

Final Exam
Principles of Economics for Scientists
Caltech/Coursera
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Question 1.

- Consider a competitive market with 1000 identical consumers and 10 identical firms. Each consumer utility function is given by

$$U(q, m) = A \log(q) + m,$$

with $A > 0$, where q denotes the quantity sold in the market. Each firm has a cost function given by

$$c(q) = \frac{q^2}{2}.$$

- QUESTION: Compute the equilibrium profits for EACH firm at the competitive equilibrium.

Question 2

- Consider the same competitive market described in Question 1, and assume that $A = 3$.
- Suppose the the government introduces a tax of \$10 p/unit sold on consumers and also a tax of \$ 10 p/unit sold on firms.
- QUESTION: Compute the equilibrium deadweight-loss in this case.

Question 3

- Consider the same market setting of Question 2, and assume that all of the firms are owned by individuals who are NOT consumers in the market, and that all tax revenues are returned to consumers using an identical lump-sum transfer.

- QUESTION: Suppose that consumers are asked to vote in a local election about whether or not they favor the introduction of the taxes versus having no taxes at all. Would the consumers favor or oppose the policy?

Question 4

- Consider the same setting as in Question 1, with $A = 3$. But, assume that the consumption of good q generates a negative externality in other consumers. In particular, assume that the total level of the externality e is equal to q_{total} , where q_{total} denotes the total amount consumed in the market, and that the damage experienced by EACH consumer is given by

$$\frac{e^2}{20000}$$

- QUESTION: What is the optimal Pigouvian tax (imposed on consumers) in this market?

Question 5

- Consider the same setting as in the previous question, including the shape and presence of the externalities.
- Now suppose that the government uses as permit market, instead of Pigouvian taxes, to address the externality problem. In particular, suppose that the government issues $100\sqrt{3}$ unites of permits, which are sold to consumers, and that each permit allows the consumer holding it to consumer one unit of good q .
- QUESTION: What is the DWL in this case?

Question 6

- Consider a market in which aggregate demand for good q is driven by

$$q_{mkt}^D = 1000 - p.$$

- Suppose that any firm producing in this market has a constant marginal cost of \$100/unit, and no fixed or semi-fixed costs. Suppose also that the consumption of good q generates a negative externality on consumers, and that the total damage generated when q units are consumed in the market is given by

$$\frac{q^2}{2}.$$

- QUESTION: In which of the following two scenarios is the deadweight loss LARGER, monopoly or perfect competition?