Written Exam for the B.Sc. or M.Sc. in Economics winter 2015-16

Organizations and Incentives

Final Exam/ Elective Course/ Master's Course

January 20, 2016

(3-hour closed book exam)

Answers must be in English.

This exam question consists of 4 pages in total, including this one.

The exam consists of 4 questions with several parts. In order to get the maximum possible number of points, you must answer all questions correctly. In total, there are 90 points attainable, and the exam duration is 180 minutes. When answering mathematical questions, all steps of your analysis must be comprehensible. When answering non-technical questions, you answers can be short and concise (e.g., using bullet points), but your arguments must be explained sufficiently.

Good Luck!

Question 1: ***(30 points)***

Consider the following principal-agent model with one principal, P, and a single agent, A.

The agent chooses an effort level, $e \geq 0$. Exerting effort is costly for A, with effort costs given by the cost function

$$C(e) = \frac{1}{2} c\, e^2.$$

The output produced by the agent, measured as the net revenue y that the principal receives from the agent's work, is the sum of the agent's effort and an exogenous noise term, ε:

$$y = e + \varepsilon.$$

ε is drawn from a normal distribution with mean 0 and variance σ^2.

P can observe *y* , but neither *e* nor ε. She offers the agent a "linear" contract that consists of a fixed salary, *s*, and a performance-contingent component, *by*, where *b* corresponds to a commission rate paid to the agent (defined as a fraction of the output generated by A).

A's total wage payment if he accepts the contract offered by the principal is thus given by

$$w = s + by.$$

The agent A is risk averse and maximizes the following utility function

$$u(w, e) = E(w) - \frac{1}{2} r Var(w) - C(e) = s + be - \frac{1}{2} r b^2 \sigma^2 - \frac{1}{2} c\, e^2$$

where *E(.)* and *Var(.)* denote the expected value and variance of the agent's wage, respectively, and the parameter *r>0* measures the agent's degree of risk aversion. If the agent does not accept the contract, he has an outside option yielding utility $\underline{u}$.

The principal P is risk neutral and maximizes her expected profit,

$$E(\pi) = E(y - w) = e - s - be$$

The timing of events is as follows:

- P chooses the parameters of the contract (*s*, *b*) and makes a contract offer to A.
- A accepts or rejects the contract.
- If he accepts the contract, A determines his level of effort.
- The noise term is realized, and both players receive their payoffs.

Assume that *c = 2*, *r = 0.25*, $\sigma^2 = 2$, $\underline{u} = 0$.
(*Note*: for answering later parts of the question, it can be useful to first derive the general solution, and only insert the parameter values in the last stage of your analysis for each part of the question).

Please answer the following questions:

a) Assume that the agent has accepted a contract with salary *s* and commission rate *b*. Which effort level does he choose? *(4 points)*

b) Which condition needs to be fulfilled for the agent to be willing to accept a contract offer with salary *s* and commission rate *b*? *(2 points)*

c) Determine the first-best level of effort, i.e., the effort level that maximizes the sum of the principal's payoff and the agent's utility. Which commission rate *b* would induce the agent to choose this effort level (according to your result from part a)? *(4 points)*

d) Consider now the principal's problem. Which commission rate *b* will she offer to the agent? What is the resulting effort that the agent exerts in equilibrium? *(10 points)*

e) How does the optimal commission rate change if $r = 0.5$ instead of 0.25? How does this affect A's effort in equilibrium? *(2 points)*

f) Explain what is meant by the "tradeoff between incentives and insurance" in principal-agent problems. You can use your answers to parts a) – e) to illustrate your response (but you are also encouraged to respond if you have not answered all of the above questions). *(8 points)*

Question 2: ***(22 points)***

It is often argued that compensation schemes do not only affect workers' performance incentives, but that they can also have "selection effects" (or affect "worker sorting").

a) Explain briefly what is meant by "worker sorting" and the selection effects of compensation schemes. *(4 points)*

b) Explain why it is difficult to disentangle the incentive and selection effects of compensation schemes empirically: discuss at least 3 factors that complicate the empirical identification of sorting / selection effects. *(6 points)*

c) Throughout the course, we have discussed various studies that have analyzed the selection effects of compensation schemes. Consider two of these studies and describe how the authors of the studies have tried to tackle the challenges you mentioned in part b). To do so, describe the empirical strategies of the papers and explain how the authors use their approach to analyze sorting / selection effects. Do the studies differ in the degree to which they can address the different challenges? *(12 points)*

Question 3: ***(26 points)***

a) Why is it generally difficult to determine whether an individual's behavior is influenced by her peers (i.e., whether there are peer effects)? *(5 points)*

b) The paper "Peers at Work" by Mas and Moretti (AER 2009) uses scanner data from a supermarket chain to study peer effects.
   - Briefly summarize the basic setup of their study and
   - describe Mas' and Moretti's empirical strategy for identifying peer effects. *(10 points)*

c) One important concern is that the observed peer effects in their study may be spurious. This could, for example, be the case if more productive workers worked at times of the day when demand was higher (e.g., in order to shorten the queues). How do the authors address this concern empirically? *(3 points)*

d) Mas and Moretti also investigate potential channels though which peers could affect each other's behavior.
   - Sketch (at least) two of these channels.
   - Explain which information Mas and Moretti use to distinguish between the channels, and how they use it. *(8 points)*

Question 4: ***(12 points)***

Consider the following statement:

"The fact that some firms pay their salesforce only commission rates in the range of 2-3% of a salesperson's sales volume shows that these firms do not know how to set incentives right. In order to be motivated to work hard, it is vital that an employee realizes some immediate returns to her efforts in her pocket. At such low commission rates, an employee is certainly not motivated to work as hard as he could, so these rates can ultimately also not be optimal for firms. Employers finally have to understand that paying their employees decent wages is not a zero-sum game, but can be mutually beneficial for the firm and its employees."

Please comment on the statement. Which parts of it do / don't you agree with? Explain your responses based on the theoretical models and / or empirical evidence discussed throughout the course (you can also make use of your responses to the other exam questions).