

# Intra-Firm Competition and Uniform Wages\*

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## Abstract

Large employers often pay similar wages across establishments despite wide variation in local labor market conditions. This paper provides causal evidence on the effects of abandoning uniform wage policies. I study a 2019 reform in Wisconsin that temporarily raised the pay of correctional officers at six maximum-security prisons by about 20%, while leaving wages unchanged elsewhere. Using high-frequency administrative payroll data and Minnesota prisons as a counterfactual, I find that the policy increased employment at eligible prisons but reduced average hours by a similar magnitude, leaving total labor supply unchanged. Nearly half of the increase in employment came from internal transfers, indicating internal competition for workers across facilities. Moreover, separations increased at the one maximum security prison excluded from the raise, consistent with morale effects from perceived pay inequity. Together, these findings show that uniform wages can enable large employers to suppress internal poaching and preserve morale. A simple monopsony model formalizes how centralized uniform wage setting enhances employer market power by limiting intra-firm competition.

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# 1 Introduction

Standard economic theory predicts that wages respond to local labor market conditions. However, growing empirical evidence finds that establishments within the same firm tend to set similar wages, even when they are located in very different places. For instance, Derenoncourt and Weil (2025) show that large employers like Amazon, Target, and Walmart have firm-specific minimum wages that bind across all establishments in the United States. More generally, Hazell et al. (2022) show that posted wages are far less responsive to local labor market conditions within-firm than across-firms. Although many studies have documented the existence of uniform wage practices, less is known about why firms do not optimize across geography. A key limitation for uncovering mechanisms is that it is rare to find a natural experiment where a firm switches pay structures from uniform to heterogeneous wage setting.

In this paper, I study the labor market effects of switching from a uniform pay structure to allowing for establishment-specific wage differences. Specifically, I examine a 2019 policy in Wisconsin that temporarily increased the wages of correctional officers in maximum security prisons, but not in other facilities. Prior to this policy, the wages of correctional officers were uniform across prisons of all security levels and depended primarily on employees' tenure. However, amid growing worker shortages, the department announced a temporary wage increase of \$5/hour, equivalent to about a 20% pay increase, at select maximum security prisons from April 2019 to June 2020, while keeping wages in other prisons stable. Thus, the policy effectively introduced wage differentiation across prisons when they originally had a uniform wage structure.

Leveraging high-frequency payroll data, I identify the impact of the establishment-specific wage increase by comparing changes in Wisconsin prisons to those in the neighboring state of Minnesota, which maintained a uniform wage schedule throughout the study period. The out-of-state counterfactual control group allows me to not only estimate the direct effect of the policy on maximum security prisons that received the wage increase, but also the spillover effects onto other prisons not targeted by the reform. Survey evidence from Hazell et al. (2022) suggest that these externality effects may be important if establishments within the same firm are competing for the same workers. My empirical design therefore captures the aggregate effect on a firm choosing to differentiate wages across establishments.

I document three sets of results. First, focusing specifically on the maximum security prisons that received the pay increase, I find that the program succeeded in its goal of increasing employment and reducing overtime. Although employment at these facilities increased by around 4%, the average worker's hours decreased by nearly the same amount, leaving aggregate hours essentially unchanged. The fall in average hours is inconsistent with standard

labor supply models, which predict that higher wages should increase hours worked. To understand why hours fell, I show that the reduction in hours was driven entirely by a decline in overtime hours, suggesting that correctional officers may have been initially working involuntarily long hours. As a placebo check, I find no impact on the hours or employment of occupations that were not eligible for the policy, indicating that the effects are not driven by other contemporaneous shocks. As a result of the opposing extensive and intensive labor supply responses, maximum security prisons ended up with a 16% larger wage bill for little increase in hours of work.

Second, I show that there is internal labor competition across prisons within the same state. Nearly half the increase in the number of correctional officers at maximum security prisons is driven by transfers from nearby medium security prisons. Focusing on facilities within driving distance from a maximum security prison, I find that employment at these establishments fell by 5% during the period of the temporary pay increase. This led to a decrease in aggregate hours, which the prisons offset by increasing the average hours of correctional officers who remain employed at the facility. As a placebo check, I show that there were no similar spillover effects on prisons located far from maximum security facilities. Taken together, the evidence suggests that establishments within the same firm compete for the same workers.

Third, I find an increase in separations at the one maximum security prison that was excluded from the pay raise. Although there are seven maximum security prisons in Wisconsin, only six of them were facing staffing shortages and consequently received a temporary pay increase. Critics of the policy argued that this pay discrepancy would lower morale at the excluded facility. Consistent with this view, I find that separation rates at the excluded facility increased precisely when the policy went into effect and fell back down after the policy ended. The rise in separation rates resulted in a 13% decrease in employment. However, aggregate hours only fell by half that amount as the prison compensated by increasing the hours of remaining correctional officers.

As suggestive evidence that the increase in separations reflects morale concerns, I draw on prior research showing that pay inequality reduces morale only when it is perceived as unjustified (Breza, Kaur, and Shamdasani, 2018). Although workers at the excluded maximum security prison may feel unfairly left out, this concern is likely less relevant for those in medium and minimum security facilities because they operate in distinct work environments. Consistent with this interpretation, I find no increase in quits among medium or minimum security prisons excluded from the pay raise.

The effects of the program provide one of the first empirical evidence of competition and fairness concerns between establishments within the same firm. Although surveys of

HR managers suggest that these are important rationales for why employers set uniform wages, there has been little empirical validation of these mechanisms (Hazell et al., 2022). My paper shows that increasing the wages at one establishment can have large spillover effects onto other worksites in the same company. Building on monopsony models with heterogeneous worker preferences, I show that employers may use uniform wages to limit competition between its establishments, enabling them to set lower wages (Card et al., 2012).

My paper contributes to four areas of research. First, my paper adds to the literature on the wage setting behavior of multi-establishment firms. Previous papers have documented that large employers tend to offer similar wages to all workers of the same occupation within a country (Hazell et al., 2022) and even across countries (Hjort, Li, and Sarsons, 2020).<sup>1</sup> Studies have used variation in national wage setting policies as exogenous shocks to study local labor market competition and monopsony power (Staiger, Spetz, and Phibbs, 2010; Emanuel and Harrington, 2020; Droste, 2024; Derenoncourt and Weil, 2025; Goto and Yamagishi, 2025). However, less is known about the effect on employers that choose to switch from a uniform wage schedule to establishment-specific pay. I provide novel evidence that within-firm competition can incentivize employers to maintain uniform wages as a way to suppress wage competition, similar to how no-poach agreements limit competition among franchisees (Krueger and Ashenfelter, 2022; Callaci et al., 2024).

Second, my paper contributes to the literature on labor supply and employer constraints. Studies of tax holidays generally find a positive Frisch elasticity of labor supply, implying that individuals would work more in response to a wage increase (Sigurdsson, 2020; Tortarolo, Cruces, and Castillo, 2020; Martinez, Saez, and Siegenthaler, 2021). In contrast, I show that the hours of correctional officers fell after receiving a temporary 20% raise. Moreover, in both directly and indirectly treated prisons, I find that employment and average worker’s hours move in opposite directions, suggesting that prisons view these two inputs as substitutes (Quach, 2020). These results add to growing evidence that employers exert considerable control over workers’ hours (Chetty et al., 2011; Labanca and Pozzoli, 2022; Lachowska et al., 2023).

Third, I contribute to the literature on fairness concerns in the labor market. Prior work has shown that workers’ morale falls when they are paid less than their peers, and this leads to negative impacts on job satisfaction, turnover, and productivity (Card et al., 2012; Breza, Kaur, and Shamdasani, 2018; Cullen and Perez-Truglia, 2022; Dube, Giuliano, and Leonard, 2019). A common assumption in these studies is that a peer group is defined by workers in the same occupation-establishment. However, I provide suggestive evidence that workers are

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<sup>1</sup>Relatedly, DellaVigna and Gentzkow (2019) shows that firms also set the same prices for goods sold in different markets across the United States.

also aware of pay differences across establishments within the same firm, implying that wage dispersion across worksites can generate similar morale effects.

Fourth, I add to the literature on incentivizing public sector employment. Previous papers have evaluated the effectiveness of increasing worker pay (Dal Bó, Finan, and Rossi, 2013), setting minimum staffing requirements (Matsudaira, 2014), and subsidizing facilities for hiring more staff (Gandhi et al., 2024). These studies have generally found such policy tools to be effective at increasing public sector employment. In contrast, I explore a cautionary setting, showing that while temporary wage increases increased employment in the targeted facilities, they had negative spillover effects on other worksites.

The remainder of this paper is organized as follows. In section 2, I explain the institutional details of the temporary wage increase for correctional officers in maximum security prisons. Section 3 describes the administrative payroll data and empirical strategy. I report my main results in section 4. Section 5 develops a theoretical model to interpret my empirical findings and relate them to firms' incentives for setting uniform wages across establishments. I conclude in section 6 by summarizing my findings and areas for future research.

## 2 Temporary Wage Increase at Maximum Security Prisons

Prior to 2019, the hourly wage rate of correctional officers in Wisconsin depended on workers' tenure and shift schedule, but not their specific worksite. However, this temporarily changed in 2019 amid a growing worker shortage at select maximum security prisons. While about 10% of positions for correctional officers and sergeants were vacant in medium and minimum security prisons, the vacancy rate was over 20% in maximum security facilities. To address this issue, the Department of Corrections (DOC) introduced the Critical Vacancy Add-on Pilot Program in April 2019. Under this program, correctional officers and sergeants at six maximum security institutions would receive a \$5.00/hour wage increase from April 28, 2019 through June 20, 2020.<sup>2</sup> However, one maximum security prison, the Wisconsin Secure Program Facility (WSPF), was excluded from the pilot program because it did not have as severe of a worker shortage.

To visualize the mandate of the policy, Panel A of Figure 1 plots average wages of correctional officers and sergeants over time for four types of prisons: minimum, medium, maximum security prisons excluding WSPF, and WSPF. I find that wages across the prisons were fairly similarly to each other in the year prior to the pilot, consistent with a uniform

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<sup>2</sup>The six prisons that received the temporary wage increase are Columbia Correctional Institution (CCI), Dodge Correctional Institution (DCI), Green Bay Correctional Institution (GBCI), Lincoln Hills and Copper Lake Schools (LHS/CLS), Taycheedah Correctional Institution (TCI), and Waupun Correctional Institution (WCI).

wage structure. The wages in the treated maximum security prisons then increased sharply in May 2019 before falling back down in June 2020. The \$5 per hour pay increase was equivalent to approximately a 20% raise for correctional officers.

In addition to the Add-on Pilot Program, the Wisconsin DOC also implemented two additional policies during the 5-year period of my sample. First, it periodically gave all prison guards a lump-sum bonus that depended on their years of service. These bonuses appear as sudden spikes in average wages in Figure 1. I will show that the bonuses in 2018 and 2020 had no detectable effects, indicating that these lump-sum payments likely do not bias my estimates of the effects of the pilot program. Second, the DOC permanently increased the wages of all correctional officers by \$1.66/hour starting January 19, 2020. However, employees covered by the pilot program would be exempt from this pay increase until after their \$5.00 add-on expires. Although this policy reduces the wage gap across prisons, it does not fully close the gap so therefore does not affect the broader interpretation of my natural experiment.

The increase in wages to only maximum security prisons offers a unique natural experiment to study the impact of switching from a uniform wage structure to establishment-specific wages. Standard spatial models argue that a multi-establishment employer would maximize profits by varying wages across locations in response to local product demand and labor market conditions (Hazell et al., 2022). However, this fails to capture a common practice among large employers of setting similar wages across their establishments. To inform these models, I leverage the pilot program to evaluate the costs and benefits of adopting a wage structure that differentiates wages across establishments.

To identify the aggregate impact of the pilot program, I use prisons in Minnesota as a counterfactual control group. Panel B of Figure 1 shows that wages of correctional officers were the same across minimum, medium, and maximum security prisons in Minnesota from January 2018 to December 2021. Unlike Wisconsin, where annual wage increases are worker-specific as a function of individuals' tenure, correctional officers receive periodic pay increases as a group due to collective bargaining agreements. However, these wage increases are fairly small relative to the large pilot program implemented in Wisconsin, so will not have a significant effect on my analysis. Moreover, there is a stable period from August 2018 to January 2020 in which neither state implemented any major policies affecting correctional officers, aside from the pilot program that I am studying. Thus, Minnesota is a reasonable comparison group to predict how outcomes in Wisconsin would have evolved if it also maintained a uniform wage policy across its prisons.

Besides leveraging Minnesota as a counterfactual control group, the structure of the policy also offers two useful validation tests. First, since the wage increase was temporary, its effects will be largest between May 2019 and June 2020, when the pilot program was

active. This allows me to use post-June 2020 as an additional test of what happened after the policy was reversed. Second, given that the wage increase only applied to correctional officers and sergeants, I am able to use other prison occupations as a placebo test. For instance, Appendix Figure A.I plots average wages over time for Wisconsin DOC employees in education, healthcare, senior security roles above correctional sergeants, and other prison occupations. I leverage these occupations that were exempt from the pilot program to show that there were no other large contemporaneous shocks specific to the Wisconsin prison system.

## 2.1 Theoretical Predictions

Before proceeding with the empirical analysis, this section discusses the predicted effects of the pilot program given its policy intent and the findings of previous empirical studies.

First, the temporary wage increase is expected to increase the number of workers and reduce overtime hours at the eligible maximum security prisons. In a memo to prison employees, the Department of Corrections stated that “the intent of this Pilot Program is to positively impact our recruitment and retention efforts at our most vulnerable institutions and reduce the overall overtime required of our dedicated staff” (Wisconsin Department of Corrections, 2019). The same memo also mentions that employee morale has been deteriorating due to long periods of mandatory overtime. Thus, contrary to standard labor supply models, it is unclear whether the net number of hours worked will increase or decrease following the pay increase, as the employer has strong discretion over employees’ hours.

Second, the policy may also increase the number of internal transfers to eligible prisons. As part of the pilot program, the DOC announced that they are suspending limitations on transfer frequencies and probationary periods.<sup>3</sup> Given that transfers are not mandatory, but requested by workers, I expect most transfers to be from prisons located near one of the treated facilities.

Third, the program may also have negative morale effects on prisons excluded from the wage increase. In particular, critics of the policy argued that it was unfair that the Wisconsin Secure Program Facility (WSPF) was the only maximum security prison excluded from the pilot program, resulting in different wages to workers performing the same job. For instance, in criticism of Democratic governor Tony Evers who approved the temporary wage increase, Republican senator Howard Marklein argued that “the DOC has made an unfair decision and it is a mistake. I believe that the DOC may create a new vacancy problem at the Boscobel Prison by picking winners and losers” (Marklein, 2019), where Boscobel refers to the city in

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<sup>3</sup>To prevent disruption, staff usually cannot request a transfer until they have served at least 1 year at their current institution since their last transfer or hire date.

which WSPF is located. If the policy worsened morale in WSPF, then I would expect an increase in separations from that prison.

Whether or not the pay increase at maximum security prisons had spillover effects onto other facilities is central to current hypotheses for why large firms set uniform wages across establishments. In a survey of HR managers conducted by Hazell et al. (2022), the most common reason given for setting national wages is that the company is competing in a national labor market for relatively mobile workers. Relatedly, over 20% of respondents said “workers in these jobs sometimes transfer across locations and we do not want to adjust their pay if they do”.<sup>4</sup> In addition, nearly 40% of managers cited internal fairness norms as a reason for setting uniform wages. These survey responses suggest that intra-firm competition and morale concerns play an important role in determining wages across establishments. To my knowledge, this paper will be the first to empirically test how workers respond when their employer increases wages in another establishment within the same firm.

### 3 Data and Empirical Strategy

My main analysis uses administrative paycheck data provided by the Wisconsin and Minnesota Department of Corrections. For Wisconsin, the data is aggregated at the biweekly paycheck level by prison-occupation groups from January 2018 to December 2022. The data contains all adult institutions but omits the state’s three juvenile correction facilities, including a recipient of the temporary wage increase - the Lincoln Hills and Copper Lake Schools. This omission limits the external validity of my analysis to youth prisons, but does not bias my findings on the impact on adult facilities.

I observe up to six occupation groups per prison: correctional officers, correctional sergeants, security supervisors, education, health care, and other. For each group, the data contains three sets of outcome variables. First, I observe the average hourly wage and net earnings for each occupation, which I can further decompose by regular pay and overtime pay. The DOC defined the average hourly wage as non-overtime pay divided by non-overtime hours, so it occasionally also captures lump sum bonuses. Second, in terms of labor supply and demand, the data has the number of employees, the number of unfilled vacancies, and the number of hours worked for each occupation-prison. Third, to measure flows in employment, the data also provides the number of new hires, separations, and internal transfers, where I can distinguish between transfers into or out of each prison, but I do not observe the target of the transfers.

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<sup>4</sup>More generally, Carballo, Mansfield, and Pfander (2024) find that within-firm transitions between establishments account for 7.8% of all job transitions in the United States.



The data for Minnesota is at a more granular level than the Wisconsin data. Rather than prison-occupation aggregates, I observe biweekly paycheck information at the individual worker level from January 2018 to December 2022. However, to make the sample comparable to the Wisconsin data, I collapse the data to the prison-occupation level. Although Minnesota prisons are classified into 4 security levels, I group the two highest security levels as maximum security for comparability with Wisconsin. There are two main distinctions between the samples after the aggregation. First, wages in Minnesota are workers’ actual hourly rate, rather than their implied wage absent overtime pay. Thus, only Wisconsin exhibits wage spikes in Figure 1 due to lump-sum bonuses. Second, the micro-data in Minnesota has more granular job titles than the aggregated data in Wisconsin. For comparability, I aggregate the job titles correctional officer 1, 2, and 3 as simply “correctional officer”, and relabel correctional lieutenant as correctional sergeant.<sup>5</sup> I keep other occupations at their granular job-title level for my placebo analysis.

For robustness checks, I include two additional datasets to control for changes in local labor market conditions. First, I merge on data from the Quarterly Census of Employment and Wages (QCEW), which provides county-level measures of employment and wages for private sector jobs, computed by the Census Bureau from administrative micro-data. Second, since the temporary wage increase lasted for a year starting in May 2019, it partially overlapped with the beginning of the Covid-19 pandemic. To control for pandemic specific shocks, I merge on county-level data for the number of cases and deaths from Covid-19 over time. Together, these datasets allow me to control for broader changes at the county in which each prison is located.

Table I reports descriptive statistics of the prisons in Wisconsin and Minnesota, prior to the temporary wage increase. I highlight four important differences between the prisons. First, Minnesota prisons pay their correctional officers about 15% more than in Wisconsin. Thus, the temporary pay increase brought wages in Wisconsin only a little above the rate in Minnesota. Second, the prisons that qualified for the pay increase had on average a 25% unfilled vacancy rate, whereas other prisons had on average only 10%. Facilities with a larger worker shortage also tended to work more hours. In maximum security prisons, correctional officers in Wisconsin were working nearly 20 hours more every two weeks relative to their counterparts in Minnesota. Third, although transfers are rare relative to the number of workers, there appears to be more transfers out of each prison than transfers into them. The reason for this discrepancy is that correction officers who transfer for a promotion are

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<sup>5</sup>The career trajectory of correctional officers typically progresses from correctional officer 1, 2, 3, then sergeant, lieutenant, captain, and warden. However, the data for Minnesota does not distinguish sergeants from lieutenants.

not recorded as a “transfer-in” since they now have a different job title. Fourth, there are 22 prisons in Wisconsin, but only 11 prisons in Minnesota.<sup>6</sup> For statistical power, my main empirical specification will use all prisons in Minnesota as a control group, regardless of which prisons I am examining in Wisconsin as my treatment. In principle, this restriction is innocuous since all Minnesota facilities were exempt from the pay increase.

Although Wisconsin exhibits some wage differences across prisons even before the pilot program, this variation reflects differences in workers’ tenure and shifts, rather than efforts to align prisons with local labor market conditions. For example, Appendix Figures A.II and A.III compare job adverts for correctional officers posted by the Wisconsin DOC in 2021 and 2023 respectively. In 2021, correctional officers’ pay depends on their years of experience and whether they are working nights, weekends, or overtime. In contrast, the DOC permanently adopted an establishment-specific wage schedule in 2023 so that wages also depend on the security level and vacancy rate of each facility. The pilot program allows me to isolate the impact of increasing some establishments’ wages while keeping others constant.

My empirical strategy uses a difference-in-difference design that compares outcomes in Wisconsin to Minnesota over time. I estimate the following regression:

$$y_{it} = \sum_{\substack{\tau=-9 \\ \tau \neq -1}}^{17} \beta_{\tau} D_{WI(i),q(t)=\tau} + \alpha_i + \alpha_t + \varepsilon_{it} \quad (1)$$

where  $y_{it}$  represents the outcome of prison-occupation  $i$  in the biweekly pay period  $t$ . For worker-level outcomes such as “average wage”, I weigh the regression by the number of workers in each prison-occupation to capture the effect on the average worker. The treatment indicators  $D_{WI(i),q(t)=\tau}$  equal one if prison  $i$  is located in Wisconsin and the pay cycle  $t$  is  $\tau$  time periods since May 2019, the first month of the temporary pay increase. I aggregate the time periods  $\tau$  into 4 paycheck intervals for statistical power so each estimate represents 8-week intervals. My benchmark specification controls for prison ( $\alpha_i$ ) and paycheck ( $\alpha_t$ ) fixed effects. Thus, the coefficients of interest,  $\beta_{\tau}$ , represent the change in outcomes in Wisconsin since the period before the pilot program, relative to the evolution of outcomes in Minnesota. Standard errors are clustered at the prison level.

To summarize my results, I will also estimate an aggregated regression of the form

$$y_{it} = \beta D_{WI,During} + \gamma D_{WI,After} + \alpha_i + \alpha_t + \varepsilon_{it} \quad (2)$$

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<sup>6</sup>For comparison, Wisconsin had about 2.4 times as many incarcerated individuals as Minnesota in 2019 (Prison Policy Initiative, 2023).

where the dummy  $D_{WI,During}$  equals 1 for Wisconsin during the period of the pilot program (i.e. April 28, 2019 - June 20, 2020) and  $D_{WI,After}$  equals 1 for Wisconsin after the program ended.

My empirical strategy assumes that absent the temporary wage increase, outcomes in Wisconsin and Minnesota would have evolved at the same rate. I validate my empirical design by showing that outcomes were trending similarly between facilities in Wisconsin and Minnesota in the year prior to the policy change. Moreover, I show that my results are robust to additional controls and that there was no effect among the placebo occupations. Since the implications of the temporary wage policy differ across prisons, my analysis estimates Equation (1) using different sub-samples of the prisons in Wisconsin as the treatment group, while keeping all facilities in Minnesota in the control group.

## 4 Empirical Results

### 4.1 Direct Effect on Maximum Security Prisons

I begin my analysis by examining the impact of the temporary pay increase on the maximum security prisons directly targeted by the policy. Figure 2 plots the estimates of equation (1) for three outcomes of correctional officers and sergeants: hourly wage, earnings, and weekly hours averaged across workers. I document four results. First, across all three panels, I find that average outcomes were trending similarly between maximum security prisons in Wisconsin and prisons in Minnesota. The absence of pre-trends supports the parallel trends assumption of my empirical design. Second, Panel A shows that wages increased 20% starting in May 2019 and then fell back down after June 2020, coinciding precisely with the period of the temporary wage increase.<sup>7</sup> Wages remain fairly stable after the end of the policy. Third, in contrast to the persistent 20% increase in hourly wages from May 2019 to June 2020, Panel B shows that the impact on earnings diminished over this time period. Although earnings initially increased by 20%, this effect decreased to less than 10% by the end of 2019.<sup>8</sup> Fourth, Panel C shows that the fading earnings effect was due to a reduction in workers' hours. Unlike the wage and earnings estimates, I find no spikes in workers' weekly hours in the month of the bonuses, suggesting that the lump-sum transfers had little impact on workers' labor supply. In contrast, I show that the hours of correctional officers started falling immediately after the temporary wage increase went into effect, culminating in a 7% reduction by December

<sup>7</sup>The sudden spikes in wages in mid-2018 and late-2020 represent one-time lump sum bonuses in Wisconsin.

<sup>8</sup>Appendix Figure A.IV shows that the sudden drop in earnings near the end of the policy period is due to a lump sum bonus in Minnesota.

2020. Thus, workers' earnings did not increase by as much as wages due to a reduction in hours.

The fall in hours contradicts the predictions of standard theories of labor supply. Previous quasi-experimental estimates of the intertemporal labor supply elasticity range from 0.025 to 0.4, with larger estimates at the intensive margin (Sigurdsson, 2020; Tortarolo, Cruces, and Castillo, 2020; Martinez, Saez, and Siegenthaler, 2021). In general, workers would want to work more during periods of a temporary wage increase. Instead, the fall in hours suggests that workers' hours are constrained by decisions made by the prisons. Prior to the pay increase, correctional officers were required to work mandatory overtime due to the worker shortage (Wisconsin Department of Corrections, 2019). As a result, employees were initially working above their optimal number of hours. If the wage increase brought in more workers, this relaxed the firm's hours constraints, thereby allowing employees to cut back on their long workweeks. Consistent with this view, Appendix Figure A.V shows that the entire reduction in hours is driven by a decrease in overtime hours, rather than regular base hours. By December 2020, the average correctional officer in Wisconsin maximum security prisons was working about 7 fewer overtime hours per week. Overall, the temporary wage increase appears to be a net positive for correctional officers, leading to more pay and fewer hours.

To examine whether the policy accomplished its goal of reducing labor shortages at maximum security prisons, Figure 3 plots the impact of the policy on aggregate prison-level outcomes. Mirroring the impact on workers' earnings, Panel A finds that prisons' wage bills increased by 20% immediately after the policy went into effect, and then decreased slightly over the year. However, prisons' wage bill did not fall as much as the average worker's earnings. The reason for this can be seen in Panel B, where I find that the policy increased the number of correctional officers. Despite the increase in employment, Panel C finds only a small increase in the aggregate number of worker-hours, consistent with the result that correctional officers are each working shorter hours. Thus, from the perspective of the maximum security prisons, the policy managed to increase the number of correctional officers, but barely increased the amount of hours worked.

The null effect on aggregate hours highlights the importance of distinguishing between intensive and extensive labor supply responses. Previous work focusing on the extensive margin show that raising workers' wages has a positive impact on recruitment. For instance, in a randomized control trial, Dal Bó, Finan, and Rossi (2013) found that a 33% wage increase led to 26% more job applicants and a 35% increase in the conversion rate. Although I am studying a temporary pay increase rather than a permanent one, the event-study estimates in Figure 3 similarly find a comparable increase in employment in response to the 20% pay raise. However, this increase in the number of workers does not translate into increased work

hours once I factor in intensive margin responses.

To validate my empirical design, Appendix Figure A.VI plots the difference-in-difference estimates for all occupations aside from correctional officers and sergeants. If the changes in correction officers' hours are driven by overall expansions in the prison system or other Wisconsin-specific shocks, then I would expect to see similar responses even among occupations exempt from the pilot program. In contrast, the placebo test finds no positive wage effects and subsequently no impact on exempt workers' average hours or aggregate employment. These null effects imply that my main results are not biased by other contemporaneous shocks that differentially affected Wisconsin and Minnesota, unless those shocks also specifically targeted correctional officers at exactly the same time as the temporary wage increase.

Table II summarizes the effects of the temporary wage increase on eligible prisons during the period of the program. In effect, I report the estimates of  $\beta$  from equation (2). Column (1) corresponds with the specification from Figures 2 and 3. In Panel A, I find that the wages of correctional officers increased by 21%, but their weekly hours fell by 4%, so average earnings only increased 11.5%. In Panel B, I show that the wage bill of maximum security prisons increased by 16%, but there was no statistically significant effect on the number of correctional officers or the total number of worker-hours. The null effect on employment partially reflects the small negative pre-trend observed in panel (b) of Figure 3. Nevertheless, consistent with the figures, I find that the increase in employment is fully offset by the decrease in workers' hours.

To test the robustness of my estimates, Column (2) shows that these effects are unchanged after restricting the sample to only maximum security prisons in both states. In columns (3) and (4), I further show that the results are robust to controlling for local labor market conditions (i.e. county-level private sector wages and employment) and exposure to Covid-19 (i.e. county-level Covid case and death rates). Thus, my estimates are not driven by broader changes to the labor market in which each prison is located.<sup>9</sup> Together, the estimates indicate that the temporary wage policy benefited workers, but did not succeed in increasing hours of labor at maximum security prisons.

## 4.2 Spillover Effects: Internal Competition

Next, I explore whether the temporary wage increase at maximum security prisons had spillover effects onto medium and minimum security prisons. One reason why employers may set uniform wages across the whole firm is that their establishments compete against

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<sup>9</sup>Moreover, although the temporary wage increase overlapped with the start of Covid-19, the visual evidence from Figures 2 and 3 suggest that the effects of the policy already materialized prior to March 2020.

each other for workers. To test this hypothesis, I estimate the impact of the policy on the employment flow of correctional officers and sergeants into the affected maximum security prisons. Since there are months in which prisons have no hires, separations, or transfers, I estimate equation (1) in levels rather than logs to avoid computing the logarithm of zero.

Figure 4 decomposes the change in employment at maximum security prisons into each of its flow components. Similar to the analysis on the stock of workers, I find that employment flows were trending at the same rate between Wisconsin and Minnesota in the year prior to the temporary wage increase. Afterwards, each outcome responded differently to the policy change. First, Panel (a) shows that there was a spike in hires near the end of 2019. While this is the largest increase in hires during the 3 year study period, there are also other spikes in hiring after the end of the pilot program that are unlikely to be driven by the policy. Thus, the evidence is suggestive, but not conclusive, that maximum security prisons were able to hire more workers as a result of the wage increase.

Second, Panel (b) shows an immediate decrease in separations in the 2 months after correctional officers received their \$5/hr raise. However, separation rates return to status quo soon afterwards. This implies that some workers, who would otherwise have quit in May 2019, decided to remain at the prison due to the wage increase. Interestingly, there is no immediate rise in separations right after the policy ended, suggesting that the temporary wage increase had some persistent impacts.

Third, Panel (c) shows a sharp increase in transfers into maximum security prisons following the temporary wage increase. In the first six months after the enactment of the policy, maximum security prisons received on average 3 additional correctional officers due to a rise in internal transfers. This is comparable to the spike in hires in Panel (a). Thus, a large share of the increase in employment at maximum security prisons is driven by internal transfers, rather than recruitment or retention. This indicates that prisons within the Wisconsin Department of Corrections system are competing against each other for workers.

Fourth, Panel (d) plots the impact on transfers out of maximum security prisons. Unlike the other outcomes, I find no immediate effect after workers started receiving their \$5/hour bonus, suggesting that correctional officers already working at maximum security prisons had sorted themselves into those positions and had no latent intent of transferring out. However, after the pilot program ended, I find a small increase in transfers out that lasts about 6 months. This may suggest that some individuals who had initially transferred into the maximum security prisons as a result of the wage increase are now returning to their previous worksite following the end of the policy.

To measure the cumulative effect of the change in employment flows, Appendix Figure A.VII plots the cumulative sum of the estimates in Figure 4. Panel (a) shows that the

temporary wage increase raised average employment in maximum security prisons by about 5 workers due to changes in hires and separations. In comparison, panel (b) finds that internal transfers increased employment by approximately 3 employees. In both cases, I find that the increase in correctional officers did not revert back to its previous levels after the temporary wage increase was removed. The persistent impact of the wage increase is consistent with existing empirical evidence that transitory wage increases can have long-run impacts on the labor market (Huet-Vaughn and Piqueras, 2023; Quach, 2025). Together, the estimates suggest that internal transfers explain nearly half the increase in employment, indicating a high degree of competition between prisons for the same workers.<sup>10</sup>

The large increase in internal transfers suggests that the temporary wage policy may have had negative externalities on prisons exempt from the reform. To examine how these spillover effects impacted medium and minimum security prisons, I again estimate a difference-in-difference comparing prisons in Wisconsin to those in Minnesota. However, this time, I restrict the treatment group to Wisconsin prisons near one of the maximum security facilities that received the temporary pay increase. In particular, Appendix B finds that the entire increase in internal transfers is coming from 3 medium security prisons located within 45 minute drive of a maximum security facility.

Figure 5 plots the spillover effects onto prisons located near one of the treated facilities. At the prison level, I find that employment in these facilities fell precisely during the period of the temporary wage increase and recovers after the policy ended. However, I find no effect on the aggregate number of hours worked at these facilities. In fact, aggregate hours increased after the policy ended. Turning to the worker-level results, I find that the pattern in aggregate hours can be explained by an increase in average hours per correctional officer. Nearby prisons appear to offset the burden of having fewer workers by asking remaining employees to work longer hours. This increase then persisted even after employment levels recovered, suggesting a stickiness in workers' hours.

To test whether there were other contemporaneous factors that pushed correctional officers to transfer to nearby prisons, Appendix Figure A.VIII plots the effect on the number of separations over time. In contrast to the sharp spike in out-transfers, I find no impact on the number of separations. This suggests that workers were leaving due to the \$5/hour wage increase in nearby establishments, and not because of unobserved push-factors such as deteriorating working conditions in the out-sending prisons.

Table III test the robustness of the spillover effects to alternative specifications. Column

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<sup>10</sup>Given that maximum security prisons had about 100 correctional officers on average at baseline (see Table I), an increase of 8 correctional officers is comparable to the employment effect estimated in panel B of figure 3.

(1) summarizes the estimates from the baseline specification. Column (2) restricts the control group in Minnesota to only medium security prisons so that I am comparing similar types of institutions across both states. Column (3) adds controls for local wage and employment levels using the QCEW. Column (4) adds controls for the rate of Covid cases and deaths in the county of each prison. Across all specifications, I find that the number of correctional officers fell by about 4-5%, consistent with the estimates in Figure 5. Unlike the Figures though, the table suggests a decrease in aggregate hours with no change in average hours worked per officer. This discrepancy is driven primarily by a slight negative pre-trend in worker's hours prior to the implementation of the pilot program. In either case, both the figures and the table indicate that maximum-security prisons drew correctional officers away from nearby facilities. At best, this externality did not affect total hours worked; at worst, it may have slightly reduced them.

An alternative interpretation of my results is that the change in employment was driven by the Wisconsin-wide wage increase for correctional officers in January 2020, as depicted in Panel A of Appendix Figure A.IX. This contemporaneous policy fully explains the positive wage effect in Table III. However, it is unlikely that this wage increase affected employment levels in medium security prisons. First, the timing of the transfers started immediately after the pilot program began and predated the state-wide wage increase. Second, I find that employment only decreased in facilities located within driving distance of a maximum security prison. Appendix Table A.I replicates my analysis for prisons that require over a 45 minute drive to reach a prison in the pilot program. In this case, I continue to find a positive wage effect, but there was no change in employment or hours at these prisons. The fact that employment only fell at facilities located geographically close to a treated prison indicates that the negative employment effect reflects poaching across establishments, rather than other contemporaneous shocks.

### **4.3 Spillover Effects: Fairness Concerns**

Besides poaching workers from nearby facilities, raising the wages at one establishment may also lower the morale of workers in competing worksites due to relative pay concerns. While most research on horizontal pay equity concerns has focused on within-establishment comparisons, less is known about comparisons across establishments within the same firm. To test whether the pilot program had negative morale effects, I focus on the response of correctional officers in the Wisconsin Secure Program Facility (WSPF). This was the only maximum security prison excluded from the pilot program, leading some critics to argue that it was unfair that workers doing the same job would receive different pay. In Panel B of Appendix Figure A.IX, I show that correctional officers in WSPF did not receive the same 20% pay raise



that their peers in other maximum security prisons experienced. Rather, they only received the same annual pay increase that medium and minimum security prison officers received in January 2020.

Figure 6 plots difference-in-difference estimates comparing WSPF to prisons in Minnesota. Panel (a) shows that there was no effect on the number of transfers out of WSPF to other facilities. This is to be expected since WSPF is over 1.5 hours drive from the nearest maximum security prison, too far to justify the longer commute for a \$5/hour raise. Instead, panel (b) finds that separations rates increased immediately after the pilot project went into effect, and went back down by the time the policy ended. The parallel pre-trends and precise timing of the increase in separations suggest that this effect is a direct result of the policy. Panel (c) shows that the increase in separations led to a permanent 10% decrease in aggregate employment of correctional officers. The fall in employment did not recover after the end of the pilot project, implying that WSPF was unable to hire new officers to replace those who left.<sup>11</sup> Lastly, as with the other prisons, panel (d) finds that employment and workers' hours move in opposite directions. To compensate for the decrease in employment, WSPF increased the average hours of its remaining correctional officers and sergeants.

Table IV tests the robustness of the effects on WSPF to additional controls and alternative sample restrictions. The estimates remain stable to restricting the sample to only maximum security prisons (column 2) or controlling for labor market and Covid conditions (columns 3 and 4). In all cases, I find an increase in average wages, similar to the other prisons excluded from the pilot program. Despite the wage increase, employment fell by about 13%. This employment effect is three times larger than the decrease in employment at facilities located nearby a treated maximum security prison. Although I find that WSPF tried to compensate for the decrease in employment by increasing the hours of stayers, the aggregate number hours still fell by 5-7%.

The increase in separations from WSPF indicates that incumbent workers became less satisfied with their jobs. To indirectly test whether this is driven by morale concerns, I leverage previous research showing that workers' morale only decreases when they view pay inequality to be unjustified (Breza, Kaur, and Shamdasani, 2018). Officers at WSPF may view the pilot program as unfair given that they also work in a maximum security facility, yet were the only ones excluded from the pay increase. In contrast, although correctional officers at medium and minimum security prisons did not receive a pay increase, they may believe that the pay difference is justified given their different work environments. Consistent with this view, recall that Appendix Figure A.VIII found no effect on separations from

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<sup>11</sup>Although employment further falls in the latter half of 2021, this was true across all prisons and likely reflects a broader state level shock.

medium security prisons near an eligible maximum security facility, and Table A.I found no employment effects among prisons located farther away. Overall, the empirical evidence is consistent with a model of relative pay concerns across establishments. Nonetheless, in the absence of direct measures of job satisfaction, I cannot conclusively attribute the increase in separations to fairness concerns.

## 5 Model of Uniform Wage Setting

To summarize, the empirical analysis uncovered two costs associated with varying wages across establishments within the same firm. First, establishments compete against each other for workers, so raising the wages at one worksite reduces the labor supply at another. Second, workers' morale may fall if they are excluded from a pay raise that comparable peers in other establishments receive, leading to an increase in separations. These are two of the leading mechanisms identified in a survey of HR managers by Hazell et al. (2022) for why large employers engage in national wage setting.<sup>12</sup>

In this section, I develop a simple monopsony model to illustrate the impact of these mechanisms on wage dispersion across establishments. An insight from the model is that uniform wage setting may be a tool used by large employers to reduce competition between establishments and decrease wages. This in turn leads to lower employment levels, which is consistent with the labor shortages experiences by the Wisconsin DOC.

My model builds on the framework of Card et al. (2018) where firms' market power is driven by heterogeneity in workers' valuation for jobs at different employers. Suppose there are  $J$  establishments indexed by  $j = 1, \dots, J$ . There is a continuum unit mass of identical workers who each choose to work at one establishment. For worker  $i$ , the indirect utility of working at establishment  $j$  is

$$u_{ij} = \beta \ln(w_j) + \varepsilon_{sj}$$

where  $w_j$  is the wage at establishment  $j$  and  $\varepsilon_{sj}$  represents idiosyncratic preferences for specific match factors like the distance to work. If we assume that the  $\{\varepsilon_{sj}\}$  are independently drawn from a type I extreme value distribution, then the labor supply to each establishment can be represented by logit choice probabilities:

$$L_j(w) = \frac{\exp(\beta w_j)}{\sum_{k=1}^J \exp(\beta w_k)} \quad (3)$$

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<sup>12</sup>The other two rationales are that all employees in the firm work in areas with similar costs of living, and that it is administratively costly to tailor wages to each location. My model below will also show how firms' behavior differ depending on the feasibility of tailor establishment-specific wages.

An establishment  $j$ 's labor supply thus depends on not only its own wage  $w_j$ , but also on the wages offered by all other establishments.

On the labor demand side, I assume firms take the labor supply to its establishment as given and set wages to maximize its profits. Consider two different firm structures. In the first case, each establishment operates independently as its own firm. In the second case, a fraction of establishments belong to the same firm.

### Case 1: Decentralized Establishments

Each establishment solves the following profit maximization problem:

$$\max_{w_j} \pi_j = f_j(L_j(w)) - w_j L_j(w)$$

subject to equation (3). The first order condition implies that the establishment would set wages to satisfy:

$$w_j^d = f'_j - \frac{1}{\beta(1 - L_j)} \quad (4)$$

where  $f'_j$  represents the marginal productivity of labor. As workers' labor supply becomes more sensitive to the wage (i.e.  $\beta \rightarrow \infty$ ), then wages converge to the establishment's marginal revenue product. Otherwise, each establishment would mark down wages proportional to the inverse labor supply elasticity. In this benchmark model, wages at each establishment depends on local productivity and prices, captured by  $f'_j$ , and local labor market competition.

### Case 2: Centralized Establishments

Next, suppose  $\frac{J_0}{J}$  of the establishments were owned by the same firm. The employer chooses wages  $w = \{w_1, \dots, w_{J_0}\}$  to maximize the sum of profits across the establishments:

$$\max_w \sum_{j=1}^{J_0} f_j(L_j(w)) - w_j L_j(w)$$

where  $L_j(w)$  is given by equation (3). The first order condition for the optimal wage at a particular establishment  $j$  is

$$\underbrace{(f'_j - w_j) \frac{\partial L_j}{\partial w_j} - L_j}_{\text{Direct Effect}} + \underbrace{\sum_{m \neq j}^{J_0} (f'_m - w_m) \frac{\partial L_m}{\partial w_j}}_{\text{Spillover Effect}} = 0 \quad (5)$$

The firm now takes into account not just how raising the wages at establishment  $j$  affects

that particular worksite, but also how it affects the labor supply of competing establishments. Solving the first order condition implies an optimal wage

$$\begin{aligned} w_j^c &= f_j' - \frac{1}{\beta(1 - L_j)} - \frac{\sum_{m \neq j}^{J_0} L_m[f_m' - w_m]}{(1 - L_j)} \\ &= w_j^d - \frac{\sum_{m \neq j}^{J_0} L_m[f_m' - w_m]}{(1 - L_j)} \end{aligned} \quad (6)$$

A key prediction of the model is that multi-establishment firms would set lower wages at each worksite relative to a scenario where the market is decentralized.<sup>13</sup>

Although a multi-establishment firm would set lower wages, the model predicts that they would also have a wider spread in wages across establishments. For example, consider two establishments  $j$  and  $k$ . By equation 6, the difference in wages between the two worksites is

$$\begin{aligned} \Delta w^c &= \Delta w^d - \left[ \frac{\sum_{m \neq j} L_m[f_m' - w_m]}{(1 - L_j)} - \frac{\sum_{m \neq k} L_m[f_m' - w_m]}{(1 - L_k)} \right] \\ &= \Delta w^d - \left[ \underbrace{\frac{L_k[f_k' - w_k]}{(1 - L_j)} - \frac{L_j[f_j' - w_j]}{(1 - L_k)}}_{\text{Spillover between } j \text{ and } k} + \underbrace{\frac{\sum_{m \notin \{j, k\}} (L_j - L_k) L_m[f_m' - w_m]}{(1 - L_j)(1 - L_k)}}_{\text{Spillover to other establishments within the firm}} \right] \end{aligned}$$

where  $\Delta w = w_j - w_k$ . Without loss of generality, suppose  $w_j^c > w_k^c$ . Suppose the productivity of location  $j$  increases. In a decentralized market,  $\frac{\partial \Delta w^d}{\partial f_j'} = 1$ , as wages rise with productivity. However, in a centralized market,

$$\frac{\partial \Delta w^c}{\partial f_j'} = 1 + \frac{L_j}{1 - L_k}$$

Intuitively, the firm would want to further increase the spread because it internalizes the benefits from redirecting workers from low productivity establishments to high productivity ones. For example, even if the Wisconsin DOC is paying below market wages, it may still want to set higher wages at maximum security prisons because those facilities have higher marginal returns per worker. Note that this strategy works for the firm because they have monopsony power. If wages always equal marginal revenue product, then there are no additional gains to redirecting workers.

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<sup>13</sup>The counterfactual comparison assumes that the productivity of each establishment is the same regardless of whether they are centrally owned or not. This assumption is made to isolate the incentive mechanism associated with centralization. In practice, merging multiple establishments together may also impact the firm's overall productivity.

## 5.1 Why Do Firms Set Uniform Wages?

If a multi-establishment firm has incentives to spread wages, then why do studies find that many large employers set uniform wages across establishments? I consider two potential mechanisms motivated by my empirical findings and the survey responses in Hazell et al. (2022).

### Case 3: Market Power

One possibility is that employers do not have the technology and information to set optimal wages for each establishment. Implementing equation (5) in practice would require knowledge of not only the labor supply elasticity facing each establishment, but also the cross-elasticities. Nevertheless, the firm may want to avoid letting each establishment set their own wages.

My empirical analysis found that increasing the wages at one establishment can lead to internal poaching. If these establishments were each their own firm, then we might expect increased wage competition (Staiger, Spetz, and Phibbs, 2010; Droste, 2024; Goto and Yamagishi, 2025), though at least one paper finds little wage spillovers across firms (Derenoncourt and Weil, 2025). However, if they all belong to the same firm, then the employer has tools to try and avoid bidding up wages. One example of this is through the use of no-poach agreements, in which franchisees are not allowed to hire each other's workers (Krueger and Ashenfelter, 2022; Callaci et al., 2024). Another policy that employers can use is to set uniform wages. I show below that under certain circumstances, uniform wages can increase profits relative to letting each establishment set their own wages.

Suppose a multi-establishment firm can only set a uniform wage:

$$\begin{aligned} \max_w \quad & \sum_{j=1}^{J_0} f_j(L_j(w)) - w_j L_j(w) \\ \text{s.t.} \quad & w_1 = w_2 = \dots = w_{J_0} \end{aligned}$$

The first-order conditions to this problem would set wages as

$$w^* = \frac{1}{J_0} \sum_{j=1}^{J_0} f'_j - \frac{1}{\beta(1 - J_0 L)} \quad (7)$$

Notice how this compares to the optimal wage in a decentralized market in equation (4). If the market is perfectly competitive (i.e.  $\beta \rightarrow \infty$ ), then a uniform wage is suboptimal for the firm since some establishments would be paying less than marginal revenue product and

unable to attract workers, whereas other establishments would be paying too much. In that case, it makes sense for the firm to simply let each establishment set its own wages. However, if the firm has market power, then the markdown from a uniform wage would be larger than in a decentralized market. In particular, the markdown can be sufficiently large to justify a uniform wage. Equation (7) implies that as the number of establishments in the firm approaches the size of the whole market, the optimal wage will continuously shrink to negative infinity.<sup>14</sup> In short, large firms can set a uniform wage to leverage their market power and prevent internal wage competition.

#### Case 4: Fairness concerns

A second reason multi-establishment firms may set a uniform wage is due to morale concerns. My empirical analysis showed suggestive evidence that raising the wages at one set of establishments can lead to increased quits in excluded establishments. This is consistent with the survey of HR managers by Hazell et al. (2022), which found that nearly 40% of respondents cited internal fairness norms as a reason for national wage setting. To incorporate this mechanism into the model, I include in the workers' indirect utility a term  $a_j$  to represent firm-specific amenities such as the perceived fairness of the firm's wages. In that case, workers' labor supply function becomes

$$L_j(w) = \frac{\exp(\beta w_j + \gamma a_j)}{\sum_{k=1}^J \exp(\beta w_k + \gamma a_k)}$$

In this case, even if firms can hyper-optimize wages according to equation (6), they might nevertheless choose to set uniform wages if workers' preferences for fairness (i.e.  $\gamma$ ) is sufficiently high.

## 6 Discussion and Conclusion

This paper provides novel evidence on why large employers often choose to set uniform wages across establishments despite wide variation in local labor market conditions. Exploiting a natural experiment in which the Wisconsin Department of Corrections temporarily differentiated pay across prisons, I show that introducing establishment-specific wages can generate both internal competition and morale costs within the same firm. The wage increase at maximum security prisons raised employment and reduced overtime, but partly by drawing workers away from nearby facilities. Moreover, excluding one maximum security prison from

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<sup>14</sup>The model is not well defined when the firm is the entire market and workers have no outside option because, in that case, the firm can set negative wages and workers have no place to flee.

the pay increase led to higher separations, consistent with fairness concerns when workers perceive unequal treatment among comparable peers.

Together, these findings demonstrate that multi-establishment employers face important internal frictions that shape their wage-setting behavior. Firms may prefer uniform wages, even when local conditions differ, because uniformity mitigates costly internal poaching and preserves morale. The theoretical model shows that when establishments share a common labor pool, centralized wage setting can serve as a form of monopsony power, allowing firms to restrain wage competition across their own worksites.

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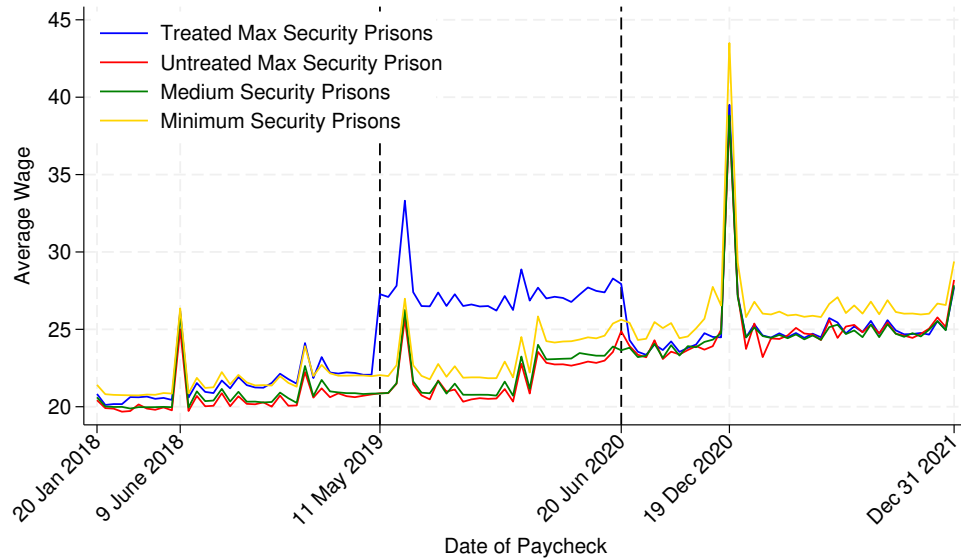
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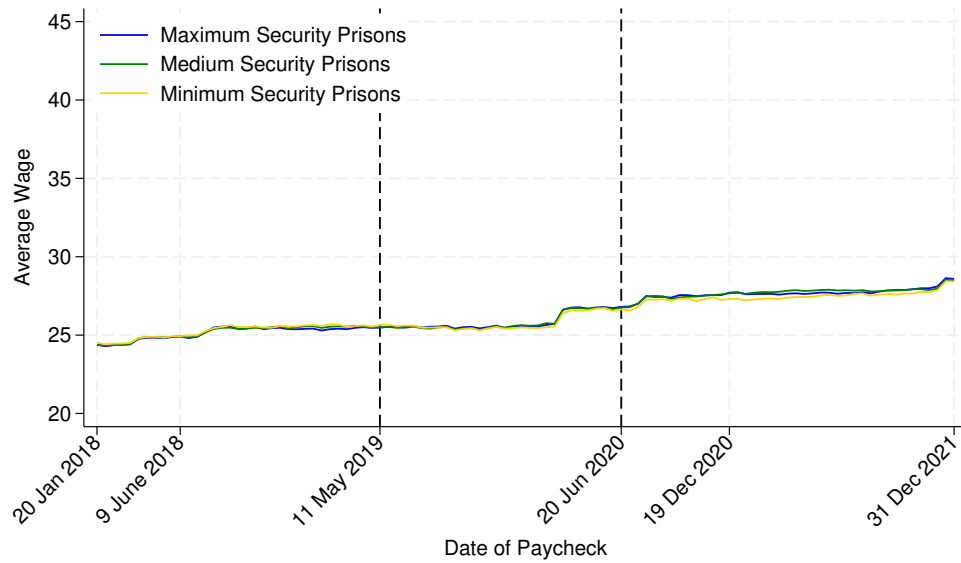
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Figure 1: Average Workers of Correction Officers & Sergeants Over Time



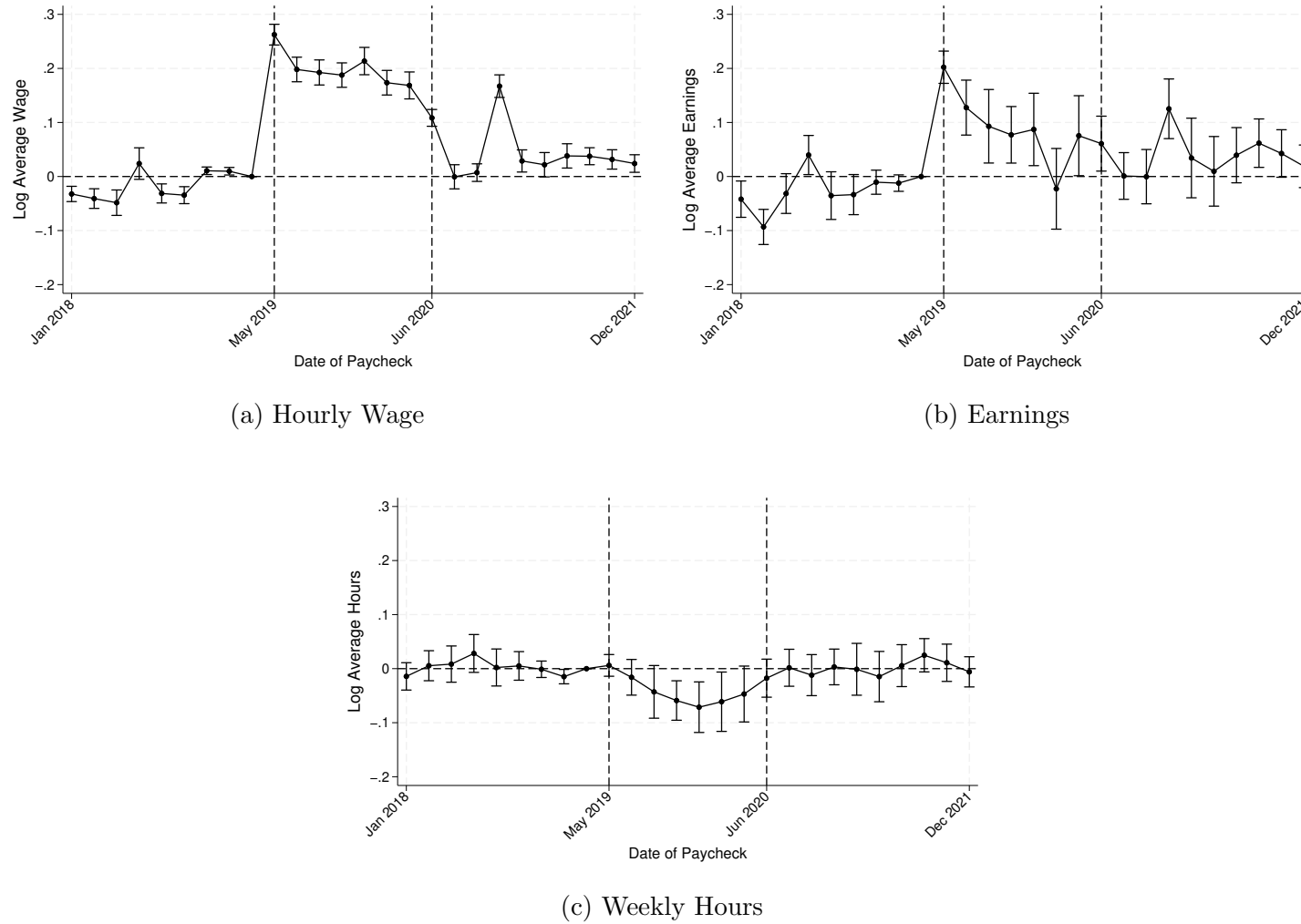
(a) Wisconsin



(b) Minnesota

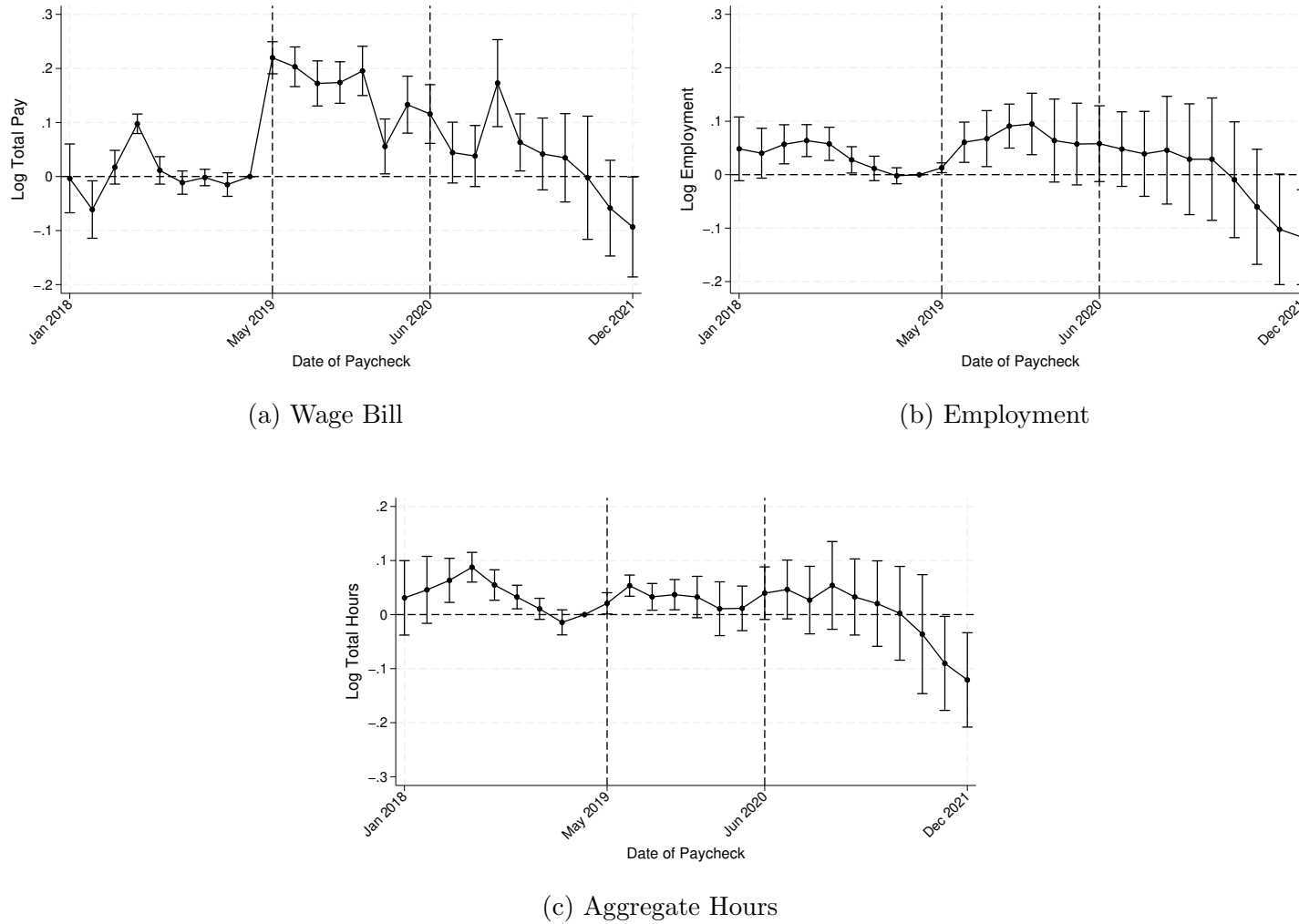
Notes: This figure plots average wages of correctional officers and correctional sergeants over time, separately by the security level of the prison. Panel (A) plots wages for Wisconsin, where wages are calculated as all non-overtime pay, divided by the number of hours. Panel (B) plots base wages over time for Minnesota.

Figure 2: Effect on Correctional Officers and Sergeants in Maximum Security Prisons



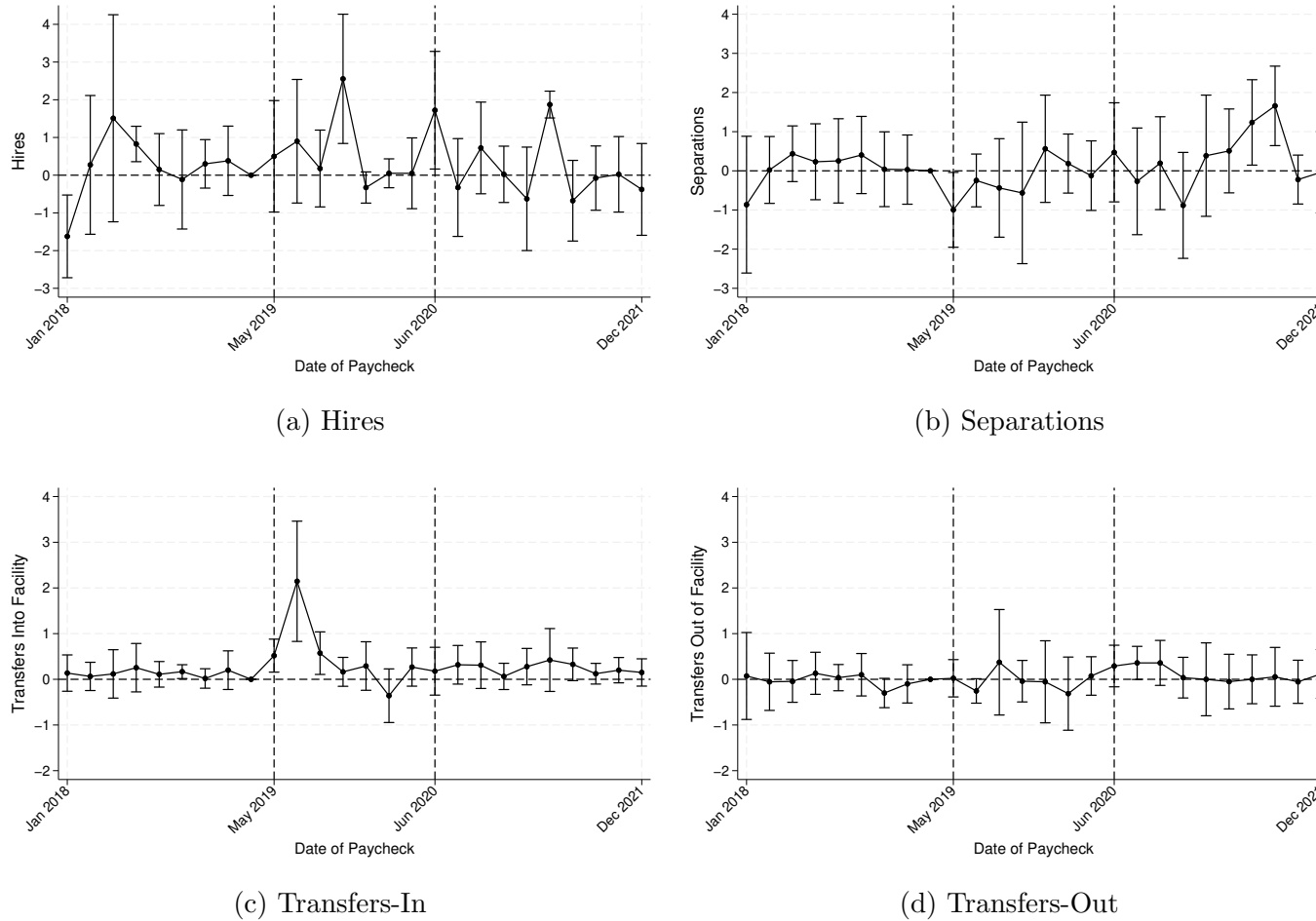
Notes: This figure plots difference-in-difference estimates comparing average worker-level outcomes of correctional officers/sergeants in Wisconsin to Minnesota over time, computed using equation (1). Each estimate represents the average impact over 4 biweekly paychecks. The sample in Wisconsin is restricted to only maximum security prisons excluding WSPF, and Minnesota to all prisons.

Figure 3: Effect on Wage Bill, Employment, and Aggregate Hours of Maximum Security Prisons



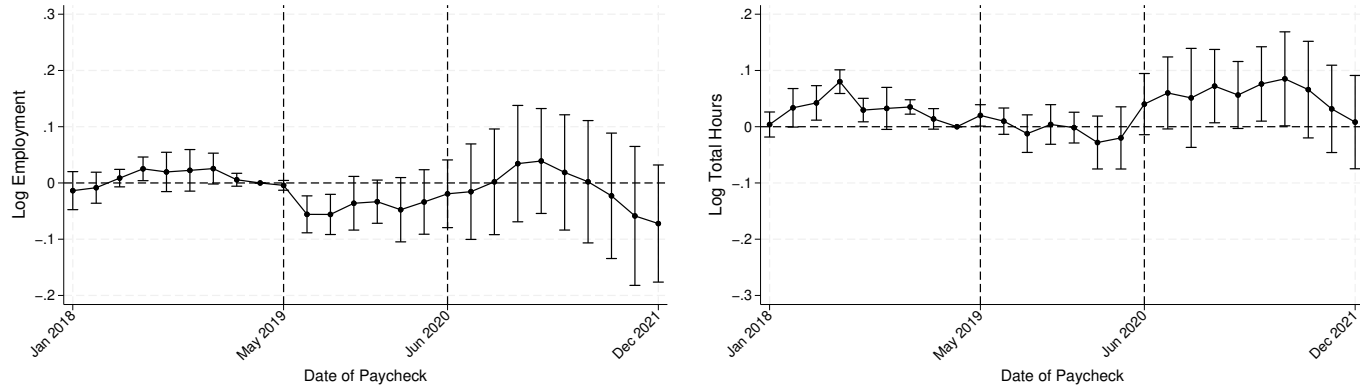
Notes: This figure plots difference-in-difference estimates comparing prison-level outcomes of correctional officers/sergeants in Wisconsin to Minnesota over time, computed using equation (1). Each estimate represents the average impact over 4 biweekly paychecks. The sample in Wisconsin is restricted to only maximum security prisons, excluding WSPF, which did not receive the temporary wage increase.

Figure 4: Effect on Employment Flows of Correctional Officers/Sergeants in Maximum Security Prisons



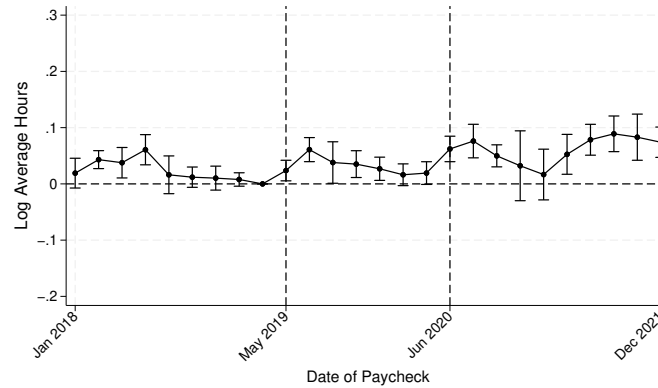
Notes: This figure plots difference-in-difference estimates comparing the flow of correctional officers/sergeants into maximum security prisons in Wisconsin versus Minnesota over time, computed using equation (1). Transfers refers to movement of workers between prisons within the same state, whereas hires and separations refer to movements from outside the DOC system. Each estimate represents the average impact over 4 biweekly paychecks. The sample in Wisconsin is restricted to only maximum security prisons, excluding WSPF, which did not receive the temporary wage increase.

Figure 5: Effect on Prisons within 45 Minute Drive of a Treated Maximum Security Facility



(a) Prison: Employment

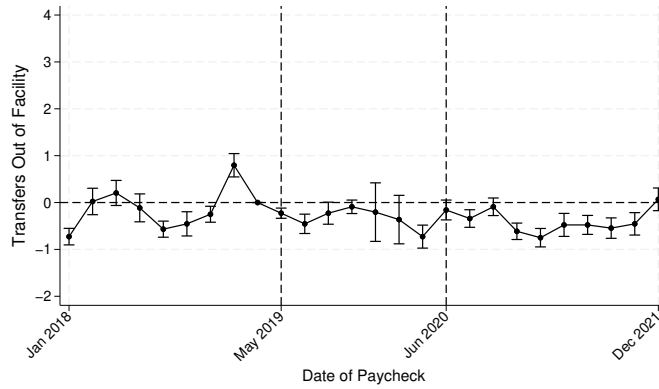
(b) Prison: Aggregate Hours



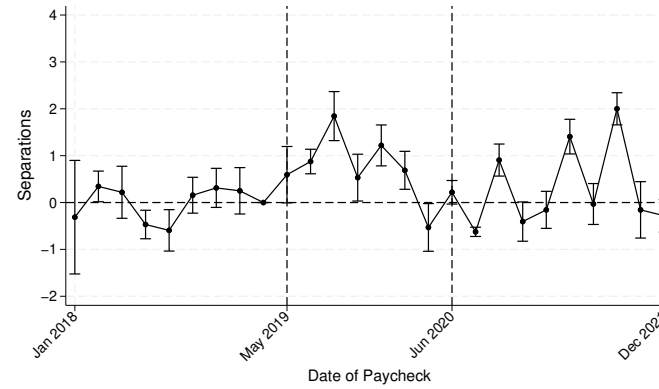
(c) Worker: Average Hours

Notes: This figure plots difference-in-difference estimates comparing prison-level outcomes of correctional officers/sergeants in Wisconsin to Minnesota over time, computed using equation (1). Each estimate represents the average impact over 4 biweekly paychecks. The sample in Wisconsin is restricted to prisons located within 45 minute drive of a maximum security prison that received the temporary wage increase.

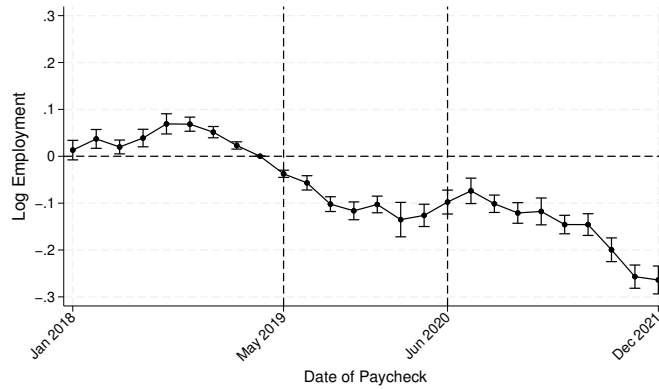
Figure 6: Effect on the Maximum Security Prison Excluded from the Pay Increase



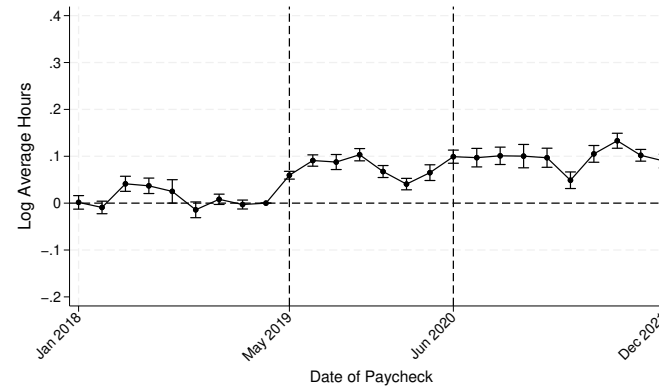
(a) Prison: Transfers



(b) Prison: Separations



(c) Prison: Employment



(d) Worker: Average Hours

Notes: This figure plots difference-in-difference estimates comparing outcomes of correctional officers/sergeants in Wisconsin to Minnesota over time, computed using equation (1). Each estimate represents the average impact over 4 biweekly paychecks. The sample in Wisconsin is restricted to only WSPF.



Table I: Characteristics of Prisons in Wisconsin and Minnesota, Jan - Apr 2019

Variable	Wisconsin		Minnesota		T-Test
	Mean	St. Dev.	Mean	St. Dev.	Difference
<u>Maximum Security Prisons</u>					
Average Hourly Wage	22.11	0.68	25.48	0.44	-3.37***
Average Biweekly Hours	101.99	3.76	83.17	2.04	18.82***
Number of Employees	99.88	27.61	55.12	5.41	44.76**
Transfers Out of Facility	1.20	0.27	0.08	0.14	1.12***
Transfers Into Facility	0.60	0.34	0.00	0.00	0.60**
Share of Vacancies Unfilled	0.25	0.04	.	.	.
Number of Prisons	5		3		
<u>Excluded Max Security Prison</u>					
Average Hourly Wage	20.76	.	.	.	.
Average Biweekly Hours	88.98	.	.	.	.
Number of Employees	72.00	.	.	.	.
Transfers Out of Facility	2.25	.	.	.	.
Transfers Into Facility	0.50	.	.	.	.
Share of Vacancies Unfilled	0.09	.	.	.	.
Number of Prisons	1		0		
<u>Medium Security Prisons</u>					
Average Hourly Wage	20.92	0.45	25.64	0.17	-4.72***
Average Biweekly Hours	92.45	3.70	81.63	0.65	10.82***
Number of Employees	97.81	22.67	65.73	14.06	32.08**
Transfers Out of Facility	0.98	0.65	0.50	0.43	0.48
Transfers Into Facility	0.73	0.45	0.33	0.29	0.39
Share of Vacancies Unfilled	0.12	0.04	.	.	.
Number of Prisons	10		3		
<u>Minimum Security Prisons</u>					
Average Hourly Wage	22.43	0.80	25.65	1.08	-3.22***
Average Biweekly Hours	89.46	5.57	82.99	2.70	6.46**
Number of Employees	38.74	22.90	30.61	28.42	8.13
Transfers Out of Facility	0.29	0.29	0.40	0.45	-0.11
Transfers Into Facility	0.67	0.49	0.35	0.42	0.32
Share of Vacancies Unfilled	0.08	0.05	.	.	.
Number of Prisons	6		5		

Notes: This table reports the characteristics of prisons in Wisconsin and Minnesota averaged over all biweekly paycheck from January to April 2019. The prisons are divided into four groups: maximum, medium, and minimum security, where Wisconsin Secure Program Facility is isolated in the second panel. The sample is restricted to only correctional officers and sergeants. \*10%, \*\* 5%, \*\*\* 1% significance level.

Table II: Effect of Wage Increase on Maximum Security Prisons

	(1)	(2)	(3)	(4)
<u>Panel A: Worker Level Outcomes</u>				
Log Wage	0.2135*** (0.0121)	0.2101*** (0.0128)	0.2132*** (0.0115)	0.2137*** (0.0121)
Log Hours	-0.0443** (0.0193)	-0.0430* (0.0202)	-0.0444** (0.0189)	-0.0442** (0.0194)
Log Earnings	0.1151*** (0.0304)	0.1158*** (0.0323)	0.1146*** (0.0294)	0.1154*** (0.0304)
<u>Panel B: Prison Level Outcomes</u>				
Log Wage Bill	0.1602*** (0.0150)	0.1707*** (0.0183)	0.1607*** (0.0153)	0.1604*** (0.0149)
Log Employment	0.0309 (0.0290)	0.0465 (0.0300)	0.0303 (0.0277)	0.0308 (0.0290)
Log Aggregate Hours	-0.0065 (0.0126)	0.0074 (0.0129)	-0.0064 (0.0123)	-0.0065 (0.0126)
Prison FE	Yes	Yes	Yes	Yes
Biweekly FE	Yes	Yes	Yes	Yes
Only Max Security	No	Yes	No	No
County QCEW Controls	No	No	Yes	No
County Covid Controls	No	No	No	Yes
Number of Prison-Years	1659	827	1659	1659

Notes: This table reports the estimates from equation (2) for the period during the temporary wage increase. The sample is restricted to only correctional officers and sergeants. Column (1) compares maximum security prisons in Wisconsin to all prisons in Minnesota. Column (2) restricts the prisons in both states to only maximum security prisons. Column (3) controls for county-level wage and employment. Column (4) controls for Covid case rate and death rate at the county of each prison. \*10%, \*\* 5%, \*\*\* 1% significance level.

Table III: Spillover Effect on Prisons within 45 Minute Drive from Max Security Facility

	(1)	(2)	(3)	(4)
<u>Panel A: Worker Level Outcomes</u>				
Log Wage	0.0407*** (0.0079)	0.0406*** (0.0092)	0.0407*** (0.0073)	0.0411*** (0.0081)
Log Hours	0.0092 (0.0123)	0.0100 (0.0144)	0.0086 (0.0117)	0.0092 (0.0123)
Log Earnings	0.0461* (0.0230)	0.0463 (0.0247)	0.0453* (0.0219)	0.0466* (0.0230)
<u>Panel B: Prison Level Outcomes</u>				
Log Wage Bill	0.0086 (0.0127)	0.0104 (0.0152)	0.0108 (0.0103)	0.0094 (0.0128)
Log Employment	-0.0479** (0.0170)	-0.0400* (0.0168)	-0.0467** (0.0170)	-0.0475** (0.0168)
Log Aggregate Hours	-0.0342*** (0.0100)	-0.0289* (0.0124)	-0.0324*** (0.0092)	-0.0338*** (0.0099)
Prison FE	Yes	Yes	Yes	Yes
Biweekly FE	Yes	Yes	Yes	Yes
Only Max Security	No	Yes	No	No
County QCEW Controls	No	No	Yes	No
County Covid Controls	No	No	No	Yes
Number of Prison-Years	1453	621	1453	1453

Notes: This table reports the estimates from equation (2) for the period during the temporary wage increase. The sample is restricted to only correctional officers and sergeants. Column (1) compares prisons in Wisconsin that are located within 45 minute drive of a treated maximum security prison to all prisons in Minnesota. Column (2) restricts the prisons in both states to only medium security prisons. Column (3) controls for county-level wage and employment. Column (4) controls for Covid case rate and death rate at the county of each prison. \*10%, \*\* 5%, \*\*\* 1% significance level.

Table IV: Effect of Wage Increase on the Excluded Maximum Security Prisons

	(1)	(2)	(3)	(4)
<u>Panel A: Worker Level Outcomes</u>				
Log Wage	0.0421*** (0.0026)	0.0387*** (0.0037)	0.0408*** (0.0026)	0.0419*** (0.0027)
Log Hours	0.0633*** (0.0053)	0.0642*** (0.0059)	0.0620*** (0.0051)	0.0628*** (0.0050)
Log Earnings	0.1213*** (0.0075)	0.1214*** (0.0107)	0.1184*** (0.0075)	0.1202*** (0.0072)
<u>Panel B: Prison Level Outcomes</u>				
Log Wage Bill	-0.0066 (0.0069)	0.0039 (0.0132)	-0.0095 (0.0071)	-0.0074 (0.0067)
Log Employment	-0.1333*** (0.0082)	-0.1177*** (0.0035)	-0.1340*** (0.0089)	-0.1335*** (0.0084)
Log Aggregate Hours	-0.0679*** (0.0071)	-0.0540*** (0.0073)	-0.0695*** (0.0076)	-0.0683*** (0.0071)
Prison FE	Yes	Yes	Yes	Yes
Biweekly FE	Yes	Yes	Yes	Yes
Only Max Security	No	Yes	No	No
County QCEW Controls	No	No	Yes	No
County Covid Controls	No	No	No	Yes
Number of Prison-Years	1247	415	1247	1247

Notes: This table reports the estimates from equation (2) for the period during the temporary wage increase. The sample is restricted to only correctional officers and sergeants. Column (1) compares the Wisconsin Secure Program Facility to all prisons in Minnesota. Column (2) restricts the prisons in both states to only maximum security prisons. Column (3) controls for county-level wage and employment. Column (4) controls for Covid case rate and death rate at the county of each prison. \*10%, \*\* 5%, \*\*\* 1% significance level.

# UNIFORM WAGES AND LABOR SHORTAGES ONLINE APPENDIX

Simon Quach<sup>1</sup>

## Contents

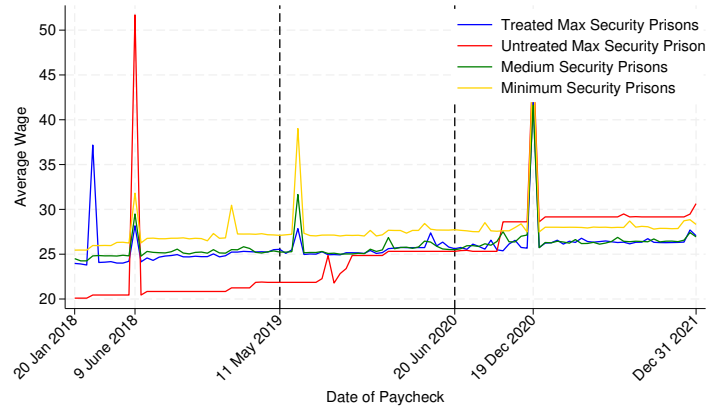
<b>A</b>	<b>Supplementary figures and tables</b>	<b>1</b>
<b>B</b>	<b>Identifying Competing Prisons</b>	<b>12</b>
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B.2	Heterogeneity by Commuting Time . . . . .	12

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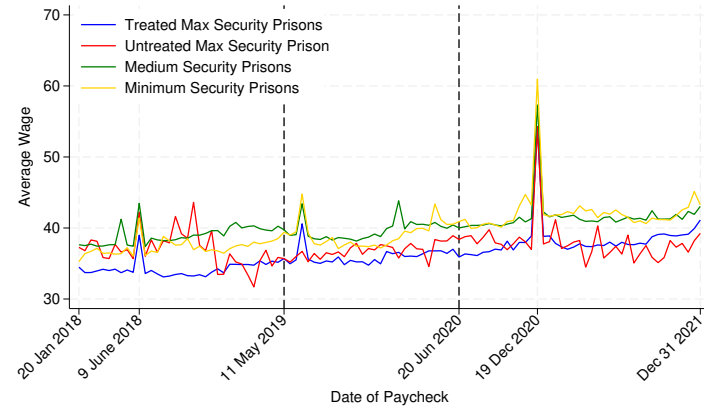
<sup>1</sup>University of Southern California, Department of Economics 3620 S. Vermont Ave., KAP 364D  
Los Angeles, CA 90089-0253, [simonqua@usc.edu](mailto:simonqua@usc.edu)

## Appendix A. Supplementary figures and tables

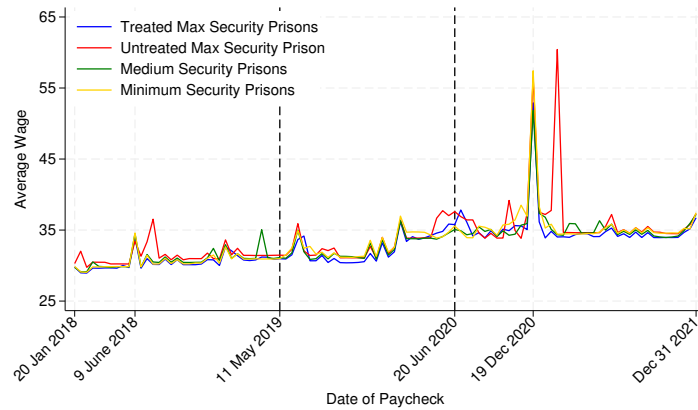
Appendix Figure A.I: Wages Over Time, by Occupation Group



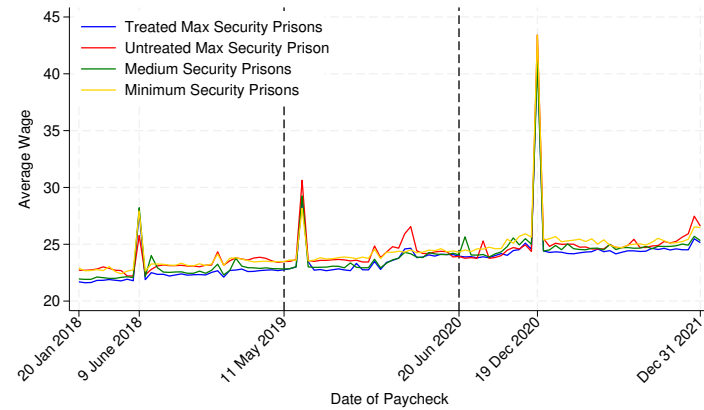
(a) Education



(b) Health and Psychological Services



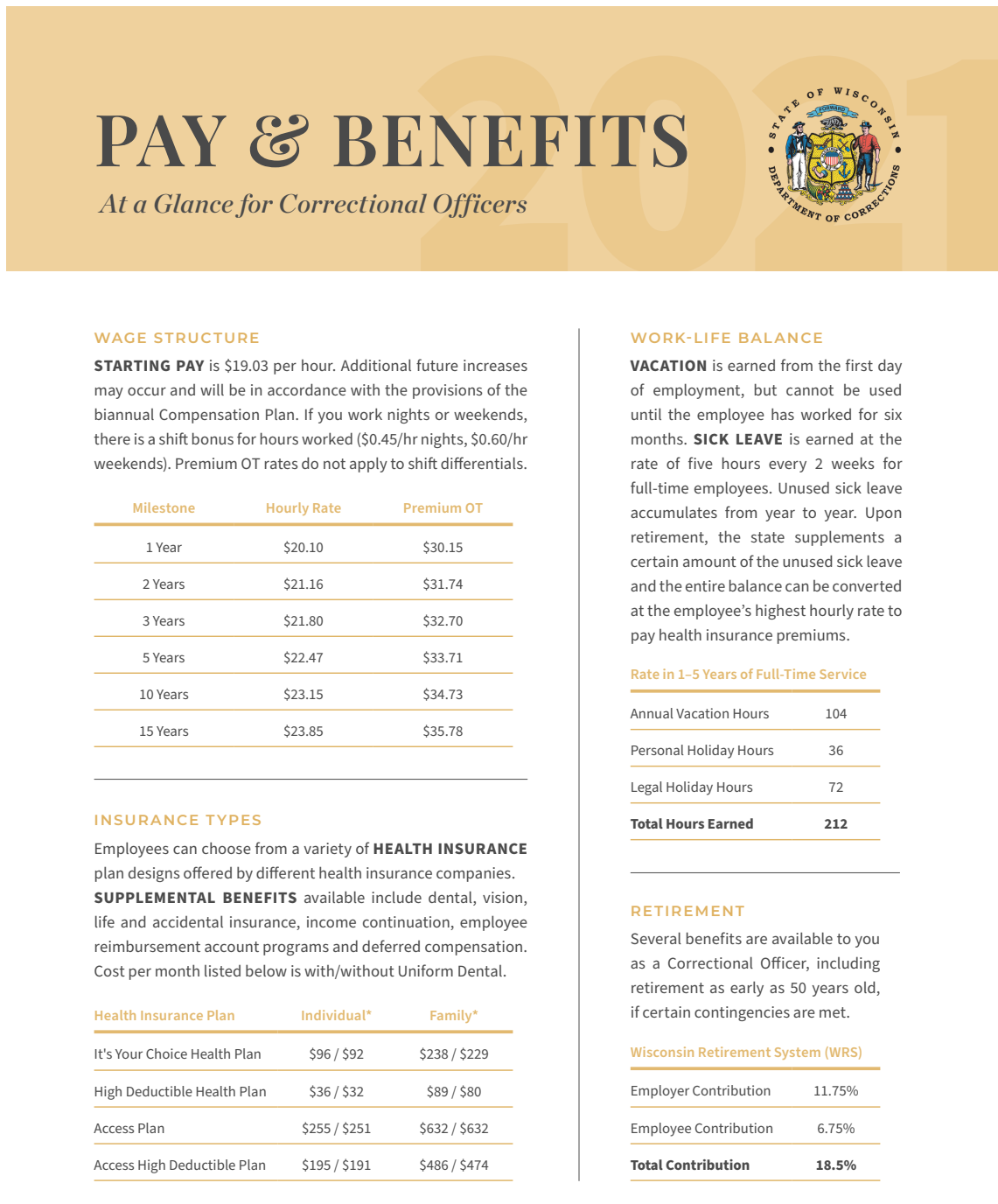
(c) Security Supervisors



(d) Other

Notes: This figure plots average wages for prison workers in Wisconsin over time, separately by the security level of the prison and the occupation.

Appendix Figure A.II: Pay and Benefits of Correctional Officers, 2021



To learn more about career opportunities or employee benefits, visit **WISC.JOBS** for hiring qualifications and application instructions.



Appendix Figure A.III: Pay and Benefits of Correctional Officers, 2023

# CORRECTIONAL OFFICER PAY & BENEFITS

## Wage Structure

**Starting base pay is \$33.00 per hour**, with scheduled increases based on years of service as indicated below. There is also a shift bonus (\$0.80/hour) for any hours worked on nights or weekends. Additional future increases may occur and will be in accordance with the provisions of the biennial Compensation Plan. Earn \$33.00 per hour starting pay as a Correctional Officer! Employees working in certain institutions may be eligible to receive a \$1, \$3 or \$5 per hour add-on.

Years of Service	Starting Base Pay	Potential Eligible Add-On Pay		
		Medium Security	Maximum Security	High Vacancy*
1 Year	\$33.64	\$34.64	\$36.64	\$38.64
2 Years	\$34.74	\$35.74	\$37.74	\$39.74
3 Years	\$35.40	\$36.40	\$38.40	\$40.40
5 Years	\$36.09	\$37.09	\$39.09	\$41.09
10 Years	\$36.81	\$37.81	\$39.81	\$41.81
15 Years	\$37.53	\$38.53	\$40.53	\$42.53
20 Years	\$38.30	\$39.30	\$41.30	\$43.30
25 Years	\$39.07	\$40.07	\$42.07	\$44.07

\*Employees at high vacancy sites may also be eligible for the \$1 medium or \$3 maximum security add-ons in addition to the high vacancy rates noted.

## Health Insurance Plans

Employees can choose from a variety of health insurance plan designs offered by many health insurance companies. Supplemental benefits available include dental, vision, life and accidental insurance, income continuation, employee reimbursement account programs and deferred compensation. Cost per month below is with/without Uniform Dental.

Health Insurance Plan	Individual	Family
It's Your Choice Health Plan	\$115 / \$112	\$286 / \$276
High Deductible Health Plan	\$42 / \$39	\$107 / \$97
Access Plan	\$270 / \$267	\$673 / \$663
Access High Deductible Plan	\$197 / \$194	\$494 / \$484

## Work-Life Balance

**Vacation** is earned from the first day of employment, but cannot be used until the employee has worked for six months. **Sick Leave** is earned at the rate of five hours every two weeks for full-time employees. Unused sick leave accumulates from year to year. Upon retirement, the state supplements a certain amount of the unused sick leave and the entire balance can be converted at the employee's highest hourly rate to pay health insurance premiums. Rates below are based on 1-5 years of full-time service.

Vacation	104 hours
Personal Holiday	36 hours
Legal Holiday	72 hours
Sick Leave	130 hours
<b>Annual Total</b>	<b>342 hours</b>

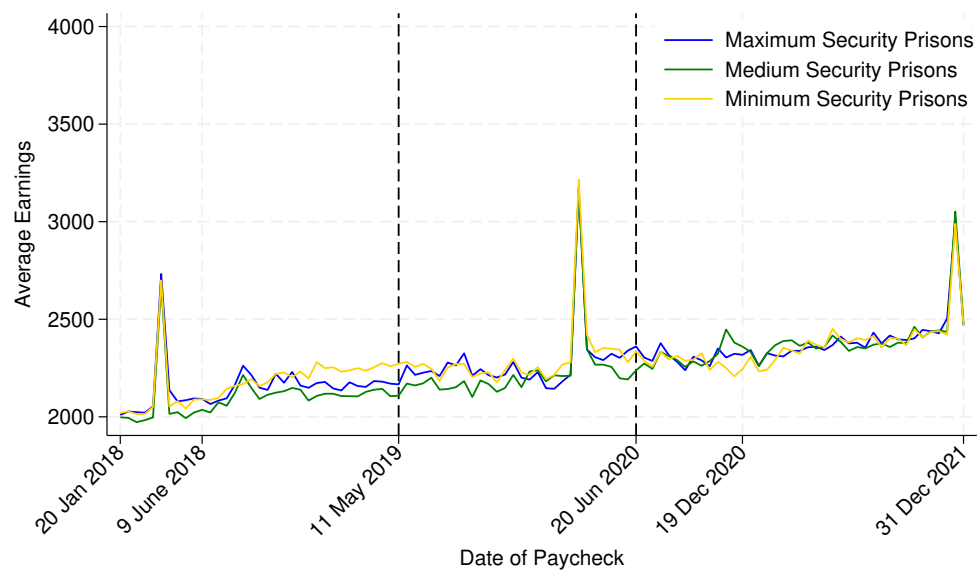
## Wisconsin Retirement System (WRS)

Several benefits are available to you as a Correctional Officer, including retirement as early as 50 years old, if certain contingencies are met.

Employer Contribution	14.3%
Employee Contribution	6.9%
<b>Annual Total</b>	<b>21.2%</b>

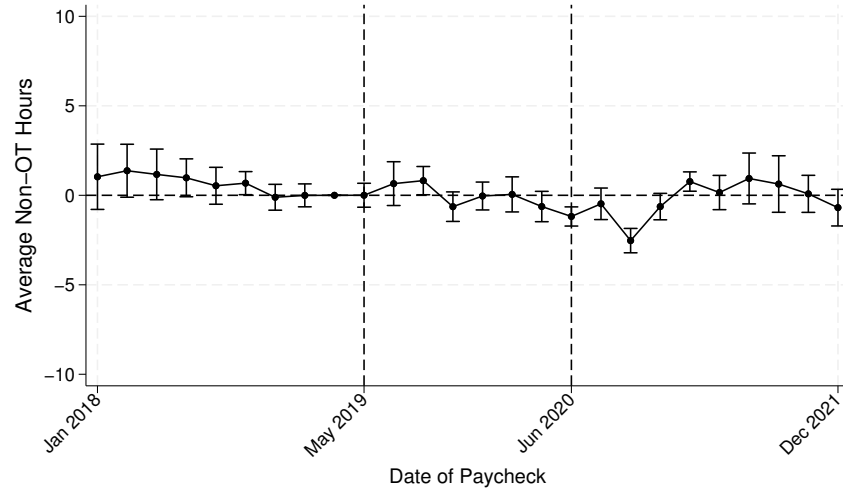


Appendix Figure A.IV: Average Earnings of Correctional Officers and Sergeants in Minnesota Over Time

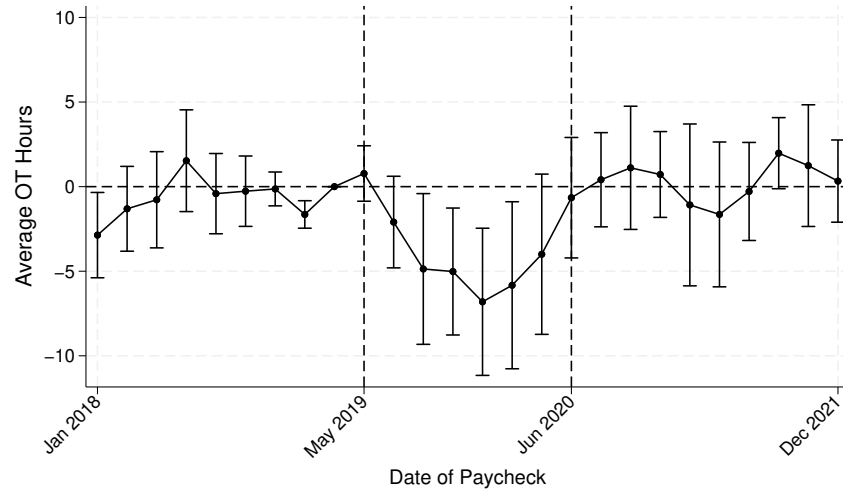


Notes: This figure plots average earnings for correctional officers and sergeants workers in Minnesota over time, separately by the security level of the prison.

Appendix Figure A.V: Effect on Hours in Max Prisons



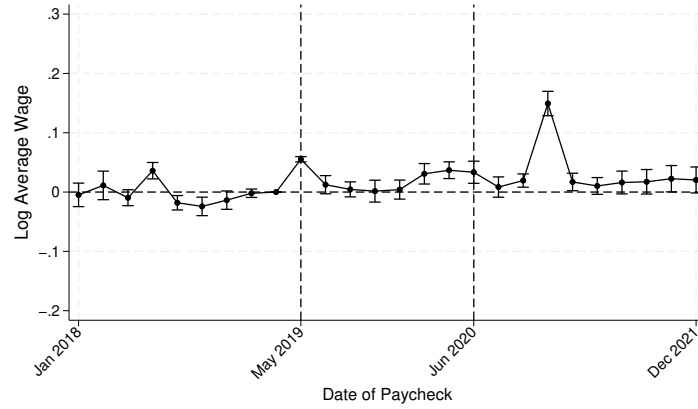
(a) Base Hours



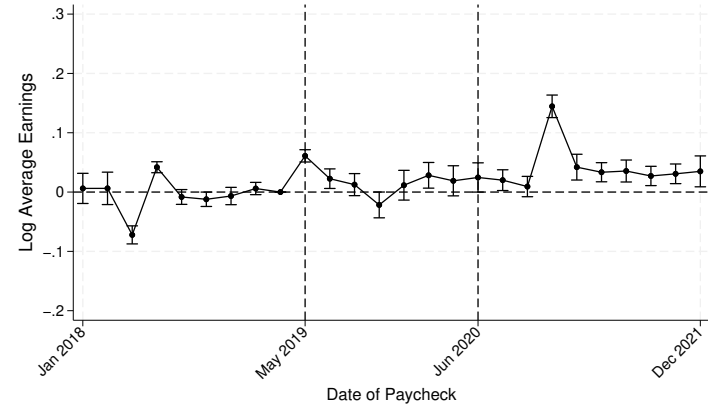
(b) OT Hours

Notes: This figure plots difference-in-difference estimates comparing the hours of the average correctional officers/sergeants in Wisconsin to Minnesota over time, computed using equation (1).

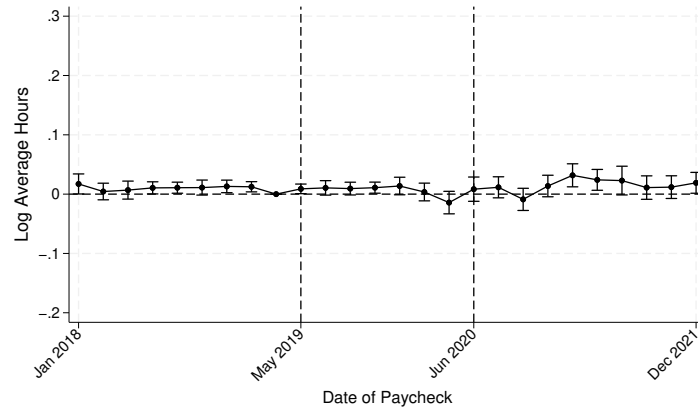
Appendix Figure A.VI: Effect on Non-Correctional Officers at Maximum Security Prisons



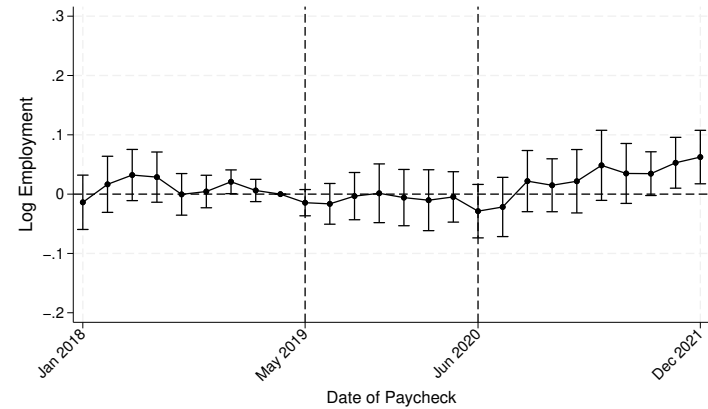
(a) Wage



(b) Earnings



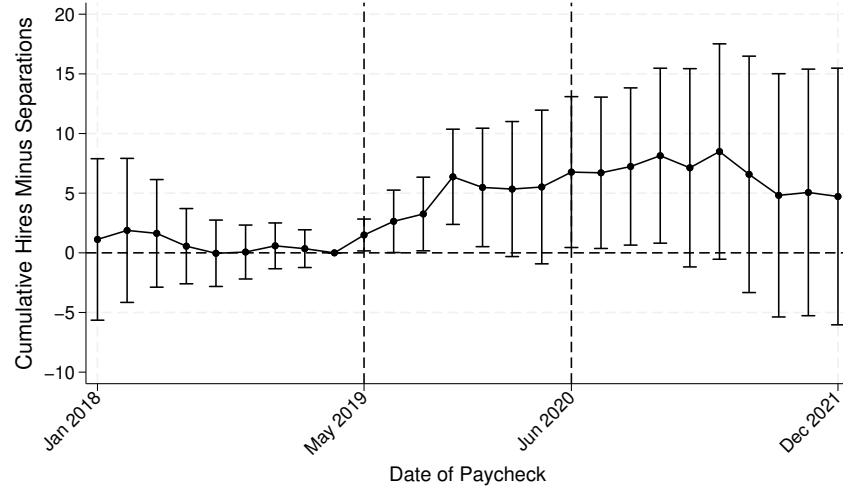
(c) Hours



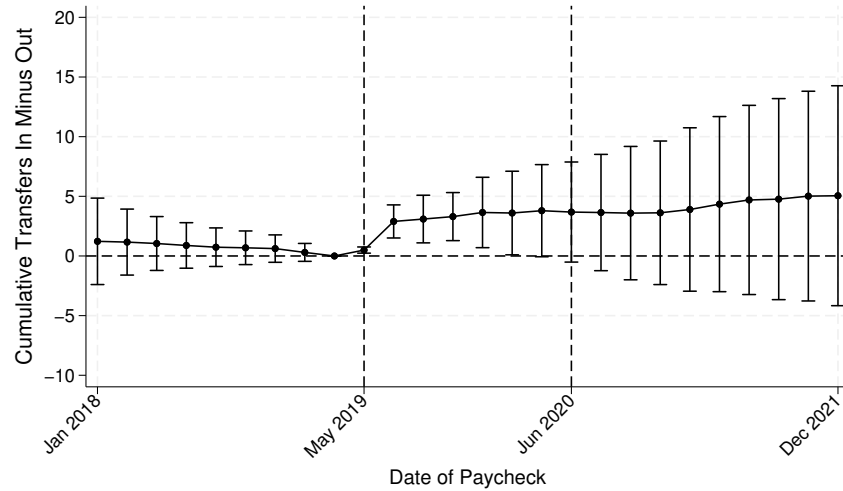
(d) Employment

Notes: This figure plots difference-in-difference estimates comparing maximum security prisons in Wisconsin to all prisons Minnesota over time, computed using equation (1). The sample is restricted to all occupations excluding correctional officers and sergeants.

Appendix Figure A.VII: Cumulative Flow Effects in Maximum Security Prisons



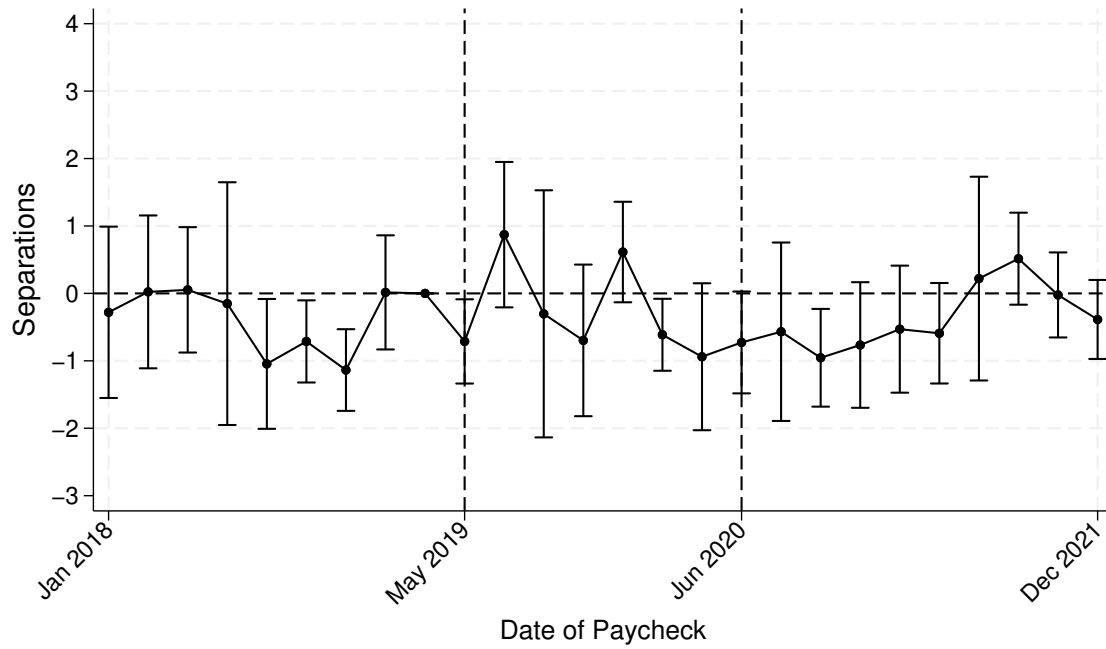
(a) Cumulative Effect on Hires Minus Separations



(b) Cumulative Effect on Transfers

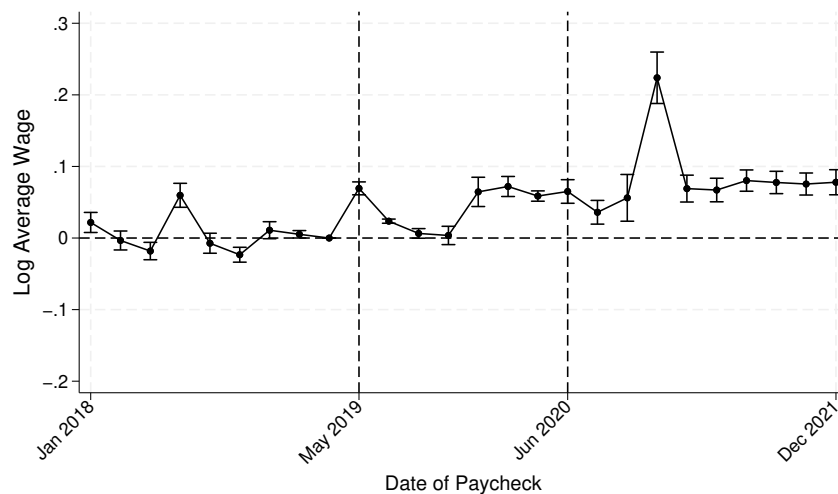
Notes: This figure plots cumulative sums of difference-in-difference estimates comparing the flow of correctional officers/sergeants in Wisconsin to Minnesota over time, computed as the running sum of  $\beta_\tau$  estimates from equation (1).

Appendix Figure A.VIII: Effect on Separations on Prisons within 45 Minute Drive of a Treated Maximum Security

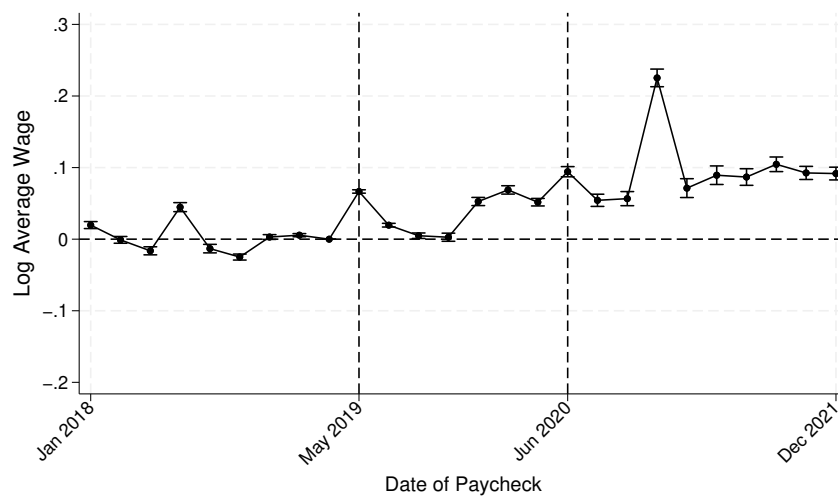


Notes: This figure compares the number of separations between Wisconsin prisons located near a maximum security facility that received a pay increase and prisons in Minnesota.

Appendix Figure A.IX: Wage Effect on Prisons Not Eligible for Temporary Wage Increase



(a) within 45 Min Drive of a Treated Prison



(b) Wisconsin Secure Program Facility

Notes: This figure compares the average wage of correctional officers in a Wisconsin to Minnesota over time. Panel (a) restricts the sample in Wisconsin to prisons located near a maximum security facility that received a pay increase. Panel (b) restricts the sample in Wisconsin to only WSPF.

Appendix Table A.I: Spillover Effect on Prisons Beyond 45 Minute Drive from Max Security Facility

	(1)	(2)	(3)	(4)
<u>Panel A: Worker Level Outcomes</u>				
Log Wage	0.0429*** (0.0033)	0.0417*** (0.0051)	0.0427*** (0.0034)	0.0428*** (0.0033)
Log Hours	-0.0167* (0.0091)	-0.0170 (0.0125)	-0.0147 (0.0096)	-0.0168* (0.0091)
Log Earnings	0.0177 (0.0127)	0.0145 (0.0156)	0.0199 (0.0131)	0.0176 (0.0127)
<u>Panel B: Prison Level Outcomes</u>				
Log Wage Bill	0.0339*** (0.0093)	0.0248* (0.0127)	0.0361*** (0.0087)	0.0338*** (0.0093)
Log Employment	0.0095 (0.0149)	0.0154 (0.0242)	0.0088 (0.0150)	0.0095 (0.0149)
Log Aggregate Hours	-0.0046 (0.0103)	-0.0063 (0.0157)	-0.0025 (0.0097)	-0.0046 (0.0103)
Prison FE	Yes	Yes	Yes	Yes
Biweekly FE	Yes	Yes	Yes	Yes
Only Max Security	No	Yes	No	No
County QCEW Controls	No	No	Yes	No
County Covid Controls	No	No	No	Yes
Number of Prison-Years	2483	1033	2483	2483

Notes: This table reports the estimates from equation 2 for the period during the temporary wage increase. The sample is restricted to only correctional officers and sergeants. Column (1) compares prisons in Wisconsin that are located beyond 45 minute drive of a treated maximum security prison to all prisons in Minnesota. Column (2) restricts the prisons in both states to only medium security prisons. Column (3) controls for county-level wage and employment. Column (4) controls for Covid case rate and death rate at the county of each prison. \*10%, \*\* 5%, \*\*\* 1% significance level.



## Appendix B. Identifying Competing Prisons

In this section, I use heterogeneity in transfer rates to identify the facilities competing for workers with the maximum security prisons affected by the temporary wage policy. I examine heterogeneity along two dimensions: prison security level and distance from the nearest maximum security prison. Consistent with models of compensating differentials, I show that workers from medium security prisons and nearby prisons are more likely to transfer after the wage increase goes into effect.

### B.1 Heterogeneity by Security Level

Models of compensating differentials argue that workers sort into establishments based on their preferences for specific amenities or dis-amenities (Rosen, 1986). In my setting, correctional officers might have heterogeneous preferences for the security level of different prisons. In that case, I would expect transfers to the maximum security prisons to come from medium security facilities rather than minimum security ones. To test for heterogeneity by prison security level, I divide facilities in Wisconsin into three groups: minimum security, medium security, and WSPF which was the one maximum security prison exempt from the wage increase. I estimate equation (1) separately for each group, comparing the number of transfers out of the facilities over time relative to the transfer rate across all prisons in Minnesota.

Appendix Figure B.I plots the difference-in-difference estimates for the three groups. I find that only medium security prisons experienced a sharp increase in transfers out during the period of the temporary wage increase. If correctional officers sorted based on their preferences for the security level of their worksite, then the temporary wage increase should have a stronger effect on the marginal worker in medium security prisons, rather than on workers in minimum security ones. Consistent with these predictions, I find that the \$5/hour premium is sufficient to incentivize workers from medium security prisons to transfer, but not employees from other facilities. However, I find no effect on transfers from WSPF, suggesting that sorting by security level is not the only relevant margin of heterogeneity that determines competition between the prisons.

### B.2 Heterogeneity by Commuting Time

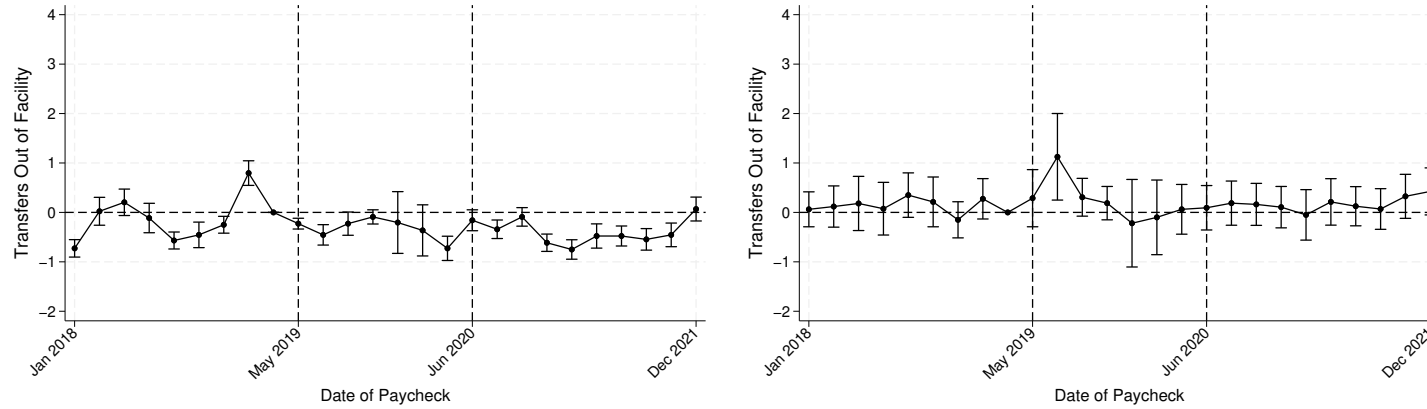
Another important dimension that affects transfer is likely commuting time. Since maximum security facilities tend to be spread apart, commuting costs may prevent workers at WSPF from transferring to other maximum security prisons for the bonus. To test whether workers factor in commuting time into their transfer decision, I use Google map to determine the nearest treated maximum security prison from each facility in terms of driving time.

Appendix Figure B.II plots the distribution of commuting times from each exempt institution to their nearest maximum security prison. I find that medium security prisons are more likely than other facilities to be located near a maximum security prison. In particular, four medium security prisons are within a one hour drive of a maximum security facility, whereas only one minimum security prison meets this criteria. Moreover, WSPF is located 97 minutes away from the nearest treated facility. Thus, commuting costs are very high for someone working at WSPF or a minimum security prison to transfer for a \$5/hour wage increase.

Indeed, I show in Appendix Figure B.III that the number of out-transfers is especially pronounced when I restrict the sample to the 3 medium security facilities within a 45 minute drive of a treated maximum security prison. In contrast, I find no change in transfers among the remaining prisons, even though half of them are also medium security institutions. As a result, the estimates suggest that commuting time is the primary determinant of competition across establishments within the same firm.

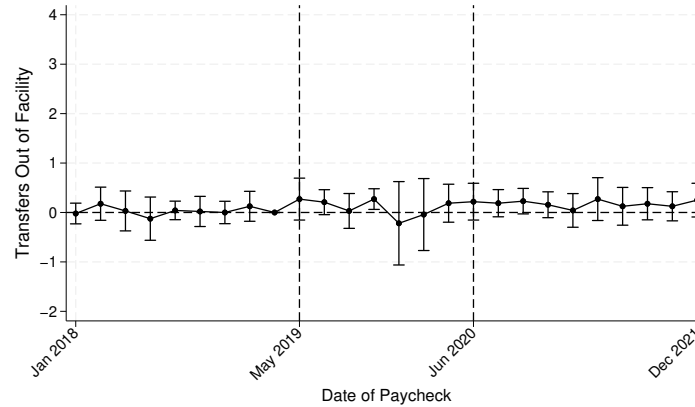
The implied willingness to accept for longer commutes is within the range of previous estimates in the literature. Prior studies find that workers value travel time at a rate of 20-100% of their hourly wage (Small, Winston, and Yan, 2005; Mulalic, Van Ommeren, and Pilegaard, 2014; Le Barbanchon, Rathelot, and Roulet, 2021). In our case, correction officers earn on average about \$20/hour, so prior estimates suggest that they would value commute time at about 6.7 cents to 33 cents per minute. Using the upper range of estimates suggest that workers would be willing to accept a 15 minute increase in their commute for a \$5/hour pay increase. Given that we are using commuting time between prisons, rather than between home and prison, it is reasonable to expect that for many workers, switching worksites may lead to no more than a 15 minute increase in travel time.

Appendix Figure B.I: Effect on Transfer of Correctional Officers/Sergeants Out of “Unaffected” Prisons



(a) Excluded Max (WSPF)

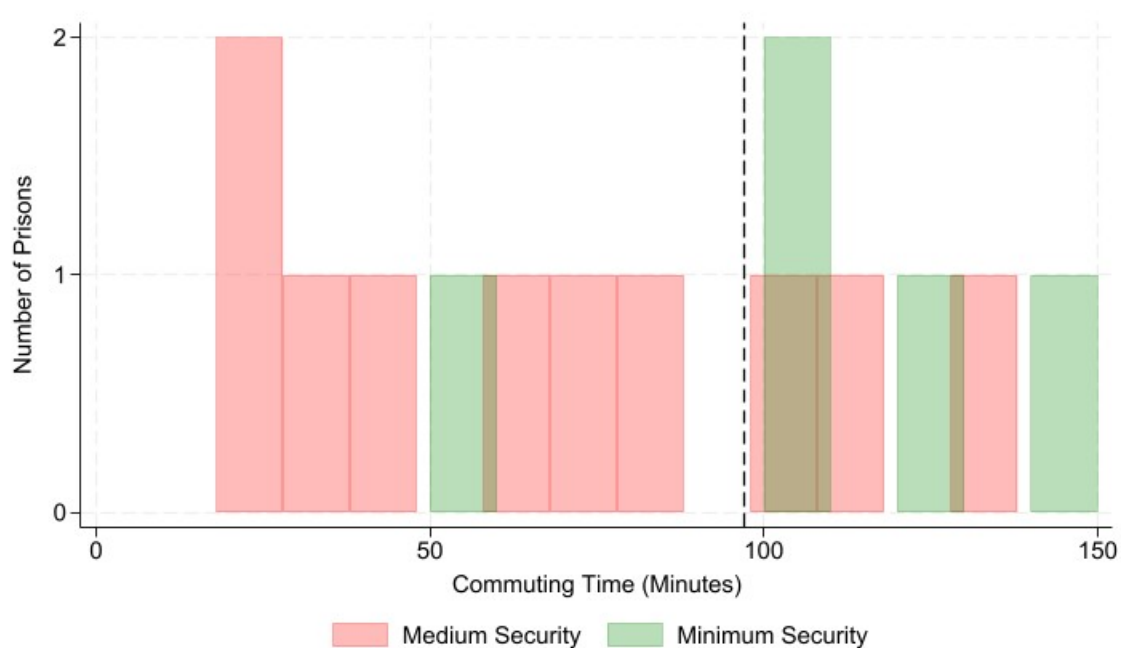
(b) Medium



(c) Minimum

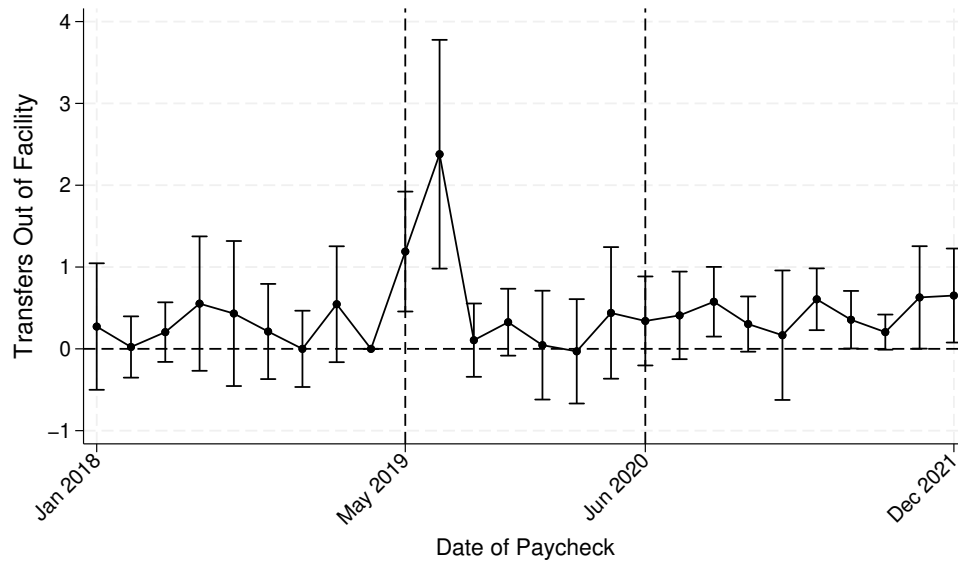
Notes: This figure plots difference-in-difference estimates comparing the flow of correctional officers/sergeants in Wisconsin versus Minnesota over time, computed using equation (1). Panel (a) plots the effect on the number of transfers out of WSPF to other prisons. Panels (b) and (c) plot the equivalent for transfers out of medium and minimum security prisons. Each estimate represents the average impact over 4 biweekly paychecks. Estimates are clustered at the prison level.

Appendix Figure B.II: Histogram of Commuting Time from Nearest Treated Maximum Security Prison

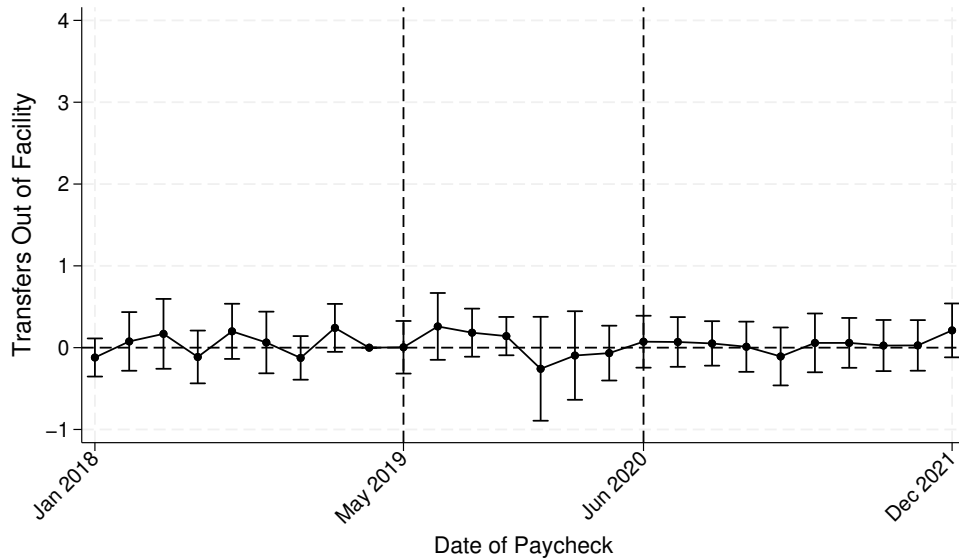


Notes: This figure plots the distribution of commute times to drive from medium and minimum security prisons to the nearest maximum security prison that received a temporary pay increase. The dotted dash line is for WSPF, which is the one maximum security prison exempt from the wage increase.

Appendix Figure B.III: Heterogeneity in Transfers Out of Facility by Commuting Time to Nearest Treated Maximum Security Prison



(a)  $< 45\text{min}$  Driving Distance



(b)  $\geq 45\text{min}$  Driving Distance

Notes: This figure plots difference-in-difference estimates comparing the flow of correctional officers/sergeants in Wisconsin versus Minnesota over time, computed using equation (1). Panel (a) plots the effect on the number of transfers out of prisons within 45 minute drive from a maximum security prison that received the temporary pay increase. Panel (b) plots the equivalent for transfers out of prisons with over 45 minutes commute time. Each estimate represents the average impact over 4 biweekly paychecks. Estimates are clustered at the prison level.