

Introduction to Industrial Organization
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Lecture Note 10

Oligopolies and Bertrand model (ch 7 and ch. 8)

Last Model: Bertrand Model

- Main criticism of Cournot model is that firms choose quantities. In real world, firm choose prices and then produce whatever is necessary to satisfy demand.
- In Bertrand model, firms strategically choose prices to maximize profits. Will see that the basic model yields very strong prediction about prices and competition.

Bertrand Model:

2 firms strategically choose prices

Demand: $p = a - bQ$

Costs: $TC=cq$

Consumers have perfect information. They buy from the firm that charges the lowest price. If prices are the same, the firms split the market.

We will see that the only equilibrium is for both firms to employ marginal cost price ($p_1^* = p_2^* = c$). Yielding zero profits for both firms and the efficient level of output.

Consider firm 1's profit maximization problem,

Given p_2 :

$$\pi_1 \begin{cases} (a - bp_1)(p_1 - c) & \text{if } p_1 < p_2 \\ \frac{1}{2}(a - bp_1)(p_1 - c) & \text{if } p_1 = p_2 \\ 0 & \text{if } p_1 > p_2 \end{cases}$$

Because profits are discontinuous in p_1 , cannot use calculus. Just use intuition to solve firm's problem.

If $p_2 > c$, $p_1^* = p_2 - \varepsilon$ firm 1 will undercut firm 2 slightly since

$$\begin{aligned} & \text{at } p_2 - \varepsilon, \\ & \pi = (a - bp_2 + p_2\varepsilon)(p_2 - \varepsilon - c) \\ & \approx (a - bp_2)(p_2 - c) \text{ for small } \varepsilon \\ & > \frac{1}{2}(a - bp_2)(p_2 - c) \text{ which is profits if firm sets } p_1 = p_2 \\ & > 0 \text{ which is profits if 1 chooses } p_1 > p_2 \end{aligned}$$

If $p_2 = c$, then

$$p_1^* \geq c$$

If 1 chooses $p_1^* = c$, sells $\frac{1}{2}(a - bc)$ units, but earns zero profits. If $p_1^* \geq c$, still earns zero profits.

So, firm 1's best response function look like

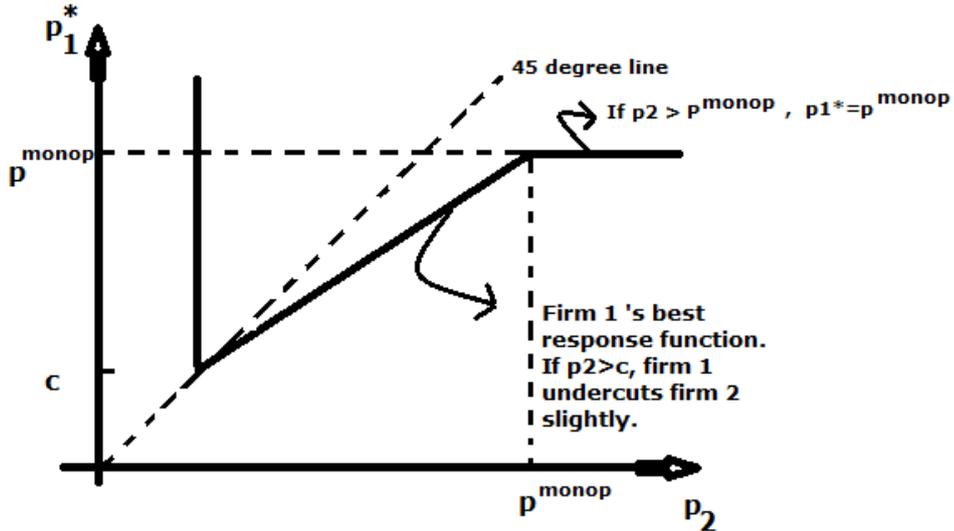


Figure 7.e13: Bertrand model-BR

Similarly, firm 2 has an incentive to slightly undercut firm 2 if $p_1 > c$.

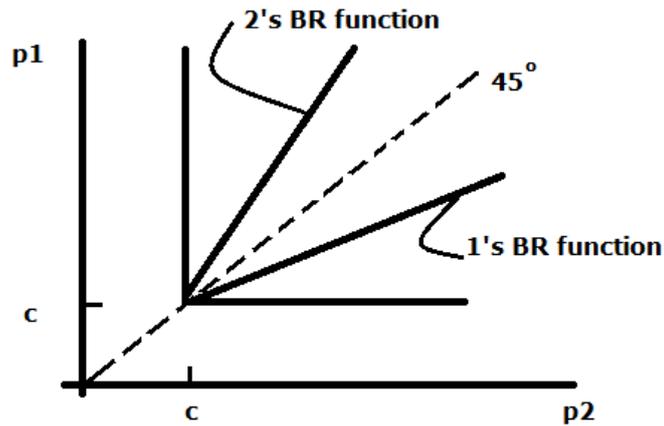


Figure 7.e14 Bertrand Model- 2 BRs

The only equilibrium is at $p_1^* = p_2^* = c$. Where the BR functions intersect. If $p_1^* = c$, then firm 2 has no incentive to change price from c . If $p_2^* = c$, firm 1 has no incentive to charge price from c .

So when consumers view goods as perfect substitutes, Bertrand competition quickly drives prices down to marginal costs.

This is in contrast to Cournot:

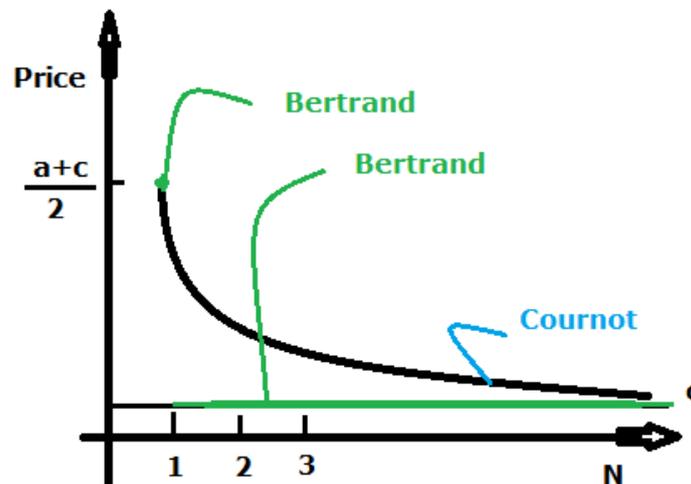


Figure7.e15: Bertrand vs Cournot - prices

Assumption that firm set prices is more realistic than setting quantities. But effects of competition too intense. Can get more realistic results:

- 1) making products slightly differentiated. Coke and Pepsi are slightly different produces. If Coke undercuts Peps, it will not really receive 100% market share. This lower the incentive to undercut.
- 2) allow firms to compete over several periods. Firms better off by not controlling undercutting each other in the LR. Only in the SR.
- 3) Capacity constraints. What if one firm is not capable of satisfying 100% of market demand because of capacity constraints.

Bertrand with capacity constraints.

- Assume 2 firms compete in Bertrand fashion
- Demand: $p = a - bQ$
- Cost cq
- Firms potentially capacity constrained. Firm 1 and firm 2 produce at most K_1 and K_2 units of output. Assume $p(K_1+K_2) > c$

Claim: $p_1^* = p_2^* = p(K_1 + K_2) = a - b(K_1 + K_2)$

If firm 1 chooses $p_1 = p_1^*$

Firm 2 will not find it optimal to choose $p_2 < p_1^*$ because it will not be able to satisfy the extra demand.

If firm 1 chooses $p_2 > p_1^*$, demand equals $Q(p_2) - K_2 \rightarrow$ residual demand. If residual demand $< K_2$ (an assumption), then firm 2 will not find it optimal to undercut firm 1.

For the rest of the class, we will do a review for the midterm exam.