Industrial Organization, Week 6
Advertising

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Agenda

Advertising plan

- Plan: We look at advertising today
- This is more of applied IO, we have the main theory under our belts
- Persuasive model and informative model under monopoly
- Competition with advertising

How do we model advertising?

$$Q_p \equiv \frac{\partial Q}{\partial p} < 0; Q_p \equiv \frac{\partial Q}{\partial A} > 0 \tag{1}$$

$$\Pi(p, A) = pQ(p, A) - C(Q(p, A)) - A \tag{2}$$

$$\frac{\partial \Pi}{\partial p} = (p - C')Q_p = 0 \leftrightarrow \frac{p - C'}{p} = -\frac{Q}{pQ_p} = \frac{1}{\eta_{Q,p}} \tag{3}$$

$$\frac{\partial \Pi}{\partial A} = (p - C')Q_A - 1 = 0 \leftrightarrow \frac{p - C'}{p} = \frac{1}{Q_A}\frac{1}{P} = \frac{Q}{AQ_A}\frac{A}{PQ} = \frac{1}{\eta_{Q,A}}\frac{A}{pQ} \tag{4}$$

$$\frac{1}{\eta_{Q,p}} = \frac{1}{\eta_{Q,A}}\frac{A}{pQ} \leftrightarrow \frac{A}{pQ} = \frac{\eta_{Q,A}}{\eta_{Q,p}} \tag{5}$$

So the monopolist sets their advertising expenditure as a function of the ratio advertising elasticity of demand and price elasticity of demand.

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Interpreting Advertising: Persuasive

- We can use hotelling to represent different valuations. Consumers on the hotelling map with the firm at 1.
- We can boost everyones valuation by advertising, let the willingness to pay be: $g(A)x$
- $Q(p, A) = 1 - \frac{p}{g(A)} \leftrightarrow \eta_{Q,p} = \frac{p}{g(A)-p}$
- Can also be interpreted as complementary

Interpreting Advertising: Informative

- The firm randomly sends advertising to N consumers hoping to inform them.
- The firm sends A messages, the consumers who have not received an ad is $(1 - \frac{1}{N})^A \approx e^{-\frac{A}{N}}$
- $Q(p, Q) = N(1 - e^{-\frac{A}{N}})d(p) \equiv G(A)d(p)$
- First derivative is positive, second derivative is negative.
- The price is not affected in this view.

Interpreting Advertising: Informative 2

- Information does not have to be about the product, it can be about the firm
- Signalling theory tells us it can also just be about costs.
- If the good product and bad product look identical, then a firm may advertise to differentiate.

The welfare effects are difficult

- Result 1: If price is not increasing in advertising, too little advertising is supplied by monopolist.
- Result 2: If the price is increasing in advertising, ambigous welfare effects.

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Hotelling with three types of consumers

- Fully informed consumers $\lambda_1\lambda_2$. Informed only about firm 1 $\lambda_1(1-\lambda_2)$
- $Q_1(p_1, p_2, \lambda_1, \lambda_2) = \lambda_1[(1-\lambda_2) + \lambda_2\overline{x}(p_1, p_2)]$
- If the good product and bad product look identical, then a firm may advertise to differentiate.
- To simplify assume that the advertising cost function is: $A(\lambda_i) = a\frac{\lambda_i^2}{2}$
- with $a > \frac{\tau}{2}$ to ensure not everybody is informed at equilibrium

Hotelling with three types of consumers 2

$$\Pi = (p_1 - c)Q_1(p_1, p_2, \lambda_1, \lambda_2) - A(\lambda_1) \tag{6}$$

$$\rightarrow \lambda_1 = \frac{1}{a}(p_1 - c)[1 - \lambda_2 + \lambda_2 \frac{1}{2\tau}(p_2 - p_1 + \tau)] \tag{7}$$

$$\rightarrow p_1 = \frac{p_2 + c + \tau}{2} + \frac{1 - \lambda_2}{\lambda_2}\tau \tag{8}$$

$$\rightarrow p = c + \frac{2 - \lambda^*}{\lambda^*}\tau \tag{9}$$

$$\rightarrow \lambda^* = \frac{2}{1 + \sqrt{\frac{2a}{\tau}}} \tag{10}$$

$$\rightarrow \pi_1 = \frac{2a}{(1 + \sqrt{\frac{2a}{\tau}})^2} \tag{11}$$

Hotelling with three types of consumers 3

- There is a zero sum aspect to advertising competition.
- Higher advertising costs lead more market power
- Firms prefer there to be higher advertising costs

Conclusion

- The effect of advertising is ambigous
- It is difficult to know if advertising informative or persuasive