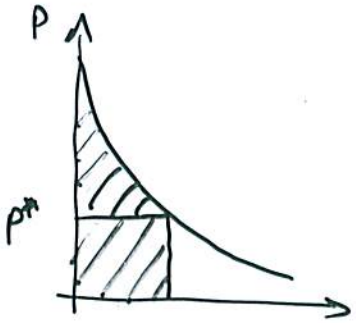
PRICE DISCRIMINATION

- Recall that a monopolist will try to sell to each consumer at his reservation price



- The same will apply to other firms that escape price competition and 'sell to value'
- Pigou classified price discrimination in three categories:
  (1) personalised pricing (from old fashioned haggling through loyalty cards)
  (2) versioning (such as first / business / economy tickets)
  (3) group pricing (e.g., student and OAP discounts)
- These have been around for generations; technology is making them more powerful and pervasive.

Price discrimination through versioning:

> It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriages or to upholster the third-class seats that some company or other has open carriages with wooden benches. What the company is trying to do is to prevent the passengers who can pay the second class fare from traveling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich. And it is again for the same reason that the companies, having proved almost cruel to the third-class passengers and mean to the second-class ones, become lavish in dealing with first-class passengers. Having refused the poor what is necessary, they give the rich what is superfluous.
>
> Jules Dupuit, 1849

PRICE DISCRIMINATION (2)

- Versioning can include 'pricing for sharing': e.g., scientific journals have a higher price for libraries than for private readers
- This can be implicit, e.g. Disney movies are cheaper than titles people usually rent
- Versioning can include marketing incentives, e.g., Wall Street Journal online subscription is expensive for businesses, cheap for students and free for academics
- Much of the promised efficiency gain from e-commerce was predicated on the hope of more effective price discrimination
- To what extent is this reasonable?

PRICE DISCRIMINATION (3)

- In general, is efficient
- Suppose my students and I will analyse the security of a new product for £10,000. Bank A will pay £8000 for a report, and bank B will pay £4000.
- With uniform pricing, maximum revenue is £8000 (1 × £8000 or 2 × £4000) so no deal. But if I can set P_A = £7500, P_B = £3500, everyone wins
- But even economists are surprised at the depth and persistence of discrimination in airline prices (to NY; maybe £200 econ, £2000 business, £4000 first)
- Public reaction against price discrimination can be strong, especially when the strategy is 'damaged goods' and especially when discrimination is overt. (This led, for example, to railway price regulation)
- One way of concealing the extent of price discrimination is bundling

BUNDLING

- Refers to practice of selling a number of products together
- Prime example – Microsoft Office
- Reason: suppose Alice and Bob have following reservation prices for Word and Excel

	Word	Excel
Alice	£100	£150
Bob	£150	£100

- With separate pricing, MS could charge £100 per product and get £200 per customer, or £150 per product and get £150
- By selling them together, it can get £250
- Bundling often used as a means of price discrimination (Office vs Works)

ASYMMETRIC INFORMATION

- Recall the 'market for Lemons' - 50 good used cars worth £2000 and 50 bad used cars worth £1000 have an equilibrium price of about £1000 if buyers can't tell the difference
- One fix is for sellers to offer a warranty. This is much cheaper for owners of good cars, so acts as a signal for the hidden information
- Similarly, it is often hard for employers to measure staff productivity. Many use education as a signal for a combination of intelligence and diligence (research suggests it's a better signal for diligence.)
- Signaling theory is also important for recommender systems, from google to the Grameen bank
- Signaling can be privately efficient but publicly inefficient

ASYMMETRIC INFORMATION (2)

- Volvo drivers have more accidents. Is this because:
  - Volvo drivers are people who know they're bad drivers and bought a Volvo to survive accidents better?
  - Volvo drivers compensate for their greater safety by driving faster?
- The first effect is called <u>adverse selection</u> the second <u>moral hazard</u>. They are also distinguished as cases of <u>hidden information</u> versus <u>hidden action</u>.
- The lemons example showed how markets can be destroyed by adverse selection.
- The classic example of moral hazard affecting markets is in insurance. If your car insurance had no excess or no-claim bonus, you'd have little incentive to lock your car
- Moral hazard leads to surveillance and/or to rationing

THE THEORY OF THE FIRM

- Why have companies at all? Why do people not just trade with each other as individuals?
- This happens in some markets (agricultural day labour, computer contract staff) while in others there is lifetime employment at large bureaucracies, and there are many sectors inbetween
- Main explanation – transaction costs (Ronald Coase, 1937). Costs of search, information, bargaining, enforcement, ...
- Firms exist to economise on the cost of coordinating economic activity
- The ideal size of companies in a sector will be determined inter alia by transaction costs
- Effect of technology?

Auctions

- Auctions have been around for thousands of years and are the standard way of selling livestock, fine art, mineral rights, government bonds, ...
- Many other sales from corporate takeovers to house sales are auctions in effect
- Auctions are a success of the Internet with eBay one of the firms that grew in the boom and survived the bust. Many business-to-business auction sites too
- Auctions of spectrum for next-generation mobiles raised huge sums in USA and UK (less elsewhere) but cost telecoms companies billions
- Rapidly growing interest among computer scientists in using auctions to allocate resources in distributed systems
- Many issues of asymmetric information, signalling, strategic play, ...

TYPES OF AUCTION

- Ascending-bid, or English, auction: start at a reserve price and raise it till one winner remains (if price increase is steady, with no jumps allowed, this is also called a Japanese auction)
- Descending-bid, or Dutch, auction: start high and cut the price till somebody bids
- First-price sealed-bid auction: each bidder independently submits one bid without seeing other bids. Highest bid wins
- Second-price sealed-bid auction, aka Vickrey auction: each bidder independently submits one bid without seeing other bids. The highest bidder wins, and pays the price bid by the second highest bidder
- All-pay auction: price raised by increments, everybody pays at every round, until there is one bidder left who gets the goods (lobbying contest, or war of attrition)
- Dutch and English auctions are also known as 'open first-price' and 'open second-price' auctions

STRATEGIC EQUIVALENCE

- In a Dutch auction, each bidder must choose a price at which she calls out, assuming no-one else has
- In a first-price sealed-bid auction, each bidder must also choose a price independent of others
- The two are <u>strategically equivalent</u>
- With the ascending auction, the last person wins at the price at which the second-last dropped out
- This is strategically equivalent to the sealed-bid second-price auction (modulo, possibly, the bid increment)
- The two pairs are not however strategically equivalent. In an ascending / second-price auction it's always best to bid truthfully, while in a Dutch / first-price auction, you may reduce your bid if you think your valuation is much higher than everyone else's

REVENUE EQUIVALENCE

- Weaker concept - not 'who will win' but 'how much money on average'
- The Revenue Equivalence Theorem says that under ideal conditions you get the same revenue from any well-behaved auction
- 'Ideal conditions' includes a requirement that the bidders are risk-neutral
- 'Well-behaved' includes that the bidder with the highest value gets the goods ('Pareto efficiency') and that the bidder with the lowest value gets zero surplus (i.e., suitable reserve price)
- Then the English auction, the Dutch auction and even the all-pay auction yield the same revenue, as bidders adjust their strategies
- Reason for reserve price: suppose that A, B have valuation £10 or £100 with probability 0·5, so we have cases (10,10), (100,10), (10,100) and (100,100). English auction revenue, no reserve = $\frac{1}{4}(10+11+11+100) = £33$
  But with a reserve of £100, it's 3/4 of 100 = £75
- Also, bidders must not be affiliated - no collusion, private values independent or common values with independent

WHAT GOES WRONG (1)

- In a private-value auction, each bidder has an exogenously determined value v_i (think: sculpture). At least in a second price auction, everything you ever buy is a bargain
- In a common-value auction, there is a true price v which bidders estimate with error ε_i, getting values of $v + \varepsilon_i$. (Think: mineral leases - the oil's either there or not!)
- Here, the person who buys the goods is the person who most overestimated the price!
- This is the 'winner's curse'
- E.g., auction of Roman Empire in 193 AD to Didius Julianus; problems of UK (and some US) phone companies after recent spectrum auctions
- Many real auctions somewhere between these extremes, e.g. other people's preferences for art affect your resale value

WHAT GOES WRONG (2)

- Bidding rings - bidders collude to buy low, then perhaps hold a private auction later and split the proceeds
- First-price auctions are harder to rig if crooks have imperfect enforcement - you need one low bid. With second-price auctions, you need one high and one low (e.g., New Zealand bids of $7m and $5000)
- Entry deterrence: in 1991, auction of ITV franchises required bidders to draw up a detailed programming plan. In Midlands and Central Scotland, incumbents learned there was no competition and bid under 1p per head (vs £9-16 elsewhere)
- Predation: 'we'll top any other bid' claims in takeover battles
- Sniping, and other boundary effects

WHAT GOES WRONG (3)

- Risk averse bidders : if you'd rather have a certain profit of £1 than a 50% chance of £2, revenue equivalence fails - you will bid higher at a first-price auction
- Signalling games : show aggression by making a large hike in the bid
- Multiple objects sold simultaneously - huge potential for such games leading to tacit collusion ('we want SF, LA and SD, and if you compete with us there we'll also compete in your patch and push prices up there')
- Budget constraints - if bidders are cash limited, all-pay auctions are more profitable
- Externalities between bidders (e.g., arms sales)

more - see Klemperer

COMBINATORIAL AUCTIONS

- Externalities can lead to preferences for particular bundles of goods
- Early reference: bidding for landing slots at airports. Also: mineral rights, spectrum, ...
- Idea: bid ($X for A and B and C) or ($Y for A and D and E) or ...
- Critical application for computer scientists: finding a route across a network in presence of congestion (bid for A→B and B→C, or A→D and D→C, or...)
- The allocation problem in such auctions is NP-complete
- Practical algorithms can work up to a few thousand objects
- Additional problem: how to make the auction strategy-proof (i.e., truth-telling is the best strategy)?
- Key problem in new field of 'algorithmic mechanism design'. Solution by Feigenbaum et al uses Vickrey-Clark-Groves mechanism