

Did Working with Women Change the Workplace?

Evidence from Wartime Tokyo *

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Abstract

This paper studies how organizational responses to policies promoting women were shaped by wartime exposure to female coworkers in the Tokyo civil service. We assemble a new personnel panel covering more than 330,000 public servants over 35 years and link wartime assignments to postwar workplace composition and careers. Identification exploits office-level shocks from military conscription: when men were drafted, managers reshuffled staff and hired replacements, creating plausibly exogenous variation in contact with women. We find that offices led by managers with greater wartime exposure were more likely to hire and retain women after restrictions were lifted, and that exposure increased the likelihood that veterans later worked with women. These effects persist, suggesting that temporary disruptions can change workplace norms and accelerate organizational diversification.

Keywords: Female representation, Long-term effects, Personnel economics

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1 Introduction

Organizational responses to policies promoting women vary across workplaces. These responses come not only from leaders but also from employees at different ranks. Men's prior experience working with women shapes how they accommodate female hires and how much influence they exert over hiring and promotion. As a result, the existing hierarchy and attitudes inside an office largely determine whether diversification succeeds.

We study the rapid integration of women into the Tokyo civil service by asking whether postwar entry was concentrated in offices where male incumbents had greater wartime exposure to female coworkers. During World War II, the civil service hired many women to fill posts vacated by men who left for wartime industry or were drafted, while managerial positions remained closed because women were barred from the national exam for elite civil servants. After the war, the ban was lifted and policy expanded women's employment, but diversification and the retention of women in managerial roles varied widely across departments, positions, and workplaces.

We study how men's wartime exposure to female coworkers shaped postwar integration of women after hiring restrictions were lifted, and whether these effects persisted in diversifying the Tokyo civil service. We assemble a new personnel record covering the universe of public servants over 50 years, with prewar, wartime, and postwar assignments, occupations, wages, and other biographical details. These data let us measure each man's wartime coworker exposure to women and link it to his subsequent assignments and the gender composition of those workplaces. For identification, we exploit exposure induced by conscription shocks: when men were drafted, managers rapidly reshuffled staff and hired replacements, creating plausibly exogenous variation in contact with women. We then test whether men with greater exposure—especially those with more hiring discretion—later facilitated the integration and retention of women, and whether these women helped open pathways for future cohorts.

We provide three sets of results. First, offices that hired more women were more likely to be led by managers who had greater wartime exposure to female coworkers. A 10 percentage point increase in a manager's wartime exposure is associated with nearly a 7 percent higher likelihood

of working with any women in the postwar period, corresponding to about 0.2 additional women. Second, exposure to women causally increased the likelihood that wartime veterans worked with women after the war. A 10 percentage point increase in a veteran's wartime exposure raised the number of women he later worked with by about 0.5, with larger effects for veterans who held non-managerial positions in the postwar period. Third, we find [long-term impacts].

To examine office-level adjustments in workforce composition, we construct a novel panel of personnel records on public servants in Tokyo spanning four decades.¹ The dataset contains rich biographical information on employees, including their occupations, positions, and wartime drafting experiences.

We interpret our findings as evidence that the conscription of male workers during the war changed the gender composition of affected workplaces, primarily through the relocation of existing staff around the vacated positions. Since conscription targeted workers regardless of their rank or status in the civil service, we infer that when a key individual was drafted, their position was typically filled either by male hires with relevant experience or by transfers from nearby offices. Nevertheless, conscription generated a statistically significant shift in gender composition across employees.

Our second result suggests that the disruption caused by conscription led the coworkers of drafted employees to work in more gender-balanced offices later in their careers. Several mechanisms could explain this pattern. Greater exposure to women during the war may have reduced bias and increased men's willingness to work alongside female colleagues—particularly in roles with hiring discretion. Alternatively, affected workers may have been reassigned to offices with higher female representation because they were perceived as more accommodating toward women.

Our findings contribute to the economic history literature examining the effects of the World Wars on gender balance in the postwar economy. Recent work by Aneja et al. (2024) and Bianchi

¹The data spans over the pre-war period (from 1928) to post periods (1958).

and Giorcelli (2022) documents how the wartime experiences of male employees continued to shape their labor market outcomes after the war. Our paper is the first to provide evidence of such persistence in wartime experiences within an organization. Previous research, including Acemoglu et al. (2004), Goldin and Olivetti (2013), and Doepke et al. (2015), shows that regions with higher male casualties during the Second World War subsequently absorbed more women into their labor markets.² We find that this persistence also holds when the analysis is decomposed to the smallest peer unit—the office level. However, our current analysis cannot fully disentangle the mechanisms behind this persistence: workplace diversification may have resulted either from the preferences and behaviors of affected workers or from management decisions to reassign them to more gender-diverse environments.

Our paper also contributes to the literature estimating the replacement costs of workers following sudden employee exits (Jäger et al. (2025)). A large body of research examines the costs employers face in replacing lost labor (Ordway (1919), Oi (1962), Alan (2011)). We extend this work by emphasizing how replacement costs depend on the internal composition of the workplace—particularly the distribution of positions across employees relative to exiting worker. Moreover, unlike traditional analyses based on private firms, we study a public sector organization characterized by rigid promotion structures and capped wages.

Our paper also contributes to the literature on how peers shape workers' future career trajectories. Recent studies such as Minni (2025) and Cullen and Perez-Truglia (2023) show that assignment to high-performing managers or peers can significantly influence subordinates' career outcomes³. We extend this literature by providing evidence on the long-term effects of working with managers who differ exogenously in their prior experience with female colleagues and examining the lasting implications of such exposure.

Section 2 provides background on the Tokyo civil service and their personnel policies, as well as the drafting rules during World War II. Section 3 describes the data sources and the digitization process. Section 4 discusses the empirical model, Section 5 reports the results, and Section 6

²Related literature finds evidence of persisting shifts in labor market composition for blacks (Ferrara (2022)).

³Arai and Nakazawa (2025) discuss the effect of peer effects in the context of civil servants in Japan.

concludes.

2 Background

2.1 Institutional Details of Tokyo Civil Service

The Tokyo public service, comprising the *Tokyo-Fu* and *Tokyo-Shi*, managed public good provision across geographically distinct areas of Tokyo. Although these bodies operated over separate regions, their main offices were centrally located in downtown Tokyo (Figure 1).

In 1944, under intensifying war pressures and facing repeated military defeats, the central government mandated the amalgamation of *Tokyo-Fu* and *Tokyo-Shi* into a single entity, named *Tokyo-To*, through a federal bill. This merger, driven by operational inefficiencies and resource allocation challenges during the war, resulted in significant layoffs, particularly affecting *Tokyo-Shi* employees.

Tokyo-To employed approximately 15,000 highly educated staff, with 30 percent hired through national exams and the remainder locally. The organizational structure was hierarchical, dividing departments based on the public services provided, with some departments split into as many as four layers. Employees were assigned an occupation, such as engineers, managers, clerks, or assistants, along with a classification reflecting their professional expertise and experience. These assignments were determined upon entry into the organization, although transitions across occupations occasionally occurred. The recruitment process for non-assistant employees was merit-based, relying on competitive examinations and internal assessments. Within the civil service, workers were further categorized into upper and lower classes, with managers representing the upper class and clerks or engineers forming the lower class. Leadership positions, such as department heads, were typically filled by personnel recruited from the central government. For many employees, the typical career path involved progressing step by step up the job ladder, with clerks serving as the standard entry point for civil servants aiming to advance. However, the level of competition for promotions among employees was likely influenced by the conscription of a significant portion of

the workforce into military service, which temporarily reduced the pool of available candidates. This shift may have also led to substantial changes in both the promotion process and the speed of advancement for positions such as clerks and managerial staff. In fact, many staff members were conscripted as soldiers, resulting in a severe manpower shortage for managing wartime administration (Tokyo Metropolitan Government 2013).

2.2 Drafting Process of the Japanese Military Service

The Japanese military assembled its forces by calling active service troops and reservists, a process pivotal to our study's analysis of workforce dynamics during and post-conflict periods. The conscription system was designed to ensure a steady supply of personnel by mandating physical examinations for all eligible men upon reaching the age of 20, with those meeting the criteria randomly selected for service.

The drafting process, as outlined in Figure 3, was structured into several stages to efficiently classify conscripts based on their physical capabilities and the military's operational needs. Initially, all eligible men underwent a physical examination to determine their fitness for active duty. Those deemed fit were assigned to active service, where they served as soldiers for a fixed period. Upon completing active duty, these individuals transitioned to the reservist category, ensuring they remained available for military recall during national emergencies. For individuals who did not meet the physical standards for active duty, an alternative route, termed replacement service, was established. These men received training but were not immediately deployed, instead forming a reserve pool for supplementary support when required. Additionally, a subset of candidates was fully exempted from military obligations due to severe health conditions or other qualifying factors.

As the war intensified, particularly in the wake of Japan's challenges during the Second Sino-Japanese War (1937–1945), the drafting system underwent significant modifications to address the military's increasing personnel demands. In 1943, reserve obligations were extended: the period of reserve service following active duty increased from 5–6 years to 15 years, and the secondary reserve period was prolonged until the age of 45. These changes ensured that the military could

rely on a broader pool of trained personnel over an extended timeframe, providing critical support for wartime operations.

2.3 The Impact of the War on *Tokyo-To*

The war significantly altered the workforce composition within *Tokyo-To*, particularly affecting female participation rates and the distribution of staff across various offices. The conscription system, which required eligible men to serve in the military, had profound implications for public institutions, especially in urban centers like Tokyo. Male workers in administrative, engineering, and clerical roles were not exempt from military obligations, leading to their systematic removal from public service positions as they were drafted into active or reserve duty. This mass conscription created substantial disruptions in the operations of public offices and left critical gaps in the workforce that urgently needed to be addressed.

During the war period, the entry of female workers also became a notable feature of *Tokyo-To*'s workforce. Before the war, female employees were largely concentrated in specific departments and were almost absent from the core administrative divisions of the metropolitan government. Their roles were typically limited to auxiliary or supporting tasks, reflecting the gendered labor practices of the time. However, the rapid expansion of labor demand driven by conscription accelerated the entry of women into the workforce. Units were generally structured to include a manager, clerks or engineers, and assistants. Female workers were primarily hired as assistants to support unit leaders in their tasks, often in offices with a lower concentration of engineers. Their continuation and promotion within the organization depended heavily on the approval of their respective unit managers, with their relationships with male incumbents—such as direct subordinates to unit managers or co-workers to clerks and engineers—playing a significant role. In addition to conscription, the demands of wartime administration likely necessitated an increase in the number of staff employed by *Tokyo-To*. The rising responsibilities of the metropolitan government during the war made it essential to expand its workforce. Historical evidence suggest that both the city and the prefecture increased the number of employees and departments during this period (Tokyo

Metropolitan Government 2013).

To compensate for the depletion of male workers, *Tokyo-To* rapidly increased the recruitment of women, who were not subject to military service. Women entered the public workforce in unprecedented numbers, particularly in assistant roles, as highlighted in Figure 5. Panel (a) illustrates the sharp increase in the population of female public civil servants during the World War II (WWII) period, marked by the shaded red area. The count of female employees rose significantly between 1938 and 1944, reflecting a direct response to the conscription of men. However, this trend reversed immediately after the war as male workers returned to their civilian roles, leading to a sharp decline in the number of female public civil servants.

Panel (b) of Figure 5 provides further insight by examining the share of women in the public sector workforce during the same period. The proportion of female public civil servants also increased markedly during WWII, albeit remaining relatively small compared to the overall workforce. The rise in this share highlights not only the increasing reliance on women but also the gendered constraints of wartime employment policies, which often relegated women to lower-ranking and temporary roles within the organizational hierarchy. This unequal distribution persisted even after the war, as men resumed their pre-war positions, and women were often pushed out of public service.

Table 1 shows the difference between offices in 1936 with and without employees that were drafted 2 years later. We find a statistically significant different between the share of female workers between offices categories. Workers in future drafted offices were more likely to be occupied with male. Since the Japanese military service only conscripted males, the difference in gender balance between offices validates the drafting pattern. The two office categories matches each other with respect to its share of new workers and share of higher-ranked workers. We fail to reject similarities between the at least at the 15th confidence level. Drafted and non-drafted employees worked in offices with nearly half of their peers hired at most 4 years before. Also they did not differ in the share of higher-class public servants that they reported to.

3 Data

Our primary data set comes from a historical archive of directory of staff of the Tokyo public servants. The archives include information about the name of the employee, their positions, and their home address. We infer the gender of the staff by using an algorithm trained on historical Japanese names. The personnel record covers from 1928 to 1958.

The directory of staff was published annually with a full list of their employees. The two co-governing institutions (*Tokyo-Shi* and *Tokyo-Fu*) both published separately until the merger of the two institutions in 1943. The Tokyo-Fu directory contains a list of the employees that was drafted into the war. Since we observe the positions of all the employees in a institution, we identify the drafted individual and their surrounding co-workers in a directory.

Our secondary data is the biographical directory of staff at 1942. The biography lists detailed information about higher ranked employees. It includes (1) Date of birth, (2) Prefecture of origin, (3) Education attainment (name of graduating institution) (4) Starting date of entering the public servant system, (5) hobbies, and (6) Physical address. However, the directory was not published annually like the directories, but only published in some years. Also only the Tokyo-Shi and Tokyo-To published biographical directories of their employees. In addition the biographical directory only reports the details for employees at least in positions higher than a clerk.

We develop an algorithm that integrates multiple neural networks and computer vision technologies to detect complex layout structures in archival records and extract categorized text data. Given that most modern optical character recognition (OCR) systems are primarily trained on the English language, we utilize a neural network-based OCR developed by the National Diet Library in Japan. This OCR is adept at identifying texts within a document page, which we further analyze using named entity recognition technology to categorize information based on content and layout. We apply this algorithm to a series of historical documents to augment the biographical details of employees. This process generates a comprehensive panel data set of public sector employees in historic Tokyo, detailing their internal assignments by occupation and rank, along with biographic details for a subset of these employees.

Our OCR works better for the recent years than the older years. Since the calligraphy of Japanese letters changed after the war, a modern OCR fails to accurately identify the letters in the directory. Even though we use the NDL OCR, which is trained on historical Japanese letters, due to the resolution of the scanned images, the OCR sometimes fail to identify the content. However, we did recover approximately 70% of employees in the historic era, and almost everyone for those in the more modern era (Figure 7).

We predict the gender of the employee by using an external named entity recognition algorithm that predicts the gender of the name. In contrast to Western names, Japanese names tend to reveal the gender of the employee easily. We measure the size and share of female workers of each office unit by aggregating over the pool of employees belonging to a given group. We measure the length of tenure for each employee that we identify in the directory by searching for the first and last year of the directory that we identify their name. Consequently, if an employee is missing in a directory between two directories in which the employee is detected, we treat the employee to be hired in the missing directory. We also infer the location of the office that an employee commuted to by referring to the name of the office unit.

The digitization of the historical archival documents leaves us with a sample of 333,000 observations across 35 years. The data identifies 126,372 unique names and 15,406 female names.

4 Empirical Model

4.1 First-stage: Draft-induced hiring

Before turning to the main IV specification, we document that military drafting led to hiring at the position and office level. Because the number of new hires is a count outcome, we estimate Poisson models with fixed effects. Let $Y_{j,p,t}$ denote the number of new hires (or new female hires) in position p within office j in year t . The conditional expectation is

$$\mathbb{E}[Y_{j,p,t} | X] = \exp(\beta_1 D_{j,p,t} + \beta_2 \log(M_{j,p,t} + 1) + \gamma_j + \delta_p + \lambda_t), \quad (1)$$

where $D_{j,p,t}$ is the number of male workers drafted from that position (or, for spillover specifications, from neighboring positions within the same kakari or ka), $M_{j,p,t}$ is the cumulative male stock (baseline), and γ_j , δ_p , and λ_t are office, position, and year fixed effects. The coefficient β_1 is a semi-elasticity: a one-unit increase in drafts is associated with a $100 \times \beta_1\%$ change in expected hires. We also estimate spillover effects by defining neighboring drafts as (a) drafts in other positions within the same kakari (subsection) but different occupation (engineer, non-engineer, yato), and (b) drafts in positions of the same occupation within the same ka (section). Finally, we allow the immediate draft effect to vary by whether the position is engineer-type or not.

4.2 OLS approach

I estimate the following OLS model.

$$Y_{i,j,p,t} = X_{i,j,p}\beta + \iota_{i,j} + \mu_{i,p} + \lambda_t + \epsilon_{i,j,p,t} \quad (2)$$

$Y_{i,j,p,t}$ is the share of female employees measure of employee i at time $t+k$. $X_{i,j,p,t}$ is the share of drafted workers in office j of position p at time t . $\iota_{i,j}$ and $\mu_{i,p}$ denotes the position and occupation fixed effects for the employee during the war period. λ_t denotes the time fixed effect.

We control for occupation and office fixed effects to avoid confounding the results with different female entry patterns across different departments in the Tokyo-public sector. As discussed in the background section, the entry of female workers happened only in occupations that was occupied by lower tier public servants. By controlling for the occupations and their affiliated departments through the fixed effects, we avoid confounding the results with correlation of female exposure and positional attributes.

4.3 Instrumental variable approach

We estimate the causal effect of office diversification on future outcomes using a instrumental variable strategy.

$$Y_{i,j,p,t} = X_{i,j,p}\beta + \iota_j + \mu_p + \lambda_t + \epsilon_{i,j,p,t} \quad (3)$$

$$X_{i,j,p} = Z_{i,j,p}\delta + \iota_j + \mu_p + \lambda_t + \varsigma_{i,j,p,t} \quad (4)$$

$Z_{i,j,t}$ is the share of employees drafted at t . We define $X_{i,j,p,t}$ and $Z_{i,j,p,t}$ as the mean share of female and drafted workers in an office during the war period.

The identification accures from the cross-sectional variation across workers with different wartime experienced from the war. We are comparing workers in an office with any of their fellow employees getting drafted against those without any disruptions in the workplace and compare their future outcomes.

The interpretation of the IV estimate differs from the OLS estimate. Firstly the estimate avoids committed variable bias and recovers the direct causal impact of working with more women on future career trajectories. However, the IV only recovers estimates for sample with a high probability of getting drafted in the military force. As we covered in the background section, government officials were exempt from drafting and only lower-tier workers who occupied positions as clerk with part-time contracts were non-exempt. Therefore, the IV estimate only recovers the LATE for a subset of the population. Nevertheless the IV estimates do have a causal interpretation, so that the signs of the OLS estimates could be interpreted with more confidence.

The IV estimator will only be estimated through the employees with information on their peers drafting experience. As we discussed in the Data section, only the Tokyo-Fu directory contains the list of drafted employees and their peer in their position and office. However, even after removing the Tokyo-Shi workers from the sample, we remain with approximately 9,000 unique employees from Tokyo-Fu that we can fully measure their peers composition through out the war period.

In addition, the higher exposure to women during the war may lead employees to leave the

workplace than others without exposure. This attrition in the data breaks the balanced-ness of the treated and controlled group based on the treatment status. Aneja, Farina, and Xu 2024 documents that the daughters of male workers exposed to more women during the war were more likely to participate in the labor market compared to their counterparts. Such intergenerational transfer of leniency towards womens' entry to the labor markets could also exists across household partners. The husband exposed to women may become more acceptive towards their partners to enter the labor force, which may also lead to the men to exit the labor force. To account for such scenarios, the estimates should be seen with more caution especially for samples at the end of the time span covered by the data set.

4.4 Over-identified 2SLS approach (In progress)

We also provide estimates of β through a over-identified 2SLS approach. Since we can measure the share of military drafted workers and their co-workers in 5 separated years, we can corroborate the estimated system of equations by adding additional instruments. Wooldridge (2010) provides the arguments that when 2SLS with many instruments is more efficient than the IV that aggregates the exogenous variation. We include separate instruments the each measure the share of drafted workers in each office and position pair. The number of instruments in such case would be more than the number of parameters estimated in the second stage regression equation.

$$\begin{aligned} Y_{i,j,p,t} &= \sum_{k \in T} X_{i,j,p,k} \beta + \iota_j + \mu_p + \lambda_t + \varepsilon_{i,j,p,t} \\ X_{i,j,p,k} &= \sum_{l \in T} Z_{i,j,p,l} \delta + \iota'_j + \mu'_p + \lambda'_t + \varsigma_{i,j,p,l} \\ T &\equiv \{1938, 1939, 1940, 1944\} \end{aligned} \tag{5}$$

For the 2SLS to be more efficient than the the IV, the all the instruments needs have explanatory power on the regressor. We provide estimates

4.5 Discussion of Identification Strategy for IV and 2SLS

The identification strategy relies on the randomness of the drafting process, conditional on observable controls. We provide a historical background of the drafting procedure and present balanced test results that compare the drafted and non-drafted populations. The exogenous removal of employees from offices led to changes in office composition, thereby altering the working environment for remaining employees. This removal was orthogonal to the employees' unobserved attributes, strengthening our identification strategy. We attribute observed differences in future outcomes among employees to these draft-driven changes in co-working experiences, interpreting these as causal effects on office composition.

We provide balanced tables that highlights the randomness of the drafting process.

5 Results

5.1 Assignment of women to offices post-form

Table 1 reports OLS estimates linking post-reform female inclusion under a manager to the manager's wartime exposure to female coworkers. Columns 1–3 model the probability that a manager includes at least one woman. A 10 percentage point increase in exposure raises this probability by 4 points using the maximum exposure measure (column 1) and by 7 points using the mean exposure measure (column 2). Column 3 restricts the sample to departmental managers; the estimate is positive but imprecise due to the smaller sample size. Columns 4–6 report the OLS results on the extensive margin. A 10 percentage point increase in exposure is associated with 0.1–0.8 additional women in the manager's office unit, depending on the measure. We cannot estimate the effect for departmental managers because of limited statistical power.

5.2 Draft induced vacancies and managers efforts on replacement

Table 2 reports Poisson estimates of how managers respond to losing a worker to military drafting. Column 1 shows that an own-position draft increases new hiring by about 4% relative to non-impacted office units in the same department. Column 2 shows a 6% increase in new female hires. Column 3 reports the OLS estimate for female hiring; the coefficient is positive but imprecise, which is expected because OLS is ill-suited to rare-count outcomes and many office units never hired women. The interaction column shows that engineering offices were less likely to replace drafted workers, by about 2 percentage points.

Columns 4–6 report spillovers from drafting in neighboring positions within the same office unit. Drafting increases new hires in adjacent positions by about 1%, with no detectable change in gender composition relative to non-impacted offices. Column 7 reports spillovers across occupations within the impacted office; drafting raises new hires in other occupations by about 1%.

5.3 The causal effect of exposure to women on the post-reform assignment of women to offices

Table 3 compares OLS and IV estimates of how wartime exposure to female coworkers affects the post-reform assignment of women to offices. The OLS coefficient is positive, consistent with the descriptive patterns in Table 1, and likely reflects non-random sorting of managers into offices with different gender composition. The IV estimate, which uses drafting-induced shocks to female exposure, points in the same direction but is statistically imprecise. A key limitation is sample selection: only a small subset of managers both experienced a drafted coworker and worked alongside women, which sharply narrows the identifying variation. The first-stage relationship between drafting and female exposure is therefore weaker in the post-reform sample, reducing power and inflating standard errors.

Columns 3–4 restrict the sample to managers with wartime exposure and yield similar point estimates but even weaker first-stage strength. This underscores that selection into the overlap

group is nontrivial: few managers satisfy both exposure conditions, so estimates hinge on a thin slice of the data. Taken together, the results do not allow us to reject a zero causal effect, and any interpretation must emphasize limited statistical power rather than a precise null.

5.4 Long term impacts of working with female entrants

6 Conclusion

This paper examines the long-term effects of gender diversification in the workplace, leveraging a unique historical shock: the mass conscription of male workers during World War II in Tokyo. Using a novel, detailed personnel dataset, we explore how the forced entry of women into public service roles during wartime influenced gender dynamics and organizational structures in the years that followed.

Our findings reveal three key insights. First, wartime drafting disrupted existing workplace gender compositions, compelling organizations to rely on female employees. This resulted in a measurable and persistent increase in female representation within affected offices, even after the war ended. Second, our instrumental variable estimates demonstrate that exposure to higher female shares during the war significantly influenced long-term gender diversity within organizations. These effects likely stem from changes in attitudes toward gender integration and the normalization of female participation in professional environments.

Third, the benefits of diversification were unevenly distributed. Female employees remained concentrated in lower-tier positions and faced limited opportunities for advancement. Additionally, structural reversals occurred post-war as men reclaimed their positions, highlighting the fragility of gains achieved under temporary shocks.

By demonstrating the causal relationship between exposure to female coworkers and subsequent workplace diversification, this study contributes to the literature on labor markets, gender inequality, and the economics of organizational behavior. Our results emphasize the potential for temporary shocks to drive persistent changes in workplace diversity, while also underscoring the

role of institutional and societal constraints in shaping these outcomes.

Table 1: Wartime Female Exposure and Postwar Female Inclusion in Kakari

	Has Female (Binary)			Number of Females		
	(1) Kakaricho (Max)	(2) Kakaricho (Mean)	(3) Kacho (Max)	(4) Kakaricho (Max)	(5) Kakaricho (Mean)	(6) Kacho (Max)
Kakaricho Exposure (Max)	0.418*** (0.092)			1.165** (0.374)		
Kakaricho Exposure (Mean)		0.715*** (0.141)			1.810** (0.563)	
Kacho Exposure (Max)			0.242 (0.200)			-0.485 (0.743)
Engineer Share (Ka)	0.015 (0.040)	0.019 (0.040)	0.309*** (0.091)	-0.381** (0.136)	-0.374** (0.137)	-0.449 (0.637)
No. Kakaricho (Ka)	0.018*** (0.003)	0.018*** (0.003)	0.016*** (0.004)	-0.036 (0.027)	-0.036 (0.027)	-0.096* (0.045)
Kakari Size	0.006*** (0.001)	0.006*** (0.001)	0.005*** (0.001)	0.061*** (0.014)	0.061*** (0.014)	0.076*** (0.014)
Kyoku FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Office	Office	Office	Office	Office	Office
Observations	2,324	2,324	613	2,324	2,324	613
R ² (within)	0.174	0.177	0.247	0.502	0.502	0.562

Notes: Columns 1–3 estimate a linear probability model $\mathbf{1}[\text{Female}_{j,t} > 0] = \beta \text{Exposure}_{m(j)} + X'_{j,t}\gamma + \iota_k + \varepsilon_{j,t}$; columns 4–6 estimate $N_{j,t}^f = \beta \text{Exposure}_{m(j)} + X'_{j,t}\gamma + \iota_k + \varepsilon_{j,t}$ by OLS. The unit of observation is kakari \times year (postwar, 1947–). Exposure is the share of females in the manager $m(j)$'s wartime (1937–1945) position \times kakari \times year cell, aggregated as maximum (cols. 1, 3, 4, 6) or mean (cols. 2, 5) across wartime years. Kakaricho = subsection chief; Kacho = section chief. Controls include engineer share, number of kakaricho, and kakari size. Standard errors clustered at office level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Draft-Induced Hiring: Immediate and Spillover Effects

	(1) Total	(2) Female	(3) Female	(7) Total × Engineer	(4) Total	(5) Female	(6) Total
Own drafts	0.043*** (0.005)	0.059*** (0.018)	0.009 (0.006)	0.054*** (0.007)			
Adj. (kakari, across)					0.008*** (0.002)	0.008** (0.004)	
Adj. (ka, within)							0.009*** (0.002)
log(M+1)	0.464*** (0.027)	0.434*** (0.065)	0.126*** (0.026)	0.463*** (0.027)	0.464*** (0.028)	0.435*** (0.067)	0.468*** (0.028)
Own × Eng.				−0.018** (0.008)			
<i>Model</i>							
Poisson / OLS	Poisson	Poisson	OLS	Poisson	Poisson	Poisson	Poisson
<i>Fixed effects</i>							
year_num	Yes	Yes	Yes	Yes	Yes	Yes	Yes
kyoku	Yes	Yes	Yes	Yes	Yes	Yes	Yes
pos_norm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,701	10,178	11,775	11,701	11,701	10,178	11,701

Notes: Columns 1–2 and 4–7 estimate $\mathbb{E}[Y_{j,p,t} | X] = \exp(\beta_1 D_{j,p,t} + \beta_2 \log(M_{j,p,t} + 1) + \gamma_j + \delta_p + \lambda_t)$ by Poisson pseudo-maximum likelihood; column 3 estimates the same specification by OLS. The unit of observation is position × office × year (wartime, 1938–1945). *Total* is the count of new hires; *Female* is the count of new female hires. D is the number of males drafted from the own position (cols. 1–3, 7), from neighboring positions within the same kakari across occupations (cols. 4–5), or from the same occupation within the ka (col. 6). M is the cumulative male stock. Poisson coefficients are semi-elasticities. Standard errors clustered by office in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel A: Second Stage (Dep. var.: Number of Females)

Table 3: Direct Draft Shock: OLS vs. IV

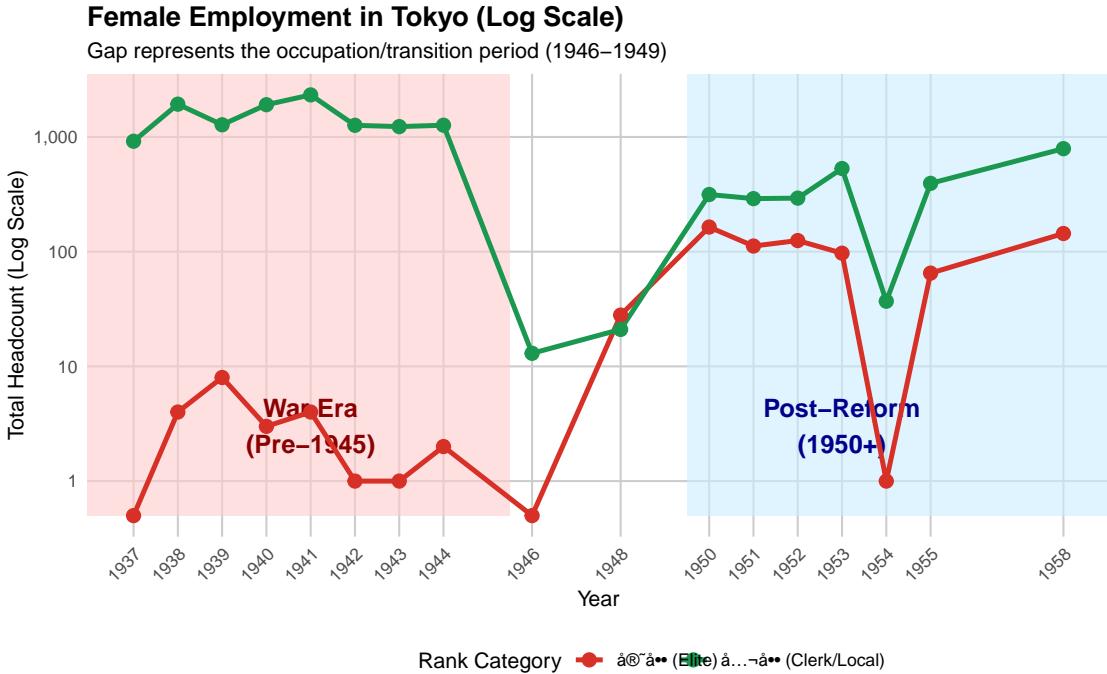
	OLS (Uncond) (1)	IV (Uncond) (2)	OLS (Cond) (3)	IV (Cond) (4)
Exposure (uncond)	1.730*** (0.133)	5.033* (2.771)		
Exposure (cond)			1.266*** (0.241)	3.846 (16.56)
Engineer share	0.047** (0.019)	0.029 (0.026)	-0.043 (0.075)	0.025 (0.447)
No. Kakari-cho	-0.001 (0.009)	-0.005 (0.009)	0.006 (0.009)	0.003 (0.022)
Kakari size	0.030*** (0.005)	0.031*** (0.004)	0.027*** (0.006)	0.028*** (0.008)
Year FE	Yes	Yes	Yes	Yes
Kyoku FE	Yes	Yes	Yes	Yes
Observations	6,662	6,662	2,324	2,324
R ²	0.275	0.207	0.341	0.298
F-test (1st stage)		3.187		0.074

Panel B: First Stage (Dep. var.: Exposure)

	OLS (Uncond) (1)	IV (Uncond) (2)	OLS (Cond) (3)	IV (Cond) (4)
Draft shock (uncond)		-0.029*** (0.010)		
Draft shock (cond)				-0.005 (0.019)
Engineer share		0.003 (0.008)		-0.021 (0.013)
No. Kakari-cho		0.001*** (0.000)		0.001* (0.001)
Kakari size		-0.000*** (0.000)		-0.000 (0.000)
Year FE	Yes			Yes
Kyoku FE	Yes			Yes
Position FE	Yes			Yes
Observations		6,661		2,324
R ²		0.079		0.064

Notes: Panel A reports estimates of $Y_{j,t} = \beta \text{Exposure}_j + X'_{j,t}\gamma + \iota_k + \lambda_t + \varepsilon_{j,t}$, where Y is the number of females in kakari j in postwar year t (1947–) and Exposure is the mean share of females in the position \times kakari \times year cell during wartime (1937–1945). Columns 1–2 are unconditional OLS and IV; columns 3–4 are conditional OLS and IV. IV specifications instrument Exposure with the wartime draft shock (share of males drafted); Panel B reports the corresponding first stage in columns 2 and 4. “Cond” conditions on kakaricho (subsection chief) wartime offices; “Uncond” uses all wartime survivors. Controls include engineer share, number of kakaricho, and kakari size. Standard errors clustered at the office level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1: Female Employment in Tokyo by Rank Category



Note: Headcounts are shown on a log scale; the gap reflects the 1946–1949 transition period.

References

- Daron Acemoglu, David H. Autor, and David Lyle. Women, war, and wages: The effect of female labor supply on the wage structure at midcentury. *Journal of Political Economy*, 112(3):497–551, 2004. doi: 10.1086/383100. URL <https://doi.org/10.1086/383100>.
- Manning Alan. Chapter 11 - imperfect competition in the labor market. volume 4 of *Handbook of Labor Economics*, pages 973–1041. Elsevier, 2011. doi: [https://doi.org/10.1016/S0169-7218\(11\)02409-9](https://doi.org/10.1016/S0169-7218(11)02409-9). URL <https://www.sciencedirect.com/science/article/pii/S0169721811024099>.
- Abhay Aneja, Silvia Farina, and Guo Xu. Beyond the war: Public service and the transmission of gender norms. Working Paper 32639, National Bureau of Economic Research, June 2024. URL <http://www.nber.org/papers/w32639>.
- Natsuki Arai and Nobuhiko Nakazawa. Long-run peer effects and promotion: Evidence from 70-plus years of career records in japan. *Economic Inquiry*, 63(3):740–758, 2025. doi: <https://doi.org/10.1111/ecin.13278>. URL <https://onlinelibrary.wiley.com/doi/abs/10.1111/ecin.13278>.
- George Baker, Michael Gibbs, and Bengt Holmstrom. The internal economics of the firm: Evidence from personnel data. *The Quarterly Journal of Economics*, 109(4):881–919, 1994. ISSN 00335533, 15314650. URL <http://www.jstor.org/stable/2118351>.

- Nicola Bianchi and Michela Giorcelli. The dynamics and spillovers of management interventions: Evidence from the training within industry program. *Journal of Political Economy*, 130(6):1630–1675, 2022. doi: 10.1086/719277. URL <https://doi.org/10.1086/719277>.
- Zoë Cullen and Ricardo Perez-Truglia. The old boys’ club: Schmoozing and the gender gap. *American Economic Review*, 113(7):1703–40, July 2023. doi: 10.1257/aer.20210863. URL <https://www.aeaweb.org/articles?id=10.1257/aer.20210863>.
- Melissa Dell. Deep learning for economists, 2024. URL <https://arxiv.org/abs/2407.15339>.
- Matthias Doepke, Moshe Hazan, and Yishay D. Maoz. The baby boom and world war ii: A macroeconomic analysis. *The Review of Economic Studies*, 82(3):1031–1073, 03 2015. ISSN 0034-6527. doi: 10.1093/restud/rdv010. URL <https://doi.org/10.1093/restud/rdv010>.
- Tokyo Metropolitan Government (Ed.). Compilation of historical materials of tokyo ii: Establishment of the tokyo metropolitan system (vol. 1). tokyo: Kinokuniya., 2013.
- Andreas Ferrara. World war ii and black economic progress. *Journal of Labor Economics*, 40(4):1053–1091, 2022. doi: 10.1086/716921. URL <https://doi.org/10.1086/716921>.
- Olle Folke and Johanna Rickne. Sexual harassment and gender inequality in the labor market*. *The Quarterly Journal of Economics*, 137(4):2163–2212, 05 2022. ISSN 0033-5533. doi: 10.1093/qje/qjac018. URL <https://doi.org/10.1093/qje/qjac018>.
- Paola Giuliano. Gender: A historical perspective. In *The Oxford Handbook of Women and the Economy*. Oxford University Press, 07 2018. ISBN 9780190628963. doi: 10.1093/oxfordhb/9780190628963.013.29. URL <https://doi.org/10.1093/oxfordhb/9780190628963.013.29>.
- Claudia Goldin. The quiet revolution that transformed women’s employment, education, and family. *American Economic Review*, 96(2):1–21, May 2006. doi: 10.1257/000282806777212350. URL <https://www.aeaweb.org/articles?id=10.1257/000282806777212350>.
- Claudia Goldin and Claudia Olivetti. Shocking labor supply: A reassessment of the role of world war ii on women’s labor supply. *American Economic Review*, 103(3):257–262, 2013.
- Simon Jäger, Jörg Heining, and Nathan Lazarus. How substitutable are workers? evidence from worker deaths. *American Economic Review, conditionally accepted*, 2025.
- Taylor Jaworski. “you’re in the army now:” the impact of world war ii on women’s education, work, and family. *The Journal of Economic History*, 74(1):169–195, 2014. doi: 10.1017/S0022050714000060.
- Virginia Minni. Making the invisible hand visible: Managers and the allocation of workers to jobs. Conditionally accepted, *Quarterly Journal of Economics*, September 2025. URL <https://example.com/paper.pdf>.

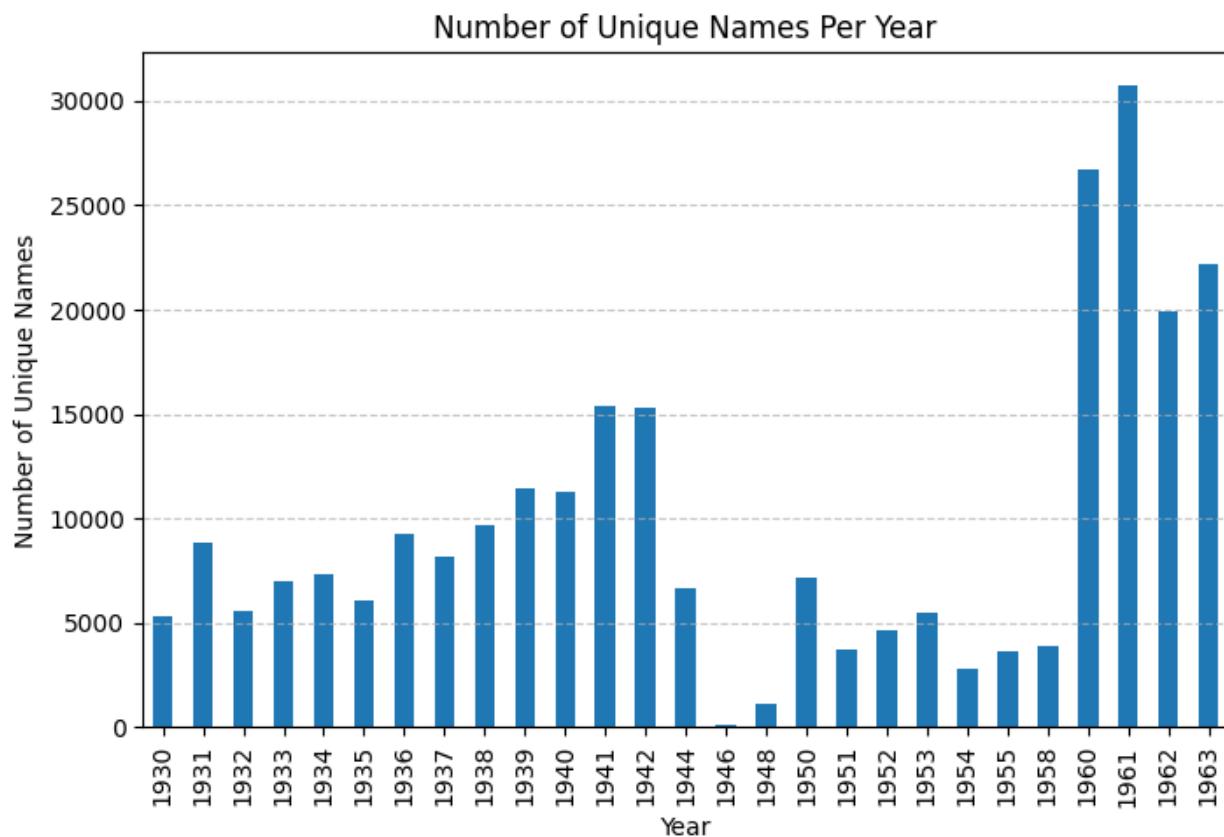
Walter Y. Oi. Labor as a quasi-fixed factor. *Journal of Political Economy*, 70(6):538–555, 1962.
doi: 10.1086/258715. URL <https://doi.org/10.1086/258715>.

Tead Ordway. The turnover of factory labor. sumner h. slichter. *Journal of Political Economy*, 27(7):615–618, 1919. doi: 10.1086/253212. URL <https://doi.org/10.1086/253212>.

Evan K. Rose. The rise and fall of female labor force participation during world war ii in the united states. *The Journal of Economic History*, 78(3):673–711, 2018. doi: 10.1017/S0022050718000323.

Edoardo Teso. The long-term effect of demographic shocks on the evolution of gender roles: Evidence from the transatlantic slave trade. *Journal of the European Economic Association*, 17(2):497–534, 04 2018. ISSN 1542-4766. doi: 10.1093/jeea/jvy010. URL <https://doi.org/10.1093/jeea/jvy010>.

Figure 2: Number of unique names by year



A Appendix