Managerial Economics

A Definition:

The application of mathematical, statistical and decision-science tools to economic models to solve managerial problems

Some managerial problems:

What product to produce

What price to charge

Where/how to get financing

Where to locate

How to advertise

What method of production to use

Whether or not to invest in new equipment

Managers' Objectives

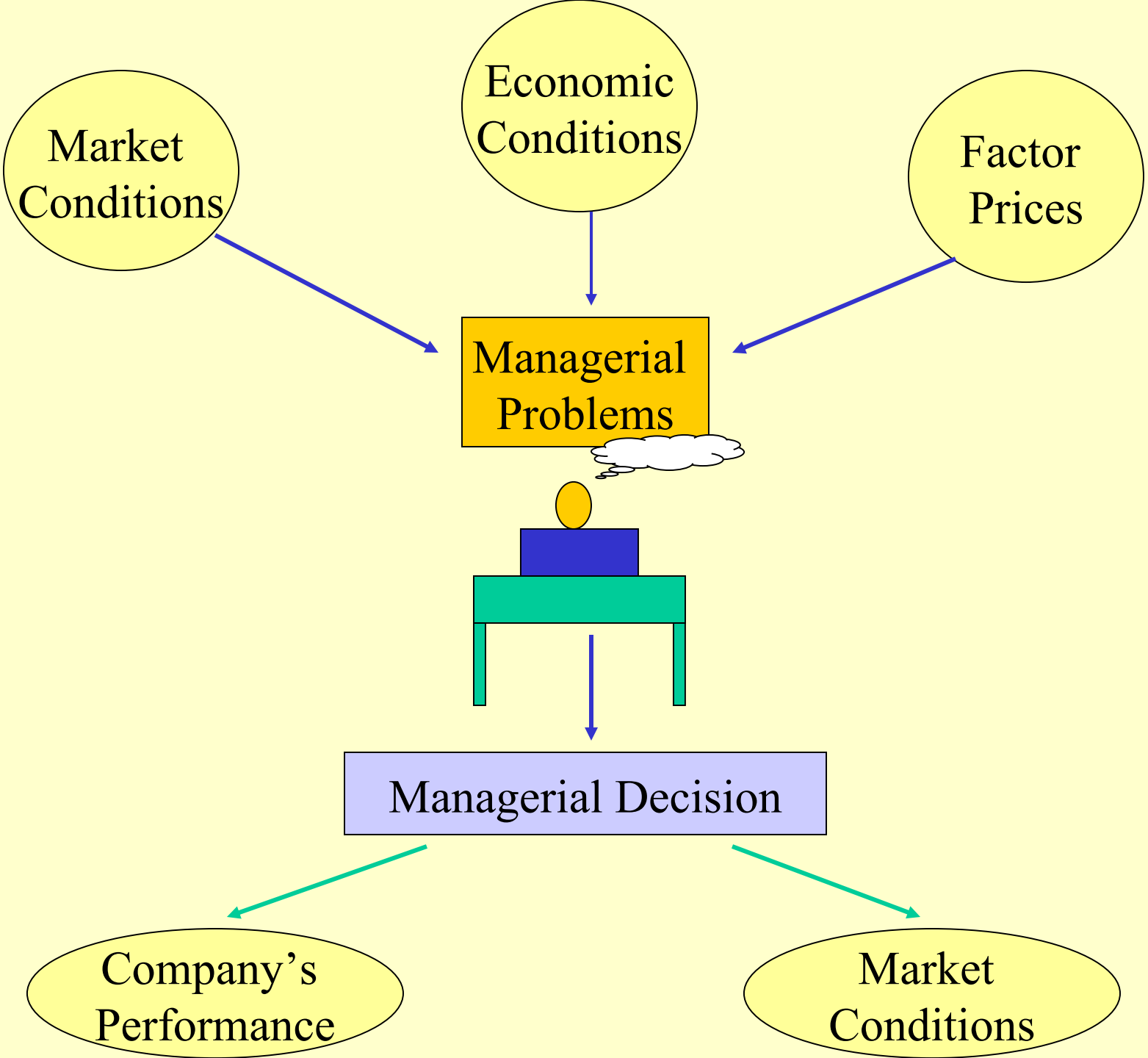
- Maximizing the value of the firm
  (Through profit maximization)

- Alternative objectives:
  - =>Market share maximization
  - =>Growth Maximization
  - =>Maximizing their own benefits
  - =>Stisfice vs. optimize

Decision Making Process

- Identifying the problem or the decision to be made

  Abstraction: Identifying the relevant factors in the problem and formulating the problem into a manageable set of questions/problems (while abstracting from irrelevant factors)
- Identifying alternative solutions to each problem
- Using relevant data to evaluate alternative solutions
- Choosing the best solution consistent with the firm's objective


Market Conditions
Economic Conditions
Factor Prices
Managerial Problems
Managerial Decision
Company's Performance
Market Conditions

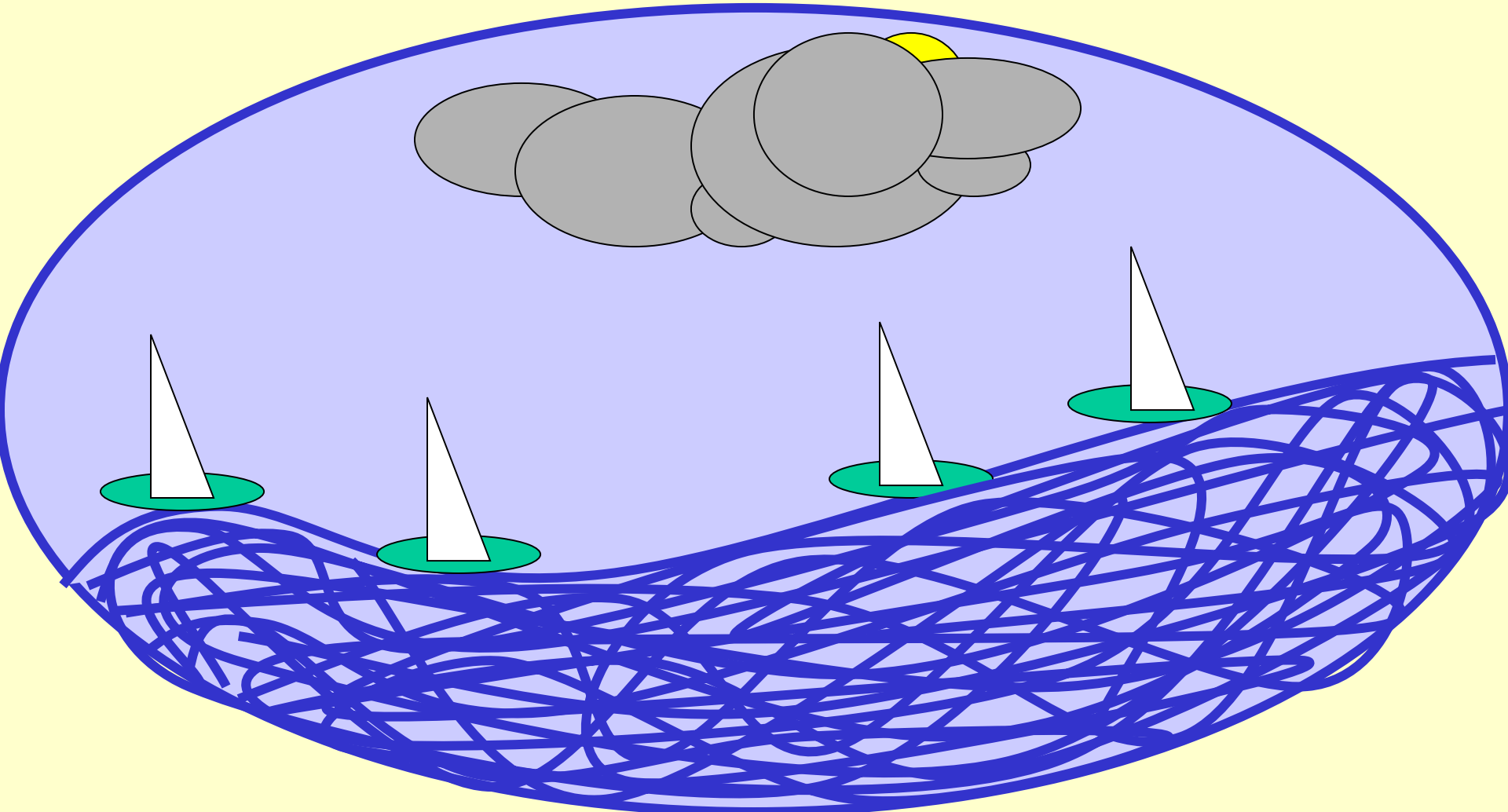
Consider the following news headlines:

- Gateway cuts jobs: PC maker to trim 15 percent of staff, expects shortfall in third quarter.
- U.S. consumers lost confidence in August.
- The International Monetary Fund will cut its global economic growth forecast for this year to 2.8 percent.
- Coca-Cola Co., facing a stiff challenge from its arch rival PepsiCo Inc. in the fast-growing alternative drinks market, may be preparing to acquire the Nantucket Nectars line of juice and tea products, analysts said Tuesday.

The ups and downs:

	High	Low	Last	PE
MSFT	31	21	30	24
IBM	101	72	99	16
Mot	26	17	19	13.3
AT&T	37	24	36	19
GM	36	19	32	NA
KFT	36	28	34	17.9
MCD	45	31	43	15.4
WMT	52	42	47	18.14

Macroeconomics, Microeconomics and and Managerial Decision Making



Optimization and Value Maximization

- The value of a firm is the sum of the discounted future profits of the firm.

$$\text{Profit}_t \qquad TR_t - TC_t$$

$$\text{Value} = \Sigma \frac{\text{Profit}_t}{(1+i)^t} = \Sigma \frac{TR_t - TC_t}{(1+i)^t}$$

- Functional Relationship

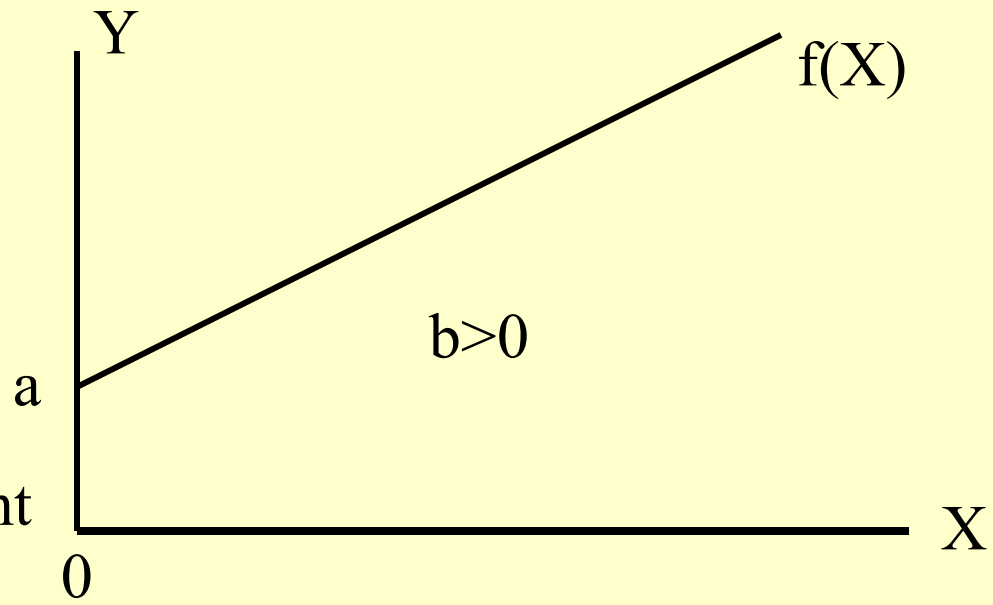
$TR = f(Q) = P.\ Q$

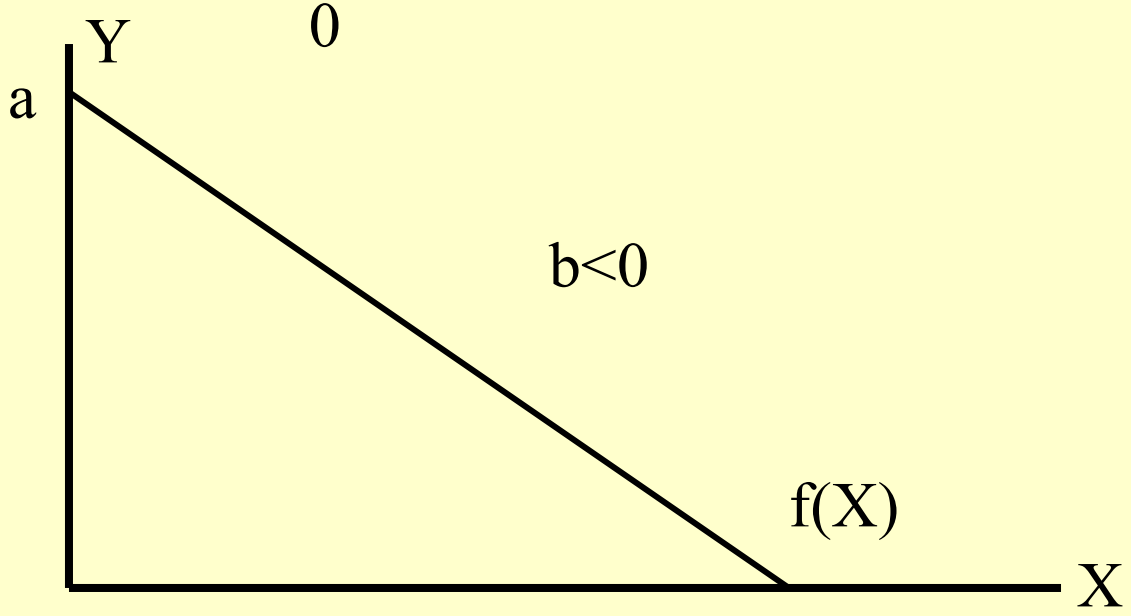
$TC = g(Q)$

Linear Relations

$Y = f(X) = a + b X$

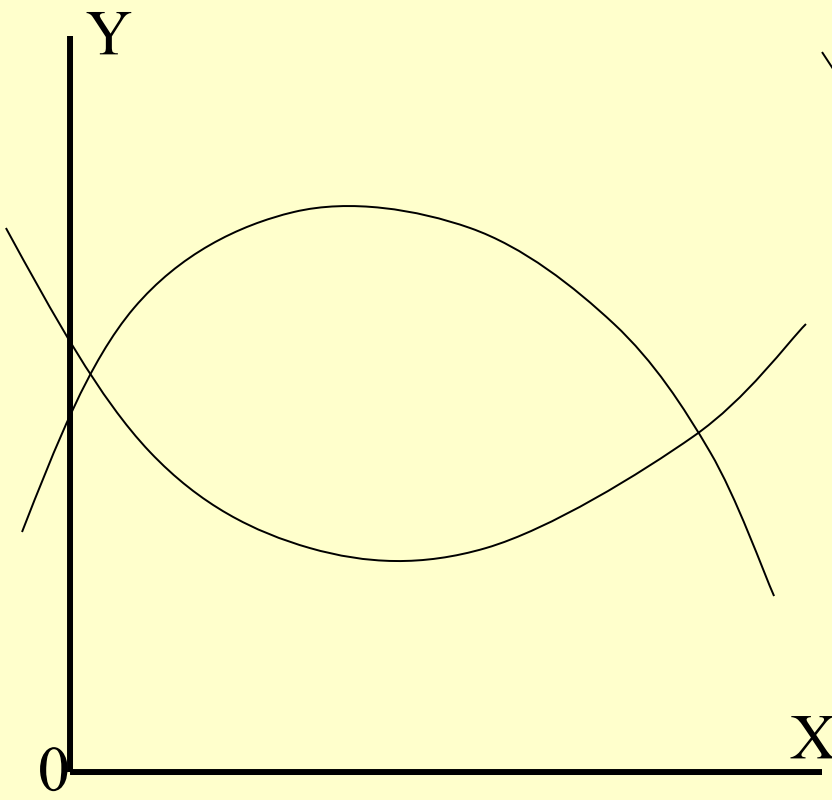
Slope = $dX/dY = b$ = Constant

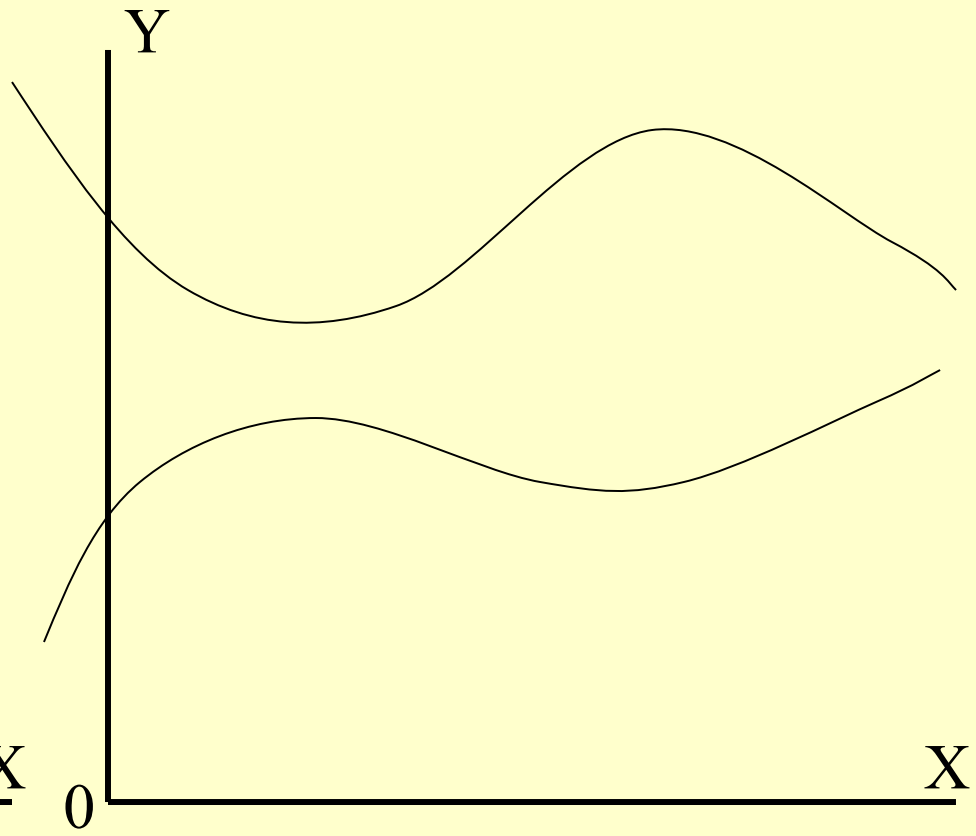




Nonlinear Relations

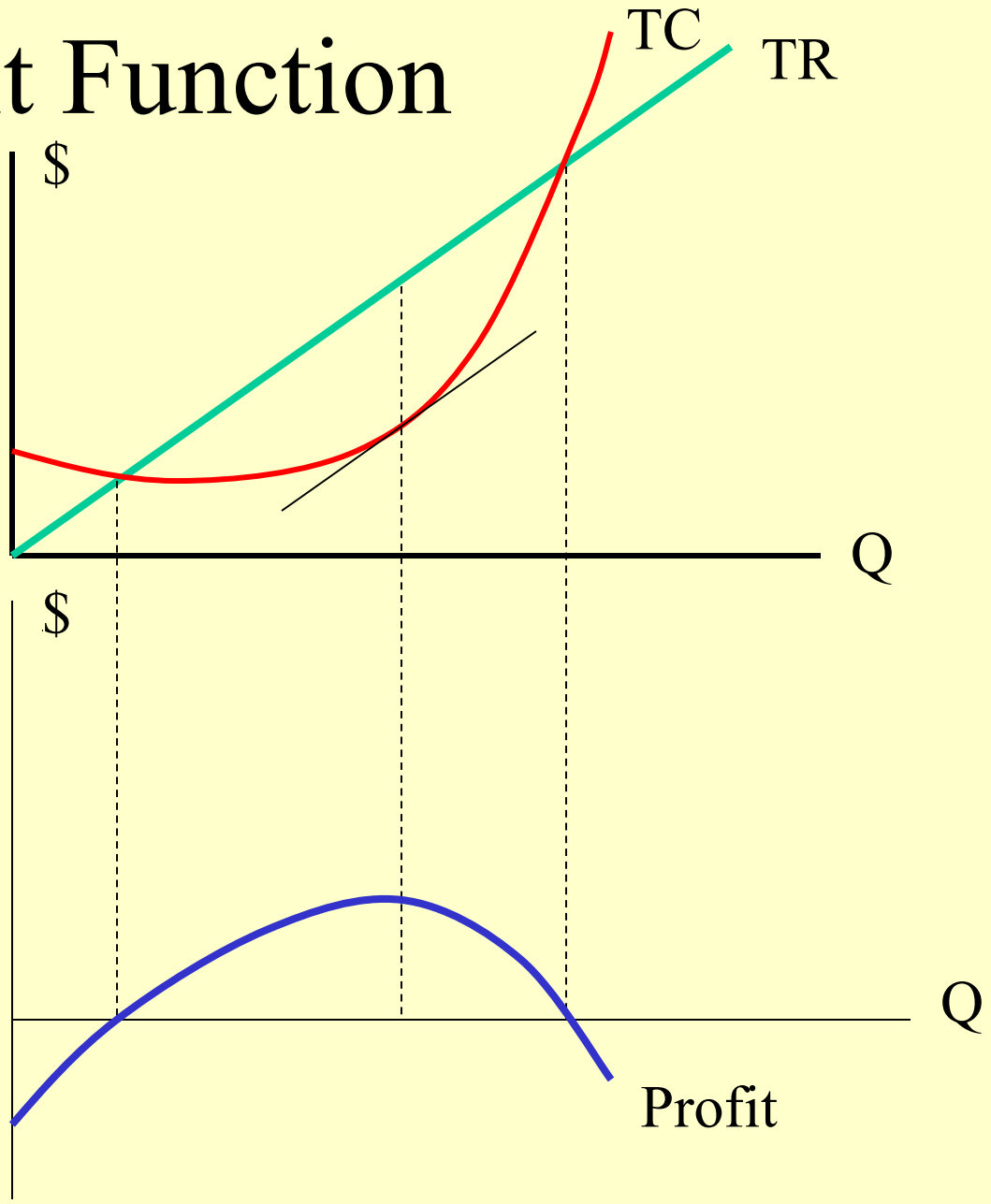
- Y = f (x)
- Standard nonlinear forms: Quadratic, Cubic





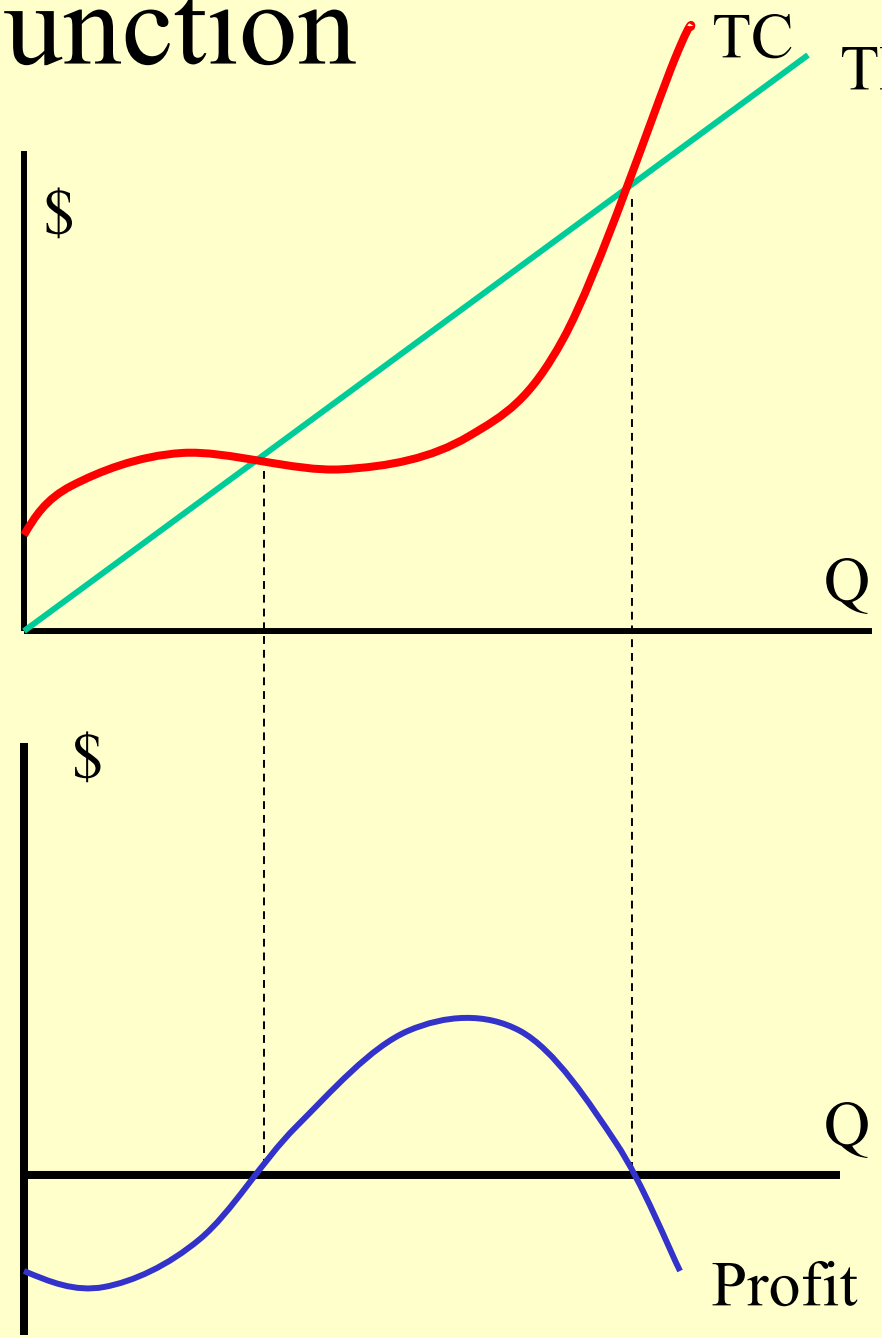
Profit Function

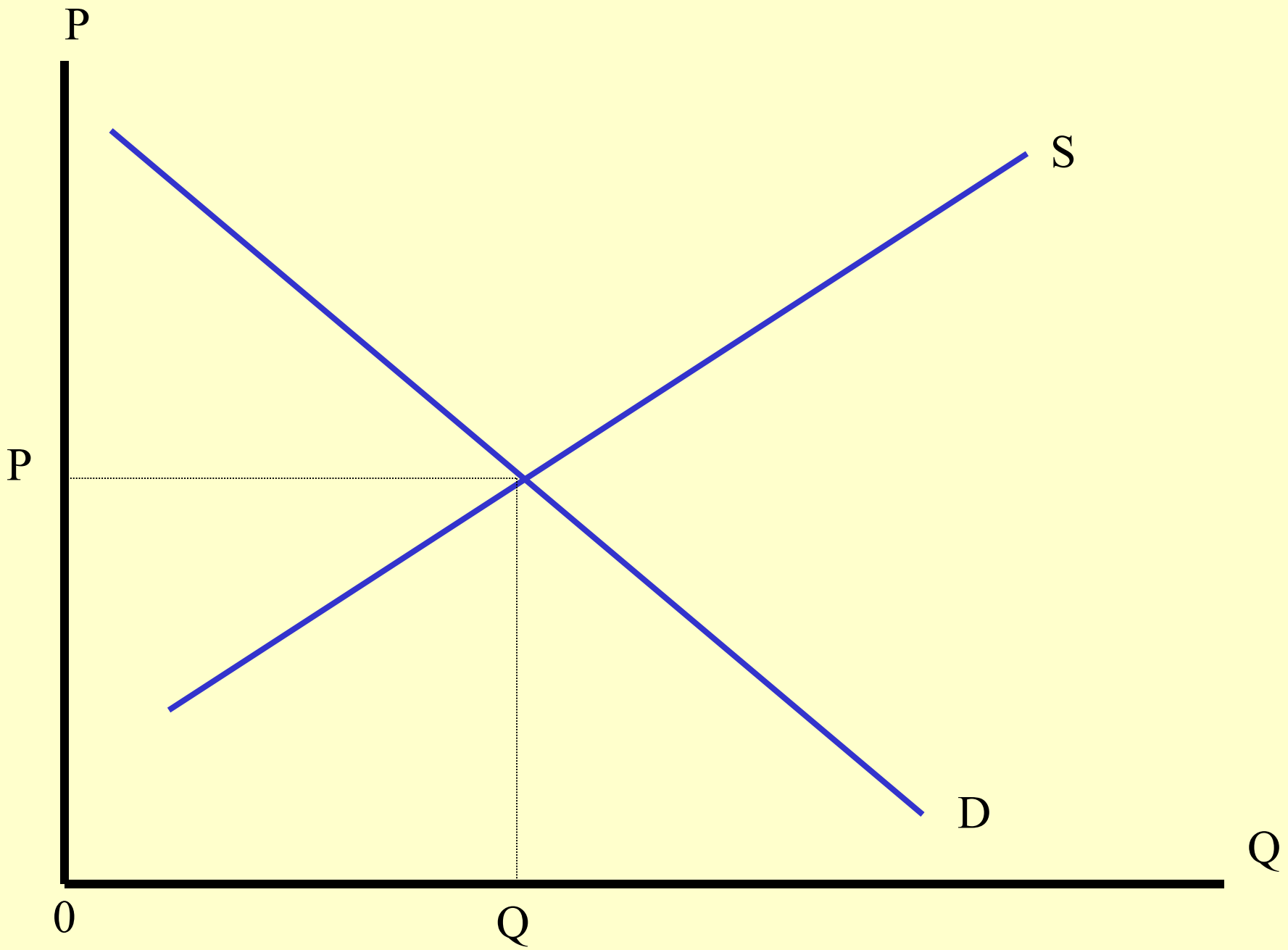
- Linear TR
- Quadratic TC
- Quadratic Profit



Profit Function

- Linear or Quadratic TR
- Cubic TC
- Cubic Profit




P
S
P
D
Q
0
Q

Demand : A definition

- Demand: A quantity of a good or service a buyer (or buyers) would buy under a ***certain*** set of conditions
- Demand curve is a curve showing the quantities of a good or service a buyer (or buyers) would buy at ***various*** prices, ceteris paribus
- Quantity demanded: The quantity of a good a buyer (or buyers) would be willing and able to buy at a ***specific*** price, ceteris paribus

Supply: A definition

- Supply: A quantity of a good or service a producer (or producers) would be willing to produce and offer to the market for sale under a ***given*** set of conditions
- Supply curve: A curve showing the ***quantities*** of a good or service a producer (or producers) would produce and offer to the market for sale at ***various*** prices
- Quantity supplied: The quantity of a good or service a producer (or producers) would produce and offer for sale to the market at a ***specific*** price, ceteris paribus

Why do we study supply and demand?

We assume, generally, firms are value maximizers, realizing that the value of a firm is function of its (expected) future profits.

Profit = TR - TC

TR = P . Q

==> What are the factors that determine p and Q?

==> What are the elements determining a firm's costs?

Supply and Demand Schedule

Price	Supply	Demand
$ 0.00	----	670
1.00	210	470
1.25	290	420
1.50	370	370
1.75	450	320
2.00	530	270
2.25	610	220
2.50	690	170

Supply and Demand Equations

- Demand:

$$Qd = 670 - 200\,P$$

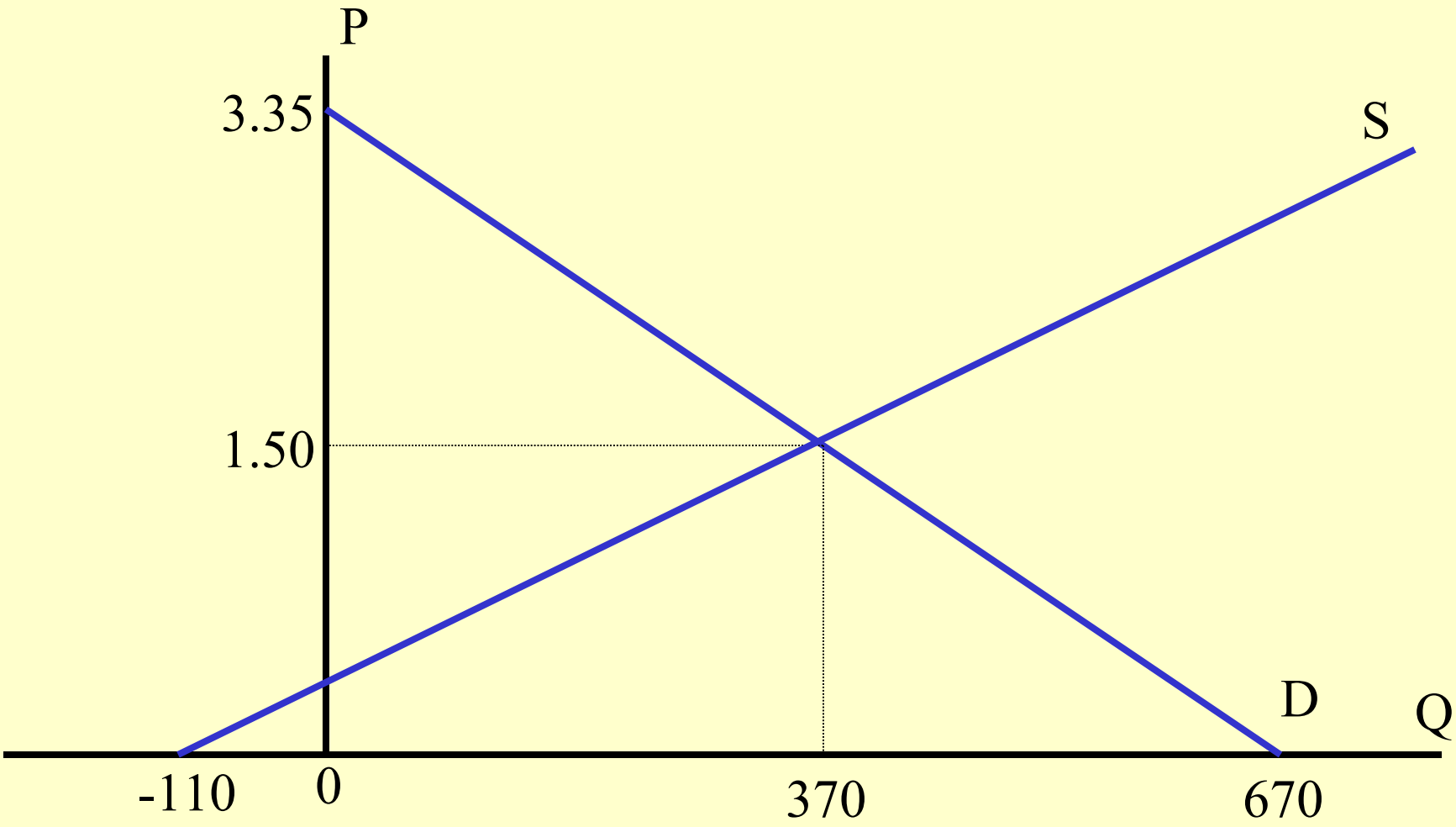
$$P = 3.35 - .005\,Qd$$

- Supply:

$$Qs = -110 + 320\,P$$

$$P = .34375 + .003125\,Qs$$

Supply and demand plotted:



An algebraic approach to supply and demand:

$Qd = f(\text{Price}, \text{Income}, X1, X2, \ldots\ldots Xn)$

$Qd = 20 + .1\ \text{Income} - 2\ \text{Age} - 50\ \text{Price}$

$Qs = g(\text{Price}, W1, W2, \ldots\ldots Wn)$

$Qs = -40 - 5\ \text{Wage} + 30\ \text{Price}$

$\text{Income} = 2000$

$\text{Age} = 30$

$\text{Wage} = \$8$

Supply and demand curves

$$Qd = 20 + .1\ \text{Income} - 2\ \text{Age} - 50\ \text{Price}$$

($2000) (30)

$$Qd = 160 - 50P$$

$$P = 3.2 - .02\ Qd$$

$$Qs = -40 - 5\ \text{Wage} + 30\ \text{Price}$$

($8)

$$Qs = -80 + 30\ P$$

$$P = 2.666 + .0333\ Q$$

Shifts in supply and demand curve:

- A change in any non-price factor in the demand function would result in a shift in the curve: changes in the intercepts.

- A change in any non-price factor in the supply function would result in a shift in the curve: changes in the intercepts.

Demand and Revenue

- Recall that:

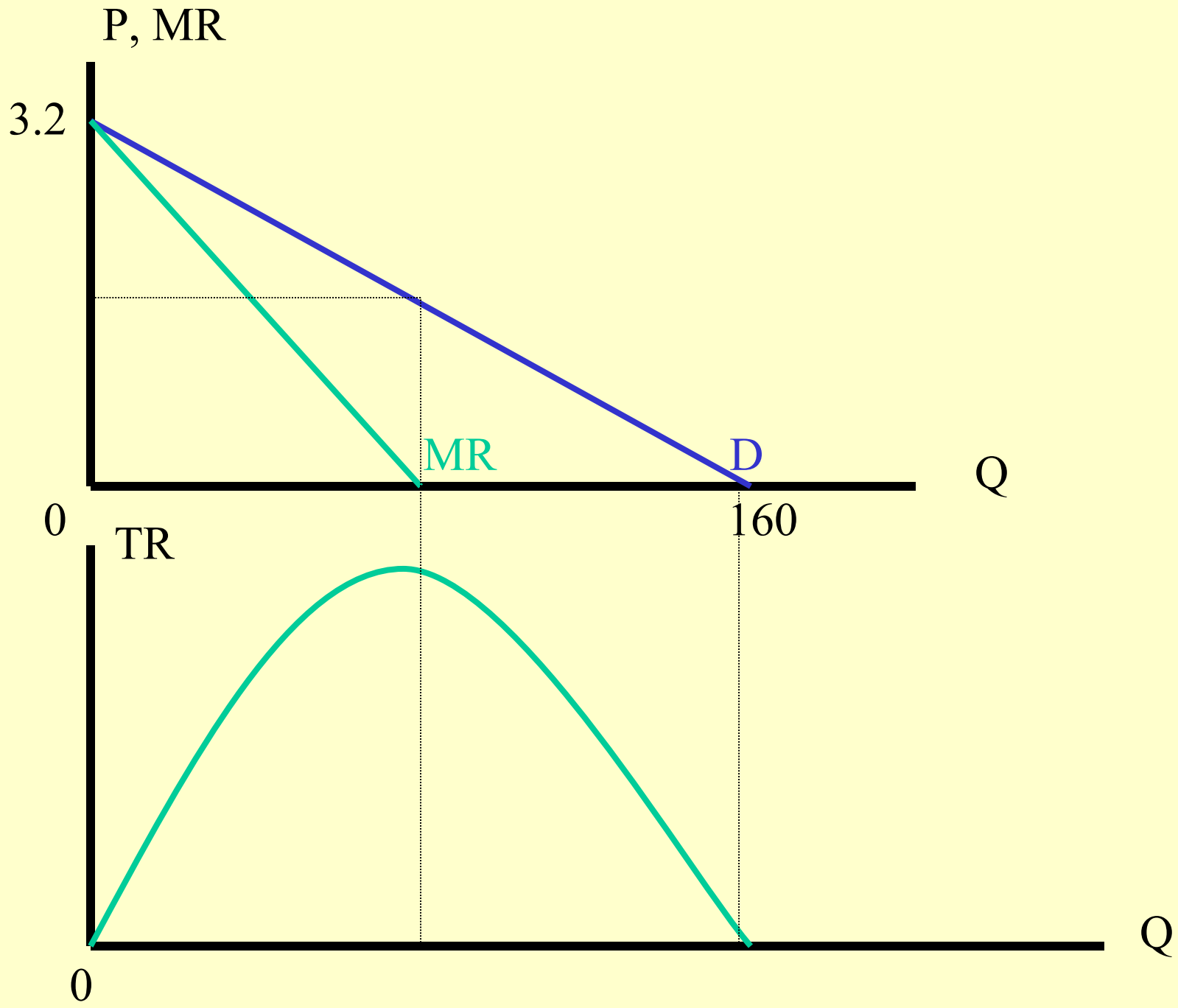
$$TR = \text{Price} \times \text{Quantity} = P \cdot Q$$

If $P = f(Q) = 3.2 - .02\,Q$,

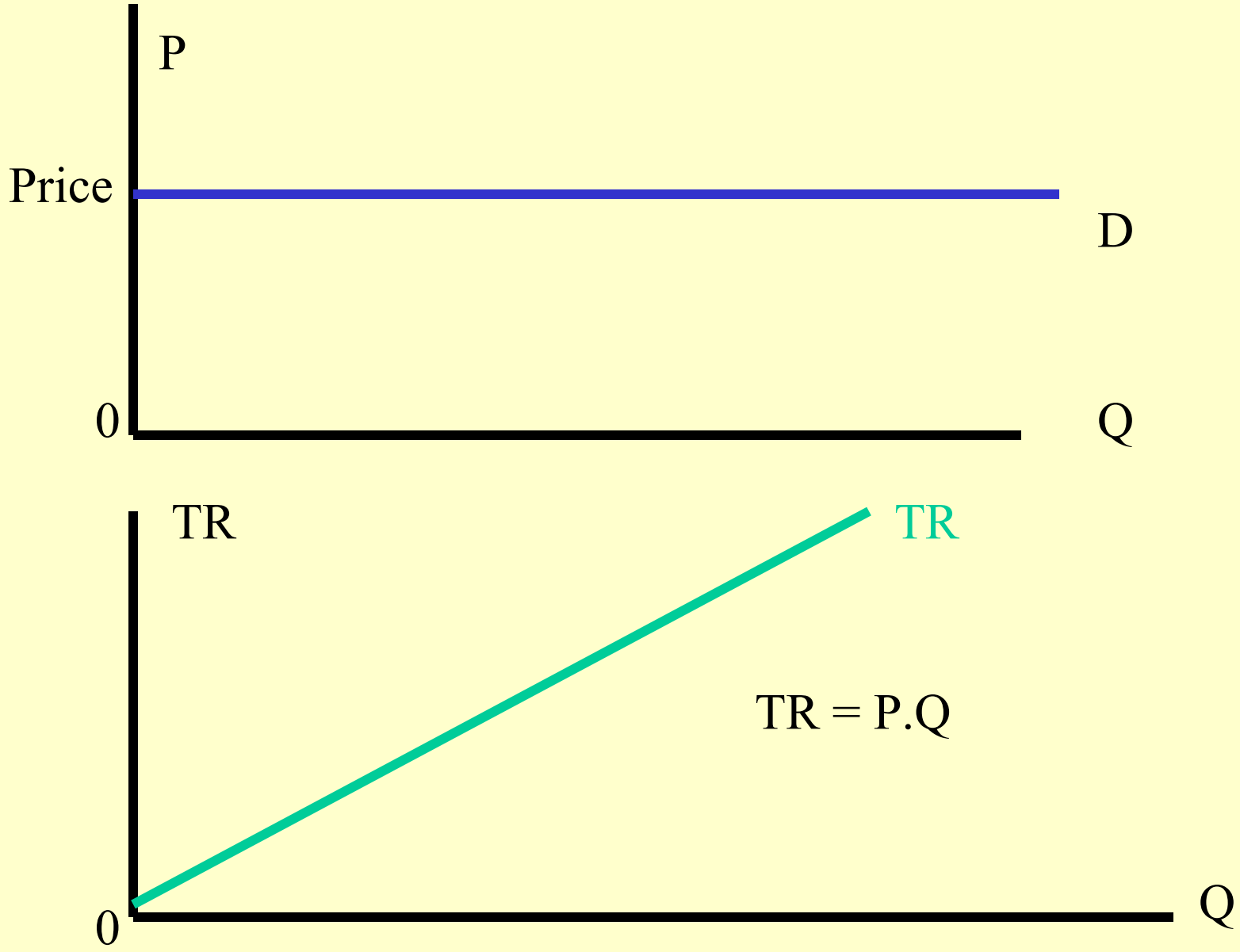
we can write: $TR = (3.2 - .02Q).Q$

Or, $$TR = 3.2\,Q - .02\,Q^2$$

(a quadratic function)


P, MR
3.2
MR
D
Q
0
160
TR
Q
0

The case of a horizontal demand curve:

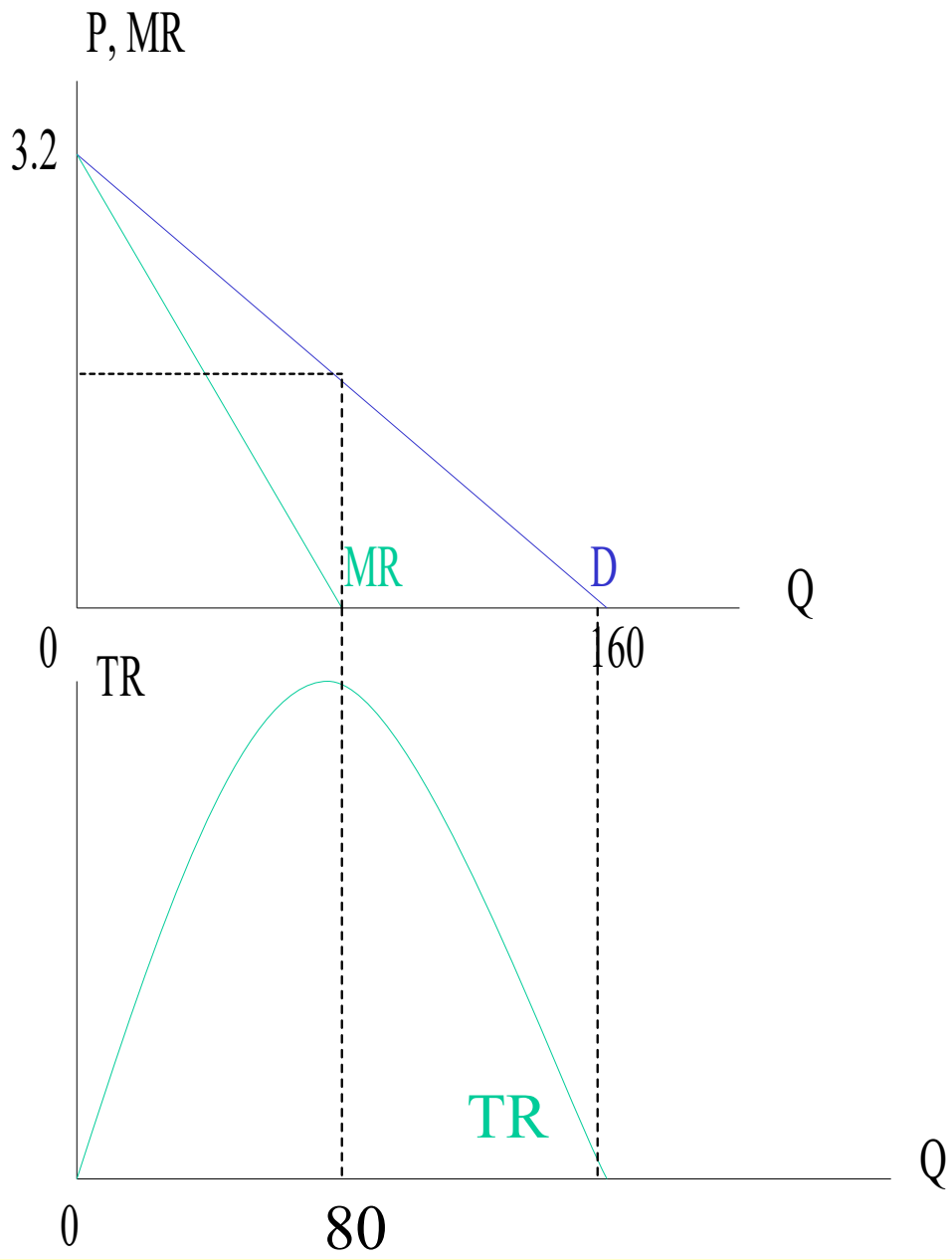


Marginal versus Average

Recall: $TR = P.\,Q = 3.2\,Q - .02\,Q^2$

$$AR = \frac{TR}{Q} = 3.2 - .02\,Q = P$$

$$MR = \frac{\Delta TR}{\Delta Q} = \frac{d\,TR}{d\,Q} = 3.2 - .04\,Q$$



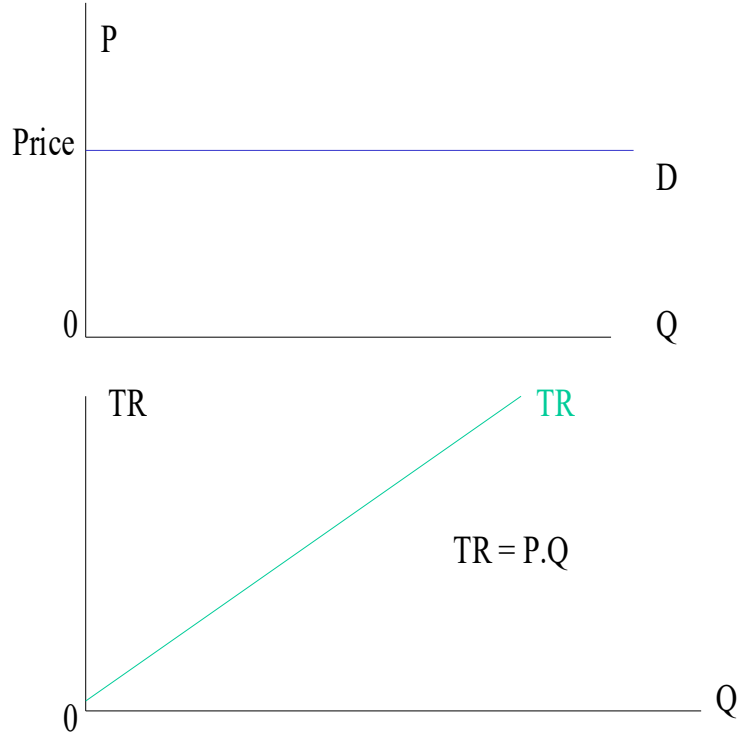
$P = 3.2 - .02\,Q$

$MR = 3.2 - .04\,Q$

MR = Slope of TR

$TR = 3.2\,Q - .02\,Q^2$

The case of a horizontal demand curve:



In this case the price, P, is a constant.

$$TR = P.\,Q$$

$$MR = \frac{dTR}{dQ} = \frac{d(P.Q)}{dQ} = P$$

$$\Longrightarrow \quad P = MR$$

Why is the demand curve generally downward-sloping?

The Consumer theory :

- The indifference curve
- The Budget line

The Consumer Theory

- The concept of “utility”
- Cardinal measurement of utility
- Ordinal measurement of utility
- Marginal utility
- The principle of diminishing marginal utility
- Marginal utility and consumer choice
- Consumers’ optimizing behavior
- The Consumer’s optimizing rule

>> the cardinal approach

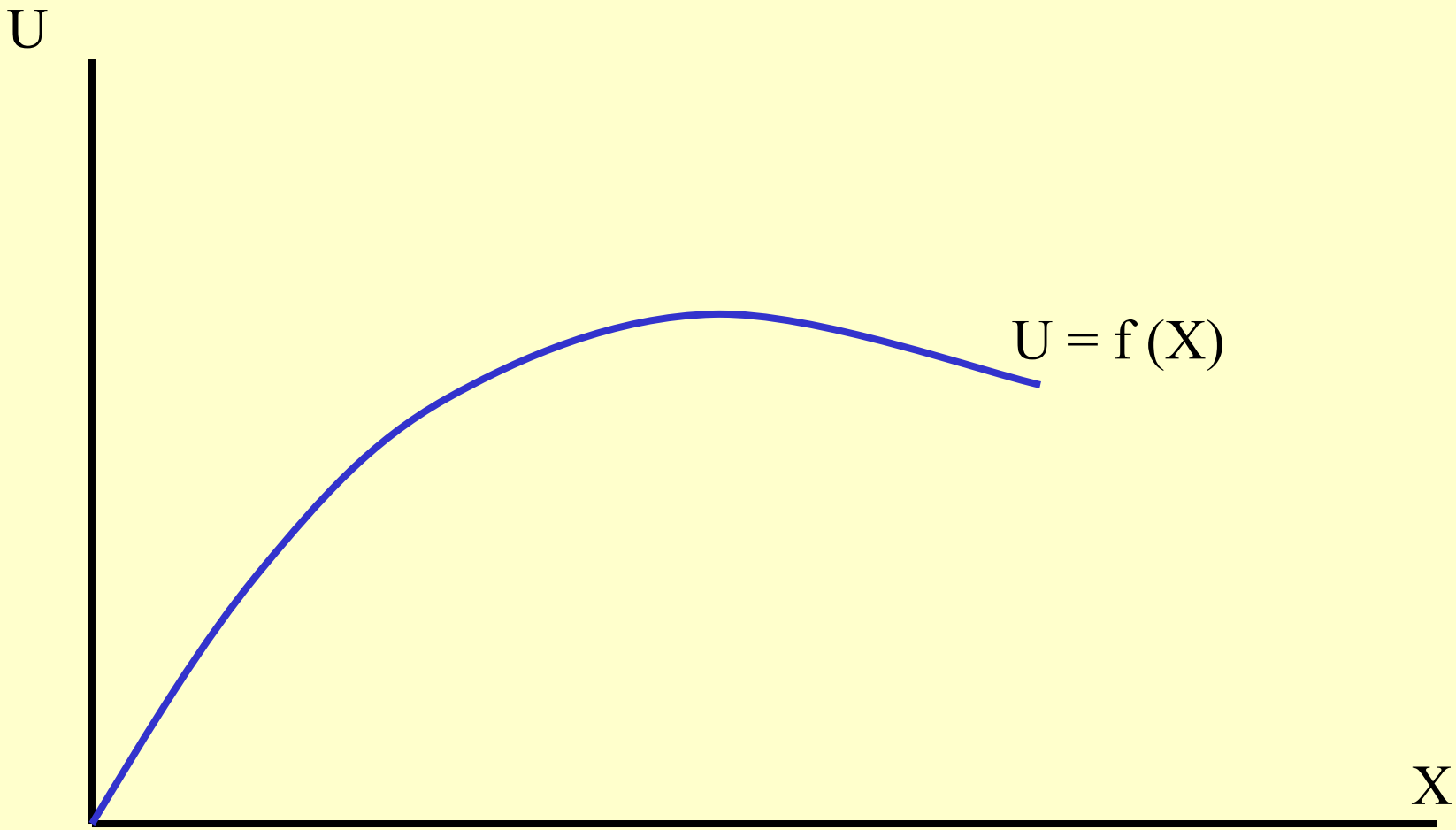
>> the ordinal approach

Utility

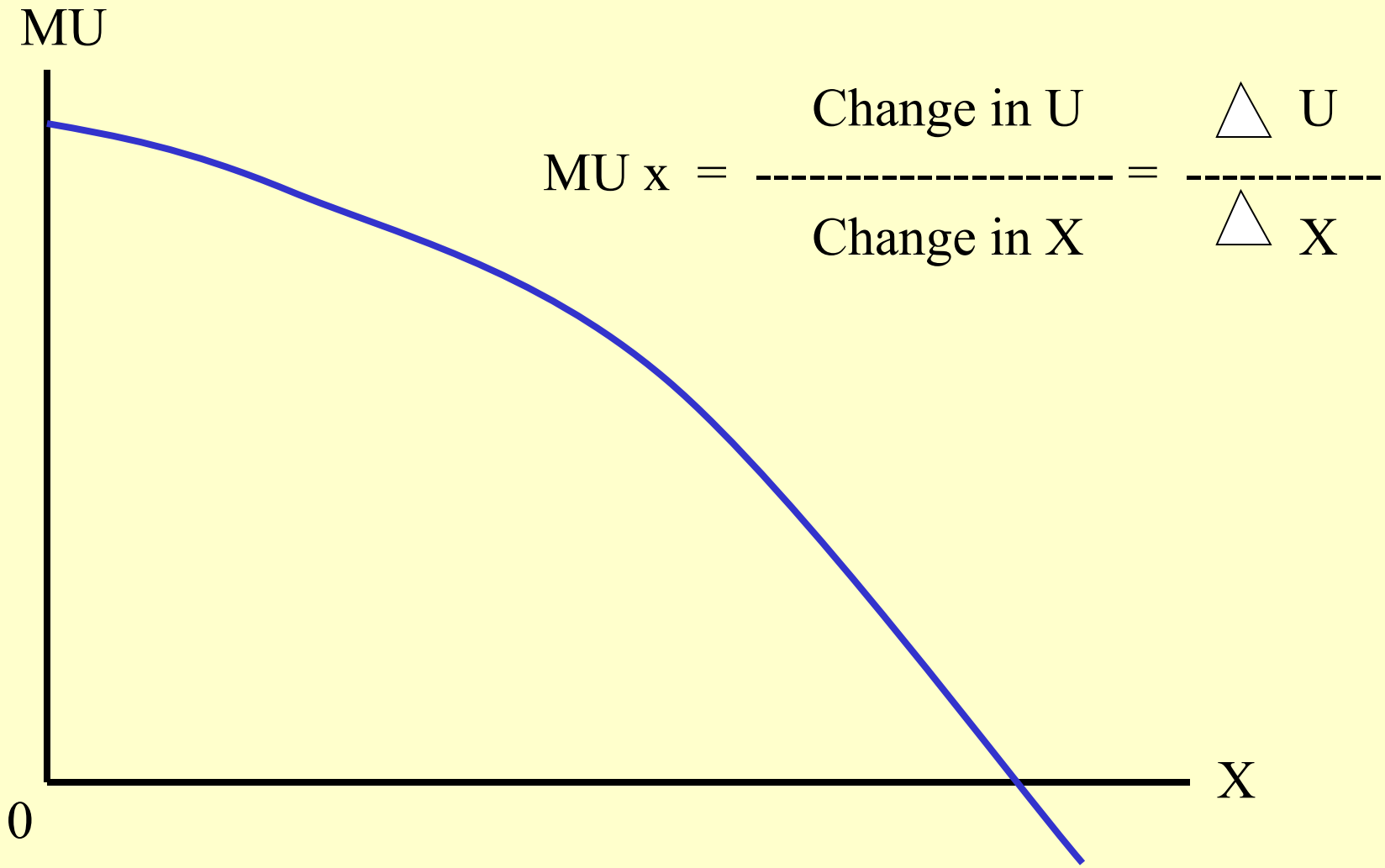
The satisfaction or pleasure a consumer derives from the consumption or possession of a good (or service) or an activity (or lack thereof), over a certain span of time.

Note: An economic "bad" is an object, a condition, or an activity that brings on harm or displeasure to a consumer. A consumer derives utility from having an economic "bad" reduced or eliminated.

Diminishing Marginal Utility



Marginal Utility



Consumer Choice

Constrained by her income, to maximize her total utility a consumer allocates her income among different goods in such a way that the utility derived from the last dollar spent on each good would be equal to that each of the other goods.

The principle of diminishing marginal utility:

- As a consumer consumes more and more of a good, beyond a certain level, the utility of each additional unit of it (marginal utility) begins to decrease.
- As a consumer consumes more and more of a good, beyond a certain level, each additional unit of that good becomes less dear to him/her

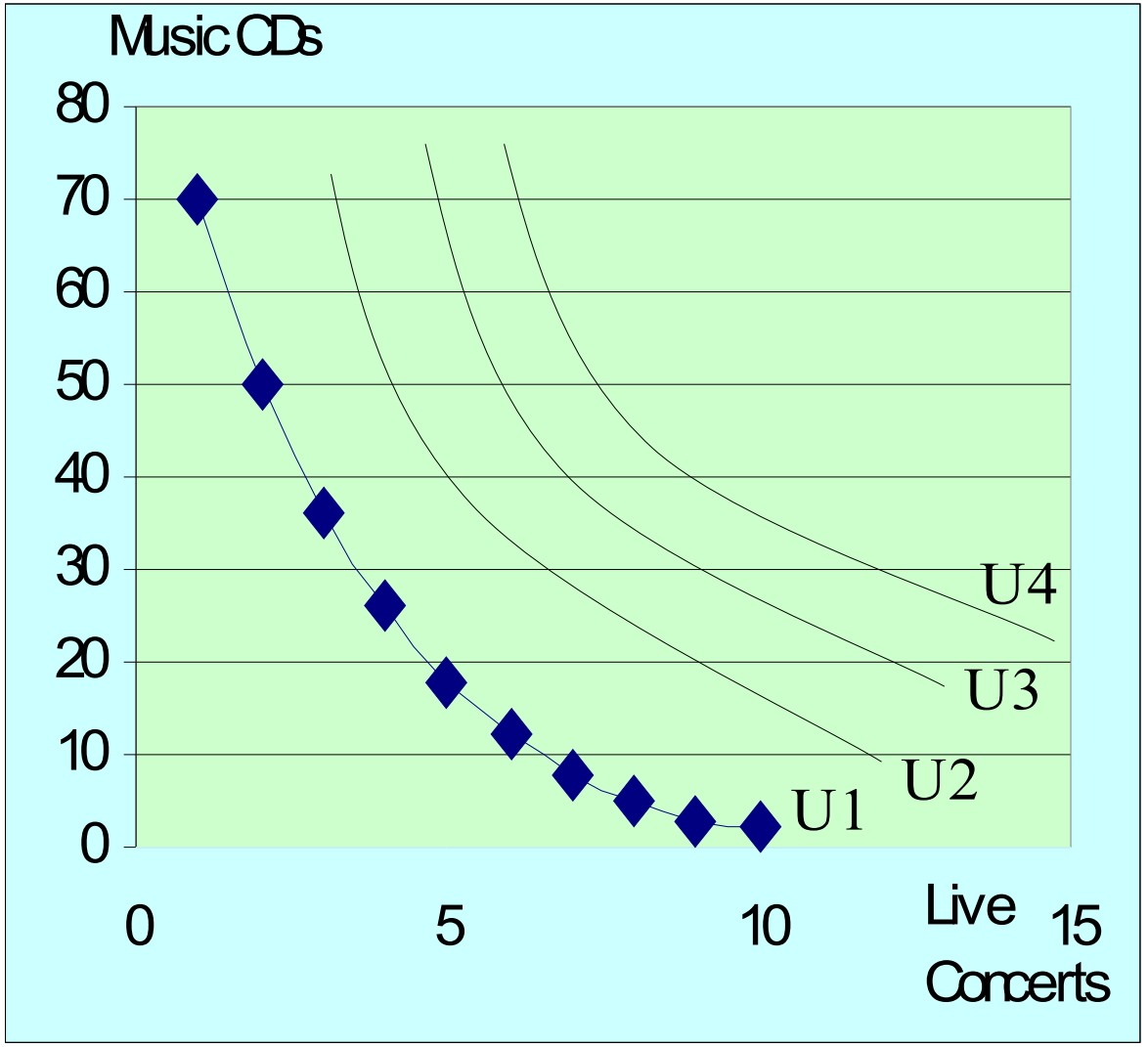
An Indifference Curve: Definition

- An indifference curve is a curve showing all the quantity mixes of two goods from which the consumer derives the same level of utility.
- An indifference curve is convex to the origin, reflecting the principle of diminishing marginal utility.
- The slope of an indifference curve measures the marginal rate of substitution, MRS.

Utility and Indifference Curves

AN INDIFFERENCE SCHEDULE

Live Conc.	Mus. CDs
10	2
9	3
8	5
7	8
6	12
5	18
4	26
3	36
2	50
1	70



Properties of an indifference curve

- Generally, negatively sloped, reflecting marginal rate of substitution
- Convex to the origin, reflecting diminishing marginal utility
- Two indifference curves cannot cross
- Special case: a positively sloped indifference curve

Marginal Rate of Substitution

- Definition: The rate at which a consumer is willing to substitute one good for another good while remaining at the same level of satisfaction. That is the amount of good X needed to replace one unit of (lost) good Y to keep the consumer's level of satisfaction (utility) unchanged.

- MRS = Slope of the indifference curve

Again suppose a consumer consumes two goods; X and Y

$$U = f(X, Y)$$

As X increases => U will increase

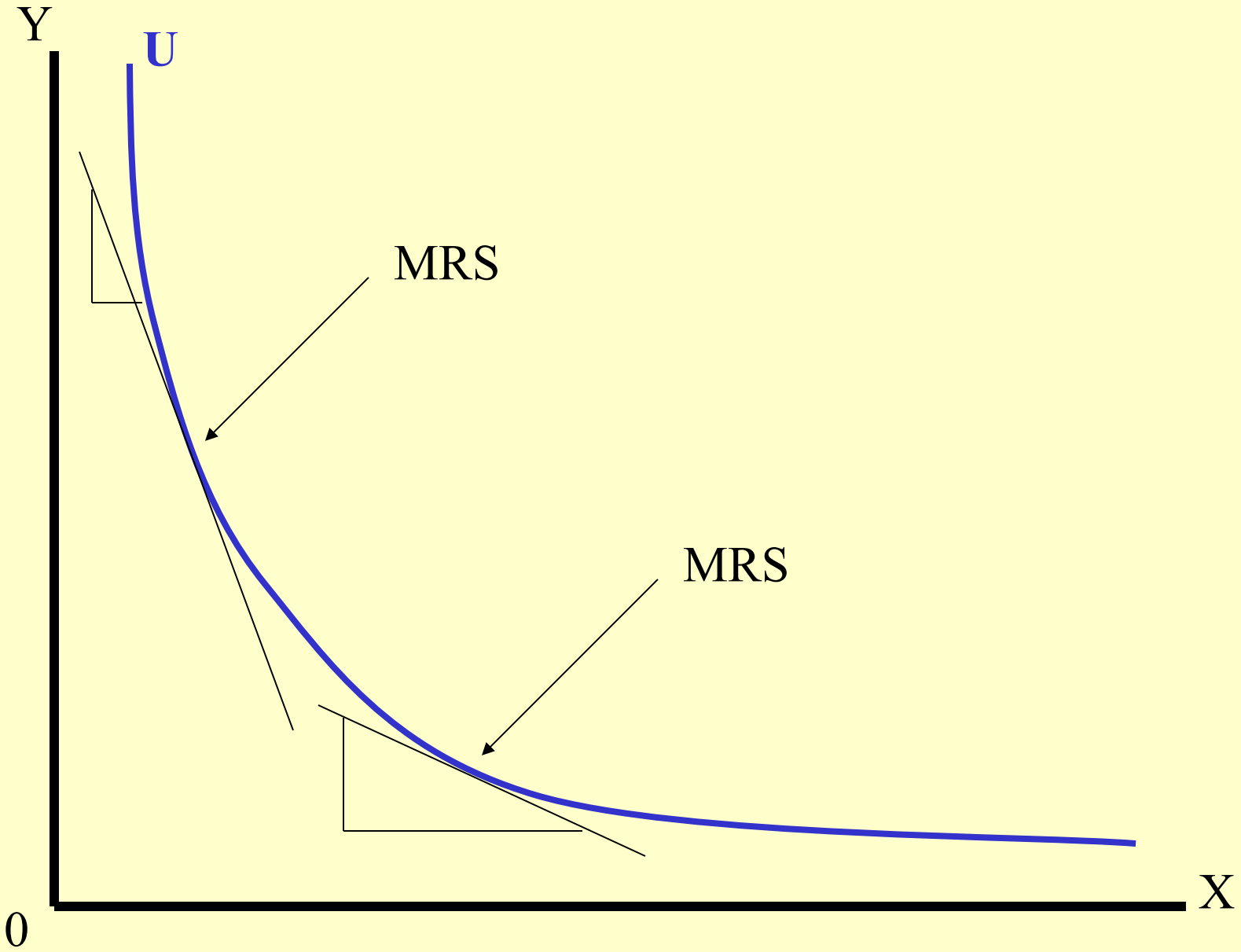
As Y increases => U will increase

Recall:

$$MU_x = \frac{\Delta U}{\Delta X} \qquad MU_y = \frac{\Delta U}{\Delta Y}$$

Along any given indifference curve $\Delta U = MU_x \Delta X + MU_y \Delta Y = 0$

$$\text{Slope of an indifference curve} = \frac{\Delta Y}{\Delta X} = -\frac{MU_x}{MU_y} = MRS$$


Y
U
MRS
MRS
X
0

Budget Line

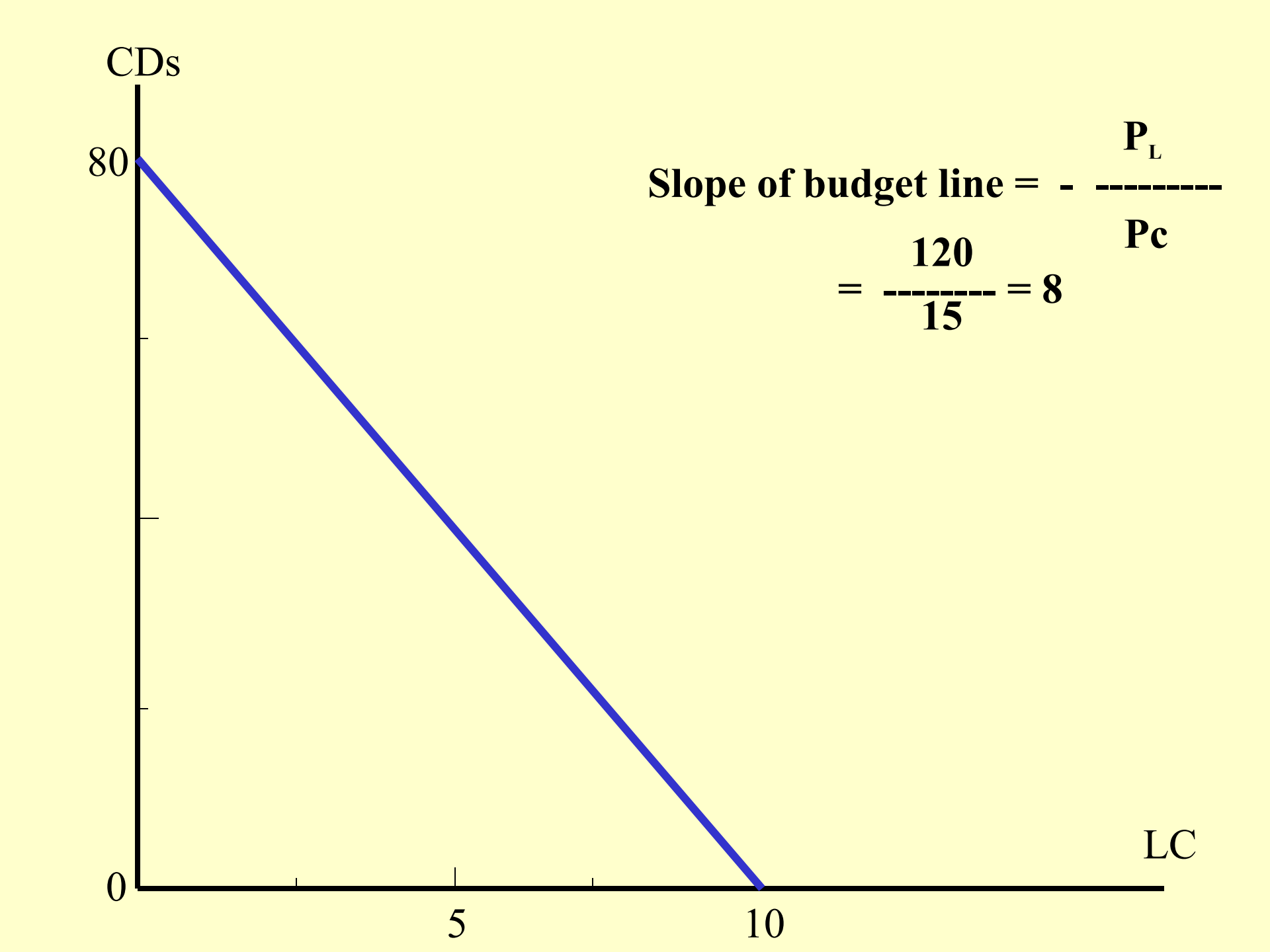
A line showing all combinations of the quantities of two goods a consumer can buy with a given amount of income (budget).

Assuming a consumer is spending all her income on two (symbolic) consumer goods: CDs and live concerts,

$$\text{Income} = P_c \cdot Q_c + P_L \cdot Q_L$$

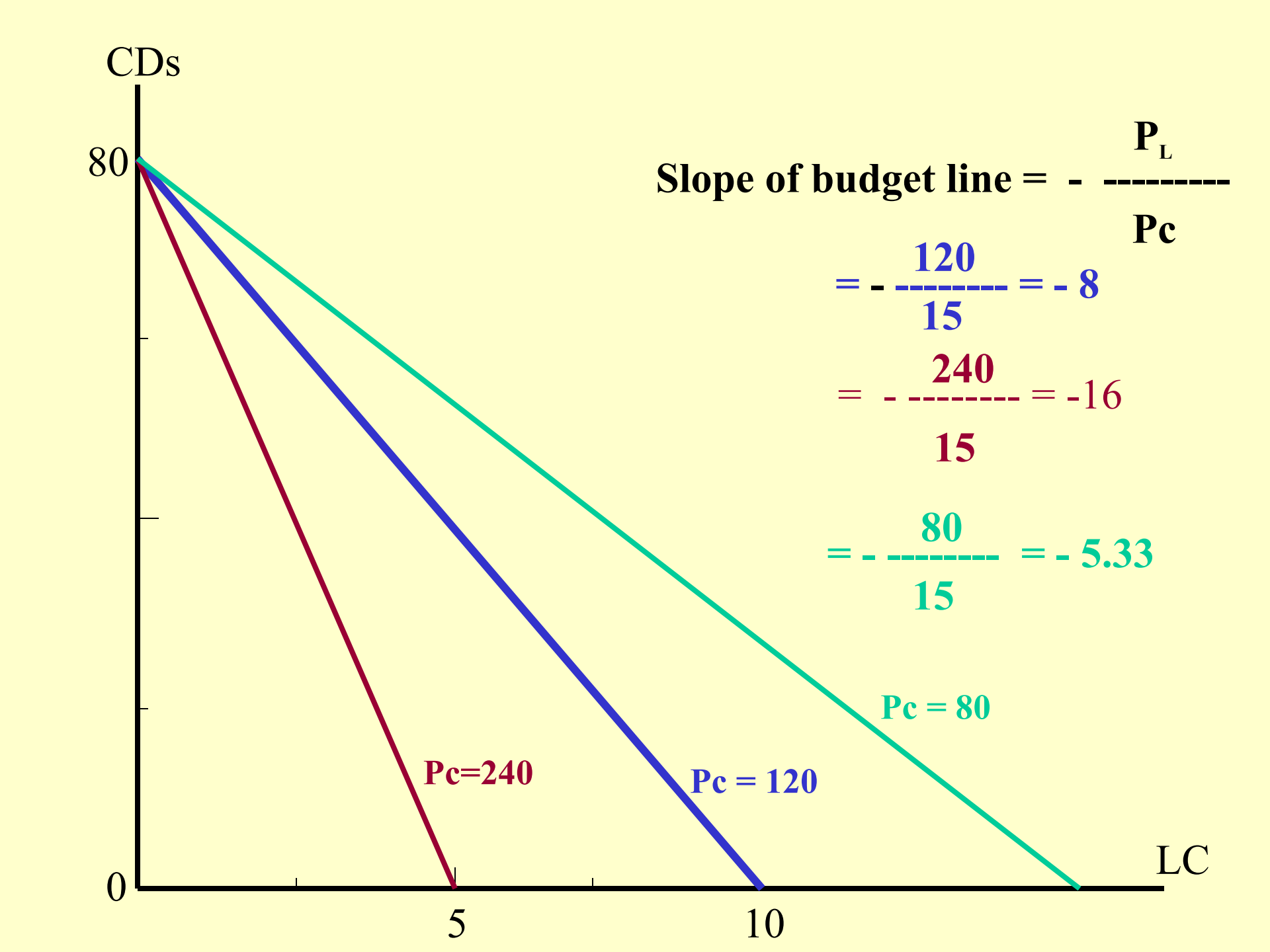
$P_c = 15$, $P_L = 120$, Income = 1200

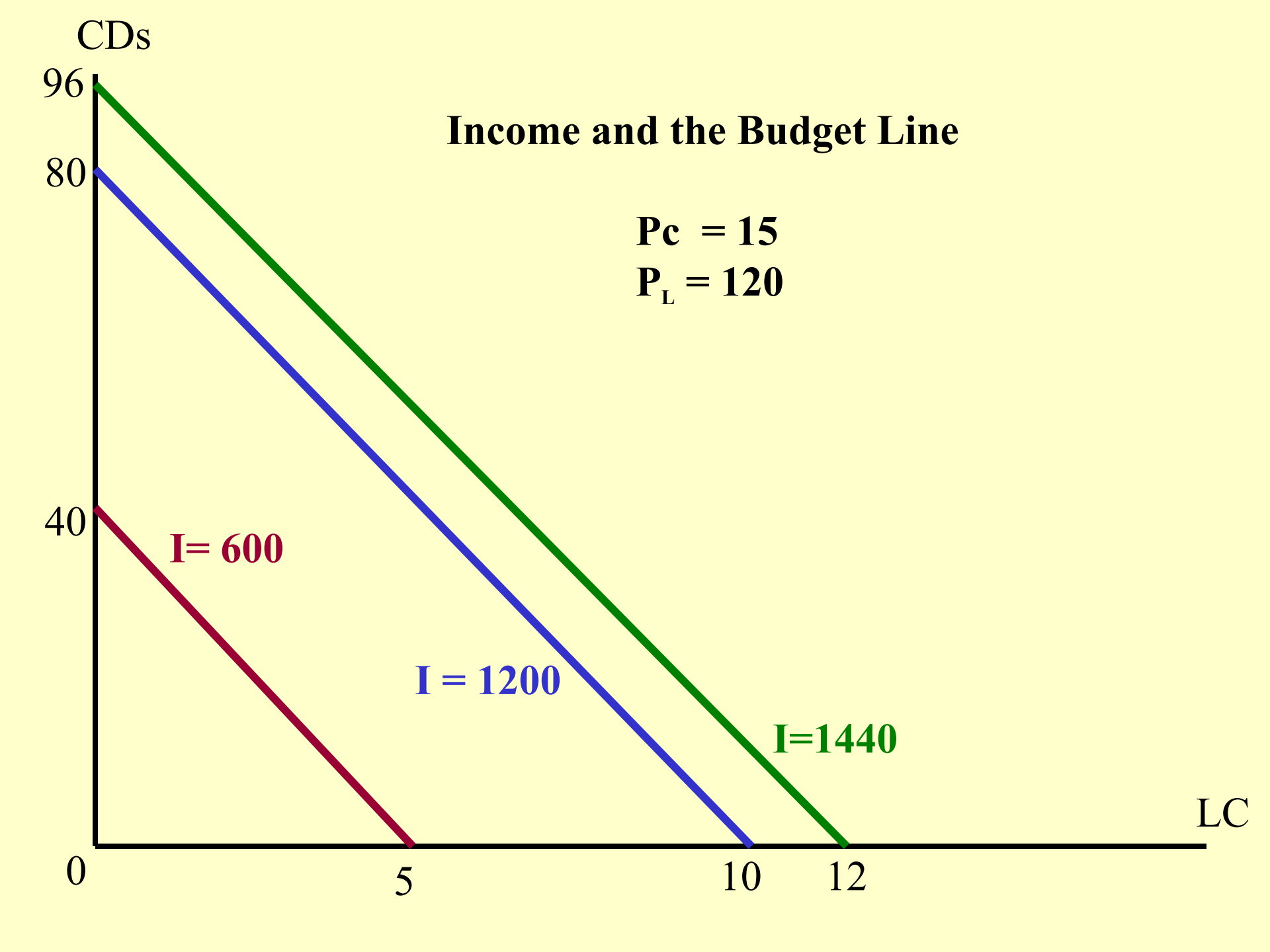
CD intercept = 80 LC intercept = 10

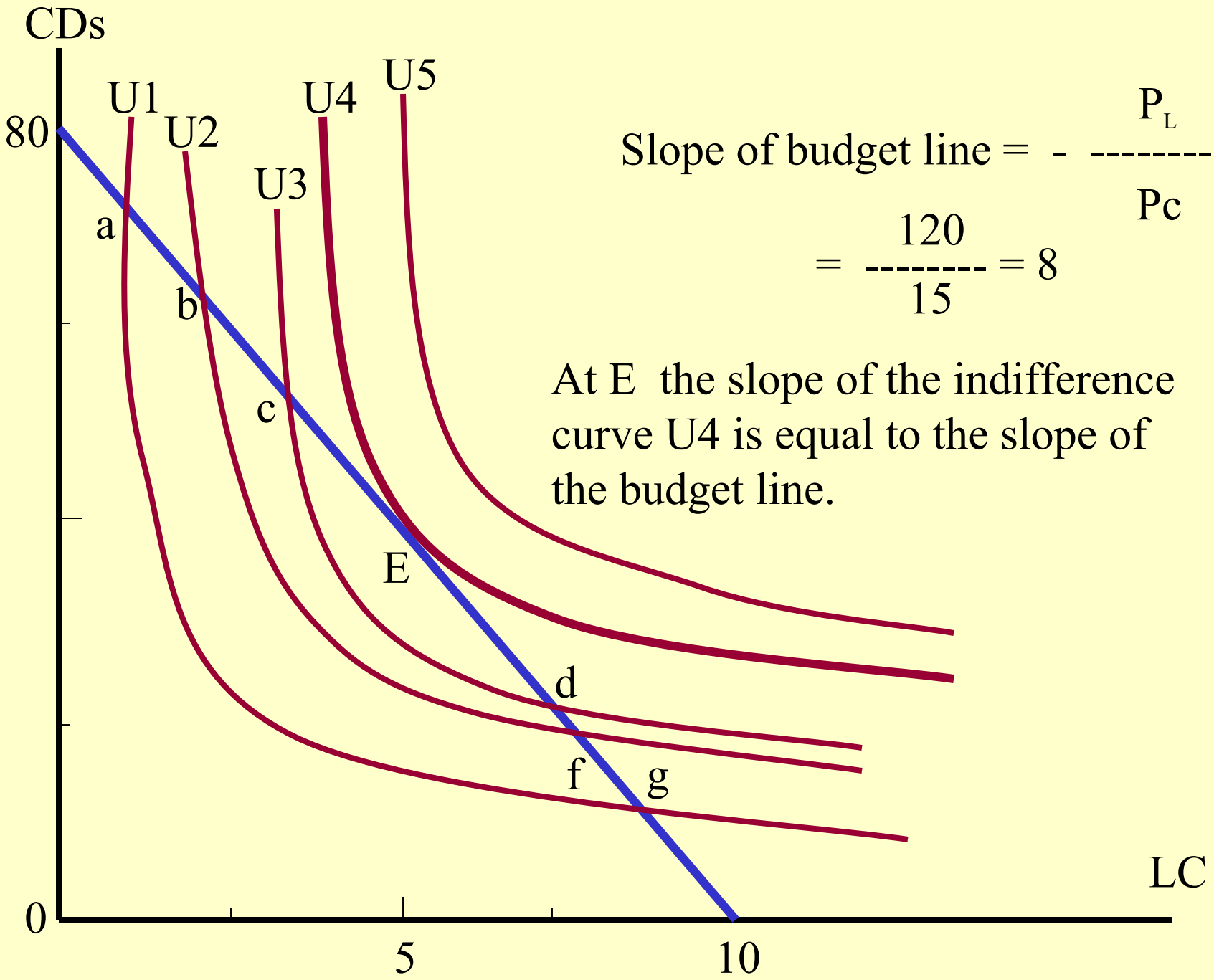


$$\text{Slope of budget line} = -\frac{P_L}{Pc}$$

$$= \frac{120}{15} = 8$$


CDs
80
0
5
10
LC
Pc=240
Pc = 120
Pc = 80
Slope of budget line = - PL / Pc
= - 120 / 15 = - 8
= - 240 / 15 = -16
= - 80 / 15 = - 5.33


CDs
96
80
40
0
5
10
12
LC
Income and the Budget Line
Pc = 15
P_L = 120
I= 600
I = 1200
I=1440



$$\text{Slope of budget line} = -\frac{P_L}{Pc}$$

$$= \frac{120}{15} = 8$$

At E the slope of the indifference curve U4 is equal to the slope of the budget line.

Utility Maximization

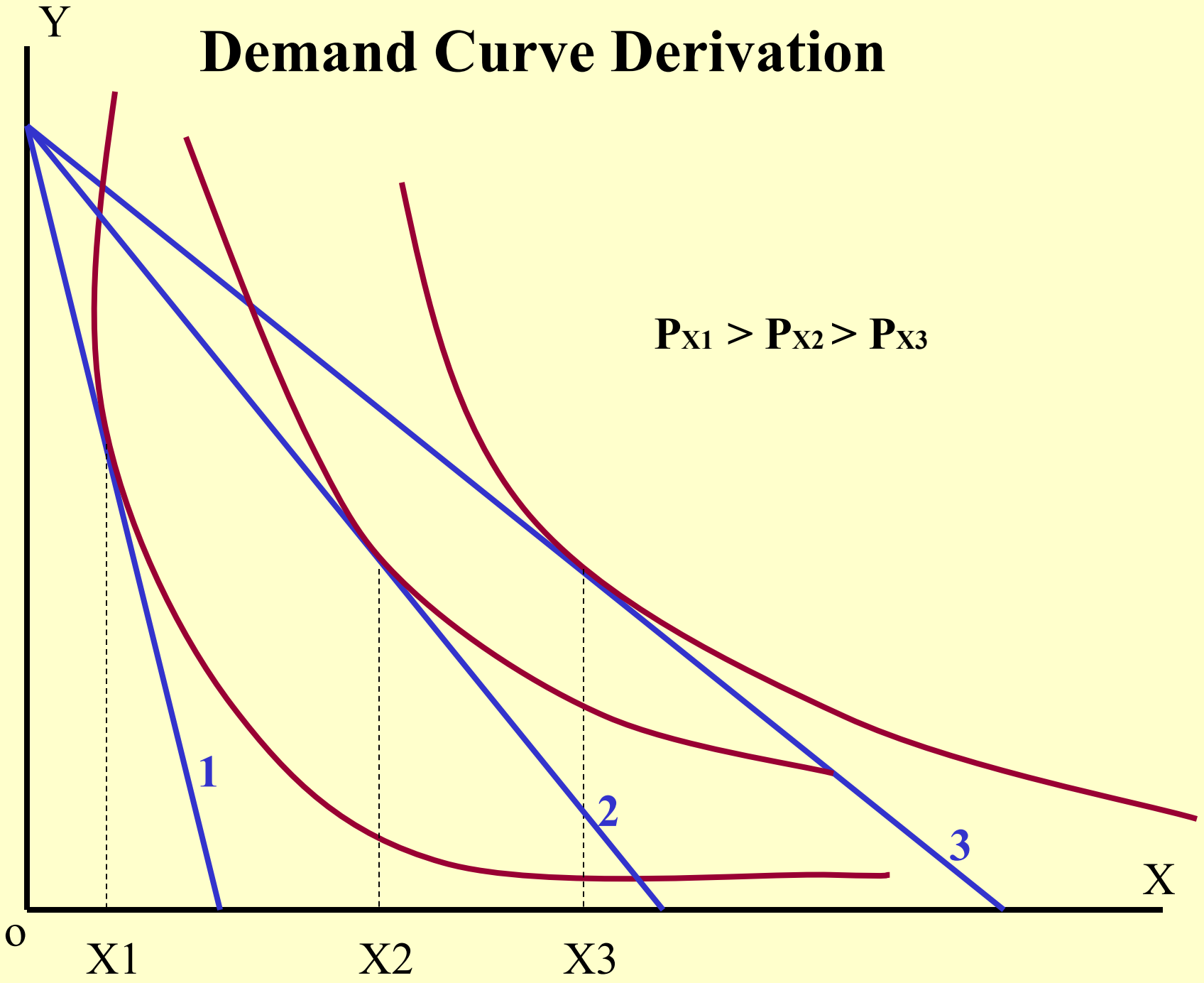
Recall that:

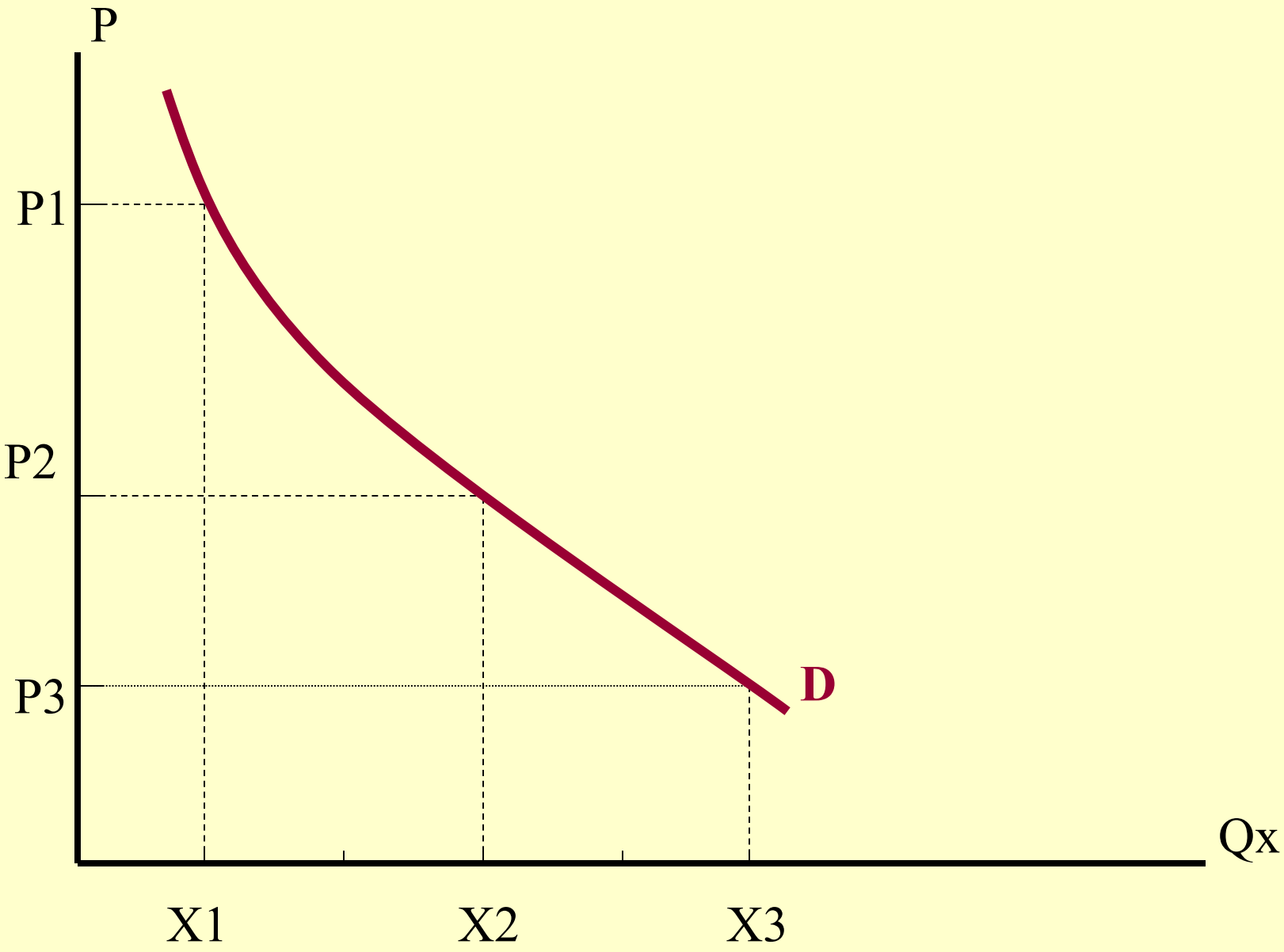
$$\text{Slope of the indifference curve} = -\frac{MU_L}{MUc} = MRS$$

$$\text{Slope of the budget line} = -\frac{P_L}{Pc}$$

$$\text{At point E: } -\frac{P_L}{Pc} = -\frac{MU_L}{MUc} = MRS$$

Demand Curve Derivation




P
P1
P2
P3
D
Qx
X1
X2
X3

Elasticity

A general definition:

Elasticity is a standardized measure of the sensitivity of one (dependent) variable to changes in another variable.

Price elasticity of demand:

A measure of the sensitivity of the quantity demanded a good to changes in the price of that good.

Measuring Elasticity

- Elasticity is measured by the ratio between the percentage change in on variable and the percentage change in another variable:

$$\text{Elasticity} = \frac{\text{Percentage change in Y}}{\text{Percentage change in X}}$$

$$= \frac{\Delta Y / Y}{\Delta X / X}$$

Elasticity of Demand

- The (market) demand for a good is affected by numerous factors: price, income, taste, population, weather, expectations, population demographics, etc.
- The degree of sensitivity or responsiveness of the demand to changes in any of the factors affecting it can be measured in terms of "elasticity".

$$E_z = \frac{\text{percentage change in Qd}}{\text{percentage change in X}}$$

Measuring Elasticity

Measuring a change in percentage terms:

$$\% \text{ change in } Y = \frac{Y_2 - Y_1}{Y_1}$$

Y1 = 80

Y2 =100

$$= \frac{Y_1 - Y_2}{Y_2}$$

$$\text{Arc \% change} = \frac{Y_2 - Y_1}{\frac{Y_2 + Y_1}{2}}$$

Measuring Elasticity

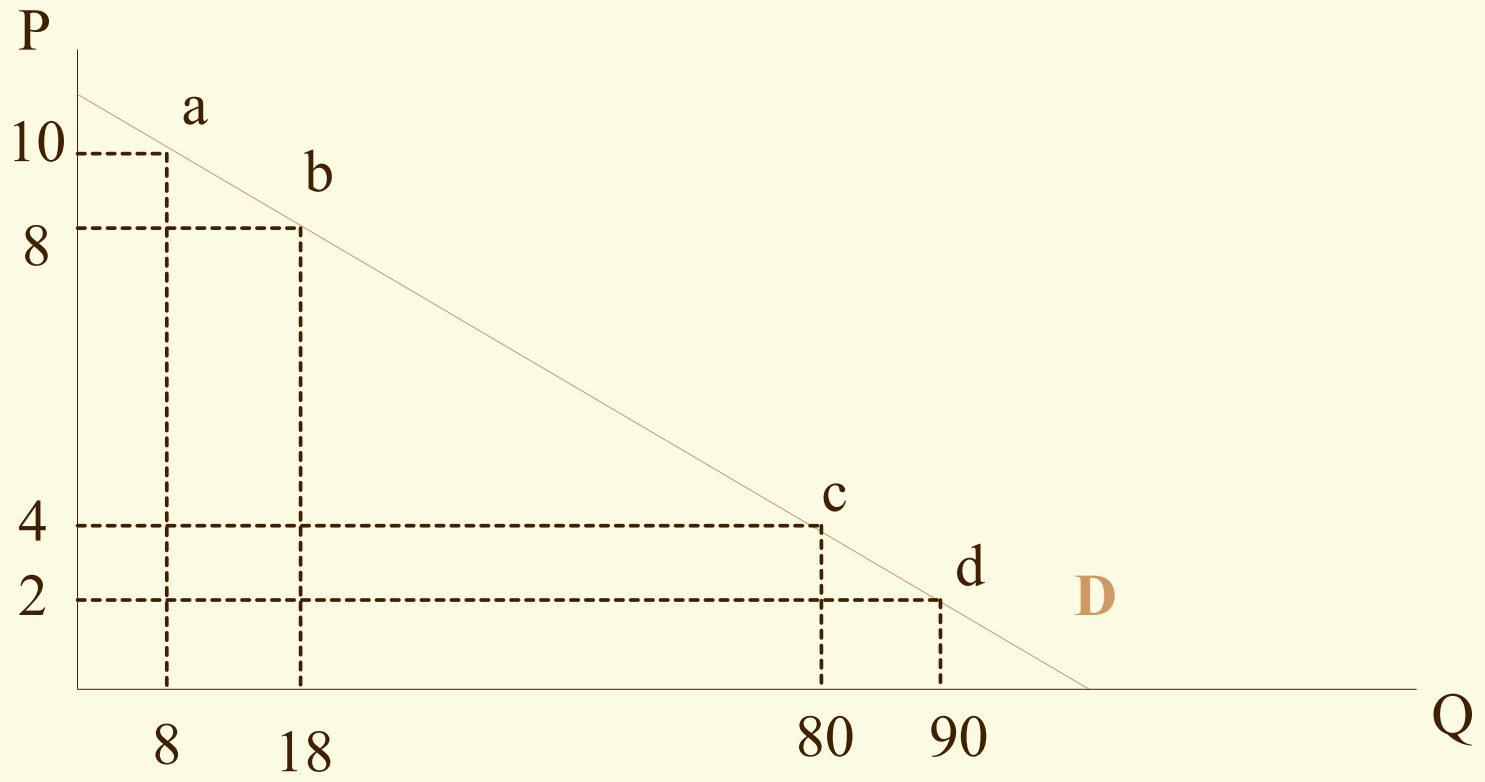
$$Ez = \frac{\dfrac{\text{Change in } Q_x}{Q_{x1}}}{\dfrac{\text{Change in } Z}{Z_1}}$$

$$(\text{Arc})Ez = \frac{\dfrac{\text{Change in } Q_x}{Qx1 + Qx2}}{\dfrac{\text{Change in } Z}{Z_1 + Z_2}}$$

Price Elasticity of Demand

Definition: A measure of the responsiveness of quantity demanded of a good to changes in its price.

$$Ep = \frac{\dfrac{Q_{x2} - Q_{x1}}{Q_{x1} + Q_{x2}}}{\dfrac{P_2 - P_1}{P_1 + P_2}}$$



Ep (a --- b) = (10/8)/(-2/10) = -6.25

Ep (c ---d) = (10/80)/(-2/4) = -.25

Arc (Price) Elasticity

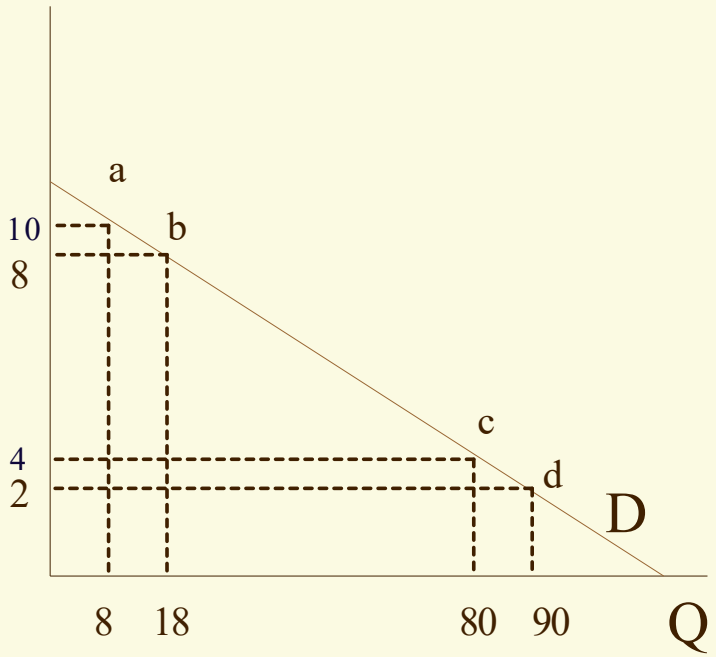
Note that if we *increased* the price,

(from 8 to 10 or 2 to 4)

the original P and Q would be 2 and 8 and 18 and 90, respectively.

Ep = (-10/18)/(2/8) = -2.22

Ep = (-10/90)/(2/2) = -.11



Arc Elasticity

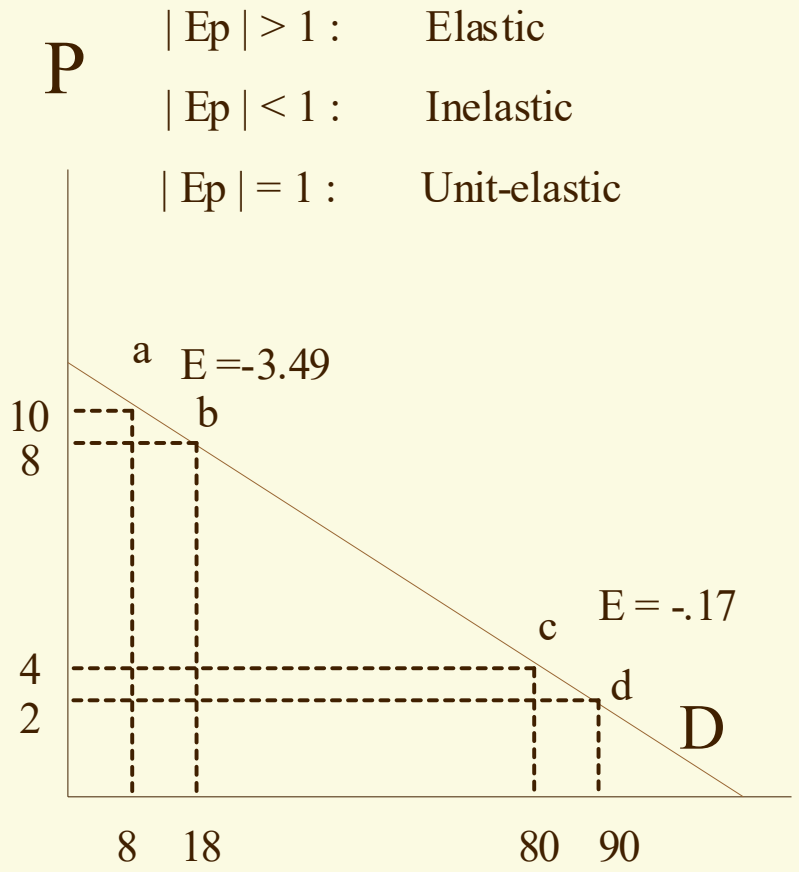
To get the average elasticity between two points on a demand curve we take the average of the two end points (for both price and quantity) and use it as the initial value:

$$Ea = \frac{\frac{Q2-Q1}{(Q1+Q2)}}{\frac{P2-P1}{(P1+P2)}} = \frac{\frac{10}{8+18}}{\frac{-2}{10+8}} = -3.49$$

Elasticity and the Price Level

Along a linear demand curve as the price goes up, |elasticity | increases.

Note that between points "a" and "b" the (arc) elasticity of the above demand curve is -3.49, whereas between "c" and "d" it is -.17.

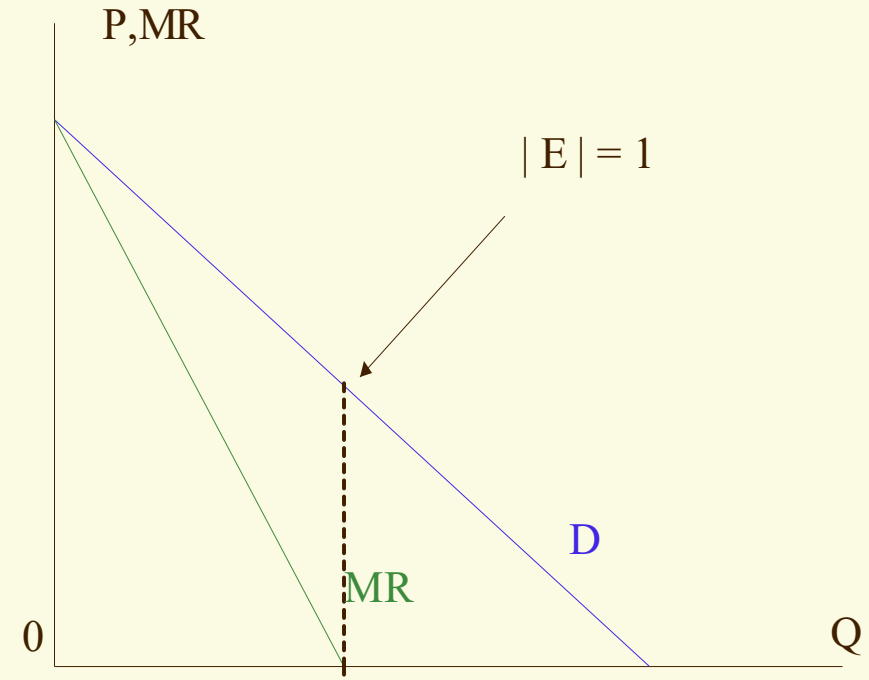


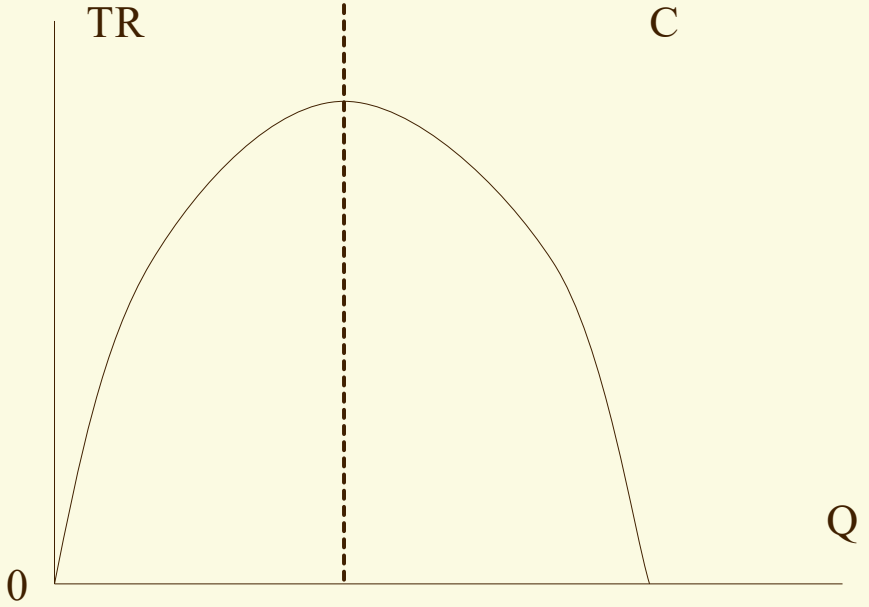
Point Elasticity

$$E = \frac{\frac{\triangle Q}{Q_1+Q_2}}{\frac{\triangle P}{P_1+P_2}} = \frac{\triangle Q}{\triangle P} \cdot \frac{P_1+P_2}{Q_1+Q_2} = \frac{\triangle Q}{\triangle P} \cdot \frac{P}{Q}$$

Or,

$$= \frac{dQ}{dP} \cdot \frac{P}{Q}$$





$$Q = C - b\,P$$

$$\mathbf{P} = \frac{C}{b} - \frac{1}{b}\,Q$$

$$\mathbf{MR} = \frac{C}{b} - \frac{2}{b}\,Q$$

Note:
In the demand equation

$$dQ/dP = -b$$

That means

$$E_p = -b\,\frac{P}{Q}$$

A note about marginal revenue:

Recall: $TR = P.Q$; $P = f(Q)$

Marginal Revenue = Change in TR resulting from producing (selling) one additional unit of output.

$$MR = \frac{\triangle TR}{\triangle Q} = \frac{\triangle (P.Q)}{\triangle Q} = \frac{dP}{dQ}.Q + \frac{dP}{dQ}.P$$

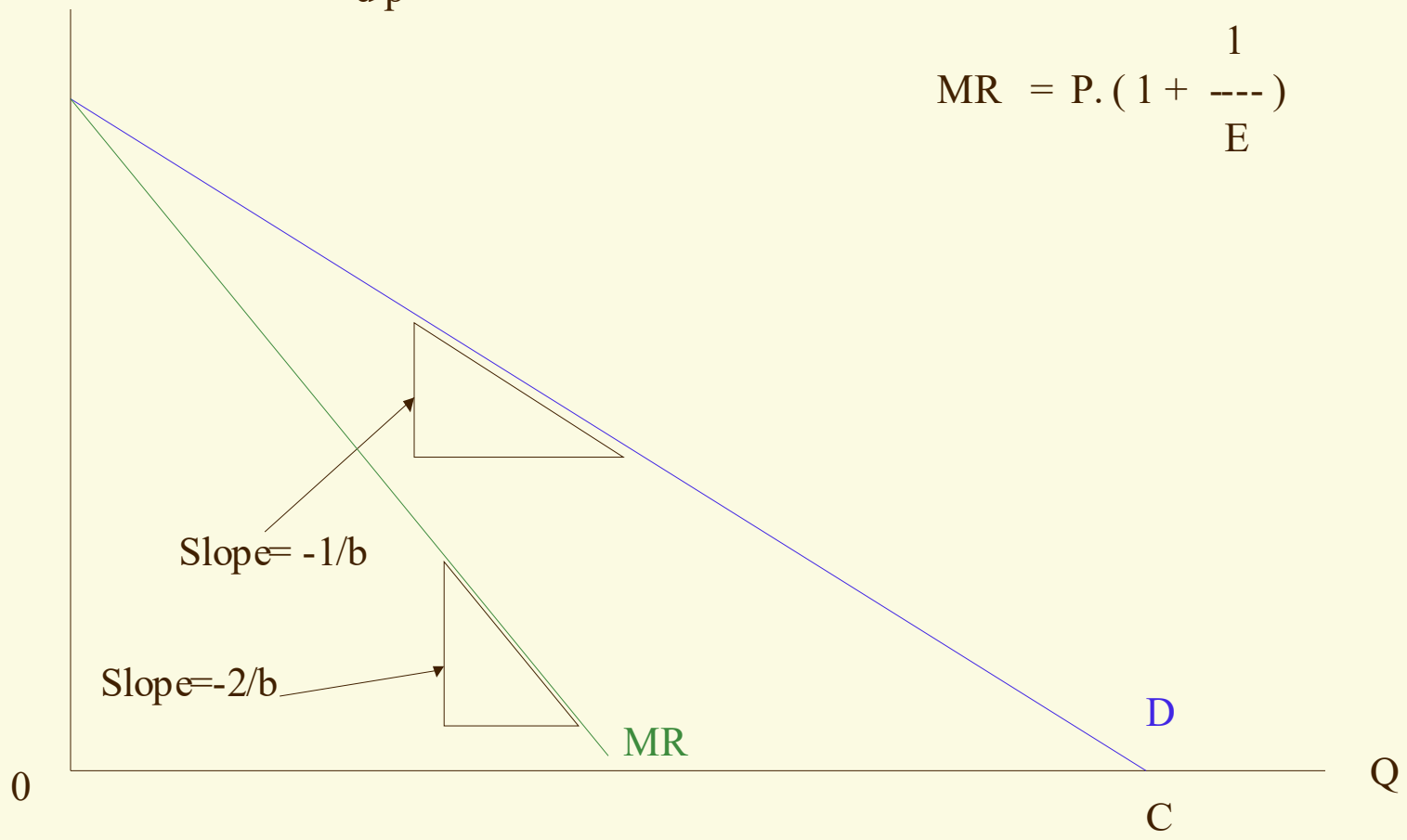
$$= \left(\frac{dP}{dQ}.\frac{Q}{P} + \frac{dP}{dQ}\right).P = P.\left(\frac{1}{E} + 1\right)$$

$$Q = C - b P$$

$$E = \frac{dQ}{dp} \cdot \frac{P}{Q} = -b \cdot \frac{P}{Q}$$

$$\frac{dQ}{dp} = -b$$

$$MR = P.\left(1 + \frac{1}{E}\right)$$



Important Observations

- When demand is ***elastic***, a decrease in price will result is an ***increase*** in the revenue (sales).
- When demand is ***inelastic***, a decrease in price will result is a ***decrease*** in the revenue (sales).
- When demand is ***unit-elastic***, an increase (or a decrease) in price will ***not*** change the revenue (sales).

What Determines Elasticity

- Necessities versus luxuries
  - Eating at restaurants
  - Groceries
- Availability of substitutes
  - Chicken versus beef
- How much of our income a good takes
  - Salt versus Nike sneakers
- The passage of time

Other Elasticity Measures

Recall: "***Elasticity***" is a (standard) measure of the degree of sensitivity (or responsiveness) of one variable to changes in another variable.

- Income Elasticity: a measure of the degree of sensitivity of demand for a good (or service) to changes in consumers' (buyers') income
- Cross Price Elasticity: a measure of the degree of sensitivity of demand for a good (or service) to changes in the price of another good or service

Income Elasticity of Demand

A measure of the degree of responsiveness of **demand** (for a good) to a change in **income**, *ceteris paribus.*

(Shift of the demand curve)

$$E_I = \frac{\frac{Q_2 - Q_1}{Q_2 + Q_1}}{\frac{I_2 - I_1}{I_1 + I_2}} = \text{or} = \frac{dQ}{dI} \cdot \frac{I}{Q}$$

Cross (Price) Elasticity

A measure of the degree of responsiveness of the ***demand*** for **one good** (X) to a change in the ***price*** of **another good** (Y):

(Shift of demand curve)

$$Ec = \frac{\dfrac{Q_{x2} - Q_{x1}}{Q_{x2} + Q_{x1}}}{\dfrac{P_{y2} - P_{y1}}{P_{y1} + P_{y2}}} \quad \text{or} = \frac{dQx}{dPy} \cdot \frac{Py}{Qx}$$

An example:

$$Qd = 200 - 2P + .05I + .5W + .5Pc$$

$P = 95, \quad I = 1000, \quad W = 80, \quad Pc = 200$

$\Longrightarrow Qd = 200$

$Ep = -2\ (95/200) = -.95$

$EI = .05\ (1000/200) = .25$

$Ew = .5\ (80/200) = .2$

$Epc = .5(200/200) = .5$

- What is “Economics”?
- What is ‘ Micro and Macro economics?
- What is Managerial Economics?
- Nature, scope and significance of Managerial Economics
- How it is useful to a Manager?
- Functions of a Managerial Economist?
- What Role a managerial Economist plays in the Management Team

Def:- Economics is the '*Study of allocation of scarce resources, among alternative uses*'.

1. Resources are always scarce.
2. They are not only scarce, but also have alternative uses.
3. Optimum allocation is required

Allocation problems are faced by individuals, Organizations (Both profit making and non- profit making) and Nations also.

Economics deals with:

1. How an individual consumer allocates his scarce resources among alternative uses?
   - in such a way that he always tries to get maximum satisfaction
   - Maximization of satisfaction / utility is the goal of an individual consumer.

2. Similarly, an individual producer aims at least cost combination of inputs to get a given quantities of output.

3. How an individual firm/Industry attains equilibrium.

A firm is said to be an equilibrium, if it attain profit maximizing level of out put.

It tries to maximize Revenue, or minimize Cost

4. How a country reach equilibrium:

" Allocating limited resources in such a way that the desired goals are reached". – The goal may be over all welfare of its people.

Individuals / organizations (profit/non profit)/nations attain their goals, by optimum use of limited resources.

Goals of a business firm

- Single goal or multiplicity of goals

1. Profit maximization - Revenue maximization
   Cost minimization

2. Wealth maximization - Value maximization.

3. William J. Baumol - Sales revenue maximization - subject to attainment of desired profit target.

4. Williamson's modal – Managerial utility maximization

5. Herbert Simon - Satisfying behavior theory

6. Edith Pen rose - Size (growth) Maximization

7. K.W. Rothschild - Long run survival –

What is Microeconomics and Macroeconomics ?

•Ragnor Frisch : Micro means " Small" and Macro means "Large"

Microeconomics deals with the study of individual behaviour.

- It deals with the equilibrium of an individual consumer, producer, firm or industry.

Macroeconomics on the other hand, deals with economy wide aggregates.

- Determination of National Income Output, Employment
- Changes in Aggregate economic activity, known as Business Cycles
- Changes in general price level , known as inflation, deflation
- Policy measures to correct disequilibrium in the economy, Monetary policy and Fiscal policy

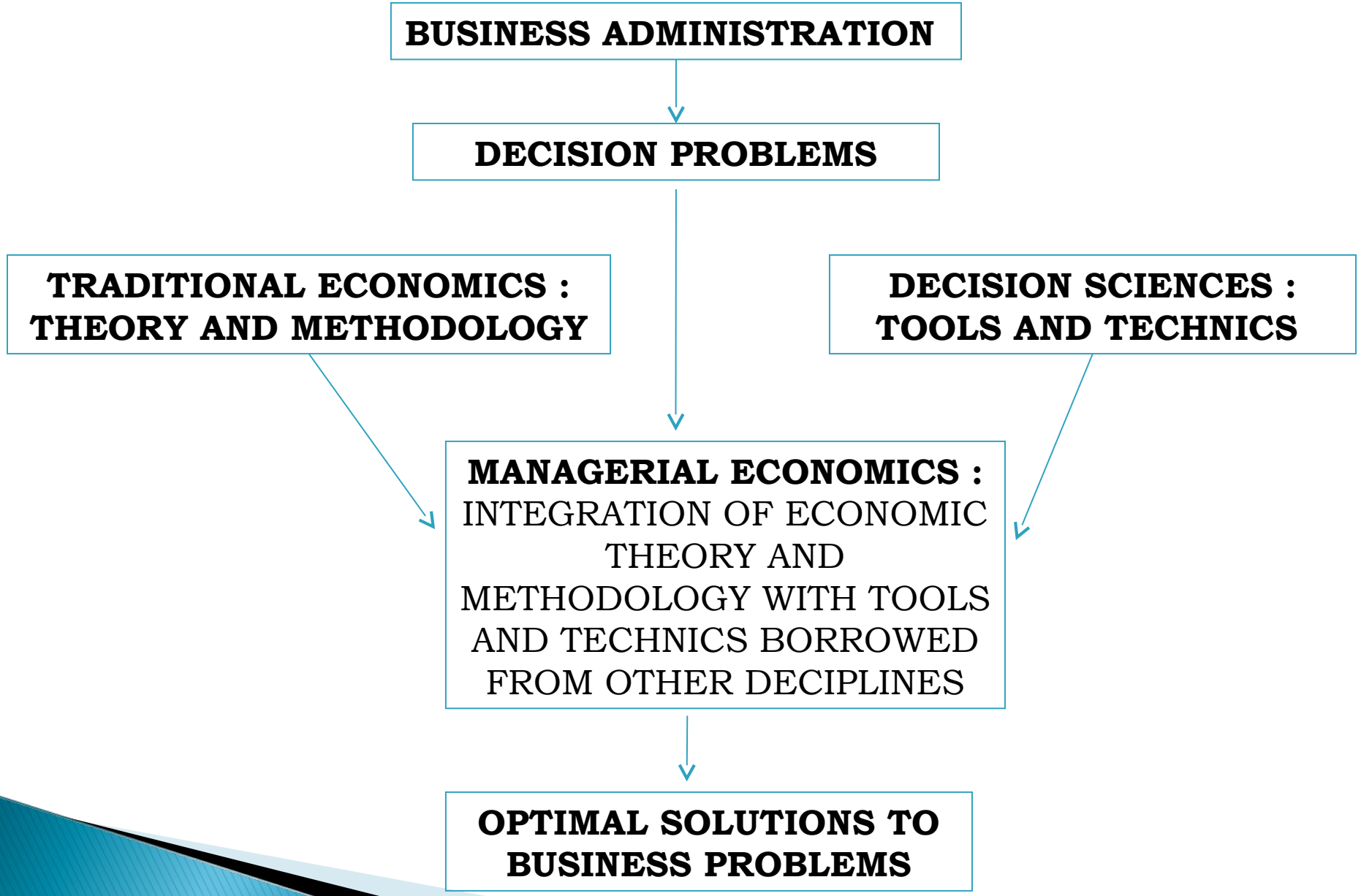
What is Managerial Economics?

"Managerial Economics is economics applied in decision making. It is a special branch of economics bridging the gap between abstract theory and managerial practice" – **Willian Warren Haynes, V.L. Mote, Samuel Paul**

"Integration of economic theory with business practice for the purpose of facilitating decision-making and forward planning" - **Milton H. Spencer**

"Managerial economics is the study of the allocation of scarce resources available to a firm or other unit of management among the activities of that unit" - **Willian Warren Haynes, V.L. Mote, Samuel Paul**

" Price theory in the service of business executives is known as Managerial economics" - **Donald Stevenson Watson**


BUSINESS ADMINISTRATION
DECISION PROBLEMS
TRADITIONAL ECONOMICS : THEORY AND METHODOLOGY
DECISION SCIENCES : TOOLS AND TECHNICS
MANAGERIAL ECONOMICS : INTEGRATION OF ECONOMIC THEORY AND METHODOLOGY WITH TOOLS AND TECHNICS BORROWED FROM OTHER DECIPLINES
OPTIMAL SOLUTIONS TO BUSINESS PROBLEMS

Nature, Scope and Significance of Managerial Economics:

- Managerial Economics – Business Economics
- Managerial Economics is 'Pragmatic'
- Managerial Economics is 'Eclectic'
- Managerial Economics is 'Normative'
- Universal applicability
- The roots of Managerial Economics spring from Micro Economics
- Relation of Managerial Economics to Economic Theory is much like that of Engineering to Physics or Medicine to Biology. It is the relation of applied field to basic fundamental discipline

Core content of Managerial Economics :

- Demand Analysis and forecasting of demand
- Production decisions (Input-Output Decisions)
- Cost Analysis (Output - Cost relations)
- Price – Output Decisions
- Profit Analysis
- Investment Decisions

The core content of Managerial Economics :

- **Theoretical foundation for demand analysis**
  - **Consumer's equilibrium :**

Cardinal Utility:

- Law of Diminishing marginal Utility
- Law of equimarginal Principle
- Consumers equilibrium and derivation demand curve

Ordinal utility Analysis:

- Indifference Curve, Budget line,
- Equilibrium using indifference curves
- Changes in Equilibrium
  - Due to change in Income – ICC Curve - Engel Curve
  - Due to change in Price - PCC Curve – Demand Curve

1. Demand Analysis :

Meaning of demand : No. of units of a commodity that customers are willing to buy at a given price under a set of conditions.

Demand function : $Q_d = f(P, Y, P_r\ W)$

Demand Schedule : A list of prices and quantitives and the list is so arranged that at each price the corresponding amount is the quantity purchased at that price

Demand curve : Slops down words from left to right.

Law of demand : inverse relation between price and quantity

Exceptions to the law of demand :

Giffens paradox
Thorsten Veblen's " Doctrine of conspicuous consumption
Price expectations

Elasticity : Measure of responsiveness - $Q_d = f(P, Y, P_r\ W)$

E = percentage change in DV/ percentage change in IV

Concepts of price, income, and cross elasticity

Price Elasticity :

Ep = Percentage change in Q_D/Percentage change in P

Types of price elasticity :

1. Perfectly elastic demand Ep = ∞
2. Elastic demand Ep > 1
3. Inelastic demand Ep < 1
4. Unit elastic demand Ep = 1
5. Perfectly inelastic demand Ep = 0

- **Elasticity and expenditure :** If demand is elastic a given fall in price causes a relatively larger increase in the total expenditure.
  - P↓ - TR↑ when demand is elastic.
  - P↓ - TR↓ when demand is inelastic.
  - P↓ ↑ - TR remains same when demand is Unit elastic.

Elastic Demand			Unit Elastic Demand			Inelastic Demand			
P	Q	PQ	P	Q	PQ	P	Q	PQ	
10	1,000 units	10,000	10	1,000 units	10,000	10	1,000 units	10,000	
9	2,000 units	18,000	9	1,111 units	10,000	9	1,050 units	9,450	
8	3,000 units	24,000	8	1,250 units	10,000	8	1,100 units	8,800	

- **Measurement of elasticity :**
  - Point and Arc elasticity
  - Elasticity when demand is linear
- **Determinants of elasticity :**
  - (1) Number and closeness of its substitutes,
  - (2) the commodity's importance in buyers' budgets,
  - (3) the number of its uses.
- **Other Elasticity Concepts**
  - Income elasticity
  - Cross elasticity

2. Theory of production :

Input – Output relation

What is a production function :

Q = f (A, B, C, D)

Production function with one variable input

- Law of variable proportions
- Equilibrium of producer with one variable input (optimum quantity of variable input)

Production function with two variable inputs

- Iso-costs, iso-quants, equilibrium - least cost combination of inputs
- Equilibrium of producer with two variable inputs (optimum combination of inputs)

Production function with all variable inputs

- Returns to Scale
  - Increasing returns to scale
  - Constant returns to scale
  - Decreasing returns to scale

3. Theory of Cost : Cost - output relations

- **Cost Concepts**
  - Opportunity Cost
  - Implicit Cost
  - Explicit Cost
- **Cost function :**
  - **Short run cost functions**
    - Fixed Cost
    - Variable Cost
    - AFC
    - AVC
    - AC
    - MC
  - **Long run cost functions**
    - LAC
    - LMC

4. Market structures - Price – Output Decisions

- **Classification of markets: 1. No of firms 2. nature of the product**
  - **Perfect competition**
    - Features of perfect competition
    - Short-run equilibrium
    - Long-run equilibrium
  - **Monopoly**
    - Meaning and Barriers to entry
    - Short-run equilibrium
    - Long-run equilibrium
    - Discriminating Monopoly
  - **Monopolistic competition**
  - **Oligopoly – Duopoly models**
    - Cournot's Model
    - Edgeworth's Model
    - Chamberlin's Model
    - Paul Sweezy's Kinked Demand Curve

5. Profit Management :

- Concept of Profit
- Profit Theories
  - Payment to factor services
  - Reward for taking risk and baring uncertainty
  - Result of Frictions and Imperfections and Monopoly
  - Reward for successful innovations
- Cost-volume-profit Analysis
  - Break even analysis
  - Make or buy decisions

6. Investment Decisions:

- **Need and importance of Capital Budgeting**
- **Capital Budgeting Techniques**
  - **Traditional Methods**
    - Payback Method
    - Accounting Rate of Return On Investment (ARORI)
  - **Discounted Cash Flow Techniques**
    - Net Present Value (NPV) $NPV = \frac{C_1}{(1+k)^1} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} \ldots\ldots \frac{C_n}{(1+k)^n} - I_0$
    - Internal Rate of Return (IRR)= $\frac{C_1}{(1+k)^1} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} \ldots\ldots \frac{C_n}{(1+k)^n} = I_0$
    - Profitability Index (PI) = $\frac{Sum\ of\ Present\ Value\ of\ Cash\ Flows}{Initial\ Investment}$
  - **Capital Budgeting under conditions of risk and uncertainty**
    - Certainty – Equivalent Approach
    - Risk Adjusted Rate of Return

Functions of a Managerial Economists:

- The main function of a manager is **decision making** and managerial Economics helps in taking rational decisions.
- The need for decision making arises only when there are more alternatives courses of action.
- **Steps in decision making :**
  - Defining the problem
  - Identifying alternative courses of action
  - Collection of data and analyzing the data
  - Evaluation of alternatives
  - Selecting the best alternative
  - Implementing the decision
  - Follow up of the action

- Specific functions to be performed by a managerial Economist :

1. Production scheduling
2. Sales forecasting
3. Market research
4. Economic analysis of competing companies
5. Pricing problems of industry
6. Investment appraisal
7. Security analysis
8. Advice on foreign exchange management
9. Advice on trade
10. Environmental forecasting

– *Survey of British Industry by Alexander and Kemp*

Role a Managerial Economist in the Management Team:

William J. Baumol, "What Can Economic Theory Contribute to Managerial Economics?" American Economic Review, 1961

Baumol concludes that "a managerial economist can become a far more helpful member of a management group by virtue of his studies of economic analysis, primarily because there he learns to become an effective model builder and because there he acquires a very rich body of tools and techniques which can help him to deal with the problems of the firm in a far more rigorous, a far more probing, and a far deeper manner".

Production and Cost Analysis: Part I

Chapter 9

Introduction

- In the supply process, households first offer the factors of production they control to the factor market.
  - The factors are then transformed by firms into goods that consumers want.
  - ***Production*** is the name given to that transformation of factors into goods.

The Role of the Firm

- A key concept in production is the firm.
- The ***firm*** is an economic institution that transforms *factors of production* (inputs) into *consumer goods* (output, quantity supplied).

The Role of the Firm

- A firm:
  - Organizes factors of production.
  - Produces goods and/or services.
  - Sells goods it produces to individuals.

The Role of the Firm

- When the firm only *organizes* production it is called a ***virtual firm***.
  - Virtual firms *subcontract* out all work.
  - While most firms are not virtual, more and more of the organizational structure of business is being separated from production.

The Firm and the Market

- Whether an activity is organized through the market depends on transaction costs.
  - ***Transaction costs*** – costs of undertaking trades through the market.

The Firm and the Market

- The various forms that businesses organize themselves include
  - sole proprietorships,
  - partnerships,
  - corporations,
  - for-profit firm,
  - nonprofit firms, and
  - cooperatives.

Firms That Maximize Profit

- ***Profit*** is the difference between total revenue and total cost.

$$Profit = total\ revenue - total\ cost$$

$$\Pi = TR - TC$$

$$\Pi = P*Q - (TC/Q)*Q$$

Firms Maximize Profit

- For an economist, ***total cost*** is explicit payments to factors of production *plus* the opportunity cost of the factors provided by the owners.
- Total Costs = accounting costs + opportunity costs.
- Accounting costs = expenses that appear "on the books."

Firms Maximize Profit

- ***Total revenue*** is the amount a firm receives for selling its good or service plus any increase in the value of the assets owned by firms.

Firms Maximize Profit

- Economists and accountants measure profit differently.

Firms Maximize Profit

- For accountants, total revenue is total sales times price.
- Profit is explicit revenue less explicit cost.

Firms Maximize Profit

- For economists, revenue includes any increase or decrease in the value of any assets the firm owns.

  - They count implicit costs which include the opportunity costs of owner-provided factors of production.

Firms Maximize Profit

- For economists:

Economic profit =

(explicit and implicit revenue)– (explicit and implicit cost)

The Production Process

- The production process can be divided into the long run and the short run

The Long Run and the Short Run

- A ***long-run decision*** is a decision in which the firm can choose among all possible production techniques.

The Long Run and the Short Run

- A ***short-run decision*** is one in which the firm is constrained in regard to what production decisions it can make.

The Long Run and the Short Run

- The terms long run and short run do not necessarily refer to specific periods of time.
  - They refer to the degree of flexibility the firm has in changing the level of output.

The Long Run and the Short Run

- In the long run:
  - By definition, the firm can vary any inputs as much as it wants.
  - All inputs are variable.

The Long Run and the Short Run

- In the short run:
  - Some the flexibility that existed in the long run no longer exists.
  - Some inputs are so costly to adjust that they are treated as fixed.

Production Tables and Production Functions

- How a firm combines factors of production to produce consumer goods can be presented in a production table.
- A ***production table*** shows the output resulting from various combinations of factors of production or inputs.

Production Tables and Production Functions

- Production tables are so complicated that in introductory economics we concentrate on short-run production analysis in which one of the factors is fixed.

Production Tables and Production Functions

- ***Marginal product*** is the additional output that will be forthcoming from an additional worker, other inputs remaining constant.

Production Tables and Production Functions

- ***Average product*** is calculated by dividing total output by the quantity of the output.

Production Tables and Production Functions

- The information in a production table is often summarized in a ***production function*** – a curve that describes the relationship between the inputs (factors of production) and outputs.

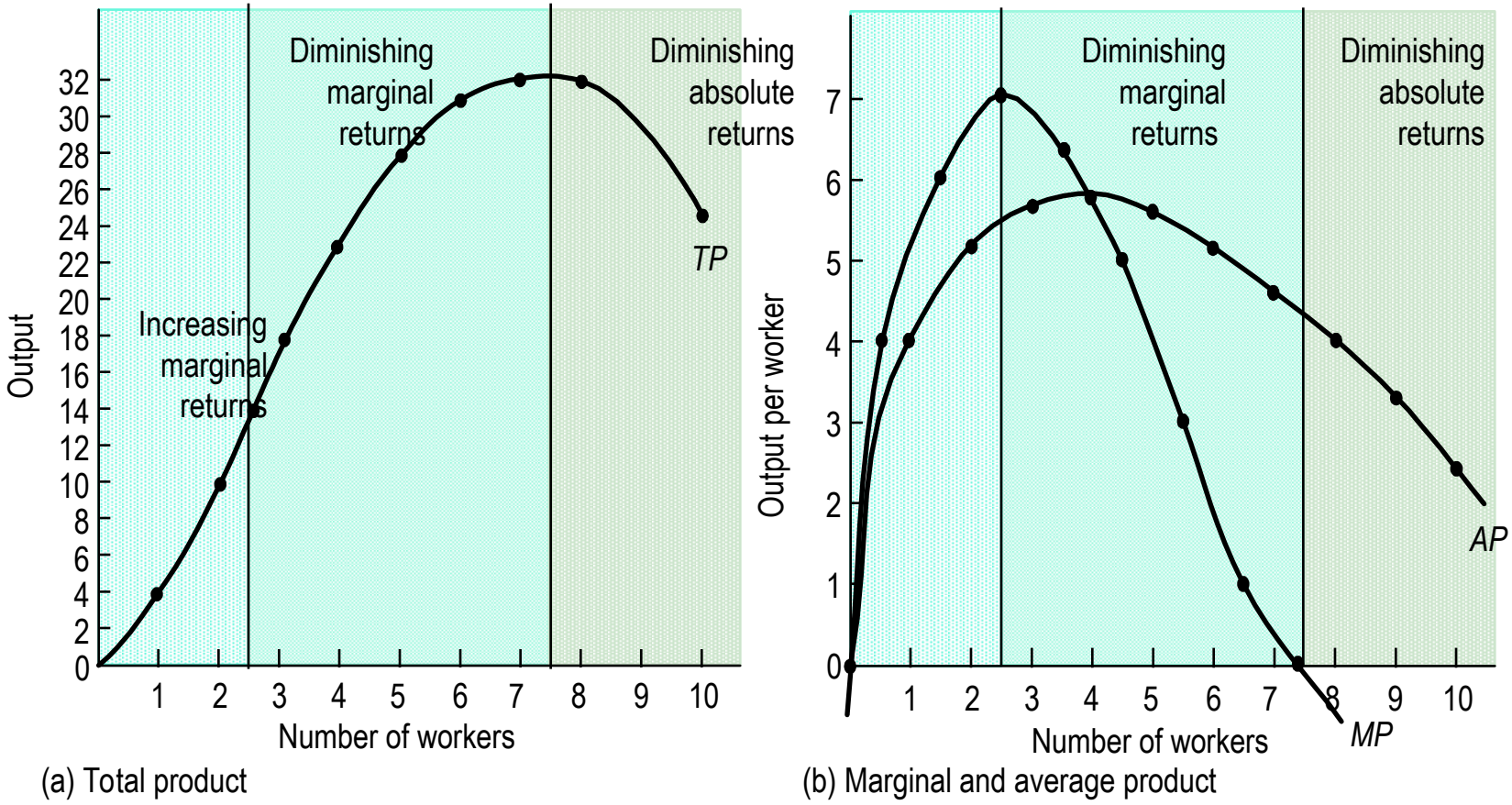
Production Tables and Production Functions

- The production function discloses the maximum amount of output that can be derived from a given number of inputs.

A Production Table

Number of workers	Total output	Marginal product	Average product	
0	0		—	
		4		
1	4		4	Increasing marginal returns
		6		
2	10		5	
		7		
3	17		5.7	
		6		
4	23		5.8	
		5		Diminishing marginal returns
5	28		5.6	
		3		
6	31		5.2	
		1		
7	32		4.6	
		0		
8	32		4.0	
		2		
9	30		3.3	Diminishing absolute returns
		5		
10	25		2.5	

A Production Function



The Law of Diminishing Marginal Productivity

- The law of diminishing marginal productivity is an important element in all real-world production processes.
- Both marginal and average productivities initially increase, but eventually they both decrease.

The Law of Diminishing Marginal Productivity

- This means that initially the production function exhibits increasing marginal productivity.
    - Then it exhibits diminishing marginal productivity.
    - Finally, it exhibits negative marginal productivity.

The Law of Diminishing Marginal Productivity

- The most relevant part of the production function is that part exhibiting diminishing marginal productivity.

The Law of Diminishing Marginal Productivity

- The ***law of diminishing marginal productivity*** states that as more and more of a variable input is added to an existing fixed input, after some point the additional output one gets from the additional variable input will fall.

The Law of Diminishing Marginal Productivity

- This law is true since, as a firm adds more and more workers, they must share the existing machines, so the marginal product of the machines increases while the marginal product of the workers decreases.

The Law of Diminishing Marginal Productivity

- This law is also called the ***flower pot law***, because it if did not hold true, the world's entire food supply could be grown in a single flower pot.

The Costs of Production

- There are many different types of costs.
- Invariably, firms believe costs are too high and try to lower them.

Costs of Production

- Fixed Costs,
- Variable Costs, and
- Total Costs

Fixed Costs, Variable Costs, and Total Costs

- ***Fixed costs*** are those that are spent and cannot be changed in the period of time under consideration.
- In the long run there are no fixed costs since all costs are variable.
- In the short run, a number of costs will be fixed.

Fixed Costs, Variable Costs, and Total Costs

- Workers represent ***variable costs*** – those that change as output changes.

Fixed Costs, Variable Costs, and Total Costs

- The sum of the variable and fixed costs are total costs.

$$TC = FC + VC$$

Costs of Production: Average Costs

- Average Total Cost, Average Fixed Cost, and Average Variable Cost
- Average costs are *costs per unit of output*

Average Costs

- Much of the firm's discussion is of average cost.

Average Costs

- ***Average total cost*** (often called average cost) equals total cost divided by the quantity produced.

$$ATC = TC/Q$$

Average Costs

- ***Average fixed cost*** equals fixed cost divided by quantity produced.

$$AFC = FC/Q$$

Average Costs

- ***Average variable cost*** equals variable cost divided by quantity produced.

$$AVC = VC/Q$$

Average Costs

- Average total cost can also be thought of as the sum of average fixed cost and average variable cost.

$$ATC = AFC + AVC$$

Marginal Cost

- ***Marginal cost*** is the increase (decrease) in total cost of increasing (or decreasing) the level of output by one unit.
- In deciding how many units to produce, the most important variable is marginal cost.

The Cost of Producing Earrings							
Output	FC	VC	TC	MC	AFC	AVC	ATC
3	50	38	88	—	16.67	12.66	29.33
4	50	50	100	12	12.50	12.50	25.00
9	50	100	150	—	5.56	11.11	16.67
10	50	108	158	8	5.00	10.80	15.80
16	50	150	200	—	3.13	9.38	12.50
17	50	157	207	7	2.94	9.24	12.18
22	50	200	250	—	2.27	9.09	11.36
23	50	210	260	10	2.17	9.13	11.30
27	50	255	305	—	1.85	9.44	11.30
28	50	270	320	15	1.79	9.64	11.42

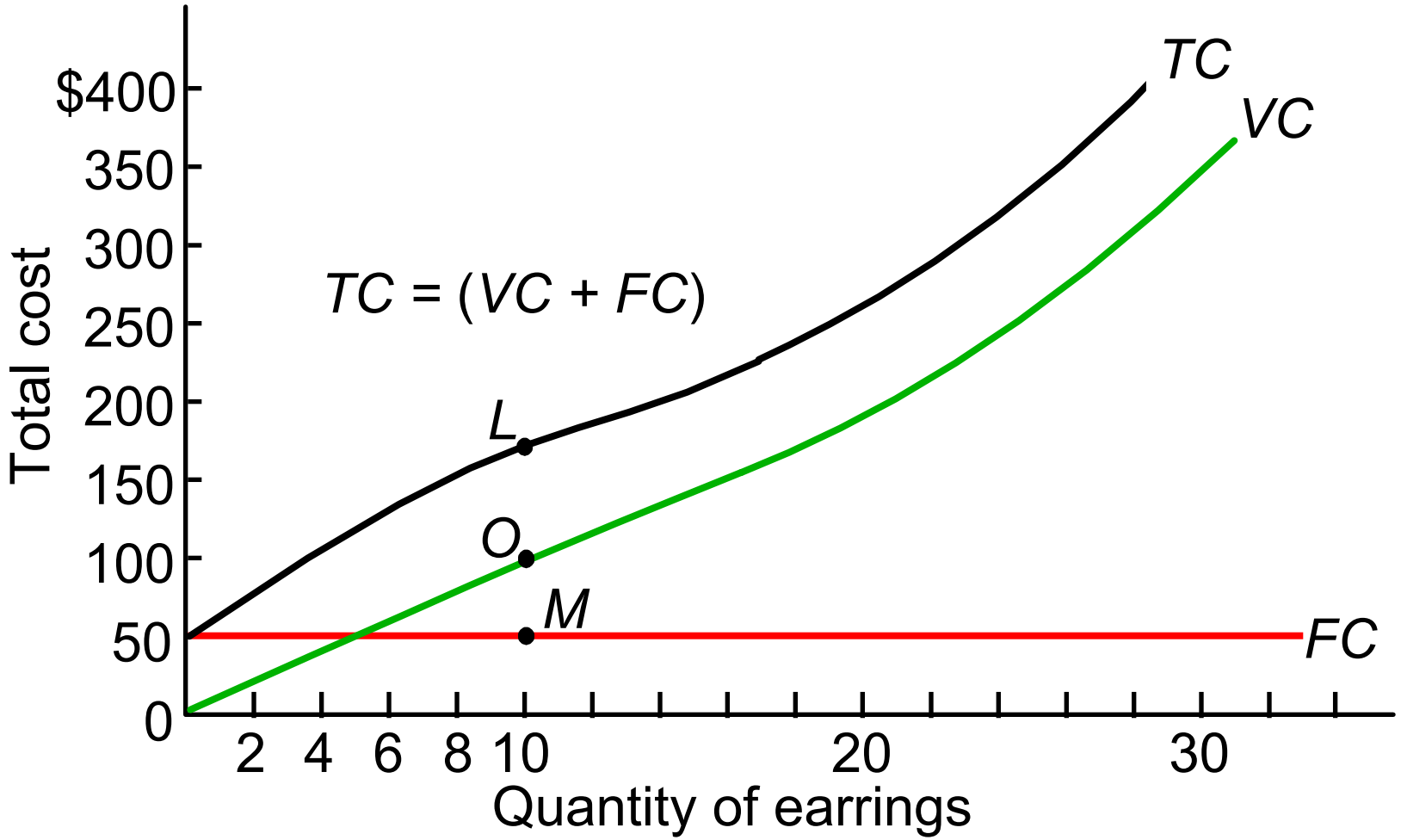
Graphing Cost Curves

- To gain a greater understanding of these concepts, it is a good idea to draw a graph.
- Quantity is put on the horizontal axis and a dollar measure of various costs on the vertical axis.

Total Cost Curves

- The total variable cost curve has the same shape as the total cost curve—increasing output increases variable cost.

Total Cost Curves



Average and Marginal Cost Curves

- The marginal cost curve goes through the minimum point of the average total cost curve and average variable cost curve.
- Each of these curves is U-shaped.

Average and Marginal Cost Curves

- The average fixed cost curve slopes down continuously.

Downward-Sloping Shape of the Average Fixed Cost Curve

- The average fixed cost curve looks like a child's slide – it starts out with a steep decline, then it becomes flatter and flatter.
- It tells us that as output increases, the same fixed cost can be spread out over a wider range of output.

The U Shape of the Average and Marginal Cost Curves

- When output is increased in the short-run, it can only be done by increasing the variable output.

The U Shape of the Average and Marginal Cost Curves

- The law of diminishing marginal productivity sets in as more and more of a variable input is added to a fixed input.
    - Marginal and average productivities fall and marginal costs rise.

The U Shape of the Average and Marginal Cost Curves

- And when average productivity of the variable input falls, average variable cost rise.

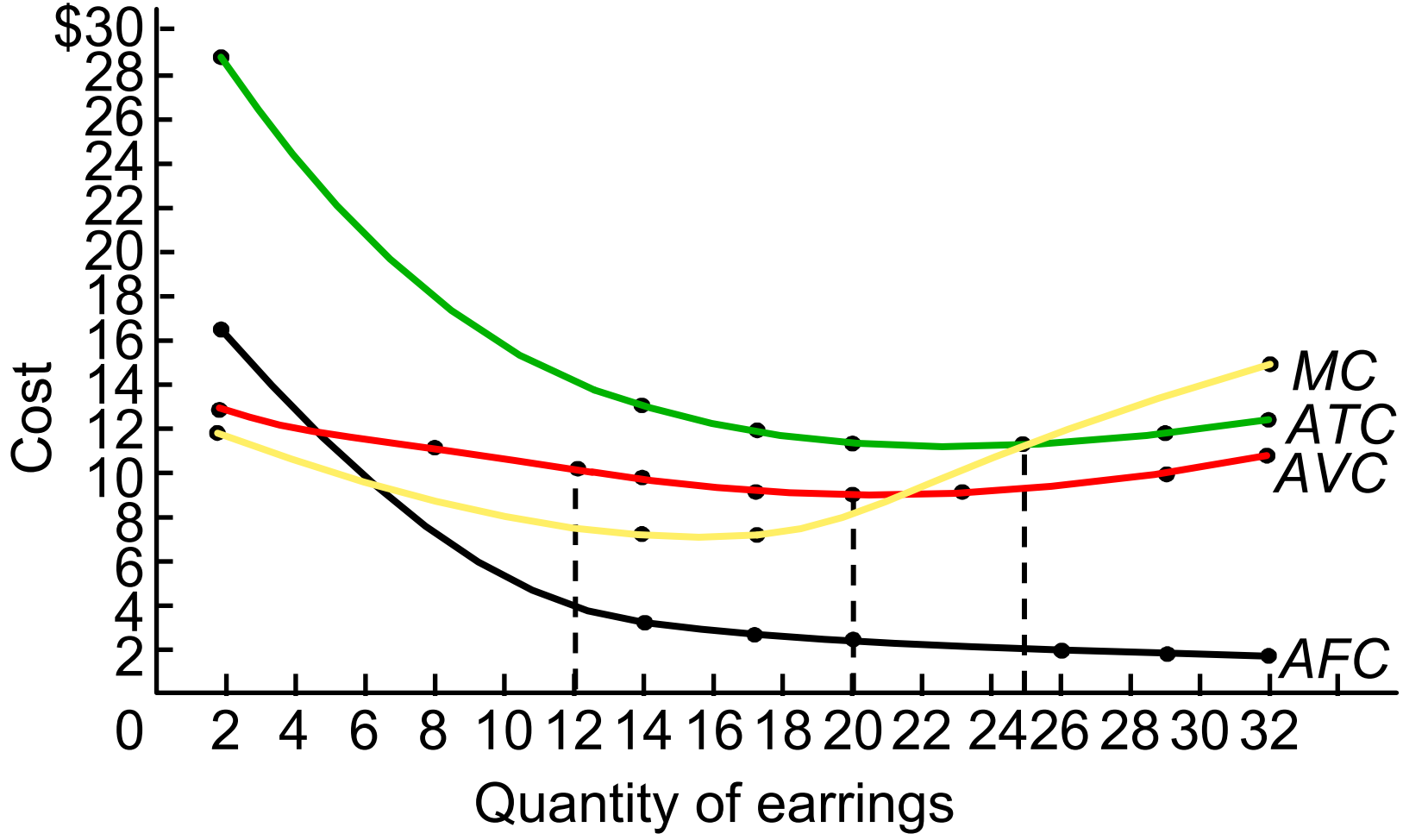
The U Shape of the Average and Marginal Cost Curves

- The average total cost curve is the vertical summation of the average fixed cost curve and the average variable cost curve, so it is always higher than both of them.

The U Shape of the Average and Marginal Cost Curves

- If the firm increased output enormously, the average variable cost curve and the average total cost curve would almost meet.
    - The firm's eye is focused on average total cost—it wants to keep it low.

Per Unit Output Cost Curves



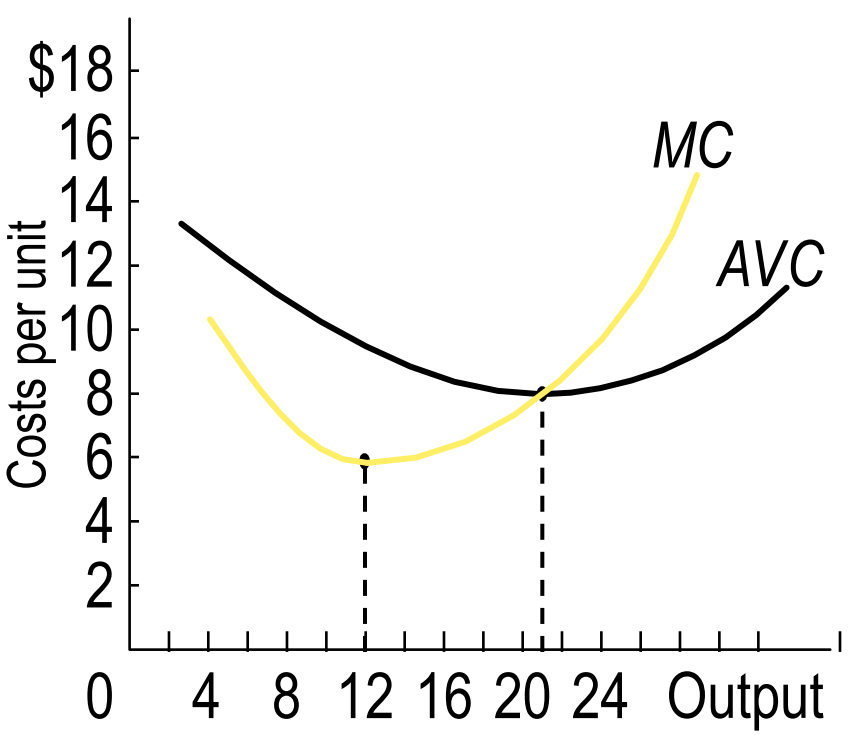
The Relationship Between Productivity and Costs

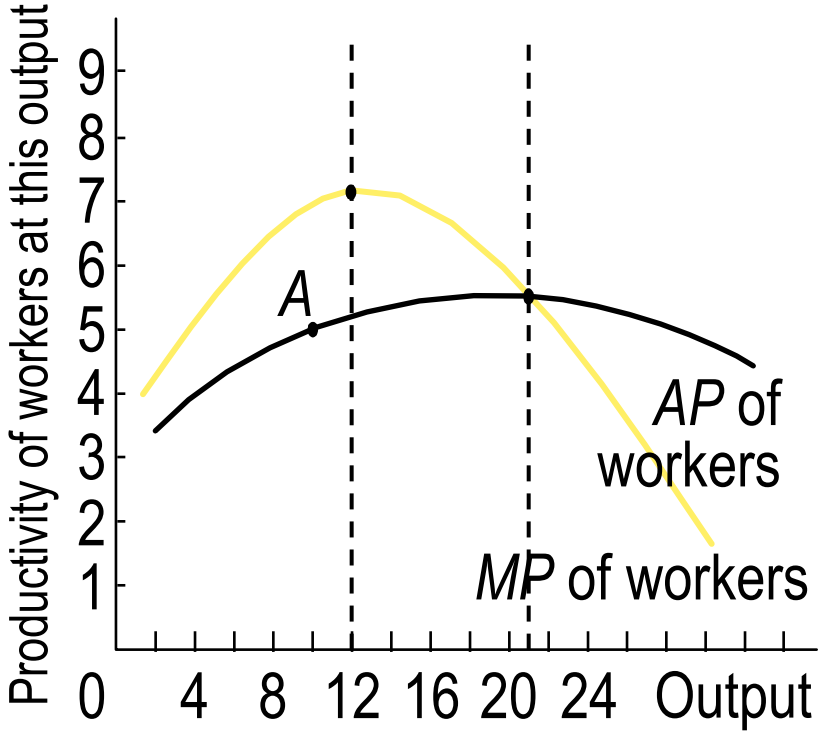
- The shapes of the cost curves are mirror-image reflections of the shapes of the corresponding productivity curves.

The Relationship Between Productivity and Costs

- When one is increasing, the other is decreasing.
  - When one is at a maximum, the other is at a minimum.

The Relationship Between Productivity and Costs





Relationship Between Marginal and Average Costs

- The marginal cost and average cost curves are related.
  - When marginal cost exceeds average cost, average cost must be rising.
  - When marginal cost is less than average cost, average cost must be falling.

Relationship Between Marginal and Average Costs

- This relationship explains why marginal cost curves always intersect average cost curves at the minimum of the average cost curve.

Relationship Between Marginal and Average Costs

- The position of the marginal cost relative to average total cost tells us whether average total cost is rising or falling.

Relationship Between Marginal and Average Costs

- To summarize:

  If MC > ATC, then ATC is rising.

  If MC = ATC, then ATC is at its low point.

  If MC < ATC, then ATC is falling.

Relationship Between Marginal and Average Costs

- Marginal and average total cost reflect a general relationship that also holds for marginal cost and average variable cost.

If MC > AVC, then AVC is rising.

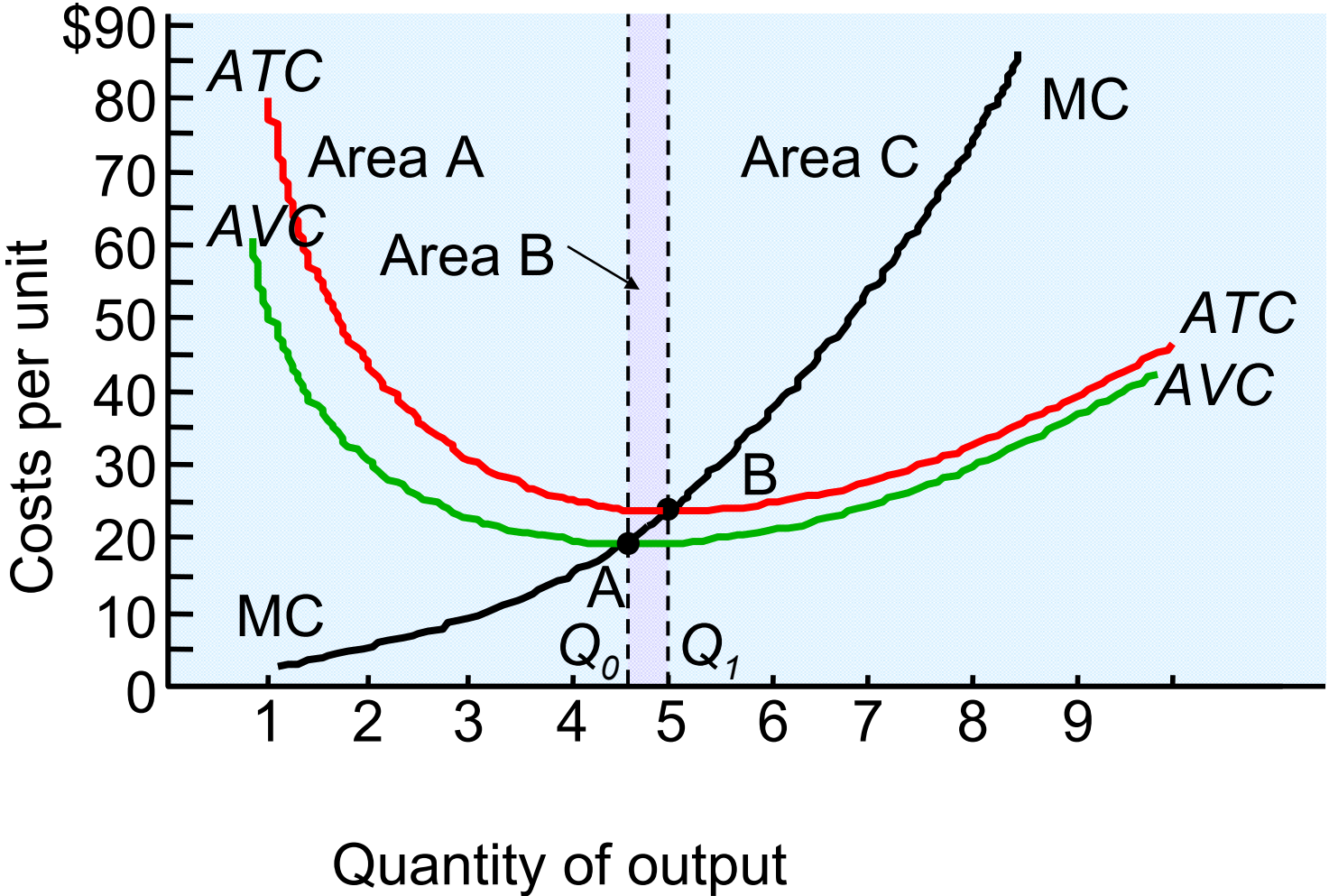
If MC = AVC, then AVC is at its low point.

If MC < AVC, then AVC is falling.

Relationship Between Marginal and Average Costs

- Average total cost will fall when marginal cost is above average variable cost, so long as average variable cost does not rise by more than average fixed cost falls.

Relationship Between Marginal and Average Costs



Production and Cost Analysis: Part I

End of Chapter 9

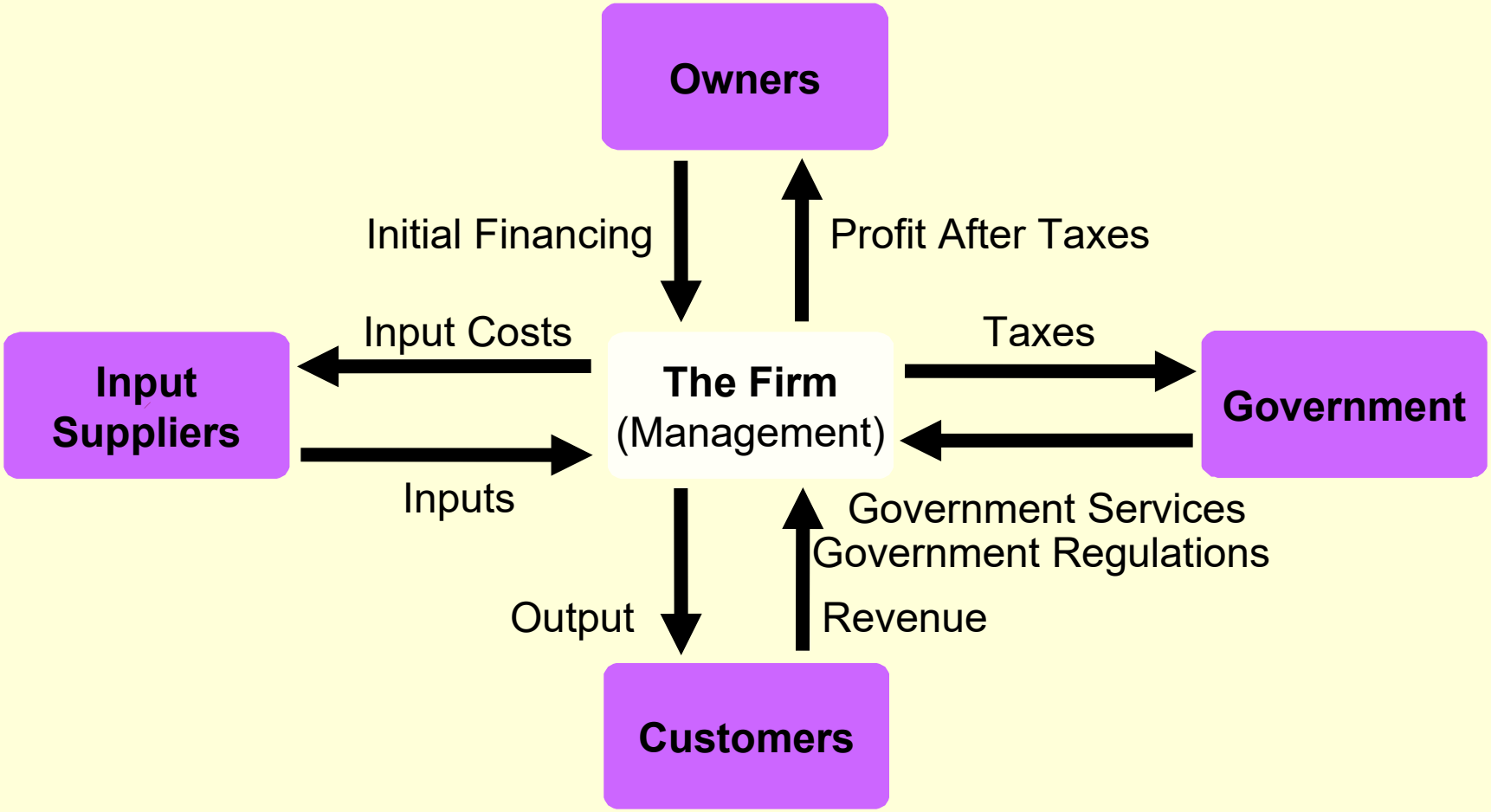
Theory of the Firm: Production & Cost

- A business firm is an organization, owned and operated by private individuals, that specializes in production
- Production is the process of combining inputs to make outputs
- The firm buys inputs from households or other firms and sells its output to consumers
- Profit of the firm = sales revenue – input costs

The Nature of the Firm

- Every firm must deal with the government
  - Pays taxes to the government
  - Must obey government laws and regulations
  - Receive valuable services from the government
    - Public capital
    - Legal systems
    - Financial systems

Fig. 1 The Firm and Its Environment



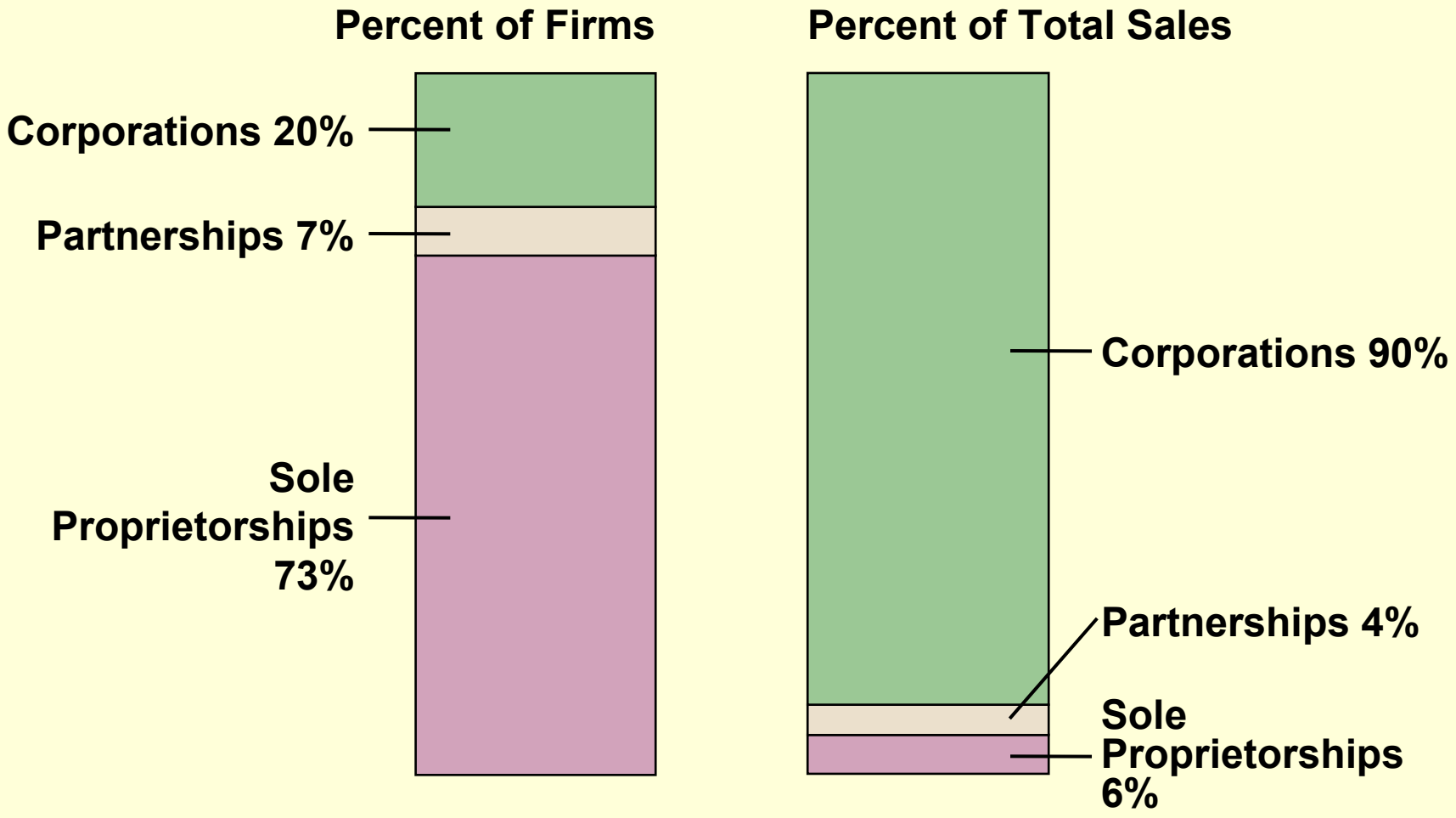
Types of Business Firms

- There are about 24 million business firms in United States—each of them falls into one of three legal categories
  - A sole proprietorship
    - A firm owned by a single individual
  - A partnership
    - A firm owned and usually operated by several individuals who share in the profits and bear personal responsibility for any losses
  - Both of the above face
    - Unlimited liability
      - Each owner is held personally responsible for the obligations of the firm
    - The difficulty of raising money to expand the business
      - Each partner bears full responsibility for the poor judgment of any one of them

Types of Business Firms

- A corporation
  - Owned by those who buy shares of stock and whose liability is limited to the amount of their investment in the firm
  - Ownership is divided among those who buy shares of stock
  - Each share of stock entitles its owner to a share of the corporation's profit
    - Some of this is paid out in dividends
- If the corporation needs additional funds it may sell more stock
- Offers the stockholder limited liability

Figure 2: Forms of Business Organization



Why a Firm?

- Most firms have employees
  - People who work for a wage or salary, but are not themselves owners
- Each worker could operate his own one-person firms as independent contractors
  - So why don't more of us do this?

The Advantages of Employment

- Gains from specialization
- Lower transaction costs
- Reduced risk

Further Gains From Specialization

- Independent contractor must
  - Design the good
  - Make the good
  - Deal with customers
  - Advertise services
- At a factory each of these tasks would be performed by different individuals who would work full time at their activity

Lower Transaction Costs

- Transaction costs are time costs and other costs required to carry out market exchanges
- In a firm with employees many supplies and services can be produced inside the organization
  - Firm can enjoy significant savings on transaction costs

Reduced Risk

- Large firm with employees offers opportunities for everyone involved to reduce risk through
  - Diversification
    - Process of reducing risk by spreading sources of income among different alternatives
- With large firms, two kinds of diversification are possible
  - Within the firm
  - Among firms
- These advantages help it attract customers, workers, and potential owners

The Limits to the Firm

- You might be tempted to conclude that bigger is always better
  - The larger the firm, the greater will be the cost savings
- However, there are limits

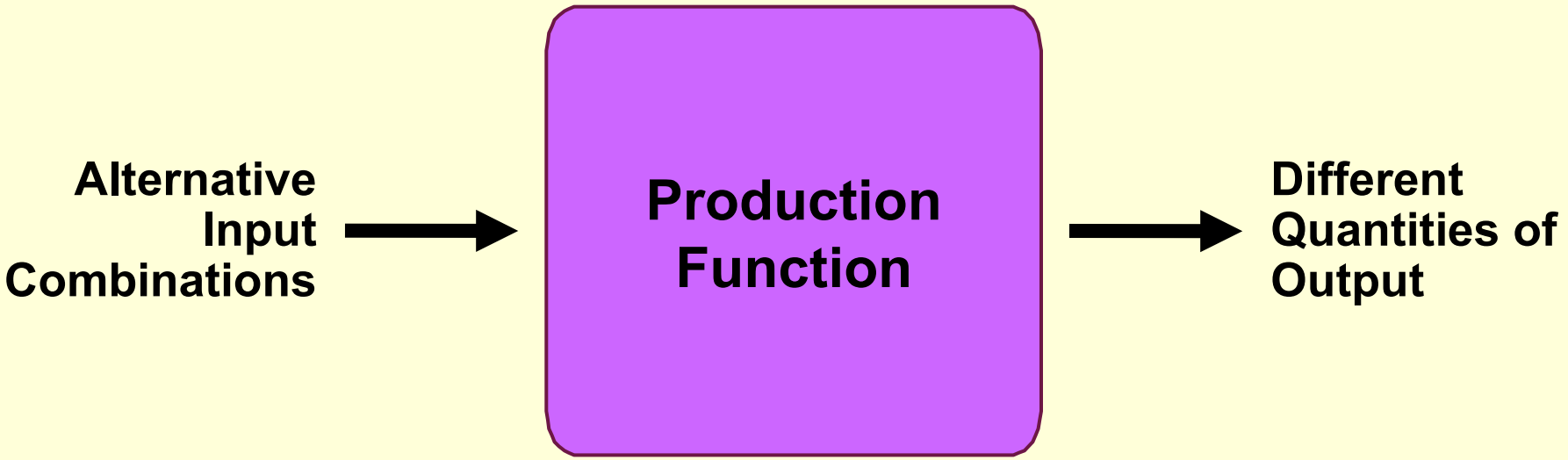
Thinking About Production

- Production involves using inputs to produce an output
- Inputs include resources
  - Labor
  - Capital
  - Land
  - Raw materials
  - Other goods and services provided by other firms
- Way in which these inputs may be combined to produce output is the firm's technology

Production technology

- A firm's technology is treated as a given
  - Constraint on its production, which is spelled out by the firm's **production function**
  - For each different combination of inputs, the production function tells us the maximum quantity of output a firm can produce over some period of time

Figure 3: The Firm's Production Function



The Short Run and the Long Run

- Useful to categorize firms' decisions into
  - Long-run decisions
  - Short-run decisions
- To guide the firm over the next several years
  - Manager must use the long-run lens
- To determine what the firm should do next week
  - Short run lens is best

Production in the Short Run

- When firms make short-run decisions, there is nothing they can do about their fixed inputs

- Fixed inputs
  - An input whose quantity must remain constant, regardless of how much output is produced
- Variable input
  - An input whose usage can change as the level of output changes
- Total product
  - Maximum quantity of output that can be produced from a given combination of inputs

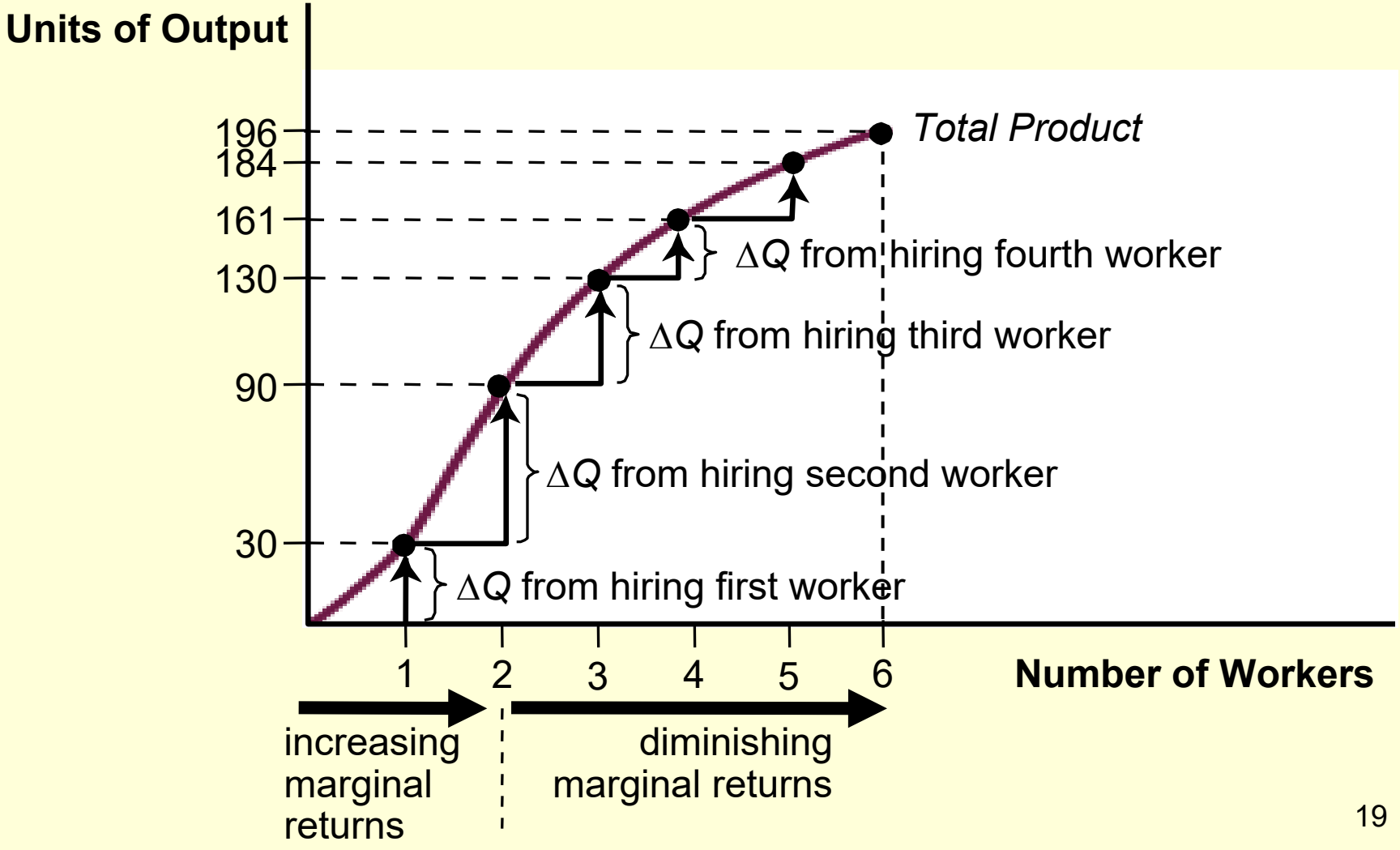
Production in the Short Run

- Marginal product of labor (MPL) is the change in total product (ΔQ) divided by the change in the number of workers hired (ΔL)

$$MPL = \frac{\Delta Q}{\Delta L}$$

  - Tells us the rise in output produced when one more worker is hired, leaving all other inputs unchanged

Figure 4: Total and Marginal Product



Marginal Returns To Labor

- As more and more workers are hired
  - MPL first increases
  - Then decreases
- Pattern is believed to be typical at many types of firms

Increasing Marginal Returns to Labor

- When the marginal product of labor increases as employment rises, we say there are increasing marginal returns to labor
  - Each time a worker is hired, total output rises by more than it did when the previous worker was hired

Diminishing Returns To Labor

- When the marginal product of labor is decreasing
  - There are diminishing marginal returns to labor
  - Output rises when another worker is added so marginal product is positive
  - But the rise in output is smaller and smaller with each successive worker
- Law of diminishing (marginal) returns states that as we continue to add more of any one input (holding the other inputs constant)
  - Its marginal product will eventually decline

Costs

- A firm's total cost of producing a given level of output is the opportunity cost of the owners
  - Everything they must give up in order to produce that amount of output

The Irrelevance of Sunk Costs

- Sunk cost is one that already has been paid, or must be paid, regardless of any future action being considered
- Should not be considered when making decisions
- Even a future payment can be sunk
  - If an unavoidable commitment to pay it has already been made

Explicit vs. Implicit Costs

- Types of costs
  - Explicit (involving actual payments)
    - Money actually paid out for the use of inputs
  - Implicit (no money changes hands)
    - The cost of inputs for which there is no direct money payment

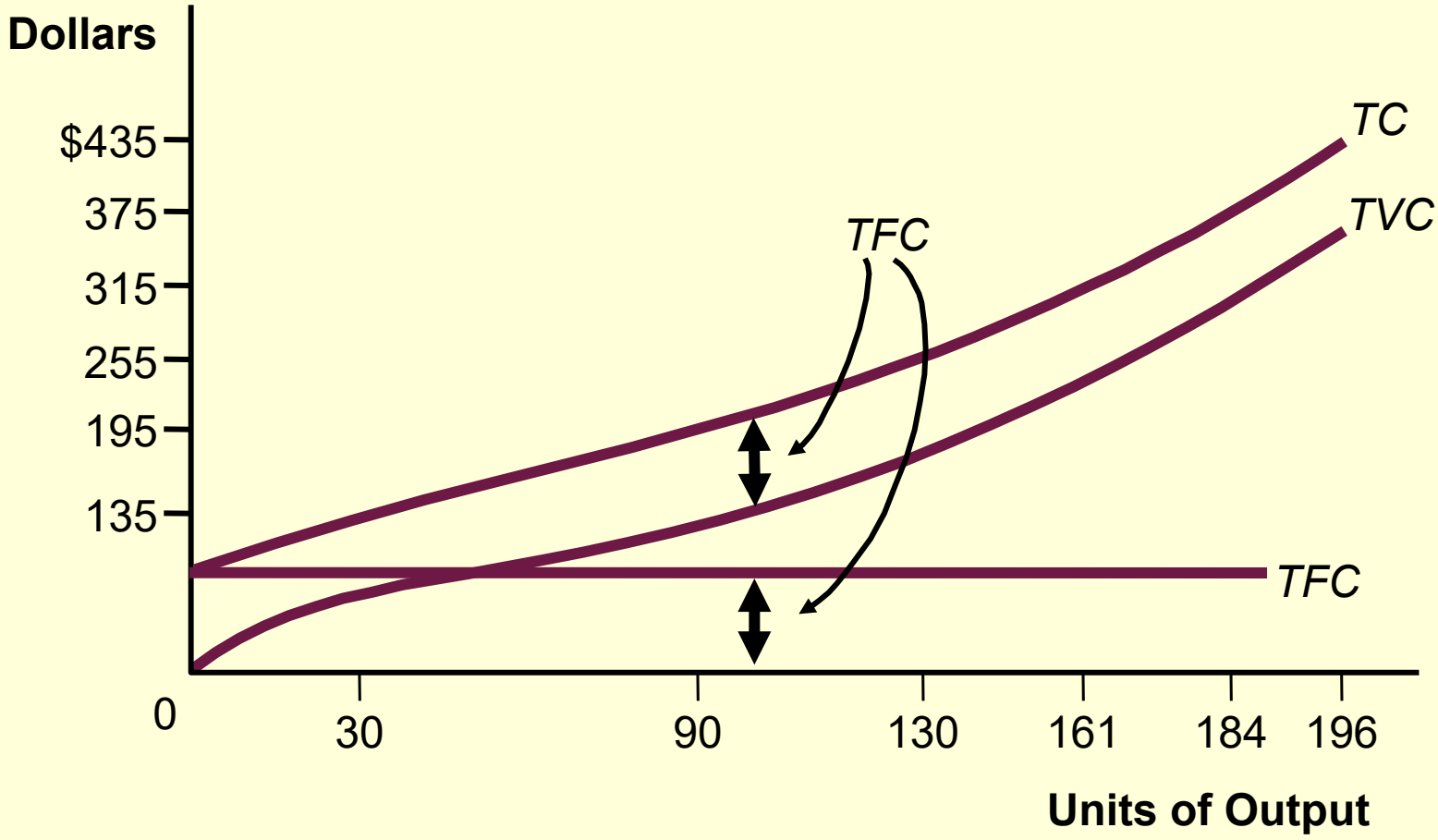
Costs in the Short Run

- Fixed costs
  - Costs of a firm's fixed inputs
- Variable costs
  - Costs of obtaining the firm's variable inputs

Measuring Short Run Costs: Total Costs

- Types of total costs
  - Total fixed costs
    - Cost of all inputs that are fixed in the short run
  - Total variable costs
    - Cost of all variable inputs used in producing a particular level of output
  - Total cost
    - Cost of all inputs—fixed and variable
    - TC = TFC + TVC

Figure 5: The Firm's Total Cost Curves



Average Costs

- Average fixed cost (AFC)
  - Total fixed cost divided by the quantity of output produced

$$AFC = \frac{TFC}{Q}$$

- Average variable cost (TVC)
  - Total variable cost divided by the quantity of output produced

$$AVC = \frac{TVC}{Q}$$

- Average total cost (TC)
  - Total cost divided by the quantity of output produced

$$ATC = \frac{TC}{Q}$$

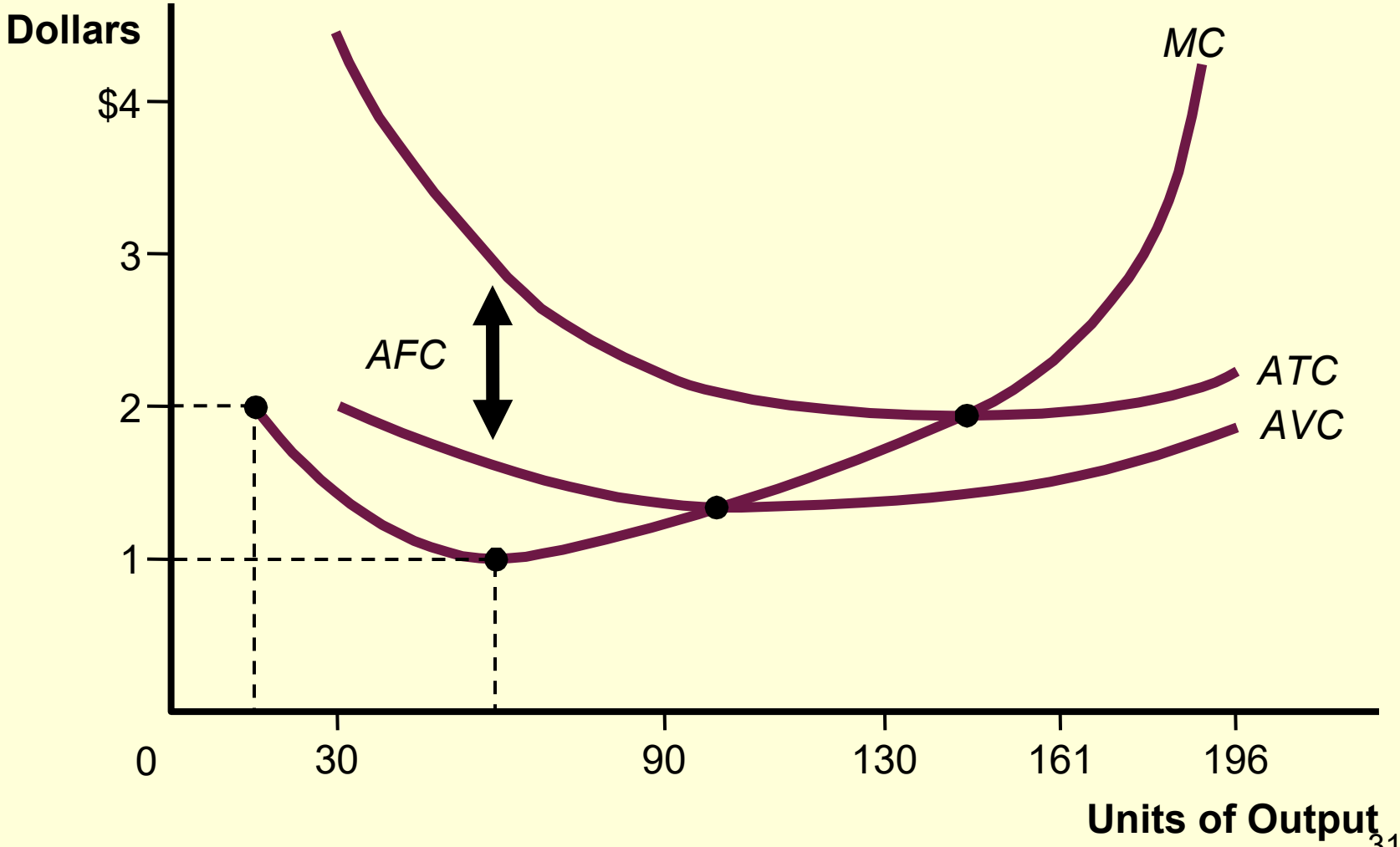
Marginal Cost

- Marginal Cost
  - Increase in total cost from producing one more unit or output
- Marginal cost is the change in total cost (ΔTC) divided by the change in output (ΔQ)

$$MC = \frac{\Delta TC}{\Delta Q}$$

  - Tells us how much cost rises per unit increase in output
  - Marginal cost for any change in output is equal to shape of total cost curve along that interval of output

Figure 6: Average And Marginal Costs



Explaining the Shape of the Marginal Cost Curve

- When the marginal product of labor (MPL) rises (falls), marginal cost (MC) ___ (___)
- Since MPL ordinarily rises and then falls, MC will do the _____—it will ____ and then _____

  – Thus, the MC curve is U-shaped

Average And Marginal Costs

- At low levels of output, the MC curve lies below the AVC and ATC curves
  - These curves will slope downward
- At higher levels of output, the MC curve will rise above the AVC and ATC curves
  - These curves will slope upward
- As output increases; the average curves will first slope downward and then slope upward
  - Will have a U-shape
- MC curve will intersect the minimum points of the AVC and ATC curves

Production And Cost in the Long Run

- In the long run, there are no fixed inputs or fixed costs - All inputs and all costs are variable

- The firm's goal is to earn the highest possible profit
  - To do this, it must follow the least cost rule

Production And Cost in the Long Run

- Long-run total cost
  - The cost of producing each quantity of output when the least-cost input mix is chosen in the long run
- Long-run average total cost
  - The cost per unit of output in the long run, when all inputs are variable
- The long-run average total cost (LRATC)
  - Cost per unit of output in the long-run

$$\text{LRATC} = \frac{\text{LRTC}}{\text{Q}}$$

The Relationship Between Long-Run And Short-Run Costs

- For some output levels, LRTC is smaller than TC
- Long-run total cost can never be _____ than, short-run total cost (LRTC __ TC)
- Long-run average cost can be never be _____ than the short–run average total cost (LRATC __ ATC)

Average Cost And Plant Size

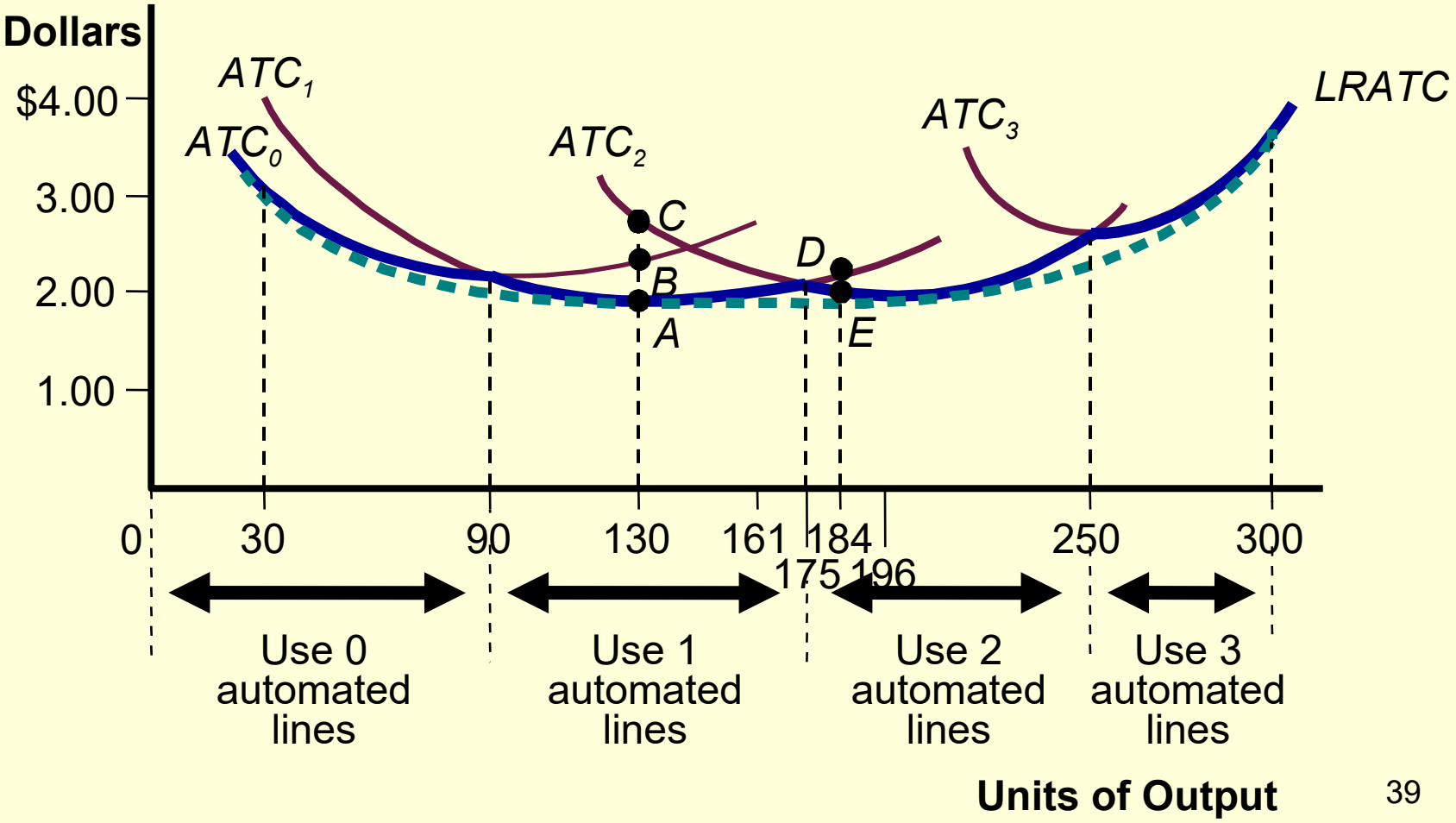
- Plant - Collection of fixed inputs at a firm's disposal
- In the long run, the firm can change the size of its plant
  - In the short run, it is stuck with its current plant size
- ATC curve tells us how average cost behaves in the short run, when the firm uses a plant of a given size

- To produce any level of output, it will always choose that ATC curve—among all of the ATC curves available—that enables it to produce at lowest possible average total cost

Graphing the LRATC Curve

- A firm's LRATC curve combines portions of each ATC curve available to firm in the long run
- In the short run, a firm can only move along its current ATC curve
- In the long run it can move from one ATC curve to another by varying the size of its plant

Figure 7: Long-Run Average Total Cost



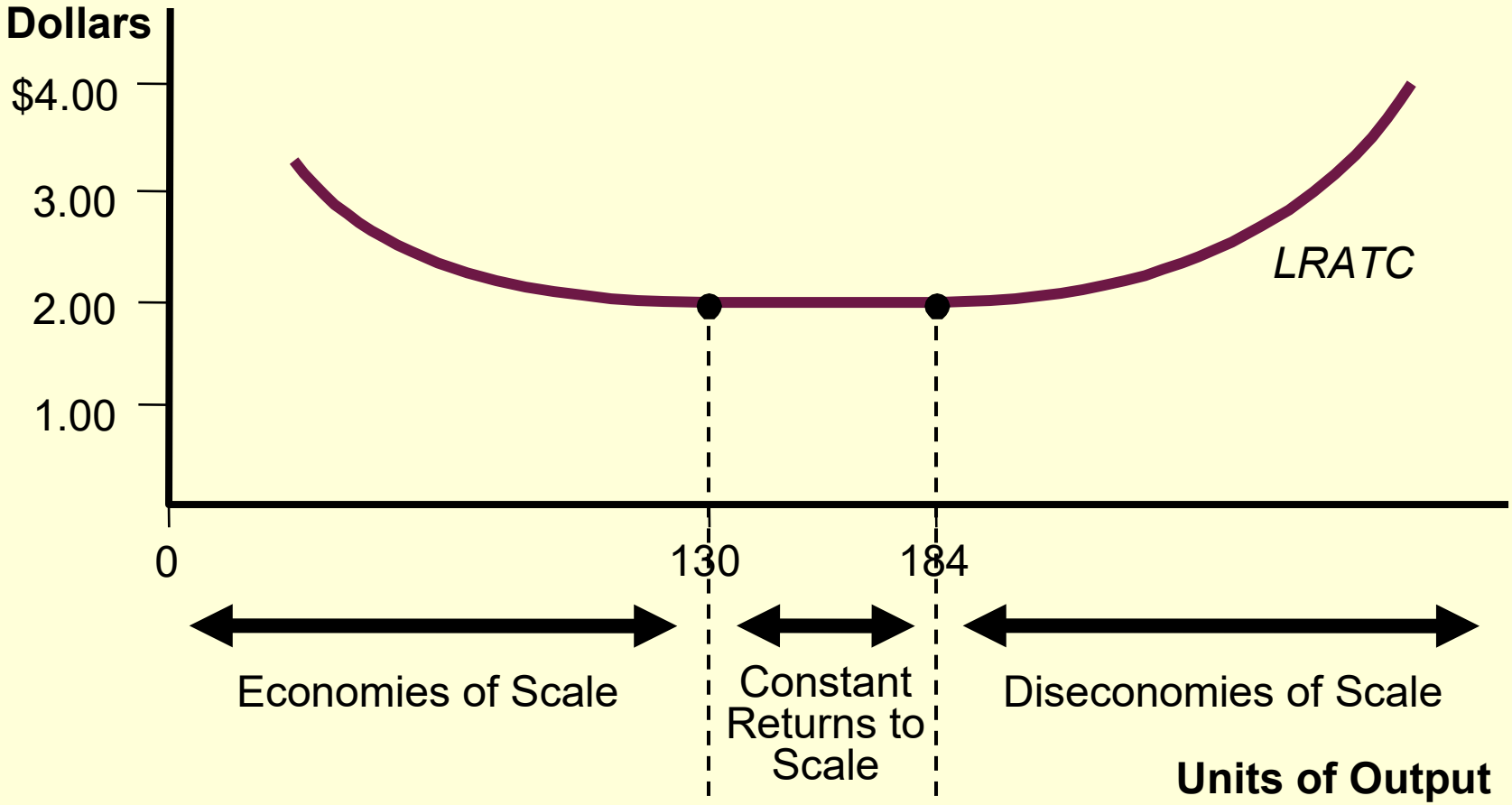
Economies of Scale

- Economics of scale
  - Long-run average age total cost _____ as output increases

- When an increase in output causes LRATC to _____, we say that the firm is enjoying economies of scale

- When long-run total cost rises proportionately less than output, production is characterized by economies of scale
  - LRATC curve slopes downward

Figure 8: The Shape Of LRATC



Gains From Specialization

- One reason for economies of scale is gains from specialization

- Opportunities for increased specialization occur at lower levels of output
  - With a relatively small plant and small workforce

More Efficient Use of Lumpy Inputs

- Economies of scale involves the “lumpy” nature of many types of plant and equipment
- Plant and equipment must be purchased in large lumps
- Making more efficient use of lumpy inputs will have more impact on LRATC at low levels of output
  - When these inputs make up a greater proportion of the firm’s total costs

Diseconomies of Scale

- Long-run average total cost _____ as output increases
- As output continues to increase, most firms will reach a point where bigness begins to cause problems
- When long-run total cost rises more than in proportion to output, there are diseconomies of scale
  - LRATC curve slopes upward
- Diseconomies of scale are more likely at higher output levels

Constant Returns To Scale

- Long-run average total cost ___ _____ as output increases

- When both output and long-run total cost rise by the same proportion, production is characterized by constant returns to scale
  - LRATC curve is flat

In sum…

- The LRATC, often shows the following pattern
  - Economies of scale (decreasing LRATC) at relatively low levels of output
  - Constant returns to scale (constant LRATC) at some intermediate levels of output
  - Diseconomies of scale (increasing LRATC) at relatively high levels of output
- This is why LRATC curves are typically U-shaped

Long Run Costs, Market Structure and Mergers

- The number of firms in a market determines the market structure

- What accounts for these differences in the number of sellers in the market?
  - Shape of the LRATC curve plays an important role in the answer

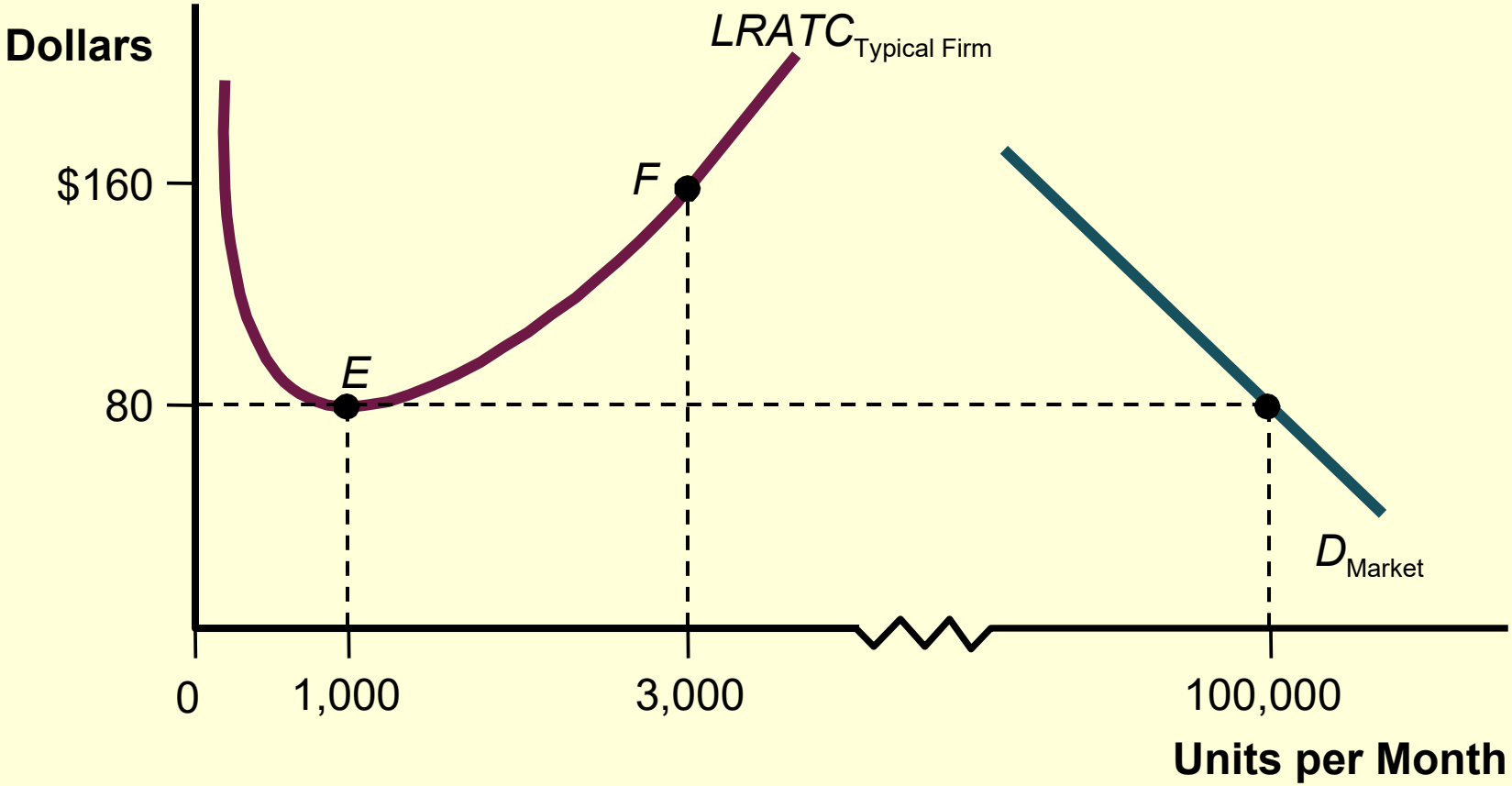
LRATC and the Size of Firms

- The output level at which the LRATC first hits bottom is known as the minimum efficient scale (MES) for the firm
  - Lowest level of output at which it can achieve minimum cost per unit
- Can also determine the maximum possible total quantity demanded by using market demand curve
- Applying these two curves—the LRATC for the typical firm, and the demand curve for the entire market—to market structure
  - When the MES is small relative to the maximum potential market
    - Firms that are relatively small will have a cost advantage over relatively large firms
    - Market should be populated by many small firms, each producing for only a tiny share of the market

LRATC and the Size of Firms

- There are significant economies of scale that continue as output increases
  - Even to the point where a typical firm is supplying the maximum possible quantity demanded
- This market will gravitate naturally toward monopoly
- In some cases the MES occurs at 25% of the maximum potential market
  - In this type of market, expect to see a few large competitors
- There are significant lumpy inputs that create economies of scale
  - Until each firm has expanded to produce for a large share of the market

Figure 9: How LRATC Helps Explain Market Structure



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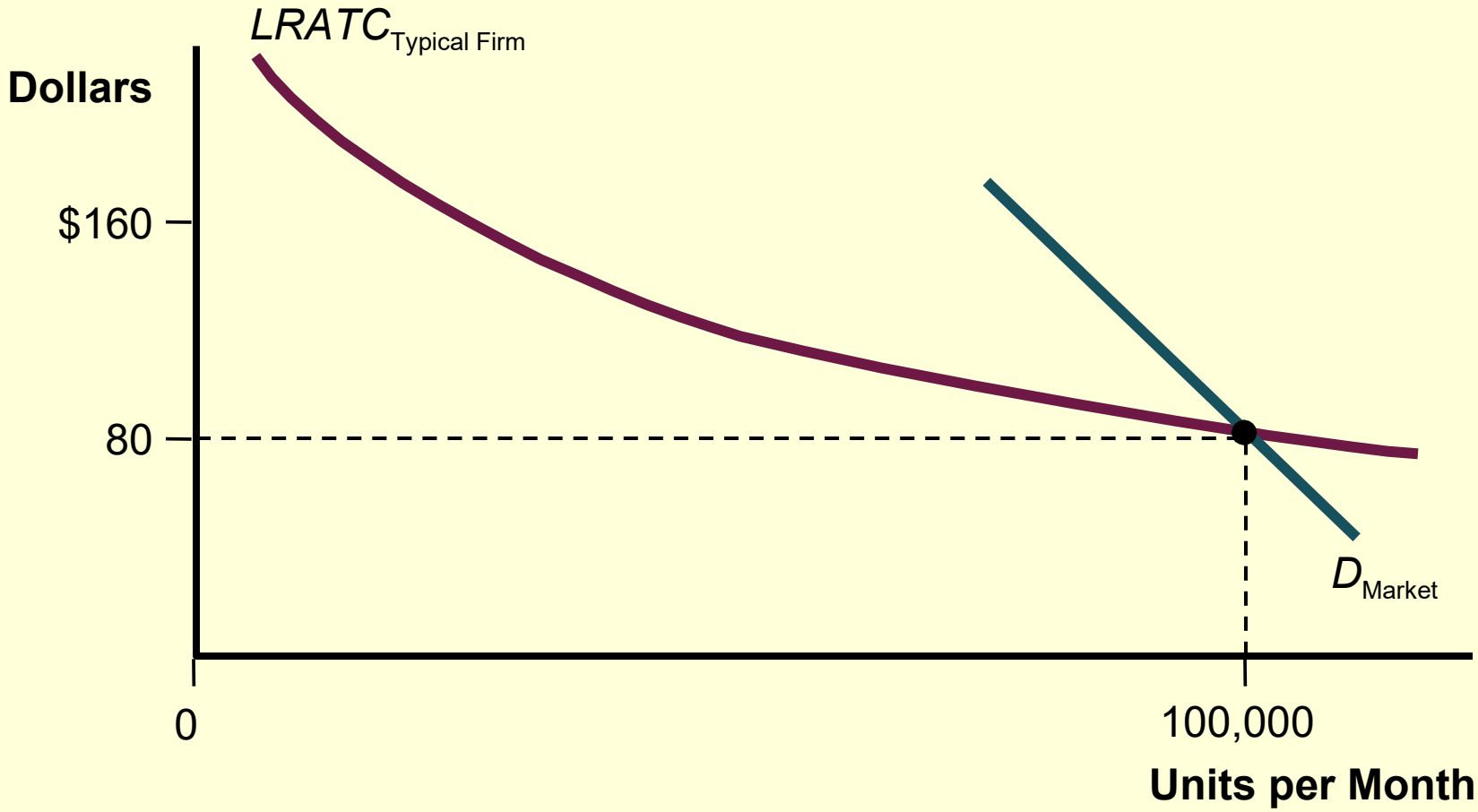

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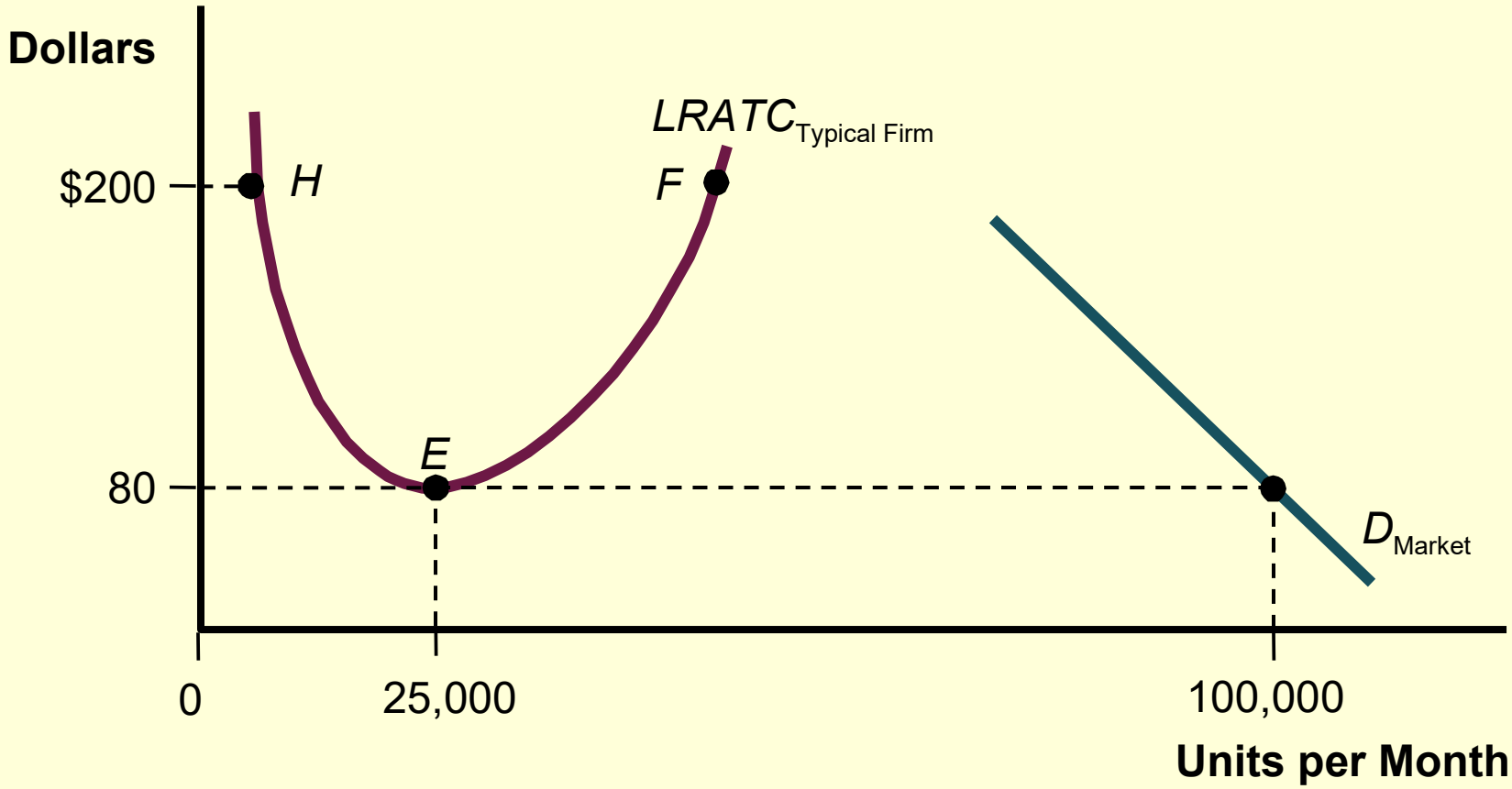

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