Evidence from a Minimum Wage Experiment

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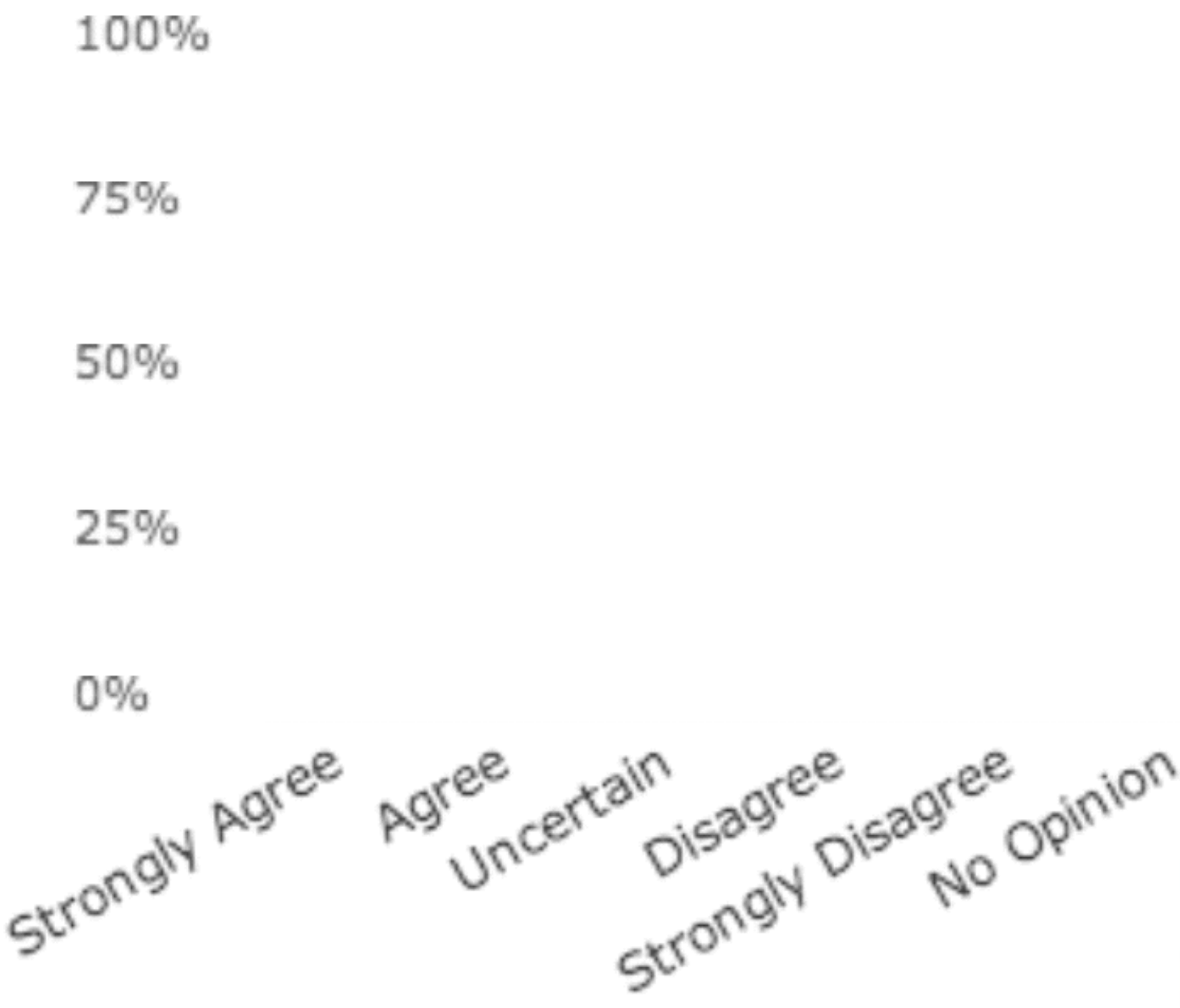
http://www.john-joseph-horton.com/papers/minimum_wage.pdf

Minimum Wage

Question A: Raising the federal minimum wage to $9 per hour would make it noticeably harder for low-skilled workers to find employment.



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IGM Forum

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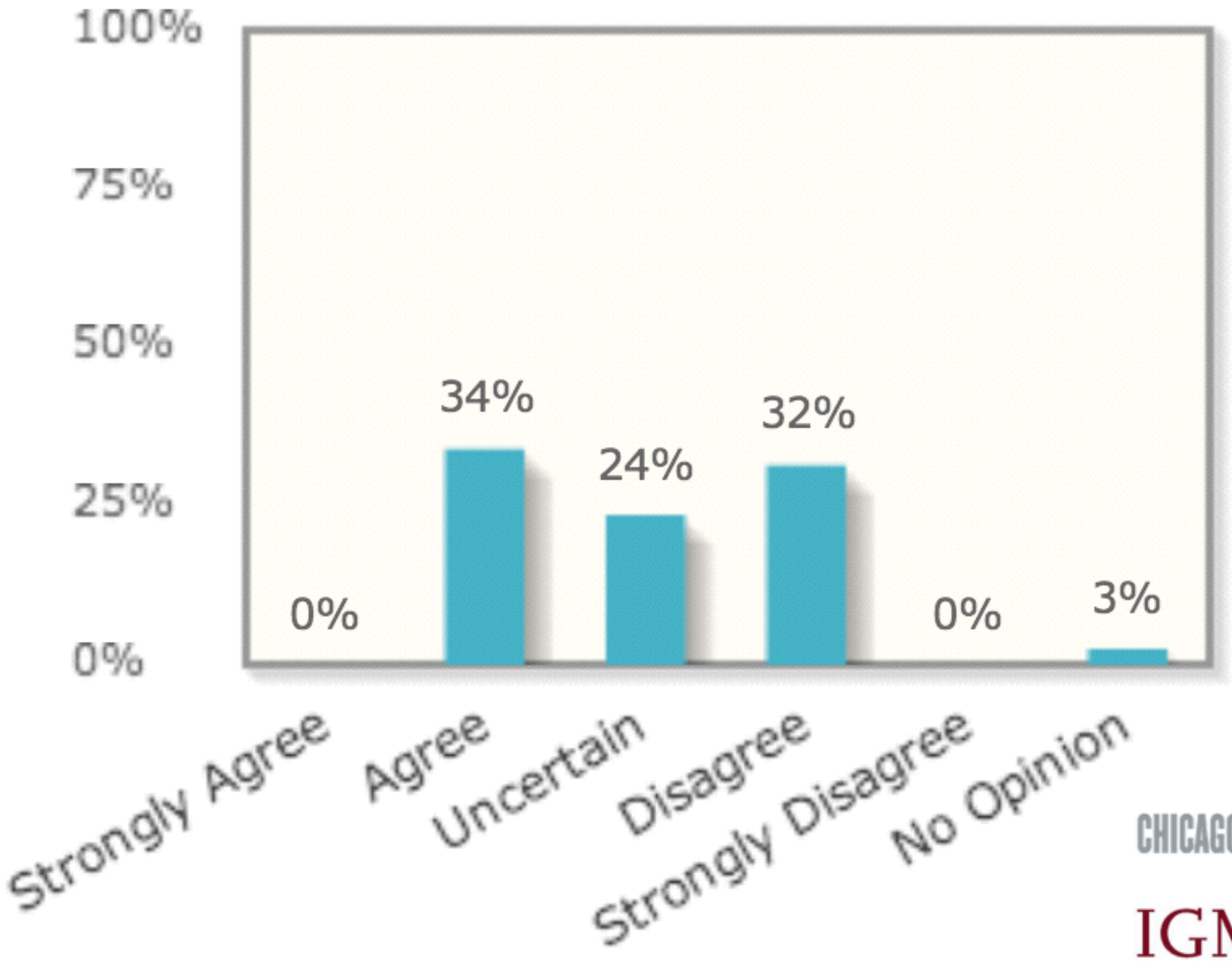

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State of the "conventional" minimum wage literature

- Much of the evidence is quasi-experimental, from US states changing their minimums:
  - Card & Krueger, Card & Katz, Neumark & Wascher, Dube et al., Meer & West, Clemens & Wither and others
- Empirical challenges
  - Concerns about selection; lack of statistical power; measurement

This paper

- Uses data from a minimum wage experiment—and eventual platform-wide imposition—conducted in an **online labor market**

- Excellent measurement made at a range of minimum wages exogenously imposed for about 160K job openings

Agenda

- Empirical context
- Experimental design
- Experimental results
- Market-wide minimum wage announcement & imposition differenes-in-differences results
- Conclusions

Experimental context

Empirical context

- A large online labor market for work that can be done remotely:
  - Computer programming, graphic design, data entry, etc.
  - Focus is primarily on hourly contracts, with hours measured precisely by platform-provided software

1. Employers post openings

Orthopaedic Surgery Research - Statistical Analysis

Indicates an hourly job

Statistical Analysis Posted 13 hours ago

Hourly Job
As needed - Less than 10 hrs/week
Less than 1 month

$$ **Intermediate**
I am looking for a mix of experience and value

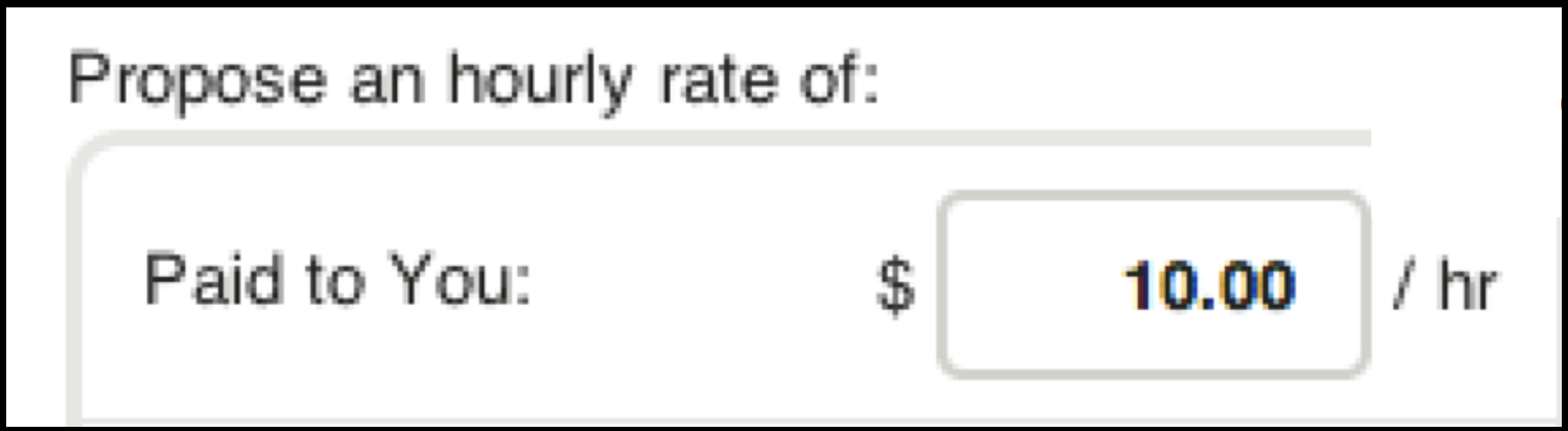
Job Description

I have a data set that needs statistical analysis. It consists of multiple reviewers' (10-20) analyses of patient's x-rays. I need to examine the reviewers' overall agreement on the x-rays and their ability to judge surgical technique from the x-rays.

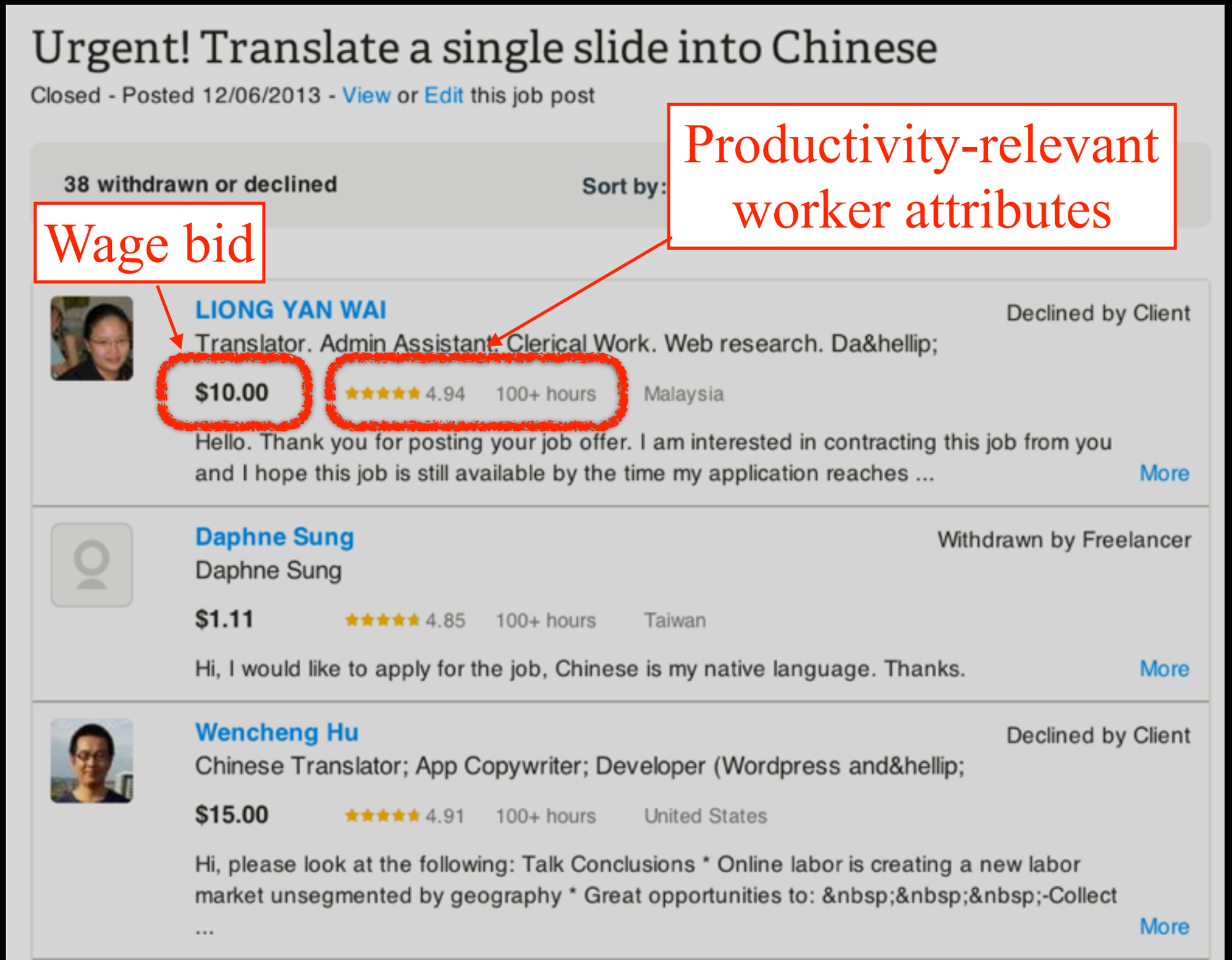
Skills Required

Data Science Scientific Writing Statistics

2. Workers apply & submit wage bids



3. Employers screen applicants



Experimental design

Platform-initiated minimum wage experiment

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  - Treatment Cells (25%): $2/hour, $3/hour & $4/hour

Platform-initiated minimum wage experiment

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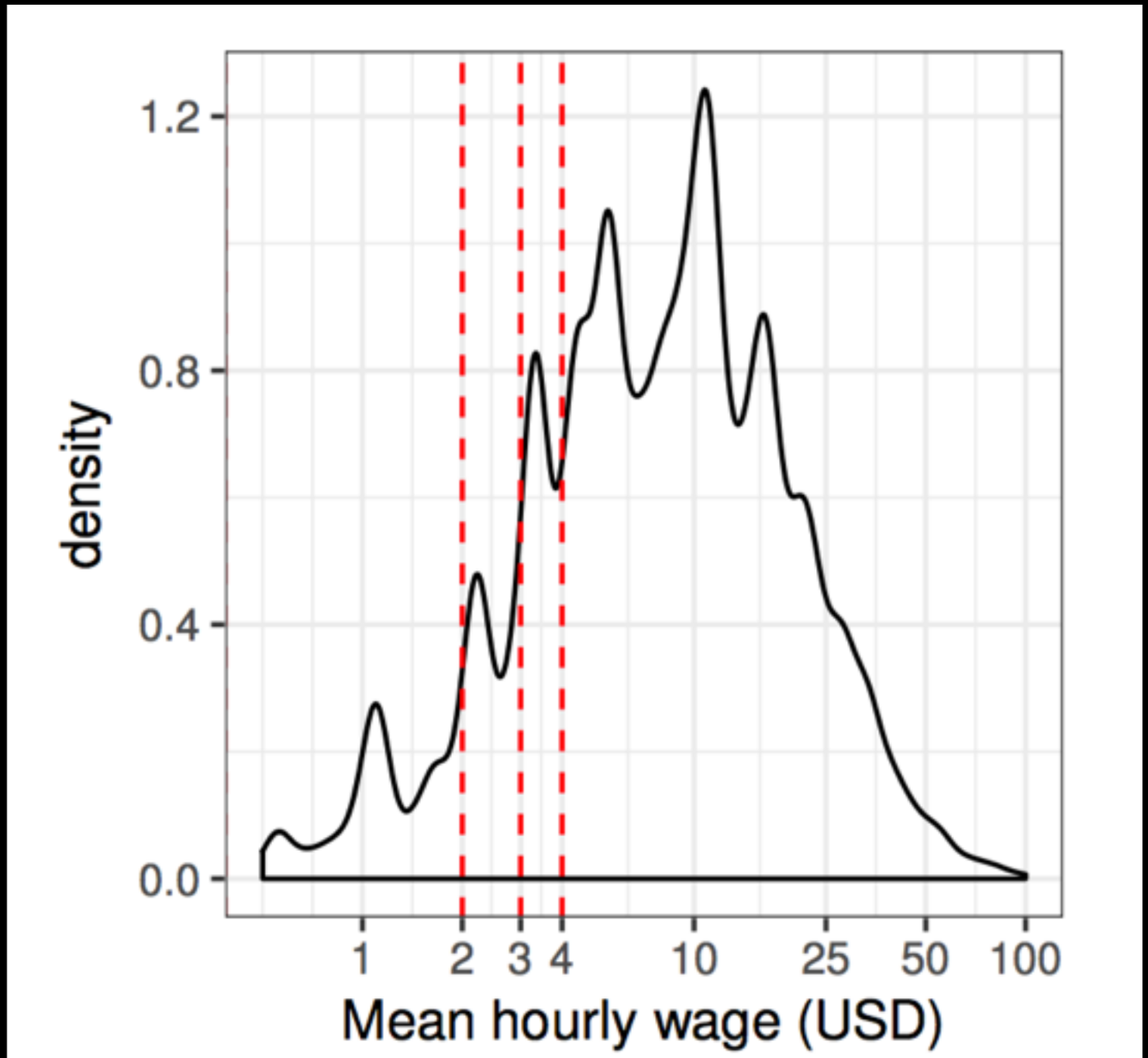
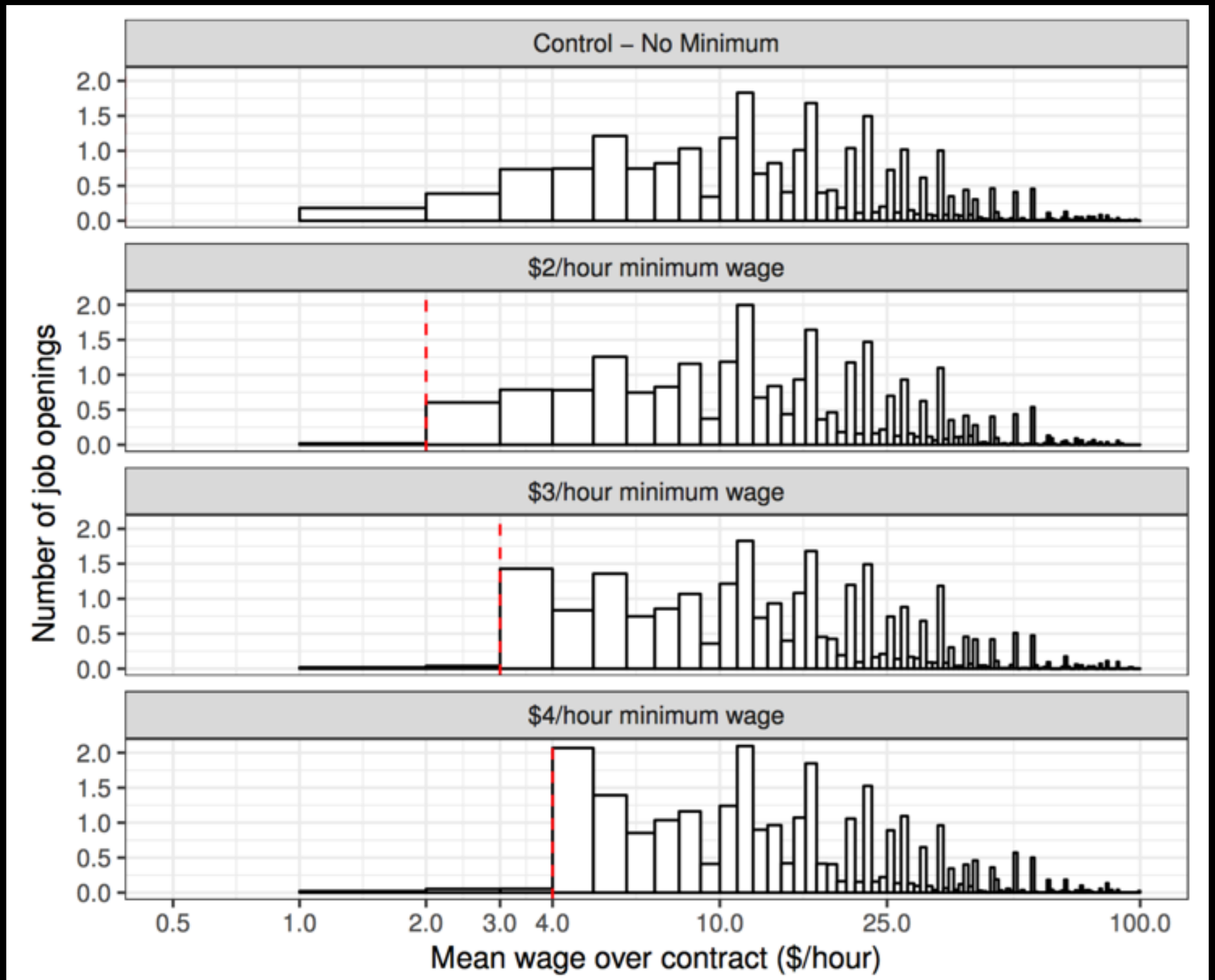
- Randomization was at the level of the employer
  - Control (75% of sample): No minimum
  - Treatment Cells (25%): $2/hour, $3/hour & $4/hour
- The minimum was enforced by not allowing wage bids below the employer's assigned minimum

Does a $2/hour MW "bite" in this market?

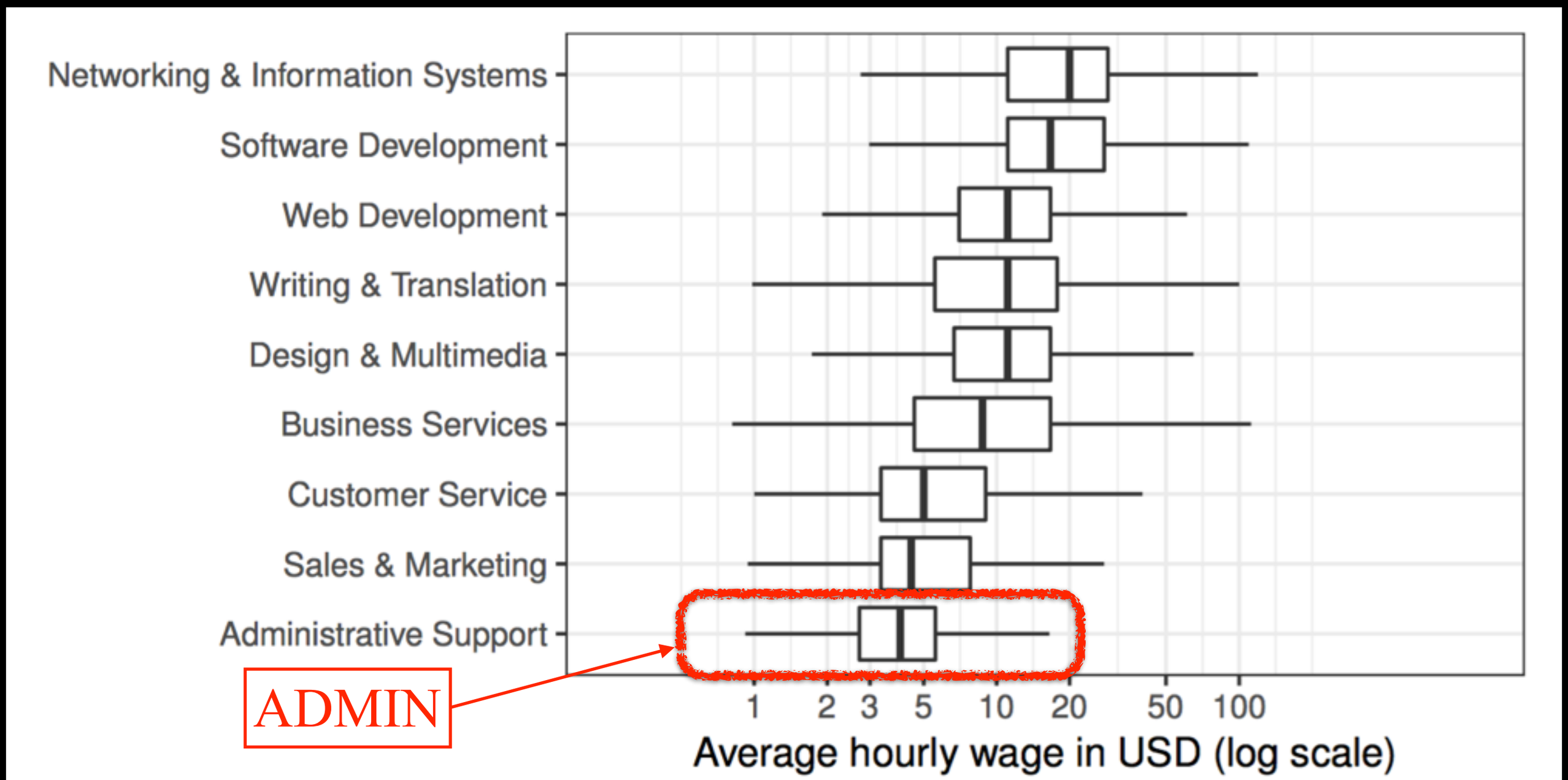


(a) Control cell of ALL

Compliance?


Control – No Minimum
$2/hour minimum wage
$3/hour minimum wage
$4/hour minimum wage
Number of job openings
2.0
1.5
1.0
0.5
0.0
0.5
1.0
2.0
3.0
4.0
10.0
25.0
100.0
Mean wage over contract ($/hour)

Where to look for effects?

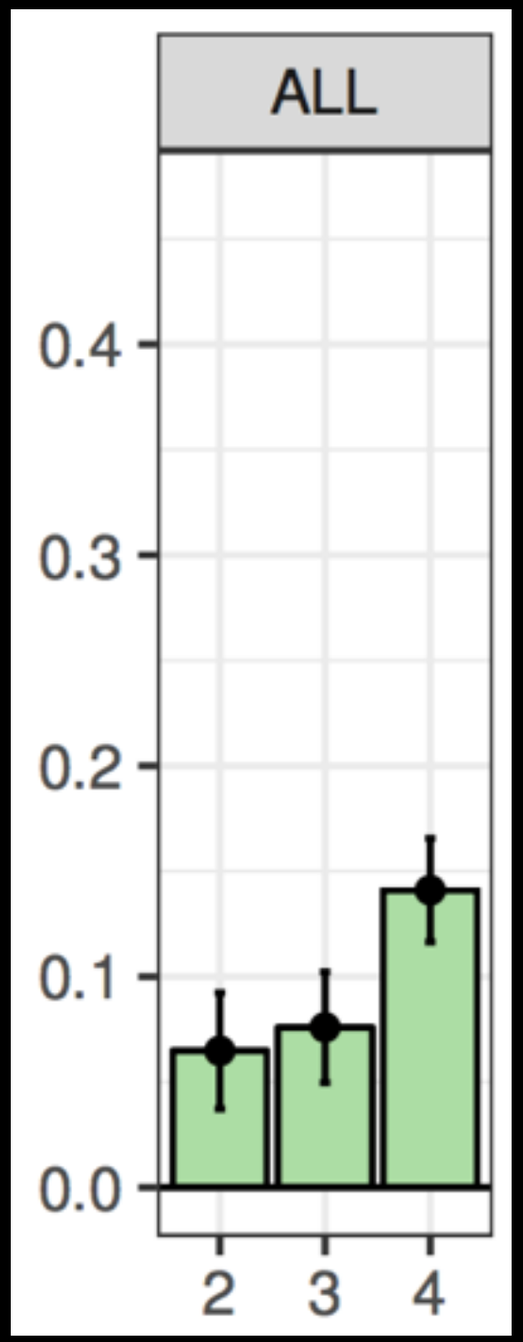


Experimental results

Outcomes

- Price
  - Log wage of hired worker (conditional upon hired)
- Quantities
  - Anyone hired?
  - Hours-worked (conditional upon a hire)
- Attributes of hired workers
  - Past wages, profile rates, past earnings
  - Country of hired workers

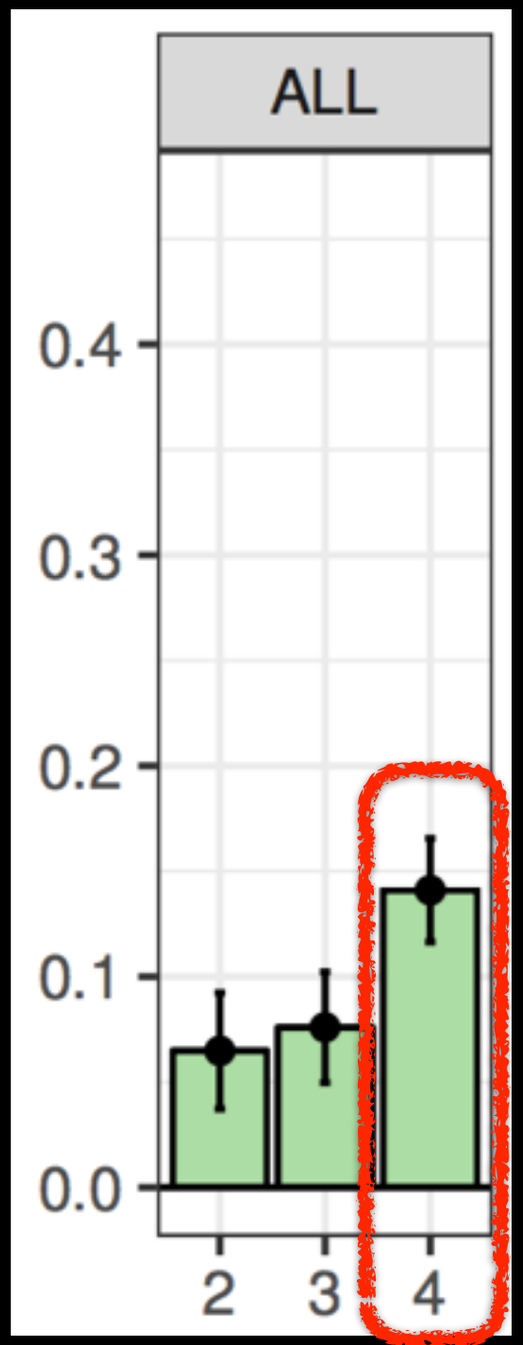
Outcome: Log wage of the hired worker



	ALL
	(1)
Panel A: Group indicators	
MW4	0.141***
	(0.015)
MW3	0.076***
	(0.015)
MW2	0.065***
	(0.015)
Constant	2.107***
	(0.004)
Observations	53,032
R^2	0.002

Outcome: Log wage of the hired worker

In MW4, hired worker wages were about 14% higher



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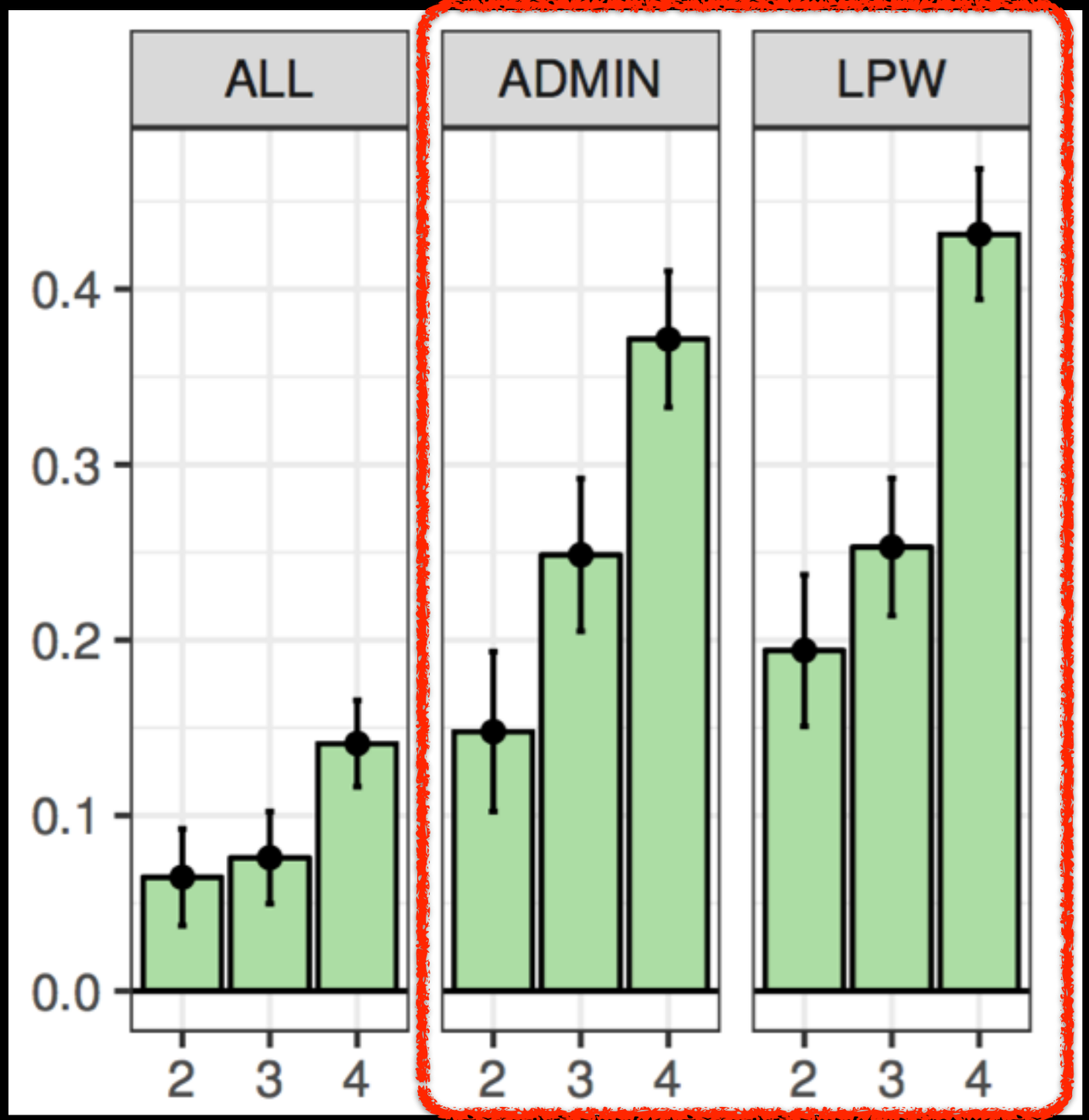


Even stronger wage increases in the sub-populations—around 40% in MW4.

LPW: "Low predicted wage" - predictions from a ML model fit w/ pre-experiment data

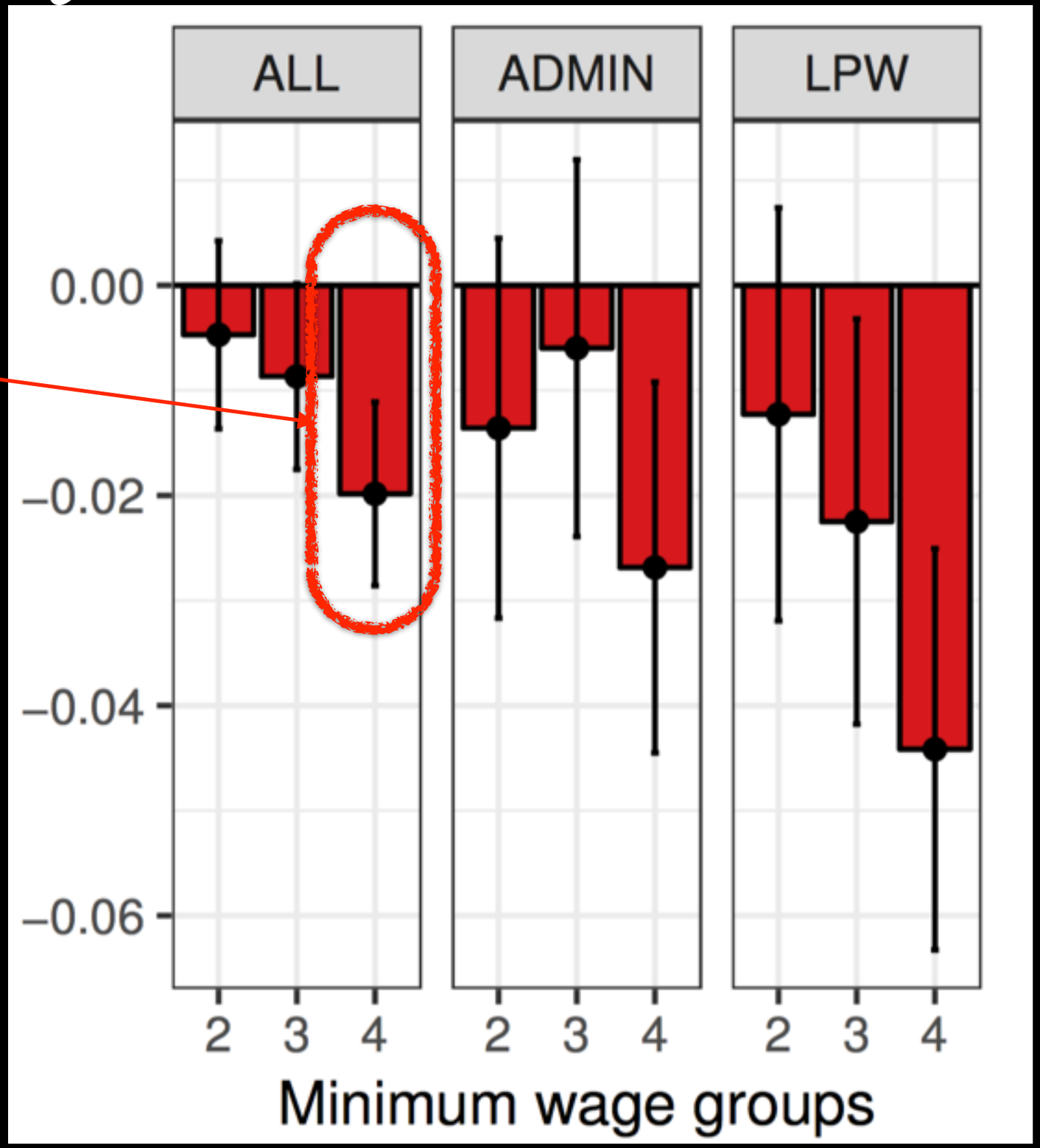
Why did wages increase?

- Markup effects—same workers hired, but at a higher wage
- Selection effects—jobs that would have paid low wages went unfilled
- Substitution effects—different (more productive) workers hired

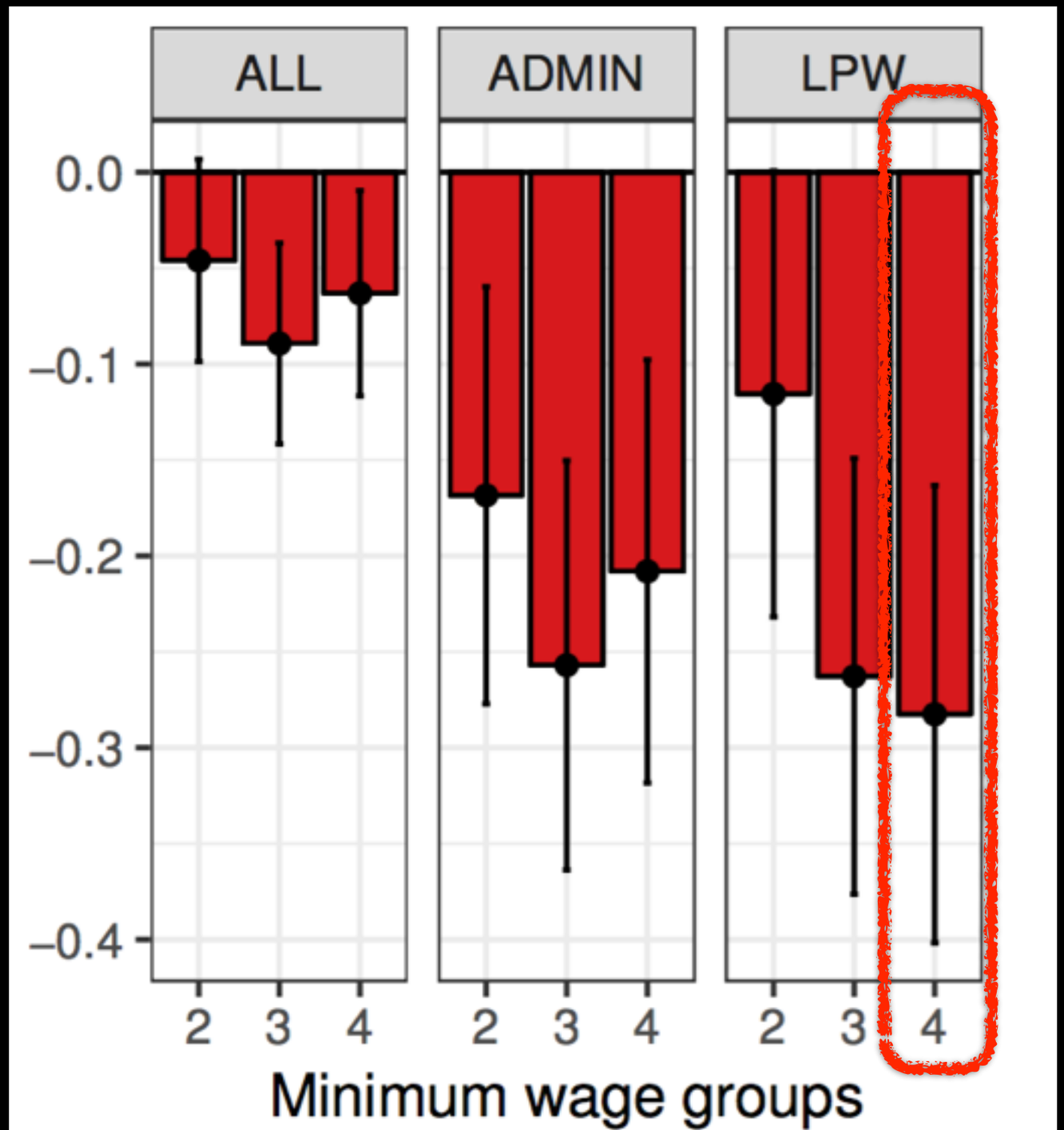
Outcome: Any worker hired?

This is only a 2 percentage point reduction, or about 4%

These are small effects. E.g., ADMIN MW3: 1% decrease for a MW near the median



Outcome: Log hours-worked, conditional upon a hire



Large reductions in hours-worked; e.g., nearly -30% in MW4 in LPW

Why the reduction in hours-worked?

- Endogenous project sizes: Firms reduce the scope of projects when labor costs are higher

- Efficiency wage: Firms hire same workers, but they are made more efficient and can complete projects more quickly

- Labor-Labor substitution: Firms hire more productive, higher wage workers that can complete projects more quickly

Outcome: the *attributes* of hired worker that are proxies for productivity

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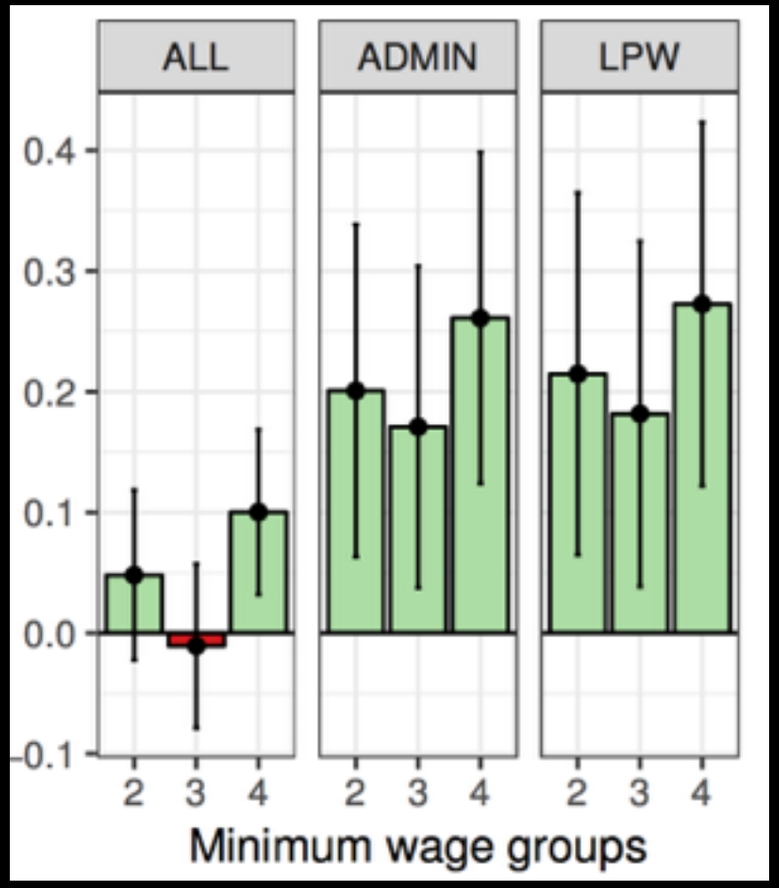
Log cumulative
past earnings



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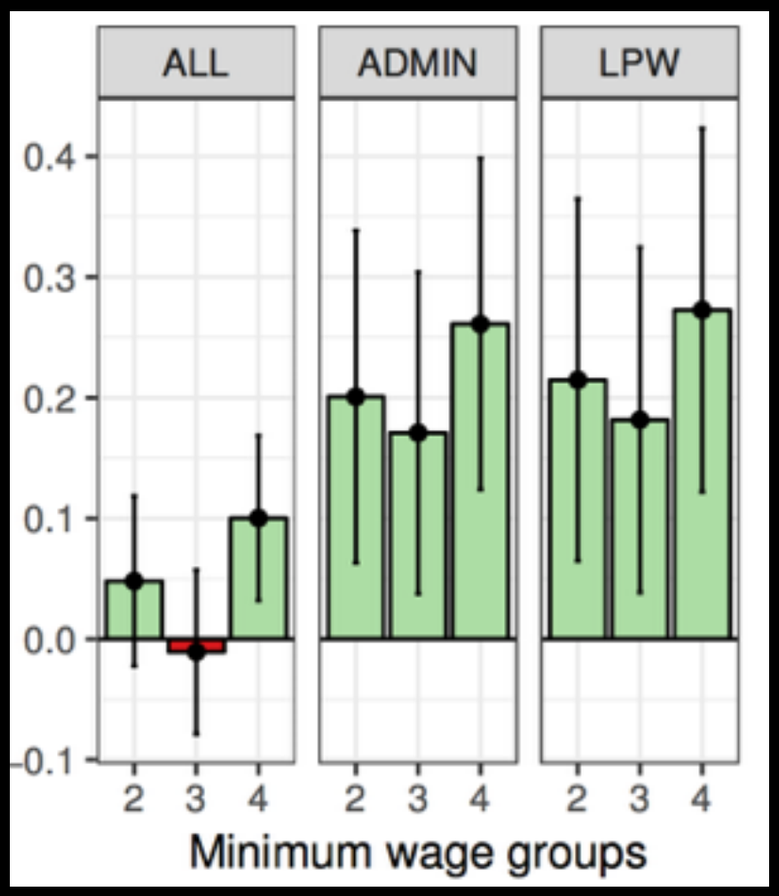
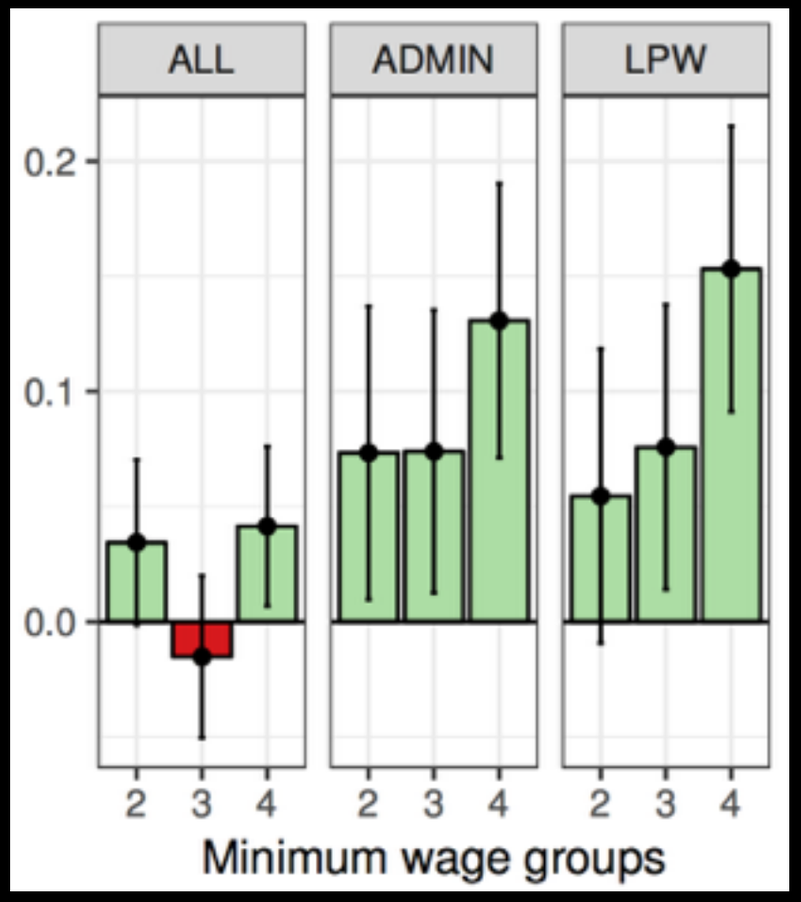


Log average past wage



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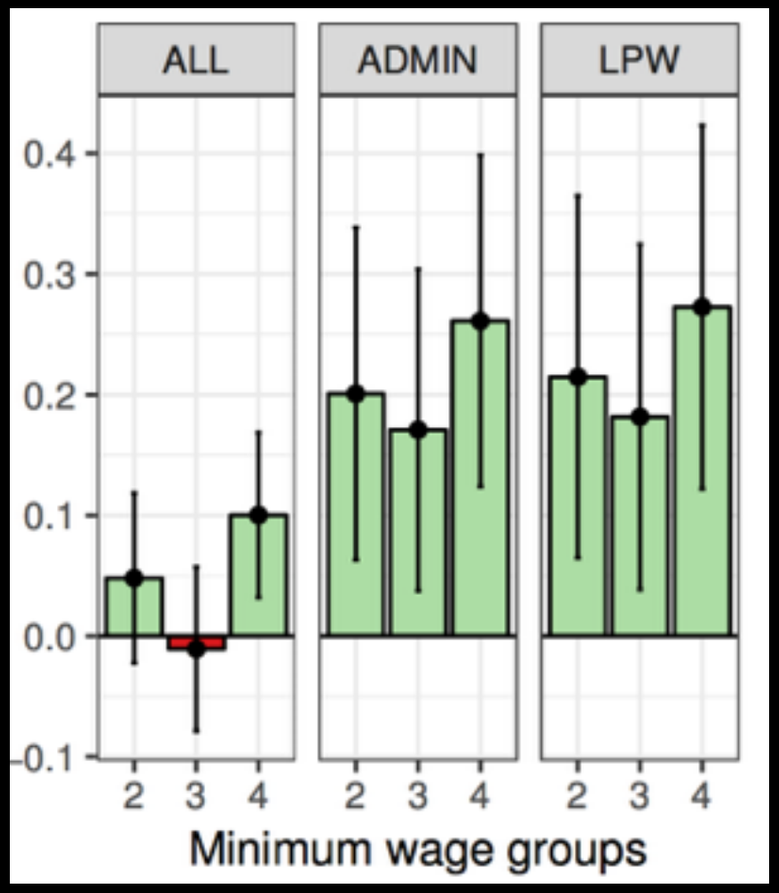

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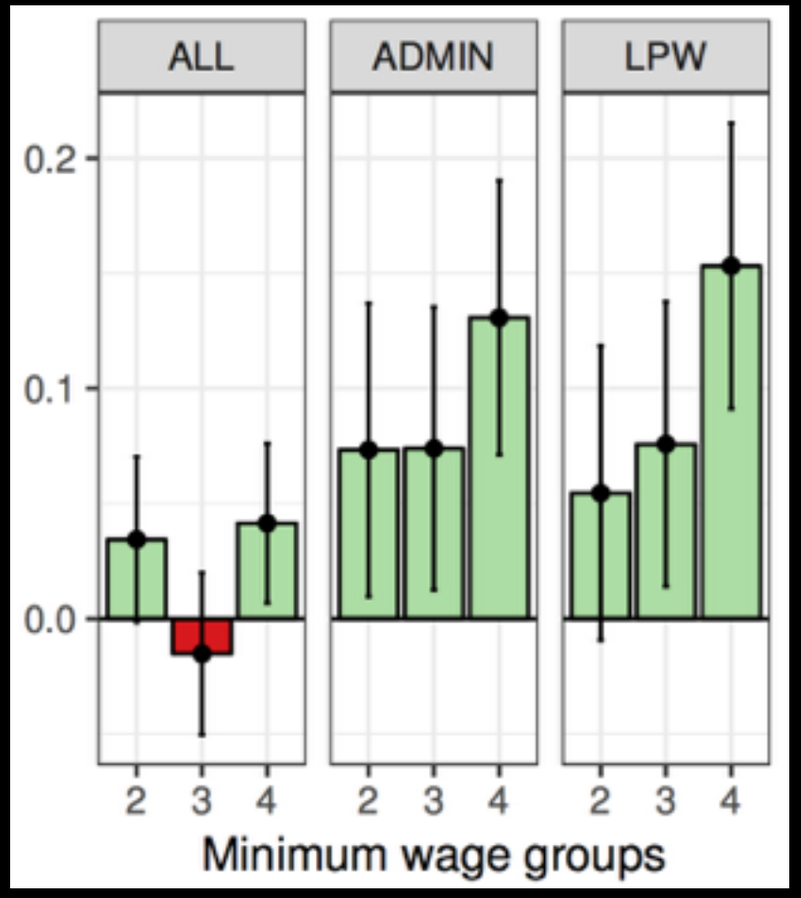
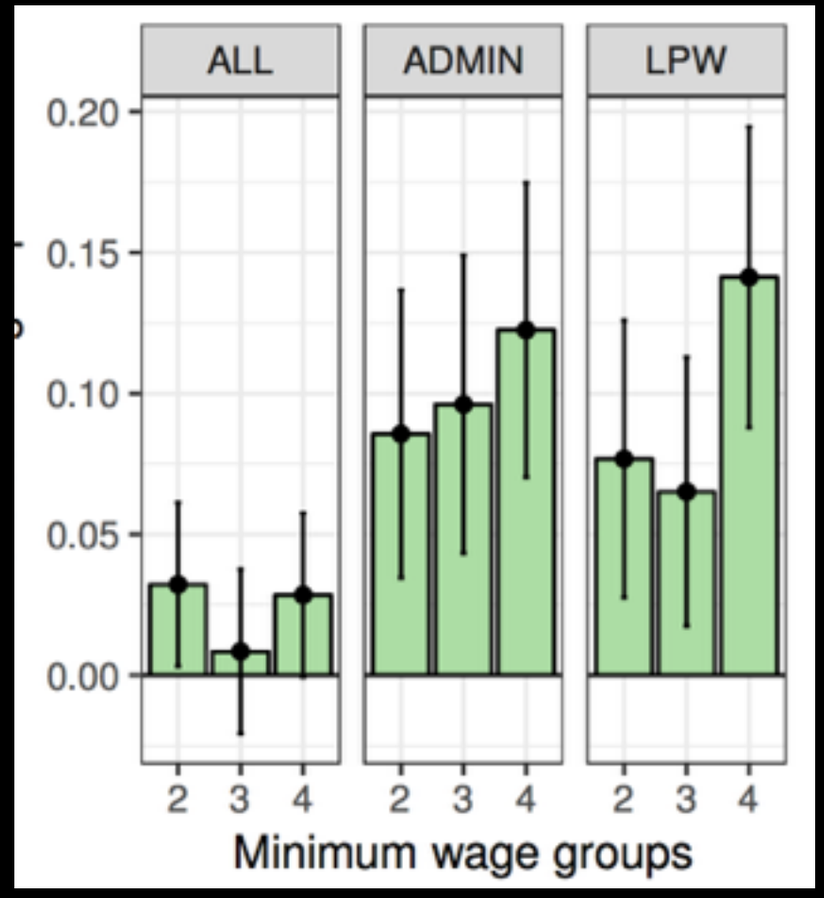


Hired worker profile rate



Labor-labor substitution by hired worker country

	Hired worker from:			
	US	India	Philippines	Bangladesh
	(1)	(2)	(3)	(4)
MW4	0.032***	−0.003	−0.011	−0.025*
	(0.008)	(0.012)	(0.014)	(0.012)
MW3	0.009	0.007	−0.006	−0.016
	(0.008)	(0.012)	(0.014)	(0.012)
MW2	0.003	0.001	0.009	−0.008
	(0.008)	(0.012)	(0.014)	(0.012)
Constant	0.073***	0.187***	0.303***	0.209***
	(0.002)	(0.004)	(0.004)	(0.004)
Observations	14,131	14,131	14,131	14,131
R^2	0.001	0.00003	0.0001	0.0004

Labor-labor substitution by hired worker country

Labor-labor substitution by demographics only detectable at highest wages

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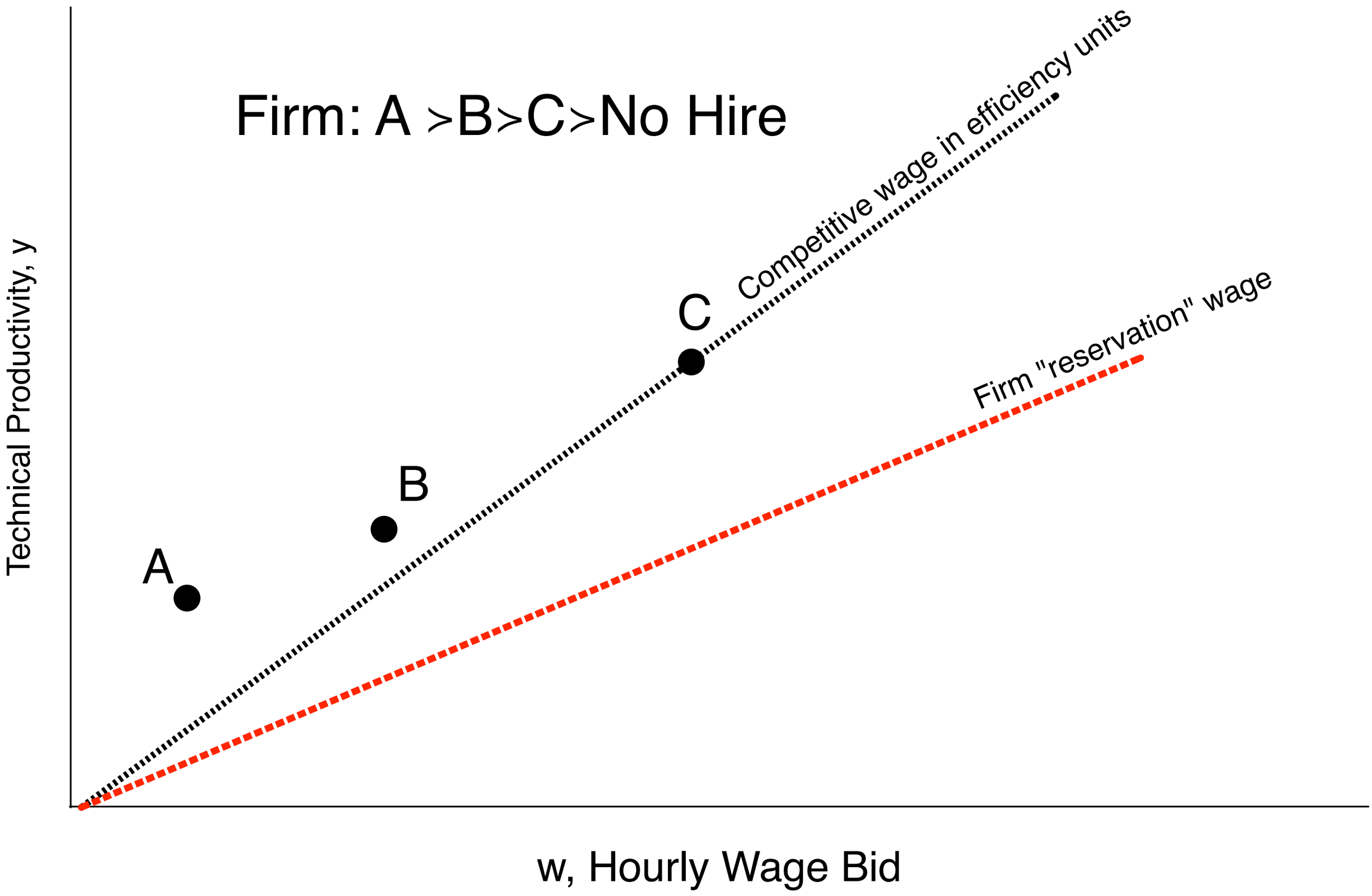
Why does substitution "work" as a margin of adjustment?

- Assume firms get a collection of applications that differ in technical productivity, **y**, and wage bid, **w**.

- The firm wants to hire the worker proposing the smallest **w/y**.

Firm: A >B>C>No Hire



Firm: B>A>C>No Hire

Competitive wage in efficiency units

Firm "reservation" wage

C

B

A

A'

Minimum Wage

Technical Productivity, y

w, Hourly Wage Bid

Firm: C≻B≻No Hire≻A

Technical Productivity, y

Competitive wage in efficiency units

Firm "reservation" wage

C

B

B'

A

A'

Minimum Wage

w, Hourly Wage Bid

What about in equilibrium?

- The problem: If all firms tried to hire more productive workers, it would bid up their wages

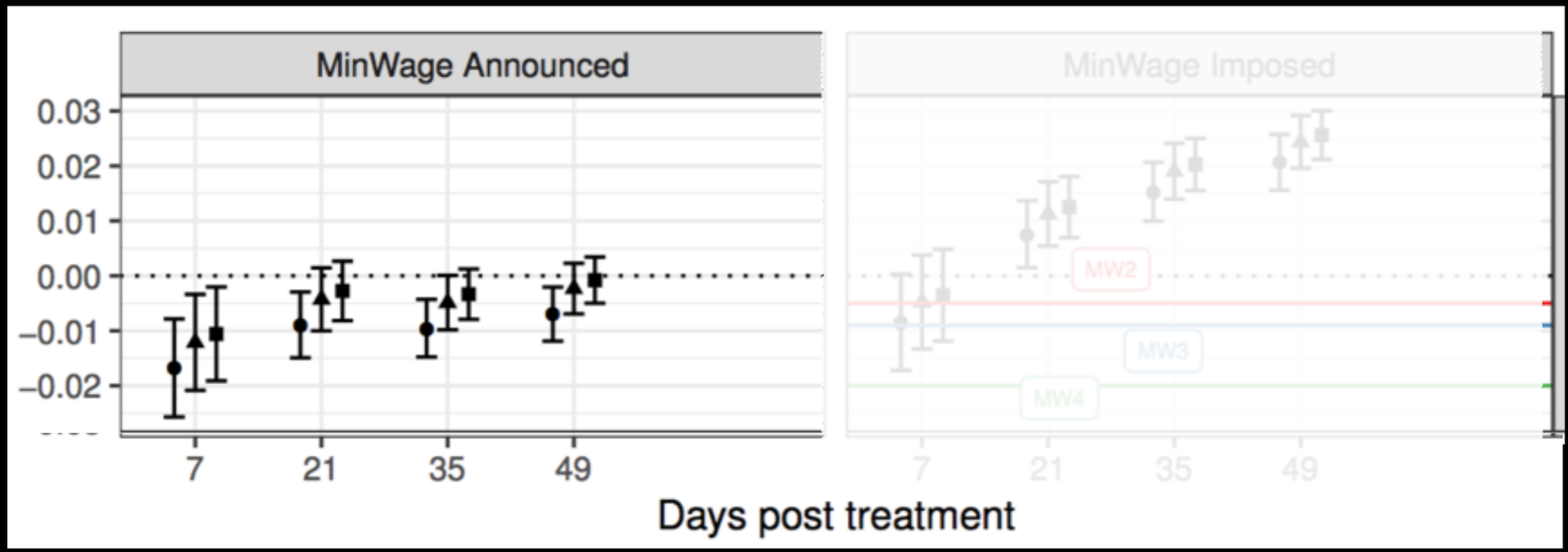
- Equilibrium results might look very different from the experimental results

Platform-wide announcement and imposition

- After the experiment ended, the platform publicly announced and then imposed a $3/hour minimum wage

- DD: I analyze job openings posted job before and just after, using one calendar year prior as a comparison.

Outcome: Hire made?



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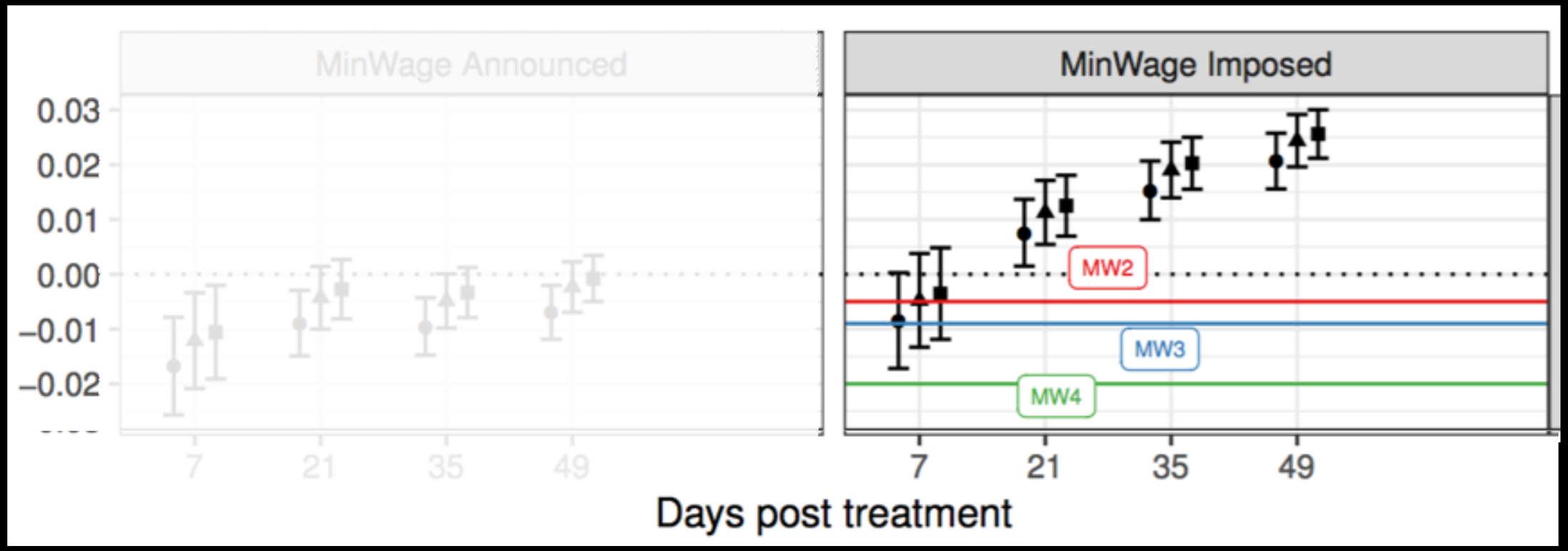
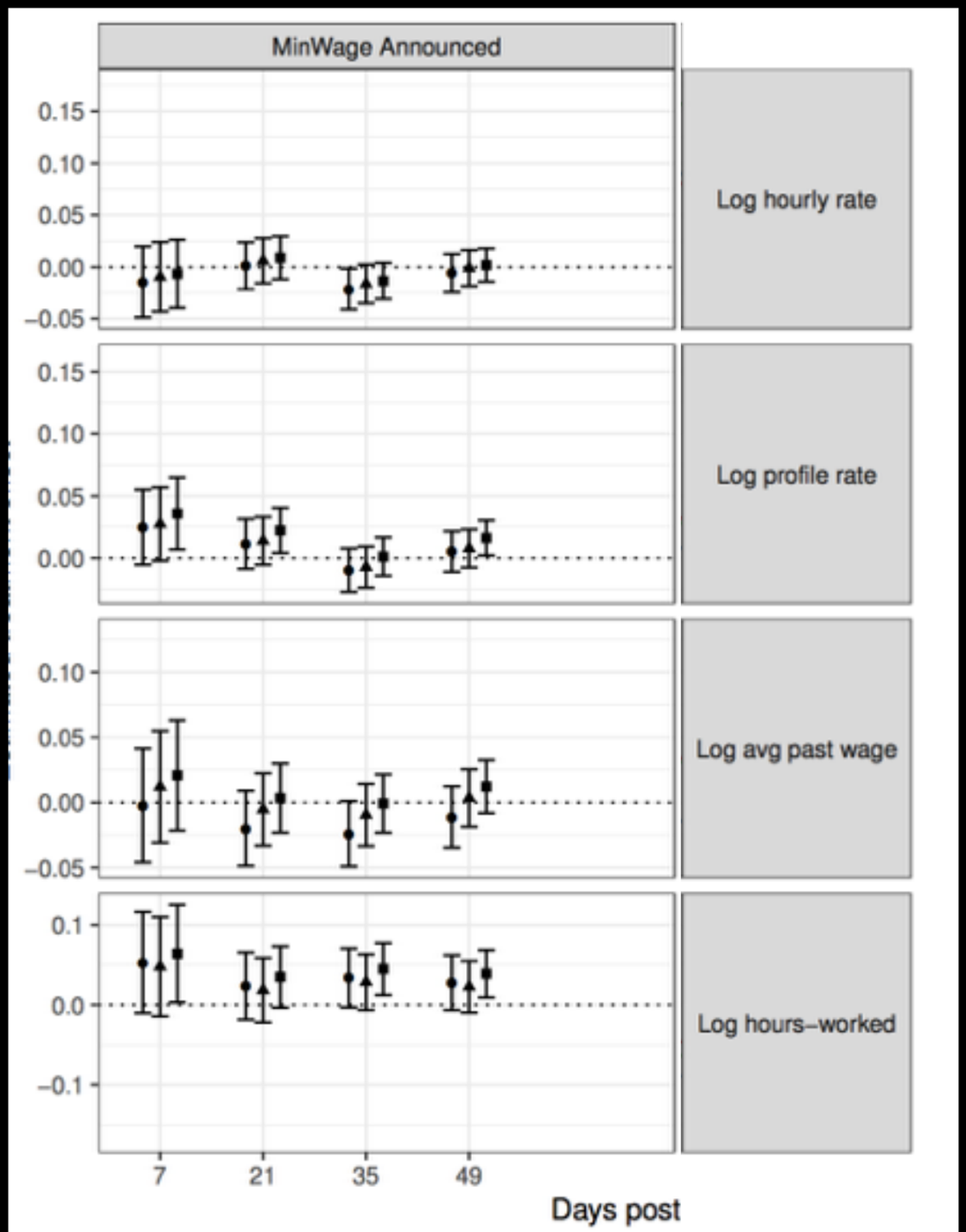
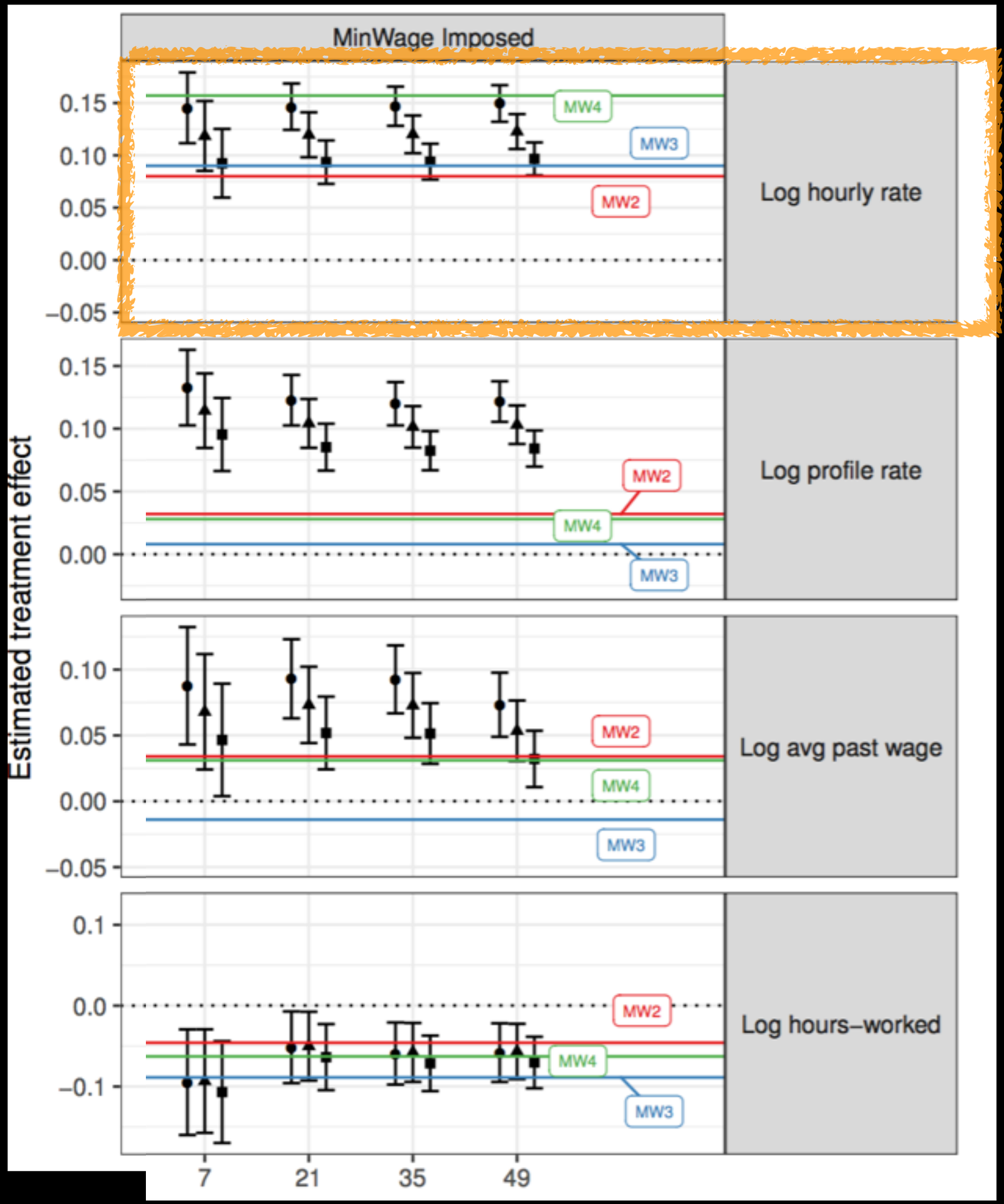
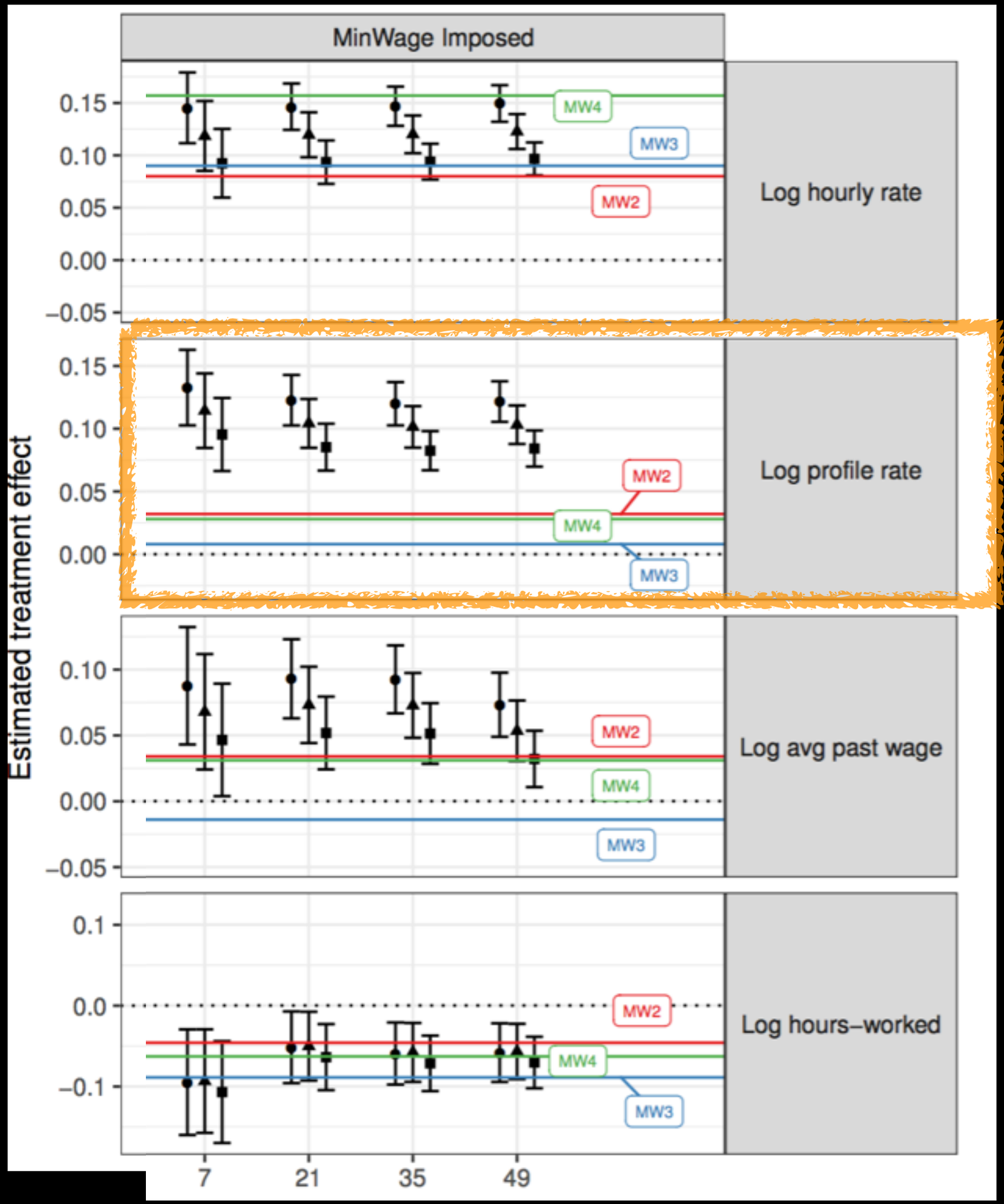


Effects of announcement on filled opening outcomes




MinWage Imposed
Log hourly rate
Log profile rate
Log avg past wage
Log hours−worked
MW2
MW3
MW4
Estimated treatment effect
0.15
0.10
0.05
0.00
−0.05
0.1
0.0
−0.1
7
21
35
49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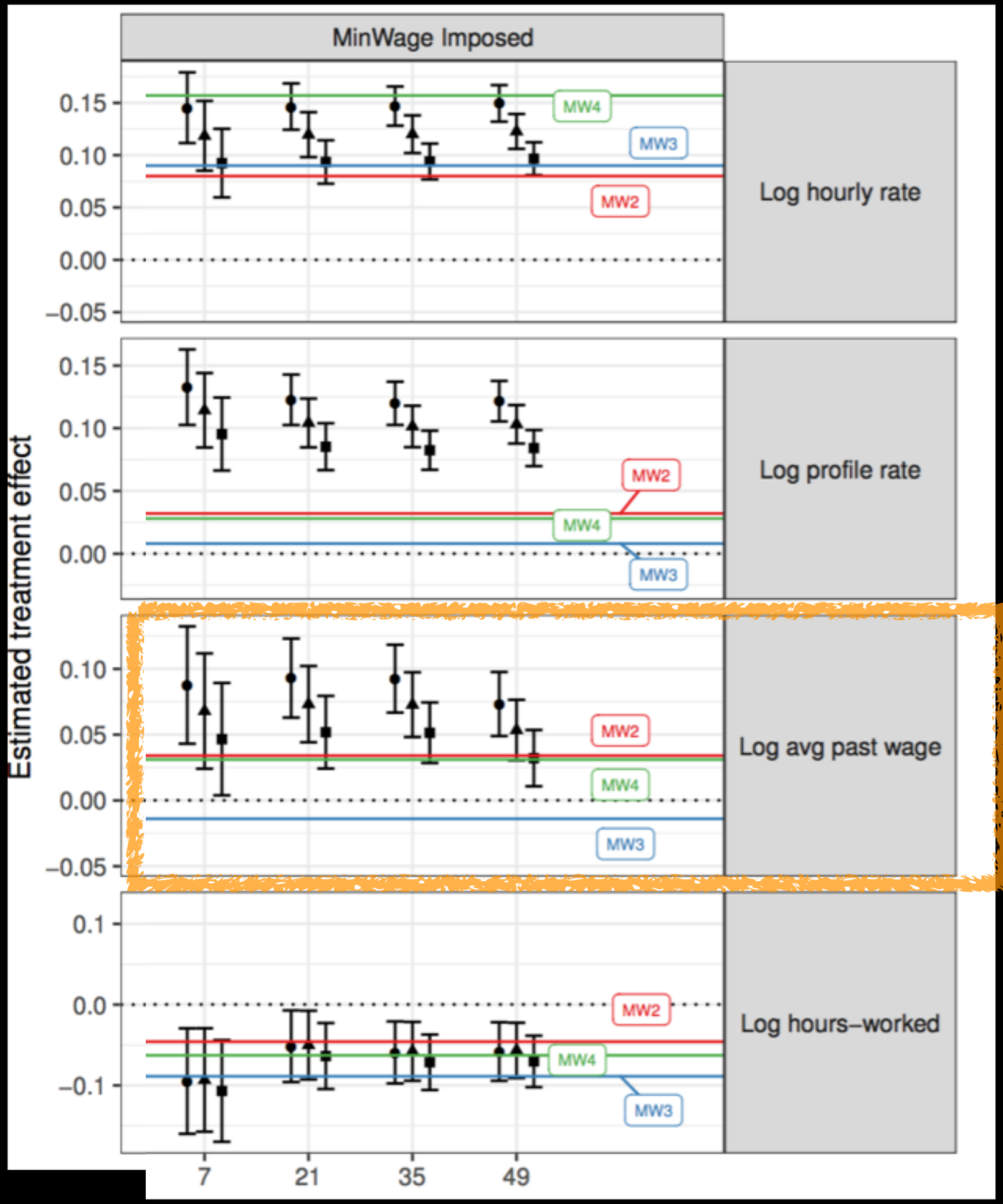
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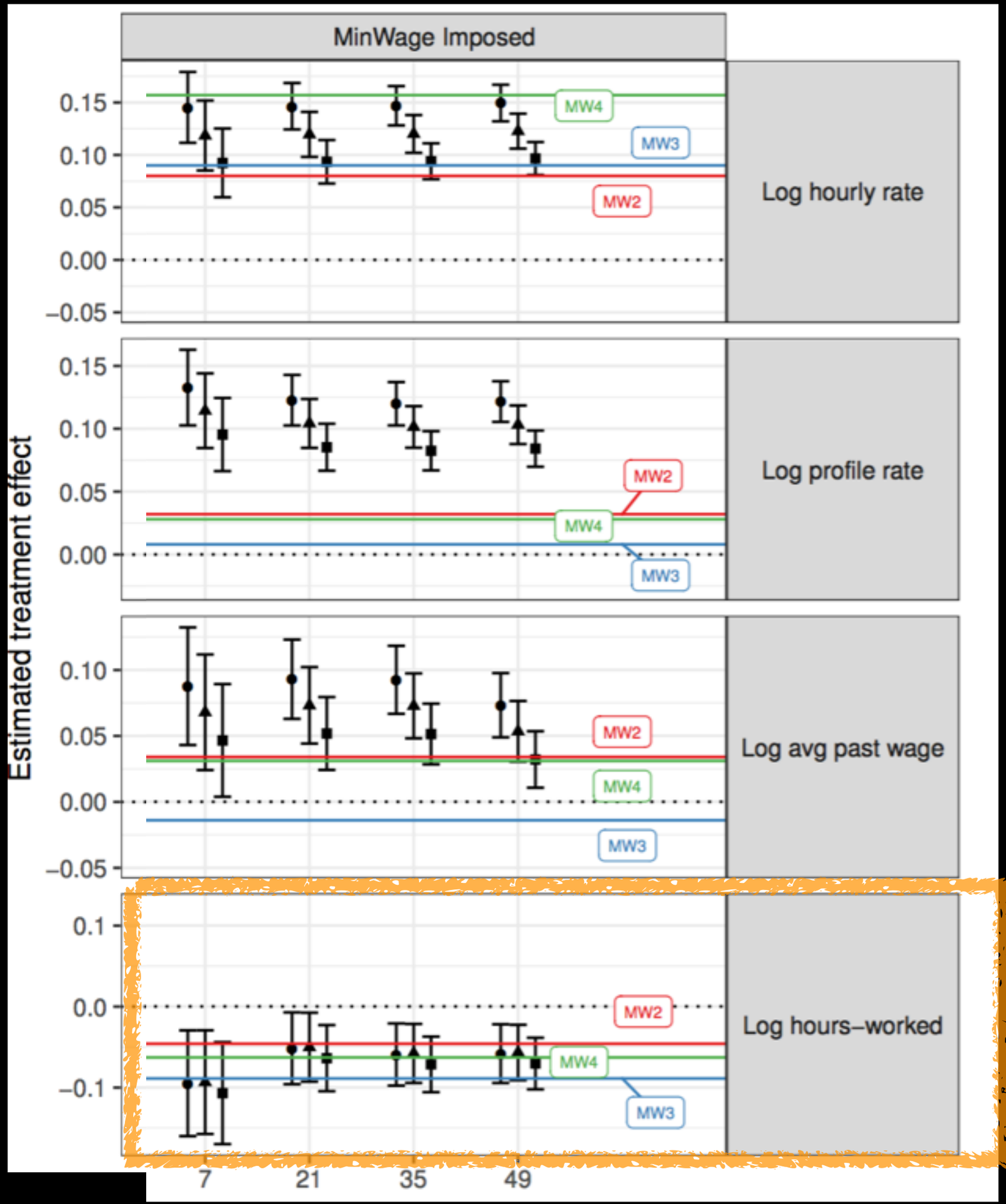
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Effects of imposition of worker bidding and hire rates

Indicator for application after the minimum wage is imposed

Indicators for average pre-period freelancer hourly wage bid

Worker FE

$$y_{ij} = \sum_{k \in K} \beta_k \left(\text{POST}_{ij} \times \text{PREWAGEBAND}_i^k \right) + c_i + \epsilon,$$

Outcome: Applicant's log wage bid

Actual Minimum Wage Imposition Year

Placebo Year (1 year prior)

1.2
0.8
0.4
0.0

Outcome: Applicant hired

Placebo Year (1 year prior)

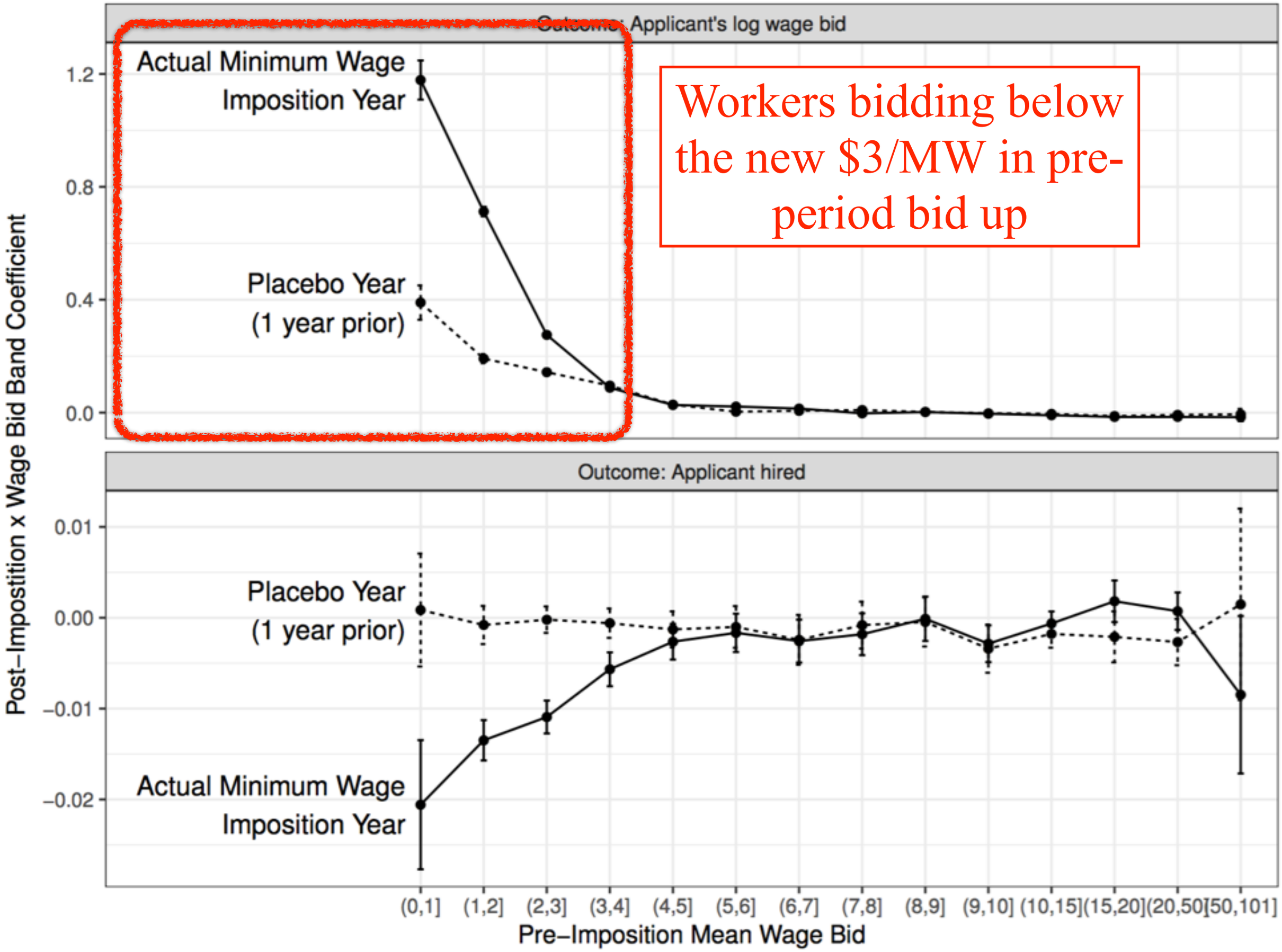
Actual Minimum Wage Imposition Year

0.01
0.00
−0.01
−0.02

Post−Impostition x Wage Bid Band Coefficient

(0,1] (1,2] (2,3] (3,4] (4,5] (5,6] (6,7] (7,8] (8,9] (9,10] (10,15] (15,20] (20,50] [50,101]

Pre−Imposition Mean Wage Bid


Outcome: Applicant's log wage bid
Actual Minimum Wage Imposition Year
Placebo Year (1 year prior)
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Workers bidding below the new $3/MW in pre-period bid up
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0.00
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Placebo Year (1 year prior)
Actual Minimum Wage Imposition Year
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Pre−Imposition Mean Wage Bid

Outcome: Applicant's log wage bid

Actual Minimum Wage Imposition Year

Placebo Year (1 year prior)

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Post−Impostition x Wage Bid Band Coefficient

0.01
0.00
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Placebo Year (1 year prior)

Actual Minimum Wage Imposition Year

Same workers had large fall-off win rate

(0,1] (1,2] (2,3] (3,4] (4,5] (5,6] (6,7] (7,8] (8,9] (9,10] (10,15] (15,20] (20,50] (50,101]

Pre−Imposition Mean Wage Bid

Summary of findings

- Prices: Large increase in hourly wages from an imposed minimum
- Quantities:
  - Little reduction in hiring from even *very* high minimum wages
  - Large reductions in hours-worked, even when no reduction in hiring
- Hired worker attributes:
  - Substantial substitution towards more productive workers
    - Evidence that the market-wide minimum wage made it harder for low-wage workers to be hired

Concluding thoughts

- Labor-labor substitution results only detectable because of fine-grained productivity measures
- Plausible that this substitution happens in conventional markets but goes largely undetected because most variation in productivity is *within* demographic groups rather than *between*

Thanks!

- Paper: Evidence from a Minimum Wage Experiment

- Author: John Joseph Horton, NYU Stern School of Business

- Paper: www.john-joseph-horton.com/papers/minimum_wage.pdf