Economics, Law and Ethics

Part IB CST

2023-24

Lecture 1: Classical economics

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with many thanks to Ross Anderson

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Overview

Introduction

Aims and objectives
Outline
Assessment
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Roadmap

Classical economics

Prices and markets
Supply and demand
Efficiency, welfare and justice

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

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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

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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

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Outline

1. Classical economics
2. How information markets are different
3. Market failures and behavioural economics
4. Auction theory and game theory
5. Principles of law
6. Law and the Internet
7. Ethics
8. Contemporary ethical issues

Lectures: Konstantinos Ioannidis (1-4), Jennifer Cobbe (5), Richard Clayton (6), Claire Benn (7), Alan Blackwell (8)

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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

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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

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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 / Keynesian / environmentalist / libertarian approach a problem of interest?

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Roadmap

- Economics as a subject is traditionally made up of macroeconomics, microeconomics and specialised topics
- 'Macro' studies the aggregate level, so it is about the performance and structure of global/regional/national economies, and topics such as employment, inflation, growth, investment, trade, savings, credit, tax, GDP/GNI…
- We will touch on this only occasionally

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Roadmap (2)

- Microeconomics or 'micro' studies the individual level, and is about how people 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/experimental social science

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Classical economics

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

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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

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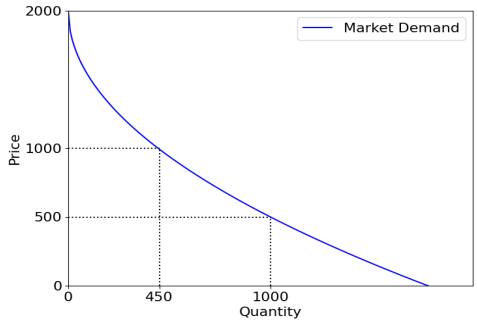
Market demand



- There might be 1 person prepared to pay £2000, 450 prepared to pay £1000, 1000 prepared to pay £500…

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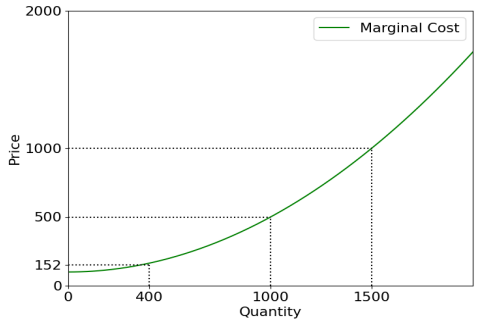
Market supply



- Producing the 400th flat costs 152£, the 1000th costs 500£, the 1500th costs 1000£ …

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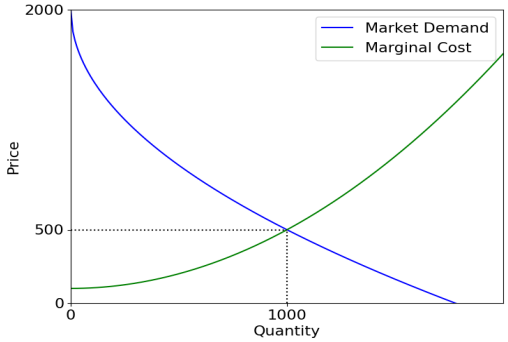
Competition pricing



- The market equilibrium price p* is where the supply and demand curves cross, i.e. £500.
- Supply has exhausted all the demand willing to pay up to 500£, and demand has exhausted all supply willing to offer flats for at least 500£.

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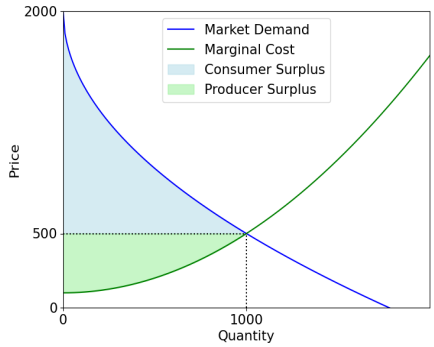
Consumer surplus (competition)



- Consumer surplus is the total amount people saved on their reservation price (blue area)
- Producer surplus is the total amount firms saved on their marginal costs (green area)

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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
- They make decisions based on marginal revenue; the additional profit they can make for every additional flat

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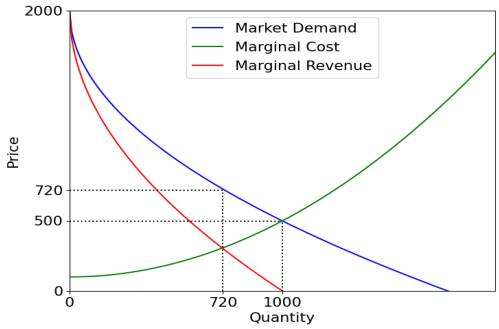
Monopoly pricing



- If the market is rigged, the monopolist might restrict supply – 720 flats at £720 pm can earn more than 1000 at £500 pm
- This is socially undesirable as there are empty flats which people would pay to rent!
- How can we formalise this?

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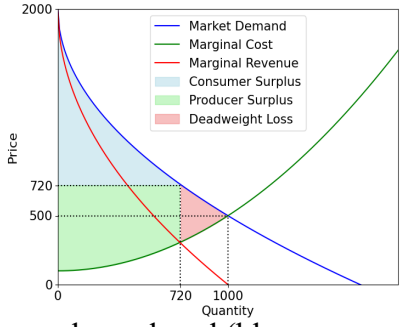
Consumer surplus (monopoly)



- Consumer surplus reduced (blue area smaller)
- Monopolist surplus increased (green area larger)
- The monopolist diminished social welfare (sum of consumer and producer surplus)
- The monopolist willing to shrink total pie if they can secure a larger piece!

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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?

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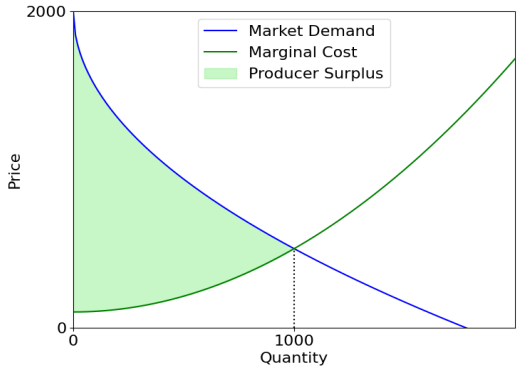
Discriminating monopolist



- If you know what everyone can pay, charge them just that!
- This arrangement is Pareto efficient!
- The monopolist captures all the consumer surplus
- Booking.com offers lower prices on mobile, e-commerce charges more to Mac users

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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

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Utility

- Utility: Preferences, or how much consumers value a good or service. Can be used to measure overall satisfaction from consuming multiple goods.
- 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

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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…

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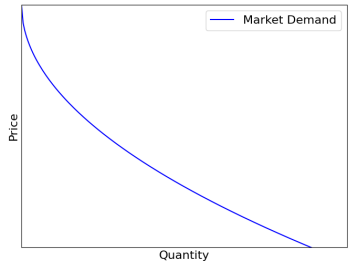
Demand



- 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…

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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)

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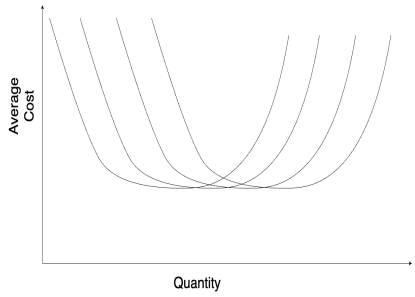
Cost evolution



- 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

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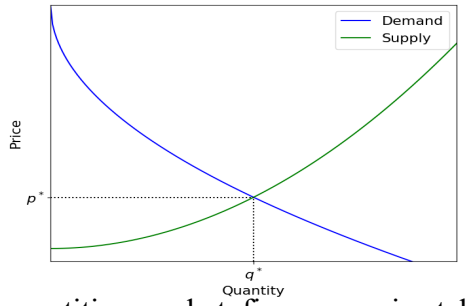
Firm supply



- In a competitive market, firms are price takers
- The demand curve faced by each firm is zero at any price above p*, 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*

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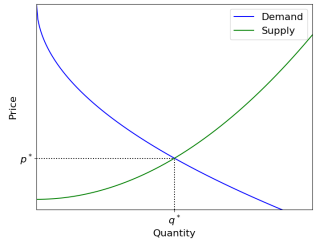
Putting it all together



- In classical economics, 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

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Equilibrium and welfare (1)

- Studying supply and demand for one good is 'partial equilibrium analysis'. 'General equilibrium analysis' adds in multiple goods including labour/leisure, capital etc
- First theorem of welfare economics: market (competitive) equilibrium is Pareto optimal
- Second theorem: any Pareto optimal allocation can be achieved by market forces provided preferences are convex

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Equilibrium and welfare (2)

- Arrow and DeBreu, 1948. Technical conditions for welfare theorems include rational actors, complete information, no transaction costs, no externalities, all firms price takers
- Violations
  - Monopoly or even oligopoly can set prices
  - Production often leads to negative externalities such as environmental pollution
  - Behavioural economics: People often make mistakes or their objective functions include more than just selfish profit-maximising

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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?

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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

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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!
- Arrow, 1950: We cannot have rational actors and simultaneously both Pareto efficiency and non-dictatorship

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