Exercise 4: Perfect Competition

Problem 1 (*Competitive Equilibrium*)

Consider a perfectly competitive market in the long run. Market demand is

$$Q^D(p) = a - p,$$

where $p \geq 0$ denotes market price, and $a > 0$. The market is served by $n \in \mathbb{N}$ identical profit-maximizing firms. Each firm has total costs of

$$C(q) = \begin{cases} c^f + q^2, & q > 0 \\ 0, & q = 0, \end{cases}$$

where $c^f > 0$ denotes quasi-fixed costs, and $q \geq 0$ denotes output of the respective firm.

(a) Determine the equilibrium number of firms as a function of a and c^f.

(b) Calculate the number of firms and profit per firm in equilibrium for

(i) $a = 120$ and $c^f = 100$,

(ii) $a = 120$ and $c^f = 64$,

(iii) $a = 126$ and $c^f = 100$.

Assume now, a tax at the rate $t \geq 0$ per unit of output is levied on producers.

(c) Determine the equilibrium number of firms as a function of a, c^f, and t.

(d) Calculate the number of firms, profit per firm, tax revenue, and the welfare loss of taxation in equilibrium for $a = 126$, $c^f = 100$, and $t = 6$.

Problems 2-6: (*Competitive Equilibrium*)

Consider a perfectly competitive market in the long run. Market demand is

$$Q^D(p) = 125 - p,$$

where $p \geq 0$ denotes market price. The market is served by $n \in \mathbb{N}$ identical profit-maximizing firms. Each firm has total costs of

$$C(q) = \begin{cases} 25 + 20q + \frac{1}{4}q^2, & q > 0 \\ 0, & q = 0, \end{cases}$$

where $q \geq 0$ denotes output of the respective firm.

Problem 2

The equilibrium number of firms is

(A) 5.

(B) 10.

(C) 15.

(D) 20.

Problem 3

In equilibrium,

(A) consumer surplus is 7,500.

(B) consumer surplus is 5,000.

(C) producer surplus is 2,500.

(D) producer surplus is 0.

Problem 4

The introduction of a price ceiling at $p' = 20$ results in a welfare loss of

(A) 0.

(B) 250.

(C) 5,000.

(D) 5,250.

Problem 5

The introduction of a price floor at $p'' = 20$ results in a welfare loss of

(A) 0.

(B) 250.

(C) 5,000.

(D) 5,250.

Problem 6

If each firm receives a lump-sum subsidy of $S = 24$ whenever quasi-fixed costs arise, the equilibrium number of firms is

(A) 13.

(B) 26.

(C) 39.

(D) 52.