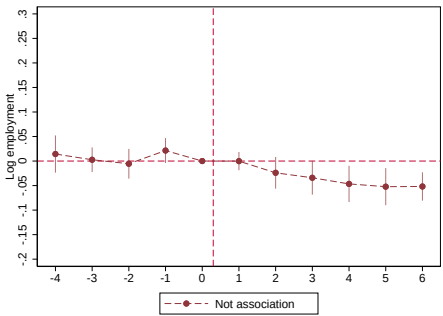
Deviate from minimum

Unaffected non-members respond as in oligopsony: ↑ wage, ↓ employment

Log wage

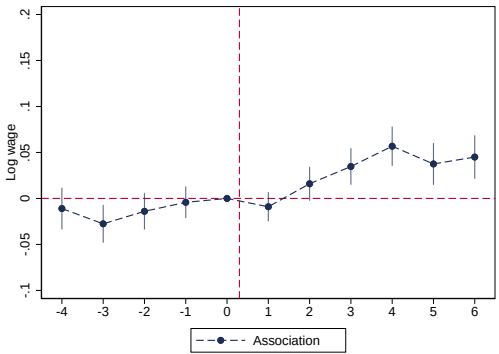


Log employment

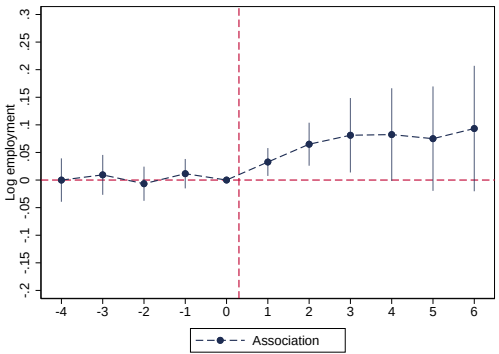


Unaffected members respond as if collusion breaks down: ↑ wage, ↑ employment

Log wage



Log employment



→ Keeping wage, employment depressed to coordinate at minimum

Ruling out alternative explanations (not collusion)

1. Correlated demand shock to members Prices, Profits, New exports, Same importer
2. Subcontract within association Large employers, New exports
3. Common TFP/input shock to members Timing, Prices
4. Violations, demand (e.g., external economies of scale) Profits
5. Violations, supply (e.g., non-homotheticity, network externalities) Common amenities, Profits

Taking stock

- **Motivation**:
  - **Bunching:** Industry associations bunch from above at the minimum wage
  - **Imperfect competition**: Track minimum wage without reducing employment
  - **Small shock**: Members forego export opportunities to stick to minimum wage
- **Spillovers reveal collusion**:
  - Large shock: Leads affected members to deviate from the minimum wage, $\uparrow$ w, n
    - ⋆ Non-members respond like oligopsony: raise wage, reduce employment
    - ⋆ Members respond like breakdown: raise wage, raise employment

Taking stock

- **Motivation**:
  - **Bunching:** Industry associations bunch from above at the minimum wage
  - **Imperfect competition**: Track minimum wage without reducing employment
  - **Small shock**: Members forego export opportunities to stick to minimum wage
- **Spillovers reveal collusion**:
  - Large shock: Leads affected members to deviate from the minimum wage, ↑ w, n
    - ⋆ Non-members respond like oligopsony: raise wage, reduce employment
    - ⋆ Members respond like breakdown: raise wage, raise employment
- **Model fit (conduct test)**: Breakdown of collusion rejects oligopsony, collusion at new wage, joint profit max Conduct test details, Backus et al. 2021
  - Supply: Nested CES, Production: Cobb-Douglas in L, K

Roadmap

1. Setting
2. Test
3. Spillovers
4. **Quantification**
5. Policy

Quantifying loss from collusion

- Collusion $\rightarrow$ Cournot oligopsony

Quantifying loss from collusion

- Collusion $\rightarrow$ Cournot oligopsony

  Three ingredients: ingredients

  - Labor supply
  - Productivity
  - Collusive conduct (punishment strategy)

Setup

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_{k} + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested:

- η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Setup

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_k + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested:

- η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Demand (Cournot) Maximize profits taking others' employment as given

$$Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$$

Setup

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_k + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested:

- η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Demand (Cournot) Maximize profits taking others' employment as given

Demand (Collusion)

- Cartel pays min wage, Fringe maximizes profits taking others' employment as given
- Punishment — punish deviations by switching to oligopsony for one period (six months)
- Collude if $2\Pi_{mw} > \Pi_{dev} + \Pi_{olig}$

Model — Summary

Supply Nested logit gives labor supply to employer j

$$n_{jkrt} = \underbrace{\left(\frac{a_{jt} w_{jt}}{\bar{W}_{kt}}\right)^{\eta}}_{\text{employer}} \underbrace{\left(\frac{a_k \bar{W}_{kt}}{\bar{W}_{rt}}\right)^{\theta}}_{\text{industry}} \underbrace{\left(\frac{\bar{W}_{rt}}{\bar{W}_t}\right)^{\lambda}}_{\text{location}} a_{jt} a_k N_t$$

Demand (Cournot) Employers maximize profits taking others' employment as given

$$w_{jt} = mrpl_{jt} \underbrace{\frac{e_{jt}}{1 + e_{jt}}}_{\mu_{jt}}$$

Demand (Collusion)

- Cartel: Workers willing to supply labor at mw
- Fringe: Maximize profits taking others' employment as given

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

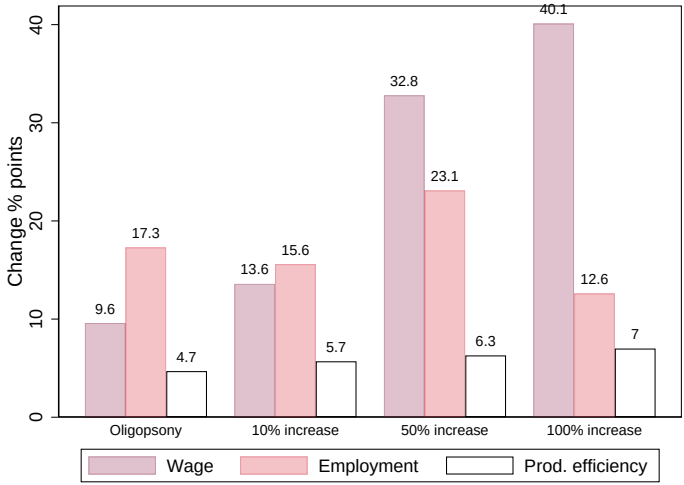
- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
  - Estimate z_j using indirect inference
  - Assume post-large shock labor supply (nested logit) + Cournot oligopsony
  - Rationalize post-large shock concentration Method 2
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Calibrated parameters

Result: Wage and employment loss from collusion

Min wage policy

Counterfactual minimum wage hikes



- Increase $>$ enforcement
- Surprisingly, 50% minimum wage hike does better than oligopsony

Conclusion

- Industry association colludes to pay garment workers exactly the minimum wage
- Collusion lowers wages, employment, productive efficiency (9.6%, 17%, 4%)
- Minimum wage can be a new, effective tool of anti-trust policy

Thank you!

Setup

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_{k} + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested:

- η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Setup

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_k + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested:

- η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Demand (Cournot) Maximize profits taking others' employment as given

$$Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$$

Setup

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_k + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested:

- η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Demand (Cournot) Maximize profits taking others' employment as given

Demand (Collusion)

- Cartel pays min wage, Fringe maximizes profits taking others' employment as given
- Punishment — punish deviations by switching to oligopsony for one period (six months)
- Collude if $2\Pi_{mw} > \Pi_{dev} + \Pi_{olig}$

Model — Summary

Supply Nested logit gives labor supply to employer j

$$n_{jkrt} = \underbrace{\left(\frac{a_{jt} w_{jt}}{\bar{W}_{kt}}\right)^{\eta}}_{\text{employer}} \underbrace{\left(\frac{a_k \bar{W}_{kt}}{\bar{W}_{rt}}\right)^{\theta}}_{\text{industry}} \underbrace{\left(\frac{\bar{W}_{rt}}{\bar{W}_t}\right)^{\lambda}}_{\text{location}} a_{jt} a_k N_t$$

Demand (Cournot) Employers maximize profits taking others' employment as given

$$w_{jt} = mrpl_{jt} \underbrace{\frac{e_{jt}}{1 + e_{jt}}}_{\mu_{jt}}$$

Demand (Collusion)

- Cartel: Workers willing to supply labor at mw
- Fringe: Maximize profits taking others' employment as given

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

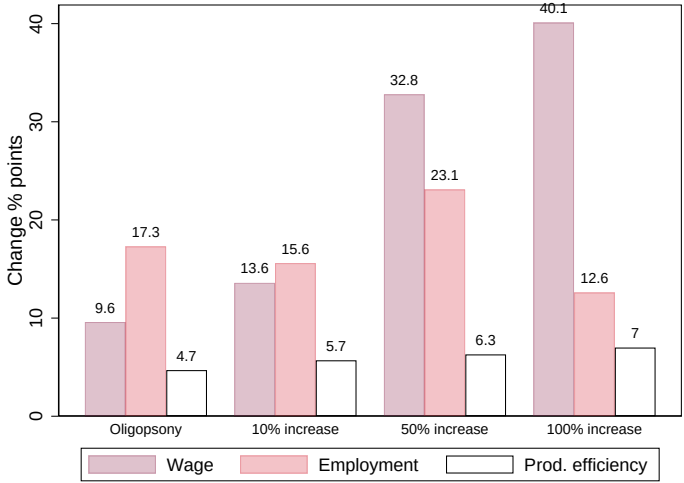
- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
  - Estimate z_j using indirect inference
  - Assume post-large shock labor supply (nested logit) + Cournot oligopsony
  - Rationalize post-large shock concentration Method 2
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Calibrated parameters

Result: Wage and employment loss from collusion

Min wage policy

Counterfactual minimum wage hikes



- Increase $>$ enforcement
- Surprisingly, 50% minimum wage hike does better than oligopsony

Conclusion

- Industry association colludes to pay garment workers exactly the minimum wage
- Collusion induces substantial wage, employment losses (9.6%, 17%)
- Minimum wage can serve as a new, effective tool of anti-trust policy

Appendix

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} I_j^{\alpha_{k2}}$
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
  - Estimate z_j using indirect inference
  - Assume post-large shock labor supply (nested logit) + Cournot oligopsony
  - Rationalize post-large shock concentration Method 2
- **Punishment:** Punish deviations with one period (six months) of oligopsony

Estimating key ingredients

- **Labor supply:** η (cross-employer), θ (cross-industry), λ (cross-location)
  - Estimate using standard techniques (Berry et al. 1995) Details
  - Instruments: export demand shocks, minimum wage hikes
- **Productivity:** $Y_j = z_j K_j^{\alpha_{k1}} l_j^{\alpha_{k2}}$
  - Estimate z_j using indirect inference
  - Assume post-large shock labor supply (nested logit) + Cournot oligopsony
  - Rationalize post-large shock concentration Method 2
- **Punishment:** Punish deviations with one period (six months) of oligopsony
  - Collude if $2\Pi_{mw} > \Pi_{dev} + \Pi_{olig}$

Calibrated parameters

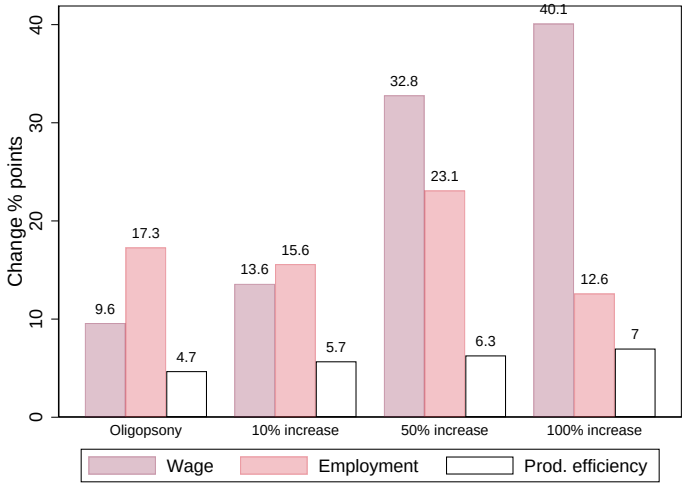
Roadmap

1. Setting
2. Test
3. Empirics
4. Quantification
5. **Policy**

Policy Counterfactuals

1. Minimum wage hikes: 10%, 50%, 100%
2. Minimum wage raised to living wage (Rs.33,920, Asia Floor Wage Alliance)

Result: Minimum wage hikes



- Surprisingly, 50% minimum wage hike does better than oligopsony

Back

Oligopsony/monopsony: Toy Model (nested ces + Cournot oligopsony)

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_k + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested: η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Oligopsony/monopsony: Toy Model (nested ces + Cournot oligopsony)

Supply Worker i chooses highest utility employer subject to idiosyncratic draw

$$u_{ijkrt} = lnw_{jt} + lna_k + lna_{jt} + \epsilon_{ijkr}$$

ϵ_{ijk}, nested: η = cross-employer, θ = cross-industry, λ = cross-location; $\eta > \theta > \lambda$

Demand (Cournot) Employers maximize profits taking others' employment as given

Oligopsony/monopsony: Toy Model (nested ces + Cournot oligopsony)

Supply Nested logit gives labor supply to employer j

$$n_{jkrt} = \underbrace{\left(\frac{a_{jt} w_{jt}}{\bar{W}_{kt}}\right)^{\eta}}_{\text{employer}} \underbrace{\left(\frac{a_k \bar{W}_{kt}}{\bar{W}_{rt}}\right)^{\theta}}_{\text{industry}} \underbrace{\left(\frac{\bar{W}_{rt}}{\bar{W}_t}\right)^{\lambda}}_{\text{location}} a_{jt} a_k N_t$$

Demand (Cournot) Employers maximize profits taking others' employment as given

$$w_{jt} = mrpl_{jt} \underbrace{\frac{e_{jt}}{1 + e_{jt}}}_{\mu_{jt}}$$

Equilibrium Workers flock to good employers, increasing size

$$s_{gj} := \frac{w_{gj} n_{gj}}{\sum_{j' \in k,r} w_{gj'} n_{gj'}} = \frac{(a_{gj} w_{gj})^{1+\eta_g}}{\sum_{j' \in k,r} (a_{gj'} w_{gj'})^{1+\eta_g}};\ s_{gkr} = \frac{(a_{kg} W_{kg})^{1+\theta_g}}{\sum_{k' \in R} a_{k'g}^{1+\theta_g} W_{k'g}^{1+\theta_g}}$$

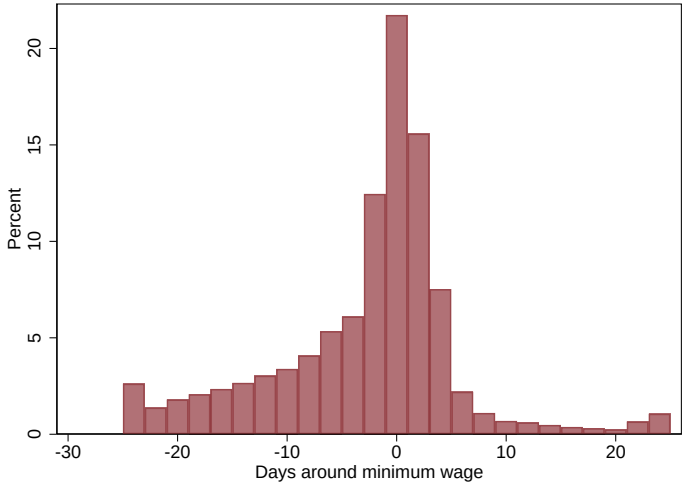
Oligopsony/monopsony: Toy Model (nested ces + Cournot oligopsony)

Elasticity Elasticity declines in employer size

$$e_{gj} = \left[\frac{1}{\eta_g} + \left(\frac{1}{\theta_g} - \frac{1}{\eta_g} \right) s_{gj} + \left(\frac{1}{\lambda_g} - \frac{1}{\theta_g} \right) s_{gj} s_{gkr} \right]^{-1}$$

Back

Motivation: Bunching from above at the minimum wage



Source: Employees' Provident Fund Organization

Back

Minimum wage: basket of goods

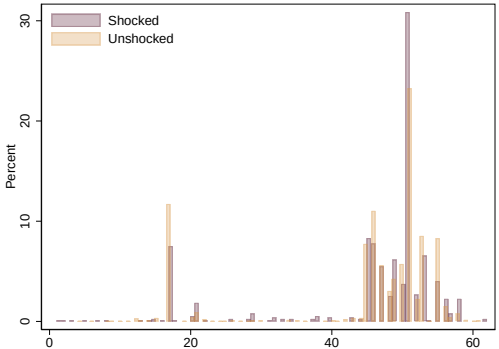
"Food items amounting to the level of $\pm$ 10 per cent of 2,400 calories, along with proteins $\geq$ 50 gm and fats $\geq$ 30 gm per day per person to constitute a national level balanced food basket."

"Further, the minimum wage should include reasonable expenditure on 'essential non-food items', such as clothing, fuel and light, house rent, education, medical expenses, footwear and transport, which must be equal to the median class and expenditure on any 'other non-food items' be equivalent to the sixth fractile (25-30 per cent) of the household expenditure distribution as per the NSSO-CES 2011/12 survey data."

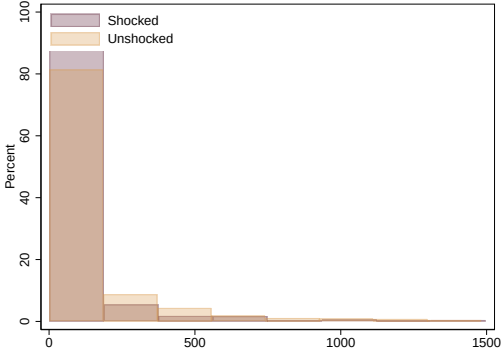
Back

Affected and unaffected members similar at baseline

HS-6 code

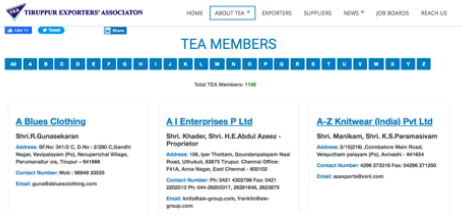


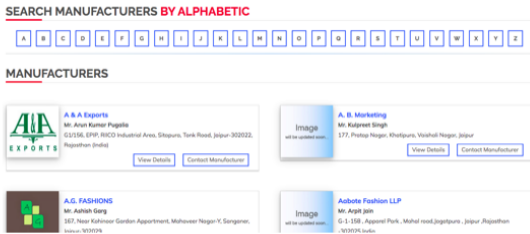
Size



Non-members

Tirupur Exporters' Association





Back

Membership criteria of TEA

- Revenue: Rs. 50 lakh for last three years
- Nominated by 2 members
- Probationary period for two years
- 1076 lifetime members, 155 associates

Back

Collusion: Predictions

Coordinate at minimum until someone else deviates; then go to oligopsony for p periods.

Deviate from paying minimum whenever $\Pi_{deviation} + \sum_{t=1}^{p} \delta^t \Pi_{olig} > \sum_{t=0}^{p} \delta^t \Pi_{mw^*}$

Collusion: Predictions

Coordinate at minimum until someone else deviates; then go to oligopsony for p periods.

Deviate from paying minimum whenever $\Pi_{deviation} + \sum_{t=1}^{p} \delta^t \Pi_{olig} > \sum_{t=0}^{p} \delta^t \Pi_{mw^*}$

1. Small shock: Do not deviate from minimum.

Collusion: Predictions

Coordinate at minimum until someone else deviates; then go to oligopsony for p periods.

Deviate from paying minimum whenever $\Pi_{deviation} + \sum_{t=1}^{p} \delta^t \Pi_{olig} > \sum_{t=0}^{p} \delta^t \Pi_{mw^*}$

1. Small shock: Do not deviate from minimum.
2. Large shock: If colluding at the minimum wage, and collusion breaks down in response to firm-specific demand shock ($\uparrow P$):
   - Own shock ($\uparrow P$): $\uparrow$ w, $\uparrow$ n
   - Spillover: $\uparrow$ w, $\uparrow$ n

Collusion: Predictions

Coordinate at minimum until someone else deviates; then go to oligopsony for p periods.

Deviate from paying minimum whenever $\Pi_{deviation} + \sum_{t=1}^{p} \delta^t \Pi_{olig} > \sum_{t=0}^{p} \delta^t \Pi_{mw^*}$

1. Small shock: Do not deviate from minimum.
2. Large shock: If colluding at the minimum wage, and collusion breaks down in response to firm-specific demand shock ($\uparrow P$):
   - Own shock ($\uparrow P$): $\uparrow$ w, $\uparrow$ n
   - Spillover: $\uparrow$ w, $\uparrow$ n
   - Intuition: only colluding at minimum (profits higher) if oligopsony wage/employment higher (for at least some) Proof

Conditions for NE

Routine (small) shocks

Routine (small) shocks

- Transitory demand, repeat nature of exporting relationships

Routine (small) shocks

- Transitory demand, repeat nature of exporting relationships
- **Small shock:** Chief importer price increases by 5-15pp between two export seasons, e.g. Zara USA (leaving state out)

Routine (small) shocks

- Transitory demand, repeat nature of exporting relationships
- **Small shock:** Chief importer price increases by 5-15pp between two export seasons, e.g. Zara USA (leaving state out)
- **Focus:** Tirupur Exporters' Association
  - Tirupur has x% of garment workers, y% of garment exports

Testing oligopsony: strategic wage spillovers (Amiti et al. 2019)

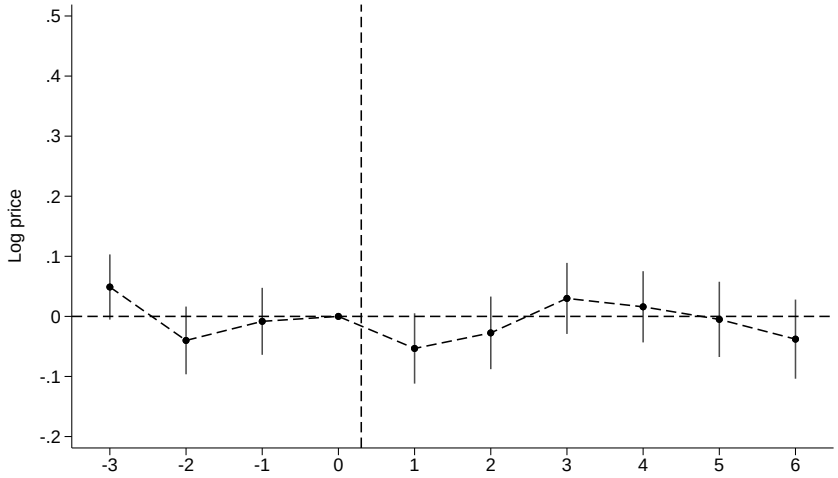
- Intuition: Strategic motives alter markdowns $\rightarrow$ as shocked employers raise wages to attract workers, unaffected employers must pay a larger share of marginal product.
  - Any competition structure (incl. oligopsony), invertible labor supply (incl. nested CES)
- Regression: $\Delta \ln w_j$ on weighted average of competitor changes ($\Delta \ln w_{-j}$), controlling for own $\Delta \ln mrpl_j$.

$$\Delta \ln w_j = \delta \Delta \ln mrpl_j + \gamma \Delta \ln w_{-j} + \xi_j$$

- $\delta =$ own pass-through, $\gamma =$ spillovers
- Instruments: own-shock for $\Delta \ln mrpl_j$ and market-level shock for $\Delta \ln w_{-j}$.

Back

Prices at unaffected members remain flat



Back

Profits decline at unaffected members

	Unaffected member	Affected member
Post	-0.053***	0.162*
	(0.012)	(0.081)
Observations	688	121

Back

Unaffected member exports

	Exports	Share		
		Chief importer	Affected	Other
Post	0.11**	82%	11%	7%
	(0.042)			
Observations	1433			

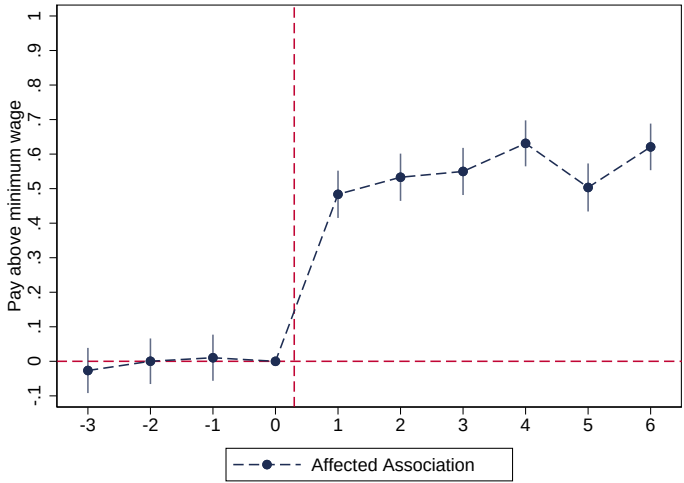
Back

Comparing similar unaffected members and non-members

	> 100 workers	Size-importer	Importer	Size	Female share	Zip code	Product (6 digit)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-member x post	-0.049**	-0.085**	-0.090**	-0.096*	-0.082*	-0.095**	-0.084**
	(0.023)	(4.366)	(4.274)	(5.969)	(4.696)	(4.060)	(4.152)
Member x post	0.095**	0.133**	0.163**	0.169*	0.158	0.143*	0.117
	(0.042)	(0.062)	(0.079)	(0.102)	(0.112)	(0.091)	(0.085)
Observations	5822	18945	18945	18945	18945	15197	14959

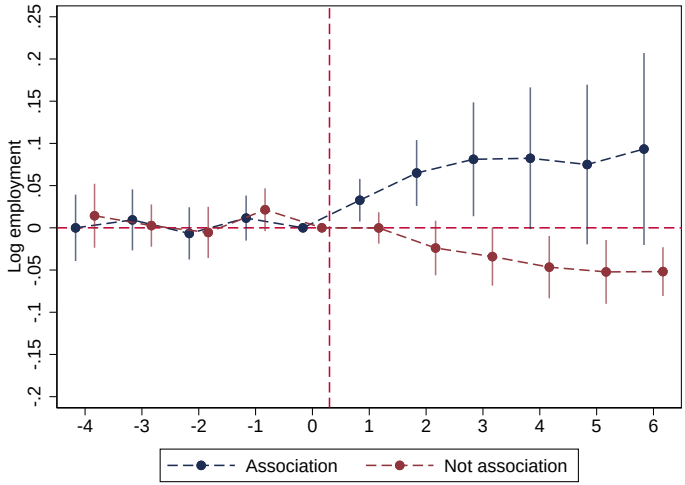
Back

Pay above minimum wage



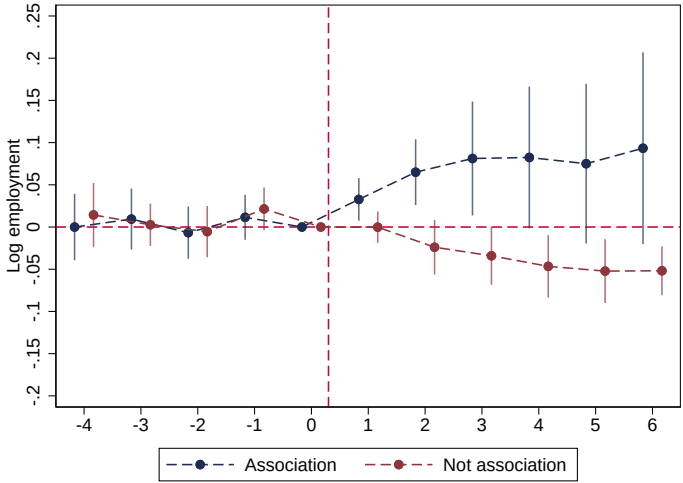
Back

Opposite employment responses true when account for time-varying Δ demand for HS-6 products



Back

Opposite employment responses true when account for importer-time FE



Back

Uncovering underlying distribution of productivity

Method 1: Indirect inference

- Assume labor supply structure (nested CES), post-period conduct (Cournot oligopsony), production function ($y_j = z_j K_j^{\alpha_1} l_j^{\alpha_2}$).
- Productivity ($F(z_j)$): Rationalizes post-period concentration.

Method 2: First-order Taylor approximation reveals $mrpl_j$ (Carrillo, Donaldson, Pomeranz, Singhal 2023)

$$\Delta Y = mrpl \Delta X + \Delta TFP + \text{2nd-order terms}$$

- Relocation shock: instrument for ΔX
- Advantage: no assumption on conduct or labor supply.

Back

Calibrated parameters

Model parameters for counterfactuals

Parameter	Name	Value	Source	Component
Estimated				
η_g	Cross-employer elasticity of substitution	3.51	Elasticity estimate	LS
θ_g	Cross-industry	1.19	Elasticity estimate	LS
λ_g	Cross-location	0.04	Elasticity estimate	LS
φ	Frisch elasticity	0.5	Calibrated from Berger et al. 2022	LS
s_{gk}	Share of industries	Varies	Data	Eqbm
W_{gk}	Industry-specific wages	Varies	Data	Eqbm
a_{gk}	Industry-specific amenities	Varies	Match s_{gk} in data	Eqbm
σ	Productivity dispersion	0.7	Firm size distribution	Prod
Z	Productivity shifter	387	Match average wage in data	Prod
Calibrated				
α	Decreasing returns to scale	0.94	Berger et al. 2023	Prod
M	Number of firms in textiles	2530	Match data	Market

Notes: This table notes parameters needed to simulate the model, their source, and which feature of the environment they correspond with (LS = labor supply, Prod = production function, Eqbm = equilibrium object).

BLP Estimation: Labor supply

$$lns_{jkrt} = \underbrace{(1+\eta)lna_j}_{employer\ fixed\ effect} + (1+\eta)w_{jt} + \underbrace{(1+\theta)lna_k}_{industry-FE} + (1+\theta)lnW_{kt} + \underbrace{(1+\lambda)-(1+\theta))lnW_{rt} - (1+\lambda)W_t}_{state-time-FE} + (1+\eta)lna_{jt}$$

- Parameters: (η, θ, a_j, a_k)
- Assume demand shocks uncorrelated with a_{jt}
- Moment condition: $\hat{\mathbf{G}} = \frac{1}{N_{jt}} \sum_{j,t} \hat{a_{jt}} \mathbf{z_{jt}^D}$
- Instruments: export demand shocks, state-industry minimum wage hikes

Back

Oligopsony/monopsony: Intuition

First-order condition

$$w_{jt} = mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

Oligopsony/monopsony: Intuition

First-order condition

$$w_{jt} = mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

Own firm-specific demand shock (↑ P)

$$\uparrow w_{jt} = \uparrow mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

Oligopsony/monopsony: Intuition

First-order condition

$$w_{jt} = mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

Own firm-specific demand shock (↑ P)

$$\uparrow w_{jt} = \uparrow mrpl_{jt} \frac{e_{jt}}{1 + e_{jt}}$$

Spillovers

$$\uparrow w_{j't} = \uparrow mrpl_{j't} \uparrow \frac{e_{j't}}{1 + e_{j't}}, \ \downarrow n_{j't}$$

- E.g. Nested CES, elasticity falls with size, which depends on wage, $s_{j't} = \frac{(w_{j't})^{1+\eta}}{\sum_{j'' \in k} (w_{j''t})^{1+\eta}}$

Toy model

Back