15.020 Competition in Telecoms
Recitation #3

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Agenda

• Cournot-Nash Equilibrium
• Double Marginalization
• Imputation Principle

Sources:
Part I: Cournot-Nash Equilibrium
First, Let’s Talk about Context

- **Oligopoly**: Small number of players in the market, facing no risk of entry
  - Telecommunications market fits
    - High barriers to entry (huge sunk and unrecoverable costs)
    - Regulation
    - Commodity undifferentiated products

- **Oligopoly** → Somewhere between competition and monopoly conditions
  - Key is pricing power
Nash Equilibrium

• A set of strategies is called a Nash Equilibrium if, holding the strategies of all other firms constant, no firm can obtain a higher payoff by choosing a different strategy.

→ No firm has the incentive to change its strategy
Cournot Model

• **Oligopoly** model in which firms produce a **homogenous** good.

• Each firm treats the output level of its competitor as **fixed** and then decides how much to **produce**.

• → For our examples, we will consider a duopoly (two firms in the market).
Cournot Model

Firm 1’s Decision Process

Assume Demand Curve: \( Q = 1,000 - 1,000P \)
- \( Q = q_1 + q_2 \)
- \( q_1 = Q(p) + q_2 \)  
(Firm 1 faces a residual demand curve)
Response Curves

\[ q_2 = R_2(q_1) \]

\[ q_1 = R_1(q_2) \]

Cournot Equilibrium
Part II: Double Marginalization
Double Marginalization

• One or more firms selling to each other along a vertical chain have market power

• Assumptions for the following examples:
  – Both upstream and downstream firms are monopolies (can be applied to case where both firms have market power, which is the case in telecommunications)
  – Downstream firm’s only cost is the purchase of upstream product
Single-Firm Monopoly
Two-Firm Monopoly
(one downstream form the other)

\[ p_u = p^* \]

\[ D_d = \text{demand curve for downstream} \]

\[ q_u = q_d \]

\[ q^* \]

\[ p_d \]

\[ p_u \]

\[ \text{MR}_u \]

\[ \text{MR}_d = D_u \]

\[ \text{MC}_d \]

\[ \text{MC}_u \]
Part III: Imputation Principle
Imputation Introduction

• Imputation Principle: A network charges its customers as much as it charges customers of the other network for the same service.

• Linked to two other concepts:
  – Reciprocity: Networks charge each other the same prices for interconnects
  – Double Marginalization
How the Pieces Come Together

• Firm A controls $P_{ab}$, which is the price Firm A charges Firm B for interconnect

• Reciprocity $\Rightarrow$ Firm B charges $P_{ba}=P_{ab}$
  $\Rightarrow$ Firm A (and likewise for Firm B)
  • controls its costs ($P_{ba}+x$)
  • can act as a monopolist (given imperfect competition)

  HOWEVER, you have unequal access (ex. ILECS and IXCs)

• ILECS would have the incentive to set $P_{ab} > Price$ charges to consumers

  $\Rightarrow$ Imputation requires Firm A to charge its customers the same fees it charges its competitors.