

# Market Failure and Cost-Benefit Analysis

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# Market Failure


# *Perfect Competition*

## *Assumptions*

- Large number of small producers
- Large number of small consumers
- Complete information
- Homogenous good
- No externalities
- No barriers to entry or exit
- Other assumptions regarding functional forms of objective functions and preferences (convexity, returns to scale)

# *Perfect Competition*

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- 
- price takers

# *Conditions for Pareto Efficiency*

- Exchange efficiency: MRS between any two goods must be the same for all individuals
- Production efficiency: MRTS between any two inputs must be the same for all firms
- Perfect competitive economies in equilibrium satisfy the 2 conditions



# Is the perfect competition model relevant?

- Theoretically
- Empirically?
- Why bother?
- So what?

# Property Rights

- Market functioning depends on property rights definition and contract enforcement
- Lack of well defined property rights can lead to over consumption or under investment
- Lack of contract enforcement increases risks in economic transactions

# Imperfect Competition

- In many cases the number of agents in a market are much smaller than what is assumed in the perfect competition model.
- 3 standard imperfect market structures:

Monopoly

Oligopoly

Monopolistic Competition



# Imperfect Competition

- A crucial common feature of imperfect market structures is that individual agents can affect prices to a certain degree.
- As a result firms face a downward sloping demand curve (in perfect competition firm's demand is flat)

# Marginal Revenue

$$MR = MC$$

$$R = p(Q).Q$$

$$MR = \frac{dp}{dQ} Q + p \frac{dQ}{dQ}$$

$$MR = p + \frac{dp}{dQ} Q \qquad \frac{dp}{dQ} < 0$$

# Sources of Imperfect Competition

- Increasing returns to scale
- Transport costs
- Imperfect information
- Strategic behaviour and collusion
- Government intervention

# Linear Demand

$$p = a - bq$$

Linear demand  
(inverse)

$$R = pq = (a - bq)q = aq - bq^2$$

$$MR = \frac{dR}{dq} = a - 2bq$$

$p$



$MR$

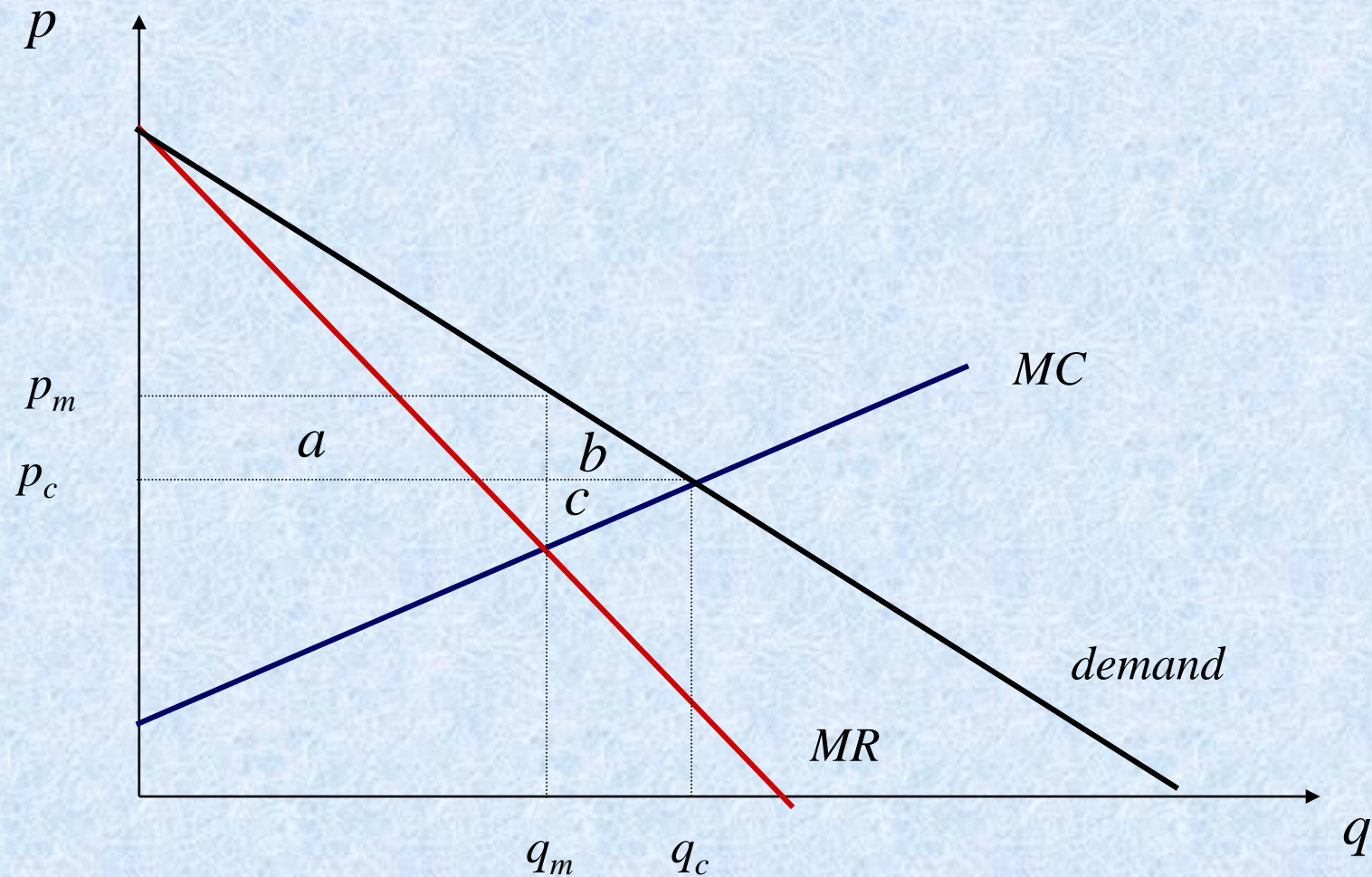
*demand*

$q$

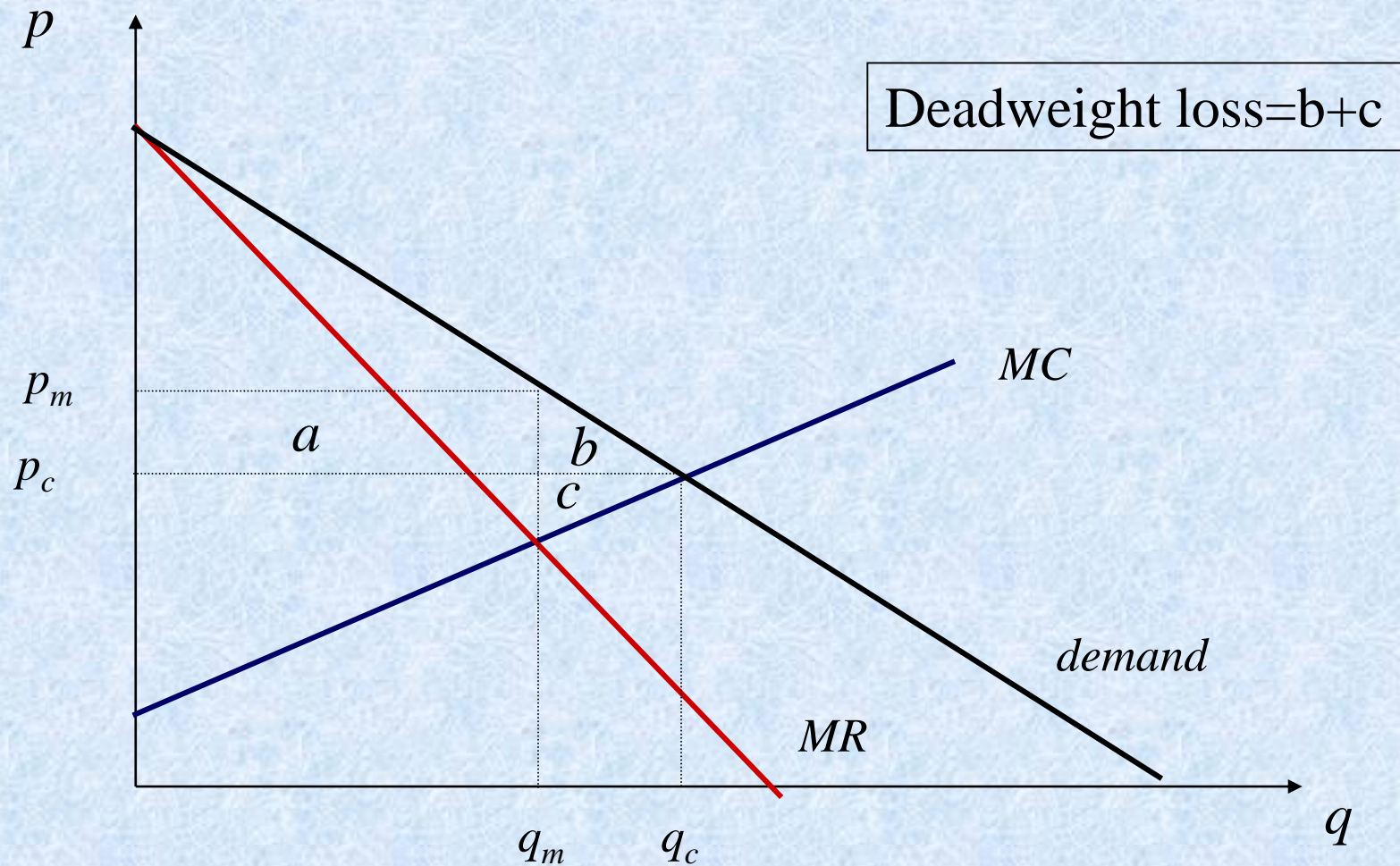




# Monopoly x Perfect Competition



# Monopoly x Perfect Competition



# More on Competition

- What is the meaning of competition?
- (i) greater freedom of rivals
- (ii) an increase in the number of rivals
- (iii) a move away from collusion towards independent behaviour between rivals
- Causal relation: (i) causes (ii) that causes (iii)
- (iv) higher rewards for winning, higher penalties for losing

# Competition and Incentives

- Competitive pressure makes organisations more efficient internally (process efficiency)
- Competition leads to the selection of the efficient firms in the market (Darwinian/Evolutionary approach)
- Competition to innovate is the major source of gains in productive efficiency over time

# Competition, Discovery and Selection

- Hayek: ‘the economic problem is a problem of the utilization of knowledge which is not given to anyone in its totality’
- ‘It is only through the process of competition that the facts will be discovered’
- Market prices communicate information that has been discovered and influence entrepreneurial efforts
- Competition is vital for discovery



# Innovation and Competitive Dynamics

- Schumpeter: ‘Capitalism is essentially a dynamic process of creative destruction’
- Focus: non-price competition through innovation
- Technological competition is a dynamic process of rivalry
- Recent work: Endogenous Growth Theory

# Competition Policy Analysis

- Competition policies have been growing in interest recently
- Monopoly regulation
- Privatisation
- New market economies in the East
- Anti trust policies

# Externalities

- There are many cases where the action of an agent affects other agents. These are called externalities.
- If one individual's actions impose a cost on others we have a negative externality.
- If one individual's actions promote a benefit on others we have a positive externality.

# Externalities

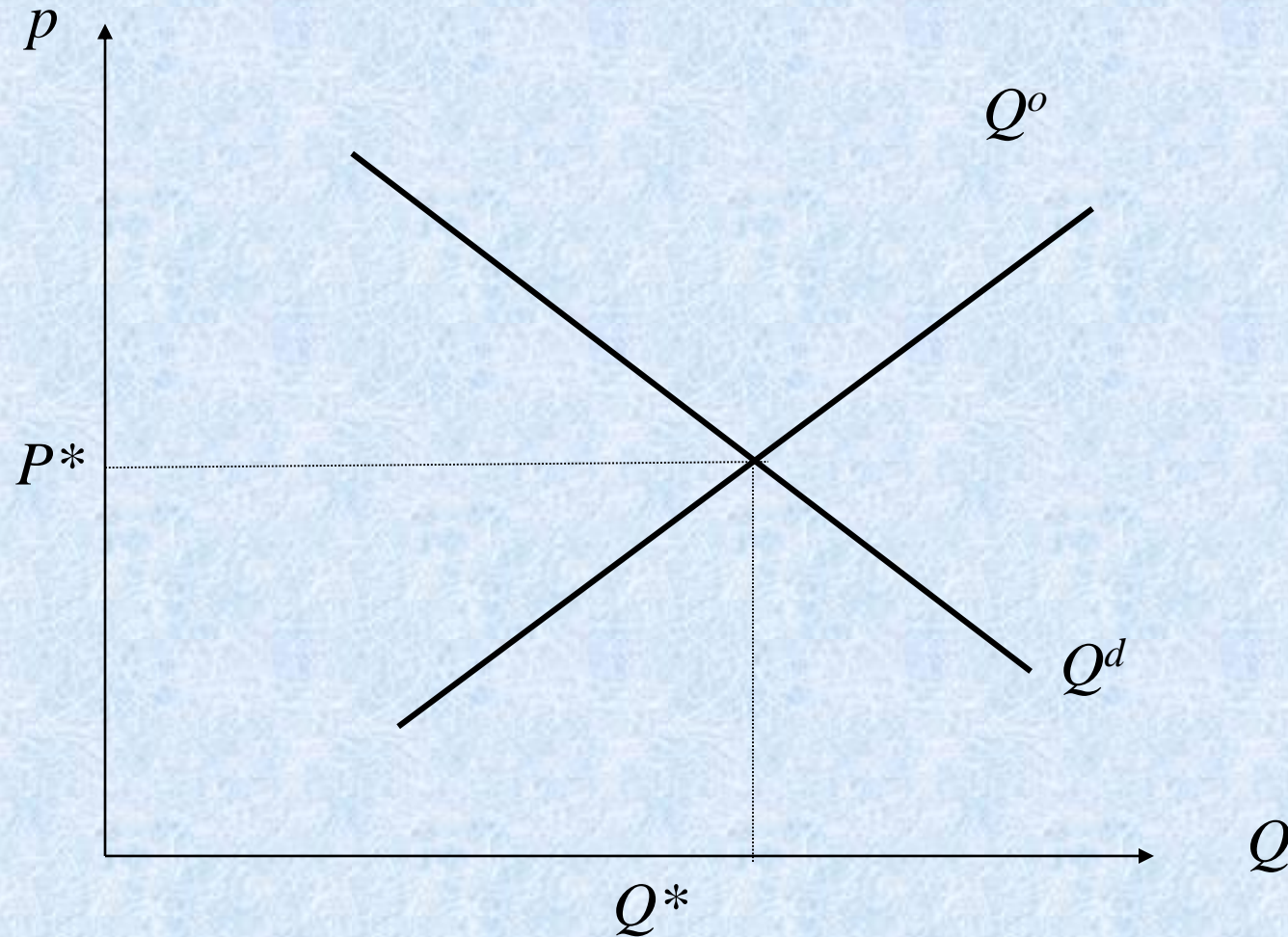
- Examples:
- Firm upstream, fishery downstream
- Bee keeper and flower plantation
- Urban noise
- Pollution
- Knowledge spillovers

# Private Costs x Social Costs

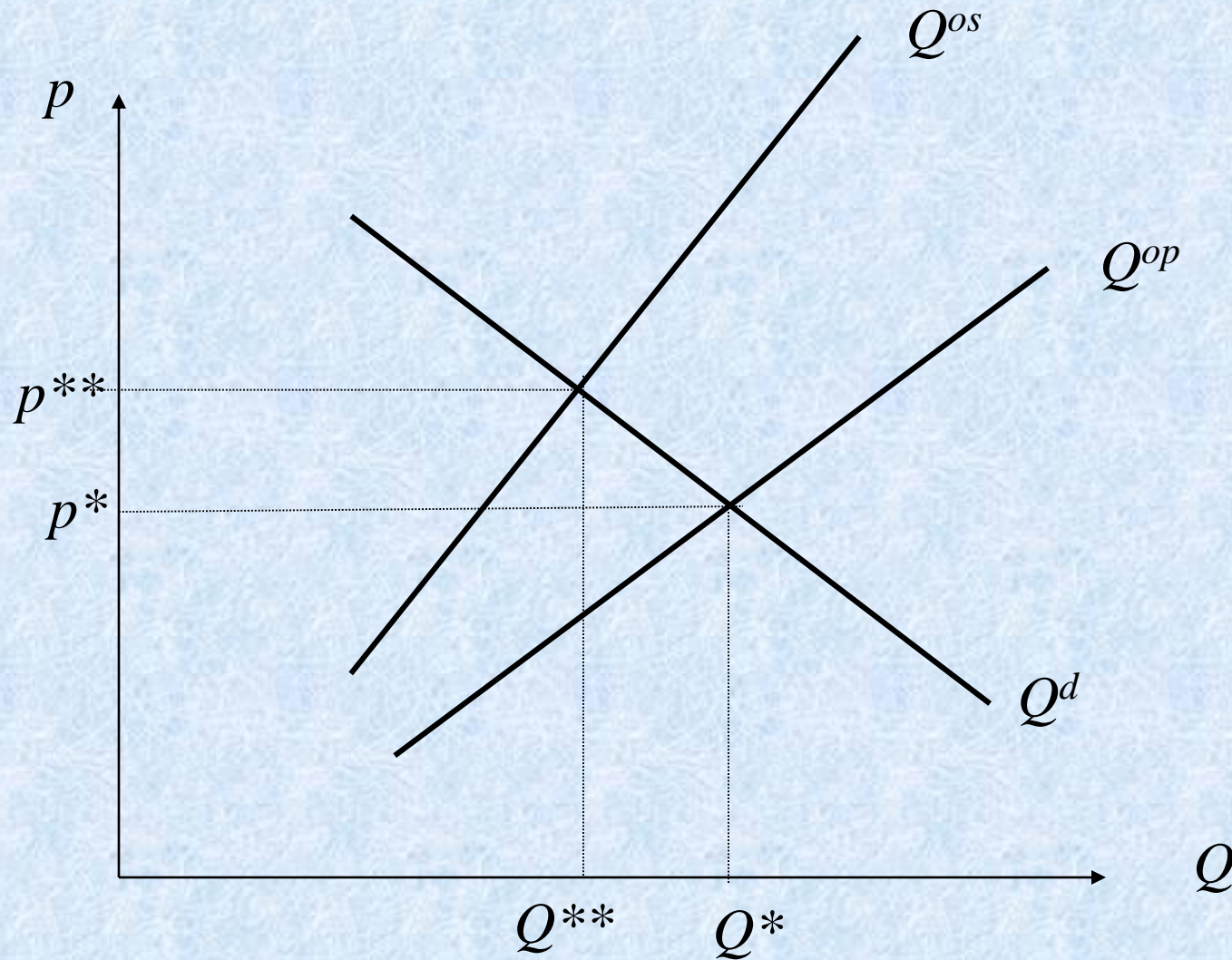
- In case of externalities the resource allocation provided by the market will not be efficient
- Since individuals do not bear the full cost of the negative externalities they generate, they will engage in excessive amounts of such activities
- Since individuals do not reap the full benefits of the positive externalities they generate, they will engage in too little amounts of such activities



# Equilibrium and Private Cost



# Equilibrium and Social Cost



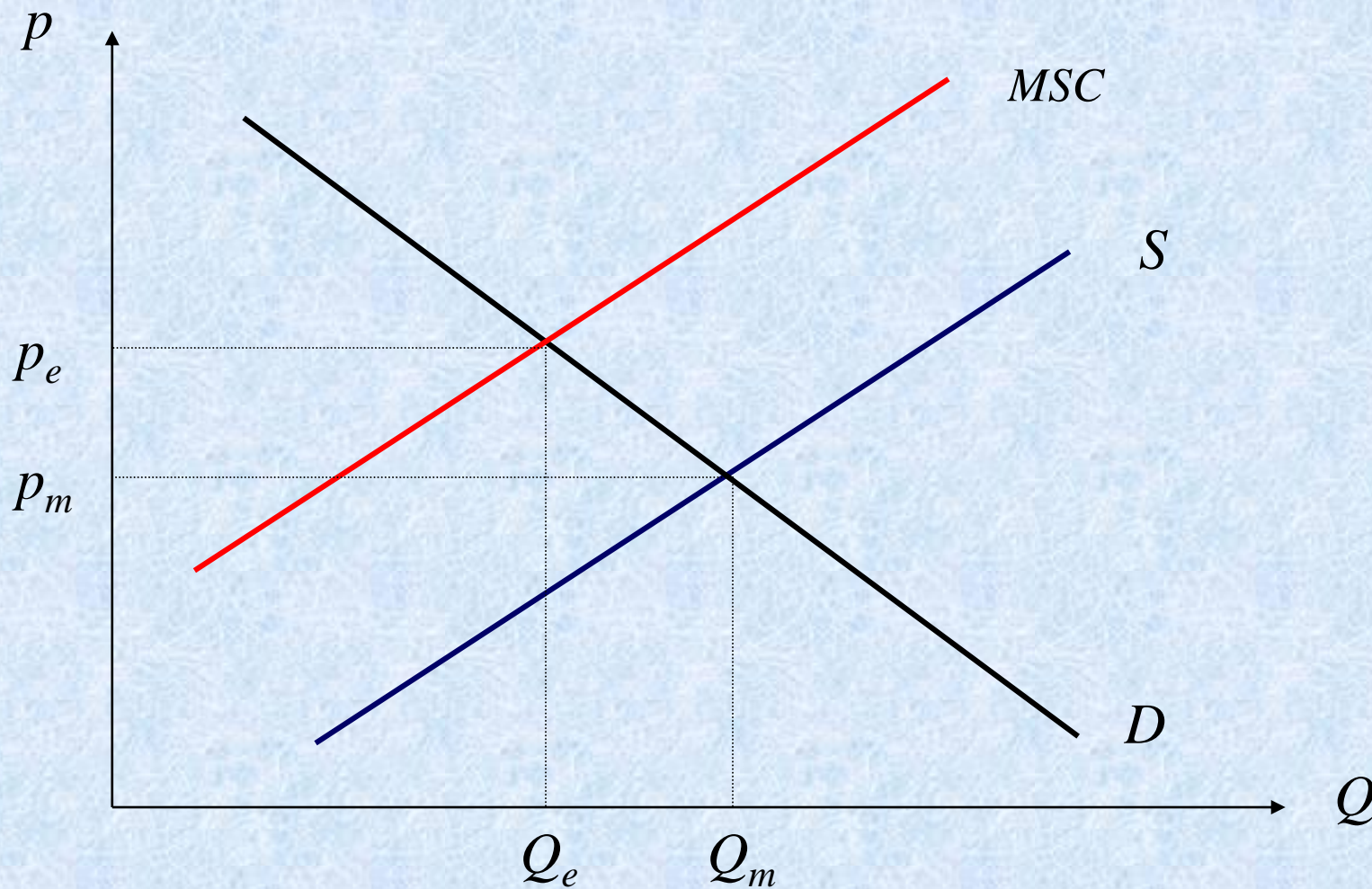
# Private Solutions

- In some cases private markets can deal with externalities without government intervention
- Expanding economic units and ‘internalising externalities’
- Assigning property rights

# The Coase Theorem

- ‘In the presence of externalities, the parties involved can get together and make arrangements by which the externality is internalised and efficiency is ensured’
- Assigning property rights to one group implies compensation from other groups in order to internalise externalities
- Example: factory pays fishermen to compensate for pollution (or fishermen pay factory not to pollute)
- Assignment of property rights impacts distribution

# Private Costs x Social Costs





# Failure of Private Solutions

- Free rider problem
- Imperfect information
- Incentives not to reveal the truth
- Transaction costs (multiple agents)
- Uncertainty about outcomes and problems with litigation

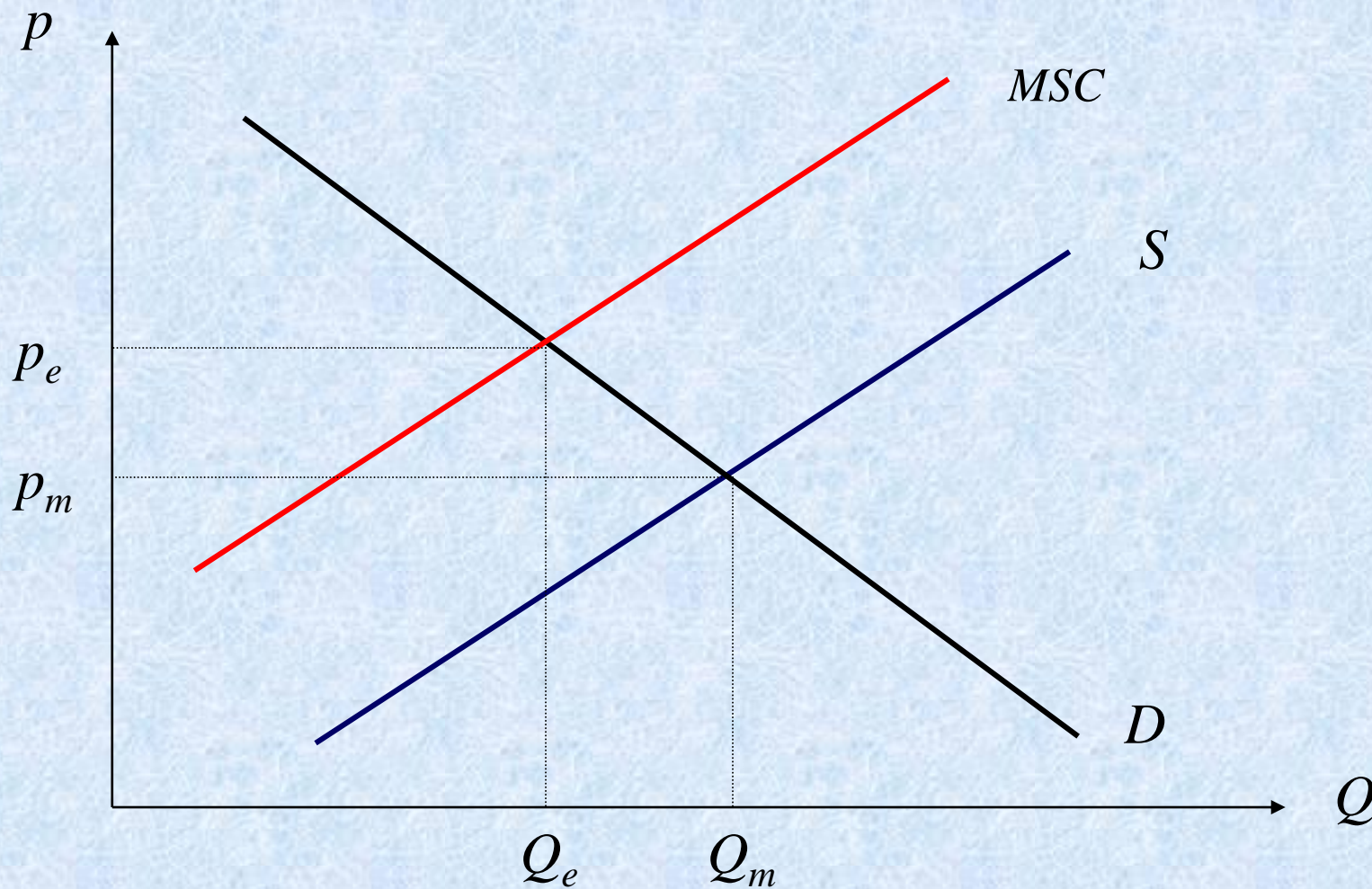
# Public Solutions

- Market-based solutions (prices, permits)
- Direct regulation (standards, limits)

# Fines and Taxes

- A typical market-based solution involves levying fees or taxes in proportion to the amount of the externality generated
- A properly calculated fine or tax presents the individual or firm with the true social costs and benefits of its actions
- These are often called Pigouvian taxes

# Private Costs x Social Costs



# Public Goods

- Two properties:
  - Non rival
  - Non exclusive
- 
- Examples: national defense, monuments, street lighting, lighthouses, parks



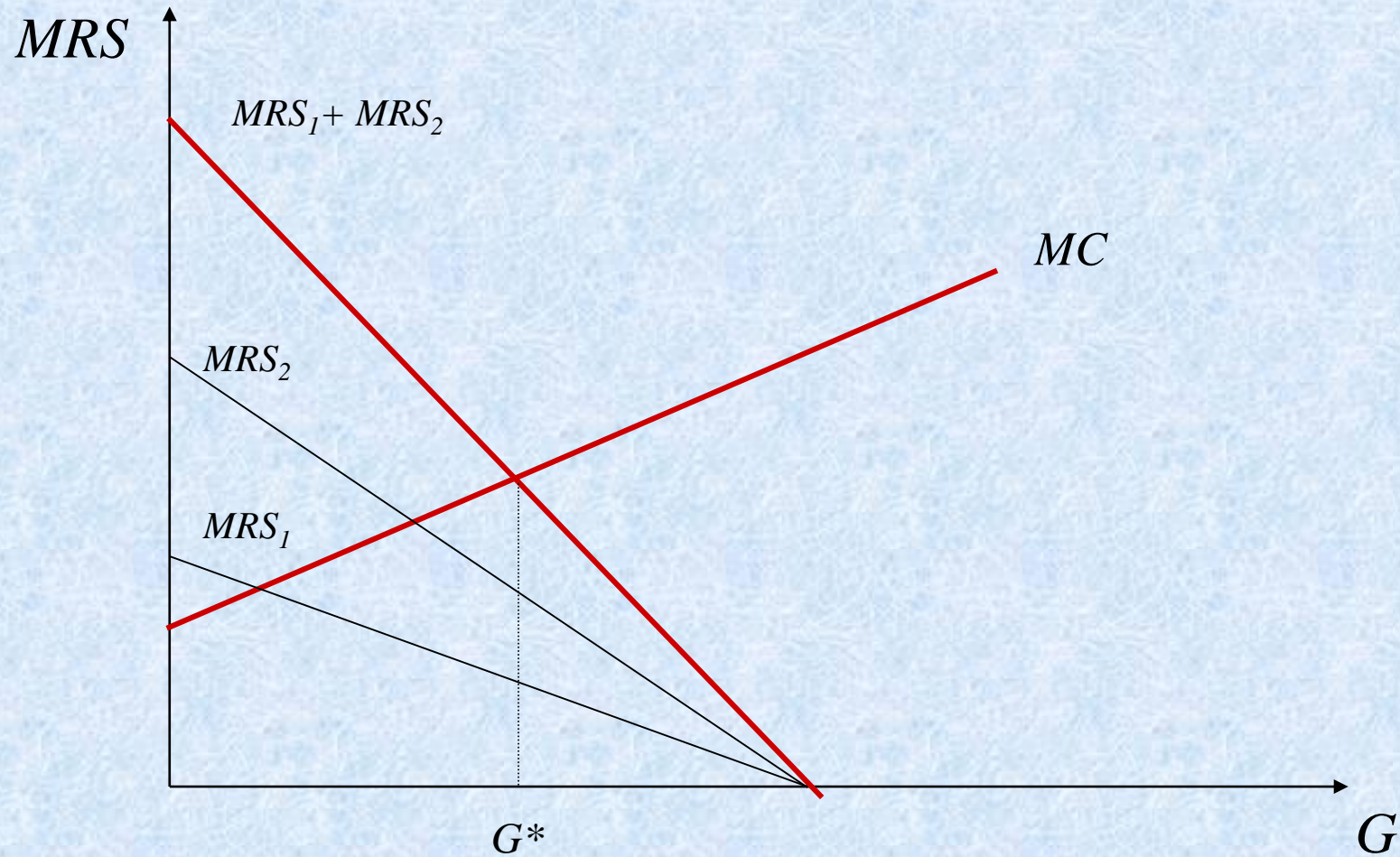
# Public Goods

- The market will not supply, or will not supply enough of a public good.
- This provides the rationale for government intervention
- The free-rider problem

# Public Goods and Efficiency

- Efficiency conditions
- For a private good, each individual's MRS must be equal marginal cost (price ratio)
- For a public good, the sum of MRS must be equal marginal cost
- In the case of a private good each person can consume a different amount, but they all must value it the same at the margin-otherwise there is room to trade
- In the case of public good each person must consume the same amount, but they can value it differently at the margin

# Public Goods and Efficiency



# *Public Goods as Extreme Externalities*

- When one individual ‘purchases’ more of a public good, all individuals consumption of that good increase by the same amount.
- When one individual ‘purchases’ more of a private good other individuals consumption of that good remain unaffected.

# Incomplete Markets

- Whenever private markets fail to provide a good or service even though the cost of providing it is less than what consumers are willing to pay, there is a market failure called incomplete market.
- Examples: Insurance, capital markets



# Incomplete Information

- There is a general belief that markets supply too little information
- Examples: labelling, financial costs
- Information can be regarded as a public good in many respects
- Much economic activity is directed at obtaining information (job market, loans, investment, insurance)
- Knowledge production (R&D)

# Equity and Distribution

- Even if the economy is Pareto efficient it might be desirable to have some government intervention
- Market allocation of income might leave some individuals with insufficient resources
- Unequal income distribution may be seen by the society as a bad thing
- More: coming lecture on Social Choice

# Merit Goods

- Assumption: Individuals may not act in their own best interests
- Fully informed individuals may make ‘bad’ decisions (smoking, drinking, seat belts, education)
- Goods that the government compels individuals to consume are called merit goods
- Problem: Bad individual decisions impose costs to the society
- Paternalism x libertarianism

# Introduction to Cost-Benefit Analysis and Policy Evaluation

# Analysis of Public Policy

- Rationale for a program (groups of interest, sources of market failure, efficiency issues, equity issues)
- Alternative forms of government intervention:
  1. Public Production (free, below cost, at cost)
  2. Private Production (taxes, subsidies, direct production, regulation)
- Program Design (targeting, cost effectiveness, additionality, establishing counterfactuals, cost-benefit analysis, implementation)



# CB Analysis - Introduction

- In many cases governments want more than a qualitative analysis of a potential program in order to make decisions (rationale for action)
- They need to know whether its benefits exceed its costs
- Cost-Benefit analysis aims to provide the means and a general framework for quantifying inputs and outputs of public programs

# Private Cost-Benefit Analysis

- CB analysis is a standard tool for investment decision making
- Steps:
  - Identify the set of alternative projects
  - Identify inputs and outputs
  - Assign values for inputs and outputs
  - Add up costs and benefits
  - Selecting the best project

# Present Discounted Value

$$NPV = R_0 + \frac{R_1}{1+r} + \frac{R_2}{(1+r)^2} + \dots + \frac{R_N}{(1+r)^N}$$

$R_i$  Results of period  $i$

$r$  Discount rate (interest)

$N$  Number of relevant periods

## *Alternative methods*

- *IRR* – Internal rate of return:  $r^*$  that makes  $NPV=0$
- Pay Back – period of time that returns initial investment
- Other financial methods

# Internal Rate of Return

$$0 = R_0 + \frac{R_1}{1 + r^*} + \frac{R_2}{(1 + r^*)^2} + \dots + \frac{R^N}{(1 + r^*)^N}$$

*$r^*$  is the rate the makes NPV=0*

# Pay Back

$$0 = R_0 + \frac{R_1}{1+r} + \frac{R_2}{(1+r)^2} + \dots + \frac{R^{N^*}}{(1+r)^{N^*}}$$

$N^*$  is the number of periods that returns the initial Investment  $R_0$



# Risks and Scenarios

- Amount and cost of inputs
- Market price
- Demand
- Political Scenarios
- Business environment
- Mapping risks, risk premium
- Scenarios and sensitivity analysis

# Social CB Analysis

- The government goes through basically the same procedures in evaluating a project
- 2 main differences:
  1. Concern with a broad range of outcomes (not only profitability)
  2. Availability of market prices (existence, social costs/benefits)

# Measuring Non-Monetised C/B

- For many of the costs and benefits associated with government projects and regulations there are no market prices (lives saved, time saved, environmental amenities)
- Economists have developed systematic procedures for estimating non-market values
- However, most of these techniques remain controversial

# Valuing Time

- Economic models: Assuming that labour markets are in equilibrium, wages represent the value of time (trade-off between labour and leisure)
- Transportation improvements can be evaluated by multiplying the time saved by user's wages
- Problem: wages might overestimate (or underestimate) the value of time due to imperfections in the job market or due to non-monetary benefits (or costs) of different jobs.

# Valuing Natural Resources

- Environmental values (use values, existence values)
- Different techniques have been proposed
- Problems: incomplete information, uncertainty, aggregating individual preferences



# Valuing Natural Resources II

## *Contingent Valuation Methods (CVM)*

- CVM works by directly soliciting by a sample of consumers of a particular natural resource of environmental amenity *they willingness to pay* and/or *willingness to accept* for a change in the level of environmental flows, in a carefully structured hypothetical market
- Example: the value of a beautiful landscape in the country side.

# Valuing Natural Resources III

## *The Hedonic Pricing Method (HP)*

- HP identifies environmental service flows as elements of a vector of characteristics describing a marketed good, typically housing. The method seeks to find a relationship between the levels of environmental services and the price of marketed goods
- Example: noise levels around airports, urban air quality

# Valuing Natural Resources IV

## *Travel Cost Methods (TCM)*

- The TCM seeks to place value on non-market environmental goods by using consumption behaviour in related markets
- The costs of consuming the services of the environmental asset are used as a proxy for price. These consumption costs will include travel costs, entry fees, on-site expenditures and outlay on capital equipment necessary for consumption
- Example: the value of a national park

# Valuing Life

- Economists' attempts to place monetary value on life have generated much emotional discussion
- However, in many times governments must choose how much to spend in different life preserving policies (transport safety, health systems, pollution control, security)
- Decision rule: when the probability of saving another life due to extra spending becomes sufficiently small



# Shadow Prices

- Whenever there is a market failure, markets may not reflect true marginal costs or benefits (sometimes the market failure is simply characterised by the absence of market)
- Economists have attempted to calculate these ‘true’ prices by revealing marginal social costs and benefits. They are called shadow prices.
- In the absence of market failure the price of a particular good equals its opportunity cost (what is forgone in alternative uses) and also its shadow price



# Shadow Prices II

<ul style="list-style-type: none"><li>• Labour</li></ul>	<ul style="list-style-type: none"><li>• Shadow wages is less than mkt wage when there is significant U</li></ul>	<ul style="list-style-type: none"><li>• No loss in output elsewhere when someone is hired</li></ul>
<ul style="list-style-type: none"><li>• Capital</li></ul>	<ul style="list-style-type: none"><li>• Shadow interest rate exceeds mkt rate when there is rationing in the K mkt</li></ul>	<ul style="list-style-type: none"><li>• Expected returns exceed interest rate because firms would like to borrow more at given rate</li></ul>
<ul style="list-style-type: none"><li>• Steel</li></ul>	<ul style="list-style-type: none"><li>• Shadow price exceeds mkt price</li></ul>	<ul style="list-style-type: none"><li>• Marginal cost of pollution in increased production is not included</li></ul>

# Discounting

- We've seen that in deciding whether to undertake a project we look at its present discounted values
- The discount rate of private firms is normally the interest rate the firm has to pay
- What discount rate should governments use?
- The central question regards the relationship between the interest rate faced by producers and the interest rate faced by consumers

# Discounting II

- If there are no market failures consumers' marginal rate of substitution equals producer's return to capital. Then using the market interest rate is appropriate.
- However, when market failures are pervasive (especially in capital markets) matters are more complicated.
- Also, projects might impact different agents in different ways. So, which rate should be used?
- This is a matter of high controversy. Many economists argue that the appropriate rate for government discounting may be none of the observed market rates, especially when projects impact future generations

# Discounting III

- Some economists believe that welfare of future generations at the same level of income should be weighted less than welfare of present generations.
- The rate at which future generation's welfare should be discounted is referred as the pure discount rate.
- Other economists however argue that that all generations should be given equal weight.
- Further reference: 1. Diamond, P. and Mirlees, J. (1971) 'Optimal Taxation and Public Production', *AER* 61: 261-78;  
2. Stiglitz, J. E. and Dasgupta, P. (1971) 'Differential Taxation, Public Goods and Economic Efficiency', *Review of Economic Studies* 39:151-74



# Cost Effectiveness

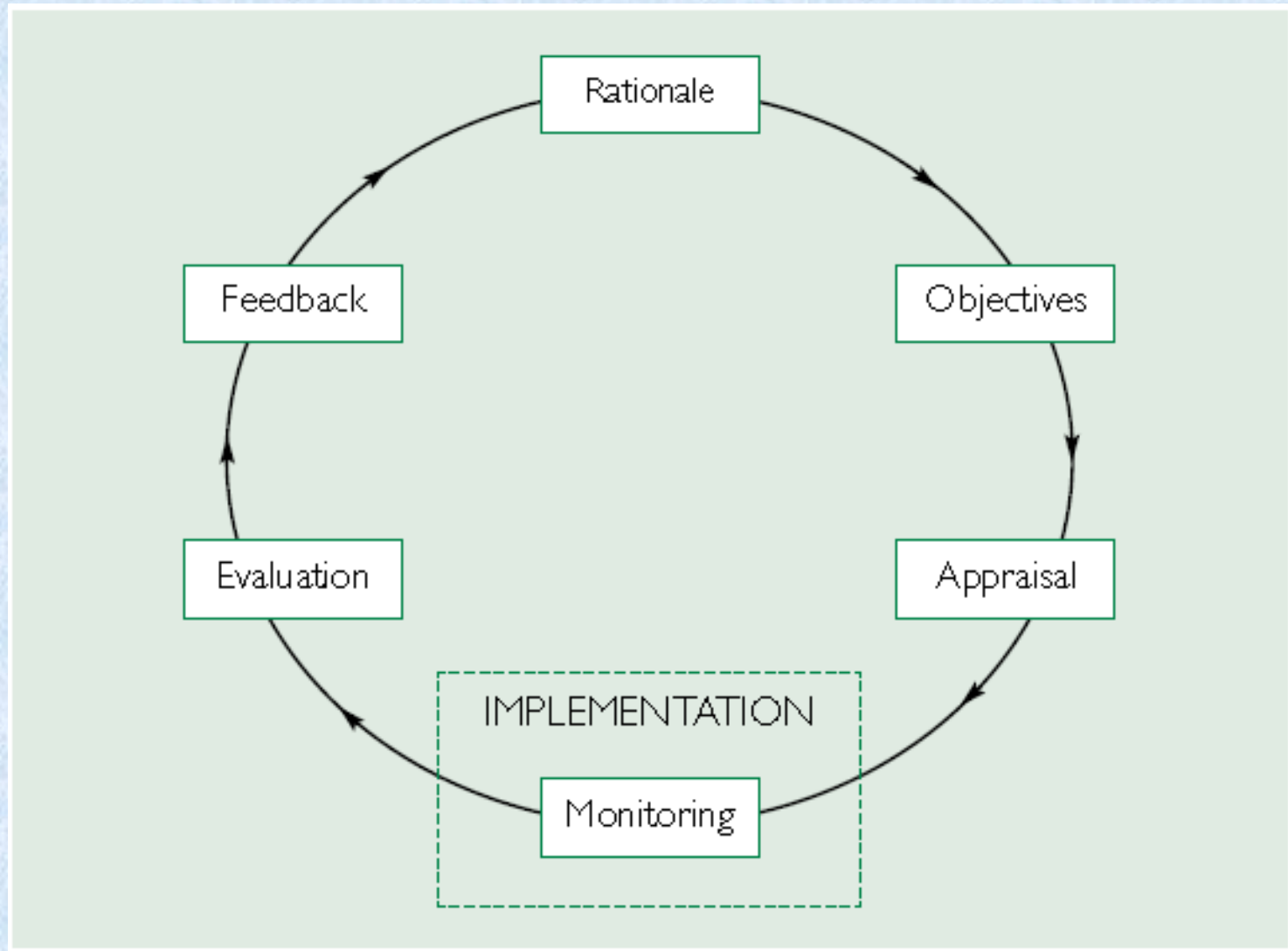
- As we've seen, in some cases there are difficulties in comparing costs (\$) and benefits (lives, health, time, environment)
- Cost effectiveness analysis provides a way of doing this by looking at programmes with the same benefits at the least cost
- However, there might be problems in measuring costs as well. Shadow prices for inputs might differ from market prices, a social rate might be used to discount costs incurred in different dates, or there are uncertainty regarding costs.



# In Summary

- Cost-benefit analysis and cost effectiveness analysis are important tools used by policy makers throughout the world
- They provide technical tools to the decision making process
- While there never will be complete precision, especially in hard-to-quantify areas (or areas where uncertainty is significant), judgments will be made weighting various considerations and therefore quantification can be helpful in resolving trade-offs.

# Policy Evaluation: Introduction



# Types of Evaluation

- Process evaluation: how the program operates; problems in service delivery.
- Cost-benefit evaluation: assessment of costs & benefits once project implemented; uses actual as opposed to projected data.
- Impact evaluation: whether project has desired effects on target population; focus on attribution & causality; most sophisticated form of evaluation.

# Impact Evaluation

- **Definition:** a study which aims to assess changes in “well-being” of individuals, households, communities or firms which can be attributed to a particular project, program or policy.

# Counterfactuals

- Key question: What would have happened had project/program/policy not been implemented?
- Need to establish counterfactual scenario
- Interested in comparing 2 states of the world, one of which we can't observe!



# How to evaluate?

- Given impossibility of observing alternative state of world studies compare: “beneficiaries” (treatment) with “non-beneficiaries” (control).
- Non-beneficiaries provide counterfactual: outcomes proxy those for beneficiaries in alternative state.
- **Either:** Non-beneficiaries must have similar characteristics to beneficiaries
- **Or:** Must be able to control for any systematic differences in characteristics which affect outcome and program participation.

# References

- Stiglitz (2000)
- HM Treasury, *The Green Book: Appraisal & Evaluation in Central Government*