# Closing the Gender Pay Gap in the US Federal Service: The Role of New Managers

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*This paper estimates the causal effect of managerial homophily (getting a same-sex manager) on employee pay in the US federal civil service. Using over 30 years of payroll data, we exploit the appointment of new managers in an event study design. We find that homophily is particularly important for female employees, whose wages increase by an additional 1.5 log points relative to male employees. These effects exist across political eras and are driven by college-educated women and those working in jobs with less routine tasks. Same-sex managers have the largest effect on women's career trajectories when there is a critical mass of women in the office. Managerial homophily operates through increases in pay grades and occupational changes. We conclude that even highly regimented pay systems are not immune to discretionary managerial actions, making female representation in managerial roles a key determinant of women's career trajectories.*

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## 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 employee characteristics has been growing (Blau and Kahn, 2017), a feature that is also found in the US federal service (Figure 1).[1] Recent research has thus emphasized the role of firm-level factors, such as the under-representation of women in high-productivity firms (Card, Cardoso, and Kline, 2016). Women are also severely under-represented in management, lagging considerably behind their presence in the labor forces they supervise (McKinsey, 2019). In the US federal service, the female management share has steadily increased over time, but still under-represents its female workforce (Figure 1).[2] We therefore ask: What effect does a same-sex supervisor have on their employees' careers and pay trajectories?

Using over 30 years of rich longitudinal data from the US federal civil service, we exploit the appointment of new managers at local offices in an event-study design to estimate the effects of managerial homophily on employees' residual wages.[3] The US civil service is often touted as a pay equity success story. It has highly regimented administrative pay scales with clearly defined progression criteria, which theoretically limit the 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 homophily, specifically same-sex managers.

In this setting, already generally favorable to women, we find that female employees still benefit from the appointment of same-sex managers. In the years following the appointment of a new same-sex manager, female employees' residual wages increase by up to 1.5 log points more than male employees do following the appointment of a male manager (herein the "differential homophily" effect). These effects are economically significant and robust.[4] Far from being an artifact of a bygone age, we document homophily effects across presidential eras. If anything the

[1] Figure 1 plots the raw gender pay gap over time, which decreased from 22 to 11 log points between 1987 and 2014. Also shown is the pay gap adjusted for gender differences in observed human capital (education), occupation, and age. A sizable gap, the vertical distance between the two curves (shaded area), remains unexplained. Because the two curves evolve in parallel, the unexplained gap as a share of the raw gap increases over time: from 13% to 37% in Panel A and from 25% to 50% in Panel B. The precise samples are defined below.

[2] The female share of management in the US federal service increased from 15% in 1987 to 38% in 2014, while the female employee share went from 34% to 46%. In US corporations, women comprise 38% of middle managers (McKinsey, 2019).

[3] We include traditional human capital variables as explanatory factors – age, tenure, education, and occupations. We also control for agencies, sub-agencies, locality pay, and local offices. Pay grades and levels are excluded as we show they are a key mechanism through which same-sex managers affect disparate pay by gender.

[4] The estimates are unchanged when the estimation sample is limited to the 90% of workers in the GS pay plan, the largest and least specialized federal pay scale. They are also robust to alternate fixed effects and controls.

differential homophily effect on women grew across eras as the female workforce became more highly educated and moved from clerical jobs into administrative careers.

Our paper thus contributes to the broad literature on the role of managers in worker careers and the emerging literature on the effects of homophily in the workplace. Managers can impact workers' careers and compensation through several mechanisms, including direct effects on worker productivity (Minni, 2022), assignment of promotable tasks (Babcock et al., 2017), and managers' evaluation abilities and leniency (Frederiksen, Kahn, and Lange, 2020). Another channel operates through workplace homophily, the tendency of individuals to gravitate towards those like themselves. When interacting with people like themselves, individuals update their beliefs faster (Golub and Jackson, 2012), are more likely to make professional referrals (Zeltzer, 2020), and are happier subordinates (Husain et al., 2021, and Grissom et al., 2012).[5] Most closely related to our study is Cullen and Perez-Truglia (2022), which documents the promotion advantage of employees who are socially close to their immediate supervisors in a South East Asian firm; they tend to be of the same gender. That is consistent with Castilla's (2011) finding that workers' performance evaluations improve when they rotate to a manager of the same-sex. Differential promotion rates, particularly early in one's career, are a key contributor to the gender pay gap (Bronson and Thoursie, 2022; Bertrand, Goldin, and Katz, 2010). Historically, female employees have encountered managerial homophily at lower rates than male employees. During the period we study, 60% of men's new managers were men while only 40% of women's new managers were women.

This paper also contributes to the growing literature on the conditions under which women in leadership are more or less successful at improving women's pay. High level "diversity" initiatives, such as improving female representation on boards of directors, have been shown to have small, if any, trickle down effects on female employees' wages (e.g., Bertrand et al., 2019; Dalvit, Patel, and Tan, 2021; Maida and Weber, 2022). Nevertheless, in corporate settings across several countries, studies have found a general positive impact of female leadership on the wages and promotion rates of female employees.[6] Recent lab and lab in the field experiments suggest that critical mass is a key factor for women in leadership (Born, Ranehill,and Sandberg, 2022) and could explain the mixed results in the literature. Our findings are consistent with larger

[5]Homophily can occur along any dimension. Most of the empirical employment literature focuses on gender, likely due to its ready availability in administrative data sets.

[6]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).

differential homophily effects in settings where women, either as employee or supervisor, have achieved a critical mass.

Finally, our central finding sounds a cautionary note for hopes that replacing performance pay and employee negotiations with algorithmic pay systems will help close the gender pay gap. Our results show that administrative pay systems may simply provide the illusion of a cure through gender differences in pay grades and steps. On the other hand, management diversity may improve pay equity across different pay-setting regimes. Consistent with this effect, Biasi and Sarsons (2022) show that moving from seniority pay to performance pay led to a re-emergence of the gender pay gap in Wisconsin teachers' salaries, an effect that was muted in schools with female principals or supervisors.

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] The US federal civil service employees over 1 million people in each year. These employees are spread geographically across the United States in close to 75,000 unique local offices.[8] They work in 500 different occupations with varying levels of female representation and include everyone from equipment operators earning $20,000 per year to aerospace engineers earning over $120,000 per year. We observe these employees over the course of their careers.

We exploit the appointment of new managers in an event study design.[9] We limit our sample to employees who experienced a first new manager event and use as controls those who have yet to see the appointment a first new manager.[10] Our treatment of interest is the appointment of a new manager of the same-sex as the employee in the office and therefore corresponds to an Intent-to-Treat (ITT) estimate. Note, the same managerial appointment will simultaneously treat some employees in an office with a same-sex manager and others in the same office with an opposite-sex manager. Our identifying assumption for the managerial homophily treatment effect is that whether the first new manager is of the same-sex as the employee or not is conditionally exogenous. We condition on a host of fixed effects, including agency-sub-agency fixed

[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.

[8]The OPM data include the employees duty stations, the physical locations where the employees work. We define a local office or workplace as the agency-sub-agency-duty station where the employee works.

[9]We observe the appointment of female managers to 5,533 offices and male managers to 6,401 offices. We have access to all quarters of data, something not available in the the synthetic data from the Office of Personnel Management obtained through the Barrientos et al. (2018) initiative. We observe managerial changes every quarter, approximately 35% percent of observed employees experience the appointment of a new manager in their office each year.

[10]We focus our estimation on the effect of the first new manager who arrives at the duty station during each worker's tenure to avoid confounding it with the effects of subsequent managerial transitions.

effects, individual fixed effects at the office level and quarter-year fixed effects, and find that this assumption is supported by parallel pre-event trends between female and male homophily effects.

Our preferred estimates focus on offices with up to 5 managers (approximately 3 managers and 25 employees, on average) and at least 10 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. We complement our event-study analysis with a TWFE-DiD of log wage residuals and several other outcomes including: GS grade, office switches, and occupational changes.

Additionally, 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' job satisfaction, pay satisfaction, perceptions of fairness and workplace climate are correlated with the share of female managers. Our findings are in line with the self-reported perceptions of female federal employees. Female employees' job and pay satisfaction are increasing in the share of female managers. These results are in keeping with recent studies finding a positive impact of female leadership on workplace climate (Tate and Yang, 2015; Lucifora and Vigani, 2022).

The remainder of the paper is organized as follows. In Section 2, we present the evolution of pay setting legislation 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 federal service data that we exploit. In Section 4, we outline our estimation and identification strategy. Section 5 reports the event study and difference-in-differences estimates and discusses threats to identification and robustness of the results. Section 6 concludes.

## II. Pay Setting in the US Federal Service

The Federal pay-setting system has been a topic of debate across decades as encapsulated in a series of bills. Because of the large number of employees involved, around 1.5 million, any pay increases also had considerable budgetary repercussions. As a result, from 1970 onward, pay increases have involved direct Presidential intervention. Below we provide a brief overview of key features of the Federal civilian employee pay-setting process partly based on Buckley (2009).

### *A. General Pay Schedule*

The creation of a merit system for Federal employment began with the Pendleton Civil Service Act of 1883. The Classification Acts of 1923 and 1949 linked salaries to duties and applied the same standards across Federal agencies, creating a "General Schedule" (GS) of pay. It has been suggested that this bureaucratic system reduces Congress' cost of monitoring the federal personnel system and helps insulate the civil service from politics (Johnson and Libecap, 1989). Standardizing compensation should also limit the scope for demographic pay disparities.

The Federal Salary Reform Act of 1962 established procedures for the Bureau of Labor Statistics to help set the salary levels of Federal GS workers inline with comparable private sector workers. The central core of the GS classification system establishes 15 grades, based on the difficulty, responsibility, and required qualifications of the positions, including education levels. Discretion in the assignment of initial grade can be exercised through "superior qualification actions." OPM (2014a) reports that the percentage of new hires receiving these discretionary actions is higher among men than women. Employees in occupations with job ladders may advance (non-competitively) to higher steps and grades at certain intervals (generally after at least a year). Advancement to the highest grades an employee is eligible for may be discretionary (based on outstanding performance). The base pay within each GS grade is set at one of 10 fixed levels, called steps.[11] Employees with acceptable performance progress through the steps following statutory waiting periods (one to three years depending on the step). Employees can also receive additional step increases–called Quality Step Increases (QSIs)–as a reward for outstanding performance with 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.[12] There are several alternative pay plans to the GS schedule. They primarily cover highly specialized workers (e.g. air traffic controllers). They have different salary grids, but otherwise function similarly. Around 20% of all federal employees are paid under non-GS plans (10% in our estimation sample). Our main estimates are unchanged when we focus only on GS employees.

Beyond job classification and career progression, the overall salary grid is also adjusted for cost of living over time and across locations. The Federal Pay Comparability Act of 1970

[11] Table A.1 in Appendix A 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%.

[12] Olson et al. (2000) found that only 3 percent receive QSIs.

allowed for GS pay adjustments via executive action. The Federal Employees Pay Comparability Act (FEPCA) of 1990 introduced locality-based pay to address challenges in recruitment and retention in high-wage areas. It also set a timetable for making Federal pay more competitive with private sector wages for employees doing comparable work in the same locality.[13] We begin our analysis by stripping locality-year fixed effects from employees wages to absorb the yearly variation in locality pay adjustments as explained in section III.A below.

FEPCA also set up a process for yearly general increases in Federal pay whereby a Federal Salary Council transmits locality pay recommendations to the President's Pay Agent, leaving the President the authority to propose alternate pay plans.[14] These pay adjustments are also reviewed annually by Congress, which may legislate a different adjustment from the one authorized by the President. Political attitudes towards federal compensation have varied over time. During most of Clinton and Bush 43, Congress generally exceeded the President's adjustment, but the Obama Era was marked by pay freezes and small (1%) adjustments.[15] We thus expect presidential cycles to influence the level of general pay increases, which may influence the ability of individual employees to seek and obtain personal adjustments.

In summary, federal civil service employees are paid according to an administrative pay system. Grade increases, QSIs, and statutory increases in the federal pay schedule and locality pay adjustments can all result in salary increases. In the analyses that follow we will control for the latter and other bureaucratic determinants to isolate the potential role of managers in helping employees move along the pay grid.

[13]Initially, there were just 29 locality areas; thirteen new locality areas were added in 2016 and there are currently 47 locality areas – regions where employees receive higher salaries. Beginning in January 1994, annual salary adjustments for most GS employees consisted 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." Because some of the required locality adjustments exceeded 30-percent they were initially only partially implemented and FEPCA plans extended into the 2000s (Table 1-1 of CRS (2010)).

[14]The Federal Salary Council comprises nine pay and labor relations experts and organizations representing GS employees, some of whom 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). The President has the authority to implement alternative pay plans when there is a "national emergency or serious economic conditions affecting the general welfare."

[15]From 1994 to 2009 Congress approved amounts equal to or higher than the President's proposed adjustment. Alternative plans were submitted for pay increases effective in 1995-98, 2001, 2003-05, 2007, 2008, and from 2010 to 2017. In 2008, following a failed attempt at introducing a pay-for-performance (PFP) President George W. Bush implemented a 3.5% pay increase for most federal employees via executive order. Conversely, under the "Campaign to Cut Waste," President Barack Obama implemented a 3–year pay freeze from 2011 to January 2014, with increases limited to 1% for that year and again in 2015. GAO (2021) provides a comparison of pay locality increases proposed by the Federal Pay Council, the President's Agent and Congress' alternative plans for 2015 to 2019.

### *B. The Role of Managers*

In addition to assigning tasks and providing supervision, managers evaluate their supervisees' performance and recommend them for step and grade increases. One component of this process is providing performance ratings. Contrary to popular belief, the federal service does link financial rewards to performance, not just tenure. Using a random-effects model on a one percent sample of federal personnel records, Oh and Lewis (2013) show that between 1988 and 2003 employees with "outstanding" performance ratings received raises that were two-thirds of a percentage point higher than those with "less than fully sucessful" ratings. The ratings had measurable effects up to two years later.

There is no minimum time under a supervisor before the employee can receive a performance rating, but the appraisal programs establish a minimum appraisal period. It is typically a year, but can vary by agency.[16] Specifically, managers have to implement the five phases of the performance management cycle: "1) planning work and setting expectations; 2) continually monitoring performance; 3) developing the capacity to perform; 4) rating periodically to summarize performance; and 5) rewarding good performance" (OPM, 2017). This rigorous and analytical appraisal process should dampen the effects of homophily (see Blair-Loy et al. 2022). Additionally, OPM has long run the Federal Employment Viewpoint Survey (FEVS) to identify practices and strategies to improve performance management. We also utilize these surveys to assess gender differences in satisfaction with management.

Yet, despite relatively constrained pay setting procedures, 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 in spite of bureaucratic procedures to eliminate that variation. Droganova (2018) shows that the gender gap in federal employees' wages and promotions is correlated with the share of female managers in the office. Specifically, it 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.

[16]Off-cycle ratings can be given when a within-grade increase (WGI) decision is inconsistent with the employee's most recent rating.

## III. Data

### *A. Employment Data*

The primary data source for the paper is quarterly administrative payroll data made public by the US Office of Personnel Management (OPM) under the Freedom of Information Act (FOIA). We focus our analysis on civilian white-collar salaried permanent employees employed by the federal government between 1982 and 2014.[17]

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 (office location). For brevity, we simply refer to the employee's agency-sub-agency-duty-station as their office.[18]

The data 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). It enables us to follow employees over the course of their careers in the federal service including any moves across roles, offices, and agencies.[19] 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.[20]

We supplement the quarterly data with HR 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 the hiring data are only available beginning in 1982, we begin our sample then. Our aim is to follow workers as they progress through their careers. Therefore, we further restrict the analysis to workers born in or after 1955, the post-Pill cohorts.[21] A data appendix provides additional details on the construction of the OPM data and

[17] White collar workers form the overwhelming majority of employees in the Federal Civil Service, only 9% were blue-collar workers in 2013.

[18] In the OPM data the "duty station" is the physical location of the office where the employee works. Multiple federal agencies or sub-agencies can be located in the same physical office building. As we are interested in the employee's immediate office environment we code each agency-sub-agency-duty station combination as a unique duty station.

[19] Approximately a quarter of employees in our sample change offices at least once in their careers.

[20] The workers in our data are paid under 112 separate pay schedules, but most workers (around 80% in the full data and 90% in our main sample) are paid under the GS schedule. Unfortunately, we do not observe at which step salaries sit within the pay grade and therefore can focus only on pay grade increases.

[21] The full sample encompassing all workers is used to calculate duty station characteristics (e.g. number of employees, gender mix of employees and managers, the appointment of new managers, etc).

each of the variables we use.[22]

The data released by OPM does not have employee race or gender but does include first and last names for most.[23] We, therefore, imputed gender based on employees' names. OPM redacted the names of all employees in sensitive occupations, primarily in law 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.[24] In our employee sample, we omit those whose gender we could not identify, but in our manager sample, we include all managers irrespective of our ability to impute their gender.[25] The data appendix details the gender imputation and the excluded sub-agencies.

To ensure that we have enough observations to estimate office gender and fixed effects, we restrict our sample to offices with at least 15 employees. We also restrict the sample to employees who work for the government for at least 5 years as we need to observe them for multiple periods in the event study.[26] Both restrictions remove noise from the estimation but do not otherwise meaningfully affect the estimates below.

The key variables and sample characteristics are summarized in Table 1 for our full sample and for our event-study sample. The full estimation sample without managerial restrictions consists of approximately 18 million quarter-year observations from approximately 250,000 unique female employees and 200,000 unique male employees who are spread across more than 10,000 offices. Our preferred 'at most 5 managers' estimation sample consists of 2 million quarter-year observations from approximately 80,000 unique female and male employees who are spread across almost 10,000 offices (Table 1c). 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 $50,000 per year and the average male employee earns roughly $7,000 more (Table 1a). However, a portion

[22]At this time, the data appendix is available upon request.

[23]The Fedscope [https://www.fedscope.opm.gov/] provide the agency-level make-up separately by race and gender without intersectionality. Among the 20 largest agencies, the correlation between the shares of Black employees and female employees is 0.37.

[24]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 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 from 1992-2012 from Vilhuber (2018), including 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.

[25]Workers who become managers in the event window are excluded from the employee sample.

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

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 male employees are slightly more educated (Table 1b).[27]

### *B. Managers*

Our data on managers is extracted from the same source, but is a distinct extract and includes managers whose gender we could not identify (about 15% of the manager sample).[28] Women's presence in management positions grew alongside their employment shares over the course of our study period (Figure 1). By 2014, women were 35% of managers, up from 16% in 1987. Despite these increases, women were under-represented in management relative to their employment shares in every year and remain so. On average, in our data, women make up 40% of employees but only about 26% of managers (Table 1c). In addition to the inter-temporal variation, there is substantial variation in female management shares across agencies and across offices within agencies in each period.[29] Female management shares range from 0% to 100% across agencies and offices.

The managers we study are close supervisors. As shown in Figure 2a (solid line), the vast majority of federal offices have only 5-10 employees per manager. We observe the management team at each office in each quarter, but we do not observe direct reporting lines and the divisions of management responsibilities within the office. We therefore focus our analysis on the 80% of offices that have smaller management teams (at most 5 managers) where the appointment of a new manager represents a supervisory change for a larger share of the office's employees. Figure 2b shows the percentage of offices treated with a new manager in each year for this sub-sample. Almost a third of offices 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 2b).

To avoid the confounding effects of previous managerial changes, the main event of interest is the first managerial change an employee experiences at the office level. We note that almost all (close to 90%) new managers in offices with up to 5 managers worked for the federal government prior to their appointment and around 50% are promotions of employees within the office (Table

[27] In our data, 86% of male workers have at least some college education compared with only 79% of female workers. Male workers are also more likely to have graduate degrees.

[28] Table A.2 summarizes the characteristics of managers.

[29] Appendix FigureA.1 displays the female management shares, as well as employee shares, for 12 large agencies in 1995 and 2014.

A.3).

We define an employee as receiving their first new manager if the appointment of a new manager at the office is the first managerial transition the employee has experienced. For the managerial transition to be a meaningful change, employees need sufficient time with their initial manager to be evaluated. We therefore only count an employee as having experienced a managerial transition if they had worked at the federal service for at least 6 months prior to the transition.[30] The "new same-sex manager" variable is equal to 1 if the employee and the first new manager at their office have the same sex, leaving opposite-sex managers and managers with unobserved sex in the base group. Under this definition, around 40% of female and male employees experience a new manager over the course of the sample period. Among those who we observe experiencing a first new manager, approximately 40% of women and 60% of men's first new managers are of the same-sex.

## IV. Identification strategy

This section details the events we exploit and the rich specification our data allows us to estimate. Given the under-representation of women in management, our focus is the differential impact of managerial homophily on women's and men's wages. We leverage managerial turnover to estimate the change in female employee wages following the appointment of a new same-sex (female) supervisor in comparison to the wage change experienced by male employees when they get a new same-sex (male) manager. Our event of interest is the appointment of a new manager at the office and employees in the office who are the same sex as the new manager are treated. The fully saturated model presented below also allows us to estimate all four pairings (two same-sex and two opposite-sex) simultaneously and derive any desired contrasts.

As explained in section II above, federal pay setting involves several components that affect pay but are outside the scope of managers' control such as locality pay premia and GS criteria. We therefore employ a conditional exogeneity estimation strategy similar to the covariate adjustment strategy suggested by Freyaldenhoven, Hansen, and Shapiro (2019) who advocate correcting for potential confounds by first residualizing outcomes using covariates unaffected by the event. Thus, we begin our estimation by constructing a log pay residual for each employee – the pay purged of the observable characteristics of employees, offices, and localities.

[30] Estimates are virtually indistinguishable if treatment is defined as the first new managerial appointment after 1 year of service.

### *A. Estimation of Unexplained Pay Variation*

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. We therefore begin by regressing the individuals' annual log pay on localities of offices to purge this variation from the data.[31] We estimate these regressions separately for each year to fully account for the magnitude and yearly variation of the locality pay adjustments under FEPCA.

We then use the locality purged wages to estimate the unexplained component of worker pay, the pay unexplained by observable characteristics, again estimating the regression separately by calendar year.

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

where $\hat{w}_{iqy}$ is the residual stripped of locality pay for individual $i$ in quarter $q$ and year $y$, $X_{iqy}$ are observable characteristics, including age, education, occupation, a part-time indicator, and tenure.[32] Office fixed effects, $\theta_{dy}$, capture the common features of offices, such as size and the female employee share, that are shared by all employees at the office in a particular year $y$. We denote the resulting log pay residual as $\hat{\omega}_{iqy}$.

Figure 3 presents the residual wages from equation 1, averaged in each year by gender (solid symbols) for our sub-sample of offices with at most 5 managers. The distance between the average male and female residuals, which hovers between 1.9 and 3.1 log points, corresponds to the average unexplained pay gap each year. One potential mechanism behind these unexplained disparities is observationally equivalent male and female workers moving through the grid at different paces. Indeed, when we include the endogenous pay plans and grades (hollow symbols), the male and female residuals are much closer to each other. The endogenous pay grid hides the underlying gender pay gap. Thus, Figure 3 illustrates a key point: most (85%) of the unexplained pay gap over time operates through workers placement on the pay grid, a decision heavily influenced by

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

[32] The part-time indicator is equal to 1 in each quarter-year in which the employee worked less than full-time. OPM defines part-time permanent workers as those working between 16 and 32 hours a week. The salaries provided by OPM are annualized full-time salaries, not pay, and do not mechanically fluctuate with hours worked. OPM notes a number of circumstances in which employees may choose to work part time including illness and "to balance routine and/or unexpected work and family demands" (https://www.opm.gov/policy-data-oversight/hiring-information/part-time-and-job-sharing/). 8.5% of federal workers in our sample work part time at some point in their careers. 6% of full-time workers have at least one part-time spell.

their managers. Below we present evidence that new managers help employees move through the grid, therefore that placement in the grid has a discretionary component.

### *B. Event study DiD*

We estimate the differential (DiD) effects of a new manager of the same-sex as the employee $NSM_{idt}$ on the log pay residuals $\hat{\omega}_{itq}$ obtained from equation 1 in an event study design with year-quarter and individual-office (TW) fixed effects, that is, we allow each individual's fixed effect to vary when they switch offices.[33] We restrict the sample to employees who eventually received a first new manager, for which the event is well-defined, thus using those who have yet to receive a first new manager as controls. We estimate the following specification using residualized pay,

$$\begin{aligned}\hat{\omega}_{itq} = \delta_k \cdot \mathbb{I}^{Event} \cdot NSM_{idt} + \delta_k^f \cdot \mathbb{I}^{Event} \cdot F_i \cdot \ NSM_{idt} \\ + \alpha_k \cdot \mathbb{I}^{Event} + \alpha_k^f \cdot \mathbb{I}^{Event} \cdot F_i + \gamma_i + \lambda_q + \varepsilon_{itq},\end{aligned} \tag{2}$$

where $\hat{\omega}_{itq}$ denotes the pay residual from equation 1 for an individual $i$ in event year $t$ and calendar year-quarter $q$ and where $\mathbb{I}^{Event}$ is a vector of event times.[34] The indicator variable $F_i$ denotes female employees and is used in interactions (the first-order coefficients are absorbed by the individual fixed effects). Thus $\alpha_k$ and $\alpha_k^f$ respectively capture the wage dynamics around a new manager's appointment irrespective of whether the manager is the same-sex as the employee at event time $t = k$. The indicator variable $NSM_{idt}$ is turned on when the new manager is of the same-sex as the employee, thus $\delta_k$ is the effect of homophily in general, and $\delta_k^f$ is the differential effect of homophily on female employees, at event time $k = t$. The fixed effects $\gamma_i$ and $\lambda_q$, denote individual effects that are allowed to vary with office moves and calendar year-quarter fixed effects. The event study residual is denoted by $\varepsilon_{itq}$.

An important advantage of this specification is that it allows us to easily recover the dynamic impacts of all four possible pairings on log wage residuals. The total effect of a new female manager on female employees' residual wages, is the sum of all coefficients: $\delta_k+\delta_k^f+\alpha_k+\alpha_k^f$ (the female homophily effect). The analogous effects for men are $\delta_k+\alpha_k$.[35] The differential effect

[33]About 25% of employees switch offices at some point. Estimates are robust to restricting each individual to a single fixed effect (Figure 10).

[34]The vector of event time includes five event-year indicators before and after the event. The year prior to treatment, $k = -1$ is our base year and its coefficient is set to zero. The fifth event-year indicator before and after the event is an absorbing indicator equal to one for periods 5 or more years before or after the event. We report estimates for event years from $-4$ to $+4$ and omit the lower and upper absorbing years in the figures.

[35]The opposite sex effects on female employees omit the same-sex coefficients and are $\alpha_k + \alpha_k^f$, while those on male employees, also omit the female interaction coefficients leaving $\alpha_k$.

of homophily on female workers is the difference in the homophily effect on female workers minus the effect on male workers: $\delta_k^f + \alpha_k^f$.[36]

As explained earlier, we focus on each employee's first managerial transition to obtain as clean and comparable an estimate as possible. Because we do not observe the manager(s) each employee reports to, the same-sex manager effects correspond to the effect of the appointment of a same-sex manager at the employee's office. Given that the offices we focus on have relatively small management teams (5 or fewer managers), changes in their composition could affect the office as a whole. Therefore, one could also think of these effects as "Intent-To-Treat" estimates of the effect of a particular employee receiving a new same-sex supervisor. One advantage of this event definition is that it excludes any reshuffling of individual supervision assignments within an office due to supervisor-employee match quality, productivity, or similar confounding sorting.

## V. Event-study DiD Results

We begin by presenting our main event-study results for our preferred sample. We then investigate heterogeneity in treatment effects in order to understand when and for whom same-sex managers might have larger impact on pay. This is followed by a thorough discussion of robustness and potential threats to identification including balance of the observed characteristics of workers and offices by new manager gender and analyses of the sensitivity of the estimates to key specification and sample choices. We complement the event-study analysis with two-way fixed-effects difference-in-differences (TWFE-DiD) estimates of the overall effect of the appointment of same-sex managers on residual log wages, promotions, retention (office moves), and occupational upgrades. We test the robustness of the estimates using to newly proposed estimators for staggered treatment effects (Borusyak et al., 2021).

### *A. Main Results*

Figure 4 depicts our main event study results.[37] The solid orange line represents the total effect of the appointment of a new same-sex manager on female employees ($\delta_k + \delta_k^f + \alpha_k + \alpha_k^f$), herein the female homophily effect. In contrast, the blue lines depict the effect of the appointment

[36] We can also compute the effect of female managers on the gender pay gap as: $\alpha_k^f + \delta_k + \delta_k^f$, and the effects of male managers on the gender pay gap as: $\alpha_k^f - \delta_k$. Thus the differential effect of female versus male managers on the gender pay gap is: $2 \cdot \delta_k + \delta_k^f$. The intuition behind the expression is that when the female managers' effect on male wages is turned on the homophily effect is absent. The total effects of new managers on the gender pay gap would account for all four cases, weighted by their relative frequency, which varies over time.

[37] Figure A.3a graphs the raw coefficients. Figure A.3b provides the resulting estimates for all 4 cases and shows that female managers get larger raises for both their female and male employees than male managers do.

of a new same-sex manager on male employees ($\delta_k + \alpha_k$), herein the "male homophily effect."[38] Table 2 reports the corresponding point estimates with standard errors (clustered at the office level). All employees, male and female are on an upward wage trajectory early in their careers when new managers arrive (Table 2, column 3). The residual wage growth (the new manager coefficients) in the pre-period is the same for male and female employees and is independent of the new manager being of the same-sex. In the period prior to the new manager's arrival, the $\alpha^f$, $\delta$ and $\delta^f$ coefficients are negligible and insignificant (Figure A.3A and Table 2). The vertical distance between the two curves (plotted in Figure 4b with standard errors) nets out any wage growth around the arrival of new managers' (event time effects) and gives us a cleanly identified differential homophily effect.[39]

Our first novel finding is that women benefit from the appointment of a new same-sex manager at their workplace (Figure 4a) and that managerial homophily is more important for their wage trajectories than it is for men. Following the appointment of a new same-sex manager, female employees' wages grow 1.5 log points more than male employees (Figure 4b). These estimates are nearly identical if one limits the sample to the 90% of workers paid within the GS pay plan (Figures 4c and 4d).

Educational attainment is a key factor in employees' initial GS grades and promotion ceilings.[40] Figure 5 presents the event-study estimates for employees with less than a Bachelor's degree and those with at least a Bachelor's degree. The differential impact of a new same-sex manager appears to be driven by their effect on more educated workers. Female employees with at least a Bachelor's degree have a same-sex manager effect that is roughly 3 log points higher than male employees' same-sex effect. There is no difference in the same-sex effect across employee gender for employees with less education and the male employee homophily effect is similar across education groups. This could reflect that highly educated employees are eligible for a wider range of pay grades or benefit from discretion playing larger role in their duties and evaluation. To gain insight into these competing mechanisms, we estimate the effect of same-sex

[38]These effects are sizeable hovering around 8 to 10 log points in the 2 to 4 years following the appointment of new managers. While consistent with wage increases associated with grade increases, the event-time indicators, the $\alpha_k$, seem to capture a pre-existing pattern of wage growth that is common to male and female employees. The gender gaps we focus on display no such pre-trends.

[39]A new same-sex manager is also a new manager. We, therefore, focus on the total effect that includes the differential effect on female employees of both new managers ($\alpha^f$) and same-sex managers ($\delta^f$). This is a conservative choice. The estimates are more than twice as large if one only considers the same-sex female employee interaction ($\delta^f$, Table 2 column 2). A positive estimate indicates the homophily effect on employee residual wages is larger for female employees.

[40]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.

manager appointments for workers whose positions involve more or less routine cognitive tasks.[41] The effects mirror the education results: the differential homophily effect on women comes from those in jobs with less routine tasks. Even within education groups, the differential homophily effects are driven by women in jobs with less routine tasks (Figure 6).

Next we ask if the effects of same-sex managers varies with the composition of the office (Figure 7). As with education and tasks, we find that the female homophily effects are far more affected by the office composition than male homophily effects. We first split the sample by into employees with an above and below median share of same-sex employees (47%) in their office at the time (quarter) of hiring. The male homophily effect is unaffected by the employee composition of their offices. In contrast, the same-sex share has a large effect on the female homophily effect. The female homophily effect is largest in offices with above median initial same-sex (female) employee shares. The resulting differential homophily effects are positive in above median-share offices and negative differential homophily effects in below-median same-sex share offices. A similar but less stark pattern emerges when one compares the homophily effects across offices with above and below-median initial same-sex manager shares (46%). New same-sex managers increase female employees' wages the most when they are appointed in offices with above-median initial same-sex (female) manager shares. Once again, the effects are largest for those in jobs with less routine tasks (Figure A.5).

At the beginning of our sample, during the Reagan-Bush Era, 81% of men's new managers were men, while only 31% of women's new managers were women. By the Obama era, male employees still received disproportionately more new male managers, but the gap had significantly narrowed to 69% and 43%, respectively. In Figure 8, we divide our data by presidential cycles: Reagan and Bush 41 (1987–1992), Clinton (1993-2000), Bush 43 (2001–2008), and the first six years of Obama (2008-2014).[42] At first blush, the effects of female homophily seem to steadily increases across the eras, but they have to be distinguished from important demographic changes. The importance of demographic representation in management is not a historical artifact: same-sex effects are present across all these Presidential Eras. However, the differential effect of having a same-sex manager on female and male employees evolves over eras alongside female employees'

[41] We use Acemoglu and Autor's (2010) "routine cognitive" scores. It is implemented through a custom occupational cross-walk between the federal service occupation codes and the O*NET occupation codes. We coded workers with median or above-median routine cognitive scores as having more routine jobs and those below median were coded as having less routine jobs.

[42] The Reagan and Bush era runs into the seam of our data and has a smaller sample compared to the later presidential eras: 4,818 compared with 7,037 in Clinton, 15,445 in Bush 43 and 7,030 in Obama.

places in the federal workforce. In the earliest era (Reagan-Bush 41) where estimates are noisier, likely due to the initial seam of our sample, male employees appear to benefit relatively more than female employees from having a same-sex manager.[43] The differential homophily effect converges in Clinton Era and then is significantly stronger for women in the Bush 43 Era. It remains positive in the Obama Era, but the overall effect is dampened for everyone, likely due to a pay freeze during most of that period (2011-2014) that severely constrained managerial discretion.

To distinguish the changing time effects arising from changes in the composition of the female workforce and their roles, we reproduce the presidential era estimates for workers with at least a Bachelor's degree, the group driving the earlier homophily effect estimates (Figure A.6). Among college educated workers, the overall and differential homophily effects are fairly stable across eras and mirror what we saw in the full sample. This suggests that the growth in the differential homophily effect across eras reflects composition changes among female workers rather than changes in the extent of homophily among managers.

The analyses above show that the same-sex manager effect is robust to employee type and exists across presidential eras. In order to gain more insight into the mechanisms underlying our results we next ask whether the degree of homophily varies with the type of manager appointed. One might wonder, for example, whether younger generations are more immune to homophily. Gender norms, particularly around women's role in the workplace have shifted across cohorts. While we did not find substantial differences in effects across eras above, we nonetheless reproduce our estimates by manager age. We compare those who are 35 or younger when they first become managers (the first quartile) to those who are older than 35 (Figure 9b).[44] While the estimates for the former are much less precise, the point estimates across the groups are indistinguishable, suggesting that generational change is not driving the new female (male) manager effect and will not eliminate the gender wage gaps.[45] This also suggests managers on the "fast track" are not more immune to the impact of homophily.

Finally, we compare the homophily of new same-sex managers who are new to both the role and the office (external appointments) to those who worked at the office prior to their

[43]Our main estimates are robust to excluding those treated in these years and beginning the sample with those treated in 1993 (**??**).

[44]The average and median new manager is approximately 45 years old.

[45]We failed to find any statistically significant differences across a number of manager age splits including those that isolated the oldest managers.

managerial appointment (internal appointments). Roughly half of the new managers we observe are external appointments. Those new to the office may, at least initially, be more arms length and have fewer social ties with their employees. Consistent with recent studies demonstrating the importance of social ties in the workplace (Cullen and Perez-Truglia, 2022), our estimates of differential homophily effects are noticeably smaller, when the new manager is an external hire (Figure 9a), although the differences are not statistically significant.

### *B. Threats to Identification and Sensitivity of Estimates*

Our estimation strategy uses management turnover as a natural experiment. It is natural to ask whether the offices where male and female managers are appointed are comparable before their appointment. If, for example, women were more likely to be appointed as managers as part of a remediation scheme in offices with worsening gender gaps, our estimates would conflate the effect of same-sex managers on women with the circumstances of their appointment. Fortunately, that does not appear to be the case. The gender pay gaps are stable before a new manager and a new same-sex manager is appointed (the coefficients on the female employee interactions are 0 in the pre-event period, Table 2).

It is also reassuring that external hires are not driving our results, as one might choose to bring in new leadership from outside the office when attempting to correct a problematic workplace culture or environment (Figure 9A). One can never prove the absence of relevant unobserved variables, but both employees and offices that receive new male and new female managers and the workers who receive new same and opposite-sex managers appear comparable in the preceding year (Table 3). Female employees who receive new female managers have the same salaries, unexplained pay gaps, education levels, and federal job tenure as female employees who receive new male managers (Table 3, columns 1 and 2, and columns 5 and 6). The only notable exception is the share of female employees in the office. Female managers are appointed at offices that have more female employees. This is, however, a fixed and stable difference that should be absorbed and not affect the event-study estimates. Additionally, while the stock of existing male and female managers differ modestly on observables, most notably education, and birth cohort, newly appointed male and female managers have indistinguishable observable characteristics (Table A.2).

Consistent with the appointment of new male and female managers being independent of trends in their offices, our estimates are robust to numerous combinations of controls and fixed

effects. Panel A of Figure 10 reproduces our main estimate from Figure 4b (the difference in the effect of same-sex managers on female and male employees: $\delta_k^f + \alpha_k^f$) alongside estimates from specifications that include individual fixed effects in lieu of individual fixed effects that vary when individuals change office and estimates that exclude office fixed effects in estimation of the residuals that are the dependent variables in event studies. The overall pattern of results is unchanged across the specifications and the estimates are similar.

Roughly a quarter of employees in our sample change offices at some point in their government service. While getting a new manager may be a motivation for changing jobs our results are not driven by office moves. The effects are largely indistinguishable when the sample is restricted to employees who only work at one office during their careers (Figure 10b), and as shown below, the arrival of same-sex managers has at most a negligible effect on the rate of office moves. The estimates are also robust to excluding part-time workers and those with any part-time spells during their careers.[46] The estimates are similar, but about half the magnitude when one expands the sample to include offices with up to 20 managers (Figure 10b). This is what one would expect as the treatment provided by the arrival of a new manager in a larger office is likely diluted. [47]

### *C. Mechanisms: Grades and Occupations*

Compensation is an aggregate measure of workers' advancement. We next examine the direct effect of same-sex managers on the criteria directly affecting worker pay. In the highly structured federal employment and compensation system, managers could impact workers' pay through merit increases in pay steps and expedited grade increases (our proxy for promotions). Managers could expand effort directly obtaining pay step or grade increases for their subordinates, or direct them to the occupational upgrades required for such increases. They could also indirectly increase pay by initiating performance evaluations (e.g., Oh and Lewis (2013)) to 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 employees receive more pay grade increases and experience more occupational changes following the appointment of a new same-sex manager at their office.

[46]The incidence of spells of part-time work is a notable difference between male and female employees: 8% of employees have at least one spell part-time work during their federal careers (12% of female employees compared with only 4% of male employees). The estimates are virtually identical when the sample is restricted to employees who only work full-time throughout their entire federal careers.

[47]It is a smaller change in the overall management team and it is likely a smaller share of employees see a change in their evaluator(s).

While step increases can occur in consecutive years, occupation and pay grade changes are less frequent. The average GS-pay-plan employee in our sample experiences just over three pay grade increases and 0.75 occupational changes during the observation period (Table 1). We therefore estimate the cumulative effect of same-sex managers on promotions using a two-way fixed effects difference-in-differences (TWFE-DiD) approach. As in the event studies, we limit the sample to those receiving a new manager of an observed gender during the observation period and use residualized pay and GS grades as dependent variables.[48] Because each government pay scale has a different number and spacing of pay grades, we focus this analysis on the 90% of employees in our estimation sample under the GS pay scale. For example, we estimate the impact of same-sex managers on residualized pay grade, $P_{iqt}$, in TWFE-DiD among employees under the GS-schedule:

$$
\begin{aligned}
P_{iq} = {} & \delta Post_{it} \cdot NSM_{idt} \cdot + \delta^{f} Post_{it} \cdot F_i \cdot NSM_{idt} + \alpha^{f} Post_{it} \cdot F_i \\
& + \gamma_i + \lambda_t + \epsilon_{itq},
\end{aligned} \tag{3}
$$

where $F_i$ is an indicator that equals 1 if the employee is female and $NSM_{idt}$ is an indicator that equals 1 if the employee's first new manager is the same-sex as them and 0 otherwise. $Post_{it}$ takes on the value 1 after the new manager arrives and 0 before (replacing the event time indicators). The individual and time-fixed effects, $\gamma_i$ and $\lambda_t$, absorb the first-order effects of $F_i$ and $Post_{it}$, respectively.

Table 4 presents the resulting estimates for six outcomes of interest, among employees at offices with up to 5 managers. In addition to the estimated coefficients, $\alpha$ and $\alpha^F$ of the arrival of a first new manager, and the estimated coefficients, $\delta$ and $\delta^F$, of the same-sex manager treatment, we present the sum of estimates (with standard errors) of female managerial homophily, $\alpha + \alpha^F + \delta + \delta^F$, male managerial homophily, $\alpha + \delta$, and of the difference between the two, differential homophily $\alpha^F + \delta^F$. We confirm the robustness of our estimates to the recently identified issues with parallel trend assumptions in staggered TWFE-DiDs (see, for example, Callaway and Sant'Anna, 2021 and Borusyak, 2021).[49] We use the heterogeneous effects version of the Borusyak (2021) estimator which computes estimates separately by sub-groups. Specifically we

[48] The log pay residual is the remainder after controlling for location, age, education, tenure, part-time status, occupation, and agency-sub-agency-office FEs in yearly regressions. The residualized GS grade is estimated using same regressions as the log pay residual.

[49] Borusyak (2021) proposes a new DiD estimator that is unbiased and efficient in staggered DiD settings in which two-way fixed effects may be biased, particularly those in which the already treated observations serve as problematic controls in two-way fixed effect estimation.

compute the same-sex manager effect separately for male and female employees. We report the resulting estimates and their difference in Table 4, columns 3, 6 and 9.

For reference and comparability with our earlier estimates, we begin by providing estimates for the GS pay scale employee sub-sample using the pay residual variable used in the earlier event study analysis (panel A). Mirroring the event study results, the TWFE-DiD estimates that female employees' residual pay increases roughly 1.5 log points more than male employees' pay following the appointment of a new same sex manager (1.4 log points with TWFE (col. 2) and 1.6 log points with Borusyak's heterogeneous treatment effects estimator (col. 3). Next, we turn to the effect of new same-sex managers on pay grade.[50] Once again, female employees see faster progression following the appointment of a new same-sex manager. Following the appointment of a new same-sex manager, female employees see their residual GS grade increase by 0.15 more (roughly 10% of a standard deviation) than male employees who receive a same-sex manager (Table 4b). Once again, TWFE and Borusyak's heterogeneous effects method produce virtually identical estimates.

One way employees can increase their pay grades is to move into new roles with additional responsibilities or upgrade their skills. Next, we look at occupational changes. Managers could provide guidance about such opportunities and favorable assessments could facilitate such moves. We cannot observe the exact tasks of each worker, but we observe their occupational hierarchical rank.[51] In addition, changes in their detailed occupational codes will also reflect if their roles are evolving. To that end, we estimate Equation 3 using as dependent variable an indicator equal to one when the worker's occupational code changes.[52] We find that female employees experience significantly more occupation code changes overall and in comparison to male employees following the appointment of new same-sex managers. These changes do not appear to be associated with office moves. There is no meaningful increase in office moves following the appointment of new same-sex managers, all the point estimates are less than 0.01 on a mean of 0.32, (Table 4c).

### *D. Employee Sentiment*

Managers' roles in workplaces extend beyond formal employee performance reviews. We seek to test whether employees' subjective views align with our objective finding that women's

[50] We residualize pay grade in a similar manner to wages using the same controls and equations as discussed in Section IV.A.

[51] We observe the following broad occupation categories: Professional, Administrative, Technical, Clerical, Other white collar occupations. Moves from a clerical to an administrative jobs would present opportunities for further wage increases.

[52] Occupation codes can change for a number of reasons including systemic re-coding of a whole employee group. However, these should affect all workers and not be systemically correlated with the arrival of a new same-sex manager.

presence on management teams improves women's career trajectories. The Federal Employee Viewpoint Survey (FEVS) is administered by OPM and is designed to provide a representative snapshot of employee experiences and perceptions of agency management (OPM, 2014).[53] It is regularly used by the government to evaluate human resource policies and programs. Each iteration of the survey contains demographic information on the respondents along with their responses to questions about their workplaces and their experiences in them.[54]

We link data on women's presence in management teams to employee survey data to examine the relationship between women's presence in management and employees' experiences in the workplace. Because the FEVS is an anonymous survey, we cannot link individual respondents to their payroll data. Instead, we link each employee's survey responses to the characteristics of the management teams at their agencies. For comparability with the preceding event-study analysis, we restrict the sample to the 29 agencies that appear in that sample and in the OPM survey.[55] The FEVS Public Release Data Files begin in 2006. We use the 2006-2014 surveys in the analysis that follows.

Table 5 presents OLS estimates of employee sentiment regressed on indicators for the respondent being a female employee, the majority of her agency's management being female, their interaction and agency and year fixed-effects. The dependent variables are employees' stated views on job satisfaction, pay satisfaction, recognition, promotion of diversity, no tolerance for discrimination, and trust in supervisor. Employees respond on a 5 point scale with 5 indicating the most satisfaction or agreement. The regression estimates show a significant female disadvantage across the survey areas with the notable exception of pay satisfaction. As in the event studies, the estimates show a differential homophily effect for female employees. Having a high share of same-sex managers is more important for female employees than for men. This is consistent with our event-study estimates showing same-sex managers that same-sex managers matter more for women's careers, particularly when they are a critical mass.

[53]The FEVS takes an annual probability sample from the population of permanent federal employees. 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. Originally administered as the Federal Human Capital Survey (FHCS) in 2002, it was administered bi-annually until 2010, when it became an annual survey. Additional information on the FEVS is available at: https://www.opm.gov/fevs/about/

[54]The 98-item survey covers eight topic areas: personal work experiences, work unit, agency, supervisor, leadership, satisfaction, work/life, and demographics. It includes questions of the form: "How satisfied are you with....."'

[55]We use the survey weights provided by OPM (OPM, 2014).

## VI. Conclusion

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 sectors whose levels of pay and pay differentials echo those found in the broader economy. A wide-ranging and well-documented set of rules and legislation constrains federal service pay setting with compliance closely monitored by a strong union and large bureaucracy. Yet, federal pay varies more with gender and race than can be explained by observed qualifications (Olson et al, 2000; Lewis and Oh, 2009; Oh and Lewis, 2013). We show that the demographic diversity of managers plays a role in these disparities.

We bring thirty-three years of rich longitudinal data from this setting to the task of identifying the causal effects of homophily on employees' career trajectories. The movement of women into managerial roles over the last 30 years has ameliorated the homophily imbalance: 43% of female employees' new managers were women at the end of our period up from only 30% at the beginning. We exploit 30,000 employees' first managerial team changes in an event-study design to estimate the same-sex manager effect. These estimates are robust to alternate samples, specifications, controls, fixed effects, and treatment definitions. We find that the appointment of same-sex managers has larger effects on the career trajectories of women. The differential homophily effect on residual wages is approximately 1.5 log points, roughly equivalent to half a step increase within a pay grade, close to half the average residual gender gap of 2.7 log points (Table 1, row 3).

We find substantial treatment effect heterogeneity by education and the routineness of the employees' occupations. We find the largest effects for women in occupations with less routine tasks, a group where there is potentially more scope for discretionary evaluation. Effects are also larger when newly appointed managers arise from internal appointments, a group who may have more established social ties with their workers.

We confirm the differential promotion (pay grade) mechanism behind these effects by directly estimating the effect of homophily on pay grade increases. 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 we cannot exactly pin down how female managers increase women's progression through the pay scale, performance reviews and personal guidance are the

two natural channels. In accordance with the classic statistical discrimination literature, female managers may assess female employees' work more favorably or assign them more "promotable" tasks, 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 employees are more effective at self-promotion or more likely to pursue pay increases when they have a female manager. The actions through which female managers speed the progression of female employees are beyond the scope of this paper and are a fruitful topic for future research.

These findings sound a cautionary note for studies that estimate pay disparities conditional on pay grade or algorithmic score or job title. When 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. Then the adoption of these schemes will mask and deceptively rationalize disparities instead of eliminating them. That is indeed the case here. Figure 3 plots the unexplained pay gap with and without accounting for workers' potentially endogenous pay grades. It shows that the assignment of men and women to pay plan grades appears to "close the gender pay". Most (almost 90%) of the unexplained pay gap over time operates through workers' placement on the pay grid, a decision heavily influenced by their managers and their gender.

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).

This paper estimates the effect of the appointment of same-sex managers on career trajectories 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. The civil service's pay system is, on average, more highly regulated and deterministic than many of those found in the private sector. Gender gaps in managers' assessments of subordinates are larger on more subjective measures (e.g. employee's potential) than on more concrete measures such as past productivity (Benson, Li and Shue, 2022). It is therefore likely that, if anything, direct supervisors' homophily plays an even larger role in career progression in the private sector.

A disheartening aspect of the narrowing of the US gender pay gap over the last forty years is the fact that the share of the pay gap unexplained by traditional employee-based characteristics has been increasing, particularly at the upper end of the wage distribution (Fortin et al., 2017). Given the historical under-representation of women in management, our findings suggest managers are a key hidden factor in the previously unexplained gender gap. As the Presidential Era analyses illustrate, managerial homophily has grown in importance in women's career trajectories as they have gained more education and moved into occupations with less routine tasks.

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## Figures and Tables

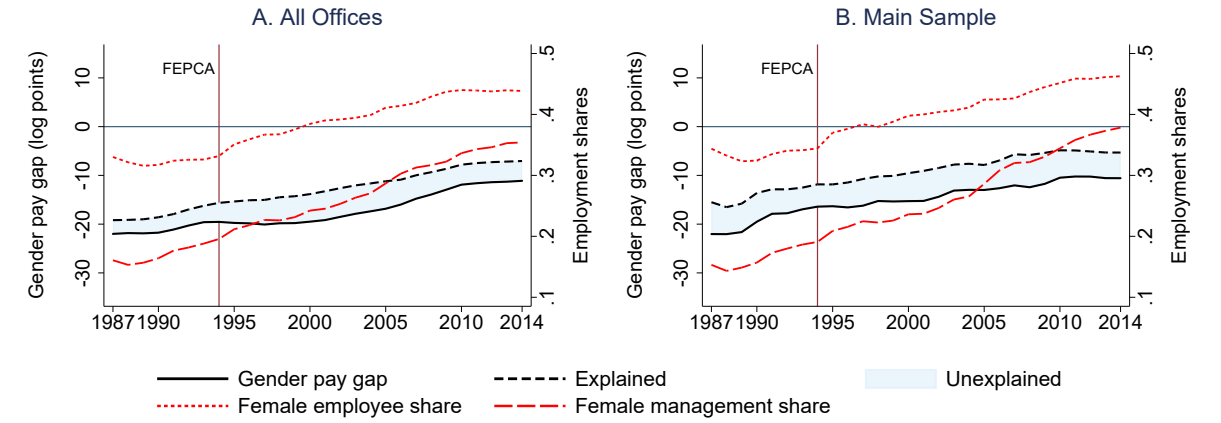


FIGURE 1. GENDER PAY GAP AND FEMALE EMPLOYMENT

Note: The "full sample" in Panel A is restricted to workers who were employed by the U.S. Federal Service for at least 5 years, work in offices with at least 10 employees, and born in the year starting 1955. Panel B further restricts the sample to offices with no more than 5 managers. The "Explained" pay gap is the gender pay gap that can be explained by locality FE, education, occupation, age, and age$^2$. Both female management share and female employee share are based on the managers and employees whose gender we were able to identify.

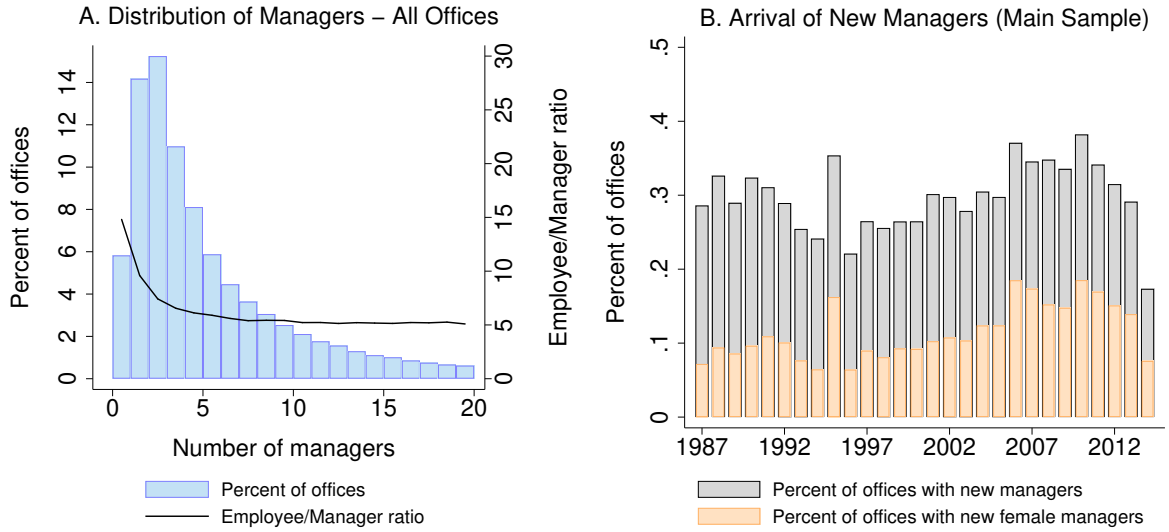


FIGURE 2. MANAGERS ACROSS OFFICES

Note: In panel A, 20 managers bin does not include offices with more than 20 managers. There are 11,964 offices in the full sample: 1,791 offices have more than 20 managers in at least one year while 11,177 offices have 20 managers or less in at least one year.

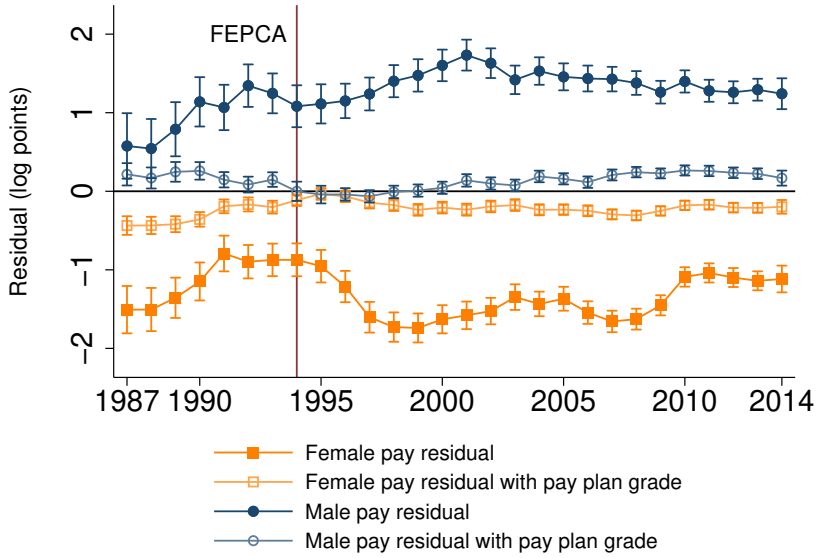


FIGURE 3. PAY RESIDUALS BY GENDER

Note: Female and male pay residuals are from yearly regressions of individuals' log pay on birth year bins, education, tenure, occupation, share of female workers at the office, and office FEs. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

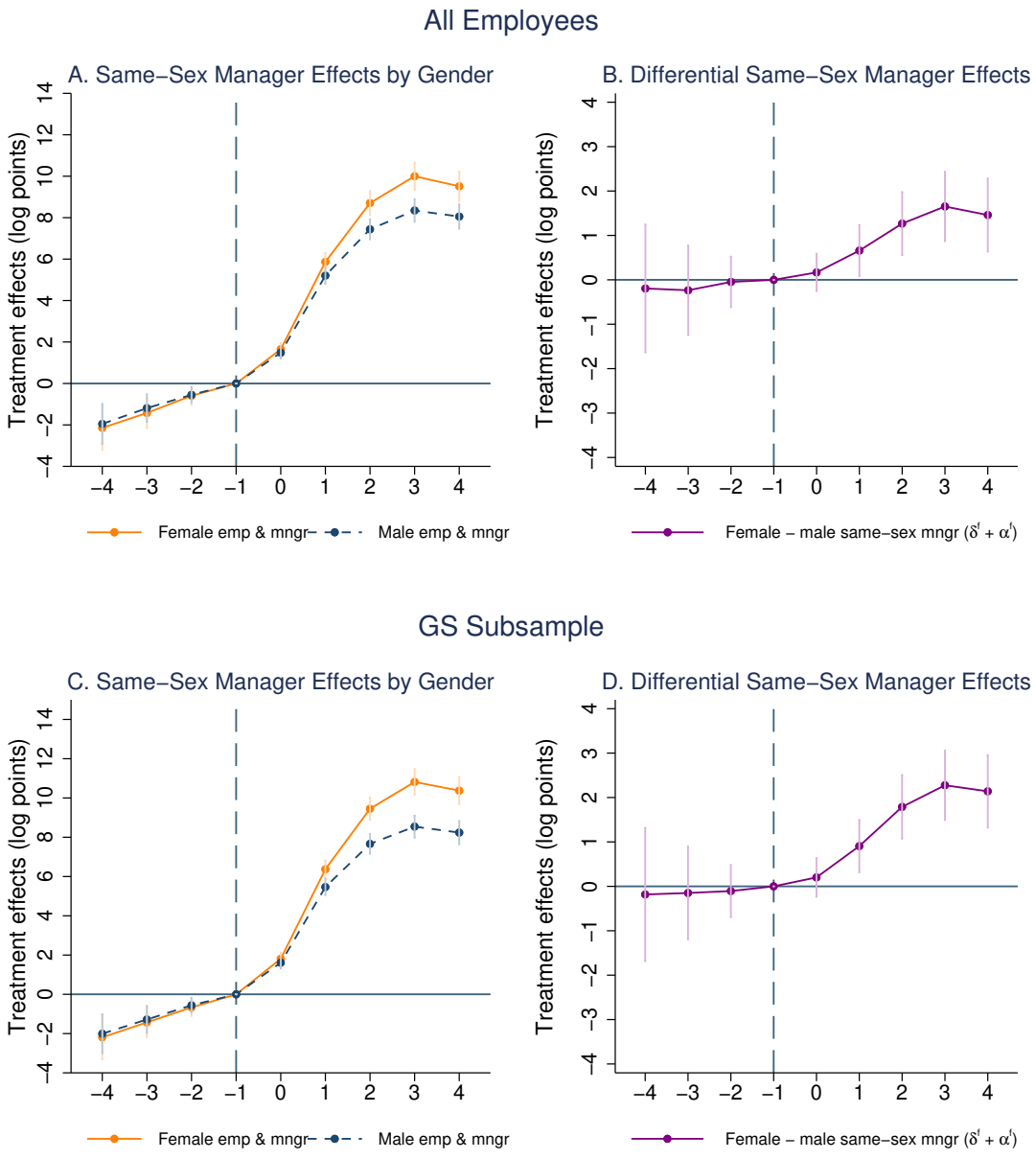


FIGURE 4. EVENT STUDY ESTIMATES: EFFECTS OF FIRST NEW MANAGERS

Note: Estimates and standard errors for all employees are reported in Table 2. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

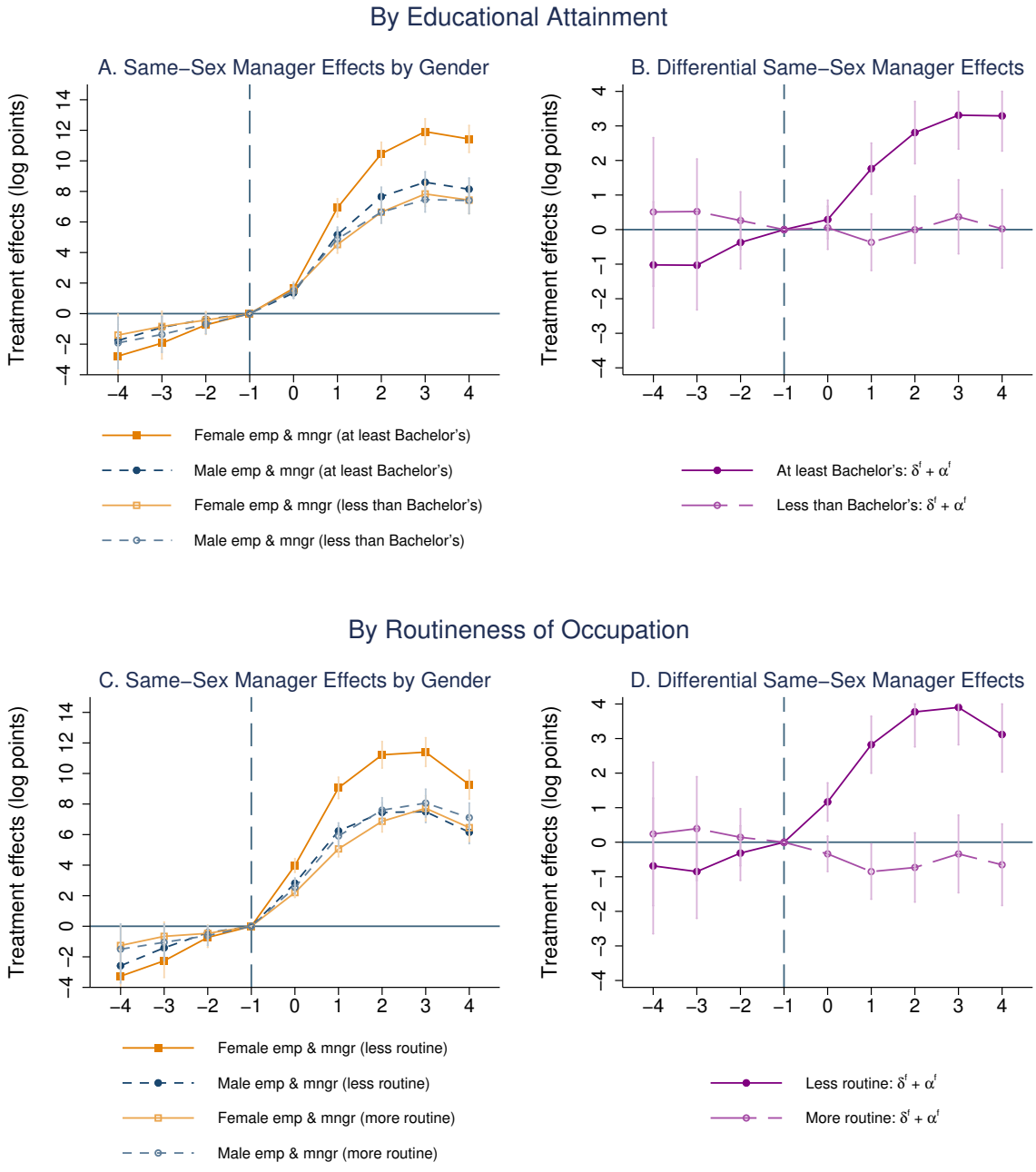


FIGURE 5. HETEROGENEITY OF EVENT STUDY ESTIMATES BY EDUCATIONAL ATTAINMENT AND OCCUPATIONAL ROUTINENESS

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

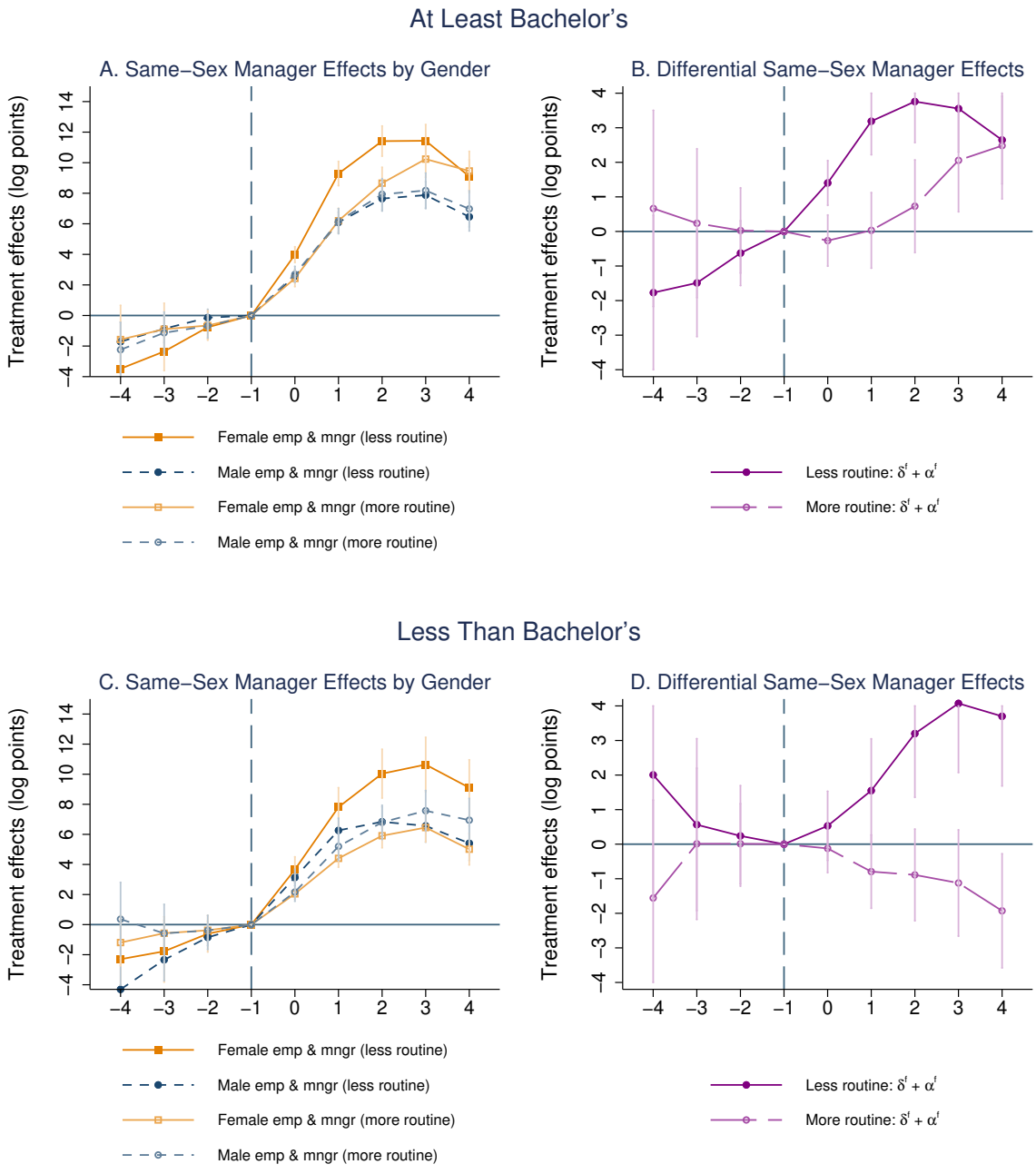


FIGURE 6. HETEROGENEITY OF EVENT STUDY ESTIMATES BY OCCUPATIONAL ROUTINENESS FOR EMPLOYEES WITH LESS THAN AND AT LEAST A BACHELOR'S DEGREE

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

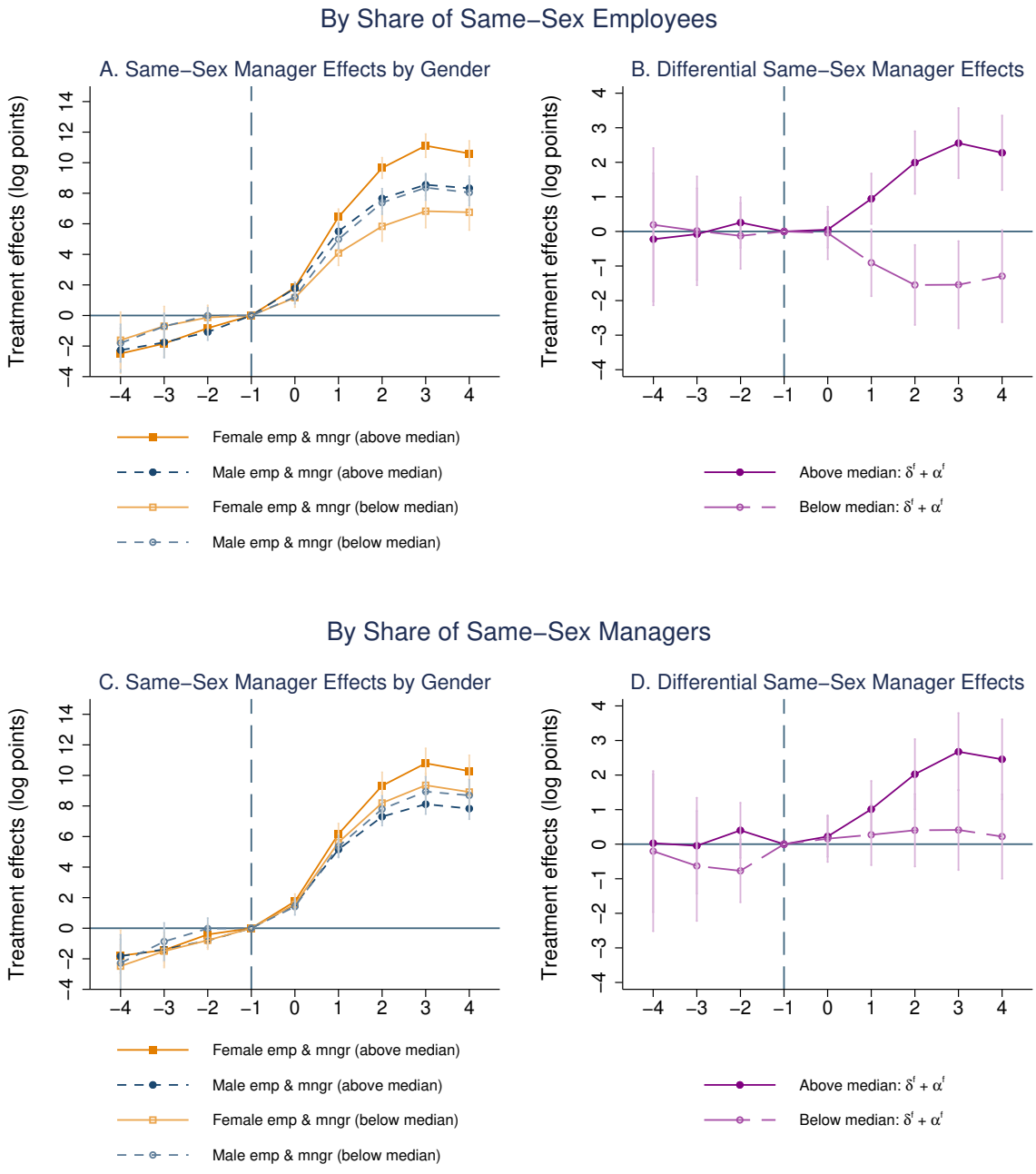


FIGURE 7. HETEROGENEITY OF EVENT STUDY ESTIMATES BY INITIAL SHARE OF SAME-SEX EMPLOYEES AND MANAGERS

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

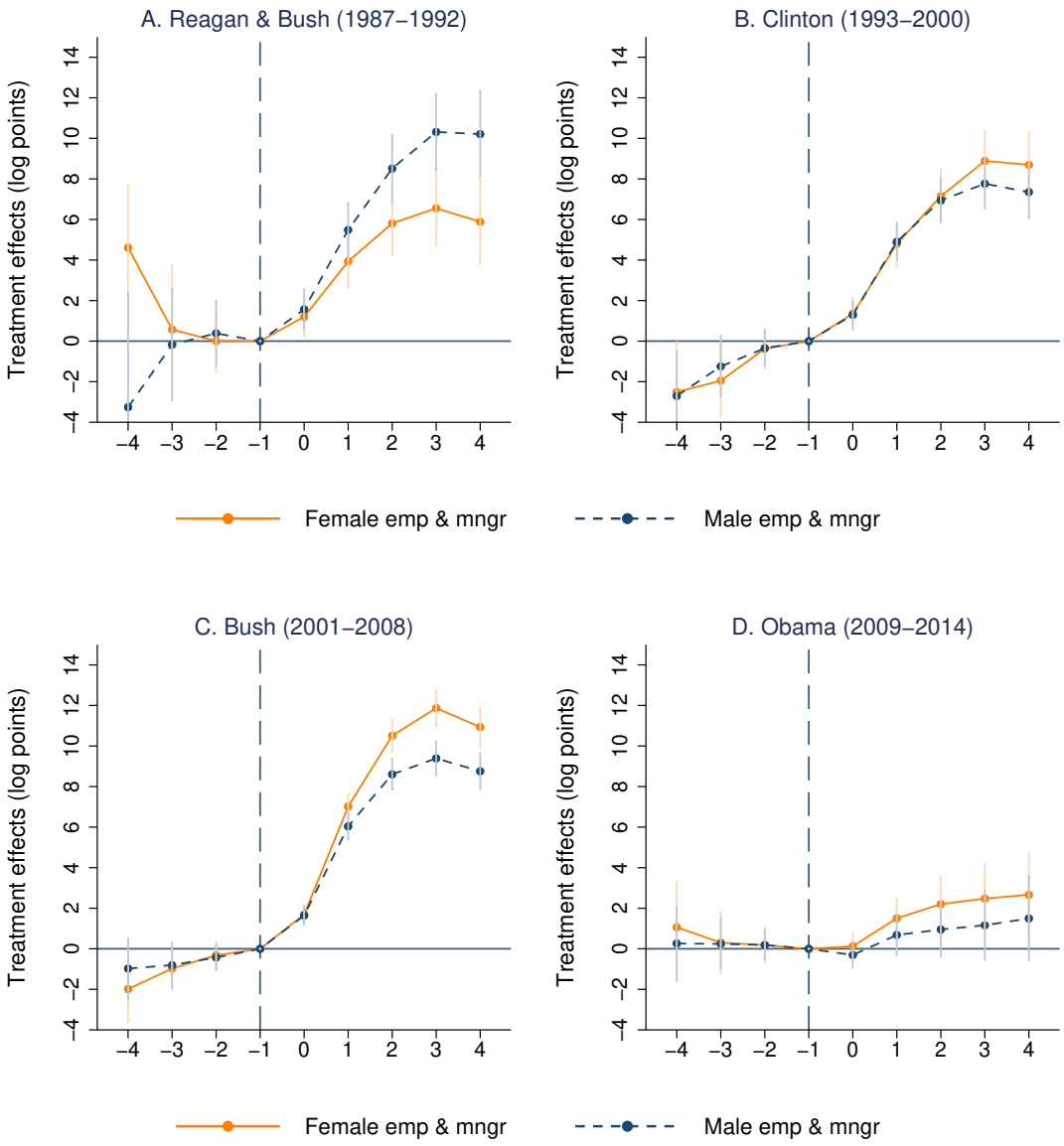


FIGURE 8. EVENT STUDY ESTIMATES BY PRESIDENTIAL ERA

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office. There are 4,818 employees in the Reagan and Bush (1987-1992) sample, 7,037 employees in the Clinton (1993-2000) sample, 15,445 employees in the Bush (2001-2008) sample, and 7,030 employees in the Obama (2009-2014) sample.

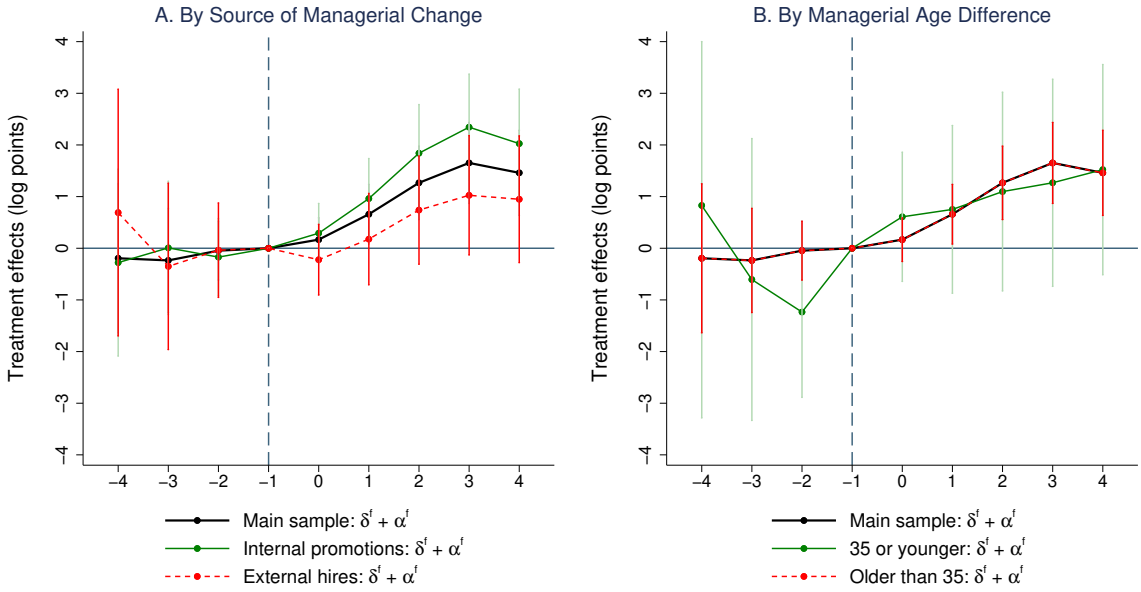


FIGURE 9. EVENT STUDY ESTIMATES BY SOURCE AND TYPE OF MANAGERIAL CHANGE

Note: Each line plots differential homophily effect estimates from a separate regression using the specification in equation 2. "Main Sample" reproduces the differential homophily effect from Figure 4B. Panel A splits the estimation sample by the manager's previous location of employment. The "external hires" estimates are estimated on the sub-sample of employees whose new manager had not previously worked at the office. The "internal hires" estimates are from the sub-sample of employees whose new managers had previously worked at the office as employees. Panel B splits the sample by the age of the new manager at appointment. The "35 or younger" and "older than 35" estimates are from the sub-samples of employees whose new manager was that age at appointment.

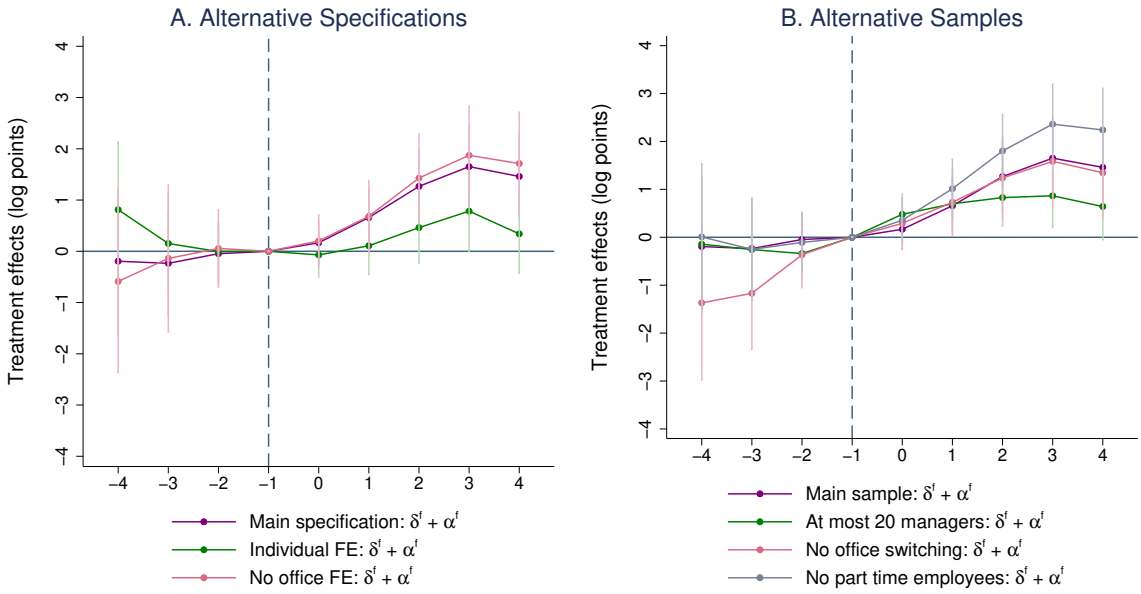


FIGURE 10. SENSITIVITY ANALYSIS: DIFFERENITAL HOMOPHILY EFFECTS

Note: Main specification refers to the specification estimated in equation (2) in section IV. The main specification reproduces the estimates from Figure 4B. In Panel A, the "individual FE" estimates replace individual-office FEs with individual effects that do not vary with office changes. "No office FEs" estimates exclude office FEs in the first stage, but contain individual-office FEs in the second stage. In Panel B, "at most 20 managers" expands the estimation sample to include all employees working in offices with at most 20 managers in the quarter prior to getting a new manager. "No office switching" excludes the 25% of employees that switch offices at any point in the sample. "No part time employees" excludes the 8% of employees who have a part-time spell during their federal service. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

Table 1—Descriptive statistics – Offices Up to 5 Managers

| Sample | Female employees | | Male employees | |
|---|---|---|---|---|
| | Main sample | Event study | Main sample | Event study |
| | (1) | (2) | (3) | (4) |
| | *Panel A: Outcomes* | | | |
| Salary | 50,610 | 50,023 | 57,771 | 57,130 |
| | (23,636) | (22,931) | (26,075) | (25,695) |
| Log salary | 10.72 | 10.72 | 10.86 | 10.85 |
| | (0.48) | (0.47) | (0.47) | (0.46) |
| Unexplained log salary (x100)* | -1.34 | -1.69 | 1.35 | 1.07 |
| | (17.47) | (17.48) | (18.34) | (18.48) |
| N pay plan changes | 0.02 | 0.01 | 0.02 | 0.02 |
| | (0.29) | (0.14) | (0.23) | (0.22) |
| N grade changes (GS sample) | 2.97 | 3.05 | 2.77 | 2.91 |
| | (1.96) | (1.93) | (1.84) | (1.82) |
| | *Panel B: Individual characteristics* | | | |
| Birth year 1955-1960 | 0.22 | 0.19 | 0.23 | 0.20 |
| | (0.42) | (0.39) | (0.42) | (0.40) |
| Birth year 1960-1965 | 0.24 | 0.21 | 0.25 | 0.23 |
| | (0.43) | (0.41) | (0.43) | (0.42) |
| Birth year 1965-1970 | 0.21 | 0.21 | 0.21 | 0.21 |
| | (0.41) | (0.41) | (0.41) | (0.41) |
| Birth year 1970-1975 | 0.14 | 0.16 | 0.14 | 0.16 |
| | (0.35) | (0.37) | (0.35) | (0.37) |
| Birth year 1975-1980 | 0.10 | 0.12 | 0.09 | 0.11 |
| | (0.30) | (0.33) | (0.29) | (0.31) |
| Birth year 1980+ | 0.08 | 0.10 | 0.07 | 0.09 |
| | (0.27) | (0.30) | (0.26) | (0.28) |
| Education: High school or less | 0.21 | 0.20 | 0.14 | 0.14 |
| | (0.41) | (0.40) | (0.35) | (0.35) |
| Education: Some college | 0.30 | 0.29 | 0.21 | 0.19 |
| | (0.46) | (0.45) | (0.40) | (0.39) |
| Education: Bachelor's degree | 0.36 | 0.39 | 0.48 | 0.49 |
| | (0.48) | (0.49) | (0.50) | (0.50) |
| Education: Graduate degree | 0.12 | 0.12 | 0.18 | 0.18 |
| | (0.33) | (0.32) | (0.38) | (0.38) |
| Tenure (years) | 8.69 | 7.30 | 9.09 | 7.87 |
| | (6.60) | (5.93) | (6.73) | (6.24) |
| | *Panel C: Workplace characteristics* | | | |
| Female employee share at office | 0.44 | 0.46 | 0.37 | 0.38 |
| | (0.22) | (0.21) | (0.22) | (0.21) |
| Female management share at office | 0.28 | 0.30 | 0.25 | 0.26 |
| | (0.31) | (0.31) | (0.30) | (0.29) |
| N offices | 9,885 | 6,913 | 9,266 | 6,443 |
| N unique individuals | 43,487 | 16,768 | 39,107 | 14,167 |
| N individuals with part time spell | 5,505 | 2,756 | 1,872 | 984 |
| N treated individuals | 16,768 | 16,768 | 14,167 | 14,167 |
| N person quarters | 1,174,846 | 721,379 | 985,882 | 591,465 |

Note: Standard deviations are in parentheses. "Main sample" refers to the sample in Figure 1B. Unexplained log pay is the residual from equation (1). Panel C is at the office–quarter level.

Table 2—Event Study Estimates: Effects of First New Managers

| Event year | New same-sex manager ($\delta$) | New same-sex manager*female ($\delta^f$) | New manager ($\alpha$) | New manager*female ($\alpha^f$) | Female-male same-sex manager ($\delta^f + \alpha^f$) |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| -4 | -0.29 | -0.14 | -1.66*** | -0.05 | -0.19 |
| | (0.79) | (1.09) | (0.63) | (0.80) | (0.74) |
| -3 | -0.04 | -0.19 | -1.15*** | -0.05 | -0.23 |
| | (0.55) | (0.76) | (0.43) | (0.54) | (0.51) |
| -2 | -0.06 | -0.22 | -0.48* | 0.18 | -0.05 |
| | (0.33) | (0.44) | (0.26) | (0.32) | (0.29) |
| 0 | -0.19 | 0.81** | 1.68*** | -0.64*** | 0.17 |
| | (0.23) | (0.32) | (0.18) | (0.23) | (0.22) |
| 1 | -0.82*** | 2.03*** | 6.03*** | -1.37*** | 0.66** |
| | (0.31) | (0.45) | (0.25) | (0.30) | (0.29) |
| 2 | -1.48*** | 3.43*** | 8.92*** | -2.16*** | 1.27*** |
| | (0.37) | (0.55) | (0.31) | (0.35) | (0.36) |
| 3 | -2.07*** | 4.32*** | 10.42*** | -2.67*** | 1.65*** |
| | (0.40) | (0.60) | (0.35) | (0.39) | (0.40) |
| 4 | -2.07*** | 4.25*** | 10.13*** | -2.79*** | 1.46*** |
| | (0.43) | (0.63) | (0.37) | (0.41) | (0.42) |
| N offices | 8,368 | 8,368 | 8,368 | 8,368 | 8,368 |
| N unique individuals | 30,935 | 30,935 | 30,935 | 30,935 | 30,935 |
| N person years | 1,312,844 | 1,312,844 | 1,312,844 | 1,312,844 | 1,312,844 |

Note: * p<0.10 ** p<0.05 *** p<0.01. Standard errors clustered at the office are in parentheses. Event year treatment effects are reported in log points. All event study specifications include quarter-year and individual-office FEs, see event study equation 2. The dependent variable is the residual log pay gap after controlling for locations (52 categories), five-year birth cohorts (7 categories, 1965 is the omitted category), education (3 categories), tenure (3 categories), and occupation dummies (18 categories), and part-time status in yearly regressions. See footnote 31 and equation 1 for details.

Table 3—Balance: Employee and Workplace Characteristics in the Year Prior to a New Manager

| Sample average | Female employees | | Male employees | |
|---|---|---|---|---|
| | New female manager | New male manager | New female manager | New male manager |
| | (1) | (2) | (3) | (4) |
| | *Panel A: Outcomes* | | | |
| Log salary | 10.44 | 10.43 | 10.58 | 10.59 |
| | (0.44) | (0.45) | (0.42) | (0.45) |
| Unexplained log salary (x100)* | -7.99 | -7.59 | -7.32 | -5.82 |
| | (18.81) | (18.99) | (20.62) | (20.26) |
| GS grade† | 7.09 | 7.29 | 8.13 | 8.54 |
| (GS sample) | (2.64) | (2.78) | (2.75) | (2.83) |
| | *Panel B: Individual characteristics* | | | |
| Birth year 1955-1960 | 0.14 | 0.16 | 0.15 | 0.16 |
| | (0.35) | (0.36) | (0.36) | (0.37) |
| Birth year 1960-1965 | 0.18 | 0.19 | 0.16 | 0.19 |
| | (0.38) | (0.39) | (0.37) | (0.39) |
| Birth year 1965-1970 | 0.19 | 0.19 | 0.18 | 0.19 |
| | (0.39) | (0.39) | (0.38) | (0.39) |
| Birth year 1970-1975 | 0.18 | 0.17 | 0.19 | 0.18 |
| | (0.38) | (0.38) | (0.39) | (0.39) |
| Birth year 1975-1980 | 0.16 | 0.15 | 0.15 | 0.14 |
| | (0.37) | (0.36) | (0.36) | (0.35) |
| Birth year 1980+ | 0.15 | 0.14 | 0.17 | 0.14 |
| | (0.36) | (0.35) | (0.37) | (0.34) |
| Education: High school or less | 0.17 | 0.18 | 0.12 | 0.15 |
| | (0.38) | (0.39) | (0.33) | (0.36) |
| Education: Some college | 0.31 | 0.27 | 0.21 | 0.21 |
| | (0.46) | (0.45) | (0.41) | (0.40) |
| Education: Bachelor's degree | 0.40 | 0.40 | 0.48 | 0.46 |
| | (0.49) | (0.49) | (0.50) | (0.50) |
| Education: Graduate degree | 0.12 | 0.14 | 0.18 | 0.19 |
| | (0.33) | (0.35) | (0.39) | (0.39) |
| Tenure (years) | 1.99 | 2.29 | 2.66 | 2.99 |
| | (2.77) | (3.14) | (3.62) | (3.81) |
| N unique individuals | 5,035 | 5,792 | 3,014 | 5,860 |
| N person quarters | 15,923 | 18,441 | 9,475 | 18,811 |
| | *Panel C: Workplace characteristics* | | | |
| | New female manager | | New male manager | |
| Female employee share at office | 0.53 | | 0.38 | |
| | (0.21) | | (0.23) | |
| Female management share at office | 0.35 | | 0.23 | |
| | (0.35) | | (0.31) | |
| N offices | 2,790 | | 3,800 | |

Note:* p<0.10 ** p<0.05 *** p<0.01. Standard errors clustered by office are in parentheses. * Unexplained log pay is the residual of log pay after controlling for location, age, education, tenure, occupation, and agency-subagency-office FEs. † GS grade is summarized at the time of arrival of the first new manager. Workplace characteristics are at the office - quarter level. GS subsample contains 90% of workers in the estimation sample.

Table 4—DID Estimates of Same-sex Manager Effects on Pay, Grade, and Occupation Switching (GS sample)

| | TWFE (1) | TWFE (2) | Borusyak (3) | TWFE (4) | TWFE (5) | Borusyak (6) | TWFE (7) | TWFE (8) | Borusyak (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Panel A: Log pay residual (X100) | | | Panel B: Residualized GS Grade | | | Panel C: Office Switching | | |
| Same-sex manager | | -1.154*** | | | -0.105*** | | -0.006* | -0.006* | |
| ($\delta$) | | (0.321) | | | (0.030) | | (0.003) | (0.003) | |
| Same-sex manager * female | | 3.166*** | | | 0.298*** | | 0.007* | 0.007* | |
| ($\delta^f$) | | (0.465) | | | (0.044) | | (0.004) | (0.004) | |
| New manager | | 7.657*** | | | 0.632*** | | 0.008*** | 0.006*** | |
| ($\alpha$) | | (0.266) | | | (0.025) | | (0.002) | (0.002) | |
| New manager*female | | -1.807*** | | | -0.150*** | | -0.003 | -0.004 | |
| ($\alpha^f$) | | (0.311) | | | (0.030) | | (0.003) | (0.003) | |
| Female employee and manager | | 7.862*** | 8.132*** | | 0.675*** | 0.709*** | 0.007*** | 0.003* | 0.003 |
| ($\delta + \delta^f + \alpha + \alpha^f$) | | (0.242) | (0.260) | | (0.024) | (0.026) | (0.002) | (0.002) | (0.002) |
| Male employee and manager | | 6.503*** | 6.545*** | | 0.527*** | 0.543*** | 0.003 | 0.001 | 0.001 |
| ($\delta + \alpha$) | | (0.213) | (0.240) | | (0.020) | (0.022) | (0.002) | (0.002) | (0.003) |
| Female - male same-sex manager | | 1.359*** | 1.587*** | | 0.148*** | 0.166*** | 0.004 | 0.003 | 0.001 |
| ($\delta^f + \alpha^f$) | | (0.311) | (0.325) | | (0.030) | (0.031) | (0.003) | (0.003) | (0.003) |
| | Panel D: Occupation category change | | | Panel E: 4-Digit Occupation change | | | Panel F: 2-Digit Occupation change | | |
| Same-sex manager | -0.009 | -0.008 | | -0.032*** | -0.020*** | | -0.030*** | -0.024*** | |
| ($\delta$) | (0.007) | (0.007) | | (0.006) | (0.005) | | (0.008) | (0.006) | |
| Same-sex manager * female | 0.018* | 0.014 | | 0.062*** | 0.036*** | | 0.036*** | 0.021** | |
| ($\delta^f$) | (0.011) | (0.011) | | (0.010) | (0.007) | | (0.011) | (0.009) | |
| New manager | 0.022*** | 0.011** | | 0.022*** | 0.016*** | | 0.054*** | 0.045*** | |
| ($\alpha$) | (0.005) | (0.005) | | (0.005) | (0.004) | | (0.006) | (0.005) | |
| New manager*female | 0.091*** | 0.089*** | | 0.046*** | 0.019*** | | 0.053*** | 0.021*** | |
| ($\alpha^f$) | (0.007) | (0.007) | | (0.007) | (0.005) | | (0.008) | (0.006) | |
| Female employee and manager | 0.122*** | 0.106*** | 0.111*** | 0.098*** | 0.051*** | 0.066*** | 0.113*** | 0.063*** | 0.075*** |
| ($\delta + \delta^f + \alpha + \alpha^f$) | (0.006) | (0.006) | (0.007) | (0.006) | (0.004) | (0.005) | (0.006) | (0.005) | (0.005) |
| Male employee and manager | 0.013*** | 0.003 | -0.002 | -0.011*** | -0.005* | -0.004 | 0.024*** | 0.022*** | 0.020*** |
| ($\delta + \alpha$) | (0.004) | (0.004) | (0.005) | (0.003) | (0.003) | (0.004) | (0.005) | (0.004) | (0.005) |
| Female - male same-sex manager | 0.109*** | 0.103*** | 0.113*** | 0.109*** | 0.056*** | 0.070*** | 0.089*** | 0.042*** | 0.055*** |
| ($\delta^f + \alpha^f$) | (0.008) | (0.008) | (0.008) | (0.007) | (0.005) | (0.005) | (0.008) | (0.006) | (0.006) |
| N unique individuals | 28,210 | 28,210 | 28,210 | 28,210 | 28,210 | 28,210 | 28,210 | 28,210 | 28,210 |
| N person years | 1,039,569 | 1,039,569 | 1,039,569 | 1,039,569 | 1,039,569 | 1,039,569 | 1,039,569 | 1,039,569 | 1,039,569 |
| Fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Individual controls | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |

Note:* p<0.10 ** p<0.05 *** p<0.01. Standard errors clustered at the office level in parentheses. Fixed effects include year-quarter, locality, and individual-office fixed effects. Individual controls include age, age$^2$, and occupation categories in regressions with office switching, 4-digit occupation, and 2-digit occupation as dependent variables. Regressions with occupation category as a dependent variable include age and age$^2$ as individual controls. Average values with standard deviations in parentheses for dependent variables are: log pay residual -1.21 (17.56); residualized GS grade -0.07 (1.47); office switching 0.32 (0.47); occupation category change 0.26 (0.44); 2-digit occupation change 0.20 (0.40); 4-digit occupation change 0.33 (0.47).

Table 5—Federal Employee Viewpoint Survey: Female Management Shares and Employee Attitudes

| Dependent variable: answers to questions on the scale 1-5 | (1) Job satisfaction[a] | (2) Pay satisfaction[a] | (3) Recognition[a] | (4) Diversity promoted[b] | (5) Discrimination not tolerated[b] | (6) Trust in supervisor[b] |
|---|---|---|---|---|---|---|
| Average Response | 3.74 | 3.58 | 3.34 | 3.59 | 3.75 | 3.80 |
| Female | -0.0462*** | -0.0066 | -0.1053*** | -0.2026*** | -0.1601*** | -0.1595*** |
| | (0.0091) | (0.0123) | (0.0050) | (0.0223) | (0.0119) | (0.0027) |
| Same-sex management share $\geq 0.5$ | -0.0142 | -0.0175 | -0.0626*** | -0.0118 | -0.0268 | -0.0690*** |
| | (0.0132) | (0.0411) | (0.0164) | (0.0256) | (0.0192) | (0.0134) |
| Same-sex management share $\geq 0.5$ * Female | -0.1080*** | 0.1157** | 0.1458*** | 0.0790 | 0.0899*** | 0.0940*** |
| | (0.0209) | (0.0461) | (0.0186) | (0.0461) | (0.0277) | (0.0141) |
| N | 448,424 | 448,937 | 448,437 | 422,019 | 409,931 | 449,042 |

Note: All specifications include year and agency fixed effects. Standard errors clustered by agency are in parentheses. * p<0.10 ** p<0.05 *** p<0.01. Same-sex management share $\geq 0.5$ is an indicator equal to 1 when at least 50% of the management at the employee's agency are the same sex as the employee. Female is equal to 1 if the employee is female. The sample is restricted to the subset of agencies whose female respondent shares in FEVS are within 15 percentage points of their shares in OPM.

[a]Each question asks the worker to rate how satisfied they are with that aspect of their employment with 1 being the least satisfied and and 5 being the most satisfied.

[b]Each questions ask the respondent to use a 1-5 scale to indicate how much she agrees with a statement with 5 indicating strong agreement. The text of the statements are: Diversity: "Policies and programs promote diversity in the workplace (e.g. recruiting minorities and women, training in awareness of diversity issues, mentoring." Discrimination: "Prohibited personnel practices (e.g. illegally discriminating for or against any employee/applicant, obstructing a person's right to complete for employment, knowingly violating veterans' preference requirements) are not tolerated." Trust in supervisor: "I have trust and confidence in my supervisor."

**APPENDIX A Supplementary Tables and Figures**


FIGURE A.1. FEMALE MANAGEMENT AND EMPLOYEE SHARES FOR SELECT AGENCIES

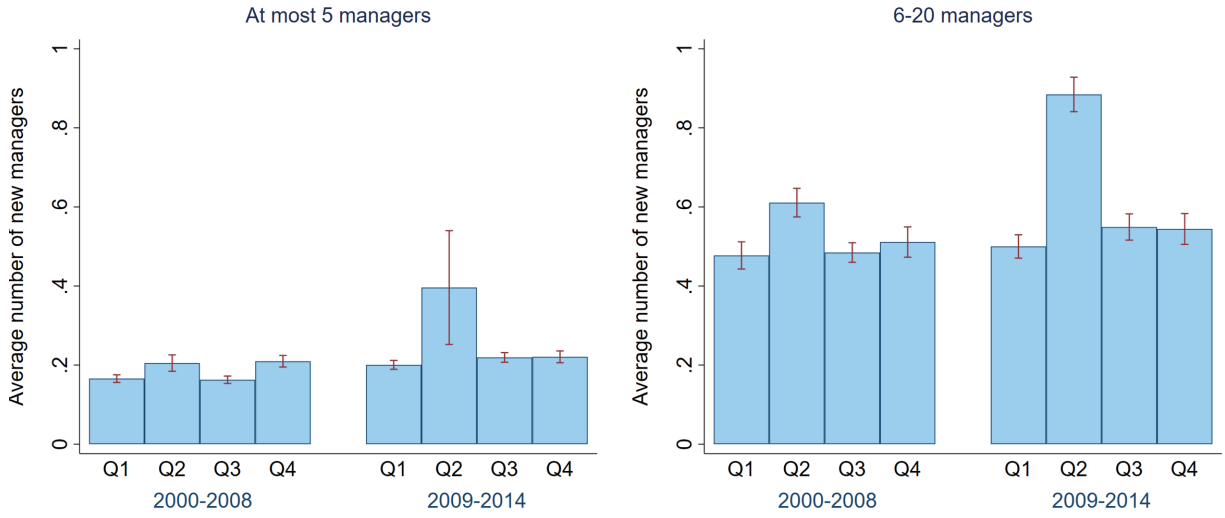


FIGURE A.2. AVERAGE QUARTERLY MANAGEMENT INCREASES

Note: Vertical bars represent 95% confidence intervals.

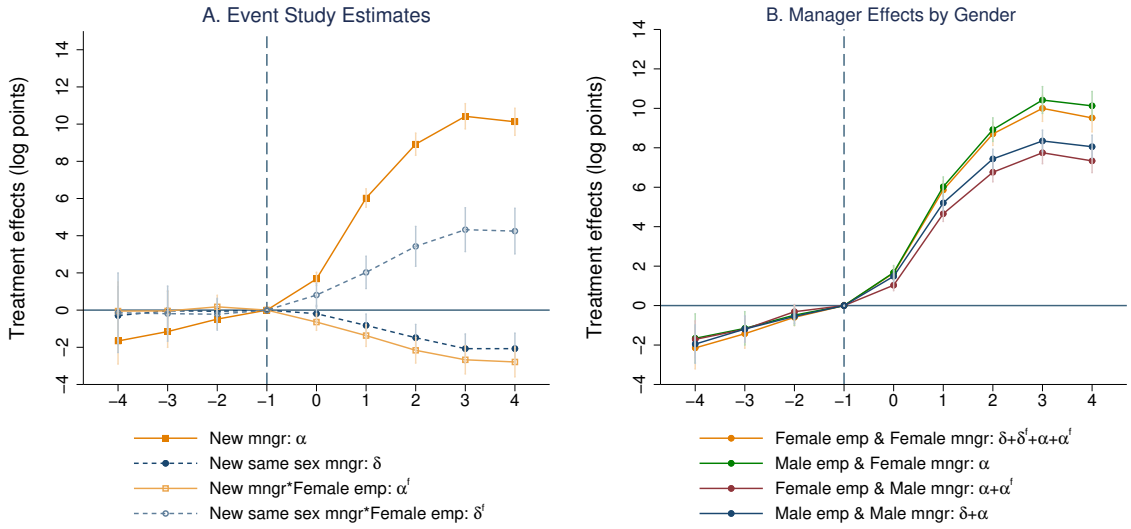


FIGURE A.3. EVENT STUDY ESTIMATES: EFFECTS OF FIRST NEW MANAGERS

Note: Estimates and standard errors for all employees are reported in Table 2. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

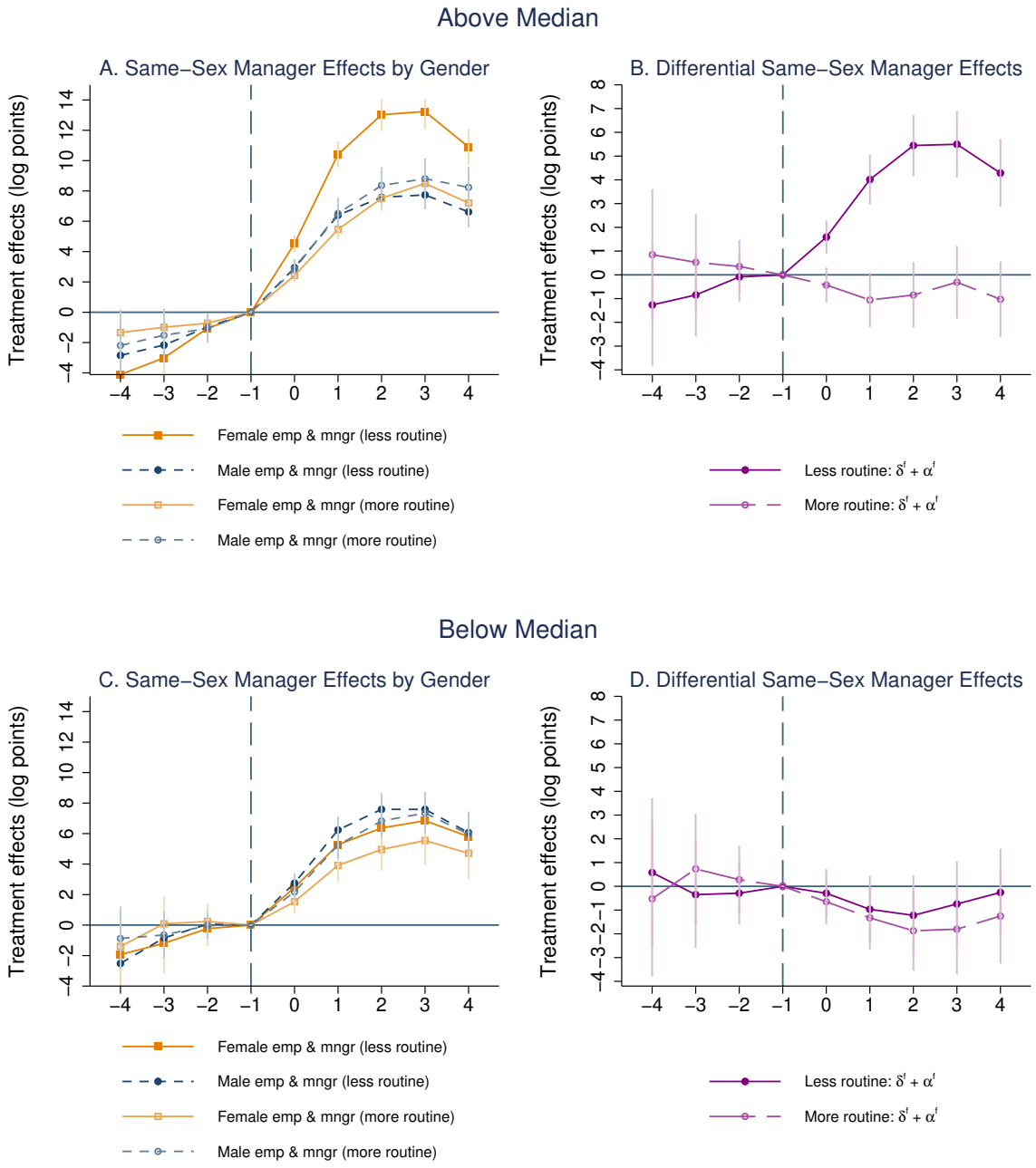


FIGURE A.4. HETEROGENEITY OF EVENT STUDY ESTIMATES BY OCCUPATIONAL ROUTINENESS FOR EMPLOYEES WITH ABOVE AND BELOW MEDIAN SHARE OF SAME-SEX EMPLOYEES IN OFFICE

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

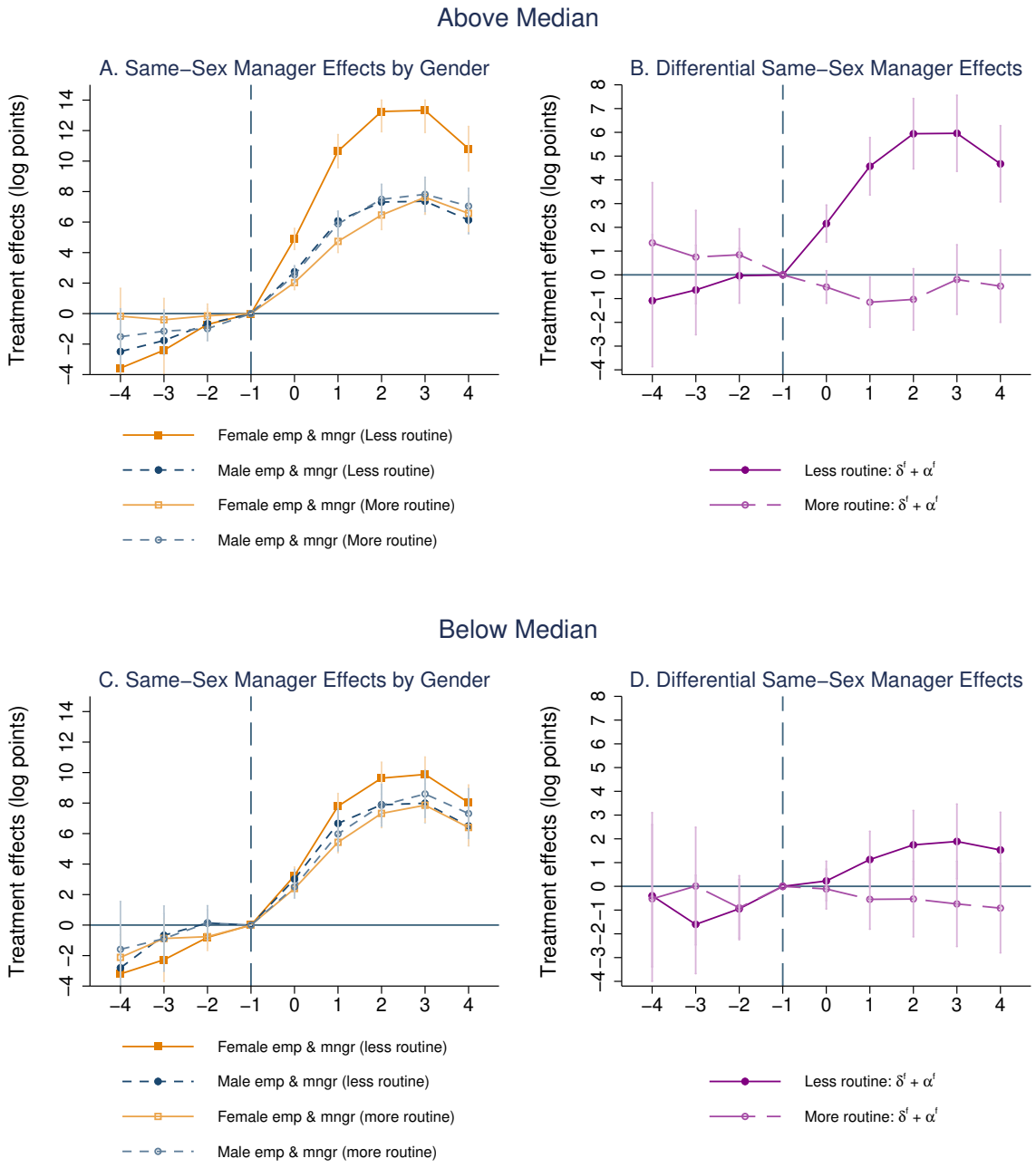


FIGURE A.5. HETEROGENEITY OF EVENT STUDY ESTIMATES BY OCCUPATIONAL ROUTINENESS FOR EMPLOYEES WITH ABOVE AND BELOW MEDIAN SHARE OF SAME-SEX MANAGERS IN OFFICE

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

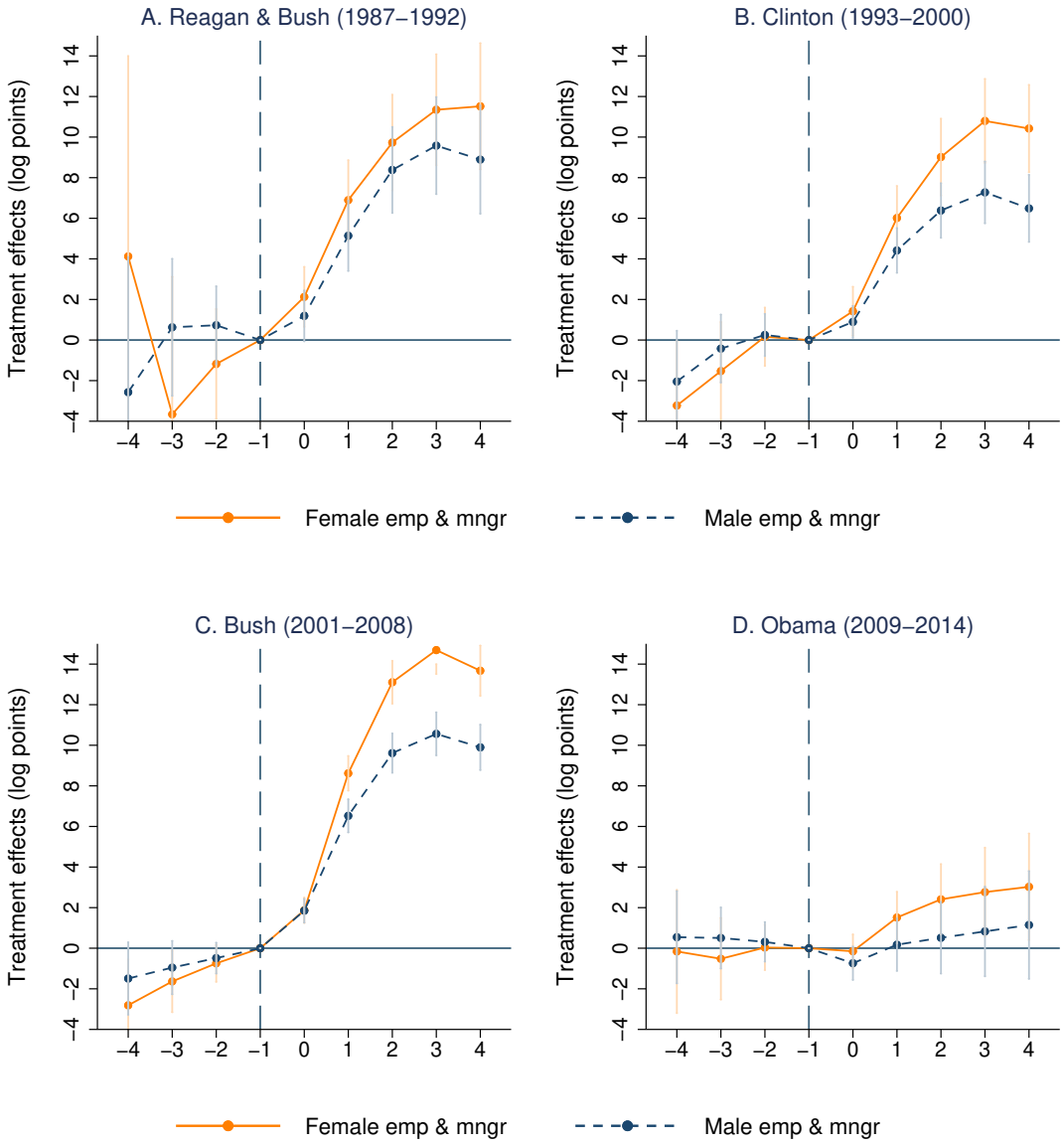


FIGURE A.6. EVENT STUDY ESTIMATES BY PRESIDENTIAL ERA FOR EMPLOYEES WITH AT LEAST A BACHELOR'S DEGREE

Note: Treatments effects are defined as in Figure 4. Vertical bars represent 95% confidence intervals with standard errors clustered by office. There are 2,481 employees in the Reagan and Bush (1987-1992) sample, 3,856 employees in the Clinton (1993-2000) sample, 8,924 employees in the Bush (2001-2008) sample, and 4,273 employees in the Obama (2009-2014) sample.

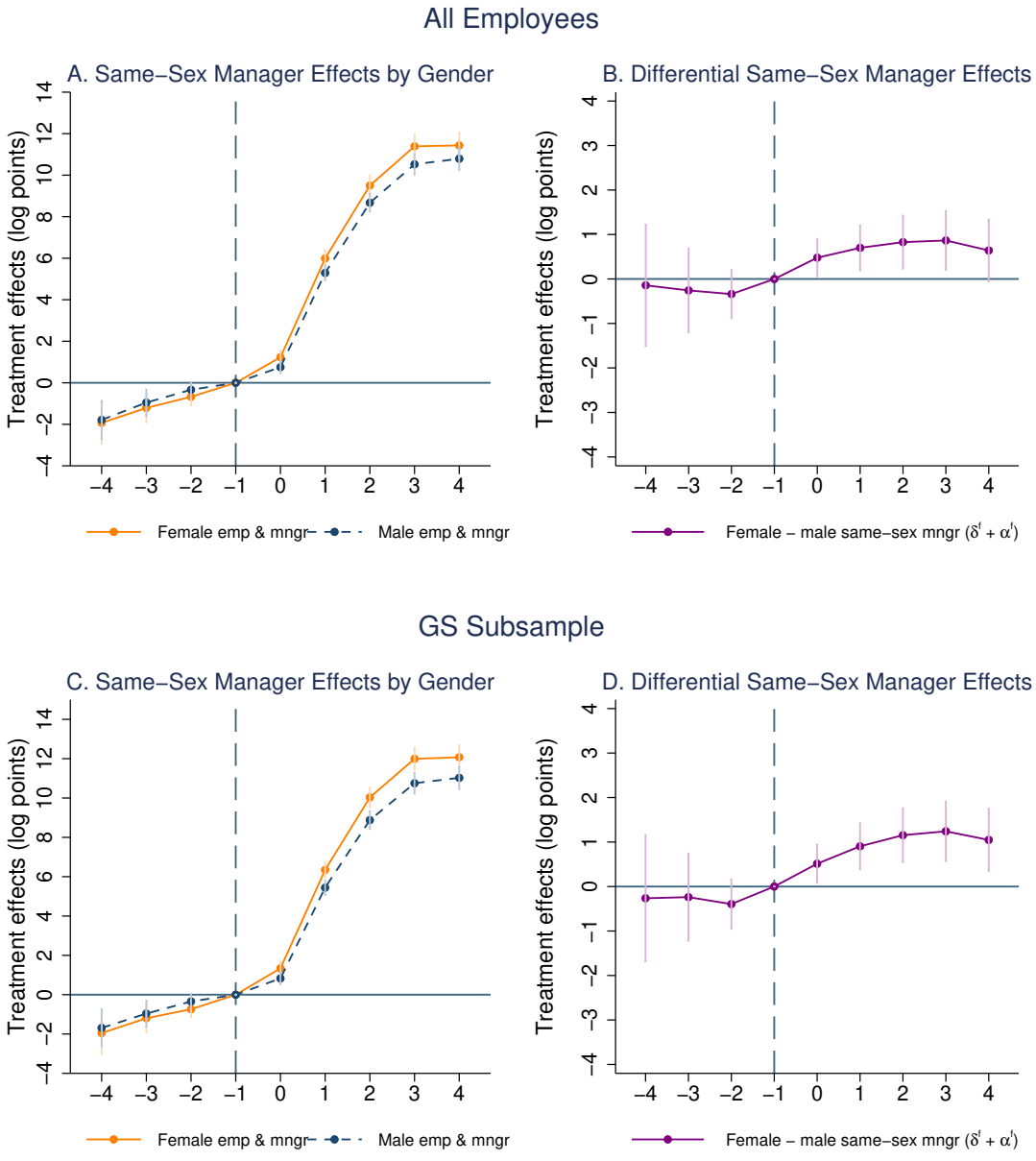


FIGURE A.7. EVENT STUDY ESTIMATES: EFFECTS OF FIRST NEW MANAGERS FOR AT MOST 20 MANAGERS SAMPLE

Note: Estimates and standard errors for all employees are reported in Table 2. Vertical bars represent 95% confidence intervals with standard errors clustered by office.

## Table A.1—Salary table 2012 General Schedule (GS)

A. Annual Rates by Grade and Step

| Grade | Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 | Step 8 | Step 9 | Step 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17,803 | 18,398 | 18,990 | 19,579 | 20,171 | 20,519 | 21,104 | 21,694 | 21,717 | 22,269 |
| 2 | 20,017 | 20,493 | 21,155 | 21,717 | 21,961 | 22,607 | 23,253 | 23,899 | 24,545 | 25,191 |
| 3 | 21,840 | 22,568 | 23,296 | 24,024 | 24,752 | 25,480 | 26,208 | 26,936 | 27,664 | 28,392 |
| 4 | 24,518 | 25,335 | 26,152 | 26,969 | 27,786 | 28,603 | 29,420 | 30,237 | 31,054 | 31,871 |
| 5 | 27,431 | 28,345 | 29,259 | 30,173 | 31,087 | 32,001 | 32,915 | 33,829 | 34,743 | 35,657 |
| 6 | 30,577 | 31,596 | 32,615 | 33,634 | 34,653 | 35,672 | 36,691 | 37,710 | 38,729 | 39,748 |
| 7 | 33,979 | 35,112 | 36,245 | 37,378 | 38,511 | 39,644 | 40,777 | 41,910 | 43,043 | 44,176 |
| 8 | 37,631 | 38,885 | 40,139 | 41,393 | 42,647 | 43,901 | 45,155 | 46,409 | 47,663 | 48,917 |
| 9 | 41,563 | 42,948 | 44,333 | 45,718 | 47,103 | 48,488 | 49,873 | 51,258 | 52,643 | 54,028 |
| 10 | 45,771 | 47,297 | 48,823 | 50,349 | 51,875 | 53,401 | 54,927 | 56,453 | 57,979 | 59,505 |
| 11 | 50,287 | 51,963 | 53,639 | 55,315 | 56,991 | 58,667 | 60,343 | 62,019 | 63,695 | 65,371 |
| 12 | 60,274 | 62,283 | 64,292 | 66,301 | 68,310 | 70,319 | 72,328 | 74,337 | 76,346 | 78,355 |
| 13 | 71,674 | 74,063 | 76,452 | 78,841 | 81,230 | 83,619 | 86,008 | 88,397 | 90,786 | 93,175 |
| 14 | 84,697 | 87,520 | 90,343 | 93,166 | 95,989 | 98,812 | 101,635 | 104,458 | 107,281 | 110,104 |
| 15 | 99,628 | 102,949 | 106,270 | 109,591 | 112,912 | 116,233 | 119,554 | 122,875 | 126,196 | 129,517 |

B. Percentage increases from previous step/grade

| Grade | Grade Increase | Step 2 Increase | Step 3 Increase | Step 4 Increase | Step 5 Increase | Step 6 Increase | Step 7 Increase | Step 8 Increase | Step 9 Increase | Step 10 Increase |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 9.787 | 0.033 | 0.032 | 0.031 | 0.030 | 0.017 | 0.028 | 0.028 | 0.001 | 0.025 |
| 2 | 0.117 | 0.024 | 0.032 | 0.026 | 0.011 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 3 | 0.087 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 4 | 0.116 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 5 | 0.112 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 6 | 0.109 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 7 | 0.105 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 8 | 0.102 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 9 | 0.099 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 10 | 0.096 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 11 | 0.094 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 12 | 0.181 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 13 | 0.173 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 14 | 0.167 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |
| 15 | 0.162 | 0.033 | 0.032 | 0.031 | 0.030 | 0.029 | 0.028 | 0.027 | 0.027 | 0.026 |

Note: Amounts are in USD. 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/

## Table A.2—Managerial Descriptive Statistics

| | All Managers | | | | New managers | | | |
|---|---|---|---|---|---|---|---|---|
| | All managers | Female managers | Male managers | Unidentified managers | All Managers | Female managers | Male managers | Unidentified managers |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Salary | 91,698 | 89,508 | 95,308 | 84,513 | 80,498 | 79,134 | 83,572 | 73,409 |
| | (40,688) | (38,143) | (42,261) | (39,245) | (38,551) | (35,376) | (40,553) | (38,380) |
| Log salary | 11.33 | 11.31 | 11.37 | 11.24 | 11.18 | 11.18 | 11.22 | 11.07 |
| | (0.46) | (0.45) | (0.45) | (0.47) | (0.49) | (0.47) | (0.49) | (0.52) |
| GS grade | 12.58 | 12.36 | 12.80 | 12.42 | 12.13 | 12.01 | 12.26 | 12.01 |
| (GS sample) | (2.22) | (2.29) | (2.11) | (2.31) | (2.48) | (2.42) | (2.47) | (2.67) |
| Age | 49.95 | 48.98 | 50.33 | 50.70 | 45.38 | 44.82 | 45.74 | 45.66 |
| | (9.08) | (9.09) | (9.07) | (8.92) | (9.80) | (9.63) | (9.86) | (10.02) |
| Birth year | 0.50 | 0.42 | 0.51 | 0.63 | 0.37 | 0.32 | 0.36 | 0.50 |
| 1955- | (0.50) | (0.49) | (0.50) | (0.48) | (0.48) | (0.46) | (0.48) | (0.50) |
| Birth year | 0.14 | 0.17 | 0.14 | 0.10 | 0.14 | 0.16 | 0.14 | 0.11 |
| 1955-1960 | (0.35) | (0.37) | (0.35) | (0.29) | (0.35) | (0.36) | (0.35) | (0.32) |
| Birth year | 0.11 | 0.13 | 0.10 | 0.06 | 0.13 | 0.15 | 0.13 | 0.09 |
| 1960-1965 | (0.31) | (0.34) | (0.31) | (0.24) | (0.34) | (0.35) | (0.34) | (0.29) |
| Birth year | 0.08 | 0.09 | 0.07 | 0.05 | 0.11 | 0.12 | 0.12 | 0.07 |
| 1965-1970 | (0.26) | (0.29) | (0.26) | (0.21) | (0.32) | (0.33) | (0.32) | (0.26) |
| Birth year | 0.04 | 0.05 | 0.04 | 0.03 | 0.08 | 0.09 | 0.09 | 0.05 |
| 1970-1975 | (0.21) | (0.23) | (0.20) | (0.16) | (0.28) | (0.29) | (0.28) | (0.22) |
| Birth year | 0.02 | 0.03 | 0.02 | 0.01 | 0.06 | 0.07 | 0.06 | 0.03 |
| 1975-1980 | (0.15) | (0.17) | (0.15) | (0.12) | (0.23) | (0.25) | (0.23) | (0.17) |
| Birth year | 0.11 | 0.11 | 0.11 | 0.13 | 0.10 | 0.10 | 0.09 | 0.14 |
| 1980+ | (0.31) | (0.31) | (0.31) | (0.34) | (0.30) | (0.30) | (0.29) | (0.35) |
| Education: | 0.12 | 0.15 | 0.10 | 0.13 | 0.13 | 0.15 | 0.11 | 0.15 |
| High school or less | (0.33) | (0.35) | (0.30) | (0.33) | (0.34) | (0.35) | (0.32) | (0.36) |
| Education: | 0.18 | 0.22 | 0.16 | 0.16 | 0.19 | 0.22 | 0.18 | 0.17 |
| Some college | (0.38) | (0.41) | (0.37) | (0.37) | (0.40) | (0.41) | (0.38) | (0.38) |

Continued on next page

| | All Managers | | | | New managers | | | |
|---|---|---|---|---|---|---|---|---|
| | All managers | Female managers | Male managers | Unidentified managers | All Managers | Female managers | Male managers | Unidentified managers |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Education: Bachelor's degree | 0.35 (0.48) | 0.33 (0.47) | 0.36 (0.48) | 0.34 (0.47) | 0.34 (0.47) | 0.33 (0.47) | 0.36 (0.48) | 0.32 (0.47) |
| Education: Graduate degree | 0.35 (0.48) | 0.31 (0.46) | 0.38 (0.48) | 0.36 (0.48) | 0.32 (0.47) | 0.30 (0.46) | 0.34 (0.47) | 0.33 (0.47) |
| Total tenure (years) | 19.33 (10.04) | 18.79 (9.84) | 19.56 (10.07) | 19.67 (10.31) | 12.73 (9.83) | 13.17 (9.72) | 12.70 (9.80) | 11.70 (10.22) |
| Managerial tenure (years) | 8.75 (7.26) | 8.01 (7.14) | 9.27 (7.42) | 8.54 (6.78) | 2.87 (5.54) | 2.53 (5.25) | 3.19 (5.85) | 2.62 (5.03) |
| N unique individuals | 259,009 | 85,244 | 127,316 | 46,449 | 164,96 | 59,293 | 78,745 | 26,923 |
| N unique individuals (GS sample) | 165,177 | 62,975 | 78,023 | 24,179 | 113,567 | 45,447 | 53,208 | 14,912 |
| N offices | 8,115 | 6,403 | 7,517 | 5,358 | 7,255 | 5,533 | 6,401 | 4,214 |

Note: Descriptives statistics are provided for the sample with at most 5 managers at the office level. Standard deviations are in parentheses. Unexplained log pay is residual log pay after controlling for location, age, education, tenure, occupation, agency-subagency-office, and share of female employees and managers. Workplace characteristics are at the office - quarter level.

Table A.3—Managerial Transitions (Event Study Sample)

| Share of total managerial changes | Female managers (1) | Male managers (2) | Unidentified managers (3) |
|---|---|---|---|
| Appointments within Federal Service | 65,338 | 85,884 | 28,334 |
| Appointments within Office | 42,531 | 49,364 | 16,503 |
| Managerial additions | 48,164 | 65,282 | 22,490 |
| Managerial replacements | 21,886 | 28,517 | 9,227 |
| Increasing female management share | 47,385 | 32,223 | 11,039 |
| Increasing male management share | 19,180 | 51,809 | 9,783 |
| >5 years younger | 22,561 | 25,921 | 7,302 |
| >5 years older | 22,397 | 34,142 | 14,340 |
| Total managerial changes | 70,050 | 93,799 | 31,717 |
| N unique individuals | 59,293 | 78,745 | 26,923 |
| N offices | 5,533 | 6,401 | 4,214 |