15.020 Competition in Telecoms Recitation #3

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Agenda

- Cournot-Nash Equilibrium
- Double Marginalization
- Imputation Principle

- Sources:
  - Sappington, David. "Price Regulation." Handbook of Telecommunications Economics, North-Holland, 2002.
  - Pindyck, Robert; Rubinfeld, Daniel. Microeconomics, Fifth Edition. Prentice Hall, 2002.
  - Carlton, Dennis; Perloff, Jeffrey. Modern Industrial Organization. Addison Wesley Longman, 2000.

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

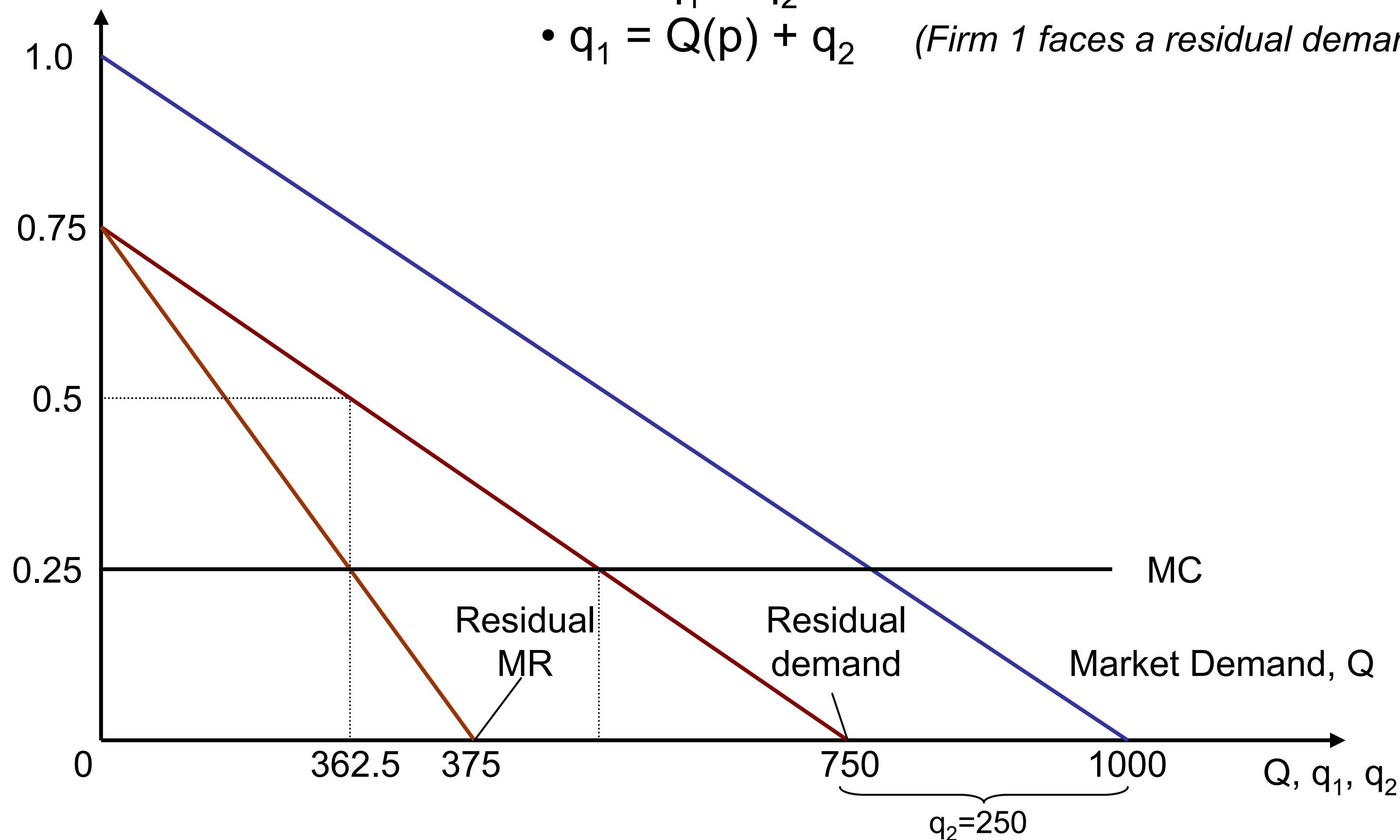
- **Oligopoly** model in which firms produce a **homogenous** good.
- Each firm treats the output level of its competitor as **fixed** and then decides how much to **produce**.

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

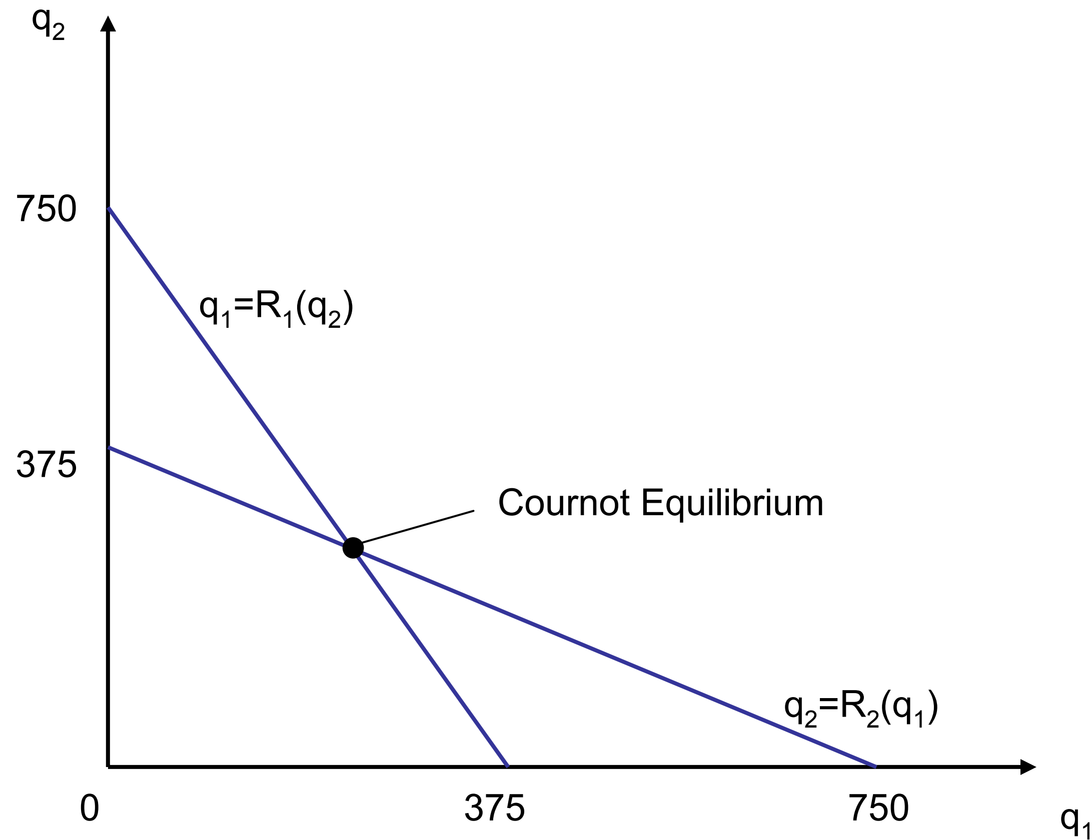
Cournot Model
Firm 1's Decision Process

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



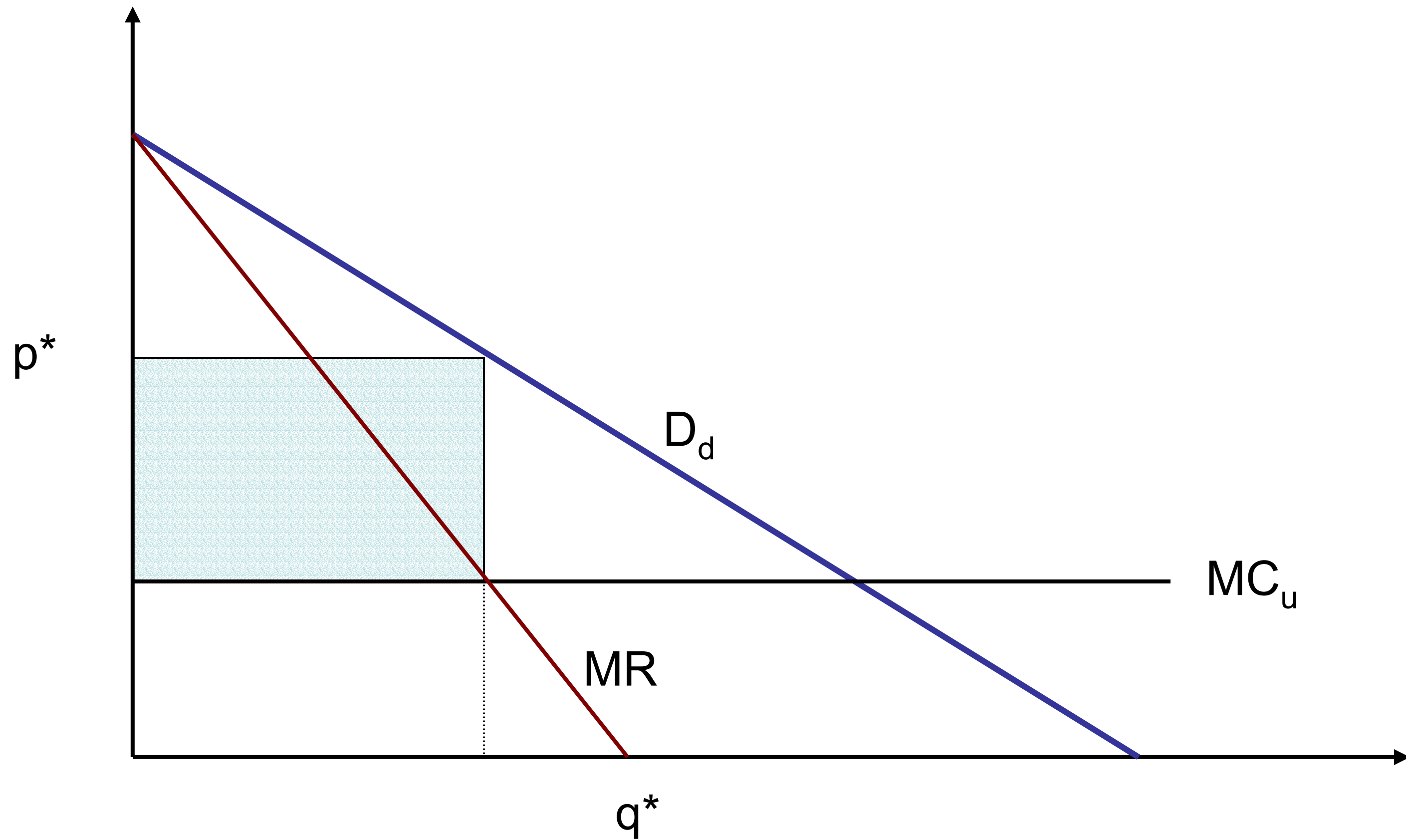
Part II: Double Marginalization

Double Marginalization

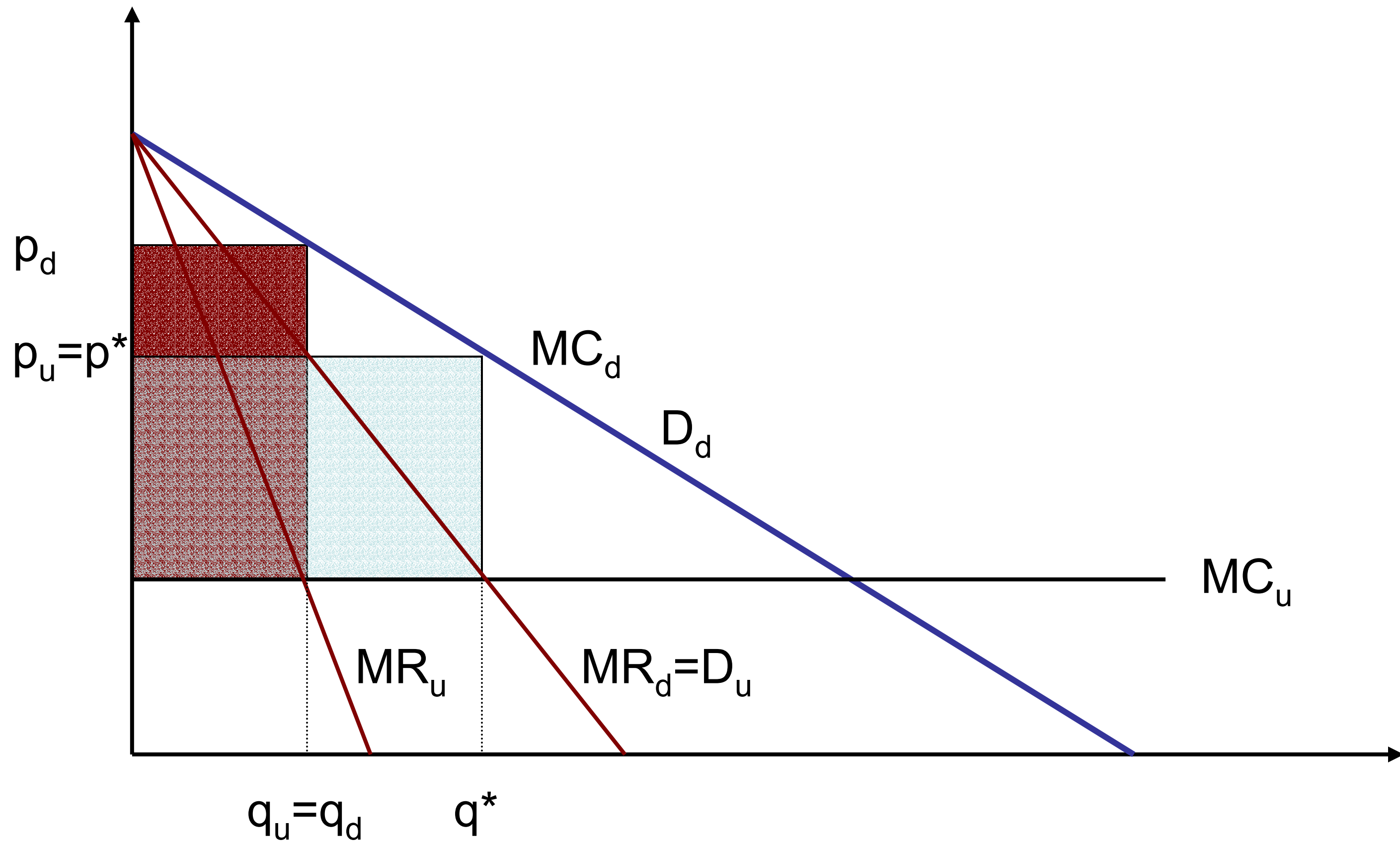
- One or more firms selling to each other along a vertical chain have market power

- 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)



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 *Pab*, which is the price Firm A charges Firm B for interconnect

- Reciprocity → Firm B charges *Pba=Pab*

  ➔Firm A (*and likewise for Firm B*)
    - controls its costs (*Pba+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

  Pab > Price charges to consumers

➔ *Imputation requires Firm A to charge its customers the same fees it charges its competitors.*