

- The difference between the two models is that in the Hotelling model the products sold by each firm are no longer identical to consumers.
- This is basically due to transportation costs.
- We can extend the arguments to derive demand curves for each firm.
- For Firm 1, we take Firm 2's price as given, say  $p_2'$ .
- At each price Firm 1 sets, we look for the indifferent consumer to derive demand for firm 1.
- We can plug in different prices set by Firm 1, to attain a demand curve  $d(p_1|p_2')$  that depends on the price Firm 2 sets.

- Having derived Firm 1's demand curve, we can use the same argument to derive Firm 2's.
- Following the same arguments as in Chapter 7, we find the Nash Equilibrium of the Hotelling model.
- If we assume constant identical marginal costs for each firm, and positive transportation costs the equilibrium price is strictly greater than marginal cost.
- Thus product differentiation provides a solution to the Bertrand paradox.

# Product Positioning

- While the Hotelling model was insightful, one restriction was that it took firms' location as given.
- How do our results change if we allow firms to choose where to locate their products?
- In many industries, product positioning is a crucial dimension.
- One consideration of a firm is the positioning of its rivals.
- For this we'll need some notion of distance from rivals in terms of product characteristics.
- This introduces an additional element of strategic interaction, a little like Chapter 7.

- Analogous to that chapter, we'll assume that firms first choose where to locate, and then choose prices given location.
- As before, we'll solve equilibrium locations in the first stage of the two stage game.
- To illustrate, first let's assume Firm 2's location is given, as are both Firms prices.
- What is Firm 1's optimal location.
- There will be two effects to take into consideration.
- One is direct and the other is strategic.

- First, for a given set of prices, the closer Firm 1 is to Firm 2, the greater Firm 1's demand and profits.
- This is the direct effect of product positioning.
- However, taking prices as given is incorrect.
- That's because prices are determined in the second period as a function of first period location choices.
- This second effect is what we'll refer to as the strategic effect.
- To illustrate, let's consider the case where the two locations are identical.

- The two products are effectively identical to every consumer.
- Thus the situation is essentially the same as in the Bertrand model.
- In equilibrium prices are set to marginal costs.
- This is basically the opposite with what we got when firms were far apart.
- Generally, it can be shown that the closer firms are together, the more intense the price competition.
- Thus the two effects point us in opposite directions.

- The direct effect pulls firms closer to one another.
- The strategic effect encourages them to be far apart, or differentiate.
- The overall effect depends on transportation costs and distributional location of consumers.
- Generally speaking, all that we can conclude is that if price competition is severe, firms will differentiate by locating far apart, and if it is not severe, they will locate near the center so as not to differentiate.

- For the purpose of studying market power, it does not matter whether products are physically differentiated or not.
- All that matters is that consumers treat them as different.
- Ways this can happen are if consumers are imperfectly informed about prices or have to pay a switching cost to sellers.
- This is akin to product differentiation.
- To illustrate a simple case of noncompetitive pricing, suppose each consumer wants to buy 1 unit of a good and is willing to pay up to  $u$ .
- But consumers do not know the price set at each store, and to visit each store they incur a search cost of  $s$ .

- If there were no such search costs, we would be in a Bertrand setting where prices were set to marginal costs.
- However with positive  $s$  another equilibrium would be for every firm to set the monopoly price.
- If every firm does this no individual firm has the incentive to deviate.
- Lowering price will not attract new customers because every consumer expects prices to be the same and search costs are positive, so search costs can result in monopoly pricing.
- Similar equilibria can occur with switching costs-i.e. cell phones, airlines...
- Note both types of costs- search and switching, can result in high levels of price dispersion.