

STUDIENZENTRUM GERZENSEE
STIFTUNG DER SCHWEIZERISCHEN NATIONALBANK

Swiss Program for Beginning Doctoral Students in Economics 1999

Final Exam in Microeconomics

Tuesday, March 7, 2000, 08.30h - 11.30h

1. You are allowed to use all material that you want (lecture notes, books, etc.) with the exception of PC's.
2. Please **do not** mention your name on top of the pages, but use your identification number from the enclosed list. The reason is that the exams will be graded anonymously. Please use **a pen** rather than a pencil so that your answers can be read without problems.
3. Good luck!

ID-Number: _____

MICROECONOMICS

Question 1

Regulation

We consider a firm which realizes two projects, of gross value S_1 and S_2 for the consumers. The firm can provide an effort e_i in order to reduce the cost associated with project i , $i = 1, 2$. The cost function of the firm for project i is:

$$C_i = \beta - e_i$$

where β is the efficiency parameter of the firm. The efficiency of the firm is the same for both projects.

Parameter β can take values in $[\underline{\beta}, \bar{\beta}]$ according to a common knowledge probability distribution with density $f(\cdot)$ and cdf $F(\cdot)$ satisfying the monotone hazard rate condition

$$\frac{d}{d\beta} \left(\frac{F(\beta)}{f(\beta)} \right) > 0.$$

The cost reducing efforts create a disutility to the firm equal to

$$\psi(e_1, e_2) = \frac{1}{2}(e_1^2 + e_2^2) + \gamma e_1 e_2, \quad \gamma > 0.$$

A regulator reimburses the observable costs C_1 and C_2 and pays a net transfer t to the firm which has utility

$$U = t - \psi(e_1, e_2).$$

Social welfare is

$$S_1 + S_2 - (1 + \lambda)(t + C_1 + C_2) + U.$$

- a) Determine the optimal regulation under complete information.

- b) Determine the optimal regulation under incomplete information when β is private information of the firm.

- c) Suppose now that the regulatory mechanism is determined by the political majority. Either the majority of size $\alpha > 1/2$ is formed of consumers who share the rent of the firm. Or the majority of size $\alpha > 1/2$ is formed of consumers who do not share the rent (in both cases the costs are still uniformly shared).

Model, under incomplete information, the optimization of the expected welfare of majority 1 or majority 2 and discuss the two regulatory mechanisms obtained. (Assume $[1 - (1 + \lambda)\alpha] < 0$, so that it is always desirable to extract the rent from the firm.)

Question 2

Group Lending with Moral Hazard

We consider a pair of entrepreneurs who can carry out a project with the following characteristics. Each entrepreneur who invests $I = 1$ gets an output of h with probability \bar{p} for a high effort level \bar{e} and probability \underline{p} for no effort, $e = 0$, with $\Delta p = \bar{p} - \underline{p} > 0$.

The disutility of effort is ψ for \bar{e} and zero for $e = 0$.

Each entrepreneur has no wealth and must borrow to invest. He can only repay his loan if he succeeds. Let x be his payment. Then, an entrepreneur's expected utility is

$$\begin{aligned} & \bar{p}(h - x) - \psi && \text{if he exerts effort } e \\ & \underline{p}(h - x) && \text{if he exerts no effort.} \end{aligned}$$

We consider a monopolistic bank which has a cost of funds r and which maximizes profits.

For simplicity we assume that investment is socially valuable only if effort \bar{e} is exerted, i.e.,

$$\bar{p}h > \psi + r \quad \text{and} \quad \underline{p}h < r.$$

The status quo utility level of the firm is zero.

a) Consider first individual contracts.

Write and solve the maximization program of the bank with participation and incentive constraints.

Determine when the bank chooses to lend.

b) The bank offers now to each entrepreneur a group lending contract (x, y) which specifies a payment

x for entrepreneur i if his partner j succeeds.

y for entrepreneur i if his partner j fails.

Write the optimization program of the bank under the constraint that the group lending contract induces participation and a high level of effort as a Nash equilibrium.

Show that group lending is useless if entrepreneurs do not observe each other's effort levels.

- c) Suppose now that entrepreneurs observe each other's effort level and can write side contracts between themselves to commit to high effort levels.

Characterize the optimal lending contract for the bank. Discuss.

Question 3

Consider a two good economy ($i = 1, 2$) and a consumer living two periods ($t = 1, 2$). The price of good i at date t is denoted p_t^i . The consumer is endowed with an income R_t in period $t = 1, 2$.

Its utility function is

$$u(C) = \sum_{i=1}^2 \sum_{t=1}^2 \sqrt{C_t^i}$$

where C_t^i represents the quantity of good i that is consumed at date t .

a) Compute the demand functions $C_i^i(p, R_1, R_2)$ of the consumer.

b) How are they changed when the consumer can also borrow (or lend) at a rate r between periods 1 and 2?

c) Explain the difference.

Question 4

Consider a pure Bertrand duopoly problem where demand is given by: $Q=3-p$, if p is the lower of the two prices charged by the firms, which have constant marginal costs $c_1=c_2=1$.

Assume firm 1 can spend a fixed cost F to raise firm 2's marginal cost to 1.5 (example: lobby to impose a tariff if firm 2 is a foreign firm).

- (a) what is the level of F above which it is not profitable for firm 1 to spend this fixed cost (be precise) ?

(b) explain in words how firm 1's reasoning would change if firms competed in quantities instead of prices. Is the difference the same as when F serves to decrease firm 1's marginal cost ?

Question 5

Spence model with productive-but-costly education.

Assume two types of workers, H and L, with probabilities a and $1-a$ in the population.

Their respective utilities are $w - c_H e$ and $w - c_L e$, where e is the level of education, w the wage and we have $1 < c_H < c_L$.

Worker productivity is $L+e$ for type L and $H+e$ for type H (with $0 < L < H$).

(a) show graphically the equilibrium if worker types are publicly observable. Why does unobservability of worker types matter ?

(b) describe the sets of separating and pooling Bayesian-perfect equilibria (be precise).

(c) which of these equilibria satisfies the Cho-Kreps intuitive criterion ?