



Cornell University
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ILR Review

Volume 58 | Number 1

Article 4

October 2004

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Abstract

Drawing on a single large U.S. corporation's personnel records for the years 1989-93, the authors analyze an example of the kind of formal salary system used by most large firms. They find that this firm's practices were consistent with most of the important conclusions of prior empirical research on internal labor markets. The system was highly centralized, covering salary levels, salary ranges, raises, and bonuses. Supervisors had little discretion over pay other than through subjective performance ratings. The firm held fairly strictly to the salary rules, leading to observable constraints on pay for employees near the top of the salary range. These constraints, however, apparently did not impose important costs on the firm in the form of increased turnover. Although the system operated without any apparent connection to external factors, the authors conclude that it transmitted external labor market forces with little distortion.

Keywords

salary systems, formal salary systems, internal labor markets, salary levels, salary ranges, raises, bonuses, performance ratings, turnover

Cover Page Footnote

The authors thank the company that provided the data for this study, and its HR employees (who must remain nameless). Mary Taber provided excellent research assistance. For comments on various drafts, the authors also thank Raj Aggerwal, Daniel Bernhardt, Charles Brown, Thomas Dohmen, Tor Eriksson, Kevin Hallock, Ming-Jen Lin, Bentley MacLeod, Lalith Munasinghe, Walter Oi, Craig Olson, Paul Oyer, Canice Prendergast, Bruce Rayton, and Aloysius Siow; participants at meetings of the Wharton/Sloan HR Network, the Econometric Society, and the Society of Labor Economists; and workshop participants at Binghamton, Illinois, Michigan, RAND, and USC. Funding was provided by the University of Chicago Graduate School of Business, and the Institute of Labor & Industrial Relations at the University of Illinois.

DO FORMAL SALARY SYSTEMS REALLY MATTER?

MICHAEL GIBBS and WALLACE HENDRICKS*

Drawing on a single large U.S. corporation's personnel records for the years 1989-93, the authors analyze an example of the kind of formal salary system used by most large firms. They find that this firm's practices were consistent with most of the important conclusions of prior empirical research on internal labor markets. The system was highly centralized, covering salary levels, salary ranges, raises, and bonuses. Supervisors had little discretion over pay other than through subjective performance ratings. The firm held fairly strictly to the salary rules, leading to observable constraints on pay for employees near the top of the salary range. These constraints, however, apparently did not impose important costs on the firm in the form of increased turnover. Although the system operated without any apparent connection to external factors, the authors conclude that it transmitted external labor market forces with little distortion.

A subject of a fundamental debate in the literature on internal labor markets is whether personnel policies have real effects, or are just a veil through which the pressures of the external labor market act relatively unimpeded. Most firms make extensive use of formal rules for personnel administration. These rules and policies seem highly bureaucratic (Adams 1997). Doeringer and Piore (1971) invoked the idea of an internal labor market, arguing that "administrative rules and customs"—personnel policies—shield workers from

the external market. Macroeconomists often assume that compensation, turnover, and job mobility are somewhat unresponsive to current economic conditions. In contrast, most work in labor economics has ignored firm personnel policies (possibly because of the type of data traditionally available for study).

In the past decade or so, however, a growing body of theoretical work has examined the design and effects of firm personnel policies. Empirical studies looking at internal labor markets have uncovered a

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The data are confidential. Researchers interested in obtaining access should contact Wallace Hendricks.

Table 1. Summary of Evidence on Ten Core Questions about Internal Labor Markets.

	Baker, Gibbs, & Holmstrom (1994a,b)*	Seltzer & Merrett (2000)	Treble et al. (2001)	Kuon (2001)	Dohmen, KriecheI, & Pfann (2001)	Dohmen (2003)	Lin (2003)	Eriksson & Weruatz (2003)	This Paper
Sample	U.S. Financial Services Firm	Australian Bank	U.K. Financial Services Firm	U.S. Insurance Claims Processor	Fokker Aircraft, Holland	Same as Dohmen, KriecheI, & Pfann	Taiwanese Auto Dealer Chain	222 Danish Firms with 200+ Employees, 1980-95	Large U.S. Firm
Interesting Features	20 Years; Stable ILM; Steady State Growth	Late 19th-Early 20th Century	Very Similar to BGH Sample	Clerical, Mostly Female	Growth & Downsizing; Blue- & White-Collar		Japanese-Owned; 3 Sub ILMs		Information on 3 Formal Salary Systems
10 Core Questions About Internal Labor Markets (Gibbons 1997) ^a									
Q ₁	✓	✓	✓		✓			✓	✓ & fast track exits [Table 4]
Q ₂	✓	✓		✓	✓	✓	✓		✓ [Table 6]
Q ₃	✓			✓		Likely			✓ Sometimes < 0 [Table 10]
Q ₄	✓			✓	✓	✓	✓		✓ [Table 11]
Q ₅	✓	✓	✓	✓	✓	✓		✓	✓ [Table 5]
Q ₆	✓		✓	✓	✓	✓		✓	Likely [Tables 3,4,8]
Q ₇	✓		✓	✓	✓	✓		✓	✓ [Tables 3,5]
Q ₈	✓		✓ Esp. low	✓	✓	✓	✓	✓	✓ & on promotion [Tables 5,7]
Q ₉	✓	✓		✓		✓	✓		✓ [Tables 7,8]
Q ₁₀	✓					✓	✓		✓ [Table 7]

The questions were as follows:

- Q₁ Is there a fast track?
- Q₂ Are nominal wage cuts rare?
- Q₃ Are changes in wage residuals serially correlated?
- Q₄ Are there cohort effects in wages?
- Q₅ Are wage increases on promotion large compared to normal increases but small compared to the difference in average wage between the 2 levels?
- Q₆ Do wage increases forecast promotions?
- Q₇ Do promotions come from and go to all deciles of the wage distributions for the lower and upper levels?
- Q₈ Are wage increases smaller for those who begin in higher quartiles of the wage distribution for that level?
- Q₉ Do wages increase and are promotions more likely with higher performance evaluations in cross-section and time-series?
- Q₁₀ Is the effect of seniority on wages independent of the presence of controls for performance evaluations?

✓ Denotes that the paper provides evidence consistent with stylized facts on this question.

^aQuestion 10 results are from Medoff and Abraham (1980)

number of stylized facts. In turn, new models have been developed that can account for many of the stylized facts. Findings that are difficult to reconcile with classical or more modern models are commonly attributed to administrative rules and customs. Yet the link between such findings and specific firm policies has not been made.

In this paper we study five years of personnel records from a single firm. Some of the information on the company's formal salary policies is of a kind that has been unavailable in prior datasets. One goal of the paper is to analyze these policies. They are similar to those used by many firms, and described in and advocated by compensation and human resource textbooks. The firm used centralized policies to set salary levels and ranges, and to determine how performance ratings were used to award raises and bonuses. We consider whether these policies can help explain findings that prior studies attributed to administrative rules.

A second goal of the paper is to add to the small but growing literature studying firm personnel records. These studies use data collected in different ways from different firms, and they often measure different variables. This lack of consistency makes it difficult to piece together from the various studies an empirical model of how firms administer their internal labor markets, and with what effects. While analyzing the firm's compensation system, we provide as much evidence related to the prior empirical literature as is feasible.

Background

Medoff and Abraham (1980) conducted the first influential analysis using firm-level data; they focused on the relationships among performance evaluations, experience, and earnings. The most extensive documentation of an internal labor market is Baker, Gibbs, and Holmstrom (1994a,b) (hereafter BGH), focusing on career and wage dynamics. Most subsequent studies have, to varying degrees, explored whether Medoff and Abraham's and BGH's findings hold for other firms in other contexts (see,

for example, single-firm studies by Lazear 1992; Gibbs 1995, 2002; Seltzer and Merrett 2000; Dohmen, Kriechele, and Pfann 2001; Treble, von Gerner, and Bridges 2001; Kwon 2001; Dohmen 2003b; Lin 2003; and Eriksson and Werwatz 2003, a study of 220 firms). Because of the scarcity of within-firm datasets, as well as inconsistent data collection and variable definitions, it can be difficult to compare findings across datasets. For this reason, Gibbons (1997) argued that "it would be a great service if empirical researchers would provide evidence on a core set of questions before studying specific issues of their own." He listed ten core questions, reproduced in Table 1 and referred to throughout the paper as Q_1 through Q_{10} . In the table, we summarize whether or not available evidence is consistent with the stylized facts on these questions from Medoff and Abraham and BGH.¹ We also reference evidence in the present study that is pertinent to these questions (the last column of Table 1). Sometimes the questions that we answer differ slightly from those analyzed in other studies, because our variables differ. For example, we focus on location in the salary range rather than job level deciles. Also, compared to prior researchers examining the same subject, we are better able to focus on cross-sectional questions, since we have a short panel.

BGH compared their findings to several base models, and concluded that their evidence was inconsistent with simple models of learning or incentives. Instead, they suggested that many of their findings were consistent with a model in which employees accumulate human capital at varying rates. However, they also argued that some of their findings seemed inconsistent with standard theoretical tools, and might be caused by "administrative rules and proce-

¹Also see Hamilton and MacKinnon (2001). They did not focus on the questions listed in Table 1, but analyzed related internal labor market questions, using personnel records from a Canadian railroad around World War II.

dures.” For example, there was clear evidence of downward nominal wage rigidity, which is difficult to explain theoretically. They also found a “Green Card effect,” or regression to the middle in pay among those at the same job level.² In addition, they found a cohort effect, whereby the entry cohort of an employee was a statistically significant predictor of earnings years later. This suggests that raises are correlated within each cohort, which might be the case if raises are administered centrally.

Subsequent theoretical work (for example, Bernhardt 1995; Gibbons and Waldman 1999, 2002; Kwon 2001; Golan 2002; Dohmen 2003a) has achieved substantial success in explaining many of these findings using integrative models based on standard tools. Still not settled, however, is whether administrative rules and procedures play some role as well. Administrative rules and procedures may simply ratify or mirror underlying wage and promotion dynamics, or they may play an additional role, constraining the firm’s personnel management in ways that affect careers, turnover, or wages beyond labor market factors. One of our aims in this paper is to try to make some progress in sorting out this difficult but fundamental issue.

To this end, our first step is to describe pay policies in more detail than has been provided before. Our second step is to look for evidence on whether the policies drive certain empirical regularities, such as the Green Card effect or the occurrence of

zero nominal raises. Finally, our third step is to see if there is evidence that the salary rules have any real effects.

Data

The data are personnel records for over 50,000 employees of a large U.S. corporation from 1989–93. The identity of the firm and certain variables must be kept confidential or disguised. The firm was in several related businesses, and vertically integrated. It was based in the Midwest, but with employees in all regions of the United States. A small percentage of employees worked in other countries, but virtually none moved between those regions and the United States. During this period the firm’s industry underwent some consolidation. Our firm completed two acquisitions just before the sample period. It announced a “major restructuring” in the early 1990s, but there was little evidence of this change in the data, and within the time frame of our study the firm used little of the restructuring reserve set aside in the balance sheet.

For each employee, the dataset includes information on demographic characteristics (age, education, gender, race, marital status, and disability status), compensation, and performance. We have the hiring date, and so company tenure. There are codes for job and workgroup (business, organization, and unit). Compensation variables include salary, salary range and pay plan, bonus eligibility, and bonuses awarded.³ Almost all salaried employees were paid through one of three pay plans—Grade, Hay, or PAQ, described below. Salary data were deflated using the monthly Consumer Price Index.

The data provide a record for every personnel change for every employee, including the date of and reason for the change. For example, for each change in a job, the personnel department would categorize the change as a promotion, demotion, lateral

²BGH coined this term because supervisors were given a green card with a matrix of percentage raise ranges as a function of location in range and performance rating. The raise percentages in the typical “green card” have the effect of regression of salary to the middle of the range, by giving smaller raises to workers in the high range of the pay scale, and larger raises to workers at the low end, for any given performance rating. Similar policies that lead to wage compression are seen in many firms with and without formal calculation of raises as a function of location in range and performance rating. In this paper, we use the term Green Card to refer to these effects, although other forces could generate them.

³We ignored small bonuses, such as “Stop Smoking” rewards, to focus on performance bonuses.

transfer, or exit.⁴ Personnel actions occurred throughout the year. However, many actions (especially compensation and performance ratings) clustered around year-ends. Thus, we restructured the data into year-end “snapshots” for each employee, with the employee’s current status (job title, codes, salary range, and so on) and information on some events that occurred over the past year (such as bonuses and promotions).

A few variables required special treatment. For example, if an employee earned more than one type of bonus (or, on rare occasions, two or more bonuses of the same type), these were summed to give the total bonus. Converting performance ratings to year-end values was especially complicated. We wanted to associate ratings with the job and salary *in which they were earned*. However, job and salary changes did not always happen at year-end. Thus, an employee might have performance ratings during a calendar year associated with the job title at the end of the *prior* year. Consider an employee given a rating early in the year, a promotion later in the year, and a new rating early the next year (before any job changes that year). Presumably, the employee’s earlier rating reflects performance in the prior job, and was part of the reason for the promotion. The latter rating reflects performance in the new job, if given before any subsequent job changes in the latter year. To associate performance ratings with the job and salary level in which they were earned, in this example, the year-end snapshot would include *next year’s* rating. Thus, two performance ratings might be relevant for the year-end snapshot. The first is any rating earned *this year*, but after any change to the year-end job, salary level,

or both (otherwise the rating would be associated with the prior year). The second is any rating earned *next year*, prior to any job or salary changes. In the small number of cases in which the employee had both of these ratings, they were averaged.

Formal Salary Rules

The firm had the kind of formal salary system used by almost all medium to large firms, and described in other studies and in compensation textbooks (Belcher and Atkinson 1987; Wallace and Fay 1988; Henderson 1989; Murphy 1991). Though the firm had three nominally different salary systems—Hay, Grade, and PAQ—for practical purposes these systems were very similar in design. Roughly speaking, Hay and Grade covered white-collar professional or managerial jobs, while PAQ covered clerical or technical office jobs (blue-collar employees are ignored, as they were paid on an hourly basis). Over the sample period, the firm gradually shifted from the Hay to the Grade system, to internalize and simplify compensation administration (there were fewer Grade than Hay ranges). Thus we lump Hay and Grade positions together in the empirical analyses.

The first step in pay administration was to determine the “target” salary level for each job: the salary for someone of typical skill and performance in that job or a similar one. Each job was assigned a number of points measuring various job aspects that the labor market is supposed to compensate. Hay jobs were assigned “Hay Points” for “Problem Solving,” “Know How,” and “Accountability” required in performing the job, by Hay Associates, a large compensation consulting firm. Grade jobs were assigned similar points through internal review by the HR department. PAQ jobs were assigned points using the Position Analysis Questionnaire, an assessment survey commonly used for blue-collar jobs (Belcher and Atkinson 1987).

Jobs were clustered into a small number of groups (a handful of Grade groups each year). Next, the base and price of a job point were determined for each group

⁴It is unclear exactly what criteria were used. Promotions and demotions presumably were associated with tangible changes in responsibility and hierarchical level, while transfers presumably were not. This definition of transitions distinguishes our study from some prior studies, which define transitions based on inferred hierarchical levels.

Table 2. Distribution of Salary within Range.

Independent Variable	N	Location in Range											
		Below	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Above
Job Tenure (years):													
1-3	26,930	5.4%	10.4	16.9	15.9	14.5	11.9	8.8	6.6	4.0	2.6	1.6	1.5
4-6	8,867	1.4	3.2	8.4	11.8	15.6	15.6	14.0	11.2	7.6	5.3	3.1	2.9
7+	3,734	0.6	1.4	4.1	6.2	8.5	12.0	15.9	15.5	13.1	10.9	7.2	4.4
Grade	18,965	3.2	9.7	16.2	16.6	15.8	13.3	10.1	6.8	4.0	2.2	1.2	0.8
Hay	3,430	2.2	5.2	11.3	12.9	17.4	15.3	13.1	7.7	6.5	3.7	2.2	2.5
PAQ (range width as % of midpoint value):													
≤36	6,381	4.7	7.8	12.9	13.8	13.1	10.7	9.1	9.2	6.2	5.5	3.6	3.6
>36	10,755	5.6	5.8	10.8	10.1	11.0	12.0	11.6	11.2	8.1	6.3	4.1	3.3
Salary Range Midpoint (\$1,000):													
<\$20K	1,407	26.5	6.0	9.3	6.8	5.1	6.0	6.0	8.0	7.0	8.0	5.3	5.9
20-<40	17,873	3.5	7.8	13.2	12.7	12.6	11.7	10.4	9.7	6.7	5.2	3.4	3.0
40-<60	11,031	3.5	9.8	17.6	17.4	16.3	12.9	9.3	6.3	3.3	2.0	0.9	0.7
60-<80	6,182	2.2	7.8	13.3	15.6	17.0	15.0	12.0	7.9	4.9	2.3	1.2	0.9
80-<100	2,220	2.4	4.0	6.9	11.3	15.5	16.8	15.3	10.1	8.2	4.5	2.8	2.3
\$100K+	818	1.2	1.3	5.5	7.1	11.7	16.0	18.3	11.5	11.0	7.2	5.3	3.8
All	39,531	4.0%	8	13.8	14.1	14.2	12.7	10.6	8.5	5.7	4	2.5	2.1

Note: In all tables, intervals for Location in Range are closed below and open above. For example, “50-60” denotes the interval $50 \leq \text{LR} < 60$. Rows sum to 100%.

(based on market pay data supplied by Hay Associates, or within-firm historical pay data for Grade and PAQ jobs). These, along with the job's total points, determined the midpoint of the salary range. For example, for job i in cluster g ,

$$(1) \quad \text{MIDPOINT}_i = \alpha_g + \beta_g \cdot \text{POINTS}_i,$$

where α_g = base and β_g = price of a point for all jobs in group g . The next step was to set ranges around the midpoints (the minimum and maximum an employee was allowed to earn). In Hay and Grade jobs, the range was always the span between 80% and 120% of the midpoint value. In PAQ jobs, salary ranges varied from a low of about 29.4% up to about 40.3% of the midpoint value. Within job groups, ranges tended to move in lockstep over time (often exactly so, or with small variation in job points). Thus, the salary structure was relatively rigid across grades within broad groups; ranges generally were not adjusted separately.⁵

As for workers in many firms (Murphy 1991; BGH 1994a), raises were determined largely as a function of the employee's location in the salary range, and performance rating. Supervisors were given little discretion over the raise other than through the rating. All else equal, employees at the lower end of the range were given larger raises, while employees at the higher end were given smaller raises. This salary compression within ranges is what BGH (1994a) termed the "Green Card effect." We will return to this effect below.

The HR department also set rules for annual bonuses. Jobs differed in whether or not employees occupying them had access to various bonus pools. Grade/Hay

employees had "Full," "Partial," or no eligibility for bonuses related to corporate or division performance. Those with "Full" eligibility (roughly speaking, those in higher hierarchical levels) were eligible for the largest bonuses. All Hay/Grade and PAQ jobs had access to smaller bonus pools that were unrelated to corporate or division performance. Supervisors had little or no ability to vary bonuses except through performance ratings.

It is worth considering the constraints put on supervisors in this (very typical) system. A supervisor probably had some say over where a new hire came into the salary range. The supervisor also determined the employee's rating, and presumably had input into the employee's promotion prospects. However, the supervisor had no direct control over the raise or bonus, or the raise or bonus pool for the business unit. Since there were only a few performance-rating categories, the supervisor's means for varying pay among subordinates in any given year were also few. Moreover, the supervisor's ability to attract and retain good employees was limited by range minimums and especially maximums.⁶

Salary Range Dynamics

We now turn to an empirical description of the dynamics of the salary system. In what follows, an important variable will be the employee's "Location in Range" (LR):

$$(2) \quad \text{Location in Range} = 100 \cdot (\text{SALARY} - \text{MIN}) / (\text{MAX} - \text{MIN}).$$

If the range is binding, the LR can go from 0 to 100; it is the employee's location in the range as a percentage of the distance from

⁵The few changes in salary ranges relative to each other were usually cases in which the range was changed from hourly to annual salary, or vice versa—reflecting, apparently, changes in salary administration for the affected jobs. In other cases, ranges tended to retain their pay level relative to other ranges from year to year. This practice resembles that followed in the U.S. government's General Scale (GS) salary plan, in which all salary ranges are given the same percentage raise each year.

⁶In theory, if each employee were assigned to a different job category, there would be great flexibility, and salary ranges would not really limit compensation. In practice, the firm decreased the number of ranges over time, and salary grades largely moved together. Thus supervisors had little ability to affect compensation of new hires or subordinates through assignment to salary range.

minimum to maximum. Because ranges vary in width, and PAQ ranges vary in width as a percentage of the midpoint value, this measure is comparable across different pay plans and employees.

Table 2 shows the distribution of employees within ranges, by pay plan, job tenure, and midpoint (a crude measure of the employee's hierarchical level). In each row, the distribution of employees across values of LR is presented (so these percentages sum to 100% for each row). For example, the mean LR is usually in the high 30s to low 40s, so the average employee was a little below the midpoint.

About 5% of those with low job tenure had a salary below the minimum, while about 4% with high job tenure had a salary above the maximum. Curious about this, we asked an HR employee if the firm "bent the rules" in some cases, so that salary ranges were not in fact binding. This employee said that the salary ranges were inviolate. Thus, these are presumably cases in which pay and range changes were not perfectly synchronized.

Consider an employee just hired at the low end of the range. Soon after being hired, the salary range is adjusted (for inflation, perhaps). If the employee's salary is not changed until the next year, it is possible that for a short period the salary is outside the range—though it was not when the salary was set. Now consider an employee near the top of the range undergoing an annual salary review. The boss or HR department may realize that the range is about to be adjusted, so the employee may be given a raise that is technically above the maximum for a short period. Similarly, the employee's salary or range information might not be updated immediately in the personnel records, so that our data make it appear that the employee is above the range when he or she is not.⁷

⁷In Dohmen (2003), workers are sometimes above the salary range because the range is adjusted downward. In our firm, ranges were not adjusted downward in nominal terms, so this cannot explain the cases that we find.

Viewing the cases in which pay is greater than the maximum as temporary coding errors, and combining these observations with those in which the $LR \geq 90$, gives an idea of how many employees were in danger of "topping out" in the range. Overall, about 5% were close to the top of the range, with greater percentages among those who have high job tenure and among those who were in the lowest- and highest-paying ranges. Thus, for some employees the salary constraints were near binding. Below we examine whether the constraints appear to have affected personnel outcomes.

Table 3 examines the dynamics behind Table 2: where and why did employees enter and exit ranges? Before turning to the main findings, note that a small number of employees moved "off scale"; that is, they were not assigned to a range. Employees were more likely to move off scale if they were already below or above the salary range, but otherwise there was no relationship between LR and going off scale in the next period.

One possible way to avoid constraints of a formal salary system is to remove employees from the system altogether. Did this occur in our sample? Once more, we asked a contact in the firm's HR department if it was possible to move an employee off scale to get around the salary constraints, and she indicated that it was not. She suggested that some off scale employees were new hires who were allowed to earn unusually high pay temporarily, because they earned more in their previous firm. These employees would be given less than normal raises over the next year or so in order to bring them in line with the firm's salary ranges. Of those off scale, over 97% were in their first year in their current job. This suggests that off scale employees were new hires, or cases in which the personnel records had not yet been updated with salary range information. Thus, the inability to move employees off scale is strong evidence that the firm did stick to the salary rules.

The top panel of Table 3 focuses on entry into ranges. Each row represents an entry source: what happened to the employee this period (stayed in the job, was

Table 3. Salary Range Dynamics.

	Location in Range at End of This Period										
Job Action	<10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90+	N
Job Action This Period:											
Stay	8.7%	12.6	13.3	14.5	13.3	11.7	9.6	6.7	4.5	5.1	33,010
Demotion	14.3	8.8	10.9	9.5	12.9	6.1	5.4	8.2	3.4	20.4	147
Lateral Transfer	6.4	10.0	11.7	14.1	14.2	12.4	10.3	7.3	5.9	7.8	1,672
Promotion	25.2	21.6	19.5	12.2	9.2	5.6	3.2	1.6	1.0	1.0	3,016
New Hire	27.8	17.9	16.1	12.9	10.5	6.1	4.7	1.6	1.0	1.2	4,264
Job Action Next Period:											
Stay	68.7	70.2	68.9	71.7	72.4	71.7	72.9	76.1	77.5	76.2	
Demotion	0.5	0.3	0.4	0.3	0.4	0.5	0.4	0.4	0.4	0.4	
Lateral Transfer	4.4	4	4	3.2	3.5	3.7	3.6	3.7	4.9	4.3	
Promotion	8.2	10	10.6	8.9	7.5	6.4	5.8	3.7	3.4	5.0	
Off Scale	1.8	1	1	1.2	1.5	1.5	1.2	0.9	0.7	1.7	
Exit	16.4%	14.5	15	14.8	14.6	16.2	16.1	15.3	13.1	12.3	
N	3,970	4,512	4,641	4,601	4,048	3,463	2,696	1,769	1,220	1,471	

Notes: The top panel shows the distribution of ending salary range, by type of job action this period; thus the rows sum to 100%. The bottom panel shows the distribution of job actions next period, by this period's ending salary range; thus the columns sum to 100%.

demoted, was laterally transferred, was promoted, or was hired). For example, the 25.2 in the first column means that 25.2% of all persons promoted were given a salary near the bottom of the range for their new job. Rows in the top panel sum to 100%.

Table 3 shows that those demoted were more likely to be moved into higher LR's in their new salary ranges; those promoted or hired were more likely to be brought into lower regions; and lateral transfers were somewhere in the middle (and similar to stayers). These findings make some sense. New hires and those promoted are comparable, since they are substitutes in filling available positions. New hires have less firm- or job-specific human capital than those promoted, but may have more general human capital or higher innate ability, or the firm would not consider them adequate substitutes for internal candidates. Lateral transfers are probably cases in which the employee was assigned to the wrong job, but has reasonably good performance or ability. Instead of giving a demotion, or having the employee stall in the current job, the firm transfers the employee. Given

the existing skills and a better job match, it may make sense to transfer the employee into the middle of the new salary range.

The fact that about 20% of demotees were brought into the upper end of their new ranges is interesting. Some demotions may be cases in which the employee was promoted too far, but was potentially a good performer in the lower-level job. The firm may have wanted to retain the demoted employee (Bernhardt 1995). The observed pattern might also be consistent with the idea that the firm was reluctant to cut nominal salary (Table 6 below), and spread changes in salary gradually over time (as it apparently did for some off scale new hires).

The bottom panel of Table 3 focuses on types of movement from locations in the range; thus each column sums to 100%. The pattern of exits across LR's was fairly constant, with some decline at higher LR's. This suggests that those who had been in the range longer (higher LR's) were more likely than other employees to have a good job match, or more job- or firm-specific human capital. Nothing in Table 3 suggests that those topping out in the range

Table 5. Salary Range Dynamics on Promotion.

Location in Range before Promotion	Location in Range after Promotion										N	%Raise / %Δ in Midpoint Value
	<10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90+		
Below-10	63.7%	22.2	8.0	4.8	0.6	0.3	0.3	0.0	0.0	0.0	311	1.54
10–20	39.1	37.7	16.6	4.1	1.8	0.2	0.5	0.0	0.0	0.0	440	1.18
20–30	28.3	33.3	30.4	4.2	1.9	1.3	0.2	0.2	0.2	0.0	477	0.83
30–40	14.6	23.0	29.0	21.2	8.3	2.0	1.5	0.3	0.0	0.0	396	0.90
40–50	11.6	10.3	24.3	26.0	16.4	5.1	2.7	2.1	0.7	0.7	292	0.63
50–60	7.4	7.4	15.7	27.0	27.0	7.8	4.4	2.0	0.5	1.0	204	0.73
60–70	8.2	4.1	8.9	8.2	30.8	27.4	8.2	0.7	2.1	1.4	146	0.65
70–80	7.9	4.8	7.9	6.3	12.7	33.3	19.0	4.8	0.0	3.2	63	0.61
80–90	4.8	4.8	7.1	11.9	23.8	19.0	16.7	7.1	2.4	2.4	42	0.38
90–Above	2.8	1.4	8.3	5.6	11.1	15.3	11.1	13.9	18.1	12.5	72	0.50
All	25.9%	22.2	20.0	12.0	9.3	5.2	2.7	1.2	0.9	0.7	2,443	0.93

Note: Except for the last two columns, these statistics show the distribution of new salary range, by location in the old salary range before promotion. Thus the rows sum to 100%. The last column shows the mean of the ratio of percent raise to percent increase in salary range midpoint value, on promotion.

these employees exit. Our data show that exit rates did tend to decline with years at the job on the first promotion, so there is evidence of a fast track exit effect in this firm as well.

Table 5 returns to the question of salary range dynamics first considered in Table 3, but looking at promotions as in Table 4. Consistent with Table 3 and earlier studies, we find that employees earned promotions from all parts of salary ranges, but promotions were more likely to come from the lower end of the range (Q_2). Most new promotees wound up in the bottom half of the new salary range; about 70% had an LR no greater than 30, and almost all had an LR no greater than 60. Thus, an employee's location in the range was likely to fall on promotion. This effect was especially strong for those promoted from the high end of their previous range. One implication of this (the last column) is that the average raise on promotion is smaller than the average difference in midpoint of the salary ranges before and after promotion (Q_5). Note that this result is further evidence of regression to the midpoint caused by the Green Card effect (see Table 7).

Do Formal Salary Systems Really Matter?

Having described formal salary policies and movement within and between salary ranges, we now look for evidence on whether the rules have observable effects on compensation and career dynamics.

A common observation is that firms are reluctant to give negative nominal raises; several studies have shown that this is reflected in truncation and a spike in the distribution of nominal salary increases at zero (BGH 1994b; Card and Hyslop 1997; McLaughlin 2000). This issue is investigated in Table 6.

Nominal salary cuts were very rare; these were mostly demotions (Q_2). If the firm was reluctant to cut nominal salary, the best it could do in cases where salary was thought to be too high was to give a zero nominal raise. Rows 3–4 show the prevalence of zero nominal raises, both overall and conditional on receiving a zero nominal raise the prior year. As in other studies, we find a spike in nominal raises at zero. Zero nominal raises were earned at all parts of the range. Employees with low performance ratings received many of these. Another important

Table 6. Incidence of Zero and Negative Raises for Stayers.

Salary Action	Location in Range Prior to Raise										All
	<10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90+	
Nominal Raises:											
% Positive	98.0%	99.5	98.9	99.0	99.0	98.8	98.2	97.1	93.7	89.9	98.1
% Negative	0.4	0.1	0.1	0.0	0.0	0.3	0.2	0.2	0.4	0.3	0.2
% Zero	1.6	0.4	1.0	1.0	1.0	0.9	1.5	2.7	5.9	9.9	1.8
% Zero, Conditional on Zero Last Year	9.1	0.0	0.0	0.0	6.7	13.3	9.1	15.2	10.9	27.3	14.6
Other:											
% Negative Real Raise	11.7	8.7	10.0	10.1	11.4	11.7	13.6	16.6	20.1	26.6	12.5
% Zero Bonus	78.4%	76.8	77.2	74.4	73.5	69.6	70.6	68.3	64.1	60.9	72.7
% Negative Real Increase (Raise + Bonus)	10.5	7.8	8.8	8.4	9.3	10.1	11.5	12.6	14.3	18.5	10.2
N	1,738	3,006	3,271	3,651	3,405	2,938	2,461	1,740	1,146	1,175	24,531

Notes: The table shows the distribution of various types of raises for employees staying in current position, by location in the range. Rows 1–3 sum to 100% within columns.

cause of zero nominal raises, however, was the constraint of the salary range maximum: they were substantially more likely (for at least two years in a row) if an employee was at or near the top of the range. In fact, the majority of zero nominal raises were caused by the constraint of the salary range maximum.

The second panel of Table 6 shows the incidence of zero bonuses, negative real raises, and negative real increases in total compensation (raise plus bonus). Negative real raises were much more prevalent near the top of the range than elsewhere in the range. For example, roughly one-fourth of employees near the top of the range earned negative real increases in a given year. However, such employees were also more likely to earn bonuses. Possibly supervisors gave bonuses as a substitute when they were unable to give raises because of salary constraints. If so, this did not fully compensate for the salary constraints: those at the top of the range were much more likely to earn negative total increases in pay than were those at lower range locations.

Table 7 presents regressions analyzing determinants of real raises and bonuses for those staying in the job (and thus in the

salary range) in a given year. Since many employees received a zero bonus, bonus regressions are Tobits. The regressions combine traditional variables, such as tenure and performance ratings, with indicators of the employee’s LR, to see if the salary rules had additional effects. As expected, ratings are important predictors of both raises and bonuses (Medoff and Abraham 1980; Gibbs 1995) (Q_9). This should be the case, at least before other variables are controlled for, because the systems were designed to award larger bonuses and raises to those with higher ratings. Performance ratings were given on the DOGNUT scale: Distinguished, Outstanding, Good, Needs Improvement, Unsatisfactory, and Too New to Evaluate.⁹

⁹Supervisors were also allowed to use a plus and minus with these categories. In practice, only a minority of the supervisors used this refinement. Therefore, we dropped all plus and minus distinctions in our analyses. We did not use the category of “Too New to Evaluate” in our analyses that required performance evaluations. Since the workers in that category all were in their first year on the job, they are not included in other analyses that require persons to stay in one job from one year to the next.

Table 7. Raises and Bonuses for Stayers.

Variable	Grade/Hay		PAQ	
	% Raise	% Bonus	% Raise	% Bonus
Intercept	4.52***	-40.99***	14.36***	-17.23***
<i>Location in Range:</i>				
<25	2.00***	-0.71	1.97***	0.06
50-75	-1.12***	0.35	-1.23***	0.48**
75-90	-2.04***	2.05*	-2.32***	0.98***
90+	-3.30***	13.20***	-3.39	0.78
Midpoint of Range (\$1,000)	-0.01***	0.55***		
Midpoint Value · LR 90+	0.01	-0.13***		
Width of Range (% of Midpoint Value)			-0.27***	0.38***
Width · LR 90+			0.00	0.05
<i>Performance Rating:</i>				
Distinguished	5.03***	8.35***	4.29***	1.37***
Outstanding	2.31***	3.95***	2.32***	0.65***
Needs Improvement or Unsatisfactory	-3.27***	4.16*	-3.13***	-0.17
Job Tenure	-0.35***	-1.24***	-0.35***	-0.39***
Job Tenure ²	0.01***	0.04***	0.01***	0.01***
N	10,189	10,186	7,570	7,653
R ²	0.18		0.19	
Probability Bonus > 0		0.29		0.25
Dependent Mean	4.55		3.64	

Notes: Regressions predict the percent raise or bonus for employees staying in their current position (bonus regressions are Tobits). Controls were included for race, gender, and year.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

Receiving a Distinguished rating increased the raise about four to five percentage points compared to receiving a Good rating; it increased the bonus by even more for Grade and Hay employees, though it had a smaller effect for PAQ employees. Thus pay for performance through bonuses was stronger for white-collar workers than for other workers.

There is some debate about what exactly performance ratings measure (Medoff and Abraham 1980; Gibbons and Waldman 1999). If they measure performance, they should include the effects of innate ability, human capital, and effort. However, if the supervisor observes signals about each, the rating could be based on any desired relative weighting of the three. For example, where much is already known about innate ability (in the case, say, of employees with high tenure), ratings might be used more to reflect current effort, as one way to keep

the worker motivated. For workers with low tenure, ratings might be used more for sorting purposes, or to elicit investments in human capital. These issues are beyond the scope of this paper. However, the results in Table 7 suggest that all of these effects may matter. Since bonuses were tied to better ratings (at least for white-collar workers), it seems plausible that they were intended as an incentive to elicit sustained or increased effort. Furthermore, if bonuses are used to provide incentives, there seems little reason to use raises for the same purpose. Some theories suggest that salaries are more likely to track an employee's outside market value (Bernhardt 1995; Gibbons and Waldman 1999, 2002), which would be based on innate ability and human capital. Therefore, the tying of raises to ratings in this firm suggests that performance ratings were also indicators

of the employee's ability and skills, at least to some extent.

Table 7 also includes controls for tenure in the current job. Prior work found that as job tenure rose, raises and promotion rates fell (BGH 1994b). This association has sometimes been ascribed to the "Peter Principle" (Peter and Hull 1969; Gibbs 1995; Lazear 2004), whereby employees are promoted to their level of incompetence. Table 7 indicates that raises and bonuses did fall with tenure, even after we control for ratings and LR (Q_{10}). However, the effect is small and of little economic significance. Much of the effect of tenure on raises and bonuses is already captured in the performance rating and current LR. Those with higher tenure (passed over more times for promotion) were more likely to get worse performance ratings but to be higher in the range.

The regressions in Table 7 include controls for whether the employee was in the bottom, the third quarter (above the midpoint), the upper quarter of the range up to $LR < 90$, or close to the top ($LR \geq 90$).¹⁰ As expected, raises declined with LR (Q_8). Moreover, the binding constraint can be seen in the large negative coefficients for the dummies indicating employees who were at the top of the range (also see Table 6). There was regression of salary to the midpoint. The coefficients suggest that the only way for stayers in any of the pay plans to continue to earn real salary increases, if they were at or above the midpoint, was to keep earning Distinguished performance ratings. Distinguished ratings were very rare, so the ability of stayers to increase their salary was quite limited. One implication of this is that the chief means of increasing earnings over the long run in this firm was by earning promotions (Lazear 1992; BGH 1994b).¹¹

This regression of pay within ranges, driven by the salary plan design, could potentially impose costs on the firm. Since it was difficult to get to the higher end of the range without earning Distinguished ratings, those near the top must have been good performers. It is clear that some were unlikely to earn promotion, since they had already been passed over several times. They also may have found that it was difficult to raise salary further, which might have reduced incentives or caused them to exit the firm. Whether this phenomenon is costly to a firm depends on whether the firm is earning rents on such employees, or how we think about the Peter Principle. If performance ratings measure "innate ability" or accumulated human capital (especially job- or firm-specific human capital), then it is likely that the firm is earning some rents on them relative to other employees in the same range. If performance ratings measure the employee's current performance, they may imply a strong match with the current job, but not high ability or human capital. In this case it is less likely that the firm is earning rents on the employee. Without a better understanding of what performance ratings measure for different classes of employees, or better measures of employee ability or human capital, it is difficult to resolve this question. However, we can employ two approaches to try to infer whether the firm in our study was facing some costs of this sort: first, by looking for evidence that the firm tried to work around such problematic cases; and second, by looking for evidence that such cases caused reductions in performance or exits from the firm.

First consider whether the firm employed "work arounds" to the salary constraints faced by employees near the top of the

¹⁰Various specifications for LR yield similar conclusions.

¹¹Even if total pay (salary plus bonus) is considered, there was regression of pay within ranges in both Grade/Hay and PAQ salary systems. In both

total dollars and percentage increase, real increases in total pay fell with the employee's location in the range. For example, in Grade/Hay jobs, employees at the bottom of the range experienced an average increase in real total pay of about \$4,000 (9.6%) per year, while those at the top of the range experienced an average increase of about \$2,300 (2.6%).

range. There are several ways this could have been done. One would have been simply to bend the rules. The description and evidence above suggest that the firm did not do this. Another possibility would have been to build weaker regression of pay into salary ranges with more “valuable” employees. For example, assume that employees who were higher in the firm’s hierarchy would have been more costly to lose. We might expect that in establishing the salary raise matrix (as a function of rating and LR), the HR department would have built in weaker salary regression for employees in such high-level jobs. If so, then the coefficients on $LR \geq 90$ in salary regressions in Table 7 would be smaller for such employees. To look for this effect, Table 7 proxies for high-level Grade/Hay employees by including controls for the midpoint value, under the assumption that higher midpoints represent higher-level jobs. This is interacted with the dummy indicating if the employee was right near the top of the range. If the firm was concerned about problems caused by high-level employees “topping out” in the salary range, then it should have penalized such employees less in their raise, so the interaction term should have a positive sign. In fact, the coefficient is positive, but it is statistically and economically insignificant.

Table 7 examines a slightly different question for PAQ employees, who did not vary much in salary midpoint. PAQ ranges varied in width as a percent of the midpoint value. Narrower ranges might have caused more employees to top out in their range. If the firm had been concerned about costs induced by this, we would expect it to build weaker Green Card effects into narrower ranges. Thus, the PAQ raise regression in Table 7 controls for the width of the range (as a percent of the midpoint value), and interacts this with the dummy indicating if the employee was near the top of the range. In this case, the coefficient is predicted to have a negative sign. However, as with Grade/Hay employees, the coefficient is statistically and economically insignificant. Thus, it does not appear that the firm tried to mitigate the potential costs of topping

out in salary by reducing the Green Card effect where the costs might be highest (for higher-level employees or in narrower salary ranges).

A third way to work around salary constraints might be through bonuses (Baker 1990). Giving larger bonuses to those ineligible for raises might improve incentives and retention. If employees at the top of the range were good performers, we might expect larger bonuses to substitute for lower raises. Table 7 shows that this did happen for Grade/Hay, but not PAQ, employees: in the Grade/Hay pay plans, the higher one’s LR, the higher one’s bonus. Moreover, the bonus was particularly large for employees who were in danger of topping out in salary. In contrast, bonuses did not vary with the width of the salary range. Thus, unlike prior researchers (Gibbs 1995), we find some evidence of bonus substitution for white-collar employees in this firm. There is no evidence of bonus substitution for PAQ employees. Note, however, that Table 6 indicates that bonuses did not fully compensate for constrained raises for employees at the top of the range.

Did employees who topped out in salary ranges have reduced incentives? We observe subjective performance ratings (and promotions, analyzed in Table 9) instead of actual performance. As discussed above, it is unclear whether subjective ratings reflected the employee’s current performance or long-term potential. There may have been behavioral effects as well. If the supervisor knew that the salary system constrained the employee’s ability to earn raises, he or she may have been less concerned with giving a high rating, since it would have had little practical effect. On the other hand, the supervisor might have been tempted to give the employee a better rating, to compensate for the fact that the employee’s raise would be lowered because of an already high salary.¹² For these rea-

¹²One important determinant of how this plays out in practice must surely be whether the supervisor pays a price for giving larger raises to employees. Some

Table 8. Performance Ratings for Stayers.

Variable	Grade/Hay	PAQ
Intercept	-0.82***	-7.12***
<i>Location in Range:</i>		
<25	-0.24***	-0.54***
50-75	0.16***	0.51***
75-90	0.43***	0.88***
90+	0.40	2.12
Midpoint of Range (\$1,000)	0.02***	
Midpoint Value · LR 90+	0.00	
Width of Range		
(% of Midpoint Value)		0.19***
Width · LR 90+		-0.02
N	11,586	9,260
Probability of Outstanding or Distinguished Rating	0.53	0.47

Notes: Logits predict whether employees who stayed in their current positions received an Outstanding or Distinguished performance rating (plus and minus distinctions were dropped). Controls were included for race, gender, and year.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

sons, performance ratings are difficult to interpret. In Table 8 we present analyses of ratings so that the reader can get a sense for how they vary with variables of interest.

Like other studies, ours finds that most employees earned middle ratings (Good or Outstanding).¹³ Only about 2% received ratings above Outstanding. Therefore, in Table 8 ratings are collapsed into two categories, "Good+" or below, and "Outstanding-" or above. The table presents logits predicting whether or not the employee earned a rating in the "Outstanding-" or above group. Employees who were higher in the range were more likely to earn high

ratings (Q_9). Ratings did not tend to be lower if the employee was at the top of the range. If anything, they were more likely to be in the top group. The interactions, between narrow range (PAQ) or high midpoint (Grade/Hay), and being at the top of the range, suggest that topping out in salary had no effect on ratings. If weak salary incentives were not associated with poorer performance evaluations, perhaps employees still had adequate promotion incentives. The results shown in the table may also reflect supervisors' inclination to give high ratings to employees at the top of the range to mitigate the Green Card effect.

Table 9 presents analyses of job transitions for Grade/Hay (Panel A) and PAQ (Panel B). Each column presents a multinomial logit predicting whether the employee stayed in the current job (the base case) or was laterally transferred, was promoted, or exited (demotions were too rare to include). If topping out in salary is costly, a firm may laterally transfer some near the top of the range into job ladders with better promotion prospects, to avoid losing them. Similarly, it might be more inclined to promote some employees near the maximum (either in preference to others, or by creating new positions). If the firm does not take these actions, salary constraints might frustrate talented employees at the top of the range, who might quit.

The first statistic in each column is the estimated coefficient. A coefficient of zero means that this variable has no estimated impact on the probability the employee stayed in the job, compared to a transition of this type. A negative coefficient means that increases in this variable are associated with a decreased relative probability of transition; a positive coefficient has the opposite interpretation. The second statistic (in parentheses) is the relative risk ratio. This is the ratio of the probability of that outcome when the variable increases by 1 unit, to the probability when the variable is not increased. This is a natural metric for marginal effects in this table, since most of the variables of interest are either dummy variables or years of tenure on the job. For

supervisors have employee salaries and bonuses taken out of their unit's budget, while others do not. We do not know what the typical practice was at this firm. The firm did not have forced curves or other constraints on rating distributions.

¹³For example, Medoff and Abraham (1980) found that 94.5% and 98% of managers in two firms that they studied received evaluations of "Good or Outstanding." The firms used 4-point and 6-point scales.

Table 9. Job Transitions.

Variable	Lateral Transfer		Promotion		Exit	
A. Grade/Hay						
Intercept	-2.06***		0.90***		-2.14***	
Location in Range:						
<25	0.23	(1.26)**	-0.09	(0.91)	-0.17	(0.84)**
50–75	0.05	(1.05)	-0.05	(0.95)	0.08	(1.08)
75–90	0.26	(1.29)	-0.62	(0.54)**	-0.13	(0.87)
90+	1.03	(2.80)	-1.62	(0.20)*	0.21	(1.23)
Midpoint of Range (\$1000)	0.00	(1.00)	-0.04	(0.96)***	0.00	(1.00)
Midpoint Value · LR 90+	-0.01	(0.99)	0.02	(1.02)	0.00	(1.00)
Distinguished	-1.24	(0.29)*	1.38	(3.97)***	-0.74	(0.47)**
Performance Rating:						
Outstanding	-0.12	(0.89)	0.72	(2.06)***	-0.32	(0.72)***
Needs Improvement or						
Unsatisfactory	0.13	(1.13)	-0.79	(0.45)	0.87	(2.39)***
Job Tenure	-0.17	(0.84)***	-0.44	(0.64)***	-0.26	(0.77)***
Job Tenure ²	0.01	(1.01)**	0.02	(1.02)***	0.01	(1.01)***
N	11,500					
B. PAQ						
Intercept	-4.18***		8.54***		-0.42	
Location in Range:						
<25	0.36	(1.43)**	0.27	(1.31)**	0.00	(1.00)
50–75	0.20	(1.23)	-0.17	(0.85)	0.02	(1.02)
75–90	0.05	(1.06)	-0.79	(0.46)***	-0.43	(0.65)***
90+	0.46	(1.58)*	-0.42	(0.66)*	-0.03	(0.97)
Width of Range (% of Midpoint Value)	0.05	(1.05)	-0.29	(0.75)***	-0.07	(0.93)***
Performance Rating:						
Distinguished	-2.46	(0.09)**	1.00	(2.71)***	-0.47	(0.63)
Outstanding	-0.05	(0.95)	0.62	(1.86)***	-0.02	(0.98)
Needs Improvement or						
Unsatisfactory	0.60	(1.83)*	-0.90	(0.41)*	1.22	(3.38)***
Job Tenure	-0.11	(0.89)***	-0.44	(0.64)***	-0.15	(0.86)***
Job Tenure ²	0.01	(1.01)***	0.02	1.02***	0.01	1.01***
N	8,169					

Notes: Job transition multilogits (base case = employee stays in position next year). Numbers in parentheses are relative risk ratios indicating the change in probability going from the base state to that variable's state. Controls were included for race, gender, and year.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

example, for Grade/Hay employees, a Distinguished performance rating raises the probability of promotion over staying in the same job by nearly four times as much as does a Good evaluation.

Two results are consistent across the entire table. First, controlling for pay level in

the salary grade, salary grade level, and recent performance, transitions declined with tenure on the job for at least the first ten years. Second, those with better ratings were less likely to be transferred or to exit, and more likely to be promoted.

For Grade/Hay employees, promotions

were less likely from both low and high ends of the range, while transfers and exits show no clear pattern. Those near the top of the range were about one-fifth as likely to earn promotion as were other employees, suggesting that some topping-out employees were in job ladders with poor promotion prospects. For PAQ employees, results are similar but stronger. PAQ employees near the top of the range were virtually certain not to receive a promotion or to exit. Instead, they may have been transferred to another job (the coefficient is only significant at the 10% level), which probably allowed more upward mobility.

Finally, Table 9 shows little evidence that the firm altered job transition rates for employees who were near the top of the range in higher level (higher midpoint) Grade/Hay jobs.¹⁴ Promotion was slightly less likely as salary grade increased, but otherwise there appear to have been no effects. Lateral transfers were no more probable. This provides no evidence of the firm working around salary constraints by offering lateral transfers. Interestingly, employees who were topping out in salary were not more likely to quit than were other employees. One interpretation is that these employees had found a good job or firm match compared to their alternatives, so that their propensity to exit did not rise despite lack of further salary growth or promotion opportunities. This suggests that the formal salary systems act largely as a veil for the external labor market, imposing no real economic costs on this firm.

Additional Findings

Above, we have provided evidence related to seven of Gibbons's ten core questions listed in Table 1. For completeness, here we provide evidence on the remaining three questions. Our panel is too short to

allow detailed analysis of these questions, but we can shed some light on how our findings square with prior work.

One important question is whether wage increases forecast promotions. BGH (1994b) found that those who earn higher annualized raises are more likely than others to be promoted, and are promoted faster. Unfortunately, for those we know were new to a job, we observe at most two years of raises and a subsequent year's job transition. However, other findings strongly suggest that the phenomenon would occur in this firm (Q_6). Promotions tended to happen quickly, and often from the low end of the range. Those at the low end of the range earned larger raises, all else equal. Therefore, it seems likely that fast promotees would have experienced fast wage growth before promotion. An interesting extension is the following: after adjusting for the Green Card effect, would annualized raises in the current job still have a negative correlation with probability of eventual promotion, and a positive correlation with years to promotion? It may be that the effect BGH found was driven by how raises are awarded as a function of the employee's LR, and how LR is related to years in the current job (this is similar to our findings, in Table 7, on how job tenure affects raises).

A second unaddressed question is whether an employee's real raises exhibit serial correlation, after the analysis controls for observed individual characteristics (BGH 1994b; Farber and Gibbons 1996). While most learning models suggest that salary should be serially uncorrelated, BGH found that raises were serially correlated once the analysis controlled for education, age, experience, and job level. This was interpreted as suggesting heterogeneity across employees in rates of human capital acquisition.¹⁵ Table 10 presents serial correlations of raise residuals over the two four-year periods that we do observe. We

¹⁴There were too few observations to include interaction in the PAQ estimation. While the program converged, the results had huge standard errors on the interaction terms.

¹⁵Another possibility is heterogeneity in learning rates across jobs, not employees (Munasinghe 2000).

Table 10. Serial Correlation in Real Raises.

	<i>Correlation of Residual with...</i>	<i>Grade/Hay</i>	<i>PAO</i>
Unadjusted	...Last Year	-0.069***	0.062**
	...2 Years Ago	0.014	0.092***
Adjusted	...Last Year	-0.104***	0.006
	...2 Years Ago	-0.014	0.029
N		1,964	1,042

Note: Serial correlations of residuals from regressions predicting percent real raises, for the same employee over four adjacent years (three raises). “Unadjusted” regressions control for education, gender, age, tenure, job function, job tenure, salary, performance rating, and year. “Adjusted” regressions control for all of those variables plus the employee’s location in the salary range.

Statistically significant at the .05 level; *at the .01 level.

ran real raise regressions for stayers, including controls for a large set of observable characteristics: education, gender, age, tenure in company and current job, job function, salary level (or range midpoint), performance rating, and year.¹⁶ Serial correlations of residuals from these regressions are presented in the “Unadjusted” rows of Table 10. Consistent with BGH, raise residuals are serially correlated with raise residuals the year before, though not two years back (Q_3). However, Grade/Hay serial correlations are negative rather than positive, which is inconsistent with an interpretation based on differences in rates of human capital accumulation.

One possible explanation for negative serial correlation is “measurement error” in wage levels. Since we are using actual personnel records, there is little or no recording error in the data. However, since wage changes occurred episodically (usually once per year) and were based at least in part on administrative rules, they may not perfectly reflect the wage desired by the firm at a given point in time. Dohmen (2003) offered several other potential explanations for serial correlation in raises. First, zero nominal increases for those at the top of the range would induce some

correlation. Ignoring such cases reduces but does not eliminate the serial correlation, as in BGH (1994b). Second, performance ratings are correlated for an individual. Third, in Dohmen’s data, wage growth could vary across wage scales (salary ranges); there was almost no such variation in our firm.

It is also possible that such serial correlations are caused by the salary rules, through the Green Card effect. Consider employees who are low in the range. All else equal, they tend to earn larger raises. Unless this puts them at or above the midpoint, the same should be true next year. This would induce positive serial correlation in raises. Similar logic should apply for those near the top of the range. Of course, employees who are near the midpoint might have a negative serial correlation, as they bounce around the midpoint over time. The overall serial correlation would depend on the distribution of employees within the range. To check for this, we reran the regressions including controls for LR (using the salary range partition from Table 2), and recomputed serial correlations for these residuals. These are presented in the “Adjusted” rows of Table 10. Adding controls for LR causes the serial correlations to disappear for PAQ employees, but has little effect for Grade/Hay employees. Thus, serial correlation in raises was only partly caused by the salary system.

A final question is whether there is a cohort effect on employee salary levels.

¹⁶Regressions were also run for all employees controlling for promotions and lateral transfers, with similar results.

Table 11. Cohort Effects on Real Salary.

<i>Variable</i>	<i>Grade/Hay</i>		<i>PAQ</i>	
Intercept	-42,723***	-40,852***	11,084***	9,938***
Tenure	1,723***	2,101***	998***	1,202***
Tenure ²	-40***	-39***	-38***	-29***
<i>Year:</i>				
1989	523	2,093	29	1,087*
1990	-276	1,056	-836***	122
1991	-162	822	-451***	192
1992	320	860	-422***	-145
N	23,734		17,161	
R ²	0.428	0.432	0.295	0.315
F	4.95		18.74	

Note: All regressions include controls for entry cohort, education, age, age squared, gender, and race.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

Beaudry and DiNardo (1991) found that the lowest level of unemployment since hiring is a statistically significant determinant of salary. Similarly, BGH (1994b) found that once they controlled for year and tenure, a cohort dummy had a statistically significant effect on salary over time, although the identification problem between cohort, year, and tenure prevented them from assessing economic significance. Both findings suggest an internal labor market, whereby an employee's pay is partially shielded from current labor market conditions. However, Eriksson and Werwatz (2003) found mixed evidence on cohort effects in their sample of 222 Danish firms.

Table 11 presents cohort/salary findings for the firm studied here. The dataset includes the original hire date, so each employee's cohort can be calculated (a small percentage of employees hired before 1966 were ignored). Regressions were run predicting the employee's real salary as a function of education, age, gender, race, year, and tenure. These were compared against similar regressions that included cohort dummies (once again, inferences about the magnitude of coefficients are impossible because of the identification problem). The table presents F-statistics assessing the added statistical power of including controls for cohorts. Both F-statistics are highly significant, suggesting that

in this firm as well, the employee's cohort had a persistent effect on salary (Q_4).

Conclusions

The pay policies of the firm studied in this paper closely match salary plans used by most large firms, and described in most compensation textbooks. Over the years studied, the firm appears to have stuck strictly to the rules and constraints of the system. Contrary to economic models wherein principals have wide latitude over salaries, raises, and bonuses, in this firm supervisors (acting on behalf of the principals, or owners) had little discretion except perhaps in hiring, promotion, and performance-rating (across a small number of subjective categories). Regression of pay within salary ranges restricted their control over salary levels after hiring, and they had only limited ability to use bonuses to work around salary constraints and fine-tune incentives.

Salary constraints were most important for employees who were near the maximum in their range. A significant percentage were near the top, especially among those who had been in the job for several years. However, these employees did not have the highest career potential. Promotions out of ranges tended to happen relatively rapidly, for those individuals at low

points in a salary range. Instead, employees who were topping out in salary were probably well suited to their current job, but did not have high enough ability to be promoted to the next hierarchical level.

The widespread use of bureaucratic pay systems suggests that they must have benefits. Formal, centralized policies may reduce administrative costs. They also may increase perceptions of equity or fairness. Similarly, limits on supervisor discretion can reduce influence costs (Milgrom 1988; Milgrom and Roberts 1988) and favoritism (Prendergast 1993; Prendergast and Topel 1996).

Our results corroborate those of the prior literature on almost all of the questions cited by Gibbons (1997). The consistency of findings on these basic questions across this and other studies provides a promising foundation for future theoretical work.

It is worthwhile to think about what wage and career dynamics are suggested by the evidence here and in related empirical work. Regression of pay within ranges or levels suggests that firms and the labor market learn about employee abilities over time, and sort them accordingly. Those with low job tenure have higher raises and are more likely to be promoted, suggesting higher ability. Those who have been passed over are revealed to have lower ability. Heterogeneity in ability (and possibly in human capital acquisition rates across individuals or jobs; it is difficult to disentangle them) leads to systematic differences in wage growth, promotion rates, and fast tracking. It also may lead to serial correlation in salary changes, even after the analysis controls for all observables. Salary *falls* for those high in the salary range, not only relative to others lower in the same range,

but also often in real terms, suggesting that the employee's outside market value also plays a role.

There is some disagreement in the literature about whether "wages are attached to jobs." Our evidence suggests that they both are and are not, in some sense. There is important dispersion in salary among those in the same job or range (or hierarchical level, in other studies). There are also important salary dynamics within these classifications. In this sense, wages are not attached to jobs. However, regression of pay within ranges implies that in the long run, wages are largely attached to grades, so that promotions are essential to long-term salary growth.

Wage and career dynamics are driven by the interaction between two forces: underlying economic factors that are the focus of traditional labor economics (acquisition of human capital; sorting; incentives; and labor market pressures), and firm personnel policies. If these conflict, we would expect to see the emergence of problems (for example, high turnover) or a redesign of the policies. The firm studied here, like most large firms, uses very bureaucratic pay policies. Yet aside from downward nominal salary rigidity, we find little evidence that the formal rules imposed important costs on the firm over the period studied. We also find little evidence, other than incomplete substitution of bonuses for raises at the top of the salary range, that the firm employed work-arounds when the system was most constraining on personnel management. Instead, the firm largely stuck to the rules. A plausible interpretation, though unverifiable here, is that the salary system has survived by evolving to mirror the wage and career dynamics that underlie it.

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