Microeconomics II

Discussion Class Durban

What to expect?

- Discussion classes are: **overview** of the course
- We focus on what we think are challenging & non revision concepts
- Give you a start to understanding the whole picture
- exercises to help understanding
- Discuss questions
- Motivate for exam

2.4

MATHEMATICAL TREATMENT OF ELASTICITIES OF SUPPLY AND DEMAND

- **elasticity** Percentage change in one variable resulting from a 1-percent increase in another.

Price Elasticity of Demand

- **price elasticity of demand** Percentage change in quantity demanded of a good resulting from a 1-percent increase in its price.

$$E_p = (\%\Delta Q)/(\%\Delta P)$$

$$E_p = \frac{\Delta Q / Q}{\Delta P / P} = \frac{P}{Q}\frac{\Delta Q}{\Delta P} \qquad \textbf{(2.1)}$$

This term is an inverse of slope

Linear Demand Curve

- Demand curve that is a straight line –example!

$$Q = a - bP$$

Figure 2.11

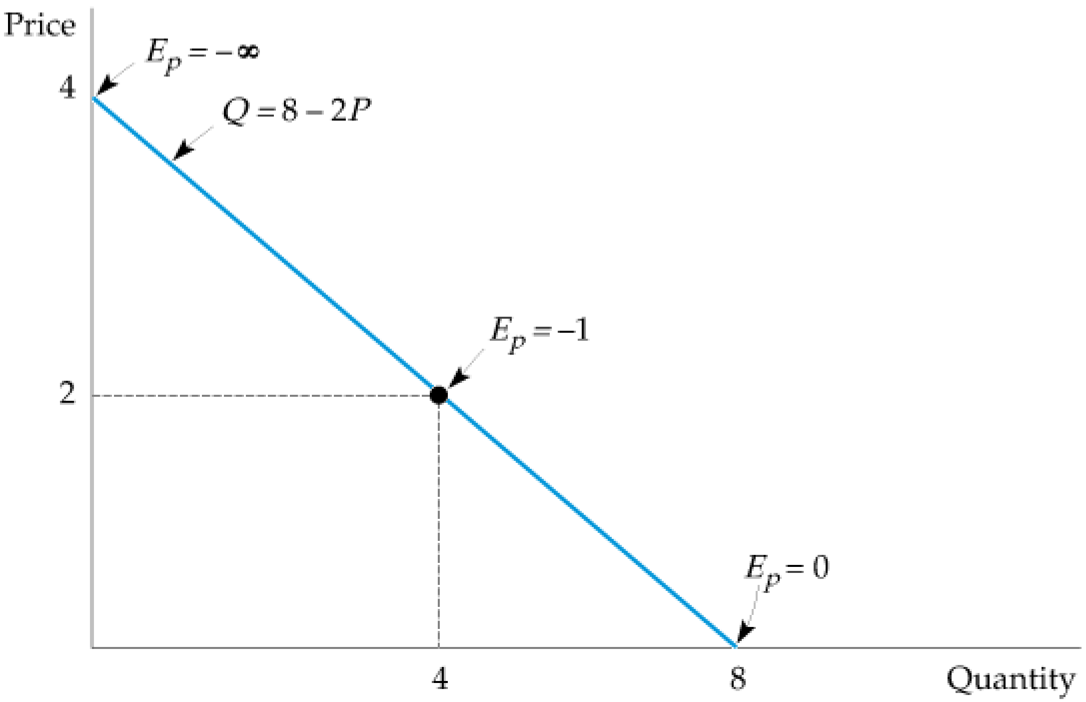
Linear Demand Curve

The price elasticity of demand depends: **on the slope of the demand curve AND on the price and quantity (equation 2.4).**
So: **elasticity varies along the curve** as price and quantity change.

Slope is constant for this linear demand curve.

Near the top elasticity is large in magnitude. (to infinite)

It becomes smaller as we move down the curve (to zero).



2.4 ELASTICITIES OF SUPPLY AND DEMAND

- **income elasticity of demand**

$$E_I = \frac{\Delta Q / Q}{\Delta I / I} = \frac{I \Delta Q}{Q \Delta I} \qquad \textbf{(2.2)}$$

- **cross-price elasticity of demand**

$$E_{Q_b P_m} = \frac{\Delta Q_b / Q_b}{\Delta P_m / P_m} = \frac{P_m}{Q_b} \frac{\Delta Q_b}{\Delta P_m} \qquad \textbf{(2.3)}$$

- **price elasticity of supply** Percentage change in quantity supplied resulting from a 1-percent increase in price.

Point versus Arc Elasticities

- **point elasticity of demand** Price elasticity at a particular point on the demand curve.
- **arc elasticity of demand** Price elasticity calculated over a range of prices. Arc elasticity: $E_p = (\Delta Q / \Delta P)(\overline{P} / \overline{Q})$

Exercise: If price of X were to increase from R10 to R20 and quantity demanded of X were to decrease from 30 to 10 units, the arc elasticity of demand would be:………

If the price of good X were to increase from R10 to R20 and the quantity demanded of X were to decrease from 30 units to 10 units, the arc elasticity of demand is

Arc elasticity: $E_p = (\Delta Q / \Delta P)(\overline{P} / \overline{Q})$

- A smaller % change in P is accompanied by a bigger % change in Q
- So X is quite responsive to P change
- Change in P = 10
- Change in Q = -20
- Ave P = (10 + 20)/2 = R15
- Ave Q = (30+10)/ 2 = 20
- (-20/10) x (15/10) = (2/1) x (3/2) = 6/2 = 3

Alternatively USE :

- Ep = $$\frac{(q_0 - q_1) / (q_0 + q_1)}{(p_0 - p_1) / (p_0 + p_1)}$$

Where:

- **P0= 10; P1=20 AND Q0=30;Q1=10**

Chapter 3 Consumer Behavior

- **theory of consumer behavior**
  Description of how consumers **allocate incomes among different goods** and services **to maximize satisfaction**

Consumer behavior is best understood in three distinct steps:

1. **Consumer preferences**
2. **Budget constraints**
3. **Consumer choices (The mix of 1 and 2)**

3.1 CONSUMER PREFERENCES

Some Basic Assumptions about Preferences

1. **Completeness:** Preferences are assumed to be *complete*. In other words, consumers can compare and rank all possible baskets. Thus, for any two market baskets *A* and *B*, a consumer will prefer *A* to *B*, will prefer *B* to *A*, or will be indifferent between the two.

   Note: these preferences ignore costs/affordabilty.

2. **Transitivity:** Preferences are *transitive*. Transitivity means that if a consumer prefers basket *A* to basket *B* and basket *B* to basket *C*, then the consumer also prefers *A* to *C*. Transitivity is normally regarded as necessary for consumer consistency.
   If A > B and B > C then A > C

3. **More is better than less/ non satiation: consumers** are assumed to be desirable—i.e., to be *good*. Consequently, *consumers always prefer more of any good to less.* In addition, consumers are never satisfied or satiated; *more is always better, even if just a little better*.

Indifference Curves

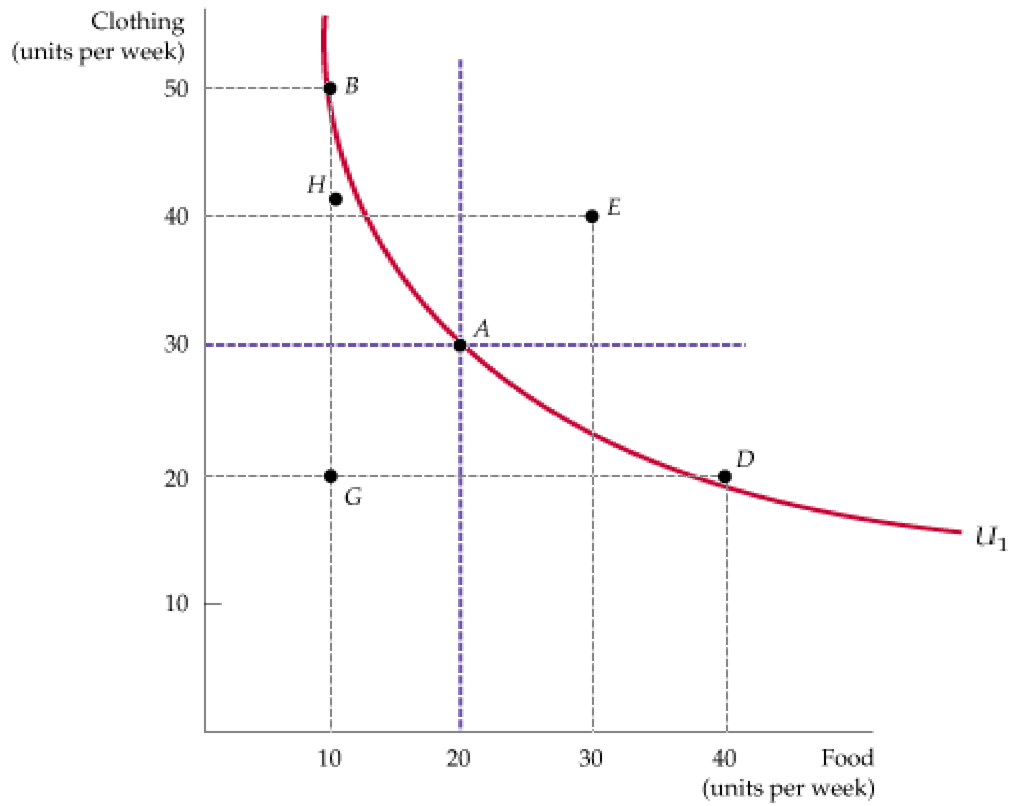
- **indifference curve:** Curve representing all combinations of market bundles that provide a consumer with same level of satisfaction.

Figure 3.2

E > B =A=D > H > G

Why is E > D

H > G

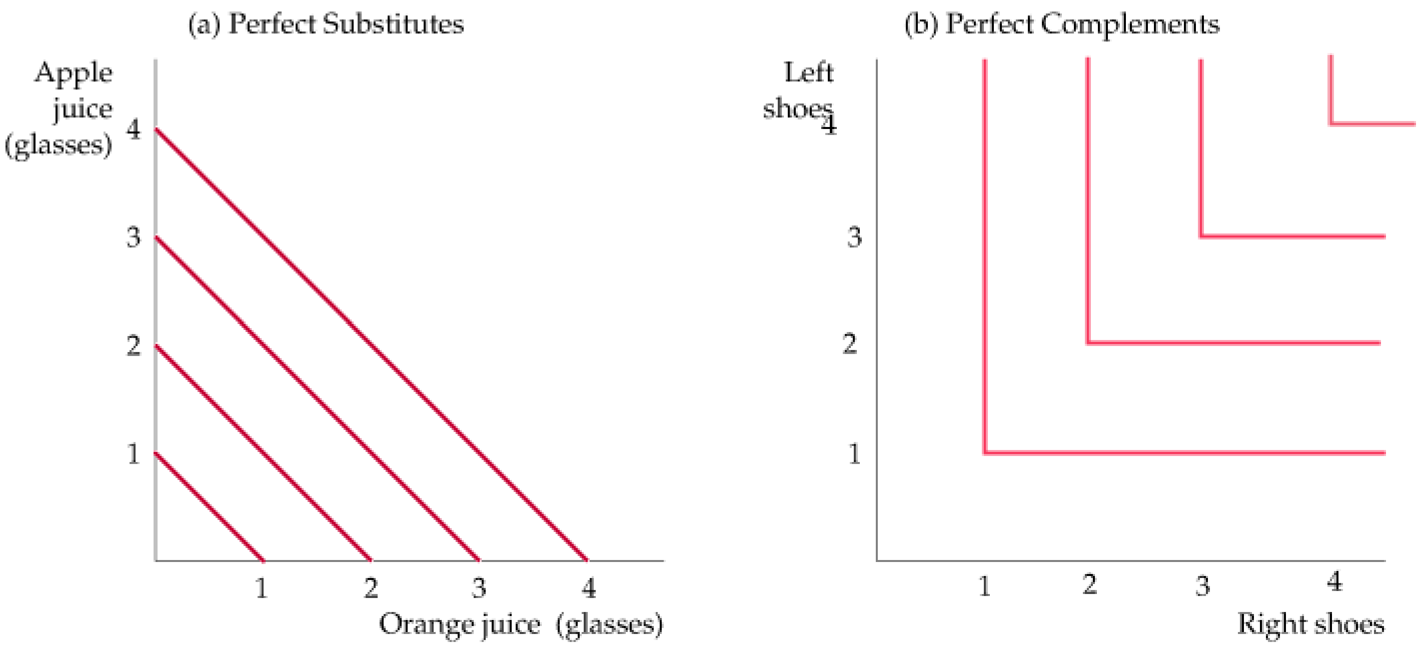


Indifference curve map: many ICs which don't intersect, because that is irrational (**so rationality is another assumption**)

Perfect Substitutes and Perfect Complements

Figure 3.6

Perfect Substitutes and Perfect Complements



MRS between two goods is constant (slope)

If I don’t have apples I can have oranges

MRS is either ZERO or Infinite (slope)

Think of shoes Left is useless without Right

3.1 CONSUMER PREFERENCES

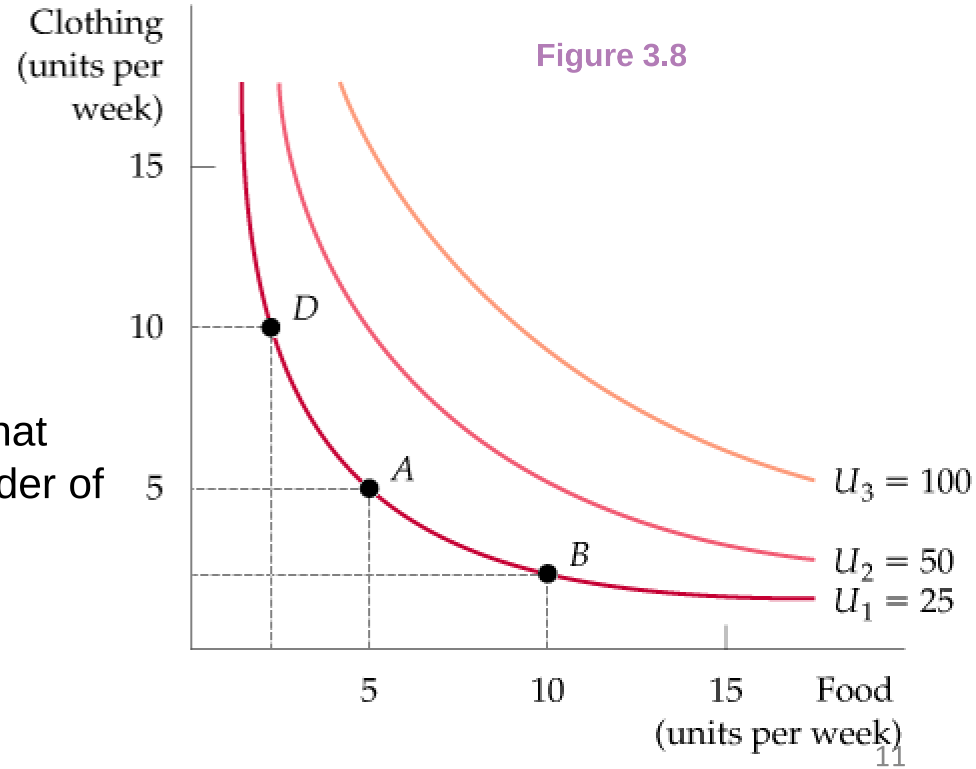
Utility and Utility Functions

- **utility** **a number** representing the satisfaction from a bundle.

- **utility function** Formula that assigns a level of utility to each bundle

A utility function is an indifference curve map where each curve has an assigned value of utility

E.g. U1 = 25



- **ordinal utility function** Utility function that generates **just a ranking** of baskets in order of most to least preferred.

- **cardinal utility function** Utility function describing **by how much** one basket is preferred to another. Assigns a number

- **budget constraints:** Constraints associated with limited incomes.

The Budget Line

- **budget line** All combinations of goods for which the total amount of money spent is equal to income.

$$P_F F + P_C C = I \tag{3.1}$$

TABLE 3.2 Market Baskets and the Budget Line

Market Basket	Food (*F*)	Clothing (*C*)	Total Spending
A	0	40	$80
B	20	30	$80
D	40	20	$80
E	60	10	$80
G	80	0	$80

Budget line *F* + 2*C* = $80

Where Pf = R1 and Pc = R2 F & C = respective units

3.2 BUDGET CONSTRAINTS******

The Budget Line

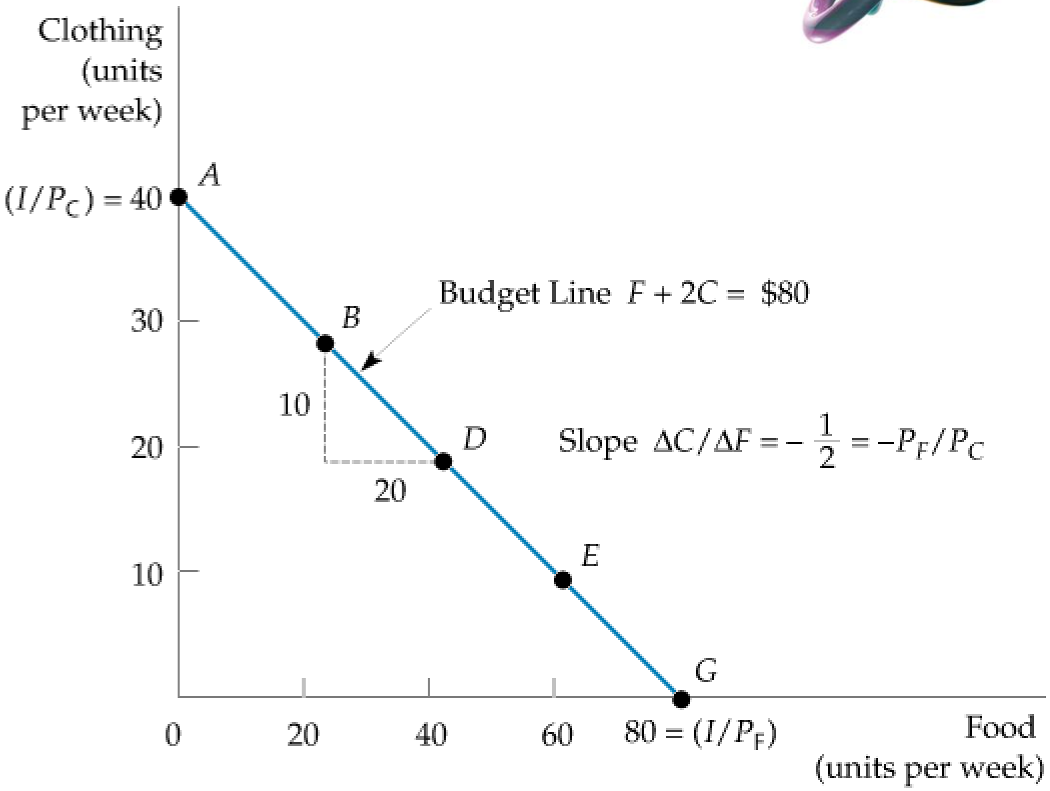
Figure 3.10

A Budget Line

From the table a budget line can be drawn describing the combinations of goods that can be purchased given $ 80

The slope of the budget line (measured between points *B* and *D*)

is $-P_F/P_C = -10/20 = -1/2$.



Increase in income pushes BL outward

& shows that more can be afforded

3.3 CONSUMER CHOICE: a mix of ICs & BL

Maximizing basket (equilibrium) must satisfy two conditions:

1. *It must be located on the budget line*.
2. *It must give the consumer the most preferred combination of goods and services*.

A consumer maximizes satisfaction by choosing market basket *A*. At this point, the budget line and indifference curve U_2 are tangent.

No higher level of satisfaction (e.g., market basket *D*) can be attained.

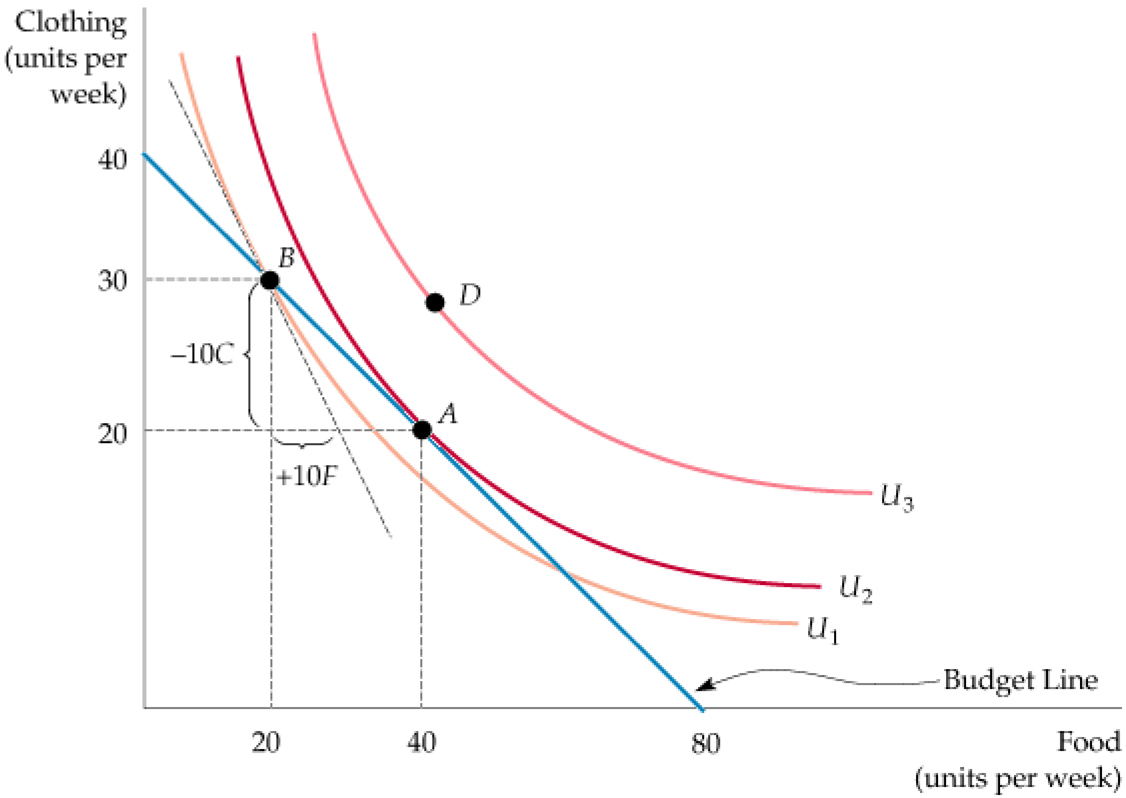
At *A*, the point of maximization, the MRS between the two goods equals the price ratio.

MRS = Pf/Pc

MB = MC

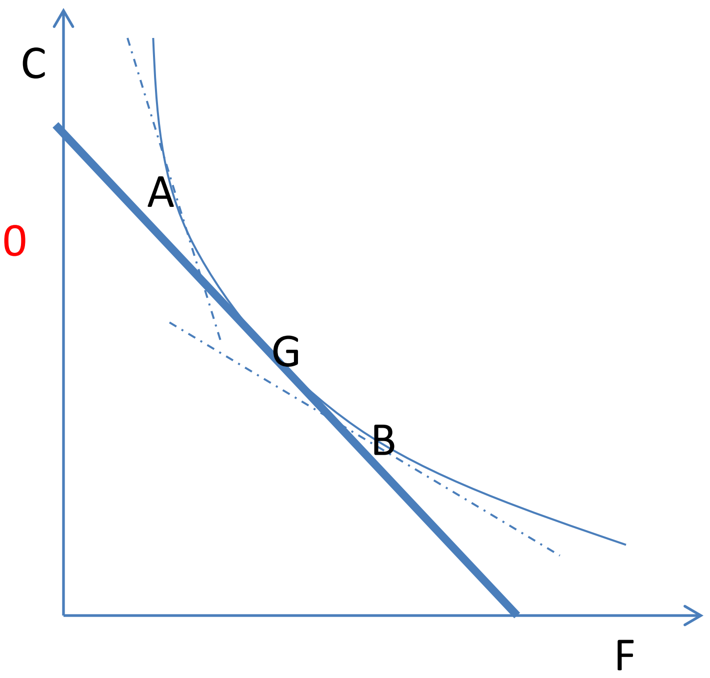
At B MRS > Pf/Pc

i.e. consumer is willing to pay more than market price



MARGINAL UTILITY AND CONSUMER CHOICE: NB slide

- MU = additional utility from consuming additional unit of good
- Diminishing MU: the slope of the IC decreases as one moves from A to B
- Meaning: the more F is consumed, less utility comes from it
- Along IC utility is constant (i.e. dU =0)
- That is: MUf as F changes + MUc as C changes = 0
- Formally:. MUF. dF + MUC . dC = 0
- dC/dF = - MUF/MUC
- MRS = slope of IC , which is dC/dF
- So: **MRS = dC/dF = MUF/MUC**
- **At equilibrium (G) slopes of IC = slope of BL**
- **i.e. MUF/MUC = PF/PC**
- This is the equi-marginal principle:
- Utility is maximised when consumer has equalised MU per rand across all goods
- **In 1st year, we said weighted MU for products equal**



CHAPTER 4 OUTLINE

4.1 Individual Demand

4.2 Income and Substitution Effects

4.3 Market Demand

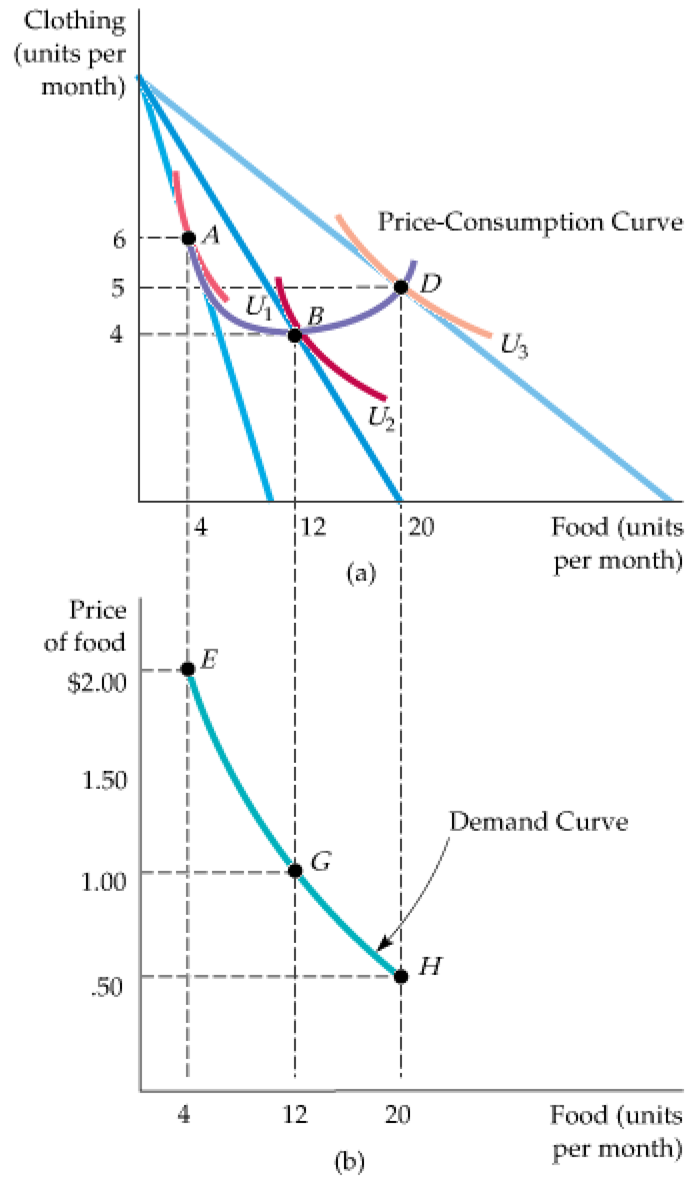
4.4 Consumer Surplus

4.1 Deriving INDIVIDUAL DEMAND from Price changes

Price Changes

Figure 4.1

Effect of Price Changes



A reduction in the price of food, with income and the price of clothing fixed, causes this consumer to choose a different market basket. (**swivel out**)

In **(a)**, the baskets that maximize utility for various prices of food (point *A*, \$2; *B*, \$1; *D*, \$0.50) trace out the price-consumption curve.

Part (b) gives the demand curve, which relates the price of food to the quantity demanded

4.1 INDIVIDUAL DEMAND

Income Changes

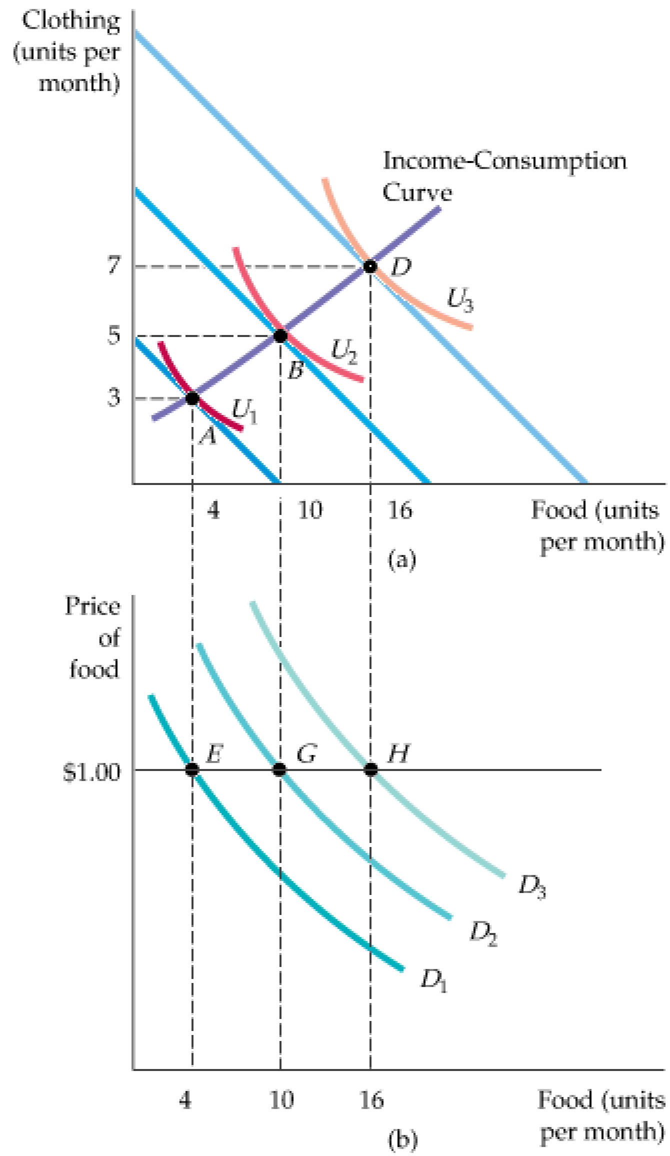
Figure 4.2

Effect of Income Changes

An increase in income, with the prices of all goods fixed, causes consumers to alter their choice of market baskets.

In part **(a)**, the baskets that maximize consumer satisfaction for various incomes (point *A*, $10; *B*, $20; *D*, $30) trace out the income-consumption curve. **Also called the ENGEL curve**

The shift to the right of the demand curve in response to the increases in income is shown in part **(b)**.



4.1 INDIVIDUAL DEMAND

Normal versus Inferior Goods

Figure 4.3

An Inferior Good

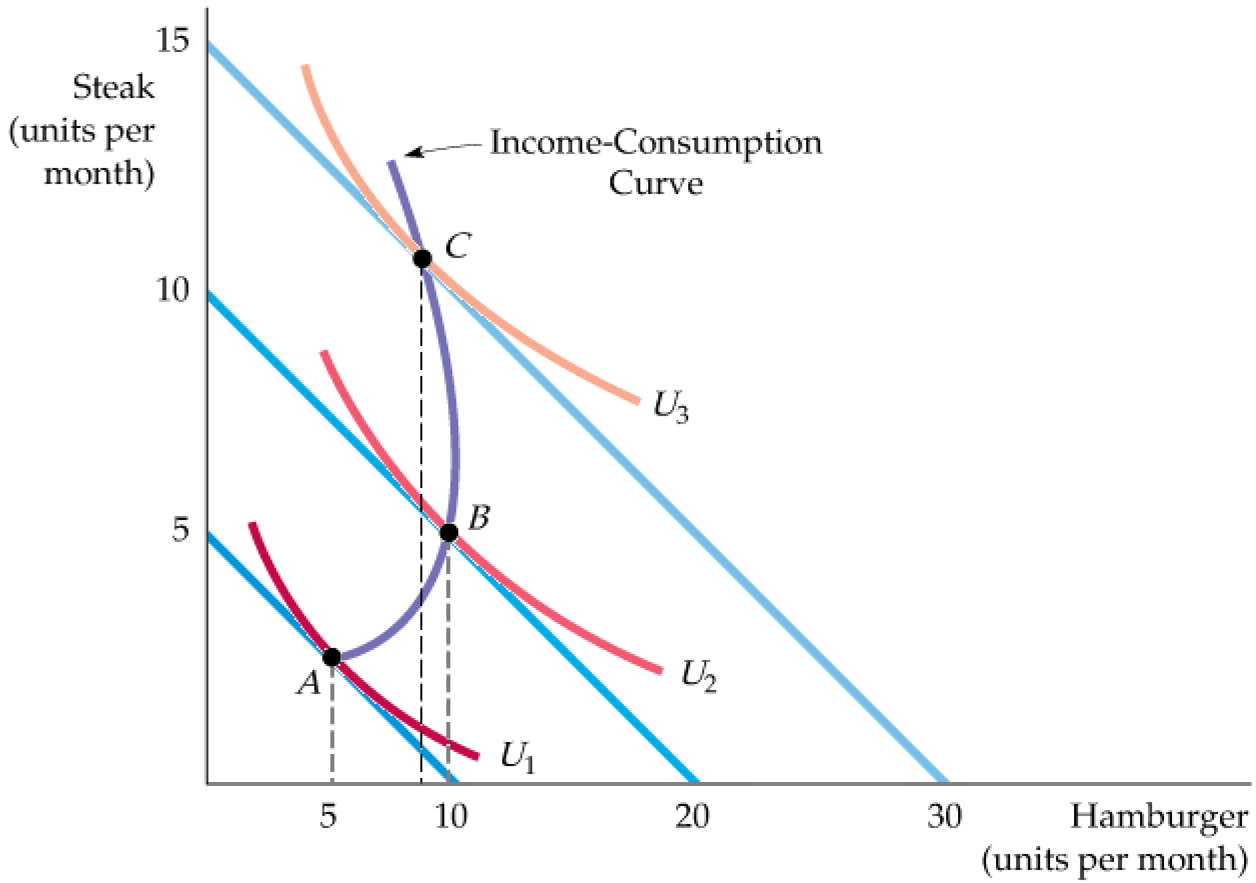
An increase in a person's income can lead to less consumption of one of the two goods being purchased.

Here, hamburger, though a normal good between *A* and *B*,

More of H is consumed with income increase

becomes an inferior good when the income-consumption curve bends backward between *B* and *C*.

Less of H is consumed with income increase



Substitutes and Complements

Recall that:

Two goods are *substitutes* if an increase in the price of one leads to an increase in the quantity demanded of the other.

Two goods are *complements* if an increase in the price of one good leads to a decrease in the quantity demanded of the other.

4.2 INCOME AND SUBSTITUTION EFFECTS

Substitution Effect

- **substitution effect** Change in consumption of a good associated with **a change in its price**.
- Price decrease leads to substituting towards good & vice versa

Income Effect

- **income effect** Change in consumption of a good resulting from an increase in purchasing power, with relative prices held constant. **If more or less is consumed depends on type of good (normal/inferior)**

The total effect of a change in price is given by the sum of the effects

$$\text{Total Effect } (F_1F_2) = \text{Substitution Effect } (F_1E) + \text{Income Effect } (EF_2)$$

4.2 Graphically: INCOME AND SUBSTITUTION EFFECTS

Figure 4.6

Income and Substitution Effects:
Normal Good

A decrease in the price of food has both an income effect and a substitution effect.

The consumer is initially at *A*, on budget line *RS*.

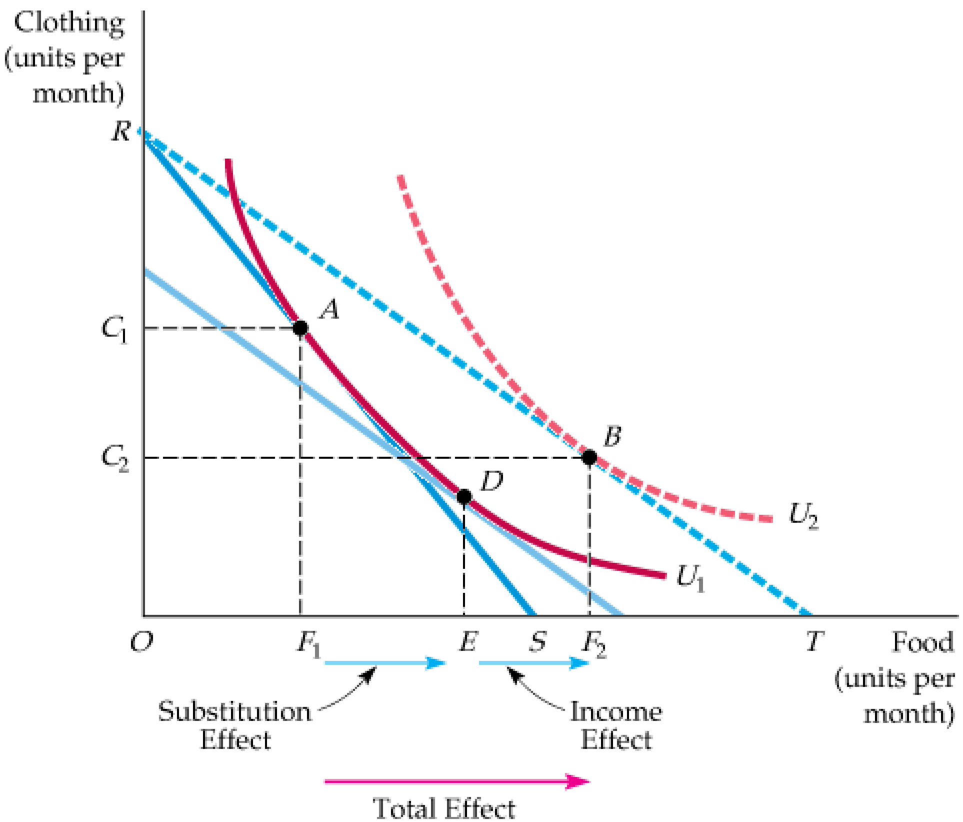
When the price of food falls, consumption increases by F_1F_2 as the consumer moves to *B*.

So this is Total Effect, which we must divide into substitution & income effects.

To find income effect: imagine the parallel shift of BL back to original IC: This is EF2 (normal good-increase in consumption)

The left over is the substitution effect : F1E

Tot Effect (F1F2) = Sub Effect (F1E) + Inco. Effect (EF2)



4.2 INCOME AND SUBSTITUTION EFFECTS

Income Effect

Figure 4.7

Income and Substitution Effects: Inferior Good

With inferior good we expect consumption of good to decrease with income increase

So income effect direction is opposite direction

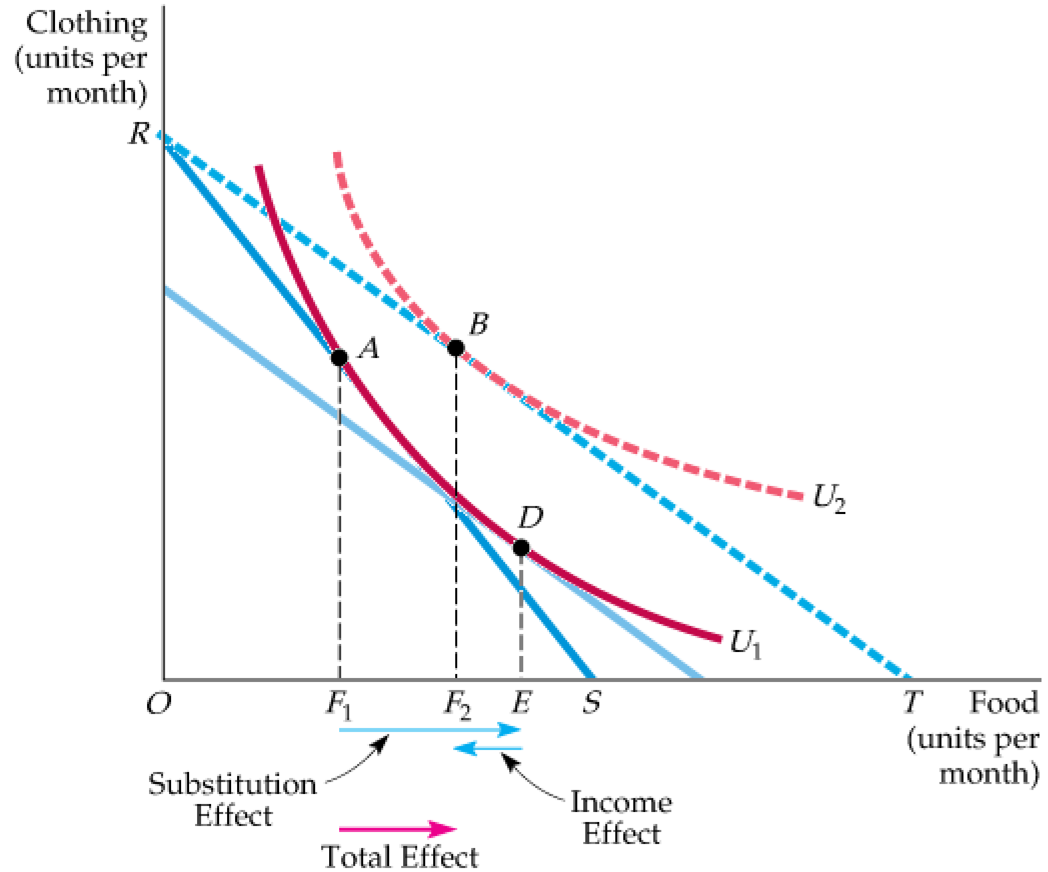
We can see the Total effect: F1 F2

Then we imagine our parallel shift of BL to original IC (D)

Y Effect = -ve F2E

Left over is Sub Effect

F1F2 = F1E – F2E



4.2 INCOME AND SUBSTITUTION EFFECTS

A Special Case: The Giffen Good

- **Giffen good** Good whose demand curve slopes upward **because the (negative) Y effect is > Sub effect**.

Figure 4.8

Upward-Sloping Demand Curve: The Giffen Good

Negative slope of Demand curve

From A to B

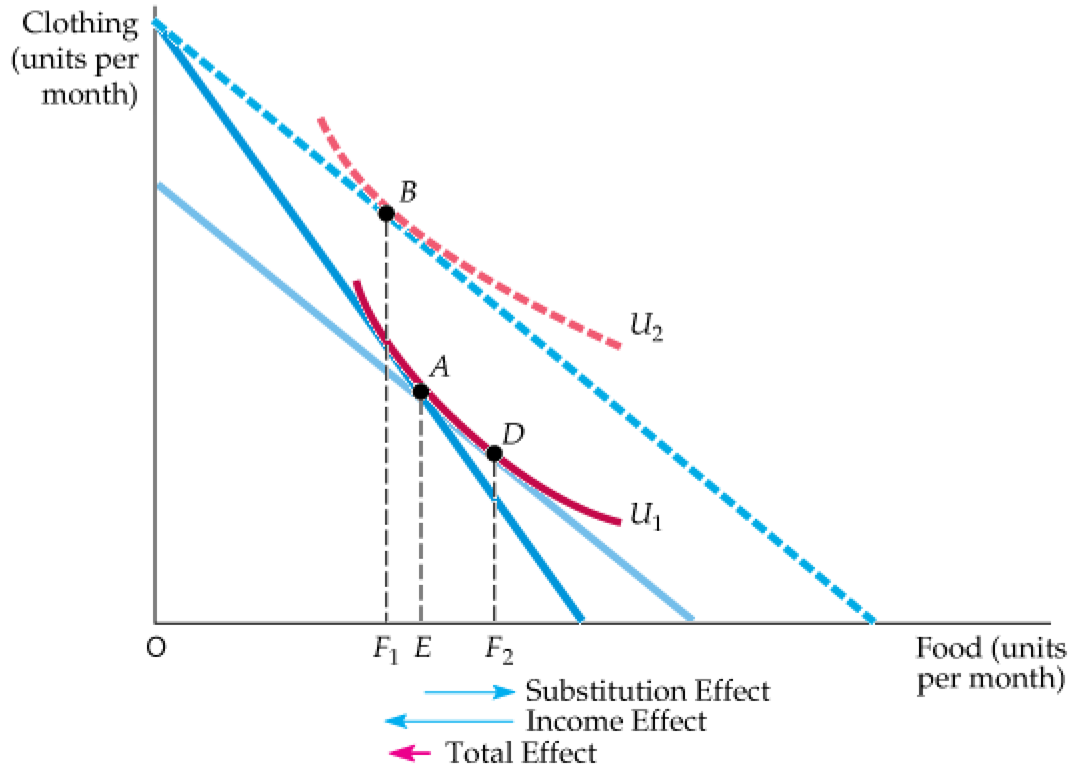
Why?

-ve Y effect is bigger than Substitution Effect

-So Total Effect is in opposite direction

-Tot Effect EF1 = Sub (EF2) – F2F1

Now do exactly the same thing for price INCREASEs where BL swivel inward



4.4 CONSUMER SURPLUS*****

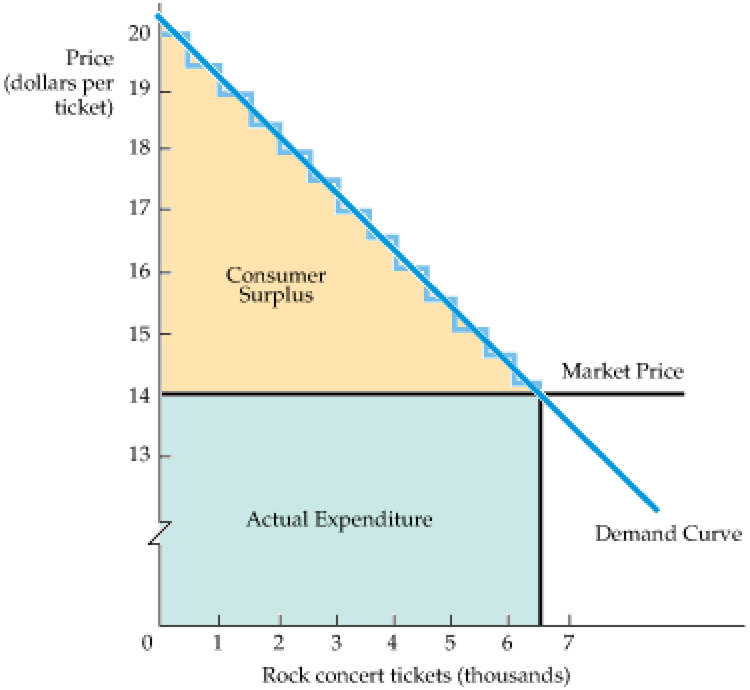
Consumer Surplus and Demand

Figure 14.4

Consumer Surplus Generalized

For the market as a whole, consumer surplus is measured by the area under the demand curve and above the line representing the purchase price of the good.

Here, the consumer surplus is given by the yellow-shaded triangle and is equal to
1/2 × ($20 − $14) × 6500 = $19,500.



Applying Consumer Surplus

When added over many individuals, it measures the aggregate benefit that consumers obtain from buying goods in a market

Consumer and producer surplus are useful in determining costs and benefits to society (welfare)

Network externalities

- Study the effects: bandwagon effect

snob effect guided by study guide

CHAPTER 6 OUTLINE

6.1 The Technology of Production

6.2 Production with One Variable Input (Labor)

6.3 Production with Two Variable Inputs

6.4 Returns to Scale

Production

The **theory of the firm** describes how a firm makes **cost-minimizing production** decisions and how the **firm's resulting cost varies with its output.**

The Production Decisions of a Firm

The **production** decisions of firms **are analogous** to the purchasing decisions of **consumers**, and can likewise be understood in three steps:

1. Production Technology (like ICs)
2. Cost Constraints (like BL)
3. Input Choices (like consumer equilibrium)

6.1 THE TECHNOLOGY OF PRODUCTION

- **factors of production** Inputs into the production process (e.g., **labor, capital**, and materials).

The Production Function

$$q = F(K, L) \qquad \textbf{(6.1)}$$

- **production function:** Function showing the highest q that a firm can produce for every specified combination of inputs.

Remember the following:

Inputs and outputs are *flows*.

Equation (6.1) applies: *constant K & Te*

Short run: some inputs are fixed (K & Te)
Long run: all inputs are variable

Production functions describe what is ***technically feasible*** when the firm operates *efficiently*.

6.2 REVISION: PRODUCTION WITH ONE VARIABLE INPUT (LABOR) K IS CONSTANT (L is also H)

TABLE 6.1 Production with One Variable Input

Amount of Labor (L)	Amount of Capital (K)	Total Output (q)	Average Product (q/L)	Marginal Product ($\Delta q/\Delta L$)
0	10	0		
1	10	10	10	10
2	10	30	15	20
3	10	60	20	30
4	10	80	20	20
5	10	95	19	15
6	10	108	18	13
7	10	112	16	4
8	10	112	14	0
9	10	108	12	–4
10	10	100	10	–8

6.2 CLASSICAL PRODUCTION WITH ONE VARIABLE INPUT (LABOR)

The Slopes of the Product Curve

Figure 6.1

Production with One Variable Input

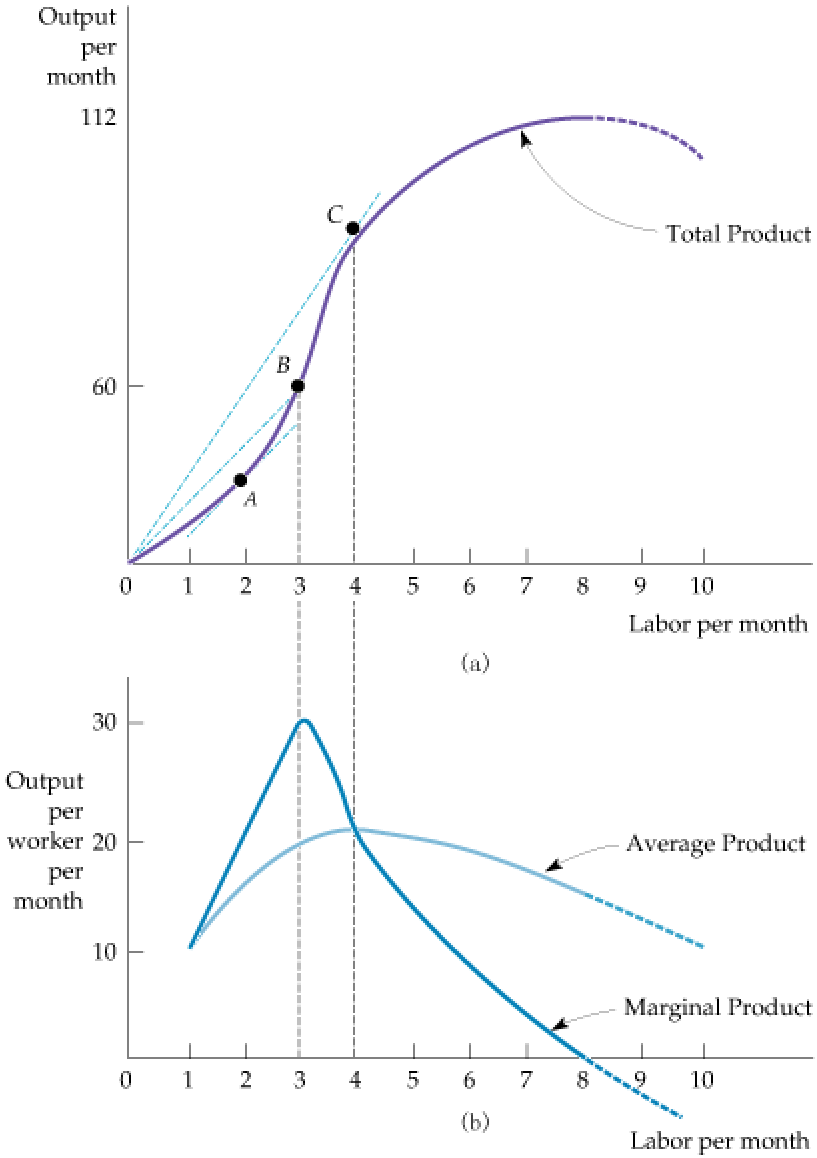
The total product curve in **(a)** shows the output produced for different amounts of labor input.

The average and marginal products in **(b)** DERIVED FROM (a).

Slope of function is maximum at B (turning pt of MP)

AP is maximum, when MP=AP

MR=0 where function is flat



6.2 PRODUCTION WITH ONE VARIABLE INPUT (LABOR)

The Law of Diminishing Marginal Returns

- **law of diminishing marginal returns** Principle that as the use of an input increases with other inputs fixed, the resulting additions to output will eventually decrease.

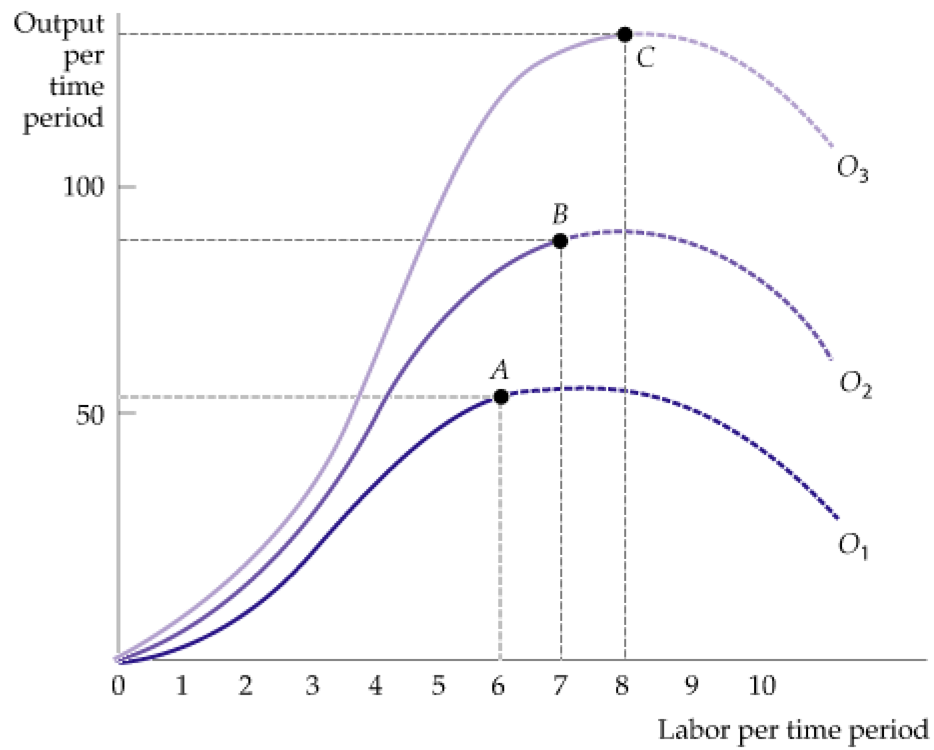
Figure 6.2

The Effect of Te. Improvement

Labor productivity (output per unit of labor) can increase if there are new Te

Shape of function shows increasing returns then decreasing returns, then no returns as L increase

This is different to productivity increase because of Te (upward shift)

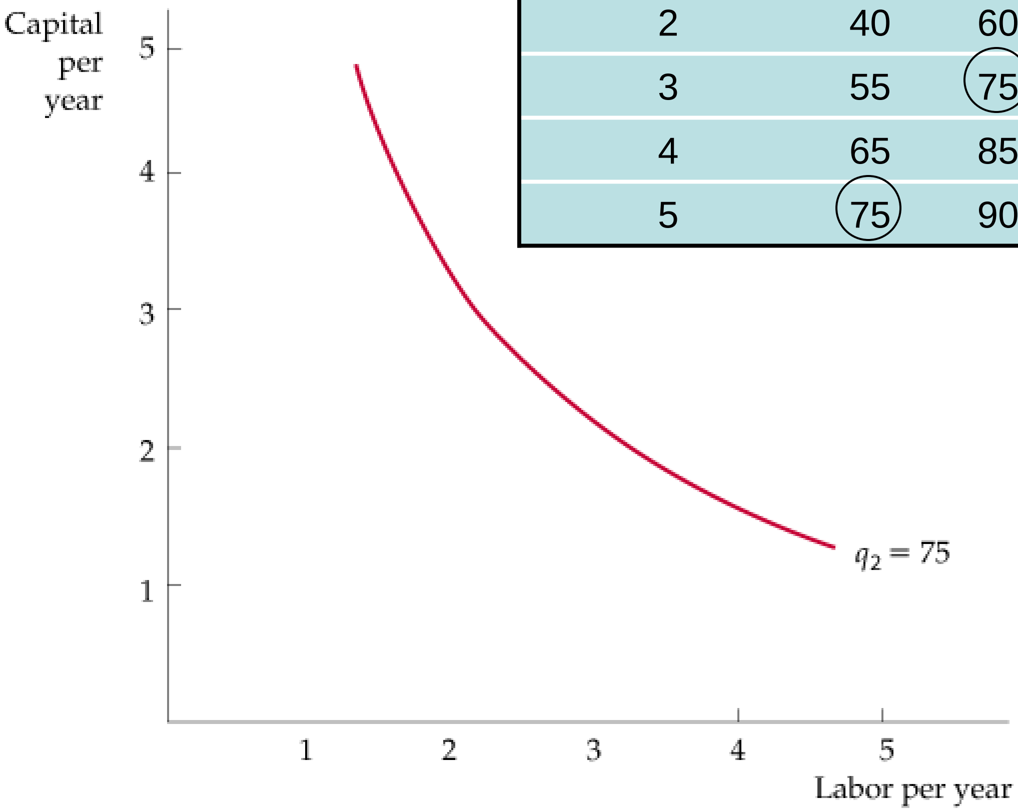


6.3 LR: PRODUCTION WITH TWO VARIABLE INPUTS

Isoquants

TABLE 6.4 Production with Two Variable Inputs

	LABOR INPUT				
Capital Input	**1**	**2**	**3**	**4**	**5**
1	20	40	55	65	75
2	40	60	75	85	90
3	55	75	90	100	105
4	65	85	100	110	115
5	75	90	105	115	120



- **isoquant** Curve showing all possible combinations of inputs that yield the same output. (similar to ICs)

Isoquants

- **isoquant map** Graph combining a number of isoquants, (**from a production function**).

Figure 6.4

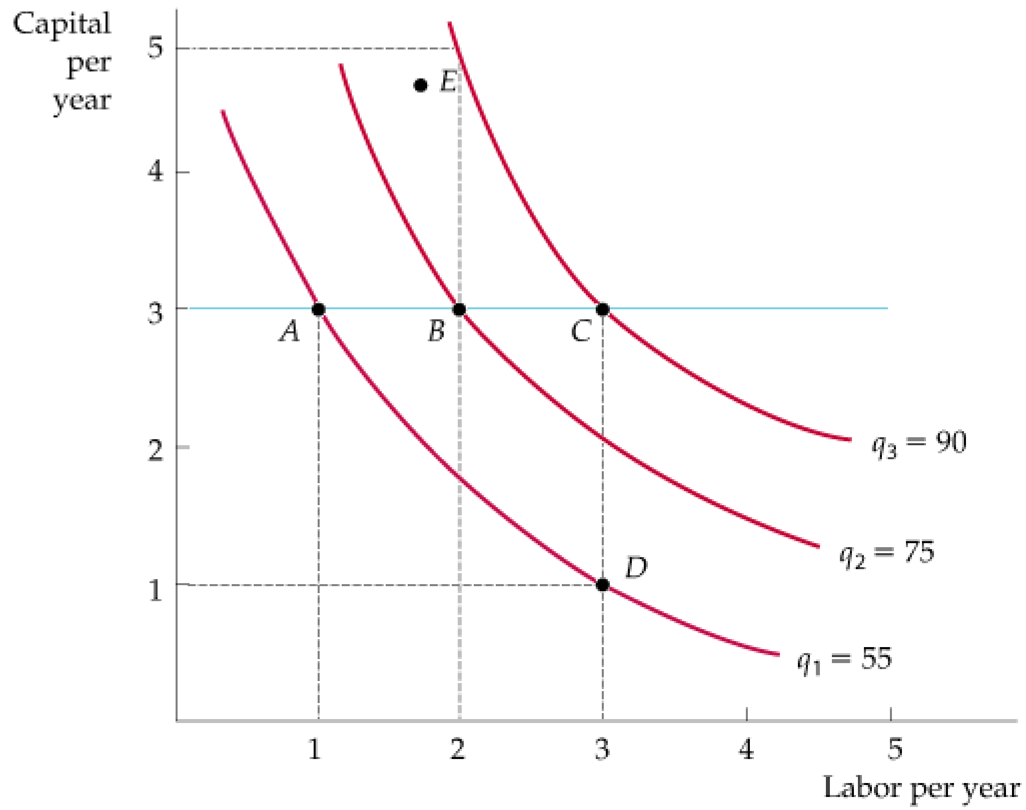
Production with Two Variable Inputs

isoquant map, describes the firm's production function.

Diminishing Marginal Returns

Holding the amount of K —say 3, **(pt A)** we can see that each additional unit of L generates less & less output. **(55;25;15)**

Exercise: How can you show Diminishing Marginal returns by distance of isoquants



Substitution Among Inputs

- **marginal rate of technical substitution (MRTS)** Amount by which the quantity of one input can be reduced when one extra unit of another input is used, so that output remains constant.

This is similar to MRS, Explain

MRTS = − ΔK/ΔL (for a fixed q)

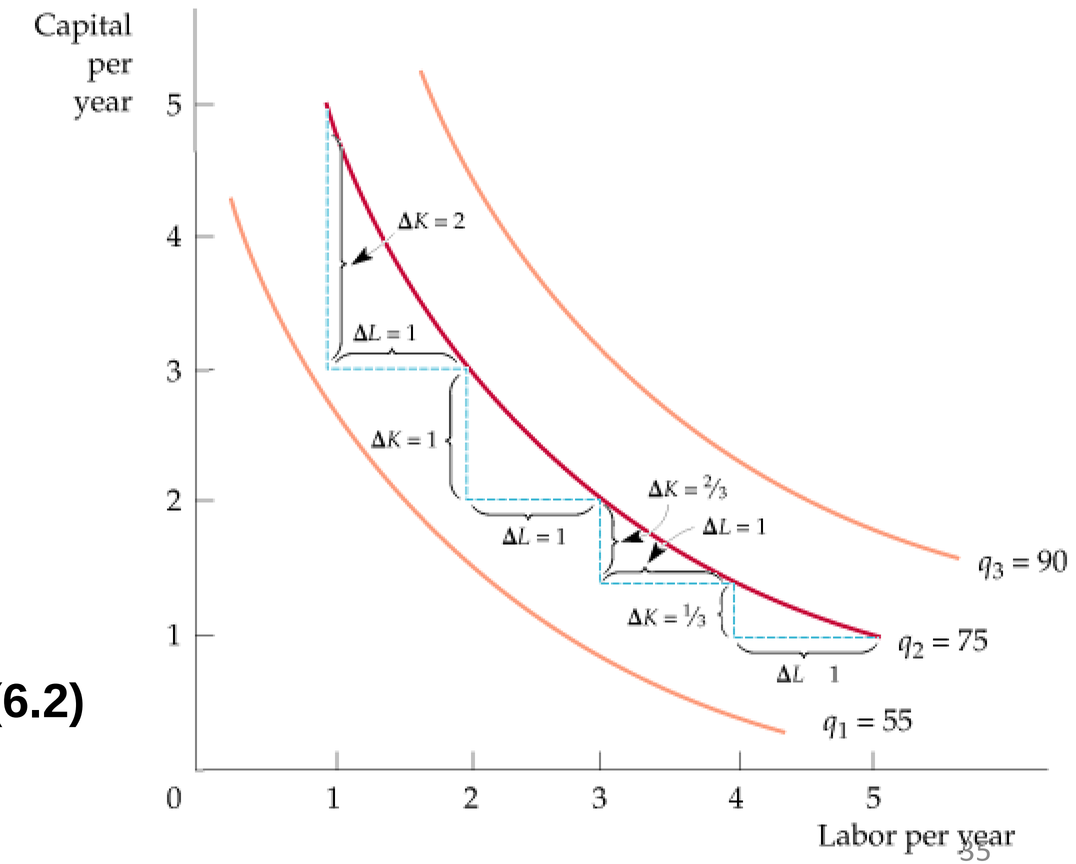
Marginal Rate of Technical Substitution

MRTS = the ability of the firm to replace capital with labor while maintaining the same level of output.

On isoquant q_2, the MRTS falls from 2 to 1 to 2/3 to 1/3.

So marginal returns from L decreases as one moves down isoquant, what about marginal return from K? What about total output?

$$(MP_L)/(MP_K) = -(\Delta K/\Delta L) = MRTS \qquad (6.2)$$



MRTS

- $MPL/MPK = -dK/dL = MRTS$
- Similar to $MUF/MUC = - dC/dF = MRS$

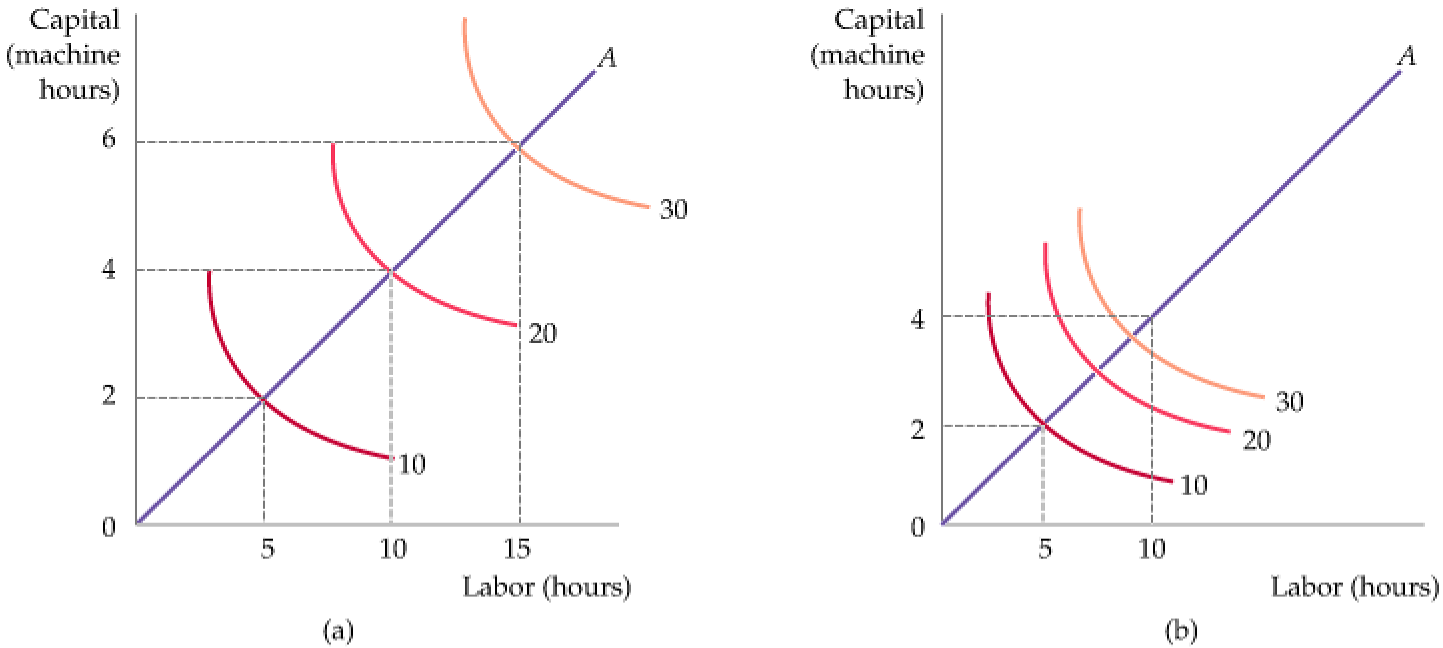
- Exercise:
- If inputs are substitutes: what do isoquants look like?
- If inputs are complements: what do isoquants look like?

6.4 RETURNS TO SCALE: We already drew D.R.T. **(sld. 34)*******

Describing Returns to Scale

Figure 6.9

Returns to Scale



constant returns to scale as shown by a movement along line 0*A* in part **(a)**, the isoquants **are equally spaced** as output increases proportionally.

when there are **increasing returns** to scale as shown in **(b)**, the isoquants move closer together as inputs are increased along the line.

Production Costs - constraints

- Now that we have dealt with isoquants (similar to ICs)
- We now focus on costs (similar to BL – income)
- You must see the parallels
- We also look at costs in SR and LR
- Economies of scale, etc.

7.1 **REVISION**: WHICH COSTS MATTER?

Fixed Costs and Variable Costs

- **total cost (TC** or **C)** Total economic cost of production, consisting of FC & VC.

- **fixed cost (FC)** does not vary with output & that can be eliminated only by shutting down.

- **variable cost (VC)** Cost that varies as output varies.

In the SR most costs are fixed & in LR most costs are variable – rent & wages must be paid!

Sunk costs can never be recovered

REVISION

$$MC = \Delta VC/\Delta q = \Delta TC/\Delta q$$

- **average total cost (ATC or just AC)** Firm's total cost divided by q.
- **average fixed cost (AFC)** Fixed cost divided by q
- **average variable cost (AVC)** Variable cost divided by q.

7.2 **REVISION:** COST IN THE **SHORT RUN**

The Shapes of the Cost Curves

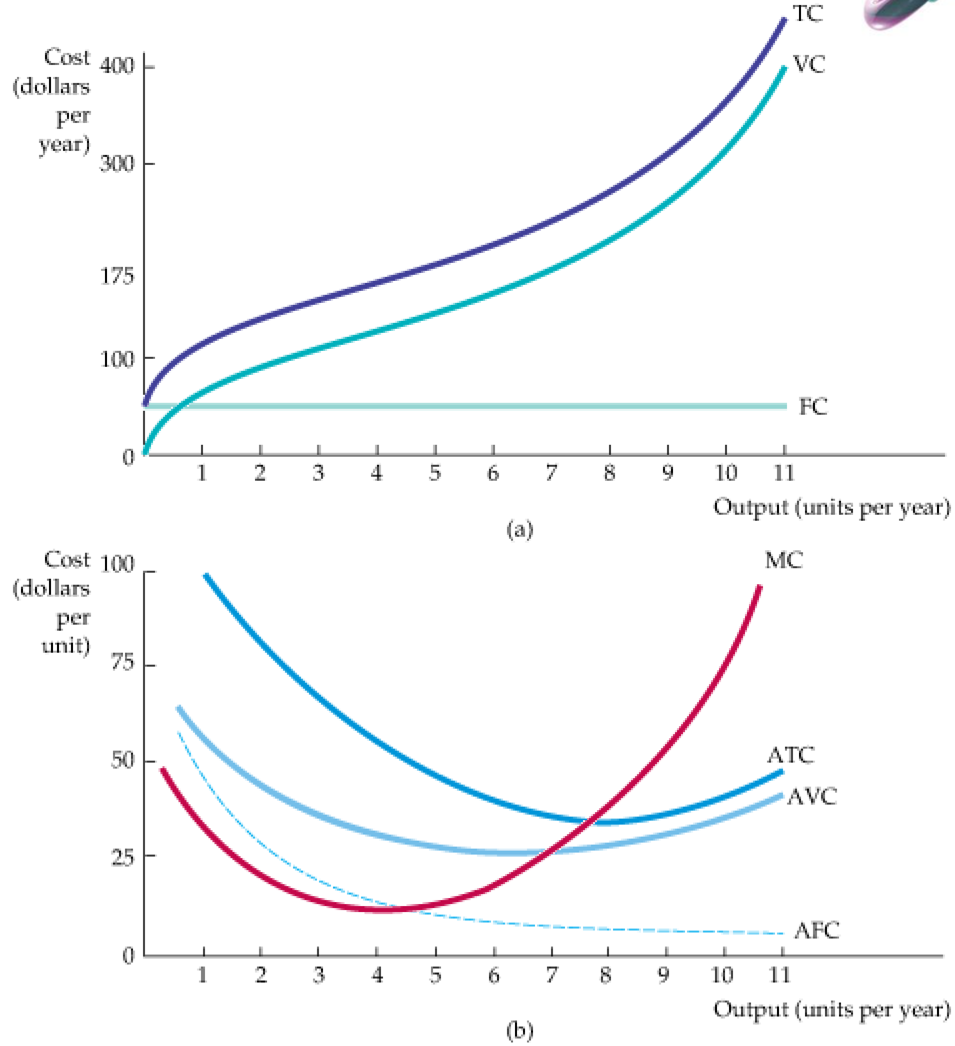
Figure 7.1

Cost Curves for a Firm

In **(a)** total cost TC is the vertical sum of fixed cost FC and variable cost VC.

In **(b)** ATC is the sum of AVC and AFC.

MC crosses the average variable cost and average total cost curves at their minimum points.



7.3 NOW COST IN THE LONG RUN- K is flexible! NB

The User Cost of Capital

- **user cost of capital** Annual cost of owning & using K, equal **to economic depreciation plus forgone interest.**

  (if it was invested in some bank)

$$\text{User Cost of Capital} = \text{Economic Depreciation} + (\text{Interest Rate})(\text{Value of Capital})$$

$$r = \text{Depreciation rate} + \text{Interest rate}$$

The **Cost-Minimizing** Input Choice

We now turn to a problem faced by firms: ***how to select inputs to produce a given output at minimum cost.***

For simplicity, we work with costs of K & L

The Price of K

The price of capital is its *user cost*, given by *r* = Depreciation rate + Interest rate.

The Rental Rate of Capital

- **rental rate** Cost per year of renting one unit of capital.

If the K market is competitive. *The competitive return is the user cost of capital.*

So cost of K is r
& cost of L is w

The Isocost Line

- **isocost line** Graph showing all possible combinations of L and K that can be purchased for a given cost.

Total cost *C* of producing any some q = the sum of the firm's L cost (*wL*) + K cost *rK:*

$$C = wL + rK \tag{7.2}$$

If we rewrite the cost equation as an equation for a straight line, we see the slope of equation

$$K = C/r - (w/r)L$$

SLOPE = w/r [absolute value]

Really a price ratio of L and K.

Similar to slope of BL (Pf/Pc or Px/Py)

The Isocost Line with isoquant

Figure 7.3

Isocost describe the combination of inputs to production that cost the same amount !!!!

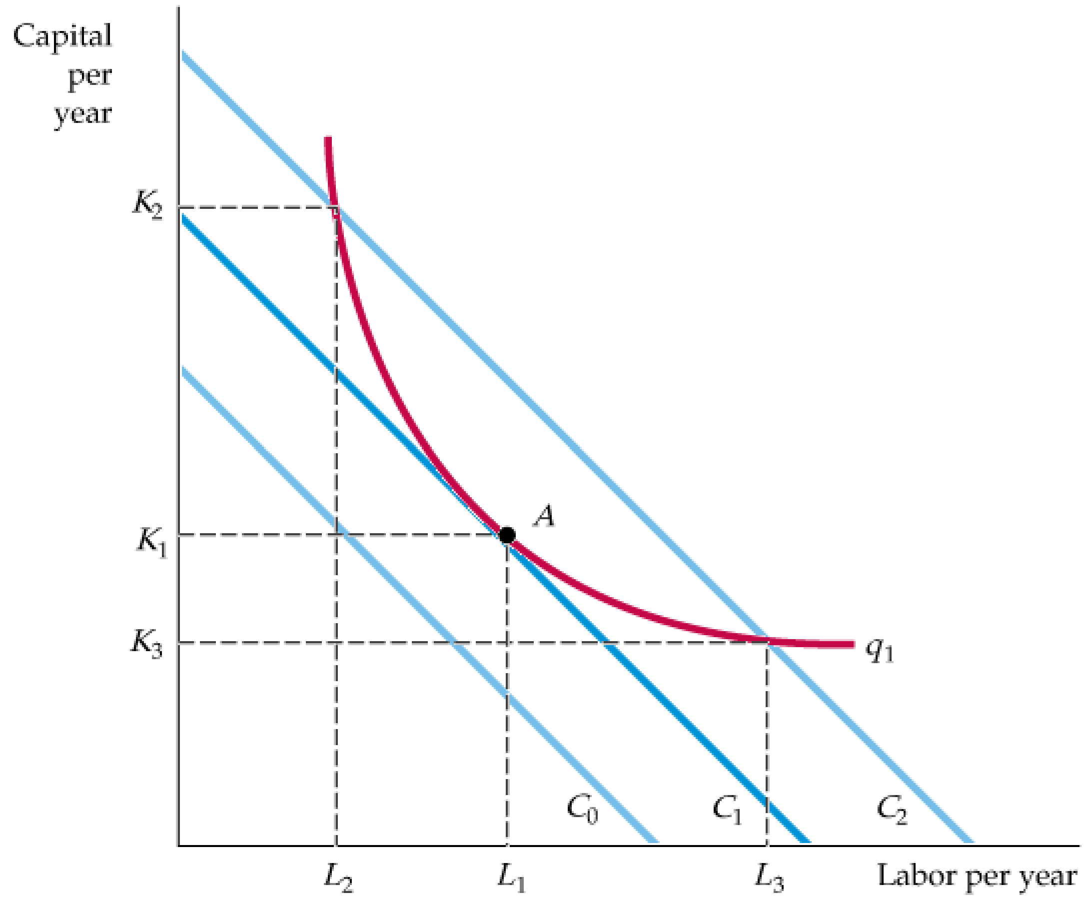
at *A* q_1 can be produced at min. cost with L_1 & K_1.

This is equilibrium in the production side of economy

MRTS = MPL/MPK = **w/r**

In consumption we had

MRS = MUF/MUC = Pf/Pc



7.3 Cost in long run NB

- If Tot Cost are the same along isocost, we can READ out Total Cost at any point along the line
- If we are given TC and costs of K, we can work out costs of L $C = wL + rK$
- We can also work out the most efficient mix of inputs, given the isoquant map (tangent pt)
- Also given 2 isocosts & one isoquant, firm can choose 2 different efficient pts associated with the two isocosts (next slide)

Choosing Inputs

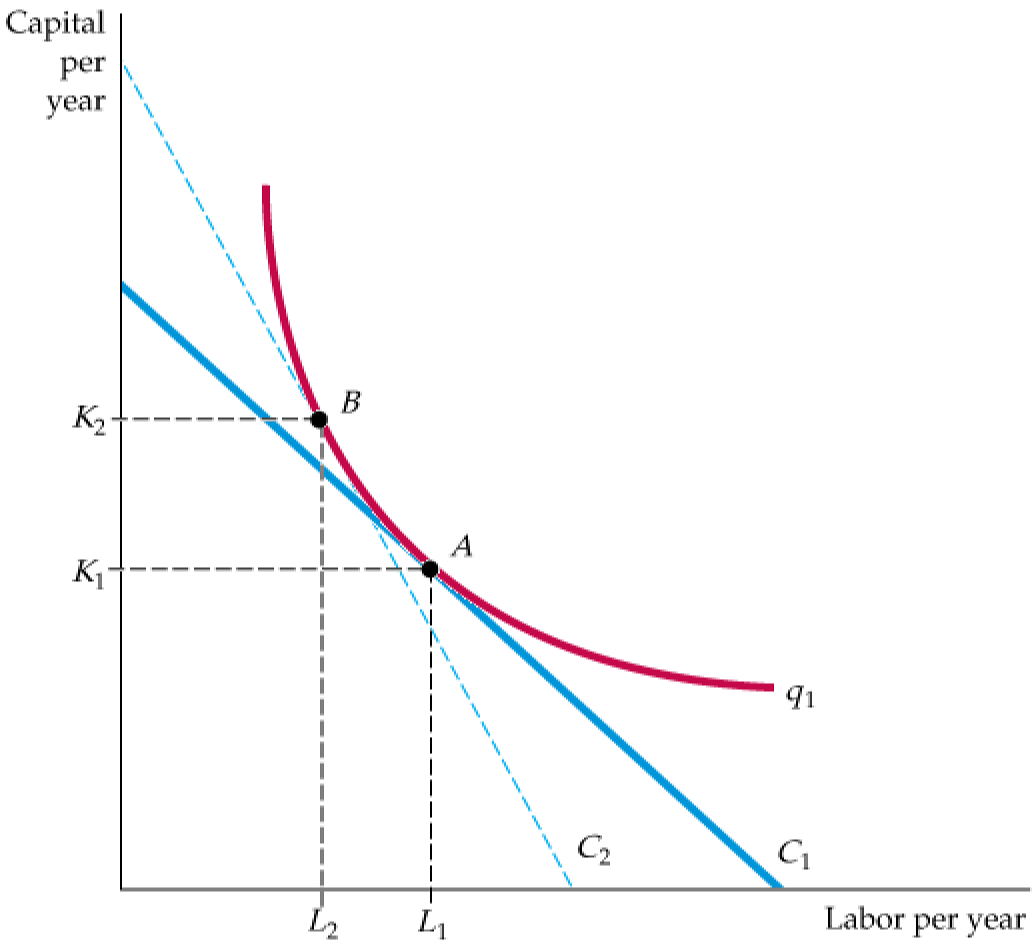
Figure 7.4

When prices of either K or L change the isocost curve will change slope

Then different combination K & L will be bought to produce same output (q1)

Cause: COST MINIMISATION requires that

MRTS=MPL/MPK=w/r



Cost Minimization **with Varying Output Levels**

- **expansion or growth path**
  Curve passing through equilibrium points

The Expansion Path and Long-Run Costs

To move from the expansion path to the cost curve, we follow three steps:

1. Basically work out the TC associated with each equilibrium point
2. Plot this TC against each output level

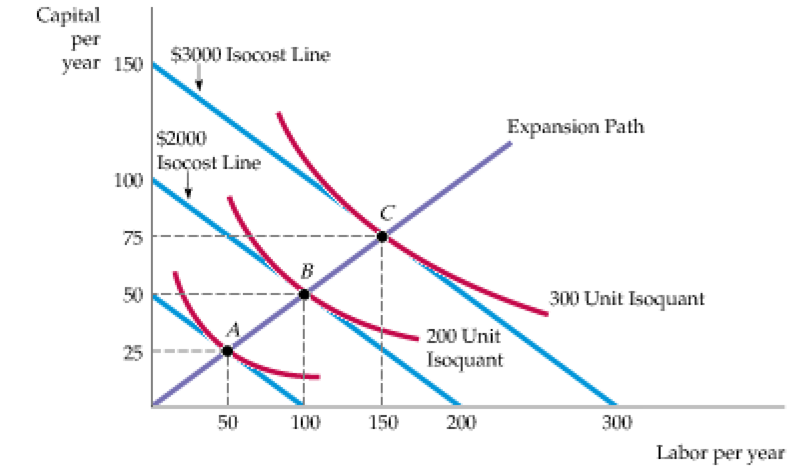
Next slide

Cost Minimization with Varying Output Levels

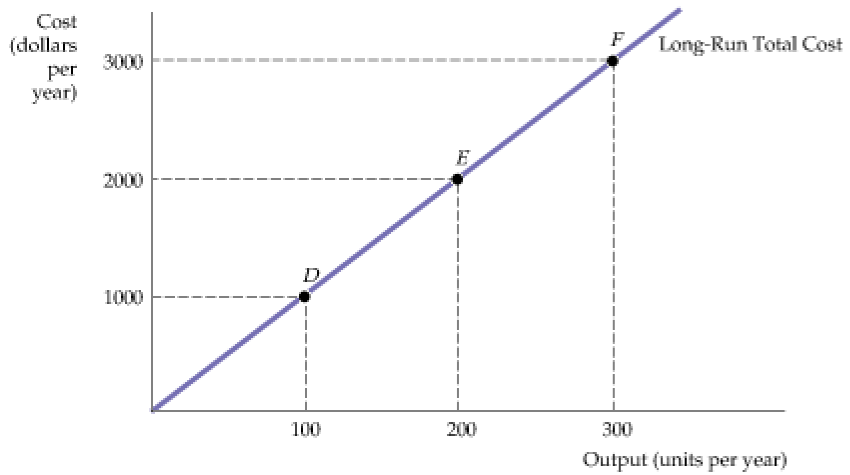
Figure 7.6

A Firm's Expansion Path and Long-Run Total Cost Curve

In **(b)**, the corresponding LR total cost curve (from the origin through points *D*, *E*, and *F*) measures the least cost of producing each level of output.



(a)



(b)

Work out that r = 20

& w = 10

Rem: TC = rK + wL

Isocost = same costs

Hint: $2000= rK

7.4 LONG-RUN VERSUS SHORT-RUN COST CURVES ****

The Inflexibility of Short-Run Production: K is not variable

Figure 7.7

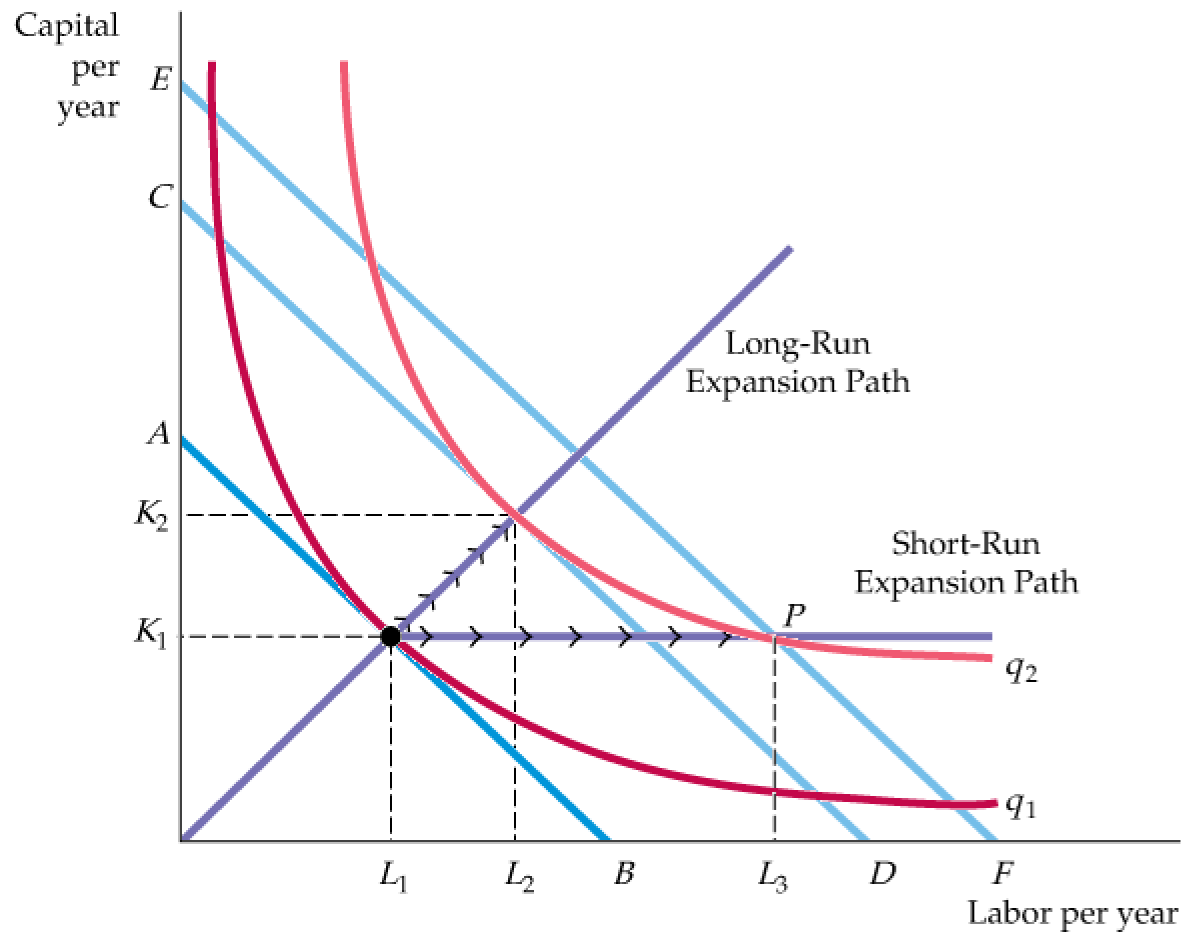
The Inflexibility of Short-Run Production

Output is initially at level q_1.

In SR q can be expanded only by increasing L

K is fixed at K_1.

In LR, q can be expanded cheaply by increasing L & K.



End of 1st part

- Now we know the relationship between TC and q in SR and LR (expansion paths)
- We can get ATC = TC/q
- And get MC = dTC/dQ

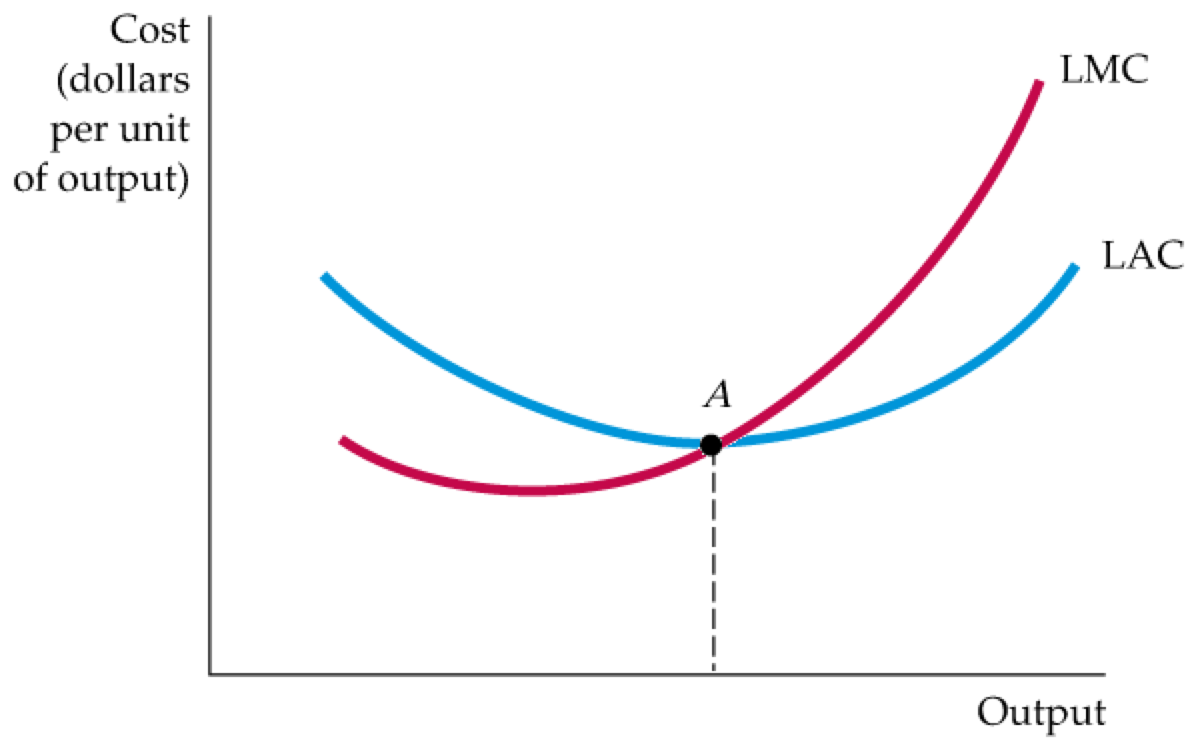
Long-Run Average Cost

The we can reproduce our familiar costs curves

Where we have increasing returns to scale we also have economies of scale

AC > MC

Falling AC



Economies and Diseconomies of Scale

At some point AC of production will begin to increase with output.

There are three reasons for this shift:

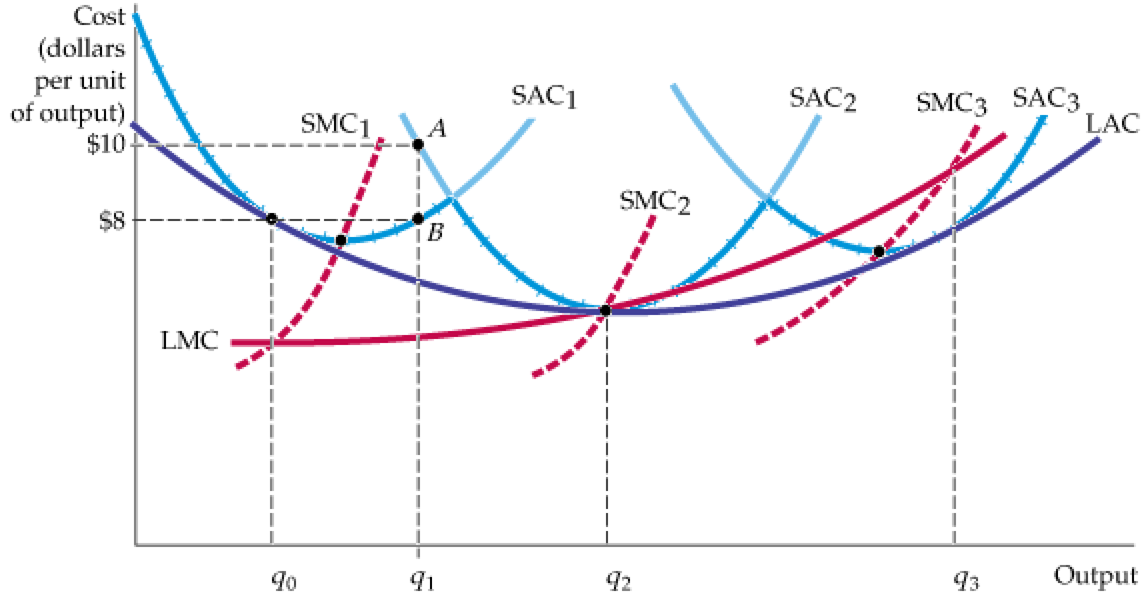
1. **In the short run, factory space and machinery may make it more difficult for workers to do their jobs effectively.**
2. **Managing a larger firm may become more complex**
3. **The advantages of buying in bulk may have disappeared**

The Relationship Between Short-Run and Long-Run Cost

The LAC is the envelope of the SAC_1, SAC_2, and SAC_3.

Only at q2 we have minima of SR & LR corresponding

This is because of economies/diseconomies of scale



7.5

PRODUCTION WITH TWO OUTPUTS—ECONOMIES OF SCOPE – **JUST SO YOU KNOW**

Economies and Diseconomies of Scope

- **economies of scope**
  Cooperation among firms to produce output is > indiv. sum.

- **diseconomies of scope**
  Cooperating firms' output is less than sum of individuals

Lets go to general equilibrium

- **Slide 89**

But the beauty of competitive markets is only ideal
Lets look at Monopoly, Monopsony, Oligopolies and their inefficiencies

- **monopoly** Market with only one seller.

- **monopsony** Market with only one buyer.

- **market power** Ability of a seller or buyer **to affect the price** of a good.

Average Revenue and Marginal Revenue

- **marginal revenue** Change in revenue resulting from a one-unit increase in output.

To see the relationship among total, average, and marginal revenue, consider a firm facing the following demand curve:

P = 6 – Q: From the table info we can draw the AR & MR graphs

TABLE 10.1 Total, Marginal, and Average Revenue (see P = AR)

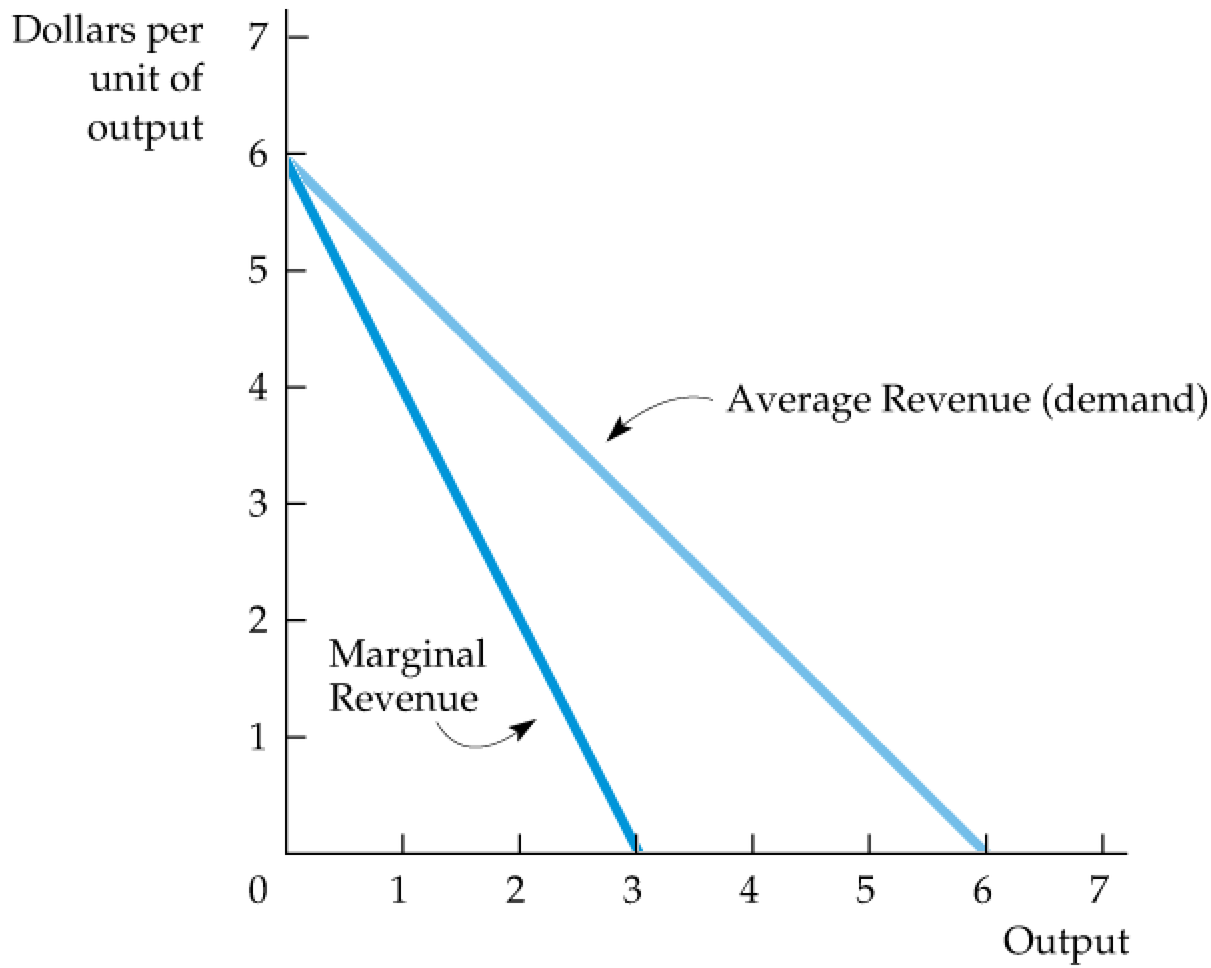
Price (P)	Quantity (Q)	Total Revenue (R)	Marginal Revenue (MR)	Average Revenue (AR)
$6	0	$0	---	---
5	**1**	**5**	**$5**	**$5**
4	**2**	**8**	**3**	**4**
3	3	9	1	3
2	4	8	-1	2
1	5	5	-3	1

Demand: P vs. Q this is same as AR vs. Q

Figure 10.1

Average and marginal revenue are shown for the demand curve $P = 6 - Q$.

MR cuts x-axis into two equal parts



The Monopolist’s Output Decision

Figure 10.2

Profit Is Maximized When MR=MC for the firm

Q^* is the output level at which MR = MC.

& then P = AR

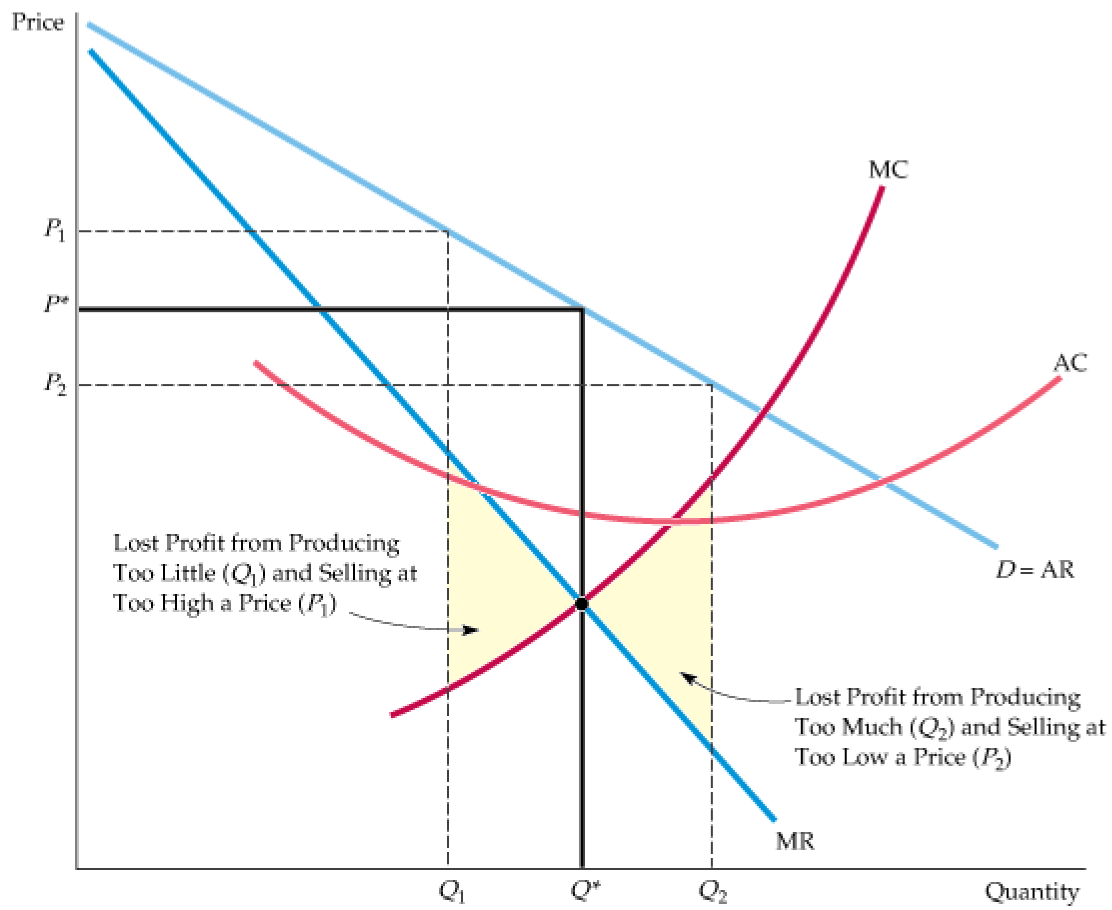
At Q1, lower profit made, P too high

for Q1

At Q2 profit is lost

P too low for Q2

Proof coming



10.1 MONOPOLY

The Monopolist's Output Decision- **algebraic proof**

Profit π is the difference between revenue and cost, both of which depend on *Q*:

$$\pi(Q) = R(Q) - C(Q)$$

As *Q* is increased from zero, profit will increase until it reaches a maximum (i.e., $\Delta\pi / \Delta Q = 0$). Then

$$\Delta\pi / \Delta Q = \Delta R / \Delta Q - \Delta C / \Delta Q = 0$$

$\Delta R/\Delta Q = MR$ and $\Delta C/\Delta Q = \mathrm{MC}$

Thus the profit-maximizing condition is that

$$\mathrm{MR} - \mathrm{MC} = 0, \text{ or } \mathrm{MR} = \mathrm{MC}$$

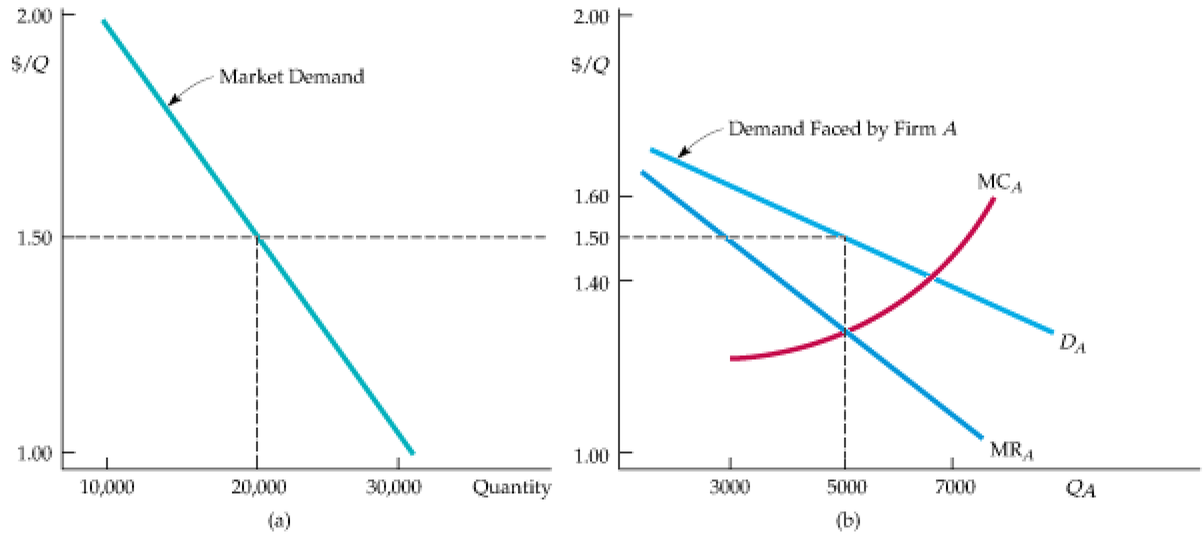
Figure 10.7

The Demand for Toothbrushes

For as long as a firm's P is above MC, it has some monopoly power

This is represented by its sloping Demand

The steeper the demand, the more power as P>>MC



Three factors determine a firm's elasticity of demand.

1. *The elasticity of market demand*. Determines how far P can be set above MC

2. *The number of firms in the market*. If there are many firms, each has limited power. Barriers to entry gives resident firms power

3. *The interaction among firms*. Collusion creates more power

Figure 10.10

Deadweight Loss from Monopoly Power

Pc is competitive

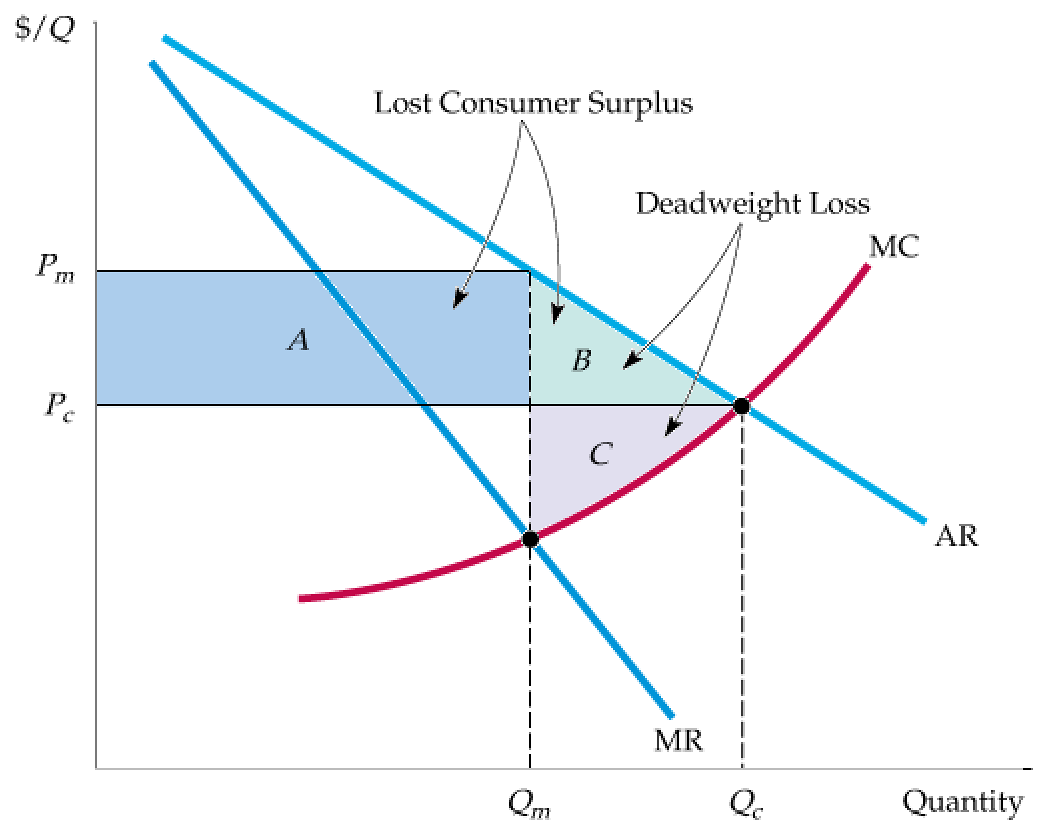
Pm is monopoly

Moving from Pc to Pm consumers lose *A* + *B* surplus,

producer gains *A* but lose *C*.

So *B* + *C* surplus go into waste

Rent seeking has similar effects



10.5 MONOPSONY- focus on buyer power

- **oligopsony** Market with only a few buyers.

- **monopsony power** Buyer's ability to affect the price of a good.

- **marginal value** Additional benefit derived from purchasing one more unit of a good. (~ MB)

- **marginal expenditure** Additional cost of buying one more unit of a good. **(~ MC)**

- **average expenditure** Price paid per unit of a good. (~ AC)

CHAPTER 11 Price discrimination

11.1 Aim of monopolists is to capture more of and more of Consumer Surplus

11.2 To do this they can charge different prices to markets with different demand (Price Discrimination)

Figure 11.1

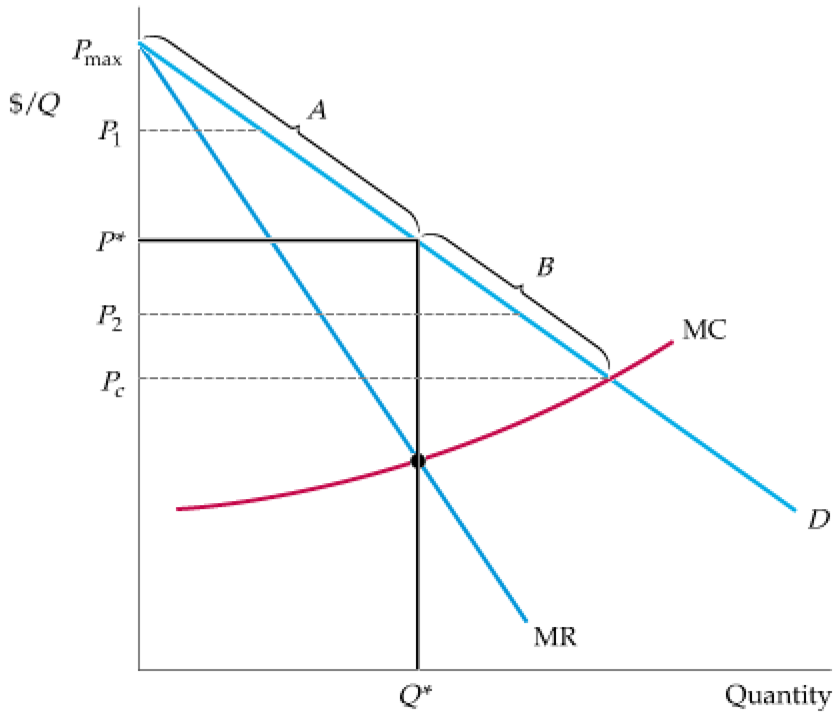
Capturing Consumer Surplus

If a monopolist can charge only one price for all customers, that price will be *P** and the quantity produced will be *Q**.

Ideally, the firm would like capture all consumer surplus in A, by charging higher price to consumers WTP above P*.

The firm would also like to sell to consumers willing to pay prices **lower than *P**, and capture Triangle B**

.



- **price discrimination**
  Practice of charging different prices to different consumer markets

First-Degree Price Discrimination

- **reservation price** Max P a customer is WTP for a good.
- **first-degree price discrimination** Practice of charging **each** customer **her reservation P.**

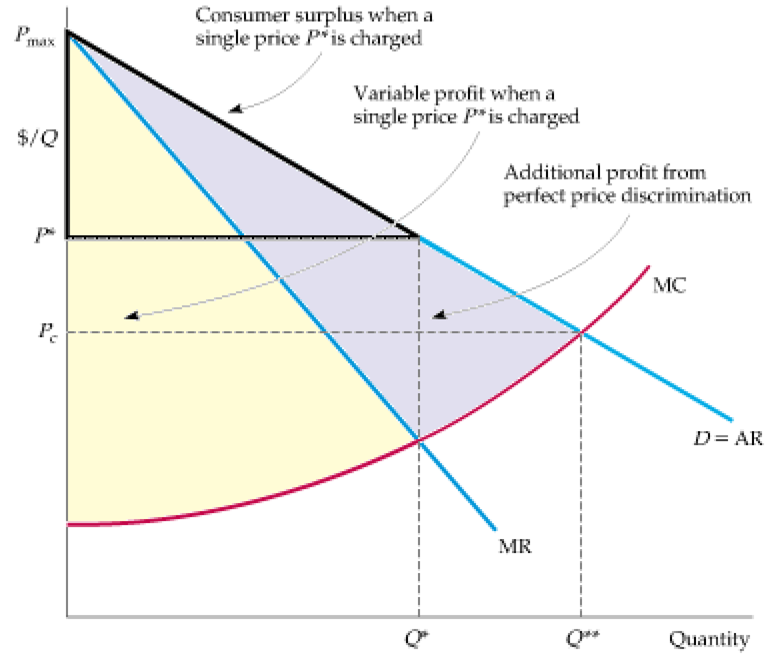
Figure 11.2

Additional Profit from Perfect First-Degree Price Discrimination

Because the firm charges each consumer her reservation P, it is profitable to expand output to *Q*** at Pc.

When only a single price, *P, is** charged, the firm's variable profit is the yellow area between the MR and MC curves.

With perfect price discrimination, this profit expands by the area between AR (demand) and MC (additional blue)



First-Degree Price Discrimination

Perfect Price Discrimination

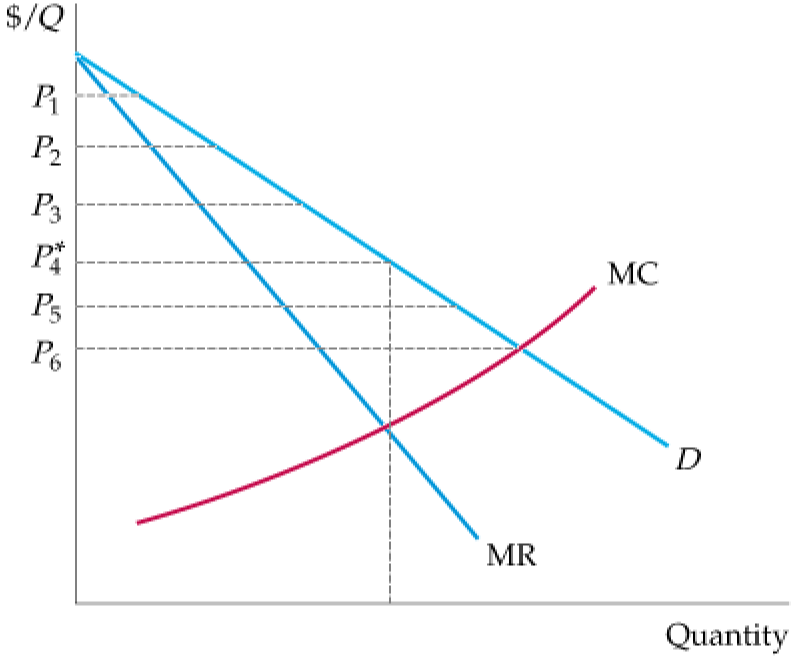
Additional profit now comes from difference between AR (demand) and MC.

Imperfect Price Discrimination

Figure 11.3

First-Degree Price Discrimination in Practice

Firms usually don't know the reservation price of **each & every** consumer, but sometimes reservation prices can **be roughly identified.**



And we get imperfect price discrimination:

Geography, age, occupation, etc

Airlines, movie tickets, etc

Study other discriminations, eg based on quantities

CHAPTER 12: Monopolistic competition & oligopoly

1.Monopolistic Competition

12.2 Oligopoly

12.3 Quantity & Price Competition

12.4 Competition versus Collusion:

Monopolistic Competition and Oligopoly

- **monopolistic competition** Market in which firms can enter freely, each producing its own brand of a differentiated product. (demand slope is?

- **oligopoly** Market in which only a few firms compete with one another, entry by new firms is impeded. (demand curve is?)

- **cartel** Market in which some or all firms explicitly collude, coordinating prices and output levels to maximize joint profits.

MONOPOLISTIC COMPETITION

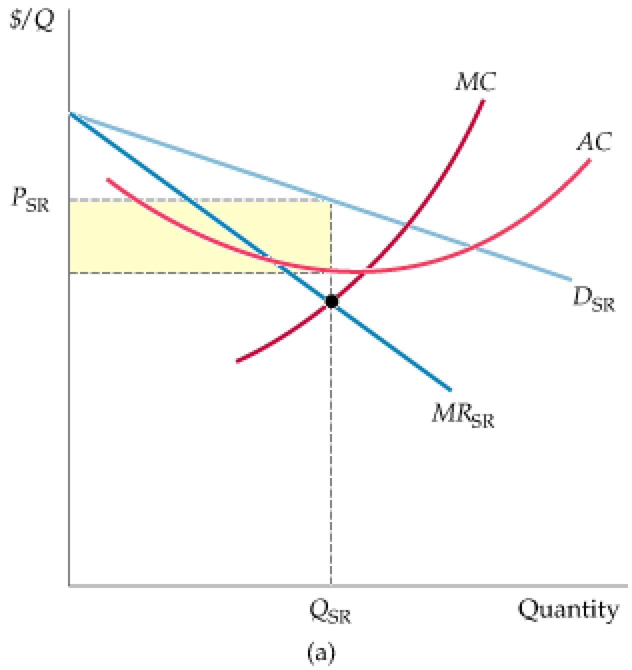
A monopolistically competitive market has two key characteristics:

1. Firms **compete by selling differentiated products** that are highly substitutable for one another but not perfect substitutes.

2. There is ***free entry and exit:*** it is relatively easy for new firms to enter and for old to leave the market

- Equilibrium in the Short Run and the Long Run

Figure 12.1



Because the firm is the only producer of its brand, **it faces a downward-sloping demand curve**.

Price exceeds MC and the firm has some monopoly power.

In the SR,

P > AC, firm earns economic profits.

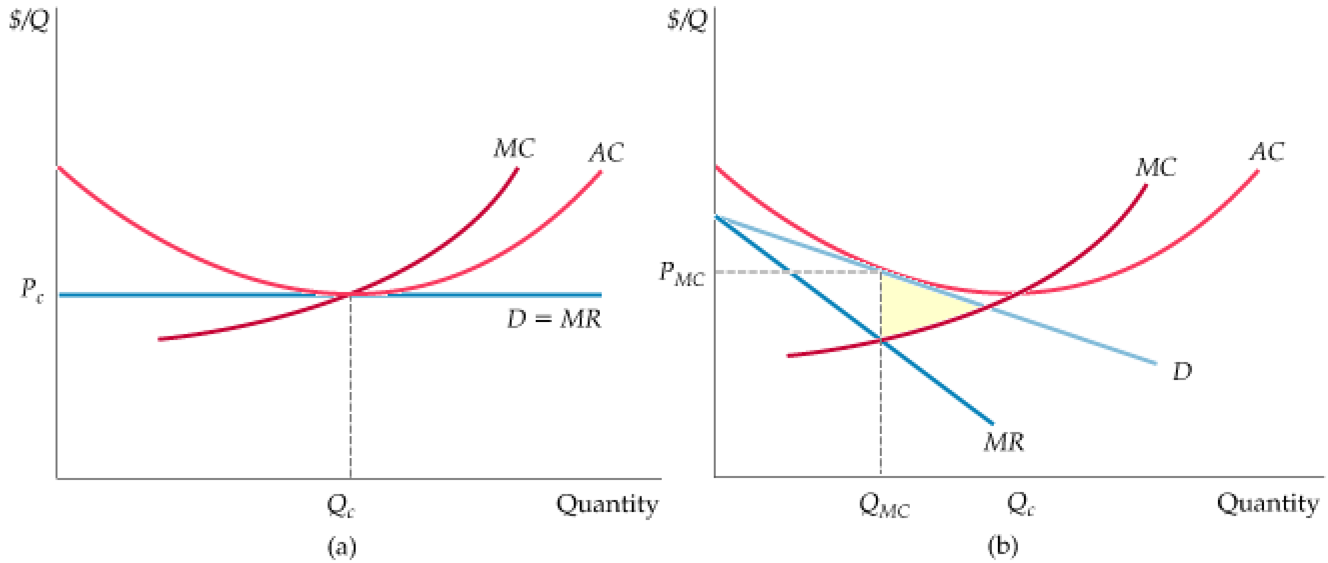
In the LR, P = AC;

Only normal profits

MONOPOLISTIC COMPETITION

- Monopolistic Competition vs. Competition & Efficiency

Figure 12.2 (continued)



Under monopolistic competition, P>MC

Thus again there is a deadweight loss, yellow-area.

Like we showed with monopoly

.

BUT product differentiation is absent in competitive markets, so that is the benefit against dead weight loss

OLIGOPOLY

In oligopolistic markets, products may not even be differentiated.

What matters: a few firms account for most production.

In some oligopolistic markets: some or all firms earn economic profits in LR because *barriers to entry*

Oligopoly is a prevalent market structure.

Examples: include automobiles, computers , aircraft manufactures (boeing & airbus)

12.2

OLIGOPOLY- definitions ****

- Equilibrium in an Oligopolistic Market

Market equilibrium: ***firms are doing the best they can*** *and* ***have no reason to change*** *their price or output.*

Nash Equilibrium: Equilibrium in oligopoly markets means that **each firm will want to do the best it can *given what its competitors are doing***

Following are illustrations of **Cournot (output)**, **Bertrand (price)** **and Stackelberg (first movers)** **models**

Cournot model (output)

Assumptions:

- 2 firms, homogenous good
- Both know mkt demand curve
- Must decide how much to produce (simultaneously!!!)
- P will depend on mkt Q
- Each firm treats competitor's q as fixed – then decides on its own
- If firm thinks competitor will product q=0, it produces Q at MR=MC on market Demand curve
- Otherwise: Firms 1's Profit-max q decreases according to other player's q
- (see q vs. Q)

- The Cournot Model

Figure 12.3

Firm 1's Output Decision

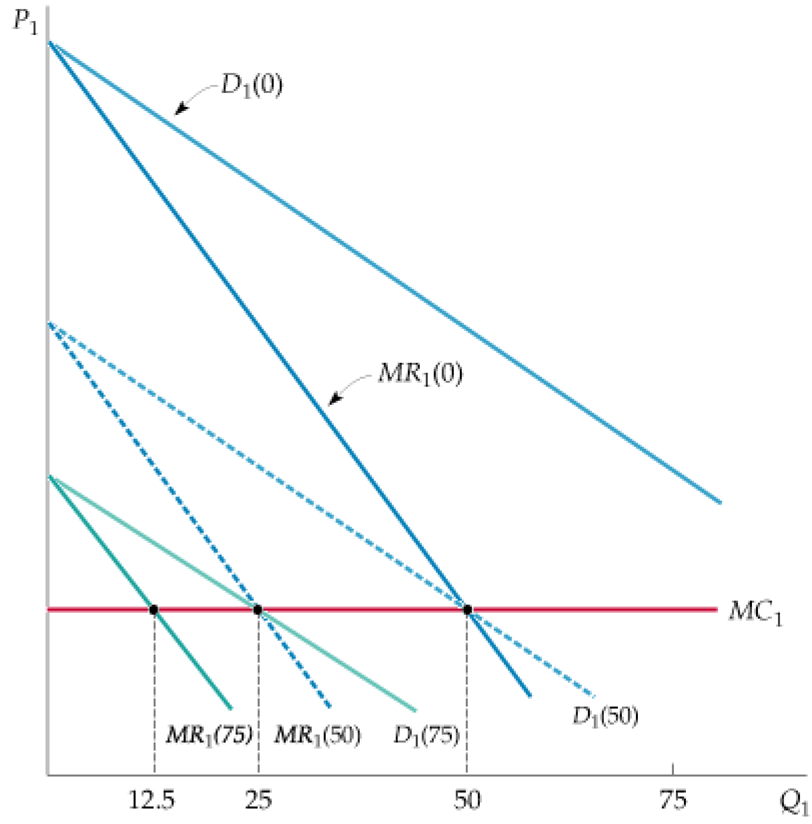
1) If Firm thinks Firm 2 will produce nothing, its demand curve is $D_1(0)$, the market demand.

The corresponding $MR_1(0)$, intersects Firm 1's marginal cost curve MC_1 at an output of 50 units.

2) If Firm 1 thinks that Firm 2 will produce 50 units, its demand curve, $D_1(50)$, is shifted by 50 units inward. Profit maximization now implies an output of 25 units.

3) If Firm 1 thinks that Firm 2 will produce 75 units, Firm 1 will produce only 12.5 units.

From these hypothetical Q results we draw the reaction curve of the firms



- The Cournot Model
  - **reaction curve** Relationship between a firm's profit-maximizing output and the amount **it thinks** its competitor will produce.

Figure 12.4

Reaction Curves and Cournot Equilibrium

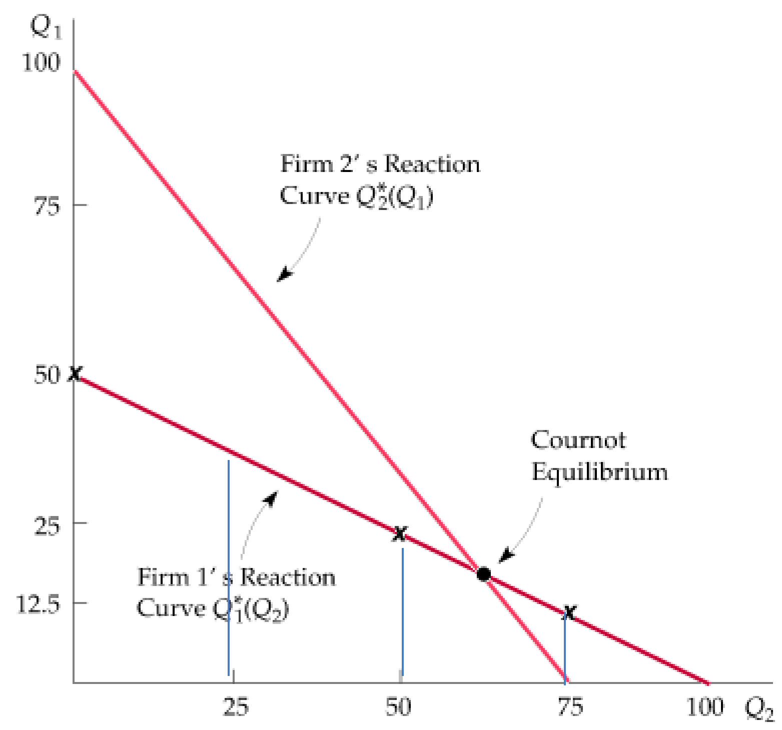
Firm 1's reaction curve comes from previous slide

Same applies to Firm 2. And get it's reaction curve

Where the 2 curves collide we have Cournot Equilibrium

Quantities associated with own price & revenues

That's the Q we want to calculate



Cournot model (output) NB!

Note criticism of Cournot Model:

- Mute about adjustment process to equilibrium
- Assumes competitor's Q stays fixed

Compare: cournot equilibrium VS. collusion (cooperation) equilibrium outcomes

Example
Assume:
$MC1 = MC2 = 0$
Given:
Demand curve $P = 30 - Q$ ....(1) & $Q = Q1 + Q2$ ....(2)

- **Determine reaction curves Firm 1 & 2 to solve for Q equilibrium**
- **Firm 1:**
- **To max profit : MR = MC & $TR1 = P . Q1$ ....(3)**
- **Subst (1) into (3) : $TR1 = (30-Q) . Q1$**
- **$= 30Q1 - QQ1$**
- **Subst (2) for Q $= 30Q1 - [(Q1+ Q2) Q1]$**
- **$= 30 Q1- Q1^2 - Q2Q1$**

- **Also remember :MR is a gradient of TR:**
- **i.e. $MR1 = dTR1/dQ1 = 30 – 2Q1 – Q2$ (profit max: $MR1 = MC1 = 0$ (assumed)**
- **$30 – 2Q1-Q2 = 0$**
- **i.e. $Q1 = 15 -1/2\ Q2$ (Reaction curve for Firm 1)................(4)**
- **Using same steps find Firm 2 reaction curve:**

$Q2 = 15 -1/2\ Q1$..................(5)

Cournot model (output)

- To find cournot equilibrium Q solve reaction curves:
- Subs (5) into (4)
- $Q1 = 15 – ½ (15 - ½ Q1)$
- $Q1 = 15 -15/2 + 1/4 Q1$
- $Q1 – ¼Q1 = 7½$
- $¾ Q1 = 7½$ (i.e. $Q1 = 10$)
- Now sub $Q1 = 10$ into equation (5, prev slide) to find $Q2=10$
- This is the Cournot Equilibrium in fig 12.5
- So: $Q (mkt) = Q1 + Q2 = 10 + 10 = 20$
- And using demand curve: $P = 30 -20 = 10$
- TR1 = Q1 * P = 10 * 10 = **R100** = TR2

(keep fig 12.5 open, pg454)

- What are the outcomes if they collude? **They work as ONE monopoly**
- i.e. **restriction of Q** (mkt) for higher P
- Again:
- Same mkt demand: $P = 30 – Q$ .... (6)
- $MR = MC = 0$ (prof-max)
- $TR = P.Q$ (for the 2 firms)
- Subs (6): $TR = (30 – Q) Q$
- $= 30Q - Q^2$
- $MR = dTR/dQ = 30 – 2Q$ ($MR=MC=0$)
- $30 - 2Q = 0$ therefore $Q = 15$
- Market P: $P = 30 - 15 = 15$
- Divide total Q into 2 for the firms ($Q1 = Q2 = 7½$)
- $TR1 = Q1 * P = 7½ * 15 = R112.5$
- $TR2 = Q2 * P = R112.5$ also
- **Conclusion: Cournot TR 1 & 2 < Collusion TR 1 & 2**
- **R100 < R112.5**
- **Collusion pays more than cournot equilibrium !!!**

12.2 Cournot vs. collusion vs competition

- The Linear Demand Curve—An Example

Figure 12.5

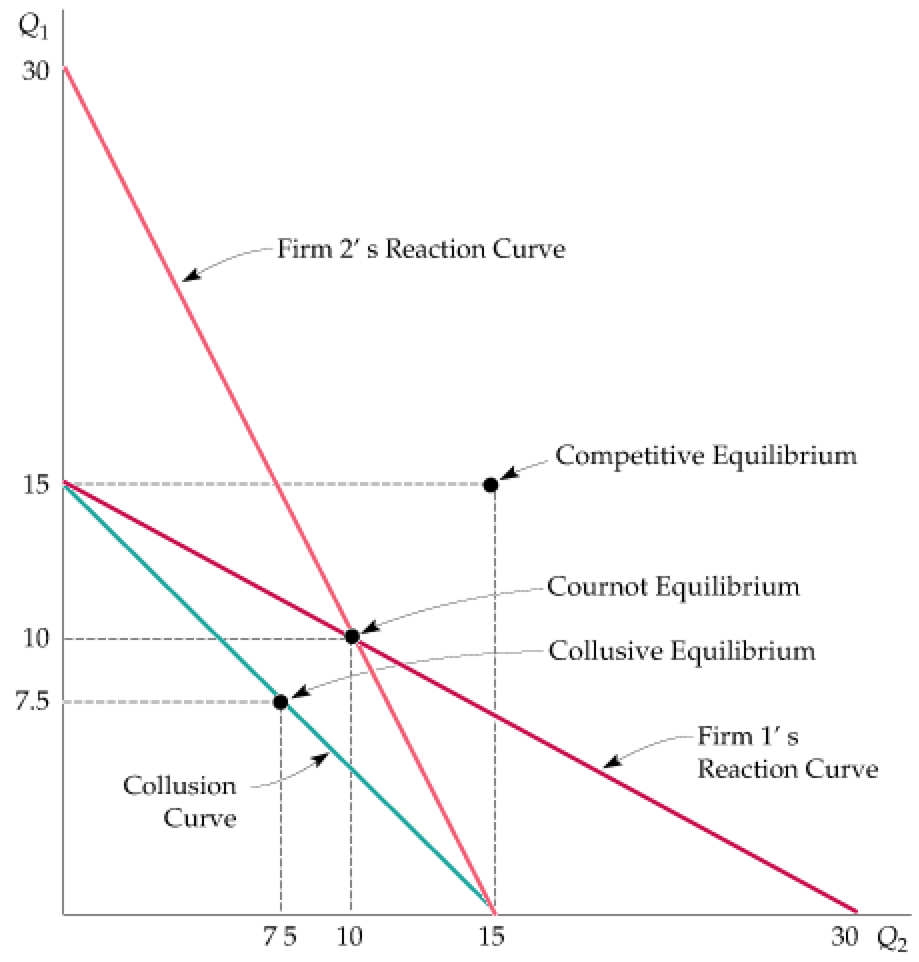
Duopoly Example

Collusion has more profits

With reduced output and higher prices

Cournot has less profits with higher output and lower prices

Competition has no economic profits with P = MC



Bertrand Model (price)

Compare price competition vs. price collusion

- Assumptions:
- Homogenous product
- Decision **made simultaneously**
- Assume MC1= MC2 = 3
- Same demand curve: P = 30 – Q
- Q = Q1 + Q2
- If you charge a price higher than MC in competition, you lose all market !
- So at Nash Equilibrium P must be 3 (=MC)
- Then: 3 = P = 30 – Q
- So: Q = 27 i.e. Q1 = 13½ = Q2
- Remember: profit= TR – TC
- & TR = P . Q and TC = MC.Q (with MC = P =3)
- So: profit = (3 x 27) – (3 x 27) = zero
- In Bertrand model equilibrium, zero profits are made!!!!!
- Unlike in quantity cournot equilibrium, in bertrand equilibrium , profit = 0

Bertrand Model (price)

- Exercise: Apply the same data to a Cournot model P= 30-Q and MC= 3

- Do it now, last exercise! (time check)

working

- In Cournot model you must find the following:
- From: $P = 30 - Q$ & $Q = Q1 + Q2$
- $TR1 = P x Q1 = (30-Q) x Q1 = 30Q1 - QQ1$
- $= 30Q1 - [(Q1+Q2) Q1] = 30Q1 - [Q1sq + Q1Q2]$
- $MR1 = 30 - 2Q1 - Q2 = 3$ (= MC)
- $Q1 = 9 = Q2$ [total Q = 18]
- Therefore: $TC1 = MC1 \times Q1 = 3 \times 9 = 27$
- But because Q = 18 so P = 30 - 18 = 12
- Hence: $TR1 = Q1 \times P = 9 \times 12 = 108$
- So profit= TR1 – TC1 = 108 – 27 = 81 (not zero)
- When firms adjust quantity they make profits!

Bertrand Model (price)

last slide with exam emphasis

- Criticism of Bertrand:
- If firms produce homogeneous goods, they'd most likely compete by Q, not P
- Even if they set same P, how is market share divided?
- Model is NB in showing us what kind of outcome is reached depending on chosen variable of competition

CHAPTER 16: General Equilibrium & Economic efficiency

16.1 General Equilibrium Analysis

16.2 Efficiency in consumption or exchange

16.4 Efficiency in Production

Study the rest according to study guide

16.1 GENERAL EQUILIBRIUM ANALYSIS

- **partial equilibrium analysis**

  Determination of equilibrium prices and quantities in a market **independent of effects from other markets**.

- **general equilibrium analysis**

  Simultaneous determination of the prices and quantities in all relevant markets, **taking feedback effects into account.**

We put consumption & production together!

16.2 EFFICIENCY IN EXCHANGE

- **exchange economy** Market in which two or more **consumers** trade two goods among themselves.

- **efficient (Pareto) allocation**
  Allocation of goods in **which no one can be made better off unless someone else is made worse off.**

- **Edgeworth box** Diagram showing all possible allocations of the **2 goods between 2 consumers** and showing their level of utility

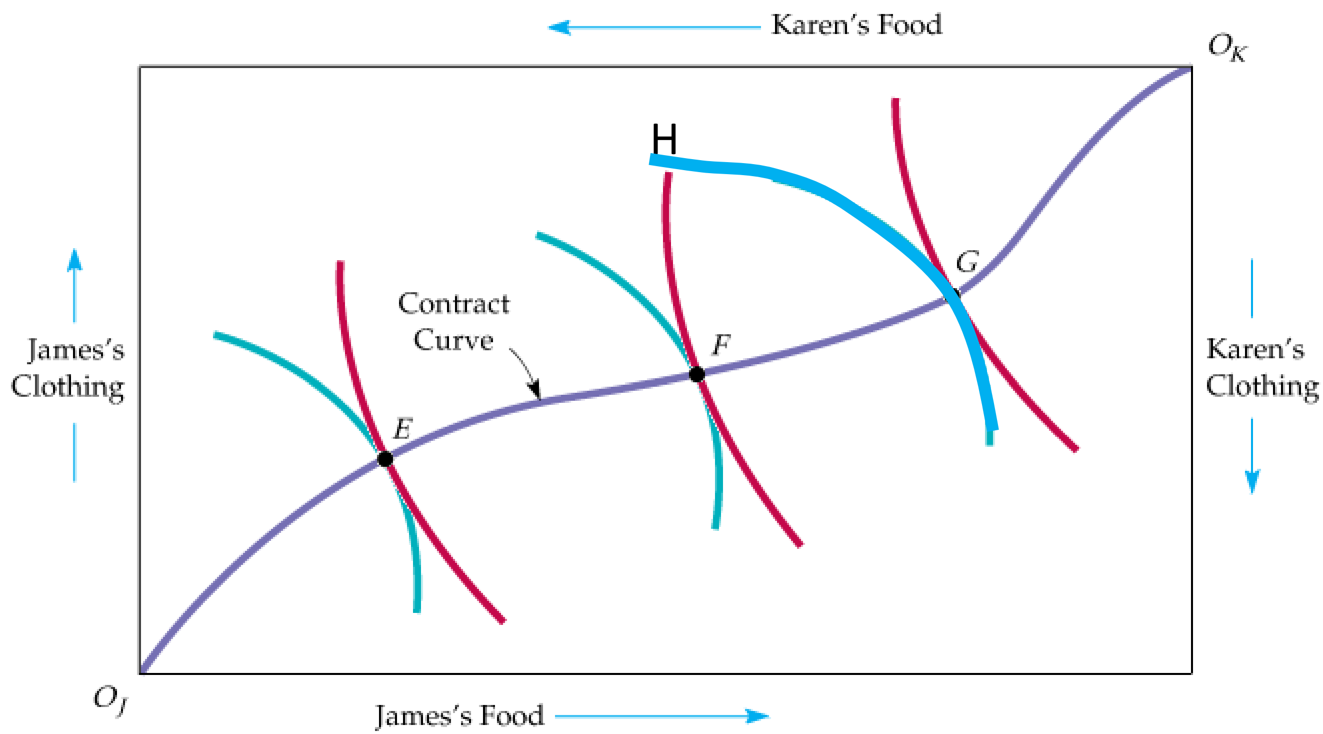
  In production: **2 inputs used to produce 2 products by 2 producers**

  2x2x2 economy

16.2 EFFICIENCY IN EXCHANGE

The Contract Curve

Figure 16.5



James & Karen can be improved by trade

They could start off at H and bargain, if K is clever/ more persuasive they'd end up at F otherwise at G

The pts of tangency between ICs are pareto efficient

The pts can joined by a contract curve

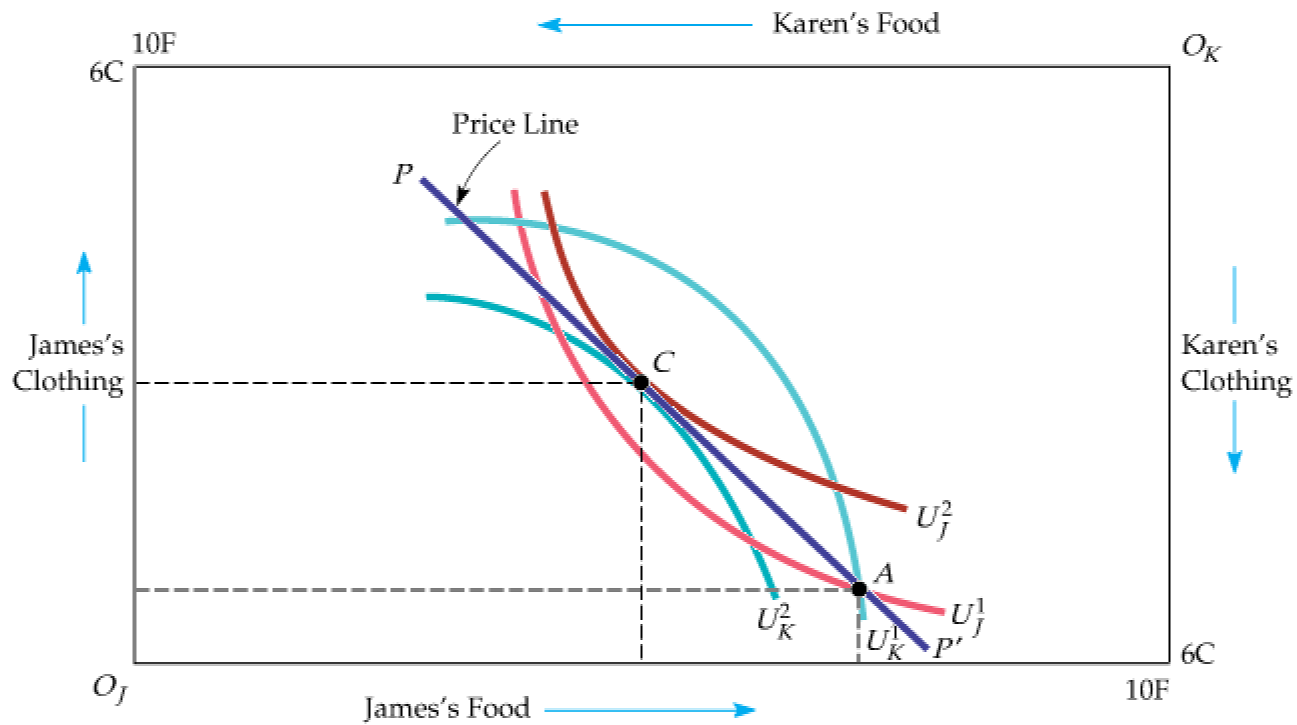
So, moving ALONG the curve would lead to pareto inefficiency

Why?

16.2 EFFICIENCY IN EXCHANGE

Consumer Equilibrium in a Competitive Market is Efficient

Figure 16.6



A competitive market ensures that the consumers reach the contract curve

They don't have to bargain & trade each time they meet

The prices of the goods determine the terms of exchange (LINE PP')

The line will move consumption from *A* to C

Competitive trade leads to economic efficiency

They are both improved not like bargaining

16.2 EFFICIENCY IN EXCHANGE *****

The Economic Efficiency of Competitive Markets

Summary of consumer market's competitive equilibrium:

1. Because the ICs are tangent, all MRS between consumers are equal.

2. Because each IC is tangent to the Price Line, each consumer's MRS of clothing for food is equal to Price Ration

This is consumption equilibrium

$$\mathrm{MRS}^{J}_{\mathrm{FC}} = P_F / P_C = \mathrm{MRS}^{K}_{\mathrm{FC}}$$

(16.1)

Input Efficiency

- **technical efficiency** Condition under which firms **combine inputs to produce output as inexpensively as possible**.

If producers of food and clothing **minimize production costs**, they will use L and K so that:

$$\mathrm{MP}_L / \mathrm{MP}_K = w / r$$

But we also showed that $MP_L / MP_K = MRTS_{LK}$

So:

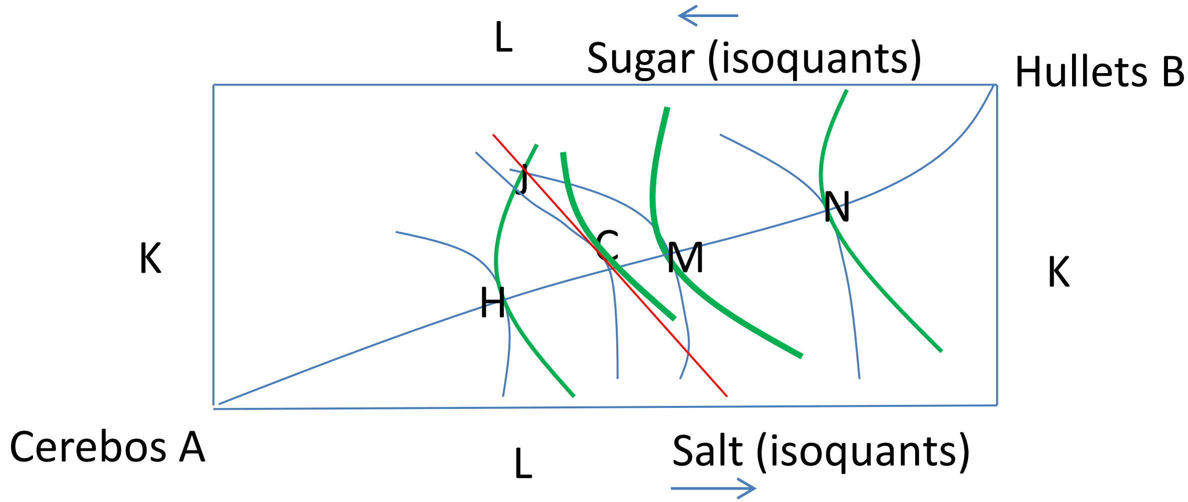
$$\mathbf{MRTS}_{LK\ (clothes)} = \mathbf{w/r} = \mathbf{MRTS}_{LK\ (food)}$$

Exercise

- **Draw an edgeworth** box where you illustrate 2 producers (A and B), who compete for the use of 2 limited inputs (K and L) to produce 2 outputs (salt and sugar)

Virtues of competitive market

- A competitive L & K market (w/r) will also lead the 2 from J to c

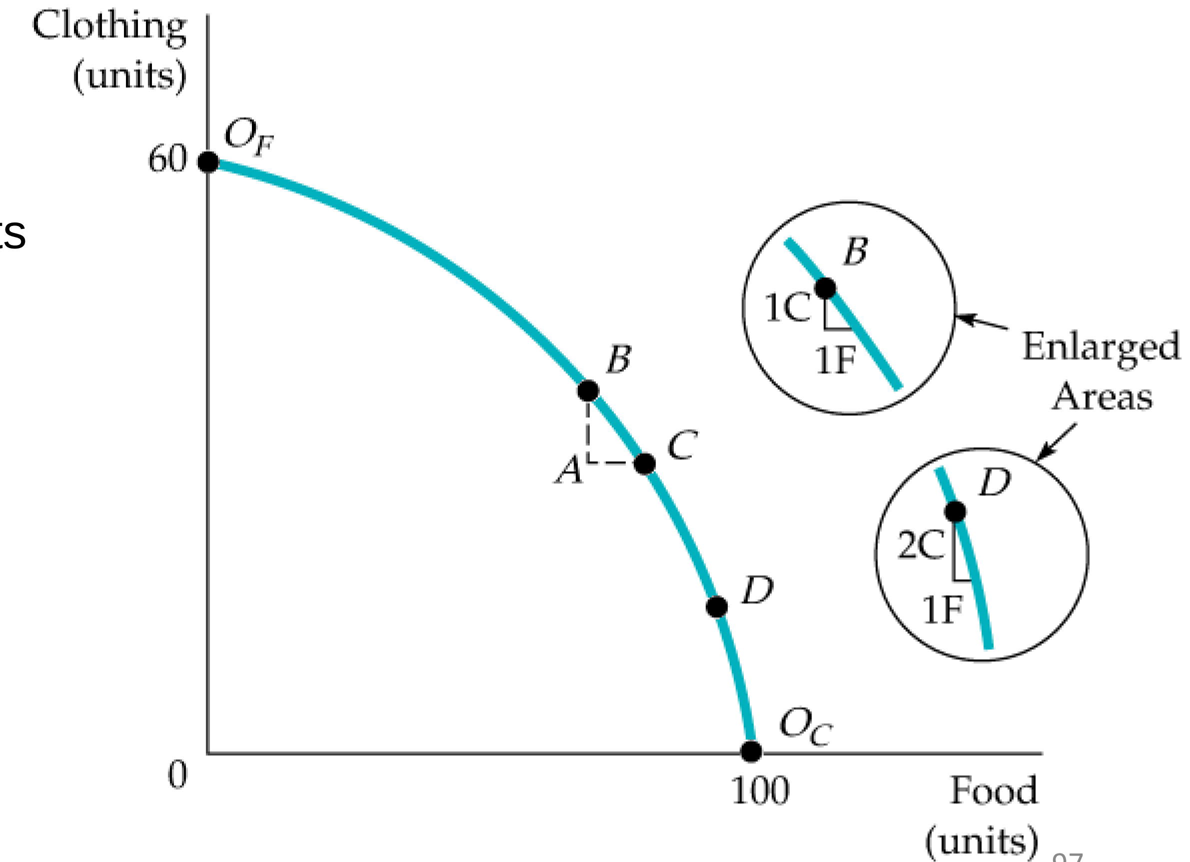


16.4 EFFICIENCY IN PRODUCTION – TOP LEVEL EFFICIENCY

We can flip the production CC into the PPF, with slope MRT

The production possibilities frontier **is concave** because its slope (the marginal rate of transformation) increases as the level of production of food increases. (showing diminishing returns)

Opportunity cost increases!!!!



When consumption & production markets meet

An economy produces output efficiently, if for each consumer, MRS= MRT

Figure 16.9

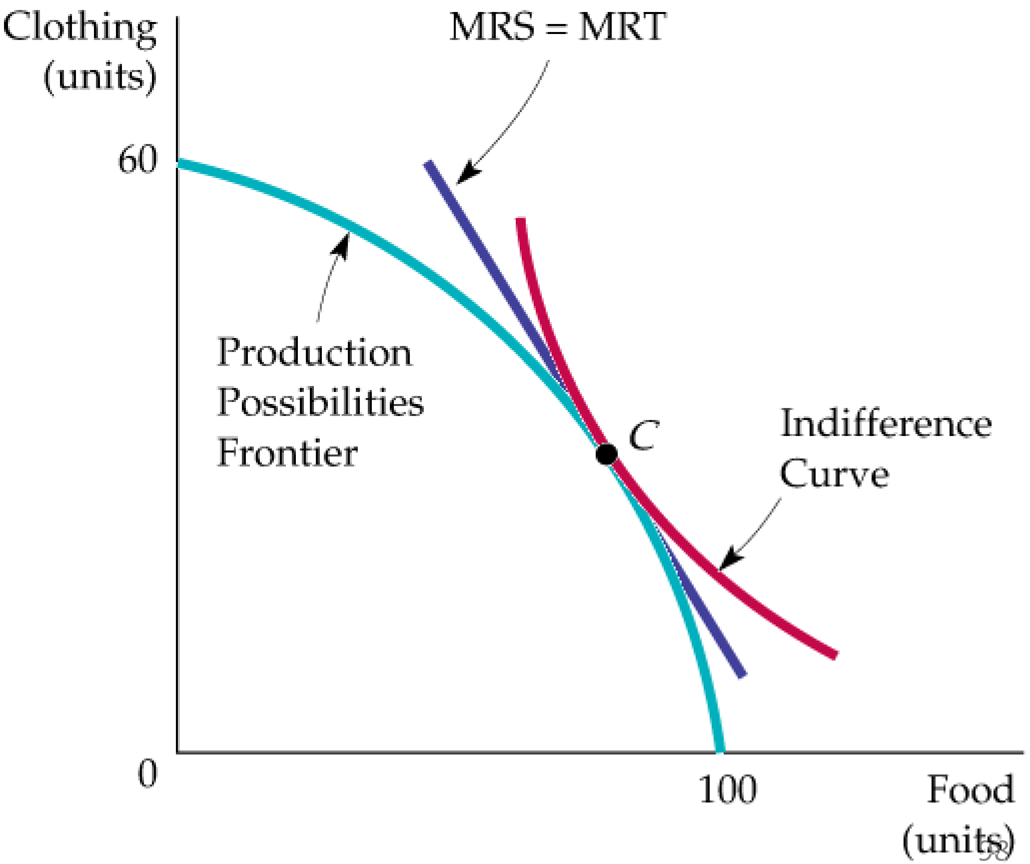
The efficient combination of outputs is produced when MRT

equal

the consumer's MRS

general equilibrium

analysis



16.4 EFFICIENCY IN PRODUCTION - **PROOF**

Efficiency in Output Markets

When output markets are perfectly competitive, consumers allocate their budgets so that:

$$\text{MRS} = P_F / P_C$$

At the same time, each profit-maximizing (efficient) firm will produce up to the point at which price is equal to marginal cost:

$$P_F = \text{MC}_F \quad \text{and} \quad P_C = \text{MC}_C$$

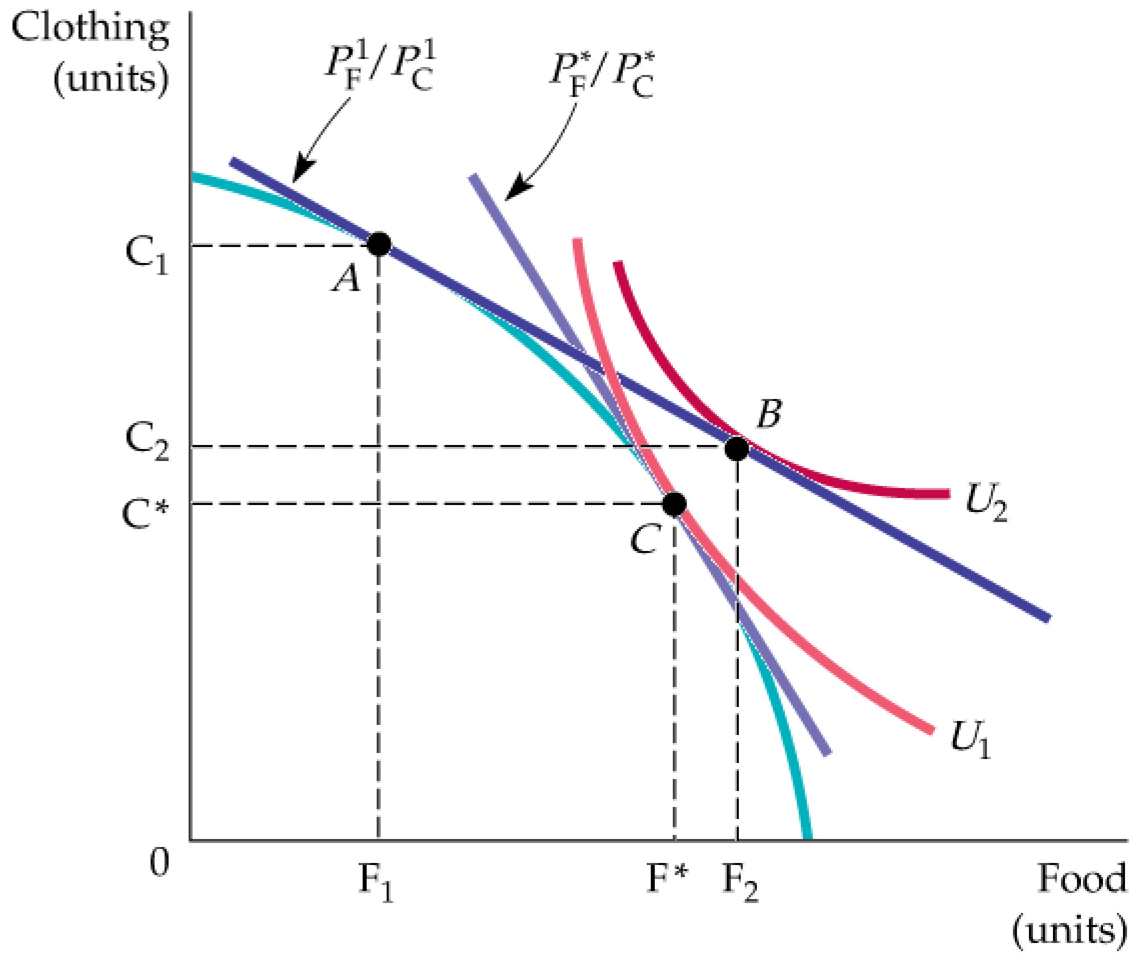
Because the MRT is equal to the ratio of the marginal costs of production, it follows:

$$\text{MRT} = \text{MC}_F / \text{MC}_C = P_F / P_C = \text{MRS} \qquad \textbf{(16.5)}$$

16.4 EFFICIENCY IN PRODUCTION – Go to slide 57

Efficiency in Output Markets

Figure 16.10



If initial prices were P1f/P1c

Producers want to produce at A, but consumers want to be at B

So there excess demand for F (F2>F1) & excess supply for C (C1>C2)

Prices will adjust until new ratio of P*f/P*c

Where MRS = MRT (efficiency)

We cant cover all topics, make sure you at least study these in exam preps

Chapters	Content
Chapter 3	Consumer theory Very NB
Chapter 4	Individual and market demand Very NB
Chapter 6	Production Very NB
Chapter 7	Cost of production Very NB
Chapter 8	Profit max Very NB
Chapter 9	Analysis of competitive markets Very NB
Chapter 10	Monopoly & its social costs Very NB
Chapter 11	Pricing Very NB
Chapter 12	Oligopolies: Very NB
Chapter 16	General equilibrium theory: Very NB