01 Introduction

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Course Overview

- The minimum of 60 points (out of 100 points) is required to pass this course.
- The points are awarded based on the following criteria:
  - Active attendance (up to 2 pts per lecture, max 10)
  - Written exam (May/June) based on readings and lectures (max 45 pts)
  - Paper (max 45 pts)
- The written exam will contain both multiple choice and open questions. The date of exam is TBA (you will be notified by e-mail about the changes).
- If you have any questions, do not hesitate to contact the lecturers.

Course Overview

- Paper topic:
  - either a **literature review** of the topic of your choosing (in the field of energy economics) or
  - essay on **specific case** regarding major energy corporation (e.g. court rulings in competition cases, energy public access or its financial position)
- Recommended length is around 10 pages of A4 format (in any case, total length should not exceed 15 pages) including all tables, charts, figures and bibliography.
- Due May 18th, reviewed in a week

Energy Economics

Energy Economics

- Branch of *applied* economics – e.i. economics of energy
  - Sources
  - Consumption
  - Trade
  - Regulation
  - Anything included in TPES

Today's Contents

- Energy market specifics
- Demand
- (Supply)

- Bhattacharyya (2008) chaps. 3 & 12

- Case study

Energy Economics

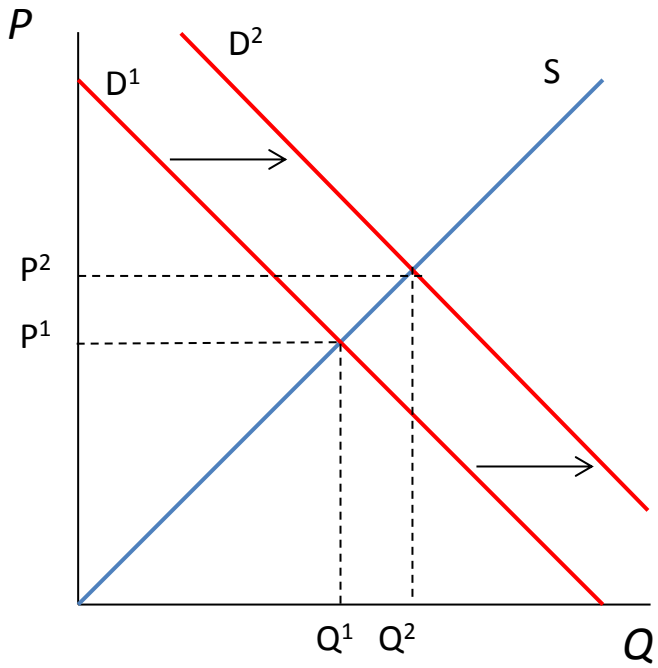
- Energy sector (research, analysis…) is complex
  - Energy consumption ubiquitous – importance of the issues – political and social stress
  - Highly technology-determined and -dependable
  - Influenced by interactions at various levels – global to local
  - Interdisciplinarity
  - From oil to wooden litter, from wind turbines to diesel engine

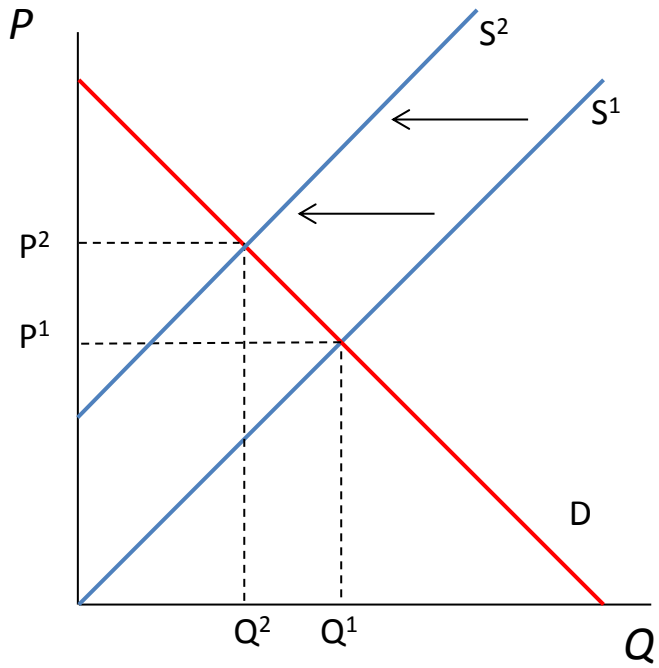
Energy Market

- Microeconomic market model (remember previous course)
  - Supply, demand, price, quantity, equilibrium
- Basic competitive market variant
  - Free entry and information flows
  - Agents are price takers
  - P = MC in short run and P = MC = AC in long run

Energy Market

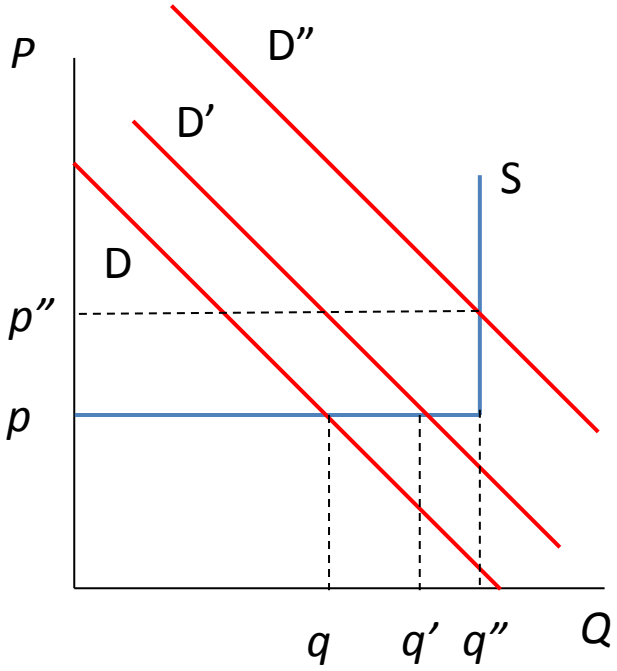
- Standard S&D competitive market

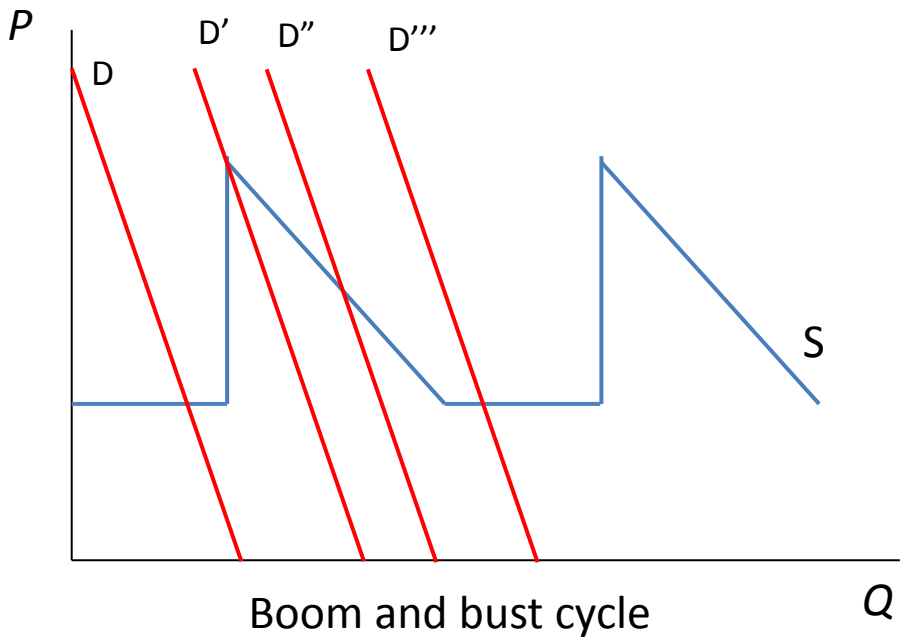




Capital Indivisibility

- Supply increments discreet, not smooth
- Inherent price instability
- Difficult to plan investment





Boom and bust cycle

Capital Indivisibility

- This may lead to:
  - Horizontal integration (oil industry)
  - Regulation (electricity)
  - Because of better managing the assets
- Decentralization production lessen capital indivisibility problem eg:
  - Renewables electricity production
  - Shale gas and oil in US

Capital Specificity

- The more an asset is specific, the less it may be used elswhere
- In energy industry assets are usually very capital intensive (ei expensive) and specific
- Coupled with economies of scale VC usually much lower than AC → firms maximizing production to make up their capital costs

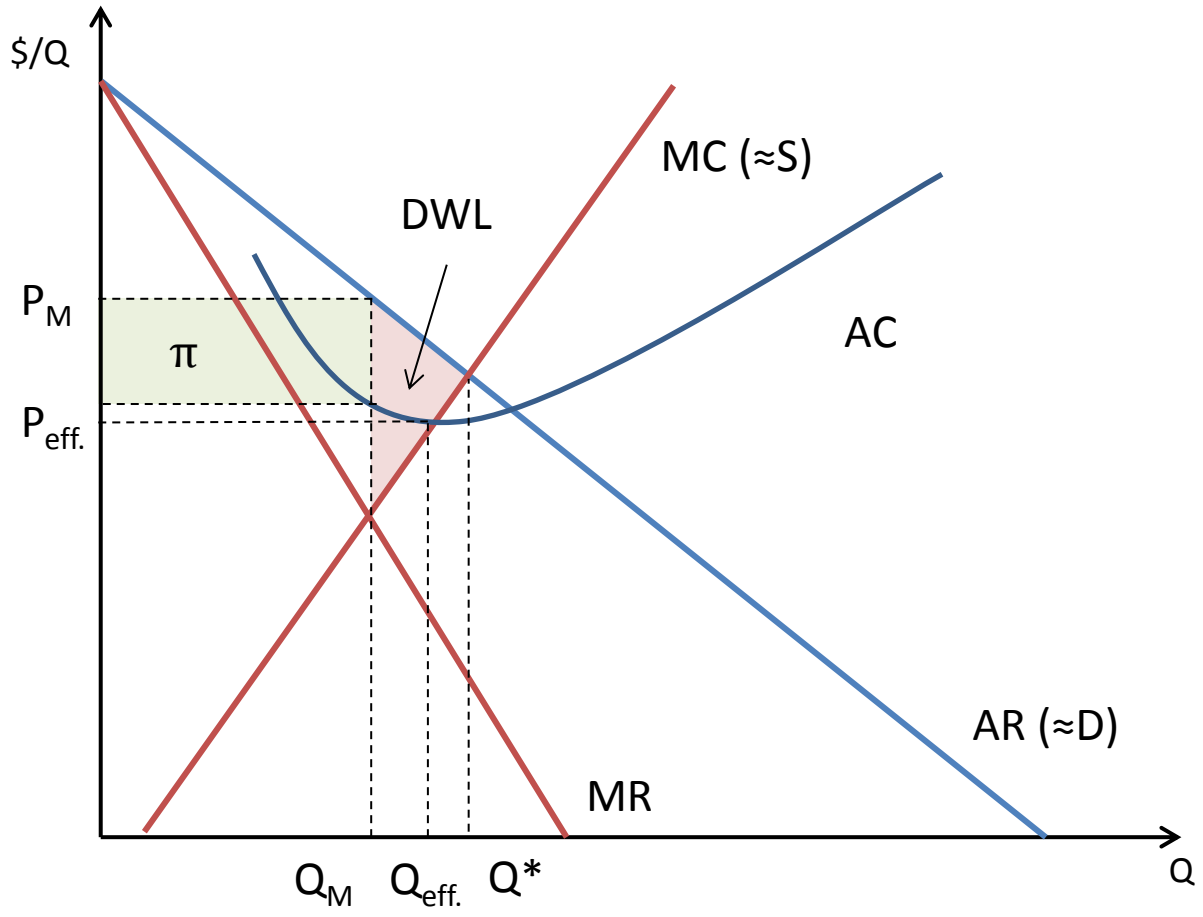
Market Failures

- Monopoly problem
- Natural monopoly and its solutions
- Rents
- Externalities

Monopoly Problem

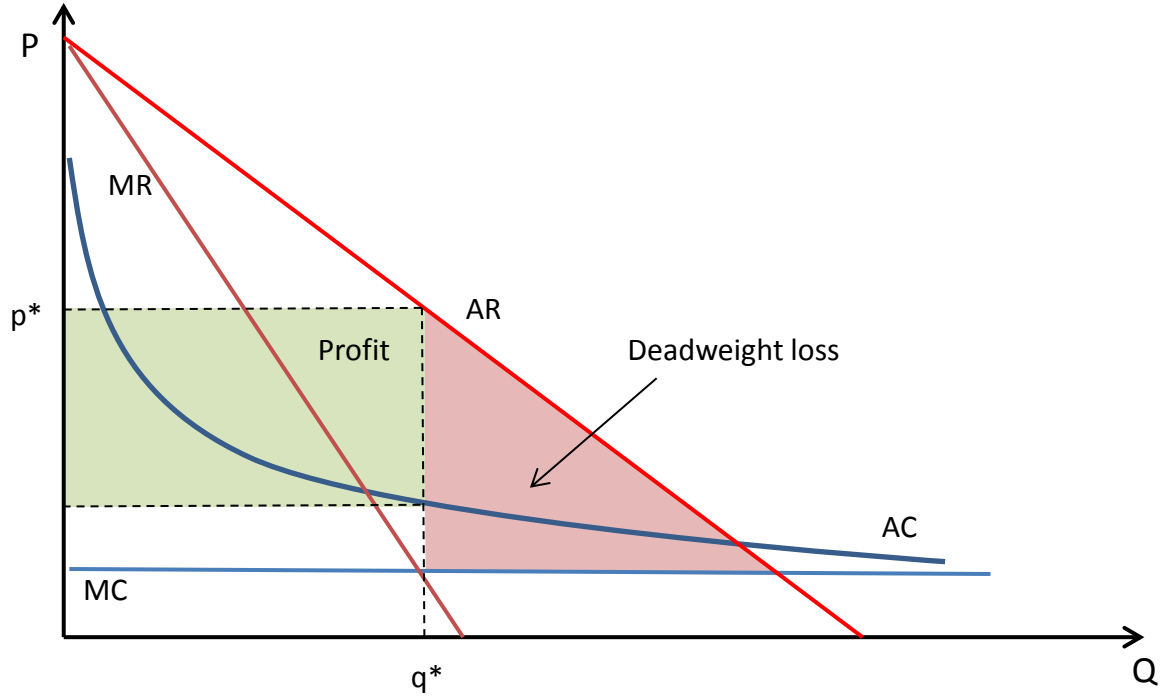
- Monopolies quite common in energy industry
  - Economies of scale
  - Capital intensiveness
  - Large projects, often international
  - Network industries
- Problems:
  - Deadweight loss
  - Inefficient capital allocation (not minimal AC)
  - Rentseeking (rent competition)
  - Price discrimination

Monopoly Market



Natural Monopoly

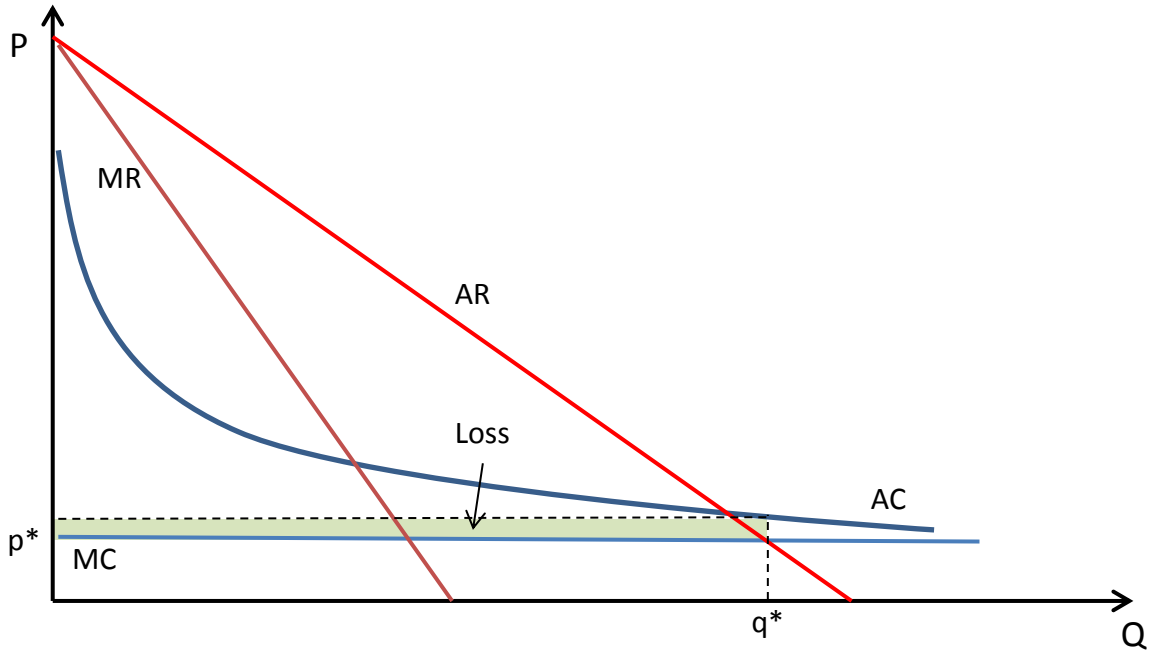
- Production by one firm least costly
- EG average cost falls with rising production



Natural Monopoly Fix

- When NM is unavoidable, how to avoid its monopolists pricing? (above MC, with rent)

1. Marginal cost pricing
   - Imply financial loss – no firm interesed
   - State may subsidize the loss – ambiguous solution



Natural Monopoly Fix

- Probable solution somewhere in between
  - Loss compensated
  - Price subsidized or above MC

Natural Monopoly Fix

2. Two-part tariff
   - Fixed and variable parts (eg fixed for plug and variable for real consumption)
   - Fixed part may be diversified
3. Ramsey pricing
   - Maximizing
   - Higher price with lower elasticity
4. Public ownership
   - Behave very much like Ramsey pricing

Other Market Failures

- Rents
  - Non-renewables rent
  - Monopolists rent
  - Distorts market
- Externalities
  - Environmental
  - Public goods

Energy Demand

Energy Demand

- Different views
  - Personal (cooking, heating, electricity)
  - Scientific (energy needed for chemical reaction)
  - Managerial (eg fuel needed in a power plant)
  - Planning – policy making (regional/country level)
- Primary x final
- Demand x Consumption
  - D – economic ex ante concept, willingness to pay
  - C – realized transactions (Demand revealed)

Demand analysis

- Since 1970's
- Trends:
  - Longer term models/predictions reaching 50-100 years ahead – global warming & energy consumption relation – sustainable development
  - Extremely short term models – operational issues with liberalized markets
  - Future security of energy supplies globally
  - Computation advances

Demand decomposition

- Buying decision (Y/N)
- Appliance selection
  - Fuel (coal, oil, gas, biomass, mix…)
  - Appliance (technology)
- Capacity utilisation (economy of operation)

Demand – Descriptive Analysis

- Growth
  - Values, indices
  - Eg TPES in physical units (toe, btu…)
- Elasticities
  - Output, price, income (ratio to energy change)
  - **e > 1** elastic, **e < 1** inelastic, **e = 1** unitary elastic
- Intensities
  - GDP to energy consumption ratio

Factor analysis

- Further understanding of energy consumption changes
- Demand determined by GDP, relative size of the economy, energy intensity etc.
- Change in overall demand (ΔE) between two years decomposed into separate effects of those
- E.g. GDP effect – What would be the ΔE had only GDP changed?
- Similarly Intensity and Structure change
- Together $Q_{eff} + I_{eff} + S_{eff} + \varepsilon = \Delta E$
- When ε is too big then we should find other explanatory variables

Energy Supply

- ES economics explained in the third lecture about investment
- Basically
  - Value chains supplying energy products – electricity, heat, fuel
  - Sources:
    - Non-renewable
    - Renewable

Demand Decomposition Case

Demand Decomposition Case

- Coal burning heating power plant
  - 5 blocks (engines): 3 coal base, 2 fuel oil peak
  - Built between 1960's and 1980's
  - Fuel oil engines not used anymore
  - 2 of 3 coal engines need $40m investment
- Coal demand comprise:
  - Outputs: Heat demand and its sustainability
  - Inputs: ETS price, coal price and availability
- Demand decomposition
  - Y/N shall we buy another engine?
  - What would it fire? (fuel question)
  - How often would it fire? (seasons, fuel price, regulation)

Demand Decomposition Case

- Heat demand?
  - Weather dependent
  - Technology dependent (consumers may unplug)
  - Heating price regulated – regulation body behavior?