The Costs of Workplace Favoritism: Evidence from Promotions in Chinese High Schools*

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Abstract

This paper studies the productivity consequences of favoritism in employee promotions within organizations. Using data from public high schools in four Chinese cities, I first show that teachers with hometown or college ties to the school principal are twice as likely to be promoted, after controlling for characteristics on their application profiles and their value-added in teaching. I then use the results from a survey in which I asked teachers to select anonymous peers to promote from a pool of applicants applying for promotion to infer each teacher's revealed fairness views regarding promotion qualifications. Contrasting these with actual past promotions in turn allows me to measure if and when a teacher might have observed unfair promotions in her own school in the past. Exposure to unfair promotions adversely affects *non-applicant* teachers' output, lowering their value-added and raising the probability that high-value-added teachers quit. The value-added effect appears to be driven primarily by teachers' social preferences for peer workers and the consequent erosion of their morale when peers suffer unfair treatment, while the quitting effect comes mainly from non-favored prospective applicants' career concerns as they learn about the principal's bias and leave due to poor promotion prospects. These adverse spillover incentive effects lead to a substantial reduction in school-wide performance. Finally, a transparency reform that required principals to disclose to their peers the profiles of promotion applicant teachers reduced the principals' bias and improved the overall productivity of schools.

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1 Introduction

Economists have long debated whether and when leaders in organizations should have discretion to make free choices - for example in hiring, task assignment, or promotions - as opposed to having to follow rules. The efficiency implications depend on whether the benefits of private information or the costs of favoritism dominate. Empirical evidence is mixed and context-specific.[1] However, the existing literature restricts attention to the *selection* decisions made by leaders themselves,[2] and we know almost nothing about how giving leaders discretion - and any resulting favoritism - changes the effort choices of downstream agents. Such incentive effects may be critical for the organization-wide productivity costs of granting upstream discretion.

Theoretically, the downstream incentive consequences of upstream favoritism for organizational performance are ambiguous. Favorable treatment can breed loyalty and induce reciprocity from the favored workers (Akerlof, 1982). Discrimination, however, can lower the incentives of the workers facing negative bias. (Prendergast & Topel, 1996; MacLeod, 2003). Apart from the relative importance of these two counteracting effects, the organization-wide impact also depends on how third-party co-workers, who are neither favored nor discriminated against, respond to favoritism they observe.[3] Such spillover effect can arise if third-party workers view themselves as potential victims or beneficiaries of (future) discrimination, or if favoritism is perceived as a fairness violation, which can reduce workers' effort (Koszegi, 2014; Falk *et al.* , 2018).[4]

This paper provides empirical evidence on the impacts of leaders' favoritism on subordinates' incentives at work by examining how school principals' bias in teacher promotions resulting from social connections affects teachers' behavior and consequent school-wide performance in Chinese public high schools. I show that applicant teachers who are socially tied to the current school principal are more likely to receive promotions than their equally-qualified competitors. Principals' biased promotion decisions in favor of applicants who belong to their social groups violate teachers' fairness norms, which adversely affects non-applicant teachers' output at both the intensive and the extensive margins, lowering their teaching performance in terms of value-added and raising the probability that high-value-added teachers quit. Mandatory disclosure of promotion applicant teachers' profiles to their peer teachers makes teachers respond more harshly to unfairness, reduces principals' bias and improves the overall productivity of schools.

Given that top-down favoritism is widespread in management, understanding how it causally shapes employees' behavior has important implications for organizational performance and how to improve it. However, there are two main challenges in uncovering empirical evidence on this question. The first issue

[1] Some studies find evidence supporting discretion (see e.g. Brogaard *et al.* , 2014; Li, 2017; Weaver, 2018), while others find evidence supporting rules (see e.g. Bandiera *et al.* , 2009; Giuliano *et al.* , 2009; Fisman *et al.* , 2017; Hjort, 2014; Durante *et al.* , 2014a; Hoffman *et al.* , 2017; Bandiera *et al.* , 2017; Xu, 2018), and yet others find mixed evidence (see e.g. Beaman & Magruder, 2012; Zinovyeva & Bagues, 2015; Jia *et al.* , 2015).

[2] For example, previous studies have looked at whether more productive workers are referred to employers by referees (Beaman & Magruder, 2012), hired by recruiters (Giuliano *et al.* , 2009; Hoffman *et al.* , 2017; Weaver, 2018), assigned to more tasks or more profitable positions by upstream leaders (Hjort, 2014; Xu, 2018), helped in collaborative jobs by managers (Bandiera *et al.* , 2009), and promoted to higher positions by evaluators (Zinovyeva & Bagues, 2015; Jia *et al.* , 2015; Fisman *et al.* , 2017; Xu, 2018); whether higher-quality papers are published (Brogaard *et al.* , 2014) and whether research projects of higher potentials are funded (Li, 2017); etc.

[3] If the groups of favored and discriminated against downstream agents are equal in size, which is probable when the resources for allocation are fixed, and these two counteracting effects are of similar magnitudes, the average effect of favoritism on the victims and the beneficiaries will be zero. In this case, the overall impact depends solely on how third-party co-workers respond.

[4] In the *Negative Reciprocity* section of the Global Preference Survey in Falk *et al.* (2018), respondents were asked about their willingness to punish someone for unfair behavior, either toward themselves or toward a third person, and a substantial share of respondents gave positive answers to both questions. Behavioral agency theory (e.g. Koszegi, 2014) predicts that workers may reduce effort in response to perceived fairness violations, especially under incomplete contracting.

relates to the difficulties in measuring both how employees perceive favoritism and their effort. Without information on what employees think unbiasedness should look like based on their available information, it is hard to tell whether and to what extent they observe the bias of their bosses, which might in turn affect the employees' behavior.[5] It is also difficult to measure the effort expended by workers even if their output can be observed, as production may be affected by the principal's favoritism itself if there exist complementarities between inputs from the principal and from workers in the production technology.[6] The second challenge is to convincingly isolate exogenous variation in favoritism. Pairing of principals and agents is endogenous both on the labor market and within an organization;[7] even within a principal-agent pair, the principal's exhibited favoritism might correlate with many other traits of his and other characteristics of his relationship with the agent.[8] Field experiments might do a better job in terms of introducing exogeneity in favoritism and measuring differences in workers' perception of bias and effort provision,[9] but they suffer from potentially more severe external validity concerns, and it is sometimes difficult to perform organization-wide welfare analysis when artificial experimental interventions do not provide straightforward counterfactuals against which to benchmark realities (see e.g. Breza, 2015).

Chinese public high schools provide an empirical setting which arguably allows me to address the endogeneity and the measurement concerns discussed above and to estimate the incentive effects of observing principals' favoritism on workers' effort choices. Teachers in these schools are promoted through the Chinese Professional Title Evaluation System where evaluations are conducted annually, and principals' recommendations play a crucial part in determining who receives promotion in the form of a title elevation. A transparency reform was introduced to different cities in different years, which required principals to disclose the profiles of teachers who apply for promotion to their peers, after which teachers can presumably better observe the qualifications of promotion applicants and the favoritism exercised by principals if they promote unqualified applicants. In cooperation with a provincial department of education in China, I collected newly digitized application profiles (formatted CVs) of teachers applying for the senior-ranked title in the promotion system in 4 cities from 2001 to 2017, merging them with personnel records of teachers and school principals as well as student test scores, to construct a unique dataset containing information on the teaching performance and the promotion history of teachers in all public high schools in these cities.

To measure social connections, I construct two pre-determined proxies of connectedness between teachers and principals: whether they were born in the same city and whether they attended the same college, which have been well-documented by previous studies to play an important role in social networks and re-

[5] Previous studies have utilized surveys to understand what constructs workers' fairness views in the workplace (e.g. Kaur, 2018). However, these surveys asked respondents to self-report their attitudes towards generally described workplace situations of discrimination or unfairness, and did not simulate contingent settings in the real workplace accounting for what workers actually observe and how they process their available information.

[6] For example, discriminated-against workers might be provided with fewer or less desirable tasks (Bandiera *et al.* , 2009; Hjort, 2014), interact less with managers (Glover *et al.* , 2017), not receive prestigious titles in academia which might affect citations (Zinovyeva & Bagues, 2015; Fisman *et al.* , 2017), etc.

[7] Existing studies deal with this problem mainly by exploiting plausibly exogenous turnover of principals (e.g. Xu, 2018) or quasi-random assignment of workers to positions or shifts (e.g. Bandiera *et al.* , 2009; Hjort, 2014; Glover *et al.* , 2017).

[8] To partially address this, Glover *et al.* (2017) surveyed the employees to provide suggestive evidence on mechanisms through which minority cashiers are less productive under biased managers in a French grocery store chain, and they find the most support for lack of workplace interactions between the minority workers and the biased managers.

[9] Generally, field experiments allow researchers to fix individual production technology and manipulate the wage rates of hired workers and their perceptions about how they are treated compared to co-workers. For example, Cohn *et al.* (2014) randomly assign working in groups of two performing identical individual tasks without complementarities, cut wages either of both workers or just one of the two after paying same-group workers the same, and compare study productivity responses; Breza *et al.* (2017) conduct an experiment in which they randomly assign workers in groups of three performing identical and non-complenentary tasks in which individual productivity is either easy or hard to observe, randomize whether coworkers within groups receive the same flat daily wage or differential wages according to their (baseline) productivity ranks, and compare their attendance and productivity at work.

source allocations in China (see e.g. Fisman *et al.* , 2018; Dai *et al.* , 2018).[10] To measure teachers' performance at work, I rely on the beginning-of-year and end-of-year class-subject average test scores of classes taught by each teacher and other class characteristics to estimate her individual-year-specific value-added (VA), namely her impact on student test scores, which is commonly used in the education literature.[11] Individual-specific average VA in a school is used to measure teachers' *quality*, while within-individual-across-year changes in VA are used to proxy their *effort*. The rationale of using value-added to measure effort comes from the observation that the production function of class test scores does not directly involve the participation of (biased) principals and is relatively homogeneous across teachers in different promotion statuses, holding class characteristics fixed.[12] I measure how teachers perceive unfairness resulting from principals' favoritism in promotions in 3 steps. First, I infer the teachers' views on appropriate qualifications for a fair promotion using the results of a survey conducted in 2018 in which I presented to the teachers the application CVs of a pool of anonymous applicants and asked them to select whom they think should receive a promotion. Then I use these inferred fairness views together with the CVs of actual applicants in the past to construct what the teachers' perceived unbiased promotion results should have looked like. In the last step, I contrast these "virtual" fair results with actual promotion decisions made by principals to measure if and when the teachers observed unfair promotions in their own schools after the transparency reform.[13]

Three main sources of variation are used to identify the existence of favoritism by principals and its impacts on teachers' behavior and school-level output. First, the turnover of principals in each school, which is decided by the local bureau of education rather than the principals themselves (unless they resign), generates shocks to the social connections between the teachers who apply for promotion and their principals. These within-school shocks enable me to examine how changes in social connectedness affect the promotion prospects of teachers in the same school, thus addressing potential sorting on time-invariant unobserved characteristics between teachers and principals to schools.

Second, holding a principal's preferences for her friends and a teacher's fairness views constant, the variation in the extent to which the principal makes unfair promotion decisions as perceived by the teacher comes from the across-year variation in the quality of the socially-connected teachers relative to the unconnected ones in the pool of applicants in a school: in a year in which the principal's socially tied applicants are better qualified or far less qualified than the untied ones, a biased principal might still make seemingly unbiased decisions in which the more qualified applicants are promoted, while in another year when the tied applicants are moderately less qualified than the untied ones, a biased principal might promote the former instead of the latter, leading to perception of unfairness by a teacher when she can observe the quality of the applicants. These within-principal-teacher shocks in the level of perceived promotion unfairness allow me to study how teachers respond to biased decisions made by principals, holding the principals' time-invariant characteristics as well as the time-invariant principal-teacher matching effects constant.

Third, the sample period captures variation in the observability of principals' biased behavior to teachers introduced by the transparency reform which mandated disclosing promotion applicants' CVs to the whole teaching staff in each school. Changes in perceptions of bias might affect how teachers respond to a given level of favoritism; how much favoritism principals consequently choose to exercise in their promotion decisions, holding their preferences constant, if they care about consequences of how teachers view their

[10] Other examples can be found in Shih *et al.* (2012); Cai (2014); Jia *et al.* (2015); Johnston (2017); Wang (2016); Fisman *et al.* (2017).
[11] See Hanushek & Rivkin (2010) for a review.
[12] I control for a set of observable job characteristics in the empirical analysis including workload, class re-assignments and end-of-last-year class test scores, etc.
[13] This revealed preference approach potentially allows me to better measure teachers' past unfairness perceptions than a retrospective self-reporting approach (see e.g. Podsakoff & Organ, 1986; Podsakoff *et al.* , 2003).

unfairness; and how these two effects combine to determine school-wide output in equilibrium.

The paper presents four main empirical findings. Using event studies exploiting within-school changes in the social groups school principals belong to induced by principal turnovers, I first show that applicant teachers who are socially connected to the incumbent principal are twice as likely to be promoted as their unconnected colleagues in the same school, after controlling for characteristics on their application CVs and their individual average value-added in the school. Principals value applicants' characteristics including value-added, experience and workload when making their promotion decisions, but seem to set a lower bar for promotion for those who are socially connected to them.

The second and the main finding is on the incentive effects of principals' favoritism on teachers' work performance. Exploiting within-principal-teacher variation in the teachers' perceived unfairness in the principals' promotion decisions, an averagely-biased promotion decision made by the same principal in each year lowers the yearly value-added of a non-applicant teacher in the school by 0.35 standard deviations in the same year and increases the probability that she quits the job by 16%, compared to a promotion decision that the teacher regards as fair. These negative effects persist for at least 3 years before they fully dissipate. Placebo tests show that perceived unfairness in future promotion results do not affect the teachers' current behavior. Unfair promotion decisions do not affect the *average* value-added or quitting probability of the applicants group; this is because the positive effects on the favorably promoted applicants are offset by the negative impacts on the unfairly denied ones. Therefore, the incentive consequences of promotion unfairness for the whole teaching staff in a school are driven almost exclusively by the adverse *spillover* effects on non-applicants.

The effect of the principal's favoritism on teachers' value-added, or effort provision, appears to be driven mainly by the teachers' social preferences for their peers and their undermined morale at work when peers suffer unfair treatment, as the effect is (1) most pronounced among non-prospective applicants and among those who have the most frequent interactions with the unfairly denied applicants,[14] (2) equally large for teachers with and without social connections to the decision-making principal, and (3) persistent even if the principal has stayed in the school for a long time, when the teachers presumably already know her well, and even if the principal has left the school and can no longer be "punished" by the teachers' reduced teaching performance. The quitting effect, on the other hand, appears to come primarily from non-favored prospective applicants' career concerns in that they learn about the principal's bias and leave due to inferred poor promotion prospects, as the effect is (1) the largest among prospective applicants who have high value-added but are not socially connected to the current principal, and (2) stronger when the principal has just entered the school, when her (biased) promotion decisions may potentially cause teachers' beliefs about her preferences to update dramatically.

Exploiting within-principal-school variation in the average level of promotion unfairness perceived by the whole teaching staff in each year, I also find that school-wide performance under the same principal is worse when the principal exhibits more favoritism in teacher promotions. In line with the adverse incentive effects on individual teachers, a school loses better-quality teachers while failing to replace them with equally able ones, produces lower test scores for the existing students and enrolls new students with lower prior test scores when its principal behaves unfairly in selecting applicant teachers for promotion.

In the last part of the paper, leveraging the across-city variation in the timing of the transparency reform, I perform difference-in-differences and triple-difference estimations and show that when non-applicant teachers can better observe the quality of their applicant peers, they respond more adversely to unfair pro-

[14] Non-prospective applicants are defined as those who have already obtained the highest Professional Title and will not participate in future promotion applications.

motions, and consequently principals become less biased in favor of their socially connected subordinates in promotions. The overall impact of this information disclosure policy on school performance is positive, as it raised the students' test scores in the provincial College Entrance Exams in cities to which the reform was introduced.

Taken together, the results suggest that giving school principals discretion in choosing which teachers to promote is costly, as they make choices in favor of those who are socially connected to them, and this leads to negative response in the teachers' effort choices when exposed to perceived unfairness and consequent decrease in school-wide output. Revealing applicants' profiles to peer teachers can partially correct the principals' favoritism and improve efficiency.

Related Literature.

This paper contributes to the literature on social incentives in organizations (see Ashraf & Bandiera, 2018, for a great review). I show that favoritism in teacher promotions by Chinese public high school principals has adverse incentive effects on teachers' effort and quitting choices out of career concerns and social preferences, while the detrimental consequences of leaders' top-down *vertical* social preferences towards subordinates documented in previous studies result mainly from inefficient selection or its combination with incentive distortion (e.g. Bandiera *et al.* , 2009; Hjort, 2014; Glover *et al.* , 2017; Xu, 2018).[15] In this sense this paper bridges the organizational economics literature on rules versus discretion at the leadership level (e.g. Hoffman *et al.* , 2017; Horton, 2017; Jacob *et al.* , 2018) with the literature in labor and behavioral economics on how workers respond to perceived treatment by employers (e.g. Krueger & Mas, 2004; Gneezy & List, 2006; Kube *et al.* , 2012, 2013; DellaVigna *et al.* , 2016; Breza *et al.* , 2017). It is also shown that school principals' favoritism-based discretion has negative aggregate impacts on organization-wide ouput, in line with findings of e.g. Giuliano *et al.* (2009); Bandiera *et al.* (2009); Hjort (2014); Hoffman *et al.* (2017); Xu (2018).

The paper also relates to the literature on fairness norms (e.g. Adams, 1963; Fehr *et al.* , 1993; Fehr & Schmidt, 1999; Fehr & Gächter, 2000; Falk *et al.* , 2008; Henrich *et al.* , 2010; Durante *et al.* , 2014b; Falk *et al.* , 2018; Enke, 2018) and their workplace consequences (see e.g. Kahneman *et al.* , 1986; Fehr *et al.* , 2009; Kaur, 2018). Previous studies have focused on the negative reciprocity behavior by workers upon whom unfairness is directly inflicted (e.g. Krueger & Mas, 2004; Bracha *et al.* , 2015; Breza *et al.* , 2017; Dube *et al.* , 2018; Coviello *et al.* , 2018; Cullen & Perez-Truglia, 2018). I show that the negative incentive effect of principals' favoritism on teachers' value-added in teaching comes primarily not from the teachers who directly suffer from the principals' biased practices themselves, but instead from the already-promoted colleagues with whom they frequently interact. This finding provides suggestive evidence of *horizontal* social preferences between co-workers (e.g. Bandiera *et al.* , 2005; Charness & Kuhn, 2007; Cohn *et al.* , 2014; Hjort, 2014; Breza *et al.* , 2017), and that violations of fairness for co-workers can also trigger negative responses, providing field evidence in the workplace for the survey results of Falk *et al.* (2018).[16] In addition, in their fairness notions the teachers heavily emphasize high value-added or productivity in the qualification for promotion and consequent salary increase, consistent with findings of e.g. Baron & Kreps (2013); Bracha *et al.* (2015); Breza *et al.* (2017) that workers view pay inequalities that reflect productivity differences as justifiable.

Finally, the paper speaks to the consequences of social connections in developing economies. When

[15] Xu (2018) isolates the effect of top-down social connections on downstream performance by fixing the position a colonial governor of the British Empire held during the patronage period and comparing the revenue the governor generated when he was connected to the incumbent Secretaries of State or not.

[16] A closely related finding is in Breza *et al.* (2017), where the authors show that paying lower wages to co-workers reduces the attendance rate of the better-paid workers within the same production unit. However, these better-paid workers are still directly affected by pay inequality and might suffer from social pressure - they are beneficiaries instead of victims.

markets function imperfectly, social connections can either enhance or lower economic efficiency.[17] In the context of China, hometown ties and college ties are well-established in earlier work to play significant roles in China in the growth of private enterprises (Dai *et al.* , 2018) and in promotions in the Chinese bureaucracy (e.g. Shih *et al.* , 2012; Jia *et al.* , 2015; Wang, 2016; Fisman *et al.* , 2017) and academia (Fisman *et al.* , 2018). This paper complements previous findings by documenting the negative productivity consequences of these social ties in the promotion system in Chinese public schools (see e.g. Karachiwalla & Park, 2017), which is an important setting in that schooling is crucial for economic growth (e.g. Barro, 1991) and school quality is critical to the return to education (e.g. Card & Krueger, 1992). Evidence on public high schools could shed light upon the whole Chinese public sector, including state-owned enterprises,[18] to which the same employee promotion system applies. Moreover, the paper points towards *internal* information disclosure within organizations as a potentially effective instrument to help address the costs of favoritism based on social ties in personnel policies, supplementing previous studies on the role of *external* transparency to the public in combating corruption and improving accountability of government officials in the developing world (see e.g. Besley & Burgess, 2001, 2002; Brunetti & Weder, 2003; Ferraz & Finan, 2008; Reinikka & Svensson, 2004, 2005, 2011).

The remainder of the paper is organized as follows. Section 2 introduces the empirical setting, the data, and the construction of the social ties and value-added measures. Section 3 shows evidence of favoritism by principals in teacher promotions based on social connections. Section 4 explains how I use the survey to infer the teachers' revealed fairness views and their perceived unfairness in past promotion results. Section 5 presents the adverse incentive effects of unfair promotions on teachers' behavior as well as their impacts on school-wide output. Section 6 evaluates the transparency reform in terms of reducing favoritism and improving productivity. Section 7 concludes.

2 Empirical Context and Data

2.1 Chinese Professional Title Evaluation System

Public high schools belong to the system of Public Institutions in China, where teachers are evaluated and promoted through the Professional Title Evaluation System that covers all professionals working in state-run enterprises and public institutions. Launched in 1986, this evaluation system is used to assign different professional ranks (or titles) to workers, which are a crucial determinant of the government-funded salaries they receive. Employees are typically elevated step by step in their ranks during their professional career.

For high school teachers, there are mainly 3 ranks from low to high: junior, middle and senior.[19] The junior rank is automatically assigned to teachers that are formally employed by the public high school system; the middle rank and the senior rankcan be applied for after fulfilling mandatory workload and seniority requirements.[20] Therefore, there are two levels of rank elevation: from junior to middle, and from

[17] Efficiency-enhancing roles of social networks include supporting business activity, facilitating job search, and providing social insurance and liquidity, while the negative efficiency implications inlcude impeding labor mobility, distorting resource allocation, and lubricating rent-seeking and corruption. See Munshi (2014) for a recent review on the empirical evidence of social networks and their implications in developing countries.

[18] The state-owned enterprises (SOEs) hold more than 30% of total assets of the secondary and tertiary sectors in China, see `http://blogs.worldbank.org/eastasiapacific/state-owned-enterprises-in-china-how-big-are-they`.

[19] A higher rank called "high senior" was introduced in 2013 to high school teachers, but only less than 1% with "exceptional contributions" have received it. I do not consider this rank in this paper, and merge it to the senior rank.

[20] A junior-ranked teacher can apply for the middle rank after holding the junior rank for at least 4 years if he has a college degree and 2 years if he has a graduate degree. A middle-ranked teacher is eligible to apply for the senior rank after being assigned the middle rank for at least 5 years and having worked in the current school for at least 4 years.

middle to senior. Evaluations are conducted annually.

The fraction of senior-ranked teachers in each school is decided by the local bureau of education (20% to 30%, depending on schools and years), so the number of middle-to-senior promotion slots for each school in a given year is pre-determined, while there are no strict quotas for the middle-ranked.[21] Consequently, there is within-school competition among the middle-ranked teachers applying for the senior rank each year, while the junior-ranked ones do not need to compete with each other for the middle rank. I focus on the elevation from the middle to the senior rank, to which the term "promotion" refers throughout the paper unless indicated otherwise. Promotion brings an increase in monthly salaries by 12%-15% (depending on cities and years), and as salary growth is exponential over time and pensions are proportional to the salaries at retirement, an (early) promotion has a persistent influence on teachers' life-long earnings, making the promotion results economically important to them.[22]

In the four cities I study, application starts in September, while the final promotion decisions are made available to teachers in each school in November. The process goes as follows: first the middle-ranked applicants submit their application profiles (a detailed CV and a personal statement) to the principal of the school they work in; after gathering all applications in the school, the principal writes a recommendation opinion for each applicant, which is very crucial in determining the results; then the recommendation letters, together with the application profiles, are submitted to a third-party committee in the city bureau of education, which is the final decision maker; after reviewing the application materials from all schools in the city, the committee delivers the promotion decisions back to each school, which are then made public to all the teachers.

Transparency Reform.

In the 4 cities I study, it is required that the name list of applicants be publicized to all the teachers in each school during the whole sample period. In 2005, city A became a pilot city of the nation-wide Open Public Information program, the then newly appointed Secretary of city A's Municipal Communist Party Committee launched an anti-corruption campaign requiring information disclosure in all personnel appointments and promotions in the city's public institutions, including the public high schools. This transparency reform requires that in addition to the name list, the promotion applicants' CVs should also be posted publicly to the whole teaching staff in each school. After piloting, the Regulations of the People's Republic of China on Open Government Information was adopted by the State Council in May 2007 and effective in May 2008[23] However, the regulations do not cover public institutions other than local governments, and information disclosure in public schools is not compulsory nationally even after the regulations became effective.

Although not mandatory, The transparency policy has since been adopted by the public school system of all the four cities by 2013 (see Table 1). Adoption was decided by the then incumbent leaders of the local bureau of education in each city. Conversations with local officials suggest that the policy was adopted by subsequent cities as it was believed that it could effectively combat corruption and improve school performance in previously adopting cities.[24]

[21] There are cases where one or two available slots are left vacant in a year and filled in the next years, which are not very common.

[22] The salaries of these public high school teachers are determined by their seniority and professional titles, which are independent of the variation in their performance. The salaries are funded jointly by the municipal and the provincial finance.

[23] See https://www.cecc.gov/resources/legal-provisions/regulations-of-the-peoples-republic-of-china-on-open-government.

[24] In Section 6, I evaluate this policy using econometrics tools and show that this was indeed true.

2.2 High School Operation

Principals in the public high schools studied in this paper are appointed by the local bureau of education which commonly rotates principals across different schools in each city, and the average length of a principal's term in a school is around 6 years. The high schools are managed by the principal, the highest leader, together with a Communist Party secretary, and a group of middle-level leaders including the deputy principals, the deans and the vice deans for academic affairs, moral education, general services, and the teachers' union, etc. These middle-level leaders are usually selected from the senior-ranked teachers in the school, and to spare time for administrative responsibilities, their teaching workload is usually reduced to half of that of the regular teachers.[25]

A cohort stays three years (or grades) in Chinese high schools. Students are enrolled in high schools based on their scores in the High School Entrance Exams (HEE), which are organized at the city level. The composition of students in a class does not change across grades in principle, except at the end of the grade 1 when the students choose one of the the two categories of subjects, liberal arts or sciences, to major in and prepare for the corresponding College Entrance Exams (CEE) upon graduation.[26] The College Entrance Exams are organized each year at the provincial level. At the end of grade 1 and grade 2, each city also organizes uniform end-of-year exams, so students' scores in these tests are comparable within the same cohort in a city.

It is common practice that a teacher follows the same classes in all grades for which the subject she teaches is required, and then returns to grade 1 with another school cohort. Most teachers teach several classes within one grade at a time. There is a class head teacher to manage student affairs for each class, which position is usually held by one of its teachers for all the three years. Teachers who retire before the graduation of the classes they currently teach are mainly replaced by newly hired veterans, while fresh college graduates usually start from grade 1. The existing teachers are re-assigned to new classes or grades mainly when the new veterans cannot fill all the non-grade-1 vacancies left by those who retire, leave the school or are selected as middle-level managers, which takes place infrequently.[27]

2.3 Administrative Data

The main administrative dataset I use is the newly digitized records of teachers' senior rank promotion application CVs, as well as the promotion results, in 112 public high schools in the four largest cities in a Chinese province from years 2001-2017 (see Table 1).[28] It covers all the public high schools in these cities which enrolled around 0.8 million students during the sample period. The application CVs include information on the applicants' demographics and their work performance measures in various aspects within the past 6 years prior to application, which I categorize into 6 types:

$$\mathrm{G} = \{\text{Demographics, Experience, Workload, Research, Teaching, Other}\}. \tag{1}$$

[25] Unfortunately, information on the middle-level leaders is not available in my data. However, I can infer possible taking-up of such positions from (permanent) teaching workload changes.

[26] Change to a new class is uncommon, as the students are assigned to classes at the beginning of grade 1 according to their stated preference for liberal arts or sciences. Unless they change their mind, they would stay in their grade-1 class. If a student changes class, she is usually placed in a class that matches her end-of-grade-1 test scores in the category of subjects she chooses.
The College Entrance Exams include the subjects Chinese, math and English for all students, in addition to which the liberal arts category tests politics, history, geography and the sciences category tests physics, chemistry and biology. At the end of grade 2, students in a category stop taking the 3 subjects required in another.

[27] The probability of such change is 9.8% in the sample I study.

[28] The total population of these 4 cities was 18.9 million in 2015, which accounts for 36.7% of the provincial population.

Variables on the application CVs, denoted as $\mathbf{X} = \{\mathbf{X}_g\}_{g \in \mathrm{G}}$, are listed in Table 2.

I supplement the application profiles with three other datasets. The first is the teachers' personnel records (1993-2017), which cover all the teachers in each school and provide information on their gender, ethnicity, city and year of birth, Communist Party membership status, college and/or graduate school attended, subject taught, past rank-elevation history in the Professional Title Evaluation System, etc. This dataset overlaps with a subset of the application profiles for the promotion applicants, while it also covers the non-applicants with less detailed information.

The second dataset is the students' test scores records (1995-2017), which include the class-subject average test scores in the High School Entrance Exams, the end-of-year exams and the College Entrance Exams. Information on class size, class head teacher and teacher assignment by subjects is also available, enabling me to match classes to the teachers who taught them in both the application profiles and the personnel records.[29] The test scores are mainly used to estimate the year-specific value-added of each teacher, which I discuss in Sub-section 2.4.2.

The last one is the profiles of school principals (1994-2017), which record the principals of schools in each year, their gender, age, city and year of birth, and the college and/or graduate school they attended.

I only include the years for which the promotion application profiles are available, and the teachers who teach one of the 9 subjects tested in the College Entrance Exams including Chinese, math, English, physics, chemistry, biology, politics, history and geography, as there is no uniform test score information on other subjects.[30] The sample covers 35,714 teachers, 210,424 teacher-year observations, 20,528 promotion applicants and 59,121 promotion applications filed. The mean promotion success rate within each school is 21.7% per year, and the average number of applications filed by a teacher who has applied at least once is 2.88, with an ultimate success rate of 51.6% for each teacher. Other summary statistics about the schools and the teachers are shown in Tables 3 and 4.

2.4 Construction of Variables

In this section, I explain how I construct two of the three primary variables used in the empirical analysis: the measures of social connections via which favoritism takes place, and the time-varying value-added measures of teachers which capture both their individual teaching quality and their productivity fluctuations over time. The third key variable, perceived promotion unfairness, will be discussed later in Section 4.

2.4.1 Social Ties

I consider social ties between a teacher and her principal or her colleagues that are pre-determined at the time they are paired in a school: college alumni ties and hometown ties, which have well-established precedence in the Chinese context in earlier work.[31]

For teachers (or principals) i and j, HomeTie_{ij} (CollegeTie_{ij}) takes value 1 if they were born in the same city (graduated from the same college). SocialTie_{ij} is a dummy indicating that i and j are connected through at least one of these two ties.

The cities in my sample are the four largest ones in the province with a large population of migrant workers, including teachers and principals, from smaller places. 93% of the teachers and the principals

[29] Only the end-of-year teachers of each class are recorded, therefore in the rare cases where there are changes of teachers during a school year, I credit the last one as the teacher who has taught the class for the whole year.

[30] The distribution of CEE subjects taught by applicants is shown in Figure **??**. Non-CEE subjects include PE, music, arts, computer science, etc.

[31] See for example Cai (2014); Jia *et al.* (2015); Wang (2016); Johnston (2017); Fisman *et al.* (2017, 2018).

graduated from one of the 6 colleges located in these cities (three in city A, two in each of cities B and C, and one in city D). 45% of them were born in the city they currently work in, and 42% graduated from a college located there.

The mean values of the between-principal-teacher measures of social ties, $\text{HomeTie}_{i,P(i,t)}$, $\text{CollegeTie}_{i,P(i,t)}$ and $\text{SocialTie}_{i,P(i,t)}$, are 0.231, 0.197 and 0.327 respectively.[32]

2.4.2 Teachers' Value-Added

To investigate whether there exists bias in the promotion recommendations by principals and their possible impacts on the behavior of school teachers, the first step is to construct a performance measure that is comparable both across different teachers to proxy individual *quality*, and within the same teacher over time to portray her *effort* provision, or performance. I choose value-added, which is defined as a teacher's impacts on students' test scores, mainly for two reasons. First, it is a standard measure of teacher quality in the education literature (Hanushek & Rivkin, 2010), used in practice for teacher evaluations in many school districts in the US and is shown to predict students' long-term outcomes (Chetty *et al.* , 2014b). Moreover, test scores in the highly competitive College Entrance Exams are virtually the sole college eligibility determinant of Chinese high school students, and high school teachers are valued by parents, principals, and more generally the Chinese society, mainly through their achievements in helping students earn high scores in these exams.

Unlike the student-level data used in most previous studies, my dataset provides test scores only at the class-subject-year level. Nevertheless, the commonly-used value-added model is still applicable. Specifically, I estimate the following empirical model for the average test scores of class c in subject k, school year t and grade $g\,(c,t)$, noted A_{ckt}:

$$\begin{aligned} & A_{ckt} = f^A_{k,g(c,t)}(A_{c,k,t-1}) + \phi^A \mathbf{x}_{ct} + g^A_{h(c)}\,(t) + \nu_{ckt}, \\ \text{where} \quad & \nu_{ckt} = \mu_{i(c,k,t),t} + \varepsilon^A_{ckt}. \end{aligned} \tag{2}$$

A_{ckt} is standardized to have zero mean and unit standard deviation within each subject-city-year cell.[33] $\mathbf{x}_{ct}$ is a vector of year-specific class characteristics, such as class size and an indicator for being an honor class. $f^A_{k,g(c,t)}(A_{c,k,t-1})$ is a subject-grade-specific control function of the end-of-last-year class average test scores in subject k, and is parameterized using cubic polynomials following Kane & Staiger (2008). $g^A_h\,(t)$ is a school-specific quadratic time trend. The error term ν_{ckt} is decomposed into two parts: a teacher-year effect for teacher i, $\mu_{i(c,k,t),t}$, and a class-subject-level idiosyncratic shock, ε^A_{ckt}. The estimate of the teacher-year-specific component is defined as the value-added (VA) of teacher i in year t.

$$\text{VA}_{it} := \hat{\mu}_{it}.$$

Measuring teachers' quality.

In order to study whether the better applicants are selected in the promotions, my first aim is to obtain a consistent measure of each teacher's quality, or their individual-specific VA. This is also the goal of most previous studies, where the VA is assumed to be time-invariant within each teacher (Kane & Staiger, 2008) or to drift smoothly over time allowing for auto-covariance across years (Chetty *et al.* , 2014a). As there might exist complementarities between schools and teachers and it is the within-school performance that should

[32] Table 5 provides more detailed summary statistics of the social tie statuses between teachers and principals.

[33] Each class-subject-year observation is weighted by the class size. For grade 1, the end-of-last-year test scores refer to the scores in the High School Entrance Exams.

be more relevant in promotion evaluations, I compute the teachers' individual within-school average VA as the measure of their quality:

$$\text{VA}_{ih} := \overline{\text{VA}_{it}}^{t \in \{t:h(i,t)=h\}}.$$

The underlying assumption for the above measure to represent teachers' true teaching quality is that classes in a school are not sorted to teachers on unobservable determinants of test scores ($\mathbb{E}\left[\varepsilon^A_{ckt}|i,h\right]=0$). However, it is conceptually not a serious issue even if this assumption does not strictly hold, as the main purpose I use this measure for is to compare promotion applicants, and it is reasonable that the teachers' actual teaching performance, rather than their innate ability, is presumably more relevant in promotion evaluations.[34]

Measuring teachers' effort.

The main purpose of this paper is to study changes in teachers' behavior in response to the promotion results in their schools, and the major outcome variable I consider is the level of teaching effort exerted, which I proxy using the within-teacher fluctuations in VA across years in the same school. For within-teacher-school variation in VA_{it} to capture changes in teacher i's teaching effort, it is required that $\mathbb{E}\left[\varepsilon^A_{ckt}|i,h,t\right]=\mathbb{E}\left[\varepsilon^A_{ckt}|i,h\right]$, that is, unobservable determinants of class average test scores do not correlate with a teacher's real input in the production function of scores within a school.[35] I cannot test for this assumption directly, but it does not cause omitted variable bias in the estimates of the impact of promotion results on the estimated VA measures if these unobservables do not themselves correlate with the promotion results. I will discuss this problem in the robustness checks in the empirical analysis.[36]

3 Favoritism in Principals' Promotion Decisions

In this section, I present the first main result of the paper: the estimate of the extent to which principals favor applicants who are socially tied to them in their promotion recommendations.

3.1 What Signals High Value-Added?

Before answering the question whether the principals tend to promote their socially connected applicants, I first investigate whether and what characteristics of an applicant on her application CV and/or her social ties to the principal can help predict her VA. Specifically, I estimate:

$$\text{VA}^{-6}_{jt} = \sum_{g\in\mathbf{G}} \mathbf{X}^g_{jt}\gamma^{\text{VA}}_g + \alpha^{VA}_H \text{HomeTie}_{j,P(j,t)} + \alpha^{\text{VA}}_C \text{CollegeTie}_{j,P(j,t)} + f^{VA}_{h(j,t)}(t) + \varepsilon^{\text{VA}}_{jt}, \tag{3}$$

where VA^{-6}_{jt} is applicant j 's average VA in the past 6 years prior to her application in year t,[37] $\mathbf{X}^g$

[34] The variation in VA_{ih} accounts for 63.4% of the total variance of VA_{it}, and the within-teacher-school residuals grow with experience for the first 5-6 years and then remain stable afterwards (see Figure **??**), which parallels the findings in Rockoff (2004).

[35] As I include controls in the empirical estimations that are at higher levels than teacher-school fixed effects, such as teacher-principal fixed effects, I do not take out within-teacher-school means (VA_{ih}) from the variable VA_{it} in advance.

[36] The major drawback of the VA estimation I perform is that I cannot observe the students' individual test scores or demographics. To check whether this causes serious issues, I cross-check how well my VA estimates match with alternative estimates using the Chetty *et al.* (2014a) method in a subsample for which individual test scores are available: all the schools in city A in years 2009-2017. The two VA estimates correlate nicely with each other with a correlation coefficient of 0.96 (see Figure **??**), providing suggestive evidence that the main VA measures capture the teachers' true impacts on test scores relatively well in the schools studied in this paper. Information on student demographics are not available in the subsample, but it might not cause substantial bias if Chinese high schools are comparable to schools in the US, where Chetty *et al.* (2014a) show that most of the sorting of students to teachers that is relevant for future test achievement is captured by prior test scores.

[37] I use the 6 year average VA as the performance measure because the performance-related information listed on the application CVs

denotes the vector of variables in category $g \in \mathbb{G}$ on the application CVs (see Definition (1)), and $f_h^{VA}(t)$ is a school-specific time trend. Standard errors are clustered at the applicant level.[38]

The estimation results are reported in Table 6. Of the 6 categories of applicant characteristics, only the teaching awards explain more than 10% of the variation in VA (58%). Social ties to the principal do not help predict an applicant's teaching performance.[39]

It is not surprising that the teaching awards are the most informative on the application CVs in terms of signaling the applicants' VA, as they are designed to honor teachers who produce bigger increase in the CEE scores of their students compared to their HEE scores *per se*.[40] The combination of the 2 highest teaching awards received in the past 6 years is indicative of an applicant's VA during the period (see Figure 1).[41] The applicants' average VA increases monotonically with the level of the highest teaching award they received, holding the second highest award fixed, and vice versa. An applicant who receives the highest possible awards (two 1st Prizes) is on average 3.1 standard deviations higher in her VA compared to one who receives the lowest awards (two Excellence Prizes).

3.2 Principals' Promotion Recommendation Decisions

Favoritism by principals via social ties.

I analyze how the principals decide whom to promote based on characteristics shown on the applicants' CVs and whether they are socially tied to the principal. Specifically, I run:

$$\mathbb{E}\left[\text{Promoted}_{jt}\right] = F\left(\mathbf{X}_{jt}\gamma^P + \alpha^P \text{SocialTie}_{j,P(j,t)} + \beta^P \text{Controls}_{jt}\right), \tag{4}$$

where $\mathbf{X}_{jt}$ denotes the vector of variables on the application CVs, and SocialTie_{jt} is an indicator for applicant j being connected to the principal through either hometown ties or college ties. Controls_{jt} includes applicant-irrelevant promotion probability determinants including a school-year fixed effect, $\lambda_{h(j,t),t}$, which controls for the expected success rate pre-determined by the number of available slots and the number of applicants in each promotion, and the share of applicants teaching the same subject as applicant j in her school, $\text{share}_{k(j),h(j,t),t}$, which gauges the within-subject competition for promotion slots. The coefficient

covers the same period of time. While the compulsory requirement is 4 years, over 96% of promotion applications are filed after at least 6 years in the current school, therefore VA^{-6} covers (a part) of the individual within-school teaching performance of an applicant.

[38] I cluster standard errors at the teacher level in most of the regressions. I also cluster standard errors at the principal level for robustness checks, which does not change the results substantially.

[39] Although $\hat{\alpha}_H^{VA}$ and $\hat{\alpha}_C^{VA}$ are statistically significant, their magnitudes are below 0.1SD of the outcome variable, and their partial R^2 is very small (0.0032).

[40] According to an official in the provincial department of education, these awards are based on "the within-city-year ranking of the difference between the average standardized (SD=1 within subject-city-year) College Entrance Exams scores and the average standardized High School Entrance Exams scores of the students (whose grade 3 is) taught by a teacher. From low to high levels the awards include the Excellence Prize (20%) which almost every teacher who teaches the 3rd grade in the year receives, the 3rd Prize (40%), the 2nd Prize (25%) and the 1st Prize (15%). To examine how well the award-assigning rules described above are followed, I construct the corresponding running variable, a crude 3-year value-added measure, using $\Delta A_{jt} := A_{jt} - A_{j,t-3}$, where A_{jt} is the mean CEE scores of the graduating classes teacher j teaches in year t and $A_{j,t-3}$ is the mean HEE score of these classes. The relationship between this running variable and teaching awards is presented in Figure **??**. The discontinuity in teaching award levels at the crude VA cutoffs should be sharp (that is, one) if the running variable is computed without errors and the rules of teaching award assignment are strictly followed. The estimated effect of surpassing the corresponding crude VA cutoffs on the probability of receiving a higher-level teaching award is 0.913. The crude 3-year VA measure has a 0.714 correlation with the 3-year average of teacher-year-specific VA (VA_{it}), the measure I construct, and indeed the 3-year average VA is a fuzzy predictor of teaching awards: surpassing the corresponding mean VA cutoffs increases the probability of an elevation in teaching award by 0.618 (see Figure **??**).

[41] The application CVs list teaching awards received by the applicant in the past 6 years, during which period it is typical for a teacher to go through the CEE twice with 2 cohorts. Therefore, most applicants list 2 teaching awards, and I construct $4 \times 4 = 16$ dummies on each combination of the two highest-level teaching awards. There are a few who list a 3rd teaching award, for which I include dummies separately in the estimation.

α^P in Equation (4) characterizes the principals' favoritism towards applicants with hometown or college ties.

Table 7 reports the regression results. Columns (1) and (2) show estimates using a logit model[42], and the rest of the table presents results using a linear probability model. Columns (2), (4) and (6) add controls of the applicants' school-specific VA (VA_{jh}), which captures possible private information the principals might have about the applicants' quality that is not reflected on their application CVs.[43] Columns (5) and (6) include a individual fixed effect, λ_j, fixing the comparison of promotion results within the same teacher who applies multiple times to address possible sorting of teachers to schools or principals. The estimates are robust to different specifications and controls.[44] An applicant who is socially tied to the principal is on average twice as likely to be promoted as an untied counterpart (see Panel (A)).[45] When considering hometown ties and college ties separately, the effect on promotion rates is 80% of the former and 60% of the latter (see Panel (B)).[46]

To present more explicitly the influence principals have on the promotion results in their schools, I use event studies to investigate whether the entry of a new principal to a school who comes from a different hometown or college than the old one has an impact on the promotion rates of applicants in the school who belong to different hometown or college groups. Upon such an event, the applicants can be divided into three types in terms of their social tie connectedness to the old and the new principals:

$$\mathbb{Q} = \{\text{Tied before \& untied after, Untied before \& tied after, Untied before \& after}\}.$$

I estimate:

$$\text{Promoted}_{j,t+s} = \sum_{\tau=-3}^{3} \sum_{q \in \mathbb{Q}} \mu_{q\tau} \mathbb{I}\left[q\left(j\right) = q, s = \tau\right] + \mathbf{X}_{j,t+s}\gamma^{\mu} + \beta^{\mu}\text{Controls}_{j,t+s} + \varepsilon^{\mu}_{j,t+s}. \tag{6}$$

The coefficients $\left\{\mu_{q\tau}\right\}_{q,\tau}$ represent the expected promotion probability of applicant group q in year τ relative to the entry of the new principal, after residualizing out within-school-year average promotion rates and the applicants' characteristics on their CVs.

Figure 3 plots the results. The horizontal axis displays the years relative to the principal entry, and on the vertical axis the coefficient estimates $\left\{\hat{\mu}_{q\tau}\right\}_{q,\tau}$ are shown. We can see that the arrival of a new principal immediately raises the probability that her socially tied applicants get promoted, and the loss of social connections upon the departure of a principal takes away at once the advantage these connections bring to the promotion prospects. $\left\{\hat{\mu}_{\text{untied to tied},\tau}\right\}_{\tau \geq 0}$ and $\left\{\hat{\mu}_{\text{tied to untied},\tau}\right\}_{\tau < 0}$ are similar in magnitudes to the coefficient estimates $\hat{\alpha}^P_H$ and $\hat{\alpha}^P_C$ in Equation (5), as expected (see Table **??**). The results also show that there is trivial heterogeneity in the extent of favoritism by how long the principals have stayed in their current

[42] $F\left(x\right) = \frac{e^x}{1+e^x}$.

[43] This is probable as the principals receive reports on the class-subject average test scores in the city-level end-of-year exams in their schools as well as the city-wide score distributions, and in principle they are able to compute crude value-added measures of a teacher using this information. However, the extent to which principals are willing and/or able to do such computations is in question. Jacob & Lefgren (2008) show that principals in a western US school district can generally identify teachers who produce the largest and smallest VA but have far less ability to distinguish between teachers in the middle.

[44] Although including the applicant fixed effects boost the standard errors, the coefficient estimates are still statistically significant.

[45] The point estimate $\hat{\alpha}^P$ is around 21 percentage points while the average success rate is 22%.

[46] In this case, the estimation equation is

$$\mathbb{E}\left[\text{Promoted}_{jt}\right] = F\left(\mathbf{X}_{jt}\gamma^P + \alpha^P_H \text{HomeTie}_{j,P(j,t)} + \alpha^P_C \text{CollegeTie}_{j,P(j,t)} + \beta^P \text{Controls}_{jt}\right). \tag{5}$$

The point estimates $\hat{\alpha}^P_H$ and $\hat{\alpha}^P_C$ are around 18 and 14 percentage points, respectively.

schools: they exhibit such discrimination as soon as they start their term, and getting to know the teachers better does not correct their bias.

Principals' evaluation criteria.

Apart from social ties, it is worth looking at how the principals select applicants in general. The first finding is that they still value other information on the application CVs including teaching awards. The estimated coefficients on the teaching award combinations in Equation (4) are plotted in Figure 2, where we can see that winning better teaching awards increases an applicant's chance of receiving a promotion, with the winners of the highest awards on average 63 percentage points more likely to succeed compared to the recipients of the lowest awards. Higher experience, heavier workload, more journal publications and other awards also better an applicant's promotion prospect (see Tables **??** and **??**).

I also investigate whether the principals evaluate applicants within the socially tied group and the untied group respectively in similar ways in terms of other characteristics on their application CVs . For clarity I first reduce the dimensionality of $\mathbf{X}$, which includes a lot of variables, by partitioning it into the 6 categories $g \in \mathbb{G}$ (see Definition (1)) and constructing the applicants' categorical promotability indices (as valued by the principals):

$$\begin{cases} \hat{\eta}_{jt}^{P,g} := & \mathbf{X}_{jt}^{g}\hat{\gamma}_{g}^{P},\ g \in \mathbb{G}, \\ \hat{\eta}_{jt}^{P,Tie} := & \hat{\alpha}_{H}^{P}\text{HomeTie}_{j,P(j,t)} + \hat{\alpha}_{C}^{P}\text{CollegeTie}_{j,P(j,t)}, \end{cases} \tag{7}$$

where $\left\{\hat{\gamma}_{g}^{P}\right\}_{g\in\mathbb{G}}$, $\hat{\alpha}_{H}^{P}$ and $\hat{\alpha}_{C}^{P}$ are the coefficient estimates from a regression of Equation (4).[47] I then estimate:

$$\mathbb{E}\left[\text{Promoted}_{jt}\right] = F\left(\sum_{g\in\mathbb{G}}^{\omega\in\{0,1\}} \rho_{g}^{\omega}\mathbb{I}\left[\text{SocialTie}_{j,P(j,t)} = \omega\right]\hat{\eta}_{jt}^{P,g} + \rho^{Tie}\hat{\eta}_{jt}^{P,Tie} + \beta^{\rho}\text{Controls}_{jt}\right). \tag{8}$$

The difference between ρ_{g}^{1} and ρ_{g}^{0} displays the extent to which the principals put higher weight on category-g characteristics in selecting whom to promote within the socially tied group in comparison with the untied group. I also replace the categorical promotability indices with a single social-tie-irrelevant composite index:

$$\hat{\eta}_{jt}^{P,\mathbf{X}} := \sum_{g\in\mathbb{G}} \hat{\eta}_{jt}^{P,g},$$

to study how the principals refer to the applicants' CVs in general.[48] Results are shown in Table 8. We can see that when evaluating applicants with different social connectedness, the principals use information from the application CVs in a very similar way ($\hat{\rho}_{g}^{0} \approx \hat{\rho}_{g}^{1}$ for $g \in \mathbb{G}$). This is also true if we think of the principals as selecting applicants by their VA: within each promotion evaluation the gaps between promotees and unpromoted applicants in their average teacher-school-specific VA are similar in both the socially tied and the untied groups (see Table 9):

$$\begin{aligned} \hat{\mathbb{E}}_{ht}\left[\text{VA}_{jh}|\text{Tied, Promoted}\right] - \hat{\mathbb{E}}_{ht}\left[\text{VA}_{jh}|\text{Tied, Denied}\right] &= 0.996, \\ \hat{\mathbb{E}}_{ht}\left[\text{VA}_{jh}|\text{Untied, Promoted}\right] - \hat{\mathbb{E}}_{ht}\left[\text{VA}_{jh}|\text{Untied, Denied}\right] &= 0.942. \end{aligned}$$

[47] I use the coefficient estimates from the logit model separating hometown ties and college ties without extra controls (see Panel (B), Column (1) of Tables 7 and Column (1) of **??**).

[48] In this case, the estimation equation is

$$\mathbb{E}\left[\text{Promoted}_{jt}\right] = F\left(\sum^{\omega\in\{0,1\}} \rho^{\omega}\mathbb{I}\left[\text{SocialTie}_{j,P(j,t)} = \omega\right]\hat{\eta}_{jt}^{P,\mathbf{X}} + +\rho^{Tie}\hat{\eta}_{jt}^{P,Tie} + \beta^{\rho}\text{Controls}_{jt}\right). \tag{9}$$

To conclude, in promotion evaluations the principals act as if they build a promotability index for each applicant using some uniform criteria which correlate positively with the applicants' VA, and show favoritism by setting a differentially low promotion threshold in this index for those applicants who are socially connected to them.

3.3 Robustness Checks

To interpret the adjusted difference in promotion rates between socially tied and untied applicants as evidence for the principals' favoritism, two underlying assumptions need to hold.

The first assumption is that the difference does not come from the principals' private information. That is, social ties must not correlate with determinants of the applicants' quality that are observable to the principals but not to me, otherwise the omitted variable bias will occur. Apart from controlling for the rich set of variables on the application CVs and the applicants' estimated VA, which has substantially helped in addressing such concerns, I provide several further robustness discussions here.

First, balance tests in Table **??** and Figure **??** show that applicants who are socially tied to their principals are not stronger, and, if anything, weaker than their untied competitors along observable characteristics. Given these patterns, it is not very likely that the socially tied applicants are so much better in the principals' private information set as to justify their starkly higher promotion rates. Second, as shown in the event studies, the principals exhibit bias in promotion evaluations throughout their term in a school. Even if it is true that the principals learn about their connected subordinates better over time and choose to promote those whom they know well, it should not show up in the differential promotion rates at the very beginning of their term when they have presumably very limited information about the applicants' within-school performance. On the other hand, even if it is the case that the principals promote their connected teachers at the beginning because they learn about their (good) performance faster, it cannot explain the persistence of their bias over years. Third, if a principal relies substantially on her private information which tells very different things about the connected and the unconnected applicants, it is not probable that she treats their application CVs in homogeneous ways as evidenced by the estimation results of Equation (8).

The second assumption is that a successful or a failed promotion does not lead to differential changes in how much applicants of different social connectedness to the principal contribute to the total output of each school. This issue relates to the question whether promoting the best-teaching-quality applicants is better for the whole school than promoting the principal's friends.[49] There are several stories in which this might not be the case. First, if the low-quality friends of a principal, once promoted, return the principal's favor by working harder, while the unpromoted high-quality untied applicants do not retaliate (or at least not as much as the friends reward), then there is rationale for the principal to favor the former group. Another possibility is that principals might cooperate better with the promoted senior-ranked teachers who are socially tied to them. As described in Sub-section 2.2, some senior-ranked teachers in each school are selected as middle-level leaders who assist the principal in school management. If a principal works better in a management team consisting of those who share the same hometown and/or college background with her, she might promote her socially connected applicants out of efficiency concerns rather than favoritism, even though these applicants might not produce the highest VA in students' test scores.

The answer to the above question is empirical. In fact, the findings presented in the next section show

[49] For example, Benson *et al.* (2018) show that firms which prioritize current job performance when making promotion decisions, at the expense of other observable characteristics that better predict managerial quality, suffer from substantial costs of managerial mismatch.

that the opposite is true: favoritism violates the fairness views of teachers, causes worsened teaching performance and leads to productivity costs for each school.

3.4 Possible Mechanisms

It is worth pointing out that principals' bias is likely driven by their intrinsic social preferences for their social groups (see e.g. Bandiera *et al.* , 2009),[50] but not necessarily so. The favors could also be handed out in exchange for unobserved bribes or due to bottom-up influence activities (see e.g. de Janvry *et al.* , 2019), which social ties are likely to facilitate (see e.g. Wang, 2016),[51] or future rewards from the favored subordinates on other occasions than the schools (see e.g. Jia *et al.* , 2015).[52] With the empirical results presented, I cannot distinguish between these possible mechanisms and therefore do not take a strong stand on whether the principals' social preferences, influence activities, or gift exchanges, play a major rule in driving the observed favoritism.

3.5 Who shows higher favoritism?

In this sub-section, I explore whether and how the weights placed by the principals in their promotion evaluations on the applicants' characteristics and social ties vary with principal types. Specifically, I estimate:

$$\mathbb{E}\left[\text{Promoted}_{jt}\right] = F\left(\sum_{g\in\{\text{G},Tie\}}\left(\tilde{\rho}^{D}_{1g}+\tilde{\rho}^{D}_{2g}D_{P(j,t),t}\right)\hat{\eta}^{P,g}_{jt}+\beta^{\tilde{\rho}}\text{Controls}_{jt}\right), \tag{10}$$

where $\left\{\hat{\eta}^{P,g}\right\}_{g\in\mathbb{G}}$ are the categorical promotability indices in Definition (7), and D represents principal demographics including age and gender. The coefficients of interest are $\left\{\tilde{\rho}^{D}_{2g}\right\}_{g\in\{\mathbb{G},tie\}}$, which characterize the heterogeneity in how much principals value applicant characteristics in the 6 different categories.

Results are shown in Table 10. The most pronounced heterogeneities lie in teaching awards and social ties. Compared to their female counterparts, male principals put 60% higher weight on the applicants' social ties.[53] A 10-year-older principal values social ties 50% more and teaching achievements 40% less compared to a younger one.[54] Male and older principals give more favoritism towards promotion applicants with social ties, and the latter also emphasize teaching quality less.[55]

3.6 Social Ties and Application Decisions

The analysis in this section has focused on the impacts of possessing social ties to the principal on the success rates of promotion applicants. Social connections can have influence on whether eligible middle-ranked teachers decide to apply or not.[56] If lacking connections to the principal discourages high-quality

[50] Bandiera *et al.* (2009) show that when managers in a fruit-picking worksite are paid fixed wages, they favor workers to whom they are socially connected irrespective of the workers' ability.

[51] Wang (2016) argues that connections enable effective and safe communication among corrupt Chinese military officers through communication, exchange and neutralization.

[52] Jia *et al.* (2015) show that connections foster loyalty of junior officials to senior ones in Chinese bureaucracy, which is not necessarily reflected in the local GDPs of the provinces governed by the junior officials.

[53] $\frac{0.487}{0.783}\approx 60\%$, see Columns (3) and (4) of Row (7) in Table 10.

[54] $\frac{0.452}{0.987}\approx 50\%$, see Columns (1) and (2) of Row (7); $\frac{-0.385}{0.974}\approx -40\%$, see Columns (1) and (2) of Row (5) in Table 10.

[55] A related work is Bagues *et al.* (2017), in which the authors show that male evaluators are more favorable toward their own sex than their female counterparts in evaluating applications to associate and full professorships in Italy and Spain.

[56] See for example Bagues *et al.* (2015), in which the authors show that connections are an important determinant of application decisions in the Italian academia, where selection on social connections is negative in that prospective candidates are significantly less likely to apply when the committee includes a colleague or a co-author.

teachers from applying, then the overall (negative) selection effects of favoritism might be even larger than what shows up in promotion evaluations themselves.

I define eligible applicants as the middle-ranked teachers who satisfy the mandatory experience and seniority requirements for applying for the senior rank, and then compare the differences in VA between the socially tied and the untied teachers among the eligible applicants, the actual applicants and the promotees:

$$\Delta_p := \hat{\mathbb{E}}_{ht}[\text{VA}_{jh}|\text{Untied}, p] - \hat{\mathbb{E}}_{ht}[\text{VA}_{jh}|\text{Tied}, p],$$

where $p \in \{\text{Promoted, Applied, Eligible}\}$.

Table 9 reports the results. The socially untied teachers are of higher VA compared to the tied ones in all the three groups, while the differences are widened as we move from the eligibles to the promotees,[57] indicating the existence of both self-selection on social connections by prospective applicants in their application decisions and selection by principals in their choices over applicants in terms of VA, while the magnitude of the former is around 17% as large as the latter.[58]

4 Teachers' Perceptions of Unfairness

In this section, I build the bridge between the two main parts of empirical analysis in the paper: documenting the existence of favoritism by school principals via social ties (Section 3), and studying the teachers' responses to their perceived unfairness in promotion results which is a direct consequence of the principals' favoritism (Section 5). Coefficient α^P in Equation (4) characterizes the principals' *preferences* for their social connections,[59] which is not directly observed by the school teachers. It is the principals' promotion decisions, or their *behavior*, that the teachers observe and potentially respond to.

I first discuss conceptually how the differences between the principals' (biased) preferences and the teachers' fairness preferences lead to the teachers' perceived unfairness in promotion results, and explain the source of variation in the perceptions of unfairness that identifies their impacts on the behavior of teachers and consequently the aggregate productivity of schools. Then I turn to implementation and explain how I use the results from a survey to infer the teachers' revealed fairness notions and the extent of unfairness they might perceive in past promotions in their schools.

4.1 Conceptual Framework

Denote the promotion results in school h in year t, which are observable to the school teachers, as Ω_{ht}.[60] It can be viewed as the image of the characteristics of the applicants in that year, $\left\{\left(\mathbf{X}_{jt}, \text{SocialTie}_{j,P(j,t)}\right)\right\}_{h(j,t)=h}$, which are observable to peer teachers after the transparency reform, under a mapping function that is parameterized using the preferences of the principal, $\left(\gamma^P, \alpha^P\right)$.

$$\left\{\left(\mathbf{X}_{jt}, \text{SocialTie}_{j,P(j,t)}\right)\right\}_{h(j,t)=h} \overset{\Omega\left(\gamma^P, \alpha^P\right)}{\longmapsto} \Omega_{ht}, \tag{11}$$

[57] $\Delta_{\text{Promoted}} > \Delta_{\text{Applied}} > \Delta_{\text{Eligible}} > 0$.

[58] $\left(\Delta_{\text{Applied}} - \Delta_{\text{Eligible}}\right) / \left(\Delta_{\text{Promoted}} - \Delta_{\text{Applied}}\right) \approx 17\%$, see Table 9.

[59] Strictly speaking, the coefficients $\left(\gamma^P, \alpha^P\right)$ in a reduced-form logit model of promotion decisions do not characterize structural preference parameters. However, under a fixed policy environment (e.g., under the transparency policy), they can proxy the principals' preferences. I abuse terminology here and refer to $\left(\gamma^P, \alpha^P\right)$ as preference parameters.

[60] Ω_{ht} is a N_{ht}-dimensional vector of binary variables indicating the promotion status of each applicant, where N_{ht} is the number of applicants in school h in year t.

where the mapping function, $\Omega\left(\gamma^P, \alpha^P\right)$, guided by the specification of Equation (4), is given by:

$$\text{Promote } j \text{ iff Ranking}_{ht}\left(\eta_{jt}^P\right) \leq N_{ht},$$

where N_{ht} is the number of promotion slots, and the latent variable is defined as:

$$\eta_{jt}^P := \mathbf{X}_{jt}\gamma^P + \alpha^P \text{SocialTie}_{j,P(j,t)}.$$

To measure unfairness in the promotion results Ω_{ht} perceived by teacher i in the school, it is necessary to understand what the fair results under her fairness views, noted Ω_{it}, would have been. The difference between Ω_{it} and the actual promotion results,

$$\Delta\Omega_{it} := \Omega_{it} - \Omega_{h(i,t),t},$$

is the unfairness perceived by teacher i.

Conceptually, Ω_{it} can be viewed as the image of applicant characteristics $\left\{\left(\mathbf{X}_{jt}, \text{SocialTie}_{ji}\right)\right\}_{h(j,t)=h}$ under a mapping function that takes the same functional form as Ω but uses the preference parameters of teacher i, $\left(\gamma^i, \alpha^i\right)$:

$$\left\{\left(\mathbf{X}_{jt}, \text{SocialTie}_{ji}\right)\right\}_{h(j,t)=h(i,t)} \overset{\Omega\left(\gamma^i,\alpha^i\right)}{\longmapsto} \Omega_{it}. \tag{12}$$

Existence of perceived unfairness.

Notice that if $\alpha^P = \alpha^i = 0$ and $\gamma^P = \gamma^i$, teacher i's perceived fair promotion results Ω_{it} , will exactly coincide with the actual results $\Omega_{h(i,t),t}$, regardless of the characteristics of the applicants. That is, if teachers in a school evaluate the applicants' CVs in the same way as their principal and neither of them have preferences for their social ties in the workplace, there will not exist unfairness perceived by the teachers. Therefore, perceived unfairness arises from at least one of the following cases: (i) the principal and the teachers hold different opinions regarding which information on the applicants' CVs is important, (ii) they both value social ties but they belong to different social groups, or (iii) they are socially tied to each other but they do not value social ties equally heavily.

Variation in perceived unfairness.

If preference parameters $\left\{\left(\gamma^P, \alpha^P\right), \left(\gamma^i, \alpha^i\right)\right\}$ are constant over time, the variation in perceived unfairness $\Delta\Omega_{it}$ comes from the variation in $\left\{\left(\mathbf{X}_{jt}, \text{SocialTie}_{j,P(j,t)}, \text{SocialTie}_{ji}\right)\right\}_{h(j,t)=h(i,t)}$, the composition of applicants in each year. For example, if an applicant who is socially tied to the principal is of higher quality compared to her untied competitors, the school teachers might not disagree with the principal promoting her; but if she is relatively weak but chosen over more qualified untied applicants, teachers in the school might view the promotion results as unfair. Notice that under these two scenarios the preferences of the principal do not change, and it is the relative quality of the principal's social connections compared to the other applicants that causes the variation in the extent to which the teachers perceive unfairness.

Although Ω_{it} is not directly observable, it can be derived if parameters $\left(\gamma^i, \alpha^i\right)$ are known. I use a survey in which I asked teachers to select anonymous peers to promote from a pool of applicants applying for promotion to infer each teacher's revealed preferences $\left(\hat{\gamma}^i, \hat{\alpha}^i\right)$. The survey is described in the next sub-section.

4.2 Survey

In early September 2018, I collaborated with the local education bureau of 2 of the 4 cities in the sample (cities A and B) and conducted surveys in 6 high schools (3 in each city), in order to collect information on the teachers' views of fairness regarding what type of applicants they think should be promoted.

Design.

We pulled the application CVs of all the applicants in year 2017 in these 6 schools and erased the names of the applicants, the schools and the cities. Then we printed these processed CVs of year-2017 applicants of each high school h, and put them into a folder $\mathscr{F}_h$. Then we presented $\mathscr{F}_h$ to teachers from another school h' ($h' \neq h$), and asked them to evaluate the CVs of these anonymous applicants and pick N_h ones they would choose to promote, where N_h is the number of applicants actually promoted in school h in year 2017. I refer to the applicants whose CVs were used in the survey as "virtual" applicants, and their schools "virtual" schools.

Implementation.

We produced 300 copies of each folder $\mathscr{F}_h$ for the survey. At the beginning of the weekly teaching staff meeting of each high school in city r ($r \in \{A, B\}$),[61] we prepared equal number of folders of the three virtual schools from the other city, $\{\mathscr{F}_h\}_{r(h)\neq r}$, and distributed one randomly selected folder to each teacher[62]. The teachers were given an hour to complete the selection task. Surveyed respondents, 684 in total, were identifiable and linked to the teachers' personnel records via a one-time ID number.

My goal is to collect the respondents' revealed preferences over virtual the characteristics of applicants on their CVs in deciding whom they think should be promoted, or how they map from applicant characteristics to promotability according to their fairness views. The subsequent step is to use these mapping functions to infer which actual applicants they might have thought deserved to be promoted in the past promotion evaluations in their own schools, to be contrasted with actual promotion decisions made by the then principal.

This approach has both advantages and limitations. Instead of asking the teachers to report retrospectively which of their colleagues they thought should have been promoted in the past years, in which case one might expect the realized promotion results to affect their answers, we placed the teachers in a disinterested context and asked them to solve a similar problem to that which is faced by the principals, which reduces the cost of truth telling and memory loss. However, in the virtual applicants we cannot simulate the teachers' real-life interactions with their peers and the private information about each other they might gather through these interactions.

4.3 Inference of Fairness Views and Past Perceived Unfairness

In this sub-section, I explain in detail how I use the survey to infer each teacher's fairness preferences and construct measures of their perceived unfairness in past promotions by contrasting their "ideal" promotion results with what actually took place in their schools.

[61] This is to make sure that in principle all the teachers were present and responded so as to minimize the sample selection problem. In fact, 96.6% of the teachers in these schools took the survey, and they are representative of teachers in the whole sample in terms of individual characteristics, see Column (C) of Table 4.

[62] The reason why we used the CVs of applicants from a different city in the survey is that it could reduce the probability that the surveyed teachers were able to infer the identities of the virtual schools or the virtual applicants. We randomly distributed the folders of three different schools so as to reduce the probability that teachers discussed with peers sitting next to them during the survey and provided collective answers.

Matching respondents and teachers by professional rank and VA.

As the survey covers only a small subset of teachers in the sample, I match respondents in the survey and teachers in the administrative data on observable characteristics so as to assign the revealed preferences of the former to the matched ones in the latter. Specifically, I divide the respondents into groups by their professional ranks (junior, middle and senior) and whether their individual-school-specific VA is above the within-rank median in their schools ($3 \times 2 = 6$ groups, noted $\mathbb{F}$). I group the teacher-year observations in the administrative data using the same method: for teacher i in year t, her group identity $f(i,t)$ is determined by the professional rank she holds in year t and the within-rank ranking of her school-specific teaching quality, $\text{VA}_{i,h(i,t)}$.

Estimating respondents' preferences.

I estimate the preferences of respondents in each group $f \in \mathbb{F}$ separately, using a model that parallels the one used for the principals (Equation (5)). For virtual applicant l evaluated by survey respondent j' in group $f(j')$, I run:

$$\mathbb{E}\left[\text{Yes}_{j'l}\right] = F\left(\mathbf{X}_l\gamma^{f(j')} + \alpha_H^{f(j')}\text{HomeTie}_{j'l} + \alpha_C^{f(j')}\text{CollegeTie}_{j'l} + \beta^{f(j')}\text{Controls}_l\right). \tag{13}$$

where $\text{Yes}_{j'l} = 1$ if respondent j' picks applicant l as one that she thinks deserves promotion. In Controls_l I include a fixed effect for the virtual school, $\lambda_{h(l)}$, and the share of same-subject applicants, $\text{share}_{k(l),h(l)}$. I estimate a logit model and obtain the coefficient estimates $\left\{\left(\hat{\gamma}^f, \hat{\alpha}_H^f, \hat{\alpha}_C^f, \hat{\beta}^f\right)\right\}_{f\in\mathbb{F}}$.

Inferring perceived fair promotion results.

These group-specific coefficient estimates are used to infer teacher i's perceived promotability of actual applicant j in her school in year t.

$$\hat{\eta}_{ijt} = \mathbf{X}_{jt}\hat{\gamma}^{f(i,t)} + \hat{\alpha}_H^{f(i,t)}\text{HomeTie}_{ij} + \hat{\alpha}_C^{f(i,t)}\text{CollegeTie}_{ij} + \hat{\beta}_1^{f(i,t),share}\text{share}_{k(j),h(i,t),t}. \tag{14}$$

The inferred preferred promotion results in year t by teacher i under her fairness views, noted $\hat{\Omega}_{it}$, is defined as:

$$\text{Promote } j \text{ iff } \text{Ranking}_{h(i,t)t}\left(\hat{\eta}_{ijt}\right) \leq N_{h(i,t),t},$$

where N_{ht} is the number of actual promotees in school h in year t.

Applicant types by actual and perceived fair promotion results.

Contrasting the inferred perceived fair promotion results $\hat{\Omega}_{it}$ and the actual results $\Omega_{h(i,t),t}$, the applicants in year t can be grouped into 4 types in teacher i's views:

$$\mathbb{M} = \{\text{Undeservingly Promoted, Deservingly Promoted, Deservingly Denied, Undeservingly Denied}\},$$

where

$$m\left(i,j,t\right)=\begin{cases}\text{Undeservingly Promoted,} & \text{if Ranking}_{h(i,t),t}(\hat{\eta}_{ijt})>N_{h(i,t),t}\ \&\ \text{Promoted}_{jt}=1,\\ \text{Deservingly Promoted,} & \text{if Ranking}_{h(i,t),t}(\hat{\eta}_{ijt})\leq N_{h(i,t),t}\ \&\ \text{Promoted}_{jt}=1,\\ \text{Deservingly Denied,} & \text{if Ranking}_{h(i,t),t}(\hat{\eta}_{ijt})>N_{h(i,t),t}\ \&\ \text{Promoted}_{jt}=0,\\ \text{Undeservingly Denied,} & \text{if Ranking}_{h(i,t),t}(\hat{\eta}_{ijt})\leq N_{h(i,t),t}\ \&\ \text{Promoted}_{jt}=0.\end{cases} \tag{15}$$

Of the 22% of applicants who are promoted, 21.8% are perceived as undeservingly promoted (see Table 11).

Measuring perceived unfairness.

Constructing a straightforward scalar measure to characterize the deviation of the actual promotion results from teacher i's perceived fair ones ($\Delta\hat{\Omega}_{it}:=\hat{\Omega}_{it}-\Omega_{h(i,t)}$), is helpful for both the empirical estimation and the interpretation of the impacts of perceived unfairness in promotions. I use the fraction of promotees regarded as undeserving by teacher i in her school in year t:

$$\text{Undeserving\%}_{it}=\frac{\#\text{ Undeservingly Promoted}_{h(i,t)t}}{\#\text{ Promoted}_{h(i,t)t}}. \tag{16}$$

The sample mean of this perceived unfairness measure is 22.1% and its standard deviation is 12.8%.

4.4 What Does an Unfair Promotion Look Like?

This sub-section describes how the surveyed teachers evaluate the virtual applicants, as opposed to the principals, in deciding who should receive promotion, which also speaks to the characteristics of a promotion which violates the teachers' fairness preferences. Similar to the heterogeneity analysis in Sub-section 3.5, I estimate the following equation:

$$\mathbb{E}\left[\text{Yes}_{j'l}\right]=F\left(\sum_{g\in\{\text{G},Tie\}}\varrho_g\hat{\eta}_l^{P,g}+\beta^{\varrho}\text{Controls}_l\right) \tag{17}$$

where j' denotes a survey respondent, variables $\left\{\hat{\eta}_l^{P,g}\right\}_{g\in\{\text{G},Tie\}}$ represent the categorical promotability indices of virtual applicant l in the principals' opinions, constructed using Definition (7). The included control variables are the same as in Equation (13). The relative sizes of coefficients $\left\{\varrho_g\right\}_{g\in\{\text{G},Tie\}}$ compared to each other show how much the surveyed teachers value certain applicant characteristics differentially more than the principals: if $\varrho_g>\varrho_{g'}$, then the teachers emphasize characteristics in category g more than category g', compared to the principals.[63]

The estimation results are reported in Table 12, for the 6 groups of respondents respectively in Columns (1) to (6) and for the whole sample in Column (7). We can see that the surveyed teachers value teaching awards around 50% more and publications 20% less, and most importantly, social ties over 70% less than principals. These patterns are fairly homogeneous across all respondent groups. The finding suggests that the major source of difference between the teachers' and the principals' promotability notions lies in that the teachers do not take into account social connections like the principals do, and they stress teaching

[63] Statistically, I test whether the coefficient estimate $\hat{\varrho}_g$ is significantly different from the mean $\frac{1}{7}\sum_{g\in\{\text{G},Tie\}}\hat{\varrho}_g$.

performance more heavily.[64]

From an alternative perspective, I compare the four types of applicants by their actual promotion results and perceived deservingness (see Definition (15)) in terms of their teaching quality and the probability that they share social ties with the principal. The results are reported in Table 13. Among promoted applicants, the perceived undeserving ones have a very high probability of being socially ties to the principal (80%), compared to the deserving group (30%). On the contrary, only around 3% of denied applicants who are viewed as treated unjustifiably are socially connected to their principals. In addition, the undeservingly promoted applicants are also significantly lower in their school-specific VA in the current school than other promotees, and the undeservingly denied applicants have on average higher VA compared to their deservingly unpromoted counterparts.

In summary, the perceived undeservingly promoted applicants consist mainly of those who have social ties to the principal but low teaching quality, a direct consequence of the principals' favoritism.

5 Impacts of Perceived Promotion Unfairness

I now present this paper's most important findings: how the teachers' perceived unfairness in the promotion results, resulting from favoritism by their school principals, affects their performance at work and the overall efficiency of schools. I first discuss the incentive effects of unfairness on teaching effort and the job quitting probability of both the applicants themselves (Sub-section 5.1) and their non-applicant colleagues (Sub-section 5.2). Then I proceed to overall impacts on worker turnover patterns and the productivity of schools (Sub-section 5.3). Throughout this section, I use the subsample consisting of the post-transparency-reform years, as the teachers' unfairness perceptions are formed based on the information provided by the applicants' CVs.

5.1 Own Incentive Effects on Applicants

I first study the impacts of unfairness on the applicants themselves, whose self-interest is directly affected by the promotion results.

5.1.1 Individual Effects of Personal Promotion Results

I perform event studies of promotion success or failure on the performance of the applicants who either think they are fairly treated or not. Specifically, I run:

$$\begin{aligned} Y_{j,t+s} = \quad & \sum_{\tau=-3}^{2} \sum_{m \in \mathbb{M}} \varphi_{m\tau} \mathbb{I}\left[m\left(j,j,t\right)=m, s=\tau\right] + g^{\varphi}_{h(j,t)}\left(t+s\right) + \mathbf{Z}_{j,t+s}\beta^{\varphi}_{j} \\ & + \lambda^{\varphi}_{j,P(j,t)} + \lambda^{\varphi}_{j,P(j,t+s)} + \varepsilon^{\varphi}_{j,t+s}. \end{aligned} \tag{18}$$

where Y is an outcome variable of interest, $m \in \mathbb{M}$ indicates the type of applicants by their promotion results and self-perceived deservingness (see Definition (15)), and $g^{\varphi}_{h}\left(t+s\right)$ is school-specific time trends.

[64] As the survey respondents do not have real interactions with the virtual applicants, by using the survey results to infer the teachers' fairness notions I might underestimate the importance of social ties between two fellow teachers in the real workplace. This can cause the perceived unfairness measure, Undeserving%, to overstate the extent to which those who are socially tied to the principal disagree with the actual promotion results, and understate the extent of unfairness perceived by those who are socially tied not to the principal but to some peer applicants. In fact, when decomposing the variable Undeserving%$_{it}$, principal-school effects account for 21% of the total variance, and teacher-principal-school fixed effects 27%, implying that there is an average perceived unfairness level which is specific to each teacher under a given principal. To address this potential measurement bias, I include in the empirical analysis in Section 5 the teacher-principal fixed effects.

The fixed effect for applicant j and the current principal in the school, $\lambda^{\varphi}_{j,P(j,t+s)}$, absorbs the teacher-principal-specific component in Y, and the fixed effect for applicant j and the principal who decides her promotion result, $\lambda^{\varphi}_{j,P(j,t)}$, takes care of a potential measurement bias (see note [64]). I also include a set of variables of job characteristics:

$$\mathbf{Z}_{j,t+s} = \left\{ \lambda_{g(j,t+s)}, \text{workload}_{j,t+s}, \text{headteacher}_{j,t+s}, \text{break}_{j,t+s}, \bar{A}^{j(c,k,t+s)=j}_{c,k,t+s-1} \right\}, \tag{19}$$

where $\lambda_{g(j,t+s)}$ is a dummy indicating the grade(s) applicant j teaches in year $t+s$, $\text{workload}_{j,t+s}$ is the number of sessions taught by j per week in year $t+s$, $\text{headteacher}_{j,t+s} = 1$ if j is a class head teacher in year $t+s$, $\text{break}_{j,t+s} = 1$ if j leaves any of the current classes she teaches in year $t+s-1$ before graduation,[65] and $\bar{A}^{j(c,k,t+s)=j}_{c,k,t+s-1}$ is the average end-of-last-year test scores of the students taught by j in year $t+s$. I allow individual-specific coefficients on $\mathbf{Z}$ to account for possible complementarities between teachers and job characteristics. I include only the applicant-year observations where the applicant works in the same school as in the application year, and for a denied applicant the years in which she has not been subsequently promoted. The coefficients $\{\varphi_{m\tau}\}_{m,\tau}$ represent the adjusted mean levels of the outcome variable of applicant group $m \in \mathbb{M}$ in year τ relative to the application year.

Teaching effort.

Figure 4 plots the estimation results where the outcome variable is teaching effort, proxied by VA ($Y_{j,t+s} = \text{VA}_{j,t+s}$). The horizontal axis displays the years relative to the application year, and on the vertical axis the coefficient estimates $\left\{\hat{\phi}_{q\tau}\right\}_{q,\tau}$ are plotted. We can see that those who think they are deservingly promoted lower their VA by around 0.26 standard deviations in the first year after promotion,[66] and the effect persists over at least three years while slowly fading out; those who think they are fairly denied promotion increase their VA by 0.41 standard deviations in the following year,[67] and continue working hard over the next few years. I do not find statistically significant changes in the teaching effort exerted by applicants who think they are unfairly evaluated, either favored or discriminated against. Compared to a fair treatment, the incentive effect of a self-perceived favor is positive, while a self-perceived wrong harms productivity.

I provide one of the possible mechanisms that can explain the findings. Among the applicants who think they are fairly treated, those who are promoted might lose to some extent the incentives to work hard as they have already completed the final step in the salary-determining evaluation system, and those who fail might be motivated to work harder upon receiving the signal that they are not qualified for promotion yet. On top of this, the promotees who think they are favored might reciprocate by exerting higher effort, and the denied applicants who think they are mistreated might reduce effort either out of an adverse morale effect or as a punishment of the principal to signal that her subjective evaluation is unacceptable and needs to be corrected in the future.

Job quitting.

Another consequence I study is whether the applicants quit their jobs ($Y_{j,t+s} = \text{Leave}_{j,t+s}$), the results on which are plotted in Figure 5.[68] It is shown that compared to the promoted, denied applicants are around 50% more likely to quit after a promotion failure; and those who think they are unfairly denied

[65] Mathematically, $\text{break}_{i,t+s} = 0$ iff $\forall\,(c, t+s)$ s.t. $j\,(c,k,t+s-1) = i$ and $g\,(c,t+s-1)$ is not the graduation grade of subject k of class c, we have $j\,(c,k,t+s) = i$.

[66] The within-applicant-principal-school standard deviation in VA is 0.621. $\frac{-0.163}{0.621} \approx -0.26$, see Panel (A), Row (1), Column (3) of Table **??**.

[67] $\frac{-0.254}{0.621} \approx -0.41$, see Panel (A), Row (3), Column (3) of Table **??**.

[68] Job quitting is defined as leaving the current school before retirement age.

are even more likely to leave, with a probability twice as large as that of the promotees. As the unfairly denied applicants have higher teaching quality than the fairly denied ones on average (see Table 13), unfair promotion can lead a school to lose good teachers.

5.1.2 Robustness Checks

For Equation (18) to consistently estimate the incentive effects of (un)fair personal promotion results on different types of applicants, the underlying assumption is that there are no unobservable promotion-associated changes in their job characteristics or working environment that can affect the applicants' teaching performance or their incentives to quit. I cannot directly test for this, but examining whether observable job characteristics change after a promotion success or failure can provide suggestive evidence on possible unobservable confounders: if we do not observe stylized changes in the former, issues with the latter might be less severe of a concern. I replace the outcome variable with the job characteristics variables in $\mathbf{Z}_{j,t+s}$ (see Definition (19)) and re-estimate Equation (18).

The results are shown in Figure **??**. I do not see significant changes in teaching workload, probability of being separated from the current classes, or students' prior test scores of an applicant after she is promoted or denied, either fairly or unfairly. The only significant change is that the newly promoted senior teachers are less likely to hold a class head teacher position than before (see Panel (B)), and this change is homogeneous across deserving and undeserving promotees. If anything this should alleviate their burden and relax their time constraints for teaching courses, nonetheless I find on average negative effects of receiving the senior-rank title on their VA.

5.1.3 Average Effects of School-Level Unfairness

From the perspective of a school, it is the *average* effects of school-level extent of unfairness on the biasedly-treated teachers, rather than the *individual* effects of bias on the favored and/or discriminated against teachers, that matter. As the number promotion slots are fixed, the number of victims and beneficiaries of discrimination is equal; and if they respond in opposite directions of the same magnitude, school-level bias does not harm the average productivity of applicants. To test for the average incentive effects of biased promotion results on the promotion applicants, I estimate the following equation:

$$\begin{aligned} Y_{i,t+s} = \quad & \textstyle\sum_{\tau=-3}^{2} \theta_\tau \text{Undeserving\%}_{it} \times \mathbb{I}\left[s=\tau\right] + \sigma^\theta Y_{i,t-1} + g^\theta_{h(i,t)}\left(t+s\right) + \mathbf{Z}_{i,t+s}\beta^\theta_i \\ & + \lambda^\theta_{i,P(i,t)} + \lambda^\theta_{i,P(i,t+s)} + \varepsilon^\theta_{i,t+s}, \end{aligned} \tag{20}$$

$\text{Undeserving\%}_{it}$ is the fraction of promotees perceived as undeserving by applicant i in her school in her application year t (see Definition (16)). The set of control variables are the same as in Equation (18), except that I also add the lagged outcome variable when estimating the impacts on VA. Coefficients $\{\theta_\tau\}_\tau$ represent the average effects of the applicants' perceived school-level unfairness on their performance in the neighboring years. θ_0 shows the immediate impacts of perceived unfairness on the teachers' performance in the same school year, θ_1, θ_2 depict persistence of these impacts, and θ_{-3}, θ_{-2} are used as placebo tests.[69] I pool all lagged and future observations relative to a promotion year in one single regression to impose common coefficients on the control variables.

Results are plotted in Figures 6 and 7. We can see that school-level unfairness in promotion results does not affect the promotion applicants' average VA or job quitting rates. This finding implies that if it is only

[69] Notice that as the lagged outcome variable $Y_{i,t-1}$ is controlled for as a covariate, $\theta_{-1} = 0$ by construction.

the applicants' productivity that is affected by biased promotion results, it does not hurt for the principal to exercise favoritism, as the the gain from the favored applicants offsets the loss from the biased against ones.[70]

5.2 Spillover Incentive Effects on Non-Applicant Teachers

Given the zero average productivity effect of school-level promotion unfairness on promotion applicants, an important question is whether and how the non-applicant peers in each school, accounting for around 78% of the whole teaching staff, respond to promotion results they view as unfair. Such potential *spillover* effects determine whether biased promotions have school-wide consequences.

5.2.1 Main Results

I re-estimate Equation (20) on the teacher-year observations where the teacher is a non-applicant in the reference promotion year and currently works in the same school as in the reference year.

Teaching effort.

The blue dots in Figure 8 plot the estimated effects of perceived promotion unfairness on the non-applicant peers' VA in teaching. Working under the same principal, a 10 percentage point increase in the fraction of undeserving promotees decreases a non-applicant teacher's VA in the same year by around 0.15 standard deviations on average.[71] Contrasted against the ideal case where there exists no perceived unfairness, the average level of existing unfairness leads to 0.35-standard-deviation lower VA of each non-applicant teacher.[72] The impact is persistent, with each teacher's VA level 0.16 and 0.09 standard deviations lower than in the no-bias scenario in the second and third following years.

There is no impact of perceived unfairness in future promotions on the teachers' current productivity, suggesting that the correlations between current unfairness and current (and future) VA of the non-applicant teachers are unlikely to result from smoothly-varying confounding determinants of students' test scores.

Job quitting.

The estimation results on quitting incentives are plotted in Figure 9. A 10 percentage point higher fraction of undeserving promotees as perceived by a non-applicant teacher leads to a 9% increase in the probability that she leaves the school in the same year, and a school-level promotion evaluation with average level of perceived unfairness makes non-applicant teachers 16% more likely to quit than a fair one.[73] Like teaching productivity, the effect on job quitting persists through the second year (12%) and the third year (8%).

Taken together, perceived unfairness in promotions has adverse spillover incentive effects on peer teachers in that it leads some of them to leave the school and lowers the productivity of those who stay.

[70] The effect on job quitting is adverse at the school level though, even if the average quitting rate is not affected. This is because higher-quality denied applicants are more likely to leave and lower quality promoted applicants are more likely to stay.

[71] The within-teacher-principal-school standard deviation in VA is 0.61. $\frac{0.1\times(-0.938)}{0.61} \approx -0.15$, see Panel (A), Column (3) of Table **??**.

[72] The average level of Undeserving%$_{it}$ is 0.22.

[73] The mean probability that a teacher leaves her current school is 0.052 per year. $\frac{0.10\times 0.0456}{0.052} \approx 0.09$ for a 10 percentage points increase in Undeserving%, and $\frac{0.22\times 0.0456}{0.052} \approx 0.16$ for average level of Undeserving% compared to zero Undeserving%. See Panel (C), Column (3) of Table **??**.

5.2.2 Robustness Checks

To interpret the estimates in the previous sub-section as the incentive effects of perceived promotion unfairness on non-applicant teachers, it is required that the extent to which they think a promotion is unfair does not proxy or lead to unobservable changes in individual job assignments and school-wide working environment that can affect their productivity and/or their incentive to quit.

One concern is that promotions based on favoritism might lead to less productive job assignments.[74] It is possible that the rank a teacher holds affects her class assignment and as a result the class assignment of other teachers, given the set of classes fixed. If, for instance, there are complementarities between students' ability and teacher's quality in the production of test scores, and promoted teachers are assigned to classes of better-achieving students, then promoting low-quality teachers is costly due to the mis-matching between high- (low-) quality teachers and low- (high-) ability students. To address this, I first show that observable patterns of matching between job characteristics and differently-ranked non-applicant teachers do not correlate with perceived promotion unfairness. The estimation results of Equation (20) using $Y_{i,t+s} \in \mathbf{Z}_{i,t+s}$ (see Definition (19)) as the outcome variables for the senior, the middle and the junior-ranked teachers are displayed in Figure **??**, where I do not find noticeable correlations between the teachers' perceived unfairness and their workload, their probability of being assigned to new classes unexpectedly, or the average prior test scores of their students. In addition, in the regression of VA on perceived unfairness I also limit the sample to teacher-year observations where the teacher teaches exactly the same classes as in the year prior to the reference promotion year, ruling out cases in which a teacher is either asked to leave her current classes, or goes back to grade 1 and teach a new cohort when she is potentially assigned to unobservably better or worse classes.[75] The estimated effect using this no-change subsample, plotted using the red dots in Figure 8, is very similar to the one using the whole sample of non-applicants.

Another concern is that unfair promotion might result in school-wide productivity changes that can affect individual teacher's VA measures even if they work equally hard. Although it is impossible for me to exhaust all such possibilities, I discuss one plausible case explicitly. As the middle-level leader positions are primarily held by the senior-ranked teachers, if teachers' managerial ability is positively correlated with their teaching quality, then unfairly promoting low-VA teachers might result in a group of poor performing leaders, potentially affecting the efficiency of all teachers in the school.[76] However, as I focus on the short-run effects of a single promotion event, this is not an issue if the newly promoted teachers do not take up such managerial positions immediately. A middle-level leader position is accompanied by reduced teaching workload and consequent departure from (some of) the current classes, but I do not see such events take place for the promoted teachers with increased probabilities immediately after their promotion to the senior rank (see Panels (A) and (C) of Figure **??**).

5.2.3 Evidence on Mechanisms

I first list several hypotheses explaining why unfair treatments by principals toward promotion applicants can reduce the incentives of non-applicant peers at work in the same school, and discuss their predictions regarding heterogeneities in the incentive effects (noted θ). Then I provide empirical evidence to assess how well each of these theories applies in the empirical context.

[74] Prendergast & Topel (1996) model this explicitly as one source of the costs of favoritism in subjective evaluations.
[75] Mathematically, the subsample satisfies that $C_{i,t+s} = C_{i,t-1}$, where $C_{it} := \{c | j\,(c, k\,(i)\,, t) = i\}$.
[76] This hypothesis is the opposite to the one discussed in the second identification threat in the estimation of favoritism in Sub-section 3.3.

Theories.

It is worth pointing out that teacher-principal fixed effects are included in all of the estimation specifications on the effects of perceived promotion unfairness, which means that the estimates do not capture the influence of any (undesirable) individual characteristics of a principal associated with her favoritism as long as these characteristics are stable and fully revealed to the teachers over the whole time period that she runs the school.

I) Learning about principal.

Teachers in a school learn about their principal's preferences or management styles as her promotion decisions are revealed each year, and they might react accordingly in their work performance. A universal prediction of such learning theories is that teachers update their beliefs about the principal more in the early stage of their principal's term when their prior beliefs are imprecise, as predicted by a Bayesian model, resulting in larger changes in their behavior.

Prediction I.1): $|\theta|$ decreases with the length of time that the promotion-evaluating principal has stayed in the school.

Moreover, if it is the principal's revealed traits that matter to teachers, one might expect the effects to disappear, or at least fade out rapidly, if the principal has left the school.

Prediction I.2): $|\theta_{\text{Same Principal}}| > |\theta_{\text{Changed Principal}}| \geq 0$.

Teachers can make inferences from unfair promotion results about their principal, either as a promotion evaluator who can affect their (future) promotion prospects and consequently their pay, or as a manager who lead and interact with them inmore general circumstances (other than promotion evaluations).

Ia) Principal as a biased promotion evaluator.

Biased promotion results might change the teachers' expectations about how the current principal will evaluate applicants in the future, which might affect the behavior of those who plan to apply in the next few years under the same principal. A straightforward prediction of this theory is that peer teachers who are more likely to go through promotion evaluation(s) by the current principal are more heavily affected. Middle-ranked teachers are the prospective applicants in the coming years, as the junior-ranked need to wait at least 4 years to be eligible to apply,[77] and the senior-ranked have already successfully passed the evaluation system. This prediction can be stated as the following:

Prediction Ia.1): $|\theta_{\text{Middle}}| > |\theta_{\text{Junior}}| \geq |\theta_{\text{Senior}}| = 0$.

Teachers know that principals have access to application profiles and can relatively well observe the qualification of applicants. When observing a low-quality but tied-to-principal applicant receives promotion while a high-quality but untied-to-principal one gets denied, a peer teacher in the school might conclude that the principal sets a lower promotion requirement for his connected subordinates than others. This might lead non-top-quality prospective applicants (middle-ranked teachers) without social ties to shirk or leave, if they think they cannot meet the discriminatively high promotion requirements even if they work hard. Reduced effort could also arise when the teachers would like to signal the principal that his current bias is unacceptable and should be corrected in future evaluations, if they have bargaining power in the school. Meanwhile, average-quality teachers with social ties might choose to stay and work harder, if they

[77] They usually wait much longer, as the mean time interval between receiving the middle rank and first applying for the senior rank is 7.8 years, longer than the average length of a principal's term (6.13 years).

think they face a favorably low threshold for promotion that is approachable through hard work. If this is the case, one might expect:

Prediction Ia.2): $\theta^{\text{VA}}_{\text{Untied, Middle}} < 0 < \theta^{\text{VA}}_{\text{Tied, Middle}}$, and $\theta^{\text{Leave}}_{\text{Untied, Middle}} > 0 > \theta^{\text{Leave}}_{\text{Tied, Middle}}$.

On the other hand, the double standards might lower the effort of upper-middle-quality teachers with social ties and induce them to stay, if their interpretation of the principal's biased promotion decision is that they need not work so hard as to qualify for promotion, given their quality and current performance. Meanwhile, non-top untied teachers might be motivated to work harder in order to meet the higher promotion requirements, and leave if they think their prospects of success are poor. In this case, the difference between socially tied and untied prospective applicants should satisfy:

Prediction Ia.3): $\theta^{\text{VA}}_{\text{Untied, Middle}} > 0 > \theta^{\text{VA}}_{\text{Tied, Middle}}$, and $\theta^{\text{Leave}}_{\text{Untied, Middle}} > 0 > \theta^{\text{Leave}}_{\text{Tied, Middle}}$.

Predictions *Ia.2)* and *Ia.3)* are the same in terms of job quitting and the opposite of each other in terms of effort provision.

Ib) Principal as an undesirable manager.

If teachers learn from unfair promotion results that the principal is discriminating in favor of his friends against those who are not socially connected to him, they might expect him to behave likewise on other occasions in the workplace, even if that has not yet happened. Under this circumstance, their working morale could be eroded, resulting in underperformance and quitting.[78] If this is the case, one might expect that the discriminated against group should be (more) affected than the favored group (see e.g. Cohn *et al.* , 2014; Glover *et al.* , 2017; Breza *et al.* , 2017).[79]

Prediction Ib): $\theta^{\text{VA}}_{\text{Untied}} < \theta^{\text{VA}}_{\text{Tied}} \leq 0$, and $\theta^{\text{Leave}}_{\text{Untied}} > \theta^{\text{Leave}}_{\text{Tied}} \geq 0$.

II) Fairness norms and social preferences for peer workers.

It is also likely that it is their peers being unfairly treated by the principal, rather than the principal showing bias, that the teachers care about and negatively respond to. In this hypothesis, the morale effect does not subside as teachers know their principal better, as long as the principal keeps delivering unfair promotion decisions in each year; neither does the effect disappear as long as the teachers still work together with colleagues who are mis-evaluated and consequently suffer from persistently lower earnings, even if the perpetrating principal has been replaced by a new one.

Prediction II.1): $|\theta|$ does not decrease with the length of time that the promotion-decision-making principal has stayed in the school.

Prediction II.2): $|\theta_{\text{Same Principal}}| = |\theta_{\text{Changed Principal}}|$.

Moreover, if teachers care about peer workers rather than the principal, being socially tied to the principal would not make unfairness more acceptable.

Prediction II.3): $\theta^{\text{VA}}_{\text{Untied}} = \theta^{\text{VA}}_{\text{Tied}} \leq 0$, and $\theta^{\text{Leave}}_{\text{Untied}} = \theta^{\text{Leave}}_{\text{Tied}} \geq 0$.

Results.

[78] See for example Arasli & Tumer (2008) who show that nepotism, favoritism and cronyism create job stress in the workplace and this increases dissatisfaction of the staff about their organizations using a survey on employees in the Cyprus banking industry.

[79] Cohn *et al.* (2014) conduct a field experiment in a firm that hires workers for one-off sales promotions and find that a wage cut of the same size decreases the performance of workers whose group members do not receive the wage cut differentially more than those whose group members' wages are also lowered. Glover *et al.* (2017) show that manager bias negatively affects minority job performance in a French grocery store chain. Breza *et al.* (2017) show in a field experiment in India that when coworkers' productivity is difficult to observe, pay inequality reduces the output and lowers the attendance of the lower-paid, given absolute pay fixed.

Teaching effort.

Several findings regarding the heterogeneities in the estimated effects of perceived promotion unfairness on teachers' productivity, $\hat{\theta}^{\text{VA}}$, are listed below:

(i) $|\hat{\theta}^{\text{VA}}|$ does not decrease as the principal stays longer in the school (see Panel (A) of Table 14), supporting Prediction *II.1)* against Prediction *I.1)*;

(ii) $|\hat{\theta}^{\text{VA}}_{\text{Same Principal}}| \approx |\hat{\theta}^{\text{VA}}_{\text{Changed Principal}}|$ (see Figure 10), supporting Prediction *II.2)* against Prediction *I.2)*;

(iii) $|\hat{\theta}^{\text{VA}}_{\text{Senior}}| > |\hat{\theta}^{\text{VA}}_{\text{Junior}}| > |\hat{\theta}^{\text{VA}}_{\text{Middle}}|$ (see Figure 12), inconsistent with Prediction *Ia.1)*;

(iv) $\hat{\theta}^{\text{VA}}_{\text{Untied}} \approx \hat{\theta}^{\text{VA}}_{\text{Tied}} < 0$ (see Panel (A) of Figure 14), supporting Prediction *II.3)* against Prediction *Ib)*;

(v) $\hat{\theta}^{\text{VA}}_{\text{Untied, Middle}} \approx \hat{\theta}^{\text{VA}}_{\text{Tied, Middle}} < 0$ (see Panel (B) of Figure 14), in line with Predictions *Ib)* and inconsistent with Predictions *Ia.2)* and *Ia.3)*.

In summary, Theory *II)* explains the empirical patterns the best: the adverse spillover incentive effect of perceived promotion unfairness on teachers' productivity appears to be driven primarily by the teachers' social preferences for their colleagues: they care about them their peers fairly treated in promotion evaluations and are demoralized when peers suffer unfairness

I provide further suggestive evidence for this proposed mechanism. First, teachers who are likely to have more frequent interactions with the "victims" (that is, the undeservingly denied applicants) tend to react more negatively (see Figure 16). Such interactions between a non-applicant and a victim include teaching the same cohort(s) (see Panel (A)) or the same subject (see Panel (B)), and sharing hometown or college ties with each other (see Panel (C)). Moreover, past treatment received by the already-promoted senior-ranked teachers play a role in determining the magnitude of their productivity response: compared to a senior-ranked teacher who was favored in her own past promotion, one who views herself as previously fairly promoted is less tolerant of current unfairness inflicted upon their peers and lowers effort even more (see Figure 17).[80]

Job quitting.

In terms of the effects on quitting behavior, $\hat{\theta}^{\text{Leave}}$, the following patterns are documented:

(i) $|\hat{\theta}^{\text{Leave}}|$ decreases as the principal stays longer in the school (see Panel (B) of Table 14), supporting Prediction *I.1)* against Prediction *II.1)*;

(ii) $|\hat{\theta}^{\text{Leave}}_{\text{Same Principal}}| > |\hat{\theta}^{\text{Leave}}_{\text{Changed Principal}}|$ (see Figure 11), supporting Prediction *I.2)* against Prediction *II.2)*;

(iii) $|\hat{\theta}^{\text{Leave}}_{\text{Senior}}| < |\hat{\theta}^{\text{Leave}}_{\text{Junior}}| < |\hat{\theta}^{\text{Leave}}_{\text{Middle}}|$ (see Figure 13), consistent with Prediction *Ia.1)*;

(iv) $\hat{\theta}^{\text{Leave}}_{\text{Untied}} \approx \hat{\theta}^{\text{Leave}}_{\text{Tied}} > 0$ (see Panel (A) of Figure 15), supporting Prediction *II.3)* against Prediction *Ib)*;

(v) $\hat{\theta}^{\text{Leave}}_{\text{Untied, Middle}} > \hat{\theta}^{\text{Leave}}_{\text{Tied, Middle}} > 0$ (see Panel (B) of Figure 15), consistent with Predictions *Ia.2)* and *Ia.3)*.

The heterogeneity patterns in the job quitting effect are the most consistent with Theory *Ia)*: when the principal's friends are chosen over other applicants with better performance, prospective applicants who

[80] The adverse effect of unfairness on non-applicant teachers is mostly likely driven by pure social preferences (or altruism) toward co-workers, rather than by social pressure or reputation concerns under which workers might be selfish but able to show "support" for each other through repeated interaction, as there are no externalities among workers due to either the production function (see e.g. Mas & Moretti, 2009) or the compensation scheme (see e.g. Bandiera *et al.* , 2005), and it is conceptually not very likely that not lowering one's performance in response to unfairness suffered by co-workers is viewed as a bad behavior towards them.

are not socially tied to the principal might choose to leave as they learn that their good work will likely not be rewarded in future promotion decisions made by the principal. Figure 18 shows that among the prospective applicants, those of higher quality are even more likely to leave, an undesirable consequence from the perspective of the current school.

Summarizing the above results, I find the strongest support for the teachers' productivity effect to work through social preferences for their peers at work, under which unfair treatment suffered by peers impose negative morale costs. This is consistent with previous findings on the effects of social incentives on productivity generated by preferences for peers (e.g. Jones & Kato, 1995; Hamilton *et al.* , 2003; Bandiera *et al.* , 2005, 2010; Breza *et al.* , 2017) and the impacts of (the violations of) fairness norms on effort provision (e.g. Krueger & Mas, 2004; Bracha *et al.* , 2015; Breza *et al.* , 2017; Dube *et al.* , 2018). The quitting effect seems more related to self-interest concerns: high-quality teachers who belong to the biased against group as the unfairly treated peers tend to leave as they learn that good teaching performance cannot better their future promotion prospects in current school.

5.3 Impacts on School-Wide Performance

Apart from studying how teachers' incentives are affected, assessing the aggregate impacts of unfair promotions on school performance is by itself important, as in general it is the overall performance of an organization that its shareholders and/or the market value. In this sub-section, I study the human capital, productivity and school market consequences of principals' unfair promotion decisions.

5.3.1 Teacher Turnover

As shown in Sub-sections 5.1 and 5.2, both the own and the spillover incentive effects indicate that unfairness in promotions leads good teachers to leave. However, how detrimental the overall impact is to a school depends on whether the quitters can be replaced with high quality new hires.

Turnover teachers can be divided into 3 groups:

$$\mathbb{O} := \{\text{Retired teachers, Job quitters, New hires}\}.$$

I first examine how the size and the average quality of these turnover workers in a school changes in each year in response to the school-year average perceived promotion unfairness, $\text{Undeserving}\%_{ht}$.[81] Specifically, I run:

$$Y_{h,t+s} = \sum_{\tau=-3}^{2} \vartheta_\tau \text{Undeserving}\%_{ht} \times \mathbb{I}[s=\tau] + \sigma^\vartheta Y_{h,t-1} + g_h^\vartheta(t+s) + \lambda^\vartheta_{P(h,t),h} + \varepsilon^\vartheta_{ht}. \tag{21}$$

where $Y_{h,t}$ represents school-level measures of turnover and includes: i) the number of teachers in turnover group $o \in \mathbb{O}$, noted N^o_{ht}; ii) the average individual-school-specific VA of these groups, noted VA^o_{ht};[82] and iii) the school-level flow in total VA:

$$\text{Change}^{VA}_{ht} := N^{\text{New}}_{ht}\text{VA}^{\text{New}}_{ht} - N^{\text{Retired}}_{ht}\text{VA}^{\text{Retired}}_{ht} - N^{\text{Quit}}_{ht}\text{VA}^{\text{Quit}}_{ht}.$$

[81] $\text{Undeserving}\%_{ht} := \overline{\text{Undeserving}\%_{it}}^{h(i,t)=h}$.

[82] $\text{VA}^o_{ht} := \overline{\text{VA}_{ih}}^{o(i,t)=0, h(i,t)=h}$.

I control for the lagged outcome variable, school-specific time trends and principal-school fixed effects and cluster standard errors at the school level.

The estimation results are plotted in Figure 19. From Panel (A) we can see that perceived promotion unfairness does not affect the number of retiring teachers,[83] while the number of job quitters increases after unfair promotions take place under a given principal in a school, resulting in more new hires to fill the vacancies. A school of average promotion unfairness loses 0.5 more teachers than when its principal promotes applicants fairly.[84]. Panel (B) shows the impacts on the average individual-school-specific VA of the turnover teachers. Again, although unfair promotion does not correlate with the teaching quality of the retiring group, it leads high-quality teachers to leave the school, and attracts new workers who will later prove to have if anything lower teaching performance in the school. Compared to a perceived fair one, an average promotion decision made by a principal in a year during her term at a school leads teachers of around 0.2 standard deviations higher individual-school-specific VA to quit.[85] Unsurprisingly there is a negative effect of unfair promotion on the school-level change in total teacher VA in the following years (see Panel (C)).

5.3.2 Students' Test Scores

To investigate possible effects of unfairness in teacher promotions on the test scores of students in a school, I estimate the following equation:

$$Y_{c,k,t+s} = \sum_{\tau=-3}^{3} \vartheta_\tau \text{Undeserving}\%_{h(c),t} \times \mathbb{I}\left[s=\tau\right] + g^{\vartheta}_{h(c)}\left(t+s\right) + \lambda^{\vartheta}_{P(c,t),h(c)} + \varepsilon^{\vartheta}_{c,k,t+s}, \tag{22}$$

where $Y_{c,k,t+s}$ is class-subject-year level test score measures.

Annual productivity.

I first consider a crude VA measure:

$$Y_{c,k,t+s} := A_{c,k,t+s} - A_{c,k,t+s-1},$$

where A_{ckt} is the end-of-year-t average test scores of class c in subject k. Unadjusted for assignment of classes to teachers within a school, this variable measures the school-wide average productivity in a year rather than the teachers' individual effort provision, capturing possible mismatching between the students and the teachers. The results are plotted in Figure 20. Under a given principal, unfair promotions on average lower the class-subject average test scores in the school by around 0.13 standard deviations in the same school year,[86] and this school-wide productivity impacts persist over time like the incentive effects on individual teachers.

CEE scores of graduating cohort.

Now I switch the subject of analysis from a school-year to a school-cohort. The impacts of unfair promotion on the College Entrance Exams (CEE) scores ($Y_{c,k,t+s} = A^{\text{CEE}}_{c,k,t+s}$) of the graduating cohort ($g\left(c,t+s\right)=3$) in a school is plotted using the red dots in Figure 21. The average cumulative influence

[83] The retirement ages are fixed for public employees in China: 60 for male and 55 for female.

[84] Average level of Undeserving$\%_{ht}$ is 0.22. $0.22 \times 2.21 \approx 0.5$, see Panel (A), Row (2), Column (3) of Table **??**. The average number of job quitters per school-year is 6.3 (SD=2.0).

[85] The standard deviation of teacher-school-specific VA is 0.56. $\frac{0.22\times 0.560}{0.56} \approx 0.2$, see Panel (B), Row (2), Column (3) of Table **??**.

[86] $-0.576 * 0.22 \approx 0.13$, see Panel (A), Column (4) of Table **??**.

of unfair promotion on the class-subject average CEE scores of a fully affected cohort is a decrease of 0.25 standard deviations.[87][88]

HEE scores of newly enrolled cohort.

By hurting the performance of the graduating cohorts, unfair promotion also makes a school less attractive to prospective students in a competitive school market and enroll new students ($g(c, t+s) = 1$) with lower High School Entrance Exams (HEE) scores ($Y_{c,k,t+s} = A^{\text{HEE}}_{c,k,t+s}$), as plotted using the blue dots in Figure 21.[89] This implies the overall influence imposed by unfair promotion on a school can be even more detrimental and lasting that shown in the productivity impacts alone: it lowers the average student quality of future school cohorts, and might lead to a vicious circle if parents respond to *absolute* school performance measures in making their school choices (see e.g. Black, 1999; Hastings & Weinstein, 2008).[90]

As one might have expected from the negative incentive effects documented in Sub-section 5.2, unfair promotion results as perceived by teachers in a school adversely affect the operation of the school as a whole: it will consequently lose good quality teachers while failing to replace them with equally able ones, produce lower test scores for the existing students, and become less attractive to high-quality prospective students in the school market.

6 Impacts of Transparency Reform

In Section 5, I held the policy environment constant in which the CVs of promotion applicants are disclosed to peer teachers within the school. I used the variation in the extent to which the promotion results are perceived as unfair by peer teachers, which is generated mainly from variation in the relative quality of the favored-by-principal applicants to their competitors, to estimate the detrimental effects of unfairness perceptions on the peer teachers' performance and the consequent productivity costs suffered by schools. In this section, I vary whether the transparency reform mandating the disclosure of applicant information is in effect, and study how that changes both the principals' and the teachers' behavior as well as school-wide output. I do this for two reasons. First, it provides empirical tests of a model (displayed in Appendix **??**) featuring the key empirical findings regarding the preferences of the principal and the teachers presented in Sections 3 and 5, which can serve as further robustness checks for the findings themselves. Moreover, studying the welfare implications of the transparency reform points towards possible policy tools that can help address the adverse productivity consequences of favoritism in employee promotions.

[87] A fully affected cohort is one which enrolls in the reference promotion year $\tau = 0$ and graduates in year $\tau = 2$. $0.22 * (-1.147) \approx 9.25$, see Panel (B), Column (6) of Table **??**.

[88] In Chinese public high schools, CEE performance of students could be important for the school principals and the teachers: it is an important aspect in the local education bureau's evaluation of principals and its decision to move them to better schools or to promote them to higher positions in the public education system; it is also valued by school principals (of better schools) in recuiting new teachers, and by parents in choosing private tutors which pay relatively high rates.

[89] In the Chinese public high school system, the local bureau of education assigns enrollment quota to each school, therefore schools compete for *better* (rather than *more*) students.

[90] In Chinese public high schools, having better students could be beneficial for school principals, other school leaders and teachers for the following reasons. First, the enrollment quota for a school in each year is decided by the local bureau of education, with some slots that can be used by the school to enroll unqualified students at a much higher tuition fee ("sponsorship" fee) which is at the disposal of the principal and the other school leaders and oftern shared by them; as parents value high peer quality for their children, attracting high-scoring qualified students could also attract more and/or higher-willingness-to-pay sponsorship-fee students. Second, better incoming students imply higher-achieving graduates holding value-added fixed, which is beneficial for the school and the teachers as explained in note [88].
Black (1999) shows that parents are willing to pay more for US elementary schools that produce test scores by comparing the prices of houses located on attendance district boundaries within school district. Hastings & Weinstein (2008) show using a natural experiment and a field experiment that provided direct information on school test scores to lower-income families in a public school choice plan in the US significantly increases the fraction of parents choosing higher-test-score schools.

6.1 Teachers' Response to Promotion Unfairness

Absent the transparency reform, peer teachers can not see the application CVs and have noisy beliefs about the applicants' quality. Therefore, when a principal unfairly promotes her hometown or college fellows who are outperformed by other applicants not socially tied to her, teachers do not know for sure if unfairness exists: without a clear idea of the applicants' quality, they cannot rule out the possibility that the socially-tied promotees are actually better and more promotable. Teachers can only *infer* that the promotion results are unfair with a positive but smaller-than-one probability from the fact that the principal's friends get promoted while his non-friends do not. As a result, actual unfairness, or the teachers' perceived unfairness when they are able to observe the applicants' quality, should not have adversely affected their behavior as heavily before the transparency reform as after.[91]

I empirically test whether this is the case by performing the following difference-in-difference-in-differences estimation on the whole sample covering both the pre- and post-reform years, exploiting the different timing of the transparency reform in the 4 cities:

$$\begin{aligned} \text{VA}_{it} = \quad & \theta^{Post}\text{Post}_{r(i,t),t} \times \text{Undeserving\%}_{it} + \theta^{Pre}\left(1 - \text{Post}_{r(i,t),t}\right) \times \text{Undeserving\%}_{it} \\ & + \pi^{\theta}\text{Post}_{r(i,t),t} + \sigma^{\theta}\text{VA}_{i,t-1} + g^{\theta}_{h(i,t)}(t) + \mathbf{Z}_{it}\beta^{\theta}_{i} + \lambda^{\theta}_{i,P(i,t)} + \varepsilon^{\theta}_{it}, \end{aligned} \tag{23}$$

where $\text{Post}_{rt} = 1$ if the transparency reform is effective in city r in year t. Without loss of generality and for the sake of clarity, I only study the immediate VA effect on non-applicant teachers in the reference promotion year. The same set of controls as in the main estimation equation of the incentive effects (Equation (20)) are included. If the hypothesis stated above is true, we shall expect $\theta^{Post} < \theta^{Pre} < 0$.

The results are presented in Column (1) of Table 15. We can see that $\hat{\theta}^{Post} = -0.953$ (SE=0.029), which is similar to the estimate when using only the post-reform sample, and $\hat{\theta}^{Pre} = -0.673$ (SE=0.024). The policy change led teachers to adversely respond to principal's bias around 40% more harshly in their effort choices. This pre- and post-reform heterogeneity in the effect of promotion unfairness on teaching productivity shows that increasing the observability of unfairness makes it more costly in terms of the teachers' lowered performance, providing additional supportive evidence that the documented reduction in the non-applicant teachers' VA associated with biased promotions indeed comes from their perceptions of unfairness.

6.2 Extent of Unfairness in Promotions

As shown in the last sub-section, the productivity cost of unfairness becomes larger after the transparency reform, as teachers punish unfairness more when it can be precisely observed. A straightforward prediction is that principals become less biased after the reform if they care about the performance of their schools or how their subordinates view them.[92]

I test this hypothesis by investigating whether the policy change made principals less biased in favor of their hometown and college fellows and whether it lowered the probability of promotions being unfair. Specifically, I estimate a difference-in-difference-in-differences model on the principals' promotion decisions:

$$\begin{aligned} \mathbb{E}\left[\text{Promoted}_{jt}\right] = \quad & F(\mathbf{X}_{jt}\gamma^{P} + \alpha^{Post}\text{Post}_{r(j,t),t} \times \text{SocialTie}_{j,P(j,t)} \\ & + \alpha^{Pre}\left(1 - \text{Post}_{r(j,t),t}\right) \times \text{SocialTie}_{j,P(j,t)} + \beta^{P}\text{Controls}_{jt}), \end{aligned} \tag{24}$$

[91] This idea is formalized in Proposition **??** of the principal-agent model in Appendix **??**.
[92] This idea is formalized in Proposition **??** of the principal-agent model in Appendix **??**.

and a difference-in-differences model on the teachers' perceived unfairness:

$$\text{Undeserving\%}_{it} = \delta \text{Post}_{r(i,t)t} + g^{\delta}_{h(i,t)}(t) + \lambda_{i,P(i,t)} + \varepsilon^{\delta}_{it}. \tag{25}$$

Controls in Equation (24) are the same as in the main estimation equation of favoritism (Equation (5)). School-specific time trends and teacher-principal fixed effects are included in the estimation of promotion unfairness.

Columns (2) and (3) of Table 15 report the results. The transparency reform made principals put 50% lower weight on their social ties to the applicants in promotion evaluations, and it led to a 50% decrease in the fraction of promotees who are perceived as unfairly promoted by peers.[93] Figure 22 plots event studies of the transparency reform on promotion unfairness,[94] where we can see the number of unfair promotions fell after the reform was launched in each city. The transparency reform proved helpful in correcting the principals' favoritism in employee promotions.[95]

6.3 School Productivity

The overall impact of the transparency reform on school productivity depends on the relative strengths between its two counter-acting components discussed in the last two sub-sections: making principals act less unfairly while at the same time leading teachers to punish unfairness more heavily.[96]

I examine the changes in the average College Entrance Exams (CEE) test scores earned by the graduating cohorts in each of the four cities brought by the transparency reform,[97] by estimating:

$$A^{\text{CEE}}_{ckt} = \delta \text{Post}_{r(c),t} + g^{\delta}_{h(c)}(t) + \lambda^{\delta}_{P(c,t),h(c)} + \varepsilon^{\delta}_{ckt}. \tag{27}$$

for the graduating cohorts ($g(c,t) = 3$). School-specific time trends and principal-school fixed effects are included to account for school-level productivity drifts over time and possible matching effects between principals and schools. Changes in relative CEE scores between cities can proxy changes in school performance, as long as other determinants of scores, such as the average innate ability of different cohorts in each city, are not correlated with the timing of the transparency reform itself.

As shown by the estimation results of Equation (27) presented in Column (4) of Table 15, the reform raised high school graduates' class-subject average CEE scores in a city where it is in effect, compared to the

[93] $\frac{0.135-0.264}{0.264} \approx -0.5$, see Column (2) of Table 15. $\frac{-0.247}{0.461} \approx -0.5$, see Column (3) of Table 15.

[94] The event-study estimation equation is given by:

$$\text{Undeserving\%}_{it} = \sum_{\tau=-3}^{3} \chi_{\tau} \mathbb{I}\left[t - t^{0}_{r(i,t)} = \tau\right] + g^{\chi}_{h(i,t)}(t) + \lambda^{\chi}_{i,P(i,t)} + \varepsilon^{\chi}_{it}, \tag{26}$$

where t^0_r is the year the reform is launched in city r.

[95] Principals might respond to information disclosure for various reasons. For example, although not monetarily rewarded for the test scores produced by their schools, the principals might care about the academic performance of students graduating from their schools either out of intrinsic concern for the students' future well-being or through the extrinsic benefits the students' good test performance could bring (see note [88]). Also, the principals might feel social pressure or stigma when their favoritism is exposed to their subordinates. While transparency as a package deal is effective in alleviating favoritism, I cannot distinguish between these potential mechanisms.

[96] This idea is formalized in Proposition **??** of the principal-agent model in Appendix **??**.

[97] The High School Entrance Exams (HEE) and other end-of-year tests are organized within each city, therefore they cannot be used to evaluate the reform whose timing varied at the city level. The College Entrance Exams (CEE) are organized at the provincial level, in which the performance of students from different cities are comparable.

other of the 4 cities.[98] The positive effect is also evident in the event study results shown in Figure 23.[99]

To conclude, the findings presented in this section suggest that requiring principals to disclose the profiles of promotion applicants to their peers is welfare-enhancing in the high schools I study. The threat from the teachers to punish the principals' unfair promotion evaluations is stronger when they can better observe their peer applicants' true quality, and this monitoring effect limits the extent to which discriminating principals act unfairly and improves school-wide performance. Mandatory disclosure of workers' performance in this study functions in similar fashions to the introduction of compensation schemes that link managers or job referrers' pay to the performance of their subordinates or referrals (Bandiera *et al.* , 2009; Beaman & Magruder, 2012): both lead to selection of high ability workers rather than socially connected ones and improve the overall productivity of an organization.

7 Conclusion

I have presented evidence that in the Chinese public schools studied in this paper, when observing biased promotion decisions made by school principals in favor of their socially connected promotion applicants, peer teachers reduce their effort at work and become more likely to quit their jobs. Although the positive effects of favoritism on the favored and the negative effects on the biased against applicants offset each other, the adverse spillover effects on non-applicant teachers impose substantial costs on the overall productivity of schools.

These findings have important implications on the costs of giving leaders discretion in promotion decisions when they exercise favirotism. First, they suggest that these costs lie not only in that biased decisions made by bosses can lead to misallocation of human capital resources, but also in that it can demoralize employees and lower their effort and performance. Second, the spillover incentive effects suggest that when evaluating the potential consequences of (bad) management practices, focusing only on their effects on the directly targeted agents might understate the true costs imposed on the whole organization.

The suggestive mechanisms through which the incentive costs of favoritism operate also shed light on the nature of the social preferences that underpin them. The adverse productivity effect of principal's biased promotion decisions is the most pronounced among non-prospective-applicants who have frequent social interactions with the victims of favoritism, suggesting that teachers hold fairness norms in the workplace and have social preferences for their co-workers: treatment received by peers at work that violates fairness norms can erode the workers' morale and increase their marginal cost of effort, leading to underperformance.

The welfare enhancement brought by the mandatory disclosure of promotion applicants' profiles to peer teachers suggests that information transparency can be adopted by higher-level authorities as an effective policy tool to combat favoritism exhibited by biased principals and its adverse impacts on organizational performance, when workers can act upon such information in ways that are relevant to the principal.

[98] The point estimates should not be interpreted as the size of the causal effect of the transparency reform, as the 4 cities account for a large fraction of the CEE takers in the province, and higher CEE scores of one city have a mechanical negative effect of the scores in the other cities after the scores are normalized to have zero mean and unit standard deviation.

[99] The event-study estimation equation is given by

$$A_{ckt}^{\text{CEE}} = \sum_{\tau=-3}^{3} \chi_\tau \mathbb{I}\left[t - t_{r(c)}^0 = \tau\right] + g_{h(c)}^{\chi}(t) + \lambda_{P(c,t),h(c)}^{\chi} + \varepsilon_{it}^{\chi}. \tag{28}$$

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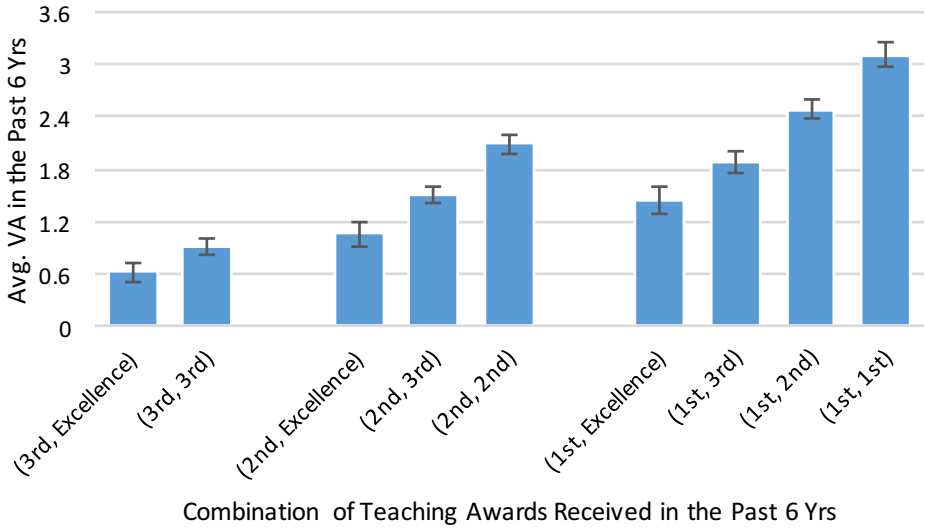
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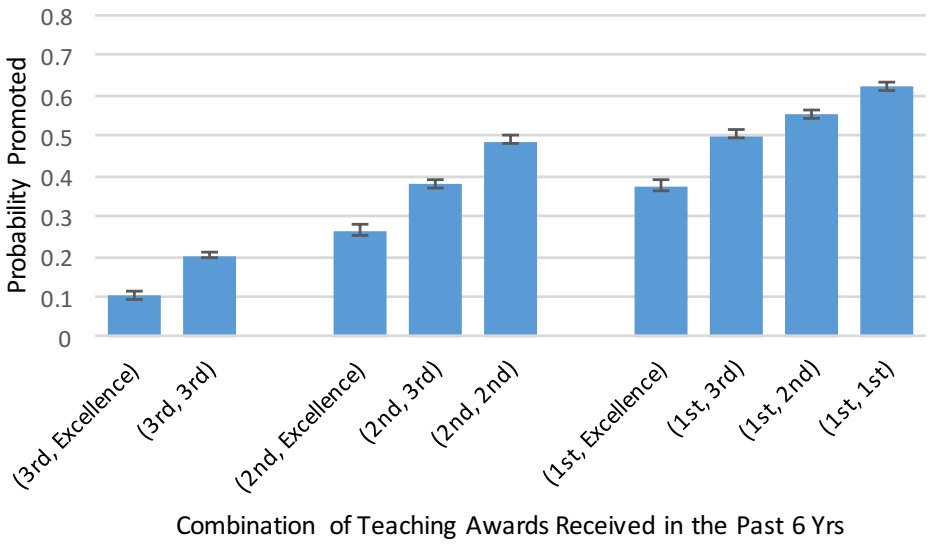
8 Figures

FIGURE 1: TEACHING AWARDS AND TEACHERS' VA



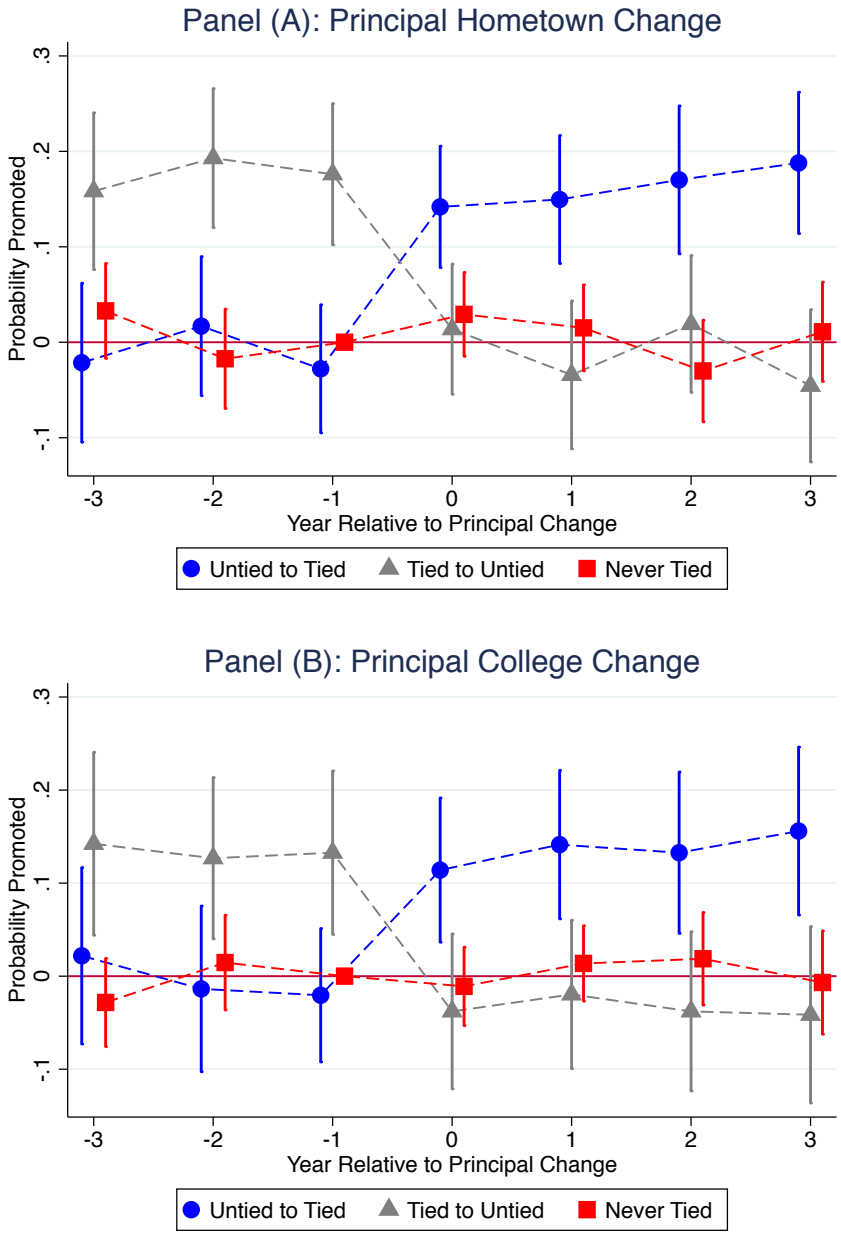
Notes: This graph plots the expected average value-added in the past 6 years of applicants with different teaching award combinations in the past 6 years (see their distribution in Figure **??**), conditional on other application profile characteristics (see Table 2 for a detailed description of these variables) and social ties with the principal. The unit of analysis is the applicant-year. Each point shows the coefficient estimate on an teaching award combination dummy in Equation (3). School-specific time trends are controlled for. The outcome variable is scaled to have unit standard deviation. N=57,613. For information on the other covariates, see Table 6. Standard errors are clustered at the applicant level. The vertical bars show the 95% confidence intervals. The omitted teaching awards combination is (Excellence, Excellence).

FIGURE 2: TEACHING AWARDS AND PROMOTION RATES



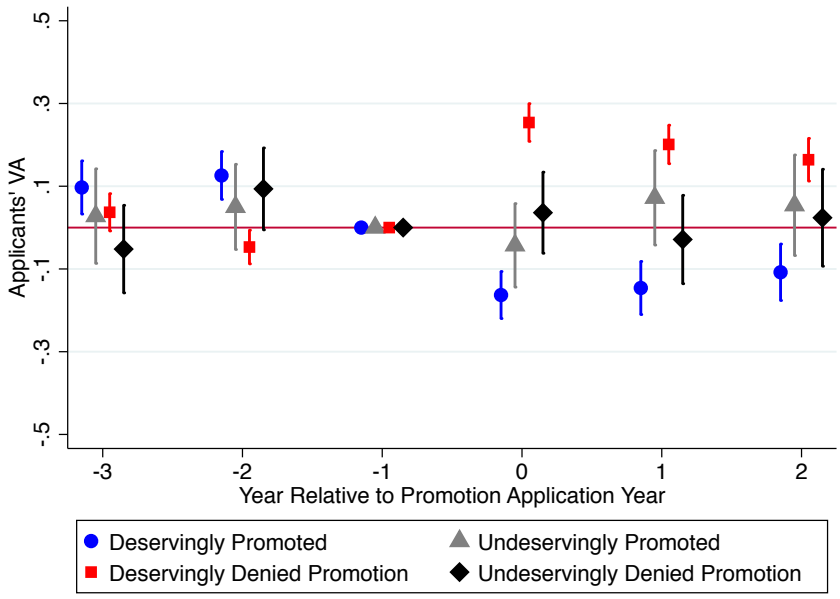
Notes: This graph plots the expected promotion probabilities of applicants with different teaching award combinations in the past 6 years (see their distribution in Figure **??**), conditional on other application profile characteristics (see Table 2 for a detailed description of these variables) and their social ties to the principal. The unit of analysis is the applicant-year. Each point shows the coefficient estimate on an teaching award combination dummy from a logit regression in Equation (4). Share of same-subject applicants and school-year fixed effects are included. N=57,613. For coefficient estimates on the other covariates, see Panel (B), Column (1) of Table 7, or Column (1) of Table **??**. Standard errors are clustered at the applicant level. Column (1) of Table 7). Coeffients are in terms of average marginal effects. The vertical bars show the 95% confidence intervals. The omitted teaching awards combination is (Excellence, Excellence).

FIGURE 3: EVENT STUDIES OF PRINCIPAL ENTRIES: PROMOTION PROBABILITIES OF DIFFERENTLY-TIED APPLICANTS



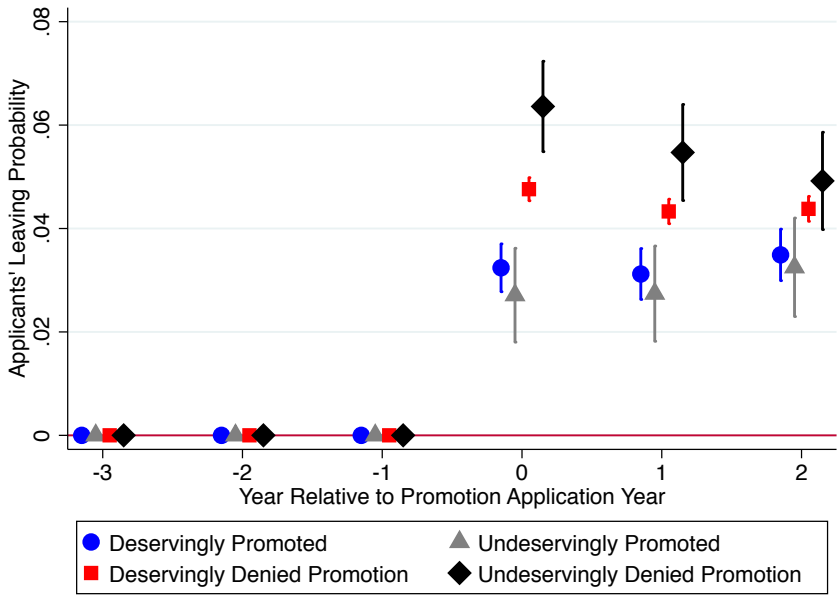
Notes: This graph plots event studies of the applicants' promotion rates before and after the entry of a new principal of different hometown or college background from the previous one. The applicants can be divided into 3 types Q={ tied before & after, tied before & untied after, untied before & tied after}. The estimated coefficients on the relative year dummies ($\{\hat{\mu}_{q\tau}\}_{\tau=-3}^{3}$) from the regressions of Equation (6), as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the applicant level are reported in Table **??**). Controls of applicant characteristics $\{\mathbf{X}_g\}_{g\in\mathbb{G}}$ ($\mathbb{G}$ ={demographics, experience, workload, research, teaching, other}, see Table 2 for a detailed description of these variables), the share of same-subject applicants, and school-year fixed effects are included. $\mu_{\text{never-tied},-1} = 0$ by construction. Mean promotion probability is 0.221 for Panel (A) and 0.212 for Panel (B).

FIGURE 4: EVENT STUDIES OF PERSONAL PROMOTION RESULTS: APPLICANTS' VALUE-ADDED



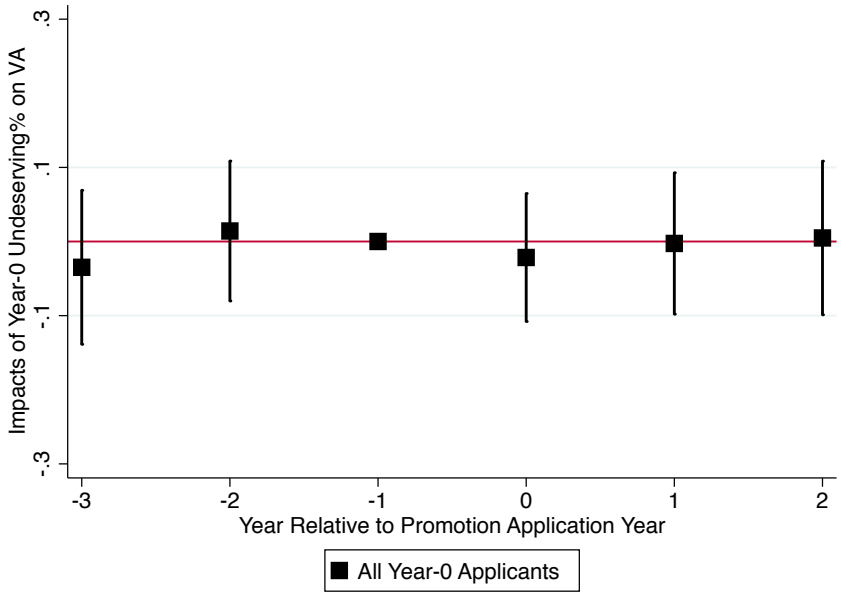
Notes: This graph plots event studies of the applicants' value-added before and after the application year of applicant type $m \in \mathbb{M}$ ={Undeservingly Promoted, Deservingly Promoted, Deservingly Denied, Undeservingly Denied}. The estimated coefficients on the relative year dummies ($\{\hat{\varphi}_{m\tau}\}_{\tau=-3}^{2}$) from the regressions of Equation (18), as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the applicant level are reported in Panel (A) of Table **??**). Only the applicant-year observations where the applicant works in the same school as the application year, and for a denied applicant the years in which she has not been subsequently promoted subsequently, are included. Applicants' job characteristics with individual-specific coefficients, school-specific time trends, applicant-(year 0)-principal fixed effects, applicant-(current)-principal fixed effects are controlled for. $\varphi_{m,-1} = 0$ by construction. The standard deviation of teacher-school-specific VA (VA_{jh}) is 0.621.

FIGURE 5: EVENT STUDIES OF PERSONAL PROMOTION RESULTS: APPLICANTS' JOB-QUITTING PROBABILITY



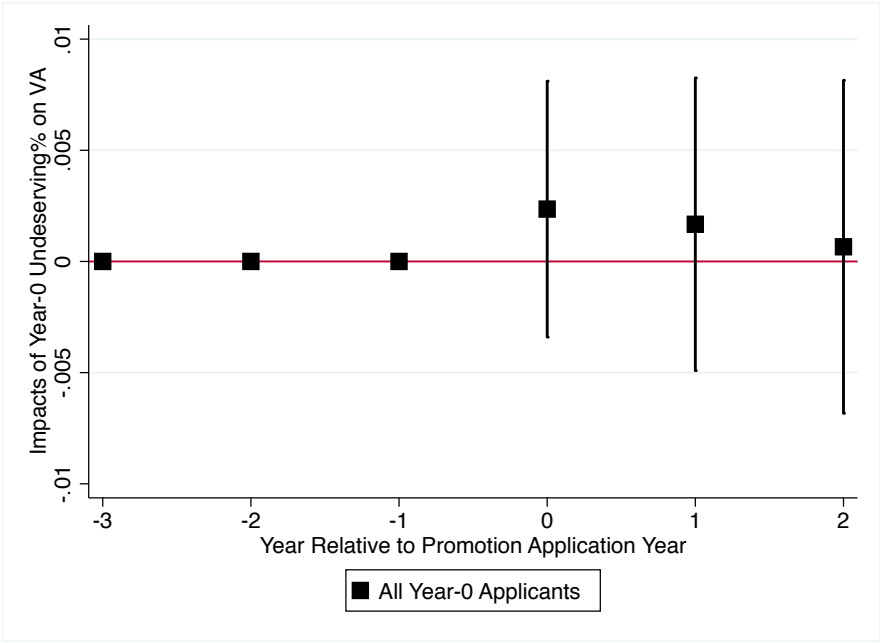
Notes: This graph plots event studies of the applicants' probability of leaving the currenty school before and after the application year of applicant type $m \in \mathbb{M}$ ={Undeservingly Promoted, Deservingly Promoted, Deservingly Denied, Undeservingly Denied}. The estimated coefficients on the relative year dummies ($\{\hat{\varphi}_{m\tau}\}_{\tau=-3}^{2}$) from the regressions of Equation (18), as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the applicant level are reported in Panel (B) of Table **??**). Only the applicant-year observations where the applicant works in the same school as the application year, and for a denied applicant the years in which she has not been subsequently promoted subsequently, are included. Applicants' job characteristics with individual-specific coefficients, school-specific time trends, applicant-(year 0)-principal fixed effects, applicant-(current)-principal fixed effects are controlled for. $\varphi_{m,\tau} = 0, \forall \tau < 0$, by construction.

FIGURE 6: IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON APPLICANTS' VALUE-ADDED



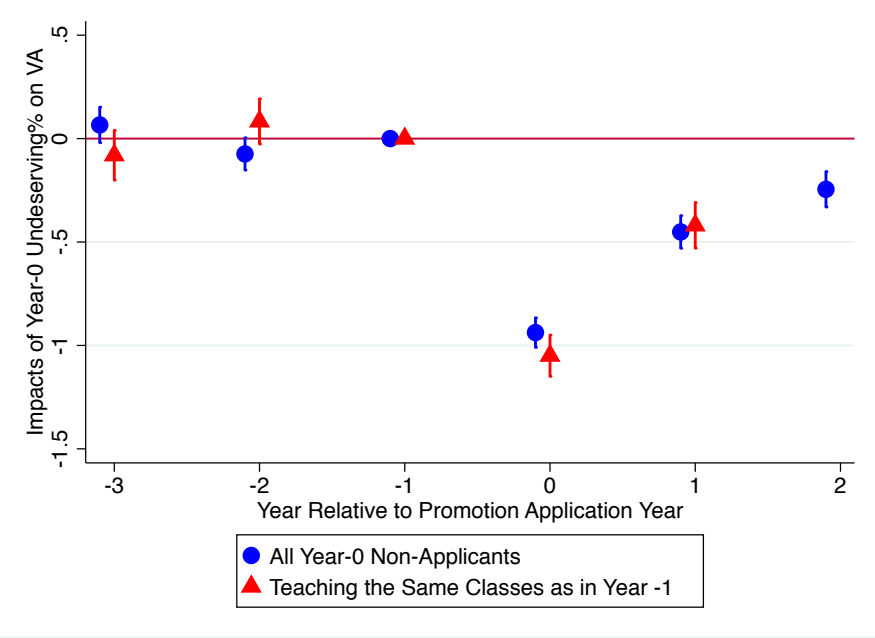
Notes: This graph shows the impacts of current perceived promotion unfairness (Undeserving%) on the current, future and lagged VA of the promotion applicants in a school. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. The estimated coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (A) of Table **??**. Only the applicant-year observations where the applicant works in the same school as the application year ($h(j,t+s) = h(j,t)$), and for a denied applicant the years in which she has not been subsequently promoted subsequently, are included. Lagged VA ($\text{VA}_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. $\theta_{-1} = 0$ by construction.

FIGURE 7: IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON APPLICANTS' JOB QUITTING PROBABILITY



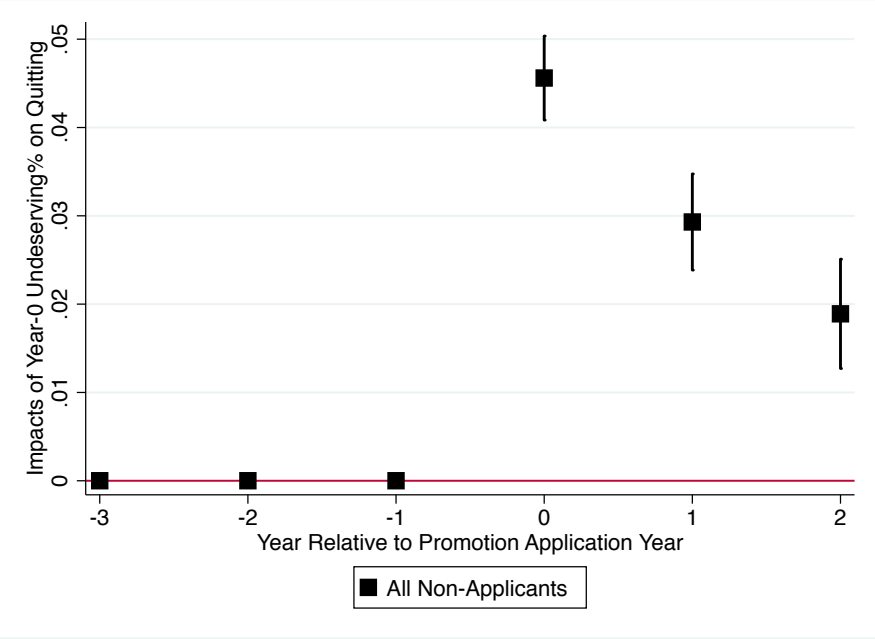
Notes: This graph shows the impacts of current perceived promotion unfairness (Undeserving%) on the current and future job quitting probabilities of the promotion applicants in a school. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. The estimated coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (B) of Table **??**. Only the applicant-year observations where the applicant works in the same school as the application year ($h(j,t+s) = h(j,t)$), and for a denied applicant the years in which she has not been subsequently promoted subsequently, are included. Job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. $\theta_{-1} = 0$ by construction.

FIGURE 8: SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' VALUE-ADDED



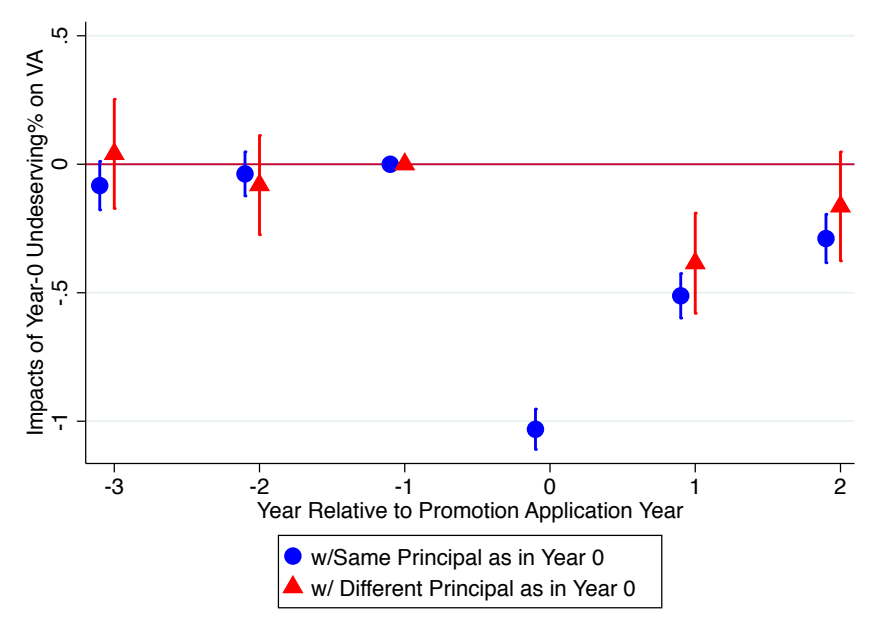
Notes: This graph shows the impacts of current perceived promotion unfairness (Undeserving%) on the current, future and lagged VA of the non-applicant teachers in a school. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. The estimated coefficients along with their associated standard errors clustered at the teacher level are reported in Panels (A) and (B) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. The blue dots show the results using the whole sample, while the results shown in the red dots include only the observations where the teacher teaches the same set of classes as in year -1. Lagged VA ($VA_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. $\theta_{-1} = 0$ by construction.

FIGURE 9: SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' JOB-QUITTING PROBABILITY



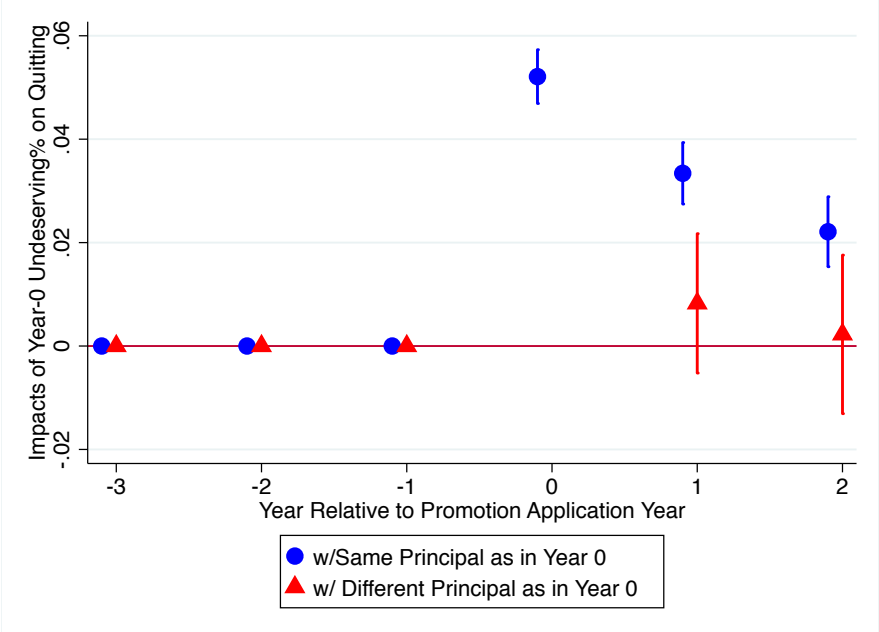
Notes: This graph shows the impacts of current perceived promotion unfairness (Undeserving%) on the current and future job quitting probabilities of the non-applicant teachers in a school. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regression of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (C) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. Job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. $\theta_\tau = 0, \forall \tau < 0$, by construction.

FIGURE 10: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' VA: PRINCIPAL'S PRESENCE



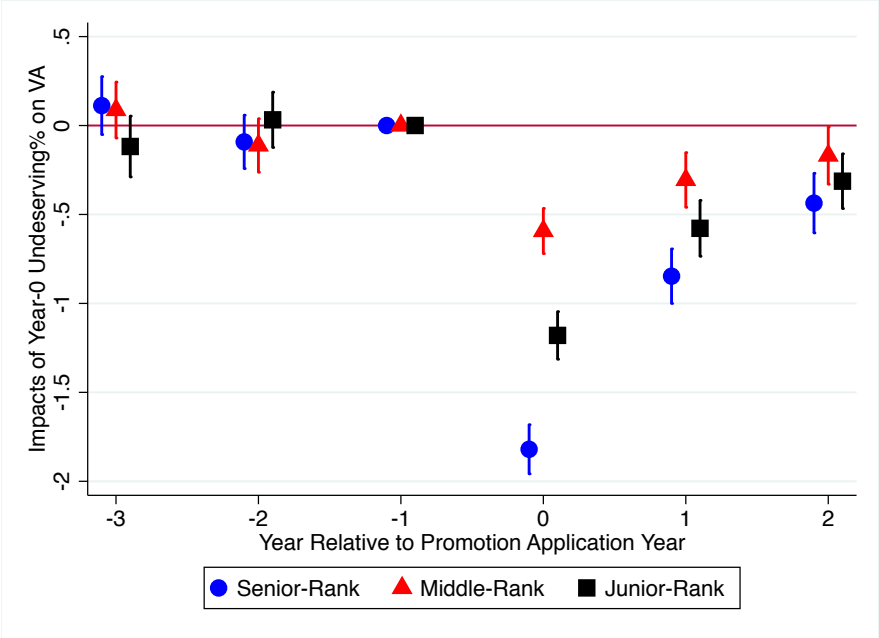
Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current, future and lagged VA of non-applicant teachers when the promotion-decision-making principal is either still in the school or not. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (A) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. The blue dots show the the results using the subsample where the principal who makes the promotion decision in year 0 is in the school ($P(i,t+s) = P(i,t)$); the red dots show the results using the subsample where the promotion-decision-making principal has left (not arrived in) the school ($P(i,t+s) \neq P(i,t)$). Lagged VA ($VA_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. The share of years when the principal is not the same as in year 0 is 16% in the sample. $\theta_{-1} = 0$, by construction.
This graph presents the empirical test results of Predictions I.2) and II.2) in Sub-section 5.2.3.

FIGURE 11: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' QUITTING PROBABILITY: PRINCIPAL'S PRESENCE



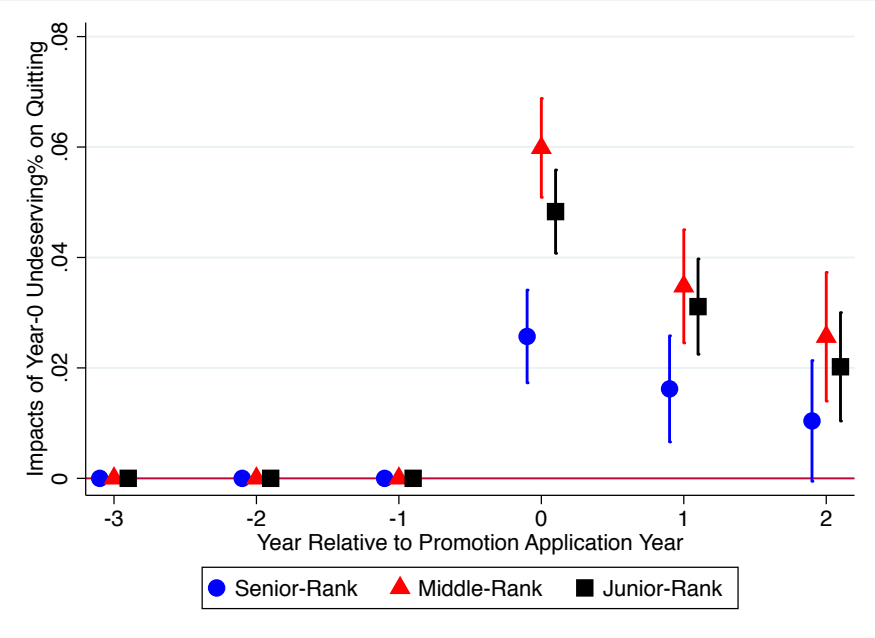
Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current and future job quitting probabilities of the non-applicant teachers when the promotion-decision-making principal is either still in the school or not. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (B) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. The blue dots show the the results using the subsample where the principal who makes the promotion decision in year 0 is in the school ($P(i,t+s) = P(i,t)$); the red dots show the results using the subsample where the promotion-decision-making principal has left (not arrived in) the school ($P(i,t+s) \neq P(i,t)$). Job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. The share of years when the principal is not the same as in year 0 is 16% in the sample. $\theta_\tau = 0, \forall \tau < 0$, by construction.
This graph presents the empirical test results of Predictions I.2) and II.2) in Sub-section 5.2.3.

FIGURE 12: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' VA: PROFESSIONAL RANKS



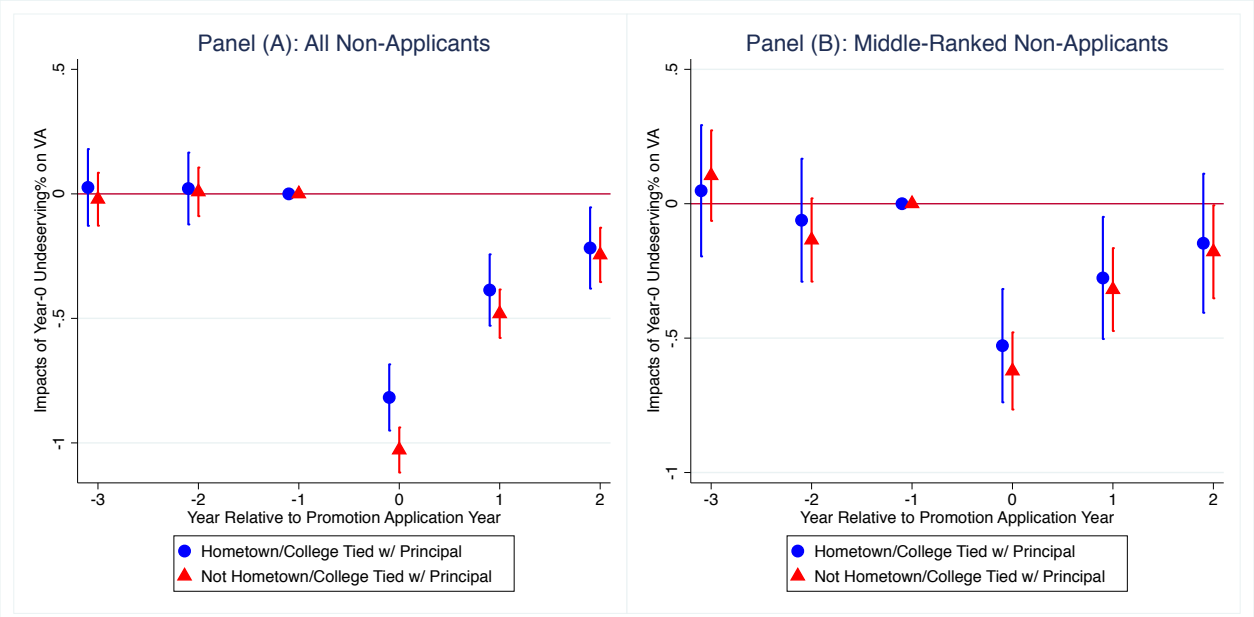
Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current, future and lagged VA of the non-applicant teachers of different professional ranks in a school. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (A) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. Lagged VA ($VA_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. Senior, middle and junior teachers account for 27%, 41% and 32% of the sample respectively. $\theta_{-1} = 0$ by construction.
This graph presents the empirical test results of Prediction *Ia.1)* in Sub-section 5.2.3.

FIGURE 13: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' QUITTING PROBABILITY: PROFESSIONAL RANKS



Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current and future job quitting probabilities of the non-applicant teachers of different professional ranks in a school. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (B) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. Job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. Senior, middle and junior teachers account for 27%, 41% and 32% of the sample respectively. $\theta_\tau = 0, \forall \tau < 0$, by construction.
This graph presents the empirical test results of Prediction *Ia.1)* in Sub-section 5.2.3.

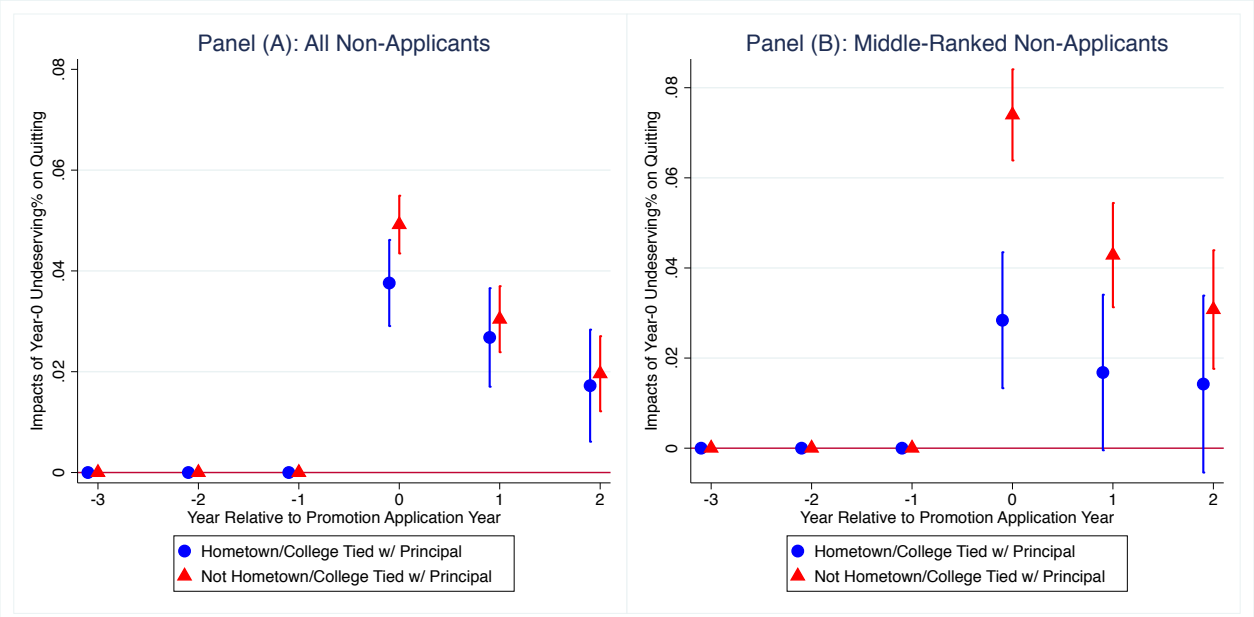
FIGURE 14: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' VA: SOCIAL TIES W/ PRINCIPAL



Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current, future and lagged VA of the non-applicant teachers who are either socially tied to the promotion-decision-making principal or not. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panels (C) and (D) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. The blue dots show the results using the subsample where the teacher is socially tied to the principal who makes the promotion decision in year 0 is in the school ($\text{SocialTie}_{i,P(i,t)} = 1$); the red dots show the results using the subsample where the teacher is not socially tied to the principal in year 0 ($\text{SocialTie}_{i,P(i,t)} = 0$). Panel (A) shows the results for all non-applicant teachers, and Panel (B) shows the results for the middle-ranked teachers (prospective applicants in the next few years) only. Lagged VA ($\text{VA}_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. The share of teachers socially tied to principal is 33% in the sample. $\theta_{-1} = 0$ by construction.

Panel (A) presents the empirical test results of Predictions *Ib)* and *II.3)*, and Panel (B) presents the test results of Predictions *Ia.2)* and Ia.3) in Sub-section 5.2.3.

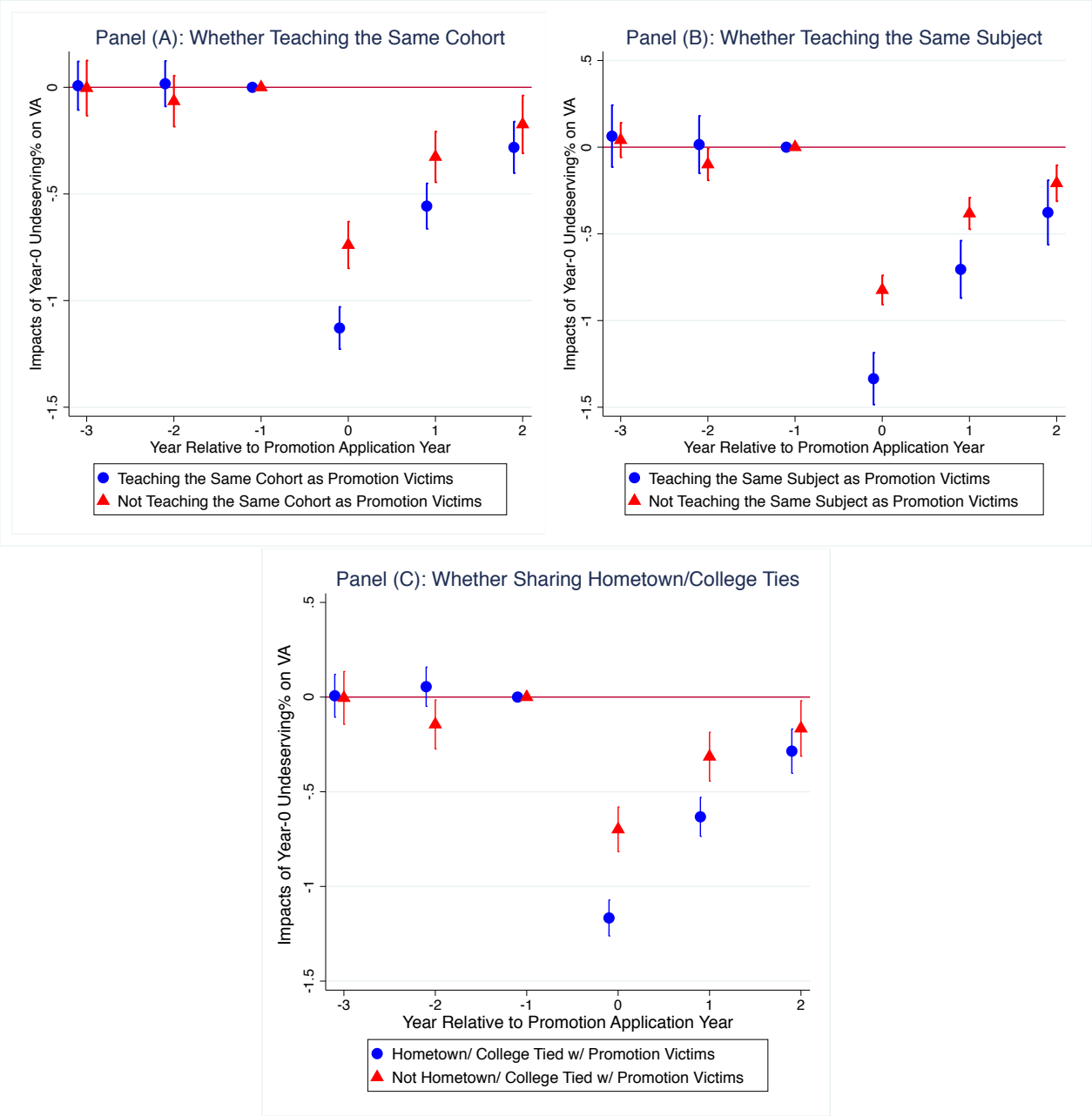
FIGURE 15: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' QUITTING PROBABILITY: SOCIAL TIES W/ PRINCIPAL



Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current and future job quitting probabilities of the non-applicant teachers who are either socially tied to the promotion-decision-making principal or not. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panels (C) and (D) of Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. The blue dots show the results using the subsample where the teacher is socially tied to the principal who makes the promotion decision in year 0 is in the school ($\text{SocialTie}_{i,P(i,t)} = 1$); the red dots show the results using the subsample where the teacher is not socially tied to the principal in year 0 ($\text{SocialTie}_{i,P(i,t)} = 0$). Panel (A) shows the results for all non-applicant teachers, and Panel (B) shows the results for the middle-ranked teachers (prospective applicants in the next few years) only. Job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. The share of teachers socially tied to principal is 33% in the sample. $\theta_\tau = 0, \forall \tau < 0$, by construction.

Panel (A) presents the empirical test results of Predictions *Ib)* and *II.3)*, and Panel (B) presents the test results of Predictions *Ia.2)* and Ia.3) in Sub-section 5.2.3.

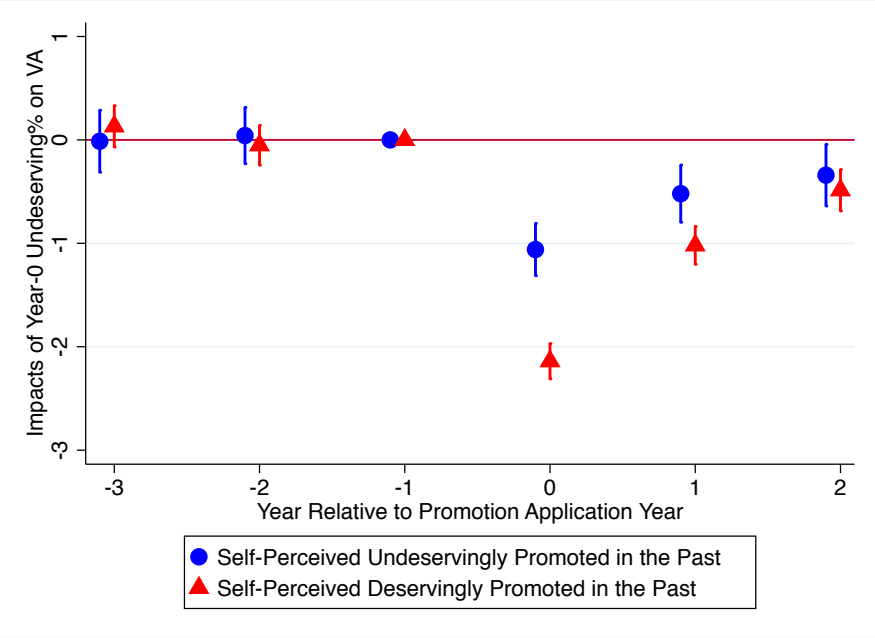
FIGURE 16: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' VA: SOCIAL INTERACTIONS WITH VICTIMS



Notes: This graph shows the heterogeneous impacts of current promotion unfairness (Undeserving%) on the current, future and lagged VA of teachers who have different levels of social interactions with the "victims" (i.e., undeservingly denied promotion). The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$), are included. The blue dots show the results using the subsample of teachers who have more often social interactions with the promotion victim(s): teaching the same cohort(s) as the victims (Panel (A))[a], teaching the same subject as the victims (Panel (B))[b], and sharing social ties with the victims (Panel (C))[c]; the red dots show the results using the subsample of teachers with less often social interactions with the promotion victim(s). Lagged VA ($VA_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. Teachers with student-cohort-interaction, subject-interaction and social ties with promotion victims account for 57%, 22% and 61% of the sample respectively. $\theta_{-1} = 0$ by construction.

[a] $\exists i'$ s.t. $m(i,i',t) =$ Undeservingly Denied and $G_{i,t+s} \cap G_{i',t+s} \neq \emptyset$, where $G_{i,t+s} := \{g(c,t+s) | j(c,k(i),t+s) = i\}$.
[b] $\exists i'$ s.t. $m(i,i',t) =$ Undeservingly Denied and $k(i) = k(i')$.
[c] $\exists i'$ s.t. $m(i,i',t) =$ Undeservingly Denied and $\text{SocialTie}_{ii'} = 1$.

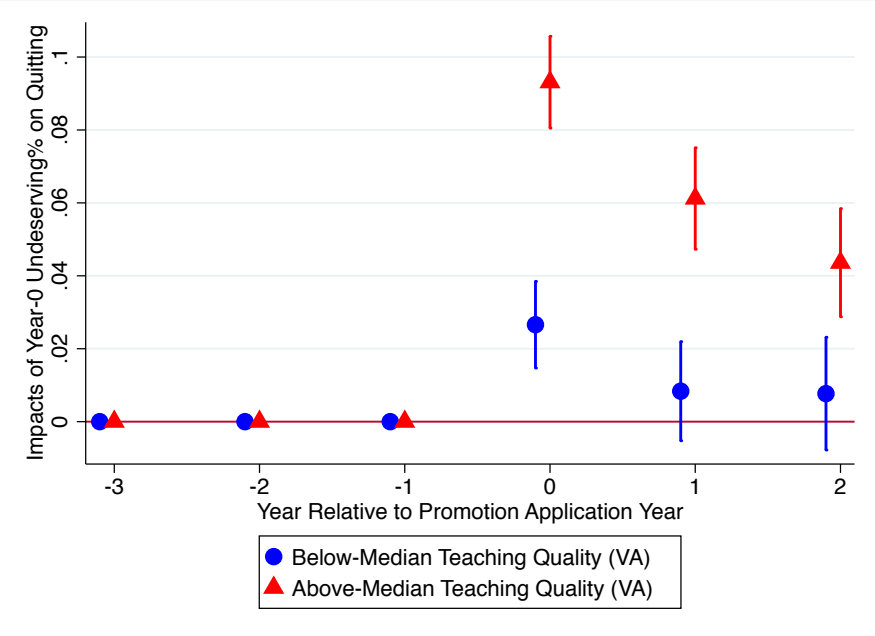
FIGURE 17: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' VA: PAST PROMOTION EXPERIENCE



Notes: This graph shows the heterogeneous impacts of current promotion unfairness (Undeserving%) on the current, future and lagged VA of senior-ranked teachers who perceive themselves as either deservingly or undeservingly promoted in the past. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regressions of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Table **??**. Only the teacher-year observations where the teacher has been promoted to the senior rank before the reference application year (year 0) and works in the same school as in the reference application year, are included. The blue dots show the results using the subsample of senior-ranked teachers who were self-perceived undeservingly promoted before year 0[a]; the red dots show the results using the subsample of senior-ranked teachers who were self-perceived deservingly promoted before year 0[b]. Lagged VA ($VA_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. The share of senior-ranked teachers who perceive themselves as deservingly promoted in the past is 76% in the sample. $\theta_{-1} = 0$ by construction.

[a] $\exists t' \leq \min\{t, t+s\}$ s.t. $m(i,i,t') =$ Undeservingly Promoted.
[b] $\exists t' \leq \min\{t, t+s\}$ s.t. $m(i,i,t') =$ Deservingly Promoted.

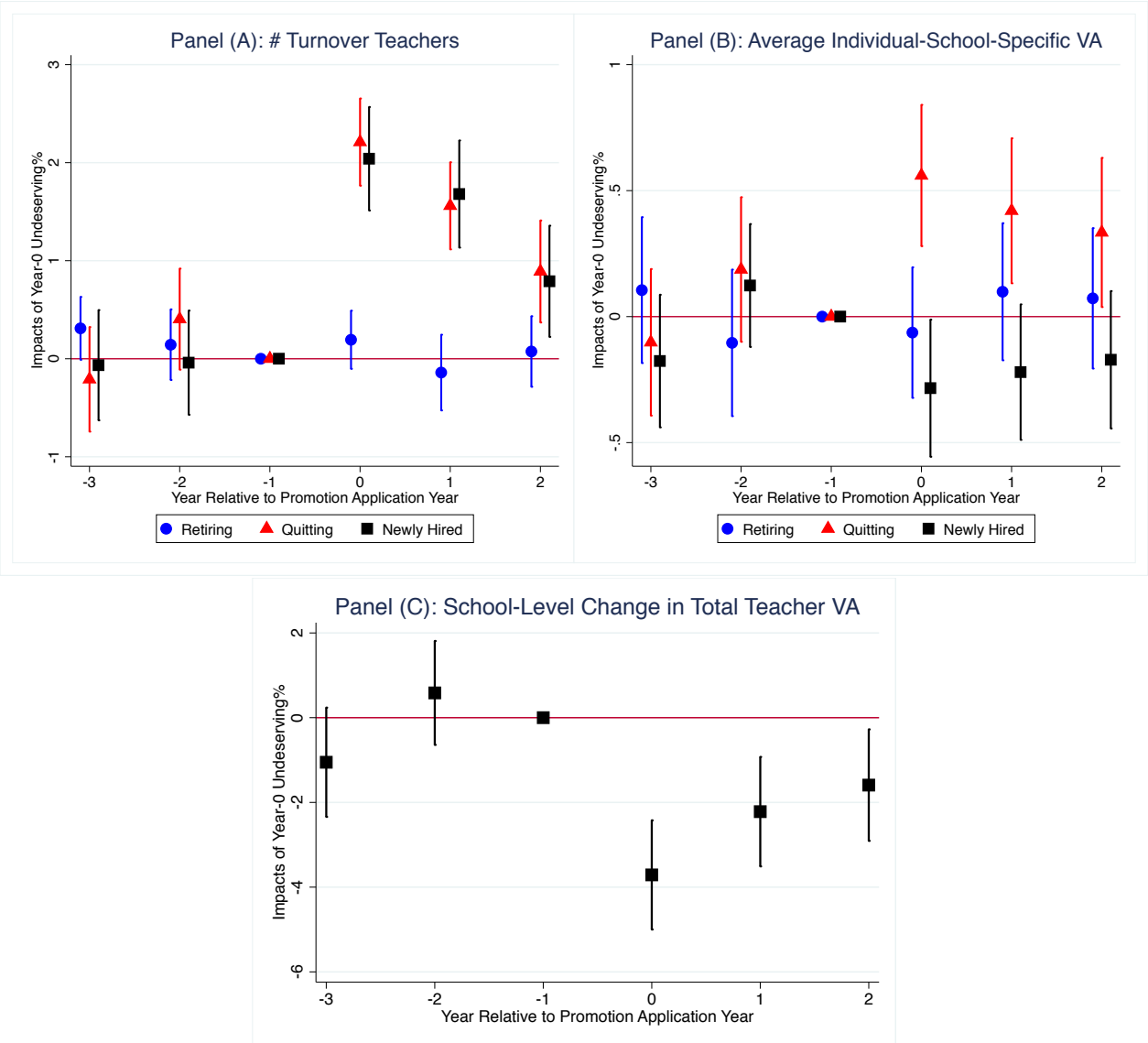
FIGURE 18: HETEROGENEOUS SPILLOVER IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON NON-APPLICANTS' QUITTING PROBABILITY: TEACHER QUALITY



Notes: This graph shows the heterogeneous impacts of current perceived promotion unfairness (Undeserving%) on the current and future job quitting probabilities of the non-applicant middle-ranked teachers of high or low teaching quality. The estimated coefficients on current Undeserving% (interacted with relative year dummies) ($\{\hat{\theta}_\tau\}_{\tau=-3}^{2}$) from the regression of Equation (20), as well as the 95% confidence intervals are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Table **??**. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0), works in the same school as in the reference application year ($h(i,t+s) = h(i,t)$) and is currently middle-ranked, are included. The blue dots show the results using the subsample where the teachers' individual-school-specific average VA is below median in the school-year[a], and the red dots plot the results for the above-median-VA teachers. Job characteristics with individual-specific coefficients, school-specific time trends, teacher-(year 0)-principal fixed effects, teacher-(current)-principal fixed effects are controlled for. The share of years when the principal is not the same as in year 0 is 16% in the sample. $\theta_\tau = 0, \forall \tau < 0$, by construction.

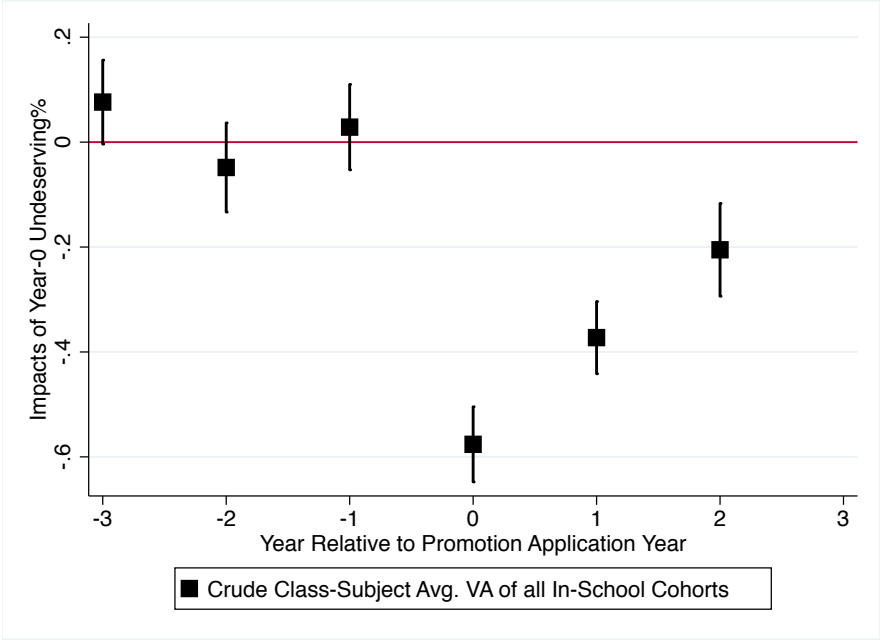
[a] $\text{VA}_{i,h(i,t)} < \text{Median}_{h(i,t),t+s}\left[\text{VA}_{i',h(i,t)}\right]^{h(i',t+s)=h(i,t)}$.

FIGURE 19: IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON TEACHER TURNOVER



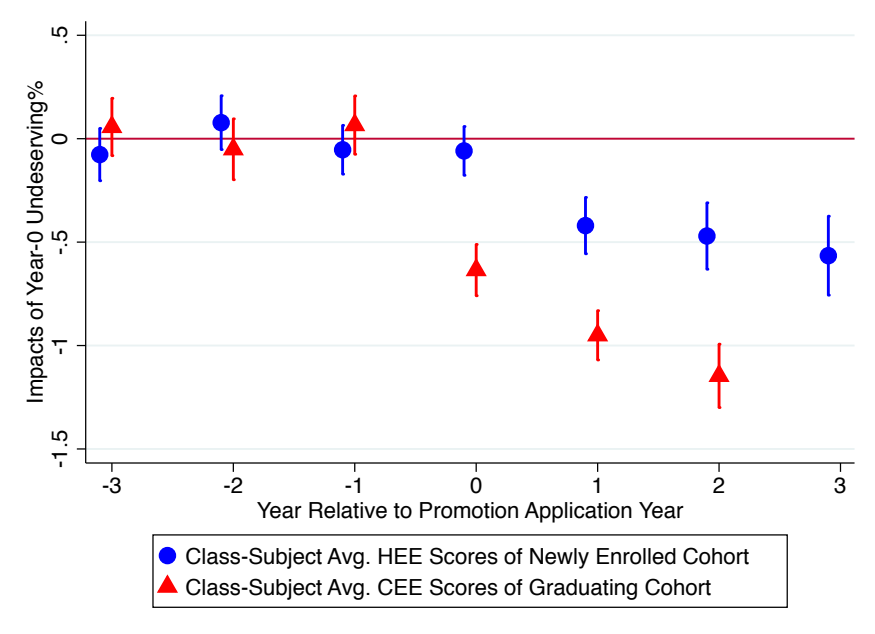
Notes: This graph shows the impacts of current promotion unfairness (Undeserving%) on current, future and lagged number and quality of turnover teachers of three types: retiring, quitting and newly hired. The unit of analysis is the school-year. The estimated coefficients on current Undeserving% (interacted with relative year dummies) from the regressions of Equation (21), as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the school level are reported in Table **??**. Lagged outcome variable, school-specific time trends and principal-school fixed effects are controlled for. The mean number of retired teachers per school-year is 3.30 (0.51); the mean number of quitting teachers per school-year is 6.31 (2.03); the mean number of new hires per school-year is 10.3 (2.83). The standard deviation of teacher-school-specific VA (VA_{ih}) is 0.56.

FIGURE 20: IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON CRUDE (CLASS-LEVEL) VA



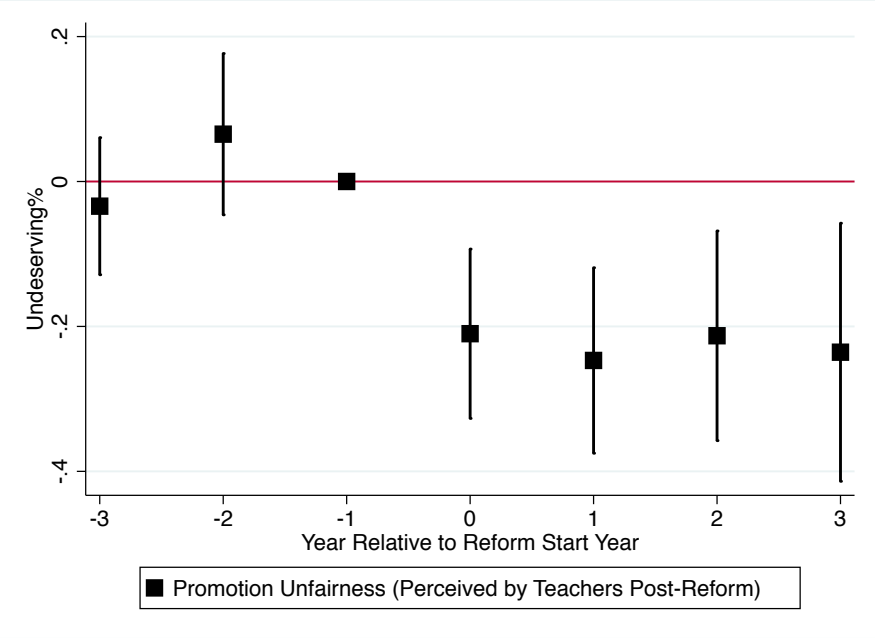
Notes: This graph shows the impacts of current promotion unfairness (Undeserving%) on a crude VA measure which takes the difference between the end-of-year and the end-of-last-year test scores of each class. The unit of analysis is the class-subject-year. The estimated coefficients from the regressions of Equation (22) on current Undeserving% (interacted with relative year dummies) , as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the school level are reported in Panel (A) of Table **??**. School specific time trends and principal-school fixed effects are controlled for.

FIGURE 21: IMPACTS OF PERCEIVED PROMOTION UNFAIRNESS ON STUDENTS' CEE AND HEE SCORES



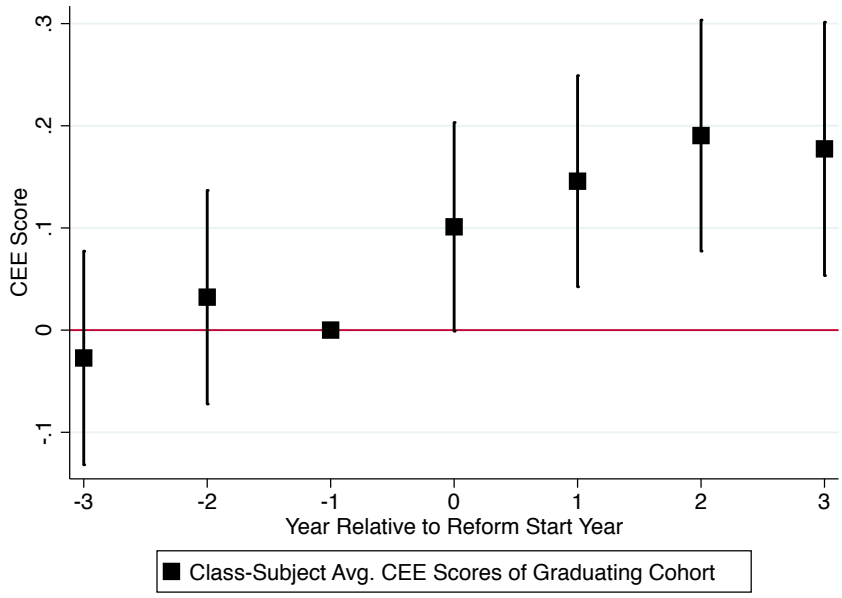
Notes: This graph shows the impacts of current promotion unfairness (Undeserving%) on the class-subject average College Entrance Exams (CEE) scores of the graduating cohort and the class-subject average High School Entrance Exams (HEE) scores of the newly enrolled cohort in a school. The unit of analysis is the class-subject-year. The estimated coefficients from the regressions of Equation (22) on current Undeserving% (interacted with relative year dummies) , as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the school level are reported in Panels (B) and (C) of Table **??**. School specific time trends and principal-school fixed effects are controlled for.
The composition of the graduating cohorts in year $\tau \leq 2$ is determined before the promotion results are revealed in the reference year 0. Therefore the impacts of unfairness on the CEE scores of these cohorts reflects the impacts on the VA they receive rather than school selection. The graduating cohort in year $\tau = 2$ is the cohort for which the reference (unfair) promotion takes place at the beginning of their grade 1, and it undergoes its potential impacts throughout their 3 years of high school.
The composition of the newly enrolled cohort in year $\tau \leq 0$ is determined before the promotion results come out in year 0. Therefore conceptually there should be no impact of promotion unfairness on the HEE scores of these newly enrolled cohorts in these years. The effects on the newly enrolled cohorts in year $\tau > 0$ shows the influence of unfairness in promotion on the quality of future incoming classes.

FIGURE 22: EVENT STUDIES OF TRANSPARENCY REFORM ON PROMOTION UNFAIRNESS (PERCEIVED BY TEACHERS)



Notes: This graph shows the impacts of the transparency reform, which requires disclosing the applicants' application CVs to peer teachers, on the perceived promotion unfairness by teachers. The estimated coefficients from the regression of Equation (26) on the relative year dummies the reform start years ($\{\hat{\chi}_\tau\}_{\tau=-3}^{3}$), as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the teacher level are reported in Panel (A) of Table (**??**). The unit of analysis is the teacher-year. School-specific time trends and principal-school fixed effects are controlled for.

FIGURE 23: EVENT STUDIES OF TRANSPARENCY REFORM ON COLLEGE ENTRANCE EXAMS PERFORMANCE



Notes: This graph shows the impacts of the transparency reform, which requires disclosing the applicants' application CVs to peer teachers, on the College Entrance Exams (CEE) scores of high school graduates. The estimated coefficients from the regression of Equation (28) on the relative year dummies to the reform start years ($\{\hat{\chi}_\tau\}_{\tau=-3}^{3}$), as well as the 95% confidence intervals, are plotted. These coefficients along with their associated standard errors clustered at the school level are reported in Panel (B) of Table (**??**). The unit of analysis is the class-subject-year. School-specific time trends and principal-school fixed effects are controlled for.

9 Tables

TABLE 1: PANEL STRUCTURE OF APPLICATION PROFILE DATASET AND TIMING OF TRANSPARENCY REFORM

City	Transparency Reform Launched in	Years Available in Data	# High Schools
A	2006	2001-2017	34
B	2010	2002-2017	31
C	2012	2003-2016	23
D	2013	2003-2016	24
Total	-	2001-2017	112

TABLE 2: VARIABLES IN CATEGORIES IN APPLICATION CVS

Category	Variables
Demographics	Gender, ethnicity, city of birth, year of birth, Communist Party membership status, college/grad school attended, subject taught, etc.
Experience	Career teaching experience, years as middle-ranked, years in current school.
Workload	Average number of sessions taught per week, years as a class head teacher, etc.
Research	Publications on national/provincial-level journals, etc.
Teaching	(Value-added-based) teaching awards of different levels.
Other	Awards of different levels from teaching demonstration contests, extra-curriculum activities, honours received by the head-teachered classes, etc.

Notes: This table lists the categorized variables on promotion applicants' formatted CVs, see Definition (1). It is required that items an applicant lists under categories of Workload, Research, Teaching and Others cover the past 6 years prior to application.

TABLE 3: DESCRIPTIVES OF HIGH SCHOOLS AND PROMOTION APPLICATIONS

	Mean	Std Dev
Panel (A): School Descriptives (per School-Year)		
# Teachers	119.3	(14.4)
# Classes	35.8	(3.72)
Class Size	48.2	(4.12)
% Junior-ranked Teachers	0.22	(0.014)
% Middle-ranked Teachers	0.53	(0.016)
% Senior-ranked Teachers	0.25	(0.015)
Panel (B): School Principals		
Male	0.472	(0.499)
Mean Age during Term	49.3	(4.32)
Length of Term (in yrs)	6.13	(1.26)
# Principals	246	-
Panel (C): Senior Rank Applications		
# Applicants per school-year	26.2	(3.41)
# Success Rate per school-year	0.217	(0.0352)
# Applications Filed (per Teacher)	2.88	(0.821)
Ultimate Success Rate (per Teacher)	0.516	-

Notes: In Panel (A), only the years for which the application profiles dataset is available are included. In Panel (B), only terms that overlap with the years for which the application profiles dataset is available are included. When calculating the length of terms in Panel (B), I use 1994 as the start year of a term for those who served as a principal in 1994, and exclude all the most recent terms (as they might have not end in the last observed year in the sample).

TABLE 4: SUMMARY STATISTICS OF TEACHERS

	(A) All Teachers		(B) Senior Rank Applicants		(C) Survey Respondents	
	Mean	SD	Mean	SD	Mean	SD
Age	37.9	(8.93)	41.3	(3.71)	37.6	(4.21)
Male	0.378	(0.484)	0.385	(0.486)	0.392	(0.488)
CPC Member	0.389	(0.487)	0.356	(0.478)	0.397	(0.489)
Ethnic Minority	0.261	(0.439)	0.247	(0.431)	0.252	(0.434)
Experience (in yrs)	14.9	(8.21)	17.4	(3.69)	13.8	(9.01)
# Years in Current School	9.92	(5.62)	13.1	(3.25)	8.98	(5.59)
# Classes Taught per Week	12.12	(1.241)	12.21	(1.284)	12.74	(1.31)
Junior-ranked	0.212	(0.408)	0	(0)	0.235	(0.424)
Middle-ranked	0.518	(0.500)	1	(0)	0.497	(0.500)
Senior-ranked	0.270	(0.444)	0	(0)	0.268	(0.443)
Obs.	210,424		59,121		687	

Notes: For Panels (A) and (B), the unit of analysis is the teacher-year. Only the years for which the application profiles dataset is available are included. For Panel (C), the unit of analysis is the respondent in the 6 surveyed schools in September 2018.

TABLE 5: DISTRIBUTION OF SOCIAL TIE TYPES

		Hometown Tied w/ Principal		
		Tie	No Tie	All
College Tie w/ Principal	Tie	10.1%	9.6%	19.7%
	No Tie	13.0%	67.3%	80.3%
	All	23.1%	76.9%	1

Notes: The unit of analysis is the applicant-year. N=57,613.

TABLE 6: WHAT PREDICTS A HIGH VALUE-ADDED TEACHER?

	Social Ties w/ Principal		Categories of Applicant Characteristics					
			Demographics	Experience	Workload	Research	Teaching	Other
Partial R^2	0.0032		0.0541	0.0391	0.0123	0.0087	0.5842	0.0403
Coefficients	Hometown	College						
	-0.0831***	0.0654***						
	(0.0142)	(0.0153)						

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors clustered at the applicant level are reported in parentheses. This table presents results from an OLS regression of the value-added of applicants in the past 6 years prior to application (VA^{-6}) on their application profile characteristics and social ties to the principal (Equation (3)). School-specific time trends are controlled for. The outcome variable is scaled to have unit standard deviation. N=57,613. The first row reports the partial R^2 of variables in each category of application profile characteristics (see Table 2 for a detailed description of these variables). The second row shows the coefficient estimates on social ties dummies. One can see that the variables in the "teaching" category explains around 60% of the variance in the applicants' VA. The coefficient estimates on the teaching awards combination dummies (which are the main variables in the "teaching" category) are shown in Figure 1.

TABLE 7: EFFECT OF SOCIAL TIES WITH PRINCIPAL ON PROMOTION RATES

	Outcome Variable: Promoted					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel (A): Pooling Hometown and College Ties					
SocialTie	0.2084***	0.2112***	0.2241**	0.2225***	0.2062***	0.2063***
	(0.0088)	(0.0087)	(0.0043)	(0.0044)	(0.0206)	(0.0210)
Teacher-School-Specific VA		0.0166***		0.0149***		0.0038
(normalized)		(0.0034)		(0.0027)		(0.0037)
(pseudo) R^2	0.721	0.723	0.705	0.710	0.832	0.834
	Panel (B): Seperating Hometown and College Ties					
HomeTie	0.1757***	0.1770***	0.1940***	0.1918***	0.1758***	0.1760***
	(0.0082)	(0.0081)	(0.0053)	(0.0052)	(0.0243)	(0.0246)
CollegeTie	0.135***	0.1376***	0.1390***	0.1383***	0.1316***	0.1309***
	(0.0082)	(0.0083)	(0.0058)	(0.0057)	(0.0231)	(0.0230)
Teacher-School-Specific VA		0.0183***		0.0164***		0.0024
(normalized)		(0.0032)		(0.0026)		(0.0038)
(pseudo) R^2	0.734	0.738	0.713	0.716	0.844	0.848
X controls	Y	Y	Y	Y	Y	Y
School-year FE	Y	Y	Y	Y	Y	Y
Share of same-subject applicants	Y	Y	Y	Y	Y	Y
Individual FE	N	N	N	N	Y	Y
Model	Logit	Logit	Linear	Linear	Linear	Linear
Mean Dep. Var	0.217	0.217	0.217	0.217	0.213	0.213
# Obs	57,613	57,613	57,613	57,613	57,613	57,613

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors clustered at applicant level are reported in parentheses.

This table presents the estimated average effect of an applicant's social ties to the principal on her promotion probability (estimation results of Equation (4)). Controls of application profile characteristics (see Table 2 for a detailed description of these variables), the share of same-subject applicants, and school-year fixed effects are included in all specifications. The coefficients on the teaching-award-combination dummies from the Panel (A) Column (1) specification are shown in Figure 2. Columns (2)(4)(6) control for the teacher-school-specific value-added of the applicants (normalized to have unit standard deviation). Columns (5) and (6) include applicant fixed effects. Coefficients are in terms of average marginal effects in the logit models (columns (1) & (2)). The expanded versions of Panel (A) and Panel (B) with coefficients on control variables are presented in Table **??** and Table **??** respectively.

TABLE 8: DO PRINCIPALS EVALUATE SOCIALLY TIED AND UNTIED APPLICANTS DIFFERENTLY ALONG OTHER CHARACTERISTICS?

Categorical Promotability Indices $\hat{\eta}_g^P$ $(g \in \mathbb{G})$	Socially Tied $\hat{\rho}_g^1$ (1)	Socially Untied $\hat{\rho}_g^0$ (2)	Difference $\hat{\rho}_g^1 - \hat{\rho}_g^0$ (3)
(1) Demographics	0.987***	1.015***	-0.028**
	(0.009)	(0.008)	(0.012)
(2) Experience	1.013***	0.991***	0.022*
	(0.0012)	(0.009)	(0.015)
(3) Workload	1.008***	0.979***	0.029*
	(0.014)	(0.012)	(0.017)
(4) Research	0.968***	1.037***	-0.069***
	(0.010)	(0.009)	(0.013)
(5) Teaching	0.976***	1.016***	-0.040***
	(0.006)	(0.005)	(0.007)
(6) Other	1.054***	0.962***	0.092***
	(0.013)	(0.010)	(0.016)
(7) Composite ($\hat{\eta}^P$)	0.989	1.010	-0.021*
	(0.009)	(0.008)	(0.012)
SocialTie		Y	
School-year FE		Y	
% same-subject applicants		Y	

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors clustered at applicant level are reported in parentheses.

This table presents the estimates on the weights the school principals put on different charactertistics of applicants who are either socially tied or untied to them. The coefficient estimates $\{\hat{\rho}_g^1, \hat{\rho}_g^0\}_{g \in \mathbb{G}}$ on the categorical promotability indices (and $\{\hat{\rho}^0, \hat{\rho}^1\}$ on the composite index) of Equation (8) are reported. Categories of applicant characteristics include $\mathbb{G}$ ={demographics, experience, workload, research, teaching, other} (see Table 2 for a detailed description of these variables). Social tie index ($\hat{\eta}^{P,Tie}$), share of same-subject applicants and school-year fixed effects are included.

TABLE 9: TEACHERS' VA BY SOCIAL TIES AND PROMOTION RESULTS/APPLICATION DECISIONS

	SocialTie=0	SocialTie=1	Difference
Promotees	0.996	0.671	0.325
Denied applicants	0	-0.271	0.270
Difference	0.996	0.942	
All applicants	0.147	0.075	0.072
Non-applying eligibles	-0.114	-0.129	0.015
Difference	0.261	0.204	
All eligibles	-0.007	-0.037	0.030

Notes: This table shows the mean teacher-school-specific VA of socially-tied-to-principal and untied teachers in groups defined by promotion results and application decisions. Eligibles are defined as the middle-ranked teachers who satisfy the mandatory experience and seniority requirement for senior rank application. The unit of analysis is the teacher-year, and school-year fixed effects are taken out. Specifically, the numbers in this table are the coefficient estimates from regression

$$\text{VA}_{j,h(j,t)} = \sum_{p \in \mathbb{P}}^{\omega \in \{0,1\}} \mathbb{I}\left[\text{SocialTie}_{j,P(j,t)} = \omega, p_{jt} = p\right] + \lambda_{h(j,t),t} + \varepsilon_{jt}$$

, where $\mathbb{P} = \{\text{Promotee, Denied applicants, Non-applying eligibles}\}$.

TABLE 10: HETEROGENEITIES IN PRINCIPALS' PREFERENCES OVER APPLICANT CHARACTERISTICS

Categorical Promotability Indices $\hat{\eta}_g^P$ $(g \in \mathbb{G})$	Principal's Age		Principal is Male	
	$\hat{\rho}_{1g}^{\text{age}}$	$\hat{\rho}_{2g}^{\text{age}}$	$\hat{\rho}_{1g}^{\text{female}}$	$\hat{\rho}_{1g}^{\text{male}}$
	(1)	(2)	(3)	(4)
(1) Demographics	0.991***	0.038***	1.032***	-0.024***
	(0.007)	(0.013)	(0.007)	(0.0010)
(2) Experience	1.013***	0.062***	1.017***	0.026***
	(0.008)	(0.013)	(0.009)	(0.012)
(3) Workload	1.021***	-0.058*	1.014***	-0.032**
	(0.009)	(0.017)	(0.012)	(0.014)
(4) Research	0.976***	0.084***	0.974***	0.051***
	(0.008)	(0.019)	(0.009)	(0.011)
(5) Teaching	0.974***	-0.385***	1.046***	-0.088***
	(0.004)	(0.008)	(0.004)	(0.005)
(6) Other	1.010***	-0.042**	0.990***	0.033***
	(0.010)	(0.019)	(0.009)	(0.012)
(7) Social Ties	0.987***	0.452***	0.783***	0.487***
	(0.003)	(0.008)	(0.004)	(0.005)
School-year FE	Y		Y	
% same-subject applicants	Y		Y	
# Principals	246		246	
Obs.	57,613		57,613	

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors clustered at applicant level are reported in parentheses.

This table presents the heterogeneities in the principals' preferences over applicants' application profile characteristics in different categories and their social ties when deciding whom to recommend for promotion. Regression results of Equation (10) are shown. The coefficient estimates on categorical promotability indices (Definition (7)), $\left\{\hat{\rho}_{1g}^D, \hat{\rho}_{2g}^D\right\}_{g\in\{\mathbb{G},tie\}}$, are reported. Categories of applicant characteristics include $\mathbb{G}$ ={demographics, experience, workload, research, teaching, other} (see Table 2 for a detailed description of these variables), and principal types are $D \in$ {principal age, principal gender}. Age is de-meaned and scaled by $\frac{1}{10}$. $\hat{\rho}_{1g}^{\text{age}}$ ($\hat{\rho}_{1g}^{\text{male}}$) shows the average weight a mean-aged principal (a female principal) puts on the applicants' characteristics in the corresponding category (the weight put on each category by an average principal is normalized to 1), while $\hat{\rho}_{2g}^{\text{age}}$ ($\hat{\rho}_{2g}^{\text{male}}$) shows the additional weight put on this category by a 10-year older principal (a male principal).

TABLE 11: DISTRIBUTION OF APPLICANTS BY PROMOTION RESULTS AND PERCEIVED DESERVINGNESS

	Unpromotable	Promotable
Promoted (22%)	Undeservingly Promoted (4.8%)	Deservingly Promoted (17.2%)
Not Promoted (78%)	Deservingly Denied (73.2%)	Undeservingly Denied (4.8%)

Notes: The unit of analysis is the teacher-applicant-year. N=6,797,345.

TABLE 12: WHAT DO SURVEY RESPONDENTS VALUE IN APPLICANTS COMPARED TO PRINCIPALS?

Respondent Group (f)	Junior		Middle		Senior		Whole Sample
	Low VA	High VA	Low VA	High VA	Low VA	High VA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Demographics	1.094	1.132	0.998	1.109	1.109	1.078	1.095
	(0.142)	(0.143)	(0.113)	(0.115)	(0.140)	(0.138)	(0.077)
(2) Experience	1.151	1.063	1.104	1.043	1.155	1.115	1.106
	(0.171)	(0.173)	(0.138)	(0.136)	(0.163)	(0.164)	(0.092)
(3) Workload	1.107	1.140	1.084	1.168	1.169	1.126	1.131*
	(0.135)	(0.133)	(0.106)	(0.104)	(0.130)	(0.131)	(0.072)
(4) Research	0.832	0.793*	0.834*	0.827*	0.754**	0.768**	0.808***
	(0.121)	(0.123)	(0.098)	(0.097)	(0.115)	(0.114)	(0.063)
(5) Teaching	1.481***	1.543***	1.494***	1.528***	1.549***	1.602***	1.529***
	(0.114)	(0.113)	(0.086)	(0.084)	(0.112)	(0.109)	(0.061)
(6) Other	1.010	1.104	1.189	1.115	1.171	1.054	1.067
	(0.162)	(0.161)	(0.126)	(0.127)	(0.154)	(0.156)	(0.083)
(7) Social Ties	0.269***	0.248***	0.303***	0.290***	0.238***	0.217***	0.269***
	(0.132)	(0.132)	(0.102)	(0.103)	(0.134)	(0.132)	(0.068)
Mean of Coefficients	0.992	1.003	1.001	1.011	1.021	0.994	1.001
% same-subject applicants in virtual school	Y	Y	Y	Y	Y	Y	Y
Virtual School FE	Y	Y	Y	Y	Y	Y	Y
# Respondents	81	81	170	171	92	92	687
Obs.	2,276	2,309	4,801	4,829	2,593	2,584	19,392

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors clustered at applicant level are reported in parentheses.

This table looks at what categories of applicant characteristics the surveyed teachers value differentially more (or less) compared to school principals. Regression results of Equation (17) are shown. The coefficient estimates on categorical promotability indices constructed using the principals' promotion decisions (Definition (7)), $\{\hat{\varrho}_g\}_{g\in\{\mathbb{G},tie\}}$, are reported. Categories of applicants' application profile characteristics include $\mathbb{G}$ ={demographics, experience, workload, research, teaching, other} (see Table 2 for a detailed description of these variables). p-values are from the likelihood ratio tests of whether the estimated coefficients are equal to the mean of coefficients ($\frac{1}{7}\sum_{g\in\{\mathbb{G},tie\}}\hat{\varrho}_g$) in each column. Fixed effects for the virtual applicants' schools and share of same-subject virtual applicants in the virtual school are included. Columns (1)-(6) show the results for each of the 6 types of survey respondents by their professional ranks and within school-rank VA, and column (7) shows the results for the whole surveyed sample. A coefficient on the principals' promotability index of category g that is larger (smaller) than the mean implies the surveyed teachers value applicants' characteristics in category g more (less) compared to the principals.

TABLE 13: VA AND SOCIAL TIES OF APPLICANTS BY PROMOTION RESULTS AND PERCEIVED DESERVINGNESS

	Teaching Quality (VA)	Social Tie	Hometown Tie	College Tie	Obs.
(1) Undeservingly Promoted	0.637	0.793	0.563	0.478	326,273
(2) Deservingly Promoted	1.137	0.295	0.213	0.181	1,169,143
p-value: (1)-(2)	[0.000]	[0.000]	[0.000]	[0.000]	-
(3) Undeservingly Denied	0.868	0.025	0.037	0.029	326,273
(4) Deservingly Denied	-0.069	0.327	0.228	0.192	4,975,656
p-value: (3)-(4)	[0.000]	[0.000]	[0.000]	[0.000]	-
All Applicants	0.217	0.329	0.232	0.196	6,797,345

Notes: This table shows the mean teacher-school-specific VA and the probability of sharing social ties with principals of the four types of applicants (Undeservingly Promoted, Deservingly Promoted, Deservingly Denied, Undeservingly Denied). The unit of analysis is the teacher-applicant-year.

TABLE 14: HETEROGENEOUS IMPACTS OF PROMOTION UNFAIRNESS BY PRINCIPAL'S LENGTH IN OFFICE

Year relative to Promotion Year	$t-3$	$t-2$	$t-1$	t	$t+1$	$t+2$	Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	
	Panel (A): Outcome Variable: Teachers' VA ($VA_{i,t+s}$)						
Undeserving%	0.023*	-0.031		-1.054***	-0.546***	-0.307***	435,998
	(0.053)	(0.048)		(0.044)	(0.049)	(0.053)	
Undeserving%×Length	0.014	-0.014	-0.011	0.038*	0.031	0.020	
	(0.023)	(0.021)	(0.019)	(0.020)	(0.023)	(0.024)	
	Panel (B): Outcome Variable: Teachers' Quitting before Retirement ($Leave_{i,t+s}$)						
Undeserving%				0.0637***	0.0572***	0.0305***	435,998
				(0.0032)	(0.0037)	(0.0042)	
Undeserving%×Length				-0.0059***	-0.0091***	-0.0038*	
				(0.0018)	(0.0019)	(0.0022)	

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors clustered at teacher level are reported in parentheses. This table presents the heterogeneous impacts of perceived promotion unfairness on teachers' VA ($VA_{i,t+s}$) and job quitting probability ($Leave_{i,t+s}$) by how long the principal has stayed in the school at the promotion year ($Length_{P(i,t),t}$). The estimated coefficients from the regressions of Equation:

$$\begin{aligned} Y_{i,t+s} = \quad & \textstyle\sum_{\tau=-3}^{2} \left((\theta_{1\tau} + \theta_{2\tau} z_{i,t+s}) \, \text{Undeserving\%}_{it} + \theta_{3\tau} z_{i,t+s} \right) \times \mathbb{I}\left[s = \tau \right] + \sigma^{\theta} Y_{i,t-1} \\ & + g^{\theta}_{h(i,t)}\left(t+s \right) + \mathbf{Z}_{i,t+s} \beta^{\theta}_{i} + \lambda^{\theta}_{i,P(i,t)} + \lambda^{\theta}_{i,P(i,t+s)} + \varepsilon^{\theta}_{i,t+s}. \end{aligned}$$

on current Undeserving% (interacted with relative year dummies) and its interactions with $Length_{P(i,t),t}$ ($\{\hat{\theta}_{1\tau}, \hat{\theta}_{2\tau}\}_{\tau=-3}^{2}$), are reported. Only the teacher-year observations where the teacher is a non-applicant in the reference application year (year 0) and works in the same school as in the reference application year ($h\left(i, t+s\right) = h\left(i,t\right)$), are included. Lagged VA ($VA_{i,t-1}$), job characteristics with individual-specific coefficients, school-specific time trends, applicant-(year 0) principal fixed effects, applicant-current-principal fixed effects are controlled for.
This table presents the empirical test results of Predictions I.1) and II.1) in Sub-section 5.2.3.

TABLE 15: EFFECTS OF APPLICANT INFORMATION DISCLOSURE ON FAVORITISM AND SCHOOL PRODUCTIVITY

Outcome Variable	Teachers' VA VA_{it} (1)	Principals' Favoritism $Promoted_{jt}$ (2)	Perceived Unfairness $Undeserving\%_{it}$ (3)	CEE Scores A^{CEE}_{ckt} (4)
Post	0.076**		-0.247***	0.174***
	(0.009)		(0.017)	(0.018)
Post×Undeserving%	-0.953***			
	(0.029)			
(1-Post)×Undeserving%	-0.673***			
	(0.024)			
Post×SocialTie		0.135***		
		(0.0085)		
(1-Post)×SocialTie		0.264***		
		(0.0102)		
Unit of analysis	Teacher-year	Applicant-year	Teacher-year	Class-subject-year
Sample	Non-Applicants	Applicants	All Teachers	Graduating cohorts
Mean Dep. Var.	0.041	0.21	0.314	0
Pre-Reform Mean Dep. Var.			0.461	
SD Dep. Var.	0.932	0.41	0.128	1
Obs.	184,421	57,613	224,421	124,704

Notes: * p=0.1, ** p=0.05, *** p=0.01. Standard errors are reported in parentheses.

Column (1) reports the coefficient estimates from regression of Equation (23). It shows the difference in the incentive effects of perceived unfairness before and after the transparency reform. Standard errors are clustered at the teacher level. Lagged VA ($VA_{i,t-1}$), school-specific time trends, job characteristics with teacher-specific coefficients and teacher-principal fixed effects are controlled for.

Column (2) reports the coefficient estimates from regression of Equation (24). It shows the difference in the extent of favoritism by principals before and after the transparency reform. Standard errors are clustered at the applicant level. A logit model is used and the coefficients are in terms of average marginal effects. Controls of applicant characteristics, the share of same-subject applicants and school-year fixed effects are included.

Column (3) reports the coefficient estimate on $Post$ ($\hat{\delta}$) from regression of Equation (25). It shows the difference in the extent of perceived promotion unfairness by teachers before and after the transparency reform. Standard errors are clustered at the teacher level. School-specific time trends and principal-school fixed effects are controlled for.

Column (4) reports the coefficient estimate on $Post$ ($\hat{\delta}$) from regression of Equation (27). It shows the difference in the College Entrance Exams (CEE) scores of high school graduates before and after the transparency reform. Standard errors are clustered at the school level. School-specific time trends and principal-school fixed effects are controlled for.