Why Do Women Earn Less Than Men? Evidence from Bus and Train Operators*

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Abstract

Even in a unionized environment where work tasks are similar, hourly wages are identical, and tenure dictates promotions, female workers earn $0.89 on the male-worker dollar (weekly earnings). We use confidential administrative data on bus and train operators from the Massachusetts Bay Transportation Authority (MBTA) to show that the weekly earnings gap can be explained entirely by the workplace choices that women and men make. Women value time and flexibility more than men, possibly due to a combination of preferences and personal life constraints. Women take more unpaid time off using the Family Medical Leave Act (FMLA) and work fewer overtime hours than men. When overtime hours are scheduled three months in advance, men and women work a similar number of hours; but when those hours are offered at the last minute, men work nearly twice as many overtime hours. When selecting work schedules, women try to avoid weekend, holiday, and split shifts more than men. To avoid unfavorable work times, women prioritize their schedules over route safety and select routes with a higher probability of accidents. Women are less likely than men to game the scheduling system by trading off work hours at regular wages for overtime hours at premium wages. Conditional on seniority, which dictates choice sets, the weekly earnings gap can be explained entirely by differences in operator choices of hours, schedules, and routes. These results suggest that some policies that increase workplace flexibility, like shift swapping, can reduce the gender earnings gap and disproportionately increase the well-being of female workers.

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1 INTRODUCTION

The ratio of female to male weekly earnings (for full-time workers) is currently 0.82, but was 0.62 in 1979 (Bureau of Labor Statistics, 2017).[1] Though female earnings have risen relative to male earnings, why has the gender earnings gap persisted? We address this question using confidential administrative data on bus and train operators of the Massachusetts Bay Transportation Authority (MBTA). Our setting allows us to control for many traditional explanations of the earnings gap, including occupational sorting, managerial bias, the motherhood penalty, and gender differences in desire to compete and negotiate for promotions. Despite having such a controlled setting, we document the existence of a gender earnings gap at the MBTA: female operators earn $0.89 on the male-operator dollar in weekly earnings. Moreover, given the MBTA's defined benefit pension program, this earnings gap carries over into retirement.

Mechanically, the earnings gap can be explained in our setting by the fact that men take 48% fewer unpaid hours off and work 83% more overtime hours per year than women. The reason for these differences is not that men and women face different choice sets in this job. Rather, it is that women have greater demand for workplace flexibility and lower demand for overtime work hours than men. These gender differences are consistent with women taking on more of the household and childcare duties than men, limiting their work availability in the process (Parker et al., 2015; Bertrand et al., 2015).

The MBTA's bus and train operators are all represented by the same union, Carmen's Local 589, and are all covered by the same bargaining agreement. The agreement specifies that seniority in one's garage is the sole determinant of one's work opportunities. Conditional on seniority, men and women face the same choice sets of schedules, routes, vacation days, and overtime hours, among other amenities. The earnings gap persists even when we condition on seniority, allowing us to explain the gap fully by the differences in choices that men and women make when faced with the same choice sets in the workplace.

[1] The Bureau of Labor Statistics (BLS) calculates this ratio for each year by taking the average (for men and women separately) of median usual weekly earnings for full-time wage and salary workers.

When overtime hours are scheduled three months in advance, men sign up for about 7% more of them than women. When overtime is scheduled the day before or the day of the necessary shift, men work almost twice as many of those hours as women. Given that the MBTA's operators are a select group of people who were not discouraged by the MBTA's job postings requiring 24/7 availability, these differences in values of time and flexibility are likely lower bounds for the general population.

We see women prioritizing schedule convenience more than men in other respects. As operators move up the seniority ladder and consequently have a greater pool of schedules to pick from, women move away from working weekends, holidays, and split shifts more than men. Women are more likely than men to take less desirable routes (defined as those routes along which men experience more accidents) to avoid the less preferable schedules.

Throughout our sample, which runs from 2011 through 2017, the Family Medical Leave Act (FMLA) plays a crucial role in giving operators the flexibility to take unpaid time off. Passed in 1993, FMLA is intended to allow workers facing a personal or family medical emergency to take up to 12 weeks off from work without pay and without retribution from the employer. Many use the law for maternity or paternity leave purposes. At the MBTA, the law has been nicknamed the "Friday-Monday Leave Act" for the way that operators have used it to avoid undesirable shifts. We find that male operators exploit FMLA to game the system: by substituting unpaid hours for overtime hours, they actually increase their earnings.

When faced with having to work a weekend shift in a particular week, men take more unpaid time off that week than in non-weekend shift weeks. They also, however, work more overtime hours in weekend-shift weeks, effectively trading off hours paid at regular wages for overtime hours paid at 1.5 times their wage. We see the same behavior during weeks when a male operator has to work a holiday shift or days when he has a split shift. Having to work an inconvenient shift also drives women to take more FMLA hours and to work more overtime, but their additional overtime hours fall short of making up for the lost pay.

Overtime opportunities at the MBTA are offered by "serial dictatorship," with the most senior operators getting first dibs on working more hours. We deduce how operators value time and flexibility by looking at the probability that a person accepts overtime, conditional on being offered the opportunity up to a day before the shift. Here again we find evidence that women value time and flexibility more than men. The difference is especially stark for those with dependents. Women with dependents – especially single women – are considerably less likely than men with dependents to accept an overtime opportunity. This is especially the case during weekends and after regular work hours, times when there are fewer childcare options available.

Finally, we consider two policy changes that reduce the ability of individuals to swap regular hours for overtime hours. The first policy change, in March of 2016, made it more difficult for operators to obtain FMLA certification and to take unpaid time off at a moment's notice. The second policy change, taking effect in July of 2017, redefined overtime hours from any hours worked in excess of 8 in a given day, to any hours worked in excess of 40 in a week.

Both policies reduced the gender earnings gap. The gap shrank from $0.89 before the FMLA policy change to $0.91 between March 2016 and July 2017 and to $0.94 from July through December 2017. Yet in addition to reducing the gap, these policies also reduced workplace flexibility. Because female workers have greater revealed preference for this flexibility, women likely fared worse from these policies than men.

We show that those who took unpaid time off with FMLA before the policy changes have now begun to take more unexcused leave instead. The increase has been especially sharp for women. Since unexcused leave is more likely to lead to service disruptions and to result in suspensions and discharge from work, the first policy change has been especially costly for women. We argue that increasing flexibility, perhaps by allowing for shift exchanges between operators, can reduce the earnings gap, reduce absenteeism, and improve service provision.

Our work is related to a large literature on the gender earnings gap. One explanation for the gap has been that women tend to cluster in lower paid occupations, industries, and firms (Blau and Kahn, 2017). Indeed, occupations in which women are over-represented tend to pay less than those in which men make up the bulk of employees (Levanon et al., 2009). Our work explores a single industry and two analogous occupations. Male and female bus and train operators have similar tasks (as illustrated by the fact that they are covered by the same collective bargaining agreement and paid the same wage), eliminating issues of measurement and job comparability that plague many occupation-level analyses.

Another thread of research suggests that the gender earnings gap is attributable to discrimination and managerial discretion. For example, Lazear and Rosen (1990) argue that men and women have similar earnings within very narrow job categories, but are not similarly represented in those categories in part because women have a lower probability of promotion than men. In the lab, wage negotiators were found to mislead women more than men (Kray et al., 2014) and several studies have found that the gender of an employee's direct manager is predictive of the wage gap (Hultin and Szulkin, 1999, 2003; Cohen and Huffman, 2007).

Our context is largely free from this concern. As in most unionized work environments, seniority drives personnel management and significantly limits any managerial discretion in pay and promotion. Wages increase at a predetermined rate, with no performance-based incentives and no managerial discretion in who receives a raise and who does not. Discharges are rare and can be challenged by the union. As a result, we argue that differential managerial promotion standards for men and women cannot explain the earnings gap in our setting.

Additional research has argued that women are less willing to compete for higher-paying positions and that this may account for the gender earnings gap (Gneezy et al., 2003; Niederle and Vesterlund, 2007; Dohmen and Falk, 2011; Reuben et al., 2017). Our setting also removes this channel from consideration. Since career advancement within the transit operator occupation is pre-determined by the collective bargaining agreement and is not based on outstanding performance, competition, or negotiation of any sort, the notion that the gender earnings gap might be explained by women's distaste for competition also does not apply.

Another factor that typically generates an earnings gap is labor market experience. Diamond et al. (2018) find that the earnings gap among Uber drivers can be partly explained by men working for longer periods of time than women and accumulating more knowledge about the best times and places to drive. In our context, however, there are limited returns to experience. All employees are required to obtain the same training for the job, regardless of their prior experience, and all who meet the basic qualifications and start work on the same day receive the same wage.

Whereas Diamond et al. (2018) find that men are more likely to drive in areas with high crime and more drinking establishments, we find that women choose bus routes with higher accident probabilities to avoid unfavorable schedules. Of course, given the inherent flexibility in the "gig" economy, Uber drivers are unlikely to be facing such tradeoffs. Similar to Diamond et al. (2018), where half of the earnings gap can be explained by male preference for faster driving, we also find that differences in male and female choices are at the root of the gap. We do not, however, identify whether the choices in our setting are the result of preferences, personal life constraints, social norms, or other forces.

Goldin (2014) suggests that remaining earnings differences arise because of differences across jobs in the value of long (uninterrupted) hours worked or of being on-call. Jobs with less substitutable workers (like lawyers and consultants) are likely to have higher pay differences than jobs with more substitutable workers (like pharmacists). We support these findings, demonstrating that a sizable earnings gap can exist in a setting where the presence of overtime hours and pay makes otherwise substitutable workers less substitutable along gender lines.

Noonan et al. (2005) considers graduates from the University of Michigan Law School, observing how the pay gap grows over time and how female graduates work fewer hours than the men. Reyes (2007) zooms in on OB/GYNs and provides additional evidence for women with high skills and job market prospects choosing positions with fewer hours and more regular schedules. In a setting that demands long hours, these choices lead to a large gender earnings gap. We extend these studies by showing that flexibility and hours considerations are important factors in the earnings gap outside of high-skilled, high-wage work as well.

Kleven et al. (2018) argue that child rearing can explain the earnings gap. The authors find that the birth of a child creates a gender gap in earnings of about 20%, with labor force participation, hours of work, and wage rates all playing a similar role in the gap. Looking at the gender earnings gap within a family, Angelov et al. (2016) demonstrate that the gap grows by 32 percentage points over a 15 year period after childbirth. While dependents drive female demand for flexibility and time away from work in our setting as well, the earnings gap shrinks only to $0.90 when we focus on those operators who do not have dependents. Our results thus provide evidence that the gap can persist even when children are not part of the story.

Finally, we also contribute to a literature on workplace amenities. Most closely related to our work, Mas and Pallais (2017) find that women place a higher value than men on flexibility and schedule regularity in an experimental setting. In their experiment, women are willing to forgo almost 40 percent of their wages to avoid irregular schedules. Workers are willing to take substantial wage cuts to avoid working evenings and weekends. We echo these findings: operators put a premium on working conventional hours. We document that women also prize not working holiday and split shifts, and show that they value schedule-related amenities more than other workplace amenities.

The next section explains the nature of work at the MBTA and Section 3 goes into detail on the data that we employ for our analyses. Section 4 shows how the earnings gap can be explained through gender differences in overtime hours and unpaid time off. Section 5 documents gender differences in the value of time away from work, flexibility, and workplace amenities. Section 6 discusses how institutional changes that reduce workplace flexibility can narrow the gender earnings gap but increase the gender well-being gap and Section 7 concludes.

2 Institutional Details

2.1 The Operators

The MBTA serves the Boston metropolitan area with 173 bus routes and 4 rail lines.[2]. Since the late 1970s, anyone with proper minimum qualifications could enter into a lottery to become a bus or train operator at the MBTA. Lotteries take place as the need for more operators emerges, sometimes with only a year between them, sometimes with as many as 10 years in between. For the latest lottery round, which took place in 2017, minimum qualifications included being at least 18 years old, a high school graduate, having a Driver's License and a clean driving record for at least the past 2 years. Applicants also needed to pass a criminal

[2] See Figure A.1 for a map of the area served and the routes.

background check as well as several customer service and driving tests, and to be "Available to work twenty four (24) hours per day, seven (7) days per week."

When applying, a person can choose to apply to be a bus operator, a heavy rail operator, or a light rail operator. There is no difference in pay between these positions and the minimum requirements are very similar.[3] All operators start as part-timers near $20 per hour, see a steady annual increase in their wage to about $33 per hour over the first 4 years of work, and then consequently have wages rise only at about the rate of inflation. The only differences in wages that arise are due to new collective bargaining agreements changing the starting wage of new hires. There is also little difference in, for example, the share of each type of operator needed to work on the weekends. The biggest difference is that bus operators are required to have a Commercial Driver's License (CDL), while light rail and heavy rail operators are not.[4]

To the extent that MBTA operators differ from high school graduates earning similar wages in other occupations, they are likely to be more flexible in order to meet the MBTA's expectation that they be available to work at all times. Indeed, to the extent that the MBTA can screen for more flexible operators, they have an incentive to do so to limit scheduling difficulties and overtime pay. Depending on the garage to which they are assigned when they start (determined by MBTA need, not by operator preference), part-time operators may be promoted to full-time status within a few months or within several years as full-time positions open up. To the extent that there is attrition among part-time operators, we expect it to skew towards those who find the schedule demands of the job to be more taxing.[5]

2.2 The Work

A rail operator is responsible for taking the train out of the yard and running it along prespecified routes at prespecified times. During a run, the operator is responsible for conducting the train along the rails in accordance with the lights, making announcements through the overhead system, opening and closing doors for passengers, and resolving any problems that

[3]For the 2017 job lottery postings, see Figures A.2-A.5.

[4]Those who do not already have a CDL when they apply will receive assistance from the MBTA in obtaining one.

[5]Conversations with operators, male and female, revealed that most saw the schedule as the most difficult aspect of the job.

may occur over the course of the day on the train.

A bus operator is likewise responsible for following the prescribed route, picking up passengers at predetermined stops, helping passengers use the fare box for fare collection, making all non-automated announcements, and resolving any mechanical or person-related conflicts that may occur on the bus. Bus operators have to deal with more unpredictable traffic, whereas rail operators, if they experience traffic, only experience it in one lane. Similarly, bus operators have more contact with passengers than rail operators through fare collection, assisting passengers with disabilities, and answering questions.

2.3 Scheduling

Operators select their routes and hours every three months in a process called The Pick.[6] During The Pick, the most senior ranked operator chooses which routes, days, and hours he would like to work. This selection is subject only to the restriction that an operator must take a 10-hour break between shifts and sign up for fewer than 60-hours per week. In addition to hours and routes, certain leave days are selected at this time. Since public transit runs on the weekends and holidays, if an operator does not want to work on these days, he must arrange his schedule and leave around them, possibly taking a vacation day on a holiday that he would otherwise have to work. Once his selections are made, the next most senior person selects her schedule and days of leave for the upcoming quarter, and so on down the seniority ladder.

Full-time operators need to schedule 40 hours of work per week. It is also possible, however, to have overtime built into one's schedule. If, for example, the routes an operator selects are expected to take 8 hours and 14 minutes, those additional 14 minutes are considered "built-in overtime" and will be paid at 1.5 times the regular wage. Additionally, the MBTA may need to run extra service to help get children to school or to substitute for service on a rail line that is under repair. During The Pick, an operator can take on such pieces of extra work – called "Trippers" – and earn overtime pay for doing so. Trippers and built-in overtime, two forms of scheduled overtime, are also valuable in that earnings from these sources count toward pension calculations.

[6] The procedures for The Pick changed in 2018. The process described here was used throughout the 2011-2017 period, the period that our data cover.

2.4 Unscheduled Overtime

The need for last-minute, unscheduled overtime work generates potential for significant extra earnings for MBTA operators. It is thus useful to understand how unscheduled overtime is offered and assigned. Before the sun rises, MBTA operators present themselves to a supervisor who confirms them to be "Work Ready." As operators find their vehicles and take them out for the first run of the day, the supervisor is most concerned with those operators who have not come in to work. Hoping to keep the number of lost trips and delays to a minimum, the supervisor tries to find operators who can pick up the runs for which others are absent. He first turns to a "cover list" that includes the names of a few operators who are on-call, ready to run any route in a given 8 hour window. When the number of absences exceeds the number of "cover list" positions, the supervisor turns to the rest of the operators in the garage for help.

Within a given garage, any full-time worker is eligible to fill an open shift and work unscheduled overtime at 1.5 times the regular wage.[7] However, the supervisor must offer these open shifts to operators by seniority. In a time-pressing situation in which there is not enough time for a person to arrive at the garage, operators who are on-site may be offered overtime. On-site offers also occur in seniority order. In other cases, overtime opportunities may be posted the day before they are required on a bulletin board at the garage and those who are interested in working those hours can tell the supervisor that they want to be considered. After a certain time cutoff, the supervisor makes calls down the list of those who stated interest, offering overtime opportunities by seniority.

The fact that the supervisor decides whom to call gives rise to a concern that favoritism, instead of seniority, could be driving the way overtime opportunities are offered. Two facts should assuage this worry. First, seniority rankings are known, so operators would be able to figure out if they have been passed over for overtime. Second, operators can bring up issues of supervisor favoritism to the union representatives in their garage and ask the union to step in on their behalf. Our conversations with the union have confirmed, however, that complaints of

[7] Though there are part-time bus and train operators, their contracts are sufficiently different from those of full-time operators that we choose to exclude them from our analyses. Part-time operators, for example, are not eligible for overtime. Overtime is also not offered to operators from other garages.

favoritism are infrequent. Our data also corroborate the notion that overtime opportunities are offered by seniority, with the most senior individuals working nearly twice as much overtime as operators at low seniority levels.

3 Data and Descriptive Statistics

Our analyses are based on a series of confidential administrative data sets obtained through a partnership with the MBTA. The main data set contains the Human Resources (HR) Department's time-card data, spanning 2011-2017. These data document how many hours of each work type (regular work, scheduled overtime, unscheduled overtime) each employee logged on each day. Additionally, the data note all the hours that an employee did not work and for what reason (sick leave, vacation, FMLA leave, unexcused, etc.).

We merge these data with HR data on individual employees, which specify the employee's age, gender, date of hire, and tenure. Since seniority is determined based on who has the longest tenure within a given garage[8], we use the tenure dates for full-time workers to calculate an individual's seniority.[9] We use federal W-4 tax forms held by HR to infer an operator's marital status and, using the selected allowances, whether he or she has dependents. Following IRS suggestions for calculating allowances, we classify operators as having dependents if they are married and put down an allowance of 3 or higher, or if they are single and put down an allowance of 2 or higher. We have this information for those operators who worked at the MBTA in 2017.

Of course, the allowances a person lists on his or her W-4 are an imperfect measure of whether that person has children or responsibilities to care for children or elderly parents. Some employees may have enough withholdings from another job or from a spouse's job so that they do not require withholdings from their job at the MBTA. Others may use withholdings as a means of shifting income intertemporally. However, we believe allowances to be a noisy

[8]When a person becomes an operator, she is assigned to a particular garage. Individuals almost never move garages throughout their time at the MBTA. In our sample of 3,011 full-time operators over 7 years, only 120 or 4% of individuals move between garages and almost all do so when transitioning from part-time to full-time. This low rate of moving exists not just because it is administratively difficult to move, but also because an operator's seniority could drop when she moves to a new garage.

[9]Full-time operators and part-time operators have separate seniority rankings.

but unbiased measure of family arrangements. Likewise, marital status on a W-4 is an imperfect measure of whether a person is partnered. An individual may be partnered, but unmarried or may be married, but filing separately. In either case, we would not observe the person's partnered status. Importantly for us, though, those who are married and filing jointly are unlikely to be separated.

We also work with precise schedule data for the 4th quarter of 2017. These document the specific schedules that each operator elected to have during that quarter's Pick: both the hours that he or she works and the routes that he or she will be taking. Note, that these data include operators' schedules, not necessarily which routes they actually operate in a particular day. So any last-minute changes in which a dispatcher reassigns an operator to take a different route are not captured in these data and routes covered through unscheduled overtime work are also not documented.

We combine the precise schedule data with data on accidents. From 2014 through 2017, we have information on the date of each accident, the ID of the operator behind the wheel at the time, the route, and the nature of the accident. Together, these two data sets allow us to create quality scores for each bus route that are based on accident probability.

In 2016, the MBTA introduced a new 5-step discipline policy that spelled out the type of punishments that operators could face for unexcused tardies or absences. We combine time-card data on unexcused leave with data on the type of discipline leveled on each operator and the date of each decision. These data are available for 2016-2017 and enable us to understand what the relationship between unexcused events and disciplinary action looks like in practice.

The discipline policy was aimed at leave-taking, specifically because of the connection between leave hours and lost trips. Using 2014-2017 data on the number of trips lost at each garage on each day and merging them with time-card data, we measure the relationship between different types of leave and lost trips.[10]

Finally, to supplement our findings on how the gender earnings gap carries over into operators' pensions, we surveyed 164 bus and rail operators about how they make decisions to work

[10]A trip, as defined by the MBTA, is a run from point A to point B and back to point A. Losing a trip means skipping a scheduled run from point A to point B and back to point A.

overtime, what they know about the pension, and how they value income today relative to income in the future. The 5-minute, anonymous, computer-based surveys were administered in person at 9 of the 11 garages over a 2 week period and $5 Dunkin' gift cards were offered as an incentive.

3.1 Operator Descriptives

We see 3,011 full-time bus and train operators in our time-card data (see Table 1). About 65% of operators drive buses, 21% run light rail (over-ground) trains, and the remaining 14 percent navigate heavy rail (under-ground) trains. Relative to male operators, female operators gravitate toward train positions: 23.2% of women operate light rail trains and 17.4% operate heavy rail trains. For men, these figures are 19.6% and 12.2%, respectively. On average, operators are 47 years old – more than a decade older than the average age in the Boston metropolitan area. The average operator has been with the MBTA for 12.4 years and is being paid $32.68 – 3 times minimum wage in Massachusetts.

About 30 percent of the MBTA's operators are women and that share is fairly constant across different tenures. Female operators tend to be about two years younger than male operators, but on average have tenures and wages that are almost identical to those of men. In our sample, 26 percent of operators are denoting their marital status as "Married" on their W-4s and 20 percent report having dependents.

These numbers are considerably lower than what one sees in the general U.S. population, where in 2014 about 48% of adults were married and in 2013 53% of adults aged 18-40 had at least one child (Masci and Gecewicz (2018) and Newport and Wilke (2013)). This gap between transit operators and the general population likely reflects the fact that those who enter a profession that requires 24/7 availability are especially independent individuals. Breaking the numbers down by gender, we see that women (14%) are less likely than men (31%) to be married, though women (28.5%) are more likely than men (15.6%) to say they have dependents. The latter could be driven by the fact that single or divorced women are more likely than single or divorced men to retain custody of their children.

Nearly 95 percent of operators have applied for Family Medical Leave Act (FMLA) certification between 2011 and 2017. Signed into federal law in 1993, FMLA guarantees a worker who has been with his or her employer for over 12 months and has worked more than 1,250 hours in the preceding year, up to 12 unpaid weeks of job-protected leave per year. This leave is intended specifically to allow the individual to address specific personal or family medical conditions without losing his or her job. Acceptable reasons for leave include employee illness, child-care, spouse-care, parent-care, and adoption.

Three quarters of operators have at some point over the seven year period that our data cover received approval of their FMLA application. In a single year, about 45 percent of operators are approved for FMLA. In contrast, 16 percent of the national workforce has FMLA certification (Waldfogel, 2001). In a survey conducted by Abt Associates for the Department of Labor in 2012, 13% of employees nationwide had taken FMLA leave, though it is worth noting that only 59% of employees nationwide are in employment circumstances that entitle them to FMLA leave (Klerman et al., 2012).

Since seniority is one of the ways through which we are able to find quasi-exogenous access to overtime, we also explore differences in our population by seniority (Table 2). Seniority serves as the mechanism by which schedules, routes, and overtime opportunities are allocated. The operators in the top decile of seniority are, unsurprisingly, older than those in the lowest seniority decile: 56 years old relative to 38 years old. As Table 2 shows, the most senior full-time operators have been with the MBTA for more than a quarter century while the most junior have been there for only 2.7 years. More senior operators are skewed toward bus drivers and more junior workers are skewed toward heavy rail operators. Unsurprisingly given that overtime is distributed according to seniority, more seasoned operators take more overtime (3.25 hours/week) than do greener operators (1.4 hours/week). While less experienced operators have slightly higher rates of FMLA certification (66.7 percent vs 62.6 percent), they take similar amounts of FMLA-excused unpaid time off on average (0.22 vs 0.21 hours/day).

4 Accounting for the Earnings Gap

4.1 Choosing Overtime and Unpaid Leave

Table 1 confirms that the average male and female wage is almost identical. We know, moreover, from our discussion of the institutional details, that seniority is the variable that controls all differences in work conditions that men and women might be experiencing at the MBTA.

Yet, when we compare how much men and women take home in an average week, we see that women earn \$0.89 on the male-worker dollar. Column 1 of Table 4 reports the results of a regression of total weekly earnings on a female dummy variable, revealing that men on average earn \$1,447.30 per week while women earn \$160.10 (11%) less. Column 2 adds a control for seniority and finds the gap remains at 11%. Column 3 interacts the female dummy variable with a dummy variable for the presence of dependents, revealing that the earnings gap shrinks only slightly (to 10%) when we compare women without dependents to men without dependents. Column 4 adds another interaction, marital status, helping us see that the earnings gap between single women with children and single men with children is the largest, at 13%. The regression reported in column 4 is shown below.

$$\begin{aligned} y_{ij} = \alpha + \beta \times \mathbf{I}(Female_i) + \lambda \times \mathbf{I}(Dependents_i) + \theta \times \mathbf{I}(MaritalStatus_i) + \\ \kappa \times \mathbf{I}(Female_i) \times \mathbf{I}(Dependents_i) \times \mathbf{I}(MarStat_i) + \phi \times \mathbf{I}(Female_i) \times \mathbf{I}(Dependents_i) + \\ \eta \times \mathbf{I}(Female_i) \times \mathbf{I}(MarStat_i) + \gamma \times \mathbf{I}(Dependents_i) \times \mathbf{I}(MarStat_i) + v \times Seniority_{ij} + \epsilon_{ij} \end{aligned} \tag{1}$$

where y_i is person i's earnings in week j, Female = 1 if an operator is female and 0 otherwise, Dependents = 1 if an operator has dependents and 0 otherwise, MarStat = 1 if an operator is married and 0 otherwise, and Seniority is a continuous variable denoting an operator's seniority decile in week j.

Visually, we can see in Figure 1 that the earnings gap exists even when we control for seniority. The x axis shows each seniority decile, from the least senior (10) to the most senior (100), and the y axis reports the average monthly income for operators in each decile. The blue series shows the average monthly income for men, while the orange series shows the average monthly income for women. The earnings gap narrows somewhat as operators become more senior and the choice sets faced by men and women expand, but it exists throughout the seniority ladder.

How do we arrive at the earnings gap despite identical choice sets? The key is in differences in overtime acceptance rates and usage of unpaid time off through FMLA. Panel A in Figure 2 shows us that if we were to take a male operator's scheduled earnings (the sum of his scheduled monthly work hours multiplied by his wage), add monthly earnings from overtime work, and subtract earnings lost from unpaid leave taken through FMLA, we would arrive at his actual earnings for the month. Panel B performs the same exercise, but for female operators.

From these two figures, we can see that male and female scheduled earnings are similar, but their actual take home pay is different. Men work about 2 times the overtime hours that women work and take about half the FMLA hours off that women take. As a result, throughout the seniority spectrum, men take home considerably more than their scheduled earnings, while women take home less until they get to the highest seniority levels. At top seniority, men and women have the broadest choice sets, ones that include overtime routes and times. The results that we report in upcoming sections suggest that, with more options, women's need to take unpaid time off decreases while their ability to work longer hours increases. This, in turn, results in a narrowing of the earnings gap at high levels of seniority.

Panels C and D in Figure 2 perform the same accounting exercise for those who have dependents, revealing that men and women with dependents behave differently. Men with dependents take less unpaid time off and work more overtime than the average male operator we saw in Panel A. Women, on the other hand, continue as in Panel B to take large amounts of unpaid leave and to fall short in making it up with overtime. These figures demonstrate visually why we saw the earnings gap grow in Table 4, when dependents came into the picture. The gap persists, however, even when we limit our observations to men and women who do not have dependents. Panel B of Figure 1 demonstrates this visually, showing average male and female monthly earnings by seniority decile for those who do not have dependents. There are thus other factors, considerations that do not involve dependents, that are driving the different choices we see operators make when it comes to FMLA usage and overtime.

To summarize, we can account for the earnings gap at the MBTA by observing men and women make different choices of overtime hours and unpaid time off when they are faced with the same choice sets. Dependents do exacerbate the gap, but most of it is there even for operators who do not have dependents.

4.2 Pension Implications

The earnings differences we document here are not only present across seniority levels, but also extend into retirement. The MBTA offers a defined benefit pension plan to its employees, with annual pension payments determined by a publicly available formula. The formula takes the average of an operator's three highest earning years and multiplies it by years of service and 2.46% to arrive at the annual pension payment. Since wages are inflation adjusted each year (and annual pension payments are not deflated when they are paid out), operators have an incentive to work the most number of hours and strive to earn the most they can when they are most senior.

Not all earnings, however, are included in the pension calculations. Earnings that are pension-eligible include those from regularly scheduled work hours and from overtime hours that are scheduled 3 months in advance. Like unscheduled overtime, scheduled overtime is also allocated by seniority, which ensures that the most senior individuals have access to the most desirable scheduled overtime shifts. Despite the additional pension incentive to work more hours at the highest levels of seniority, we still see women working fewer pension-eligible hours than men. As a result, as Figure 3 shows, the gender earnings gap extends to pension-eligible earnings as well. It is worth noting, however, that the gap is smaller than it would be if earnings from unscheduled overtime were also pension-eligible.

Using the MBTA's pension payment formula and average male and female earnings right before retirement, we can estimate the size of the pension earnings gap. For the average male operator, the annual pension payment comes out to $46,677, while for women it is $41,419.[11]

[11] $2.46\% \cdot 70,800 \cdot 26.8 = \$46,677$ and $2.46\% \cdot 66,288 \cdot 25.4 = \$41,419$, respectively. Men work an average of 26.8

Thus, men's annual pension payments exceed those of women by $5,258 or 11% per year. Given that the earnings gap at the MBTA is an average of 11% for 2011-2017, this number is mostly a reflection of the earnings gap in the workplace. However, since women live longer than men and since they tend to have lower social security payments and higher medical expenses than men (Waid, 2013), we would expect women to work towards a pension gap that is narrower than the earnings gap they experience at work.

To gain insight into why women are not working more right before retirement, when every additional dollar earned has pension implications, we surveyed 164 operators about the MBTA's pension system. 86.4% of the operators told us that earning more had either no effect or a tiny effect on their future pension payments. Specifically, we asked "If you earn an additional $1,000 this year, how much will that increase one year of your pension payment?". We also asked: "If you earn an additional $1,000 close to retirement, how much will that increase one year of your pension payment?" 87.2% chose the lowest option, <$10, as their answer to this question as well. 89.4% of women and 85.5% of men chose the lowest option for the question. This, of course, despite the fact that pension payments are calculated off of an operator's earnings while at the MBTA.[12]

Similarly, on a scale of 1 to 10, where 1 is least important and 10 is most important, pension considerations received an average score of 4.5 from women and 4.4 from men for how important they are for decisions on whether to work overtime. In contrast, providing for one's family received an average score of 8.8 from women and 8.3 from men.[13] When asked about the importance of childcare for overtime decisions, women with children gave an average score of 4.1, while men with children gave an average score of 3.4. Given the relatively small size of our survey sample and high standard deviation of responses, these means are not statistically significantly different from each other.

Still, we see that male and female operators are focused on using overtime as a way of meeting present day needs, with pension and childcare considerations secondary in importance for

years at the MBTA prior to retirement, while women work 25.4. These differences further widen the pension gap.

[12] The pension payment formula takes an extra $1,000 earned and converts it into at least an extra $24.60 per year in pension payments.

[13] Being able to buy more things got an average score of 7.7 from women and 7.3 from men.

both genders. Additionally, we use the staircase time task method employed in Falk et al. (2016) and Falk et al. (2018) to assess an individual operator's level of patience. We find that men have an average patience level of 8.2 and women have an average patience level of 8.8, with 1 being least patient and 32 most patient. Thus, men and women at the MBTA have similar discount rates in addition to similar priorities when choosing whether or not to work overtime.

Men and women appear to be similarly uninformed (or misinformed) about the pension formula, to put similarly little weight on the pension and on childcare when considering overtime, and to have similar levels of patience. The forces that generate an earnings gap in the workplace translate over into retirement. However, if female operators live longer and expect to receive more installments of the pension than men, it is possible that, in net present value (NPV) terms, the 11% gap in annual pension payments is actually much smaller. By allowing women to work more hours, the expansion of choice sets that occurs as seniority increases likely allows women to shrink the pension gap in NPV terms.

5 Roots of the Earnings Gap

The evidence we have seen so far on the earnings gap in our setting suggests that insufficient flexibility and high female values of time outside the workplace are its root causes. This leads us to a number of testable hypotheses:

1. Women value time away from work more than men
2. Women take more overtime when it is scheduled in advance than when it is unscheduled or offered at the last-minute
3. Women with dependents value time away from work and flexibility more than men with dependents
4. Women try to avoid work more than men during times when values of time outside the workplace are especially high
5. Women value preferable schedules over other workplace amenities

6. When faced with having to work an unfavorable schedule, women are more likely than men to choose unpaid leave instead

We address each of these hypotheses in the sections that follow.

5.1 Valuing Time and Flexibility

One way we can assess whether men and women value time and flexibility differently is by looking at how they behave when offered to work unscheduled overtime. To do this, we can use the fact that unscheduled overtime is offered by seniority up to a day in advance of the shift that needs to be filled. Figure 4 can help us see how we are able to exploit the seniority structure of overtime offer rules to obtain exogenous variation in the availability of overtime. In this example, we have three operators ranked by seniority. For all but the most senior operator, the availability of overtime depends on whether those more senior than him accept or reject an overtime opportunity. Assuming, we think plausibly, that no individual operator can meaningfully affect the decisions of those more senior than him, we can treat the arrival of an overtime opportunity as a Poisson process.

Utilizing our setting, we capture gender differences in overtime acceptance rates through the following regression:

$$y_{ij} = \alpha + \beta \times \mathbf{I}(Female_i) + \gamma \times \mathbf{X}_{ij} + \epsilon_{ij} \tag{2}$$

Here, y_{ij} equals 1 if person i acceptance an overtime opportunity, conditional on being offered it, on day j and is 0 otherwise. Female = 1 if an operator is female and 0 otherwise and the vector of controls includes age, tenure, seniority decile, and garage fixed effects.

As Table 3 demonstrates, women are about 4.4-4.7 percentage points less likely than men to accept unschedulde overtime. Considering that the male mean is 9.6-10.9%, we can see that men are about twice as likely as women to accept last-minute overtime opportunities. These differences are similar when we look at weekdays or weekends, days when the operators are scheduled to work and days when they are scheduled to be off. Figure 5 visualizes these differences, controlling for age, tenure, seniority, and garage. These results show us that men value overtime work more than women and that women value not having to work additional hours on top of their scheduled hours more than men. These findings echo Mas and Pallais (2017), who find that women have a higher willingness to pay than men to avoid employer scheduling discretion.

Another way to visualize these differences is by calculating each person's propensity to accept unscheduled overtime when offered it and to compare the male distribution of overtime acceptance probabilities to the female distribution. Figure 6 plots these two distributions, revealing that there are more men than women who accept overtime opportunities more than 50% of the time, while there are about twice as many women as men who decline overtime opportunities all the time. The unconditional difference in mean acceptance rates is about 5.5 percentage points, similar to the differences we saw in Figure 5.

Although the similarity of our conditional and unconditional calculations of differences is reassuring, it is best to pursue further analyses of differences in values of time and flexibility between men and women by including controls. Since the choices that men and women face are the same conditional on seniority within a garage, we should be conditioning our analyses on things like seniority and garage. To the extent that operators change their propensity to accept overtime with age or with tenure, those controls would also be good to include to help us isolate the gender effect.

Figure 7 allows us to dive deeper into what drives the differences in the propensity to accept overtime that we observe between men and women. Here, the y axis reports the percentage point difference between the male overtime acceptance probability and the female overtime acceptance probability. The x axis helps us focus on these differences across all days of the week, days on which operators are already scheduled to work, days when they are not scheduled to work, weekdays, and weekends. Regardless of whether or not they have dependents, men are 4 to 6 percentage points more likely than women to accept an overtime opportunity. The difference in acceptance rates between men and women is higher, though, if the operators have dependents, especially so if the unscheduled overtime is offered on a weekend or on a day when the operators are already scheduled to work. The presence of dependents makes the overtime opportunity more valuable for men and time spent outside of work more valuable for women.

Marital status also reveals a statistically significant heterogeneity in the value of time. The difference in acceptance probabilities between men and women is higher for married operators (4.5 to 6 percentage points) than for single operators (about 4 percentage points), with the gap about constant across the days of the week (Figure 8).

Diving deeper still, Figure 9 reveals that the biggest gaps in acceptance rates (up to 8 percentage points) are between single women and single men with dependents. These results suggest that single men are able to take care of their dependents by working more overtime, possibly to pay for child support or to finance other forms of child care. Single women, on the other hand, appear to be making the decision to do the caretaking themselves rather than to caretake through additional earnings. It is, of course, possible that for women this situation is not as much a personal preference as it is a constraint. Thus, our results imply that differences in care-taking approaches and responsibilities appear to be a major reason why women work less overtime than men.

Crucially, a gap in overtime acceptance rates barely exists for those who are married. As we can see in Figure 10, married male operators with dependents are only 0 to 2 percentage points more likely to accept overtime than married women with dependents. This suggests that those who are married with dependents, men and women, are able to divide up caretaking responsibilities at home in a way that allows them to work overtime at similar levels. Or, perhaps, the presence of dependents necessitates that women, as much as men, earn as much as possible to afford care.

Looking at operators who are married and without children, however, we see that men are as many as 6 percentage points more likely than women to accept an overtime opportunity. Married female operators who do not have dependents are, it seems, less likely to play the co-breadwinner than if they had dependents. This result is our clearest clue that intra-household dynamics – gender norms and bias mixed in with preferences – keep women from accepting opportunities to work more hours at a premium rate.

5.2 Scheduled vs. Unscheduled Overtime

If women are unable to work as much unscheduled overtime as men due to higher values of time and due to a higher cost of working unanticipated hours, we should see less of a gap between men and women when it comes to scheduled overtime. At the time of each Pick, the MBTA knows when it will definitely need operators working overtime during the following quarter and allows operators to select those slots by seniority. As with unscheduled overtime, scheduled overtime opportunities vary in their availability from quarter to quarter and are offered by seniority, so that for any individual operator the arrival of a scheduled overtime opportunity is quasi-exogenous.

Using the same logic as in section 5.1, we run regressions to see how men and women differ when it comes to working each type of overtime. While there is virtually no difference between men and women when it comes to the probability of accepting scheduled overtime, there is substantial difference in the number of hours worked. Focusing on the differences in the hours worked, Table 5 illustrates the major differences between scheduled and unscheduled overtime. Controlling for age, tenure, seniority decile, and garage fixed effects, we see that women work about 7-11% fewer scheduled overtime hours per month and about 40-47.5% fewer unscheduled overtime hours per month than men.

Single women with dependents take about 6% fewer scheduled overtime hours than single men with dependents, but about 60% fewer unscheduled overtime hours (columns (5 and 6)). For married operators with dependents, however, the difference between men and women is about 14% for scheduled overtime and only about 5% for unscheduled overtime. As in the previous section, married men and women with dependents appear to be most similar in their overtime-taking patterns. Overall, women, especially single women with children, value both time and the ability to avoid unplanned work much more than men. These differences in choices, conditional on the same workplace choice sets, are at the core of the gender earnings gap we observe at the MBTA.

These numbers also suggest that the pension earnings gap would be further exacerbated if unscheduled overtime hours were allowed to be part of the payment calculations. Additionally, policy changes that convert last-minute overtime work into overtime work scheduled in advance (e.g., better scheduling, shift exchange, etc.) would allow women to work more hours and earn more.

5.3 Scheduling Choices

We have seen that the presence of dependents and an operator's marital status play a role in creating the gender earnings gap in our controlled setting. We have also seen that, with dependents, the difference in the probabilities of unscheduled overtime acceptance between men and women is highest on weekends and on days when the operators are already scheduled to work. All of these findings suggest that an operator's schedule could be playing a role in how much pay he or she takes home.

We explore this dimension of the earnings gap by looking at how men and women pick their schedules when given the same choice sets. Every quarter, operators select their routes and work times for the following quarter through The Pick. In each garage, the operators go into a room one-by-one, by seniority, and pick from the options remaining to them. Their objective is to find a way to pick, cafeteria-style, 40 hours of regularly scheduled work. Conditional on seniority, male and female operators thus have similar options of work days and hours and route qualities to choose from.

Do they choose differently? Figure 11 plots the probability of scheduling a weekend shift on the y axis and each seniority decile on the x axis, revealing a quite linear negative relationship. Almost 100% of the least senior operators get stuck with a weekend shift on their schedule, compared to 30-35% of the most senior operators. Moreover, conditional on seniority decile, we can see that women are less likely than men to select a weekend shift in a statistically significant way (Figure 12). Conditional on having the same choice set, men and women are thus revealing that they want to make different choices.

Holiday shifts have a similar undesirability. With seniority deciles on the x axis and the probability of scheduling a holiday shift on the y axis, Figure 13 shows that, as with weekend shifts, the least senior operators are the ones who are most likely to get stuck with a holiday shift. Holidays are paid events at the MBTA, meaning that all employees are paid lump sum for 8 hours at the base wage for those days. However, buses and trains continue to run on holidays, requiring operators to choose, by seniority, whether or not to work those days. Those who end up working during a holiday get paid at their base wage for the hours that they put in, in addition to the lump sum payment for the holiday. As seniority increases and choice sets increase, women try to avoid working holiday shifts more than men.

We can also see different scheduling choices through split-shifts. Working a split shift means not working 8 hours straight, but instead working a few hours (usually during the morning rush hour), followed by a big break or split, and then the remaining hours (usually during the evening rush hour). In the same spirit as Figures 11 and 13, Figure 14 displays the average probability for each seniority decile that an operator has of being scheduled to work a split shift. These data are only available for July through December of 2017 and so are noisier than our weekend results. However, we can clearly see that the least senior male operators, around the 10th percentile, have about an 80% probability of having to work a split shift and that this probability declines with seniority to a low of about 60%.

Split shifts, like weekend shifts, thus appear to be undesirable. Conditional on seniority, women try to avoid scheduling split shifts more than men and they do so at a fairly constant rate across the seniority spectrum. Only at high seniority, when they have the largest choice over the times of day during which the splits occur and over split lengths, do women choose split shifts at similar rates to men. We thus again have evidence that women have a stronger distaste for inconvenient schedules than men.

Since the scheduling choice sets that men and women face are the same within the same seniority bin and women are taking fewer weekend shifts and split shifts than men, it has to be the case that women are also choosing something that men try to avoid. Figure 15 demonstrates that women are more likely than men to pick shifts with fewer accidents. Using data for 2014-2017 on accidents (everything from assaults on operators to collisions with other vehicles or pedestrians) on different bus routes, we derive measures of route quality.

We calculate the number of accidents that male operators on a particular bus route have experienced and then divide by the number of men we expect to drive that route in a year.

We only have data on which operators worked which routes for 2017Q4, so we assume that the number of men working on each route per year is 4 times the number of men we observe working that route in 2017Q4. For each seniority decile, we then plot the average score (e.g., male operator accidents/number of male operators) for the routes selected by women and by men in 2017Q4.

We find that women are consistently selecting routes where men experience a higher number of accidents. This suggests that there is something about the quality of the routes themselves that men try to avoid more than women, as opposed to gender differences in driving ability. It thus appears that women are trading off less convenient schedules for less desirable routes, prioritizing schedule-related amenities on the job over route quality-related amenities.

5.4 Effects of Schedules on Earnings

When women and men end up in undesirable schedules, what is the impact on their earnings? Here we show that women are more likely to respond to undesirable schedules by taking unpaid leave and less likely than men to make up those lost earnings with overtime. Consequently, undesirable schedules lead men and women to make decisions that contribute to the earnings gap.

We measure whether men and women have different leave and overtime-taking patterns when faced with undesirable schedules. Regressing the number of weekly FMLA hours of leave taken by an operator on a dummy variable for whether the operator has a weekend shift scheduled for a given week, we can obtain this difference. Figure 16 reports the coefficient on the weekend shift dummy variable in regressions that we run for men and women separately and that control for operator and month fixed effects, as well as age, tenure, and seniority. Including operator fixed effects allows us to look at how within-person behavior changes as the desirability of their schedule varies over time. Figure 16 also reports the coefficient on the weekend shift dummy for regressions where the number of weekly overtime hours worked is the outcome variable.

Both men and women take more unpaid FMLA leave during weeks where they have to work weekend shifts compared to weeks without weekend shifts. The increase for women, however, is substantially larger than it is for men. Women see an increase of 0.85 hours per week (a 34% increase off of an average of 2.5 hours of FMLA taken in non-weekend shift weeks), while men see an increase of 0.4 hours per week (a 28.6% increase off of an average of 1.4 hours of FMLA taken in non-weekend shift weeks).

On average, men work the same number of hours in weeks with a weekend shift as in weeks without one because they substitute the lost regular hours for overtime hours. Women, on the other hand, fall far short of making up lost earnings with overtime hours and work fewer hours in weekend shift weeks.[14] As a result, men earn more in weekend shift weeks than in non-weekend shift weeks, while women earn less. By affecting male and female behavior in different ways, weekend shifts exacerbate the gender earnings gap.

Holiday weeks exhibit a similar pattern, but the magnitudes for the additional FMLA hours taken and overtime hours worked in holiday weeks compared to non-holiday weeks are considerably greater than for weeks with weekend shifts. Just like Figure 16, Figure 17 shows the coefficient on the holiday shift dummy variable in regressions that we run for men and women separately and that control for operator and month fixed effects, as well as age, tenure, and seniority. Employing this specification, we see men taking an average of 1 more hour of FMLA in weeks with a holiday shift than in weeks without one and working an average of 2 more hours of overtime. Women take almost 2 more hours of FMLA in weeks with a holiday shift and work about 1.2 more hours of overtime.

As with weekend shift weeks, men generally make more and women make less on weeks with holiday shifts than on weeks without one. The increase in magnitudes of hours taken off and hours of overtime worked is likely due to the fact that not having to work during a holiday is particularly desirable and the fact that many operators are also taking vacation and sick days to avoid working the day. The sheer abundance of overtime opportunities during a holiday week likely increases the magnitudes of the hours of overtime worked.

As we would expect, split shift days reveal the same dynamics. Looking at split shift days

[14]Saturday, Friday, and Sunday, in that order, are the likeliest of all days of the week to see an operator take unpaid time off, giving FMLA the "Friday-Monday Leave Act" nickname. We are not aware of reasons why family medical emergencies would be more likely to happen on those days of the week than on other days, further suggesting that operators are using FMLA to avoid undesirable schedules.

and comparing them to non-split shift days, Figure 18 again demonstrates men trading off unpaid time off almost one-for-one with overtime hours. This time, the tradeoff occurs with about 0.7 hours of the work day. Women, on the other hand, are losing money on split shift days relative to non-split shift days due to a large increase in FMLA (.15 hours) and only a small increase (0.05 hours) in overtime hours. Seeing how undesirable schedules affect men and women differently sheds light on why, conditional on the same seniority and the same choice set, women are less likely than men to schedule themselves a weekend shift, holiday shift, or split shift. While both genders find these schedules undesirable, women find them costlier than men.

These results, along with our findings in previous sections, demonstrate that women have less flexibility than men and that they value not being at work at particularly undesirable times more than men. While we cannot fully determine whether preferences or personal life constraints are driving the choices we observe, our evidence does show that increasing the predictability of overtime opportunities along with schedule flexibility can help women work more hours and reduce the earnings gap. In the following section, we discuss the effects of two policy changes at the MBTA on the earnings gap and suggest other approaches that are grounded in our findings.

6 Altering Institutional Features

The gender earnings gap observed in our setting emerges because of differential responses to the institutional environment. Consequently, we consider how changing aspects of this environment can affect the gap. Specifically, we focus on two major policy changes undertaken by the MBTA in 2016-2017 with the objective of saving money and reducing absenteeism. One policy made it harder to take FMLA leave; another changed which hours qualified as overtime.

6.1 FMLA

In March of 2016, the MBTA hired UPMC Work Partners to be a third-party administrator in charge of making sure that FMLA certification was obtained and used properly. UPMC was now entrusted with ensuring that (1) doctor's notes certifying FMLA eligibility were legitimate and that (2) on a day-to-day basis, operators take FMLA leave in the way prescribed by their doctor. In particular, the latter role requires UPMC to ensure that operators who are only certified to take continuous FMLA leave (leave for weeks or months at a time), do not instead take it intermittently for several hours or days at a time.

By requiring operators to bring in new doctor's notes and to recertify their eligibility for FMLA, this policy change took the active FMLA certification rate at the MBTA down from 45% of all operators in 2015 to 27% of all operators by the end of 2016. As Figure 19 shows, the drop in FMLA hours was most pronounced for female operators, but was also present for male operators. FMLA-usage among women went down from an average of about 35 hours per quarter to 25 hours per quarter–a decrease of 28%. Men saw a drop from 20 hours per quarter to about 15 hours per quarter–a decrease of 25%. Additionally, the pre-trends here are fairly flat for both men and women, giving us confidence that the drops we are identifying are in fact associated with the policy change.

While there was some substitution from FMLA leave to unexcused leave, in total there was still a reduction in the amount of leave taken by both women and men. Unexcused leave, which is also unpaid, entails an operator being late or absent without notifying his supervisor or providing a legitimate excuse. Panel A in Figure 20 plots the relationship between total FMLA usage in 2014 (x axis) and total unexcused leave taken in 2015 (y axis). There is a flat relationship between the two, both for men and women. However, if we look at Panel B, where total FMLA usage in 2015 is on the x axis and total 2017 unexcused leave hours are on the y axis, we see a strong positive linear relationship emerge. Those who took a lot of FMLA before the policy change are now taking a lot of unexcused leave. The conversion, however, has been far from one-for-one – 1 FMLA hour for 0.1 unexcused hour – reducing the overall level of absenteeism at the MBTA.

This incomplete conversion reflects the fact that unexcused leave is considerably costlier to take than FMLA.[15] Whereas FMLA leave is protected under federal law and is no-questions-asked, unexcused leave can result in suspensions, limits on ability to work overtime, and ulti-

[15]Operators also reveal this to us before the policy change by mostly using FMLA, and not unexcused leave, to avoid undesirable schedules.

mately recommendations for discharge. Using data from 2016-2017, Figure 21 shows the relationship between discipline severity on the x axis and the number of unexcused events (tardies or absences) on the y axis. As we would expect, there is a positive relationship between the number of offenses and discipline severity, with a recommendation for discharge, the 5th and most severe disciplinary step, occurring after an average of 30 unexcused events. While this number is quite high, it makes clear why FMLA and not unexcused leave has been the dominant way for operators to take unpaid time off.

Given the disproportionate effect of the FMLA policy change on women, however, women are more likely to face discipline than men in this new regime. The fact that women are nevertheless willing to take unexcused leave reaffirms how much they value not having to work at particularly inconvenient times. Figure 22 illustrates vividly how the FMLA policy has led to a spike in unexcused leave, with women going from taking an average of 2 hours per quarter to an average of 16 hours in 2017Q3 (Panel A). Men see an increase from 2 hours per quarter to about 6. As in Figure 19, the flat pre-trends at 2 hours per quarter reassure us that we are capturing the effect of the policy on operator behavior. Moreover, in line with our earlier finding that the presence of dependents exacerbates the earnings gap but does not explain all of it, the increase in unexcused leave is only slightly steeper for those with dependents than for those without dependents, as shown in Panels B and C in Figure 22.

6.2 Overtime

The second policy change was announced at the end of 2016 with the new collective bargaining agreement, but did not go into effect until July 9th, 2017.[16] Overtime went from being defined as any time in excess of 8 hours worked in a day to any time worked in excess of 40 hours in a week. The result, as we can see in Figure 23, was a drop in the average number of overtime hours worked by male operators from about 40 hours per quarter to about 10 hours per quarter. Female overtime hours dropped as well, from about 20 hours to about 10 hours per quarter.[17]

[16] The policy was supposed to go into effect on January 1st, 2017, but a software issue delayed the rollout until July 9, 2017.

[17] Here, overtime refers to both scheduled and unscheduled overtime.

As with FMLA, the pre-trends here are fairly flat from 2011, through the FMLA policy change in 2016, and up to the third quarter of 2017 when the overtime policy actually took effect. The fact that the announcement of the policy at the end of 2016 does not have an immediate impact on overtime hours is evidence that either operators have no control over when they are offered overtime or that operators do not find loading up on overtime to be worthwhile, or both. Our results and our conversations with MBTA personnel suggest that the former is the most likely explanation.

Individually, the FMLA policy curtailed operators' ability to take leave while the overtime policy limited operators' opportunities for additional earnings. In conjunction, the policies made it harder for operators to engage in the kind of gaming we discuss in Section 5.4, in which operators take regular pay hours off and make them up with overtime hours at premium pay. Indeed, we see that of those men who took FMLA leave in a given week, the percent who also took overtime that same week dropped after the policy changes by 41%, from 22% to 13% (Figure 24). Similarly, the percent of women who take both FMLA leave and overtime in the same week dropped by 37%, from 16% to 10%. While reducing gaming by both sexes, the policies also reduced operator ability to shift their work hours around, effectively eliminating the hack operators used to create workplace flexibility.

Since men had been engaging in these tradeoffs more than women, the reduction in gaming capacity was mostly felt by men. One way to see this is by looking at whether the policy changes narrowed differences in leave-taking and overtime patterns between weekend shift weeks and non-weekend shift weeks. The lighter points in Figure 25 measure the intensity of these differences in 2011-2015, prior to the policy changes. The observations in full color show the differences in 2016-2017. In contrast to 2011-2015, differences in 2016-2017 between weeks with and without weekend shifts are near zero. To the small extent that operators are continuing to cover their FMLA hours with overtime hours, men and women are now doing so in statistically similar ways. As a result of the policy changes, weekend shifts no longer contribute to the gender earnings gap.

6.3 Other Ways To Reduce the Gap

The policies discussed above were aimed at reducing absenteeism at the MBTA, but they also narrowed the earnings gap, from $0.89 in 2015 to $0.94 in 2017. The policies illustrate, however, that not all ways of shrinking the gender earnings gap are created equal and some may come with substantial negative consequences. The increased oversight over FMLA usage, while reasonable, has decreased female operator welfare by forcing women to work hours that they previously revealed they prefer to avoid at the regular wage. The decrease in overtime hours, while also reasonable and in line with policies across the country, decreased male operator welfare the most by decreasing the value of the extra work hours they previously wanted to work. Operators are now taking less leave and the MBTA is spending less on overtime, saving taxpayers dollars.

Given the increase in unexcused leave, however, it is not clear that these changes have resulted in better public service provision. Panel A of Figure 26 shows, on its x axis, the hours of FMLA leave taken by operators within the same garage on a given day and on its y axis the average number of lost trips on routes coming out of each garage on a given day. Panel B, in contrast, shows the relationship between unexcused leave hours and lost trips.[18] The unexcused leave slope is steeper than the FMLA slope, with 1 hour of FMLA leave translating into .18 lost trips and 1 hour of unexcused leave resulting in .27 lost trips.

The lost trips that we are using here are marked by MBTA supervisors as having resulted from operator absence, so the differences in slopes must be due to differences in the difficulty of finding a substitute operator. What we are seeing, then, is that unannounced and unanticipated leave is harder for supervisors to manage than leave that operators take after informing their supervisor some time in advance. Thus, while the policy changes are saving taxpayer dollars through lower absenteeism and lower overtime expenditures, they are not necessarily improving service provision.

Given the differential ways in which men and women value flexibility and planned overtime opportunities, we posit that increasing workplace schedule flexibility can further reduce

[18]We are controlling for week and garage fixed effects in the background, so the relationship shown here is a residualized one.

the earnings gap, increase operator welfare (especially for women), decrease absenteeism, and improve public service provision. One such approach would be to allow operators to exchange shifts they cannot make for shifts that others cannot make, or to transfer an inconvenient shift to someone who is willing to work it for the extra income. This capability could serve as a complement to the current system that relies on seniority for shift assignment.

A 2016 study that introduced shift sharing and increased schedule stability at certain retail GAP Inc. locations suggests that this approach has merit (Williams et al. (2016)). Along with eliminating on-call positions and stabilizing schedules in other ways, the researchers allowed sales associates to swap shifts using an application on their phones. The result was happier employees, higher employee retention, and a consequent 7% increase in sales.

We believe that a similar approach would be beneficial for the MBTA as well. It would allow employees to inject flexibility into their schedules without resorting to unexcused leave, lowering the need for disciplinary actions, improving employee morale, and reducing lost trips in the process. In turn, those who would like to work for additional income, at any seniority level, would be able to do so more easily. We expect the former will benefit women more than men, while the latter benefits men more than women.

7 Conclusion

We show that a gender earnings gap can exist even in a controlled environment where work tasks are similar, wages are identical, and tenure dictates promotions. The gap of $0.89 in our setting, which is 60% of the earnings gap across the United States, can be explained entirely by the fact that, while having the same choice sets in the workplace, women and men make different choices. Women use the Family Medical Leave Act (FMLA) to take more unpaid time off than men and they work fewer overtime hours at 1.5 times the wage rate. At the root of these different choices is the fact that women value time and flexibility more than men. Men and women choose to work similar hours of overtime when it is scheduled a quarter in advance, but men work nearly twice as many overtime hours than women when they are scheduled the day before. Using W-4 filings to ascertain marital status and the presence of dependents, we show that women with dependents – especially single women – value time away from work more than men with dependents.

When selecting their work schedule for the following quarter, women try to avoid inconvenient days, like weekends, and shifts, like split-shifts, more than men. Prioritizing schedule-related amenities over route quality-related amenities, women select routes with higher probabilities of assaults and collisions in order to avoid unfavorable schedules. When faced with having to work an unfavorable schedule, like a weekend, holiday, or split shift, women take more unpaid time off. Men also take more unpaid time off in those circumstances, but they more than make up for lost earnings with overtime. While constrained schedules lead to lower earnings for women, they result in higher earnings for men. In an effort to reduce absenteeism and overtime expenditures, the MBTA oversaw two policy changes: one that made it harder to take unpaid time off with FMLA and another that made it harder to be paid at the overtime rate. While the policy changes reduced the gender earnings gap from \$0.89 to \$0.94 and made it harder for operators to trade off regular hours for overtime, they also decreased women's well-being by further constraining the work environment.

Since the operators at the MBTA are selected for their ability to work 24 hours a day, 7 days a week, it is likely that our estimate of the role of choice in the nationwide gender earnings gap is a lower bound. We show that workplaces, especially those that involve shift work or where seniority apportions amenities, can reduce their gender earnings gaps by increasing schedule predictability and flexibility for their employees. Workplaces that provide defined benefit pension plans will also see the gender pension gap narrow. The changes will allow women to work more hours, reducing absenteeism and overtime pay, and improving the reliability of service provision. Further research in this sphere has the potential to provide workplaces with additional tools to generate such schedule predictability and flexibility.

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TABLES

Table 1: Operator Characteristics

	All Operators	Male	Female	With Schedule Data	With W4 Data
Age	47.01	47.62	45.65	46.14	45.60
	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)
Female	30.72	0.00	100.00	29.48	30.46
	(0.8)	(0)	(0)	(1.1)	(1.0)
Tenure	12.42	12.52	12.20	11.09	11.10
	(0.1)	(0.2)	(0.2)	(0.2)	(0.1)
Hourly Wage	32.68	32.66	32.72	34.23	33.88
	(0.10)	(0.1)	(0.2)	(0.07)	(0.07)
Bus	65.53	68.26	59.35	68.78	65.36
	(0.9)	(1.0)	(1.6)	(1.1)	(1.0)
Light Rail	20.69	19.56	23.24	20.10	19.93
	(0.7)	(0.9)	(1.4)	(0.9)	(0.8)
Heavy Rail	13.78	12.18	17.41	11.12	14.71
	(0.6)	(0.7)	(1.2)	(0.7)	(0.7)
Ever FMLA	75.62	70.85	86.38	78.89	80.46
	(0.8)	(1.0)	(1.1)	(1.0)	(0.8)
Overtime hrs/day	0.36	0.41	0.24	0.36	0.36
	(0.008)	(0.01)	(0.01)	(0.010)	(0.009)
FMLA hrs/day	0.28	0.23	0.37	0.25	0.26
	(0.009)	(0.01)	(0.02)	(0.01)	(0.01)
Married					26.19
					(0.9)
Dependents					19.59
					(0.8)
Observations	3,011	2,086	925	1,781	2,318

Note: This table shows summary statistics for the whole sample of bus and train operators (column 1), male operators only (column 2), female operators only (column 3), only the operators for whom we have detailed schedule data (column 4), and only the operators for whom we have W-4 data on marital status and dependents (column 5). Age is in years; Female is in percent; Tenure is in years; Hourly Wage is in dollars; Bus, Light Rail, and Heavy Rail are in percent; Ever FMLA is percent who have ever been approved for FMLA; Overtime hrs/day shows scheduled plus unscheduled overtime taken on average per day; FMLA hrs/day shows average number of FMLA hours taken per day; Married is in percent; Dependents is in percent. Standard deviation in parentheses.

Table 2: Operator Characteristics by Seniority

	All Operators	Top Decile	Middle Decile	Bottom Decile
Age	47.01	55.43	44.30	40.43
	(0.2)	(0.3)	(0.6)	(0.6)
Female	30.72	28.39	31.95	25.65
	(0.8)	(2.1)	(2.6)	(2.9)
Tenure	12.42	25.61	9.07	3.35
	(0.1)	(0.2)	(0.1)	(0.06)
Hourly Wage	32.68	32.34	34.31	28.81
	(0.10)	(0.2)	(0.3)	(0.2)
Bus	65.53	71.40	61.98	65.22
	(0.9)	(2.1)	(2.7)	(3.1)
Light Rail	20.69	18.79	23.00	19.13
	(0.7)	(1.8)	(2.4)	(2.6)
Heavy Rail	13.78	9.81	15.02	15.65
	(0.6)	(1.4)	(2.0)	(2.4)
Ever FMLA	75.62	63.26	82.43	60.00
	(0.8)	(2.2)	(2.2)	(3.2)
Overtime hrs/day	0.36	0.60	0.32	0.29
	(0.008)	(0.03)	(0.02)	(0.03)
FMLA hrs/day	0.28	0.25	0.27	0.19
	(0.009)	(0.02)	(0.02)	(0.04)
Observations	3,011	479	313	230

Note: This table shows summary statistics for the whole sample of bus and train operators (column 1), for just those operators who are in the top seniority decile (column 2), for just those operators who are in the 50th seniority decile (column 3), and for just those operators who are in the bottom seniority decile (column 4). Age is in years; Female denotes percentage of operators who are female; Tenure is in years; Hourly Wage is in dollars; Bus denotes percentage of operators who are bus operators; Light Rail denotes percentage of operators who are light rail operators; Heavy Rail denotes percentage of operators who are heavy rail operators; Ever FMLA is percentage who have ever been approved for FMLA; Overtime hrs/day shows all forms of overtime (scheduled and unscheduled) taken on average per day; and FMLA hrs/day is the average number of FMLA hours taken per day. Standard deviation in parentheses.

Table 3: Probability of Accepting Overtime, Conditional on Being Offered

	Any OT	Any OT	Weekend OT	Working OT
Female	-0.047***	-0.044***	-0.044***	-0.046***
	(0.0003)	(0.0003)	(0.0006)	(0.0004)
Constant	0.096***	0.084***	0.053***	0.108***
	(0.0002)	(0.0009)	(0.0018)	(0.0012)
Controls	No	Yes	Yes	Yes
Male Mean		0.096	0.106	0.109
Adjusted R^2	0.006	0.011	0.015	0.013
Observations	3,747,826	3,747,089	995,462	2,246,614

Note: Outcomes are dummy variables that equal 1 if OT was accepted on any day (Any OT), on a weekend (Weekend OT), or on a working day (Working OT). Controls include age, tenure, seniority decile, and garage fixed effects. Standard errors in parentheses. * = p<0.05, ** = p<0.01, *** = p<0.001.

Table 4: Gender Differences in Weekly Earnings

	(1)	(2)	(3)	(4)
Female	-160.1***	-158.7***	-145.6***	-138.2***
	(1.20)	(1.19)	(1.41)	(1.58)
Seniority Decile		2.710***	3.063***	3.021***
		(0.019)	(0.020)	(0.020)
Dependents=1			2.760	26.83***
			(1.85)	(2.44)
Married=1				52.48***
				(1.60)
Female × Dependents			-33.22***	-53.58***
			(2.89)	(3.39)
Female × Married				-6.96*
				(3.52)
Dependents × Married				-71.69***
				(3.76)
Female × Dependents × Married				85.65***
				(8.67)
Constant	1447.3***	1296.3***	1316.0***	1302.7***
	(.67)	(1.25)	(1.30)	(1.37)
Adjusted R^2	0.025	0.053	0.064	0.066
Observations	682,583	682,583	571,344	571,344

Note: Outcome variable is total weekly earnings. Without any controls, women earn \$0.89 on the male-worker dollar (column 1). Controlling for seniority, women still earn \$0.89 on the male-worker dollar (column 2). Women without dependents earn \$0.90 to the \$1 earned by a man without dependents (column 3). Single women with dependents earn \$0.87 to the \$1 earned by a single man with dependents – the biggest gap in our setting (column 4). Standard errors are in parentheses. * = p<0.05, ** = p<0.01, *** = p<0.001.

Table 5: Scheduled vs. Unscheduled Overtime

	(1) Sched OT	(2) Unsched OT	(3) Sched OT	(4) Unsched OT	(5) Sched OT	(6) Unsched OT
Female (Yes=1)	-0.107***	-0.475***	-0.0691***	-0.456***	-0.0715***	-0.394***
	(0.00653)	(0.00901)	(0.00781)	(0.0113)	(0.00877)	(0.0127)
Dependents (Yes=1)			-0.0447***	-0.000344	-0.0681***	0.123***
			(0.00995)	(0.0144)	(0.0131)	(0.0189)
Female × Dependents			-0.0200	-0.0470*	0.0144	-0.204***
			(0.0159)	(0.0230)	(0.0185)	(0.0267)
Married=1					0.0316***	0.215***
					(0.00866)	(0.0125)
Female × Married					0.0329	-0.211***
					(0.0195)	(0.0280)
Dependents × Married					0.0430*	-0.347***
					(0.0204)	(0.0294)
Female × Dependents × Married					-0.119*	0.764***
					(0.0475)	(0.0687)
Constant	-0.0446**	1.176***	-0.0340	1.160***	-0.0288	1.145***
	(0.0170)	(0.0238)	(0.0178)	(0.0261)	(0.0179)	(0.0262)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.133	0.073	0.096	0.060	0.096	0.063
Observations	129,318	141,414	110,446	120,357	110,446	120,357

Note: Outcome variables are: 1) Sched OT: log hours of scheduled overtime worked per month, where scheduled overtime is selected a quarter (three months) in advance; 2) Unsched OT: log hours of unscheduled overtime worked per month, where unscheduled overtime is offered a day in advance or on the same day as the overtime shift. Controls include age, tenure, seniority decile, and garage fixed effects. Standard errors in parentheses. * = p<0.05, ** = p<0.01, *** = p<0.001.

Figure 1: The Gender Earnings Gap Across Seniority

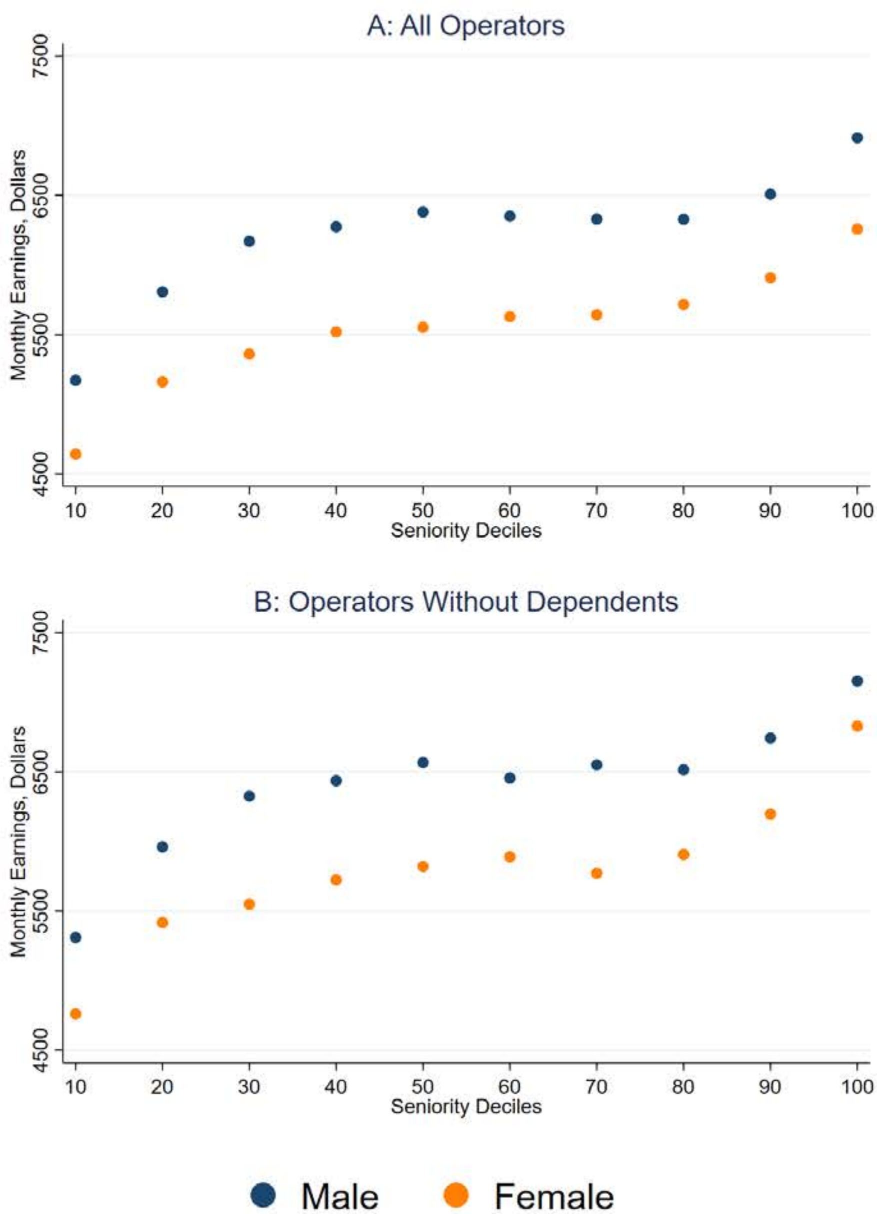


Figure 1: Panel A shows that average monthly earnings (y axis) for bus and train operators in each seniority decile (x axis). Across the seniority spectrum, women earn less than men. At lowest seniority, women make about \$4,600/month while men earn about \$5,200/month. At highest seniority, women make about \$6,300/month, while men earn almost \$7,000/month. Seniority is determined for full time operators based on which operator has the longest tenure within his or her garage each quarter. Seniority determines the order in which routes, schedules, and holidays are picked, as well as who has first access to overtime opportunities. Panel B shows average monthly earnings (y axis) for men and women without dependents for each seniority decile. Women without dependents earn less than men without dependents across the seniority ladder.

Figure 2: Accounting for the Gender Earnings Gap

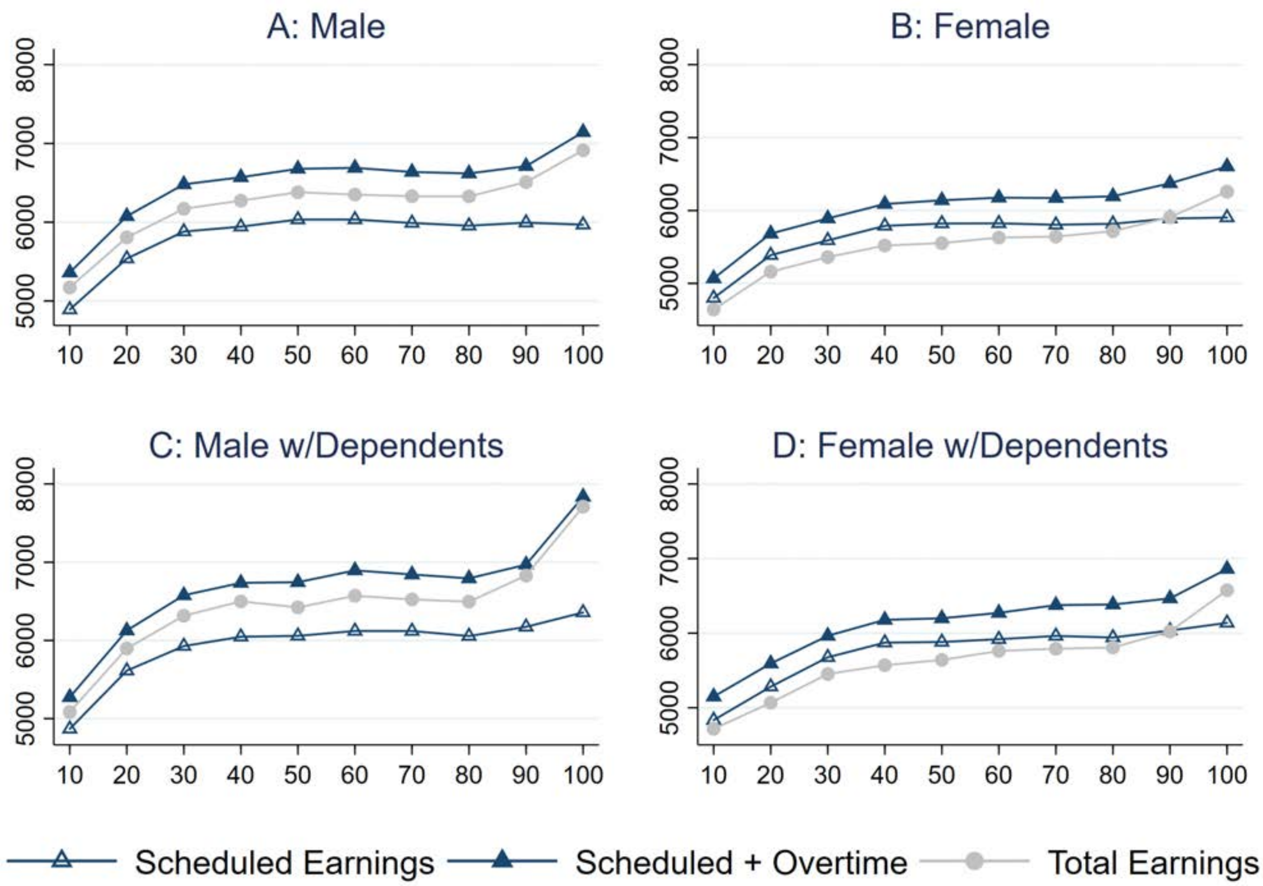


Figure 2: We perform an accounting exercise to understand the gender earnings gap. We calculate scheduled earnings based on the hours each operator is scheduled to work at his/her regular wage. We then add in the overtime hours (scheduled and unscheduled) that the operator actually works at 1.5 times his/her regular wage. Total earnings are scheduled earnings plus overtime earnings, less the earnings forgone due to unpaid leave (FMLA and unexcused). The x axis shows seniority deciles, while the y axis shows monthly earnings in dollars. Each point is the average for operators in a given seniority decile. Panel A plots the series for male operators, Panel B for female operators, Panel C for male operators with dependents, and Panel D for female operators with dependents.

Figure 3: Differences in Pension-Eligible Earnings

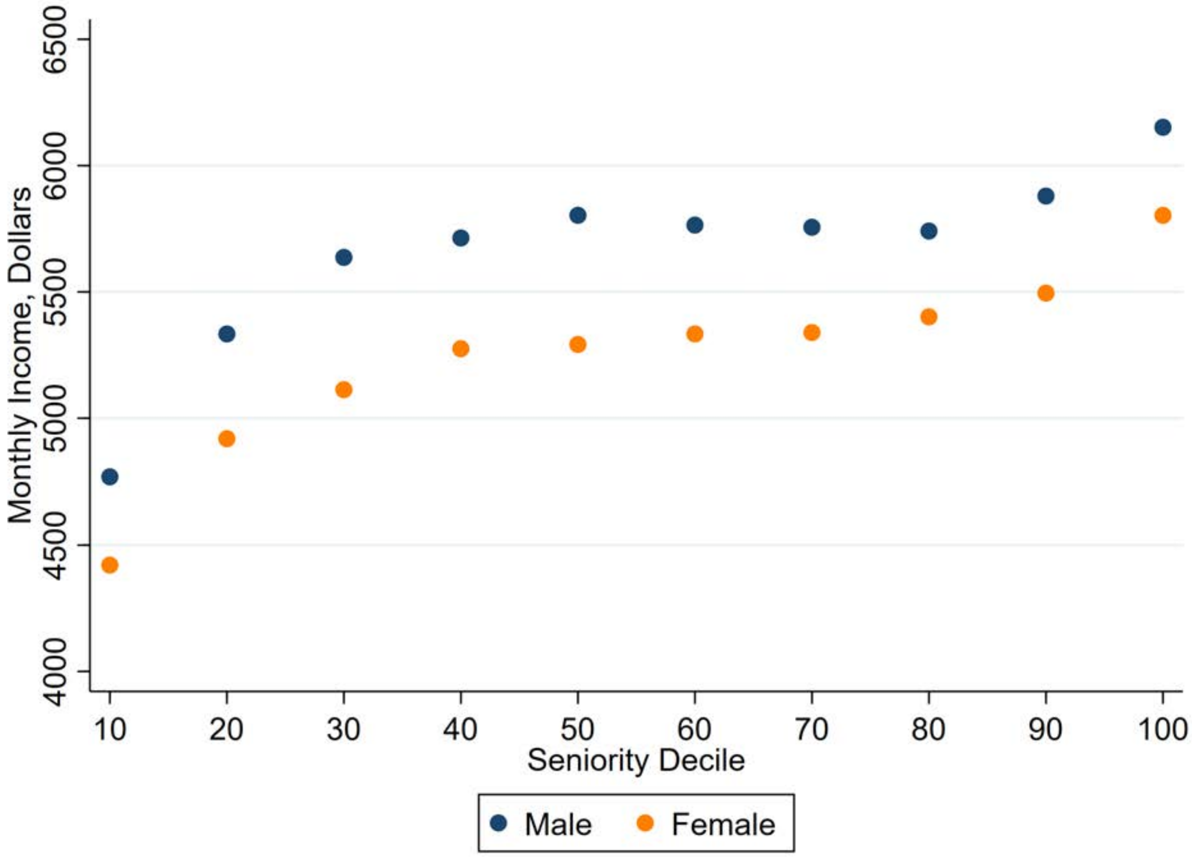


Figure 3: Conditional on seniority, where men and women have the same choice sets of schedules and routes, women take work less pension-eligible hours than men. These pension eligible hours include regular work hours and some forms of overtime. Built-in overtime, which takes workers slightly over an 8 hour work day due to the need to, for example, bring a bus or train back to the garage and trippers, which are extra pieces of work on top of a regular schedule, count towards pension calculations. Annual pension payments are calculated as 2.46% times the average of the operator's three highest paying years times years of service. The highest paying years are most likely going to be the last year's of an operator's career since his wage increases steadily with inflation over time and since most of the built-in overtime and tripper overtime opportunities are made available first to the most senior operators.

Figure 4: Exogenous Arrival of Overtime Opportunities

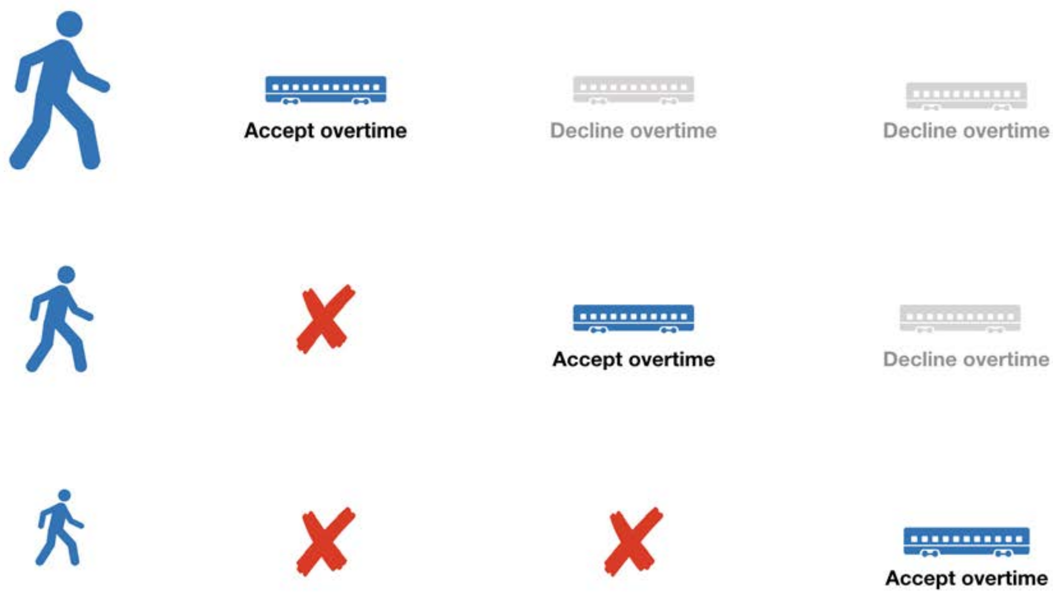


Figure 4: This figure demonstrates how we are able to exploit the seniority structure of overtime offer rules to obtain exogenous variation in the availability of overtime. In this example, we have three operators ranked by seniority. For all but the most senior operator, the availability of overtime depends on whether those more senior than him accept or reject an overtime opportunity. Assuming, we think plausibly, that no individual operator can meaningfully affect the decisions of those more senior than him, we can treat the arrival of an overtime opportunity as a Poisson process.

Figure 5: Difference in Probability of Overtime Acceptance Between Men and Women

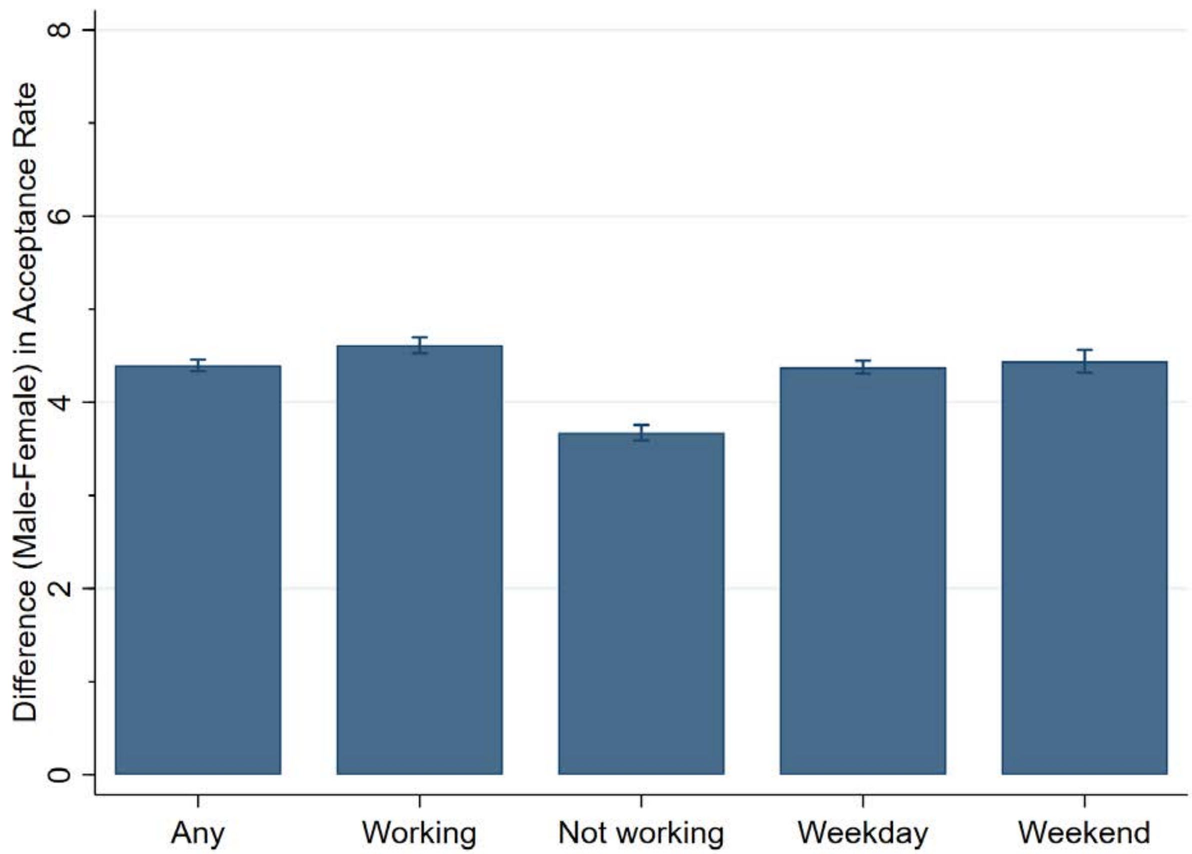


Figure 5: The arrival of overtime opportunities for any individual operator is a Poisson process, allowing us to use the process by which overtime is offered to measure male and female probabilities of accepting overtime. Do obtain the difference between male and female probabilities of accepting overtime, we regress a dummy for accepting overtime conditional on being offered on a dummy variable for female and controls for age, tenure, seniority, and garage fixed effects. We can see that, on average, men are about 3.8 to 5 percentage points more likely than women to accept an overtime opportunity, with some variation by day type.

Figure 6: Distribution of Male and Female Probabilities of Accepting Overtime, Conditional on Being Offered

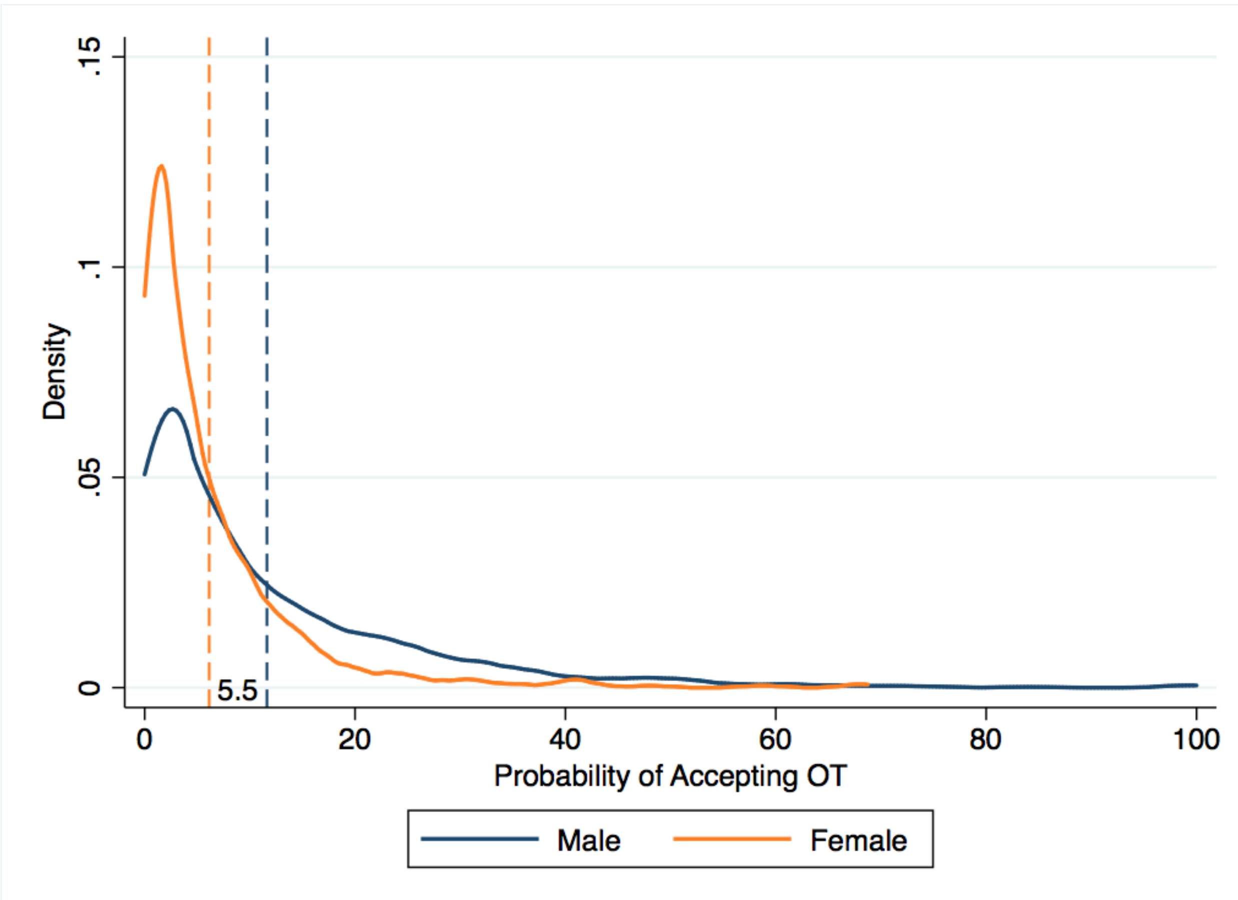


Figure 6: We calculate the probability of accepting overtime conditional on being offered an opportunity for each person over our entire sample. This figure shows the distributions of these probabilities for men and women. There are more men than women who accepted overtime opportunities more than 50% of the time, while there are about twice as many women as men who decline overtime opportunities all the time. The blue dashed vertical line marks the male mean probability of accepting overtime. The orange dashed vertical line marks the female mean probability of accepting overtime.

Figure 7: Difference in Probability of Overtime Acceptance Between Men and Women, By Dependent Status

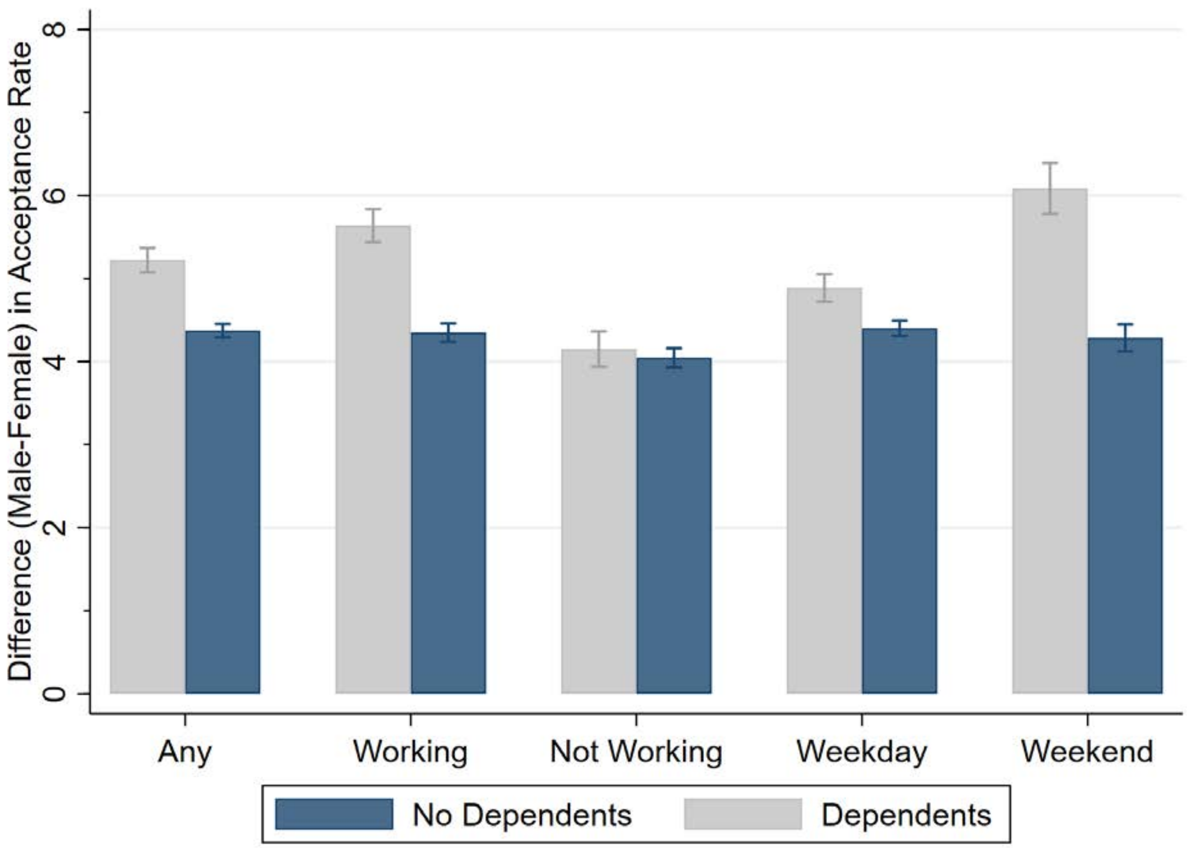


Figure 7: The arrival of overtime opportunities for any individual operator is a Poisson process, allowing us to use the seniority system by which overtime is offered to measure male and female probabilities of accepting overtime. To obtain the difference between male and female probabilities of accepting overtime, we regress a dummy variable for accepting overtime conditional on being offered on a dummy variable for female and controls for age, tenure, seniority, and garage fixed effects. We run separate regressions here for operators with and without dependents. Our results suggest that the presence of dependents plays a role in how men and women value time and how likely they are to accept overtime opportunities. Men with dependents are more likely than women with dependents to accept overtime and that gap is bigger than the gap between men and women who do not have dependents.

Figure 8: Difference in Probability of Overtime Acceptance Between Men and Women, By Marital Status

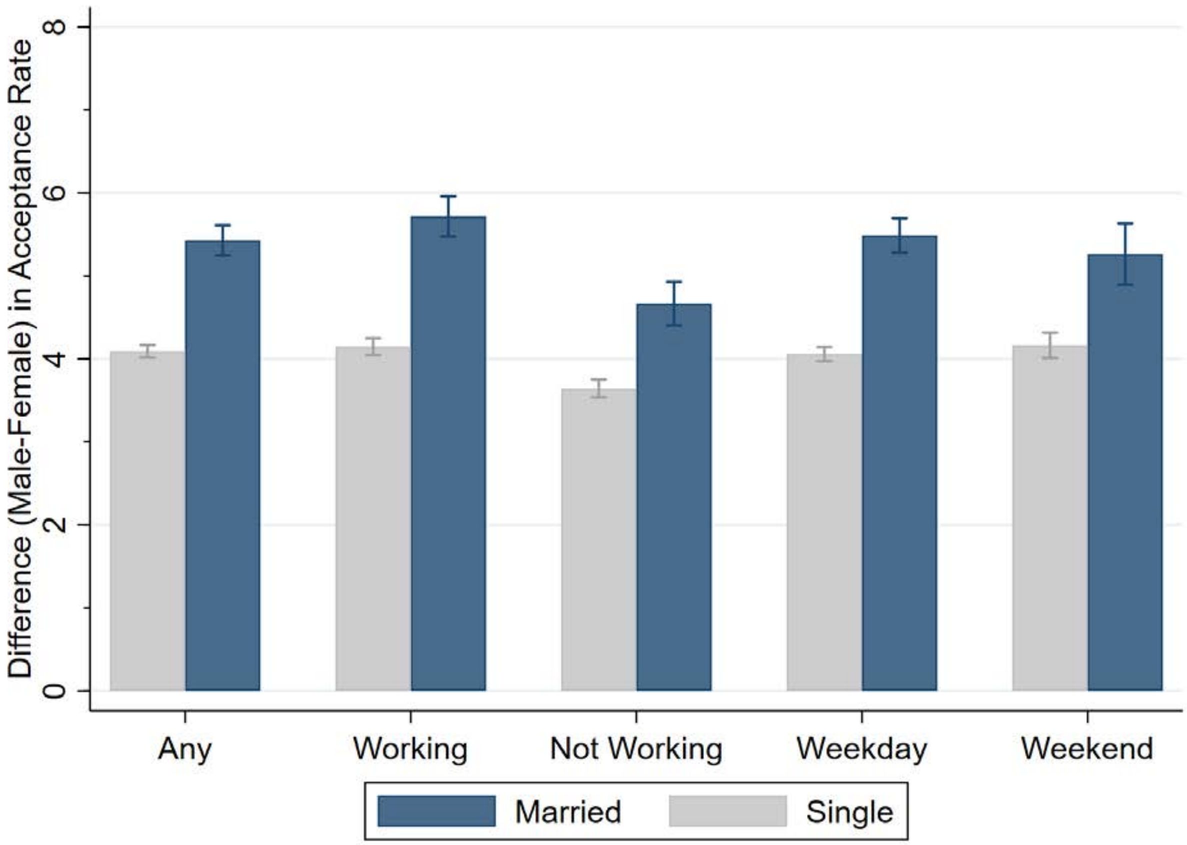


Figure 8: The arrival of overtime opportunities for any individual operator is a Poisson process, allowing us to use the seniority system by which overtime is offered to measure male and female probabilities of accepting overtime. To obtain the difference between male and female probabilities of accepting overtime, we regress a dummy variable for accepting overtime conditional on being offered on a dummy variable for female and controls for age, tenure, seniority, and garage fixed effects. We run separate regressions here for operators who are and who are not married. Our results suggest that marital status plays a role in how men and women value time and how likely they are to accept overtime opportunities. Married men are more likely than married women to accept overtime and that gap is bigger than the gap between men and women who are single.

Figure 9: Difference in Probability of Overtime Acceptance Between Single Men and Women, By Dependent Status

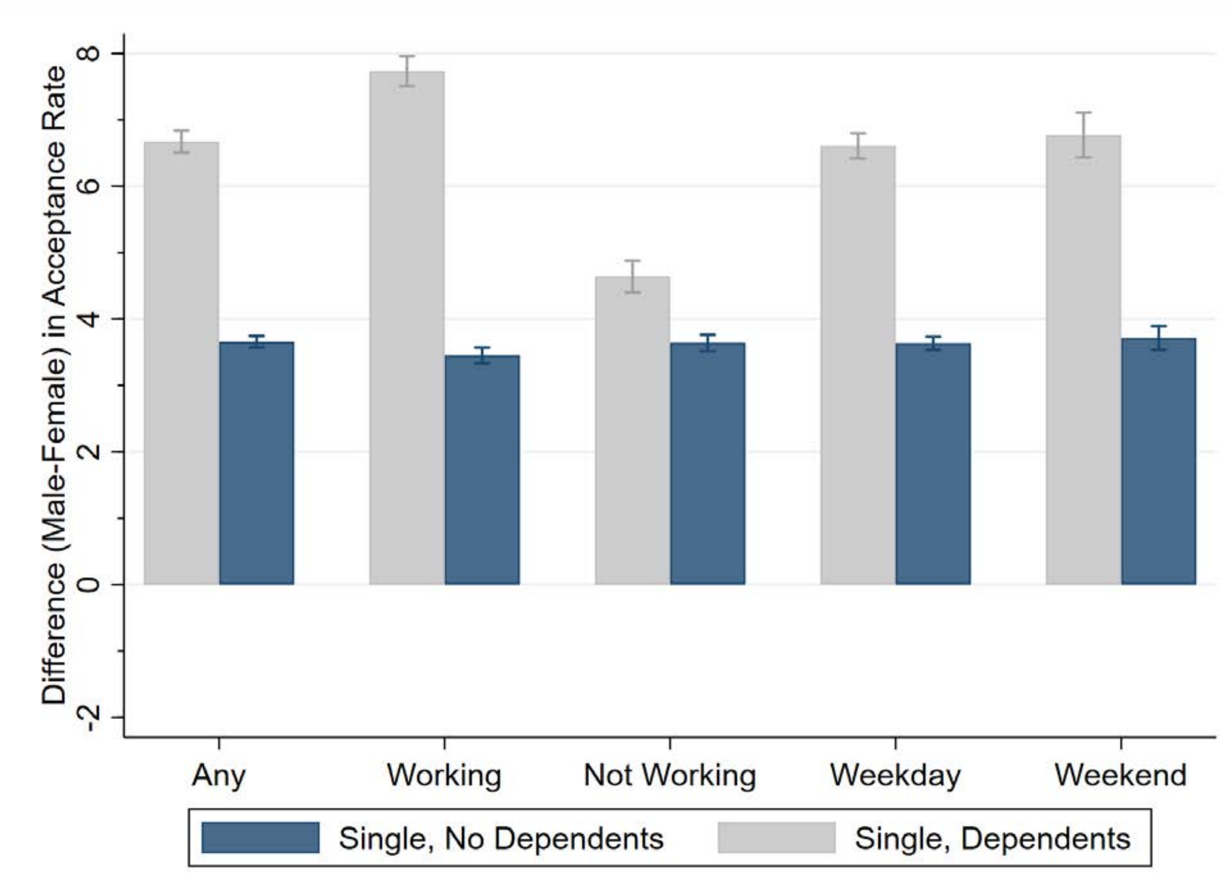


Figure 9: The arrival of overtime opportunities for any individual operator is a Poisson process, allowing us to use the seniority system by which overtime is offered to measure male and female probabilities of accepting overtime. To obtain the difference between male and female probabilities of accepting overtime, we regress a dummy variable for accepting overtime conditional on being offered on a dummy variable for female and controls for age, tenure, seniority, and garage fixed effects. We focus on single operators and run separate regressions for operators with and without dependents. Our results suggest that the presence of dependents for single operators plays an especially big role in how men and women value time and how likely they are to accept overtime opportunities. Single men with dependents are considerably more likely than single women with dependents to accept overtime and that gap is bigger than the gap between single men and women who do not have dependents.

Figure 10: Difference in Probability of Overtime Acceptance Between Married Men and Women, By Dependent Status

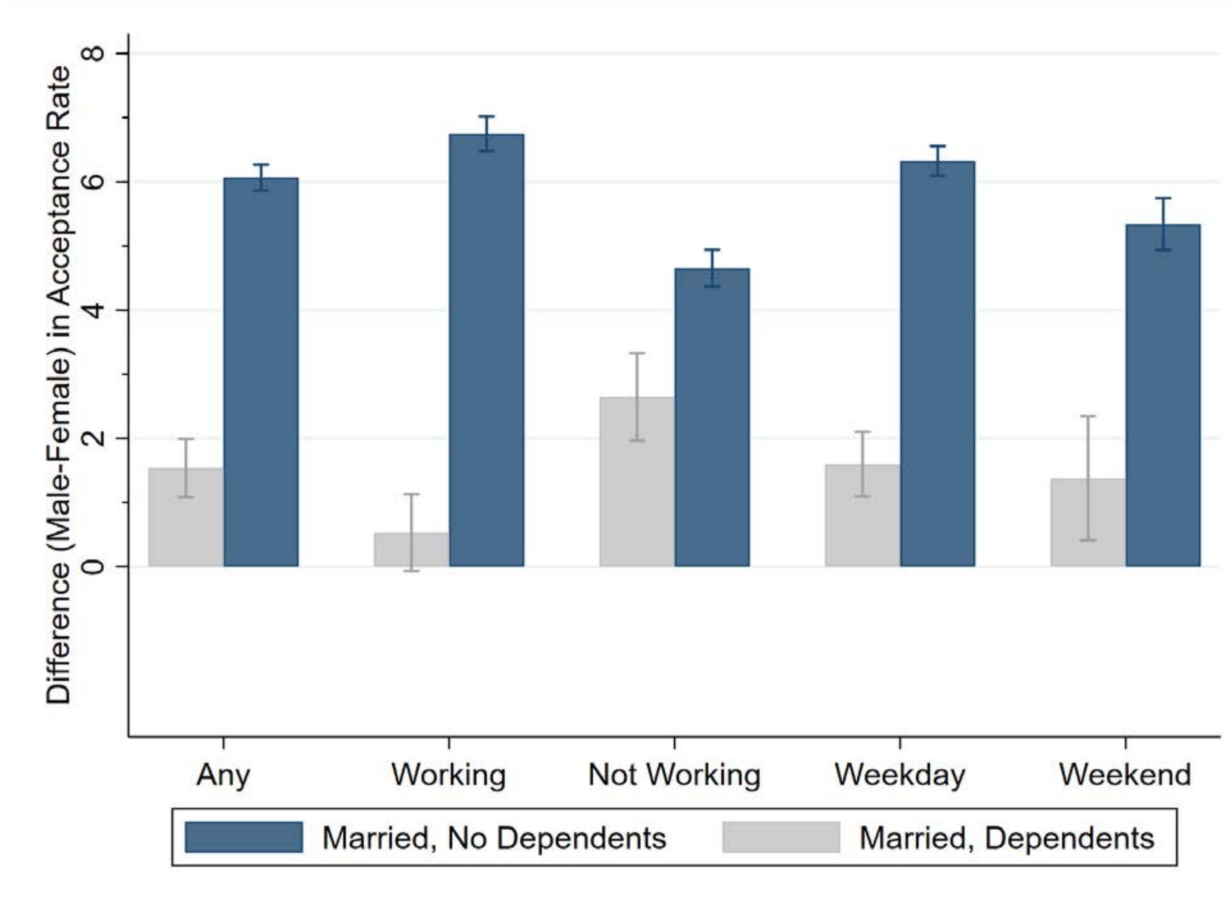


Figure 10: The arrival of overtime opportunities for any individual operator is a Poisson process, allowing us to use the seniority system by which overtime is offered to measure male and female probabilities of accepting overtime. To obtain the difference between male and female probabilities of accepting overtime, we regress a dummy variable for accepting overtime conditional on being offered on a dummy variable for female and controls for age, tenure, seniority, and garage fixed effects. We focus on married operators and run separate regressions for operators with and without dependents. Our results suggest that the presence of dependents for married operators plays a role in how men and women value time and how likely they are to accept overtime opportunities. Married men with dependents are only slightly more likely than married women with dependents to accept overtime. The gap in acceptance probability is high, though, between married men and women who do not have dependents, suggesting that for them the division of household responsibilities and bread-winning is one that sees men taking on more work outside the home.

Figure 11: Probability of Weekend Shift in Any Given Week

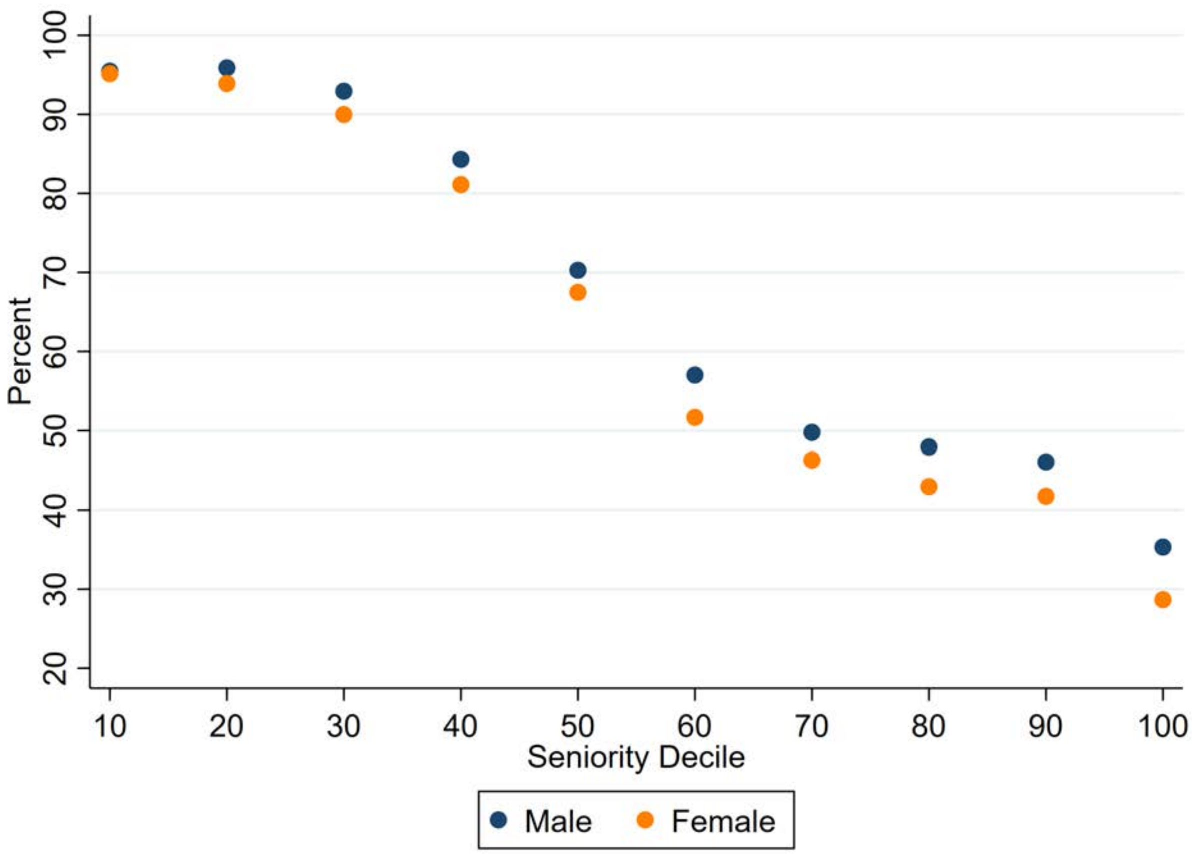


Figure 11: This binscatter displays the average probability for each seniority decile that an operator will have to work a weekend shift. The least senior operators, around the 10th percentile, are almost guaranteed to have to work a weekend shift. As seniority increases, the probability of having to work a weekend shift decreases, suggesting that weekend shifts are undesirable. Conditional on seniority, which is the same as conditioning on the same choice set of schedules and routes, women try to avoid scheduling weekend shifts more than men.

Figure 12: Women Are Less Likely Than Men To Work Weekend Shifts

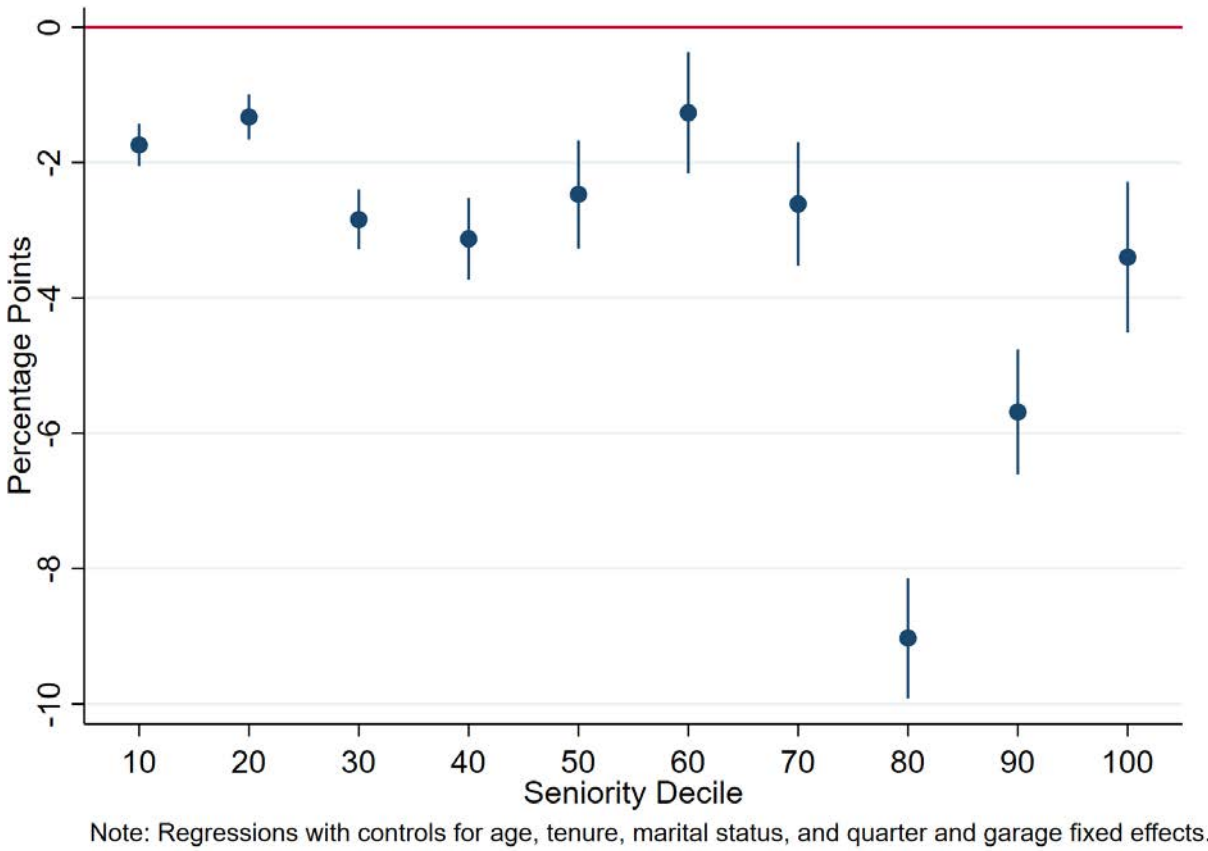


Figure 12: This charts shows, for each seniority decile, the differences in the average female probability of working a weekend shift and the average male probability of working a weekend shift. Regressions to measure these differences control for age, tenure, marital status, and quarter and garage fixed effects. The differences are negligible at low seniority levels and grow with seniority. Women try to avoid scheduling weekend shifts more than men in a statistically significant way.

Figure 13: Probability of Having to Work Holiday Shift

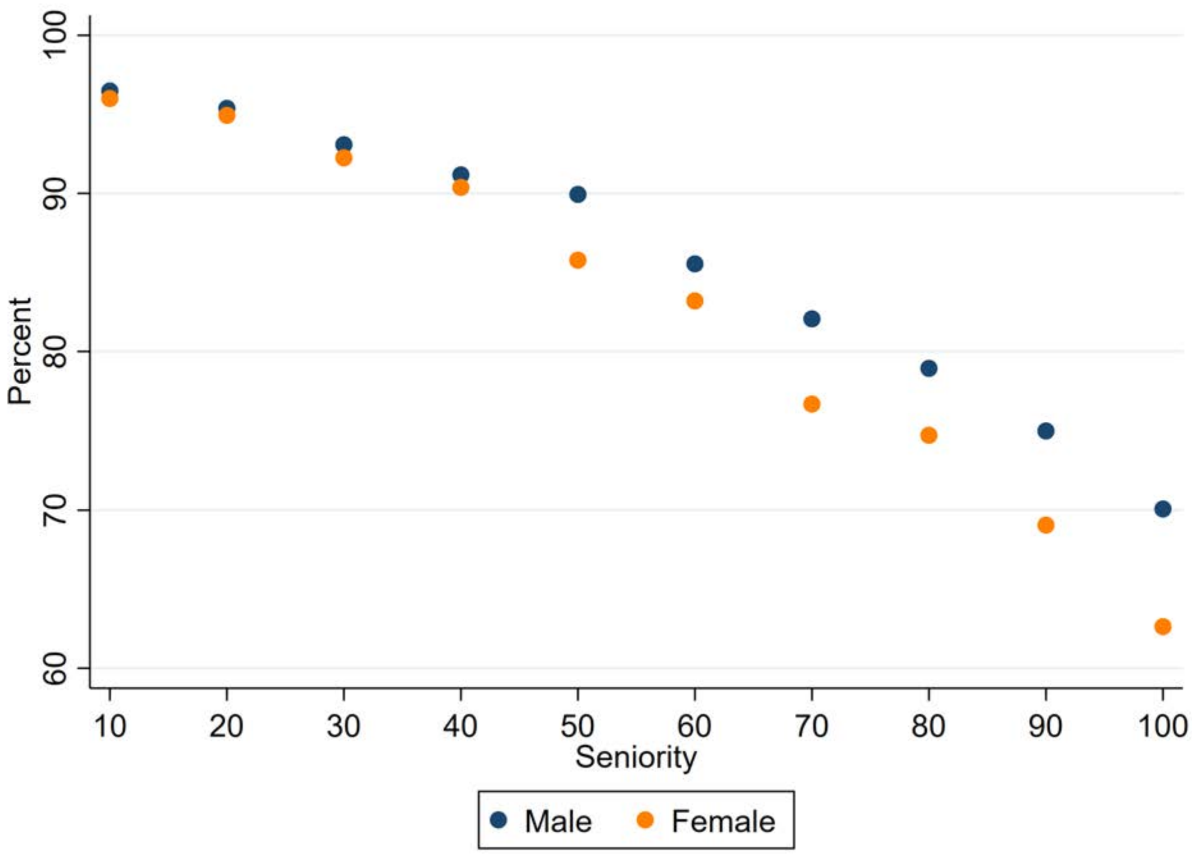


Figure 13: This binscatter displays the average probability for each seniority decile that an operator will have to work a weekday holiday shift. Similar to weekend shifts, weekday holiday shifts are mostly worked by the least senior operators, while the most senior operators are more likely to avoid scheduling them as work days for themselves. Conditional on the same seniority decile and thus the same choice set, women exhibit a stronger distaste for holiday shifts than men.

Figure 14: Probability of Split Shift on Any Given Day

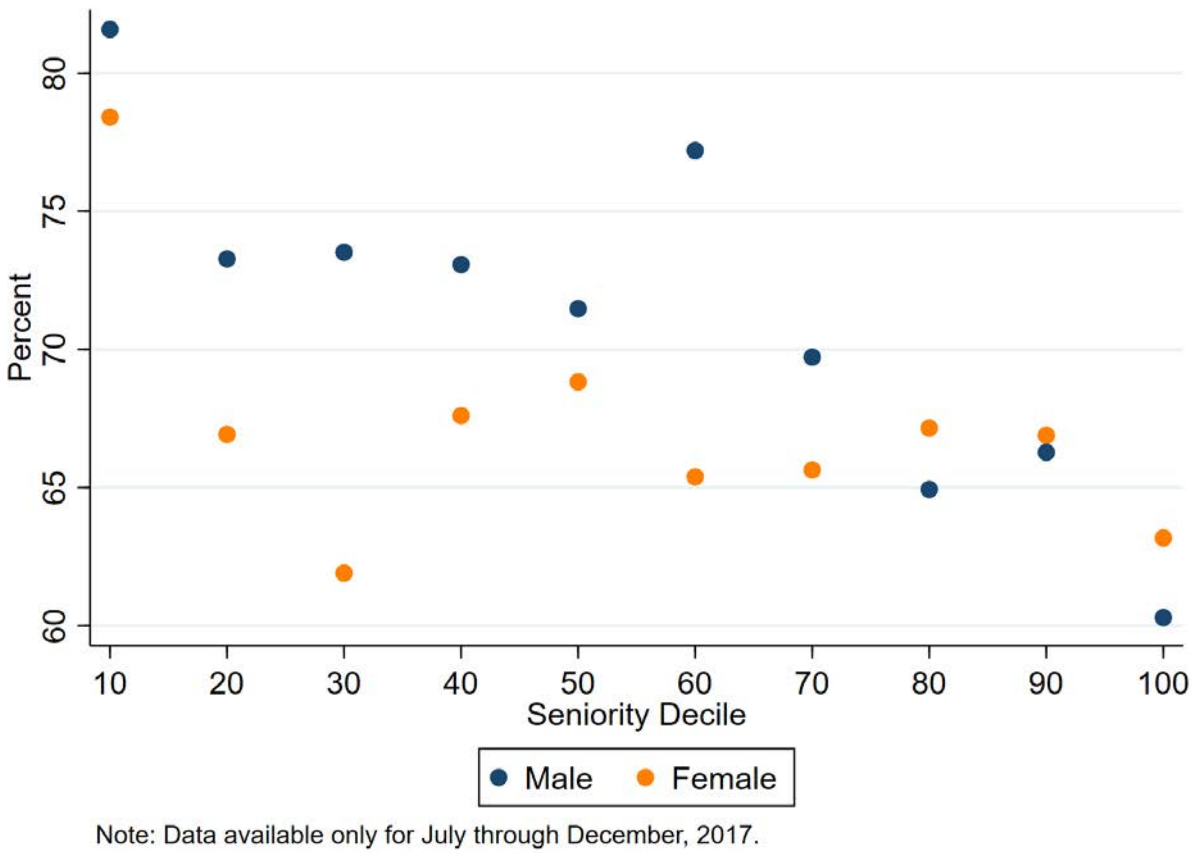


Figure 14: This binscatter displays the average probability for each seniority decile that an operator will have to work a split shift on a given day. Working a split shift means not working 8 hours straight, but instead working a few hours (usually during the morning rush hour), followed by a big break or split, and then the remaining hours (usually during the evening rush hour). The least senior male operators, around the 10th percentile, are very likely to have to work a split shift. As seniority increases, the probability of having to work a split shift decreases, suggesting that split shifts are undesirable. Conditional on seniority, which is the same as conditioning on the same choice set of schedules and routes, women try to avoid scheduling split shifts more than men. Only at high seniority, when they have the largest choice over the times of day during which the splits occur and their lengths, do women choose split shifts at similar rates to men.

Figure 15: Accidents on Scheduled Bus Routes

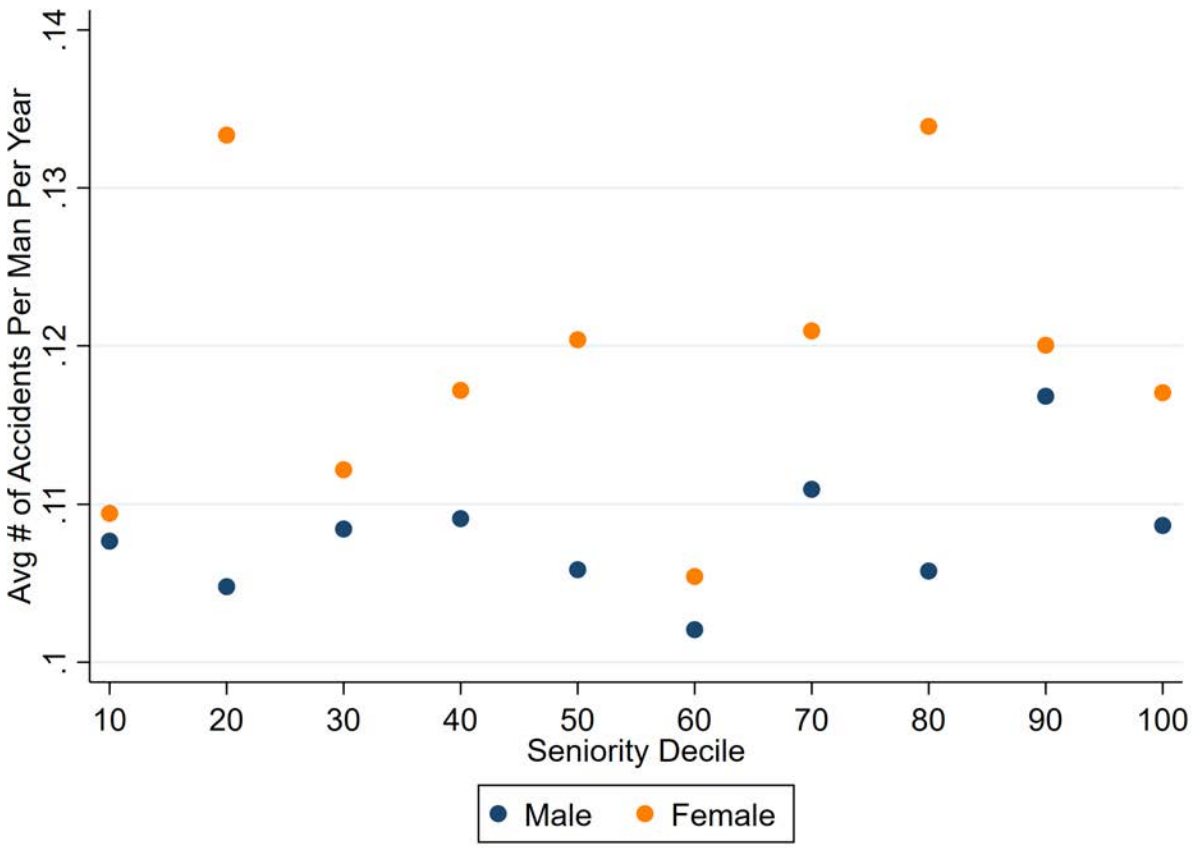


Figure 15: For each bus route, we calculate the number of accidents (collisions with other vehicles, assaults on the operator, passenger falls, etc.) experienced by male operators in 2014-2017. We use data for 2017Q4 on which route was scheduled for which operator to calculate the number of men driving each route each quarter. Assuming that the number is roughly the same across all quarters of the year, we calculate the number of men driving each route each year. We divide the number of accidents by the number of male operators working each route each year and by 4 years to get the average number of accidents per male operator per year on each route. The series plotted here show, for each seniority decile, the average route scores for routes picked by women and men for 2017Q4.

Figure 16: Difference Between Weekend Shift Weeks and Non-Weekend Shift Weeks

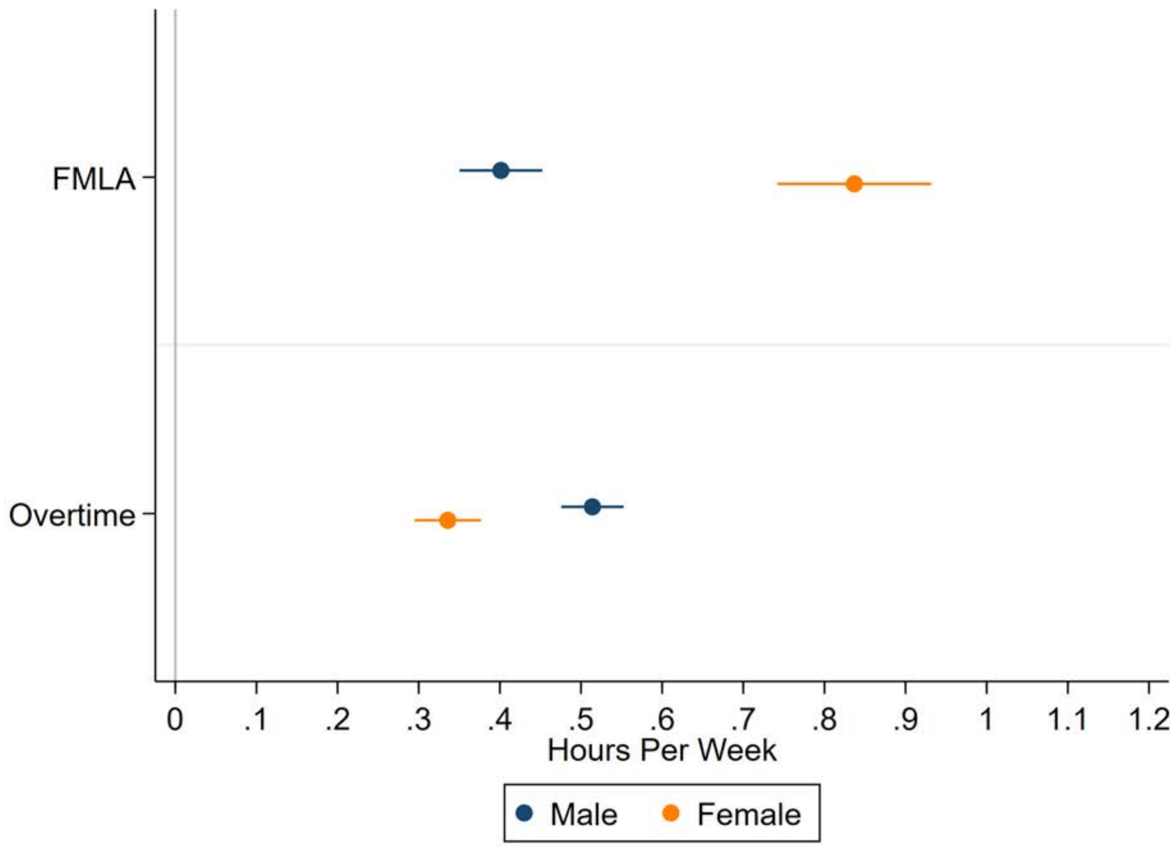


Figure 16: This chart shows how FMLA and overtime hours taken by men and women differ on weeks when they are scheduled to work a weekend shift from those weeks when they are not scheduled to work a weekend shift. We run person-week regressions of FMLA hours taken per week on a dummy variable for whether or not a weekend shift was scheduled in a particular week, as well as controls for age, tenure, seniority, and operator and month fixed effects. We run these regressions separately for male and female operators. Point estimates for the coefficient on the weekend shift dummy and 95% confidence intervals are presented here. The chart shows that during weeks with weekend shifts, men take more unpaid FMLA hours off and work similarly more overtime, in essence substituting pay at base wage for pay at the overtime rate of 1.5 X base wage. Women, on the other hand, take considerably more unpaid FMLA hours of leave during weekend shift weeks, but only work a little bit more overtime. Thus, during weeks with weekend shifts, men earn more than during weeks without weekend shifts, while women earn less.

Figure 17: Difference Between Holiday Shift Weeks and Non-Holiday Shift Weeks

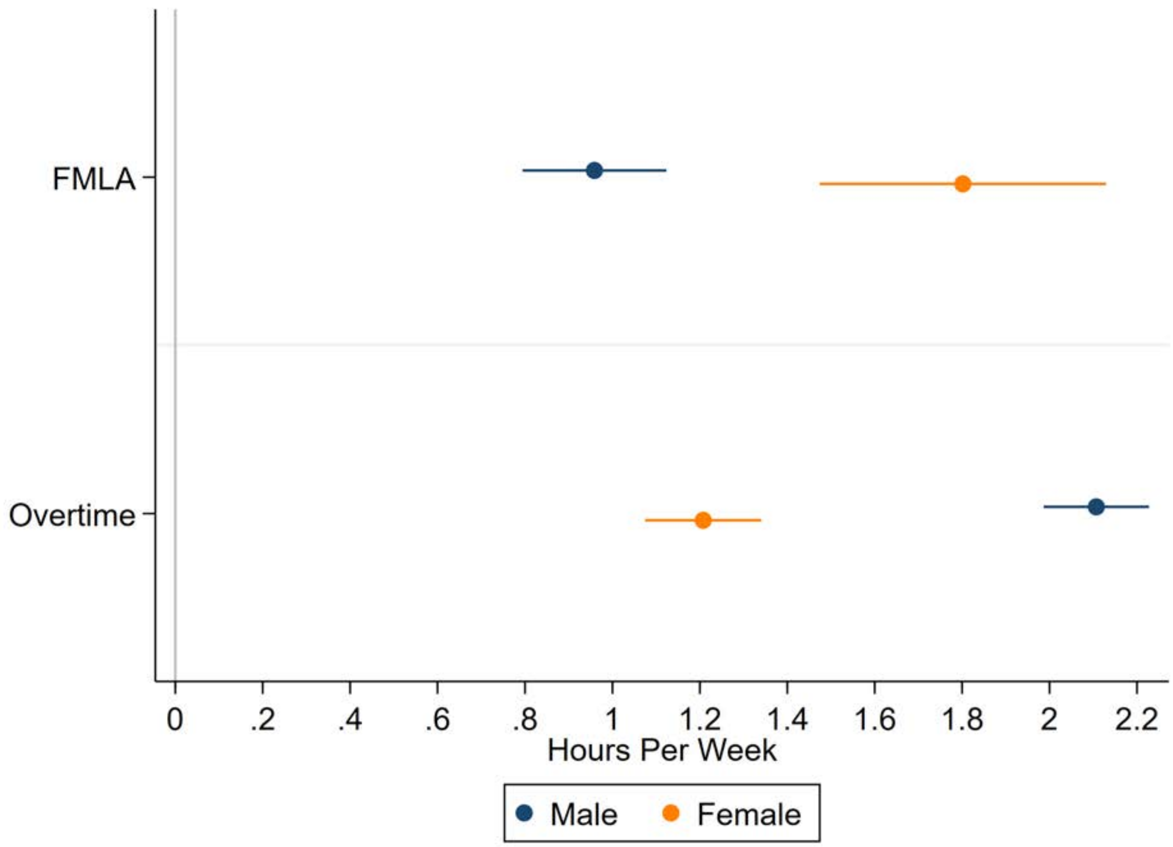


Figure 17: This chart shows how FMLA and unscheduled overtime hours taken by men and women differ on weeks when they are scheduled to work a holiday shift from those weeks when they are not scheduled to work a holiday shift. We run person-week regressions of FMLA hours taken per week on a dummy variable for whether or not a holiday shift was scheduled in a particular week, as well as controls for age, tenure, seniority, and operator and month fixed effects. We run these regressions separately for male and female operators. Point estimates for the coefficient on the holiday shift dummy and 95% confidence intervals are presented here. The chart shows that during weeks with holiday shifts, men and women take take more unpaid FMLA hours off, with the increase larger for women than for men. Men and women also work more overtime in weeks with holiday shifts, possibly because more overtime is available. The increase is bigger for men than for women. Unlike women, men more than make up the unpaid hours with overtime hours.

Figure 18: Difference Between Split Shift Days and Non-Split Shift Days

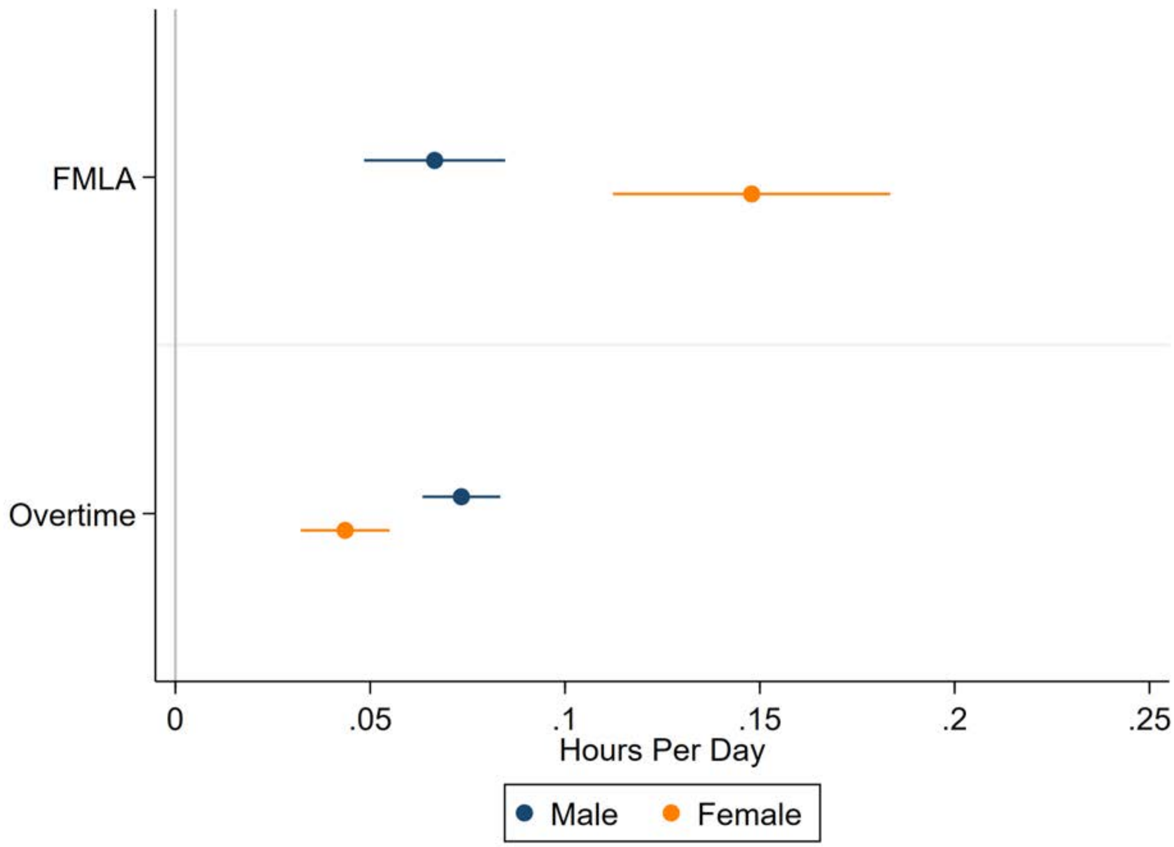


Figure 18: This chart shows how FMLA and overtime hours taken by men and women differ on days when they are scheduled to work a split shift from those days when they are not scheduled to work a split shift. We run person-week regressions of FMLA hours taken per day on a dummy variable for whether or not a split shift was scheduled in a particular day, as well as controls for age, tenure, seniority, and operator and month fixed effects. We run these regressions separately for male and female operators. Point estimates for the coefficient on the split shift dummy and 95% confidence intervals are presented here. The chart shows that during days with split shifts, men take more unpaid FMLA hours off and work similarly more overtime, in essence substituting pay at base wage for pay at the overtime rate of 1.5 X base wage. Women, on the other hand, take considerably more unpaid FMLA hours of leave during split shift days, but only work a little bit more overtime. Thus, during days with split shifts, men on average earn more than during days without split shifts, while women earn less.

Figure 19: Number of FMLA Hours, Per Quarter

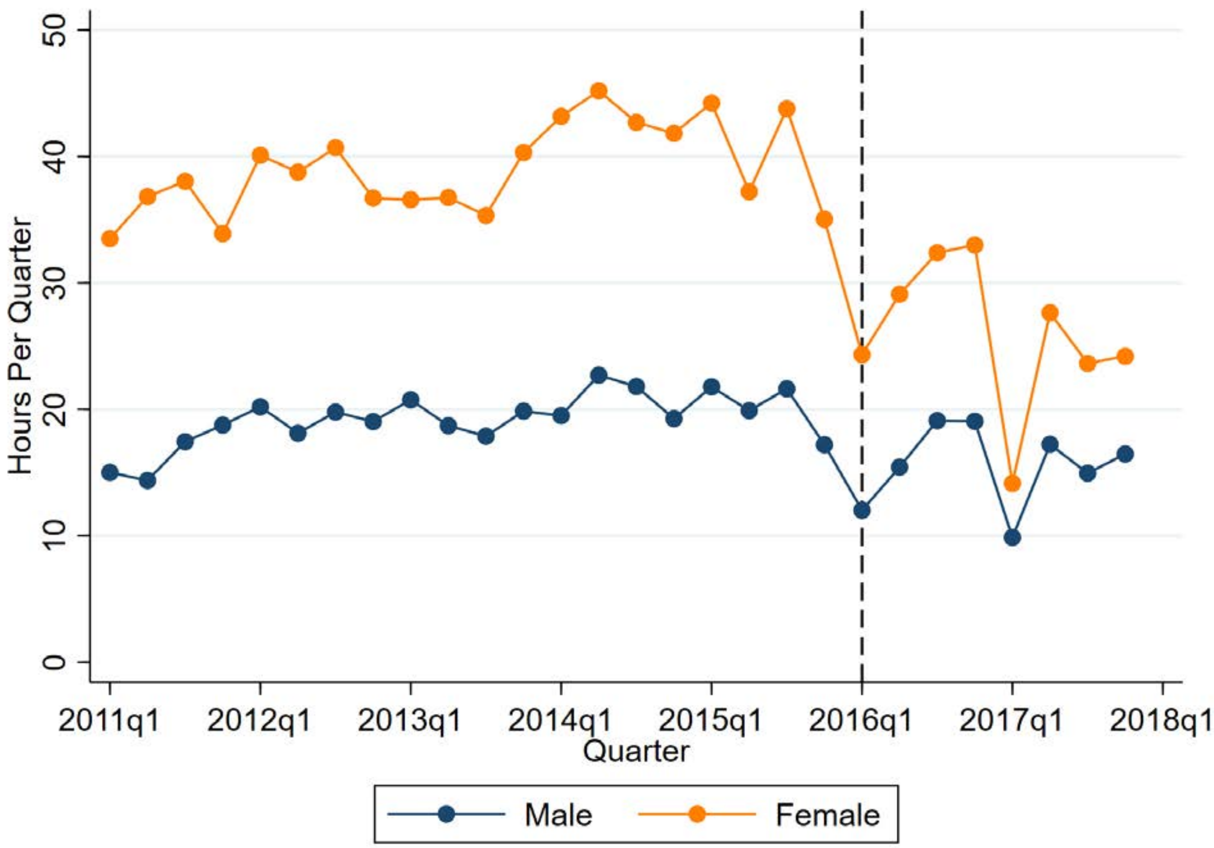


Figure 19: This chart shows how the average number of hours that operators take of FMLA per quarter changes throughout our sample, from 2011 through 2017. The vertical dashed line at 2016Q1 represents the MBTA's policy change on FMLA. In March of 2016, the MBTA hired UPMC Work Partners to be a third-party administrator in charge of making sure that FMLA certification was obtained and used properly. UPMC would now ensure that doctor's notes certifying FMLA eligibility were legitimate and that, on a day-to-day basis, operators took FMLA leave in the way that the doctor deemed might be necessary. This policy change took the active FMLA certification rate at the MBTA down from 45% to 27% of all operators. As the chart shows, the drop in FMLA usage was most pronounced for female operators, but also present for male operators.

Figure 20: FMLA Leave vs. Unexcused Leave, Before & After Policy Change

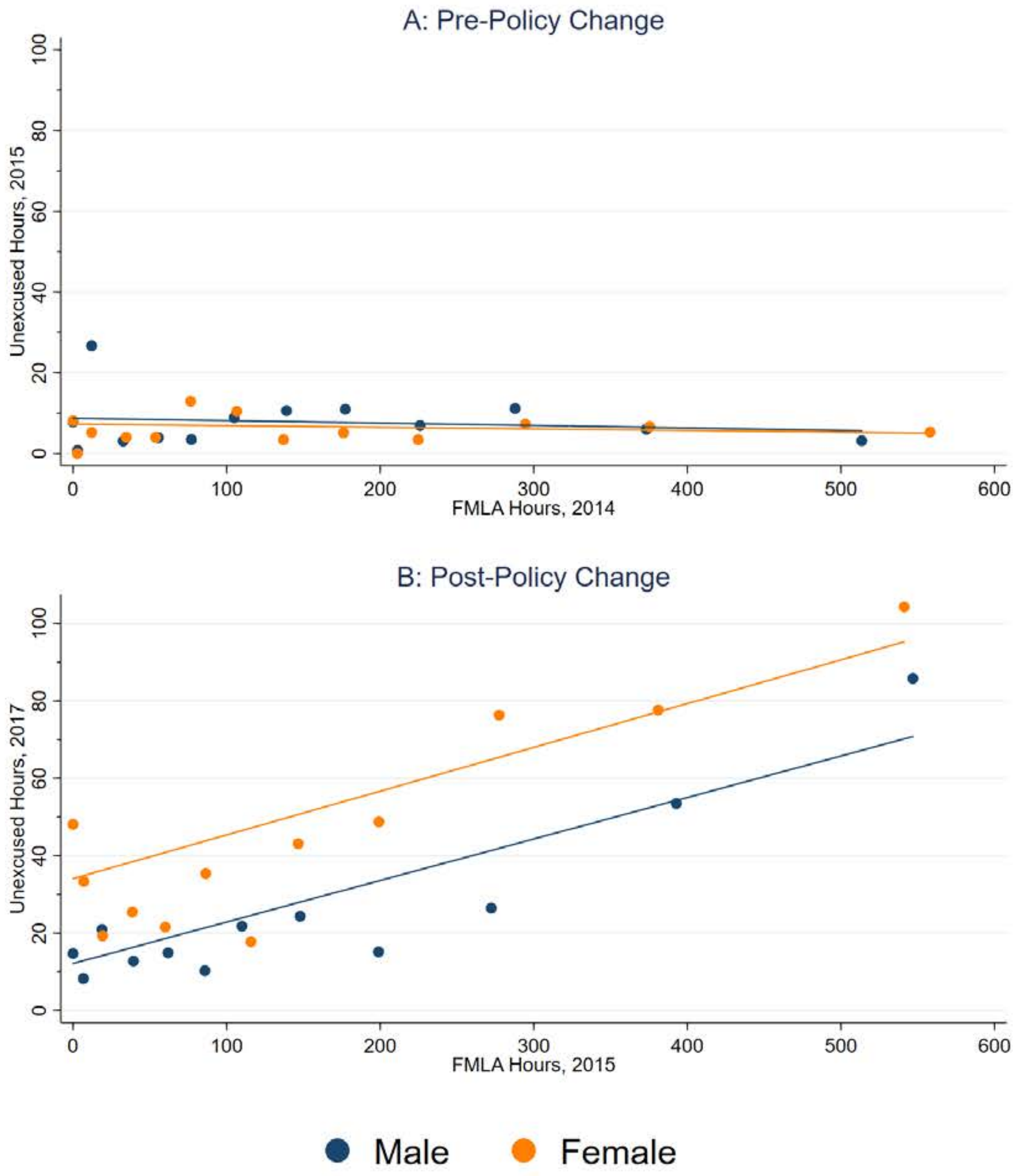


Figure 20: Panel A shows the relationship between FMLA hours of leave taken in 2014 and the amount of unexcused hours of leave taken in 2015. Panel B shows the relationship between FMLA hours taken in 2015 and the amount of unexcused hours of leave taken in 2017. Observations are at the person-year level. There is a close-to-constant relationship between the two types of leave across years 2014 and 2015, for both men and women, and an upward sloping relationship for both men and women across years 2015 and 2017.

Figure 21: Discipline Severity and Unexcused Events

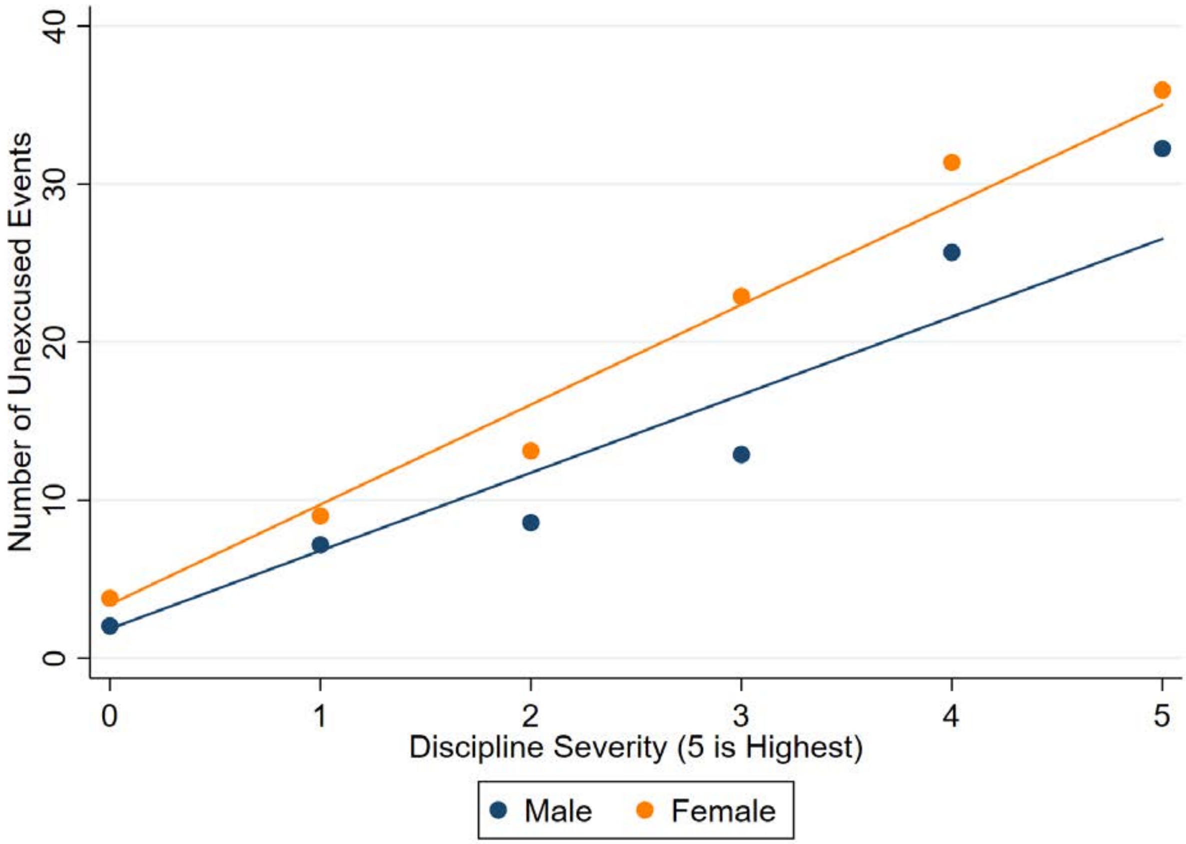


Figure 21: This chart shows the relationship, for men and women, between the average number of unexcused events and discipline severity. An unexcused event is an absence or a tardy without a legitimate excuse. Discipline severity ranges from a written warning (step 1) to a 3 day suspension without the ability to work overtime for the next 45 calendar days (step 3) to a 70 day suspension and a recommendation for discharge (step 5).

Figure 22: Hours of Unexcused Leave, By Quarter and Gender

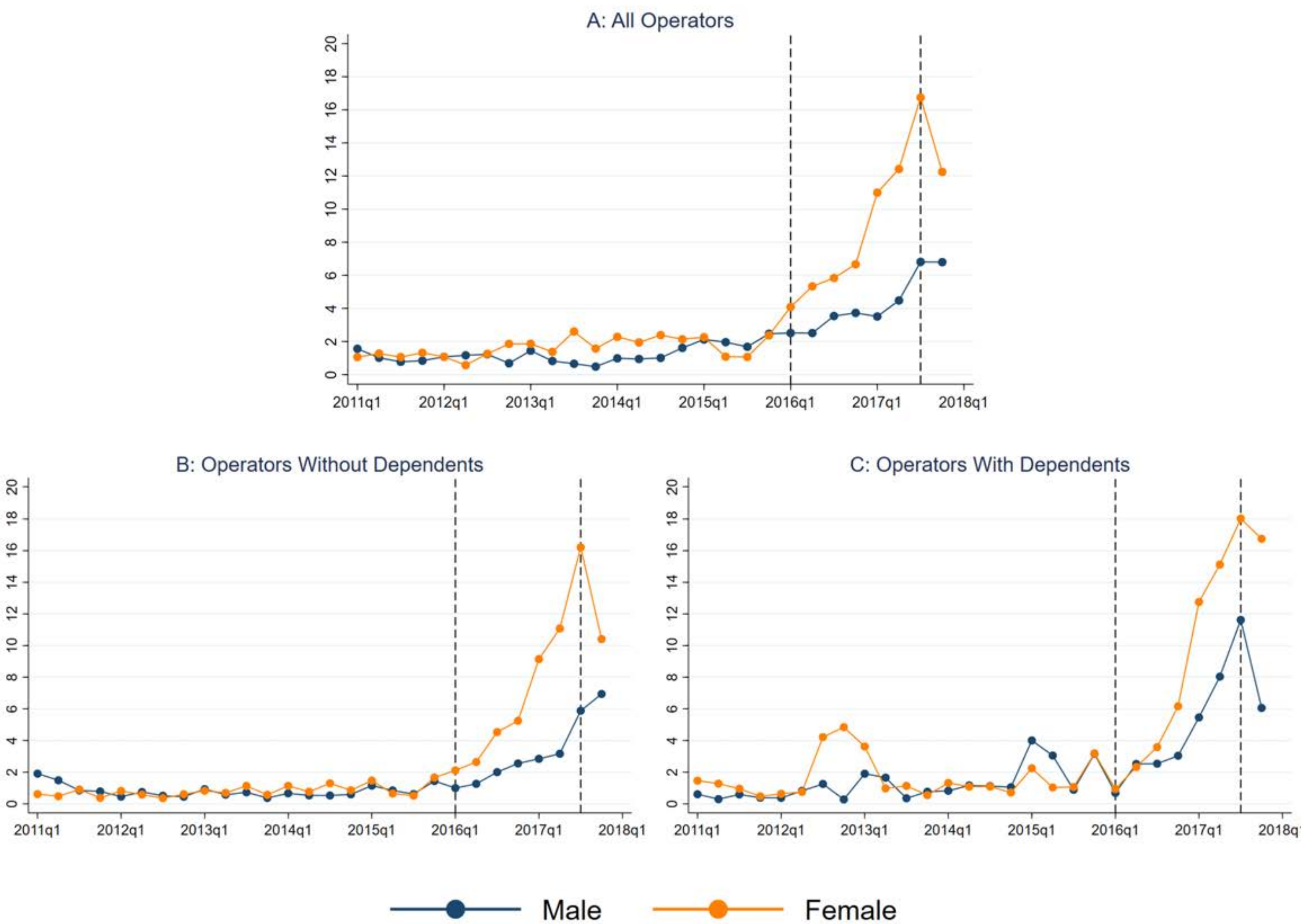


Figure 22: Panel A shows, from the first quarter of 2011 to the last quarter of 2017, the average number of hours of unexcused leave taken by operators of each gender. The left-most dashed vertical line denotes the introduction of the FMLA policy (March 2016) and the right-most dashed vertical line denotes the introduction of the overtime policy (July 2017). Panel B follows the same structure, but plots the series for men and women without dependents. Panel C plots the series for men and women with dependents.

Figure 23: Number of Overtime Hours, Per Quarter

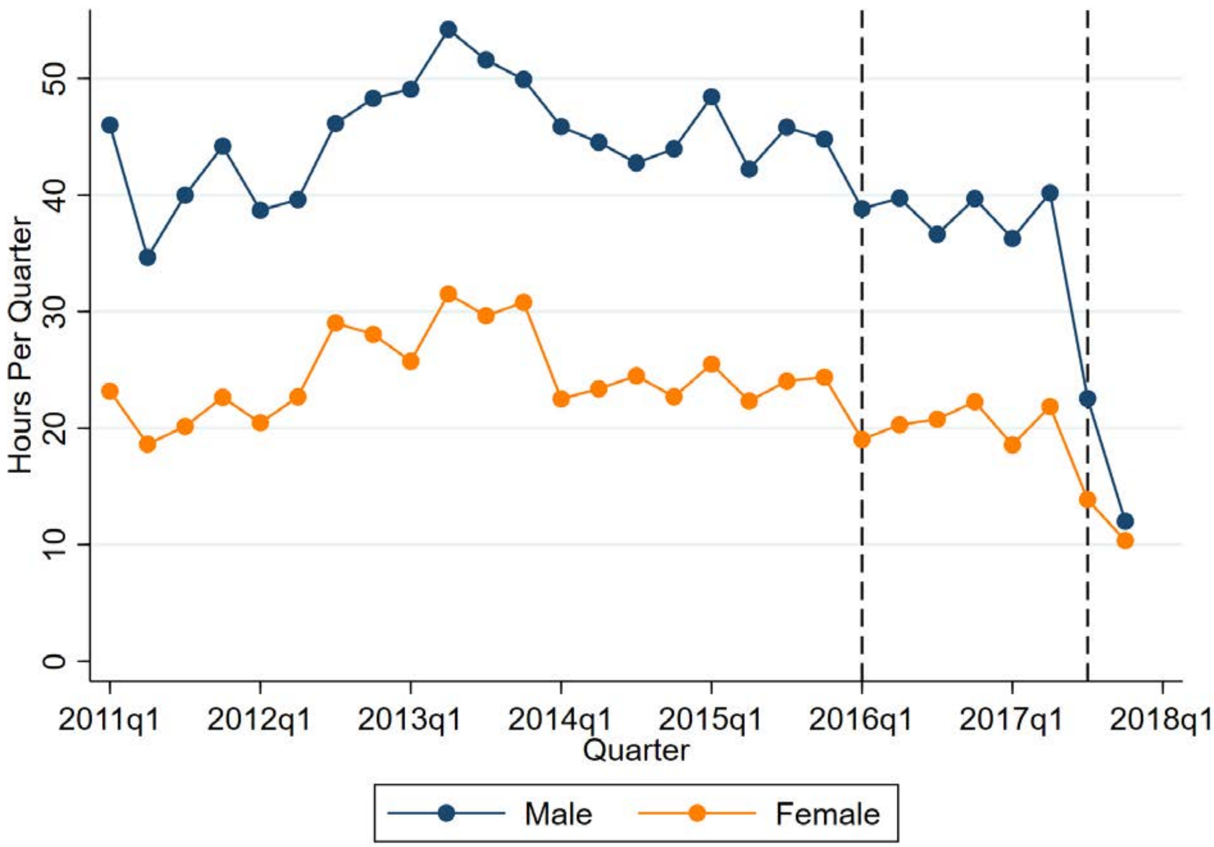


Figure 23: This chart shows how the average number of hours that operators take of overtime per quarter changes throughout our sample, from 2011 through 2017. The vertical dashed line at 2016Q1 represents the MBTA's policy change on FMLA. In March of 2016, the MBTA hired UPMC Work Partners to be a third-party administrator in charge of making sure that FMLA certification was obtained and used properly. UPMC would now ensure that doctor's notes certifying FMLA eligibility were legitimate and that, on a day-to-day basis, operators took FMLA leave in the way that the doctor deemed might be necessary. This policy change took the active FMLA certification rate at the MBTA down from 45% to 27% of all operators. The dashed line at 2017Q3 shows the timing of the introduction of the MBTA's new policy on overtime. Overtime went from being defined as any time in excess of 8 hours worked in a day to any time in excess of 40 hours worked in a week. The result was a drop in the average number of overtime hours worked by male operators from 40 hours per quarter to about 10 hours per quarter. Female hours dropped as well, but my a considerably smaller amount.

Figure 24: Of Those Who Took FMLA in a Given Week, What Percent Also Took Overtime That Week?

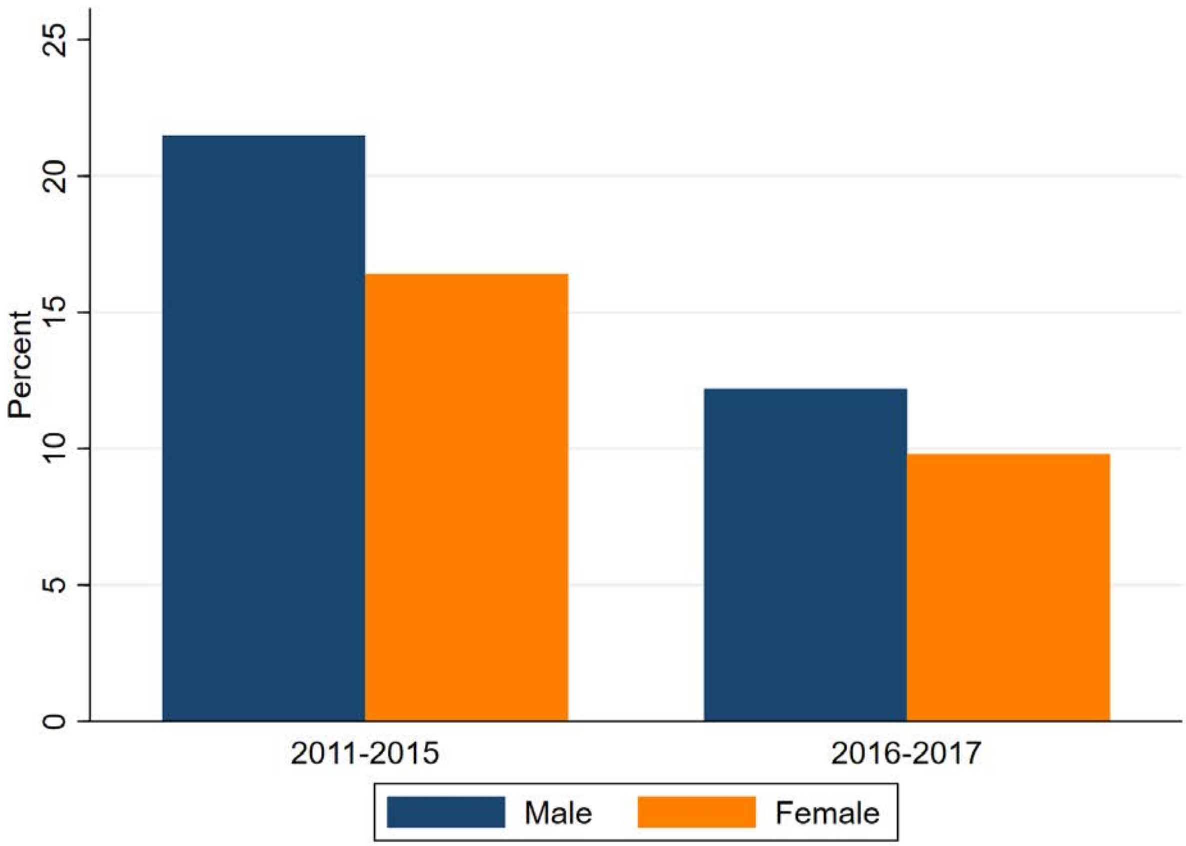


Figure 24: This chart shows the share of operators who took FMLA in a given week who also took overtime that week, by gender. Men are more likely than women to take both overtime and FMLA in a week where they are taking FMLA leave both in 2011-2015 and in 2016-2017, after the FMLA and overtime policy changes. However, the share of men and women doing both overtime and FMLA, conditional on taking FMLA, falls in 2016-2017 and the gap between men and women shrinks.

Figure 25: Weeks with Weekend Shifts vs. No Weekend Shifts, Before vs. After Policy Changes

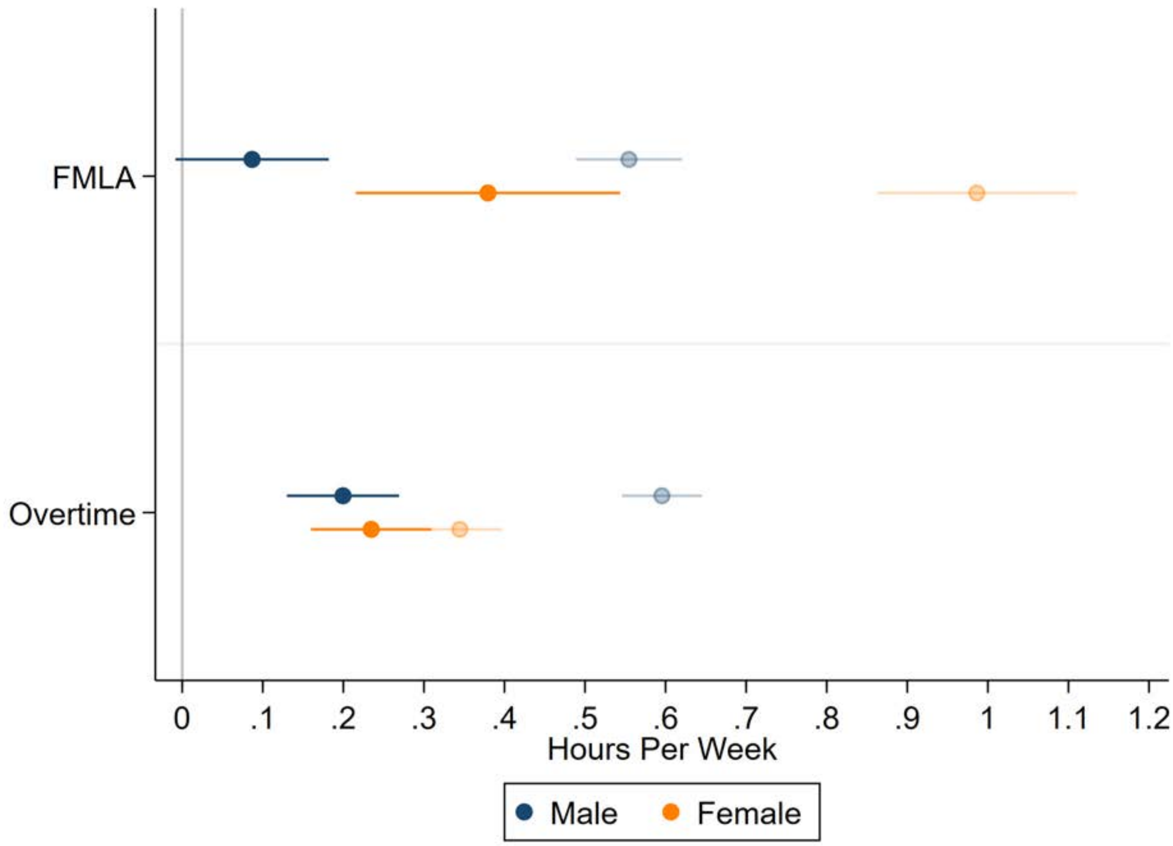


Figure 25: This chart shows how FMLA and overtime hours taken by men and women differ on weeks when they are scheduled to work a weekend shift from those weeks when they are not scheduled to work a weekend shift. The greyed-out points use data for 2011-2015 to measure the intensity of these differences prior to the 2016-2017 policy changes that made it harder to take FMLA time off and to work overtime. The observations in full color show the differences in 2016-2017, when the policy changes were taking place. We run person-week regressions of FMLA hours taken per week on a dummy variable for whether or not a weekend shift was scheduled in a particular week, as well as controls for age, tenure, seniority, and operator and month fixed effects. We run these regressions separately for male and female operators. The chart shows that during weeks with weekend shifts, men take more unpaid FMLA hours off and work similarly more overtime, in essence substituting pay at base wage for pay at the overtime rate of 1.5 X base wage. Women, on the other hand, take considerably more unpaid FMLA hours of leave during weekend shift weeks, but only work a little bit more overtime. Thus, during weeks with weekend shifts, men earn more than during weeks without weekend shifts, while women earn less. These patterns, however, are much stronger in the 2011-2015 period, before the policy changes took place in 2016-2017.

Figure 26: Lost Trips and Leave-Taking

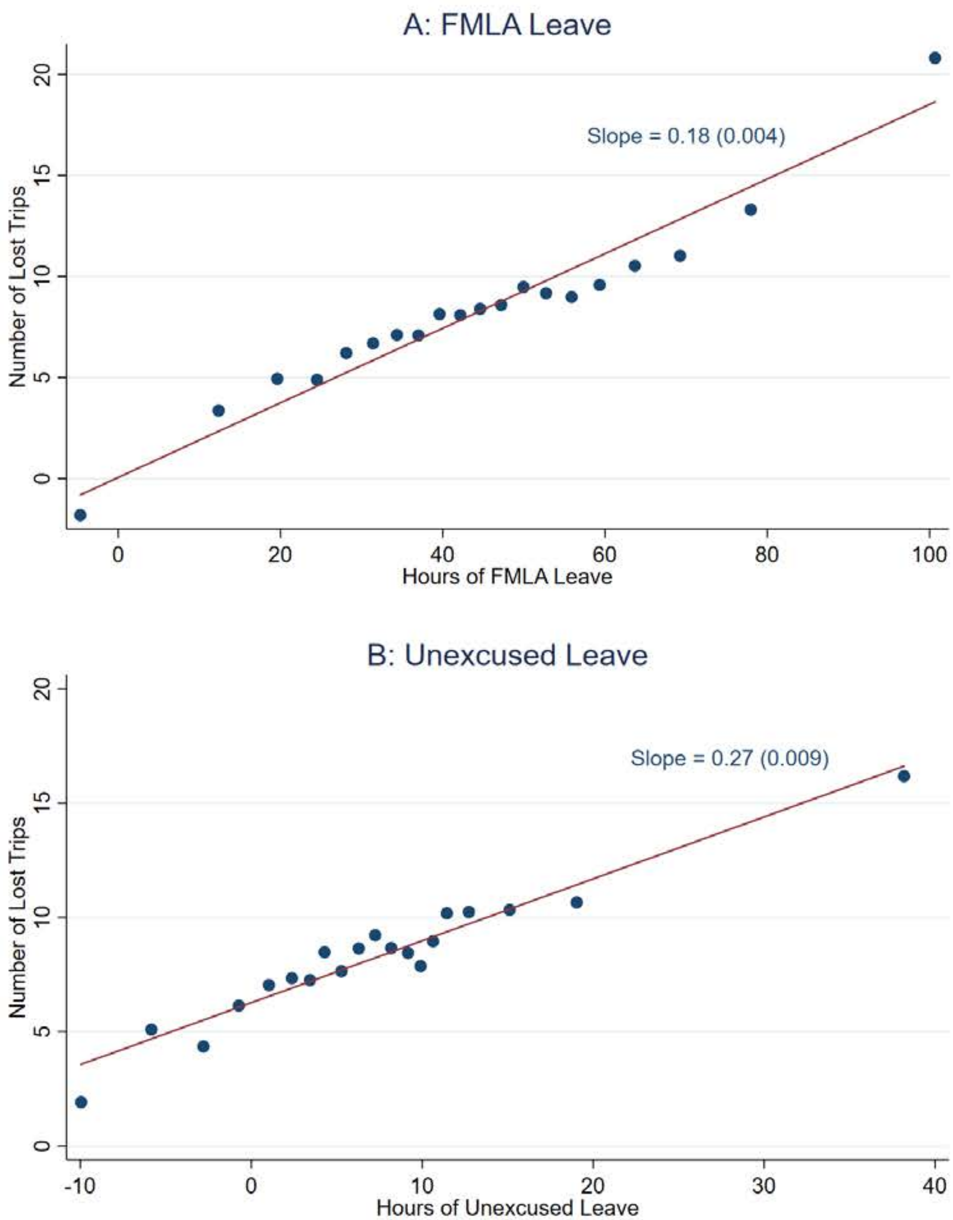


Figure 26: Panel A shows the relationship between the number of lost trips in a particular garage on a particular day as a result of operator absence (y axis) and the total number of FMLA hours of leave taken by operators in that same garage on that same day (x axis). The relationship is residualized (we are controlling for week and garage fixed effects), resulting in some of the visualized points being in negative FMLA hour territory. Panel B shows the relationship between the number of lost trips as a result of operator absence (y axis) and the total number of unexcused hours of leave taken by operators in that same garage on that same day (x axis). The relationship is also residualized. The slopes of the unconditional relationships are similar to the ones reported here. Standard errors are in parentheses. Lost trips data are available for 2014-2017, so the chart shows relationships only for those years.

Appendix

Service Map, Massachusetts Bay Transportation Authority

Figure A.1: A 2017 map of MBTA bus and train routes that service the Boston metropolitan area. Our data cover the bus and train operators that service these routes.

Job Description, Bus Operator

Massachusetts Bay Transportation Authority

Part-Time Bus Operator

SALARY:	$19.72 hourly
UNION AFFILIATION:	Local 589
DEPT:	Bus Transportation
LICENSES/CERTIFICATIONS:	A valid Driver's License is required.
SAFETY SENSITIVE:	This is a Safety Sensitive Position. Incumbents will be subject to periodic random drug & alcohol testing.
ESSENTIAL CLASSIFICATION:	During declared States of Emergencies, employees working in this classification are required to report to work for their assigned work hours or as directed by supervisory personnel.

JOB SUMMARY:

The Part-time Bus Operator will operate an MBTA Surface Vehicle; be responsible for the safety of passengers and equipment; perform vehicle inspections to ensure proper operation; collect designated fares from passengers; assist in emergency situations and work under occasional supervision following MBTA guidelines and procedures.

DUTIES & RESPONSIBILITIES:

- Operate a surface line vehicle along assigned routes.
- Pick up passengers; collect fares; check passes and ID cards for validity.
- Protect revenue collected according to defined procedures.
- Inspect and/or test the vehicle (including but not limited to brakes, lights, signs, doors, mirrors, wipers, tires and horn) to ensure serviceable condition.
- Regularly climb onto side of bus and reach with hands and arms to adjust side view mirrors.
- Ensure the proper signs are displayed and changes as needed during each trip.
- Clearly announce destination at service stops and connecting points.
- Notify the Bus Control Center Dispatcher of any emergency, requesting additional assistance if needed; and evacuate passengers if the emergency situation warrants action and the Inspector is not available to make the decision.
- Refer disputes over ID validity or fare collection to the Official in charge of the station.
- Produce a written report to the Superintendent if the dispute is not resolved.
- Prepare accident reports as required.
- Respond to each inquiry, whether from a customer, vendor or co-worker in a courteous and professional manner.
- Be familiar with the MBTA Safety Plan as well as the Part-time Bus Operator job responsibilities as outlined.
- Work any and all shifts and/or locations as assigned or directed.
- Respond or report to work as directed by supervisory personnel for emergencies, extreme weather conditions or nay other abnormal conditions that impair service or safety of service, twenty-four (24) hours per day, seven (7) days per week.
- Adhere to the rules, regulations, collective bargaining agreements (if applicable) and policies of the Authority including EEO, Anti-Discrimination and Anti-Harassment and Anti-Retaliation policies.

Figure A.2: A job posting for the 2017 bus operator lottery.

Job Requirements, Bus Operator

MINIMUM REQUIREMENTS/QUALIFICATIONS:

- Possession of a high school diploma or its equivalent (G.E.D.).
- Must be at least eighteen (18) years of age.
- Ability to successfully complete validated selection exam.
- Possession of a valid driver's license.
- Possession of a valid Class B Massachusetts Commercial Driver's License (CDL) permit with General Knowledge, Air Breaks, and Passenger endorsements at the time of hire.
- A satisfactory driving record for at least two (2) years prior to the date of hire.
- A satisfactory non-renew display for tickets report from the Massachusetts Registry of Motor Vehicles.
- Ability to pass background screenings including criminal background check, driving record check, educational verification, employment verification and references.
- Ability to pass selection interview.
- Ability to meet the MBTA medical qualifying standards established for this position, including a drug and alcohol test.
- Ability to pass the Department of Telecommunications and Energy (DTE) skill performance and road test.
- Ability to read, write, comprehend, speak and respond to instructions, posted signs, and inquiries in English.
- Ability to effectively communicate with customers, employees, and vendors.
- Successful completion of the required probationary period of 120 working days.
- Availability to work twenty four (24) hours per day, seven (7) days per week.

Figure A.3: Minimum job requirements for the 2017 bus operator lottery.

Job Description, Heavy Rail Operator

Massachusetts Bay Transportation Authority

Part-Time Motorperson

SALARY:	$19.72 hourly
UNION AFFILIATION:	Local 589
DEPT:	Heavy Rail Transportation
LICENSES/CERTIFICATIONS:	A valid Driver's License is required.
SAFETY SENSITIVE:	This is a Safety Sensitive Position. Incumbents will be subject to periodic random drug & alcohol testing.
ESSENTIAL CLASSIFICATION:	During declared States of Emergencies, employees working in this classification are required to report to work for their assigned work hours or as directed by supervisory personnel.

JOB SUMMARY:

The Part-time Motorperson will ensure the timely and safe operation of subway trains by reporting to work on-time to ensure established service schedules are met and by opening and closing train doors to ensure the safe boarding and unloading of passengers at various MBTA locations.

DUTIES & RESPONSIBILITIES:

- Operate a heavy rail vehicle along assigned line.
- Operate signal systems according to Authority guidelines.
- Report mechanical problems to the appropriate personnel.
- Make stop announcements during runs and collect any lost articles on trains.
- Prepare accident reports, vehicle and wayside defect reports when necessary and distribute to the proper Authority personnel.
- Assist the line officials in rectifying problems with his/her train when emergency conditions warrant this action.
- Work under occasional supervision.
- Follow MBTA guidelines and procedures, referring any problems or unusual occurrences to their supervisor.
- Be familiar with the MBTA Safety Plan as well as the Part-time Motorperson job responsibilities as outlined.
- Respond to each inquiry, whether from a customer, vendor or co-worker in a courteous and professional manner.
- Be familiar with the MBTA Safety Plan as well as the Part-time Motorperson job responsibilities as outlined.
- Work any and all shifts and/or locations as assigned or directed.
- Adhere to the rules, regulations, collective bargaining agreements (if applicable) and policies of the Authority including the EEO, Anti-Discrimination and Anti-Harassment and Anti-Retaliation policies.
- Perform related duties and projects as assigned.

Figure A.4: A job posting for the 2017 heavy rail operator lottery.

Job Requirements, Heavy Rail Operator

MINIMUM REQUIREMENTS/QUALIFICATIONS:

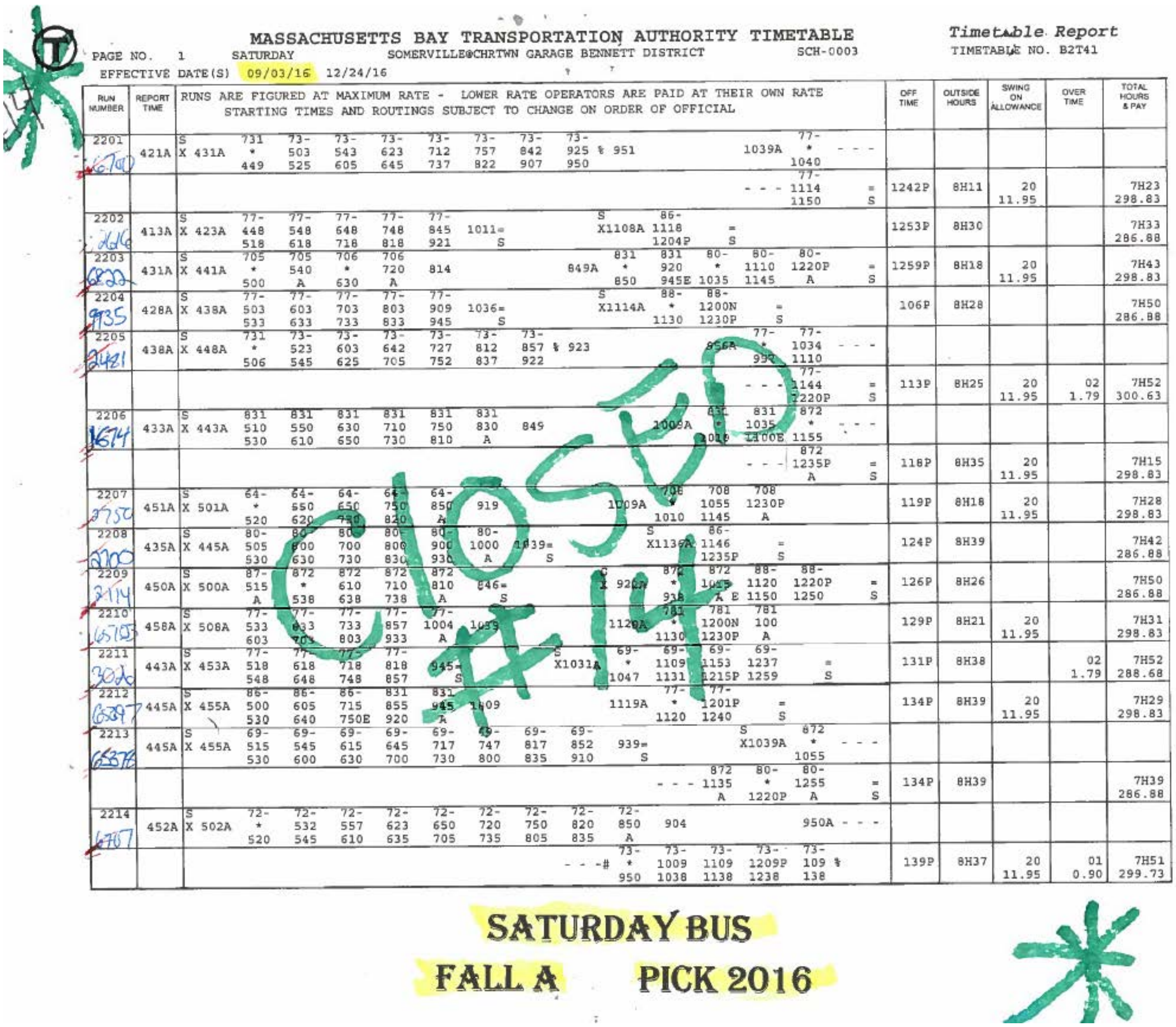
- Possession of a high school diploma or its equivalent (G.E.D.).
- Must be at least eighteen (18) years of age.
- Ability to successfully complete validated selection exam.
- Possession of a valid driver's license.
- A satisfactory driving record for at least two (2) years prior to the date of hire.
- A satisfactory non-renew display for tickets report from the Massachusetts Registry of Motor Vehicles.
- Ability to pass background screenings including criminal background check, driving record check, educational verification, employment verification and references.
- Ability to pass selection interview.
- Ability to meet the MBTA medical qualifying standards established for this position, including a drug and alcohol test.
- Ability to read, write, comprehend, speak and respond to instructions, posted signs, and inquiries in English.
- Ability to effectively communicate with customers, employees, and vendors.
- Availability to work twenty four (24) hours per day, seven (7) days per week.

Figure A.5: Minimum job requirements for the 2017 heavy rail operator lottery.

Share of Female Operators and Share of Operators Working Weekends, By Garage

Figure A.6: This chart shows, for each garage, the share of operators working a weekend shift in any given week. It also shows the share of female operators in each garage in any given week. The two dashed vertical lines separate the bus garages from the light rail garage (Green Line) and the light rail garage from the heavy rail garages. There are slightly more female operators in the rail garages, while the share of operators working a weekend shift is similar across garages.

Example of a Quarterly Pick Sheet



PAGE NO. 1 SATURDAY MASSACHUSETTS BAY TRANSPORTATION AUTHORITY TIMETABLE SOMERVILLE@CHRTWN GARAGE BENNETT DISTRICT SCH-0003

EFFECTIVE DATE(S) 09/03/16 12/24/16

Timetable Report
TIMETABLE NO. B2T41

RUN NUMBER	REPORT TIME	RUNS ARE FIGURED AT MAXIMUM RATE - LOWER RATE OPERATORS ARE PAID AT THEIR OWN RATE STARTING TIMES AND ROUTINGS SUBJECT TO CHANGE ON ORDER OF OFFICIAL	OFF TIME	OUTSIDE HOURS	SWING ON ALLOWANCE	OVER TIME	TOTAL HOURS & PAY
2201 6700	421A	S 731 73- 73- 73- 73- 73- 73- 73- 77- X 431A * 503 543 623 712 757 842 925 % 951 1039A * - - - 449 525 605 645 737 822 907 950 1040					
		77- - - - 1114 = 1150 S	1242P	8H11	20 11.95		7H23 298.83
2202 2616	413A	S 77- 77- 77- 77- 77- S 86- X 423A 448 548 648 748 845 1011= X1108A 1118 = 518 618 718 818 921 S 1204P S	1253P	8H30			7H33 286.88
2203 6822	431A	S 705 705 706 706 831 831 80- 80- 80- X 441A * 540 * 720 814 849A * 920 * 1110 1220P = 500 A 630 A 850 945E 1035 1145 A S	1259P	8H18	20 11.95		7H43 298.83
2204 9935	428A	S 77- 77- 77- 77- 77- S 88- 88- X 438A 503 603 703 803 909 1036= X1114A * 1200N = 533 633 733 833 945 S 1130 1230P S	106P	8H28			7H50 286.88
2205 2481	438A	S 731 73- 73- 73- 73- 73- 73- 77- 77- X 448A * 523 603 642 727 812 857 % 923 956A * 1034 - - - 506 545 625 705 752 837 922 957 1110					
		77- - - - 1144 = 1220P S	113P	8H25	20 11.95	02 1.79	7H52 300.63
2206 1674	433A	S 831 831 831 831 831 831 831 831 872 X 443A 510 550 630 710 750 830 849 1009A * 1035 * - - - 530 610 650 730 810 A 1010 1100E 1155					
		872 - - - 1235P = A S	118P	8H35	20 11.95		7H15 298.83
2207 2750	451A	S 64- 64- 64- 64- 64- 708 708 708 X 501A * 550 650 750 850 919 1009A * 1055 1230P 520 620 [illegible] 820 A 1010 1145 A	119P	8H18	20 11.95		7H28 298.83
2208 2700	435A	S 80- 80- 80- 80- 80- 80- S 86- X 445A 505 600 700 800 900 1000 1039= X1136A 1146 = 530 630 730 830 930 A S 1235P S	124P	8H39			7H42 286.88
2209 3114	450A	S 87- 872 872 872 872 C 872 872 88- 88- X 500A 515 * 610 710 810 846= X 920A * 1025 1120 1220P = A 538 638 738 A S 938 A E 1150 1250 S	126P	8H26			7H50 286.88
2210 65705	458A	S 77- 77- 77- 77- 77- 781 781 781 X 508A 533 633 733 857 1004 1039 1120A * 1200N 100 603 703 803 933 A 1130 1230P A	129P	8H21	20 11.95		7H31 298.83
2211 3026	443A	S 77- 77- 77- 77- S 69- 69- 69- 69- X 453A 518 618 718 818 945= X1031A * 1109 1153 1237 = 548 648 748 857 S 1047 1131 1215P 1259 S	131P	8H38		02 1.79	7H52 288.68
2212 6539	445A	S 86- 86- 86- 831 831 77- 77- X 455A 500 605 715 855 945 1009 1119A * 1201P = 530 640 750E 920 A 1120 1240 S	134P	8H39	20 11.95		7H29 298.83
2213 65376	445A	S 69- 69- 69- 69- 69- 69- 69- 69- S 872 X 455A 515 545 615 645 717 747 817 852 939= X1039A * - - - 530 600 630 700 730 800 835 910 S 1055					
		872 80- 80- - - - 1135 * 1255 = A 1220P A S	134P	8H39			7H39 286.88
2214 6707	452A	S 72- 72- 72- 72- 72- 72- 72- 72- 72- X 502A * 532 557 623 650 720 750 820 850 904 950A - - - 520 545 610 635 705 735 805 835 A					
		73- 73- 73- 73- 73- - - -# * 1009 1109 1209P 109 % 950 1038 1138 1238 138	139P	8H37	20 11.95	01 0.90	7H51 299.73

CLOSED #14

SATURDAY BUS
FALL A PICK 2016

Figure A.7: This is an example of a sheet that would be used during a quarterly process called "The Pick" during which operators select the routes and times that they will work for the following quarter. This sheet applies to Saturday routes coming out of the Bennett garage in the Fall of 2016. Each row denotes a day of work.

Share of Women Across Seniority Deciles

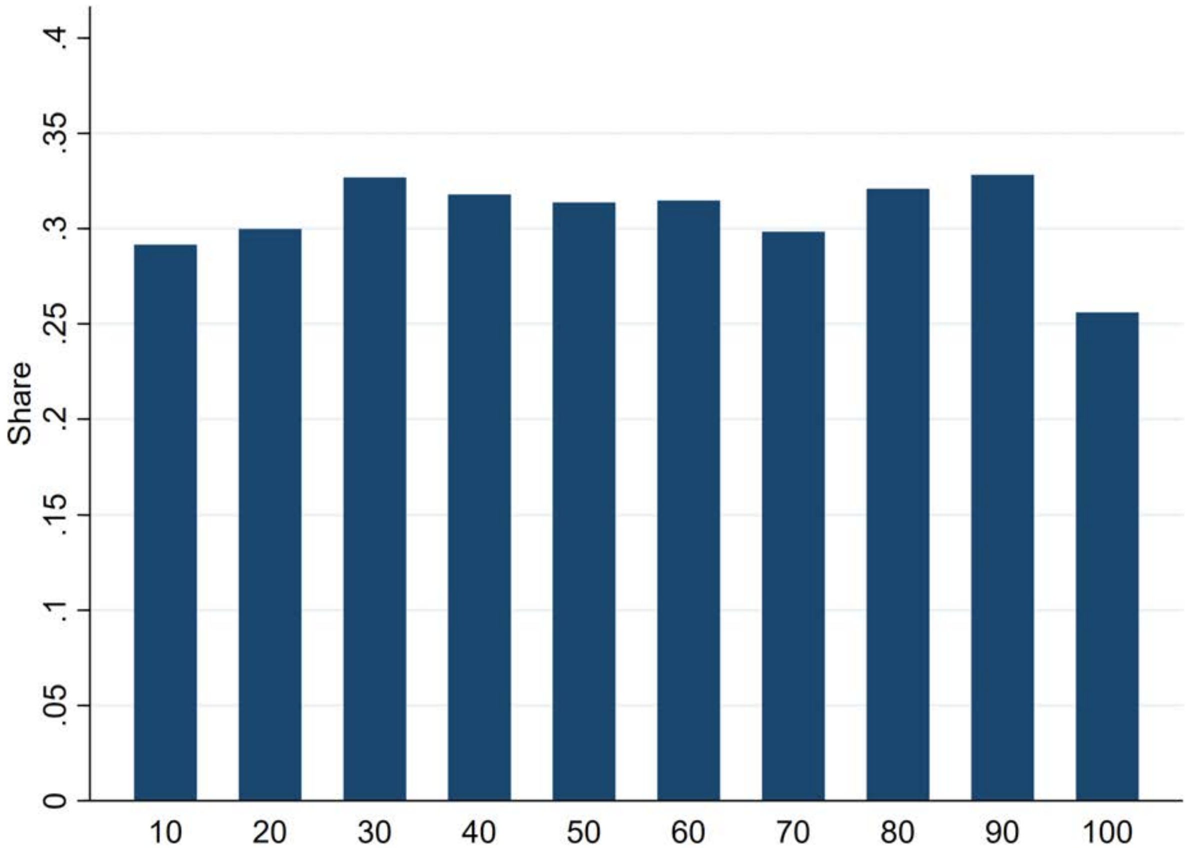


Figure A.8: Women make up a fairly consistent share of workers in each seniority level.

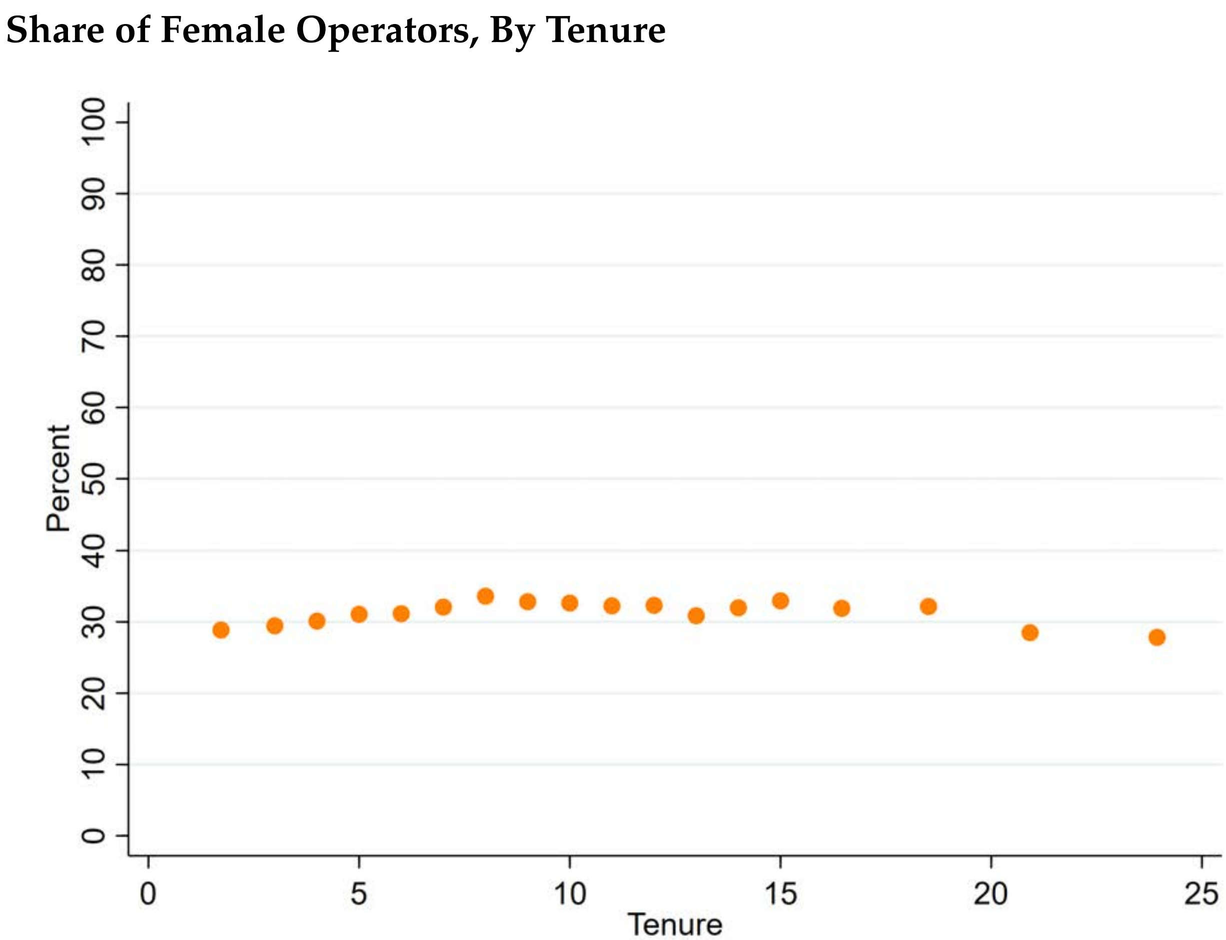


Figure A.9: Women make up a fairly consistent share of workers across tenure (in years of service) at the MBTA.

Operator Age Across Seniority

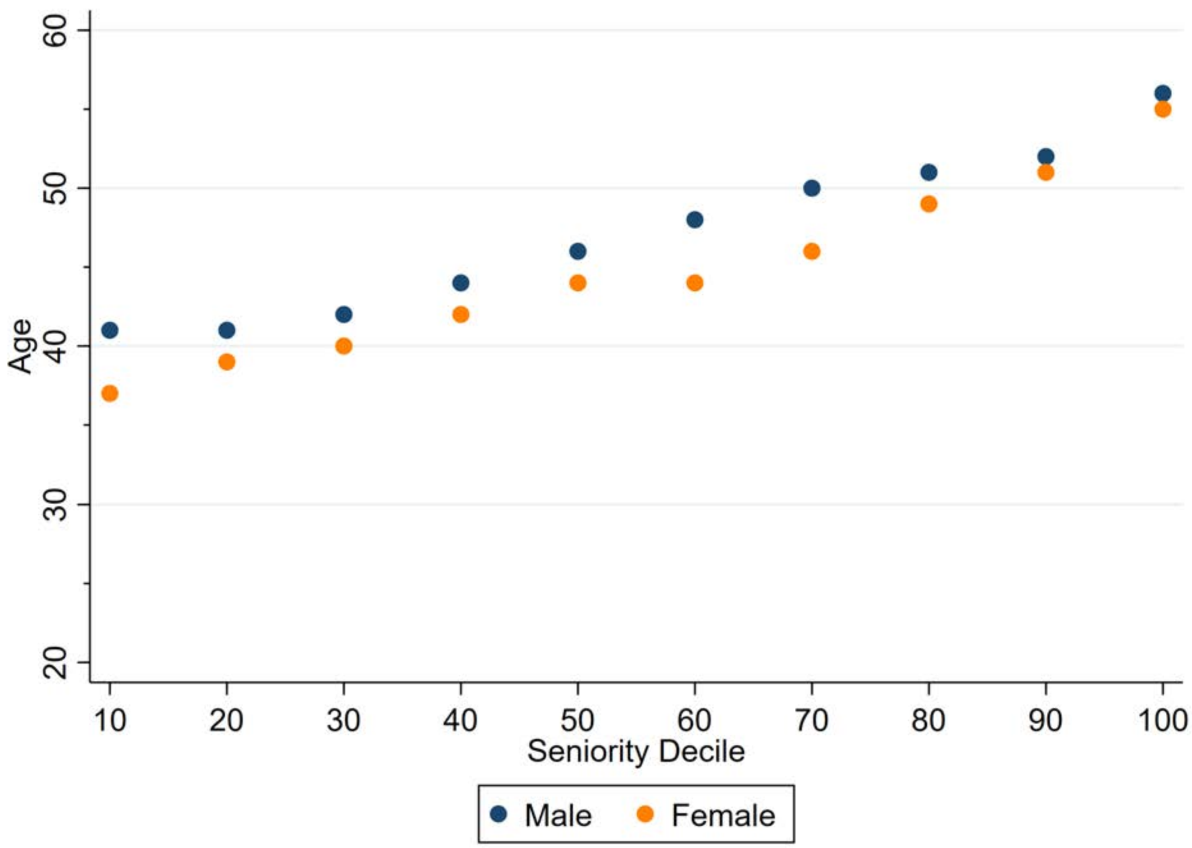


Figure A.10: This chart shows the relationship between operator age and seniority. The least senior operators are on average about 40 years old, while the most senior operators are about 55 years old. The female operators are on average slightly younger than the male operators, across the seniority spectrum.

CDF of Tenure at Termination

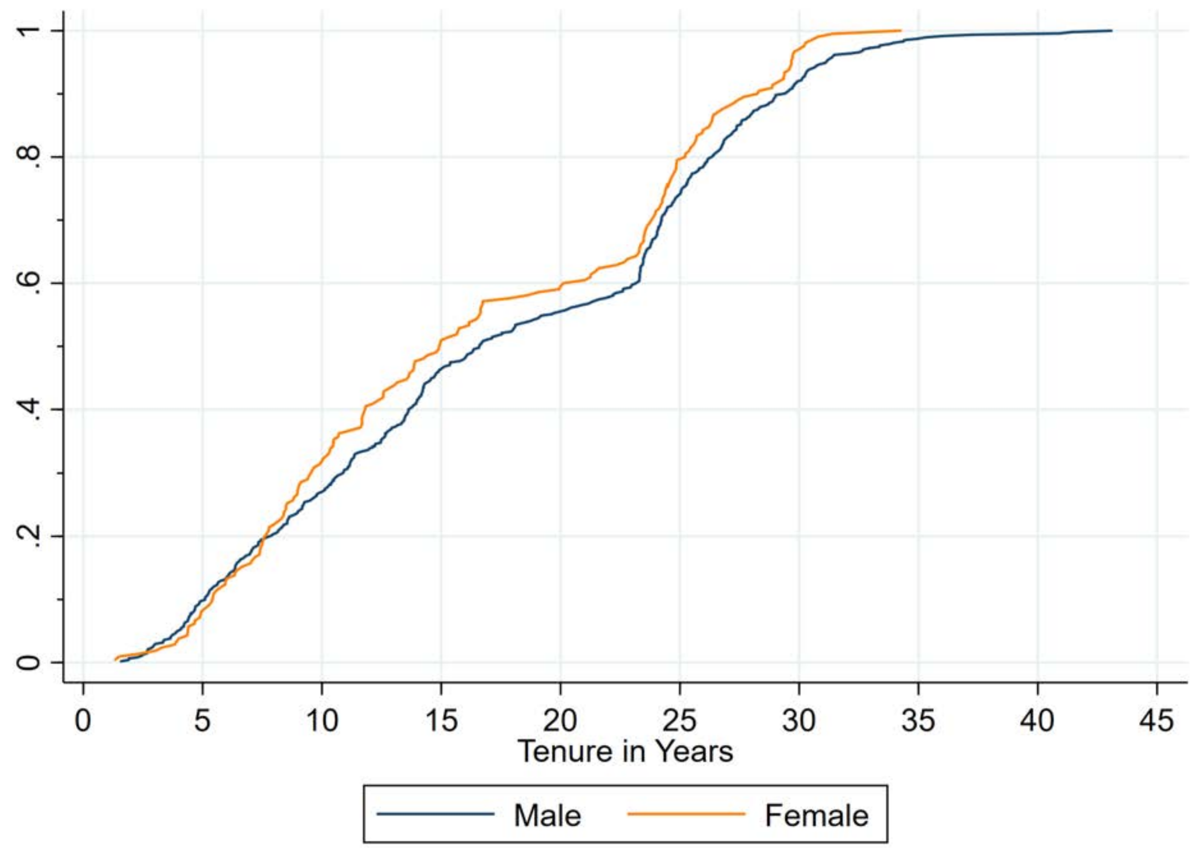


Figure A.11: This chart shows the cumulative distribution function (CDF) of operator tenure upon exiting the MBTA. The vast majority of these exits are voluntary. Discharge can occur for egregious misbehavior or frequent unexcused absenteeism. About 1% of the operators were discharged in 2016-2017 as a result of a new discipline policy that made absenteeism a just cause of suspensions and recommendations for discharge. The data presented here show the CDF for 2011-2017 and include voluntary exits and discharges based on the new discipline policy.

Share of Married Operators By Seniority

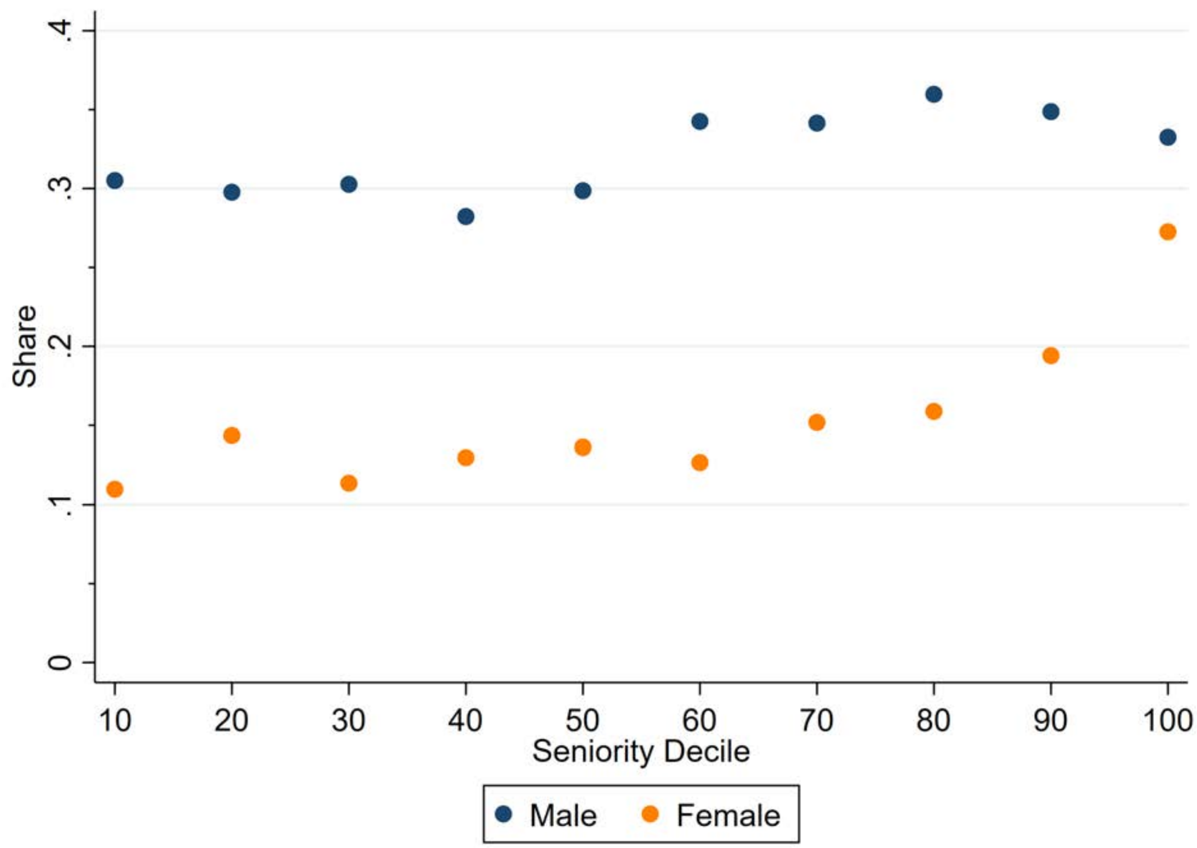


Figure A.12: This chart shows the share of men and women in each seniority decile that are married. We have some attrition of single operators for men and women, with the most senior male and female operators looking very similar in terms of marital status.

Base Wage by Seniority

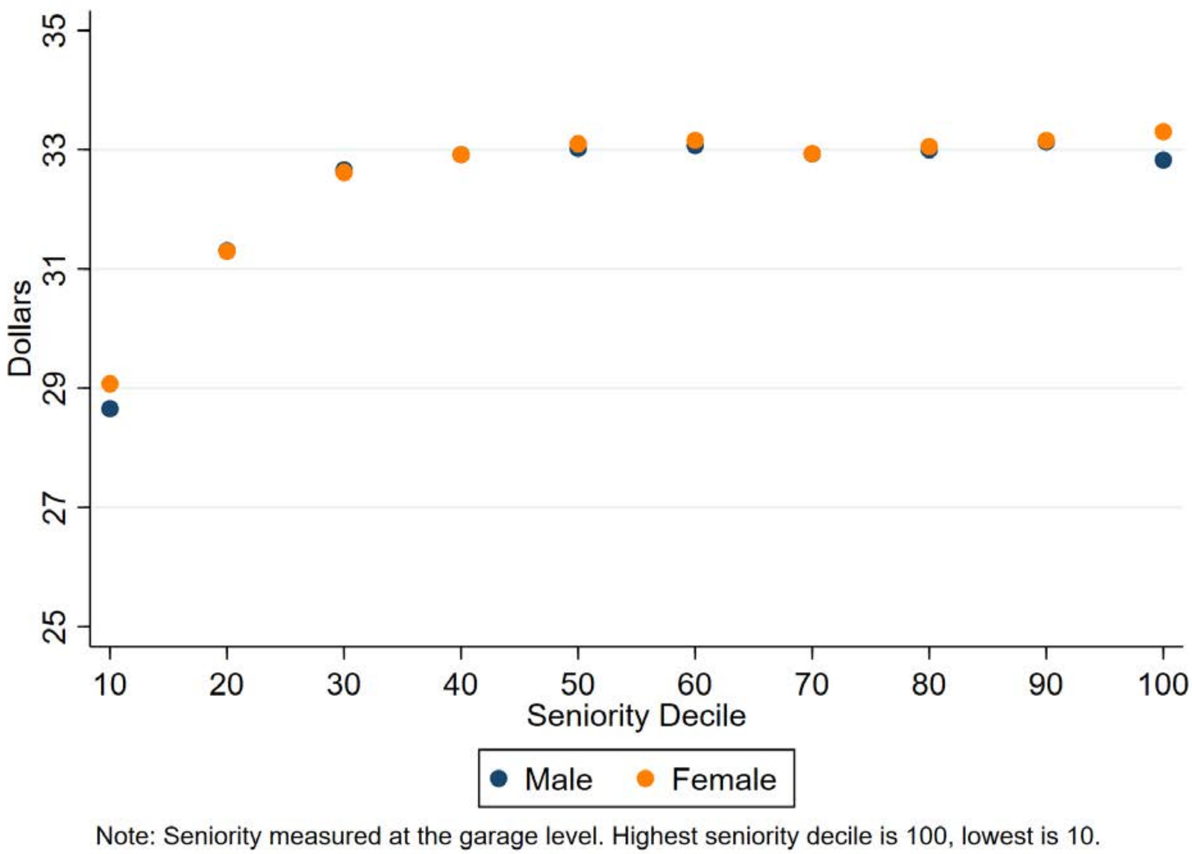


Figure A.13: This chart shows the average base wage for each seniority decile. Operator wages rise until year 4 on the job and then increase modestly with inflation for every year thereafter. Starting wages and wage increases can differ based on an operator's start date, due to changes in the collective bargaining agreement that gets renegotiated every 4 years.

Base Wage by Tenure

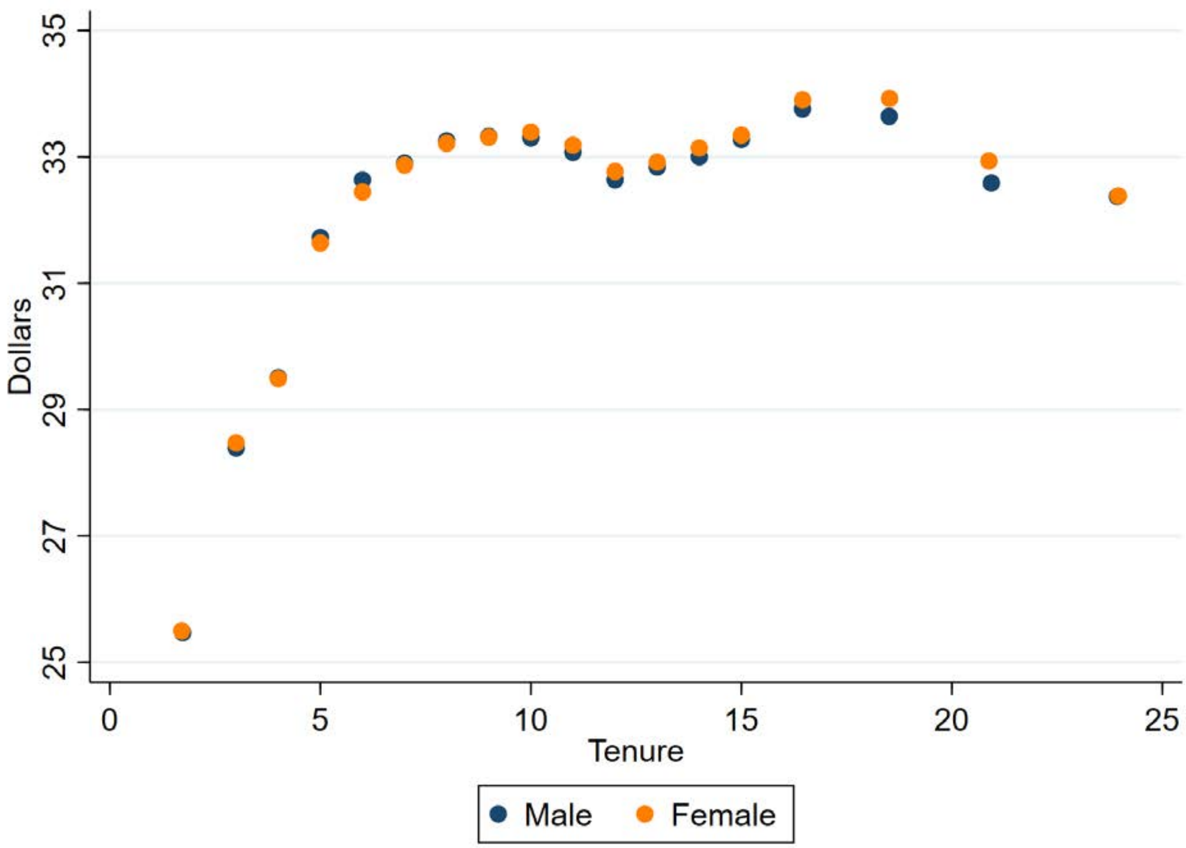


Figure A.14: This chart shows the average base wage for each year of tenure. Operator wages rise until year 4 on the job and then increase modestly with inflation for every year thereafter. Starting wages and wage increases can differ based on an operator's start date, due to changes in the collective bargaining agreement that gets renegotiated every 4 years.

Probability of Taking FMLA, By Day and Gender

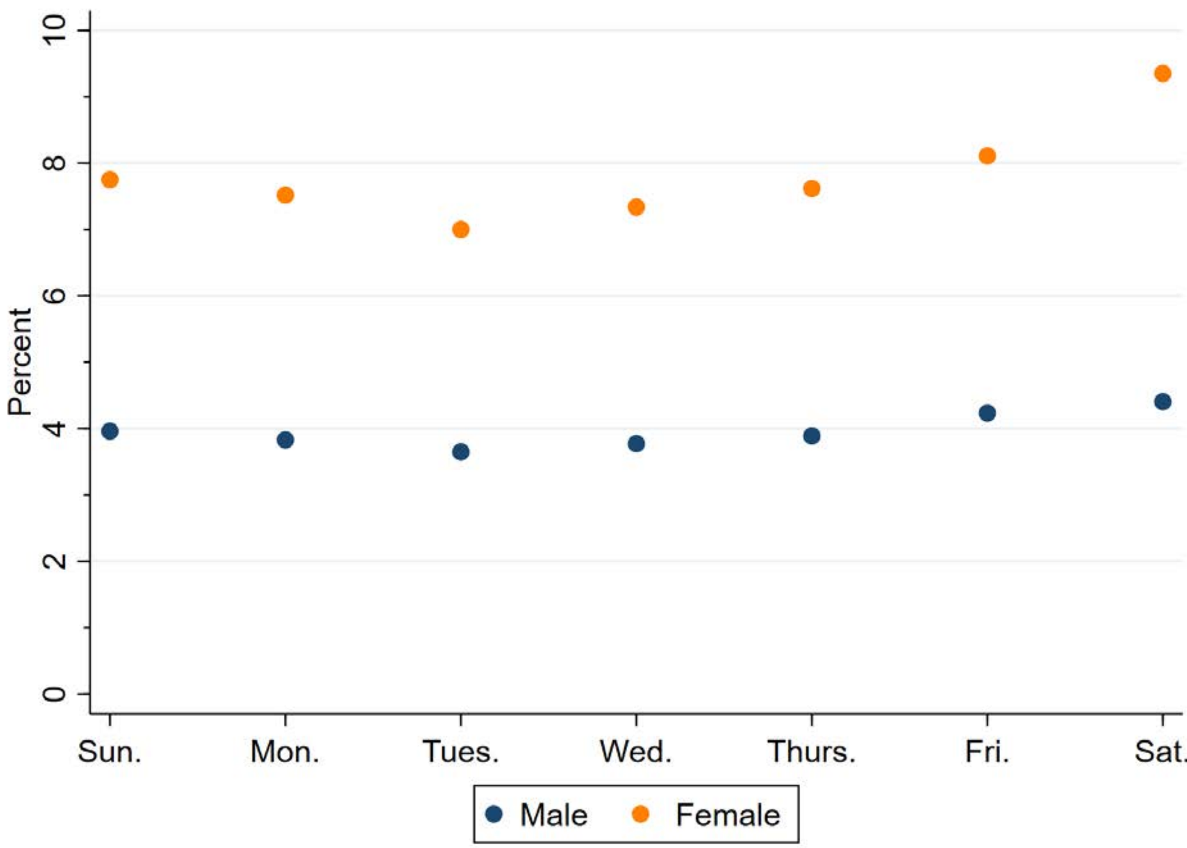


Figure A.15: This chart shows male and female probabilities of taking FMLA leave by day of week. The chart makes clear that women take more FMLA than men and that certain days are more likely to see FMLA usage than others. Saturday, Friday, and Sunday, in that order, are the likeliest of all days of the week to see an operator take unpaid time off, especially women. This variation suggests that FMLA is being used for something other than just medically-necessary time off.

Probability of Taking Overtime if Offered, By Day and Gender

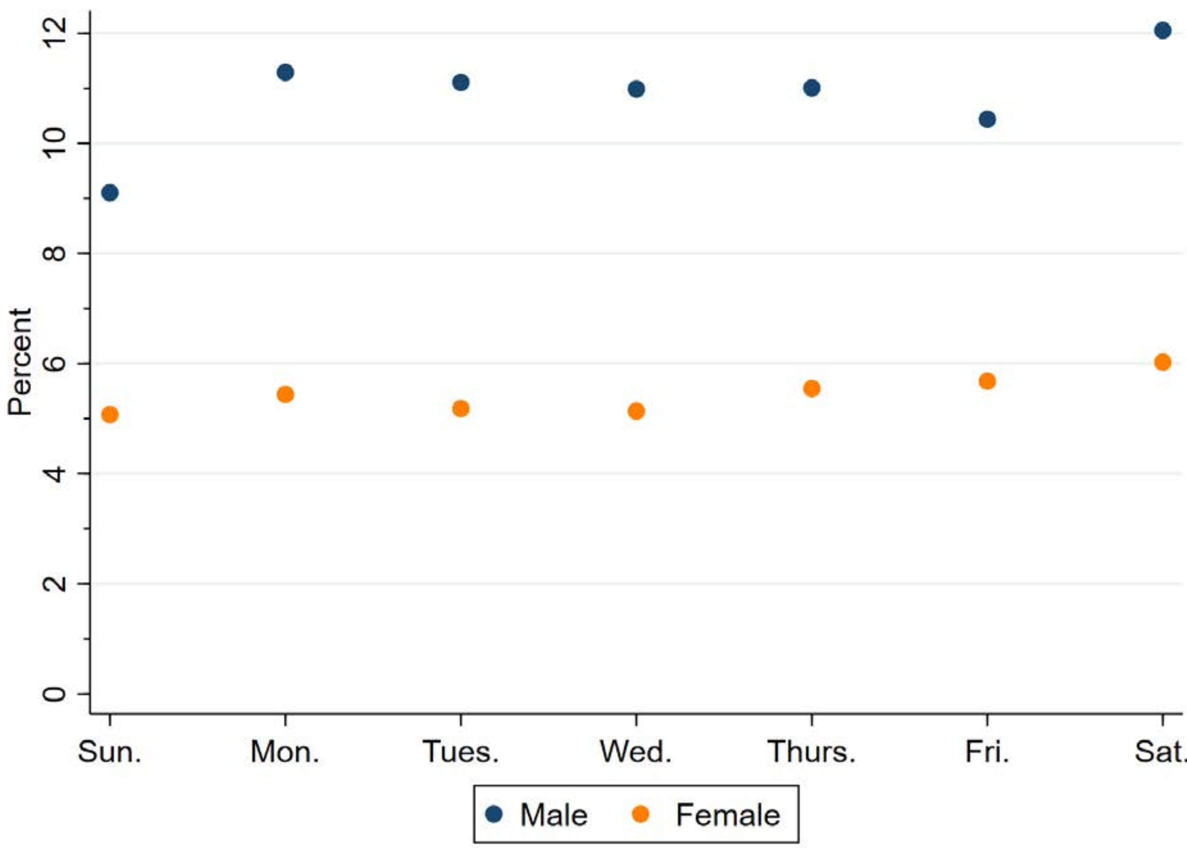


Figure A.16: This chart shows male and female probabilities of working overtime by day of week. The chart makes clear that men work more overtime than women and that certain days are more likely to see overtime worked than others. Sundays are especially unlikely to see an operator accept an overtime opportunity if one is offered, while operators are most likely to accept overtime on Saturdays. Men see more variation across days of the week than men.

Probability of Accepting Overtime Conditional on Being Offered, By Seniority

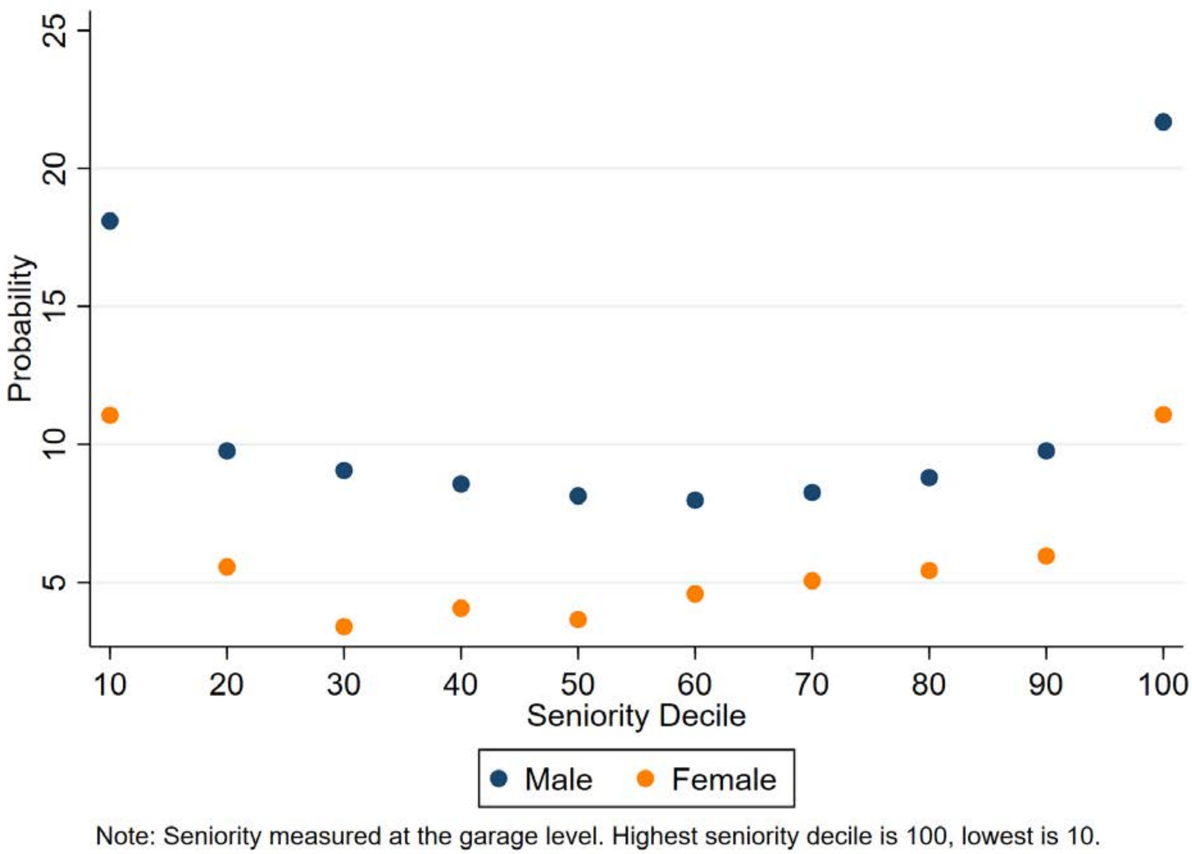


Figure A.17: Across the seniority spectrum, men are on average about twice as likely as women to accept overtime opportunities when offered them. The least senior operators, at the lowest seniority decile, are rarely offered overtime opportunities and accept them relatively frequently given the number of times they are offered. Those most senior, at the highest seniority decile, are the first to be offered overtime opportunities. They accept them at higher rates than those at lower seniorities partly because they have better opportunities to choose from and partly because the pension is calculated off of the highest earning years. Those years will be the years just before retirement for most operators, since base wages increase annually with inflation after year 4 on the job.