

An Experimental Study of Incentive Pay

Executive Summary

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In any organization in which managers are unable to fully monitor the actions of their subordinates there is a potential for misaligned incentives. If we make the reasonable assumption that employees generally like being paid but dislike exerting effort, we would expect to see employees shirking when their earnings consist of a fixed income. A manager can combat this tendency to shirk by offering labor contracts with a variable pay component that links earnings to the outcomes resulting from the employee's effort. But the manager must keep two facts in mind. First, outcomes are likely to be imperfectly related to the employee's effort. Intense competition, demand reduction, or any number of unforeseen catastrophes could render the employee's best efforts utterly unprofitable. Second, the employee is likely to be risk averse.¹ If this is the case, then the employee's expected total compensation must increase under the variable pay contract. Otherwise, he will seek work elsewhere. If the employee is sufficiently risk averse, it will be more profitable for the manager to pay a fixed salary and accept the resulting shirking than to implement incentive pay.

Standard economic theory (known as agency theory) views the manager's problem as a case of constrained optimization. It is assumed that the manager knows the employee's utility function (and therefore his risk preference) and the salary he could command at his best alternative job. He also knows the function that maps the employee's effort into outcomes. The employee (or agent) is assumed to have a utility function defined over two dimensions: wealth and labor. Intuitively, utility is strictly increasing in wealth and decreasing in labor. The manager's task is to define a contract with a fixed and variable component that will balance the increased cost of paying on the basis of performance with the value of the increased productivity such payment will encourage.

Left out of the agency theory model is any notion of how employees' personalities will interact with their payment contracts to effect: 1) the level of effort they exert under a given contract and 2) their willingness to enter into a given contract. Yet across the globe employers specifically look for certain characteristics (e.g. conscientiousness, self-motivation, persistence) when making hiring and retention decisions.

We conducted laboratory experiments to test for personality effects on effort and contract selection in an agent theoretic framework.

¹ Risk aversion implies that, for any lottery with an expected value of X , there exists some $y < X$ such that the employee would prefer a payment of y with certainty to the chance to play the lottery.

Experimental Design

The basic strategy in designing the experiments was to 1) measure subjects' risk preferences, 2) measure factors of subjects' personalities, 3) measure subjects' levels of effort under various compensation contracts and 4) elicit subjects' preferred contracts. For brevity, we omit a discussion of our methods of measuring risk preference and personality traits, except to note that we replicated the methods of other respected scholars.

Subjects' labor in the experiments was to complete 20 rounds of a visual challenge task, with 10 iterations of the visual challenges per round. In each iteration a five-letter string would appear on the subject's screen for 0.3 seconds, after which a three-letter string would appear. The subject was asked to indicate whether or not all three letters of the second string were contained in the first string. He was allowed to submit an answer of yes or no, or to skip to the next iteration. Disutility for labor was replicated by charging the subject \$0.05 per answer submitted, while charging nothing to skip.

The experimental software kept track of the subject's score each round. At the beginning of the round, the score was 0, and was incremented (decremented) by 1 for every correct (incorrect) answer. Over the course of the experiment, subjects' scores were converted into cash payments in three different ways. In rounds under a "Threshold" contract, subjects were paid a flat wage of \$1.15 (minus the cost of submitting answers) so long as they achieved a score of at least 3. Because scoring above 3 incurs additional costs of effort but results in no higher wage, agency theory predicts subjects will stop submitting answers after achieving a score of 3.

In rounds under a "Multiple" contract, subjects' scores were multiplied by \$0.20 to determine their earnings. The cost of submitting answers was subtracted from this amount. Because subjects were paid at the margin, agency theory predicts that they will submit answers whenever the expected value of doing so exceeded the cost. There is no ex ante prediction for how many answers subjects should submit in these rounds, but it is reasonable to expect the number to exceed that in the Threshold rounds.

In rounds under a "Combo" contract, subjects received \$0.90 for achieving a score of 3, plus a bonus of \$0.12 per point scored beyond that threshold. As with the Multiple contract, subjects should submit answers when the expected value exceeds the cost of doing so, but because the marginal payment is only \$0.12 per point, expected value should exceed cost less often. Thus it is reasonable to expect subjects to submit a number of answers that is, on average, greater than that under the Threshold contract and less than that under the Multiple contract.

The visual challenge tasks were organized into "sections." Each section consisted of five rounds under the same compensation plan. Every subject was required to complete a section under each contract type. (We refer to these as the compulsory sections.) Subjects were then asked to complete an additional section under the contract type of

their choice. (We refer to this as the elective section.) Earnings from the elective rounds were added to their total earnings for the experiment.

Results

The most salient results are listed below:

- 1. Subjects exerted the same amount of effort in the Combo and Multiple sections.** Regression analysis estimates that subjects submitted 9.5 answers per round in the compulsory Multiple section ($p < 0.001$) and 9.59 answers per round in the elective Multiple section ($p < 0.001$). No statistically significant difference could be found for the Combo section, whether compulsory or elective. This suggests that, within a certain range, paying employees at the margin is more important than how much they are paid at the margin.
- 2. In the compulsory sections, almost half of subjects exerted maximum effort regardless of contract type.** Of 80 subjects, 41 submitted only enough answers to achieve a score of 3 in the compulsory Threshold section. For the remaining 39, the number of answers submitted was statistically indistinguishable from 9.5.
- 3. Personality traits are correlated with effort exertion in the Threshold section.** Subjects whose psychological measures indicated a tendency toward anxiety and self-doubt were more likely to exert maximum effort in the Threshold section ($p = 0.025$). Subjects whose psychological measures indicated a tendency toward a conventional, utilitarian approach to problem solving were more likely to submit only enough answers to achieve a score of 3 ($p = 0.063$).
- 4. In the elective section, subjects' behavior conformed substantially to agency theory.** Of 21 subjects who chose the Threshold contract for their elective section, 15 (71.4%) submitted only enough answers to achieve a score of 3. This suggests that in a competitive labor market, employees who will exert maximum effort under any payment contract are more likely to self-select into incentive pay contracts.
- 5. Personality traits have explanatory power in subjects' contract selection.** Logistic regression analysis indicates that subjects with psychological measures indicating self-confidence and an even temperament were more likely to choose the Combo contract ($p = 0.077$). Subjects whose psychological measures indicated a conventional, utilitarian approach to problem solving were also more likely to choose the Combo contract ($p = 0.014$) and less likely to choose the Threshold contract ($p = 0.033$).
- 6. Previous earnings have explanatory power in subjects' contract selection.** Subjects had a clear tendency to choose the contract under which they had earned the most money in the compulsory sections ($p < 0.05$ for all three contracts). This suggests that a workable strategy for winning employees over to a variable pay structure is to give them some exposure to it, perhaps by showing them what their pay would be over time under such a structure.