Topics in Modern Economics

Final exam – May 2nd, 2016

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Part 1 : Problem – Baron-Myerson

A regulator oversights a non competitive industry. The demand function for the commodity is denoted $D(p) = 100 - 2p > 0$. The cost function to produce the commodity is $C(c, q, K) = cq + K$ with $K > 0$ and $c << 50$. The fixed cost level K is common knowledge. The gross surplus of consumer is denoted $S(p) = \int_p^{+\infty} D(x)dx + pD(p)$. It is equal to $S(q) = 2500 - p^2$.

1 – The regulator does not observe c but she has a prior on the distribution of c. We assume that c is drawn from $\{\underline{c}, \overline{c}\}$ according to the probability $Prob(c = \underline{c}) = \nu$ (and $Prob(c = \overline{c}) = 1 - \nu$) with $\underline{c} < \overline{c} << 50$. By virtue of the revelation principle the regulator restricts herself to direct truthful mechanisms. Characterize this contracts (i.e. the constraints that asymmetric information impose on the regulator).

2 – Write the optimization problem of the regulator under asymmetric information when $\lambda > 0$.

3 – Solve the regulation problem under asymmetric information neglecting second order incentive compatibility constraint.

Part 2 : Problem – Monopoly regulation & shutdown of the firm

We place ourselves in the context of a regulated firm which has a cost $C = \beta - e$ of realizing a project with social surplus S. The regulator only observes total cost C, and has an objective function $W = S - (1 + \lambda)(t + C) + U$, where $\lambda > 0$ is the shadow cost of public funds, U the firm's rent above its reservation utility of zero, and t the net transfer from the state to the firm. It is assumed that the firm's rent is $U = t - \psi(e)$, with ψ a function measuring the cost of effort such that : $\psi(0) = 0$, $\psi' > 0$ and $\psi'' > 0$. Only the firm knows its type β, which can take two values : $\beta = \underline{\beta}$ with probability ν and $\beta = \overline{\beta}$ with probability $(1 - \nu)$. We assume $\underline{\beta} < \overline{\beta}$.

1 – Using the regulator's objective function, argue why the regulator always dislikes leaving a rent to the firm.

2 – Characterize the optimal level of effort e^* and the rent of the firm U^* if the regulator had full information about the firm's type.

You are recalled the following results[1] derived from the regulator's maximization program when looking for the optimal contracts $(\underline{t}, \underline{C})$ and $(\overline{t}, \overline{C})$ meant to be picked, respectively, by types $\underline{\beta}$ and $\overline{\beta}$:

$$\underline{e} = e^* \tag{1}$$

$$\psi'(\overline{e}) = 1 - \frac{\lambda}{1+\lambda}\frac{\nu}{1-\nu}\Phi'(\overline{e}) \tag{2}$$

where $\Phi(e) = \psi(e) - \psi(e - (\overline{\beta} - \underline{\beta}))$

3 – Explain briefly why $\underline{U} = \Phi(\overline{e})$ in this setting.

4 – Show why $\underline{e} < \overline{e}$. Explain intuitively why the regulator did not pick e^* for the $\overline{\beta}$ type.

In what follows, we assume that the regulator has the possibility to shut down the regulated firm if the realized cost is too high.

5 – If the regulator shuts down the inefficient firm ($\overline{\beta}$), which contract does it offer to the efficient one ($\underline{\beta}$) ? Write the expected welfare of the regulator in that case.

6 – What is the expected welfare of the regulator if he decides to let both types of firms produce ?

7 – Show that the regulator decides to let both firms produce if and only if :

$$S \geq S_0 = (1+\lambda)(\overline{\beta} - \overline{e} + \psi(\overline{e})) + \frac{\nu}{1-\nu}\lambda\Phi(\overline{e}) \tag{3}$$

Give an intuition for this result.

8 – For this question, you are free to admit that $\overline{e}$ increases when ν increases. Show that there exists a threshold $\nu_0 \in (0, 1)$ such that for $\nu > \nu_0$, the regulator decides to shut down inefficient firms.[2] Explain why this is the case.

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[1] Please note that you are not asked to show these results.

[2] You are not asked to compute ν_0.