Closing the Gender Pay Gap in the U.S. Federal Service:
the Role of New Managers

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Using an event study design, we estimate the effects of female managers and managerial turnover on the unexplained gender pay gap in the US Federal civil service from 1982-2014. We find that changes in managerial teams reduce unexplained gender pay gaps, and the effect is roughly 30% larger when that new manager is female. In the year following the arrival of a female manager, the unexplained gender pay gap closes by 2 log points and by as much as 5 log points in subsequent years. Consistent with this, female employees receive almost 15% more pay grade increases following the arrival of a new female manager. We also find that female managers have the greatest effect in federal agencies with a critical mass of women in management positions. These findings are echoed in female employees' responses to the Federal Employee Viewpoint Survey.

I. Introduction

The US gender pay gap considerably narrowed over the last forty years, albeit at a slower pace in the 2010s. However, the share of the pay gap unexplained by traditional factors has been growing (Blau and Kahn, 2017). Various high level "diversity" initiatives, such as improving female representation on firms' board of directors, have been shown to have small, if any, trickle down effects on female employees' wages (e.g., Bertrand, Black, Jensen, and Lleras-Muney, 2019; Dalvit, Patel and Tan, 2021; Maida and Weber, 2022). On the other hand, there is growing evidence that more immediate supervisors have a potentially large effect on demographic pay disparities (e.g., Cullen and Perez-Truglia, 2019).

This paper exploits the arrival of new managers at each local office, called duty station, in an event-study design to estimate the effects of managers on the unexplained gender pay gap among US federal civilian employees from 1982 to 2014. Thus it contributes to an emerging literature using event-study settings to assess the role of supervisors in pay disparities. We find that changes in managerial teams reduce the gender pay gaps, and that the effect is roughly 30% larger when that new manager is female. In the year following the arrival of a female manager, the unexplained gender pay gap closes by 2 log points and by as much as 5 log points in subsequent years.[1] These effects are economically significant and robust.[2]

The Federal civil service is often touted as a pay equity success story.[3] It has highly regimented administrative pay scales with clearly defined pay grades, levels, and progression criteria, which theoretically limit scope for homophily and demographic characteristics to affect pay. The absence of a profit motive also mutes the potential effect of productivity differences between men and women, making it a neutral setting to study the effect of managerial turnover.[4] In this highly structured, seemingly deterministic pay environment, we find as much as half of the reduction in the unexplained pay gap can be attributed to female managers who help female employees move up pay grades and steps faster than male managers do. Indeed, we find that female employees receive almost 15% more pay grade increases (almost half a grade) following the arrival of a new

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[1]We include as explanatory factors traditional human capital variables – age, tenure, education, and occupations. We also control for agencies, sub-agencies, duty-stations, and locality pay, which is a particular component in the federal pay setting as discussed in section 2 below. Excluded are the pay grades and pay levels.

[2]The estimates are unchanged when the sample is limited to the 75% of workers in the GS pay plan, the largest and least specialized federal pay scale. We also observe the same pattern of results across presidential administrations, although the effects of female managers are largest during President George W. Bush's administration.

[3]Following the Federal Employees Pay Comparability Act (FEPCA) of 1990, it implemented a job analysis framework to set pay comparable to the private sector. This process, as shown below, eliminated the gender pay pay for a few years in the early 1990s.

[4]Nearly all (98%) of new managers are internal promotions.

female manager.

Our main contribution thus provides a warning to those who believe that algorithmic pay systems are the solution to reduce the gender pay gap as alternatives to pay settings with performance pay, or where employees negotiate their pay. Biasi and Sarsons (2022) show that moving away from seniority pay schedule following Wisconsin's Act 10 in favor of performance pay led to a re-emergence of the gender pay gap in teachers' salaries, but this effect was muted in the presence of female school principal or supervisor. Roussille (2020) shows that women's relative pay decreases in settings where employees have to negotiate their pay. Our results show that administrative pay systems may simply provide an illusion, through gender differences in pay grades and steps, that the gender pay gap has closed.

This paper also contributes to the emerging literature that outlines the conditions under which women in leadership are more or less likely to be successful at narrowing the pay gap.[5] Women have indeed made significant inroads in the federal service but remain underrepresented in management relative to their employment shares.[6] Federal agencies with a critical mass of women in their managerial ranks drive our effects. In federal agencies where female managers are in the extreme minority (less than 6% of managers, the bottom quintile of female management shares), the gender of new additions to the duty station's management team has a negligible effect. In contrast, in federal agencies with a critical mass of women in management (those with female management shares between 6 and 42%), adding a woman to the duty station's management team closes the pay gap by 2 log points. These findings about the importance of critical mass are consistent with recent lab and lab in the field experiments on women in leadership (see, for example, Stoddard, Karpowitz and Preece, 2020 and Born, Ranehill,and Sandberg, 2020).

Unlike prior studies that focus on a single firm or industry, such as manufacturing, our setting allows us to estimate the effect of managers on pay gaps across a broad range of sectors, occupations, and eras.[7] We observe approximately 800,000 unique US federal civil service employees over the course of their federal careers. These employees are spread geographically across the United States in over 30,000 unique duty stations (a narrowly defined work unit akin to an office

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[5]In corporate settings across several countries, numerous studies have found a general positive impact of female leadership on the wages and promotion rates of female employees, some with opposite effects for female peers. See, for Portugal: Cardoso and Winter-Ebmer (2010), for Norway: Kunze and Miller (2017), for Italy: Flabbi et al. (2019), and for Germany: Bhide (2019).

[6]Only one third of the managers we observe are women, and on average, the female management share was 12 percentage points below the female employment share.

[7]For example, Flabbi et al. (2019) exploit a longitudinal matched employer-employee sample of Italian manufacturing firms from 1982 to 1997, where only 26% of workers are women, and thus focus on environments where women are vastly under-represented. Their results may not readily transfer to economy-wide settings.

or workplace) and work in over 400 different occupations with varying levels of female representation. We focus on white-collar employees, who include everyone from equipment operators earning $20,000 per year to aerospace engineers earning over $120,000 per year.

Like all employers, the federal civil service experiences employee turnover. We exploit these naturally occurring manager changes in an event-study design to estimate the impact of direct managers on the unexplained gender pay gap. The arrival of a new manager is an infrequent but sufficiently common event in our setting. We observe managerial changes every quarter, approximately 32% percent of observed employees get a new manager each year.[8] These managers supervise 10 employees, on average, and are involved in the assignment and evaluation of their work and in putting them forward for promotions and pay increases. Because we do not directly observe the employee-manager pair, we estimate the effect of including an additional female (male) manager in the duty station's managerial team. As long as the appointment of new male and female managers at a duty station is independent of the gender pay gap and its trajectory at the duty station, this approach identifies the effect of treating an office with an additional female manager and the ITT effect of individual employees receiving a female manager. Our preferred estimates focus on federal duty stations with up to 5 managers (approximately 25 employees). In those settings a single managerial change represents a substantial change in office leadership and results in a sizable share of employees experiencing a change in supervision.[9]

Our findings are also in line with the self-reported perceptions of female employees in the U.S. civil service. We match our data on the share of female managers with data from the 2008-2014 Federal Employee Viewpoint Surveys (FEVS), an annual survey of US federal employees to test whether female employees' pay satisfaction, job satisfaction, perceptions of fairness and workplace climate are correlated with the share of female managers. Female employees' satisfaction with pay and favorable perceptions of workplace climate are increasing in the share of female managers. Our results are supportive of a positive impact of female leadership on workplace climate (Tate and Yang, 2015; Lucifora and Vigani, 2016).

The remainder of the paper is organized as follows. In Section 2, we present the evolution of legislation in setting pay in the US Federal civil service and discuss the role of managerial assessments. In Section 3, we summarize the unique features of the longitudinal administrative US

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[8]This allows to observe the arrivals of 12,113 of female managers and of 18,389 of male managers as we have access to all quarters of data, unlike others using the synthetic data from OPM through the Barrientos et al. (2018) initiative. We note that these "arrivals" are coming at 98% from within the federal civil service.

[9]We find the same pattern of effects in larger offices as well.

Federal Service data that we employ.[10] In Section 4, we outline our estimation and identification strategy. Section 5 reports the main event study results and their implications, as well as discusses threats to identification and robustness results. Finally, section 6 concludes.

II. Pay Setting in the US Federal Service

Over the years, the Federal pay-setting system has been a topic of considerable debate and controversy encapsulated in a series of legislations, as explained below. Because of the large numbers involved, around 1.5 million employees, any pay increases also had considerable budgetary repercussions. As a result, from 1970 onwards, pay increases involved direct Presidential interventions. We provide a brief overview of Federal workers' pay-setting process partly based on Buckley (2009).

A. General Pay Schedule

Concerns over a proper merit system for Federal employment began with the Pendleton Civil Service Act of 1883, which, however, failed to establish a correlation between salaries and duties.[11] The subsequent classification Acts of 1923 and 1949 corrected this omission and focused on classifying positions according to duties and responsibilities applying the same standards across all Federal agencies. The aim was to make a job evaluation system the centerpiece of Federal compensation, creating a "General Schedule" (GS) to merge several separate "schedules" of pay rates into one.

The Federal Salary Reform Act of 1962 established procedures for the Bureau of Labor Statistics to help set the salaries of Federal GS workers to levels comparable to those in the private sector doing similar work and having comparable duties and responsibilities.[12] The Federal Pay Comparability Act of 1970 allowed adjusting GS pay by executive action.[13] In the middle and late 1980s, Federal agencies had considerable difficulty recruiting and retaining high-caliber employees especially in certain localities. The Federal Employees Pay Comparability Act (FEPCA) of 1990, aimed to address these difficulties by creating a locality-based pay system rather than

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[10]We relegate the reader to the Data Appendix for the intricate details of the extensive data cleaning process.

[11]See Buckley (2009) for a detailed account of the various legislation and https://www.generalschedule.org/articles/gs-history.

[12]The Bureau of Labor Statistics began to conduct annual surveys of salary rates in the private sector. The occupational descriptions in the survey were jointly developed by the Civil Service Commission (now the Office of Personnel Management, OPM) and the BLS.

[13]After the 1962 legislation was enacted, GS workers' pay was generally adjusted annually, there were exceptions to the yearly adjustment in 1963, 1972, 1983, and 1986. President Ronald Reagan froze pay increase in 1986 and issued an alternative plan in January 1987 that increased pay by 3 percent.

a single general schedule and by setting a timetable for reducing the potential gaps between the pay of Federal and non-Federal employees doing comparable work in the same locality and established a plan for annual adjustments to Federal employees' pay.[14]

Because some of the required locality adjustments exceeded 30-percent but were implemented at a much lower percentage, FEPCA plans extended through the early part of the 21st century.[15] Because of the size and yearly variation in locality pay adjustments, it is the first consideration that we include in constructing pay residuals to analyze gender disparities (as explained in section III.A below).

FEPCA also set up a process for yearly general increases in Federal pay: a Federal Salary Council first transmits locality pay recommendations to the President's Pay Agent, who makes the final recommendation to the President.[16] The President has the authority to implement alternative pay plans when there is a "national emergency or serious economic conditions affecting the general welfare." The pay adjustments are also reviewed annually by Congress, which may legislate a different adjustment from the one authorized by the President. From 1994 to 2009 and in 2019 and 2020, Congress either added to the President's proposed adjustment or equaled the higher rate recommended for the military.[17]

Following a failed attempt at introducing a pay-for-performance (PFP) concept, called "Working for America", President George W. Bush signed an executive order to implement an average 3.5% pay increase for most federal employees in 2008. Conversely, under the "Campaign to Cut Waste," President Barack Obama implemented a 3–year pay freeze starting in 2011 that ended in January 2014, with increases limited to 1% for that year and again in 2015.[18] We thus expect presidential cycles to influence the level of general pay increases, which themselves may influence the ability of individual employees to seek and obtain personal adjustments.

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[14]Initially, there were just 29 locality areas at the time; thirteen new locality areas were added in 2016. There are now 47 locality areas – regions across the country where employees are paid more to compensate for higher costs of living.

[15]See Table 1-1 of CRS (2010). The first pay adjustment under FEPCA, effective January 1994, closed twenty percent of the Federal/non-Federal pay gap. Beginning January 1994, annual salary adjustments for most GS employees would consist of a general cost-of-living adjustment equal to the BLS Employment Cost Index (ECI) minus one-half percentage point and a local-specific adjustment of no "less than one-fifth of the amount needed to reduce the pay disparity with private industry salaried in the locality involved to 5 percent."

[16]The Federal Salary Council is comprised of nine pay and labor relations experts and organizations representing GS employees, some of them can be political appointees. The President's Pay Agent normally includes the Secretary of Labor, the Directors of the Office of Management and Budget (OMB), and of the Office of Personnel Management (OPM).

[17]Alternative plans were submitted for pay increases effective in 1995-98, 2001, 2003-05, 2007, 2008, and from 2010 to 2017; no alternative plans were submitted for pay increases effective in 1994, 1999, 2000, 2002, 2006, or 2009. President George H.W. Bush suggested postponing the 1993 pay increase for one quarter in order to reduce the fiscal year 1993 budget by $460 million, but there was no support for this in Congress. In February 1993, President Clinton also proposed postponing the 1994 pay adjustment for one year and revising the adjustment formula to be one percentage point less than the ECI (rather than the previous half-percent). He also proposed postponing the locality-based comparability adjustment from 1994 to 1995.

[18]See GAO (2021) for a comparison of pay locality increases proposed by the Federal Pay Council, the President's Agent and Congress' alternative plans for 2015 to 2019.

There are several alternative pay plans to the GS schedule, around 80% of federal employees are paid according to these plans. Most of our results include employees under the GS schedule as well as other schedules. But we also provide some analysis focusing only on GS employees. The "job analysis" principles at the basis of FEPCA were later incorporated into proposals to equalize pay between male and female dominated jobs of comparable worth (e.g., Treiman and Hartmann, 1981). Interestingly, an unforeseen consequence of the 1990 adoption and 1994 implementation of the job analysis principles was to reduce the gender pay gap unexplained by typical "human capital" characteristics, as we discuss in section IV.A.

The central core of the GS classification system establishes 15 grades, based on the difficulty, responsibility, and required qualifications of their positions.[19] Employees in occupations with job ladders may advance (non-competitively) to higher grades by promotion at certain intervals (generally after at least a year), up to the full promotion potential. Beyond that level and in other occupations, employees compete for promotions. The basic pay rates within any GS grade are set at one of 10 fixed step rates.[20] Employees performing at an acceptable level of competence progress through the rate range following statutory waiting periods (one to three years depending on the step).[21] In addition, employees may receive additional step increases–called Quality Step Increases (QSIs)–based on outstanding performance, subject to a limit of one QSI per year. Therefore one possible way for gender pay disparities to emerge is for men and women to be subject to different performance evaluations.[22]

In summary, salaries of federal civil service employees can increase due to promotions (increases in grade), QSIs, and statutory increases in the federal pay schedule, as well as due to locality pay adjustments under the Federal Employees' Pay Comparability Act of 1990 (FEPCA). Our goal is to control for the latter and other bureaucratic determinants to extract the potential role played by managers in helping employees move along the pay grid.

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[19]Individuals with a high school diploma and no additional experience typically qualify for GS-2 positions; those with a Bachelor's degree for GS-5 positions; and those with a Master's degree for GS-9 positions.

[20] Appendix Table A1 displays the GS salary table for 2012 (rates frozen at 2010 levels) in the form of a matrix of 15 grades by 10 steps. It shows that increases along the steps (columns) range from 2.4% to 3.3%, while increases across the grades (rows) for step 1 range from 8.7% to 18.1%.

[21]The usual progression is 52 weeks (one year) between steps 1-2, 2-3, and 3-4, then 104 weeks (two years) between steps 4-5, 5-6, and 6-7, and finally 156 weeks (three years) between steps 7-8, 8-9, and 9-10. It normally takes 18 years to advance from step 1 to step 10 within a single GS grade if an employee remains in that single grade. See https://www.opm.gov/policy-data-oversight/pay-leave/pay-administration/fact-sheets/within-grade-increases/

[22]Although Olson et al. (2000) found that only 3 per cent receive quality step increases.

It has been suggested (Johnson and Libecap, 1989) that within the federal service, bureaucratic rules reduce the cost to Congress of monitoring the personnel system and help guard against supervisor behavior that could be adverse to elected officials. Yet, despite relatively constrained pay setting procedures, federal supervisors seem to find ways around those rules. Federal pay has varied by race, sex, and locality more than can be explained by observed measures of qualifications (e.g., Lewis and Oh, 2009) and despite bureaucratic procedures to block that variation. Pay grade levels have risen over time despite bureaucratic efforts to retain constant definitions of grade. Managers and supervisors may find ways to reward employees for high performance or for other goals.

Oh and Lewis (2013) use a random-effects model on a one per cent sample of federal personnel records from 1988-2003 to investigate the impact of performance ratings on promotion probabilities and annual raises. Despite widespread scepticism that the federal service strongly links financial rewards to performance, they find that, on average, outstanding performers received annual raises one-quarter and two-thirds of a percentage point higher than fully successful and less than fully successful performers. The ratings were also found to affect career advancement one or two years later.

More recently, Droganova (2018) found that the gender gap in federal employees' wages and promotions is correlated with the share of female managers in the office. Specifically the gender gap favors men in offices where all the supervisors are male and favors women in offices where all the supervisors are women. Women also start at a higher initial grade and progress faster in offices with all female management teams. Instrumental variables estimates exploiting manager retirements provide suggestive evidence in the same direction; however, that analysis is limited by the instrument's strength.

III.   Data

A.   Employment Data

The primary data source for the paper is quarterly administrative payroll data obtained from the US Office of Personnel Management (OPM) through a Freedom of Information Act (FOIA) request. We focus our analysis on civilian white collar salaried full-time employees employed by the federal government between 1982 and 2014.

The OPM data provides details of each employee's federal employment history and pay. The data includes information on each employee's place of employment, including the agency, sub-agency and duty station. It also includes information on their job, including their occupation and role in the office (i.e., manager, supervisor, employee) and their employment type (e.g., full, part-time, salaried, or hourly). These data enable us to follow employees over the course of their careers in the federal service including any moves across roles, offices, and agencies.[23] Finally, the data include information on each employee's, compensation, most notably the government pay schedule (herein called the pay plan) under which they are paid, their grade in that pay plan in each quarter, and their pay in each quarter.[24]

We supplement these data with human resources data collected at the time the employee was hired and when they separated from the government. These data include the individual's age, education, and reason for separation from the federal government (e.g., retirement). These data also include information on prior federal service for employees returning to government service after a period in the private sector. Because these data are only available beginning in 1982, we begin our sample then. The data appendix provides additional details on the construction of the OPM data and each of the variables we use.

The data we obtained from OPM does not have race or gender of employees, but does include first names and last names for most. We therefore imputed gender based on employees' names. OPM redacted the names of all employees in sensitive occupations: these are primarily employees in enforcement or security roles. We were unable to impute gender for those employees and therefore exclude law enforcement and regulatory agencies and sub-agencies (e.g., the Inspector General's office). We were able to successfully impute the gender of 95 to 99% of the employees whose full names were provided by OPM.[25] We omit employees whose gender we could not identify, but include all managers irrespective of our ability to impute their gender. The data appendix provides extensive detail on both the gender imputation and the excluded sub-agencies.

To ensure that we have enough observations to obtain estimates of duty station gender pay gaps and fixed effects, we limit our sample to offices with at least 15 employees. We also limit

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[23]Approximately 25% of employees in our sample change duty stations at least once in their careers.

[24]The workers in our data are paid under 98 separate pay schedules, but most workers (around 80%) are paid under the GS schedule.

[25]We imputed gender based on the frequency of the first name in male and female babies born in the employee's birth cohort in the Social Security Name files. Names were coded as being indicative of a gender if at least 85% of babies born in the employee's cohort with the name had the same gender. We cross-validated our gender imputation algorithm with an extract of the EHRI-SDM data for the years 1992-2012 from Vilhuber (2018) which includes information on employee gender. In the sub-sample contained in both data sets, our gender imputation algorithm accurately classifies 95.11% of males and 99.24% for female employees.

the sample to employees who work for the government for at least 5 years to observe them for a few periods before the event.[26] Both restrictions remove noise from the estimation but do not otherwise meaningfully affect the estimates below.

The key variables and sample characteristics for the resulting estimation sample are summarized in Table 1 for employees employed at duty stations with at most 5 managers and 6-20 managers. The full estimation sample without managerial restrictions consists of 2.5 million quarter-year observations from approximately 70,000 unique female employees and 60,000 unique male employees who are spread across 10,000 duty station. Our preferred at most 5 manager estimation sample consists of 1.2 million quarter-year observations from approximately 60,000 unique female and male employees who are spread across 7,000 duty stations (Table 1, Panel C). Like in the broader labor market, there is a roughly 15% raw gender pay gap among the workers in our sample. The average female employee earns $51,000 per year and the average male employee earns roughly $7,000 more (Table 1, Panel A). However, a portion of the raw gender disparity can be explained by differences in human capital, such as education. The overwhelming majority of white collar federal employees have at least some college education, but the male employees we observe are slightly more educated (Table 1, Panel B).[27]

Figure 1 plots the raw gender pay gap over time, alongside with the pay gap adjusted for gender differences in observed human capital (education), occupation, and age. A sizable gap remains unexplained after accounting for these observed differences (the vertical distance between the two curves.) Panel A illustrates these trends for employees who work for the government for at least 5 years in the full sample, while panel B further restricts employees to duty stations with at most 5 managers and at least 15 employees. Both panels, but especially panel B, show the raw gap decreases over time, but the adjusted pay gap does not decrease proportionally. Rather the two curves evolve in parallel, as a result the unexplained gap as a share of the raw gap increases over time.

B.   Managers

Women's presence in management positions grew alongside their employment shares over the course of our study period, as shown in Figure 1. By 2014, women were 40% of managers, up from

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[26] This last restriction implies that our dataset corresponds to a continuously refreshed panel data that omits high frequency employee churning (those employed less than five years). Thus our gender gap measures will be different from the ones typically obtained from cross-sectional data.

[27] In our data, 87% of the male workers have at least some college education compared with only 80% of female workers. Male workers are also more likely to have graduate degrees

16% in 1987. Despite these increases, women were under-represented in management relative to their employment shares every year and remained so. On average, in our data, women make up 40% of employees in workplaces but only about 25% of managers (Table 1, Panel C). In addition to the intertemporal variation, there is substantial variation in the female management shares across agencies and across duty-stations within agencies in each period. Female management shares range from 0% to 100% across agencies and offices.

The managers we study are close supervisors. As shown in Figure 3A (solid line), the vast majority of federal offices we study typically have only 5-10 employees per manager. Unfortunately, we only observe the management team at each duty station. We do not observed direct reporting lines and the divisions of management responsibilities within the duty station. We therefore focus our analysis around two samples with different managerial team sizes: those with 5 or fewer managers, and those with 6 to 20 managers. Figure 2B and 2C, respectively, show the percentage of duty stations treated with a new manager in each year for the two samples, separately. Approximately 10% of duty stations with up to 5 managers receive a new manager each year, and commensurate with their management shares, about a third of these new managers are women (Figure 3B). The turnover rates are comparable in larger duty stations once scaled up by the number of managers (Figure 3C). Nevertheless, our preferred analyses center on the 88% of duty stations that have the smaller management teams (at most 5 managers), because of the presumably more accurate employee-supervisor pairing.

The main event of interest in our study is the first management change an employee experiences. We define an employee's first new manager as the first new manager at the employee's duty station after the employee begins working for the federal government.[28] That first new manager event is then interacted with the gender of the first new manager to create the "new female manager" and "new male manager" variables. Under this definition, around 30% of female and male employees are treated with a first new manager over the course of the sample period.

IV. Identification strategy

In this section, we provide a more precise definition of the event that we exploit and expand on how the richness of our data allows us to estimate a very detailed specification. As explained in section II above, the federal pay setting involves several components, most of which we want to abstract from to estimate the "untainted impact" of new managers. Therefore, we begin our

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[28]A management change at a duty station will not trigger a first new manager event for all the employees at that duty station, only those who have started work since the last management change will experience their first new manager.

estimation by first constructing a log pay residual – pay received by employees not accounting for the observable characteristics of employees, duty stations, and localities. We will then use this pay residual as a dependent variable in the event study design.

A. First stage

An important component of pay for many employees from 1994 onward comes from pay adjustment for living standards in different localities, which have become more granular over time. Thus, we begin by regressing the individuals' annual log pay on localities of duty stations in a first step, using "rest of the United States and its territories and possessions" as the base group.[29] We run these regressions separately for each year, which allows us to fully account for the magnitude and yearly variation of the locality pay adjustments under FEPCA, as discussed in section II.A.

We then use residuals from step one to obtain the unexplained pay in the second step. Again, we regress, year by year, the residuals from the first step on the observable characteristics, some of which changed substantially over the entire period:

$$(1) \qquad \hat{w}_{iqy} = X'_{iqy}\beta_y + \theta_{dy} + \omega_{iqy}, \ \ y = 1987, ..., 2014$$

where $\hat{w}_{iqy}$ is the residual from step 1 for an individual i in quarter q and year y, X_{iqy} are observable characteristics, including age, education, occupation, and tenure. Duty station fixed effects are denoted by θ_{dy}; they are thought to capture some effects of duty stations, such as female share of employees, which are shared by all employees at the duty-station in a particular year. Not restricting the effects of observables to be the same across years corresponds to a model with a full set of interactions between the explanatory variables and years.[30] We denote the resulting (final) log pay residual as $\hat{\omega}_{iqy}$.

We display yearly averages of these residuals (solid symbols) by gender in Figure 2 for subsamples with duty stations with at most 5 and 6-20 managers, as well as residuals (hollow symbols) from a specification that controls for 47 pay grade and level fixed effects. The distance between the average male and female residuals corresponds to the average unexplained pay gap.

[29]First step regressions:
$$W_{iqy} = \theta_{ly} + w_{iqy}, \ \ y = 1987, ..., 2014$$
where W_{iqy} is log annual pay for an individual i in quarter q and year y, and θ_{ly} are locality fixed effects in a regression for year y.

[30]This strategy also avoids potential multicollinearity problems between duty station and their localities, when there are few duty stations at a particular locality. Localities are linked to the OPM data at the duty station level.

One potential mechanism behind these unexplained disparities that we explore more below is observationally equivalent male and female workers being hired at different places on the pay grid and moving through the grid at different paces. Indeed, when we include the endogeneous pay grades, the male and female residuals are much closer to each other, at times with some positive (negative) average female (male) residuals. It is in this sense that the pay grid hides the underlying gender pay gap.

Figure 2 shows that most (90%) of the unexplained pay gap over time operates through workers placement on the pay grid, a decision heavily influenced by their managers. However, as explained in footnote 26, we caution the reader about using familiar references to cross-sectional gender pay in the interpretation of these panel data trends.

B. Event study

Using the log pay residuals obtained in the first stage as a dependent variable, we estimate the effects of managerial turnover and gender of new managers in an event study design. The following specification is estimated separately for female and male managers, because there are a certain number of managers whose gender we do not observe:

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\begin{aligned}
\hat{\omega}_{itq} = &\sum_{k=-L,k\neq-1}^{U} \delta_k \mathbf{1}\{t=k\} \cdot F_i \cdot NM_{idt} \\
(2) \quad &+ \sum_{k=-L,k\neq-1}^{U} \delta_k^G \mathbf{1}\{t=k\} \cdot F_i \cdot (NM_{idt} \cdot G_d) + \gamma_{id} + \lambda_q + \varepsilon_{itq}, \qquad G = f, m
\end{aligned}
$$

Here, $\hat{\omega}_{itq}$ denotes the pay residual from the first stage for an individual i in event year t and calendar year-quarter q. Female employees are denoted by the indicator variable F_i. The arrival of a new manager for an individual i is denoted by NM_{idt}, and the interaction, $F_i \cdot NM_{idt}$, denotes female employees getting a new manager in event year t, therefore δ_k capture the effect of a new manager of the log gender pay gap at event time $t = k$. We further examine the additional effects of a new manager of gender $G_d = f, m$ by including its interaction with NM_{idt}. In the case of a new female manager, $G_d = f$ and the term, $F_i \cdot (NM_{idt} \cdot f)$, denotes female employees getting a new female manager in event year t at the duty station d. Therefore δ_k^G capture the effect of a new manager of gender $G_d = f, m$ on the log gender pay gap at event time $t = k$. Fixed effects in the event studies are given by γ_{id} and λ_q, which denote individual-duty station fixed effects, and calendar year-quarter fixed effects. Because there is substantial proportion of employees (25%)

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who move across duty-stations, we are able to identify individual-duty station fixed effects, which also absorb individual gender fixed effects. The event study residual is denoted by ε_{itq}.

We define treatment as the first managerial turnover the employee experiences after she begins working for the federal government. Specifically, treatment is the first time a new manager arrives at the employee's duty station.[31] Event years correspond to four consecutive quarters prior to and following treatment. Depending on when treatment occurs, event years might not be equivalent to calendar years. For example, if a duty station receives a new manager in the second quarter of the year 2000, the event year 0 is defined as 4 quarters prior to and including the event quarter, thus including the last two quarters of 1999 and the first two quarters of 2000. The first event year following treatment is then captured by the last two quarters of the year 2000, and the first two quarters of the year 2001, and so on. The year prior to treatment, $k = -1$, is excluded from the event study regressions. The absorbing years in our event study specification are denoted by $-L$ and U, where $-L$ is the earliest event year, and U is the latest event year. In our results, we report estimates for event years from -4 to +4, omitting the lower and upper absorbing years in the figures.

The definition of treatment in our event studies warrants further discussion. Managers are appointed at the duty station level, thus, individuals are treated at the duty station level. We focus on the arrival of the first new manager for each individual at the duty station to avoid confounding issues driven by the effects of previous managers.[32] Therefore, treatment status depends on whether employees working at a duty station have received managers prior to the appointment of a current new manager. If this is the first new manager for an employee working at the duty station, we define the employee to be treated. If an employee has received new managers prior to the arrival of the current new manager at the duty station, the employee is defined to not be treated even if she receives a new manager at the same time as treated employees at the same duty station. Thus, when a new manager arrives at a duty station, only a subset of individuals working at the duty station are defined as treated.

We estimate event studies separately for new female and male managers. Usually, the event study results estimated using specification (2) for new female managers would imply mirrored results for the effects of new male managers when genders of all managers are known. Because we

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[31]Our preferred estimates require treated employees to have been working at the duty station for at least one year prior to their first managerial turnover. This insures that each treated person in the event study has a pre-treatment period. However, estimates are robust to including those with even shorter tenures prior to the first new manager's arrival. They are also robust to defining the event as the first managerial turnover after at least a year of service.

[32]We have however estimated event studies using arrival of the second manager as treatment. The effects associated with the second manager, regardless of gender, are not substantial. The results can be found in Appendix XXX.

interpolate gender using an algorithm, as discussed in Section III.A, and include new managers of unknown gender, the effects of new female managers are identified relative to all non-female managers. Since the effects of new female managers and new male managers in this setting are not reciprocal of each other, their estimates need not be symmetrical. Therefore, for completeness, we estimate event studies for both new female and male managers.[33]

V. Event-study Results

In this section, we begin by presenting our main event-study results for duty stations with up to 5 managers and duty stations with 6-20 managers. We follow with estimations on additional sub-samples: first, by the agency's initial rank of the female managerial share, and second, by presidential cycles which influence the level of general pay increases. These allow us to discuss the conditions under which new female managers are found to have the largest impact. This is followed by a thorough discussion of potential threats to identification. These include the balance of the observed characteristics of workers and duty stations by new manager gender, analyses of the sensitivity of the estimates to key specification choices, and the robustness of the estimates to newly proposed estimators for staggered treatment effects (Borusyak et al., 2021). Finally, we include some simple difference-in-differences estimates of the overall effect of the arrival of same-gender managers on promotions and the adjusted pay gap to probe the primary mechanism, namely homophily, that we argue might be at play. Given the under-representation of women in management roles, such homophily will have a disparate impact on female employees.

A. Main Results

Figure 4 provides a graphical representation of our main event study results. The solid orange line is the total effect of the addition of a female manager on the gender gap. It is the combined effect of receiving a new manager (regardless of manager gender) and the effect of that new manager being female $(\delta_k + \delta_k^f)$. The dotted orange line isolates the female manager effect (δ_k^f) and the vertical distance between the two curves is the new manager effect (δ_k). Because we were unable to observe the genders of all new managers, the excluded group in the interaction is male new managers and managers of unknown genders. For completeness, the blue lines depict the analogous estimates for new male managers. A positive estimate corresponds to a reduction

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[33]Additionally, since the control group includes unknown managers that constitute both female and male managers, the effects of new female and male managers that we find in our event studies are likely to be the lower bounds of the true effects.

in the gender pay gap (the female pay penalty becoming less negative). Table 2 reports the corresponding point estimates with standard errors (clustered at the duty station level)

Our first finding is that managerial turnover reduces the gender gap. For our preferred sample, duty stations with up to 5 managers, the gender gap is stable prior to the arrival of the new manager (there is no pre-trend) and then improves following the addition of a new manager to the duty station's management team. The gender pay gap falls by 3.5 log points over the four years following the arrival of a new male manager and falls by 5 log points following the arrival of a new female manager. The pattern of estimates is similar, albeit slightly larger and noisier, in the larger (6-20 manager) offices.

Next we turn to isolating the effect of manager gender. As anticipated, the differential effect of female managers, illustrated by the dotted line (orange), is positive ranging from 1 to 1.5 log points and very precisely estimated in offices with up to 5 managers. Conversely, the differential effect of male managers, illustrated with the dotted line (blue), is negative ranging from -0.7 to -1.7 log points. Estimates are similar for employees at duty stations with 6-20 managers, although the female manager effect is smaller and less precisely estimated.

Given that, as discussed earlier, female managers are in the minority, this propels us to look at circumstances under which female managers are more or less effective at reducing the gap. In the first row of Figure 5, we present our event study results for sub-samples of agencies divided by quintiles of their rank of the female management share when these agencies were initially observed in the data.[34] Table 3 reports the corresponding estimates with standard errors clustered at the duty station level and the corresponding graphs for larger offices are available in Appendix Figure ??. Here we find sizeable differences in the total new manager effects which become larger as we move across agencies with low, medium, and high female managerial shares.[35]

The differential impact of new female vs. new male managers is largest and statistically significant in agencies with a critical mass of female managers. Agencies in the bottom quintile at the start of the period have the largest unexplained gender gaps among their employees, but the appointment of token female managers does not close the gap any more than new male managers. The results are in line with the findings of others (list...)

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[34]For many agencies created before our first observation year, such as the Departments of Agriculture, Commerce, Energy, Education, Health and Human Services, Labor, Housing and Urban Development, Transportation, etc., this corresponds to year 1982. But for others, such as the Department of Veteran Affairs created in 1989, the initial rank is measured later.

[35]The 19 agencies in the low female management share (bottom quintile) have initial female management shares of at most 6% while the 19 agencies in the high female management share (top quintile) have initial female management shares of at least 42.5%. The 54 agencies in the middle three quintiles have initial female management shares in between these extremes. There is a fair amount of persistence in these rankings. Around 60% of the agencies remain in the same group at the end of the period.

In the second row of Figure 5, we divide our data by presidential cycles from the Reagan and Bush 41 (1987–1992), Clinton (1993-2000), and Bush 43 (2001–2008) years, and present our even-study results for our preferred sample, offices with up to five managers (estimates for the up to 20 manager sample are provided in the appendix).[36] As discussed in section II.A, during the Reagan, Bush 41, and Clinton presidencies, there were frequent pay freezes, postponements, and strict limits on general increases. Nevertheless, we find sizeable total effects of new managers on the gender pay gap, but little differences between the female and male managers effectiveness at reducing the gap. The story is different during George W. Bush's presidency; as shown in Figure 1, panel B, there was a sharp increase in employment, from 25% to 33%, a time of general government reorganization and expansion. Being the latest period considered, it is also one in which newly appointed female managers are more likely to be assuming their roles in workplaces with a critical mass of women in leadership positions. Two-thirds of duty-stations had management teams that were at least 10% female during Bush 43 compared with only 40% during the Regan and Bush 41 presidencies.

The total effects of new managers are larger in this period becoming as high as 10 log points, but more importantly the impact of female and male managers are statistically and economically different in the later era. We observe that when women reach a critical mass in the managerial team and when the pay environment is more favorable to increases, new female manager become relatively more effective than new male managers at reducing the pay gap.

B.   Threats to Identification and Sensitivity of Estimates

The estimation above uses management turnover as a natural experiment. It is natural to ask whether the duty stations in which male and female managers are appointed are comparable prior to their arrival. If, for example, women were more likely to be appointed as managers in problem duty stations with worsening gender gaps as part of a remediation scheme, our estimates would conflate the effect of female managers with the circumstances of their appointment. Fortunately, that does not appear to be the case. The gender pay gaps are stable in the years before a new manager is appointed. While one can never prove the absence of relevant unobserved variables, both employees and duty stations that receive new male and new female managers appear comparable in the preceding year (Table 4). Female employees who receive new female managers have the same salaries, unexplained pay gaps, education levels, and federal job tenure as female

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[36]The Obama presidency is too close of our upper censored years to yield reliable results.

employees who receive new male managers (Table 4, columns 1 and 2 and columns 5 and 6). The only notable exception is the share of female employees at the duty station. Female managers are appointed at duty stations that have more female employees. This is, however, a fixed and stable difference that should be absorbed by the duty station fixed effects.

Consistent with the appointment of new male and female managers being independent of trends in their duty stations, our estimates are robust to various combinations of controls and fixed effects. The top row of Figure 6 displays our main estimates of the new female manager effects ($\delta_k + \delta_k^f$ and δ_k^f) from Figure 4 alongside estimates from specifications that include individual fixed effects in lieu of individual - duty station fixed effects and estimates that exclude duty station fixed effects in estimation of the first stage residuals that we use as a dependent variable in event studies. The new manager effect is somewhat smaller in the individual fixed effect specification, but the overall pattern of results is unchanged across the specifications and δ_k^f is virtually indistinguishable across them. The estimates are also robust to alternate definitions of treatment. Our preferred specification limits the treated group to those who worked for the federal government for at least a year before experiencing their first management change. Those whose workplaces experience management changes in their first year are not ever coded as treated. We believe this is the most conservative way to handle these individuals, and to the extent it affects the estimates it will bias them towards 0. An alternate approach would be to code these individuals as treated with a first new manager at the next management turnover (define treatment as the first new managerial appointment after at least one year of service). The second row of Figure 6 reproduces our main new female manager estimates alongside estimates using this alternate treatment coding. The estimates are virtually indistinguishable.

The event study estimates pool new manager arrivals that occur in different years and utilize a two-way fixed effects style estimation. Following the insights of Callaway and Sant'Anna (2021), we estimate the effects separately by the year of the first new manager's arrival. Figure 7 presents the results for 4 equally spaced years.[37] While the point estimates get noisier in the much smaller individual year samples and there is some year to year variation, the same general pattern of results is present in each year. Additionally, contrary to what some might expect, the importance of gender and manager gender in the labor market is not only a historic concern. Women's wages are still significantly affected by their manager's gender in 2007.

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[37]Note we show 2007 instead of 2008 due to concerns that the financial crisis was a unique year.

C. Mechanisms: Promotions

The highly structured nature of federal employment and compensation implies merit increases in pay steps and expedited grade increases (our proxy for promotions) are the mechanisms through which managers would need to act to impact worker pay. Managers could increase worker pay by directly expending effort to get them pay step or grade increases. They could also indirectly increase pay through the performance evaluations they provide (e.g., Oh and Lewis (2013)) which in turn could make workers eligible for or more successful in their pursuit of higher pay grades in their current role or in moving to roles with higher pay grades. We next test whether female employees receive more pay grade increases in the years following the appointment of a new female manager at their office.

Because each of the different government pay scales has a different number and spacing of pay grades, we focus this analysis on the 90% of employees in our sample who are paid under the GS pay scale. While step increases can occur in consecutive years, pay grade increases are less frequent and lumpier. The average GS-pay-plan employee in our sample experiences just over 3 pay grade increases during the entire period in which we observe them (Table 1, Panel A). We therefore estimate the cumulative effect of female managers on promotions using a two-way fixed effects difference-in-differences (DiD) approach. For ease of interpretation, we limit the sample to those who receive a new manager of observed gender during the period we observe them.

Specifically, we estimate regressions of the form:

$$(3) \qquad P_{iqt} = \delta^S (NM_{idt} \cdot S_{idt}) + \delta_f^S F_i \cdot (NM_{idt} \cdot S_{idt}) + \gamma_i + \lambda_t + \epsilon_{itq}$$

Where, F_i is an indicator that equals 1 if the employee is female and $NM_{idt} \cdot S_{idt}$ is an indicator that equals 1 in the years after a new manager arrives if the employee's first new manager is the same gender as them and 0 otherwise.[38] δ_f^S, our primary interest, isolates the differential effect of a new same gendered manager on female employees.

Table 5 presents the resulting estimates for employees in duty stations with up to 5 managers. Analogous estimates for those in duty stations with 6 to 20 managers are in the appendix. We begin by providing estimates for the GS pay scale employee subsample using the pay residual variable used in the earlier event study analysis for reference (Table 5, Panels A and B). Female

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[38]We have written the new same sex manager indicator as $NM_{idt} \cdot S_{idt}$ to serve as a reminder that δ^S is the combined effect of receiving a new manager and that manager being the same gender as the employee.

employees' pay increases 30% more than men's (4.18 log points vs. 3.15 log points) in the years following the arrival of a new same gendered manager. These estimates are comparable to our event study estimates for the full sample of employees (including those outside the GS pay plan) that showed that new female managers closed the gender pay gap by about 30% more than new male managers.

Next, we turn to the effect of new female managers on pay grade increases (our proxy for promotions). All employees, male and female, have more pay grade increases in the years following the arrival of a new same gendered manager. Employees that receive a manager of the same gender get approximately 10% more pay grade increases than those who receive an opposite gender manager (Table 5, row 1). Given the over-representation of men in management, homophily could create a gender gap in pay even if it were symmetric. However, it is not. Female employees benefit almost twice as much as male employees from the arrival of a same gender manager (Table 5, comparing rows 1 and 2).

Recent work has suggested that one must take care when using two-way fixed effects to estimate staggered DiDs (see, for example, Callaway and Sant'Anna (2021) and Borusyak (2021)). Both the GS grade increase estimates and the pay residual estimates are virtually unchanged when re-estimated using the new estimator proposed in Borusyak (2021) (Table 5, Column 3).[39] This also provides further evidence that the potential pitfalls of two-way fixed effect estimation are not driving our earlier results on employee pay disparities.

These findings sound a cautionary note for studies that estimate pay disparities conditional on pay grade or algorithmic score or job title. We have shown that even in a highly regimented and monitored workplace, such classifications are endogenous to gender. Therefore, they are what are colloquially termed "bad controls" whose inclusion may bias disparity estimates. It serves as an important reminder that if the inputs into algorithmic or deterministic wage setting are the product of discretionary decisions by human actors, the adoption of algorithmic or deterministic wage setting will formally incorporate these biased disparities. In this case, the adoption of these schemes will mask and deceptively rationalize disparities instead of eliminating them. That is indeed the case here. Figure 2 plots the unexplained pay gap with and without accounting for workers' potentially endogenous pay grades. It shows that most (almost 90%) of the unexplained pay gap over time operates through workers' placement on the pay grid, a decision heavily

[39]Borusyak (2021) proposes a new DiD estimator that is unbiased and efficient in staggered DiD settings in which two-way fixed effects are biased, particularly those in which the already treated observations serve as problematic controls in two-way fixed effect estimation. Borusyak's (2021) method uses only the never and not yet treated observations to construct counterfactual controls for the treated observations.

influenced by their managers and their gender.

<center>*D. Employee Sentiment (Work in Progress)*</center>

Managers' roles in workplaces extend beyond the formal employee performance reviews. In addition to maintaining centralized longitudinal compensation data, the federal government regularly surveys its employees about their experiences. We link data on women's presence in management teams to these employee surveys data in order to examine the relationship between women's presence on management teams and employees job satisfaction, experiences in the workplace, and their perceptions of it's climate.

The Federal Employee Viewpoint Surveys (FEVS), administered by OPM, are drawn as an annual probability sample from the population of permanent federal employees to assess the work attitudes and work experiences of federal employees.[40] It is designed to provide a representative snapshot of employees' attitudes, experiences and perceptions about how effectively agencies are managing their workforce (OPM, 2014).[41]

Each iteration of the survey contains demographic information on the respondents along with their answers to questions about their workplaces and their experiences in them. The 98-item survey covers eight topic areas: personal work experiences, work unit, agency, supervisor, leadership, satisfaction, work/life, and demographics. It includes questions such as "How satisfied are you with the recognition you receive for doing a good job?" Employees are then asked to provide answers on a 5 point scale with 5 indicating the most satisfaction. These data are regularly used by the government to evaluate human resource policies and programs (e.g. assessments of the Human Capital Framework, Diversity, Equity, Inclusion and Accessibility, Veterans' programs, and Work-Life programs).

Because the FEVS is an anonymous survey, we are not able to link individual responses to the respondent's payroll data. Instead, we link each employee's survey responses to the characteristics of the management teams at their agencies. For comparability with the pay gap analysis above, we further restrict the sample to the 29 agencies that appear in both the pay gap analysis and

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[40] Originally administered as the Federal Human Capital Survey (FHCS) in 2002, the survey was substantially modified between 2002 and 2004. It has been administered bi-annually until 2010, when it became an annual survey. The FEVS Public Release Data Files begin in 2006, we use that year and all subsequent surveys through 2014 in the analysis that follows.

[41] The exact FEVS sampling strategy varies from year to year. It is generally a stratified sample based on a census in one strata and a probability sample in the other strata. Each year's sampling frame is designed to produce results that are representative of the federal workforce overall, and at the agency and sub-agency levels. Additional information on the FEVS is available at: https://www.opm.gov/fevs/about/

<center>21</center>

in the OPM survey.[42]

Results will follow...

VI. Discussion and Conclusions

The US federal civil service provides a unique environment to study the potentially gendered impact of new managers on the pay of white-collar subordinates. The US Government is a large employer with over 1 million civilian employees spread throughout the country, covering a wide range of occupations and service sectors whose levels of pay and pay differentials echo those found in the broader economy.[43] In addition, a wide-ranging and well-documented set of rules and Federal legislation constrains the pay of federal civil service employees to pay plans and grids within plans and compliance is closely monitored by a strong union and large bureaucracy. Yet, in spite of these pay-setting constraints, federal pay varies more with gender and race than can be explained by observed qualifications and managers can find ways to assign employees to higher grade levels than formally warranted (Olson et al, 2000; Lewis and Oh, 2009; Oh and Lewis, 2013).

We bring 33 years of exquisite longitudinal data from this setting to the task of identifying the causal effect of managerial turnover and manager gender on pay disparities. We exploit more than 20,000 new manager appointments in an event-study design to accurately pinpoint the impact of managers on the gender pay gap. We find that the arrival of new managers, irrespective of gender, reduces the gap by approximately 3 log points on average in the following 2 to 3 years. When that new manager is a woman, this reduction is even larger (by 1 to 1.5 log points). Taken together, a new female manager reduces the gender gap by up to 5 log points (compared to the status quo) in the five years following her arrival. These estimates are robust to alternate samples, specifications, controls, fixed effects, and treatment definitions. The magnitude of these effects is in keeping with the scale of movements along the federal pay grid. The immediate effect is roughly equivalent to a step increase within a pay grade. In contrast, the medium-run effect is comparable to the increase in pay associated with an increase in a worker's pay grade.

We confirm the differential promotion (pay grade) mechanism behind these effects by directly estimating the effect of managerial turnover and gender on gender disparities in pay grade in-

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[42]We use the survey weights provided by OPM. They are designed to weight each respondent based on the probability of the employee's selection into survey participation and nonresponse, as well as demographics and characteristics of the sampling frame (OPM, 2014).

[43]The 1990 FEPCA has a stated goal of making Federal and private sector workers doing the "same level of work" more comparable (Buckley, 2009).

creases (promotions). In the years following the appointment of a new manager, female employees receive significantly more pay grade increases if that new manager is female. While one can only speculate on how female managers increase women's promotion, performance reviews and personal effort are the two natural channels. Female managers may assess female employees' work more favorably, making them more likely to be eligible for performance-related pay increases and more successful in their pursuit of them. It is also possible that female managers contribute even more directly to female employees' pay grade increases by paying more attention to their eligibility for increases (so they do not wait longer than necessary) or by being willing to expend more personal effort to obtain pay grade increases for them. The actions through which female managers speed the promotion of female employees are beyond the scope of this paper and are a fruitful topic for future research.

We also explore the heterogeneity of these treatment effects to gain insights into when and how manager gender affects gender gaps. First, we contrast the differential impact of new female managers across agencies sorted by the relative initial femaleness (rank) of their managerial teams. Consistent with the extant literature, we document the importance of a critical mass of women for them to become agents of change. In agencies where less than 6% of managers are women, the bottom quintile, the arrival of a new female manager at a duty station is indistinguishable from that of a new male manager. Next, we estimate the effect of managerial gender over time and across periods of abundance and scarcity. Congress and presidential administrations shape the size and compensation increases of the federal civil service through policy and legislation and also affect agency culture and set priorities. The Clinton administration, for example, decreased the size of Federal civil service and imposed strict constraints on pay increases (less than 2%), particularly in the part of his term when there was a Republican House. In contrast, the George W. Bush administration presided over a period of expansion, increasing the number of federal civil service employees, creating new agencies, and allowing more generous annual pay increases, which averaged 3.6%. Accordingly, we find that female managers closed more of the pay gap in periods when resources were more plentiful. Contrary to popular beliefs that gender has become less important over time, we continue to find large effects of manager gender throughout our sample period, including in the later years.

This paper estimates the effect of female managers on the gender gap in the federal civil service. While the federal service encompasses a wide range of occupations and industries, we can only speculate as to the effects of female managers in the private sector. However, the civil service's

pay system is, on average, more highly regulated and deterministic than many of those found in the private sector. It is therefore likely that, if anything, direct supervisors play an even larger role in gender pay gaps in the private sector.

Our findings also provide insights into the effects of policy innovations aimed at reducing the gender gap. Policies such as bans on asking about salary history at hiring and pay transparency initiatives (Baker et al., 2019), have focused on giving employees the knowledge to improve their salary position. Such policies enable women to compare their salaries to those of employees in similar positions and roles. This could close gender gaps among men and women in the same roles, but will not address gender gaps that arise due to similarly situated men and women rising through the ranks at different rates and ending up in different boxes. Similarly, salary history bans may prevent past pay disparities at previous employers from propagating to new positions, but they will not prevent disparities in promotions and roles from being carried forward and influencing future pay. This is consistent with the initial research on the effects of these initiatives, which finds modest (1%) reductions in the gender gap, primarily among new hires, following the adoption of these policies (Hansen and McNichols, 2020; Davis et al., 2021).

Our findings suggest that addressing broader disparities requires more directly addressing the assessment and promotion of female employees. In order to correct disparities accruing to longer term female employees, we argue that these need a critical mass of allies in echelons of the hierarchy not too distant from them and that these are more likely to be women.

References

BAKER, M., HALBERSTAM, Y., KROFT, K., MAS, A., AND MESSACAR, D. 2019. "Pay transparency and the gender gap" NBER Working Paper No. w25834). National Bureau of Economic Research.

BARRIENTOS, ANDR'S F., ALEXANDER BOLTON, TOM BALMAT, JEROME P. REITER, JOHN M. DE FIGUEIREDO, ASHWIN MACHANAVAJJHALA, YAN CHEN, CHARLEY KNEIFEL, AND MARK DELONG. 2018. "Providing access to confidential research data through synthesis and verification: An application to data on employees of the US federal government." *The Annals of Applied Statistics* 12(2): 1124–1156.

BIASI, BARBARA, AND HEATHER SARSONS. 2022 "Flexible Wages, Bargaining, and the Gender Gap." *Quarterly Journal of Economics,* 137(1): 215-266.

BERTRAND, MARIANNE, SANDRA E. BLACK, SISSEL JENSEN, AND ADRIANA LLERAS-MUNEY. 2019. "Breaking the glass ceiling? The effect of board quotas on female labour market outcomes in Norway." *The Review of Economic Studies,* 86(1): 191-239.

BHIDE, ANITA 2019. "Do Female Executives Reduce Gender Gaps?" JMP Stanford University.

BLAU, FRANCINE D., AND LAWRENCE M. KAHN. 2017. "The gender wage gap: Extent, trends, and explanations." *Journal of Economic Literature,* 55 (3): 789-865.

BORUSYAK, KIRILL, XAVIER JARAVEL, AND JANN SPIESS. 2021 "Revisiting event study designs: Robust and efficient estimation." arXiv preprint arXiv:2108.12419 (2021).

BUCKLEY, JOHN E. 2009. "Fifty years of BLS surveys on Federal employees' pay." *Monthly Labor Review* 132: 36.

CHOI, SUNGJOO 2018. "Pay equity in government: Analyzing determinants of gender pay disparity in the US federal government" *Administration & Society* 50(3): 346-371.

CONGRESSIONAL RESEARCH SERVICE (CRS) 2010. "Federal White-Collar Pay: FY2009 and FY2010 Salary Adjustments "CRS Report for Congress RL34463.

CARDOSO, ANA RUTE, AND RUDOLF WINTER-EBMER. 2010. "Female-led firms and gender wage policies." *Industrial & Labor Relations Review,* 64 (1): 143-163.

DALVIT, NICOLAS, ASEEM PATEL, AND JOANNE TAN. 2021. "Intra-firm hierarchies and gender gaps." *Labour Economics* : 102029.

DAVIS, JESSE, PAIGE OUIMET, AND XINXIN WANG> 2021. "Hidden Performance: Salary History Bans and Gender Pay Gap." Available at SSRN 3915609.

DROGANOVA, MARIA 2018. "Women Working for Women: Career Advancement and the Gender Wage Gap in the U. S. Federal Government". Available at SSRN: https://ssrn.com/abstract=3074466 or http://dx.doi.org/10.2139/ssrn.3074466

HANSEN, BENJAMIN, AND DREW MCNICHOLS. 2020 "Information and the Persistence of the Gender Wage Gap: Early Evidence from California's Salary History Ban.". No. w27054. National Bureau of Economic Research.

FLABBI, LUCA, MARIO MACIS, ANDREA MORO, AND FABIANO SCHIVARDI 2019. "Do female executives make a difference? The impact of female leadership on gender gaps and firm performance." *The Economic Journal* 129 (622): 2390-2423.

JOHNSON, RONALD N. AND GARY D. LIBECAP 1989. "Bureaucratic Rules, Supervisor Behavior, and the Effect on Salaries in the Federal Government," *Journal of Law, Economics, & Organization,* 5 (1): 53–82.

KUNZE, ASTRID, AND AMALIA R. MILLER 2017 "Women helping women? Evidence from private sector data on workplace hierarchies." *Review of Economics and Statistics,* 99(5): 769-775

LEWIS, G. B. AND OH, S. S. 2009. A Major Difference?: Fields of Study and Male-Female Pay Differences in Federal Employment. *American Review of Public Administration,* 39(2):107-24.

MAIDA, A. AND WEBER, A. 2022. "Female leadership and gender gap within firms: Evidence from an Italian board reform," *Industrial & Labor Relations Review,* 75(2): 488-515.

ROUSSILLE, NINA. 2020 "The central role of the ask gap in gender pay inequality." URL: https://ninaroussille. github.io/files/Roussille_askgap. pdf 34.

OH, SEONG SOO, AND GREGORY B. LEWIS. 2013. "Performance ratings and career advancement in the US Federal Civil Service." *Public Management Review* 15(5): 740–761.

TREIMAN, DONALD J., AND HEIDI I. HARTMANN 1981. *Women, Work, and Wages: Equal Pay for Jobs of Equal Value.* National Research Council. National Academies Press,

U.S. GOVERNMENT ACCOUNTABILITY OFFICE (GAO) 2009. "Womens Pay - Gender Pay Gap in the Federal Workforce Narrows as Differences in Occupation, Education, and Experience Diminish,"Report GAO-09-279.

U.S. GOVERNMENT ACCOUNTABILITY OFFICE (GAO) 2021. "Human Capital –Administration and Implementation of the General Schedule Locality Pay Program,"Report GAO-22-104580.

U.S. OFFICE OF PERSONNEL MANAGEMENT(OPM) 2014. "Government-wide Strategy on Advancing Pay Equality in the Federal Government."

U.S. OFFICE OF PERSONNEL MANAGEMENT(OPM) 2014. "Technical Report: Results From The 2014 Federal Employee Viewpoint Survey. "

VILHUBER, LARS. 2018, "Office of Personnel Management (OPM) extract of EHRI - FOIA Request 2013-06654, doi:10.7910/DVN/27927, Harvard Dataverse
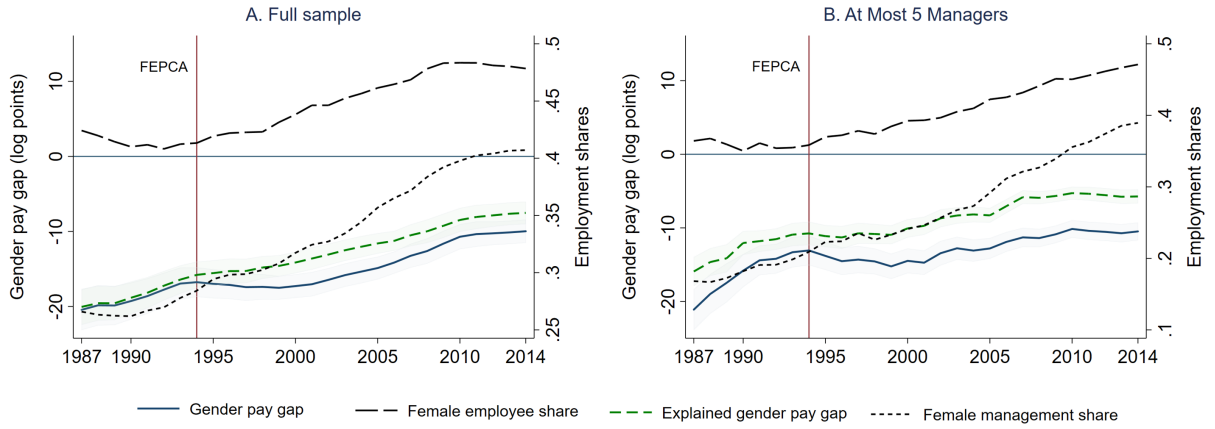
Figures and Tables

FIGURE 1. GENDER PAY GAP AND FEMALE EMPLOYMENT

Note: The full sample in the Figure is restricted to workers who were employed by the U.S. Federal Service for at least 5 years. Shaded areas denote 95% CI based on standard errors clustered at the duty station level. Adjusted pay gap - pay gap attributed to locality FE, education, occupation, age, and age^2. First FEPCA locality pay adjustment occured in January, 1994.
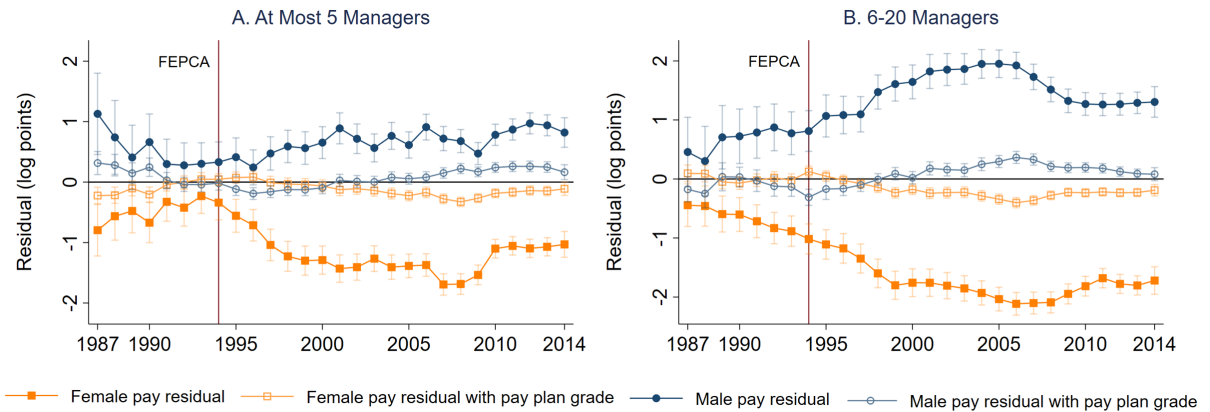
FIGURE 2. PAY RESIDUALS BY GENDER

Note: Female and male pay residuals are obtained from yearly regressions of the individual's log pay on birth year bins, education, tenure, occupations, share of female workers at duty stations, and suty station FEs. Vertical bars represent 95% CI based on standard errors clustered at the duty station level. First FEPCA locality pay adjustment occured in January, 1994.
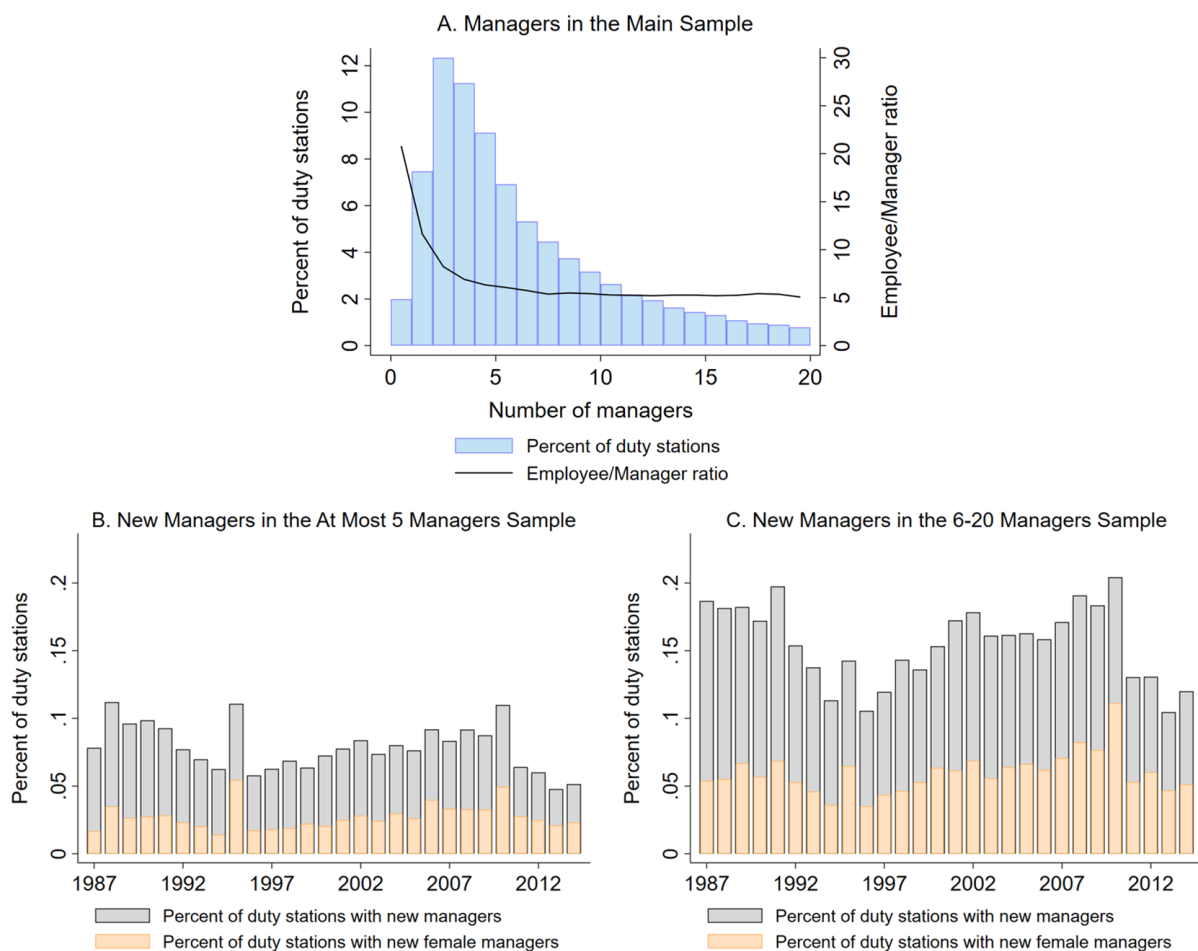
FIGURE 3. MANAGERS AT DUTY STATIONS

Note: In panel A, the bin width of number of managers bins is equal to 1. There are 9,474 duty stations in the main sample. 2,297 duty stations have more than 20 managers in at least one year in the data. 8,298 duty stations have 20 managers or less in at least one year in the data. 20 managers bar does not include duty stations with numer of managers over 20. In the main sample, 18.6% of all duty station - year observations have more than 20 managers.
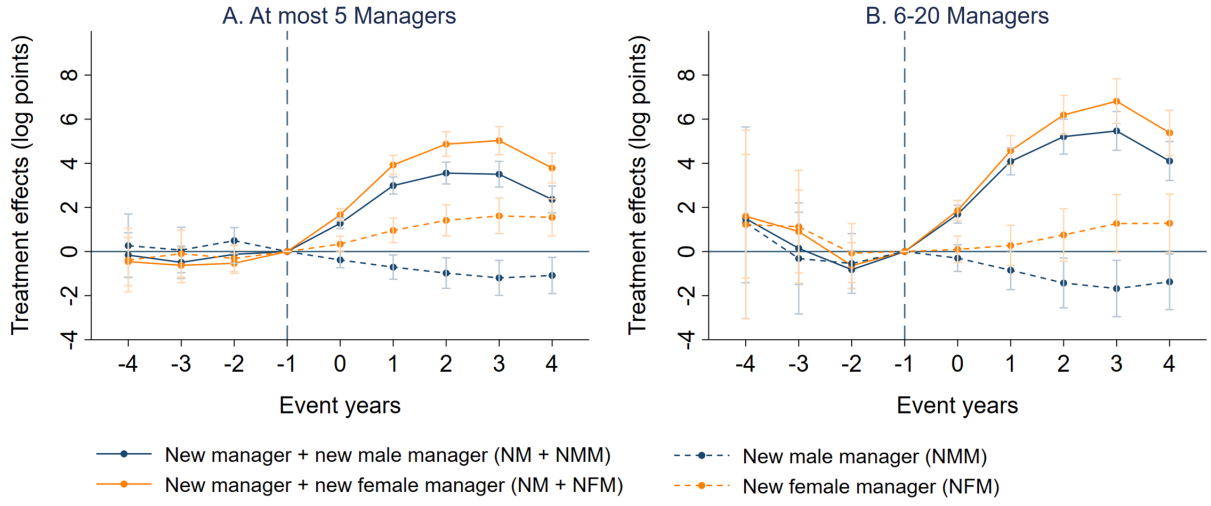
FIGURE 4. EVENT STUDY ESTIMATES OF THE EFFECTS OF FIRST NEW FE(MALE) MANAGER ON GENDER PAY GAP

Note: Estimates depicted in the Figure are contained in Table 2. Treatments effects show the log point difference in the log female and male residual pay. New manager + new male/female manager (NM + NMM/NFM) lines show the effects of managerial turnover plus the effects of the new manager being a man/woman. New male/female manager (NMM/NFM) lines show the effects of the gender of the new manager. Vertical bars represent 95% CI based on standard errors clustered at the duty station level.
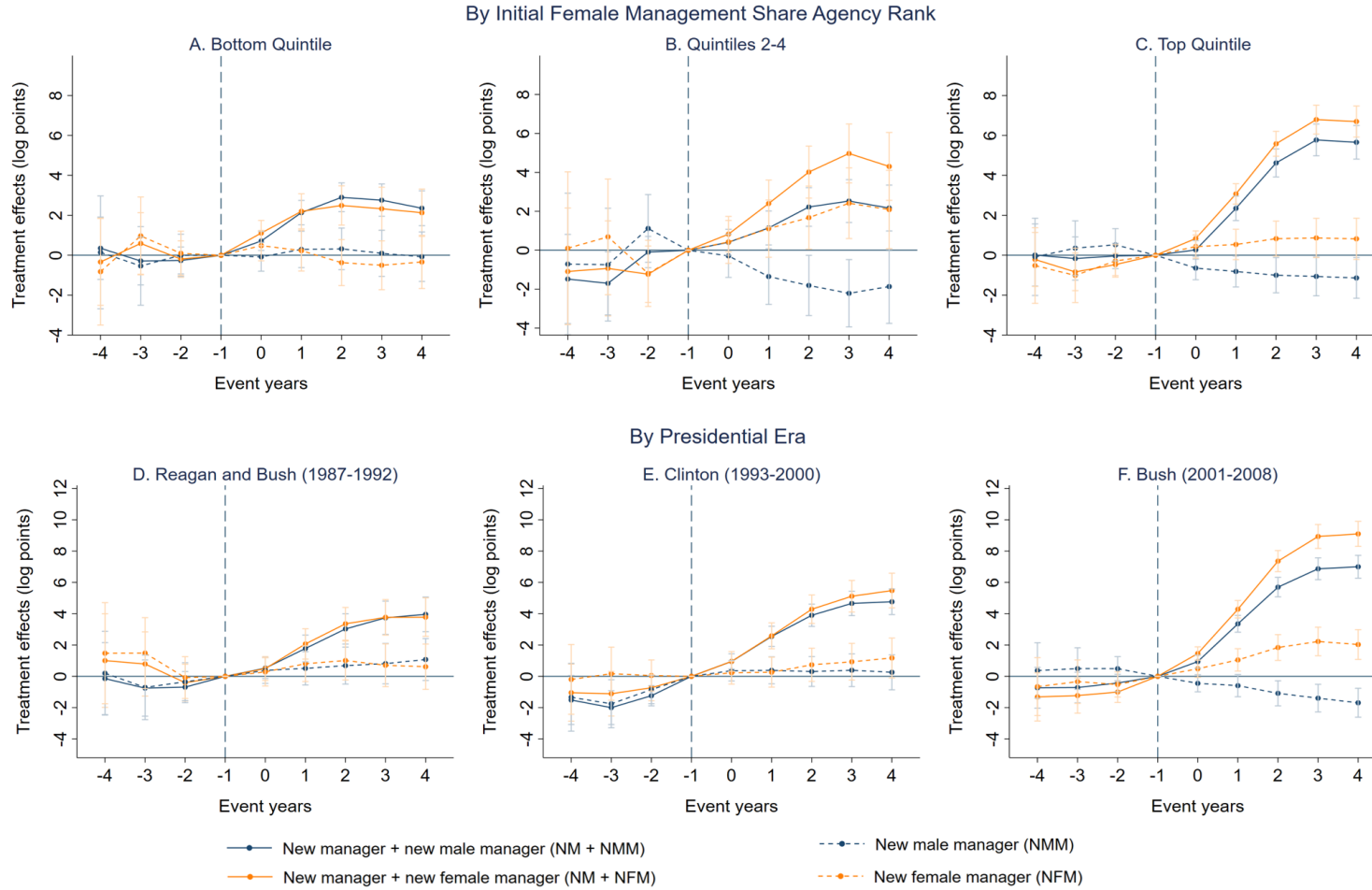
FIGURE 5. HETEROGENEITY OF EVENT STUDY ESTIMATES (AT MOST 5 MANAGERS)

Note: In Panels A, B, and C, agencies in the sample are split into 3 groups based on their female management share rank – relative standing of agencies by female management share in their first three years of existence. Agencies are retricted to exist for at least 5 years in the sample. Bottom quintile contains 19 agencies with female management share of at most 6%. Quintiles 2-4 contain 54 agencies with female management shares between 6% and 42.5%. Top quintile contains 19 agencies with female management share greater than 42.5%. Vertical bars represent 95% CI based on standard errors clustered at the duty station level.
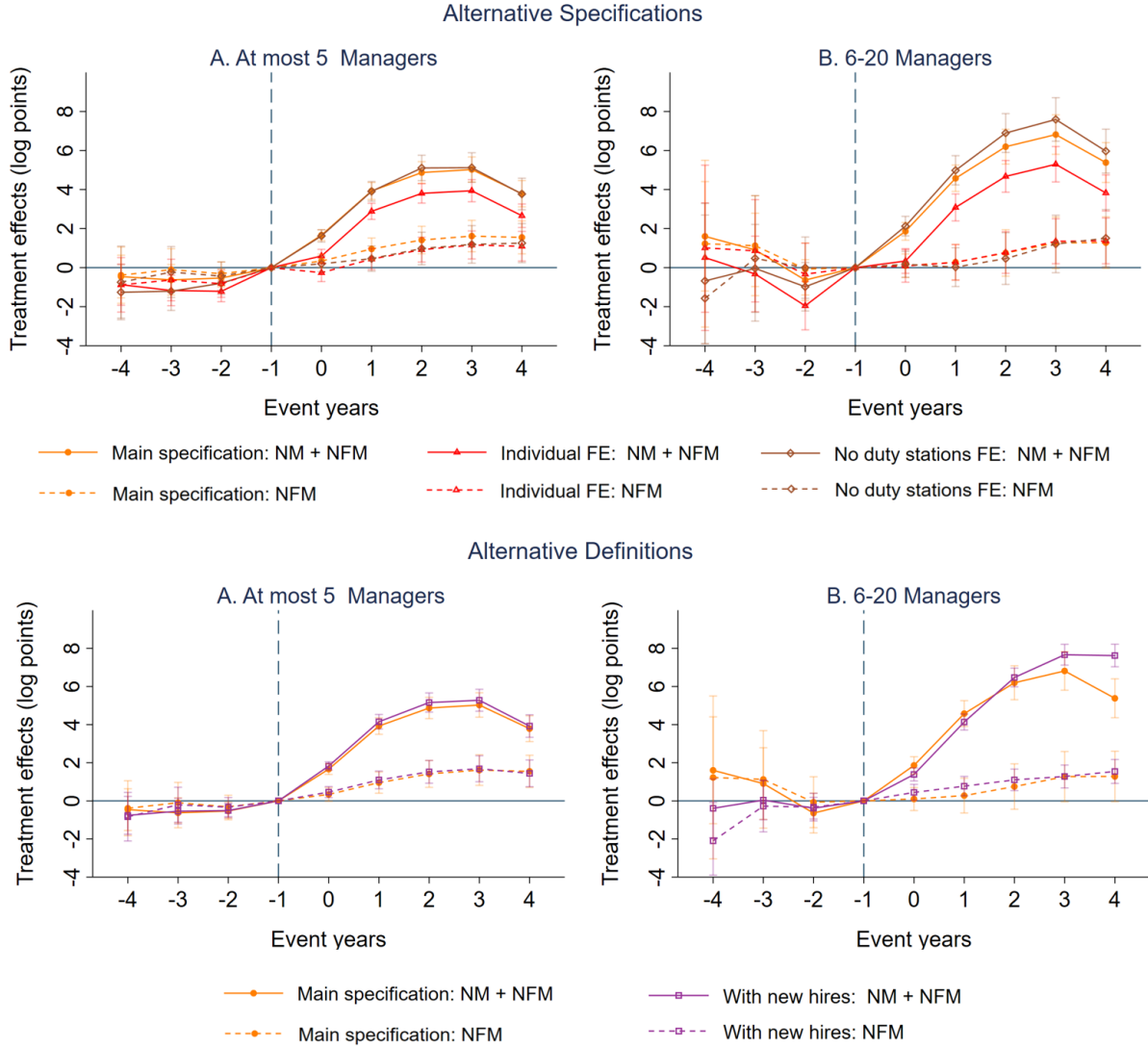
FIGURE 6. SENSITIVITY OF THE FIRST NEW FEMALE MANAGER EFFECTS

Note: Main specification refers to the specification estimated in equation (2) in section IV. The estimates are illustrated in Figure 4 and are reproduced in this Figure.

Individual FE refers to specification that uses inidividual FEs instead of individual-duty station FEs, as shown in equation (2).

No duty stations FE refers to specification that does not include duty station FEs in the first stage. The second stage is the same as in the main specification and contains individual-duty station FEs. Because duty station FEs are not included in the first stage in the no duty stations FE specification, locality FEs from stage 0 are used in stage 1 and stage 1 is estimated in one step.

With new hires refers to extending treatment definition to include individuals hired at the time that duty stations get new managers. Such individuals were exluded from treated individuals in the main treatment definition as we do not observe their employment histories prior to their duty station getting a new manager. In the treatment definition with new hires, treatment is defined as getting the employees' first new manager at the duty station since their hire.

Vertical bars represent 95% CI based on standard errors clustered at the duty station level.

FIGURE 7. EVENT STUDY ESTIMATES FOR SELECT YEARS (AT MOST 5 MANAGERS)

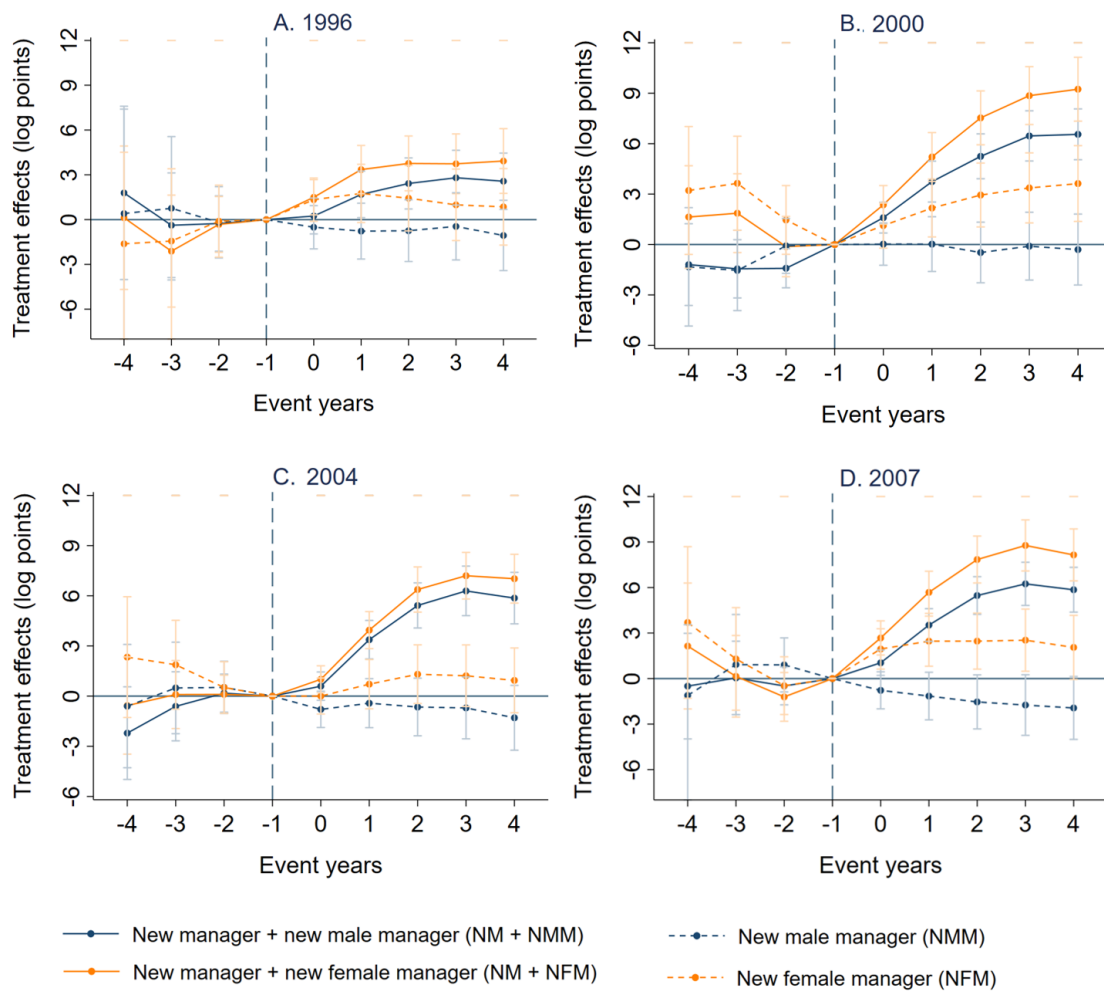Note: Vertical bars represent 95% CI based on standard errors clustered at the duty station level.

TABLE 1—DESCRIPTIVE STATISTICS

| | Female employees | | Male employees | |
| Samples | At most 5 managers | 6-20 managers | At most 5 managers | 6-20 managers |
Sample Means	(1)	(2)	(3)	(4)
	Panel A: Outcomes			
Salary	50,787.62	51,273.09	57,341.90	58,440.18
	(22,729.07)	(25,082.84)	(25,004.53)	(26,820.85)
Log_salary	10.74	10.73	10.86	10.87
	(0.46)	(0.50)	(0.45)	(0.47)
Unexplained log salary(x100)*	-1.21	-1.71	0.70	1.44
	(16.94)	(19.60)	(17.76)	(20.50)
N grade changes	3.28	3.34	3.21	3.01
	(2.01)	(2.10)	(1.91)	(1.96)
N pay plan changes	0.02	0.02	0.03	0.03
	(0.18)	(0.19)	(0.21)	(0.24)
	Panel B: Individual characteristics			
Birth year 1960-1965	0.31	0.33	0.32	0.35
	(0.46)	(0.47)	(0.47)	(0.48)
Birth year 1965-1970	0.27	0.28	0.27	0.27
	(0.44)	(0.45)	(0.45)	(0.44)
Birth year 1970-1975	0.19	0.18	0.19	0.18
	(0.39)	(0.39)	(0.39)	(0.38)
Birth year 1975-1980	0.13	0.12	0.12	0.11
	(0.34)	(0.32)	(0.33)	(0.32)
Birth year 1980+	0.10	0.09	0.09	0.08
	(0.30)	(0.29)	(0.29)	(0.28)
Education: High school or less	0.20	0.20	0.13	0.13
	(0.40)	(0.40)	(0.33)	(0.33)
Education: Some college	0.29	0.31	0.20	0.21
	(0.46)	(0.46)	(0.40)	(0.41)
Education: Bachelor's degree	0.39	0.34	0.50	0.44
	(0.49)	(0.47)	(0.50)	(0.50)
Education: Graduate degree	0.12	0.16	0.17	0.22
	(0.33)	(0.36)	(0.37)	(0.41)
Tenure (years)	7.93	8.20	8.25	8.09
	(6.28)	(6.45)	(6.32)	(6.24)
	Panel C: Workplace characteristics			
Female employee share at duty station	0.44	0.39	0.38	0.37
	(0.22)	(0.17)	(0.22)	(0.17)
Female management share at duty station	0.29	0.26	0.26	0.25
	(0.31)	(0.21)	(0.30)	(0.21)
N duty stations	6,627	4,401	6,102	4,128
N unique individuals	30,638	39,028	27,114	32,815
N treated individuals	9,501	4,960	8,282	4,007
N observations	653,781	855,221	556,643	643,903

Note: Standard deviations in parentheses.
* Unexplained log pay refers to the remainder of the log pay after controlling for location, age, education, tenure, occupation, agency-subagency-duty station, and share of female employees and managers.
Workplace characteristics are at the duty station - quarter level
Treated individuals refers to employees that get a first new manager that we define as an event in our event studies.

TABLE 2—EVENT STUDY ESTIMATES OF THE EFFECTS OF FIRST NEW FE(MALE) MANAGER ON GENDER PAY GAP

Event year	At most 5 managers				6-20 Managers			
	New male manager	New female manager	New manager + New male manager	New manager + New female manager	New male manager	New female manager	New manager + New male manager	New manager + New female manager
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
-4	0.27	-0.39	-0.16	-0.46	1.30	1.23	1.49	1.60
	(0.73)	(0.74)	(0.52)	(0.56)	(2.22)	(2.18)	(1.48)	(1.43)
-3	0.07	-0.10	-0.49	-0.63	-0.31	1.13	0.15	0.91
	(0.53)	(0.54)	(0.37)	(0.40)	(1.28)	(1.31)	(0.83)	(0.96)
-2	0.49	-0.31	-0.12	-0.53**	-0.54	-0.07	-0.82*	-0.64
	(0.30)	(0.31)	(0.21)	(0.24)	(0.69)	(0.68)	(0.44)	(0.53)
0	-0.38**	0.34*	1.28***	1.66***	-0.30	0.10	1.69***	1.86***
	(0.18)	(0.18)	(0.12)	(0.14)	(0.31)	(0.31)	(0.21)	(0.23)
1	-0.71**	0.96***	2.99***	3.93***	-0.85*	0.28	4.09***	4.58***
	(0.28)	(0.28)	(0.20)	(0.22)	(0.45)	(0.47)	(0.31)	(0.34)
2	-0.98***	1.41***	3.56***	4.87***	-1.43**	0.75	5.21***	6.20***
	(0.35)	(0.36)	(0.25)	(0.28)	(0.58)	(0.61)	(0.41)	(0.45)
3	-1.19***	1.62***	3.50***	5.03***	-1.68**	1.27*	5.47***	6.82***
	(0.40)	(0.41)	(0.30)	(0.33)	(0.65)	(0.67)	(0.45)	(0.52)
4	-1.09***	1.55***	2.36***	3.79***	-1.37**	1.28*	4.41***	5.38***
	(0.42)	(0.43)	(0.31)	(0.34)	(0.64)	(0.67)	(0.45)	(0.52)
N duty stations	7,316	7,316	7,316	7,316	4,759	4,759	4,759	4,759
N unique individuals	57,752	57,752	57,752	57,752	71,843	71,843	71,843	71,843
N observations	1,178,390	1,163,321	1,178,390	1,163,321	1,477,136	1,464,851	1,477,136	1,464,851

Note: * $p<0.10$ ** $p<0.05$ *** $p<0.01$. Standard erros clustered at the duty station level in parentheses.
Yearly treatment effects are reported in log points. Estimates in the Table are depicted in Figure 4.
The dependant variable, adjusted pay gap, is obtained from regressions of log pay on locations in stage 0 by year, then regressions of stage 0 residuals on 5 year birth year bins (1965 is the omitted category), high school or less dummy, some college dummy, graduate degree dummy, tenure ¡5 years dummy, tenure 5-10 years dummy, tenure 10-15 years dummy, occupation dummies, share of females at the duty station level, and duty station dummies.
All event study specifications include quarter-year and individual-duty station fixed effects.

TABLE 3—HETEROGENEITY OF EVENT STUDY ESTIMATES (AT MOST 5 MANAGERS)

	Bottom Quintile		Quintiles 2-4		Top Quintile	
Event year	New male manager (1)	New female manager (2)	New male manager (3)	New female manager (4)	New male manager (5)	New female manager (6)
-4	0.14 (1.44)	-0.82 (1.37)	-0.71 (1.86)	0.10 (2.00)	-0.08 (0.99)	-0.52 (0.97)
-3	-0.54 (1.00)	0.97 (0.99)	-0.74 (1.48)	0.69 (1.52)	0.35 (0.70)	-1.01 (0.69)
-2	-0.00 (0.54)	0.10 (0.57)	1.12 (0.89)	-1.19 (0.87)	0.52 (0.41)	-0.29 (0.41)
0	-0.08 (0.37)	0.48 (0.39)	-0.29 (0.56)	0.43 (0.56)	-0.64** (0.30)	0.44 (0.30)
1	0.29 (0.47)	0.23 (0.52)	-1.35* (0.73)	1.11 (0.75)	-0.82** (0.39)	0.54 (0.39)
2	0.32 (0.53)	-0.37 (0.59)	-1.81** (0.79)	1.68** (0.83)	-1.00** (0.45)	0.83* (0.45)
3	0.10 (0.59)	-0.50 (0.62)	-2.21** (0.88)	2.42*** (0.93)	-1.06** (0.50)	0.87* (0.50)
4	-0.07 (0.63)	-0.34 (0.68)	-1.86* (0.97)	2.09** (1.03)	-1.14** (0.52)	0.82 (0.53)
N duty stations	2,977	2,898	2,034	1,922	2,865	2,864
N unique individuals	20,833	20,833	12,783	12,783	24,709	24,709
N observations	479,265	478,446	224,308	223,130	511,368	511,412

Note: * p<0.10 ** p<0.05 *** p<0.01. Standard erros clustered at the duty station level in parentheses.
Yearly treatment effects are reported in log points. Estimates in the Table are depicted in Figure 5.
The dependant variable, adjusted pay gap, is obtained from regressions of log pay on locations in stage 0 by year, then regressions of stage 0 residuals on 5 year birth year bins (1965 is the omitted category), high school or less dummy, some college dummy, graduate degree dummy, tenure ¡5 years dummy, tenure 5-10 years dummy, tenure 10-15 years dummy, occupation dummies, share of females at the duty station level, and duty station dummies. All event study specifications include quarter-year and individual-duty station fixed effects.
Agencies in the sample are split into 3 groups based on their female management share rank – relative standing of agencies by female management share in their first three years of existence. Agencies are retricted to exist for at least 5 years in the sample. Bottom quintile contains 19 agencies with female management share of at most 6%. Quintiles 2-4 contain 54 agencies with female management shares between 6% and 42.5%. Top quintile contains 19 agencies with female management share greater than 42.5%.

TABLE 4—BALANCE: EMPLOYEE AND DUTY STATION CHARACTERISTICS IN THE YEAR PRIOR TO A NEW MANAGER

	At most 5 managers				6-20 managers			
	Female employees		Male employees		Female employees		Male employees	
	New female manager	New male manager	New female manager	New male manager	New female manager	New male manager	New female manager	New male manager
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Panel A: Outcomes				
Salary	43,416.56	42,334.54	50,024.58	49,929.36	40,660.28	39,578.42	46,399.26	46,125.27
	(20,984.56)	(20,529.81)	(23,787.01)	(22,834.27)	(21,809.94)	(20,751.03)	(23,711.32)	(23,140.83)
Log_salary	10.58	10.55	10.72	10.72	10.48	10.46	10.62	10.62
	(0.45)	(0.46)	(0.45)	(0.46)	(0.51)	(0.49)	(0.49)	(0.48)
Unexplained log salary(x100)*	-4.44	-4.57	-4.30	-3.24	-6.16	-6.77	-4.40	-4.01
	(17.94)	(18.49)	(19.30)	(19.17)	(21.13)	(20.44)	(22.58)	(22.63)
				Panel B: Individual characteristics				
Birth year 1960-1965	0.24	0.28	0.25	0.27	0.27	0.26	0.3	0.28
	(0.43)	(0.45)	(0.43)	(0.44)	(0.45)	(0.44)	(0.46)	(0.45)
Birth year 1965-1970	0.25	0.26	0.24	0.25	0.27	0.27	0.25	0.28
	(0.44)	(0.44)	(0.43)	(0.43)	(0.44)	(0.44)	(0.43)	(0.45)
Birth year 1970-1975	0.21	0.20	0.22	0.22	0.20	0.21	0.19	0.19
	(0.41)	(0.40)	(0.41)	(0.41)	(0.40)	(0.41)	(0.39)	(0.40)
Birth year 1975-1980	0.16	0.15	0.16	0.15	0.14	0.15	0.14	0.14
	(0.36)	(0.36)	(0.36)	(0.36)	(0.34)	(0.35)	(0.35)	(0.35)
Birth year 1980+	0.13	0.11	0.13	0.11	0.12	0.12	0.12	0.11
	(0.34)	(0.32)	(0.34)	(0.32)	(0.32)	(0.32)	(0.33)	(0.31)
Education: High school or less	0.18	0.19	0.11	0.13	0.19	0.18	0.13	0.12
	(0.38)	(0.39)	(0.32)	(0.33)	(0.39)	(0.39)	(0.34)	(0.33)
Education: Some college	0.31	0.28	0.21	0.21	0.28	0.26	0.2	0.2
	(0.46)	(0.45)	(0.41)	(0.41)	(0.45)	(0.44)	(0.40)	(0.40)
Education: Bachelor's degree	0.38	0.4	0.48	0.49	0.34	0.35	0.42	0.42
	(0.49)	(0.49)	(0.50)	(0.50)	(0.47)	(0.48)	(0.49)	(0.49)
Education: Graduate degree	0.13	0.14	0.19	0.17	0.19	0.2	0.25	0.25
	(0.34)	(0.35)	(0.39)	(0.38)	(0.39)	(0.40)	(0.43)	(0.43)
Tenure (years)	4.41	4.85	5.14	5.43	3.43	3.46	4.01	3.77
	(4.89)	(5.19)	(5.37)	(5.39)	(4.49)	(4.47)	(4.87)	(4.52)
N unique individuals	4,288	4,863	2,699	5,110	2,056	2,909	1,380	2,548
N observations	13,581	15,883	8,524	16,800	5,492	8,104	3,685	6,796

TABLE 4 CONTINUED

| | At most 5 managers | | | | 6-20 managers | | | |
| | New female manager | | New male manager | | New female manager | | New male manager | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel C: Workplace characteristics							
Female employee	0.53		0.38		0.47		0.38	
share at duty station	(0.21)		(0.22)		(0.17)		(0.17)	
Female management	0.34		0.23		0.32		0.23	
share at duty station	(0.34)		(0.30)		(0.22)		(0.20)	
N duty stations	1,956		2,694		1,060		1,524	

Note:* p<0.10 ** p<0.05 *** p<0.01. Standard erros clustered at the duty station level in parentheses.
* Unexplained log pay refers to the remainder of the log pay after controlling for location, age, education, tenure, occupation, agency-subagency-duty station, and share of female employees and managers obtained using equation (1) in section IV.
Workplace characteristics are at the duty station - quarter level.

TABLE 5—DiD ESTIMATES OF THE FIRST NEW MANAGER OF THE SAME SEX EFFECTS ON GRADE INCREASE DISPARITY AND GENDER PAY GAP (GS AT MOST 5 MANAGERS SAMPLE)

	DiD	DiD	Borusyak DiD	DiD	DiD
	(1)	(2)	(3)	(4)	(5)
Panel A: Dependent variable – GS Grade					
New same sex manager	0.45***	0.34***	0.35***	0.25***	0.26***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
New same sex manager* Female emp.				0.43***	0.18***
				(0.05)	(0.04)
Panel B: Dependent variable – Log pay residual (X100)					
New same sex manager		3.62***	3.72***		3.15***
		(0.17)	(0.24)		(0.22)
New same sex manager* Female emp.					1.03***
					(0.33)
N unique individuals	14,243	14,243	14,243	14,243	14,243
N observations	441,338	441,338	441,338	441,338	441,338
Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Locality fixed effects	Yes	Yes	Yes	Yes	Yes
Education, age, and age^2	No	Yes	Yes	No	Yes
Occupation	No	Yes	Yes	No	Yes

Note:* p<0.10 ** p<0.05 *** p<0.01. Standard erros clustered at the duty station level in parentheses. The estimates are reported for the at most 5 managers sample.
Log pay residual refers to the remainder of the log pay after controlling for location, age, education, tenure, occupation, agency-subagency-duty station, and share of female employees and managers obtained using equation (1) in section IV.
New same sex manager variable indicates individuals being treated with a first new manager of the same sex.
Estimates in columns (1) and (2) are taken from Table 5 columns (5) and (6) for Log pay residual regressions, and columns (3) and (4) for GS grade.