Economics of Tariff Setting: Beyond Cost of Service

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Market Failures

Sometimes markets can fail to operate in beneficial way. Market failures can be so severe as to merit *regulation*. There are three main classes of market failure:

- Asymmetric information: consumers do not have enough information about the goods that they buy
- Problems of externalities: behaviour of one firm affects others for reasons other than prices
- Market power: ineffective competition - actual or potential
  - *Market power is the main focus of utility regulation*

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Market Failure: Market Power

The extreme case of market power is when the industry is dominated by only one firm, protected by barriers to entry.

- Productive inefficiency: monopolist does not have enough incentives to cut their costs and to introduce new products
- Allocative inefficiency: monopolist sell less quantity at a higher price obtaining higher profits

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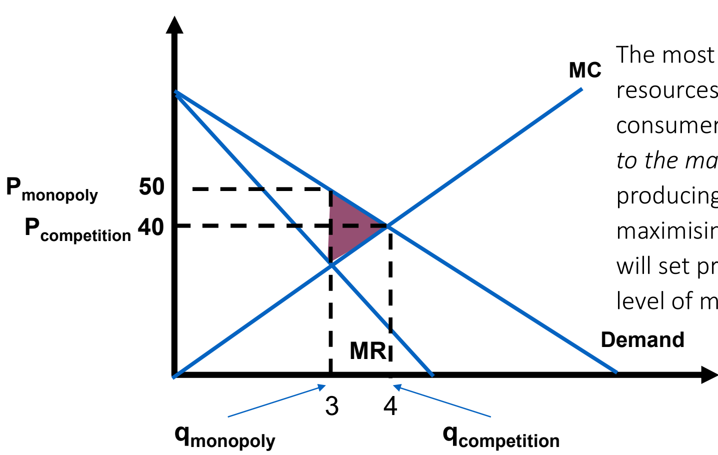
Market Failure: Market Power



The most efficient use of resources is when consumers face a *price equal to the marginal cost* of producing the good. A profit maximising monopolist will set prices above the level of marginal costs.

Solution: Introduce more competition into the market but ….

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Natural Monopoly – Economic Definitions

- In an industry, where average cost of a single firm that can produce entire output to meet the market demand is lower than in case of presence of more than one firm. (<u>subadditivity of the cost functions</u>).
- An industry that does not 'naturally' attract entrants and who can not survive even in the absence of predatory measures by the incumbent monopolist (<u>sustainability of monopoly</u>).

Economic characteristics of Natural Monopoly

- Production is more efficient by one firm than by many firms
  - <u>average cost of production is falling</u> over the relevant portion of market demand(?)
- pricing at marginal cost results in losses, rendering competition undesirable

- public utility industries (gas, electric, water) characterised by
    - high fixed cost network infrastructure
    - returns to scale

Economic Conditions for Natural Monopoly

- Falling average and Marginal cost is a sufficient condition
- Presence of sub-additivity is a necessary condition
- Sustainability of monopoly

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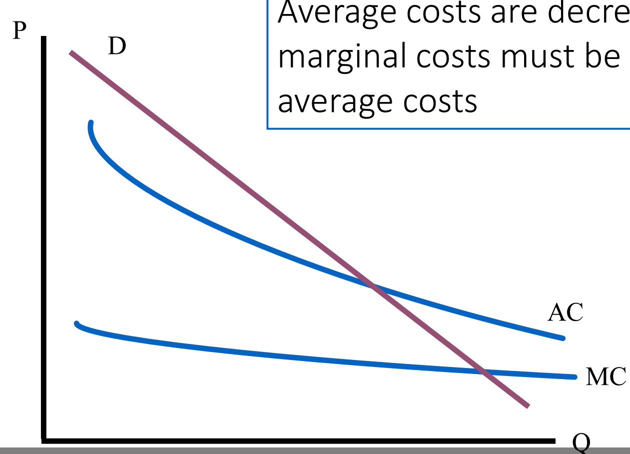
Natural Monopoly: Cost Characteristics

Average costs are decreasing, so marginal costs must be lower than average costs



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Natural Monopoly: Sub-additivity

- If a single firm can produce a product or a group of products more cheaply than two or more firms, a <u>natural monopoly</u> is deemed to exist.
- Sub-additivity defines it more technically as,

  "If costs in an industry are sub-additive, a natural monopoly exists in an industry."

  If two firms produce outputs Q1 and Q2 respectively and their cost function is defined as c(.) , sub-additivity would exist if

$$c(q1+q2) < c(q1) + c(q2)$$

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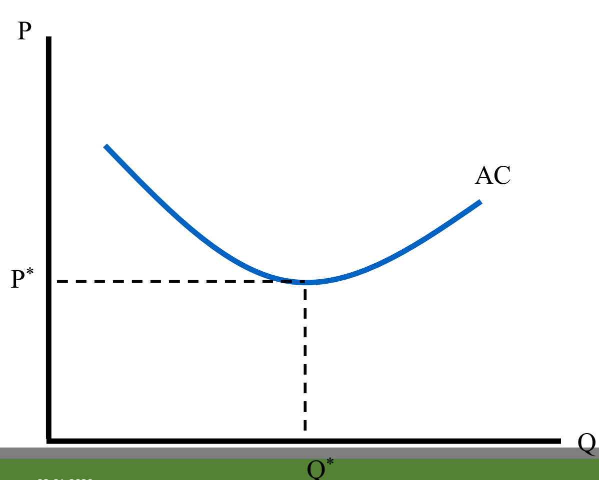
Natural Monopoly: Sub-additivity



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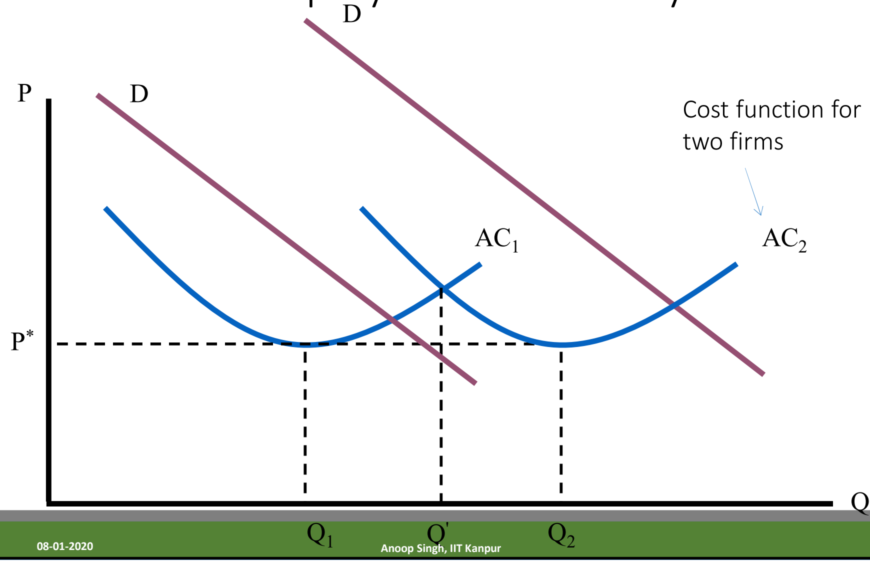
Natural Monopoly: Sub-additivity



Natural Monopoly: Sub-additivity

- Imp.: Note the difference between economies of scale and subadditivity. The later can exist even in the presence of this economies of scale In the previous figure, we can note that average cost associated with a single firm AC1 lies below AC2 even though the former exhibits this economies of scale for quantities more than's Q*.
- In a single product case, economies of scale is a sufficient condition for subadditivity.

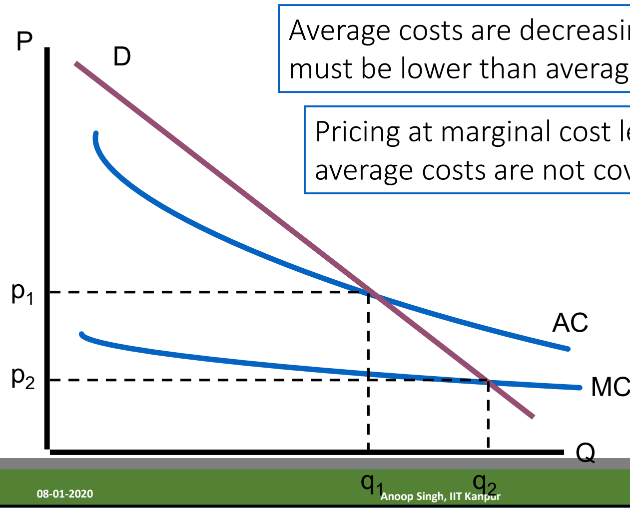
Pricing for Natural Monopoly

- MC Pricing
- AC Pricing
- Non-Linear Pricing
- Ramsey Pricing

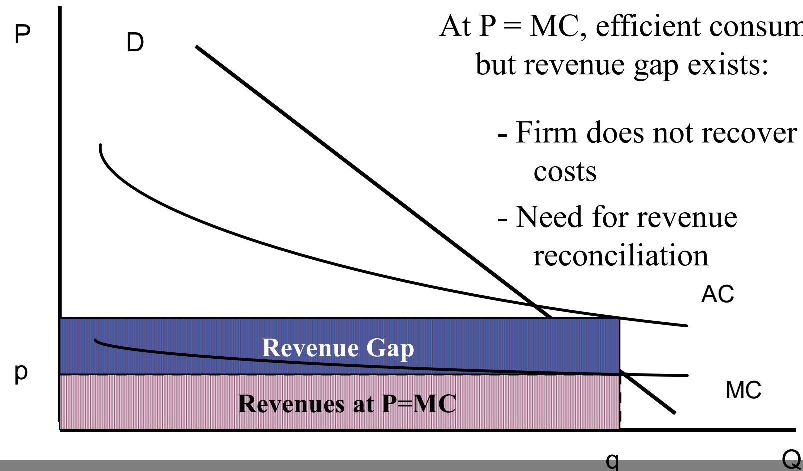
Natural Monopoly: MC < AC

Average costs are decreasing, so marginal costs must be lower than average costs

Pricing at marginal cost leads to loss as average costs are not covered



Natural Monopoly: Revenue Gap



At P = MC, efficient consumption, but revenue gap exists:

- Firm does not recover all costs
- Need for revenue reconciliation

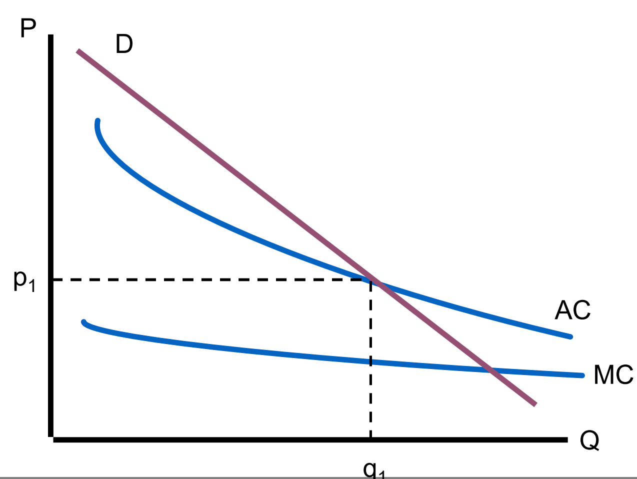
Marginal Cost Pricing

- Outcome has allocative efficiency.
- Weak incentive to reduce costs.
- Firm does not covers costs and makes losses.
- Use tax revenues or direct subsidy to firm to cover revenue shortfall?

Issues with use of subsidy for bridging revenue gap

- Subsidy for bridging the revenues shortfall
  - Govt. need to raise taxes to fund the subsidy. Taxes are distortionary
  - Reduced incentive for cost reduction since the producer knows that revenue gap would be funded
  - Costs may exceed consumer benefits
  - Distributional issues

Average Cost Pricing



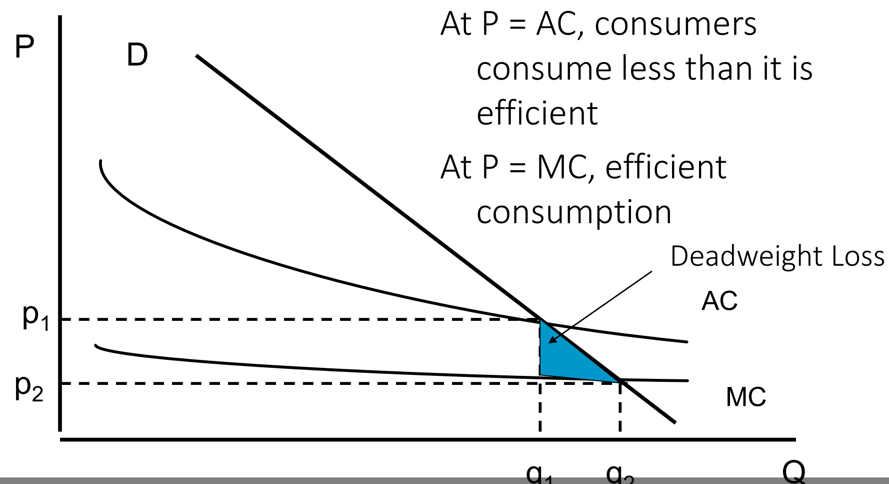
Average Cost Pricing

- Firm covers costs including opportunity cost of capital. (i.e. reasonable returns are covered in AC)
- Failure of allocative efficiency. Less quantity and higher price that in MC pricing case (but lower P and higher Q than profit maximisation by the monopoly)
- Weak incentive to reduce costs since costs are covered.
- Does not require subsidy or distortionary taxes to cover revenue shortfall.

Natural Monopoly: AC Vs MC Pricing

At P = AC, consumers consume less than it is efficient

At P = MC, efficient consumption



Natural Monopoly: Non-Linear Pricing

- Also called Block Pricing
- Most basic form would be a two-part tariff

  $P = a + b\,Q$

  a – Fixed Charge covers revenue shortfall due to MC pricing. (to be recovered from all consumers)

  b – Variable Charge, equal to marginal cost
- Revenue shortfall is covered.
- Firm earns economic profits, i.e. opportunity cost of capital.
- Little incentive to reduce costs.

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