# Economics, Law and Ethics

## Part IB CST

## 2023-24

## Lecture 1: Classical economics

Alice Hutchings, Richard Clayton

*with many thanks to Ross Anderson*

# Overview

## Introduction

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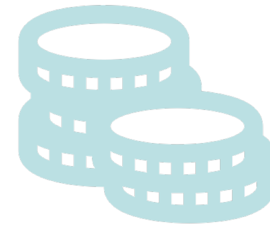


## Classical economics

Prices and markets

Supply and demand

Efficiency, welfare and justice

Why do you think Economics, Law, and Ethics is important to you, as a computer scientist?

# Why teach this course?

Systems: economics used in protocol design, congestion control, mechanisms like blockchain...

Theory: the combinatorial auction is now seen as the archetypal complexity-theory problem

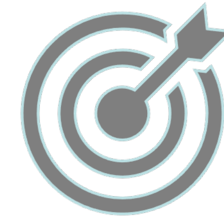
Professional: over half of you will become entrepreneurs or go into consultancy, management

Law: what can make you liable online?

Ethics: how can you navigate the many grey areas?

Course accreditation: requirement for CS

# Aims and Objectives



**Aims**: introduce you to basic concepts in economics, law and ethics

**Objectives**: On completion of this course, students should be able to:

- Reflect on and discuss professional, economic, social, environmental, moral and ethical issues relating to computer science
- Define and explain economic and legal terminology and arguments
- Apply the philosophies and theories covered to computer science problems and scenarios
- Reflect on the main constraints that markets, legislation and ethics place on firms dealing in information goods and services

# Outline

- Classical economics
- How information markets are different
- Market failures and behavioural economics
- Auction theory and game theory
- Principles of law
- Law and the Internet (Richard Clayton)
- Ethics
- Contemporary ethical issues

# Assessment

## Summative assessment

Two examination questions in Paper 7

Essay style

https://www.cl.cam.ac.uk/teaching/exams/pastpapers/t-EconomicsLawandEthics.html

## Formative assessment

Supervisions

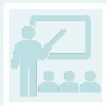
Interacting with your peers

# Resources

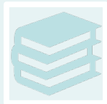
- Shapiro and Varian “Information Rules”
- Hare “Technology is not neutral”
- Optional further reading:
  - Links to various articles on the course materials site
  - Varian “Intermediate Microeconomics”
  - Adam Smith, “The Wealth of Nations”
  - Richard Thaler, “Misbehaving”
  - JK Galbraith, “A History of Economics”
  - William Poundstone, “Prisoners’ Dilemma”
  - Steven Pinker, “The Better Angels of our Nature”
  - Nuffield Bioethics Council report on biodata

# Studying a humanities subject

It’s not like learning to prove theorems or program in Java, which gives a testable skill



Wide reading is important – ideas become clearer when approached from several perspectives



College libraries are a good place to start

Dig into some subproblem that interests you

Work out different viewpoints: how would a socialist / Keynsian / environmentalist / libertarian approach a problem of interest?

# Roadmap

- Economics as a subject is traditionally made up of macroeconomics, microeconomics and specialised topics
- ‘Macro’ is about the performance and structure of the global economy or a nation or region. It’s about models of employment, inflation, growth, investment, trade, savings, credit, tax, GNP…
- We will touch on this only occasionally

# Roadmap (2)

- Microeconomics or ‘micro’ is about how individuals and firms react to incentives, how market mechanisms establish prices, and the circumstances in which markets can fail
- Many topics of interest to computer scientists & engineers include game theory, the economics of information, the economics of dependability, and behavioural economics (economics + psychology)
- Our tools range from mathematical models to empirical social science

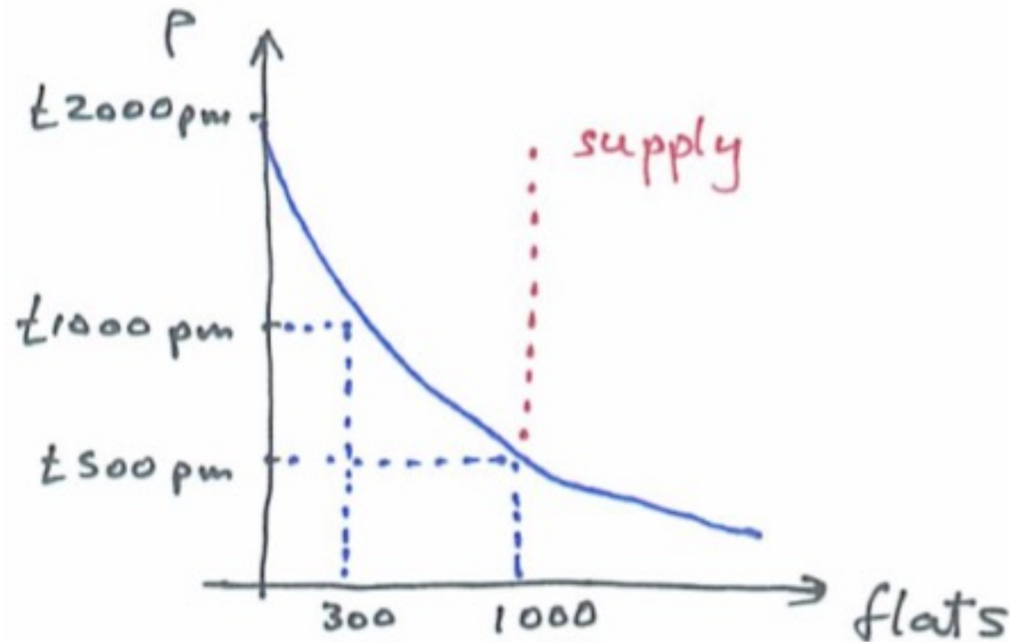
# Classical economics

- Interlocking models of consumption, production, labour, finance, etc., in a world of free competition

# Prices and markets

| | |
|---|---|
| Consider | As an introduction to theories of prices, consumers and markets, consider an idealised market for flats in Cambridge |
| Simplify | Simplify to two types – one-bed flats in town, or house-shares in Cherry Hinton. People who can afford flats will rent them, and those who can't will cycle to distant house-shares instead |
| Assume | Assume that there are 1000 flats to rent, and that people vary in their ability / willingness to pay |

# Accommodation market

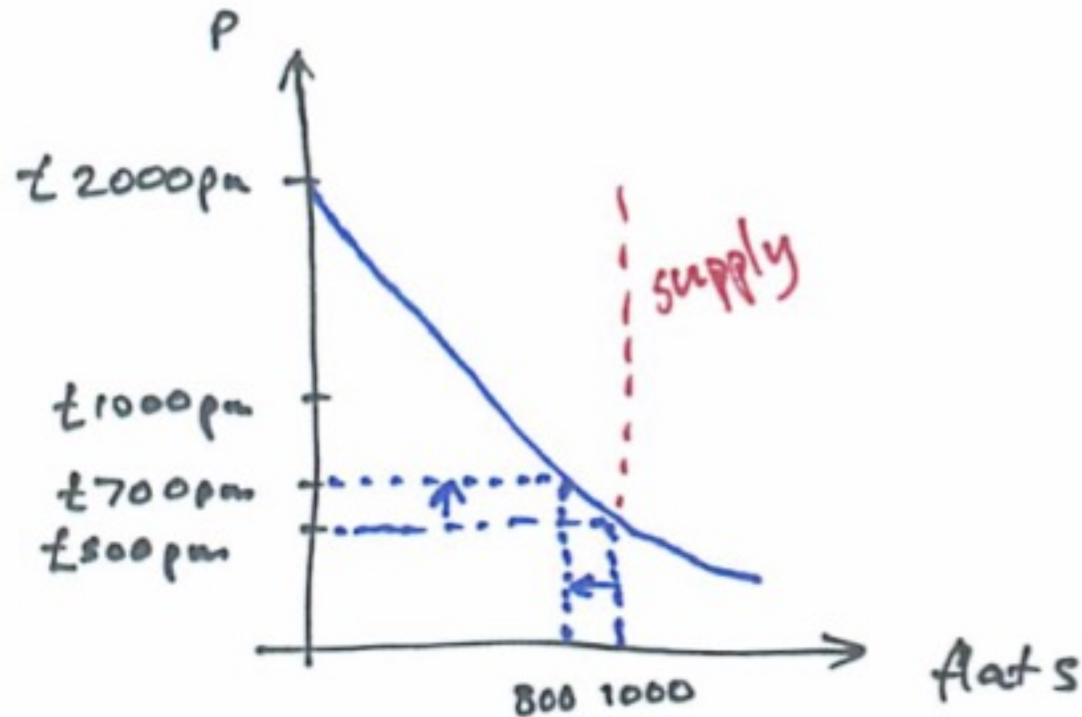



- So there might be 1 person prepared to pay £2000, 300 prepared to pay £1000, 1000 prepared to pay £500…
- With 1000 flats to let, the market equilibrium price p* is where the supply and demand curves cross, i.e. £500

# Monopoly

- One seller or producer of a particular good or service, dominating and controlling the entire supply
- Significant market power and control over pricing
- Price maker, has the power to set prices

# Monopoly

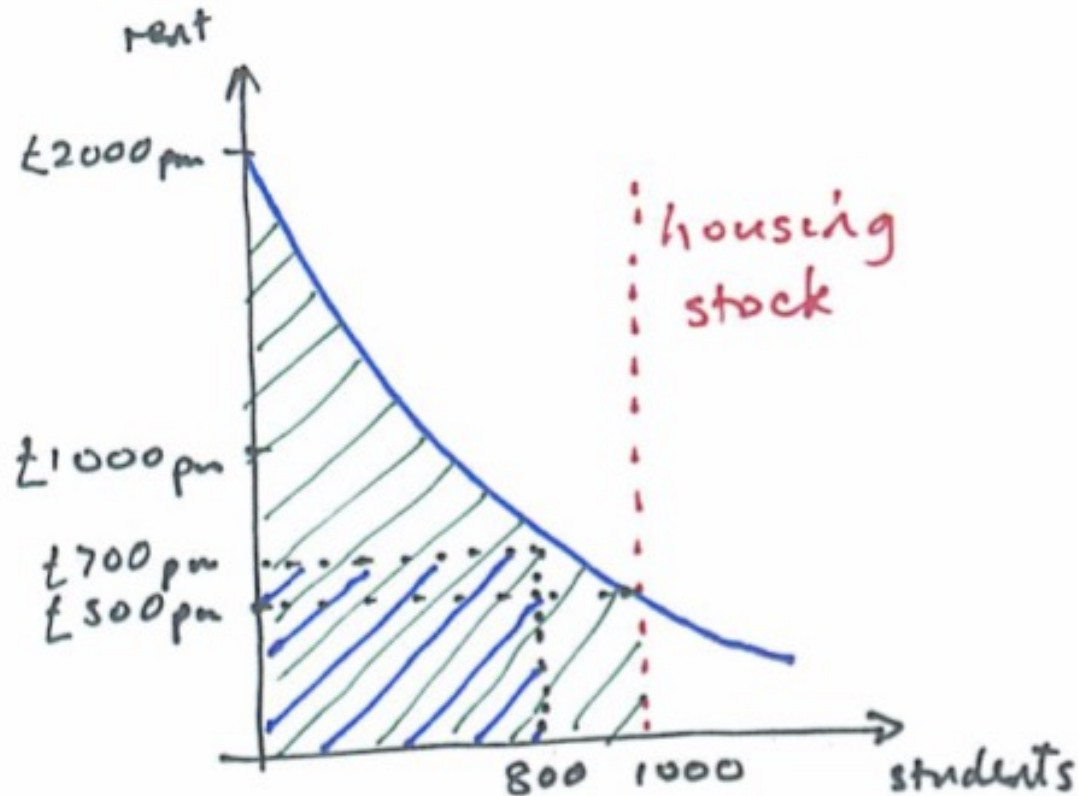



- If the market is rigged, the cartel might restrict supply – 800 flats at £700 pm can earn more than 1000 at £500 pm
- This is inefficient! (there are empty flats which people would pay to rent)
- How can we formalise this?

# Efficiency

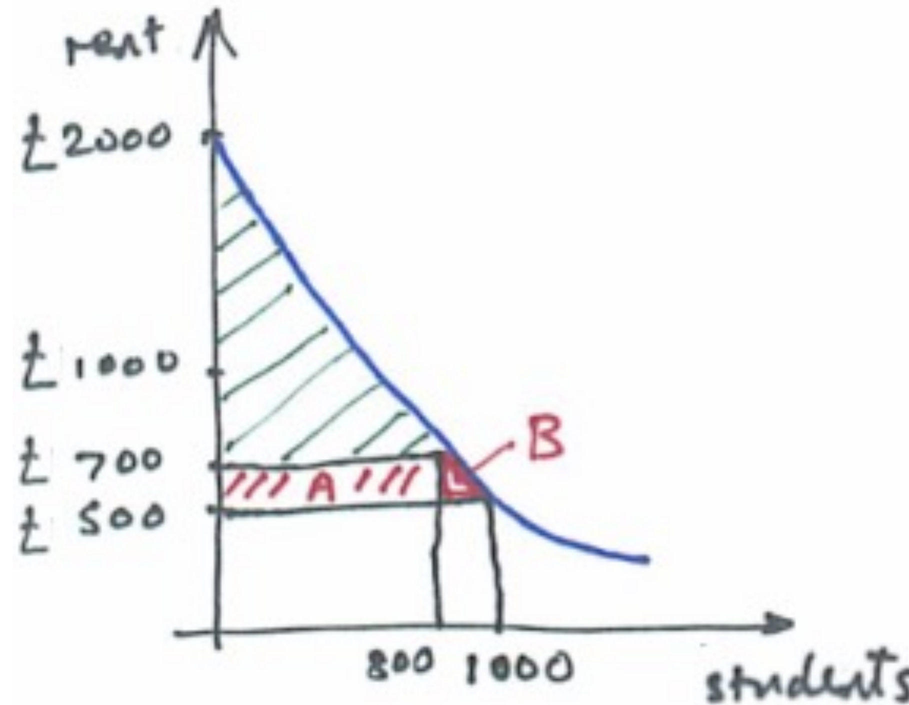
- A monopolist might leave some flats empty despite people being prepared to pay for them
- Definitions
  - A *Pareto improvement* is a way to make some people better off without making anyone worse off
  - A *Pareto efficient allocation* is such that no Pareto improvement is possible
- This is weak: pure monarchy and pure communism are both Pareto efficient!
- Anyway, is there any way for the monopolist to find a Pareto efficient allocation?

# Discriminating monopolist



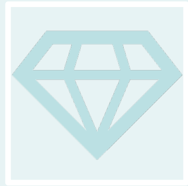

- If you know what everyone can pay, charge them just that!
- This arrangement is Pareto efficient!
- The monopolist captures all the consumer surplus …

# Consumer surplus



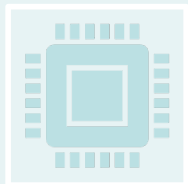

- Consumer surplus is the total amount people saved on their reservation price
- Ordinary monopoly: green area left to consumers
- The monopolist diminished surplus by A and B
- The discriminating monopolist gets the lot!

# The marginalist revolution



Until 1871, no-one had a good theory of supply and demand. Why are essentials like water cheap, while diamonds are expensive?

Solution: the value of the last and least wanted addition to your consumption of a good sets its value to you (Karl Menger, Stanley Jevons, 1871)



Shifted thinking from costs of production to demand, and led to ‘classical synthesis’ of Marshall and others – interlocking models of consumption, production, labour, finance etc in a world of free competition

# Utility

- Utility: Preferences, or how much consumers value a good or service
- Marginal Utility: The additional satisfaction or value that an individual derives from consuming an additional unit of good or service
- Law of Diminishing Marginal Utility: As an individual consumes more of a particular good, the additional satisfaction from each successive unit tends to decrease

# Supply and demand

- Suppose a local coal market in 1840 had three typical suppliers / customers

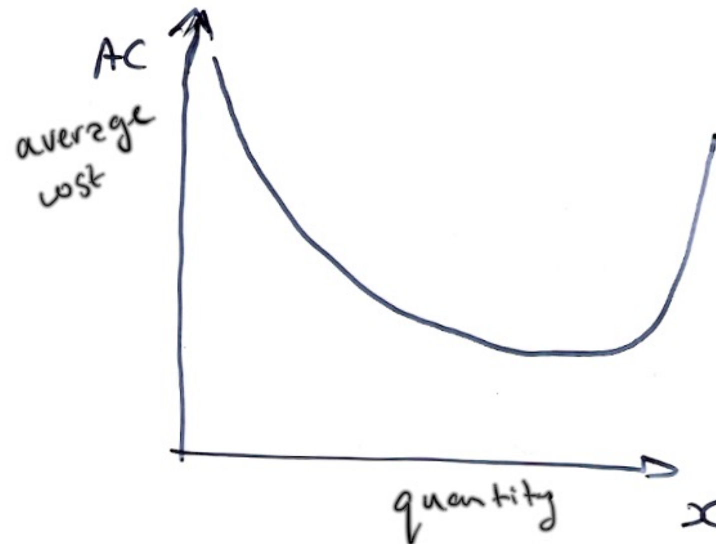
| Suppliers (price) | | Customers (price) | |
|---|---|---|---|
| Sea coal gathering | (8s) | Blacksmiths | (15s) |
| Small deep mine | (5s) | Households | (8s) |
| Open-cast mine | (2s) | Export | (3s) |

- The market price determines who produces and who consumes
- It's determined by the marginal transaction
- It fluctuates with demand (weather) and can evolve in the long term with tech, investment…

# Demand

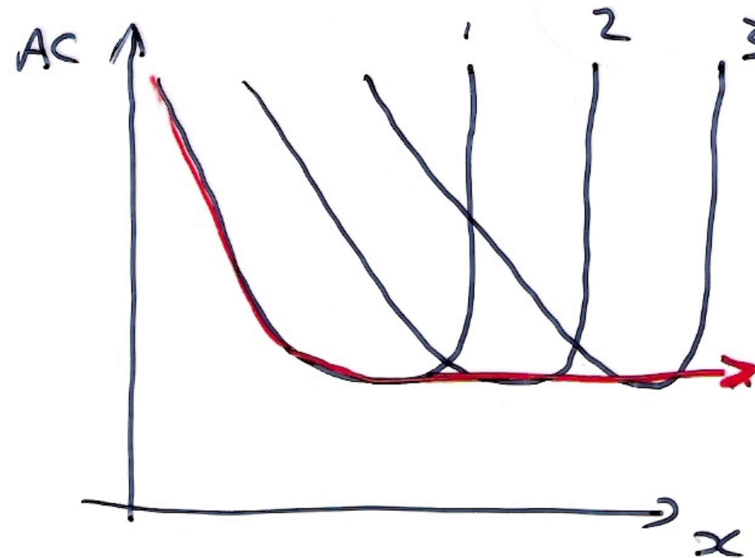
- Assuming functions well-behaved, we can get a consumer's demand from their utility or vice versa
- Market demand is the sum of demand over consumers
- In general, a price change will have a substitution effect (if beer goes up, drink more wine) and an income effect (if rent goes up, you're poorer), but at the level of this course, we can ignore this…

# Supply



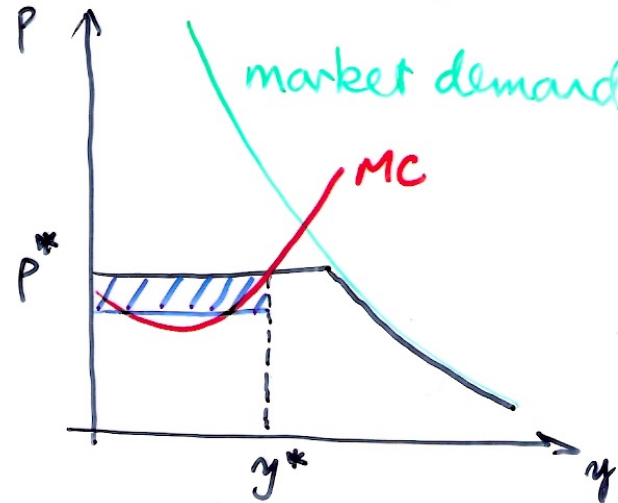

- Firms typically have fixed costs and variable costs, so the average cost of goods initially falls with output
- The variable costs typically rise at some point (overtime etc) and eventually rise sharply due to capacity constraints
- Thus the supply curve typically takes the above convex shape, at least in the short run (static analysis)

# Cost evolution



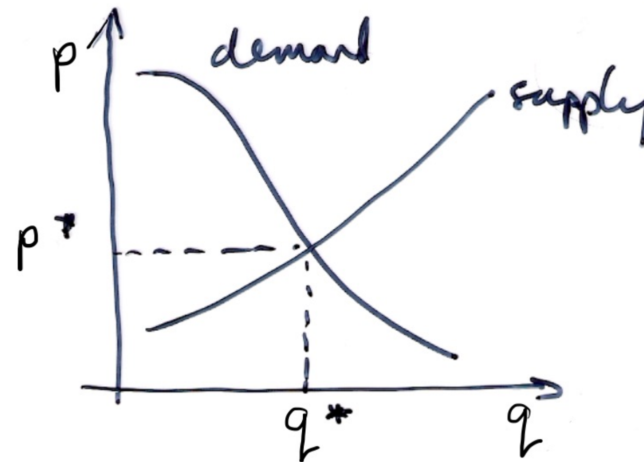

- In the long run, firms can fix capacity constraints by building more factories
- This gives nearly constant fixed costs and thus constant returns to scale as the firm / industry expands

# Firm supply




- In a competitive market, firms are price takers
- The demand curve faced by each firm is in black – at any price above p*, demand is zero, while at any price below p*, the firm would face all the demand
- The firm's profit is maximised when it sets output so that its marginal cost equals the price p*

# Putting it all together




- In the classical synthesis, prices are set where supply and demand curves intersect in competitive markets
- Key: p* will be the marginal cost of the marginal supplier
- Similar models apply in markets for labour etc
- Intrinsic advantages of non-marginal suppliers (e.g. easily mined coal, good farmland) get built into rental values
- By 100 years ago, people thought they understood the 'invisible hand' and just had to guard against monopoly

# Equilibrium (1)

- Studying supply and demand for one good is ‘partial equilibrium analysis’. ‘General equilibrium analysis’ adds in labour, capital etc
- First theorem of welfare economics: market equilibrium is Pareto optimal
- Second theorem: any Pareto optimal allocation can be achieved by market forces provided preferences are convex

# Equilibrium (2)

- Arrow and DeBreu, 1948. Technical conditions include rational actors, property rights, complete information, no transaction costs … (assumptions often broken in practice)

# Efficiency, welfare and justice (1)

- Efficiency does not imply justice! Giving the king all the money is Pareto efficient
- Different theories of justice are consistent with different welfare functions
  - $W = \sum U_i$ is classical utilitarian welfare
  - $W = \min U_i$ is Rawlsian welfare – that of the most miserable citizen

# Efficiency, welfare and justice (2)

- Pigou: diminishing marginal utility of money means that transferring £1 from a rich man to a poor one will generally increase welfare
- But no perfect way to aggregate personal choices into social welfare that's consistent with democracy!

# Transaction costs

- Trades are not free! Time & effort; commissions; search; bargaining;  policing and enforcement
- Ronald Coase (1937): why do some sectors have large companies, and others small ones? External transaction costs higher than internal ones
- Jensen-Mockling (1976): agency costs within firms also matter hugely
- Oliver Williamson (1980s-90s): incomplete contracts: frequency, specificity, uncertainty, limited rationality, opportunistic behavior
- So should tech make firms smaller on average?