Principles of Economics I
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Problem Set 4 (Due October 9, 2020)

1. Consider the labor discipline model covered in class. According to the model, workers supply (extra) effort to make sure that they can keep a job that generates an employment rent. Explain in a few words how the following factors affect employment rent.
   (a) Unemployment benefits paid for a shorter duration of time.
   (b) Announcement that the plant where you work currently will close after six months.
   (c) A decline in the demand for the product that your company sells
   (d) The departure of your boss.

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2. Classify the following expenditures in a firm as fixed costs or variable costs. The answers that you give may depend on the time horizon that you have in mind.
   (a) R&D investments to come up with a new pharmaceutical.
   (b) Advertising campaign on conventional or social media.
   (c) Renting the premises for a summer cafe in a park.
   (d) Employing workers to the cafe on a fixed wage contract for the whole summer.
   (e) Hiring temporary help for the cafe on sunny days.

3. In this exercise, you are invited to think a bit more about the price elasticity of demand.
   (a) Consider the demand for oil in any given month. Is this likely to be elastic or inelastic?

(b) What about the demand for oil over a longer horizon (over a span of ten years). Explain any differences that you may have in your first two answers.

(c) What happens to the elasticity of pulled corn (nyhtökaura) as more meat-like vegetarian products enter the market?

(d) Fair trade coffee versus the mainstream coffee brands. Compare the price differences at your local supermarket to the premium that fair trade producers get for their beans. What do you conclude abot the demand elasticities?

(e) In Figure 7.19 of the textbook, the reported price elasticity of Snacks and candy is 0.295 from a study based on demand observations in scanner data. On p.302 and in the lecture notes, we have seen that at profit maximizing prices, the markup (a number between 0 and 1) should be equal to the inverse of the elasticity. Stores can set their prices. Should we conclude that they are not profit-maximizing or can you give other explanations?

4. This exercise lets you construct demand curves for different populations of consumers. Imagine that each consumer chooses whether to buy the product or not and her willingness to pay (wtp) is denoted by v.

(a) There are 100 consumers. The consumers are anonymous, but we use numbers for their names. Consumer 1 has wtp $v_1 = 198$, consumer 2 has wtp $v_2 = 196$, and in general consumer i has wtp $200 - 2i$ so that $v_{100} = 0$. Construct the demand curve, i.e. for each Q, find price (or prices) P such that the number of consumers with wtp at least P is Q.

(b) Compare the demand curve you obtained in part a. to the line $P(Q) = 200 - 2Q$ in the (Q, P) -coordinate system. Compute the marginal revenue curve for this continuous demand curve.

(c) For the rest of this exercise, we use continuous demand curves, but you should interpret them with part a. in mind. Consider another demand curve for another population of size 100 given by $P(Q) = 150 - Q$ if $Q \leq 100$ and $P(Q) = 0$ for $Q > 100$. Notice that the willingnesses to pay in this case are more concentrated in this population than in part a. but the average wtp is the same.

Compute the marginal revenue curve (again as a function of Q) for this population.

(d) For any A with $A > 100$ and $A < 200$, consider the demand curve $P_A(Q) = A - \frac{A-100}{100}2Q$ for $Q \leq 100$ and $P_A(Q) = 0$ for $Q > 100$. Compute the marginal revenue curve for this demand. What is the economic meaning of the case when $A = 100$?

5. Consider next cost functions and profit maximization in the populations described in the previous exercise. Consider the case of constant marginal costs, i.e. the case where the cost function is $C(Q) = F + cQ$, where F is the fixed cost of production and c is the marginal cost of producing an additional unit.

   (a) Compute the profit maximizing Q for the demand curves given in parts b. and c. of the previous exercise for numerical values $F = 800$ and $c = 5$. Compute also the associated prices and profits. For which population is the profit larger? How does your answer change if $F = 1200$?

   (b) Assume next that the product has a much larger marginal cost $c = 40$ and a much lower fixed cost $F = 100$. Which market has a higher profit at this marginal cost?

   (c) Suppose now that $F = 0$ and find the values of c for which selling to the population in part b. is more profitable than selling for the population of part c. in the previous exercise. Can you explain this in economic terms (keep in mind that the average wtp is the same in the two populations but the differences in wtp's are smaller in the population of part c.)

   (d) (Extra credit) Compute the optimal sales quantity when $F = 0$ for the general case where $P_A(Q) = A - \frac{A-100}{100}2Q$ and $C(Q) = cQ$. Will you always find a quantity where $MR(Q) = MC(Q)$? If not, what is the optimal Q in this case. Hint: You cannot find numerical solutions for Q and P in this case, but you can solve for Q in terms of the parameters A and c of the model.