

# Practice problem set 21

## Market structure

This problem set constitutes recommended material for the relevant lab. The choice of tasks to be presented instructionally in every lab is in the discretion of the individual teacher. Students are expected to work on practice problems, however, are not required to submit written solutions. It is non-negotiable policy in this course to not provide hand-outs with the solutions of practice problem sets.

1. Suppose there are three identical firms thinking about entering a market in which there is no incumbent firm. There is a small but positive cost of entry  $F$ . The product is homogeneous, with inverse demand  $p = 1 - Q$ , where  $Q$  is aggregate quantity. Unit cost is zero.
  - (a) Suppose the firms compete in prices if they enter. Determine the number of firms that enter, and compute the equilibrium price and profits per firm.
  - (b) Suppose that firms compete in quantities if they enter. Determine the number of firms that enter, and compute the equilibrium price and profits per firm.
  - (c) How does the equilibrium in (b) change if  $F = 1/10$ ?
  - (d) Comment more generally, and with reference to empirical evidence, on how the equilibrium level of concentration depends on the size of the sunk cost and the intensity of price competition.

*UoL: 2002 za / 2006 zb*

2. Consider a market where  $N$  symmetric firms produce a homogeneous product and compete by simultaneously setting quantities. The inverse demand function is given by  $P = a - Q$ , where  $Q$  is the total quantity produced. The marginal cost of production is constant and equal to  $c$  for all firms. Derive the aggregate quantity produced at the Cournot-Nash equilibrium. Then derive the equilibrium price, the equilibrium profit for each firm, and the equilibrium industry profit, and show that all three are decreasing in  $N$ .

*UoL: 2004 za / 2008 za*

3. Consider a market with demand function  $Q = 1 - P$ . There are  $N \geq 4$  firms with zero costs and  $M > 0$  firms with average and marginal costs equal to  $c > 0$ .
  - (a) How does the four-firm concentration ratio depend on  $c$  if firms compete by *simultaneously setting prices*?
  - (b) How does the four-firm concentration ratio depend on  $c$  if firms compete by *simultaneously setting quantities*?
  - (c) Based on your answers to (a) and (b), briefly comment on the impact of the *intensity of price competition* and *cost differentials* on the industry concentration.
  - (d) A regulator's objective function ( $W$ ) is a weighted sum of the aggregate firms' profit ( $\Pi$ ) and consumer surplus ( $CS$ ) such that  $W = \lambda\Pi + (1 - \lambda)CS$ , where  $0 \leq \lambda \leq 1$ . Substitute the equilibrium values of  $\Pi$  and  $CS$  into the regulator's objective assuming that firms compete by *simultaneously setting quantities*.
  - (e) *One* of the  $N$  firms with zero costs intends to acquire *all* of the  $M$  firms that have positive costs. For which values of  $\lambda$  would the regulator permit this transaction and *why*?

*Final exam – April 2017*

4. Consider an industry in which firms, first, decide freely if they will enter at cost  $f > 0$  and, then, they compete with respect to prices without being able to collude. Assume that the final equilibrium profit for each firm depends on the number of firms,  $N$ , and the size of demand,  $S$ . Calculate the equations of the comparative statics for  $N$  and  $S$  and explain their sign.

*End-module 3 test – March 2016*

5. Consider the following expression

$$dN^* = \left( d\Pi_i - \frac{\partial \Pi_i}{\partial S} dS - \frac{\partial \Pi_i}{\partial t} dt \right) / \frac{\partial \Pi_i}{\partial N} = df / \frac{\partial \Pi_i}{\partial N}$$

- (a) Explain what this double equality is about and how is derived.  
 (b) Calculate the comparative statics with respect to  $t$  and infer on its meaning.

*Final Exam – 2015*

6. Consider an exogenous sunk cost industry with  $N$  firms where equilibrium profit of firm  $i$ , is denoted by  $\Pi_i(N, S, t)$ , where  $S$  is the intercept of the market demand and  $t$  is the slope of the representative firm's reaction function. Firms abort entrance if profit does not exceed the sunk cost.

- (a) Compute the differential with respect to  $N$ .  
 (b) Prove mathematically that at equilibrium an increase in  $t$  will decrease  $N$ .  
 (c) Provide the economic reason why an increase in  $t$  will decrease  $N$ .

*Final exam – April 2017*

7. A researcher has estimated a model of industry profitability using cross-industry data and has found a positive coefficient on the concentration variable. He claims that the results show that higher concentration leads to higher industry profit. What is the theoretical basis for this claim? Do you agree with this conclusion? What would your advice be to a policy maker worried about the high level of concentration in many industries?

*UoL: 2002 za / 2006 zb / 2011 za*