ECON4820 – Strategic Competition, Postponed exam, spring 2022

Problem 1 – the Bertrand paradox (25%)

In class we have discussed the *Bertrand paradox*, which is about the unique Nash equilibrium in the classical model where two firms who both sell a perfectly homogeneous good (perfect substitutes) and compete in prices. Assume that the two firms share the same marginal cost.

a)

Explain the paradox in your own words. What is the equilibrium, and why is it unique?

In class we have discussed three different extensions of the model, that all lead to a different price equilibrium. The three extensions are i) capacity constraints, ii) imperfect substitutes, and iii) search costs/imperfectly informed consumers.

b)

Explain why the equilibrium is no longer the same as in problem a) when firms are capacity constrained.

c)

Explain why the equilibrium is no longer the same as in problem a) if the goods provided by the firms are imperfect substitutes.

d)

Explain why the equilibrium is no longer the same as in problem a) if there are search costs/the consumers are imperfectly informed.

e)

What is the common theme connecting problems b, c and d?

Problem 2 – Vertical relationships (25%)

In real life, we observe many contracts that do not rely exclusively on linear prices (a constant per-unit price). In class, we argued that one reason for this is the poor performance of the linear price contracts in certain vertical relationships.

a)

Explain the equilibrium when a monopolist manufacturer sells his goods wholesale to a monopolist retailer, using a linear price contract. Why is the outcome undesirable?

b)

Explain how a two-part tariff (the franchise model) solves this problem.

We are still in a model with a monopolist manufacturer and a monopolist retailer. Explain what we mean by downstream service provision. *What additional problems arise when sales of the good depend on such service provision? Does a two-part tariff solve this new problem as well?*

Explain what additional problems arise for the manufacturer when he sells his goods wholesale to more than one retailer, but sales still depend on downstream service provision. Can you think of any interventions the manufacturer can undertake in order to improve on the outcome under linear price contracts?

Problem 3 – Horizontal product differentiation (50%)

In this problem we assume that products and consumers are located at different points along the real line $[0,1]$. Assume further that if a consumer of type x buys product i at location l_i, then she derives utility $v_{i(x)} = r - \tau(x - l_i)^2 - p_i$. Further, assume that firm i has a constant marginal production cost c_i, which might differ between the firms.

a) *Explain what the parameters r and τ measure, and how we should interpret them.*

b) *Explain what we mean by the indifferent consumer and show that she will be located at $\hat{x} = \frac{l_1 + l_2}{2} - \frac{p_1 - p_2}{2\tau(l_2 - l_1)}$.*

c) *We imagine a game taking place in two stages; first the firms choose locations on the line $[0,1]$, then the locations become common knowledge and the firms compete in prices. In this exam, we are only concerned with the second-stage price equilibrium as a function of the pair of locations. Derive this price equilibrium!*

d) *What will the equilibrium price be if $c_1 = c_2 = c$, and either $l_1 = l_2$ or $\tau = 0$? What kind of an equilibrium is this?*

e) *Consider again this second-stage price equilibrium and general locations l_1 and l_2. If firm 1 gets a lower marginal cost, what happens to the price that firm 1 and firm 2 charges, respectively? Does the response depend on the locations of the two firms? Derive and explain!*

f) *In this final problem assume that the two firms are located symmetrically, i.e. equally far from their respective extremes. This means that if $l_1 = a$, then $l_2 = 1 - a$, and consequentially that $l_1 + l_2 = 1$. Define the distance between them to be L, i.e. $L = l_2 - l_1 \in [0,1]$. When firm 1 gets a lower marginal cost, how does that move the equilibrium location of the indifferent consumer? How does the answer depend on τ and on the distance between the firms?*