Minimum Wages and Workplace Injuries

Michael Davies, *UC Berkeley (incoming)*
R. Jisung Park, *U Penn*
Anna Stansbury, *MIT Sloan*

June 2025

Plan

Effect of minimum wage on injuries is ambiguous ex ante...

Effect of minimum wage on injuries is ambiguous ex ante...

↑ Increase injury rates if:

Effect of minimum wage on injuries is ambiguous ex ante...

↑ Increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
  - "Everybody at every level will say that we really, really want to be safe. But **safety doesn't pay the bills**." John Crane, Fuyao Safety Director (quoted in *American Factory* 2020).

Effect of minimum wage on injuries is ambiguous ex ante...

↑ Increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
- Work intensification: Firms might intensify the pace of work to increase productivity in line with labor costs.
  - "Employees are expected to maintain a very high pace of work... There is a **direct connection between Amazon's employee monitoring and discipline systems and workplace MSDs.**" Washington Dept. of Labor and Industries investigation (2021).

Effect of minimum wage on injuries is ambiguous ex ante...

↑ Increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
- Work intensification: Firms might intensify the pace of work to increase productivity in line with labor costs.

↓ Reduce injury rates if:

- Lower turnover: Higher minimum wages could reduce turnover (Dube 2021), reducing injury propensity
- Efficiency wages: Higher minimum wages could reduce financial pressures or hours worked, or facilitate employees' pro-health behaviors (e.g. more sleep, less stress)

Effect of minimum wage on injuries is ambiguous ex ante...

↑ Increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
- Work intensification: Firms might intensify the pace of work to increase productivity in line with labor costs.

↓ Reduce injury rates if:

- Lower turnover: Higher minimum wages could reduce turnover (Dube 2021), reducing injury propensity
- Efficiency wages: Higher minimum wages could reduce financial pressures or hours worked, or facilitate employees' pro-health behaviors (e.g. more sleep, less stress)

≈ Ambiguous if:

Effect of minimum wage on injuries is ambiguous ex ante...

↑ Increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
- Work intensification: Firms might intensify the pace of work to increase productivity in line with labor costs.

↓ Reduce injury rates if:

- Lower turnover: Higher minimum wages could reduce turnover (Dube 2021), reducing injury propensity
- Efficiency wages: Higher minimum wages could reduce financial pressures or hours worked, or facilitate employees' pro-health behaviors (e.g. more sleep, less stress)

≈ Ambiguous if:

- Induced capital investment: could increase or decrease injury rates, depending what tasks are automated

Our paper: Overview

Our paper: Overview

Setting: California, 2000–2019, SOC 5-digit occupation-metro area labor markets.

Injury data: Occupation-metro-year injury rates constructed from workers' compensation data (13m claims) and BLS OEWS employment figures.

Our paper: Overview

Setting: California, 2000–2019, SOC 5-digit occupation-metro area labor markets.

Injury data: Occupation-metro-year injury rates constructed from workers' compensation data (13m claims) and BLS OEWS employment figures.

Identifying variation:

Our paper: Overview

Setting: California, 2000–2019, SOC 5-digit occupation-metro area labor markets.

Injury data: Occupation-metro-year injury rates constructed from workers' compensation data (13m claims) and BLS OEWS employment figures.

Identifying variation:

1. Geographic variation in the timing and magnitude of minimum wage hikes

Our paper: Overview

Setting: California, 2000–2019, SOC 5-digit occupation-metro area labor markets.

Injury data: Occupation-metro-year injury rates constructed from workers' compensation data (13m claims) and BLS OEWS employment figures.

Identifying variation:

1. Geographic variation in the timing and magnitude of minimum wage hikes
2. Local labor market *exposure* to minimum wage shocks: e.g. share of cooks in San Francisco in 2003 earning less than 1.3x local minimum.

Our paper: Overview

Setting: California, 2000–2019, SOC 5-digit occupation-metro area labor markets.

Injury data: Occupation-metro-year injury rates constructed from workers' compensation data (13m claims) and BLS OEWS employment figures.

Identifying variation:

1. Geographic variation in the timing and magnitude of minimum wage hikes
2. Local labor market *exposure* to minimum wage shocks: e.g. share of cooks in San Francisco in 2003 earning less than 1.3x local minimum.

Findings: higher minimum wages increase injury rates for exposed workers

- Elasticity of injury rate to min. wage-induced wake hikes ≈ 1.4
- $\approx$ 3 more injuries per 1,000 low-wage workers.
- Suggestive evidence that work intensification is one mechanism behind our findings.

Plan

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\left(min_{m,t} * exposure_{o,m,t}\right) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\left(min_{m,t} * exposure_{o,m,t}\right) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

- $y_{o,m,t}$: Log injury rate or log mean hourly wage (OEWS).

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\left(min_{m,t} * exposure_{o,m,t}\right) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

- $y_{o,m,t}$: Log injury rate or log mean hourly wage (OEWS).
- $min_{m,t}$: Minimum wage shock
  - Real year-on-year minimum wage change, *or*
  - Indicator for large nominal increase ($> 5\%$).

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\left(min_{m,t} * exposure_{o,m,t}\right) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

- $y_{o,m,t}$: Log injury rate or log mean hourly wage (OEWS).
- $min_{m,t}$: Minimum wage shock
  - Real year-on-year minimum wage change, *or*
  - Indicator for large nominal increase ($> 5\%$).
- $exposure_{o,m,t}$: Share earning less than 1.3x min wage.

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\,(min_{m,t} * exposure_{o,m,t}) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

- $y_{o,m,t}$: Log injury rate or log mean hourly wage (OEWS).
- $min_{m,t}$: Minimum wage shock
  - Real year-on-year minimum wage change, *or*
  - Indicator for large nominal increase ($> 5\%$).
- $exposure_{o,m,t}$: Share earning less than 1.3x min wage.
- β: Coefficient of interest

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\left(min_{m,t} * exposure_{o,m,t}\right) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

- $y_{o,m,t}$: Log injury rate or log mean hourly wage (OEWS).
- $min_{m,t}$: Minimum wage shock
  - Real year-on-year minimum wage change, *or*
  - Indicator for large nominal increase ($> 5\%$).
- $exposure_{o,m,t}$: Share earning less than 1.3x min wage.
- β: Coefficient of interest
- Fixed effects: occupation-metro, metro-year, and occupation-year.

Constructing the injury rate

$$injuryrate_{o,m,t} = \frac{injuries_{o,m,t}}{employment_{o,m,t}}$$

(where o = SOC 5-digit occupation, m = metro area, t = year.)

Constructing the injury rate

$$injuryrate_{o,m,t} = \frac{injuries_{o,m,t}}{employment_{o,m,t}}$$

(where o = SOC 5-digit occupation, m = metro area, t = year.)

Injuries = Workers' Compensation claims:

1. Source: California Worker's Compensation scheme (13m claims, 2000-2019)
2. Raw data: claim-level (containing raw text job title, NAICS industry code, ZIP code of injury)
3. Match these to SOC 5-digit occupations using NIOSH Industry and Occupation Computer Coding System ("NIOCCS") (successfully matches 72% of claims using 80% probability cut-off threshold)

Constructing the injury rate

$$injuryrate_{o,m,t} = \frac{injuries_{o,m,t}}{employment_{o,m,t}}$$

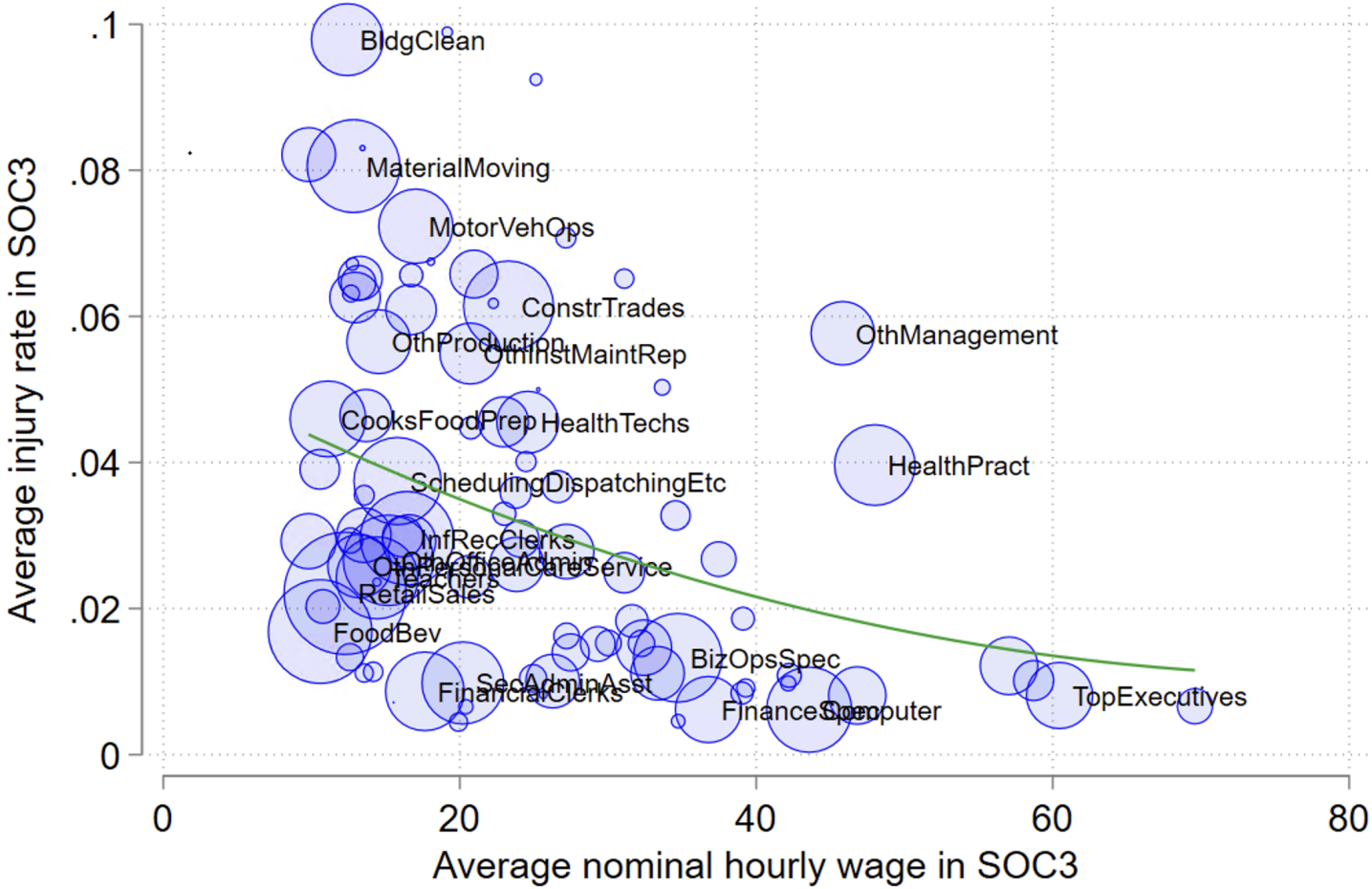
(where o = SOC 5-digit occupation, m = metro area, t = year.)

Injuries = Workers' Compensation claims:

1. Source: California Worker's Compensation scheme (13m claims, 2000-2019)
2. Raw data: claim-level (containing raw text job title, NAICS industry code, ZIP code of injury)
3. Match these to SOC 5-digit occupations using NIOSH Industry and Occupation Computer Coding System ("NIOCCS") (successfully matches 72% of claims using 80% probability cut-off threshold)

Employment: estimates of occupation-metro area employment from BLS OES.

Injury rates by occupation



This figure shows the average hourly wage and average annual injury rate across the SOC 5-digit occupations in our data.

(Summary stats) (Over time)

Minimum wage variation

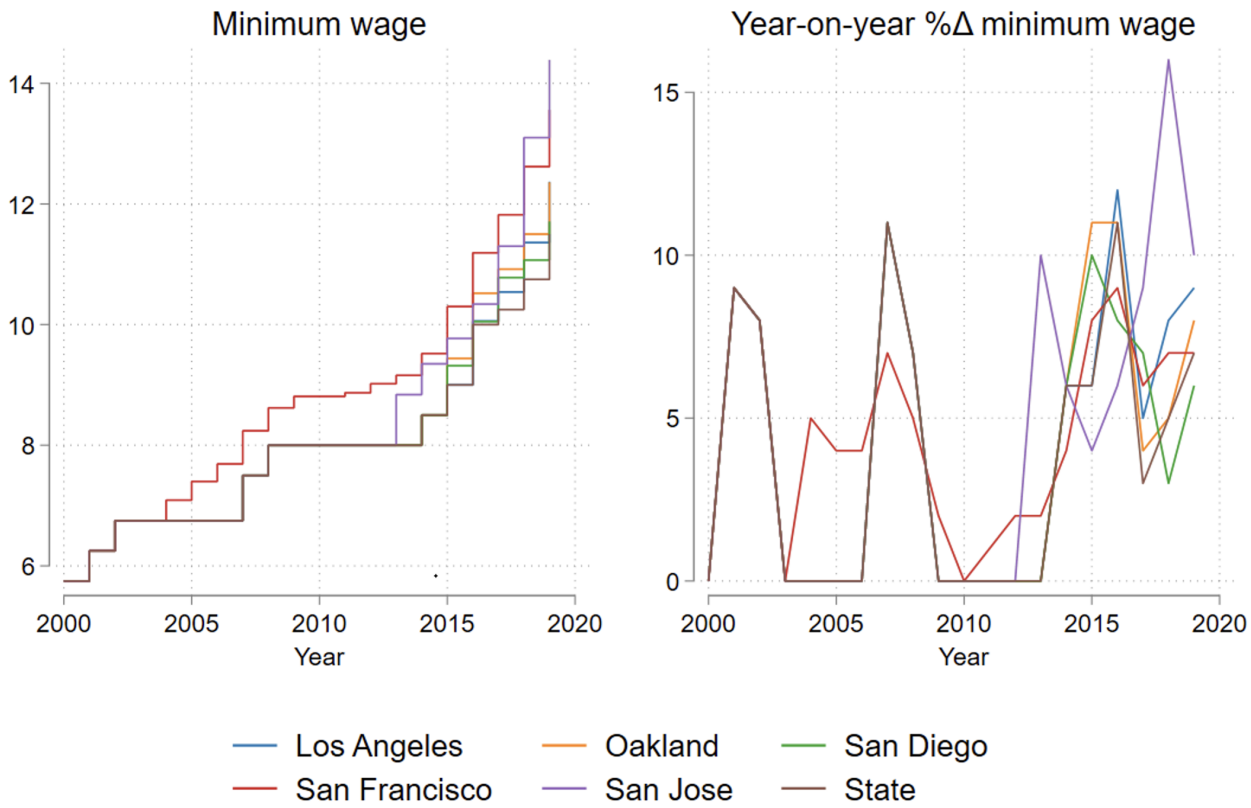
We use two minimum wage shock variables:

1. Real year-on-year % change in minimum wage *(mean=2%)*
2. Dummy for nominal minimum increase $\geq 5\%$ *(mean = 0.43)*

Minimum wage variation

We use two minimum wage shock variables:

1. Real year-on-year % change in minimum wage *(mean=2%)*
2. Dummy for nominal minimum increase $\geq 5\%$ *(mean = 0.43)*



(Kaitz index) (Real yoy shock) (Large min wage dummy) (Residualized variation)

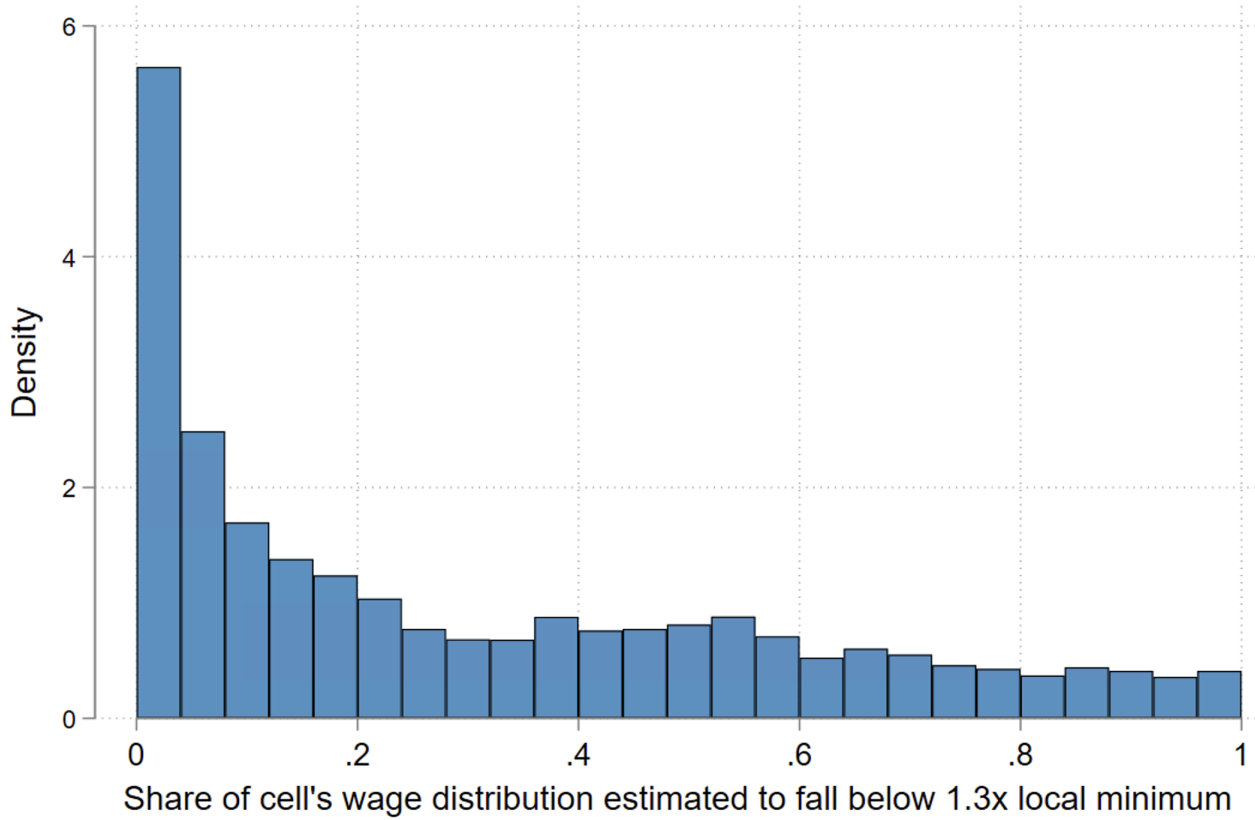
Exposure - construction

Exposure - construction

Exposure: % of metro-occupation in year t earning less than 1.3x local minimum wage (estimated from OEWS wage percentile data.)

Exposure - construction

Exposure: % of metro-occupation in year t earning less than 1.3x local minimum wage (estimated from OEWS wage percentile data.)



Three dimensions of variation:

- Across occupation (within metro-year)
- Across years (within occ-metro) (Example)
- Across metros (within occ-year) (Example)

High-exposure occupations: summary statistics

Occupation title	Inj. rate	Emp. share	Exp.
Other Food Prep./Serving Related Workers	2.9	1.3	89.4
Food and Beverage Serving Workers	1.7	4.6	80.6
Agricultural Workers	8.2	1.2	76.1
Cooks and Food Preparation Workers	4.6	2.5	60.6
Retail Sales Workers	2.2	6.5	56.6
Other Personal Care/Service Workers	2.6	1.7	51.9
Building Cleaning/Pest Control Workers	9.8	2.2	47.6
Material Moving Workers	8.1	3.7	46.1
Other Protective Service Workers	3.0	1.3	38.6
Nursing/Psychiatric/Home Health Aides	6.3	1.1	34.1

This table shows, in % terms, the injury rate, share of sample employment, and average exposure across cells (share of cell estimated to earn less than 1.3x local minimum) for the top 10 most exposed occupation groups (3-digit SOC) representing over 1% of employment in our sample.

High-exposure occupations: summary statistics

Occupation title	Inj. rate	Emp. share	Exp.
Other Food Prep./Serving Related Workers	2.9	1.3	89.4
Food and Beverage Serving Workers	1.7	4.6	80.6
Agricultural Workers	8.2	1.2	76.1
Cooks and Food Preparation Workers	4.6	2.5	60.6
Retail Sales Workers	2.2	6.5	56.6
Other Personal Care/Service Workers	2.6	1.7	51.9
Building Cleaning/Pest Control Workers	9.8	2.2	47.6
Material Moving Workers	8.1	3.7	46.1
Other Protective Service Workers	3.0	1.3	38.6
Nursing/Psychiatric/Home Health Aides	6.3	1.1	34.1

This table shows, in % terms, the injury rate, share of sample employment, and average exposure across cells (share of cell estimated to earn less than 1.3x local minimum) for the top 10 most exposed occupation groups (3-digit SOC) representing over 1% of employment in our sample.

Most common injuries (for high-exposure cells)

Nature of injury	%
Strain or Tear	29.2
Laceration	13.5
Contusion	12.9
Other Specific Injuries, NOC	8.7
Sprain or Tear	8.2
All Other Cumulative	4.7
Burn	3.0
Multiple Physical Injuries	2.9
Inflammation	2.6
Puncture	2.5

Cause of injury	%
Lifting	11.0
Strain or Injury by, NOC	7.4
Other Miscellaneous, NOC	6.2
Fall, Slip, Trip, NOC	5.4
Fall, Slip, Trip Same Level	4.5
Cumulative, NOC	4.1
Repetitive Motion	3.9
Struck by Falling Object	3.9
Cut, Puncture, Scrape, NOC	3.7
... by Tool or Utensil	3.4

Note: "High exposure" = 50% of the workforce earns less than 1.3x min wage

Headline specification

$$y_{o,m,t} = \alpha_{o,m} + \alpha_{m,t} + \alpha_{o,t} + \beta\,(min_{m,t} * exposure_{o,m,t}) + \gamma min_{m,t} + \delta exposure_{o,m,t} + \epsilon_{o,m,t}$$

(o = SOC 5-digit occupation, m = metro area, t = year, employment-weighted)

- $y_{o,m,t}$: Log injury rate or log mean hourly wage (OEWS).
- $min_{m,t}$: Minimum wage shock
  - Real year-on-year minimum wage change, *or*
  - Indicator for large nominal increase ($> 5\%$).
- $exposure_{o,m,t}$: Share earning less than 1.3x min wage.
- Fixed effects: occupation-metro, metro-year, and occupation-year.

Plan

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

For a fully exposed occupation

- 10% increase in min. wage $\Rightarrow$ 11% increase in injury rates

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

For a fully exposed occupation

- 10% increase in min. wage $\Rightarrow$ 11% increase in injury rates
- 10% increase in min. wage $\Rightarrow$ 8% increase in mean hourly wage

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

Implications:

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

Implications:

- Implied elasticity of injury rate to MW-induced wage changes: $\frac{1.145}{0.812} \approx 1.4$
- $\rightarrow$ 3 add'l injuries per year per 1,000 MW-exposed workers

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

Implications (large min wage shock dummy)

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

Implications (large min wage shock dummy)

For a fully-exposed occupation:

- Average large min. wage increase $\Rightarrow$ 7.7% increase in injury rates
- Average large min. wage increase $\Rightarrow$ 3.9% increase in mean hourly wage

Headline results

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	Injury	Wage	Injury	Wage
Minimum-exposure interaction	1.145***	0.812***	0.077***	0.039***
	(0.382)	(0.062)	(0.023)	(0.004)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318

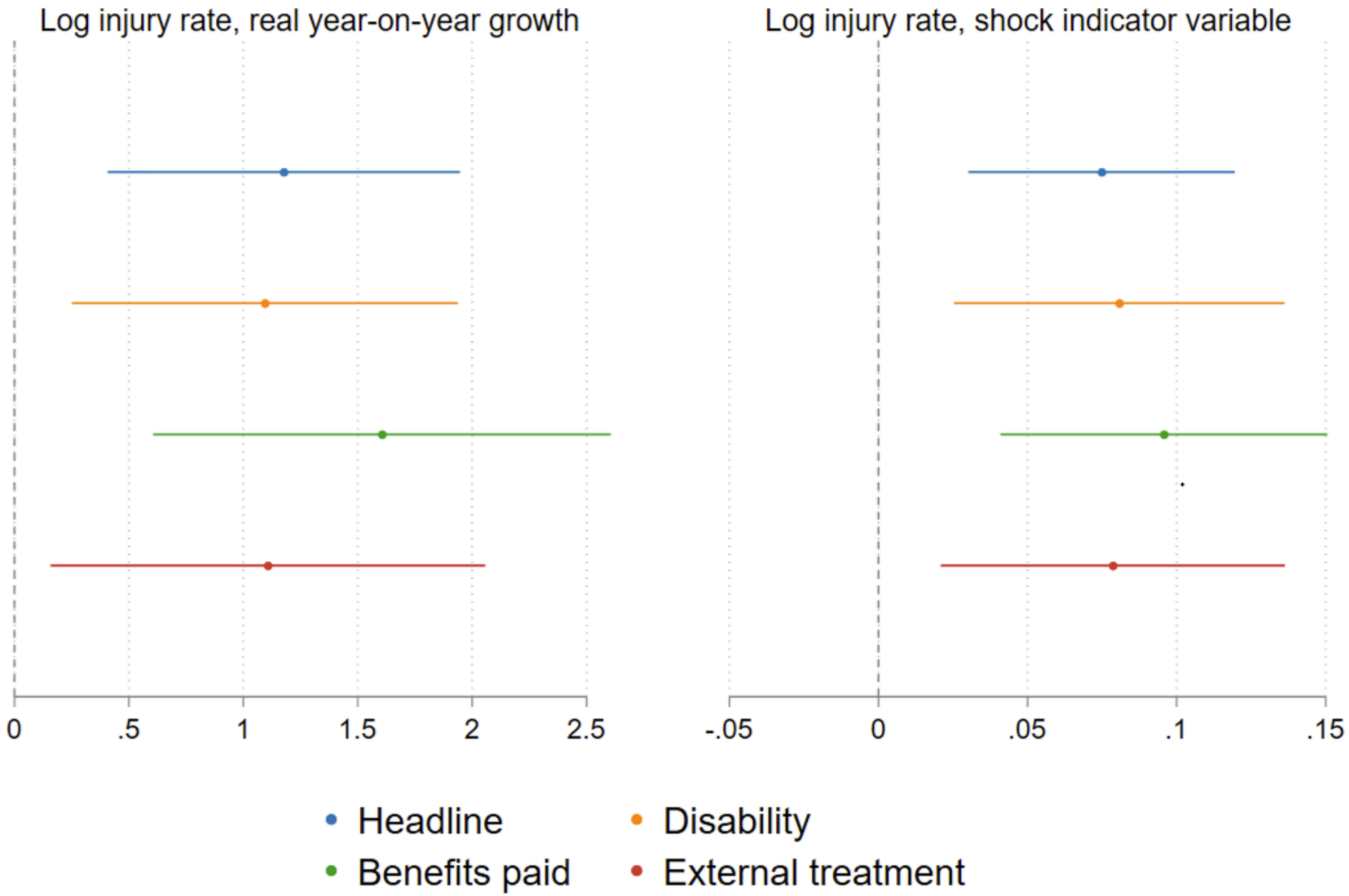
Employment-weighted; standard errors clustered at metro-occ level: * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).
(Alternate fixed effects) (Accidents only) (Employment) (Injury count)

Implications (large min wage shock dummy)
For a fully-exposed occupation:

- Average large min. wage increase $\Rightarrow$ 7.7% increase in injury rates
- Average large min. wage increase $\Rightarrow$ 3.9% increase in mean hourly wage

$\rightarrow$ Implied elasticity of injury rate to MW-induced wage changes: $\frac{0.077}{0.039} \approx 2$

More severe injuries show similar proportional increases (addressing reporting concerns)

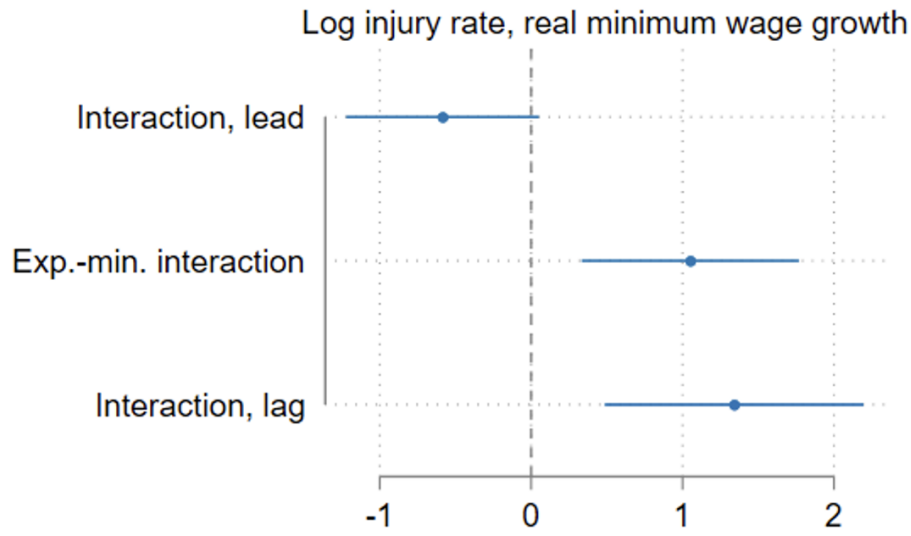


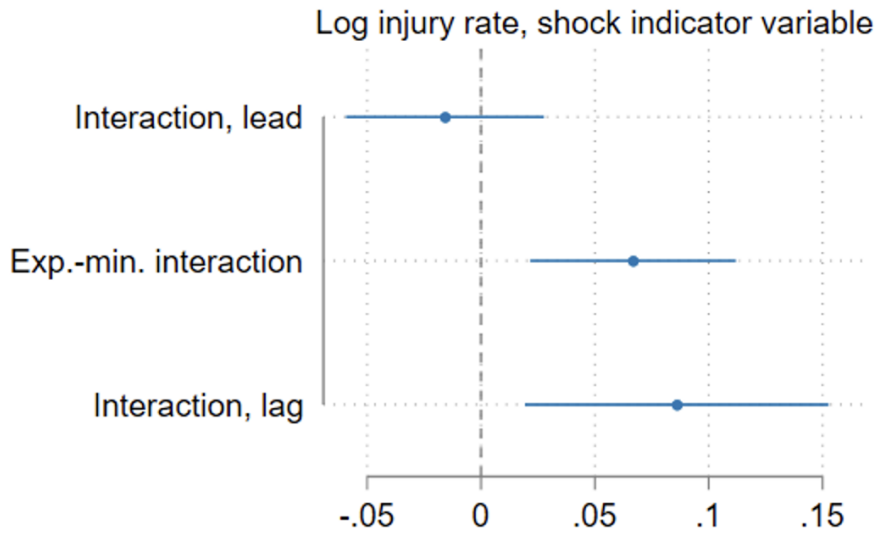
Benefits data suggests average injury, if anything, is more severe

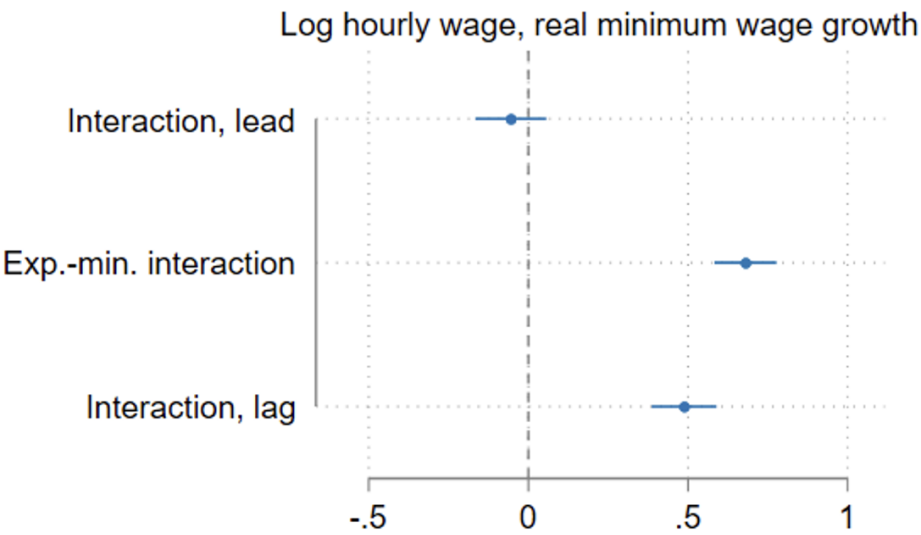
Minimum wage:	Real year-on-year growth			Shock indicator variable		
Dep var:	Log Benefits per Worker	Log Benefit Rate	Log Benefits per Claim	Log Benefits per Worker	Log Benefit Rate	Log Benefits per Claim
MW-Exposure Interaction	2.545***	1.452***	1.320	0.240***	0.105***	0.166***
	(0.970)	(0.507)	(0.872)	(0.059)	(0.028)	(0.057)
N	85,350	85,350	85,350	85,350	85,350	85,350

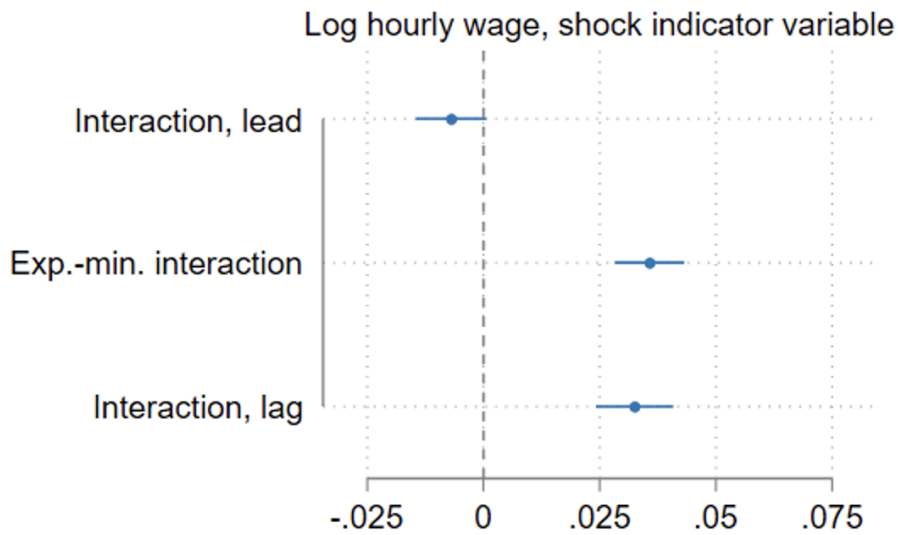
* ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$). Fixed effects: metro-occ, occ-year, metro-year.

Falsification test: No effect in year before shock

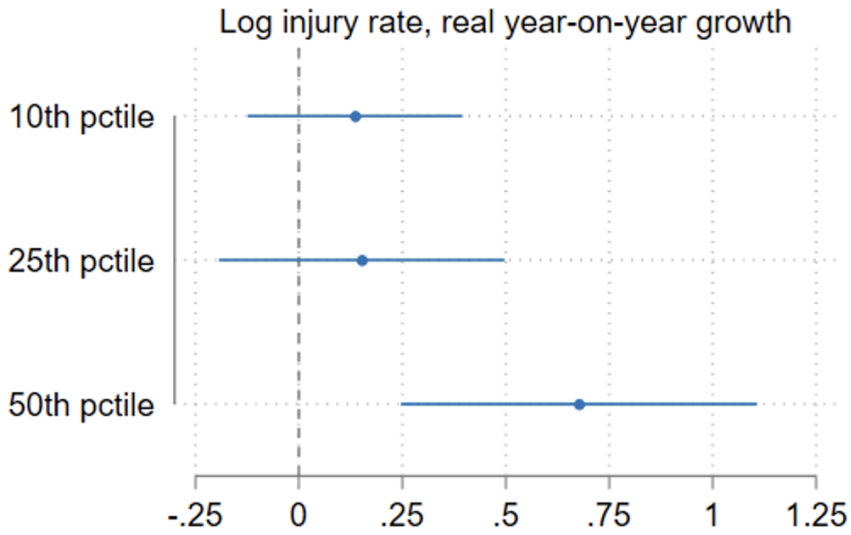


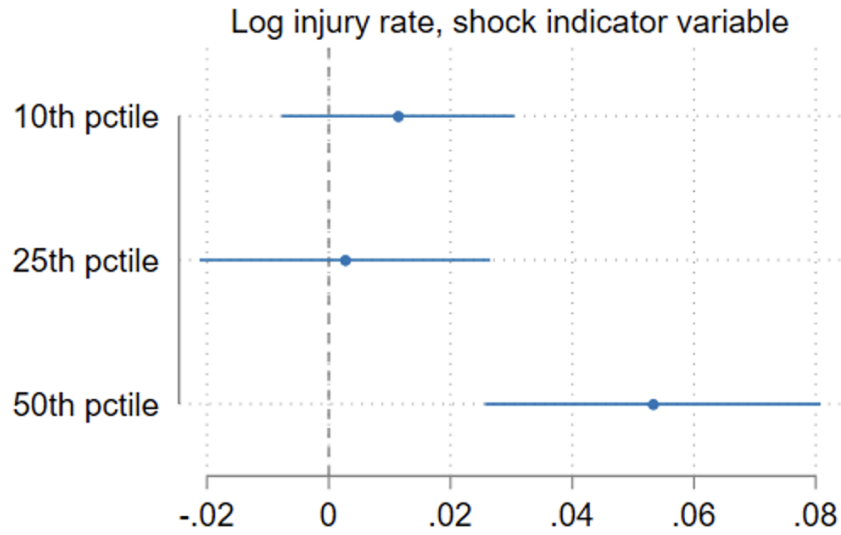


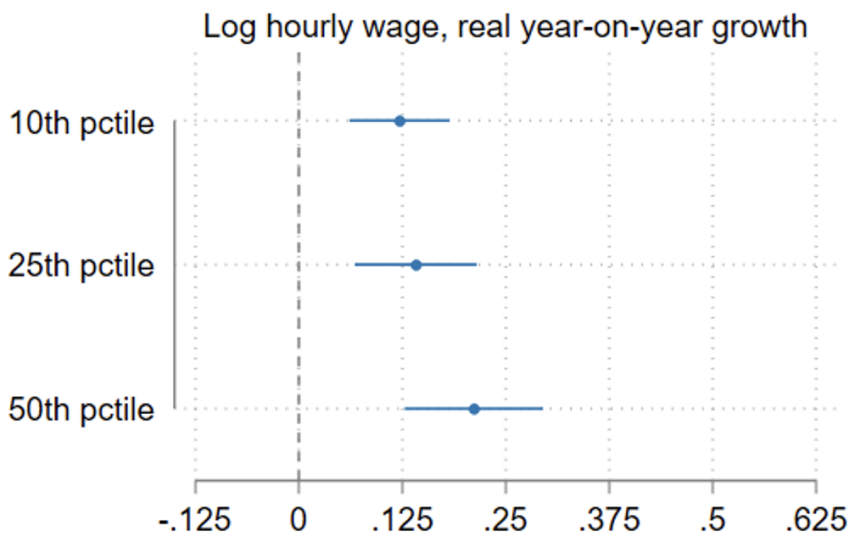


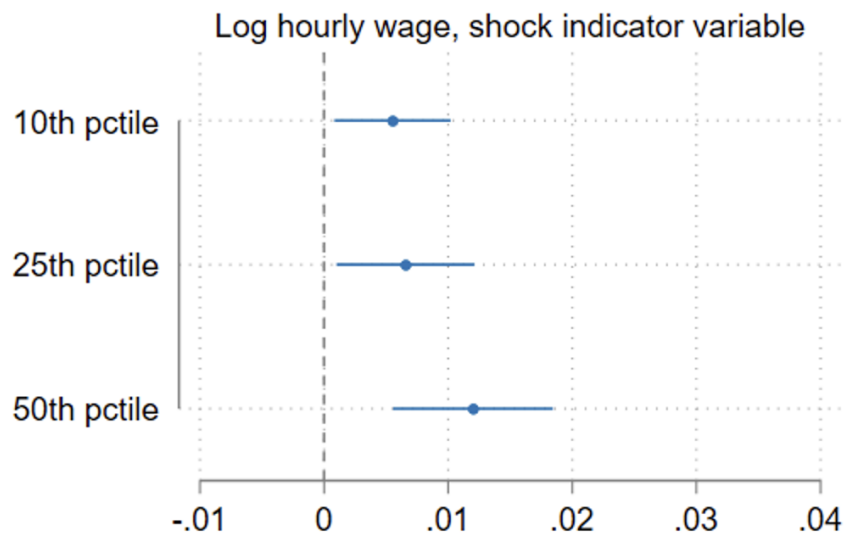


Falsification test: More exposed cells see bigger effects









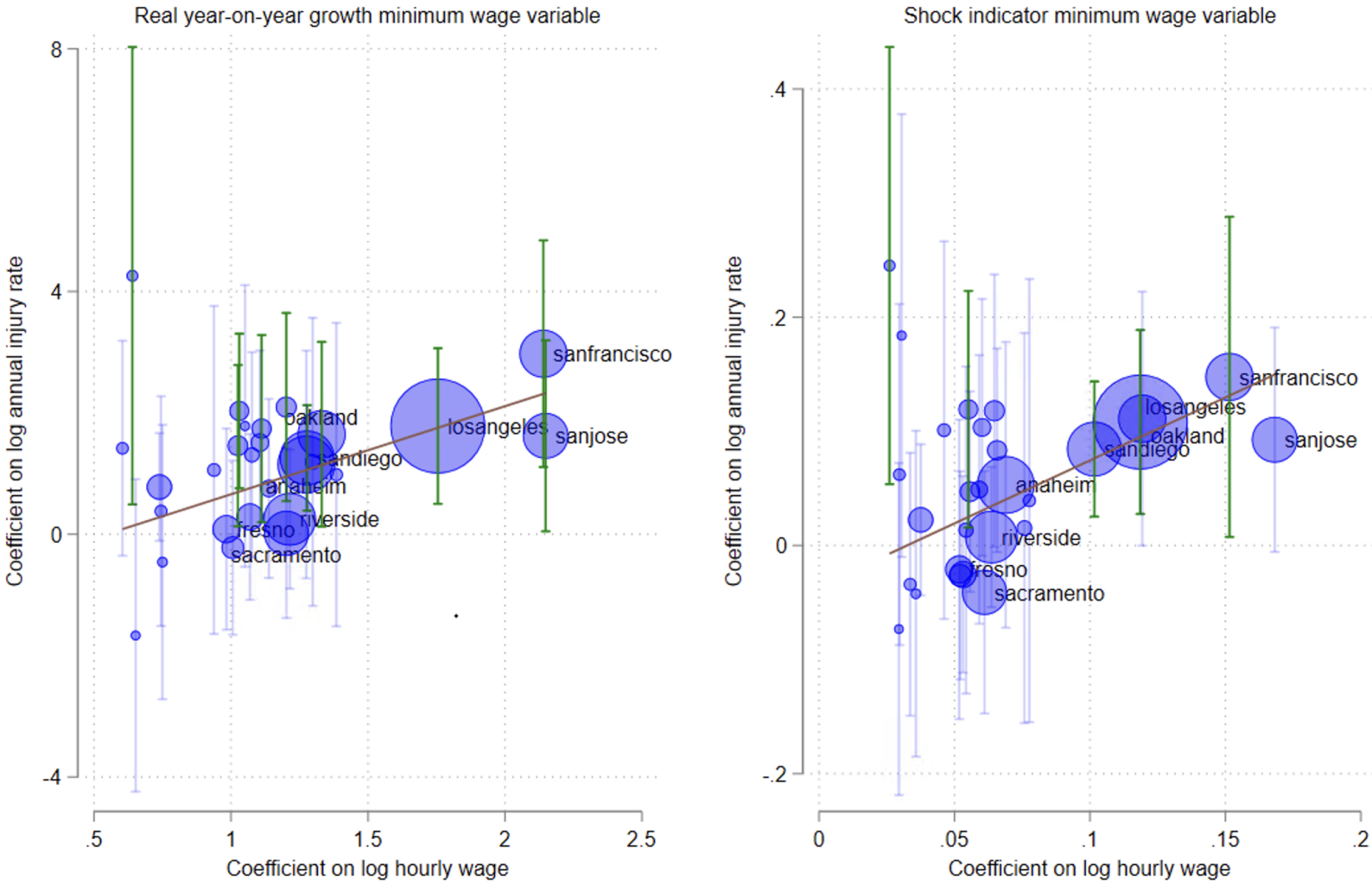
(Higher exposure thresholds)

Other robustness tests

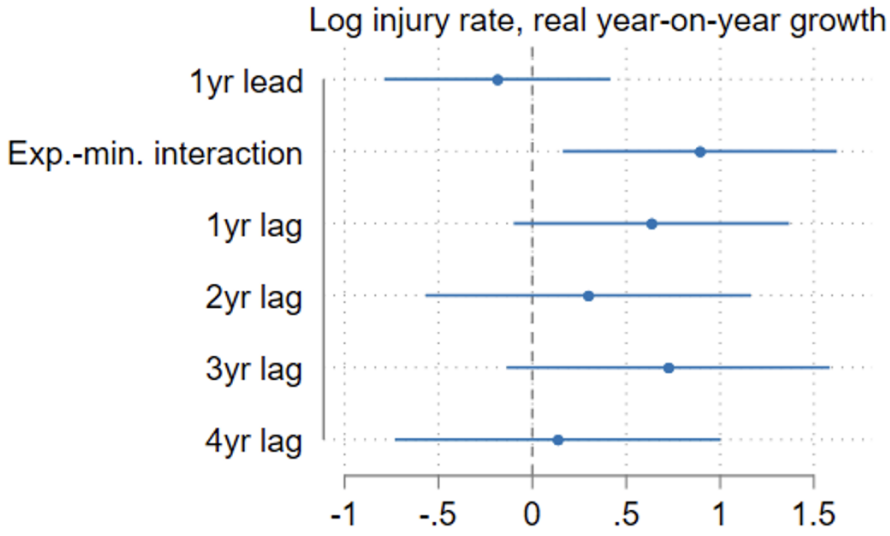
(Injury OWE Robustness)

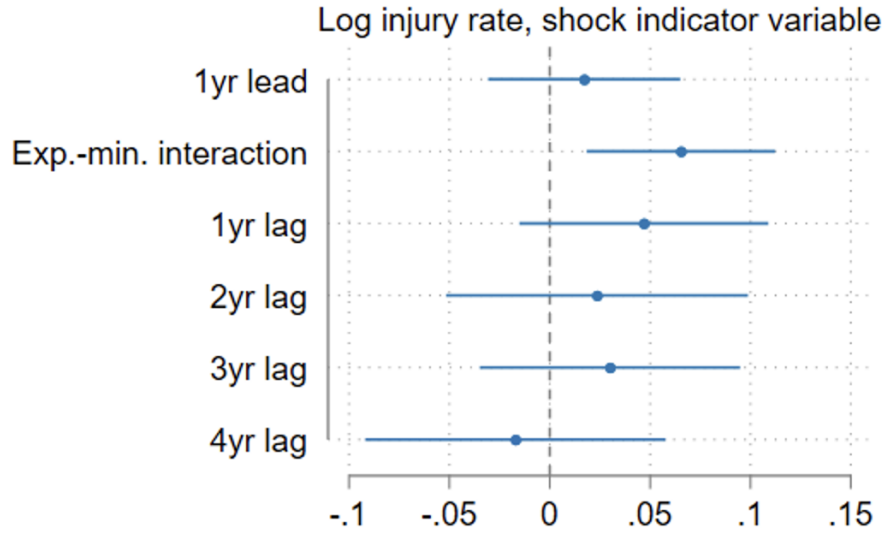
City-Specific Effects

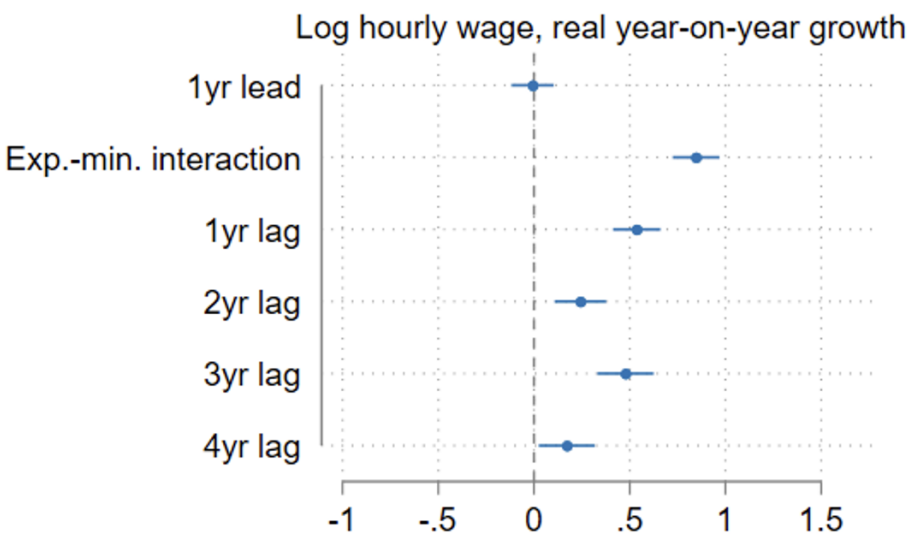
We run our same baseline regression separately for each metro area, with metro-occ and year fixed effects. This identifies only off *within-city, cross-occupation* differences in minimum wage exposure:

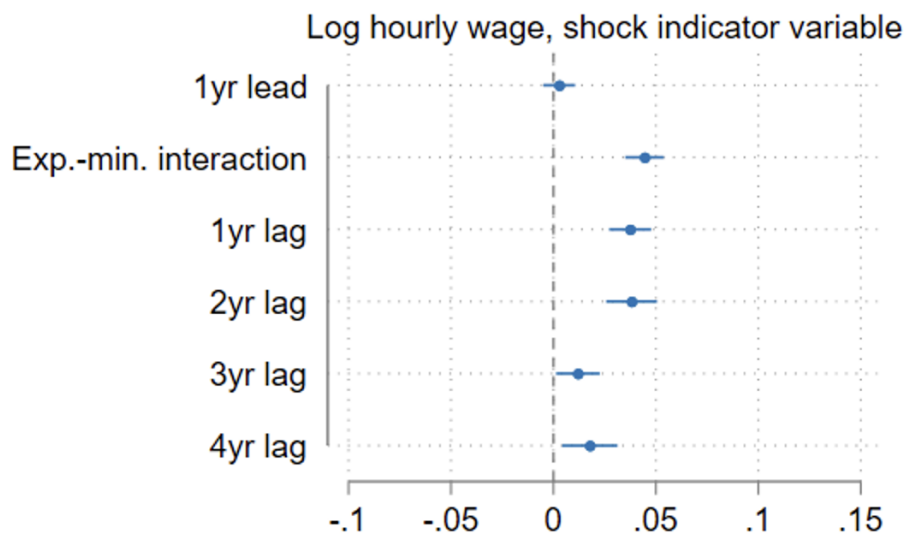


Persistence: injury effects appear to last as long as wage effects (and fade out as wage effects fade)









Plan

Mechanisms: revisiting conceptual framework

↑ Minimum wage hikes might increase injury rates if:

Mechanisms: revisiting conceptual framework

↑ Minimum wage hikes might increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
- Work intensification: Firms might intensify the pace of work to increase productivity in line with labor costs.

Mechanisms: revisiting conceptual framework

↑ Minimum wage hikes might increase injury rates if:

- Reduced safety spending: Firms have (some) discretion over safety, and providing safety is costly.
- Work intensification: Firms might intensify the pace of work to increase productivity in line with labor costs.

We use nature and cause of injury data to isolate injuries we believe are most likely caused by work intensification:

Cumulative physical injuries: injuries relating to repetitive physical motion (e.g. carpal tunnel syndrome, RSI) *approx* 8% of our sample.

Cumulative physical injuries are common in low-wage jobs

Annual cumulative physical injury rates:

- Food preparation workers, Cooks: 0.26%
- Laborers and material movers: 0.54%
- Building cleaning workers: 0.61%

Minimum Wage increases disproportionately increase Cumulative physical injuries

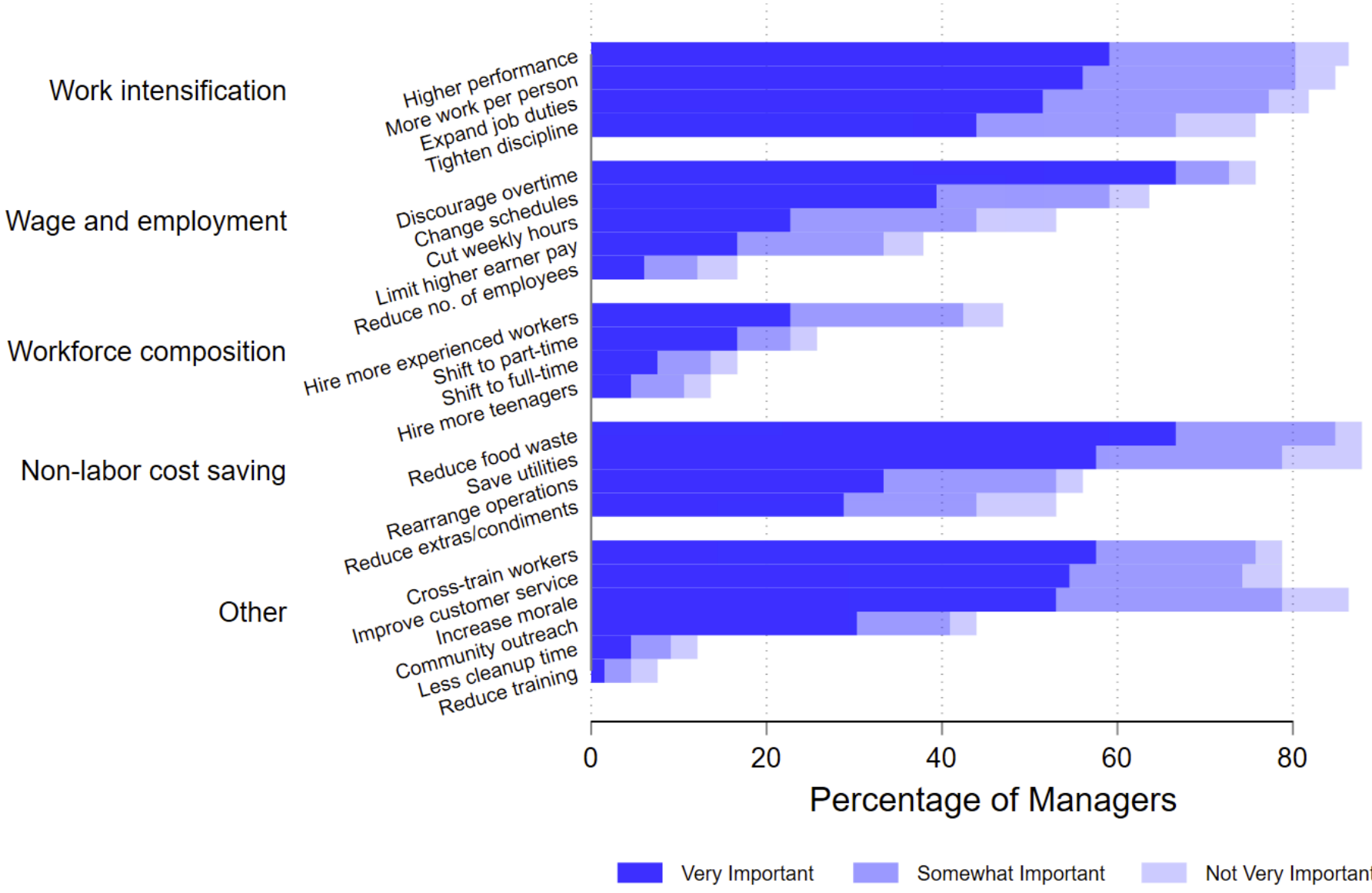
Minimum Wage increases disproportionately increase Cumulative physical injuries

Injury-wage elasticity is almost twice as high for cumulative physical injury rate as overall injury rate, suggesting an important role for work intensification:

Minimum wage variable:	Real year-on-year growth		Shock indicator variable	
Dependent variable:	CP	All claims	CP	All claims
Min.-exp. interaction	2.174***	1.169***	0.117***	0.079***
	(0.594)	(0.411)	(0.037)	(0.025)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	67,768	67,768	67,768	67,768

Employment-weighted regression; standard errors clustered at metro-occupation level. * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$).

This is consistent with survey evidence from Hirsch et al. (2015)



Plan

Conclusions

Using the universe of Workers' Compensation claims from California in 2000-2019 we find that:

Minimum wage increases increase workplace injury rates:

- Elasticity of injury rate to minimum-wage induced wage changes is around 1.5
- A 10% minimum wage increase on average induces 3 additional workplace injuries per 1,000 low-wage workers per year
- Injuries remain elevated for as long as wages remain elevated

Conclusions

Using the universe of Workers' Compensation claims from California in 2000-2019 we find that:

Minimum wage increases increase workplace injury rates:

- Elasticity of injury rate to minimum-wage induced wage changes is around 1.5
- A 10% minimum wage increase on average induces 3 additional workplace injuries per 1,000 low-wage workers per year
- Injuries remain elevated for as long as wages remain elevated

Work intensification seems to play an important role:

- Cumulative physical injury rate increases at twice the rate of regular injuries.
- But cannot rule out a role for reduced safety spending as well

Conclusions

Using the universe of Workers' Compensation claims from California in 2000-2019 we find that:

Minimum wage increases increase workplace injury rates:

- Elasticity of injury rate to minimum-wage induced wage changes is around 1.5
- A 10% minimum wage increase on average induces 3 additional workplace injuries per 1,000 low-wage workers per year
- Injuries remain elevated for as long as wages remain elevated

Work intensification seems to play an important role:

- Cumulative physical injury rate increases at twice the rate of regular injuries.
- But cannot rule out a role for reduced safety spending as well

Back-of-the-envelope welfare calculation: Welfare cost of increased injuries $\approx$ 10% of minimum wage increase (more)

Conclusions

Using the universe of Workers' Compensation claims from California in 2000-2019 we find that:

Minimum wage increases increase workplace injury rates:

- Elasticity of injury rate to minimum-wage induced wage changes is around 1.5
- A 10% minimum wage increase on average induces 3 additional workplace injuries per 1,000 low-wage workers per year
- Injuries remain elevated for as long as wages remain elevated

Work intensification seems to play an important role:

- Cumulative physical injury rate increases at twice the rate of regular injuries.
- But cannot rule out a role for reduced safety spending as well

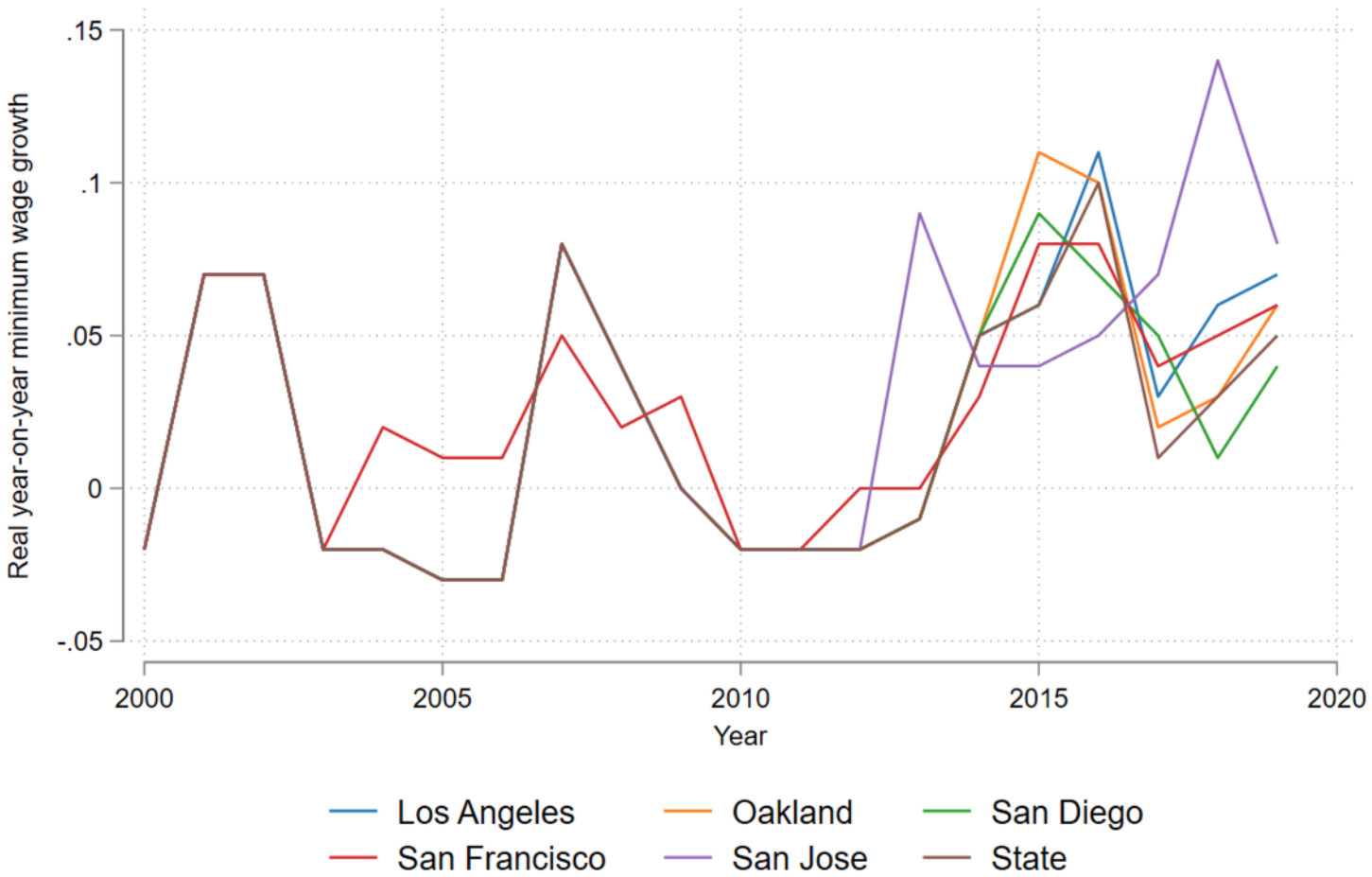
Back-of-the-envelope welfare calculation: Welfare cost of increased injuries $\approx$ 10% of minimum wage increase (more)

Thank you! Comments appreciated: amms@mit.edu

Plan

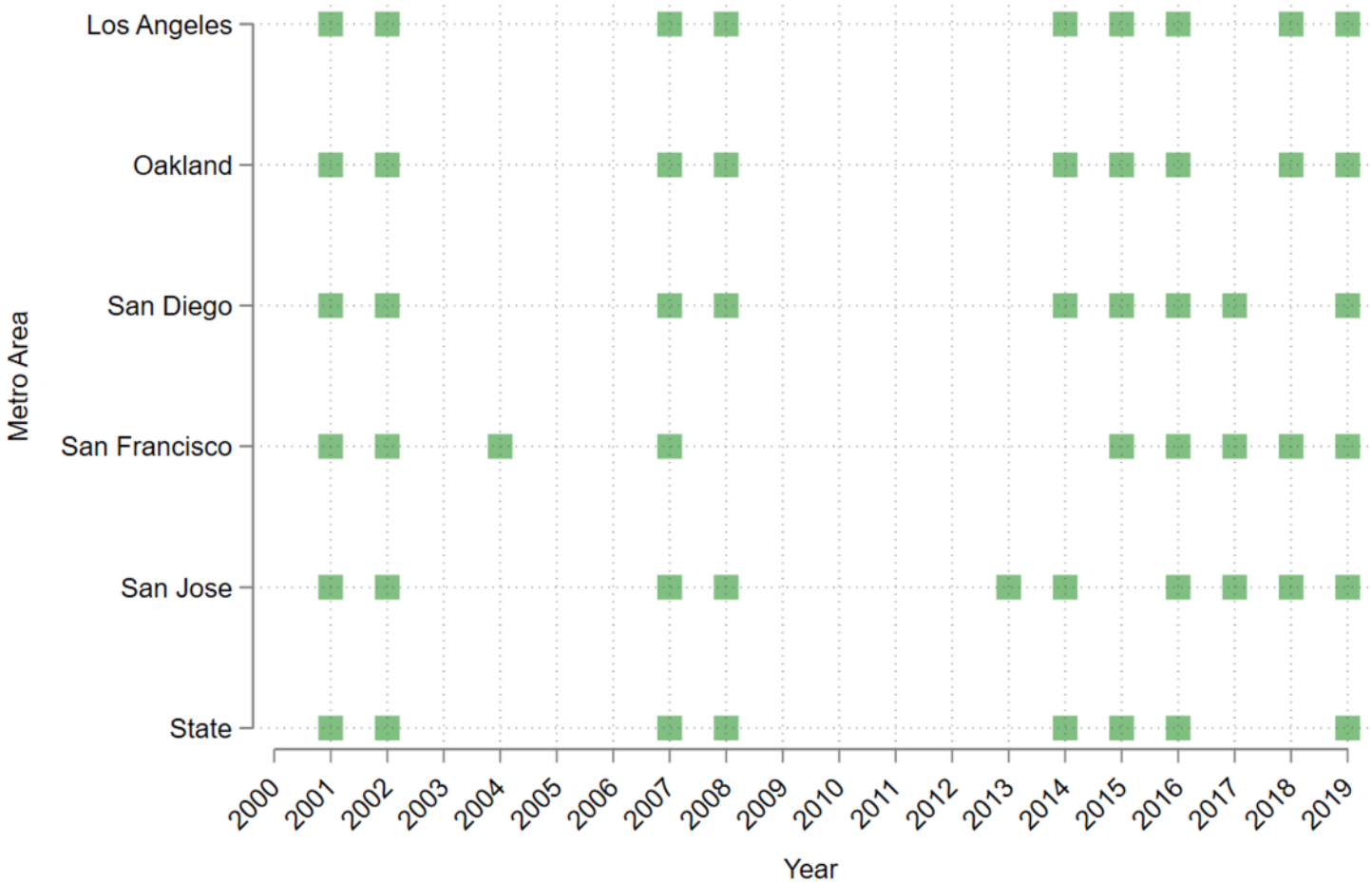
Appendix

Minimum wage shock: Real yoy % change



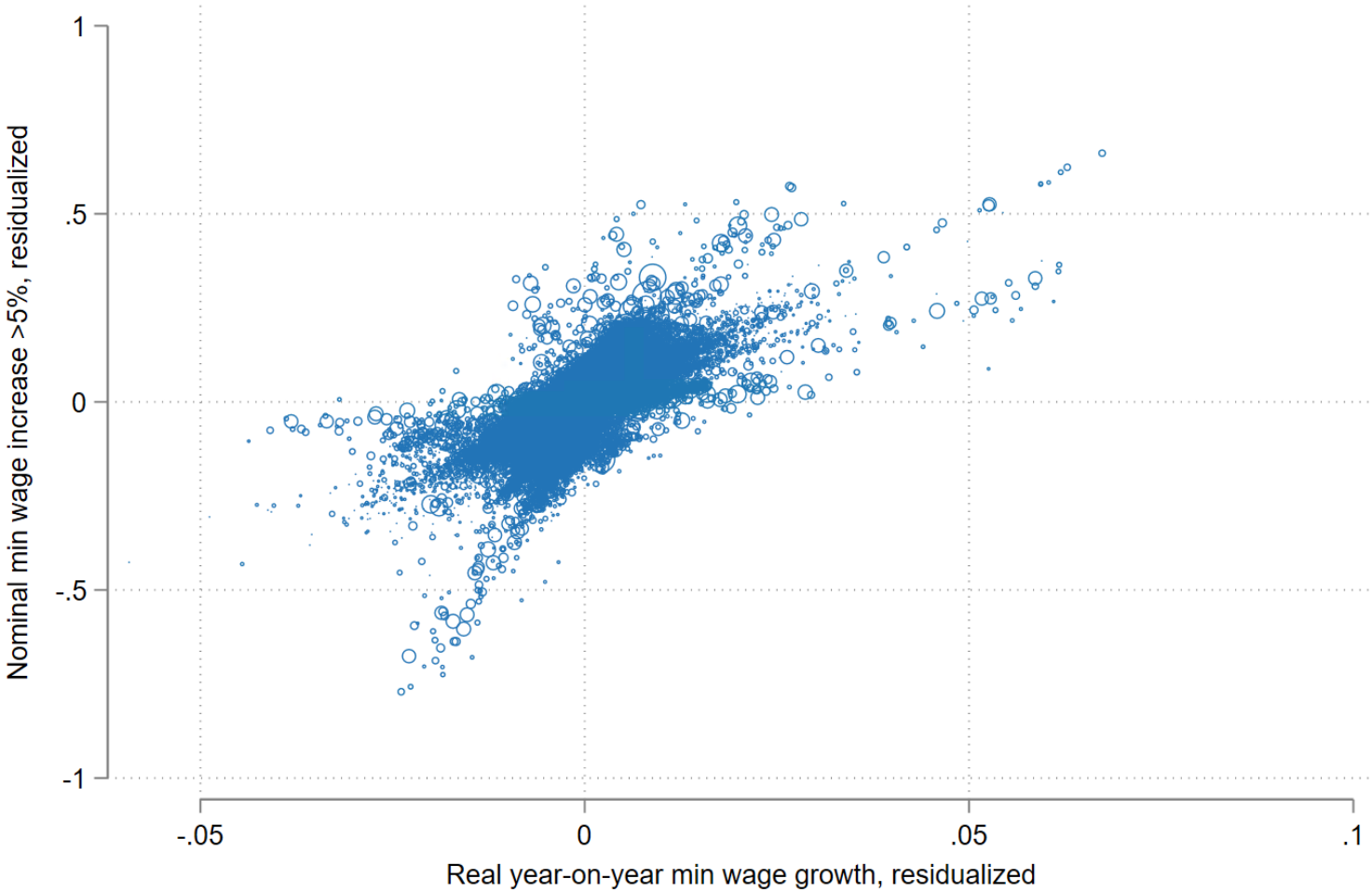
(Minimum wages over time)

Minimum wage shock: Dummy for large nominal increase



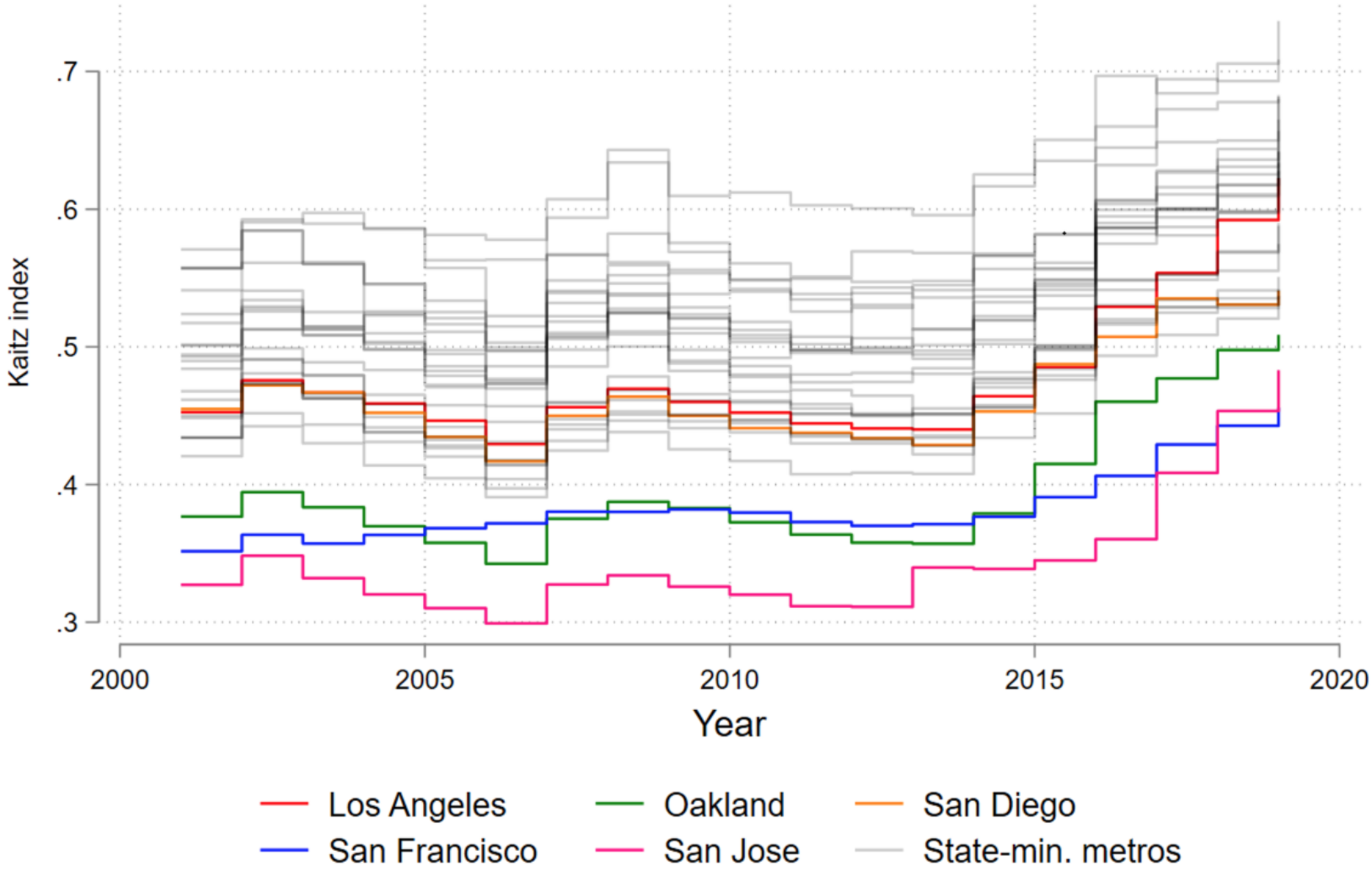
(Minimum wages over time)

Minimum wage shock: residualized variation



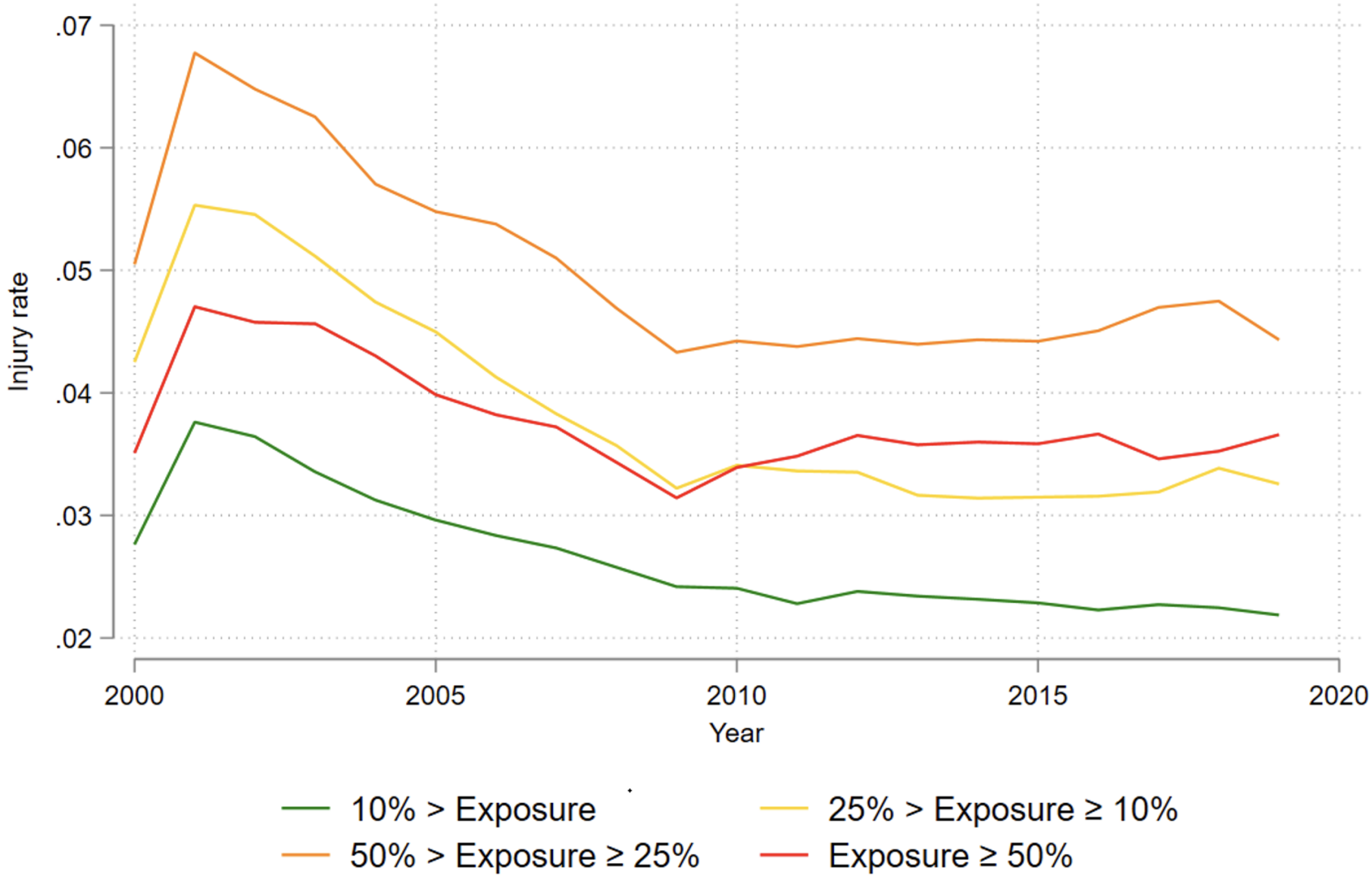
(Minimum wages over time)

Minimum-median ratio (Kaitz index)



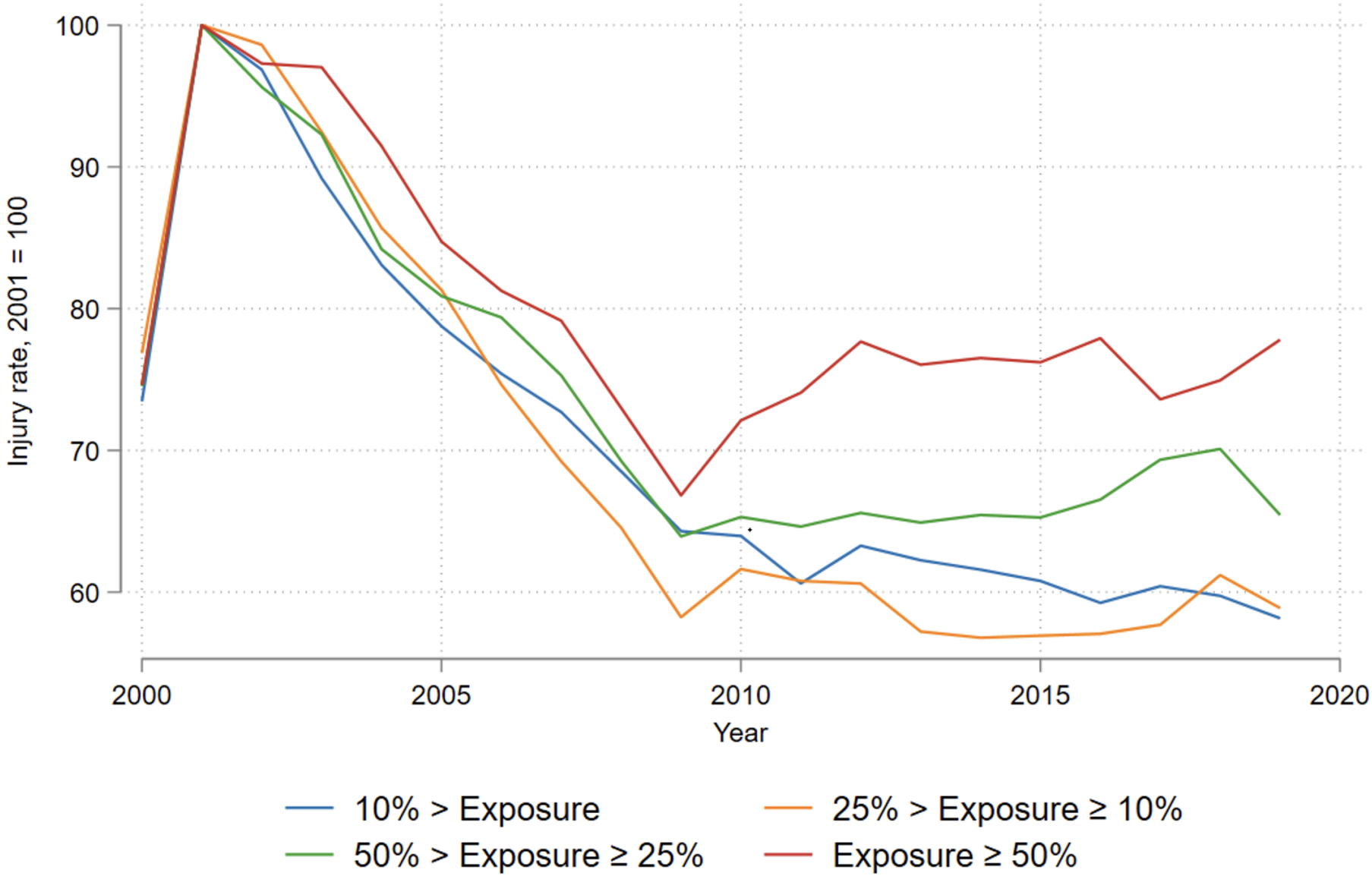
(Minimum wages over time)

Injury rates over time



(Injury by occupation)

Injury rates over time, indexed to 2001



(Injury by occupation)

Exposure - rationale

Our occupation-metro-year specific exposure measure allows variation on three dimensions:

1. Within metro and year, across occupations: low-wage occupations are more exposed to the minimum wage than high-wage occupations.
2. Within occupation-metro, across years: some minimum wage changes have more bite than others.
3. Within occupation-year, across metro areas: same occupation in different cities have different wage levels; different cities have different min wages.

Exposure - rationale

Our occupation-metro-year specific exposure measure allows variation on three dimensions:

1. Within metro and year, across occupations: low-wage occupations are more exposed to the minimum wage than high-wage occupations.
2. Within occupation-metro, across years: some minimum wage changes have more bite than others.
3. Within occupation-year, across metro areas: same occupation in different cities have different wage levels; different cities have different min wages.

Example of within-occupation within-year exposure variation: Cooks in 2005

- Merced: 72%
- Los Angeles: 49%
- San Francisco: 27%
- Napa: 19%

(Exposure variation)

Accidents only

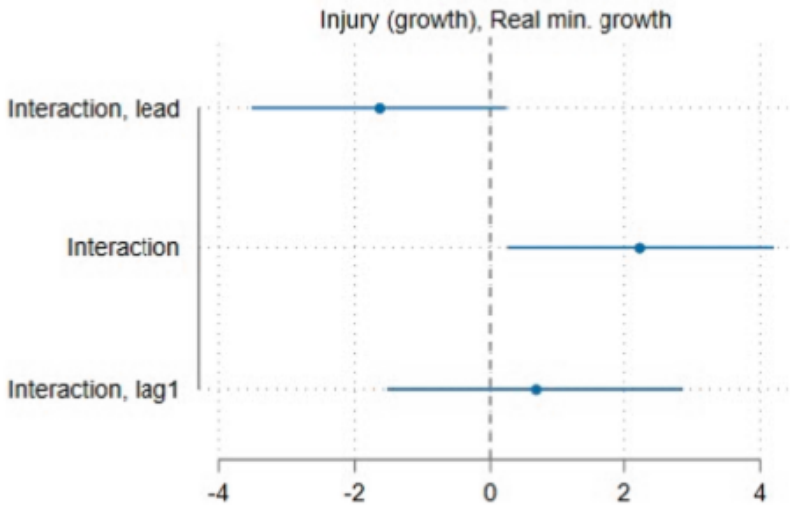
Effect of exposure-minimum wage shock interaction on injury and accident rates, 2000-2019

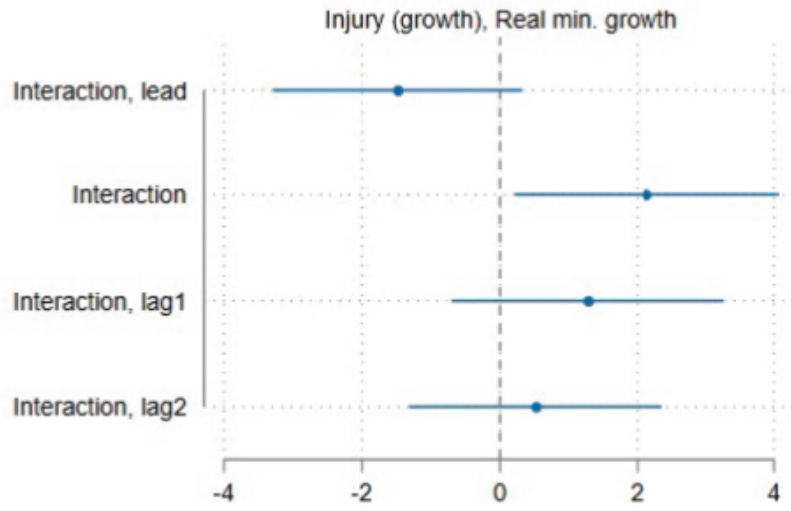
Min. var.:	Real year-on-year growth			Shock indicator variable		
Dep. var.:	Acc.	Acc. (strict)	All claims	Acc.	Acc. (strict)	All claims
Min * exp	1.129***	1.033***	1.140***	0.081***	0.072***	0.076***
	(0.382)	(0.394)	(0.382)	(0.024)	(0.025)	(0.023)
Fixed effects	Metro-Occ	Metro-Occ	Metro-Occ	Metro-Occ	Metro-Occ	Metro-Occ
	Metro-Year	Metro-Year	Metro-Year	Metro-Year	Metro-Year	Metro-Year
	Occ-Year	Occ-Year	Occ-Year	Occ-Year	Occ-Year	Occ-Year
N	113,296	107,613	113,296	113,296	107,613	113,296

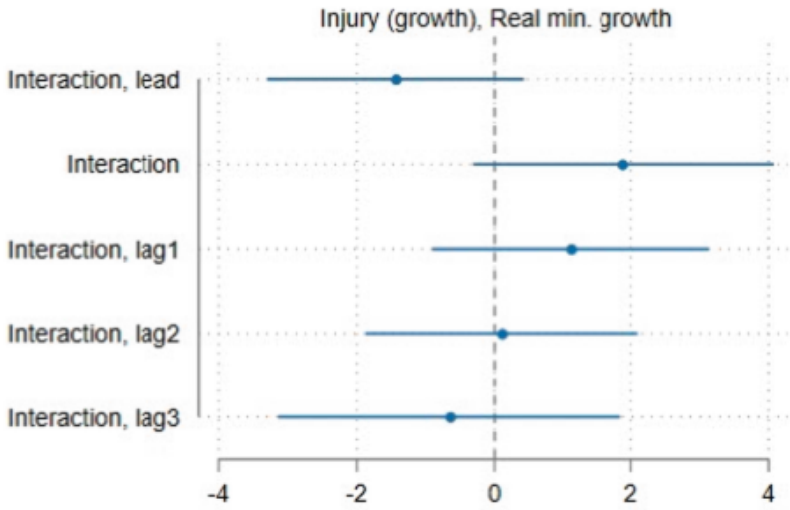
This table reports our baseline coefficients (columns 3 and 6) alongside estimates of the effect of minimum wage shocks on log accident rates for two definitions of "accident", assessed using COI and NOI data. Employment-weighted regression. SEs clustered at metro-occupation level. * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$)

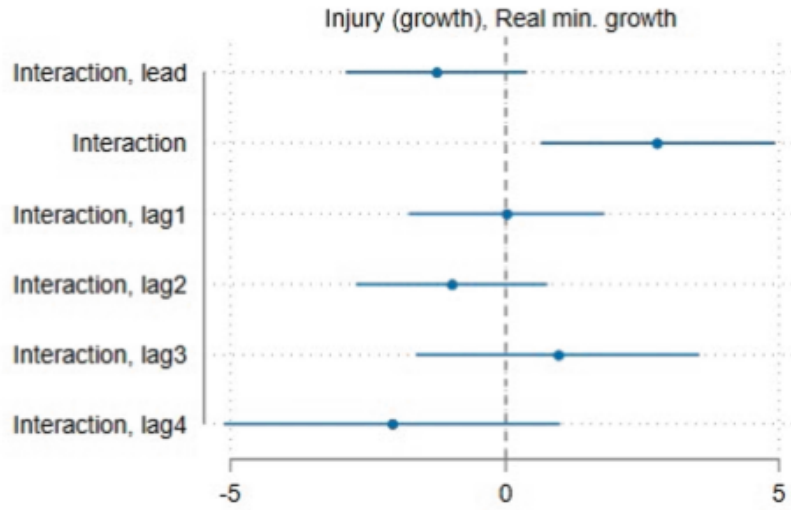
(Main results) (Cumulative Physical)

Growth rate dependent variable regressions



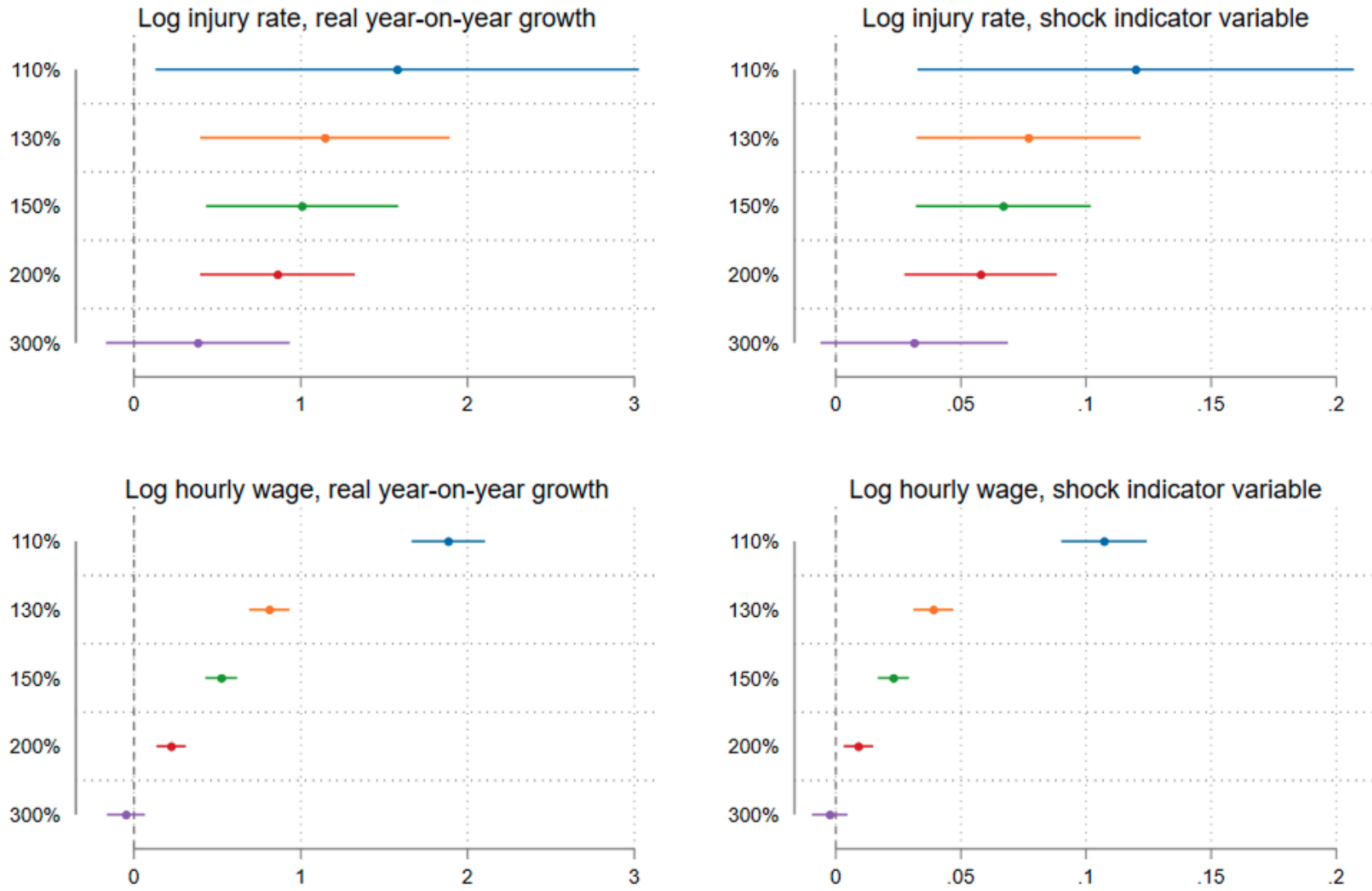






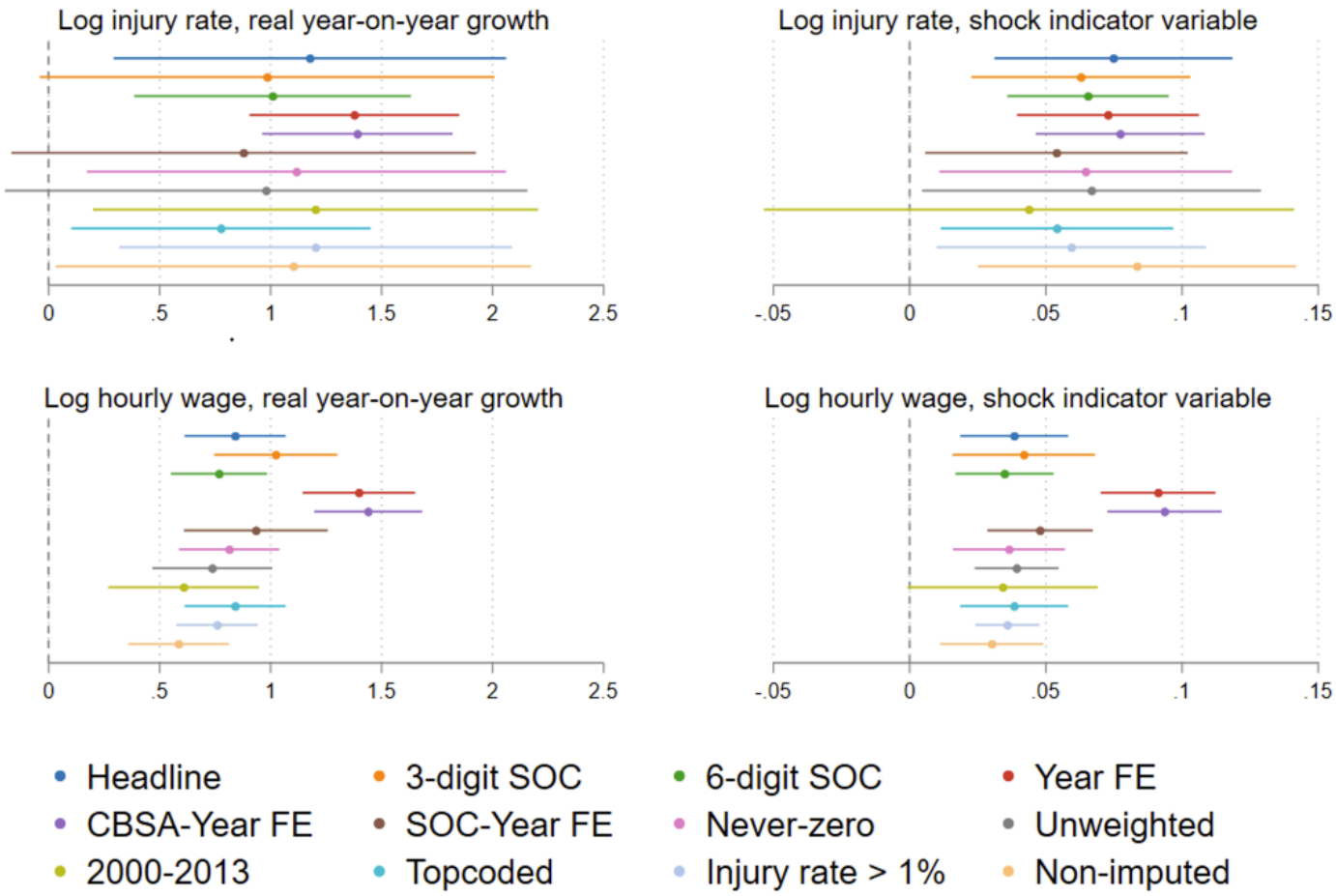
(Back)

Falsification test: Raising exposure threshold reduces effects



(Back)

Robustness checks: CBSA-level clustering



Summary statistics

Summary statistics for selected variables, 2010

Name	Mean	P10	P25	P50	P75	P90
Employment	1,760	50	110	340	1,250	3,830
Injury Rate	4.1	0	0.5	1.9	4.7	9.2
Hourly Wage	26.03	11.71	15.55	22.15	33.20	45.28

This table reports the mean and selected percentiles of employment, injury rate, and hourly wages (2010 USD) across metro-occupation labor market cells in 2010 (the midpoint of our sample).

Employment-weighted summary statistics for selected variables, 2010

Name	Mean	P10	P25	P50	P75	P90
Employment	18,341	900	2,740	8,374	23,900	51,320
Injury Rate	3.1	0.5	0.9	2.1	4.1	6.9
Hourly Wage	24.07	10.65	12.5	18.48	31.09	45.17

This table reports the mean and selected percentiles of employment, injury rate, and hourly wages (2010 USD) across metro-occupation labor markets in 2010 (the midpoint of our sample), weighted by cell employment.

(Injury rate by occupation)

Most common causes of injury

Most common causes of injury

Cause of injury	Number of injuries	Share of total (%)
Lifting	933,516	10.3
Strain or Injury by, NOC	711,512	7.9
Other Miscellaneous, NOC	691,014	7.6
Repetitive Motion	440,950	4.9
Fall, Slip, Trip, NOC	427,620	4.7
Cumulative, NOC	381,247	4.2
On Same Level	353,415	3.9
Pushing or Pulling	330,783	3.7
Cut, Puncture, Scrape	306,222	3.4
Falling or Flying Object	295,543	3.3

Most common natures of injury

Most common natures of injury

Nature of injury	Number of injuries	Share of total (%)
Strain or Tear	2,727,539	30.1
Contusion	997,491	11.0
Laceration	984,242	10.9
Sprain or Tear	859,693	9.5
All Other Specific Injuries, NOC	774,178	8.6
All Other Cumulative Injuries	440,977	4.9
Puncture	310,555	3.4
Multiple Physical Injuries Only	250,993	2.8
Inflammation	244,963	2.7
Fracture	233,941	2.6

Occupations with many cumulative physical injuries

Occupations with highest number of cumulative physical (CP) injuries

Occupation Title	CP Injuries	CP Injury Rate	Exp.
Laborers/Material Movers, Hand	46,276	3.1	53.1
Building Cleaning Workers	35,881	3.0	48.8
Customer Service Reps.	28,071	4.9	14.2
Office Clerks, General	26,212	2.9	22.1
Secretaries/Admin. Assistants	16,626	1.1	7.8
Driver/Sales Workers/Truck Drivers	15,646	1.6	16.9
Misc. Assemblers/Fabricators	14,988	3.8	32.5
Police Officers	14,748	6.6	0.1
Cooks	12,655	1.3	57.7
Cashiers	11,900	0.8	63.7

In this table, we show total cumulative physical injury count, average occupational CP injury rate over the sample, and average occupational exposure for the 5-digit SOC occupations with the highest number of CP injuries.

Dependent variable: Average age of injured (log)

Minimum wage variable:	Real year-on-year growth	Shock indicator variab
Minimum-exposure interaction	0.051	0.010**
	(0.056)	(0.004)
Fixed effects	Metro-Occ	Metro-Occ
	Metro-Year	Metro-Year
	Occ-Year	Occ-Year
N	67,766	67,766

Dependent variable: Average tenure of injured (log)

Effect of exposure-minimum wage shock interaction on log average tenure of injured, 2000-2019

	Real year-on-year growth	Shock indicator variable
Minimum-exposure interaction	0.942***	0.032*
	(0.264)	(0.020)
Fixed effects	Metro-Occ	Metro-Occ
	Metro-Year	Metro-Year
	Occ-Year	Occ-Year
N	103,678	103,678

* (p<0.10), ** (p<0.05), *** (p<0.01)

NIOCCS occupation coding: examples

Occupation name only:

- "Veterinary Assistant" → SOC 31-9096 *Veterinary Assistants and Laboratory Animal Caretakers*
- "Front Desk Reception" → SOC 43-4171 *Receptionists and Information Clerks*
- "Professor of Medicine" → SOC 25-1000 *Postsecondary Teachers*

Occupation name and NAICS code:

- "Cook", NAICS 611212 (junior colleges) → SOC 35-2012 *Cooks, Institution and Cafeteria*
- "Cook", NAICS 71321 (casinos) → SOC 35-2014 *Cooks, Restaurant*
- "Cook", nonsense NAICS → SOC 35-2019 *Cooks, All Other*

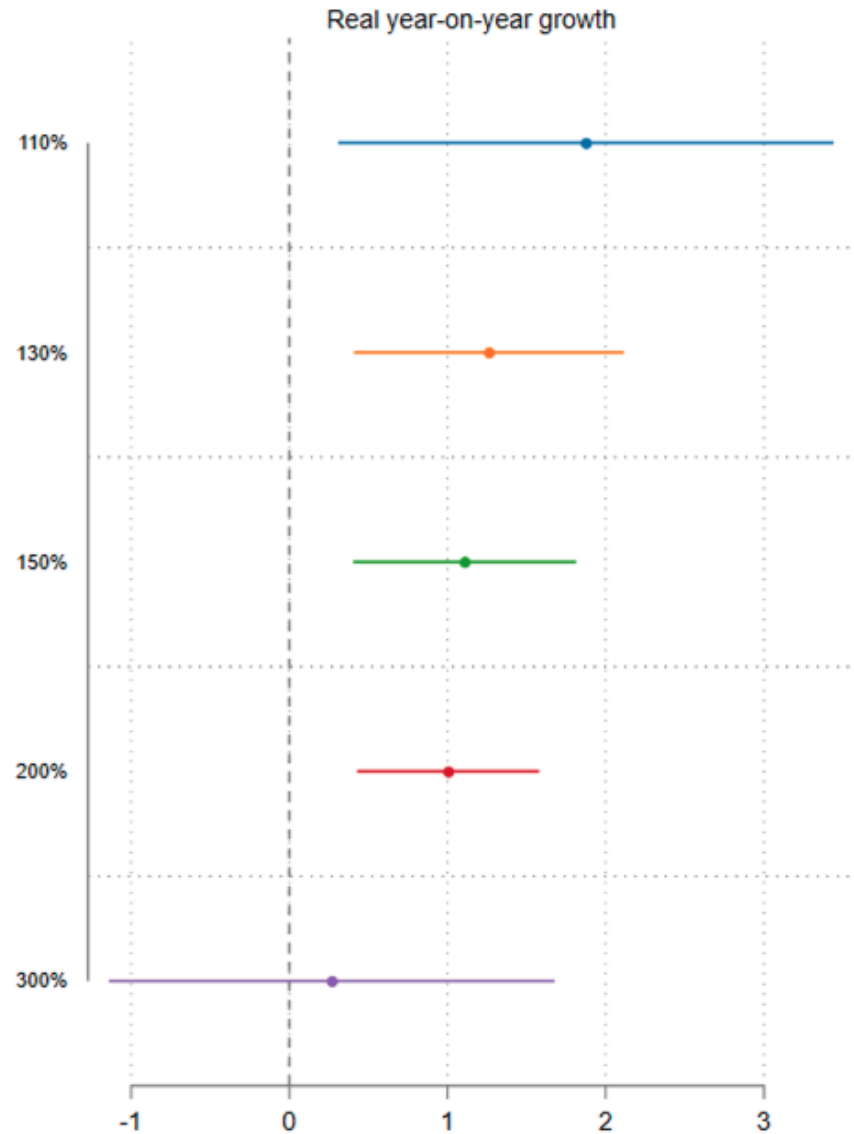
A trickier example: SOC 37-3012 Pesticide handlers, sprayers, and applicators

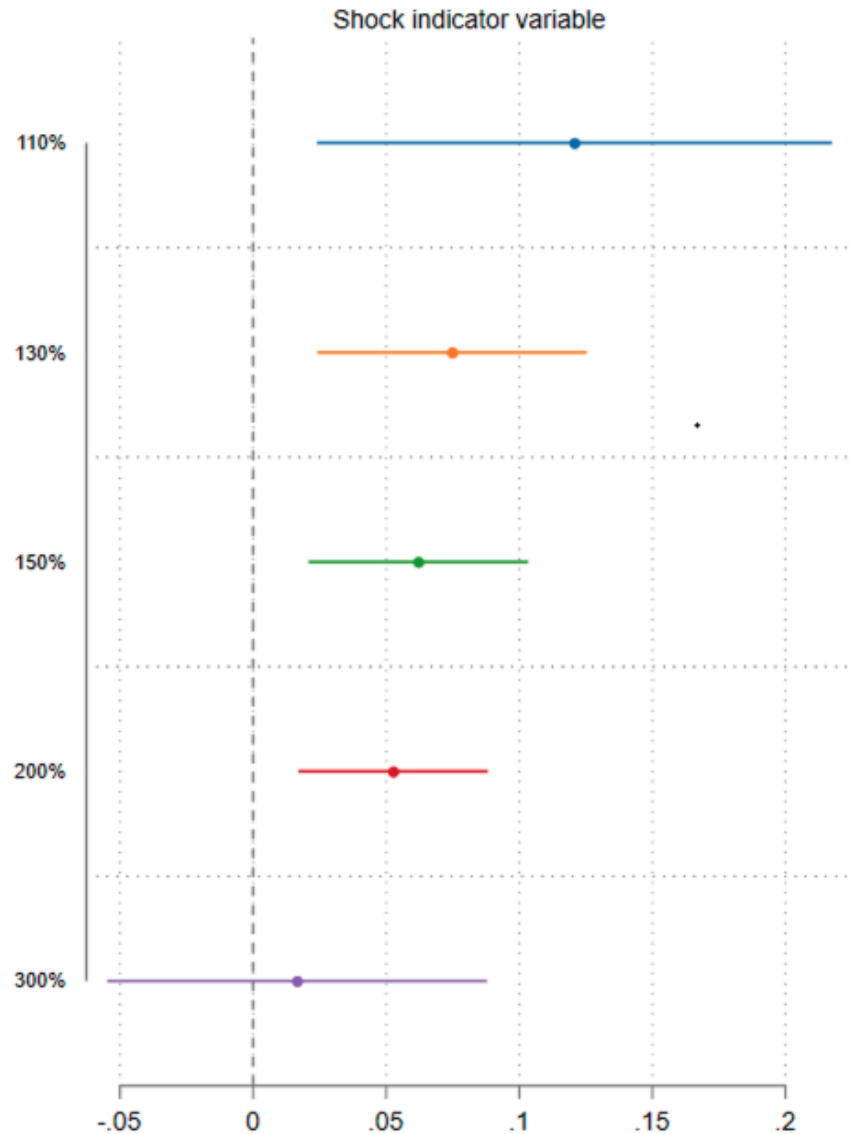
- 82% of SOC-CBSA-year cells have zero injuries
- 185 jobs with "pesticide" in the title; only 34 were assigned a SOC code with 90% probability

(Back to constructing injury rate)

Pseudo-Poisson ML specification

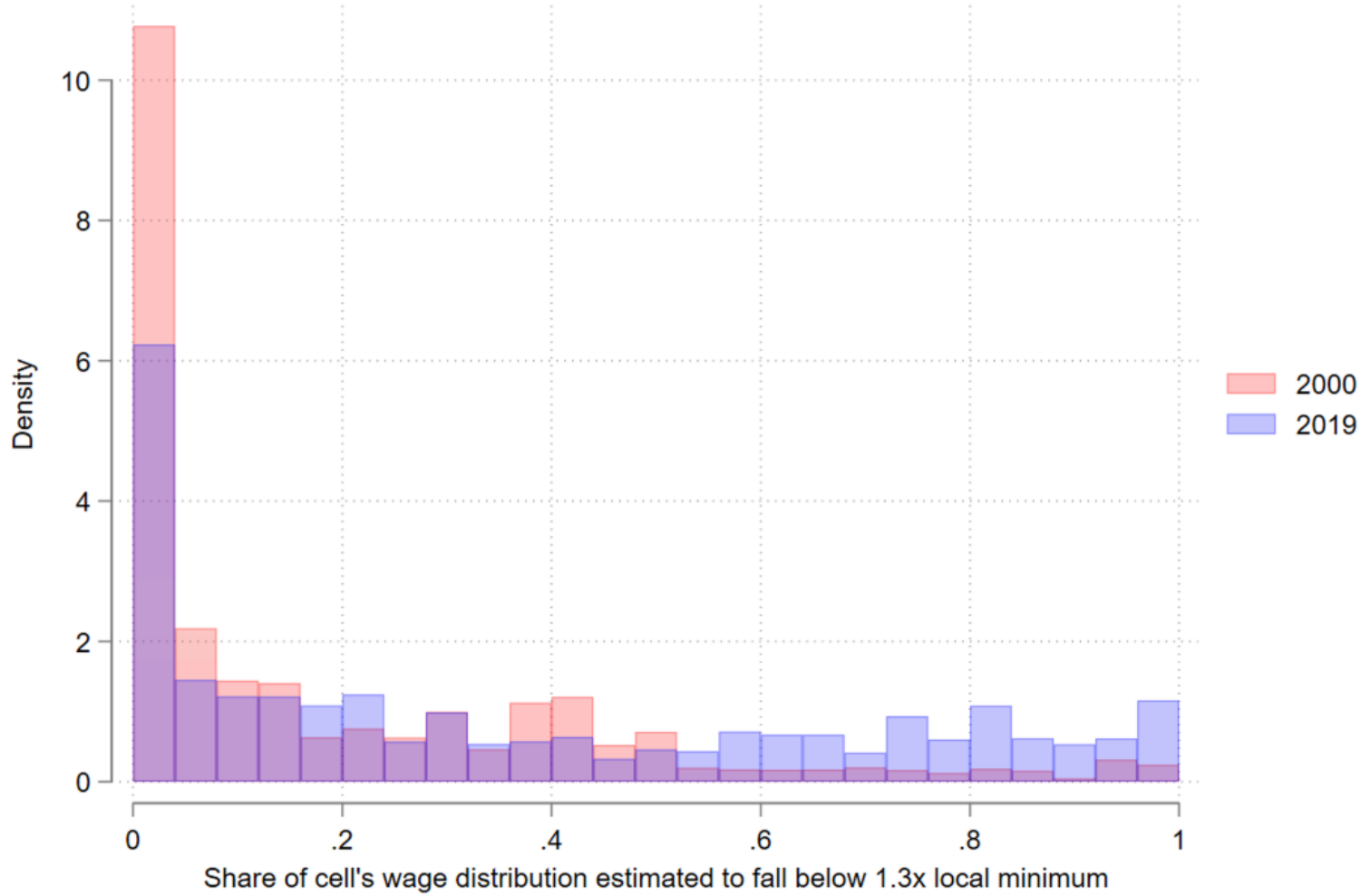
Effect of minimum wage shocks for varying exposure thresholds, PPML specfication





Exposure variation by year

Exposure variation by year



This plot shows the distribution of estimated exposure across occupation-metro-year cells, weighted by cell employment, in 2000 and in 2019.

(Back)

Alternate fixed effects

Dep var:	Log injury rate			Log mean hourly wage		
Panel A: Min wage shock variable = Real year-on-year growth						
Min-exposure	1.355***	0.862**	1.370***	1.386***	0.887***	1.432***
interaction	(0.266)	(0.366)	(0.262)	(0.047)	(0.075)	(0.044)
Panel B: Min wage shock variable = Indicator for > 5% nominal min wage growth						
Min-exposure	0.073***	0.056**	0.077***	0.091***	0.046***	0.093***
interaction	(0.017)	(0.022)	(0.017)	(0.003)	(0.004)	(0.003)
Fixed effects	Met-Occ Year	Met-Occ Occ-Year	Met-Occ Met-Year	Met-Occ Year	Met-Occ Occ-Year	Met-Occ Met-Year
N	116,723	116,318	116,723	116,723	116,318	116,723

This table reports our baseline estimates with different fixed effects. * ($p<0.10$), ** ($p<0.05$), *** ($p<0.01$)

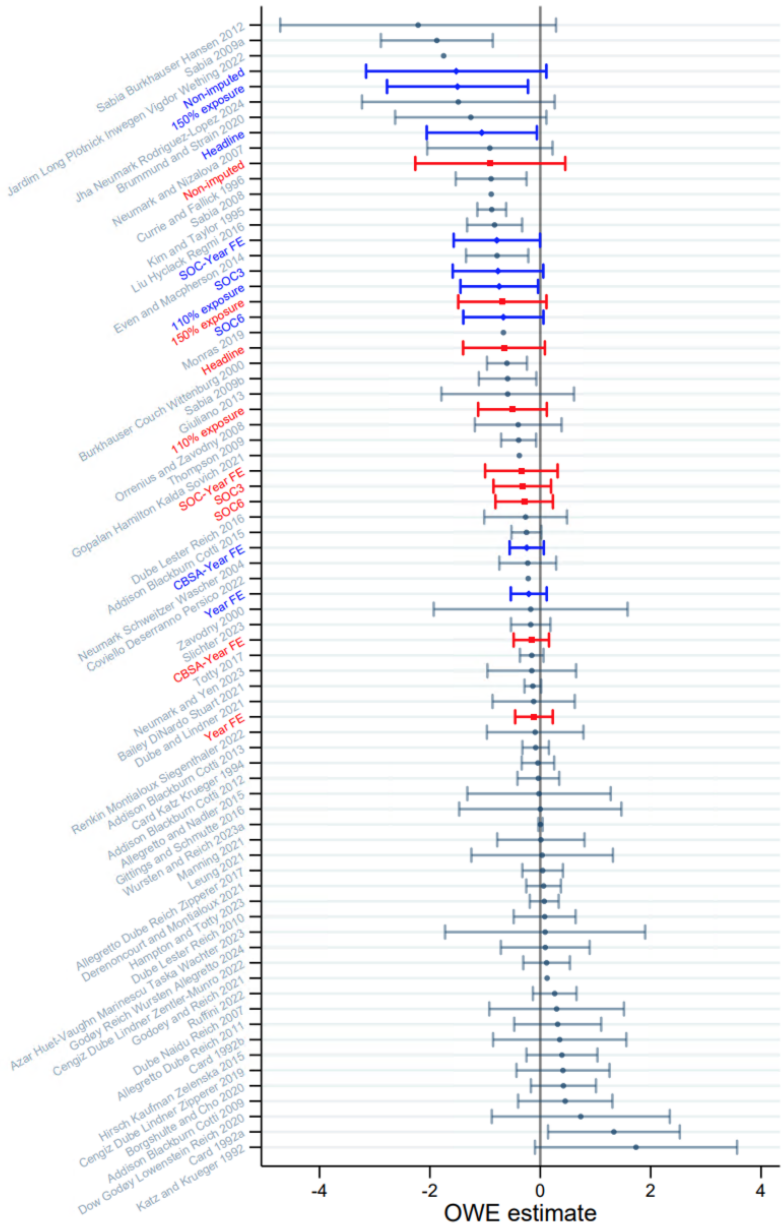
(Back to main results)

Employment results: baseline specification

Min wage:	Real year-on-year growth			Shock indicator variable		
	Reduced Form	*First Stage*	*2SLS OWE*	*Reduced Form*	*First Stage*	*2SLS OWE*
Dep:	Emp	Wage	Emp	Emp	Wage	Emp
Exp.-min. interaction	-0.551*	0.838***		-0.041**	0.038***	
	(0.315)	(0.060)		(0.019)	(0.004)	
Log hourly mean wage			-0.658*			-1.060**
			(0.378)			(0.509)
Fixed effects	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year	Metro-Occ Metro-Year Occ-Year
N	116,318	116,318	116,318	116,318	116,318	116,318

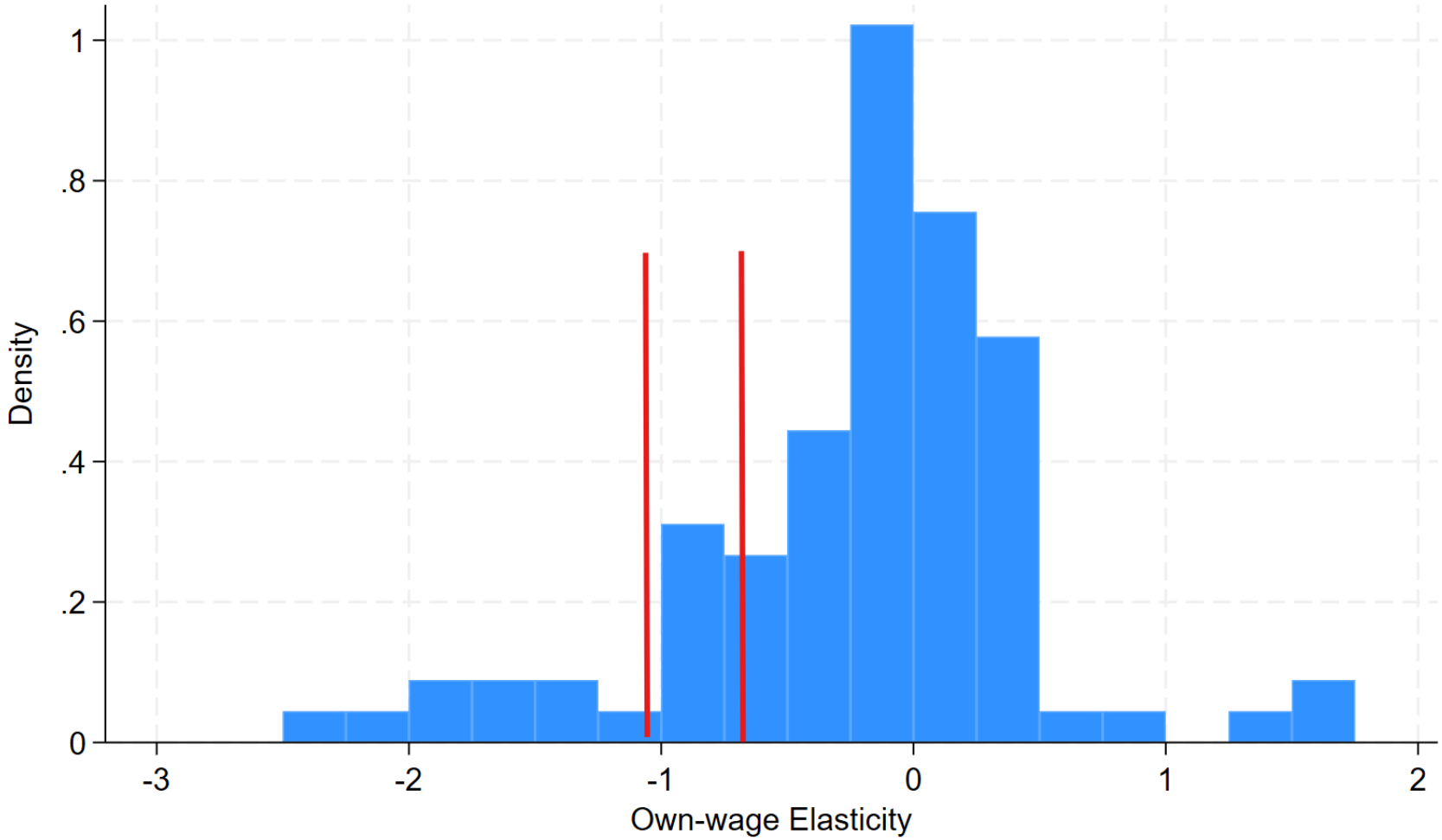
(Back)

Employment Results: Comparison to literature



Employment results: Comparison to literature

Our implied own-wage elasticities: -0.66 (real year-on-year shock); -1.06 (large nominal shock indicator)



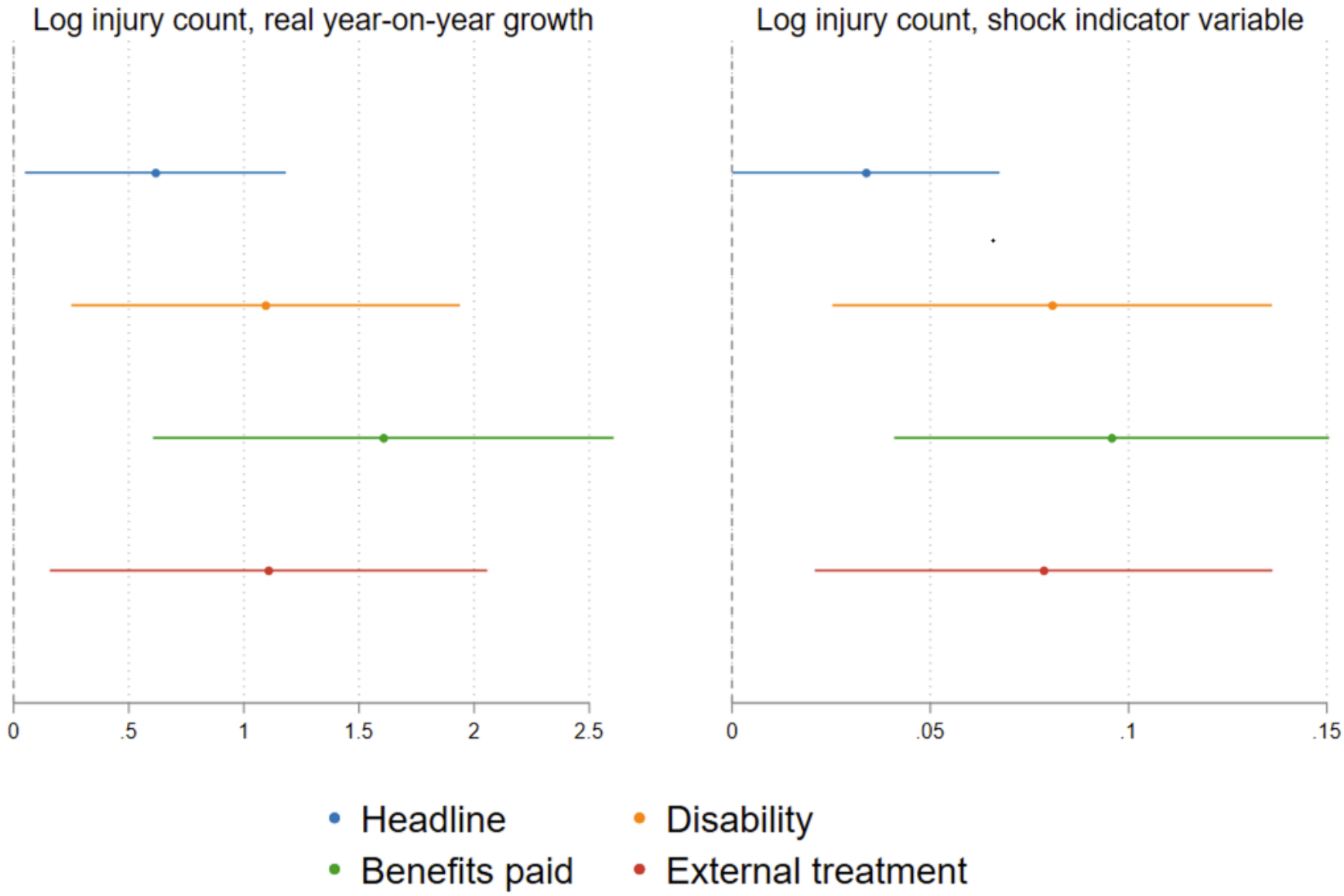
(Back)

Injury Count Dependent Variable

Minimum wage variable:	Real year-on-year growth	Shock indicator variable
Minimum-exposure interaction	0.618**	0.034*
	(0.291)	(0.017)
Fixed effects	Metro-Occ	Metro-Occ
	Metro-Year	Metro-Year
	Occ-Year	Occ-Year
N	116,318	116,318

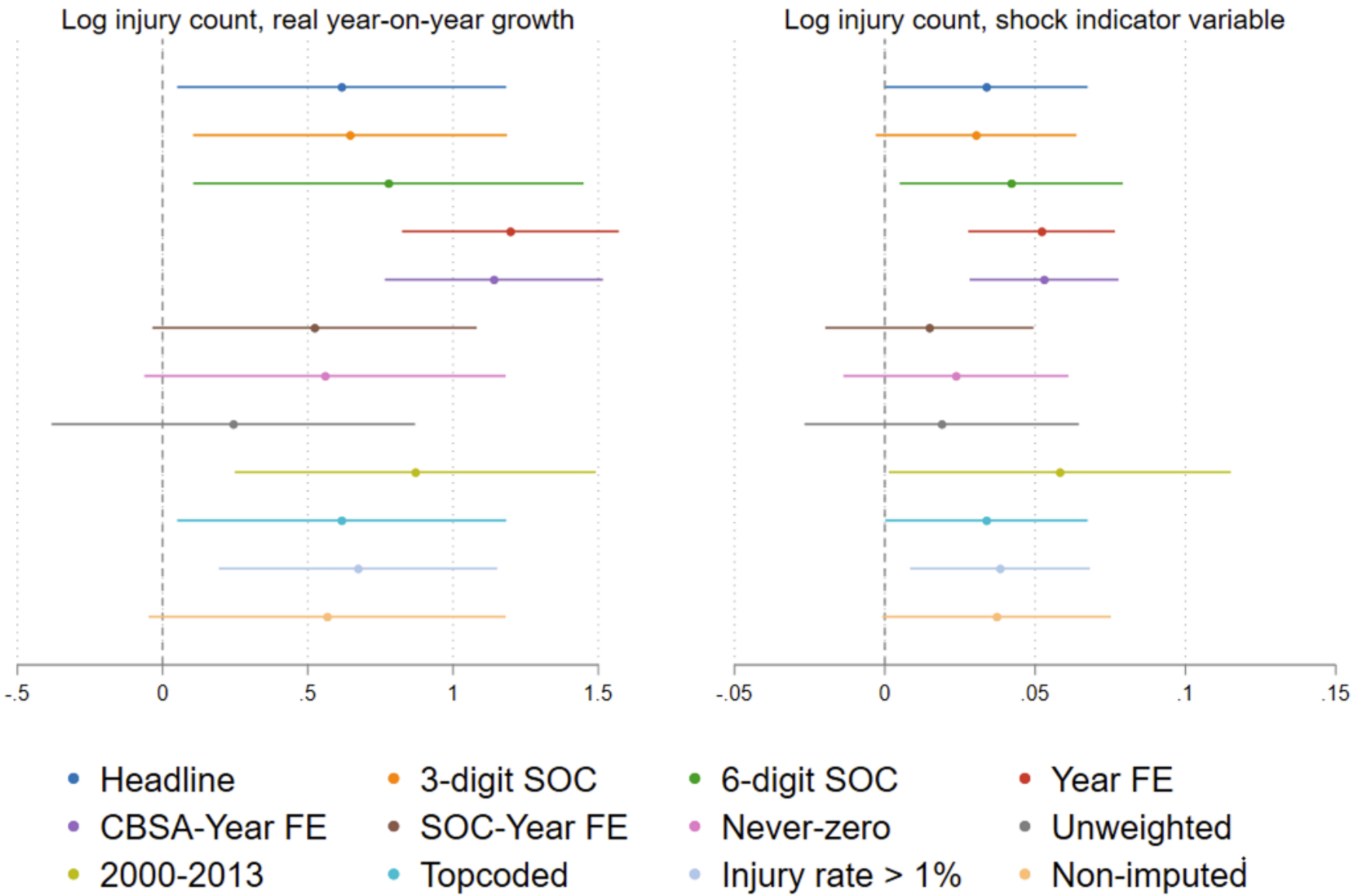
(Main Results)

Injury Count Dependent Variable: Severity



(Main Results)

Injury Count Dependent Variable: Robustness



(Main Results)

Welfare Calculation

To what extent does the increased injury risk offset the welfare benefits of higher minimum wages?

Welfare Calculation

To what extent does the increased injury risk offset the welfare benefits of higher minimum wages?

Leigh (2011): average cost of an occupational injury in the US in 2007 = \$21,713

- 25% medical costs
- 60% lost earnings + fringe benefits ($\approx$ lost market production)
- 16% lost home production

Welfare Calculation

To what extent does the increased injury risk offset the welfare benefits of higher minimum wages?

Leigh (2011): average cost of an occupational injury in the US in 2007 = \$21,713

- 25% medical costs
- 60% lost earnings + fringe benefits ($\approx$ lost market production)
- 16% lost home production

Consider a 10% increase in the minimum wage in 2007:

Welfare Calculation

To what extent does the increased injury risk offset the welfare benefits of higher minimum wages?

Leigh (2011): average cost of an occupational injury in the US in 2007 = \$21,713

- 25% medical costs
- 60% lost earnings + fringe benefits ($\approx$ lost market production)
- 16% lost home production

Consider a 10% increase in the minimum wage in 2007:

Wage effect: \$0.53/hour higher wages $\rightarrow\approx$ \$800 increase in annual earnings

Injury effect: 0.28pp higher annual injury risk $\rightarrow \approx$ \$70 expected welfare cost

Welfare Calculation

To what extent does the increased injury risk offset the welfare benefits of higher minimum wages?

Leigh (2011): average cost of an occupational injury in the US in 2007 = \$21,713

- 25% medical costs
- 60% lost earnings + fringe benefits ($\approx$ lost market production)
- 16% lost home production

Consider a 10% increase in the minimum wage in 2007:

Wage effect: \$0.53/hour higher wages $\rightarrow \approx$ \$800 increase in annual earnings

Injury effect: 0.28pp higher annual injury risk $\rightarrow \approx$ \$70 expected welfare cost

Increased injury risk offsets roughly 10% of the welfare benefit of higher wages

Welfare Calculation

To what extent does the increased injury risk offset the welfare benefits of higher minimum wages?

Leigh (2011): average cost of an occupational injury in the US in 2007 = \$21,713

- 25% medical costs
- 60% lost earnings + fringe benefits ($\approx$ lost market production)
- 16% lost home production

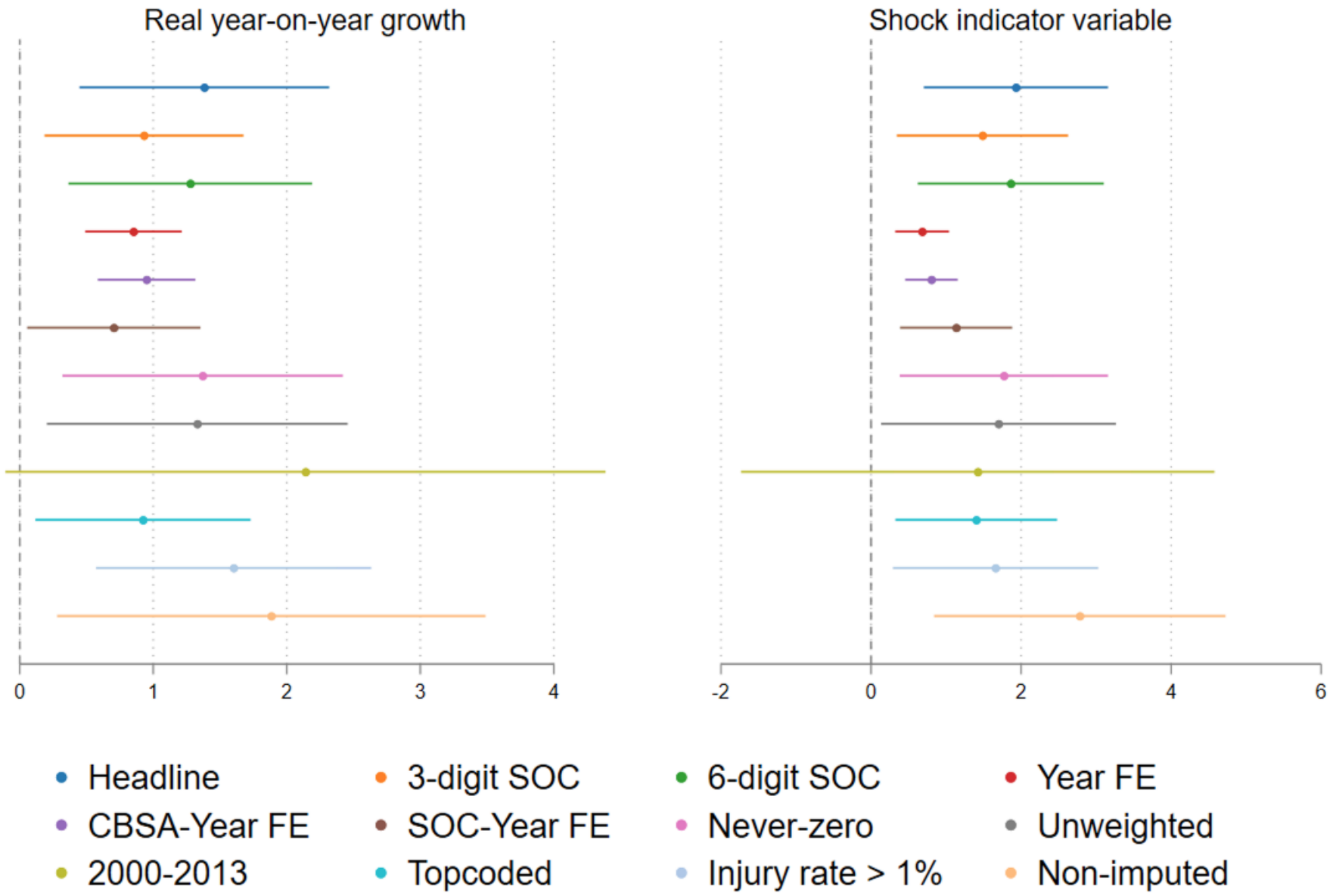
Consider a 10% increase in the minimum wage in 2007:

Wage effect: \$0.53/hour higher wages $\rightarrow \approx$ \$800 increase in annual earnings

Injury effect: 0.28pp higher annual injury risk $\rightarrow \approx$ \$70 expected welfare cost

Increased injury risk offsets roughly 10% of the welfare benefit of higher wages
Caveats: underestimates because (1) ignores risk aversion (2) ignores direct welfare cost of injuries; but overestimates because lost earnings is substantially lower for min wage workers
(Conclusion)

Injury Rate: Own-Wage Elasticity (Robustness)



(Robustness)

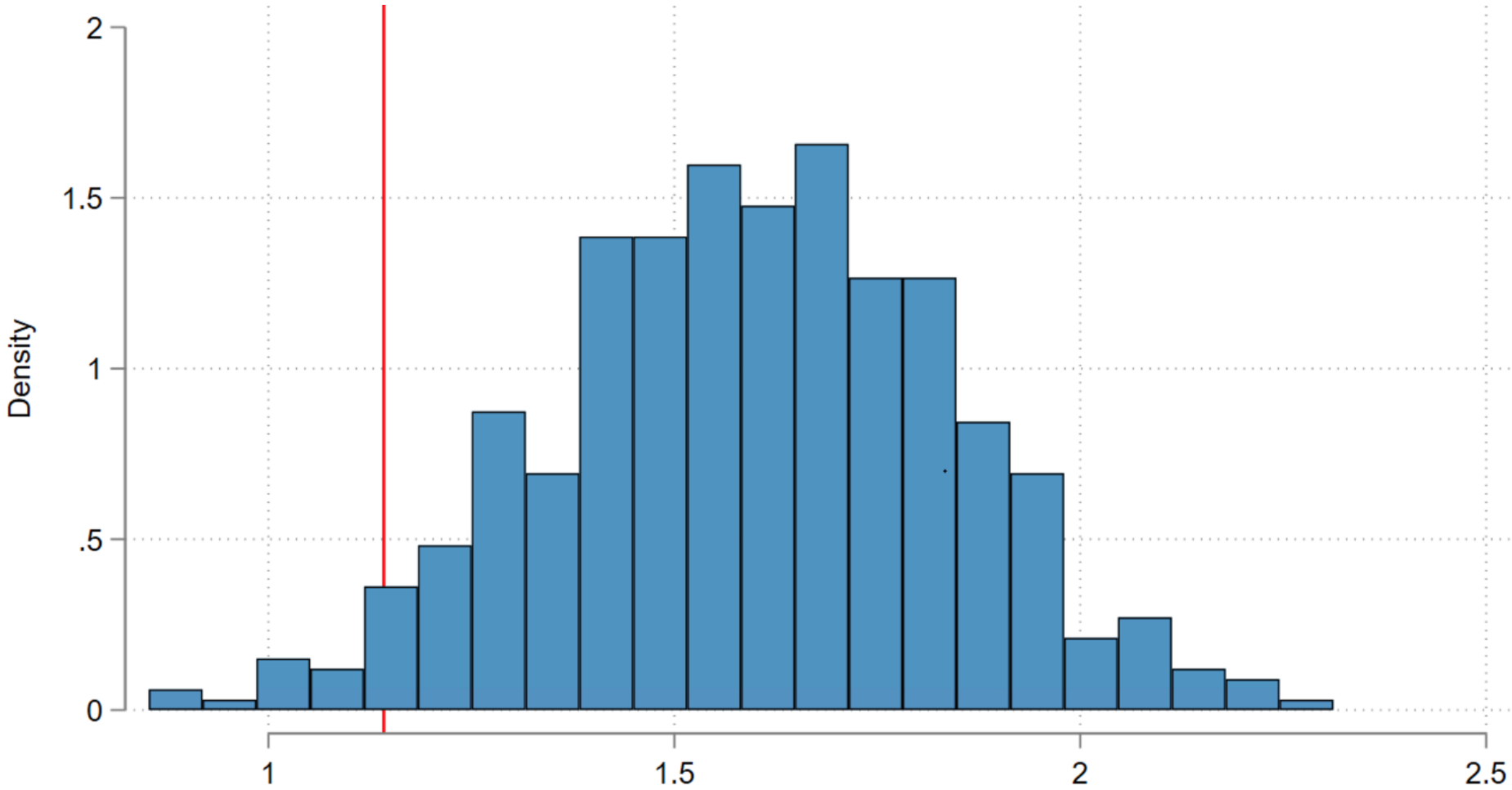
Injury Rate: Own-Wage Elasticity w/ DZ median employment OWE

- Our Employment OWE: -0.66 (real-yoy-shock) or -1.1 (large min wage shock)
- Median DZ Employment OWE: -0.11

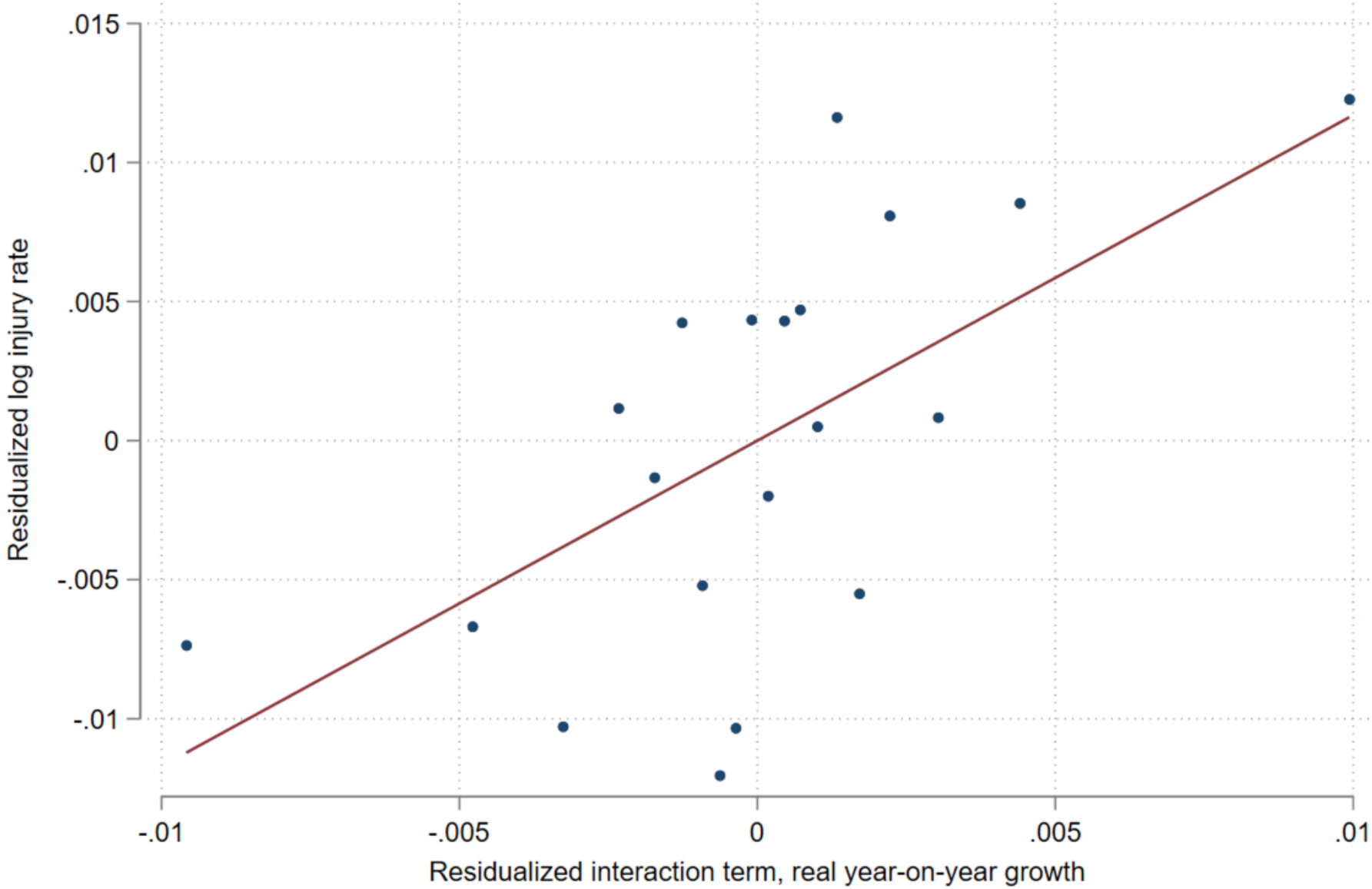
Implied injury-rate-wage elasticity, varying assumptions about employment effect:

	Real-yoy min wage shock	Large nominal min wage shock
Our estimate	1.4	1.9
Assuming DZ employment OWE	0.84	0.99
Assuming no change in employment	0.73	0.88

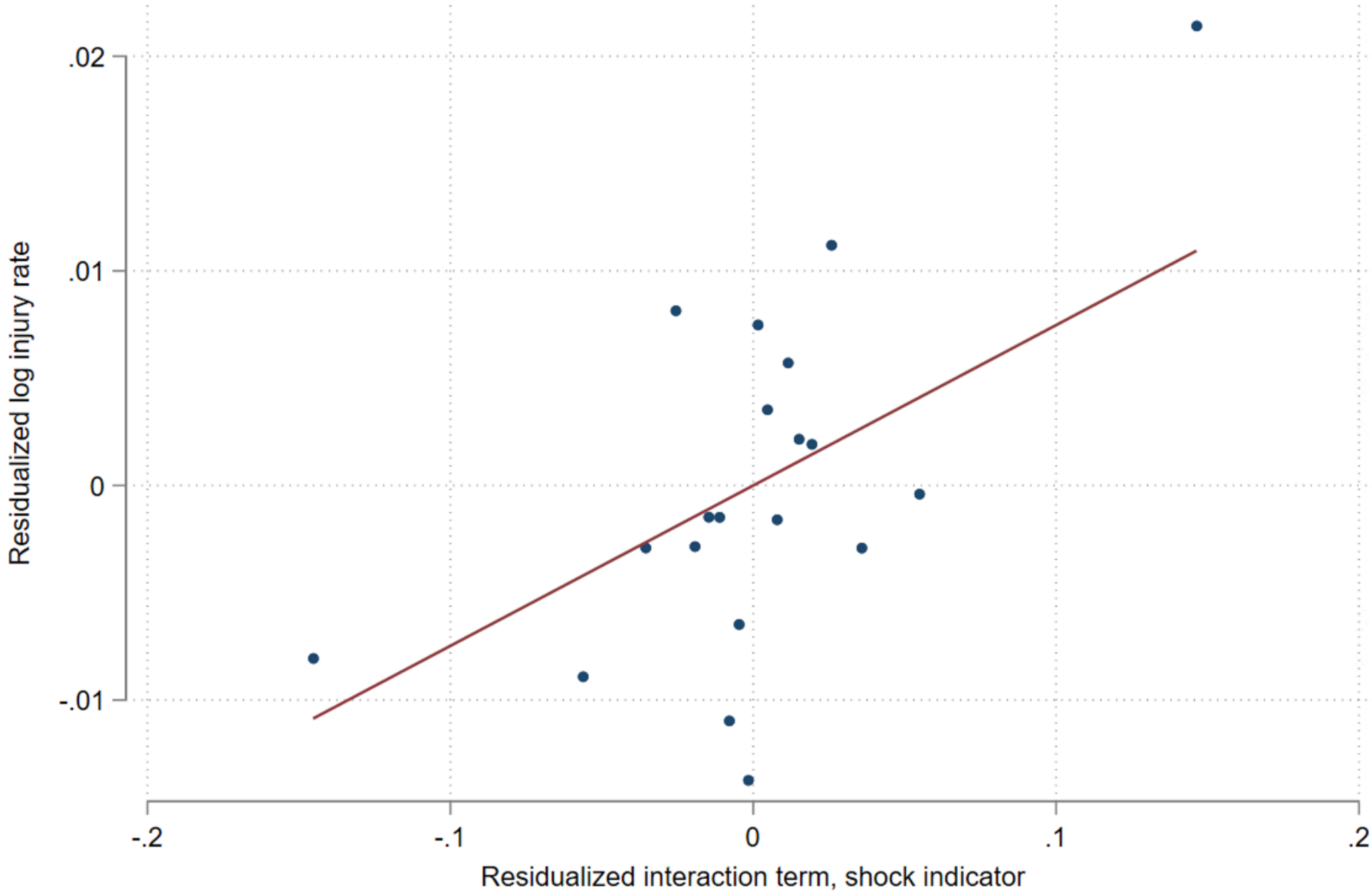
Randomization test for negative weights



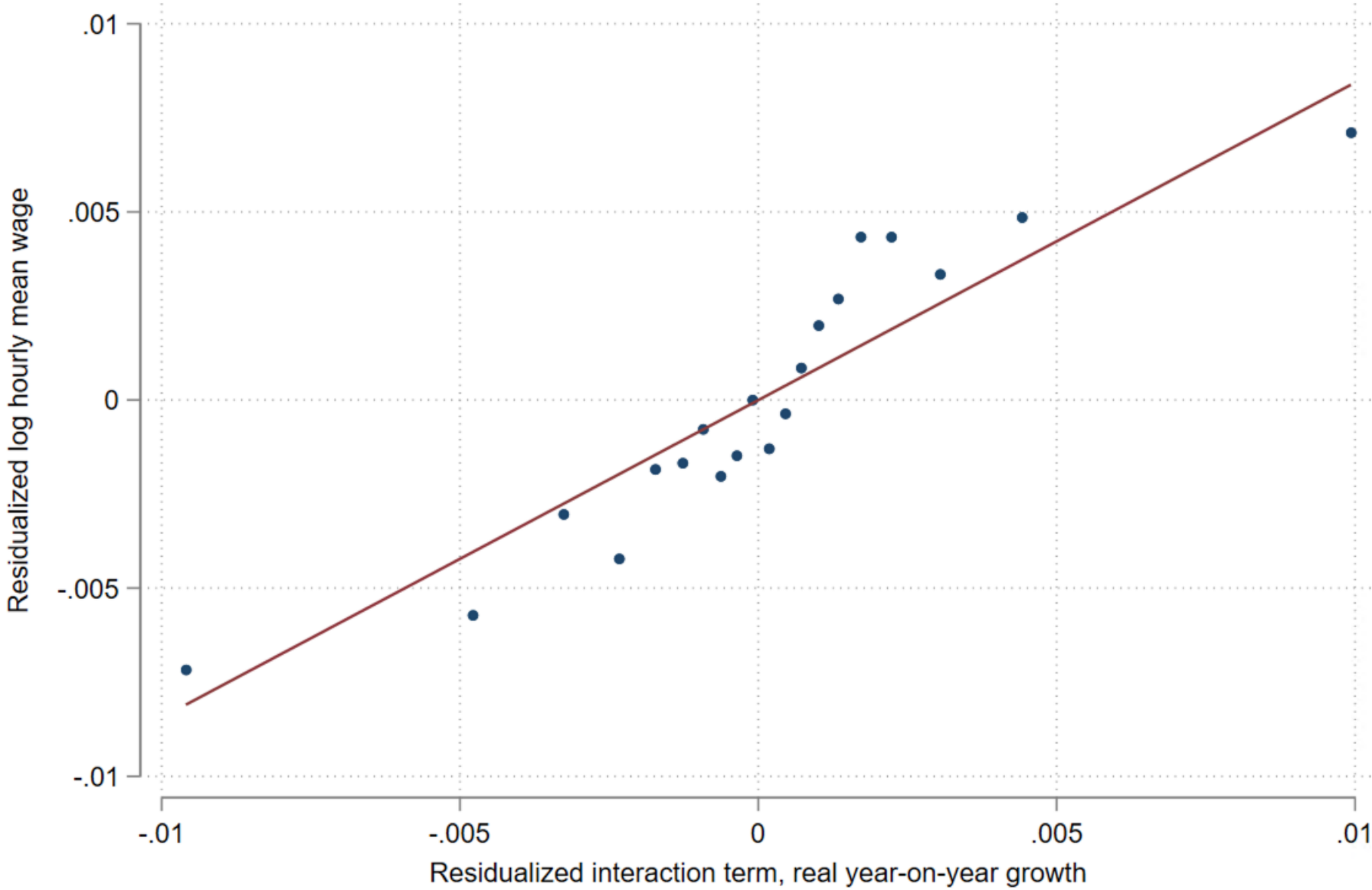
Binscatter, injuries and real year-on-year minimum wage growth



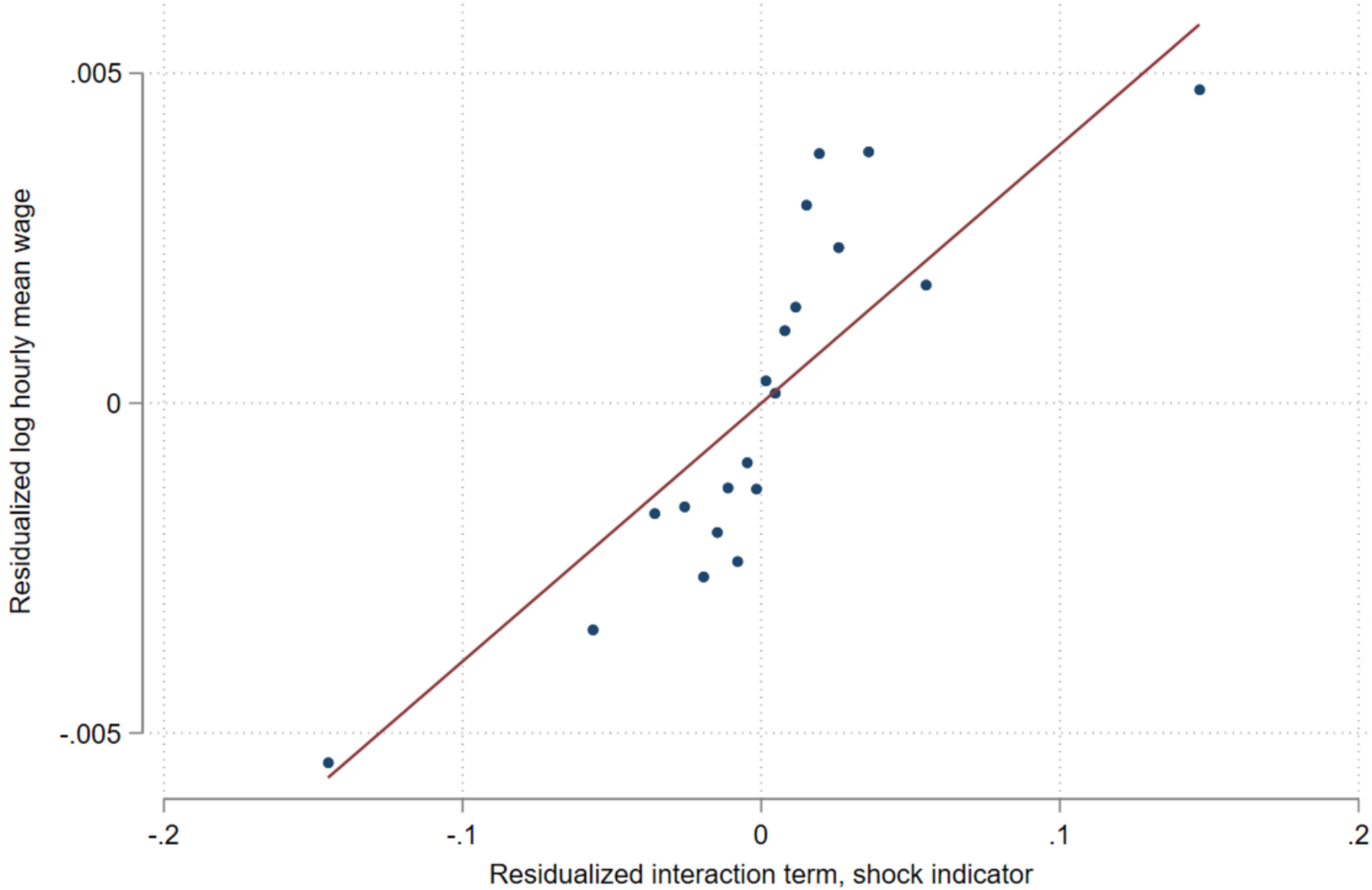
Binscatter, injuries and shock indicator variable



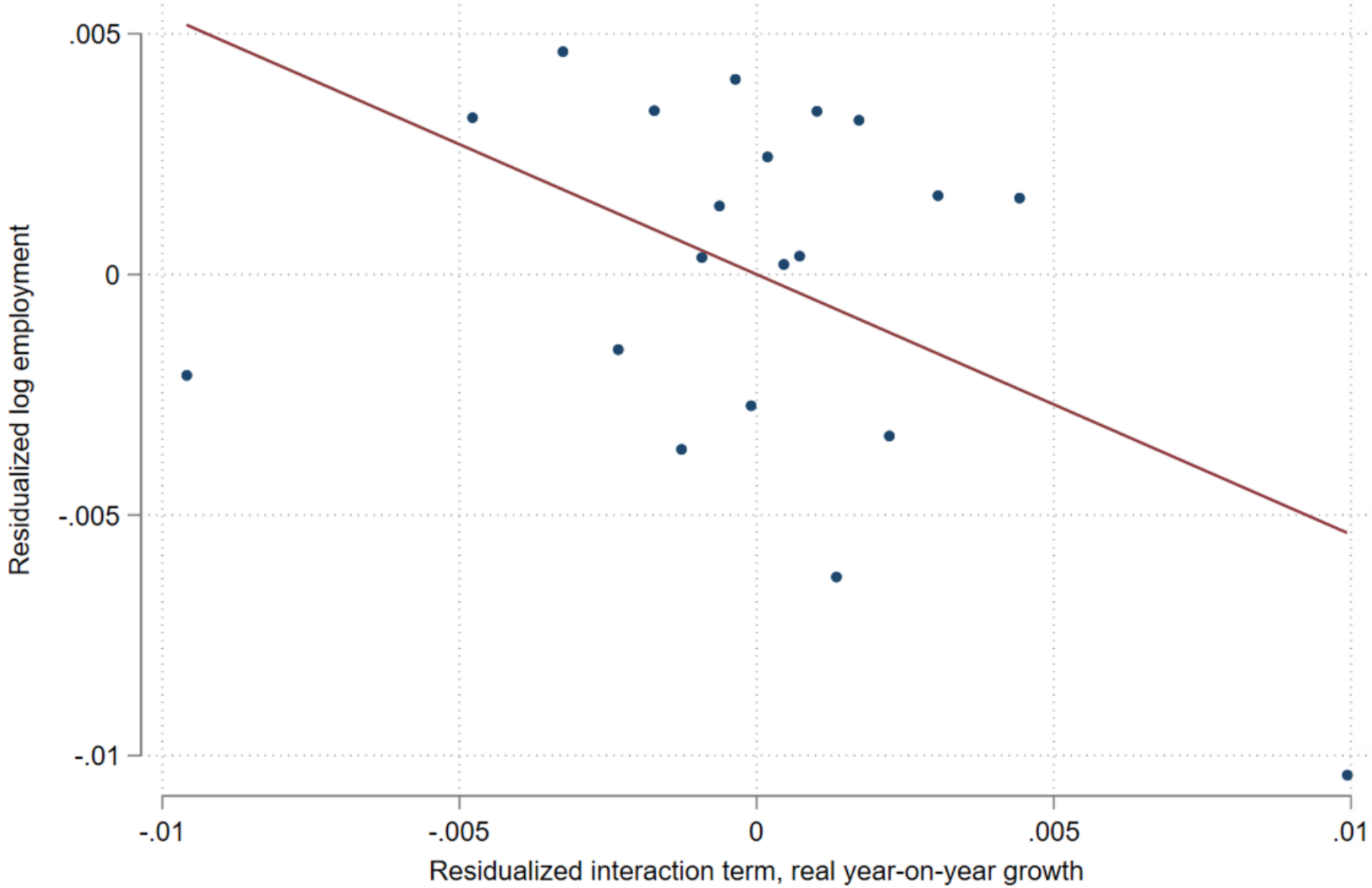
Binscatter, wages and real year-on-year minimum wage growth



Binscatter, wages and shock indicator variable



Binscatter, employment and real year-on-year minimum wage growth



Binscatter, employment and shock indicator variable