Problem Set #2

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Question 1

(a) Using the demand function, (1), we can solve:

$$\frac{dQ}{dP}\frac{P}{Q} = -\frac{1}{a_1}\frac{a_0 - a_1 Q + \nu}{Q} = 1 - \frac{a_0 + \nu}{a_1 Q}$$

(b) A Cournot equilibrium with homogenous firms is characterized by:

$$\frac{dC}{dq} - \frac{Q}{N}\frac{dP}{dQ} = P$$

Solving for Q^* and P^* with a fixed N and F yields:

$$Q^* = \frac{b_0 - a_0 + \eta + \nu}{2b_1 - \left(\frac{1}{N} + 1\right) a_1}, \qquad P^* = a_0 - \frac{b_0 - a_0 + \eta + \nu}{2\frac{b_1}{a_1} - 1/N - 1} + \nu$$

Letting $b_1 = 0$,

$$Q^* = \left[\frac{b_0 - a_0 + \eta + \nu}{(N+1)a_1}\right] N, \qquad P^* = a_0 + \left[\frac{b_0 - a_0 + \eta + \nu}{1 + N}\right] N + \nu$$

(c) N/A

(d) Using the values calculated above, we can calculate the Lerner index, L_I, and Herfindahl index, H, as follows:

$$\begin{aligned} L_I &= -1/\varepsilon = -\left(1 - \frac{a_0 + \nu}{a_1 Q^*}\right)^{-1} = \frac{a_1 Q^*}{a_0 + \nu - a_1 Q^*} \\ &= \left(\frac{b_0 - a_0 + \eta + \nu}{a_0 + \nu - (b_0 - a_0 + \eta + \nu)\frac{N}{N+1}}\right)\frac{N}{N+1} \\ &= \left(\frac{b_0 - a_0 + \eta + \nu}{(2a_0 - b_0 - \eta)N + a_0 + \nu}\right) N \\ H &= \sum_{i=1}^{N}\left(\frac{q^*}{Q^*}\right)^2 = \sum_{i=1}^{N}\frac{1}{N^2} = \frac{1}{N} \end{aligned}$$

(e) Equilibrium elasticity is:

$$\varepsilon^* = \frac{(b_0 + \eta - 2a_0)N - a_0 - \nu}{(b_0 - a_0 + \eta + \nu)N}$$

Thus, we can calculate:

$$\frac{\partial \varepsilon^*}{\partial F} = 0$$
$$\frac{\partial \varepsilon^*}{\partial \nu} = \frac{-(b_0 - a_0 + \eta + \nu)N - [(b_0 + \eta - 2a_0)N - a_0 - \nu]N}{(b_0 - a_0 + \eta + \nu)^2 N^2}$$
$$\frac{\partial \varepsilon^*}{\partial \eta} = \frac{(b_0 - a_0 + \eta + \nu)N^2 - [(b_0 + \eta - 2a_0)N - a_0 - \nu]N}{(b_0 - a_0 + \eta + \nu)^2 N^2}$$

(f)

(g)

Question 2

(a)

(b)

(c)

(d)

(e)

(f)

Question 3

(a)

(b)

(c)