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The role of personal and relative job performance in promotion decisions

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Abstract

This study employs personnel data from a large university to examine how supervisors utilize information on employees' job performance in promotion decisions. The study shows that better-performing employees are rewarded with promotions as a higher output of peer-reviewed publications and better quality of research output are associated with a higher probability of being promoted. The study also shows that supervisors compare their subordinates' job performance when deciding on promotions: employees who outperform their colleagues in terms of research output and research quality are more likely to be promoted. Subsequently, the study provides evidence to support the key premise of the tournament theory that promotions depend on relative comparisons of employees' performance.

JEL classification: J24, M5

Keywords: Promotion, job performance, tournament theory, performance appraisal

1. Introduction

One important reason why employers monitor employees' work performance is to identify more able workers in order to promote more qualified employees to higher-ranking jobs that involve more responsibility. Because the number of jobs at the higher rungs of a job ladder is typically limited in organizations, only a portion of employees at lower rungs can be promoted. As a result, promotion decisions are typically based on a comparison of the relative performance of employees doing the same job, where the performance of colleagues provides a benchmark as to how each employee can be expected to perform. Sometimes employers can explicitly tie promotions to relative job performance to create incentives for employees to exert more work effort. Employers may, for example, use a tournament-type incentive scheme, in which only the best-performing employees at each job level are promoted to higher-paying job levels (Lazear and Rosen, 1981; Lazear, 1999). This kind of tournament creates an incentive for employees to work harder because they can only achieve a reward by outperforming their colleagues.

One key problem concerning promotions is that accurately measured information on employee performance is often not available. There are certain jobs, such as salespersons and pieceworkers, for whom job performance can easily be measured. However, in more versatile work environments, employees often have a variety of job tasks, some of which are directly observable and quantifiable and some of which are not (Holmstrom and Milgrom, 1991). In such work environments, employers can turn to supervisors' appraisals of subordinates to gather information about employee performance (Baker et al., 1994). The advantage of such performance appraisals is that they allow supervisors to take into account not only the measurable achievements of workers but also achievements that are more difficult to quantify. This discretion of supervisors can lead to more accurate appraisals if supervisors take advantage of the private information they have on employee performance. Consequently, supervisors' performance ratings may provide a more comprehensive view of overall job performance (Prendergast and Topel, 1993).

Previous studies that have examined the role of job performance in promotion decisions have typically used subjective performance ratings as a measure of employee performance (Lazear,

1999, 2000; DeVaro, 2006a, 2006b; Frederiksen et al., 2017).¹ However, there are three key reasons why such ratings may be problematic. First, supervisors' performance ratings can suffer from subjective biases (Bol, 2008, 2011; Bol and Smith, 2011). In particular, supervisors may refrain from differentiation among employees by 'compressing' performance ratings around certain ratings (Moers, 2005; Bol, 2011; Frederiksen et al., 2017), favour certain employees in their appraisals (Prendergast and Topel, 1996) or show leniency by rating employees higher than their actual performance warrants (Jawahar and Williams, 1997; Moers, 2005). Second, performance ratings provide only a bounded measure of performance differences as supervisors have only a limited number of alternative ratings to choose from. Supervisors may further limit the variation in ratings by avoiding the use of some ratings and compressing their ratings to certain values (Frederiksen et al., 2017). Third, performance ratings can be an inappropriate control for worker performance in promotion studies if supervisors manipulate ratings to justify their promotion decisions (Blackwell et al., 1994).

In this study, we employ personnel data from a large university to analyse how promotions depend on observable work achievements. The data allow us to distinguish between employees' personal and relative achievements, as measured by research output, research quality and other academic activities. Consequently, we can overcome the most important limitations of prior studies. First, we have detailed information on worker achievements, which allows us to directly test the key premise of tournament theory that promotions are determined based on relative performance comparisons. Second, we can accurately identify the reference group against which supervisors compare employees when evaluating their relative job performance. To our knowledge, our study is the first to use such detailed information on relative worker achievements in examining promotions. Third, we can examine promotions along a well-defined job ladder: the university analysed in this study has an accurate job hierarchy based on a ladder of job levels, in which higher levels are associated with greater complexity, responsibility and autonomy. Earlier studies on predictors of promotions have often been complicated by uncertainty regarding the precise hierarchy of jobs. Such uncertainty makes it difficult to distinguish promotions from other within-firm job changes, such as formal upgrades of a current position that do not involve changes in job duties (Pergamit and Veum, 1999).

¹ Other proxy variables that have been used in studies to measure performance differences include performance-based wage bonuses (DeVaro and Kauhanen, 2016) and worker absenteeism rates (Audas et al., 2004).

The personnel data we use in our analysis include information on the job performance and job characteristics of 1,074 full-time faculty members of a large Finnish multidisciplinary university in 2017 and 2018. We begin the study by describing how promotion decisions are made at the case university (Section 2). We then describe the personnel data, methods and main results (Section 3). The results show that better performing employees were more likely to be promoted to higher job levels. In particular, the findings support the key premise of the tournament theory that internal promotions are determined by relative comparisons of worker achievements. Finally, we conclude with a discussion of the limitations of our study and some suggestions for future research.

2. Promotions and performance appraisals at our case university

Based on the complexity of job duties and responsibilities, each faculty member is assigned to one of the eleven job levels (also called complexity levels). The job levels define the job ladder of the university: an upward movement along the job ladder denotes promotion because higher job levels are accompanied by greater job complexity, responsibility and autonomy. Faculty members hold various occupational titles that vary along the job ladder as follows: early-career researchers such as doctoral students and teaching assistants work at job levels 1–4, recent doctoral graduates work at job level 5, more experienced postdoctoral researchers and lecturers work at levels 6 and 7, and full professors work at job levels 8–11.² A key observation here is that the eleven-rung job ladder – and not the occupational title or academic rank – effectively determines the job hierarchy of the university. For example, a full professor is the highest academic rank, but full professors work at four different job levels (8–11) based on the nature of their job tasks and responsibilities.

The job ladder determines the salary scale for the faculty. In 2018, the base monthly salaries ranged from 1,827 euros at the lowest job level to 6,929 euros at the highest job level. In addition to the base salary, the employee can earn a salary increase based on an appraisal of his or her job performance. Employee performance is appraised on a nine-grade scale. Employees who receive the lowest performance grade (1) do not earn a performance-based salary increase, so their monthly earnings consist only of the base salary. Employees with performance grades from 2 to 9 earn a salary increase that raises their base salary by 4, 10, 16, 22, 28, 34, 40 and 46%, respectively. Additionally, faculty members can earn supplementary salary increases for certain additional job duties, such as administrative tasks.³

² In 2017–2018, the faculty members held eighteen distinct occupational titles. The occupations at job levels 5–7 correspond to the assistant and associate professor ranks of academia in North American and many European countries.

³ The same salary system is applied in all Finnish universities. See ‘*General collective agreement for universities*’ for a detailed description of the salary system (downloadable at www.sivista.fi/esittely/english/general-collective-agreement-for-universities/).

2.1. Assignment to job levels and evaluation of job performance

There are general guidelines that describe how employees are assigned to different job levels and how their job performance should be appraised. At the time of recruitment, each employee is assigned to one of the 11 job levels and to one of the 9 performance grades based on their qualifications and prior merit. Following the initial assignment, an employee's job level and performance are assessed once every two years in a pre-scheduled assessment meeting between the immediate supervisor (typically the chair or vice-chair of a department) and the employee. As a result of this meeting, the supervisor makes a proposal about the employee's job level and performance grade and communicates it to the employee. The proposal must be agreed upon and signed by the employee and the supervisor.⁴ The proposal is then approved by the dean of the faculty. As a final step, the central administration of the university verifies that the job level assignments and the performance appraisals have been conducted consistently within the departments and gives final approvals to the proposals. The employee is entitled to request a reassessment at any time in the event of significant changes in his or her job performance, job duties or responsibilities. Similarly, the supervisor may request a reassessment if a subordinate's job requirements and/or performance have changed to such an extent that a new assessment is considered necessary.

Assessment of the employee's job level is based on three factors: 1) the nature and the responsibilities of the job, 2) the required interaction skills and 3) the knowledge and skills needed for the job. Higher job levels involve more diversified job tasks and increased job qualifications, responsibilities and complexity. A representative employee at the lowest job levels holds a master's degree, conducts postgraduate research and has small-scale teaching and administrative responsibilities. A representative employee at the upper end of the job ladder holds a doctoral degree, has eligibility to serve as a full professor, has diversified teaching responsibilities with more advanced courses, supervises master's and doctoral theses, manages research projects and academic co-operation networks and has demanding administrative duties.

⁴ The employee's option to appeal the supervisor's assessment outcome may potentially reduce subjective bias in performance appraisal: to prevent appeals from unsatisfied employees, supervisors may put greater effort into appraisals to provide more accurate assessments (Prendergast and Topel, 1993).

Performance appraisal is based on an assessment of how well an employee has performed within his or her job level, as measured by merits in three activities: 1) teaching, 2) research and 3) societal engagement and contributions to the university community. The employee's merits in each of these three activities are rated on a scale ranging from very low to excellent. The overall performance grade is calculated using these three ratings by weighting each rating by the share of working time the employee spent on that activity. The overall performance grade varies from one to nine.

3. Analysis of promotions

3.1. Empirical approach

The personnel data

The data were obtained from the personnel records of a large Finnish multidisciplinary university for the years 2017 and 2018. The personnel data were combined with worker-specific performance data that contain information on employees' research output, research quality and a variety of other academic activities and merits. The original personnel dataset includes information on all the teaching and research faculty of the university, but we restrict our analyses to full-time employees who worked at the university in both years. The sample consists of 2,148 observations for 1,074 employees.

Promotion regression and variables

To examine how promotions relate to observable worker achievements, we regress a promotion dummy (that equals one if an employee's job level increased between 2017 and 2018) on a set of worker-specific performance measures and control variables measured in 2017. We are interested in two performance measures: the number of peer-reviewed publications and an index that measures their quality. We hypothesize that these two measures are important determinants of promotions, as supervisors have a strong incentive to emphasize them in their personnel decisions. This is because the core funding of Finnish universities comes from the state budget, and state funding is partially linked to the number of peer-reviewed publications and their quality. The hypothesis is also supported by previous literature: prior studies have theorized that incentives for prioritizing research output may have strengthened in academia in past decades, and present empirical evidence indicates that universities have become more inclined to base personnel decisions on research merits without considering other achievements (Laband and Tollison, 2003; Remler and Pema, 2009).⁵

⁵ If employees recognize this emphasis on peer-reviewed publications, they may devote more of their working time to writing them at the expense of other job duties (Holmstrom and Milgrom, 1991; Baker, 1992). Brickley and Zimmerman (2001) provide tentative evidence that academic researchers respond to incentives by showing that faculty members at one business school began to devote more of their work effort to duties that became relatively more important determinants of compensation.

In defining peer-reviewed publications and their quality, we utilize the publication classification used in Finnish universities, called the *Publication Forum classification*. This classification divides various peer-reviewed publications (articles, conference proceedings, book chapters and scholarly books) into four quality levels, which are rated on a scale of zero to three.⁶ This classification is used to determine the state funding received by universities, which is partly tied to universities' quality-weighted publication volume. We use this classification to generate two variables that measure each employee's annual research performance. The first variable counts the number of publications that are defined as peer-reviewed in this classification. The second variable, which we call the publication quality index, measures the average quality rating of an employee's annual peer-reviewed publications, with a value ranging from zero to three.

Promotion regression models also control for two other performance measures: the numbers of other publications and other academic activities. Other publications consist of various non-peer-reviewed publications, including, for example, articles in professional journals and newspapers, book chapters, discussion papers and conference proceedings. Other academic activities include, among other things, conference presentations, awards, honours, referee reports, editorships and fellowships.⁷

We examine separately how the likelihood of promotion depended on employees' personal job performance and their performance relative to that of their colleagues. That is, we first estimate promotion regressions using employee-specific performance measures, and next, to test whether promotion decisions were based on relative performance comparisons, using relative performance measures. Relative performance measures were obtained by subtracting the average values of performance measures of each employee's colleagues from his or her own measures, where 'colleagues' refer to other employees who worked in the same department

⁶ For a more detailed description of the *Publication Forum classification*, see <https://julkaisufoorumi.fi/en/evaluations/decision-level-individual-publications>.

⁷ All employee performance data were collected from a university's database that contains annual information on various employee-specific performance measures. Peer-reviewed publications are automatically added to this database, but other achievements must be recorded by the employees themselves. However, employees have a strong incentive to record all their achievements in the database, as this information is used in appraisal of their job performance. The performance data lack information on teaching loads and merits. However, there are two reasons why teaching performance might carry less weight in promotions in our case university. First, teaching loads are typically uniform for employees doing the same job in the same department, so there are no significant differences between employees that could contribute to promotion opportunities. Second, it is difficult for supervisors to assess employees' teaching skills because student evaluations of instructors are not collected.

and at the same job level in the same year.⁸ For example, if an employee published six peer-reviewed publications during the year, while the average number of peer-reviewed publications by her colleagues was two, then her relative number of peer-reviewed publications was four.

Estimated promotion regressions include control variables for various worker and job characteristics. A dummy variable for female workers is included to test for gender differences in promotions. To account for the length of service in the university, the models include a set of job seniority dummies that indicate how many years the employee had worked at this university.⁹ Employee's quadratic age is included as a proxy for overall work experience. Furthermore, to account for the effects of education level, the models include dummy variables for the highest degree completed (master's degree or lower, licentiate's degree, doctoral degree) and a dummy variable that indicates whether the employee's level of education increased from the previous year (i.e. between 2017 and 2018). Promotion regressions also control for the university department and the job level to account for the possibility that promotion opportunities may have differed across departments and job levels.

Summary of the data

Table 1 reports the summary statistics of the regression variables in 2017 for those employees who worked at the university in both years, separately for all employees and by promotion status. Around eleven percent of full-time faculty members were promoted to higher levels of the job ladder between 2017 and 2018. The table shows that the promoted employees were, on average, younger than the non-promoted employees, and they worked in less demanding jobs. Furthermore, the research performance of promoted employees was better than that of non-promoted employees: they published more peer-reviewed publications, on average, and these publications were of higher quality.

[Table 1 here]

⁸ Promotion regressions that include relative performance measures are estimated using a sample that excludes those employees who had no colleagues working in the same department and at the same job level in the same year. The relative performance measures have the advantage that they account for discipline-related differences in worker achievements. For example, the average number of peer-reviewed publications varied considerably across academic disciplines at our case university.

⁹ Due to data limitations, job seniority is measured using eight dummy variables: separate dummies for employees with 0–6 years of seniority, and a dummy for employees with seven or more years of seniority.

An examination of performance grade distributions implies that the university's performance appraisal practices had many similarities to those observed in other organisations and firms (Dohmen, 2004; Frederiksen et al., 2017). Most notably, the performance grade distributions imply that supervisors tended to refrain from giving the lowest grades and tended to use only a limited set of grades: the lowest grades, 1 and 2, were very rarely used, and grades tended to cluster into a few selected values within each job level. Job level-specific performance grade distributions reveal that at each job level, more than half of employees had one of the two most common performance grades. This proportion ranged from 52% (at job level 8) to 94% (at job level 1).

3.2. Determinants of promotions

We will now examine the determinants of promotions by regressing the promotion dummy variable (that equals one for employees whose job level increased between 2017 and 2018) on a set of employee-specific performance measures and background characteristics measured in 2017. Promotion regressions were estimated using a sample that was restricted in two ways. First, employees who worked at the highest job level (11) in 2017 were excluded because they had no opportunity for promotion. Second, employees who published more than ten peer-reviewed publications in 2017 were excluded from the sample.¹⁰

Table 2 reports the regression coefficients of the explanatory variables of interest. The results in column 1 suggest that the likelihood of promotion increased with the research output and the quality of publications: each peer-reviewed publication increased the promotion probability by 2.2%, and a one-unit increase in the publication quality index was associated with a 2.8% higher promotion probability. Column 2 reports an alternative specification that illustrates the importance of top-level publications in promotion decisions. In this specification, the dummy variable *Top-level publication* equals one for those employees who published at least one peer-

¹⁰ The latter exclusion removed 43 employees from the sample. Appendix Table A1 illustrates the impact of this exclusion on the results of promotion regressions. Columns 1 and 3 show that when these employees are excluded from the sample, the coefficient estimate on the peer-reviewed publication variable more than quadruples. This implies that if these highly productive employees are included in the estimation sample, the importance of peer-reviewed publications in promotion decisions will be underestimated. The model in column 2 provides an alternative way to assess the role of peer-reviewed publications in promotion decisions. It uses the full sample but includes a squared term of peer-reviewed publications to account for the possibility that these publications may be nonlinearly related to promotion probability. The statistically significant negative coefficient of the squared term implies that the promotion probability increased with peer-reviewed publications, but at a diminishing rate.

reviewed publication with the highest quality rating (3) in 2017. The coefficient estimate implies that employees who achieved top-level publications were more than 9% more likely to be promoted than employees who lacked such publications. When both quality measures (publication quality index and the top-level publication dummy) are included in the model simultaneously in column 3, both have a positive coefficient, but neither coefficient is statistically significant at the 10% level. Imprecise estimates of these coefficients may be due to multicollinearity, as the correlation coefficient of the quality measures is 0.64.

Column 4 shows that promotion decisions also depended on how well employees performed relative to their colleagues who worked at the same job level and in the same department: employees who outperformed their colleagues in terms of quantity and/or quality of peer-reviewed publications had a higher probability of being promoted. For example, when an employee's publication count exceeded the average publication count of colleagues by one, his or her promotion probability increased by 1%. These findings imply that the university's promotion practices had features resembling a tournament-type promotion scheme, in which the best-performing employees at each job level are promoted to higher levels of the job hierarchy.

Column 5 estimates a model that relates promotions simultaneously to employees' personal and relative performance measures. These results suggest that promotion chances depended on two factors: the total number of peer-reviewed publications produced by the employee and the relative quality of these publications. Based on the estimates, each additional publication was associated with a 2.5% higher probability of being promoted. Similarly, if the value of the employee's publication quality index exceeded the average quality index of colleagues by one unit, the employee's promotion probability was almost 7% higher.

The coefficients of other performance measures are not reported here for brevity, but they suggest that other achievements were less relevant to promotion decisions. The coefficient estimate on other, non-peer-reviewed publications is close to zero and statistically insignificant, suggesting that these publications were not an important determinant of promotions. Other academic activities (conference presentations, referee reports, etc.) were positively associated with promotion, with each additional activity increasing the promotion probability by 0.3%. However, this estimate was only marginally statistically significant ($p = .128$). The results also reveal, for example, that there was no statistically significant difference in the promotion

probabilities of female and male employees with comparable background characteristics and job performance.¹¹

Table 2 relates promotions to a set of performance measures that supervisors can easily observe when deciding on promotions. They measure employees' job performance over a fairly short period, within one year. When supervisors make promotion decisions, they may also take advantage of other private information that they have on subordinates' work achievements. This private information can provide a broader view of employees' job performance over a longer period, for example by taking account of work achievements that are not easily measurable. The problem is that because this information is at least partially unquantifiable, it is difficult to control for it in promotion regressions. However, supervisors' private information may be reflected in their appraisals of employees' job performance. To test whether employees' performance appraisals determined promotions, we augmented the regression model in the first column of Table 2 with employees' performance grades in 2017. The results of this augmented model are reported in Appendix Table A1. They illustrate that employees whose past job performance was appraised to be better were more likely to be promoted to higher levels of the job ladder. Previous studies have found a similar positive relationship between promotions and performance ratings (Frederiksen et al., 2017). Our results demonstrate that performance ratings were a significant determinant of promotions even after accounting for observable worker achievements. This observation suggests that performance ratings contain additional information on employees' abilities and long-term job performance that is not reflected in their recent work achievements.

[Table 2 here]

¹¹ Previous studies have often found gender biases in academic promotions, with female workers being less likely to be promoted than comparable and similarly performing male workers (e.g., Ward, 2001; Ginther and Hayes, 2003). In our previous paper, we examined whether promotion opportunities differed between female and male employees in the same university that we analyse in this study (using an older and more limited dataset) and found that there was no gender difference in promotion probability after employees' publication outputs were controlled for (Jokinen and Pehkonen, 2017).

3.3. Other rewards of job performance: performance pay

Table 2 reveals that better job performance was associated with improved promotion opportunities at our case university. There was also another way in which better job performance could have been rewarded: by giving employees higher performance grades, as the grades were attached to salary increments. To examine this possibility, we regressed a dummy variable indicating whether the employee's performance grade increased between 2017 and 2018 on a set of performance measures and background characteristics measured in 2017. The sample used in these estimations included only those employees whose job level remained unchanged over the two-year period.¹² In addition, those employees who had the highest performance grade (9) were excluded from the sample because they had no opportunity to be upgraded to higher grades.

The results show that only the number of peer-reviewed publications was a significant determinant of *performance grade increments* (Table 3). Other performance measures – quality of peer-reviewed publications, number of other publications and number of other academic activities – were not associated with the probability of obtaining a higher performance grade.¹³ On the other hand, the findings of a further analysis (Appendix Table A2) reveal that employees with a higher *current performance grade* were indeed more productive than others: they produced more peer-reviewed and other publications and had a greater number of other academic activities. However, the quality of their publications was not better than that of employees whose performance was appraised to be lower.

[Table 3 here]

¹² This sample restriction was made because a preliminary examination of the data implied that the performance grade changes of employees who moved along the job ladder were different from those of other employees. In particular, promotions to higher job levels were often accompanied by a reduction in performance grade (in 36% of cases), while the performance grades of those who remained at the same job level were almost never reduced. This suggests that performance grades were determined within job levels (i.e. performance grade distributions were job level-specific). This is also reflected in the fact that performance grades were typically higher and more diversified for employees working at higher job levels: the mean performance grade for early-stage researchers working at job levels 1–4 was 3.5, with a standard deviation of 1.2, while more experienced researchers working at job levels 5–11 had a mean performance grade of 5.4 and a standard deviation of 1.5.

¹³ The weak link between performance measures and performance grade increments may be at least partially attributable to budgetary considerations: because assignments to higher performance grades result in higher salaries, supervisors may have been inclined to avoid changes to appraisals to limit pay increases.

One possible explanation for the weak link between the performance grade *increments* and *recent* work achievements is that grade increments (and the accompanying pay increases) were primarily used to give salary increases to more senior employees who had performed well over the longer term, but who had not been promoted to higher-paying job levels. In other words, performance grade increments may have been used to award within job level seniority bonuses.¹⁴ Our findings (Appendix Table A2) are consistent with this hypothesis: more senior employees had higher performance grades than their less experienced, but otherwise comparable, colleagues.¹⁵ This finding also suggests that job seniority may capture other relevant determinants of performance grades, such as employees' unmeasurable abilities and longer-term work achievements.

¹⁴ The authors would like to thank an anonymous reviewer for suggesting this explanation.

¹⁵ To save space, the coefficient estimates of the job seniority dummies are not reported in Table A2.

4. Conclusions and discussion

In this study, we employ personnel data from a large university to examine how supervisors use information about employees' observable job performance when deciding on promotions. The results show that better job performance was associated with a higher promotion probability and highlight the importance of peer-reviewed publications in promotion decisions: employees who published more and better-quality peer-reviewed publications were more likely to be promoted. A higher output of peer-reviewed publications also improved the chances of achieving higher performance grades. The pronounced role of peer-reviewed publications in personnel decisions is to be expected: supervisors had an incentive to prioritise them in their decisions, as the university's funding partially depends on the number and quality of these publications. These findings are also consistent with previous studies showing that universities have become more inclined to base personnel decisions on research merits without considering other achievements (Laband and Tollison, 2003; Remler and Pema, 2009).

We examined how promotions depended on both employees' personal job performance and their performance relative to that of their colleagues. Examining whether promotions were linked to relative job performance allowed us to test the key premise of tournament theory that internal promotions are determined by relative comparisons of worker achievements (Lazear and Rosen, 1981). Prior studies have used proxy measures of employee performance, such as performance ratings (Lazear, 1999, 2000) and worker absenteeism rates (Audas et al., 2004), to illustrate that promotions depend on relative performance comparisons. We used actual measures of employees' relative performance differences to reach the same conclusion: according to our findings, promotion opportunities were higher for employees who outperformed their colleagues.

Our study also confirms the findings of prior studies (e.g., Frederiksen et al., 2017) that employees' better performance ratings increase their likelihood of being promoted. Our findings further illustrate that this conclusion holds even after accounting for observable employee performance: prior performance grade was a significant determinant of later promotions after worker achievements were controlled for. Overall, these findings suggest that supervisors used information about both recent achievements and past performance appraisals when deciding which employees to promote.

While our results consistently show that better achieving employees were more likely to be promoted, they also imply that there were additional factors affecting promotions that were overlooked in the analysis. This is revealed by the fact that the coefficient estimates on performance measures in promotion regressions were often quite small, and the regressions explained only a rather small part of the variation in promotions. One potential explanation for these findings is that supervisors may have had private information about employees' performance that was not captured by the included performance measures, and they may have used this information to gain a more comprehensive view of employees' overall performance when deciding on promotions. This information could consist of measurable factors that we did not control for in our analysis (such as teaching merits) as well as factors that are not quantifiable or measurable (such as employees' performance in activities that require social skills or co-operation skills). Furthermore, our data allowed us to measure job performance within just one year, while promotion decisions could actually be based on longer-term performance. One interesting avenue for future research would be to examine the separate contributions of recent work accomplishments and longer-term job performance to promotion decisions.

Because our results are based on data from one university, they should not be interpreted as conclusive evidence on how promotions depend on employees' observable job performance. Promotion practices can vary substantially across organizations, and therefore more research is needed on other organizations to determine whether our results can be more widely generalized. Nevertheless, the relationship between promotions and job performance can only be examined with sufficiently detailed organization-specific datasets. This is because the key variables for the analysis, namely, the employee-level performance measures, are typically missing from conventional survey and administrative datasets. Furthermore, examining how relative performance differences relate to promotions requires that for each employee it is possible to accurately identify the employees (colleagues) to whom his or her job performance is compared. This can be difficult when using administrative data, as they often do not contain sufficiently accurate information to determine each employee's colleagues. Finally, defining promotions can be difficult when using conventional datasets because they often lack detailed information on firm-level job hierarchy. Our personnel data allowed us to overcome all these difficulties, and hopefully more similar datasets will be available for future research.

Tables

Table 1: Descriptive statistics in 2017

Variable	All employees	Promoted	Non-promoted
Age (years)	43.1 (11.1)	36.6 (9.0)	43.9 (11.1)
Gender (% males)	50.9	51.3	50.9
Proportion of employees whose level of education increased between 2017 and 2018 (%)	3.5	9.2	2.7
Job level	5.3 (2.0)	4.0 (1.9)	5.5 (1.9)
Performance grade	4.9 (1.7)	4.3 (1.7)	4.9 (1.7)
Peer-reviewed publications	2.3 (4.0)	2.9 (3.8)	2.2 (4.0)
Publication quality index	0.9 (0.9)	1.0 (0.9)	0.8 (0.9)
Other publications	0.9 (2.1)	0.7 (1.2)	0.9 (2.2)
Other academic activities	4.0 (7.1)	4.2 (9.5)	4.0 (6.7)
Observations	1,074	119	955

Notes: Table reports the average values of variables for those employees who worked at the university both in 2017 and 2018 (standard deviations in parentheses). Promoted = job level increased between 2017 and 2018.

Table 2: Promotions along the job ladder

Dependent variable: job level increased between 2017 and 2018					
	(1)	(2)	(3)	(4)	(5)
<u>Absolute performance in 2017</u>					
Peer-reviewed publications	0.022*** (0.007)		0.021*** (0.007)		0.025*** (0.007)
Publication quality index	0.028** (0.014)		0.023 (0.016)		-0.041 (0.043)
Top-level publication		0.093*** (0.032)	0.021 (0.038)		
<u>Relative performance in 2017</u>					
Peer-reviewed publications				0.010** (0.005)	-0.004 (0.005)
Publication quality index				0.039*** (0.012)	0.068* (0.038)
<u>Controls (measured in 2017):</u>					
Other performance measures	Yes	Yes	Yes	Yes	Yes
Worker characteristics	Yes	Yes	Yes	Yes	Yes
Department	Yes	Yes	Yes	Yes	Yes
Job level	Yes	Yes	Yes	Yes	Yes
Observations	1,031	1,031	1,031	1,019	1,019
Adjusted R ²	0.165	0.148	0.165	0.159	0.165

Notes: Coefficient estimates from linear probability models. Robust standard errors in parentheses. Worker characteristics include gender, quadratic age, job seniority dummies, level of education dummies and a dummy variable that equals one for those employees whose level of education increased between 2017 and 2018. Other performance measures include other (non-peer-reviewed) publications and other academic activities (e.g., conference presentations, referee reports and awards). Regressions that include relative performance measures (columns 4 and 5) were estimated using a sample that excludes those employees who had no colleagues working in the same department and at the same job level in 2017. All models include a constant term. Statistically significant at the * 10% level; ** at the 5% level; *** at the 1% level.

Table 3: Increase in performance grade

Dependent variable: performance level increased between 2017 and 2018 (sample = employees whose job level remained unchanged)			
	(1)	(2)	(3)
<u>Absolute performance in 2017</u>			
Peer-reviewed publications	0.012** (0.005)		0.015** (0.006)
Publication quality index	-0.012 (0.010)		0.004 (0.027)
<u>Relative performance in 2017</u>			
Peer-reviewed publications		0.003 (0.004)	-0.004 (0.005)
Publication quality index		-0.004 (0.009)	-0.013 (0.025)
<u>Controls (measured in 2017):</u>			
Other performance measures	Yes	Yes	Yes
Worker characteristics	Yes	Yes	Yes
Department	Yes	Yes	Yes
Performance grade	Yes	Yes	Yes
Observations	896	884	884
Adjusted R ²	0.069	0.061	0.065

Notes: Coefficient estimates from linear probability models. Robust standard errors in parentheses. Worker characteristics include gender, quadratic age, job seniority dummies, level of education dummies and a dummy variable that equals one for those employees whose level of education increased between 2017 and 2018. Other performance measures include other (non-peer-reviewed) publications and other academic activities (e.g., conference presentations, referee reports and awards). The regressions that include relative performance measures (columns 2 and 3) were estimated using a sample that excludes those employees who had no colleagues working in the same department and at the same job level in 2017. All models include a constant term. Statistically significant at the * 10% level; ** at the 5% level; *** at the 1% level.

Appendix: Additional results

Table A1: Promotions along the job ladder

Dependent variable: job level increased between 2017 and 2018				
	Full sample (accounting for nonlinearity)		Sample: Employees with more than ten peer-reviewed publications in 2017 excluded	
	(1)	(2)	(3)	(4)
<u>Absolute performance in 2017</u>				
Peer-reviewed publications	0.005* (0.003)	0.022*** (0.006)	0.022*** (0.007)	0.020*** (0.007)
Peer-reviewed publications ²		-0.001*** (0.000)		
Publication quality index	0.044*** (0.012)	0.031** (0.013)	0.028** (0.014)	0.027** (0.013)
<u>Performance grade in 2017</u>				
Grade 1 or 2				(Reference)
Grade 3				0.088* (0.048)
Grade 4				0.119** (0.054)
Grade 5				0.117** (0.057)
Grade 6				0.171*** (0.061)
Grade 7				0.170*** (0.063)
Grade 8				0.224*** (0.077)
Grade 9				0.191*** (0.064)
<u>Controls (measured in 2017):</u>				
Other performance measures	Yes	Yes	Yes	Yes
Worker characteristics	Yes	Yes	Yes	Yes
Department	Yes	Yes	Yes	Yes
Job level	Yes	Yes	Yes	Yes
Observations	1,074	1,074	1,031	1,031
Adjusted R ²	0.163	0.171	0.165	0.169

Notes: See notes to Table 2.

Table A2: Ordered probit on current performance grade

Dependent variable: performance grade		
	(1)	(2)
<u>Absolute performance</u>		
Peer-reviewed publications	0.041*** (0.014)	
Publication quality index	0.011 (0.030)	
Other publications	0.043*** (0.010)	
Other academic activities	0.012*** (0.004)	
<u>Relative performance</u>		
Peer-reviewed publications		0.028** (0.011)
Publication quality index		0.032 (0.028)
Other publications		0.029*** (0.010)
Other academic activities		0.010*** (0.004)
<u>Controls</u>		
Worker characteristics	Yes	Yes
Department	Yes	Yes
Job level	Yes	Yes
Observations	2,613	2,580
Pseudo R ²	0.282	0.279
Log pseudolikelihood	-3429	-3391

Notes: Table reports the coefficient estimates of the ordered probit models. Robust standard errors in parentheses. The models were estimated using a sample that includes all full-time employees who worked at the university in 2017–2018. Worker characteristics include gender, quadratic age, job seniority dummies and level of education dummies. Other academic activities include, for example, conference presentations, referee reports and awards. The model in column 2 that includes relative performance measures was estimated using a sample that excludes those employees who had no colleagues working in the same department and at the same job level in the same year. Statistically significant at the * 10% level; ** at the 5% level; *** at the 1% level.

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