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Class 29, G601. TIROLE, CHAPTER 7: Horizontal Differentiation

Outline of the Chapter

REST HERE AT HOME

Monopolistic Competition: Edward Chamberlin, The Theory of Monopolistic Competition (Harvard University Press, first edition 1933, 8th edition 1962) Atomistic firms. Later in Tirole, but the simplest case. Linear City, Hotelling. (1929) Economic Journal. But with quadratic travel costs. 2 firms. Circular City: Salop (1979) Bell Journal of Economics. Advertising models- Butters. NEXT TIME: Things from the Appendix. Di?erentiated ProductsSymmetric: Dixit-Stiglitz (1977) American Economic Review. This is a modern formulation of Chamberlin. Vertical: Shaked-Sutton (1982) Econometrica. Review session on Saturday afternoon. 4-5. O?ce hours: Sunday afternoon. 4-5. Final exam time and place and style. Equation sheet-hand in with exam. Entire semester. Only parts of readings we covered. Reader included. 2

Monopolistic Competition, p. 287

Edward Chamberlin, The Theory of Monopolistic Competition (Harvard University Press, first edition 1933, 8th edition 1962)

Later in Tirole, but the simplest case.

Atomistic firms.

1. Each firm is small. Firms ignore the effect of changes in their own output on how other firms behave.

2. Free entry. So profits are zero.

3. Each firm has market power.

Are there too many firms? Chamberlin thought so, but he was confused.

YES. TRADE DIVERSION. When Apex enters, it increases its profits at the expense of Brydox's, who loses customers. This is a negative externality of one firm on another.

NO. NONAPPROPRIABILITY OF CONSUMER SURPLUS. When Apex enters, it increases consumer surplus by adding to product variety. Unless Apex can perfectly price discriminate, it will ignore that.

Linear City, Hotelling. (1929) p. 279.

But with quadratic travel costs, not linear. And with firms located at the end points, not just anywhere. And with just 2 firms. And with positive marginal cost of c.

Firms are located at points x=0 and x=1. A consumer at point x incurs travel cost tx^2 to go to store 1, and $t(1-x)^2$ to go to Store 2. Firms choose price simultaneously. All consumers buy from one store or the other. ("the market is COVERED")

The indifferent consumer is at x such that

$$p_1 + tx^2 = p_2 + t(1-x)^2, \tag{1}$$

which yields

$$D_1 = x = \frac{p_2 - p_1 + t}{2t} \tag{2}$$

and

$$D_2 = 1 - x = \frac{p_1 - p_2 + t}{2t} \tag{3}$$

This is actually the same as it would be for linear transportation cost, for this special case where the stores are at the end points and the market is covered.

Firm 1's profit is

$$\pi_1 = (p_1 - c)\frac{p_2 - p_1 + t}{2t} \tag{4}$$

with first order condition

$$p_2 + c + t - 2p_1 = 0. \tag{5}$$

The goods are thus strategic complements. The reaction curve for Firm 1 is

$$p_1 = \frac{p_2 + c + t}{2}. \tag{6}$$

The equilibrium is at $p_1 = p_2 = c + t$.

How about nonexistence of equilibrium in pure strategies? We avoid that by our assumption that the firms are at the end points. Nonexistence only arose when the two firms were close together with consumers beyond each, which created a discontinuity.

But quadratic costs also avoid it. Suppose we generalize to allow Firm 1 to locate at a and firm 2 at $(1 - b)$.

The indifferent consumer is at x in between a and (1-b) such that

$$p_1 + t(x - a)^2 = p_2 + t(1 - b - x)^2, \tag{7}$$

which yields

$$D_1 = x = a + \frac{1 - a - b}{2} + \frac{p_2 - p_1}{2t(1 - a - b)} \tag{8}$$

and

$$D_2 = 1 - x = b + \frac{1 - a - b}{2} + \frac{p_1 - p_2}{2t(1 - a - b)} \tag{9}$$

Firm 1's profit is

$$\pi_1 = (p_1 - c)\left(a + \frac{1 - a - b}{2} + \frac{p_2 - p_1}{2t(1 - a - b)}\right) \tag{10}$$

It turns out that in equilibrium (which is no longer symmetric)

$$p_1 = c + t(1 - a - b)\left(1 + \frac{a - b}{3}\right) \tag{11}$$

and

$$p_2 = c + t(1 - a - b)\left(1 + \frac{b - a}{3}\right) \tag{12}$$

Linear City– Endogenous Simultaneous Location, p. 281

Now, let firms choose location first, then prices. Firms will locate at 0 and 1. This is due to price strategies being strategic complements.

Firm 1 chooses location a to maximize its profit,

$$\pi_1(a, b, p_1(a, b), p_2(a, b)) \tag{13}$$

Here is how profits increase with a.

$$\frac{\partial \pi_1}{\partial a} + \frac{\partial \pi_1}{\partial p_1}\frac{\partial p_1}{\partial a} + \frac{\partial \pi_1}{\partial p_2}\frac{\partial p_2}{\partial a} \tag{14}$$

The second term is zero because by the Envelope Theorem and second period maximization, $\frac{\partial \pi_1}{\partial p_1} = 0$. It can be shown, as Tirole does, that the rest of the expression is negative. Hence, profits fall with a, and the corner solution $a = 0$ is optimal.

Advertising

Butters (1977). Informative advertising. Identical products, produced at constant marginal cost c. Consumers all have reservation price $\overline{s}$. A consumer can only buy from a firm if it gets an ad from the firm.

Dixit-Stiglitz Model

Di?erentiated Products Symmetric: Dixit-Stiglitz (1977) American Economic Review. This is a modern formulation of Chamberlin. 7

Vertical Di?erentiation

Shaked-Sutton (1982) Econometrica.