

The internal economics of the firm: further evidence from personnel data

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Abstract

Baker, Gibbs and Holmström [Quarterly Journal of Economics 109 (1994) 881] [BGH] carried out a detailed description of the internal hierarchical structure of a firm together with its pay and promotion dynamics. Their work has become the basis of much theoretical work, but little attempt has been made to establish its generality. Accordingly, we replicate their analysis as closely as possible using data from a large British financial sector firm between 1989 and 1997. In many respects, our results are similar to those described by BGH, but they also differ in important ways, suggesting that more needs to be understood. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Two influential approaches to the personnel operations of firms were distinguished by Lazear (1992). In the Internal Labour Market approach, the job is paramount; in the human capital approach, the worker is paramount. The evidence from empirical studies as to whether “the person define(s) the job, or the job

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define(s) the person” is scanty, and almost entirely restricted to US studies. The most influential study of the kind—by Baker et al. (1994) (hereafter BGH)—has set a large part of the agenda of personnel economics. In their paper, BGH analysed the personnel records of a large service sector firm over a period of 20 years from 1969 to 1988. Their objective was to see to what extent the arrangements in the organisation corresponded to those, which Doeringer and Piore (1971) suggested, would characterise an Internal Labour Market (ILM), rather than the human-capital view. Accordingly they analysed the hierarchical structure, ports of entry, patterns of careers and turnover, and the wage structure within the firm. It is unlikely, of course, that BGH’s results are general, and therefore we argue that replication papers such as this one are of value.

To add to the body of evidence, we study a different firm, over a different time period, and in a different economy. The firm, like BGH’s, is a service sector employer. It is a similar size to theirs having around 40,000 full-time employees, and 20,000 part-time employees. We have data from the personnel and payroll archives that have been maintained since 1988, referring to the firm’s British

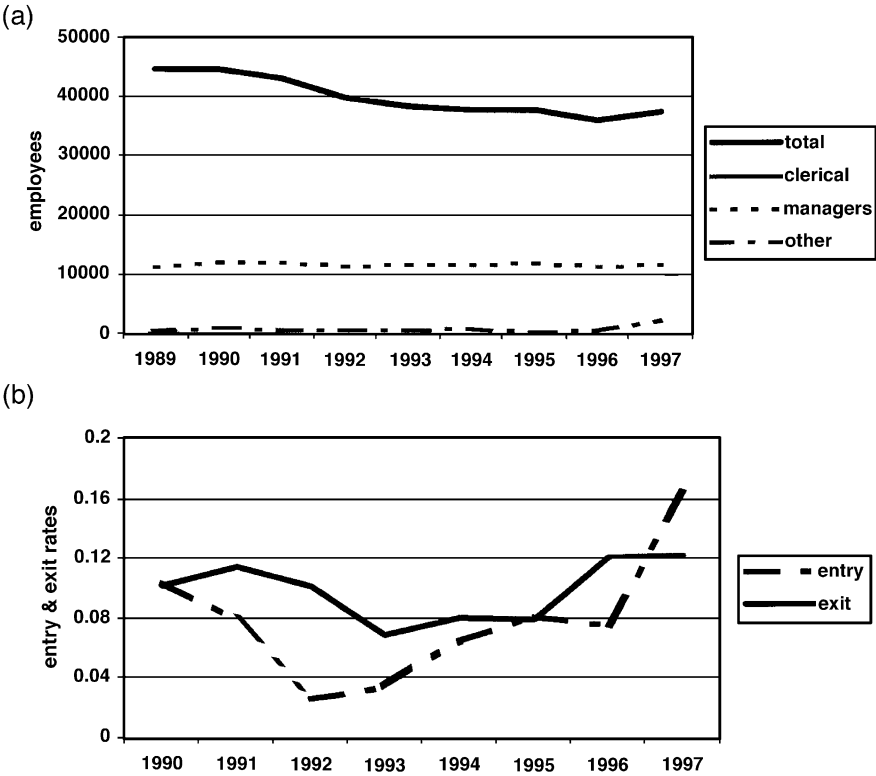


Fig. 1. (a) Number of employees, (b) Entry and exit.

operations. Our data run from January 1989 to March 1997, giving 99 monthly observations. Each observation includes an employee ID number, age, sex, marital status, number of children, ethnic origin, job code, work unit code, salary, bonus, hierarchical grade, date of entry into current spell of employment, performance rating, partial post code of home and work, and for those employees in post in March 1991, some indicators of educational attainment. Note that BGH only consider the management grades, while we include both clerical and managerial grades. We argue that the clerical grades are different and that they perform a particular function within the hierarchy.

1.1. Overview of the firm

Fig. 1 shows the change in employment over the 9 years of our data period. Overall, employment declined by about 20%, although this crude figure disguises some important changes in the structure of employment, not all grades in the hierarchy suffered the same degree of decline, and part of the downsizing has been achieved by workers changing their contracts from full to part-time. Management grades (7–13) constitute a varying proportion of total employment. The decline in the overall employment is mainly due to a decline in clerical grades (2–6), while the number of employees in the management grades remains fairly constant over time, and their proportion increases.

As can be seen, the decline in the size of the firm has been generated, in the main, by a significant fall in the entry rate during 1990/1992. Since that time, both the entry and exit rates have increased to a level above their 1990 rates, which indicates that there has been a subsequent increase in turnover.

2. The hierarchy

2.1. Structure

Our firm, unlike BGH's, has an explicit hierarchical structure in which workers can be assigned to one of 14 levels or grades. Two of these grades seem not to be a part of the hierarchy; grade 1 contains different types of individuals, often earning significant salaries; grade 99 is a sort of unclassified state; individuals' can transit from both 1 and 99 into almost all the other grades. The hierarchical structure can thus be considered simply as grades 2–13, for this reason we have not reconstructed Fig. 2 in BGH, in which they infer the hierarchy from the pattern of job moves.

BGH identify four significant levels in their firm, and characterise this as a 'remarkably simple' structure. Our firm also has a simple structure, which could justifiably be divided into three or four significant levels, consisting of training

Table 1
Transition matrix between grades in the hierarchy

Old grade	New grade														Percentage	Sample size
	Exit	2	3	4	5	6	7	8	9	10	11	12	13	Other		
Entry	·	7.1	16.6	24.4	13.1	8.0	11.1	3.6	2.3	1.1	0.4	0.0	0.0	12.4	100.0	25 297
2	17.6	1.7	52.0	26.8	1.5	0.2	·	·	·	·	·	·	·	0.1	100.0	2887
3	15.1	·	35.2	48.1	1.4	0.1	0.0	·	·	·	·	·	·	0.0	100.0	13 182
4	11.1	0.0	0.1	70.2	18.0	0.5	0.1	·	·	·	·	·	·	0.1	100.0	57 266
5	9.4	0.0	0.0	1.0	79.8	8.7	0.6	0.0	0.0	·	·	·	·	0.4	100.0	91 266
6	7.4	·	·	0.0	1.1	83.5	7.8	0.0	0.0	·	·	·	·	0.1	100.0	60 773
7	9.6	·	·	0.0	0.1	1.3	79.7	8.9	0.3	0.0	·	·	·	0.0	100.0	48 382
8	9.6	·	·	·	0.0	0.1	1.4	79.9	8.7	0.3	0.0	·	·	·	100.0	23 262
9	10.7	·	·	·	·	0.0	0.1	1.0	83.0	5.0	0.1	·	·	0.0	100.0	14 593
10	13.0	·	·	·	·	·	·	0.0	0.7	80.9	5.3	0.1	·	0.0	100.0	5199
11	13.2	·	·	·	·	·	·	·	·	0.2	84.7	2.0	·	·	100.0	1610
12	17.2	·	·	·	·	·	·	·	·	·	·	80.9	1.9	·	100.0	309
13	24.1	·	·	·	·	·	·	·	·	·	·	·	74.1	1.9	100.0	54
Other	14.4	·	·	0.8	2.5	4.3	8.4	2.3	1.4	1.1	0.7	0.3	0.1	63.7	100.0	4658
Total	9.2	0.5	3.0	15.6	25.1	17.7	13.6	6.9	4.3	1.5	0.5	0.1	0.0	1.9	100.0	348 738

Transitions between hierarchical grades, including entry and exit, over the period 1989–1997 (annual, January-to-January). The numbers show the movements between the old grade (or entry) and the new grade (or exit) as a percentage of the number of employees in the old grade. A dot (·) indicates that the move never occurs, while 0.0 implies a percentage smaller than 0.05.

grades 2–4, clerical grades 5–6, middle managers 7–8, and senior managers in grades 9 and above. This view is based on our replication of BGH's Table 1, which is our Table 1 as well.

The transitions are year on year over the period giving 348738 observed transitions. Since the hierarchical structure is explicit, and the great majority of transitions are upwards or to the same level, there are no problems with identifying and relating level codes to each other. It is worth pointing out, though, that the two parts of the hierarchy (clerical grades, 2–6 and management grades 7–13) have very different structures. It appears that the clerical grades 2–5 are more in the nature of a training system with standards-based promotions, which all employees are expected to complete. Only in the transit from grade 5 to 6 (the top clerical

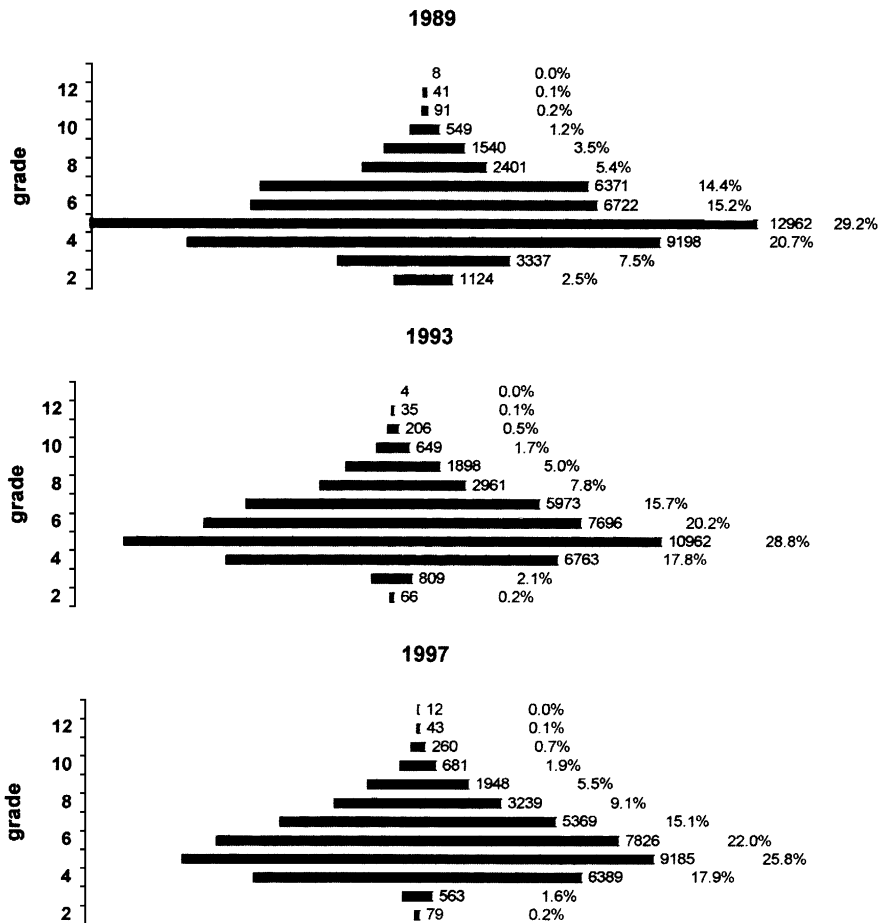


Fig. 2. Size of grades over time.

grade) does the promotion rate fall to a level similar to that observed for the management grades. We conjecture therefore that grades 5 and 6 are the main clerical grades and 2–4 are the training grades referred to above. Demotions are relatively rare. The promotion rates can be interpreted as the average promotion rates over the period and, as can be seen, this rate is around 8%.

There is a distinct break in the promotion rates for managerial grades at grade 9. Promotions from 7 to 8 are awarded to just under 9% of employees in those grades. Promotions are harder to come by for the higher managerial grades at rates around 5% from grades 9 to 10 and 2% from the grades above that.

2.2. Stability of the hierarchy

Just as BGH observed a large measure of structural stability in the hierarchy of their firm over a long period of growth, so do we observe similar stability during a period of decline. As they point out, this observation is hard to square with the existing theories of hierarchy, which predict that the number of levels should increase with firm size. The changes in the distribution of individuals over the period are shown in Fig. 2. The main aspect of the change is the growth in the relative numbers in the management grades from 23% of employment in 1989 to 31% in 1997.

3. Careers, entry and exit

One of the basic functions of an Internal Labour Market as outlined by Doeringer and Piore (1971) is that it gives, in some ways, preferential treatment to “insiders” over “outsiders”. In particular, hiring to places in the middle ranks of the hierarchy is biased in favour of “insiders”. In this way, the firm is able to offer employees a career. BGH’s firm fitted this pattern in some respects, although the extent of outside hiring at all levels is about a quarter of all entrants into all levels except, of course, the lowest which had 100% of entrants hired from outside the firm. Exit rates were also similar at all levels. These facts are of importance because they indicate the influence that the external labour market exerts on the internal workings of the firm.

BGH also ask if outside hires fare better than incumbents in their later years in the firm. The conclusion they reach is that new hires tend to do rather better than incumbents on average, but that their performance is much more variable. They argue that this is because observation of incumbents in their prior career with the firm, is a more effective screen than the hiring process.

The nature of screening processes is also of interest, and can provide useful information on the nature of promotion processes. For instance, if the purpose of promotion is to sort employees according to ability, then we should observe people who are promoted quickly at one level being promoted quickly at higher levels.

Alternatively, if firm-specific human capital acquisition is important for promotion, then a fast promotee will have less of it than a slower promotee. A similar set of considerations apply for exit rates.

BGH find evidence of fast tracks in their data, and also of a fast track exit effect by which early promotees also tend to exit at higher rates. The present section examines whether our firm exhibits similar behaviour.

3.1. Ports of entry and exit

BGH found that one of the most pronounced discrepancies between their data and what would be suggested by the model of an ILM, is the apparent non-existence of defined ports of entry and exit. The lowest entry level at any point in our hierarchy is 9.7% (cf. row 11 of Table 2). The entry levels in our firm are not as high as those reported by BGH, but seem substantial enough to imply considerable impact of the external market on the internal one. The pattern of entry is related to the distinction between staff and management grades. It appears that entry levels decline within staff grades 2–6 as ILM theory would suggest. However, it is U-shaped in management grades 7–13 with relatively high external entry at the lowest rung of the management hierarchy, which then falls before increasing again at the top. It appears that both the lower and higher levels of management are exposed to higher degrees of external competition than the ILM theory would suggest.

3.2. New hires versus incumbents

Following BGH's Table 3, we compare the performance of workers promoted into grade 5¹ from within (incumbents) with the performance of workers newly hired into grade 5 from outside (new hires). Relative performance is judged in terms of the proportion of these two groups exiting grade 5 (and successive grades) over the following 5 years. The comparison is presented as our own Table 3. This is based on all workers who entered grade 5 prior to March 1992. The columns show the proportion of workers who were in each grade a specified number of years after promotion into grade 5. These are shown separately for new

¹ Grade 5 was chosen as the nearest equivalent to BGH's Level 2. We have calculated the entries in Table 3 in the same way as BGH seem to have calculated theirs. In particular, we constructed "quasi cohorts" in the same way as described in their footnote 10.

Doing similar computations for entrants into grades 7 and 9 yields results that are very little different qualitatively to those reported in Table 3, except, of course, that the promotion rates out of these grades are lower than for grade 5. It is still true for the higher grades that incumbents have promotion rates out of the grade that are no higher than for new entrants.

Table 2
Career and level characteristics

	Grade									
	2	3	4	5	6	7	8	9	10–13	Other
Number of outside entrants to grade	2424	2426	1923	859	698	882	349	242	99	171
Percent with 1-year careers	19.3	22.2	23.6	16.9	11.5	16.9	15.8	16.5	13.1	22.2
Percent with 2-year careers	9.9	9.4	8.7	9.1	10.5	17.0	18.9	18.2	25.3	20.5
Percent with 3-year careers	6.3	5.3	5.9	5.8	9.6	10.3	12.9	12.4	15.2	11.7
Percent with 4-year careers	3.5	4.4	4.7	7.9	9.6	8.3	8.3	10.7	15.2	11.1
Percent with 5-year careers	6	5	4.7	7.8	9.0	7.1	6.3	8.3	5.1	5.3
Average age of new hires	19.0	20.3	29.7	28.2	26.5	30.0	31.8	32.6	38.5	26.7
Number promoted into grade	0	1942	3337	2450	1047	875	517	228	352	12
Average age of those promoted into grade	N/A	19.1	21.1	26.3	27.9	27.1	30.3	32.2	34.8	31.6
Number of person-months in grade	22 463	145 473	686 284	109 1394	754 001	588 099	292 441	183 318	91 111	60 019
Percent of all entrants into grade who were outside hires	77.2	36.7	26.3	11.8	9.9	18.5	9.7	11.8	12.2	21.9
Promotion rate (percent) per year	80.6	49.7	18.7	9.8	7.9	9.3	9.0	5.2	1.9	21.9
Exit rate (percent) per year	17.6	15.1	11.1	9.4	7.4	9.6	9.6	10.7	13.3	14.4

The first nine lines of this use data up to March 1992 only, in order to accommodate line 6. The remainder of the table uses the whole data set. Because of this, the statistics in the bottom part of the table appear inconsistent with those in the top part.

Table 3

Career attainment, new hires versus incumbents promoted into grade 5

Current grade	New hire/ incumbent	Years since entering grade 5				
		1	2	3	4	5
2	New hire	.	.	.	.	.
	Incumbent	.	0.02	.	.	.
3	New hire	0.13	.	.	.	.
	Incumbent	0.02	0.03	0.02	.	.
4	New hire	.	0.24	0.40	0.89	1.01
	Incumbent	0.95	1.07	1.17	1.41	1.61
5	New hire	80.91	65.41	53.39	48.44	42.23
	Incumbent	93.78	84.48	76.23	68.16	60.46
6	New hire	12.90	18.51	22.58	24.22	27.87
	Incumbent	4.65	12.84	18.95	23.64	27.84
7	New hire	2.28	13.52	21.12	21.40	21.11
	Incumbent	0.27	1.19	3.22	6.09	9.24
8	New hire	.	0.37	0.93	3.27	6.08
	Incumbent	.	.	.	0.22	0.56
9	New hire	0.13	.	.	0.15	0.68
	Incumbent	.	.	.	.	0.02
Other	New hire	3.63	1.95	1.59	1.63	1.01
	Incumbent	0.32	0.36	0.41	0.48	0.28
Grade (average)	New hire	5.03	5.39	5.61	5.70	5.86
	Incumbent	5.03	5.13	5.23	5.33	5.45
Grade (variance)	New hire	0.91	0.96	1.02	1.09	1.10
	Incumbent	0.34	0.48	0.59	0.69	0.75
Exit rate (%)	New hire	17.52	11.43	8.39	10.62	12.17
	Incumbent	4.56	6.70	7.07	6.49	7.34
N	New hire	902	927	822	753	674
	Incumbent	6488	6196	5782	5374	5025

Career performance of employees who entered grade 5 from outside ('new hire') or after a promotion ('incumbent'). Cells in the top panel contain the number of employees who are in the given grade, as a percentage of employees who entered grade 5 and remain in the firm.

hires and for incumbents. Thus, 80.91% of new hires into grade 5 were still in grade 5, 1 year after their promotion. After 5 years, 57.77% had moved on, leaving only 42.23% still in grade 5. Incumbents were generally less successful: 93.78% were still in grade 5 after a year; 60.46% after 5 years.

This pattern is rather different from the one observed by BGH. Their Level 2 entrants were less successful in moving on after 1 year if they were incumbents than if they were new hires, but this reversed and remained reversed 2 years after entering Level 2. After 5 years 29.0% of new hires remained in the grade at which they had entered, but only 18.4% of incumbents remained. This suggests that career dynamics in our firm are rather different from those in BGH's. Exit rates show a similar pattern to that in BGH for as long as we are able to observe them.

Because we have a shorter data period than theirs, we are able to calculate comparative exit rates for only 5 years after promotion. We too find that incumbents' exit rates are lower than new hires', but we have no evidence on whether the relationship between the exit rates of the two groups changes 7 years after promotion, as BGH find.

Despite these differences, there is still strong evidence that our firm uses the promotion as a sorting mechanism. We find similar patterns of career outcomes to those described by BGH, with new hires advancing farther than incumbents on average, but having more variable outcomes.

3.3. Timing of adjacent promotions

Above, we noted BGH's argument that 'if individuals differ in terms of innate ability, and the firm uses promotions to sort individuals on the basis of this ability, then those promoted quickly once should be promoted quickly again'. This argument seems flawed, since it ignores the possibility that ability may be multidimensional. If ability is unidimensional, multiple promotions may be necessary to achieve sorting, if the firm cannot achieve sufficiently detailed resolution of the uncertainty in a single step. But the existence of multiple promotions may arise because there is more than one attribute on which firms want to sort. The sequential nature of promotion further suggests that these different attributes are correlated, so that information about ability at low level tasks provides information about ability at higher level tasks. Otherwise, it is hard to understand why tests for different types of ability are not administered simultaneously.

In a multidimensional context, it is not true that speed of promotion at one level should be a predictor of speed of promotion at other levels, since some kinds of ability may be more difficult to detect than others, and these differences may be individual specific. For instance: Consider a system with two kinds of ability, L and H. Suppose that the hierarchy consists of an entry grade and two higher grades, one which is suited for people of ability L and the other for people of ability H. Suppose also that an H person can only signal H after having signalled L, but impossible for an L person to signal H. If it is also easier for an L person to signal L, than for an H person to signal L, the L person would be promoted more rapidly than the H person to L, but not at all to H.

These difficulties arise primarily because promotion is a forward-looking action, with the character of an investment decision. They necessarily involve imperfect information, and observed outcomes may be due just as much to information costs as to the substantive benefits and costs. Neither are these the only difficulties, for the remarks above assume that promotion is primarily a sorting device. Suppose instead that the primary ability is the ability to learn. This could be used to explain multiple, sequential hierarchies in which people advance at differential rates.

Interpretation of the evidence in this area is thus difficult, and as far as we know there is little assistance to be had from extant theory. Interpretations are certainly not as simple as BGH suggest. They identify fast tracks in their firm according to which the speed of promotion at one level of the hierarchy is a predictor of speed of promotion elsewhere. We develop Table 4 in BGH by considering all transitions between grades (rather than just the level 1–level 2 transition, as BGH do). We find similar evidence of fast tracks. Looking down columns, which control for tenure, we see promotion rates fall uniformly. We also find, as BGH do a “fast track” exit effect. Looking down columns, we see that those individuals promoted more quickly also tend to have higher exit rates.

There are, of course, a number of potential explanations for these effects, one of which is that if workers differ in terms of ability then those high ability workers promoted quickly will also have more chance of being promoted again. Bridges (1998) explores these aspects further and finds evidence that “fast track” effects

Table 4
Promotion/exit rates

Years in previous grade		Years in present grade						
		1	2	3	4	5	6	7
1	Promotion rate (%)	19.87	28.17	21.29	11.74	15.33	12.77	9.24
	Exit rate (%)	10.47	13.26	9.47	10.96	7.87	9.35	9.70
	<i>N</i>	3649	2542	1489	1031	724	556	433
2	Promotion rate (%)	8.02	13.42	14.37	10.06	13.08	11.49	8.18
	Exit rate (%)	6.79	9.16	6.13	7.71	8.25	8.37	7.80
	<i>N</i>	3166	2697	2088	1660	1261	992	795
3	Promotion rate (%)	4.23	9.43	10.44	7.95	9.96	7.92	7.54
	Exit rate (%)	5.50	8.82	6.54	8.98	6.61	9.40	10.60
	<i>N</i>	2362	2132	1743	1447	1135	947	783
4	Promotion rate (%)	3.14	7.28	7.16	5.71	8.56	7.59	6.20
	Exit rate (%)	4.57	8.36	9.36	5.93	6.95	5.70	10.22
	<i>N</i>	700	646	545	455	374	316	274
5	Promotion rate (%)	1.45	3.07	7.51	5.31	4.41	4.42	4.38
	Exit rate (%)	3.78	7.06	8.87	4.49	6.86	7.18	10.63
	<i>N</i>	344	326	293	245	204	181	160
6	Promotion rate (%)	3.05	5.43	7.32	2.99	10.81	4.26	4.65
	Exit rate (%)	3.55	5.43	10.98	6.72	4.50	4.26	9.30
	<i>N</i>	197	184	164	134	111	94	86
7	Promotion rate (%)	4.17	3.73	1.69	5.66	2.35	7.41	0
	Exit rate (%)	2.78	8.21	8.47	7.55	2.35	9.88	10.45
	<i>N</i>	144	134	118	106	85	81	67
Total	Promotion rate (%)	10.00	14.62	12.63	8.31	10.46	8.47	6.87
	Exit rate (%)	7.14	10.02	7.63	8.27	7.14	8.28	9.68
	<i>N</i>	11 337	9393	7079	5645	4369	3600	2997

The table shows promotion and exit rates by time in the current grade, against the time spent in their previous grade.

remain after controlling for human capital effects. van Gameren and Lindeboom (1999) have analysed data from the same source. They show, amongst other things, that promotion probabilities are positively related to the number of jobs occupied at a given grade. This supports the notion that workers acquire skills in different tasks at a given grade in order to enhance promotion probabilities. This evidence thus supports the idea outlined above that promotion processes are more complex than simple sorting on a unidimensional attribute.

4. Wages and the hierarchy

An important element of the Doeringer and Piore characterisation of an Internal Labour market which BGH examine is the wage structure. They argue that wages will be attached to jobs, and that part of the explanation of this will be that this gives a way of an organisation precommitting to rewards. This precommitment is an important element of the view that organisations generate incentives through the structure of rewards on offer in a sequence of tournaments within the hierarchy. This idea is developed in Lazear and Rosen (1981) and Rosen (1986). The incentive argument also suggests that the structure of rewards is convex.

We split our sample into two groups: clerical (grades 2–6) and management (grades 7–13). Our findings, illustrated in Figs. 3 and 4, bear a strong similarity to BGH's but differ in detail.² Just as in their firm, the main engine of salary advancement is promotion, so it is in ours. Mean salaries in lower grades are consistently lower than mean salaries in higher grades. Absolute wage differentials in the clerical grades show remarkable consistency over time, but since there is a slight improvement in real wages over the 9-year period, this implies slight compression of differentials over time. The same is not true of managerial grades. Here there has been a marked broadening of differentials between the lower and higher grades, with the lowest managerial grade actually showing a slight diminution in real wages over the 9 years and the most senior grades showing a substantial 25% increase.

Fig. 4 also shows the convexity of the pay structure that tournament theory would suggest. The ratio of mean pay in grade 13 is around 15 times that of a grade 5 (which we conjectured is the lowest non-training grade). This is identical to the comparable ratio computed by BGH.

Another interesting characteristic of the pay structure, observed both in our firm and in BGH's is the substantial overlap in pay within grades. This suggests that

² In one respect, the BGH results seem a little odd, in that there appears to be virtually no real wage growth over 20 years. Were there no productivity improvements in their firm during this period, or were they all appropriated by shareholders?

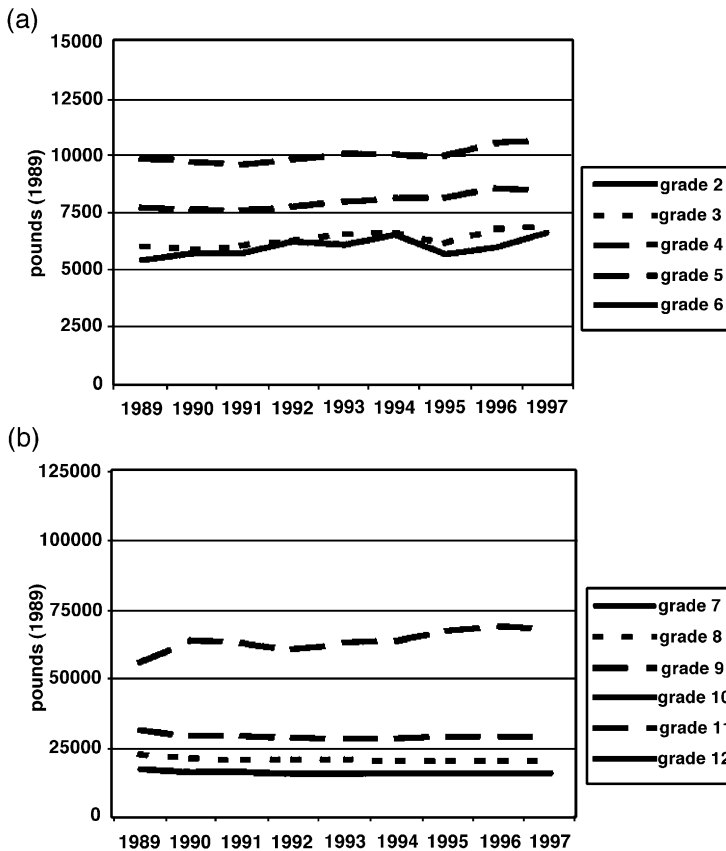


Fig. 3. Mean annual salary, (a) clerical grades, (b) managerial grades.

pay is not determined solely by job. While promotions are the main way in which pay progression is driven, promotion may involve other aspects such as relocation which will make these delayed payments less attractive to some groups of the workforce. Similarly, as Goldin (1986) argues, if women have less attachment to the workforce than men, they will be less motivated by deferred remuneration schemes. She reasons that as a consequence, they are more likely to be paid a piece rate. In a similar way, the organisation might well retain the flexibility to give (relatively) high rewards within grades to circumvent this problem and generating the overlap observed.

BGH report regressions of human capital variables and levels in the hierarchy on current salary. They are able to explain 71% of the variance in salary using time variation, sex and race dummies, together with years of education and current

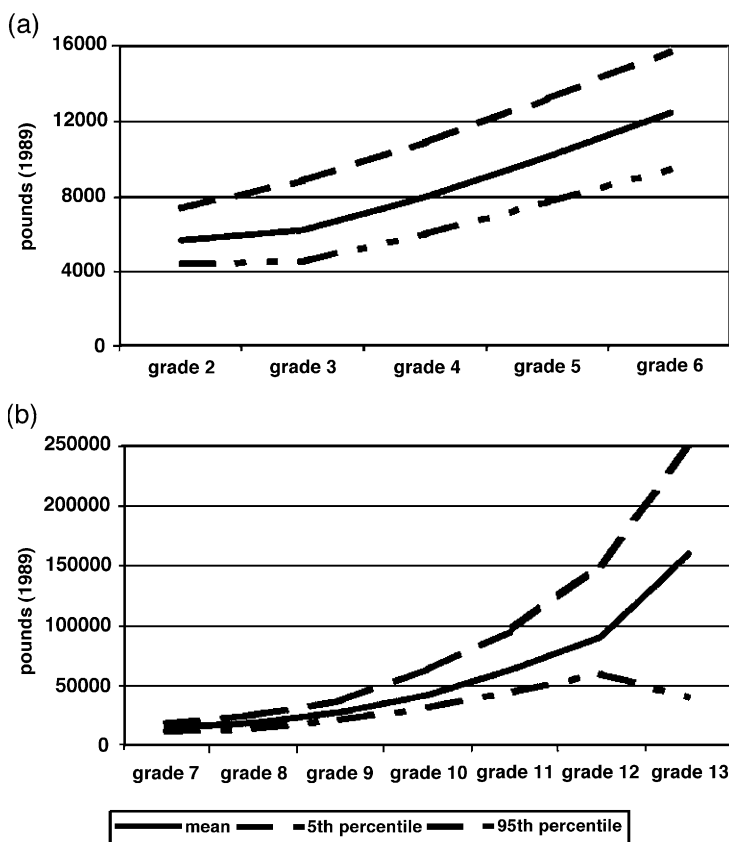


Fig. 4. Salary ranges, (a) clerical grades, (b) managerial grades.

level. They find that human capital variables explain about 35% of variance in salary, and that levels are more powerful, as the R^2 increases to 68%.

Table 5 below replicates their work as closely as possible, for managerial grades only.³ We do not have any reliable information on race, nor are our education variables as detailed as BGH's. We know only if workers are university graduates or not, and whether they have a professional qualification. Despite having what are apparently less informative regressors, our results are remarkably similar to BGH's. Our two human capital variables (one of which is industry-, but not firm-, specific) account for 22% of variance in current salary. This is less than

³ Results for the clerical grades can be found in Appendix Table 5a.

Table 5
Effects of human capital and hierarchical level on current salary—managerial grades

Independent variables	1989–1997 Pooled regressions			1989 Cross-section
	(i) Human capital	(ii) Levels	(i) and (ii) Combined	
Year dummies	Yes	Yes	Yes	No
Sex dummy	Yes	No	Yes	Yes
Intercept	9.91 (1052.6)	9.74 (2669.3)	9.75 (1622.8)	9.82 (699.0)
Degree	0.334 (70.78)	·	0.051 (16.31)	0.025 (2.607)
Professional qualification	−0.145 (38.05)	·	−0.085 (34.81)	−0.091 (12.10)
Tenure	−0.008 (8.90)	·	0.002 (3.64)	−0.002 (0.964)
Tenure squared	0.0007 (29.42)	·	0.0001 (5.98)	0.0003 (5.092)
Grade 8	·	0.284 (114.6)	0.265 (105.7)	0.263 (34.70)
Grade 9	·	0.615 (206.8)	0.582 (186.7)	0.572 (57.41)
Grade 10	·	1.056 (209.1)	1.003 (194.0)	1.011 (63.00)
Grade 11	·	1.656 (197.8)	1.575 (187.9)	1.635 (63.95)
Grade 12	·	1.961 (82.73)	1.884 (80.71)	1.825 (22.61)
<i>R</i> -squared	0.226	0.676	0.688	
<i>R</i> -squared, regression without year dummies	0.195	0.650	0.668	0.675
<i>N</i>	58 100	58 100	58 100	6214
Dependent mean	10.12	10.12	10.12	10.03

BGH's figure, but this should not be surprising, in the light of the less detailed nature of our human capital variables. Levels are also important. Their inclusion increases the R^2 to 69%, almost exactly the same as BGH's finding.

Table 6
Salary premiums by type of job transition and across levels

Grade	Percent salary premiums on:			Percent difference in mean pay across levels
	Stay	Demotion	Promotion	
2	3.7	3.6	N/A	N/A
3	1.9	−1.4	0.9	6.4
4	0.9	−0.2	16.2	25.6
5	0.3	−0.4	10.6	25.5
6	−0.3	−7.2	8.0	23.0
7	−1.4	−4.7	19.3	24.5
8	−1.5	−4.0	10.3	32.4
9	0.5	−5.3	14.4	41.1
10	−0.8	−5.0	9.5	46.7
11	−1.5	N/A	4.5	53.2
12	1.2	N/A	5.3	39.2
13	0.2	N/A	4.6	71.7
2–13	0.0	−2.6	11.9	

The last column compares the mean pay in a grade with the mean payment in the next lower grade.

Table 7
Distribution of pay for promotees in salary deciles before and after promotion

Promotion	Before/after promotion	N	Percentage in each salary decile										All
			Bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	Top	
Grade 2 to grade 3	Before	1502	12.1	12.3	10.7	11.2	10.5	10.6	9.7	8.7	7.7	6.6	100
	After	1500	16.4	13.8	9.5	11.4	15.9	10.0	6.6	6.2	6.5	3.6	100
Grade 3 to grade 4	Before	6317	8.5	9.6	11.2	10.4	11.8	11.1	9.3	9.7	10.1	8.2	100
	After	6298	33.4	10.4	13.3	5.9	5.4	6.7	5.4	13.1	3.6	2.7	100
Grade 4 to grade 5	Before	10200	5.5	8.5	9.9	11.4	12.9	11.3	10.3	9.9	11.7	8.4	100
	After	10165	33.8	16.8	11.7	9.2	8.2	7.2	5.7	2.9	2.7	1.9	100
Grade 5 to grade 6	Before	7859	9.8	10.3	10.0	9.3	9.2	10.4	10.0	11.0	11.9	8.1	100
	After	7820	30.2	17.8	16.3	13.0	7.8	4.8	2.9	3.2	2.6	1.3	100
Grade 6 to grade 7	Before	4673	16.0	17.0	12.1	9.1	8.6	7.9	8.4	7.3	6.7	6.9	100
	After	4663	28.7	18.5	10.4	13.6	12.7	7.1	3.5	2.3	1.7	1.5	100
Grade 7 to grade 8	Before	4260	6.2	4.6	7.2	7.8	8.4	10.0	10.0	13.0	14.1	18.7	100
	After	4244	29.1	14.8	13.3	13.2	6.4	6.3	5.2	3.5	3.0	5.3	100
Grade 8 to grade 9	Before	1983	3.9	3.9	5.2	6.8	9.0	9.8	11.9	10.6	16.1	22.7	100
	After	1984	25.8	20.7	15.6	8.2	7.8	6.3	3.3	2.7	2.7	7.0	100
Grade 9 to grade 10	Before	696	0.9	1.0	1.9	2.6	3.9	7.7	11.8	12.8	20.1	37.4	100
	After	701	20.5	17.1	12.6	10.1	8.8	6.3	4.0	5.0	6.3	9.3	100
Grade 10 to grade 11	Before	260	0.4	0.8	0.8	2.3	3.7	6.7	7.1	16.5	29.1	32.7	100
	After	263	15.5	13.2	7.9	9.7	11.8	8.9	10.5	6.5	8.1	7.9	100
Grade 11 to grade 12	Before	28	0.0	0.0	3.6	14.3	10.7	20.7	6.1	14.3	19.6	10.7	100
	After	27	11.1	22.2	33.3	18.5	1.9	4.4	0.7	1.9	5.9	0.0	100

Deciles are calculated within hierarchical grade and year; difference in number of observations before and after promotion occurs because of missing salary data.

When grade dummies are included without the human capital variables, the effect of the grade dummies is accentuated. They account for 68% of variance on their own. It appears that these dummies act as a proxy for omitted human capital characteristics.

The extent to which wages are attached to grades can be gauged by the size of the pay premiums gained by individuals on promotion. The middle 3 columns in Table 6 compute the percentage salary change for those individuals, who stay where they are, are demoted, or who are promoted in a year. This verifies that salary dynamics are heavily dependent on the promotion process.

The differential between grades 2 and 3 is so small as not to require comment. For promotion to grades 4, 5 and 7, the proportion of the total pay differential obtained on promotion is large compared both with other promotions in our firm and with BGH's results. Promotion premiums thus explain only a part of the differences in pay between grades, but it appears that (as conjectured earlier) promotions to grades 4 and 5 are more standards-based than others, while promotion to grade 7 has great symbolic significance, confirmed by a large salary payment and the opportunity to earn further pay increases by further promotions rather than by staying within the same grade.

Table 7 examines the relationship between pay and promotions more closely. In particular, the origin and destination percentile in the salary distributions of the grade the individual is promoted out of and into are examined. Two things need to be noted. Firstly, if promotion were random, then the expected value of the proportion in each decile would of course be 0.1. Secondly, if the grades were

Table 8
Exit rates by level and salary decile

Grade	N	Exit rate in each decile										χ^2 value
		Bottom	2nd	3rd	4th	5th	6th	7th	8th	9th	Top	
2	2887	13.6	13.7	14.3	14.8	19.7	19.1	21.3	19.8	19.4	20.4	14.1
3	13042	10.8	11.0	10.0	14.7	17.1	15.9	18.8	19.3	16.9	15.8	87.6
4	56772	10.0	10.1	10.6	10.5	12.0	11.7	11.6	12.2	11.2	9.5	40.0
5	90721	9.6	9.9	10.7	10.5	9.7	9.1	9.1	8.3	8.0	9.2	65.3
6	60331	7.5	7.8	7.5	6.4	6.7	7.3	6.9	8.1	8.2	7.8	25.1
7	47983	13.6	8.3	6.9	7.1	9.0	8.5	9.9	9.9	10.8	12.2	205.1
8	22958	7.8	7.0	7.9	8.1	8.1	9.7	10.1	11.6	11.7	14.4	116.7
9	14285	6.7	7.2	9.6	9.2	10.4	11.9	10.4	11.9	13.8	15.7	92.7
10	4925	13.4	10.9	9.6	13.7	11.5	12.0	16.5	11.8	14.0	16.1	17.0
11	1497	14.8	13.2	12.0	11.5	15.0	16.0	8.9	10.7	10.1	15.2	7.3
12	263	23.1	19.6	13.7	27.6	7.1	6.4	6.0	11.1	27.4	13.8	9.1
Total	320109	12.0	11.4	11.3	10.2	8.7	7.8	7.8	8.5	9.1	11.7	796.5

These are annual exit rates. Deciles are calculated within each hierarchical grade and year. Critical values for the χ^2 -test are 21.67 at the 1% level and 16.92 at 5% significance.

Table 9

“Green card” effects of relative salary in title on raises, by performance rating

Level	Salary quartile	Performance rating				
		1–2	3	4	5	1–5
3	Top	2.0	3.6	4.5	3.4	4.0
	3rd	2.7	3.8	4.9	4.7	4.3
	2nd	1.7	4.6	5.9	7.6	5.1
	Bottom	1.5	5.7	6.7	8.8	5.9
	<i>N</i>	98	2527	1561	111	4297
4	Top	3.2	3.8	3.4	1.8	3.3
	3rd	1.8	2.6	2.8	3.6	2.8
	2nd	3.4	3.8	4.5	5.4	4.2
	Bottom	1.2	4.5	5.3	5.8	4.9
	<i>N</i>	456	16454	18609	3368	38887
5	Top	1.4	2.2	2.6	2.1	2.3
	3rd	2.8	2.8	2.2	3.1	2.6
	2nd	2.1	3.1	3.8	4.2	3.6
	Bottom	3.7	4.1	4.1	4.4	4.1
	<i>N</i>	382	20110	35344	14544	70380
6	Top	1.0	1.5	2.1	1.7	1.8
	3rd	0.6	1.9	1.9	1.9	1.9
	2nd	1.4	2.1	2.9	4.3	3.0
	Bottom	2.3	3.4	4.1	4.5	3.9
	<i>N</i>	239	10496	22144	15368	48247
7	Top	–1.4	0.8	3.8	4.0	1.5
	3rd	–2.5	0.6	2.3	3.2	0.9
	2nd	–1.7	0.8	4.2	3.0	1.4
	Bottom	0.7	1.0	2.6	3.6	1.2
	<i>N</i>	1044	24741	5859	567	32211
8	Top	–1.2	0.9	4.0	4.8	1.9
	3rd	–2.5	0.4	2.4	3.5	1.0
	2nd	–1.9	0.6	2.6	4.6	1.1
	Bottom	–1.7	0.7	2.3	4.5	1.1
	<i>N</i>	397	11283	4358	398	16436
9	Top	–0.2	0.9	5.1	5.2	3.1
	3rd	–0.8	1.8	3.2	4.7	2.5
	2nd	–1.5	0.9	2.6	3.8	1.6
	Bottom	–0.4	0.5	2.2	3.0	1.0
	<i>N</i>	186	6000	3926	436	10548
10	Top	–0.5	0.9	8.5	24.5	7.7
	3rd	–18.4	–0.6	2.0	5.3	1.1
	2nd	–5.5	–0.6	2.0	6.1	0.7
	Bottom	–4.2	–0.5	–0.1	3.5	–0.3
	<i>N</i>	26	1621	1587	196	3430
2–12	Top	–1.7	0.7	4.8	3.3	2.1
	3rd	–0.1	1.4	2.5	2.3	2.0
	2nd	2.8	3.0	3.3	3.2	3.2
	Bottom	2.2	3.9	4.1	4.1	4.0
	<i>N</i>	2834	93528	94214	35133	225709

non-overlapping intervals of salary, such that the grade number simply indicated a range of compensation, and that *grade* was determined by *pay*, then BGH suggest that since as soon as pay reached a certain limit the individual was promoted, workers would be promoted out of the top decile and into the bottom decile of successive grades. This certainly is not the pattern observed, though for management grades the pattern leans in that direction. The proportions are increasing as we look across deciles of the origin distribution and conversely decreasing as we examine the destination deciles.

Table 8 examines the pattern of exit rates by grade and decile. Exit rates such as these will reflect the quality of the underlying matches at points in the hierarchy. One reason why workers might separate is if their remuneration within the organisation does not match their market value, and discussions concerning the strategic aspects of promotion policy will in some part consider retention of workers. BGH find little significant variation in exit rates across deciles or grades in their organisation. In contrast, there is variation in exit rates in our data, although a clear overall pattern is difficult to discern. The data for management grades 8–10 suggests that the exit rates are increasing in the deciles within the grade. This might suggest some promotion bottlenecks within the organisation.

Table 9 examines what BGH call “Green Card effects”. These effects are the direct application of rules, which an ILM might operate, concerning pay progression within an organisation. BGH report that the organisation they study issue guidelines on pay progression as a function of performance and relative to reference groups (these guidelines being printed on green cards). We know of no such explicit rule within the organisation we study, and there is certainly nothing similar to the green cards. However, we felt it worthwhile, partly to achieve completeness, to replicate this table and examine whether the effect operates implicitly.

In BGH, the rules will tend to give relatively higher rates of earnings growth to workers in lower point of the within grade earnings distribution. The effect of this is to generate pay compression within grades; Lazear (1989) discusses reasons why firms might want to compress the earnings distribution. What we find is quite interesting in the sense that compression is present in the staff grades but that dispersion occurs in the management grades. This might reflect other aspects of the remuneration pattern within the hierarchy. Firms might worry about high pay spreads when the main route to pay progression is winning promotion tournaments, as this might induce less cooperative behaviour and a “too high” degree of competition between workers. One way to obviate this is to give individual rewards, such as bonuses, which is what we observe.

Note to Table 9:

Shows the mean percentage salary rise in 1989 constant pounds, by performance rating in the same period. Performance is rated on a scale from 1 (worst) to 5 (best).

5. Conclusion

The objective of this paper has been to replicate the analysis of Baker et al. (1994) to gauge to what extent their findings can be regarded as characteristic of large firms generally, and to what extent they are special. In effect, we have aimed to increase the sample size of such studies by adding one additional observation.

Remarkably, although the two firms operate in different countries, with different employment law, regulatory and educational systems, the structures of the two firms have many similarities. There are nonetheless some important differences. Both these facts merit further investigation. It may be, for instance, that the similarities are largely due to both firms being in the same industry. BGH describe their firm as operating in the service sector. We can only reveal that ours is a financial sector firm. It would be of considerable interest to compare a large manufacturing enterprise with these two.

In common with BGH, we have found:

- That ports of entry are not as clearly defined as the theory of internal labour market would suggest.
- That the convexity of the pay structure is in line with theories of lifetime incentives suggested by Lazear (1979).
- That hierarchies appear to sort workers by ability, although what ability and exactly how this is done is still not clear.

The main differences between BGH's results and ours are that:

- Exit rates are more variable in our data than in BGH's.
- The hierarchy changes its structure more markedly in our firm, with the management grades becoming proportionately more important over the period studied. Our results confirm BGH's in the sense that there appeared to be no fundamental change in the number of grades over time.
- The evidence of pay compression within grades found by BGH appears to be true in our data for the staff grades only. There is actually dispersion of pay in the management grades.

The two studies suggest together that many of the characteristics of internal labour markets are reflected in organisational data of this type. However, there are sufficient differences to suggest that other complexities exist, which are not covered by the ILM model. In particular, although careers are important, job are filled from outside the hierarchy sufficiently frequently to suggest that the internal market is not fully insulated from competitive pressure.

Although there is evidence that promotions are used as a sorting device, this evidence is not incompatible with the alternative notion that they are also used as incentives. The problem of distinguishing these alternative roles seems rather intractable.

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Appendix A

Table 5a. Effects of human capital and hierarchical level on current salary–clerical grades

Independent variables	1989–1997 Pooled regressions			1989 Cross-section
	(i) Human capital	(ii) Levels	(i) and (ii) Combined	
Year dummies	Yes	Yes	Yes	No
Sex dummy	Yes	No	Yes	Yes
Intercept	8.80 (4700.6)	8.57 (1213.7)	8.63 (3651.1)	8.80 (938.6)
Degree	0.129 (26.39)	·	0.065 (16.95)	0.058 (4.311)
Professional qualification	–0.010 (8.189)	·	–0.057 (59.82)	–0.064 (21.12)
Tenure	0.049 (214.3)	·	0.028 (136.4)	0.027 (41.65)
Tenure squared	–0.0009 (126.5)	·	–0.0005 (72.89)	–0.0004 (17.69)
Grade 4	·	0.284 (95.89)	0.196 (78.21)	0.17 (18.28)
Grade 5	·	0.511 (176.48)	0.348 (135.39)	0.33 (34.91)
Grade 6	·	0.704 (240.58)	0.496 (186.91)	0.47 (48.78)
<i>R</i> -squared	0.728	0.749	0.831	
<i>R</i> -squared, regression w/o year dummies	0.557	0.494	0.679	0.70
<i>N</i>	122 332	122 332	122 332	14 199
Dependent mean	9.42	9.42	9.42	9.32

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