HSS 201: Economics for Engineers

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Short and Long Run Costs

- In short run, there are fixed, as well as, variable costs
- In long, there are only variable costs

Fixed and Variable Cost

- Fixed Cost (FC): The cost does not vary with the change in output level.

- Variable Cost (FC): The cost does vary with the change in output level.

Fixed and Sunk Costs

Fixed costs are those costs that are paid by a firm irrespective of the level of output. These costs can be avoided if the firm goes out of business.

Examples of FC are salaries and wages of CEOs, Board of Directors, among others; office rent.

Sunk Costs are those cost that *cannot be recovered*. The cost of factor equipment such as machinery cannot be recovered fully even if the firm shuts down.

Types of Short Run Costs

1. Total Cost (TC) = Total Fixed Cost (TFC) + Total Variable Cost (TVC)
2. Average Cost (AC) = $\frac{TC}{Q}$
   - AC = Average Fixed Cost (AFC) + Average Variable Cost (AVC)
   - AFC = $\frac{TFC}{Q}$
   - AVC = $\frac{TVC}{Q}$
3. Marginal Cost (MC) = $\frac{dTC}{dQ} = \frac{dTFC}{dQ} + \frac{dTVC}{dQ}$

A Firm's Short Run Costs

Output	FC	VC	TC	AFC	AVC	ATC	MC
0	50	0	50	-	-	-	-
1	50	50	100	50	50	100	50
2	50	78	128	25	39	64	28
3	50	98	148	16.7	32.7	49.3	20
4	50	112	162	12.5	28	40.5	14
5	50	130	180	10	26	36	18
6	50	150	200	8.3	25	33.3	20
7	50	175	225	7.1	25	32.1	25
8	50	204	251	6.3	25.5	31.8	29
9	50	242	292	5.6	26.9	32.4	38
10	50	300	350	5	30	35	58
11	50	385	435	4.5	35	39.5	85

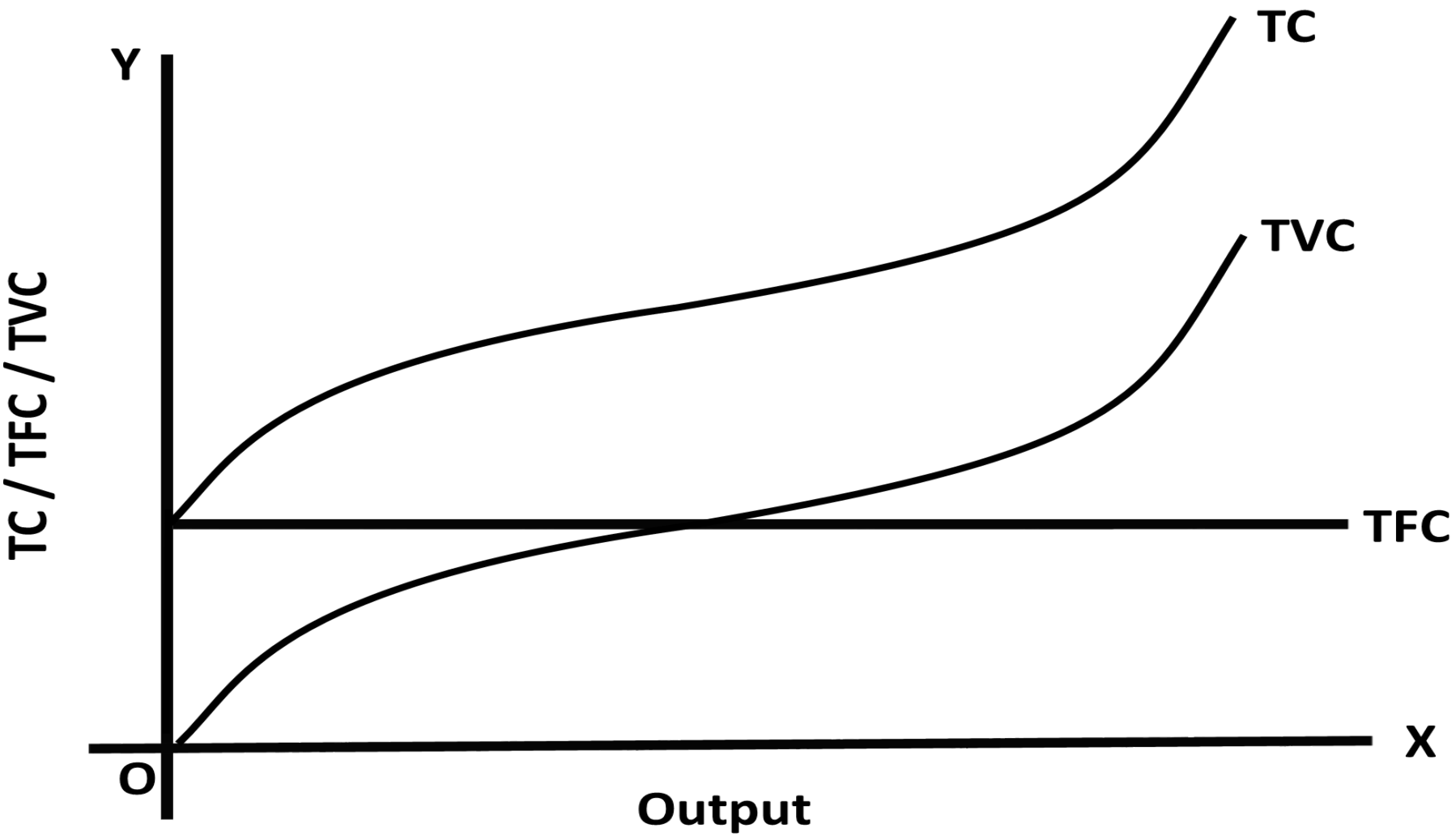
Arriving at Marginal Cost from Total Cost

At a prevaling wage rate, w, the firm can hire any amount of labor.

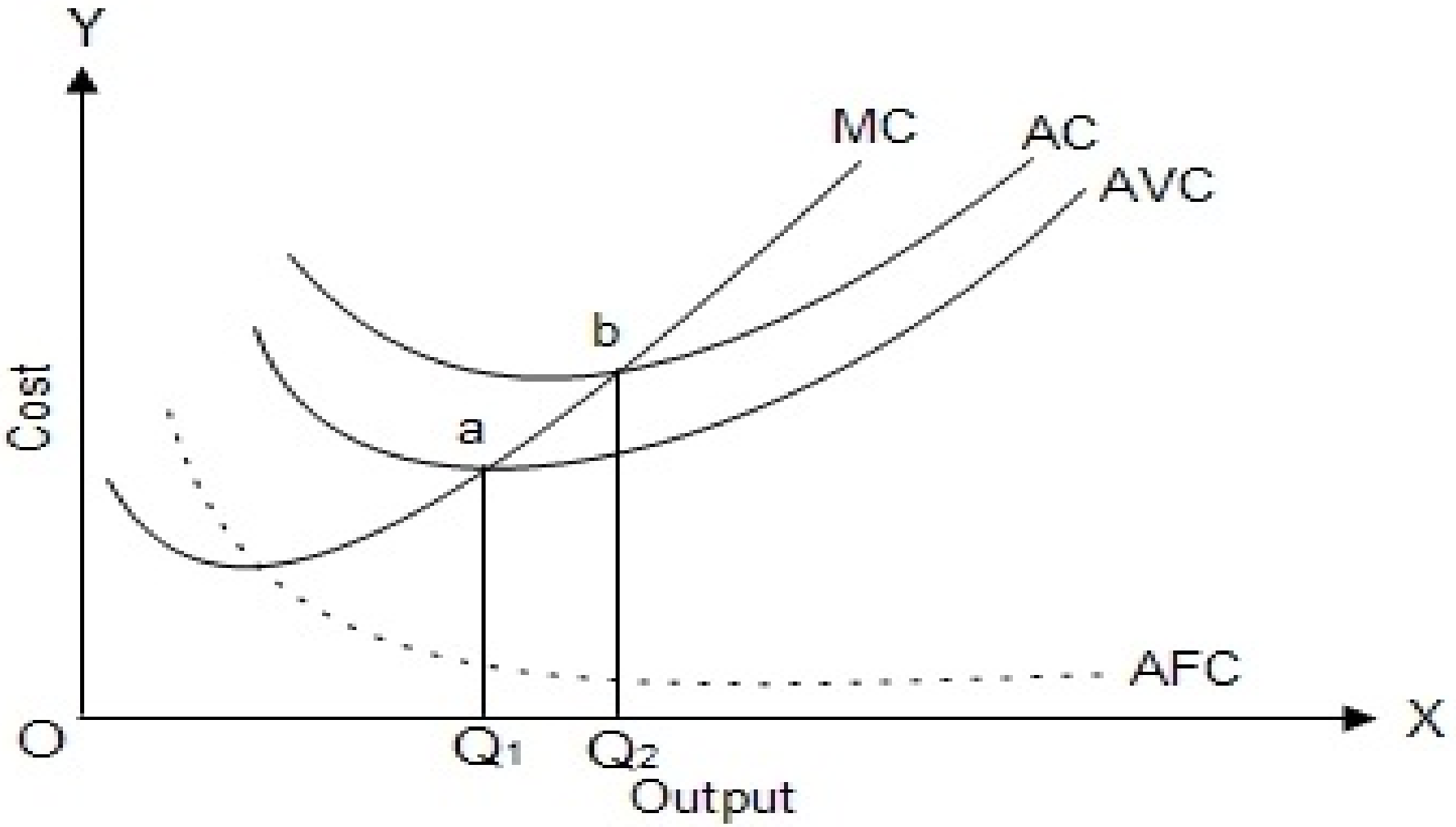
$$TC = wL + \overline{rK}$$
$$\frac{dTC}{dQ} = w\frac{dL}{dQ}$$
$$MC = w.\frac{1}{MP_L}$$

Recall, MP_L change in output resulting from a change in labor input. While $\frac{1}{MP_L}$ is extra labor needed to obtain an extra unit of output.

Total Fixed and Variable Cost Curves



Average and Marginal Cost Curves



The Relationship between Average and Marginal Costs

$$TC = AC \times Q$$

$$\frac{dTC}{dQ} = \frac{dAC}{dQ}.Q + AC$$

$$MC = \frac{dAC}{dQ}.Q + AC$$

$$\frac{dAC}{dQ} = \frac{MC - AC}{Q}$$

1. If MC $>$AC, then $\frac{dAC}{dQ} > 0$
2. If MC = AC, then $\frac{dAC}{dQ} = 0$
3. If MC $<$AC, then $\frac{dAC}{dQ} < 0$

The Relationship between Average and Marginal Costs

1. The vertical distance between AC and AVCat every point on the curve is AFC

2. MC crosses AVC and AVC at their minimum points