Part I: Cost and Benefit Analysis

1. Introduction

A rational individual should take an action if and only if extra (marginal) benefits ≥ extra (marginal) costs

Repeated action (e.g. Sell how many Q): Do the action until MB = MC
Q-Type [Optimal quantity for greatest possible net gain]: Split Total B into MB [MC(N) = TB(N)-TB(N-1)]
Benefit of an action: Monetary value (pick up $100 cash) and worth of action (willing to pay $100 to do)

Opportunity cost: Value of the opportunities lost (Includes monetary ($) and non monetary (time) costs)
1. List out all possible actions, choose **only best** alternative Y
2. OC(X) = Benefits (Y) – Costs (Y) + Costs (X)

2. Power of Trade and Comparative Advantage

	Painting		Roofing		Given costs: Take reciprocal Given production: Directly		300<400, 40>30, Absolute advantage for Painting: Ron
Paul	300hr	40	400hr	30	1/300 P = 1/400 R	P=3/4 R	3/4<2, Comparative advantage for Painting: Paul
Ron	200hr	60	100hr	120	60P = 120 R	P=2 R	

Exam Warning: Note column/row labels, CA of X is determined by OC represented by **nY**, $OC_X \times OC_Y = 1$

Absolute advantage:	Ability to produce more under a certain time period / Lower production cost @
Comparative adv.:	Ability to produce a good at a lower OC than another / Relatively more efficient
Terms of Trade (ToT):	Exchange n X for 1 Y: Agree to trade when OC ≤ ToT ≤ OC (≤ if mutually beneficial) Nobody is worse off as long as they trade under the ToT (even when ToT = OC)

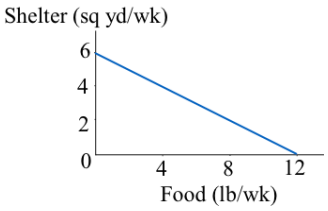
Production Possibilities Curve (PPC): Describes the maximum amount of one good that can be produced for every possible level of production of the other good. (All possibilities a country can produce)

	Shelter	Food
Chris	6	12
Dana	4	4

Under Curve: Inefficient
On curve: Most Efficient
Over curve: Impossible to do

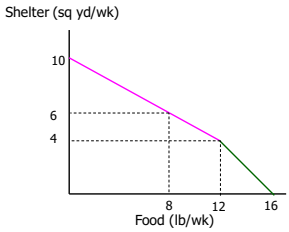
1. Match axis to table value
2. Draw **convex** curve by shift

PPC of Chris: $\frac{x}{a} + \frac{y}{b} = 1$

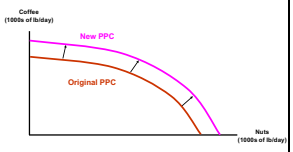


OC for (x-axis good) is 1/slope of (y-axis good)

Combined PPC:



Shift of PPC:
- Productive Resources (labor)
- Technology



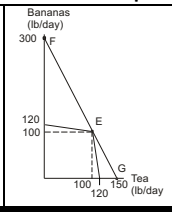
Concept: First employ those resources with the lowest OC, then turn to resources with higher OC
From the top, we start producing Food, only after Chris's time is all used up, we then turn to Dana

Gains from specialization are larger when difference in OC is larger

International trade: Given the price of each good (X & Y) on the market, find the maximum consumption.

e.g. Price of Painting is 5, Price of Roofing is 2. Paul: P=3/4 R, Ron: P=2 R
1. See how much X is worth of Y: 2P=5R→P=2.5R
2. Compare: 2.5>2 → Put line on Ron [Linear programming]
3. Find total revenue at point: =5*100 + 2*0 = 500
4. Find x intercept and y intercept: x intercept=500/2=250

Result: Expanded domestic consumption possibilities



11. Public Good

	Rival: Use of good reduces others availability	Non Rival
Excludable:	Private Good: Efficient; e.g: iPhone	Club Good: Inefficient; e.g: "Free" TV (ads)
Non Excludable: Not paying, still can use	Common Resources: e.g: Tuna in the Ocean Strong incentive to consume before others → Tragedy of the commons: Goods that are unowned and nonexcludable are overused and unmaintained → externalities	Public Good: Inefficient; e.g: Public Security Have incentive to pay less / rely on others Free Rider: Benefit without paying (non ex.): → Good may be underprovided (costs) Forced: Pay, no benefit → Overproduction
Example Situation: Re: Cattle	Tree cutter knows that a tree not harvested this year will be more valuable next year. But if he not cut now, someone else will. → Not take into account cost on society	Govt. tax $10 each in 10 people, every dollar result in $0.25 benefit as a whole → Benefit =0.25*10*10-10=15 C>B if buy individually, but B>C tgt. Total willingness: Sum Q at each P; Convex
Solution:	Define property rights/regulation/tax/quota: → Define limit everyone can consume → No incentive to consume before others	• VCG Truthful Value Reporting: Each pays [value of good] – [sum of others report], other tax • Donations → Encourage contribution

Part II: Supply and Demand

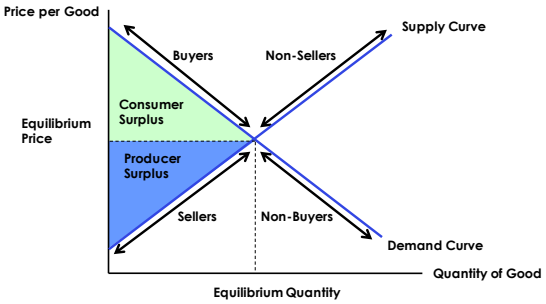
3. Supply and Demand

Law of Demand: Curve is downward sloping	Law of Supply: Curve is upward sloping
• When P is high, good only bought by high buyers • When P is low, good is <u>also</u> bought by low buyers • As P increase, people switch to substitutes • As P increase, people cannot afford as much of it	• When P is low, good only sold by low cost sellers • When P is high, good <u>also</u> sold by high cost sellers • For the same supplier, MC for producing an additional unit is increasing

Meaning of curve: How much Q will buy/sell for P

Consumer/Producer Surplus: C/P gain from trade:
Total CS: Sum of all individual CS
→ Difference between price willing to pay [sell] (reservation price) and actual paid [sold] price

CS: Area below curve, above price (May not be △)
PS: Area above curve, below price (may not be △)



Change in demand/supply: Shift of the whole curve: <u>Increase → Shift rightwards</u> (May not be //)
≠ Change in quantity demanded/supplied (along curve, change only due to P)

Demand shifters (non price factors):	Supply shifters (non price factors):
• Income (I↑ → Normal (Luxury) D↑ / Inferior D↓) • Population (Pop. ↑ → Higher Q for every P) • Price of complements (Other D↑, our D↓) • Price of substitutes (Other D↑, our D↓) • Expectations (Expect P↑ in future → curr. D↑) • Tastes	• Tech. Innovations/Input Prices (Cost ↓ → S↑) • Entry or Exit of Producers (More producers →S↑) • Changes in other OC (If P of alt. good ↑, sellers chase higher profit, curr. good S↓) • Expectations (Expect P↑ in future → curr. S↓) • Taxes and Subsidies (Cost ↑ → S↓)

5. Elasticity

Elasticity: Responsiveness to price: How much P will affect Q (Elastic: Change in P affects Q a lot)

Calculation:	Mid Point Formula:	Point Slope Formula:	|Ed|<1: Inelastic |Ed|=1: Unitary Elastic |Ed|>1: Elastic
$E = \frac{\%\Delta Q}{\%\Delta P}$	$E = \frac{\frac{\Delta Q}{avg\ Q}}{\frac{\Delta P}{avg\ P}}$	$E = \frac{1}{slope} \times \frac{P}{Q}$	

Predicting P and Q changes: (only for const. elasticity curve)

$$\%\Delta P_{From\ Demand} = \frac{\%\Delta Demand}{|E_D| + |E_S|}$$

$$\%\Delta Q_{From\ Demand} = \%\Delta P \times E_S$$

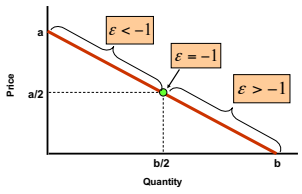
$$\%\Delta = (1 + \%\Delta_S)(1 + \%\Delta_D) - 1$$

Elasticity ≠ slope, but if two linear demand (or supply) curves run through a common point, then at any given Q the curve that is <u>flatter is more elastic</u> **(E/I)**

Perfectly elastic: —
Perfectly inelastic: |

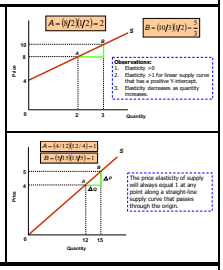
Determinants of Elasticity of Demand:
- Availability of substitutes (Sub ↑ → easier switch → E↑)
- Time horizon (Time ↑ → easier to switch → E↑)
- Type of good (More specific → More substitutes → E↑)
- Necessities vs luxuries (Necessity: Q change less with P)
- Share of budget (Larger purchase size → More sensitive)

Elasticity of D varies at every point:
Above mid: Elastic;
Below mid: Inelastic
At Mid point:
Unitary Elastic,
max revenue (P*Q)



Determinants of Elasticity of Supply:
- Change in per-unit costs with increased production (expensive to produce additional unit → E↓) (e.g. Land)
- Time horizon (Time ↑ → easier to adapt (labor) → E↑)
- Share of market of inputs (If Q↑ cause input cost ↑, E↓)
- Geographic scope (wider scope → E↓) (≈ 'Type of good')

Elasticity of S: keep sign
Y intercept > 0: Elastic
Y intercept < 0: Inelastic
Y intercept = 0: Unit Elastic
→ Connect origin and (P,Q)
→ $\lim_{Q \to \infty} |E| = 1$



Perfectly Elastic:	D: Competitive firms	S: (Vending machine)	Const. Elasticity:
Perfectly Inelastic:	D: Buy 10 gallons of gas	S: Land, Essentials (e.g. Food)	D: $P^k Q = const.$
Unitary Elastic:	D: Buy 10 dollars of gas (Const. Expenditure/Revenue)		S: Power function

Cross price elasticity of demand: $= \frac{\%\Delta Q_{\ Demanded,A}}{\%\Delta P_B}$

Income elasticity of demand: $= \frac{\%\Delta Q_{\ Demanded}}{\%\Delta\ Income}$

Substitutes: +ve	Complements: -ve	Normal Good: +ve	Luxury: >1	Inferior: -ve

Part III: How Supply and Demand Determine Prices

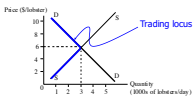
4. Price Determination

Eqm occurs at P-Q pair satisfying both producers and consumers, no tendency to change (intersection)

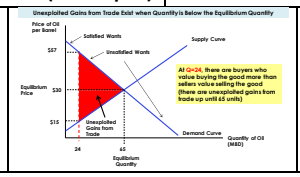
- Goods must be produced at the **lowest possible cost**
- Goods must satisfy the **highest valued demands**

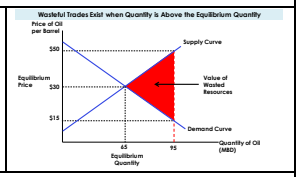
→ Total surplus (gains from trade) maximized in free markets (at eqm)

Trading locus: Where all trade takes place



- P > Eqm: Excess supply/surplus, sellers will reduce P
- P < Eqm: Excess demand, buyers offer higher P to compete
- Q < Eqm: Unexploited gains from trade
- Q > Eqm: Wasteful trades/Wasted resources





D (S) shift → Moving along same S (D) curve
If D and S both shift, only one change of P and Q can be determined

P-Q move in same (opp.) direction → D (S) change
Do not know if increase or decrease if not ∥ shift
Exam: Link two points (P,Q) → That curve is fixed

7. Price System

Problem: Arrange our limited resources to satisfy as many of our wants as possible | Markets link to each other

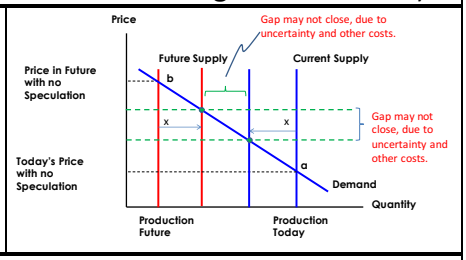
Sol 1: Central planning: A single official or bureaucracy is responsible for allocating limited resources

Problems:
- Too much information (cost of production and people's preference) to process
- Too few incentives: My well being is determined by the central planner but not by myself

Sol 2: Price System: where no-one (or everyone) is responsible for allocating limited resources

- Market forces of supply and demand are the organizing elements (information)
- Prices direct resources exactly where they are most valued / signal producers what to produce:
  - Profits (Losses) are higher in industries that consumers want expanded (contracted)
  - Equilibrium price reflects the OC of the good (value of the good's in its next highest-value use)

- Arbitrage: Buy low, sell high in two markets selling same product
- Speculation: Profit from future price changes;
  - Believe price increase (decrease) in future → Make money by buying (selling) now and selling (buying) in the future
  - Do not want to lose money → Have incentive to be correct
  - Smoothen price fluctuations if correct, destabilize otherwise



Futures: A contract to buy or sell specified Q of a good at a pre-determined P and time in the future
→ Provide a way to speculate without physically holding the good; Exam: "Did I buy/sell too high/low?"
→ Risk Reduction: Ensure that you can get a certain amount of a good/cash in the future (prevent sudden price surge)

E.g: Contract: X supply 100 bushels of apples, on Dec 1, at Price of $1 per bushel to Y
On Dec 1, price is 0.7 per bushel → X gain $30, Y lose $30 → Cash Settlement: Y pay $30 to X

10. Externalities

Social perspective: Continue to expand production while MSB > MSC (vs Private perspective: MPB>MPC)
→ Markets with externalities do not maximize social surplus, market outcome is not socially optimal

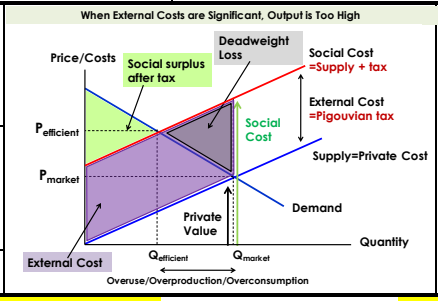
- Private cost: Paid by the consumer or producer
- External cost: Paid by people outside the market
- Social cost: Cost to everyone (Private + External)

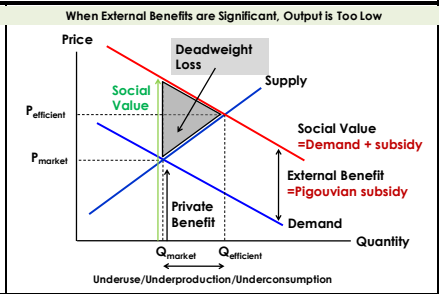
- Social surplus: Social benefit – social cost
  - = CS + PS + other's economic surplus
- Socially efficient eqm: P-Q maximizing social surplus

External Costs/-ve externalities:
- Market Q > Socially efficient Q
- Solution: Tax = $Costs; S shift

External Benefits/+ve externalities:
- Market Q < Socially efficient Q
- Solution: Subsidy = $Benefit; D shift

"Solution" has no DWL/revenue, offset





Coase Theorem: If property rights are fully assigned and if people can negotiate costlessly with one another, they will always arrive at efficient solutions to problems created by externalities.

Property rights: Doesn't matter who own it, but *someone* must own it:
Exam: Determine socially optimum
→ See who is liable, who pay who
→"At least pay how much" vs gains

Plan (pollution)	V (4)	W (3)	X (2)	Y (1)	Z (0)
Cost to X	200	290	700	1300	2100
Cost to Y	50	80	140	230	325

Taxing negative externalities: Both start from V, shift wrt C&B
Tradable pollution permits: Both start from X, trade and pay
→ Same effect; Imperfect info: (know External Cost vs Quantity)

Part IV: Government Policies on Supply and Demand

6. Taxes and Subsidies

Who pays/benefits not depend on who writes the check, depends on elasticity: More elastic → Bear/Benefit more:

$\text{Burden}_{\text{Demand}} = \frac{|E_S|}{|E_S| + |E_D|}$

Result in cost/govt. revenue and DWL

Tax: // Decrease in D or S (depend on who pays)

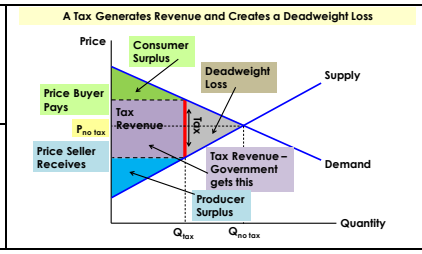
Tax wedge: Place on LHS of graph, size = price of tax

3x3 System:

$Q = aP_D - b$

$Q = cP_S - d$

$P_D - P_S = \text{Tax}$



More elastic → DWL ↓ (Area of △↓), Q impact ↑

Perfectly inelastic: Limit, shift other curve, DWL=0

Application of burden: Yatch/Health Insurance

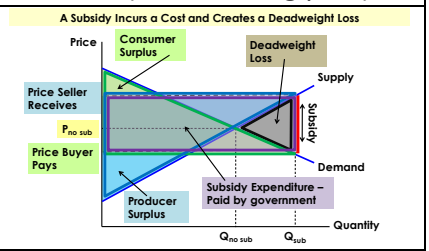
Subsidy: // Increase in D or S (who is being paid)

Subsidy wedge: on RHS of graph, size = price of sub

$Q = aP_D - b$

$Q = cP_S - d$

$P_S - P_D = \text{Subsidy}$



Welfare = CS + PS – Subsidy Expenditure

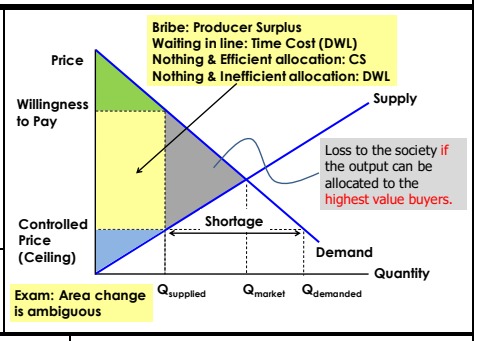
When consumers are encouraged to do sth. that they would not have done, results in welfare loss

8. Price Ceiling and Floors

Price Ceiling: Max price in market, below eqm.

- Shortages (Excess demand) → Black market/Subletting
- Reduction of Product Quality: ∵ Cannot Raise P
  - Lower quality, Lower cost, S↑
  - Lower willing to pay for lower quality, D↓
- Misallocation of Resources:
  - Goods not satisfying highest valued demands
  - Lack of price incentive → Produce wrongly

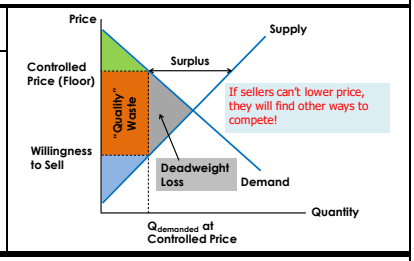
- Bribery/ Wait in Line → Increase willingness (Compete other than P)
- DWL (Lost CS+PS)



Price Floor: Min price in market, above eqm.

- Surpluses (Excess supply) (Re: Min. Wage vs Subsidy)
- Misallocation of Resources
  - Allow high-cost firms to operate
  - Prevent low-cost firms from entering as they are not good at increasing quality

- DWL
- Wasteful increase in Product Quality
  - Compete using means other than price



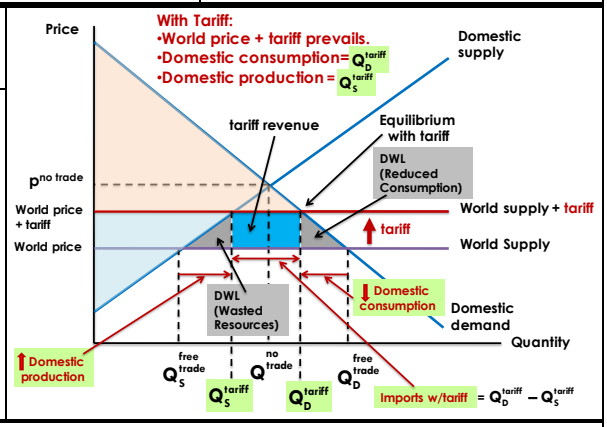
9. International Trade

Free trade (Assume Small country): World price prevails;
→ Domestic Consumption/Production: Net Import/Exports

Trade Barriers (Protectionism): A tax on net **imports**

Trade Quota: Restriction on Q of goods imported (Wedge)

- ↑ Domestic Production; ↓ Domestic Consumption
- Reduces economic efficiency (DWL) (Two parts):
  - Low cost producers are prevented from selling
  - Mutually profitable gains are prevented by law
- Small no. of producers → Benefit per producer is high
- Large no. of consumers → Loss per consumer is low



Rebuttals for Arguments against International Trade:

- Trade reduces the number of jobs in the country
  - Tariffs raise P of protected goods → Less $ spent on other goods → Jobs lost in other industries
  - Trade creates jobs: $ spent on other country's good are often used to buy our goods (exports)
- It is wrong to trade with countries that use child labor
  - The alternative is often worse: Prostitution, Scrounging in refuse dumps, etc.
- We need to keep some industries for reasons of national security
  - True, but this statement can be abused by almost every industry
- We need to keep some "key" industries because of beneficial spillovers onto other sectors.
  - True, some industries are characterized by large spillovers to other industries (e.g. Computer chips)
  - BUT Subsidy is a better option, tariff would only be second best
  - Hard to determine which industries are "key"
- We can increase the country's well-being with strategic trade protectionism
  - Depends on Price Elasticity of Demand (Few Subs. → Successful; Otherwise encourage switching)

Part V: Competitive Market

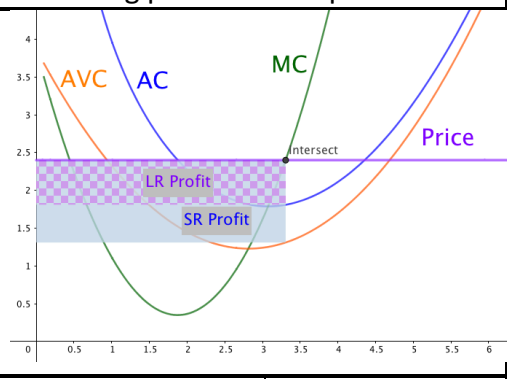
12. Profit Maximization in Competitive Firms

- Perfectly competitive market: Firms maximize profit by controlling Q, **have no control over P**
- Many potential sellers, product is similar, each firm is small relative to size of market
- Demand is perfectly elastic for <u>your</u> product ≠ D for the whole market (Regular downward slope)

Fixed factor (input): Cannot be changed in short run using quantity (e.g. Rent) → Total cost when Q=0
Variable factor/cost: Can be changed in short run with quantity (e.g. Ingredients) =MC

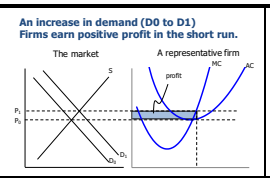
- Sunk Cost: Once incurred, can never be recovered; Fixed cost is sunk in the short run
- Zero/Normal profit: Profit level when firm is covering all its costs, including opportunity costs
- Economic profit: TR – explicit cost ($) – implicit cost (OC) VS Accounting profit: TR – explicit cost

- $TR = \int_0^Q MC dQ \, , AVC = \frac{\int_0^Q MC dQ}{Q}, P = MR, AC = AVC + \frac{FC}{Q}$
- Produce iff MR(n)≥MC(n) [i.e. <u>until MR(n)=MC(n)</u>]
- If variable input and output are <u>perfectly divisible</u>,
  - Profit is maximized when P=MC (Modify Q s.t. MC=P)
  - P↑, intersection point increase, Q↑
- MC curve cuts AC and AVC at min points; MC(0)=AVC(0);



Short Run: Profit = Q*(P–AVC); Produce while SRP ≥ 0 (P≥AVC)

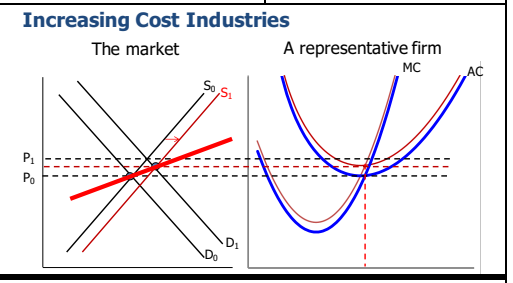
- Otherwise, if P<AVC, <u>exit immediately</u> in SR (set Q=0); Loss=FC
- If P<AC (TR<TC), still produce at P=MC in SR, exit in long run
  - A smaller loss is better than a larger one, recover FC



Entry, S↑
Firm cost shift
Link old & new
MC-AC intersect

Long Run: Profit = Q*(P–AC); Profitable if P > AC, Firms enter (exit)

- <u>Firm's</u> LR (SR) Supply Curve: Portion of MC above AC (AVC);
- Zero profit in long run: If firms earn +ve profits (profitable), new firms enter until all firms earn zero profit; LR: P = min(AC)
  - D↑ → +ve Profit in short run → Firms enter → S↑, P↓



Industry vs (Representative) Firm: Find <u>Industry's</u> LR supply curve:

- Increasing/Decreasing/Const. cost industry: +ve/-ve/0 slope
  - Increasing cost industry: Input costs ↑ ∝ no. of firms
- D↑, P↑ → SRπ↑, Entry → S↑ → Input cost ↑ → Curve shift

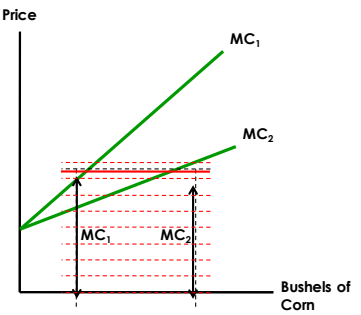
13. The Invisible Hand

Invisible hand: Conditions: Prices accurately signal C&B (No externalities), Competitive (no monopoly)

1. Competition yields efficient allocation across firms within an industry:

Call out a price, tell firms they will be rewarded for each unit they produce
Raise the price bit by bit, until the desired total quantity is desired

- In a market economy (free/unregulated market) with perfectly divisible output,
  - $P=MC_1=MC_2=MC_N$ → Total cost of production is minimized
  - If firm's profit is maximized, cost of individual firm is minimized
  - Condition: MC is not always higher in one firm than the others
- Lower cost firms will produce more output, vice versa



2. Competition yields efficient allocation across industries: (Balance of industries)

- Firm entry and exit decisions:
  - Profits encourage entry → Reduces profit; Losses encourage exit → Reduces losses;
  - Elimination Principle:
    - Above normal profits are eliminated by entry, below normal profits are eliminated by exit
    - Tendency for profit rate in all competitive industries to go to zero
    - Marginal value of resources in all industries is the same
- Entry draws resources from other industries; Exit releases resources for other industries
  - Ensures that resources move across industries to optimally balance production
  - Greatest use is made of our limited resources, align with social incentive

Creative Destruction: Competition encourages innovation

- Since no one profits from the commonplace, one must innovate to earn above normal profits
- Those who fail to innovate will be displaced by those who do through Creative Destruction

Part VI: Monopoly

14. Monopoly

Monopoly: A firm with market power Competitive forces: Drive P down to average cost of production
Market Power: Power to raise price above marginal cost without fear that other firms will enter
Monopoly: Barriers to entry, socially inefficient; Competitive market: No barriers, free entry, efficient

Benefit of monopoly: Provide incentives for Research and Development

- There is only a "monopoly" and +ve profits in SR, profits are competed away under competition in LR
- Small π in SR and zero π in LR under competition cannot cover R&D expenditure, no incentive
- R&D is good for society, as benefit often outweighs its cost

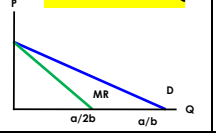
Natural monopoly: When a single firm can supply entire market with lower cost than two or more firms

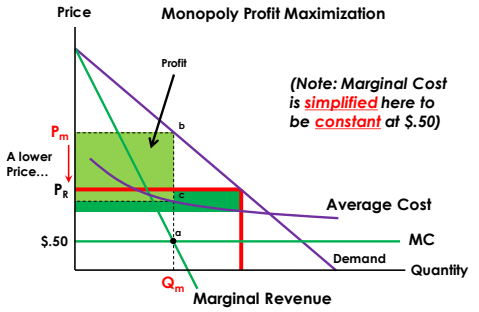
- The largest firm (economy of scale) can produce at lower per unit cost than smaller firms (AC decreasing)

Finding π-maximizing P: Monopoly has no S curve (depend on D)

1. Draw curve of MR (Link y-intercept and 1/2 * x-intercept)
2. Find intersect of MR and MC, get Quantity (max π)
3. From Quantity, Find **P from Demand Curve**
4. From Quantity, Find intersect of AC. π=Q*(P-AC)

P=a-bQ
MR=a-2bQ





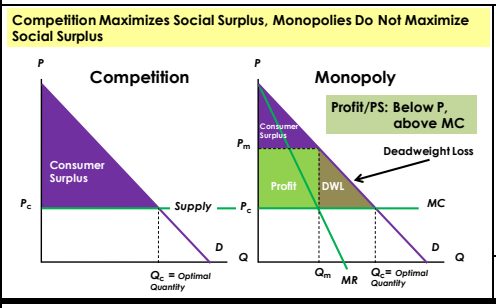
- Monopoly: Q↓, P↑ than competitive firm
  Some CS is transferred to profit, others → DWL

Solution: Patent buyout/Price control

- Compensate patent holders value of patents, allow firms to access patent with small cost
- Price can be driven down, eliminating DWL

Natural monopoly → Government ownership

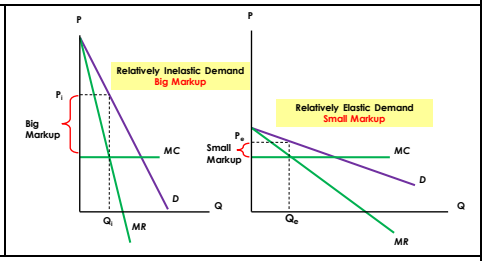
Without price control, firm maximize at P_M, Q_M
If control at P_R, Monopolist chooses $Q_R > Q_M$ (output ↑)
Optimal for society: P=MC, but P=MC<AC, exit
Minimum P: Intersect of AC and D curve (zero profit)



Monopoly can markup/profit: Charge P>MC, earn +ve profit

$$P = \frac{1}{1 - (\frac{1}{|E|})} MC$$

E calculated at point of max π



Inelastic Demand → Larger markup → Raise P higher above MC

17. Price Discrimination

- Under monopoly: MC=MC<P, output produced is too low for social efficiency
  - Excludes buyers who should be in the market (as they are willing to pay price ≥ MC)
- Price discrimination: Charing different buyers a different price for the same good
  - → Higher Profit → More incentive for innovation; Output more socially efficient → DWL ↓, TS ↑
  - Should set a higher price in markets with more inelastic demand
- Perfect PD: Charge each consumer with his reservation price (≥MC); CS = 0, PS = Whole triangle

1. Split into submarkets
2. List MR of submarkets individually
3. List price: MR/MC analysis of "rich" submarket
4. Discounted price: MR/MC analysis of "poor" submarket

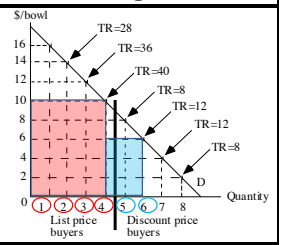
e.g: MC=4; Use coupon iff res. price < 9

List price submarket

Visitor	Res. price	MR
A	$16	$16
B	$14	$12
C	$12	$6
D	$10	$4

Discount price submarket

Visitor	Res. price	MR
E	$8	$8
F	$6	$4
G	$4	$0
H	$2	-$4



- Key: Separate market into submarkets with physical attributes or hurdles / Group customers
  - Examples of hurdles: Coupon (looks bad), Temporary Sales, Hardback books (waiting time)
  - Grouping: Customers value their looks/time more than the economic benefit
- Arbitrage: Makes it difficult for a firm to set different price in different market, reduce profit
  - Preventing arbitrage: Choose attributes that are hard to mimic (e.g. age, gender, poison)
- Tying: One good (base good) is tied to a second good (variable good) (e.g. Printers and Ink)
  - High volume users are likely more price insensitive than low volume users
  - Charge high volume users a higher price than low volume users:
    - Set price of base good below cost, variable good above cost → Charge based on usage
- Bundling: Require produces to be purchased together in a bundle or package (e.g. Microsoft Office)
  - Used when firms have more information of D for bundle than individual; Prevent arbitrage

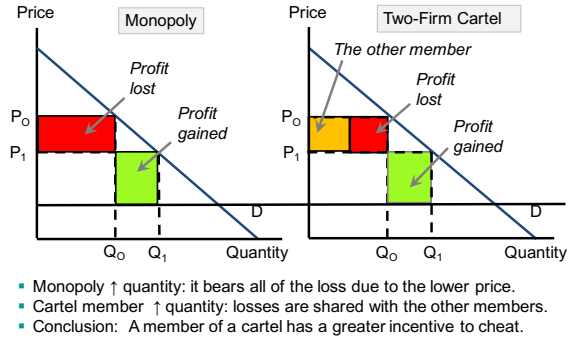
Part VII: Oligopoly and Game Theory

16. Oligopoly

- Oligopoly: Industry that is dominated by a small number of firms, limits competition
- Cartel: An oligopoly that tries to act together to reduce supply, raise prices, and maximize profits
  - Price below monopoly levels but above competitive levels
  - More firms in an industry, the closer price will be to competitive levels
  - Tends to be most successful when there are barriers to entry (increased cost of entry)
    - e.g. Control over a key input, economies of scale, network effects, government barriers
  - Most are illegal: Reduce competition, antitrust laws, block mergers / corruption
- Tacit collusion: When firms limit competition with one another without explicit agreement

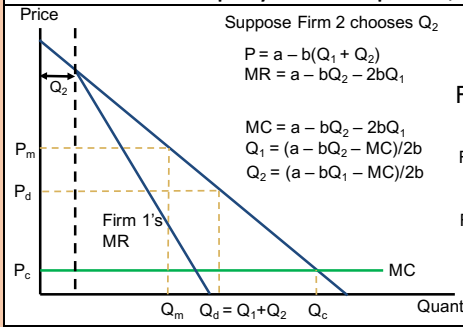
Cartels tend to collapse and lose power: Due to Cheating, New entrants, Govt. Regulation / Enforce

- Incentive to cheat by cartel members: Profits and losses are shared between members:
  - Q↑↑ due to cheating → P↓ to competitive level
  - To cheat is a dominant strategy (Nash Equilibrium)



- Monopoly ↑ quantity: it bears all of the loss due to the lower price.
- Cartel member ↑ quantity: losses are shared with the other members.
- Conclusion: A member of a cartel has a greater incentive to cheat.

- Cournot Duopoly: Find eqm Q_1, Q_2 to not deviate



For duopoly:
$Q_1 = Q_2 = (a - MC)/3b$

For a monopoly:
$MR = a - 2bQ = MC$
$Q = (a - MC)/2b$

For a perfectly competitive market:
$MC = a - bQ = MC$
$Q = (a - MC)/b$

- Bertrand Duopoly: Firms compete with P decisions
  - Firms with lower price get all consumers
  - Nash equilibrium: P_1=MC=P_2

- Price matching: Offer price certain % lower than their competitor → No incentive to drop price, as competitor will get all customers
- Loyalty Plans: Lock in customers, reward them with special treatment → ↑monopoly
- Innovation: Product differentiation → less substitutes → more inelastic → higher profit

Part ∞: Exam Keystone