

Lecture 1: Introduction

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Introduction: Monopoly Pricing

- In the competitive model, there are many sellers that act as price takers
- In most markets, however, companies can profitably increase prices
- Suppose, at the other extreme, that there is only one seller, a monopolist
- Suppose that the inverse demand function of selling q units, $P(q)$, is a decreasing function when it is positive
- For example, assume that it is linear

$$P(q) = \begin{cases} 2 - q & \text{if } q \leq 2 \\ 0 & \text{if } q > 2 \end{cases}$$

- Suppose that the costs of producing q units, $C(q)$, are increasing
 - For example, assume that they are linear, $C(q) = q$
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- Firm selects quantity that maximises profits, revenues minus costs

$$\text{Max}_q P(q)q - C(q)$$

$$\text{Max}_q (2 - q)q - q$$

- The firm would select, q^m such that

$$-q^m + (2 - q^m) - 1 = 0$$

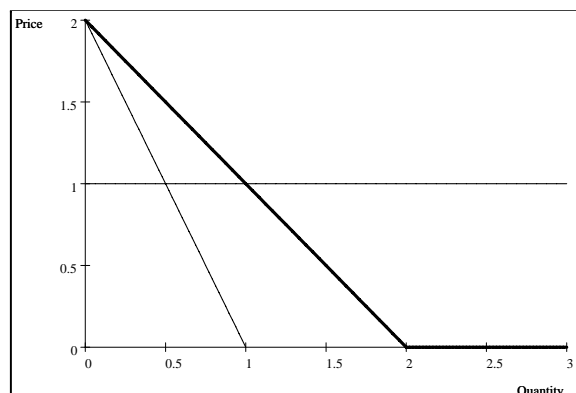
$$2 - 2q^m - 1 = 0$$

$$q^m = \frac{1}{2}$$

- And therefore

$$P(q^m) = P\left(\frac{1}{2}\right) = 2 - \frac{1}{2} = \frac{3}{2}$$

- Representation



Demand, marginal revenue and marginal cost

- Quantity selected, $\frac{1}{2}$ is lower than the quantity s.t. demand=marginal cost, 1
 - Monopolist selects quantity s. t. marginal revenue=marginal cost, $2 - 2q^m = 1$
 - As a consequence, price, $\frac{3}{2}$, is higher than the competitive price, 1
 - Firm selecting the price instead of the quantity would give the same result
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Motivation: Multiple Sellers

- What happens when there are more than one firm (but not many)?
 - The demand (and therefore profits) of each firm also depends on the quantity placed (or the price set) by the others
 - More generally, decision-maker well-being also depends on the actions of others
 - As a consequence, the optimal decision depends on the decisions of the others
 - Other examples include: political candidate choosing a policy platform, bidder in an auction, negotiator in a purchase,...
 - Game Theory: framework to analyse decisions in the presence of strategic interdependence
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Today's Lecture

- Monopoly pricing
 - Motivation to study GT: analyse oligopoly markets
 - Elements of a game
 - Example 1: Prisoner's dilemma
 - Example 2: Coordination game
 - Example 3: Matching pennies
 - Example 4: Stag hunt
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Elements of a "Game"

- Players: who is involved?
 - For each player, a set of actions: what can you play?
 - Outcomes: for each set of actions, what happens?
 - Payoffs: what are the preferences over these outcomes?
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Example 1: Prisoner's Dilemma

- Two suspects in a major crime are held in separate cells and answer whether they committed the crime
- If both confess, sentence of 5 years in prison each. If none confesses, 2 years each. If one confesses and the other does not, 1 and 10 years, respec.
- Players: the two suspects. Actions for each: Confess or Don't Confess. Payoffs: equal to (minus) the years in prison
- Representation in a table:

1\2	Don't Confess	Confess
Don't Confess	-2,-2	-10,-1
Confess	-1,-10	-5,-5

- Gains from cooperation but each has an incentive to "free-ride"
 - Situations that can be modelled similarly: working in a joint project, arms race,..
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Example 2: Coordination Game (or BoS)

- Here, better to cooperate but disagreement on the best outcome
- Bach or Stravinsky (BoS): Two people wish to go out together but there are two concerts available
- One prefers Bach and the other Stravinsky but equally dislike going alone
- Representation in a table:

1\2	Bach	Stravinsky
Bach	2,1	0,0
Stravinsky	0,0	1,2

- Sometimes called the Battle of the Sexes (also BoS)
 - Situations that can be modelled similarly: two officials of a political party deciding the stand on an issue, two merging firms selecting one of the two current computer technologies
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Example 3: Matching Pennies

- 2 persons choose simultaneously whether to show head or tail of a coin
- If they match, person 2 pays \$1 to person 1 and if they do not match , person 1 pays \$1 to person 2
- Representation in a table:

1\2	Head	Tail
Head	1,-1	-1,1
Tail	-1,1	1,-1

- Situations that can be modelled similarly: choices for the appearance of a new product by an established producer and a new firm
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Example 4: Stag Hunt

- Each of two hunters can choose whether to remain attentive to pursuit a stag or catch a hare
- If they both pursuit the stag, they catch it and share it equally
- If any hunter tries to catch a hare, the stag scapes and the hare belongs to the defeating hunter alone
- They prefer to catch the stag and share it equally than catch a hare
- Representation in a table:

1\2	Stag	Hare
Stag	2,2	0,1
Hare	1,0	1,1

- Situations that can be modelled similarly: security dilemma faced by a pair of countries
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