

# CERGE-EI

## Preparatory Microeconomics

Final exam

August 17, 2011

**Rules:** You have 120 minutes. There are 100 points total. The exam has 3 pages. It is your responsibility to make sure you have all pages. Cheating and other violations of academic honesty will be punished to the fullest extent possible. Don't forget to write your name on the exam booklet. If you want to ask a question, you must ask it in public and the answer will be given in public (so that everyone can hear it).

### TRUE-FALSE-UNCERTAIN

Indicate whether a statement is true, or false, or uncertain, and briefly explain. No points without explanation.

- (7 points)** The marginal revenue of a monopoly firm is positive if the demand is elastic.
- (8 points)** In a competitive market, we observe that the price increased and the quantity decreased. We conclude that demand must have increased.
- (9 points)** A firm was emitting higher than welfare-maximizing amount of pollution, hence the government introduced a Pigouvian tax, and after that, the firm reduced the amount of pollution to the welfare-maximizing amount. We conclude that the introduction of the Pigouvian tax was a Pareto-improvement.

### PROBLEMS

#### 4. (18 points)

A new university has \$9m to spend on research  $x$  and other activities  $y$ ; of which it currently plans to spend \$3m on research. Its funding body considers the following plans in an attempt to encourage research:

**Plan A:** Increase the funding unconditionally by \$3m (i.e., the university may allocate the money any way it wishes).

**Plan B:** Increase the funding by \$3m if and only if the university spends at least \$3m more on research than at present.

**Plan C:** Match each \$2m spent on research by an extra \$1m of unconditional funding.

(a) Find expressions for the budget sets faced by the university under each plan and sketch them.

(b) The university's preferences over bundles  $(x; y)$  are such that it would choose to spend constant budget shares of  $\frac{1}{3}$  and  $\frac{2}{3}$  on  $x$  and  $y$  under any linear budget constraint. What bundle will the university choose for each of the plans?

(c) Which plan results in most being spent on research?

(d) Which plan results in the funding body having to put up least money?

**5. (12 points)**

Tom and Jane love to play “Hide and Seek”. Jane hides upstairs or downstairs. Tom can look upstairs or downstairs but not in both places. If Tom finds Jane upstairs, he gets two scoops of ice cream, but if he finds her downstairs, he gets one scoop. If Tom finds Jane, she gets no ice cream, but if he doesn’t find her she gets one scoop and Tom gets none.

- (a) Draw the payoff table for Jane and Tom (in number of ice-cream scoops).
- (b) Are there any Nash equilibria in pure strategies?
- (c) Find a Nash equilibrium in mixed strategies for this game.
- (d) If both use equilibrium strategies, what fraction of the time will Tom find Jane?

**6. (26 points)**

There is a competitive market with a downward-sloping demand. Two types of firms are supplying in that market: low-cost firms have constant marginal cost  $c_L$ , but they are unable to supply more than  $Q_L$  units of output altogether. High-cost firms have constant marginal cost  $c_H$ , with  $c_H > c_L$ , but they can supply any quantity of output. Fixed costs are zero for both types of firms. The demand is sufficiently high such that the equilibrium quantity will always be above  $Q_L$ .

- (a) Draw the industry supply and the demand curves. What will be the equilibrium price?
- (b) The government decides to provide a subsidy of  $\sigma$  per unit of output, with  $\sigma < (c_H - c_L)$ . The subsidy is provided to all firms in the industry. Draw the supply and demand curves under the subsidy, the equilibrium price and quantity, the change in consumer and producer surpluses, and the deadweight loss.
- (c) The lobby of low-cost firms exploits its political connections and persuades the government that the subsidy  $\sigma$  should be provided only to them, but not to the high-cost firms. Draw the supply and demand curves under this subsidy, the equilibrium price and quantity, the change in consumer and producer surpluses (compared to the market without the subsidy), and the deadweight loss.
- (d) There is a change in government, and it is now the high-cost firms that have the right connections and persuade the government to provide the subsidy only to them, and not to the low-cost firms. Draw the supply and demand curves under this subsidy, the equilibrium price and quantity, the change in consumer and producer surpluses (compared to the market without the subsidy), and the deadweight loss.
- (e) Why do the outcomes differ between the subsidy to the low-cost and the high-cost firms?

**7. (20 points)**

A monopolist produces widgets at a constant unit cost of \$2 per unit. The monopolist cannot sell the widgets itself, but has to work through a retailer instead. The retailer incurs no costs other than the price  $p_M$  it has to pay the monopolist for every widget. The demand for widgets is  $D(p_R) = 14 - p_R$ , where  $p_R$  is the price set by the retailer.

- (a) Determine the optimal prices  $p_M$  and  $p_R$ , and the corresponding profits  $\pi_M$  and  $\pi_R$ .
- (b) Show that if the monopolist engaged directly in the retail business, its profit would exceed the sum  $\pi_M + \pi_R$  of part (a)
- (c) Suppose now that the monopolist can also charge the retailer a franchise fee  $F$  in addition to the per-unit price  $p_M$  (so, this is a two-part tariff). Determine  $p_M$ ,  $p_R$  and  $F$ , and compare  $M$ 's profit to that in part (a).