Industrial Organisation

Lecture 9: More on advertising

Tom Holden
http://io.tholden.org/

Outline

- More on advertising:
  - Models.
  - Welfare.
  - Empirics.

- Reminder:
  - Additional reference for the advertising material: Bagwell (2005)

Informative advertising with free entry: Butters (1977) (1/3)

- There are a large number of firms, each of which can produce at most one instance of the same good, for a cost of c.
- There is no entry cost, but no one will buy from a firm unless they receive an advert from them.
- Sending an advert to one random consumer costs a. Each advert lists the firm's price.
- Consumers will buy from any firm that sends them an advert with a price below their valuation v.
- Consumers who receive adverts from multiple firms buy from the cheapest.

Informative advertising with free entry: Butters (1977) (2/3)

- If a firm sends an advert listing a price P, with some probability $X(P)$ it will be the cheapest advert that consumer receives, and they will make profits of $P - c$.
  - Thus total expected profits from sending an advert are $(P - c)X(P) - a$.
- Because there are a large number of firms (equivalently, no entry costs), each firm must make zero profits.
  - If there was a firm making positive profits, then I would want to send out adverts offering a price just below the one it had chosen.
  - But then my rival faces a lower probability of selling at his posted price, so must be making lower profits.
- Hence: $a = (P - c)X(P)$ for all P firms set, so $X(P) = \frac{a}{P-c}$.
  - Since $X(P)$ is a probability the price can never be below the level at which $1 = X(P) = \frac{a}{P-c}$, i.e. $P \geq a + c$.
  - Since no one will buy if $P > v$, no firm will advertise a price above v. But since $X(v) = \frac{a}{v-c} > 0$ there must be a probability $\frac{a}{v-c}$ that a consumer will only receive one advert, meaning firms can still sell at v.
  - Indeed, in equilibrium, there are firms setting a price at every point between $a + c$ and v.

Informative advertising with free entry: Butters (1977) (3/3)

- $X(P)$ looks a lot like the demand curve faced by each firm.
- Intuitively then, we might expect monopolistic-competition style distortions.

- In fact, this is efficient (welfare optimal).
  - Price is a transfer, so it's irrelevant.
  - The social benefit to reaching a new consumer (for sure) is $v - c$.
  - Thus the social benefit from sending another advert is $v - c$ times the probability that the consumer had not received any other adverts. But this probability is $\frac{a}{v-c}$, in equilibrium.
  - So social benefit to another ad equals the cost!
  - However, when consumers have heterogeneous valuations it may be shown that advertising is inadequate.

Advertising in oligopoly: Grossman and Shapiro (1984) (1/3)

- Two firms, Hotelling set-up, fixed locations (0 and 1), linear transport cost t, zero MC.
- Firm A (B) sends adverts to a proportion z_A (z_B).
- This costs them $\frac{r}{2}z_A^2$ ($\frac{r}{2}z_B^2$).
- Adverts are randomly distributed over consumers so, e.g. a proportion $(1-z_A)(1-z_B)$ receive no ads so do not buy.
- As in the standard Hotelling model, of those consumers who received two ads, the indifferent one is located at $x^* = \frac{1}{2} + \frac{p_B - p_A}{2t}$.
- Demand faced by firm A is then: $z_A(1-z_B) + z_A z_B x^*$.

Advertising in oligopoly: Grossman and Shapiro (1984) (2/3)

- So firm A's profits are: $z_A\left[(1-z_B)+z_B\left(\frac{1}{2}+\frac{p_B-p_A}{2t}\right)\right]p_A-\frac{r}{2}z_A^2$.
- FOC z_A: $0=\left[(1-z_B)+z_B\left(\frac{1}{2}+\frac{p_B-p_A}{2t}\right)\right]p_A-rz_A$.
  - I.e. $z_A=\frac{p_A}{r}\left[(1-z_B)+z_B\left(\frac{1}{2}+\frac{p_B-p_A}{2t}\right)\right]$.
- FOC p_A: $0=z_A\left[(1-z_B)+z_B\left(\frac{1}{2}+\frac{p_B-p_A}{2t}\right)\right]-\frac{z_Az_B}{2t}p_A$.
  - I.e. $p_A=\frac{2t}{z_B}\left[(1-z_B)+z_B\left(\frac{1}{2}+\frac{p_B-p_A}{2t}\right)\right]$.
- Solution must be symmetric, with $p:=p_A=p_B$ and $z:=z_A=z_B$. Hence:
  - $z=\frac{p}{r}\left(1-\frac{z}{2}\right)$ and $p=\frac{2t}{z}\left(1-\frac{z}{2}\right)$.
  - I.e. $\frac{pz}{2t}=\frac{rz}{p}$. So $p=\sqrt{2tr}$ and $z=\frac{\frac{p}{r}}{1+\frac{1p}{2r}}=\frac{2p}{2r+p}=\frac{2\sqrt{2tr}}{2r+\sqrt{2tr}}=\frac{2}{1+\sqrt{\frac{2r}{t}}}$.
  - For this to be valid we need $z<1$. $r>\frac{t}{2}$ is necessary and sufficient for this.
  - Profits then are: $\frac{2}{1+\sqrt{\frac{2r}{t}}}\left[1-\frac{1}{2}\frac{2}{1+\sqrt{\frac{2r}{t}}}\right]\sqrt{2tr}-\frac{r}{2}\left[\frac{2}{1+\sqrt{\frac{2r}{t}}}\right]^2=\frac{2\sqrt{2tr}\left(1+\sqrt{\frac{2r}{t}}\right)-2\sqrt{2tr}-2r}{\left(1+\sqrt{\frac{2r}{t}}\right)^2}=\frac{2r}{\left(1+\sqrt{\frac{2r}{t}}\right)^2}$

Advertising in oligopoly: Grossman and Shapiro (1984) (3/3)

- So…
  - Price is higher than without the need for advertising. ($r > \frac{t}{2}$ implies $P = \sqrt{2tr} > t$.)
  - When products are more differentiated (t is high), there is more advertising.
    - So even if we observe higher differentiation in industries with a lot of advertising, it does not mean that advertising caused the differentiation.
  - Expensive advertising actually increases profits.
    - High costs reduce the amount of advertising performed, reducing the proportion of consumers who see two adverts, pushing up prices.
  - Advertising cost and differentiation have the same (positive) effect on profits, but opposite effects on the amount of advertising performed.
    - Thus we should not be surprised by finding either a positive or a negative correlation between advertising and profits.
  - There may be too much or too little advertising.
    - If extra advertising reaches a new consumer, then the social benefit exceeds the private benefit to the firm (non-appropriability).
    - But firm A has an incentive to advertise more in order to expand its market share (business stealing).

Complementary advertising

- A model of complementary advertising will begin with specifications for agent's utility functions under which viewing adverts (or others viewing adverts) is a complement for the good.
- A very simple model is the following.
  - If I have not seen an advert, then I value the good at zero.
  - If I have seen an advert, then I value the good at v.
- Thus every model of informative advertising may be reinterpreted as a model of complementary advertising.

Empirics

- Read Bagwell (2005)!
  - Conclusion is that different views are valid in different industries.
- Consistent with the informative/search view.
  - Benham (1972) found eyeglass prices were higher where advertising was banned.
  - Kwoka (1984) found a similar result for optometry.
  - Milyo and Waldfogel (1999) look at the end of a ban on liquor price advertising and find firms cut the prices of only those goods that either they advertise or their rival does.
- Other important papers:
  - Comanor and Wilson (1967) find profits, advertising and differentiation move together. (Possible in Grossman and Shapiro (1984) model.)
  - Nelson (1974), Porter (1974), Esposito et al. (1990) – product characteristics are important. Experience goods different to search goods etc. Some evidence for an inverse-U relationship between concentration and advertising (but e.g. Willis and Rogers (1998) find the opposite result.)

Summary

- Advertising is not unambiguously bad.
- All three views (persuasive, informative, complementary) have something going for them.
  - But the persuasive view is unpopular these days for methodological reasons.
- Empirical evidence is hard to interpret, since differentiation, entry, advertising and profits are all endogenous.

Recap: Advertising exercises

- OZ Ex. 11.7
  - Question 1,2

- OZ Extra exercises:
  - http://ozshy.50webs.com/io-exercises.pdf
  - Set #16

Merry Christmas!

- And a Happy New Year.