Final Exam: Econ 490 Compensation in Organizations

Instructor: Jacob Kohlhepp

Section 3: May 3, 2024 at 12pm

Name: _____ PID: _____

You have 3 hours to complete this exam. Please stop writing when told to do so. Write all answers in the space provided, and show work where possible. If you run out of room, make a note and use the additional pages attached at the end of the exam. This is a closed book exam. The only materials you may use are a pen and paper. By taking this exam, you agree to follow the UNC Chapel Hill honor code, in particular the standards of academic integrity. All academic dishonesty will be reported to the Office of Student Conduct and the Student Attorney General. Each reading question is worth 5 points. Each model question is worth 3 points. There are a total of 100 points.

1 Readings

Answer these questions in 3 sentences or less.

1. Describe the policy from Alexander (2020) "How do Doctors Respond to Incentives?" How did doctors respond?

2. In Gong, Zhang and Zhou (2023) "Retention Effects of Employee Stock Options," what was the main finding?

3. What does Macleod and Urquiola (2021) "Why Does the United States Have the Best Research Universities?" use to measure the rise of US universities?

4. Describe the method used in "Team Incentives and Performance: Evidence from a Retail Chain" by Friebel, Heniz Krueger and Zubanov (2017).

5. In Blair and Chung (2022) "Job Market Signaling through Occupational Licensing," in what types of states does occupational licensing reduce the racial wage gap the most? Use one sentence.

2 Multitasking

Setup

- Output is $y = ae_1 + be_2$, where $a > b, a > 0$
- Cost of effort is:
$$c(e_1, e_2) = \begin{cases} 0 & \text{if } e_1 + e_2 \leq 2\bar{e} \\ (e_1 + e_2 - 2\bar{e})^2/2 & \text{if } e_1 + e_2 > 2\bar{e} \end{cases}$$
- We assume that without incentives the worker supplies all 0 cost effort and splits effort evenly:
$$e_1 = e_2 = \bar{e}$$
- Only task 1 effort is measured: $m = e_1$
- The firm can only pay based on task 1: $w(m) = \alpha + \beta m = \alpha + \beta e_1$
- The firm's outside option is 0, the worker's is $\bar{u}$

Questions

1. Solve for the first-best e_1, e_2. For this problem only assume that $a > b$.

2. From now on we are solving for equilibrium, meaning the firm cannot choose effort directly but just chooses a compensation scheme. Setup the worker's effort choice problem.

3. Solve for worker's choice of effort assuming for now until told otherwise that $\beta > 0$.

4. Write down the inequality that determines whether the worker takes the job. Argue that it must be an equality.

5. Setup the firm's profit maximization problem. Substitute past work in so that it is only a function of β.

6. Solve for the profit-maximizing β, e_1, e_2.

7. Now, solve for e_1, e_2 when $\beta = 0$. You may use the same steps we just did or do it your own way.

8. Assume that $a = 2, b = 1, \bar{e} = 2$. Using the work you have already done, should the firm set $\beta = 0$ or $\beta > 0$? Find β, e_1, e_2.

3 Relational Contracts

Setup

- A firm and a worker both have discount rate δ and interact for many periods ($t = 1, ..., \infty$)
- At each period t the following occur:
  - First the firm offers a flat wage w_t
  - Second the worker chooses high (H) or low (L) effort e_t
- High effort has cost $c > 0$, low effort has cost 0.
- High effort yields revenue $v \geq 0$, low effort yields revenue 0.
- Firm outside option is 0, worker outside option is $\bar{u} > 0$.
- Assume the firm wants to motivate high effort.

Questions

1. Guess an equilibrium strategy for the firm in words. Guess an equilibrium strategy for the worker in words. (Hint: guess the same strategy as in class)

2. Call the high wage w_H and the low wage w_L. Assume the strategy you guessed is being played. What value of w_L will the firm choose? What is the worker's payoff in any period where the firm posts a wage of w_L? Justify your answers.

*** For the next two subquestions, suppose the worker is considering one shot deviations when they slacked in the past (so are now being offered w_L forever).

3. Consider two deviations: taking the job and exerting low effort and taking the job and exerting high effort. Argue either mathematically or verbally that one is a more attractive deviation.

4. Write down one inequality that captures when the worker has no incentive to make the more attractive deviation in the last subquestion. Make sure to simplify. When does it hold?

*** For the next two subquestions, suppose the worker is considering one shot deviations when they never slacked in the past (so are currently being offered w_H each period).

5. Consider two deviations: taking the job and exerting low effort and not taking the job. Argue either mathematically or verbally that one is a more attractive deviation.

6. Write down one inequality that captures when the worker has no incentive to make the more attractive deviation in the last subquestion. Make sure to simplify.

7. Using the inequality you just derived, find the firm's optimal choice of w_H and profit.

8. Suppose initially $\delta = 0.5, v = 4, \bar{u} = 1, c = 1$. Then, conditions change and $\delta = 0.5, v = 7, \bar{u} = 4, c = 1$. Explain what happens to profit and provide an economic example.

4 Career Concerns

Setup

- There are two firms and one worker.
- The worker has a skill level a that no one knows.
- However, everyone knows that skills are distributed uniformly between $[0, A]$. That is, $a \sim U[0, A]$
- The worker exerts unobserved, costly effort: $c(e) = e^2/2$
- Revenue is equal to effort plus skill: $y = e + a$
- The worker is hired and exerts effort in two periods.
- The worker is hired in each period by the firm that posts the highest wage, and if there is a tie they randomly pick a firm (Bertrand style)
- All outside options are 0.

Questions

1. What is the first-best level of effort for a single period? That is, the e_{FB} that maximizes output less the cost of effort?

2. How much effort will the worker exert in period 2? Justify your answer.

3. Denote the effort the firm believes the worker exerts in period 1 $\tilde{e}_1$. How can the firm recover the worker's skill using $\tilde{e}_1$ and output y_1?

4. What output levels y_1 will the firm never observe if the worker does the effort that is expected ($\tilde{e}_1$)?

5. Suppose the firms believe skill is a in period 2. What wage will they bid in period 2? Justify your answer.

6. Solve for the worker's optimal effort.

7. What wage do the firms in period 1 bid? Justify your answer.

8. How does this effort compare to the effort in sub question 1? Why is the worker working hard?

9. Suppose $A = 20$. If a worker has skill 12, how does their wage change from period 1 to period 2?