Justus Liebig University Giessen
Faculty 02 - Economics and Business Studies
Chair VWL I

Competition Policy and Strategy
Assignment 10

Exercise 10.1 (**Information Exchange**)
Assume the following situation: In a market with differentiated goods, two firms compete in Bertrand competition. Both duopolists know the market demand. This is $q_i(p_i, p_j) = 110 - p_i + 0.5p_j$. The marginal costs of firm 2 are common knowledge. The marginal costs of firm 1 are known only to the firm itself.

a) Calculate the market equilibria for $c_L = 10$ and $c_H = 40$ when Bertrand duopolists have perfect information regarding the realization of costs.

b) Calculate the reaction function of firm 1 and 2 in general if the cost of firm 1 (c_L or c_H) from the point of view of firm 2 is each realized with probability 50%. The cost for firm 2 is c_2.

c) Determine the prices of the companies for

   i. $c_2 = c_L$

   ii. $c_2 = c_H$.

   Plot the response functions on a graph.

d) Compare the equilibrium prices and profits of firms 1 and 2 under full information (see a.) with those under uncertainty. Assume that firm 2 has low costs with $c_2 = c_L$.

e) Assume that companies can exchange information with each other before interacting in the market. What incentives arise? Consider the following cases:

   i. The information is verifiable and

   ii. The information is not verifiable.

Exercise 10.2 (Research & Development)
In a duopoly, the profit of the two firms 1 and 2 in the sales market depends on their constant marginal costs (c_1 and c_2). The profit for firm $j \in \{1, 2\}$ is

$$\pi_j = 50 - 3c_j + c_i.$$

The two companies spend the amount $0.5k_1^2$ and $0.5k_2^2$ on R&D activities, respectively. The unit cost of company j then is

$$c_j = 5 - k_j - \beta k_i,$$

where β represents a so-called (output) spillover.

a) Determine the research intensities k_1 and k_2 of the two firms when competing against each other in R&D. In other words, the firms determine their desired level of cost reduction, taking into account their competitor's decision. Calculate the firms' profits and their marginal costs in equilibrium for $\beta_{NC} = \frac{1}{4}$. What is the effect of changing the spillover parameter β on a firm's optimal research intensity? Interpret your answer in economic terms.

b) The firms now agree on the level of their respective research intensity so that the joint profit is maximized. Calculate the firms' profits and their marginal costs for $\beta_{NC} = \frac{1}{4}$. What is the minimum spillover parameter β such that firms invest more in R&D in the presence of such coordination than they would in the absence of such coordination? Interpret your answer in economic terms.

c) Now assume that the firms enter into a research collaboration, which increases the spillover parameter to $\beta = 0.4$. Calculate the firms' profits and their marginal costs. How high must β_{RC} be for the research cooperation to increase the firms' research intensity?