Empirical IO Homework

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Question 1

We write the utility function of consumer $i \in \{1, \ldots, I\}$, for good $j \in \{1, \ldots, J\}$ as

$$U_{ij} = \zeta_j - \alpha_i p_j + \epsilon_{ij} \tag{1}$$

where $I = 2000, J = 4$.

We emphasize that consumer tastes $\zeta_j = \frac{j}{5}$ is homogeneous among consumers for each product j, price sensitivity α_i follows log-normal distribution and ϵ_{ij} individual taste shock is extreme value distributed.

Then we randomly draw α_i from aforementioned log-normal distribution and compute the prices of Bertrand Nash equilibrium, market shares and profits. Results are collected in Table 1.

Table 1: Benchmark Case

	Price	Market Share	Profit
Product 1	0.7198	0.098892	122.5872
Product 2	0.90939	0.087358	123.9411
Product 3	1.1028	0.079868	128.2329
Product 4	1.3008	0.07493	134.9956

Notes: Random generator is 2021.

Question 2

As we assume all goods will be sold through a single retailer with two part tariffs contracts with RPM offered simultaneously to that retailer who needs decide simultaneously to accept or reject with a zero profit outside option and the marginal cost of distribution is zero and wholesale prices are equal to the marginal cost of production, the firms capture full monopoly rents through fixed fees. In addition, the retailer face exogenous outside option where $\Pi^r = 0$

And we write first-order conditions of each firm j as follows

$$s_j(\mathbf{p}) + \sum_{k=1}^{J} (p_k - c_k) \frac{\partial s_k(\mathbf{p})}{\partial p_j} = 0, \quad \forall j \tag{2}$$

It turns out that the system can be viewed as a single firm with all goods. In other words, the ownership matrix can be written as

$$\begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1. \end{pmatrix}$$

we collect the results in Table 2. And we find naturally that profits and prices of each firm and product increase with enhanced monopoly power.

Table 2: Retailer Case

	Price	Market Share	Profit
Product 1	1.5014	0.050039	140.2461
Product 2	1.7498	0.046408	143.8451
Product 3	1.9836	0.044704	150.5309
Product 4	2.2065	0.04427	159.9508

Notes: Random generator is 2021.