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Abstract

We estimate long-term peer effects in the workplace by investigating whether working with a future executive in the early stages of a junior employee's career will make them more likely to be promoted in the future. Using the data for comprehensive career history at the Japanese central administration, from 1946 to 2019, we find that long-term peer effects are substantial and persistent: Junior employees who work with a future executive in the same division during the first few years of their employment are promoted significantly faster, on average, than employees who do not work with a future executive. They are also more likely to be promoted to the executive level in the future. Additional empirical analysis suggests that improved network connections between senior and junior employees are crucial for the promotion of junior employees in the future.

Keywords: Peer Effect, Coworkers, Promotion, Productivity, Social Connection

J.E.L. Codes: J01, J24, M12, M51

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1 Introduction

The peer effect in the workplace is one of the most important topics in human resource management and labor economics. The interaction between bosses and coworkers can significantly affect employees' motivation, productivity, and promotion opportunities, which may influence a firm's performance and productivity in the long run. Given that employees' compensation is one of firms' largest expenses, firms would be significantly better off if they could allocate human resources efficiently by taking peer effects in the workplace into account.[1]

In this paper, we focus on peer effects in the workplace and ask whether working with a future executive helps an employee to be promoted in the future. Although the importance of peer effects in the workplace is widely recognized, there is little empirical evidence on the long-term peer effects on an employee's promotion due to two challenges. First, estimating causality between peer effects and future promotion is difficult because of endogeneity. An employee's promotion could be based on a number of different factors, such as their ability, productivity, and character, which are difficult to measure. Therefore, there could be an unobserved factor that causes the omitted-variable problem between peer effect and an employee's future promotion. Second, the availability of extensive human resource panel data following the long-term career history of employees is limited. The scarcity of data makes it difficult for researchers to analyze the causality between peer effects and long-term promotion.

We overcome these obstacles by using a novel human resource dataset from the Japanese Ministry of Finance (MOF) that records the comprehensive career history of employees for more than seventy years between 1946 and 2019. The advantage of using this dataset is that the matching between a junior and senior employee in the first few years could be regarded as exogenous on promotion due to the following institutional features at the MOF: 1) a fairly closed and homogeneous group of employees competes for executive positions over a long period, and 2) these employees are trained as generalists and experience frequent job

[1] For various aspects of personnel economics, see Lazear (2011).

rotations assigned by the human resource department. In particular, job assignments for junior employees are regarded as part of their on-the-job training (OJT) based on rotations. Therefore, early assignments are effectively random, and exposure to more and less productive senior employees is not driven by unobserved propensities to excel.

To estimate the long-run impact of being assigned to more successful senior employees, we focus on junior employees' first five years of employment. The treatment is then defined as working with a senior employee, who will be an executive in the future, in the same division. Executive positions are fairly competitive, with only 14 percent of employees promoted 30 years after employment on average. Since the treatment is based on divisions managed by directors, who still have several years to be promoted to the executive level, whether a senior employee becomes an executive in the future is not known at the time of the treatment. The results of the balanced test are consistent with the assumption that the early assignment is exogenous, finding no significant difference between the control and treatment groups.

We employ several econometric models to estimate the long-term peer effect on promotion. First, we use the linear probability model and two-way fixed effect model to estimate the average treatment effect by comparing the control and treatment groups. The empirical results show that the long-term peer effects are substantial and persistent—junior employees who work with a future executive in the same division during the first few years of their careers are promoted significantly faster than other employees, on average, and are more likely to be promoted to the executive level in the future. For example, the experience of working with a future executive in the first five years of employment increases the probability of becoming an executive by 2.8 percentage points, which is approximately a 20 percent increase relative to the average promotion rate.

Second, we estimate the dynamic treatment effect by using the event study—we focus on employees who received the treatment at different times. The event study is valid as long as there is no trend in the outcomes before the peer effect shocks occur, and the data is consistent with this implication. The results of the event study show that employees who receive a positive peer effect shock are promoted significantly faster after the shock, and the

effects last over the course of employees' careers.

There could be two possible mechanisms that are consistent with the significant and persistent peer effects found in this paper: enhanced productivity through the accumulation of human capital or improved network connections holding productivity fixed. To disentangle these two mechanisms, we exploit the heterogeneity of the treatment group to find the following two tendencies: 1) the grade of the future executive should be relatively close to that of the junior employee at the time of the treatment to have significantly positive peer effects, and 2) the peer effects are proportional to the number of interactions with future executives. Given the nature of network connections and the diminishing marginal return of learning, these results likely suggest that improved network connections between senior and junior employees are crucial to explaining the rapid promotion of junior employees who have worked with future executives, but they are not conclusive. We also provide several robustness checks, of which the main results are robust.

The contribution of this paper is two-fold: First, it is one of the first attempts to quantify the long-term peer effects on employees' promotion over more than 20 years. Empirical analysis shows that junior employees will be promoted significantly faster after working with future executives, confirming the influence of bosses as in Hoffman and Tadelis (2021), Lazear et al. (2015), and Lyle and Smith (2014). Second, this paper finds that the dynamic characteristics of peers, which cannot be observed at the moment of interaction, could be an important factor in explaining the long-term peer effects. The literature typically focuses on the static characteristics of peers that remain unchanged over time, such as gender by Cullen and Perez-Truglia (2019), race by Giuliano et al. (2011), or ability by Mas and Moretti (2009).[2] However, this paper finds that the ex-post status of senior employees with whom

[2] A series of papers, including Amodio and Martinez-Carrasco (2018), Bandiera et al. (2005), Bandiera et al. (2007), Bandiera et al. (2009), Bandiera et al. (2010), Bandiera et al. (2013), Brune et al. (2021), Cornelissen et al. (2017), and Park (2019), analyzes the peer effects inside firms to show that peers in the workplace significantly affect a worker's effort and productivity. Other papers focus on the peer effects outside firms in experimental settings, such as Booij et al. (2017) and Falk and Ichino (2006), schools or class rooms such as Ammermueller and Pischke (2009), Azoulay et al. (2010), Booij et al. (2017), Booth et al. (2018), Carrell et al. (2009), Dustmann et al. (2018), Eisenkopf et al. (2015), Jackson (2012), Jackson and Bruegmann (2009), Lavy et al. (2012), Park et al. (2018), and Stinebrickner and Stinebrickner (2006), or sports teams, such as Arcidiacono et al. (2017), Gould and Kaplan (2011), and Guryan et al. (2009). Most of these studies find statistically and economically significant peer effects.

junior employees interact at an early stage in their careers is crucial for the promotion of junior employees in the long run. This implication is consistent with the findings of various literature that experience at an early stage of people's lives could affect their decisions and career outcomes for the rest of their lives.[3]

The remainder of this paper is organized as follows: Section 2 describes the institutional background to motivate the analysis. Sections 3 and 4 set out the data and methods used. Section 5 presents the main empirical results. Section 6 provides a discussion of the results, including robustness checks, and section 7 offers concluding remarks.

2 Institutional Background

The MOF is in charge of formulating fiscal policy in Japan. As indicated in Figure 1, it has six internal bureaus (the Minister's secretariat, Budget bureau, Tax bureau, Customs and Tariff bureau, Financial bureau, and International bureau), with 55 subdivisions. According to the budget for the fiscal year 2020, 1,966 employees worked in the central administration of the MOF.

At the MOF, there are three institutional features in human resource management that make our dataset unique for analyzing long-term peer effects. First, a closed group of candidates competes for executive positions over a long period. Second, job assignments for junior employees can be regarded as exogenous. Third, the interactive nature of the work offers employees ample opportunities to accumulate social connections and human capital. These institutional features provide researchers with an ideal environment for a natural experiment to measure peer effects at an early stage in an employee's career on promotion in the long run.

[3]For example, see Genda et al. (2010), Kawaguchi and Kondo (2020), von Wachter (2020), and von Wachter and Bender (2006) for the labor market outcomes, Giuliano and Spilimbergo (2013) and Malmendier and Nagel (2011) for people's beliefs and risk tolerance, and Malmendier et al. (2021) for monetary policy stance.

2.1 Long-Term Competition for Executive Positions

At the MOF, a small and closed group of candidates competes for executive positions over a long period. There are three reasons for this. First, the recruitment and human resource management for the managerial and technical tracks are completely separated from the beginning, and all the executive positions in the central administration are held by employees on the managerial track.[4] In addition, transfers between the managerial and technical tracks mid-way through an employee's career are not possible by design. As there are no external entrants, only a small group of managerial-track employees are eligible for executive positions in the central administration. In this paper, we focus on employees on the managerial track to analyze the promotion to executives.

Second, employees are expected to work at the MOF and related organizations for their entire professional career, from recruitment until retirement. The implicit selection process for managerial positions typically starts in the middle of their careers, and candidates are typically promoted to managerial positions 20 years into their careers. Promotions to executive positions start after approximately 30 years.

Third, the promotion of employees is strictly hierarchical and based on the seniority and performance of employees. In particular, an employee's age and the year they started working at the MOF are critical for human resource management, and executive positions are usually succeeded by employees younger than incumbents. As a result, a fairly closed cohort of employees (approximately 20 on the managerial track each year) who begin working at the MOF in the same year will compete for managerial positions for over 20 years. Normally, only one employee in the same cohort could become the chief administrative officer of the ministry ("Jimu-Jikan" in Japanese), and the other employees in the same cohort will leave the central administration when that happens.[5]

Due to these institutional features, competition for executive positions at the MOF is

[4]For example, as of October 2019, 90.6% of managerial positions (directors of internal subdivisions) and all executive positions (directors of internal bureaus and above) were occupied by employees on the managerial track.

[5]Similar practices in human resource management are common across other Japanese firms and organizations, as discussed by Moriguchi (2014) and Kambayashi and Kato (2017).

similar to a tournament, as described by Lazear and Rosen (1981) and Lazear (2018), in which the employee who performs the best among the competitors receives a prize. In other words, the relative performance of employees, compared to their cohort, and their long-term reputation in the organization are crucial for their future promotion.

2.2 Job Assignments for Junior Employees

Job assignments for junior employees at the MOF can be regarded as exogenous for three reasons. First, job assignments are centrally controlled by the human resource department and frequently change. This practice aims to expose junior employees to various types of jobs at the MOF and relevant organizations and train them as generalists to manage the organization in the future.

Second, junior employees are treated equally, and their positions are assigned based on a rotation, regardless of their performance and characteristics. This is because the first few years of work at the MOF are regarded as part of OJT to understand the structure and workflow of the organization. Typically, junior employees spend a few years at the different internal bureaus of the MOF or other ministries.[6] In contrast, senior employees are more likely to remain in a certain bureau, as they specialize in certain administrative areas. Since employment at the MOF tends to be for an employee's entire career, this practice is regarded as essential in the organization and has not changed in more than 70 years.

Third, junior employees are relatively homogeneous in terms of productivity, age, and educational background. Job seekers at the MOF are required to pass the national qualifying exams and go through multiple job interviews to control productivity at entry level. Since mid-career employment is extremely rare, the majority of employees start working at the MOF immediately after graduating from college, which makes most of them in their early twenties. Most of them graduate from the University of Tokyo, one of Japan's most prestigious institutions.

[6]In fact, a director of the human resource department at the MOF once told the authors that job assignments for junior employees are part of a routine and will not affect their future promotion.

2.3 Interactive Nature of the Work

The work at the central administration is interactive, which provides ample opportunities for junior employees to learn from senior employees and for senior employees to observe the characteristics of junior employees. The primary work unit of the central administration is an internal division that is led by a director and consists of several deputy directors and section chiefs. The size of the divisions is relatively small—a typical division consists of ten to twenty employees, with approximately five to ten employees on the managerial track. Junior employees' primary tasks are to coordinate logistical matters, carry out general surveys, and draft policy documents under the supervision of the section chiefs and deputy directors. The directors are in charge of consulting on policy matters with executives at the central administration and policymakers.

As their first few years are regarded as a part of OJT, junior employees have many opportunities to learn from senior employees and accumulate their human capital. On the other hand, senior employees have ample opportunity to observe junior employees' abilities, productivity, and characteristics, which reduces asymmetric information between senior and junior employees.

3 Data

We constructed a panel of human resource data at the MOF between 1946 and 2019, using the MOF's annually published human resource directories augmented with administrative data. The data includes two key pieces of information: job titles of the employees and the divisions to which they belong. As shown in Table 1, job titles of the employees are associated with their grades, which are the basis of their salary.[7] We use these grades as a time-varying measure of promotion and regard the grades above nine as the executives at the MOF.[8] We also construct the time-invariant measure of promotion, such as the probability

[7]The grades in this paper combine the grades in the regular salary table and the grades in the salary tables for the designated administrators.

[8]In the fiscal year 2020, there were seven titles at MOF (director general of five internal bureaus and two vice ministers of finance) that are associated with grades above nine.

of becoming an executive or the chief executive of the MOF.

Information on the internal bureaus and divisions to which employees belong enables us to identify the individual members of the divisions in a specific year and match the junior and senior employees in the same division. We also have information on years of experience, major in the college, and other educational backgrounds. We use this information for control variables.

In this paper, we primarily focus on the data after 1946 because the central administration in Japan was significantly reorganized after World War II, and we want to avoid this structural break affecting the results. We do not use the samples in which employees are transferred outside the central administration, such as to local organizations or organizations in foreign countries, to maintain the compatibility of titles and grades. We also focus on employees who started work at the MOF immediately after graduation because mid-career employment is extremely rare.

Table 2 summarizes the descriptive statistics of the final sample, which consists of 25,765 observations covering 1,669 employees. The probability of becoming the chief executive is 3.8%, and the probability of becoming an executive is 14.1%, suggesting that the positions of executives are fairly competitive. On average, employees work at the MOF for 26.9 years and become an executive after 29.9 years. When we focus on the interactions with future executives within the first five years, we have approximately 1,819 interactions among 6,049 observations, which makes the chance of working with a future executive in the first five years of employment 30.1%.

Figure 2 illustrates the career history of one chief executive, with his grades and the number of years after he joined the MOF. Different colors correspond to the MOF's different internal bureaus. As is evident from the figure, the job rotations of employees at the MOF are frequent and diverse—this chief executive changed titles across different bureaus every few years and was transferred outside the MOF quite often. His promotion was gradual and took a long time. It took him 31 years after joining the MOF to reach the executive level above grade 9, and it took him an additional 4 years to become the chief executive.

4 Methodology

4.1 Construction of the Baseline Shock Variable

We construct an indicator of whether a junior employee, within five years of joining the MOF, worked in the same division as a senior employee who subsequently became an executive. By regarding this indicator as a shock to a junior employee's career, we investigate the long-term peer effects on a junior employee's promotion, up to 20 years after experiencing the shock on average.

To formally define the variable, we introduce some notations. First, we denote the set of employees in the sample as $\mathcal{E}$ and the set of years covered by the sample period as $\mathcal{T}$. Second, I define the subset of employees who became an executive, above grade 9, at some point in their career as $\mathcal{F} \equiv \{i : i \in \mathcal{E},\ \exists t \in \mathcal{T},\ Grade_{i,t} \geq 9\}$, where $Grade_{i,t}$ denotes the grade of employee i at year t. Third, I denote the year that employee i starts to work at the MOF as t_i^0. Then, the shock variables for $t \in [t_i^0, t_i^0 + 5]$ are defined as follows.

$$Shock_{i,t} \equiv \begin{cases} 1 & \text{, if } \exists\ i \in \mathcal{E},\ j \in \mathcal{F}, \\ & Division_{i,t} = Division_{j,t} \text{ and } t_i^0 > t_j^0, \\ 0 & \text{otherwise,} \end{cases} \tag{1}$$

where $Division_{i,t}$ denotes the division that employee i belongs to at year t. In other words, $Shock_{i,t}$ is an indicator of whether junior employee i, within five years of joining the MOF, works with future executive j, who is more senior than the junior employee, in the same division.

The underlying assumption for constructing this indicator as an exogenous shock is that the opportunity for junior employees to work with a future executive during the first five years of their career can be regarded as exogenous due to institutional features, and unobservable factors, such as non-cognitive skills or productivity, do not affect their opportunities. This provides an ideal environment for a natural experiment. To see whether there

is no significant difference prior to the shock between the employees who received the shock and those who did not, we provide a balanced test for the characteristics of the employees. As shown in Table 3, there is no significant difference between the control and treatment groups in many respects, such as grades, hometown, specialization, and the colleges employees graduated from.[9] Therefore, the results show that the junior employees are similar in many observable characteristics, which is consistent with the underlying assumption.

4.2 Linear Probability Model

We first define the outcome of the promotion as follows:

$$Executive_{i,t} \equiv \begin{cases} 1 & \text{if } \exists\ t \in \mathcal{T}, Grade_{i,t} \geq 9, \text{ for } i \in \mathcal{E}, \\ 0 & \text{otherwise.} \end{cases} \tag{2}$$

Note that this outcome variable is an indicator of whether an employee becomes an executive at a certain point in time and does not vary across time even though it has t subscript. To identify the causal effect of working with a future executive on the future promotion of junior employees, we estimate the following linear probability model:

$$Executive_{i,t} = \alpha + \beta Shock_{i,t} + \gamma X_i + \delta T_t + \varepsilon_{i,t}, \tag{3}$$

where X_i is a vector of individual characteristics and T_t is a vector of year dummies. Since the shock variables are only defined for $t \in [t_i^0, t_i^0 + 5]$, we effectively focus only on the first five years of an employee's career history to run this regression.[10] The parameter of interest is β, which shows the impact of working with a future executive on whether a junior employee becomes an executive in the future. If the shock is exogenous and not correlated with the error term, β will be consistently estimated by OLS.

[9] The only exception is M.A. holders at the University of Tokyo, who are less likely to get a positive peer effect. However, the fraction of such a sample is less than 3% and it does not affect the main results.

[10] This regression model is similar to the alternative model omitting the time variation. The estimates based on such model are presented in Section 6.4.2.

4.3 Two-Way Fixed Effect Model

To estimate the average peer effects on future promotion across time, we also run the regression using the whole sample. First, we define the variant of shock variable as follows:

$$Shock_{i,t}^{DID} \equiv \begin{cases} 1 & \text{for } t \in [\tau, \tau + h] \text{ if } Shock_{i,\tau} = 1, \\ 0 & \text{otherwise.} \end{cases} \tag{4}$$

In other words, $Shock_{i,t}^{DID}$ takes one for h years after employee i received the shock and zero otherwise, where h can be interpreted as the length of the period that the shock can last. We estimate the effect of the shock across years using the following two-way fixed effect model, in which both individual fixed effects, λ_i, and time trend, T_t, are controlled:

$$Grade_{i,t} = \alpha + \beta Shock_{i,t}^{DID} + \gamma X_i + \delta T_t + \varepsilon_{i,t}. \tag{5}$$

The estimation is based on the minimization problem involving the deviations of the dependent and independent variables from the mean across time and individuals.[11] The underlying assumption is that there is no significant difference between the control and treatment groups in the trend of the outcome variable before the shock, which is shown in Figure 3. For inference, we use the cluster-robust standard errors throughout the paper, unless noted otherwise, which consider the clusters in individual employees and years.

4.4 Event-Study Analysis

In addition to estimating the average treatment effect, we also estimate the dynamic treatment effect of working with a future executive by focusing on the employees who received the shock. First, we denote the year when the junior employee had a shock as t_i^s. Then, we define the following treatment indicator based on $Shock_{i,t_i^s}$ to measure the dynamic effect

[11] For details, see Chapter 3 of Baltagi (2013) and Imai and Kim (2020).

of the shock k years after:

$$Event_{i,t}^{k} \equiv \begin{cases} 1 & \text{if } t = t_i^s + k, \\ 0 & \text{if } t \neq t_i^s + k. \end{cases} \tag{6}$$

There are several things to note on this indicator variable: First, it has the dimension of k, in addition to individuals i and time t, which corresponds to the horizon of the dynamic effects that we want to estimate. Second, k ranges between -5 and K, which starts from the negative value to check if there is any trend before the shock and ends at the maximum period of employment, K. For illustration, suppose that a junior employee i received a shock in 1980, $Shock_{i,1980} = 1$. Then we have $Event_{i,1975}^{-5} = \cdots = Event_{i,1981}^{1} = \cdots = Event_{i,1980+K}^{K} = 1$ and $Event_{i,1981}^{2} = Event_{i,1981}^{3} = \cdots = Event_{i,1981}^{K} = 0$ for 1981.[12] Using this variable, we run the following event-study regression:

$$Grade_{i,t} = \alpha + \sum_{k \neq -1}^{K} \beta_k Event_{i,t}^{k} + \gamma X_i + \varepsilon_{i,t}, \tag{7}$$

where the dependent variable is the time-varying grade of employee i in year t, and X_i is a vector of individual characteristics. $k = -1$ is excluded from the regression to use the time before the treatment as the reference point. The parameter of interest is β_k, which estimates the dynamic treatment effects on the junior employee who received the shock.

Instead of comparing the control and treatment groups, as we did in the linear probability and two-way fixed effect models, we exploit the variations in the treatment group in terms of the timing of the treatment. More specifically, we assume that there is no ex-ante difference between the employees who received the shock, and the timing of the shock is orthogonal to their grades prior to the shock. This assumption also implies that employees display no anticipation behavior. Given that employees' preferences are rarely considered in the job rotations at the MOF, and employees are not given much notice of a transfer to a different workplace, this no-anticipation condition is likely to be satisfied. This assumption can be

[12] For details, see Schmidheiny and Siegloch (2019).

directly tested by seeing if there are any significant differences in the time trends in the grades prior to the shocks.[13] This assumption will be discussed with the results.

5 Empirical Results

5.1 Linear Probability Model

Table 4 shows the estimates, based on the linear probability model in Equation (3), for different dependent variables of promotion. The dependent variable of the first specification is the probability of becoming a chief executive and that of the second specification is the probability of becoming an executive. The first column in Table 4 shows that the opportunity to work with a future executive increases the probability of becoming the chief executive of the MOF by 1.7 percentage points. Similarly, the second column shows that having a peer effect with a future executive increases the probability of becoming an executive by 2.8 percentage points, which is approximately a 20 percent increase relative to the average promotion rate.

5.2 Two-Way Fixed Effect Model

Table 5 shows the estimates based on the two-way fixed effect regression in Equation (5) for the time-varying grades. The coefficient of the shock is estimated to be significantly positive with a magnitude of 0.54.[14] Given that the mean of the dependent variables is 3.87, the estimate implies that junior employees who had an opportunity to work with a future executive are at a greater grade by 14.0 percentage points relative to other junior employees who did not have this opportunity.

[13] For details, see Borusyak and Jaravel (2016).

[14] The results using $h = 5$ are presented as a benchmark, but the results are robust for different choices of h.

5.3 Event-Study Analysis

Figure 4 and Table 6 show the estimates of dynamic causal effect based on the event study. Figure 4 plots the average treatment effect of working with a future executive on an employee's future promotions—the horizontal axis shows the years after the shock that are normalized to happen at year zero. The figure shows that there is no significant trend prior to the shock, which validates the identification assumption.[15] The figure further illustrates that junior employees who worked with a future executive had a significantly positive peer effect immediately after the shock, which increases their average grades. In addition, the figure indicates that the positive peer effect is persistent and lasts for a long time over the course of employees' careers. Table 6 lists the corresponding econometric results, up to 20 years, with the different definitions of shocks. Even if we change the group of junior employees who received the shock from the first five years to the first six or seven years, the results are robust, and the peer effect is significant and persistent. For example, the magnitude of the peer effect is estimated to be 0.67 after 5 years, 1.11 after 10 years, and 2.18 after 20 years. These estimates imply that the peer effects of working with a future executive accumulate over time.

Figure 5 and Table 7 show the results of the event study when we change the definition of exogenous shocks to work with a future chief executive in the first five, six, or seven years. Figure 5 also indicates that there is no significant trend prior to the shock. Similar to the shock with future executives, the estimated peer effects are significant and persistent. In addition, the magnitude of the estimates is slightly larger than in the case where the shocks are based on work experience with a future executive. For example, the estimate is 2.89 after 20 years.

[15] The only exception is the estimates at year $t-2$, in which the magnitude of the estimates is very close to zero, but the tight standard error makes the estimates significantly negative.

6 Discussion of the Results

6.1 Two Possible Mechanisms

There are two possible mechanisms to explain the significant and persistent peer effects found in this paper: increased accumulation of human capital or social connections between junior and senior employees. Increased accumulation of human capital, the first hypothesis, focuses on the improved learning of junior employees. Working with a future executive, who is a particularly talented and competent employee in their cohort, will have positive externality on the productivity of junior employees. More specifically, the productivity of junior employees improves by learning from future executives and exchanging ideas with them. As junior employees' productivity increases, their improved performance is recognized in the organization, which increases the speed of their promotion. This explanation is consistent with a series of papers in the literature, such as Guryan et al. (2009), Cornelissen et al. (2017), and Jarosch et al. (2020), on the positive externality in the workplace.

On the other hand, the second hypothesis claims that the experience of working with a future executive gives junior employees a strong social connection inside an organization without improving their productivity. Given the interactive nature of the work at the MOF, senior employees have a strong incentive to have competent people working under them whose ability and characteristics are well known. As a result, senior employees may prefer to work with junior employees they have worked with previously. As senior employees are promoted, these junior employees are promoted faster than the other employees in their cohort. In other words, the experience of working with a future executive alleviates the problem of asymmetric information between senior and junior employees, which will make junior employees more likely to be promoted in the future. This mechanism is consistent with the effects of social connections and decision making discussed in Shue (2013) and Cullen and Perez-Truglia (2019).

6.2 Heterogeneity Across Employees

It is extremely challenging disentangling the mechanisms of accumulating human capital and social connections using the observed data and empirical results, as these mechanisms are closely intertwined with each other and involve various unobservable characteristics of the employees. However, to shed some light on this issue, this subsection provides two additional analyses, the results of which are summarized in Table 8.

First, we investigate whether the gap in the grades of junior employees and future executives affects the estimates of the peer effects. Figure 6 illustrates the distribution of the gaps in the grades between junior and senior employees within the first five years. It shows that the distribution is relatively uniform except for the gaps of two and five. To estimate the heterogeneous effects of the gap in grades, we first construct the disaggregated shock variable as follows:

$$Shock^{g}_{i,t} \equiv \begin{cases} 1 & \text{if } \exists\ i \in \mathcal{E},\ j \in \mathcal{F}, g \in [1,5] \\ & Division_{i,t} = Division_{j,t} \text{ and } g = Grade_{j,t} - Grade_{i,t}, \\ 0 & \text{otherwise.} \end{cases} \tag{8}$$

Then, we estimate the following regression:

$$Executive_{i,t} = \alpha + \sum_{g=1}^{5} \beta_g Shock^{g}_{i,t} + \gamma X_i + \delta T_t + \varepsilon_{i,t}. \tag{9}$$

Panel A of Table 8 shows that the peer effects stem mainly from interactions with a future executive with smaller gaps in grades, especially two and three. For example, a junior employee who worked with a future executive, whose grade is greater by three, is more likely to be an executive in the future by 3.3 percentage points, while that probability falls to 2.0 percentage points if the gap is four. Roughly speaking, the gap in three grades corresponds to ten to fifteen years of gap in the years of entry. These results suggest that the peer effects are stronger in cases where junior employees interact with a future executive

whose grades are relatively close.

Second, we analyze whether the number of interactions with future executives is crucial for the promotion of junior employees. Figure 7 shows the distribution of the number of years worked with future executives in the first five years, showing that a majority of employees have one or two years of interaction with future executives. Panel B Table 8 shows the results of the linear probability model using the disaggregated shock variable analogous to ones based on gaps.[16] The results show that the number of interactions with future executives is associated with significantly positive effects on future promotion. For example, the probability of becoming an executive in the future is 3.3% higher if a junior employee works with future executives for two years in their first five years at the MOF.[17]

6.3 Interpretation of Results

Additional analysis exploits the heterogeneity among the treatment group in the main analysis to find two tendencies, both of which seem to be consistent with the social connection hypothesis. First, the grade of the future executive should be relatively close to that of the junior employee at the time of interaction to have significantly positive peer effects, which is consistent with the social connection hypothesis. This is because the social connection that junior employees build in the first few years at the MOF is effective until senior employees retire. As a result, social connections would last longer if the grades of junior and senior employees were closer, which would make the estimated peer effects significant. On the other hand, the difference in grades does not matter under the human capital hypothesis because junior employees could potentially learn from any competent future executives, and the gap in grades simply reflects the differences in the set of skills they learn.

Second, the peer effects are proportional to the number of interactions with future executives, which is likely to be consistent with the social connection hypothesis because junior employees' network connections proportionally expand as the number of interactions with

[16] The sample of five years is not used since its sample size is too small.

[17] Note that we count the number of years with any future executives, and the exposure could be to different future executives.

future executives increases. On the other hand, the peer effects are likely to diminish under the human capital hypothesis as the number of interactions increases, due to the diminishing marginal return of learning.

Therefore, both of these tendencies found in the additional analysis suggest that the positive peer effects found in this paper are driven by the formation of social network connections, although this is not conclusive. Since the social connections between junior and senior employees are crucial for future promotion, junior employees who are lucky enough to work with future executives at an early stage in their career tend to be promoted faster than other employees.

6.4 Robustness Checks

In this section, we provide several robustness checks, for which the main results are generally robust. First, we employ the logit and probit models to incorporate nonlinearity in the specifications. Second, we use an alternative specification by omitting the variations across time. Third, we control the initial divisions and eliminate the first couple of years from the treatment to mitigate the issue of endogeneity. Last, we conduct the analysis using samples before 2001 to avoid the effects of a potential structural break.

6.4.1 Logit and Probit Models

First, we estimate the peer effect of working with a future executive using the logit and probit models. More specifically, we focus on the conditional probability of the binary outcome of promotion, $P\left(Executive_{i,t} = 1 | Z_{i,t}\right)$, where $Z_{i,t}$ is the controls in Equation (3), and estimate it by assuming that the underlying distribution is the normal distribution (probit model) or the logistic distribution (logit model). Unlike the linear probability model, these models do not assume a constant marginal effect and the predicted values range between 0 and 1, satisfying the boundary condition for probability.

Table 9 reports the results. Similar to the main results, the estimates are positive and statistically significant at the 1% level, suggesting that working with a future executive

increases the speed of the promotion of a junior worker.

6.4.2 Alternative Specification

Second, we present the results based on an alternative specification omitting the time variation. This specification is potentially useful since the linear probability model in Equation (3) uses an indicator variable invariant across time as an outcome variable and estimating the peer effects in a dynamic framework may lead to some econometric issues. To describe the specification, we first define the set of years that employee i works with a future executive as $\mathcal{T}_i \equiv \{t : t \in [t_i^0, t_i^0 + 5], s.t.\ Shock_{i,t} = 1\}$. Then, we define an indicator variable that corresponds to the number of years that they interact with future executive as follows:

$$Shock_i^n \equiv \begin{cases} 1 & \text{if } |\mathcal{T}_i| = n, \\ 0 & \text{otherwise.} \end{cases} \tag{10}$$

Using this indicator variable, we run the following regression to estimate the effect on future promotion:

$$Executive_i = \alpha + \sum_{n=1}^{4} \beta_n Shock_i^n + \varepsilon_i, \tag{11}$$

where $Executive_i$ is made by omitting the time variation from $Executive_{i,t}$ in Equation (2). The parameters of interest are $\{\beta_n\}_{n=1}^4$, which capture the individual effects of the number of years working with a future executive.

Table 10 shows the results, which are similar to the results in the previous subsection. Some estimates are statistically significant and the magnitudes are large, especially when the junior employee interacts with future executives multiple times.

6.4.3 Controlling the Initial Divisions

Third, we run the regression by controlling the initial divisions to mitigate the issues of endogeneity. There are a couple of reasons for this. First, the initial divisions may be correlated with unobserved individual characteristics. More specifically, the scores of the

national qualifying exams and interviews could be important factors for the human resource department to determine the initial divisions of junior employees. Second, it is possible that the performance of the division, in which a junior employee works with a future executive, may affect the promotion of both employees. In either way, the estimates of the peer effects in the main analysis could be contaminated by other factors. To address this issue, we eliminate the shocks in the first couple of years and add a dummy variable for the initial division, which could be used as a control for unobserved characteristics and the performance of the division.

Table 11 shows the results of the shocks in the first year being eliminated (Panel A) and the shocks in the first two years being eliminated (Panel B). Similar to the main analysis, the peer effects are positive and statistically significant, even after controlling for the effects of initial divisions.

6.4.4 Possible Structural Break

Finally, we conduct the analysis using the sample before 2001 to avoid the effects of a potential structural break. Since the original sample covers a relatively long period from 1946 to 2019, there could be a structural break affecting the outcomes of promotions. One potential structural break happened in 2001 when the Japanese government restructured the central administration into twelve ministries and one cabinet office to promote transparency and efficiency.[18] As a result of this restructure, two internal bureaus of the MOF (banking and securities bureaus) were detached and established as an independent institution, the Financial Service Agency, and the Japanese name of the MOF was changed from "Okura-Sho" to "Zaimu-Sho." These organizational changes could have substantially changed the practice of hiring and promotion. To avoid this structural change affecting the estimates of the peer effects, we estimate the main model using the samples prior to 2001.

Table 12 shows the results, which are generally similar to the main analysis. There are positive and statistically significant peer effects from future executives, even before the

[18] For details, see Ministry of Foreign Affair's website: https://www.mofa.go.jp/about/hq/central_gov/index.html.

structural break. The subperiod after 2001 is not used due to the short sample.

7 Conclusion

Using the novel dataset of comprehensive career history at the Japanese central administration, this paper shows that long-term peer effects are substantial and persistent—junior employees who work with a future executive in the same division in the first few years of their career will be promoted significantly faster, on average, and they are more likely to be promoted to the executive level in the future.

This paper confirms the importance of peer effects in the workplace in the long run and has several important economic implications. First, firms should allocate human resources carefully, especially at the beginning of employees' careers, given the significance and persistence of peer effects in the long run. Second, firms should increase the opportunities for junior employees to interact with senior employees and mentors because human capital accumulation or social connection, or both, appear to play a critical role in future promotion, which could be associated with the enhanced productivity of junior employees. Junior employees would receive significant benefits if firms could organize formal or informal activities to help them interact with senior employees. Third, it would be beneficial for firms to maintain transparency in their human resource allocation and evaluation to ensure that asymmetric information between junior and senior employees is mitigated. In other words, social connections in an organization will play a less important role in the promotion of employees if the evaluation of those employees becomes more transparent. All of these measures could, in the long run, significantly enhance the productivity of employees and, thereby, that of firms.

References

Ammermueller, Andreas and Jörn-Steffen Pischke, "Peer Effects in European Primary Schools: Evidence from the Progress in International Reading Literacy Study," *Journal of Labor Economics*, 2009, *27* (3), 315–348.

Amodio, Francesco and Miguel A Martinez-Carrasco, "Input allocation, workforce management and productivity spillovers: Evidence from personnel data," *The Review of Economic Studies*, 2018, *85* (4), 1937–1970.

Arcidiacono, Peter, Josh Kinsler, and Joseph Price, "Productivity Spillovers in Team Production: Evidence from Professional Basketball," *Journal of Labor Economics*, 2017, *35* (1), 191–225.

Azoulay, Pierre, Joshua S Graff Zivin, and Jialan Wang, "Superstar Extinction," *The Quarterly Journal of Economics*, 2010, *125* (2), 549–589.

Baltagi, Badi H., *Econometric Analysis of Panel Data*, England: John Wiley & Sons, Ltd, 2013.

Bandiera, Oriana, Iwan Barankay, and Imran Rasul, "Social Preferences and the Response to Incentives: Evidence from Personnel Data," *The Quarterly Journal of Economics*, 2005, *120* (3), 917–962.

_ , _ , and _ , "Incentives for Managers and Inequality among Workers: Evidence from a Firm-Level Experiment," *The Quarterly Journal of Economics*, 2007, *122* (2), 729–773.

_ , _ , and _ , "Social Connections and Incentives in the Workplace: Evidence from Personnel Data," *Econometrica*, 2009, *77* (4), 1047–1094.

_ , _ , and _ , "Social Incentives in the Workplace," *The Review of Economic Studies*, 2010, *77* (2), 417–458.

_ , _ , and _ , "Team Incentives: Evidence from a Firm Level Experiment," *Journal of the European Economic Association*, 2013, *11* (5), 1079–1114.

Booij, Adam S, Edwin Leuven, and Hessel Oosterbeek, "Ability Peer Effects in University: Evidence from a Randomized Experiment," *The Review of Economic Studies*, 2017, *84* (2), 547–578.

Booth, Alison L, Lina Cardona-Sosa, and Patrick Nolen, "Do Single-Sex Classes Affect Academic Achievement? An Experiment in a Coeducational University," *Journal of Public Economics*, 2018, *168*, 109–126.

Borusyak, Kirill and Xavier Jaravel, "Revisiting Event Study Designs," Working Paper 2016.

Brune, Lasse, Eric Chyn, and Jason Kerwin, "Peers and Motivation at Work Evidence from a Firm Experiment in Malawi," *Journal of Human Resources*, 2021, *forthcoming.*

Carrell, Scott E, Richard L Fullerton, and James E West, "Does Your Cohort Matter? Measuring Peer Effects in College Achievement," *Journal of Labor Economics*, 2009, *27* (3), 439–464.

Cornelissen, Thomas, Christian Dustmann, and Uta Schönberg, "Peer Effects in the Workplace," *American Economic Review*, February 2017, *107* (2), 425–56.

Cullen, Zoë B and Ricardo Perez-Truglia, "The Old Boys' Club: Schmoozing and the Gender Gap," Technical Report, National Bureau of Economic Research 2019.

Dustmann, Christian, Hyejin Ku et al., "Why Are Single-Sex Schools Successful?," *Labour Economics*, 2018, *54*, 79–99.

Eisenkopf, Gerald, Zohal Hessami, Urs Fischbacher, and Heinrich W Ursprung, "Academic Performance and Single-Sex Schooling: Evidence from a Natural Experiment in Switzerland," *Journal of Economic Behavior & Organization*, 2015, *115*, 123–143.

Falk, Armin and Andrea Ichino, "Clean Evidence on Peer Effects," *Journal of Labor Economics*, 2006, *24* (1), 39–57.

Genda, Yuji, Ayako Kondo, and Souichi Ohta, "Long-Term Effects of a Recession at Labor Market Entry in Japan and the United States," *Journal of Human Resources*, 2010, *45* (1), 157–196.

Giuliano, Laura, David I Levine, and Jonathan Leonard, "Racial Bias in the Manager-Employee Relationship An Analysis of Quits, Dismissals, and Promotions at a Large Retail Firm," *Journal of Human Resources*, 2011, *46* (1), 26–52.

Giuliano, Paola and Antonio Spilimbergo, "Growing up in a Recession," *The Review of Economic Studies*, 11 2013, *81* (2), 787–817.

Gould, Eric D and Todd R Kaplan, "Learning Unethical Practices from a Co-Worker: the Peer Effect of Jose Canseco," *Labour Economics*, 2011, *18* (3), 338–348.

Guryan, Jonathan, Kory Kroft, and Matthew J. Notowidigdo, "Peer Effects in the Workplace: Evidence from Random Groupings in Professional Golf Tournaments," *American Economic Journal: Applied Economics*, October 2009, *1* (4), 34–68.

Hoffman, Mitchell and Steven Tadelis, "People Management Skills, Employee Attrition, and Manager Rewards: An Empirical Analysis," *Journal of Political Economy*, 2021, *129* (1), 243–285.

Imai, Kosuke and In Song Kim, "On the Use of Two-Way Fixed Effects Regression Models for Causal Inference with Panel Data," *Political Analysis*, 2020, p. 1–11.

Jackson, C Kirabo, "Single-Sex Schools, Student Achievement, and Course Selection: Evidence from Rule-Based Student Assignments in Trinidad and Tobago," *Journal of Public Economics*, 2012, *96* (1-2), 173–187.

_ **and Elias Bruegmann**, "Teaching Students and Teaching Each Other: The Importance of Peer Learning for Teachers," *American Economic Journal: Applied Economics*, 2009, *1* (4), 85–108.

Jarosch, Gregor, Ezra Oberfield, and Esteban Rossi-Hansberg, "Learning from Coworkers," *Econometrica*, September 2020, *Forthcoming.*

Kambayashi, Ryo and Takao Kato, "Long-Term Employment and Job Security over the Past 25 Years: A Comparative Study of Japan and the United States," *ILR Review*, 2017, *70* (2), 359–394.

Kawaguchi, Daiji and Ayako Kondo, "The Effects of Graduating from College During a Recession on Living Standards," *Economic Inquiry*, 2020, *58* (1), 283–293.

Lavy, Victor, Olmo Silva, and Felix Weinhardt, "The Good, the Bad, and the Average: Evidence on Ability Peer Effects in Schools," *Journal of Labor Economics*, 2012, *30* (2), 367–414.

Lazear, Edward P., "Inside the Firm," in Steffan Altmann and Zimmermann Klaus F, eds., *Steffan Altmann and Zimmermann Klaus F, eds.*, Oxford University Press, 2011.

_ , "Compensation and Incentives in the Workplace," *Journal of Economic Perspectives*, August 2018, *32* (3), 195–214.

_ **and Sherwin Rosen**, "Rank-Order Tournaments as Optimum Labor Contracts," *Journal of Political Economy*, 1981, *89* (5), 841–864.

_ **, Kathryn L. Shaw, and Christopher T. Stanton**, "The Value of Bosses," *Journal of Labor Economics*, 2015, *33* (4), 823–861.

Lyle, David S. and John Z. Smith, "The Effect of High-Performing Mentors on Junior Officer Promotion in the US Army," *Journal of Labor Economics*, 2014, *32* (2), 229–258.

Malmendier, Ulrike and Stefan Nagel, "Depression Babies: Do Macroeconomic Experiences Affect Risk Taking?," *The Quarterly Journal of Economics*, 02 2011, *126* (1), 373–416.

_ **,** _ **, and Zhen Yan**, "The Making of Hawks and Doves," *Journal of Monetary Economics*, 2021, *117*, 19–42.

Mas, Alexandre and Enrico Moretti, "Peers at work," *American Economic Review*, 2009, *99* (1), 112–45.

Moriguchi, Chiaki, "Japanese-Style Human Resource Management and Its Historical Origins," *Japan Labor Review*, 2014, *11* (3), 58–77.

Park, Hyunjoon, Jere R Behrman, and Jaesung Choi, "Do Single-Sex Schools Enhance Students' STEM (Science, Technology, Engineering, and Mathematics) Outcomes?," *Economics of Education Review*, 2018, *62*, 35–47.

Park, Sangyoon, "Socializing at Work: Evidence from a Field Experiment with Manufacturing Workers," *American Economic Journal: Applied Economics*, 2019, *11* (3), 424–55.

Schmidheiny, Kurt and Sebastian Siegloch, "On Event Study Designs and Distributed Lag Models: Equivalence, Generalization and Practical Implications," Technical Report, IZA Institute of Labor Economics 2019.

Shue, Kelly, "Executive Networks and Firm Policies: Evidence from the Random Assignment of MBA Peers," *The Review of Financial Studies*, 04 2013, *26* (6), 1401–1442.

Stinebrickner, Ralph and Todd R Stinebrickner, "What Can Be Learned about Peer Effects Using College Roommates? Evidence from New Survey Data and Students from Disadvantaged Backgrounds," *Journal of Public Economics*, 2006, *90* (8-9), 1435–1454.

von Wachter, Till, "The Persistent Effects of Initial Labor Market Conditions for Young Adults and Their Sources," *Journal of Economic Perspectives*, November 2020, *34* (4), 168–94.

_ **and Stefan Bender**, "In the Right Place at the Wrong Time: The Role of Firms and Luck in Young Workers' Careers," *American Economic Review*, December 2006, *96* (5), 1679–1705.

Organization Chart(As of January 2020)

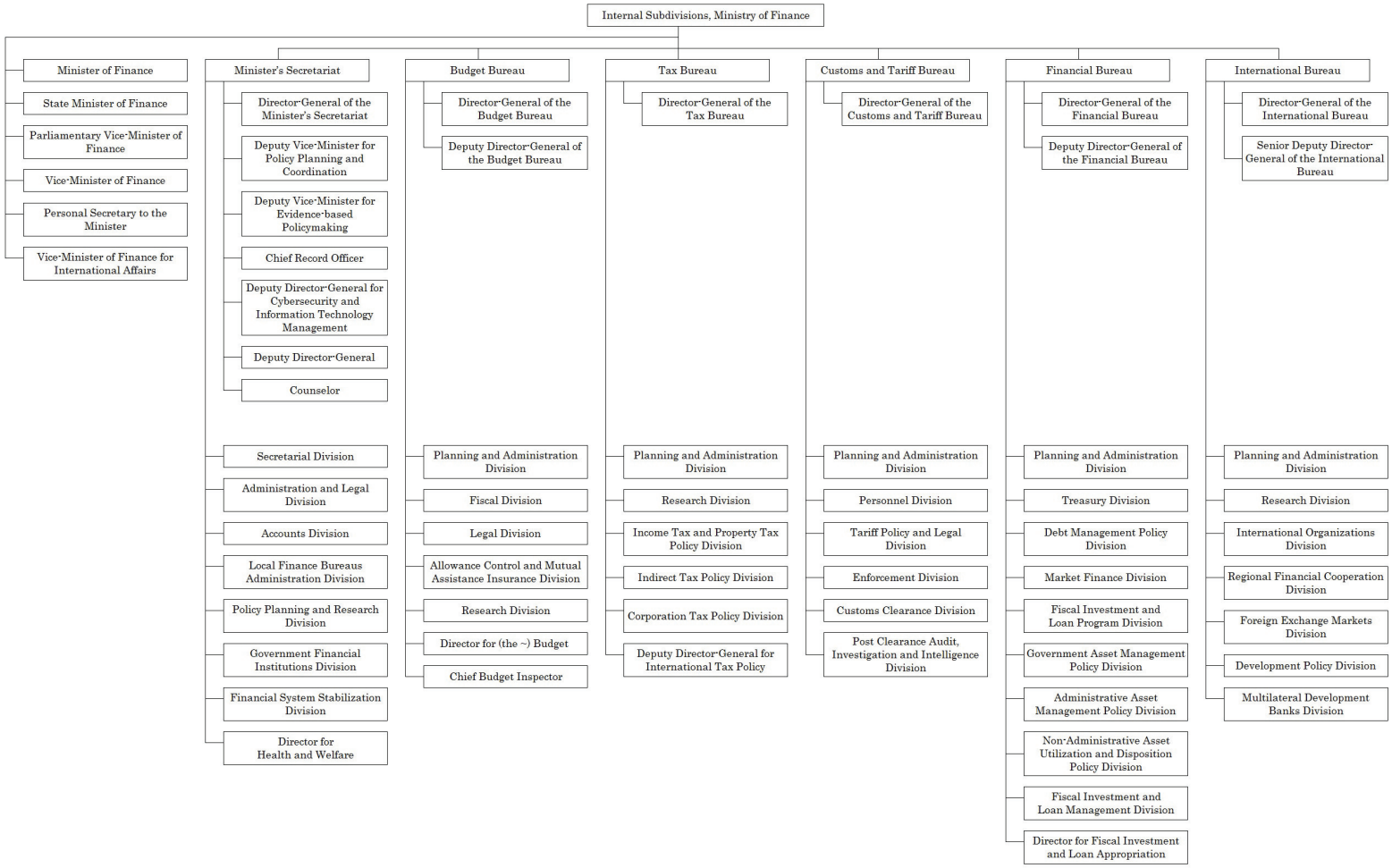

Figure 1: Organizational Structure at MOF

Note: This figure is taken from the Ministry of finance's website.

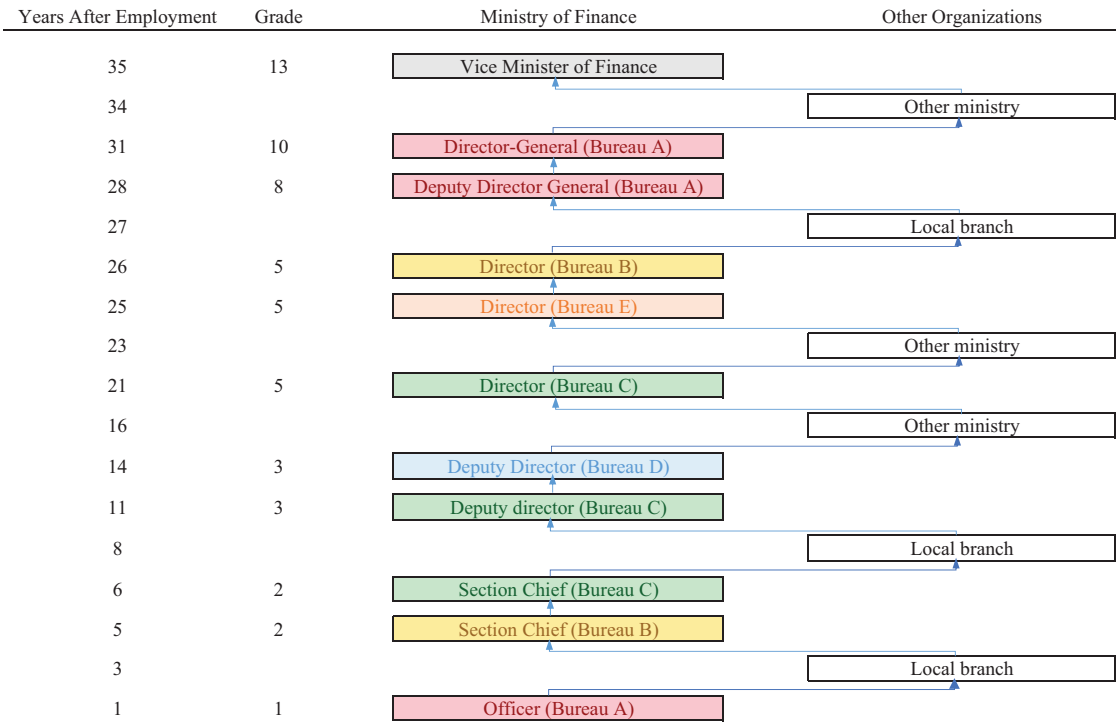

Figure 2: Example of the Career History of A Chief Executive

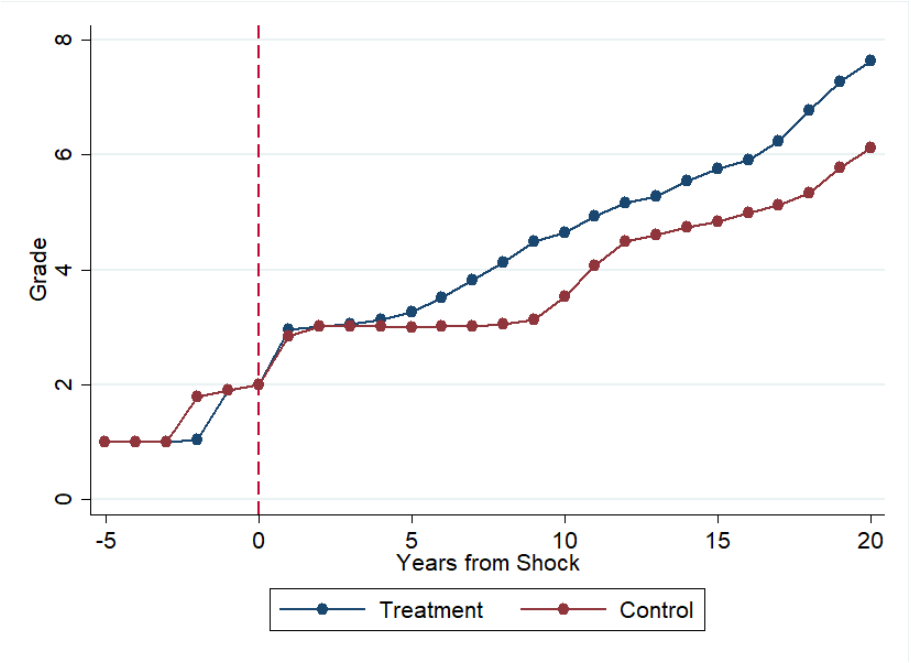

Figure 3: Trend of the Grades of Control and Treatment Groups

Note: This figure plots the grades of the treatment and control groups over time. The treatment group receives the shock at Year 0, while the control group never receives the shock.

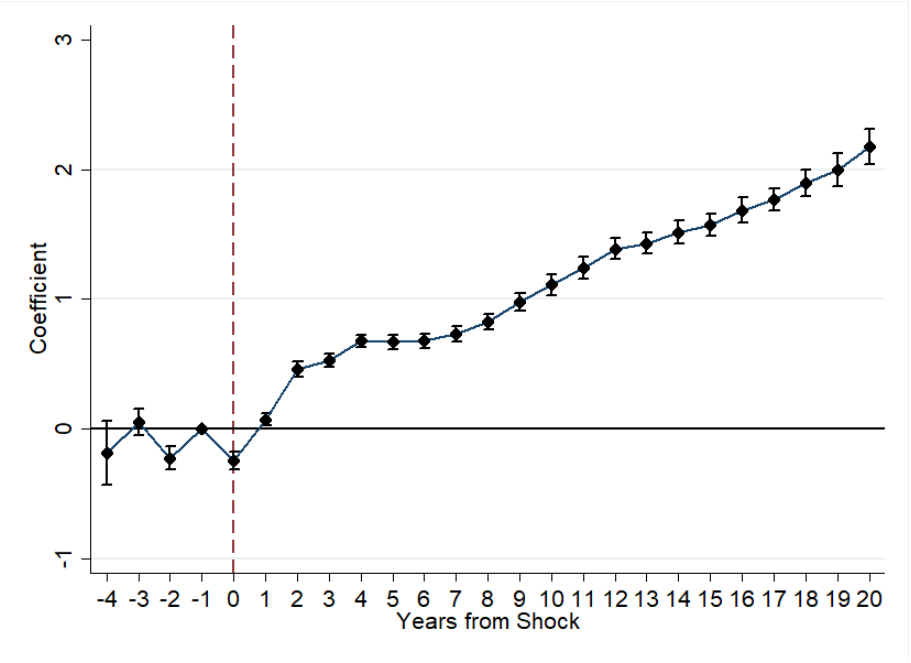

Figure 4: Event Study of the Shocks to Work with Future Executives

Note: This figure shows the estimates of event study described in Equation (7). The point estimates and corresponding 90% confidence intervals are plotted. The dotted vertical line is drawn one year before the shock.

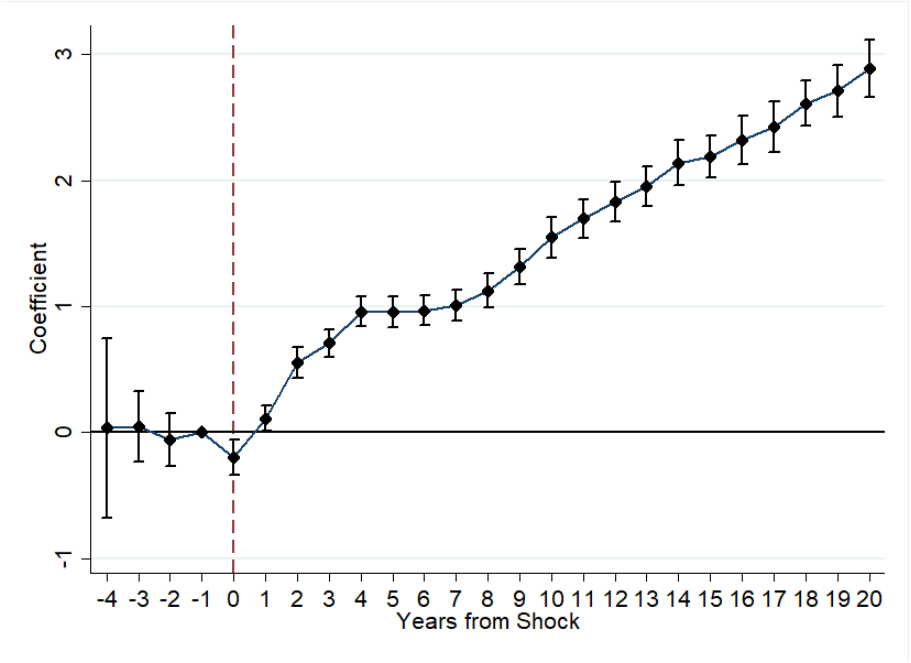

Figure 5: Event Study of the Shocks to Work with Future Chief Executives

Note: Same as the note in Figure 4.

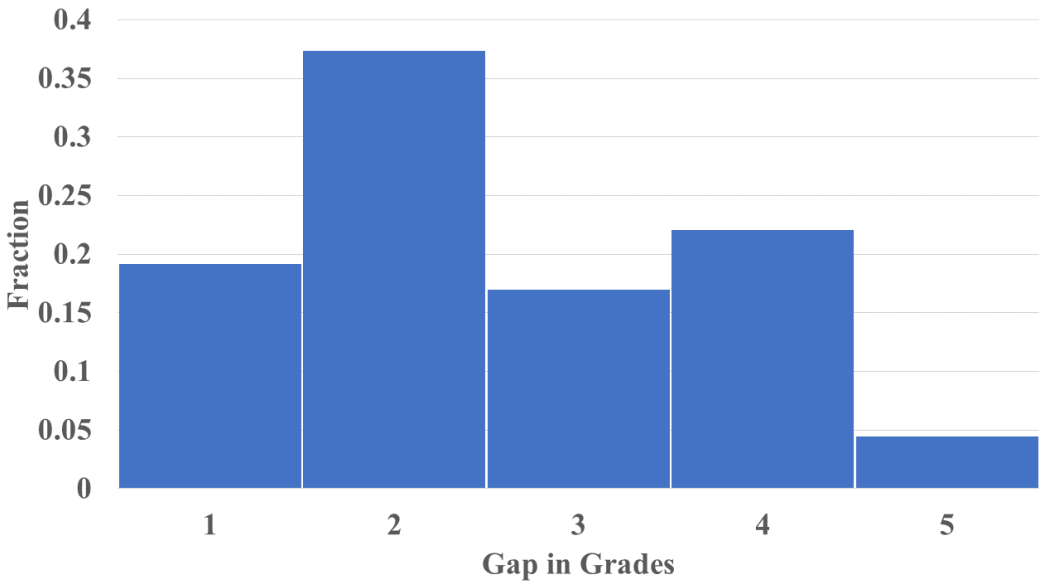

Figure 6: Distribution of the Gap in Grades

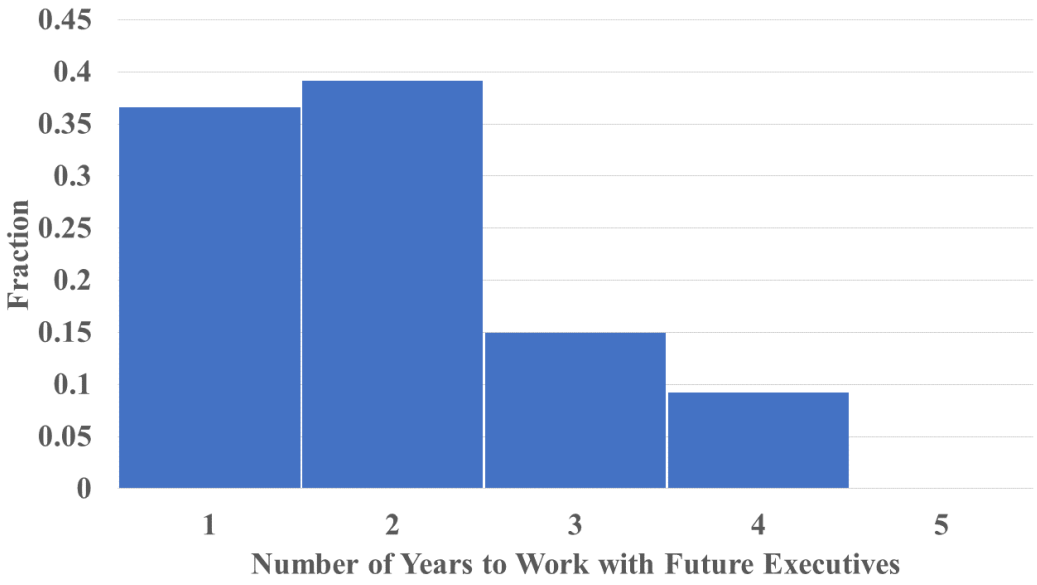

Figure 7: Distribution of the Number of Years to Work with Future Executives

Table 1: Grade, Title, and Annual Salary of the Employees at the MOF

Grade	Title	Annual Salary
1.	Official	$ 31,530
2.	Chief	$ 45,360
3.	Deputy Director of a Division	$ 73,140
4.	Director of an Office	—
5.	Director of a Division	$ 125,330
6.	Director of a Planning and Administration Division	—
7.	Deputy Director-General of a Bureau	—
8.	Deputy Vice-Minister	—
9.	Director-General (Customs and Tariff Bureau, Policy and Markets Bureau)	—
10.	Director-General (Tax Bureau, Financial Bureau, International Bureau, Strategy Development and Management Bureau, Supervision Bureau), Director-General of the Minister's Secretariat	$ 178,040
11.	Director-General of the Budget Bureau, Vice Minister for International Affairs	—
12.	Vice-Minister of Finance for International Affairs Commissioner of Financial Services Agency	—
13.	Vice-Minister of Finance	$ 233,740

[a.] This table summarizes the grade, title, and annual salary of employees at the Japanese MOF.

[b.] Annual salary is based on the examples disclosed by the Cabinet Bureau of Personnel Affairs (https://www.cas.go.jp/jp/gaiyou/jimu/jinjikyoku/pdf/r01_kyuyo.pdf(in Japanese) and converted using the exchange rate of 100 Japanese yen per US dollar.

Table 2: Descriptive Statistics for Main Variables

Variables	Mean	Std. Deviation
Grades	3.873	2.154
Probability of becoming the chief executive	0.038	0.190
Probability of becoming an executive	0.141	0.348
Probability of working with a future executive within the first five years	0.301	0.459
Average years of work	26.923	7.033
Average years of becoming an executive	29.948	4.525
Number of observations	25,765	25,765

[a.] This table reports the descriptive statistics of the main variables that cover the sample period between 1946 and 2019.

Table 3: Balance Tests Prior to the Shock

	Means		Difference	Std. Error
	Treatment	Control		
Grade	1.366	1.380	0.014	0.014
Hometown: Tokyo	0.408	0.384	-0.024	0.014
Specialization: Economics	0.268	0.262	-0.006	0.012
Law	0.679	0.668	-0.011	0.013
Education: Univ. of Tokyo	0.827	0.812	-0.016	0.011
Univ. of Tokyo × MA	0.020	0.034	0.014	0.005
Kyoto Univ.	0.078	0.082	0.004	0.008
Kyoto Univ. × MA	0.005	0.005	0.001	0.002
Hitotsubashi Univ.	0.048	0.040	-0.008	0.006
Hitotsubashi Univ. × MA	0.003	0.005	0.003	0.002
Tokyo Tech Univ.	0.002	0.003	0.001	0.001
Tokyo Tech Univ.× MA	0.002	0.001	0.001	0.001
Keio Univ.	0.017	0.023	0.006	0.004
Keio Univ. × MA	0.001	0.001	0.000	0.001
Waseda Univ.	0.024	0.025	0.002	0.004
Waseda Univ. × MA	0.000	0.001	0.001	0.001
Number of Observations	1,819	4,230		

[a.] This table reports the means of treatment and control groups (employees who receive the shock and those who do not) prior to the shock, the differences of the means, and corresponding standard errors.

Table 4: Results of Linear Probability Model

	(1)	(2)
Dependent Variable	*Chief Executive*	*Executive*
Shock	0.017	0.028
	(0.005)	(0.009)
Dependent Variable Mean	0.037	0.141
Adjusted R^2	0.035	0.108
Number of Observations	6,049	6,049

[a.] This table shows the estimates of the linear probability model based on the OLS described in Equation (3).

[b.] Heteroskedasticity-robust standard errors are reported in parentheses.

Table 5: Results of Two-Way Fixed Effect Model

Shock	0.541
	(0.026)
Individual and Year FE	YES
Dependent Variable Mean	3.873
Adjusted R^2	0.054
Number of Observations	25,765

[a.] This table reports the estimates coefficient of the two-way fixed effect model described in Equation (5).

[b.] Cluster-robust standard error across time and individuals is reported in parentheses.

Table 6: Results of Event Study (Working with Future Executive)

Years from the Shock	(1)	(2)	(3)
-6			-0.501
			(0.471)
-5		0.026	0.197
		(0.293)	(0.133)
-4	-0.185	-0.015	-0.067
	(0.147)	(0.126)	(0.085)
-3	0.052	-0.015	-0.043
	(0.062)	(0.052)	(0.050)
-2	-0.227	-0.140	-0.139
	(0.054)	(0.052)	(0.050)
+0	-0.250	-0.145	-0.135
	(0.041)	(0.043)	(0.037)
+1	0.070	0.124	0.114
	(0.029)	(0.030)	(0.025)
+2	0.459	0.504	0.466
	(0.035)	(0.035)	(0.029)
+3	0.527	0.559	0.518
	(0.029)	(0.028)	(0.027)
+4	0.678	0.709	0.657
	(0.028)	(0.026)	(0.023)
+5	0.668	0.682	0.629
	(0.035)	(0.033)	(0.031)
+6	0.678	0.696	0.634
	(0.034)	(0.032)	(0.028)
+7	0.731	0.742	0.672
	(0.034)	(0.032)	(0.030)
+8	0.827	0.837	0.776
	(0.036)	(0.034)	(0.031)
+9	0.977	0.990	0.909
	(0.042)	(0.041)	(0.039)
+10	1.109	1.121	1.049
	(0.047)	(0.044)	(0.040)
+15	1.571	1.552	1.442
	(0.051)	(0.048)	(0.043)
+20	2.175	2.129	1.966
	(0.082)	(0.076)	(0.075)
Years of Experience Before the Shock	5	6	7
Fixed Effects	YES	YES	YES
Dependent Variable Mean	3.941	3.941	3.941
Adjusted R^2	0.659	0.651	0.635
Number of Observations	16,079	16,429	16,800

[a.] This table shows the estimates of β_k on Equation (7). Three specifications are reported depending on the years of experience before the shock: (1) five years, (2) six years, and (3) seven years.

[b.] Cluster-robust standard errors across time and individuals are reported in parentheses.

Table 7: Results of Event Study (Working with Future Chief Executive)

Years from the Shock	(1)	(2)	(3)
-6			-0.233
			(1.087)
-5		-1.659	-0.545
		(0.365)	(0.311)
-4	0.041	-0.293	-0.297
	(0.427)	(0.267)	(0.189)
-3	0.056	-0.127	-0.083
	(0.167)	(0.135)	(0.120)
-2	-0.062	-0.036	0.003
	(0.124)	(0.107)	(0.102)
+0	-0.198	-0.147	-0.130
	(0.081)	(0.074)	(0.065)
+1	0.112	0.127	0.126
	(0.061)	(0.056)	(0.049)
+2	0.553	0.556	0.533
	(0.071)	(0.065)	(0.056)
+3	0.710	0.707	0.677
	(0.066)	(0.062)	(0.053)
+4	0.962	0.953	0.910
	(0.072)	(0.066)	(0.057)
+5	0.961	0.943	0.900
	(0.074)	(0.068)	(0.061)
+6	0.972	0.955	0.912
	(0.072)	(0.067)	(0.060)
+7	1.014	0.993	0.951
	(0.072)	(0.067)	(0.061)
+8	1.131	1.112	1.080
	(0.078)	(0.075)	(0.069)
+9	1.320	1.292	1.269
	(0.080)	(0.073)	(0.069)
+10	1.556	1.533	1.486
	(0.094)	(0.087)	(0.080)
+15	2.200	2.166	2.086
	(0.097)	(0.095)	(0.086)
+20	2.891	2.809	2.716
	(0.135)	(0.129)	(0.134)
Years of Experience Before the Shock	5	6	7
Fixed Effects	YES	YES	YES
Dependent Variable Mean	3.941	3.941	3.941
Adjusted R^2	0.674	0.662	0.642
Number of Observations	10,206	10,532	10,881

[a.] This table shows the estimates of β_k on Equation (7). Three specifications are reported depending on the years of experience before the shock: (1) five years, (2) six years, and (3) seven years.

[b.] Cluster-robust standard errors across time and individuals are reported in parentheses.

Table 8: Results Analyzing the Heterogeneity Among the Treatment Group

Dependent Variable	(1) *Chief Executive*	(2) *Executive*
Panel A: Gaps in Grades		
Shock (Gap: 1)	0.015	0.039
	(0.012)	(0.021)
Shock (Gap: 2)	0.019	0.030
	(0.011)	(0.018)
Shock (Gap: 3)	0.024	0.033
	(0.009)	(0.015)
Shock (Gap: 4)	0.011	0.020
	(0.006)	(0.011)
Shock (Gap: 5)	0.020	0.006
	(0.015)	(0.021)
Adjusted R^2	0.035	0.108
Number of Observations	6,049	6,049
Panel B: Number of Interactions		
Number of Shocks: 1	0.014	-0.005
	(0.005)	(0.010)
Number of Shocks: 2	0.023	0.033
	(0.005)	(0.010)
Number of Shocks: 3	0.017	0.035
	(0.007)	(0.015)
Number of Shocks: 4	0.049	0.100
	(0.012)	(0.021)
Adjusted R^2	0.039	0.114
Number of Observations	6,074	6,074

[a.] This table shows the results of robustness checks based on the model in Equation (8). *Panel A* shows the results when the shocks are constructed considering the gaps in the grades. *Panel B* shows the results when the shocks are constructed considering the number of interactions with future executives.

[b.] Cluster-robust standard errors across time and individuals are reported in parentheses.

Table 9: Results of Probit and Logit Models

	(1)	(2)
Dependent Variable	*Chief Executive*	*Executive*
Panel A: Probit Model		
Shock	0.364	0.170
	(0.092)	(0.062)
Pseudo R^2	0.121	0.107
Panel B: Logit Model		
Shock	0.728	0.316
	(0.205)	(0.112)
Pseudo R^2	0.121	0.106
Number of Observations	3,553	3,659

[a.] This table shows the estimates of the logit and probit models based on Equation (3).

[b.] Heteroskedasticity-robust standard errors are reported in parentheses.

Table 10: Results Based on Alternative Specification Omitting Time Variation

	(1)	(2)
Dependent Variable	*Chief Executive*	*Executive*
Number of Shocks: 1	0.008	-0.012
	(0.009)	(0.017)
Number of Shocks: 2	0.016	0.018
	(0.096)	(0.018)
Number of Shocks: 3	0.008	0.027
	(0.013)	(0.028)
Number of Shocks: 4	0.045	0.079
	(0.026)	(0.041)
Dependent Variable Mean	0.020	0.086
Adjusted R^2	0.020	0.046
Number of Observations	1,669	1,669

[a.] This table shows the results of robustness checks based on the alternative specification in Equation (11).

[b.] Heteroskedasticity-robust standard errors are reported in parentheses.

Table 11: Results Controlling the Initial Divisions

	(1)	(2)
Dependent Variable	*Chief Executive*	*Executive*
Panel A: Excluding the First Year		
Shock	0.020	0.038
	(0.006)	(0.010)
Adjusted R^2	0.040	0.112
Panel B: Excluding the First and Second Years		
Shock	0.022	0.035
	(0.007)	(0.012)
Adjusted R^2	0.040	0.111
Number of Observations	6,049	6,049

[a.] This table shows the results of robustness checks based on the linear probability model in Equation (3). *Panel A* shows the results when we control the initial divisions and exclude the first year from the treatment. *Panel B* shows the results when we control the initial divisions and exclude the first two years from the treatment.

[b.] Heteroskedasticity-robust standard errors are reported in parentheses.

Table 12: Results Using the Sample Prior to 2001

	(1)	(2)
Dependent Variable	*Chief Executive*	*Executive*
Shock	0.020	0.033
	(0.006)	(0.010)
Dependent Variable Mean	0.037	0.141
Adjusted R^2	0.033	0.091
Number of Observations	4,535	4,535

[a.] This table shows the results of robustness checks based on the linear probability model in Equation (3), where the sample period is restricted to the years prior to 2001.

[b.] Heteroskedasticity-robust standard errors are reported in parentheses.