Lecture 6: Does Performance Pay Work?

Compensation in Organizations

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Thinking Through the Theory

▶ We found that performance-pay works less well compared to effort-based pay.

▶ But effort-based pay is usually infeasible!

▶ So if we want to know if performance-pay works we should not compare the two.

▶ Instead we should ask: does forcing the firm to not use performance pay reduce surplus?

Thinking Through the Theory

- Question: What does no performance pay mean?

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- ▶ Question: What does no performance pay mean?
    - ▶ Answer: $\beta = 0$

- ▶ How does this impact worker effort?

Thinking Through the Theory

- If $\beta = 0$ then the benefit to the worker of effort is 0.

- But the marginal cost is positive!

- Therefore exert no effort $e = 0$

- In math: For $e > 0$, we have $c'(e) > 0 = \beta \implies e = 0$.

Thinking Through the Theory

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$$\begin{aligned}
\pi_{\beta=0} &= E[y - w(y)] \\
&= e - \alpha - \beta e \\
&= 0 - \alpha - 0 \cdot 0 \\
&= -\alpha
\end{aligned}$$

Thinking Through the Theory

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- But we still need the worker to take the job.

- Therefore we need $\alpha \geq \bar{u}$

- Therefore the best we can do is $\alpha = \bar{u}$

- Therefore profit is $-\bar{u}$

Thinking Through the Theory

- So $\pi_{\beta=0} = -\bar{u}$

- Assume $\bar{u} > 0$, we are better off setting $\alpha = -\infty$

- Then the worker does not take the job and the firm makes $0 > \pi_{\beta=0} = -\bar{u}$

- Performance pay has positive profit, so: $\pi_p > -\bar{u} = \pi_{\beta=0}$
    - To see this clearly just plug in $c(e) = e^2/2$

    - Then $\pi_p = \frac{1}{2} \frac{1}{1+r\sigma^2} - \bar{u}$.

    - This is more than $-\bar{u}$

Thinking Through the Theory

▶ The theory unambiguously says that performance pay is better than no performance pay.

▶ Another way to see this is it just remember this theorem:

Theorem

When wages depend only on output, effort is e_p which solves

$$c'(e_p) = \frac{1}{1 + r\sigma^2 c''(e_p)}$$

and $\beta_p = c'(e_p), \alpha_p = \bar{u} - \beta_p e_p + r\beta^2\sigma^2/2 + c(e_p)$.

▶ We showed that the firm maximizes total surplus.

▶ The firm could have chosen $\beta = 0$ but it doesn't, so total surplus must be larger with performance pay than without it!

Table of Contents

Discussion: Muralidharan and Sundararaman (2011)

"Teacher Performance Pay: Experimental Evidence from India"

- ▶ This is Muralidharan and Sundararaman (2011).

- ▶ Motivation: Research shows rewarding based on teacher characteristics like tenure and master's degrees does not improve outcomes.

- ▶ Concern: other work highlights the possibility of perverse outcomes.
    - ▶ Neal and Schanzenbach (2010): teachers focused attention on students in the middle of the distribution

    - ▶ Question: how does this compare to another paper we read?

- ▶ Research method: randomized control trial in India.

- ▶ Group bonuses vs. individual bonuses vs. nothing

- ▶ Bonuses are on average 3 annual salary.

"Teacher Performance Pay: Experimental Evidence from India"

- ▶ 300 schools, with 100 in each treatment group.

- ▶ 0.27 (math) and 0.17 (lang.) std. dev. improvements vs. control group

- ▶ Gains are "broad-based" across academic achievement distirbution (what does this mean?)

- ▶ Also gains in social studies and science (why is this interesting?)

- ▶ Individual incentives worked better in the long term than group, but were the same in the short term (why might this be?)

"Teacher Performance Pay: Experimental Evidence from India"

- ▶ 100 additional schools were given more money to get more supplies

- ▶ 100 additional, additional schools were given more money to hire extra teachers.

- ▶ These 200 schools had better test scores (+0.08 st. dev.).

- ▶ But performance pay improved scores more for less money.

"Teacher Performance Pay: Experimental Evidence from India"

Why is sample balance important?

TABLE 2
SAMPLE BALANCE ACROSS TREATMENTS

	Control (1)	Group Incentive (2)	Individual Incentive (3)	p-Value (Equality of All Groups) (4)
			A. Means of Baseline Variables	
School-level variables:				
1. Total enrollment (baseline: grades 1–5)	113.2	111.3	112.6	.82
2. Total test takers (baseline: grades 2–5)	64.9	62.0	66.5	.89
3. Number of teachers	3.07	3.12	3.14	.58
4. Pupil-teacher ratio	39.5	40.6	37.5	.66
5. Infrastructure index (0–6)	3.19	3.14	3.26	.84
6. Proximity to facilities index (8–24)	14.65	14.66	14.72	.98
Baseline test performance:				
7. Math (raw %)	18.5	18.0	17.5	.69
8. Math (normalized; in SD)	.032	.001	−.032	.70
9. Telugu (raw %)	35.1	34.9	33.5	.52
10. Telugu (normalized; in SD)	.026	.021	−.046	.53

"Teacher Performance Pay: Experimental Evidence from India"

Why would attrition be concerning?

	B. Means of End Line Variables			
Teacher turnover and attrition:				
Year 1 (relative to year 0):				
11. Teacher attrition (%)	.30	.34	.30	.54
12. Teacher turnover (%)	.34	.34	.32	.82
Year 2 (relative to year 0):				
13. Teacher attrition (%)	.35	.38	.34	.57
14. Teacher turnover (%)	.34	.36	.33	.70
Student turnover and attrition:				
Year 1 (relative to year 0):				
15. Student attrition from baseline to end-of-year tests	.081	.065	.066	.15
16. Baseline math test score of attritors (equality of all groups)	−.17	−.13	−.22	.77
17. Baseline Telugu test score of attritors (equality of all groups)	−.26	−.17	−.25	.64
Year 2 (relative to year 0):				
18. Student attrition from baseline to end-of-year tests	.219	.192	.208	.23
19. Baseline math test score of attritors (equality of all groups)	−.13	−.05	−.14	.56
20. Baseline Telugu test score of attritors (equality of all groups)	−.18	−.11	−.21	.64

"Teacher Performance Pay: Experimental Evidence from India"

D. Description of Incentive Treatments

Teachers in incentive schools were offered bonus payments on the basis of the average improvement in test scores (in math and language) of students taught by them subject to a minimum improvement of 5 percent. The bonus formula was

$$\text{Bonus} =$$

$$\begin{cases} \text{Rs. } 500 \times (\% \text{ gain in average test scores} - 5\%) & \text{if gain} > 5\% \\ 0 & \text{otherwise.} \end{cases}$$

All teachers in group incentive schools received the same bonus based on average school-level improvement in test scores, whereas the bonus for teachers in individual incentive schools was based on the average

"Teacher Performance Pay: Experimental Evidence from India"

TABLE 9
TEACHER BEHAVIOR (Observation and Interviews)

TEACHER BEHAVIOR	INCENTIVE VERSUS CONTROL SCHOOLS (%)			
	Incentive Schools (1)	Control Schools (2)	p-Value of Difference (3)	Correlation with Student Test Score Gains (4)
Teacher absence (%)	.25	.23	.199	−.103
Actively teaching at point of observation (%)	.42	.43	.391	.135***
Did you do any special preparation for the end of year tests? (% Yes)	.64	.32	.000***	.095**
What kind of preparation did you do? (unprompted; % mentioning):				
Extra homework	.42	.20	.000***	.061
Extra classwork	.47	.23	.000***	.084**
Extra classes/teaching beyond school hours	.16	.05	.000***	.198***
Gave practice tests	.30	.14	.000***	.105**
Paid special attention to weaker children	.20	.07	.000***	.010

"Teacher Performance Pay: Experimental Evidence from India"

- This paper has many nice features

"Teacher Performance Pay: Experimental Evidence from India"

- ▶ This paper has many nice features

- ▶ Turnover and transfer of teachers are shown to have no discernible impact.

- ▶ Exams were given by external teams, student identities were verified.

- ▶ Results are shown by type of question (multiple choice, repeat)

- ▶ Teacher behavior was measured ($\beta \uparrow \implies e \uparrow \implies y \uparrow$)

"Performance Pay and Productivity"

- ▶ This is Lazear (2000)

- ▶ Safelite Glass Corporation installs automobile glass

- ▶ In 1994, they switched from hourly pay to a piece rate system

- ▶ This is performance pay: worker wage depends on output

- ▶ Data: 3,000 workers and 19 month period

- ▶ Productivity Measure: units-per-worker-per-day
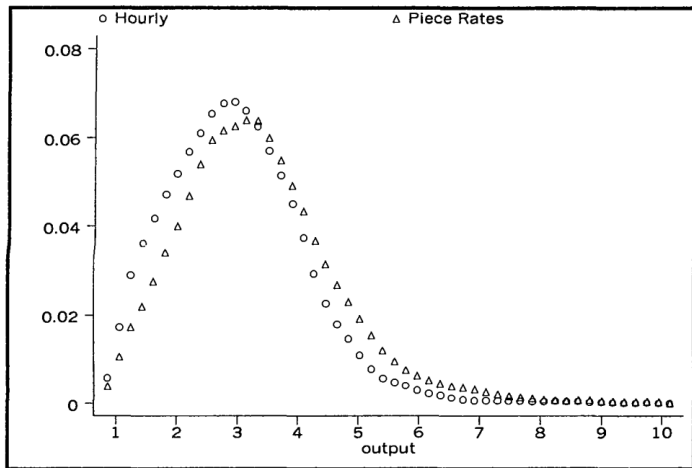
"Performance Pay and Productivity"

FIGURE 3. KERNEL DENSITIES IN THE TWO REGIMES

"Performance Pay and Productivity"

TABLE 3—REGRESSION RESULTS

Regression number	Dummy for PPP person-month observation	Tenure	Time since PPP	New regime	R^2	Description
1	0.368 (0.013)				0.04	Dummies for month and year included
2	0.197 (0.009)				0.73	Dummies for month and year; worker-specific dummies included (2,755 individual workers)
3	0.313 (0.014)	0.343 (0.017)	0.107 (0.024)		0.05	Dummies for month and year included
4	0.202 (0.009)	0.224 (0.058)	0.273 (0.018)		0.76	Dummies for month and year; worker-specific dummies included (2,755 individual workers)
5	0.309 (0.014)	0.424 (0.019)	0.130 (0.024)	0.243 (0.025)	0.06	Dummies for month and year included

Productivity increased by 44 percent (first coef. divided by the pre-performance pay mean)

"Performance Pay and Productivity"

- ▶ Workers hired under pay for performance system are more productive.

- ▶ Pay increased by 7 percent.

- ▶ Profit likely rose: 44% productivity increase vs. 7 percent pay increase.

"It's Not What You Pay it's the Way that You Pay it and that's What Gets Results: Jockeys' Pay and Performance"

▶ This is Fernie and Metcalf (1999).

▶ Setting: horseracing jockeys

▶ Three big findings:
  ▶ Incentives and monitoring mechanisms are used to align jockey's interests with their firm.

  ▶ Pay and performance are positively associated.

  ▶ Performance is better under performance pay than flat fees.

Fernie and Metcalf (1999): Setting

- ▶ 109 full jockeys, 201 apprentices.

- ▶ Supply of jockeys is purposefully restricted, jockeys cannot be replaced by capital.

- ▶ Demand for horseracing was stable throughout the period.

- ▶ Jockey pay was between 2-3 of total costs of horse owners.

- ▶ Effort is hard to measure: jockey can attribute bad performance to the horse

- ▶ Jockeys can be bribed by a bookie.

Fernie and Metcalf (1999): Measuring Performance

▶ One option: return to placing a dollar bet on all horses the jockey rode in a season.

▶ Problem: returns are driven by many other factors and are well understood not to reflect the jockey's performance.

▶ Other option: total wins

▶ Problem: Big confounding factor is the horse and the matching between horses and riders

▶ Fix: system of separating horse effect and rider effect.

Fernie and Metcalf (1999): Non-Performance Pay

▶ For some jockeys, there was a switch to non-performance pay.

▶ "Mega-rich owners" retained certain jockeys by paying sums of up to 1 million pounds.

▶ The payments did not depend on performance.

▶ We can compare performance before and after switch to non-performance pay.

▶ This accounts for the selection margin (why is this an issue?)

▶ They find worse performance, in line with out theory ($\beta = 0 \implies e = 0$)

More Evidence that Performance Pay Boosts Productivity

▶ We looked at windshield installers, teachers, ministers, jockeys, doctors.

More Evidence that Performance Pay Boosts Productivity

▶ We looked at windshield installers, teachers, ministers, jockeys, doctors.

▶ But other papers show evidence in other settings:

  ▶ Paarsch and Shearer (1996): Canadian tree planters

  ▶ Banker, Lee, and Potter (1996): retail sales

  ▶ Andrew Foster and Mark Rosenzweig (1994): farmers in the Phillipines

  ▶ Larry Kahn and Peter Sherer (1990): white-collar office workers

  ▶ Question: What do these jobs have in common?

Summarizing Empirical Evidence

▶ Performance pay improves performance ($\beta \uparrow \implies e \uparrow$)

▶ But other implications are mixed.

▶ In particular the risk incentive trade-off ($\sigma^2 \uparrow \not\implies \beta \downarrow$)

Summarizing Empirical Evidence

- ▶ Performance pay improves performance ($\beta \uparrow \implies e \uparrow$)

- ▶ But other implications are mixed.

- ▶ In particular the risk incentive trade-off ($\sigma^2 \uparrow \not\implies \beta \downarrow$)

"The Provision of Incentives in Firms" (Prendergast 1999)

"This paper provides an overview of the existing theoretical and empirical work on the provision of incentives. It reviews the costs and benefits of many types of pay-for-performance, such as piece rates, promotions, and long-term incentives. The main conclusions are (i) while there is considerable evidence that individuals respond to pay-for-performance, there is less evidence that contracts are designed as predicted by the theory, (ii) there has been little progress made in distinguishing amongst plausible theories, and (iii) we still know little about how incentives are provided to workers whose output is difficult to measure."