Introduction to Industrial Organization
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Lecture Note 13

Price discrimination (ch 10)-2nd price discrimination-continue

How can the monopolist discriminate between θ_H and θ_L?

1. If first or third degree price discrimination is possible, problem is easy.

   Set $p_L = p_H = c$ (marginal cost) in order to get both types to consume the efficient amounts. The extract all surplus via the fixed fee.

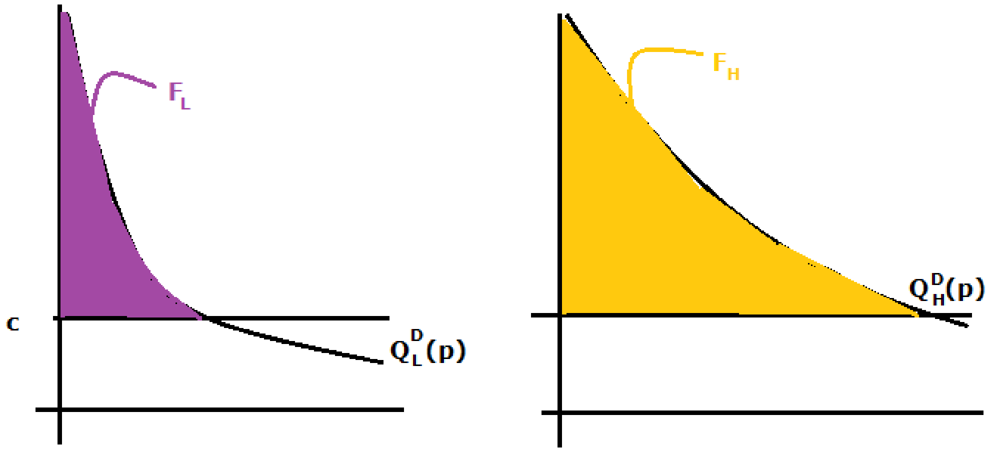

Figure 10.e10 Fixed fee in for two types of consumers

2. If first or third degree price discrimination not possible, firm can engage in 2nd price discrimination. Will design two plans (F_L, p_L) for θ_L and $((F_H, p_H)$ for θ_H types. These two plans must satisfy the same for constraints that Starbucks faces when designing its coffee products.

   1) $\theta_H \ln(q_H^*(p_H)) - p_H q_H^*(p_H) - F_H \geq 0$

   2) $\theta_L \ln(q_L^*(p_L)) - p_L q_L^*(p_L) - F_L \geq 0$

   The two expressions above means that θ_H and θ_L must get utility >=0

   3) $\theta_H \ln(q_H^*(p_H)) - p_H q_H^*(p_H) - F_H \geq \theta_H \ln(q_H^*(p_L)) - p_L q_H^*(p_L) - F_L$

   4) $\theta_L \ln(q_L^*(p_L)) - p_L q_L^*(p_L) - F_L \geq \theta_L \ln(q_L^*(p_H)) - p_H q_L^*(p_H) - F_L$

   The two expressions above means that θ_H must prefer (F_H, p_H) to (F_L, p_L) and

θ_L must prefer (F_L, p_L) to (F_H, p_H).

The firm's profits will be

$$\pi = \max_{F_H, p_H, F_L, p_L} \{F_L + F_H + p_H q_H^*(p_H) + p_L q_L^*(p_L) - c q_H^*(p_H) - c q_L^*(p_L)\}$$

This problem can easily be transformed in such a way that it looks identical to Starbuck's:

$$\text{Let } \widetilde{p_H} = F_H + p_H q_H^*(p_H)$$

$$\widetilde{p_L} = F_L + p_L q_L^*(p_L)$$

$$\widetilde{q_H} = \frac{1}{p_H}$$

$$\widetilde{q_L} = \frac{1}{p_L}$$

Firm's problem is now

$$\pi = \max_{\widetilde{p_H}, \widetilde{p_L}, \widetilde{q_H}, \widetilde{q_L}} \{\widetilde{p_H} + \widetilde{p_L} - c\widetilde{p_L} - c\widetilde{q_L}\}$$

such that

$$\theta_H \ln(\widetilde{q_H}) - \widetilde{p_H} \geq -\theta_H \ln\theta_H$$
$$\theta_L \ln(\widetilde{q_L}) - \widetilde{p_L} \geq -\theta_L \ln\theta_L$$
$$\theta_H \ln(\widetilde{q_H}) - \widetilde{p_H} \geq \theta_H \ln(\widetilde{q_L}) - \widetilde{p_L}$$
$$\theta_L \ln(\widetilde{q_L}) - \widetilde{p_L} \geq \theta_L \ln(\widetilde{q_H}) - \widetilde{p_H}$$

So the solution will be the same.

1) Low types set no utility
2) High types indifferent between (F_L, p_L) and (F_H, p_H).
3) Can prove that $p_H = c$ and $p_L > c$ and $F_H > F_L$.

Graphically, we can plot out the two plans.

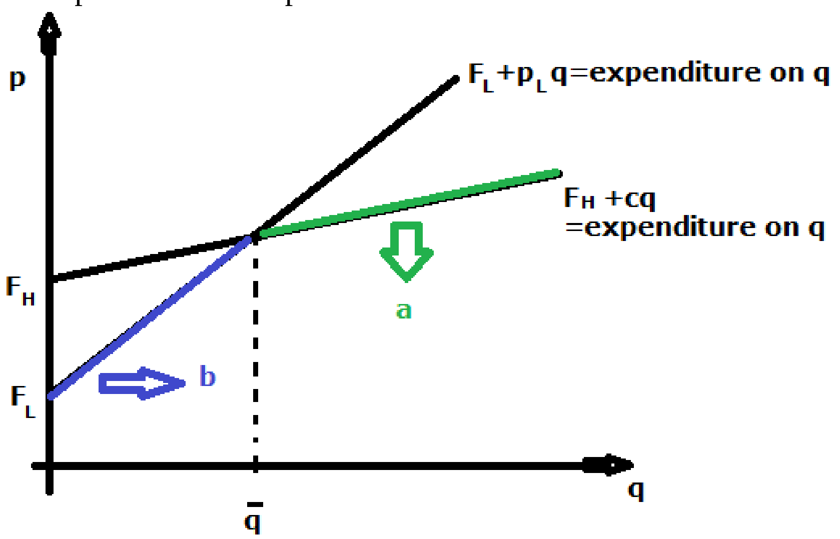

Figure 10.e11 Monopolist 2nd price discrimination

The high types will prefer a bundle along “a”. The low type will prefer a bundle along “b”.

Let other consumption=income-expenditure on q. Then we can plot our results using indifference curves. See Figure 10.e12.

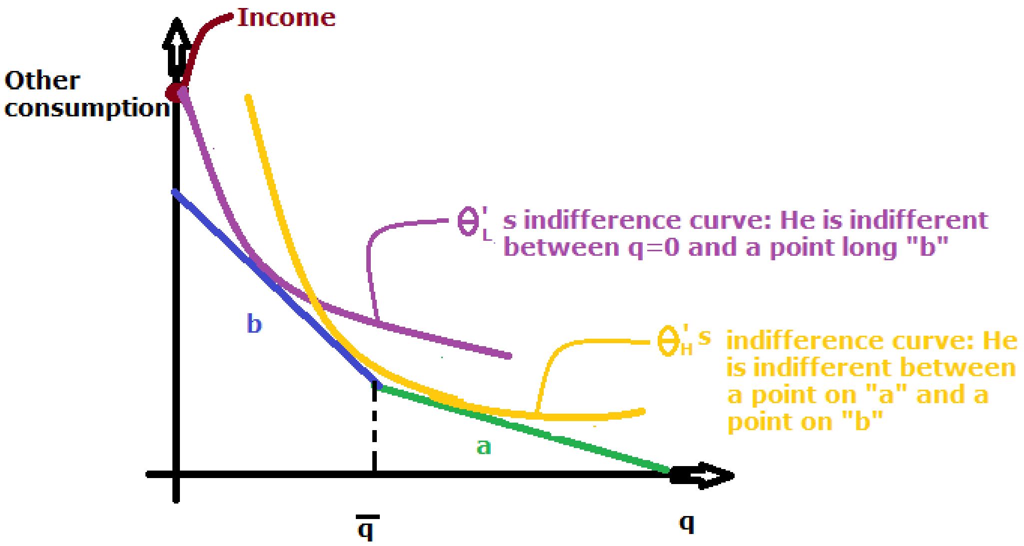

Figure 10.e12: Monopolist 2nd price discrimination-indifference curves

Finally,

- Our model does a good job of duplicating real world two part tariff.
- Zipcar offers two plans.

$$\begin{cases} F_H = 0, p_H = \$6.30 \text{ for } \theta_H \\ F_L = 60, p_L = \$7 \quad \text{ for } \theta_L \end{cases}$$

- If $\theta_H = 45, \theta_L = 26,$ and $c = 2.51$ or mdoel prodicts $F_H = 59.71, F_L = 0.66, p_L = 9.32, p_H = 6.61$

Since we have now finished price discrimination, it shall be interesting to see more on how economists analyze real questions on price discrimination. A short article or a paper (possibly on “theater on broadway”) will be discussed in the rest of the class.