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Things Can Only get Worse? An Empirical Examination of the Peter Principle

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Abstract. The results reported in this paper suggest the possible operation of the Peter Principle in a large hierarchical financial sector firm. This result holds even after we allow for variation in optimal effort over stages in the hierarchy. The method also allows us to attribute the contributory factors for the observed fall in performance after a promotion. It appears that approximately 2/3 of the fall is due to the Peter Principle and 1/3 due to lessening incentives.

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I Introduction

The famous Peter Principle, Peter and Hull (1969), states that “in a hierarchy every employee tends to rise to his level of incompetence”. This statement seems to be at odds with the conventional view of the function of promotions. Milgrom and Roberts (1992) for example observe that “Promotions serve two roles in an organisation; first, they help assign people to the roles where they can best contribute to the organization’s performance; second, promotions serve as incentives and rewards”. The second part of this is the main message of Lazear and Rosen (1981). One question is whether one in fact needs to reconcile the Peter Principle with the first part of Milgrom’s and Roberts’ definition.

The Peter Principle suggests that productivity might fall after a promotion. Lazear (2004) argues that this decreased performance is purely a statistical matter. Firms use promotion tournaments to assign workers to job slots within the organisation. The Peter Principle is a necessary by-product resulting from a regression to the mean effect in performance. This is discussed below in a simple tournament model. Here, promotion decisions are based on the level of output of an individual, in this paper we proxy output by worker’s performance evaluation scores. These performance evaluation scores will be a function of effort but also a stochastic error component. In the one-shot context the error component has zero expectation. Those who are promoted however are non-randomly selected out of the population of workers and correspondingly their errors are a non-random selection out of the distribution of errors. When workers are promoted on the basis of their performance, the workers selected for promotion tend to have experienced larger positive shocks to their performance than those not promoted. The result of this is that the expectation of the error term conditional on promotion is greater than zero. After promotion the expected value of the error will revert to zero. It is this “reversion to the mean” effect which is the “Peter Principle” effect.

II A Simple Model

We follow a simple tournament model to illustrate the main point. Workers are characterised by a convex cost of effort function $C(\mu)$ where μ is effort and $C'(\mu) > 0$ and $C''(\mu) > 0$. Consider first two identical individuals 1 and 2, in this context, identical means simply they have the same cost function. As is well known following Lazear and Rosen (1981) if these two individuals compete for a promotion which will pay W_H to the winner when they are both presently paid W_L , then individual 1 (and symmetrically 2) will maximise his/her expected gain (assuming participation)

$$W_H P(\mu_1, \mu_2) + W_L (1 - P(\mu_1, \mu_2)) - C(\mu_1) \quad (1)$$

Where $P(\mu_1, \mu_2)$ is the probability that individual 1 wins the tournament with 2. The first order condition for individual 1's effort decision is then

$$(W_H - W_L) \left. \frac{\partial P}{\partial \mu_1} \right|_{\mu_1 = \mu_1^*} = C'(\mu_1^*) \quad (2)$$

where μ^* is the optimal amount of effort that individual 1 puts in.

Since $P(\mu_1, \mu_2) = \text{Prob}(q_1 > q_2)$ where $q_i = \mu_i + \varepsilon_i$ $i = 1, 2$. Here q is output, which is the sum of effort μ_i and ε_i a stochastic error with $E(\varepsilon_i) = 0$. Rearranging this expression gives

$\text{Prob}(q_1 > q_2) = \text{Prob}(\mu_1 + \varepsilon_1 > \mu_2 + \varepsilon_2) = \text{Prob}(\varepsilon_2 - \varepsilon_1 < \mu_1 - \mu_2) = G(\mu_1 - \mu_2)$ where G is the CDF of $\varepsilon_2 - \varepsilon_1$. This implies that $\frac{\partial P}{\partial \mu_1} = g(\mu_1 - \mu_2)$ but since the two individuals

are identical then in equilibrium they will act identically and $\mu_1^* = \mu_2^* = \mu^*$ so (2) can be written

$$(W_H - W_L) g(0) = C'(\mu_1^*) \quad (3)$$

This first order condition contains the basic message of Tournament theory, that effort will increase as the size of prize, $(W_H - W_L)$ increases, and as $g(0)$ increases, which indicates that the “importance of luck” decreases.

The Peter Principle follows from the following argument:- an individual who is promoted will have $q_p = \mu^* + \varepsilon_p > q_{NP} = \mu^* + \varepsilon_{NP}$ (subscript p indicating “promoted” and “np” not promoted). This implies $\varepsilon_p > \varepsilon_{NP}$ and so it follows that

$E(\varepsilon_p | \varepsilon_p > \varepsilon_{NP}) > 0$. A consequence of this is the Peter Principle, those who are promoted will have relatively “high” ε 's, subsequent realisations will have expectation 0, therefore as Lazear (2004) points out, purely as a statistical matter *expected* performance will drop *for those who are promoted*.

III Data

The data we use comes from personnel records of all full-time employees of a large financial sector firm based in the UK covering the period January 1989 to November 2001 allowing for a potential total of 154 monthly observations for each employee in the firm. Although firm size varies over the period 1989 to 2001, the firm employs on average 40,000 full-time employees and 20,000 part-time employees in any given year. The personnel records include a unique identifier for each observation and amongst others information on salary, bonuses, commissions, performance ratings, promotions, hierarchical grade, regional area of employment, absence, exit reasons, age, gender, marital status, number of children, ethnic origin, schooling and internal qualifications is also available.

Individuals' performance is evaluated on an annual basis within the firm. The scale used is 5 “Outstanding”, 4 “High”, 3 “Good”, 2 “Improvement required” and 1 if “Unsatisfactory”. Performance evaluations are completed by worker's line managers. Table 1 give some summary statistics on performance ratings. The means reported are of the ratings of the workers in the grade they occupied when promoted.

The internal hierarchy of this firm as discussed in detail in Treble, et al. (2001) consists of 14 levels or grades. Two of these grades are classified as either un-graded

staff (S00) or un-graded managers (M00). The remaining 12 grades can be broadly categorised as training grades, clerical grades, middle managers and senior managers as suggested by Treble et al. (2001). “In house” the firm refers to these 12 grades, moving from the bottom to the top of the hierarchy, as induction grade (S01), junior staff grades (S02 and S03), senior staff grades (S04 and S05), junior management grades (M93 and M94), middle management grade (M95), senior management grade (M96) and the executive management (M97-M99).

For the purpose of this analysis we have chosen to ignore movements in and out of the un-graded staff (S00) and managerial grades (M00). The reason for this is twofold. First, observed movements from staff grades into the un-graded staff grade can either be a promotion or a demotion. This also holds true if this movement is observed for managers moving in or out of the un-graded managerial grade. Again, we are unable to distinguish between a promotion and demotion in this case. Secondly, although movements out of S00 into managerial grades are identifiable as a promotion, it is difficult to identify the specific grade within staff grades that an individual has moved out of. Therefore identification of the magnitude of the ‘jump’ is impossible. We also exclude S02 as this is most closely defined as a training grade, progression out of this grade will be automatic as long as the worker attains basic standards, see Treble et al (2001) for further discussion on this point, and won’t be really competitive in the sense of a tournament.

Table 1 Means of main variables for the sample of promoted individuals

Grade	Performance Rate	$\tilde{g}(0)$	Pay Spread
S03(N=1980)	3.6707	0.0106	1934.94
S04(N=1533)	3.4997	0.0066	2025.26
S05 (N=786)	3.4262	0.0055	3724.83
M93(N=836)	3.3900	0.0055	3502.51
M94(N=453)	3.4724	0.0043	5888.82
M95(N=101)	3.8911	0.0034	6391.94
M96 (N=34)	4.0588	0.0025	8477.56
M97 (N=11)	4.0909	0.0019	14484.77

We also omit the top two executive management grades due to the paucity of observations. Of course $\tilde{g}(0)$, on which we are reporting means in the above table isn't directly observable in the data. We will now describe our method of measuring this.

IV Measuring $\tilde{g}(0)$ - the "Importance of Luck"

One of the main contributions of this paper is that we account for changes in the incentives which face individuals as they move up the hierarchy in evaluating the "Peter Principle", to do this we need to be able to calculate the (change in the) pay spread brought about by the event of promotion. We calculate this as the difference between the pay spread after promotion ($\bar{w}_{grade+2} - \bar{w}_{grade+1}$) and the pay spread before promotion ($\bar{w}_{grade+1} - w_{grade}$), where \bar{w}_{grade} denotes the mean pay within the worker's current grade, and w_{grade} the workers actual pay. This is reasonably straight-forward, however gauging the change in 'importance of luck' $g(0)$ is arguably more difficult. To do this we need to be able to characterise the promotion structure, so that the individual can be able to work out the effect of a change in their performance rating on their promotion prospects, but we need to do this in such a way as we can regard the link as exogenous. If we estimated both the promotion relationship and the effort relationship within the same period then we would face problems of endogeneity, since both effort and the things affecting it are potentially being determined in the same period. To circumvent this problem we estimate the promotion relationship in the prior two-year period 1989-90 and then the performance relationship subsequently during the two year period 1991-92.

To take account of possible variation in the "importance of luck" we follow a method outlined in Audas, Barmby and Treble (2004) and measure $\tilde{g}(0)$ by firstly estimating a promotion Logit and then differentiating this with respect to the measure of effort. Writing the promotion Logit can be as $G(\Delta pr_i; X_i) = L(\psi' X_i + \theta \Delta pr_i)$ where L is the logistic function Δpr_i is the difference between the workers performance rating (our measure of effort) and the mean performance rating of the grade the worker is in

$\Delta pr_i = pr_i - \overline{pr_i}$, X is a set of other regressors which also affect the probability of promotion. Differentiating this expression with respect to pr_i (our measure of effort), and setting Δpr_i equal to zero gives our estimator for $\tilde{g}(0)$:

$$\tilde{g}(0) = \frac{\partial G}{\partial pr} = \theta L'(\tilde{\psi}'y) \quad (4)$$

This estimated Logit is reported in table 2. The $\tilde{g}(0)$ difference which we will use in the performance equation being computed as the imputed $\tilde{g}(0)$ for the individual in the grade above the one the worker is in minus the computed $\tilde{g}(0)$ of the individual for the grade he/she is in

Table 2: Promotion Logit for computation of $\tilde{g}(0)$ computed over the period 1989-1990, during which time there were 902416 person months.

Variable	Coeff.	S.E.
Constant	-1.4785	0.0413
Δpr	0.6973	0.0727
Δpr *Gender	-0.3016	0.0372
Δpr *Grade	0.00003	0.0121
Grade	-0.2446	0.0083
Gender	-0.4104	0.0192
Age	-0.0420	0.0013
LnL	-66312.933	

The estimated $\tilde{g}(0)$ had mean 0.007555, with standard deviation 0.005895, minimum value 0.000562 and maximum 0.03494.

V Results

We analyse the performance ratings and the way they change after promotions during a two year period 1991-2, and during this interval of time we observe 5734 promotions.

In a first instance it would be useful to check whether the underlying effort equation which Tournament theory suggests is mirrored in the data, to do this we regress the performance ratings in levels on payspreads and measures of $\tilde{g}(0)$.

Table 3 Regression of Performance Rating levels on Pay Spreads and $\tilde{g}(0)$

Variable	Coeff.	S.E.
Constant	3.2306	0.0266
Pay Spread	0.0000177	0.0000026
$\tilde{g}(0)$	37.4648	2.9732

the coefficients of both variables are positive and significant - so it appears that the pattern of relationships implied by Tournament theory are reflected in the data. Workers do appear to supply more effort in response to larger prizes (pay spreads) and in response to lower importance of luck.

To evaluate whether the Peter Principal effect is actually observed in this firm at the individual level we define as our dependent variable the difference between post (one year later) and pre promotion performance rating computed for each individual promoted. Lazear (1999) computes a similar variable using a two year difference. The reason for the difference theoretically is that individuals will take time to learn a new job role. There is also a practical constraint in so far as, in the data, we will have to wait before we observe a current performance rating in the data, by 1 year almost all promoted individuals will have received a new rating, by two years we will start to lose individuals because of turnover.

Regressing this difference on a constant would potentially reveal the existence of a Peter Principle effect if we could be sure that optimal effort levels were equal pre and post promotion. Optimal effort levels would remain unchanged if the conditions

determining workers effort responses remained unchanged. Tournament theory tell us that pay spread (“prize”) and $g(0)$ are factors which positively influence effort levels. However there is no *a priori* reason why these quantities, and therefore the optimal effort levels, would remain constant over the hierarchy.

To account for this potential variation in effort between levels of the hierarchy, we follow the central predictions of tournament theory, Lazear and Rosen (1981) that effort levels of workers are determined by the pay spreads they face and by $g(0)$ “the importance of luck” they face. In a similar way to the method used in Audas, Barmby and Treble (2004) we enter a measure of the *difference* in pay spreads faced by workers as they are promoted between grades. These pay spreads are computed in the following way; the first pay spread (that is the pay spread he/she presently faces) is computed as the difference between the mean real basic pay of the grade immediately above minus the actual real basic pay for the worker in the grade he/she is in. The pay spread the worker will face once promoted is estimated as the mean real basic pay of two grades above where the worker is minus the mean pay of the grade immediately above. The same approach is used to ensure that the variation in performance after promotion is not due to changes in $g(0)$, $g(0)$ is predicted for each individual in each grade and the appropriate difference computed.

Table 4 Regression of Difference in Performance Rating on Difference Pay Spreads and Difference in $\tilde{g}(0)$ ’s

Variable	Coeff (t)	Coeff. (t)
Constant	-0.1471 (15.55)	-0.0923 (4.24)
Diff Pay Spread		0.00000762 (2.89)
Diff $\tilde{g}(0)$		46.9368 (4.26)

The above results indicate that, holding variation in tournament incentives constant, the Peter Principle effect appears to hold. The introduction of the change in the incentives which the individual faces makes a difference, as one would expect. The mean fall of 0.14 of a point in performance that is observed after one year is, it

appears partly due to a weakening of incentives, as holding incentives constant the mean fall in performance drops to 0.09.

V Concluding Remarks

The results reported here are preliminary, however we argue that they are suggestive of the possible operation of the Peter Principle in the organisation we study. This results holds even after we allow for possible variation in optimal effort over stages in the hierarchy, using a method suggested in Audas, Barmby and Treble (2004). The method allows us to attribute approx 2/3 of the fall in performance due to the Peter Principle and 1/3 to lessening incentives.

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