Transparency and Competition

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Consumers search to minimize the expected cost of the good, i.e. the sum of the total search costs plus the expectde price. Given the distribution of prices given by $F^q(p)$ the expected price paid by a consumer who observes one price is $\int_0^{\tilde{p}} p dF^q(p)$ while the expected price of a consumer searching two times is $2\int_0^{\tilde{p}} p(1-F^q(p))dF^q(p)$. Thus, the expected gain from observing two prices instead of one is given by

$$\begin{aligned} V &= \int_0^{\tilde{p}} p dF^q(p) - 2\int_0^{\tilde{p}} p(1-F^q(p))dF^q(p) \\ &= -\int_0^{\tilde{p}} p f^q(p)dp - 2\int_0^{\tilde{p}} pF^q(p)f^q(p)dp \end{aligned}$$

Integration by parts yields

$$\begin{aligned} V &= -\left[pF(p)\right]_0^{\tilde{p}} + \int_0^{\tilde{p}} F(p)dp + \left[pF(p)^2\right]_0^{\tilde{p}} - \int_0^{\tilde{p}} F(p)^2 dp \\ &= \int_0^{\tilde{p}} F(p)dp + - \int_0^{\tilde{p}} F(p)^2 dp \end{aligned}$$

as $[pF(p)]_0^{\tilde{p}} = [pF(p)^2]_0^{\tilde{p}}$ since $F(0) = 0$ and $F(\tilde{p}) = 1$. We use that

$$\begin{aligned} \int_0^{\tilde{p}} pF^q(p)f^q(p)dp &= \left[pF(p)^2\right]_0^{\tilde{p}} - \int_0^{\tilde{p}} (F(p) + pf(p))F(p)dptextrm(byintegrationbyparts) \\ &= \left[pF(p)^2\right]_0^{\tilde{p}} - \int_0^{\tilde{p}} F(p)^2 dp - \int_0^{\tilde{p}} pf(p)F(p)dp \end{aligned}$$

such that

$$2\int_0^{\tilde{p}} pF^q(p)f^q(p)dp = \left[pF(p)^2\right]_0^{\tilde{p}} - \int_0^{\tilde{p}} F(p)^2 dp$$

A consumer will choose to search twice if $V(q) > c$ and will be indifferent between observing one or two prices only if $V(q) = c$. As argued above no equilibrium exists where all consumers search twice, hence, in equilibrium prices will be distributed such that $V(q) = c$.

Market Equilibrium with Noisy Sequential Search

Sequential search is when a consumer pays c to observe a price whereafter he chooses whether to shop at the lowest price observed to date or whether to search again. When the search is noisy the consumer observes an unknown number of prices each time he search. Although the consumer does not know how many prices he will observe he knows that k prices are observed with probability Q_k, $k = 1, 2, ...$, and $\sum_{k=1}^{\infty} Q_k = 1$.

A consumer will search as long as the cost from searching is lower than the expected gain from searching another time. Let z be the price where the consumer is indifferent between searching again and accepting the current lowest price. If the lowest price a consumer has observed is higher than z, the consumer will search again.[1] That is, z becomes the effective reservation price. Hence, no firm will set prices higher than z in equilibrium since there will be no sale here. As a consequence, no consumer will search more than once, and, hence, a share q_1 of the consumers will know only one price. This is the necessary condition for the exsistence of a dispersed price equilibrium. The q_1 consumers will be uninformed about prices while the rest of the consumers will know two or more prices, and the equilibrium will be similar to the one derived in section **??**. If $q_1 = 1$ the monopoly price equilibrium is the only possible equilibrium, since all consumers will be uninformed. As all firms charge the monopoly price, no consumer is tempted to engage in a second search. If $q_1 = 0$ all consumers know at least two prices and the only possible equilibrium is the competitive equilibrium. Note that since q_1 is a parameter and not generetad endogenously when search is sequential, a firm can not raise its price without loosing all customers.[2] For $0 < q_1 < 1$ a dispersed price equilibrium exists. The intuition is similar to the one in **?** described in section **??**. If all firms set the monopoly price $\tilde{p}$ a deviating firm could increase profits by setting $\tilde{p} - \epsilon$ loosing only little on type 1 consumers while winning all visiting consumers who have also observed other prices. If all firms are charging the competitive price r, a deviant could increase his price making a positive profit on type 1 consumers. Thus, we do not need consumers to be informed about all prices in order to arrive at an equilibrium similar to the one in **?**. Partly informed consumers in combination with uninformed consumers is sufficient.

[1]Naturally, $z \leq \tilde{p}$ before any market can exist

[2]With nonsequential search we saw that there consumers would only search once if all firms were charging the competitive price. This made it possible for firms to increase prices slightly to make a positive profit.