Principles of Economics I
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Problem Set 4 (Due October 6, 2023)

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) In Finland, your unemployment benefit depends on your previous salary and the duration of your previous working spell. If you worked for a minimum six months, your benefit when laid off is a percentage of your most recent salary (this is a somewhat simplified exposition of the actual rules). Otherwise you get the lower basic compensation. How does a change to a one-year minimum duration affect your employment rent?

   (b) A new training program that diversifies your working skills so that you can work in different job tasks.

   (c) Development of a strong competing product (e.g. electric cars) for the product of your company (e.g. combustion engine cars).

   (d) Getting close to retirement age (at constant wages per year). Discuss the effect of different pensions systems on this. You can e.g. base your discussion the Finnish system as explained in this link.

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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) Setting up the research laboratory to come up with a COVID vaccination.

   (b) Hiring famous actors to promote your new mobile game.

   (c) Renting the premises for a summer cafe in a park.

   (d) Hiring temporary help for the cafe on sunny days.

3. 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 $P(Q) = 125 - 0.5Q$ 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) Consider a firm with a constant marginal cost $c = 10$ and fixed cost F so that $C(Q) = F + 10Q$ if $Q > 0$ and $C(Q) = 0$ if $Q = 0$. The demand function is given by $P(Q) = 125 - 0.5Q$. Is there a level of production with $MC(Q) = MR(Q)$? What is the optimal price and quantity for the firm?

4. A firm residing in Finland sells software licences in two segments: professionals and students in Finland. The professionals have a higher willingness to pay and their demand curve is given by $P(Q) = 200 - 2Q$. The demand curve in the student market is given by $P(Q) = 100 - Q$.

   (a) The marginal cost of selling another licence is negligible so you can assume it to be zero. How would the firm set prices and quantities if it is possible to set different prices in the two segments e.g. by asking for a student id number?

   (b) Suppose first that the firm expands to Sweden with exactly the same populations of professionals and students as in Finland.

Compute the new demand curves for professionals and students respectively in the market comprising both countries. How do the optimal prices for the two markets compare to part a.?

(c) Suppose next that the firm sells only in the Finnish market. If the professionals can get a student id for free or if students can resell their licence, it is not possible to set different prices in the different markets. Compute the demand curve for the Finnish market consisting of both students and professionals. What is the optimal (single) price for this combined market?

(d) Suppose that Finland adopts a policy of expanding international education and the student population doubles while the professional market is unchanged. Assume that the new students have the same demand for the product as the students in Finland. What happens to the optimal price in the combined single market consisting of Finnish professionals and Finnish and international students)?