Theory of Cost and Revenue

What is a basic assumption in economics?

The motivation for business decisions is profit maximization

To understand Profit, what is necessary?

To distinguish between the way economists measure costs and the way accountants measure costs

What are Explicit Costs?

Payments to nonowners of a firm for their resources

What are Implicit Costs?

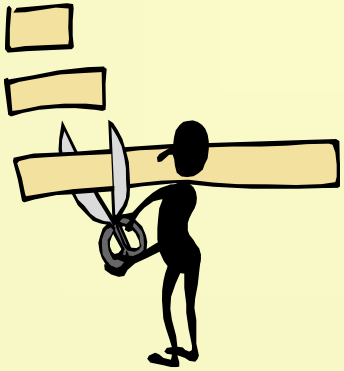
- The opportunity costs of using resources owned by the firm
- Implicit costs are non-monetary opportunity costs, such as the wages that the owner of a firm could have earned if he or she worked for someone else.

What is an example of Implicit Costs?

When you invest your nest egg in your own enterprise, you give up earning interest on that money

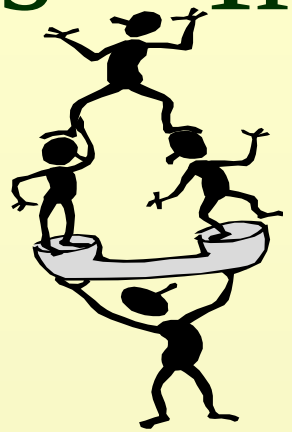
How is Accounting Profit defined?

Total revenue minus total explicit costs



What are Total Opportunity Costs?

Explicit costs + Implicit costs



What is Economic Profit?

Total revenue minus
total opportunity costs

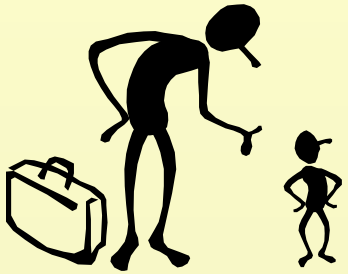
Computech's Accounting Versus Economic Profit

Item	Accounting Profit	Economic Profit
Total Revenue	$500,000	$500,000
Less Explicit costs:		
Wages & salaries	$400,000	$400,000
Materials	$50,000	$50,000
Interest paid	$10,000	$10,000
Other payments	$10,000	$10,000
Less implicit costs:		
Foregone salary	0	50,000
Foregone rent	0	10,000
Foregone interest	0	5,000
Equals profit	$30,000	-$30,000

Exhibit 1

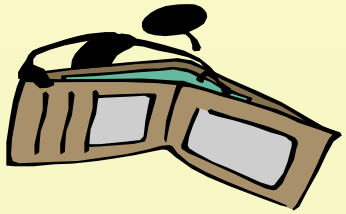
What is Normal Profit?

The minimum profit necessary to keep a firm in operation



When economists use the term "Profit", which profit do they mean?

Economic profit which, unlike accounting profit, includes implicit costs



What is a Fixed Input?

Any resource for which the quantity cannot change during the period of time under consideration

What is the Short Run?

A period of time so short that there is at least one fixed input

What is the Long Run?

A period of time so long that all inputs are variable

What is a Variable Input?

Any resource for which the quantity can change during the period of time under consideration

What is Total Fixed Cost?

Costs that do not vary as output varies and that must be paid even if output is zero

What is Total Variable Cost?

Costs that are zero when output is zero and vary as output varies

What is Total Cost?

The sum of total fixed cost and total variable cost at each level of output

$$TC = TFC + TVC$$

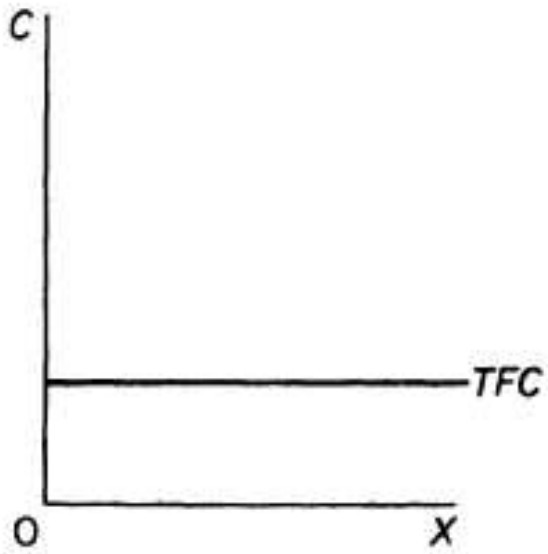


Figure 4.1

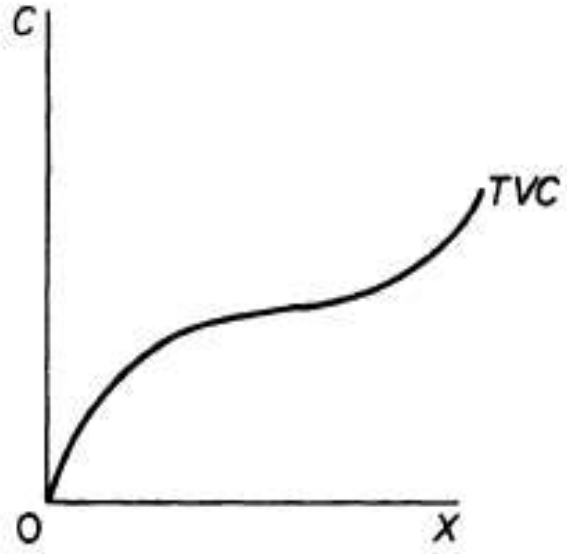


Figure 4.2

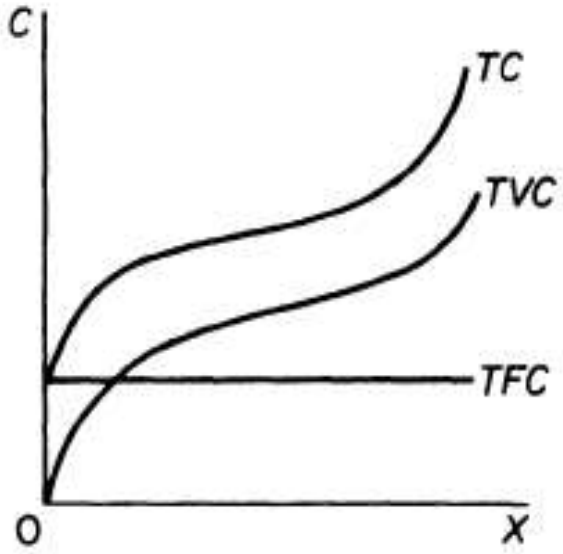


Figure 4.3

What is Average Fixed Cost?

Total fixed cost divided by the quantity of output produced

$$AFC = TFC / Q$$

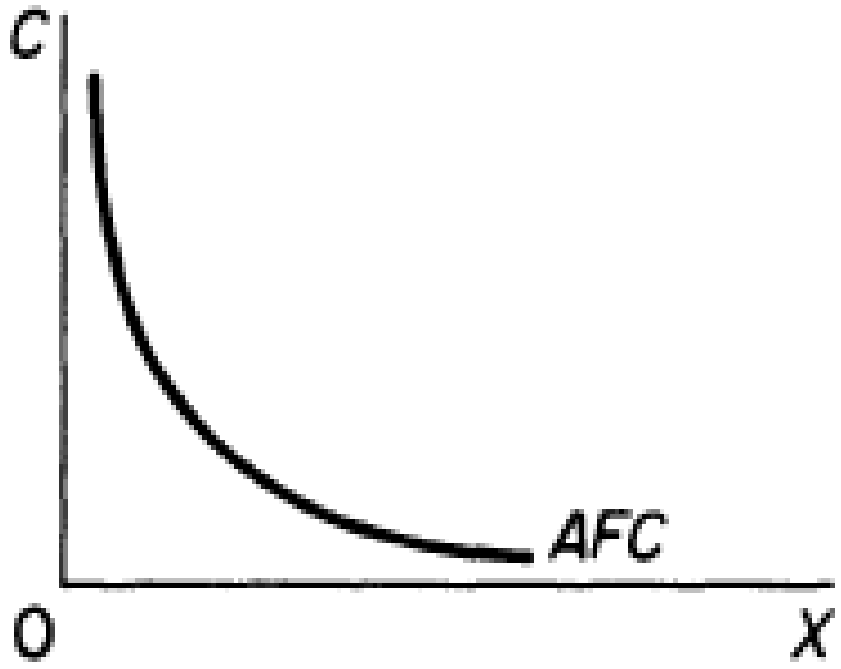


Figure 4.4

- The AFC curve is a rectangular hyperbola regardless of the shapes of the other cost curves.
- The fixed cost is spread over a larger number of units as output is expanded.
- Therefore AFC declines monotonically
- The vertical distance between the ATC and AVC curves equals AFC and hence decreases as output is increased.

What is Average Variable Cost?

Total variable cost divided by the quantity of output produced

$$AVC = TVC / Q$$

AVC curve derivation

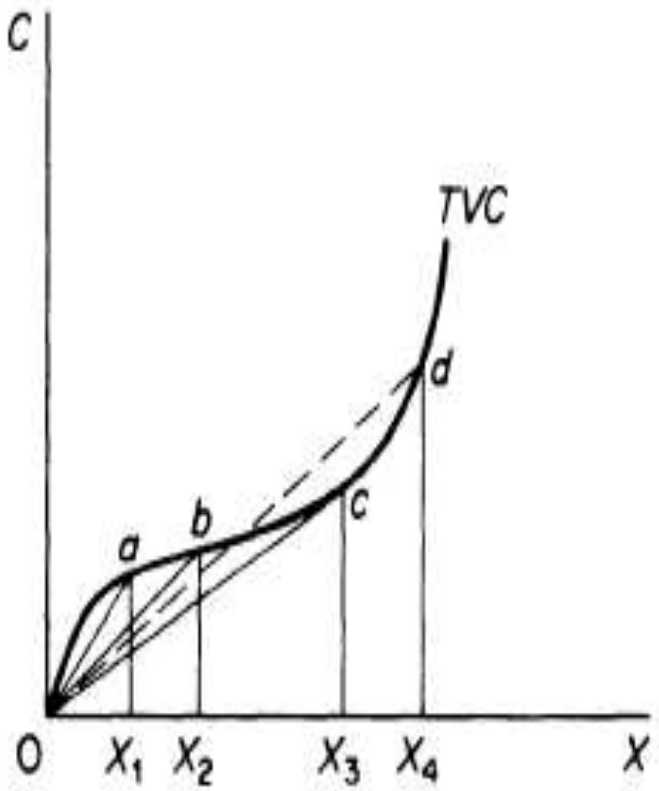


Figure 4.5

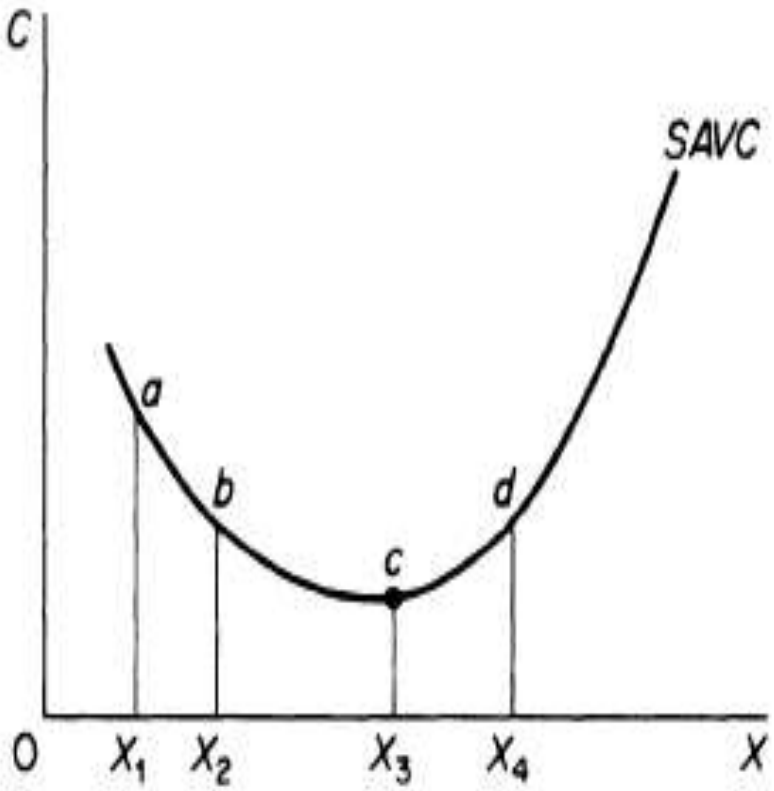
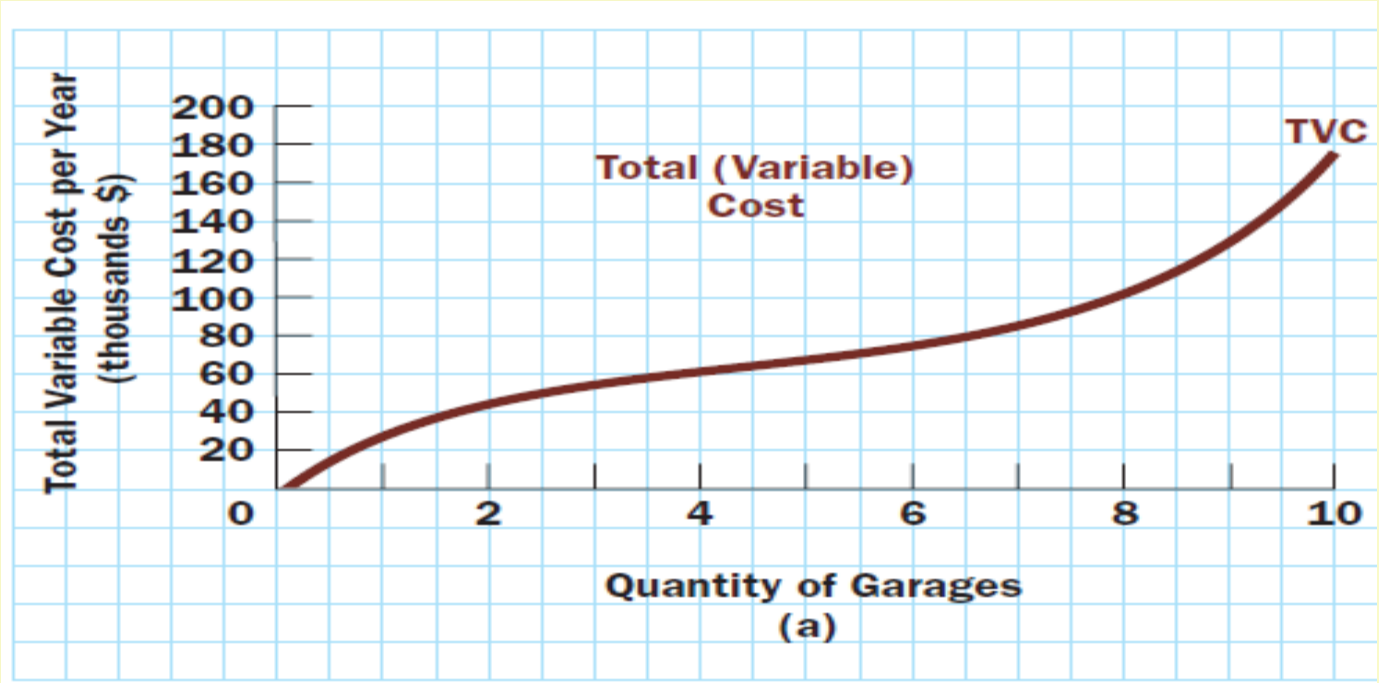


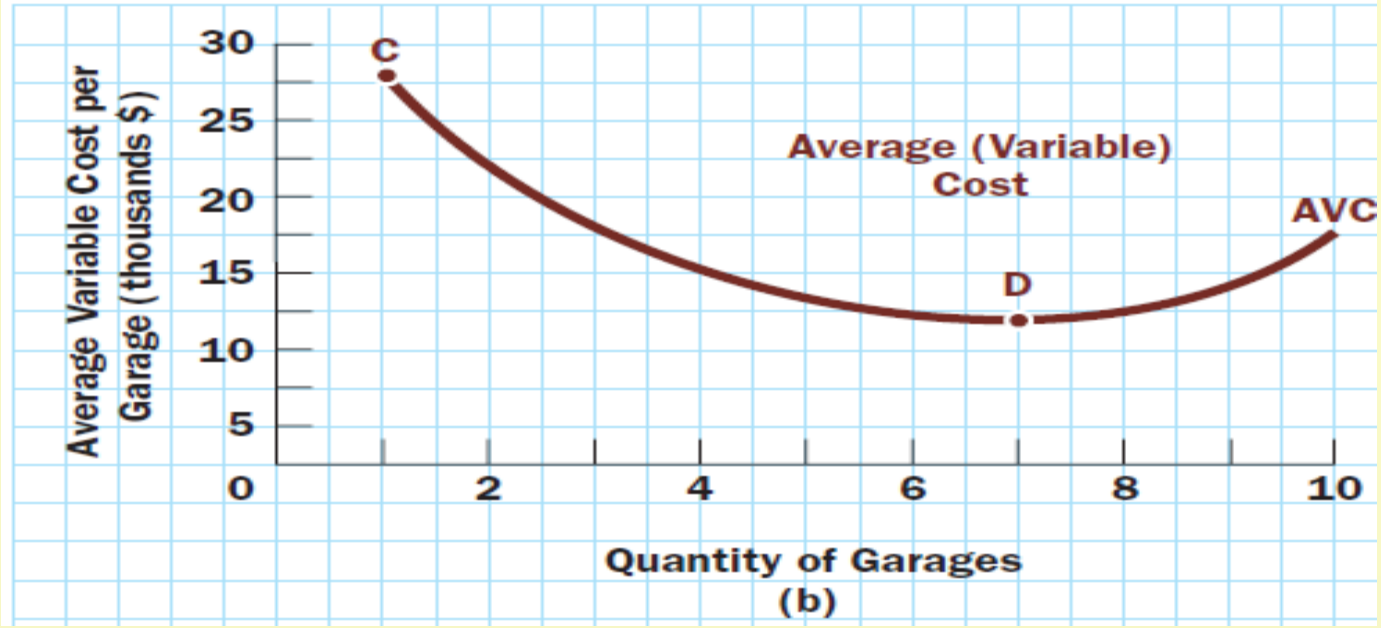
Figure 4.6

AVC curve derivation

- Graphically the *AVC at each level of output is derived from the slope of a line drawn* from the origin to the point on the *TVC curve corresponding to the particular level of* output.
- For example, in figure 4.5 the *AVC at X 1 is the slope of the ray Oa, the A VC at X 2 is the slope of the ray Ob, and so on*
- It is clear from figure 4.5 that the slope of a ray through the origin declines continuously until the ray becomes tangent to the *TVC*

curve at *c*.


Total Variable Cost per Year (thousands $)
200
180
160
140
120
100
80
60
40
20
0
2
4
6
8
10
Total (Variable) Cost
TVC
Quantity of Garages
(a)


Average Variable Cost per Garage (thousands $)
30
25
20
15
10
5
0
2
4
6
8
10
C
D
Average (Variable) Cost
AVC
Quantity of Garages
(b)

What is Average Total Cost?

Total cost divided by the quantity of output produced

$$ATC = AFC + AVC = TC/Q$$

Derivation of ATC

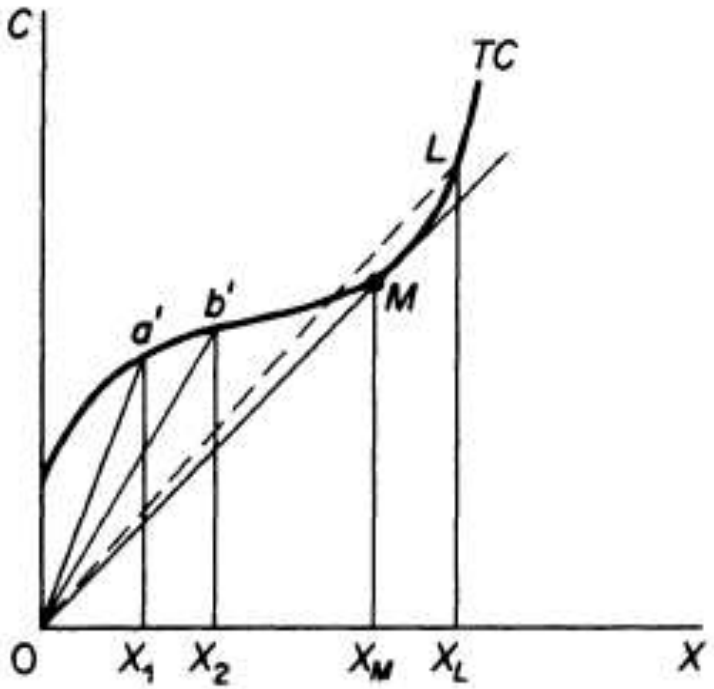


Figure 4.7

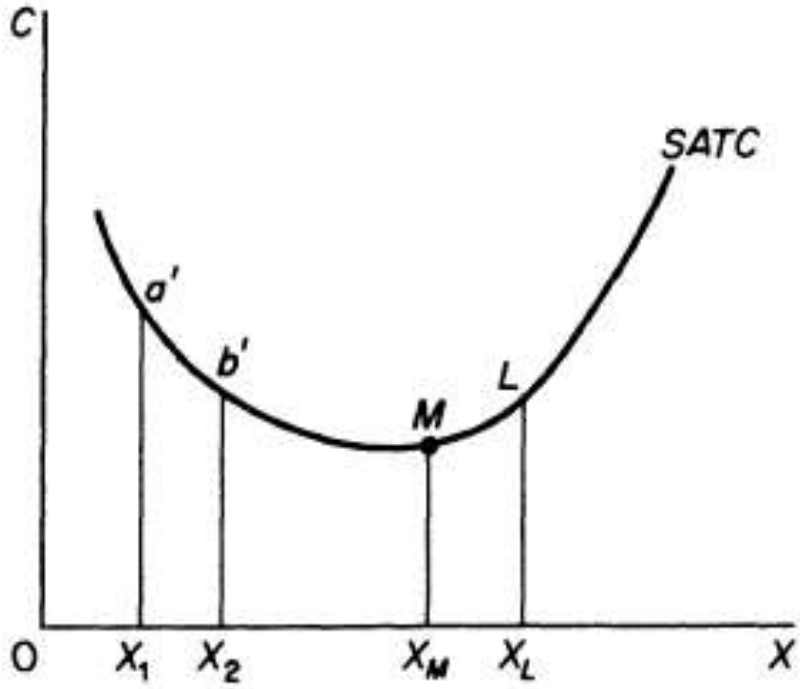


Figure 4.8

What is Marginal Cost?

The change in total cost when one unit of output is produced

$$MC = \Delta TC/\Delta Q = \Delta TVC/\Delta Q$$

MC derivation

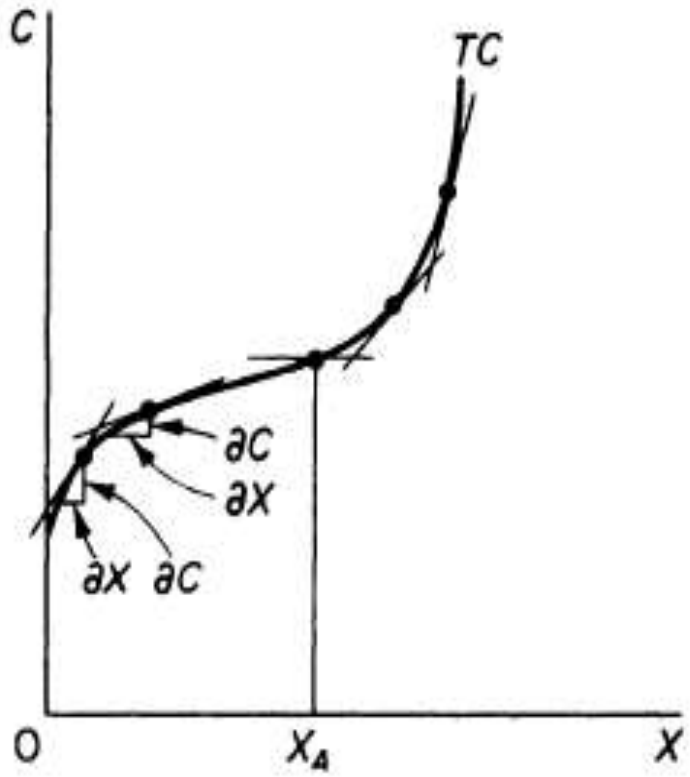


Figure 4.9

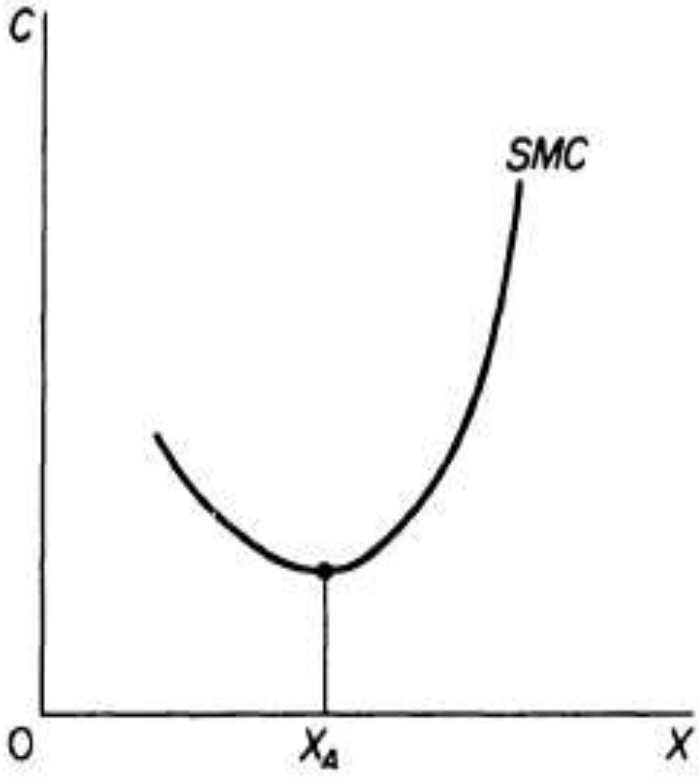


Figure 4.10

Illustrating cost curves

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Q	TFC ($)	TVC ($)	TC ($)	AFC ($)	AVC ($)	AC ($)	MC ($)
1	60	30	90	60	30.00	90.00	..
2	60	40	100	30	20.00	50.00	10
3	60	45	105	20	15.00	35.00	5
4	60	55	115	15	13.75	28.75	10
5	60	75	135	12	15.00	27.00	20
6	60	120	180	10	20.00	30.00	45

COSTS IN THE SHORT RUN

- Total cost is a cubic function of output
- ATC, AVC, and MC are all second-degree curves which first decline and then increase as output is expanded
- MC reaches its minimum before ATC and AVC, and AVC reaches its minimum before ATC
- The reader may verify that the MC curve passes through the minimum points of both the A VC and ATC curves

What is the Marginal-Average Rule?

When MC < AC, AC falls

When MC > AC, AC rises

If MC = AC, AC at minimum

When the MP_L is rising, the marginal cost of output will be falling.

When the MP_L is falling , the marginal cost of production will be rising.

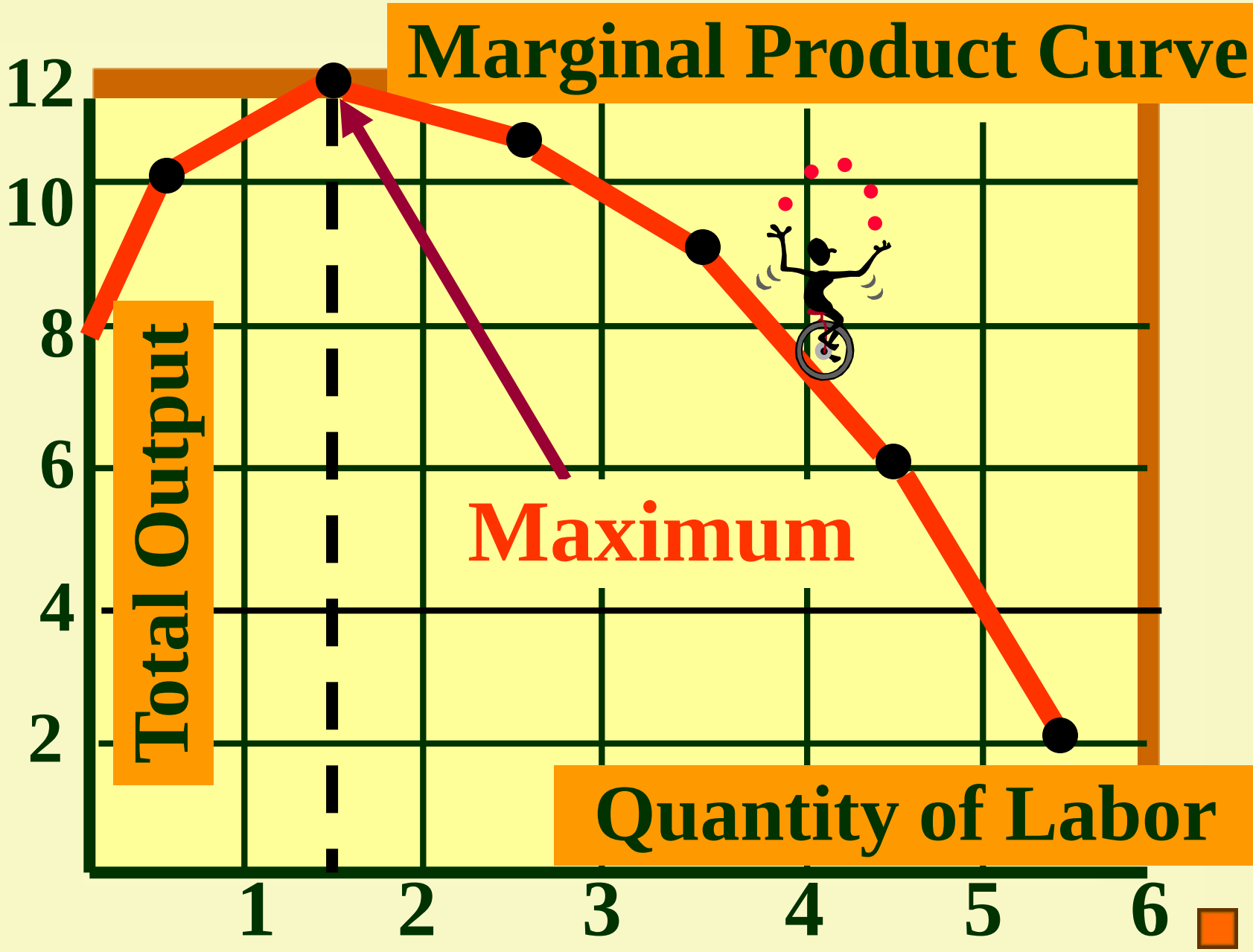
The MC falls and then rises –a U shaped- because the marginal product of labour rises and then falls

What is the relationship between slopes of the MC and MP curves?

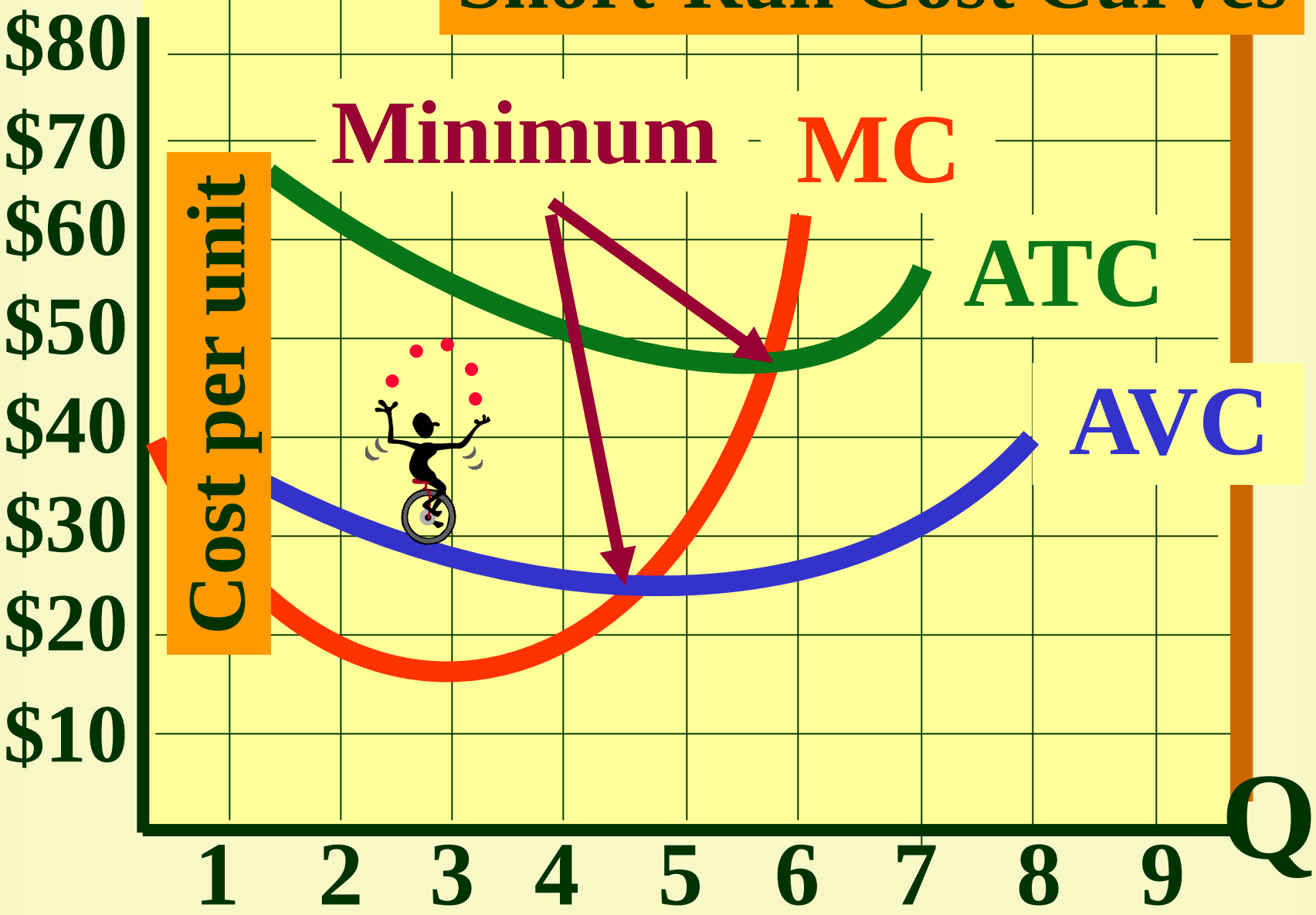
The rising portion of the MP curve corresponds to the declining portion of the MC curve, and vice versa

What is the relationship between the minimum and maximum points of the MR and MP curves?

The maximum point of the MP curve corresponds to the minimum point of the MC curve


Marginal Product Curve
12
10
8
6
4
2
Total Output
Maximum
Quantity of Labor
1
2
3
4
5
6

Short-Run Cost Curves



Production Function (PF)

The production function is the backbone of the Theory of the Firm.
The production function can be displayed in a variety of ways:

1. Product curves---short run PF

2. Isoquants---Long run PF

Product curves

Total product (TP)

Total product is the number of units of output produced.

Marginal Product (MP)

Marginal product is the additional output generated by additional input, ceteris paribus.

Average Product (AP)

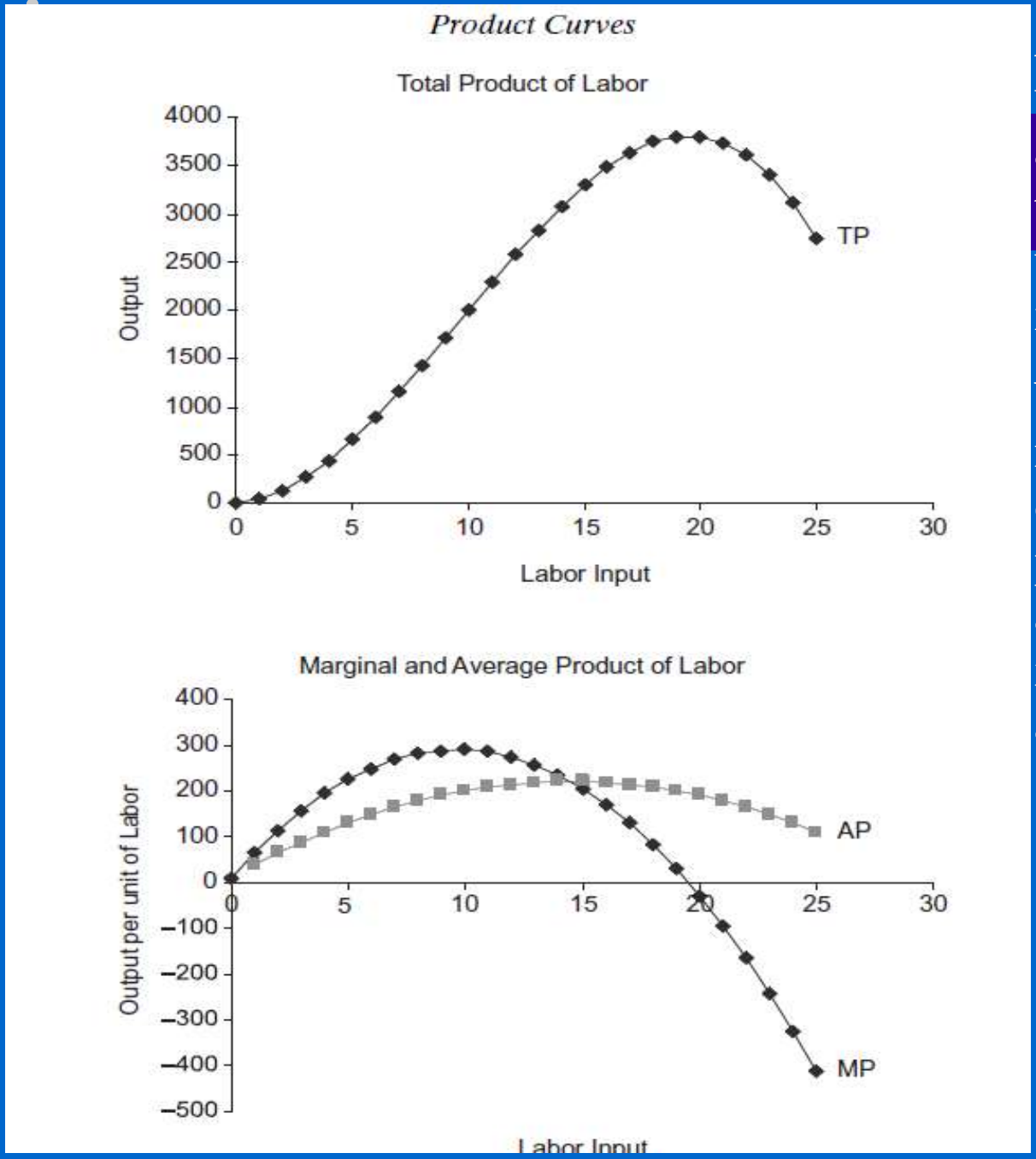
The average product is the output per input, ceteris paribus

The Law of ***Diminishing Returns***

The law says that as Labor increases, *ceteris paribus*, *output increases* at a ***decreasing rate.*** The Law of Diminishing Returns simply says that Marginal Product is decreasing.

Illustrating TP, MP and AP

Labor (L)	Total Product of Labor at K=4	Marginal Product of Labor at K=4	Average Product of Labor at K=4
0	0.0		
2	25.1	12.6	12.6
4	40.0	7.4	10.0
6	52.5	6.2	8.7
8	63.6	5.6	8.0
10	73.9	5.1	7.4



At low levels of labor use, output is increasing at an increasing rate so the TP curve is curved upward and MP is increasing.

When the MP curve reaches its peak, the TP curve is at an inflection point. From here, additional labor leads to increases in output, but at a decreasing rate

As more and more labor is used, TP reaches its maximum point (where marginal product is zero).

Product curves

Relationship between AP and MP curves

The MP curve intersects the AP curve at the maximum value of the AP curve

Whenever the marginal is greater than the average, the average must be rising and whenever the marginal is less than the average, the average must be falling.

Thus, the only time the two curves can meet is when the marginal equals the average.

Product curves

The Law of Diminishing Returns does not say that we always have diminishing returns for every level of labor use. Instead, the law says that, eventually, diminishing returns will set in.