

Week 9 and 10

Cost of production

Production

- The total amount of output produced by a firm is a function of the levels of input usage by the firm
- Total Physical Product (TPP) function - a short-run relationship between the amount of labour and the level of output, *ceteris paribus*.

Total costs

- Short run
- Long run
- Short run costs:
 - fixed costs – costs that do not vary with the level of output. Fixed costs are the same at all levels of output (even when output equals zero).
 - variable costs – costs that vary with the level of output (= 0 when output is zero)

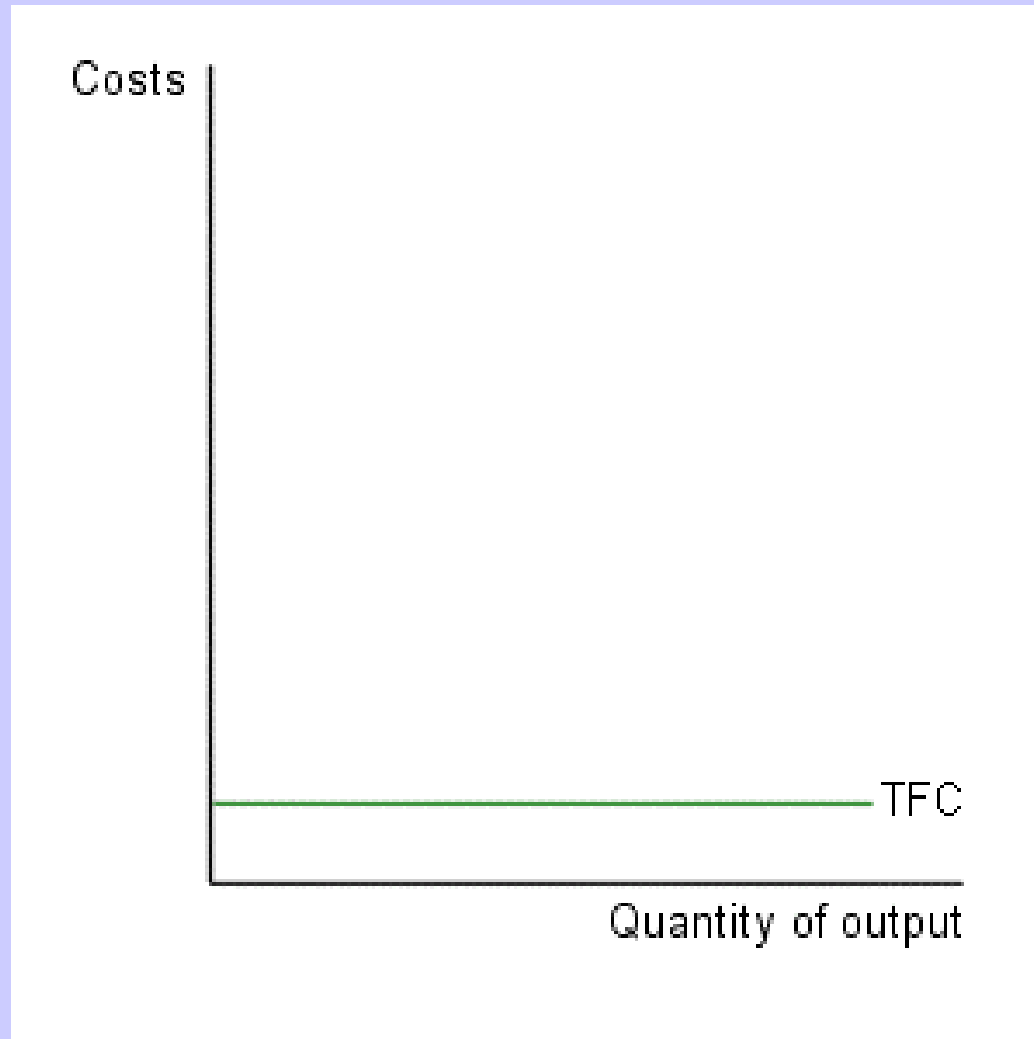
Example

Q	TFC	TVC
0	10	0
10	10	30
20	10	50
30	10	80
40	10	120
50	10	190
60	10	290

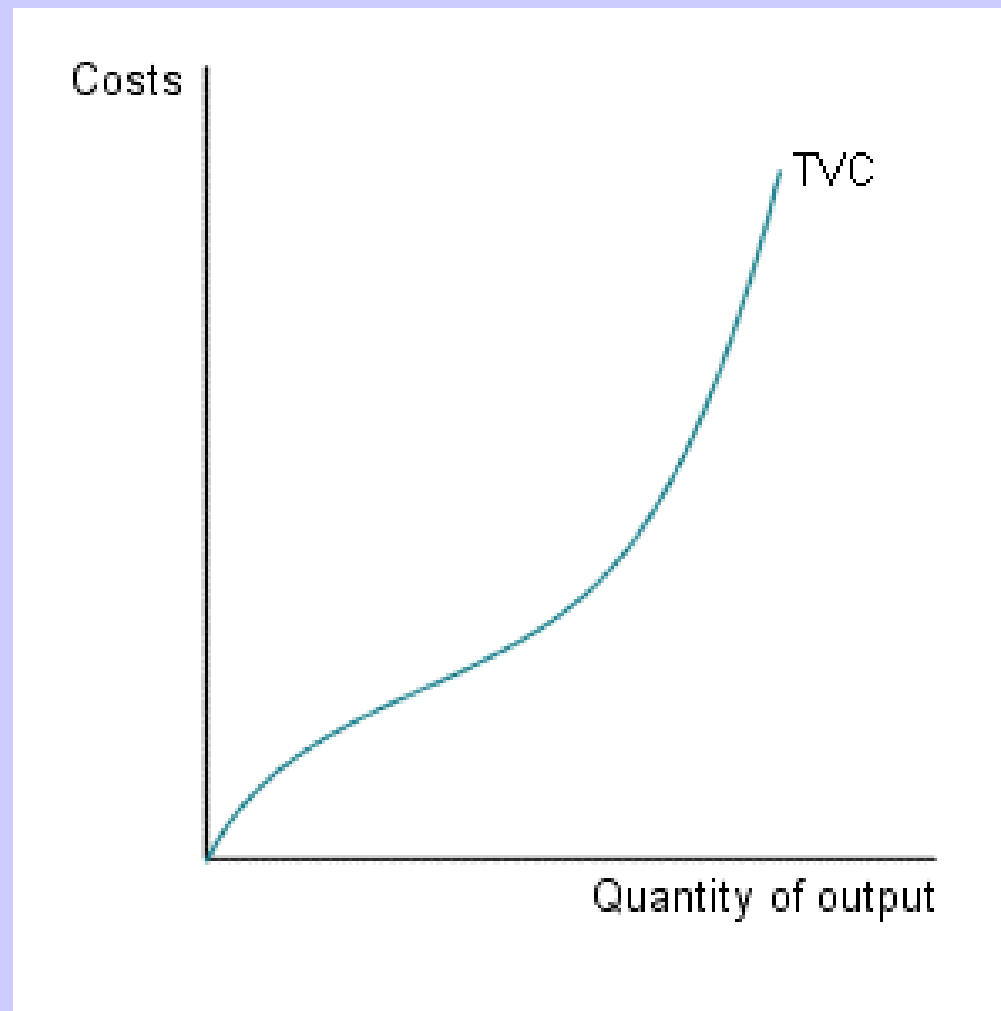
Example (cont.)

Q	TFC	TVC	TC
0	10	0	10
10	10	30	40
20	10	50	60
30	10	80	90
40	10	120	130
50	10	190	200
60	10	290	300

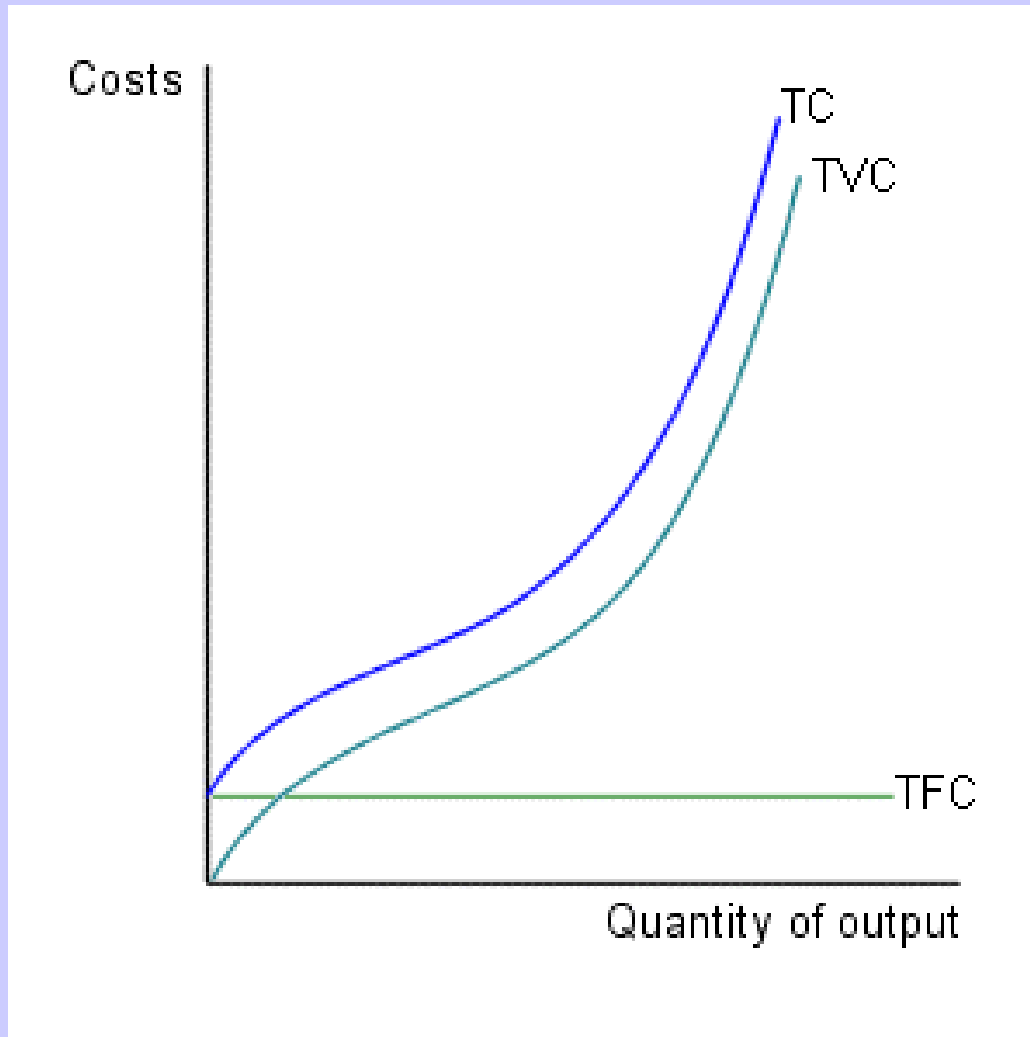
Fixed costs (FC)



Variable costs (VC)



TC, TVC, and TFC



Average fixed cost (AFC)

- Average fixed cost (AFC) = TFC / Q

Q	TFC	TVC	TC	AFC
0	10	0	10	-
10	10	30	40	1.0
20	10	50	60	0.5
30	10	80	90	0.33
40	10	120	130	0.25
50	10	190	200	0.2
60	10	290	300	0.167

Average variable cost (AVC)

- Average variable cost (AVC) = TVC / Q

Q	TFC	TVC	TC	AFC	AVC
0	10	0	10	-	-
10	10	30	40	1.0	3.0
20	10	50	60	0.5	2.5
30	10	80	90	0.33	2.67
40	10	120	130	0.25	3.0
50	10	190	200	0.2	3.8
60	10	290	300	0.167	4.83

Average total cost (ATC)

- Average total cost (ATC) = TC / Q
- $ATC = AFC + AVC$ (since $TFC + TVC = TC$)

Q	TFC	TVC	TC	AFC	AVC	ATC
0	10	0	10	-	-	-
10	10	30	40	1.0	3.0	4.0
20	10	50	60	0.5	2.5	3.0
30	10	80	90	0.33	2.67	3.0
40	10	120	130	0.25	3.0	3.25
50	10	190	200	0.2	3.8	4.0
60	10	290	300	0.167	4.83	5.0

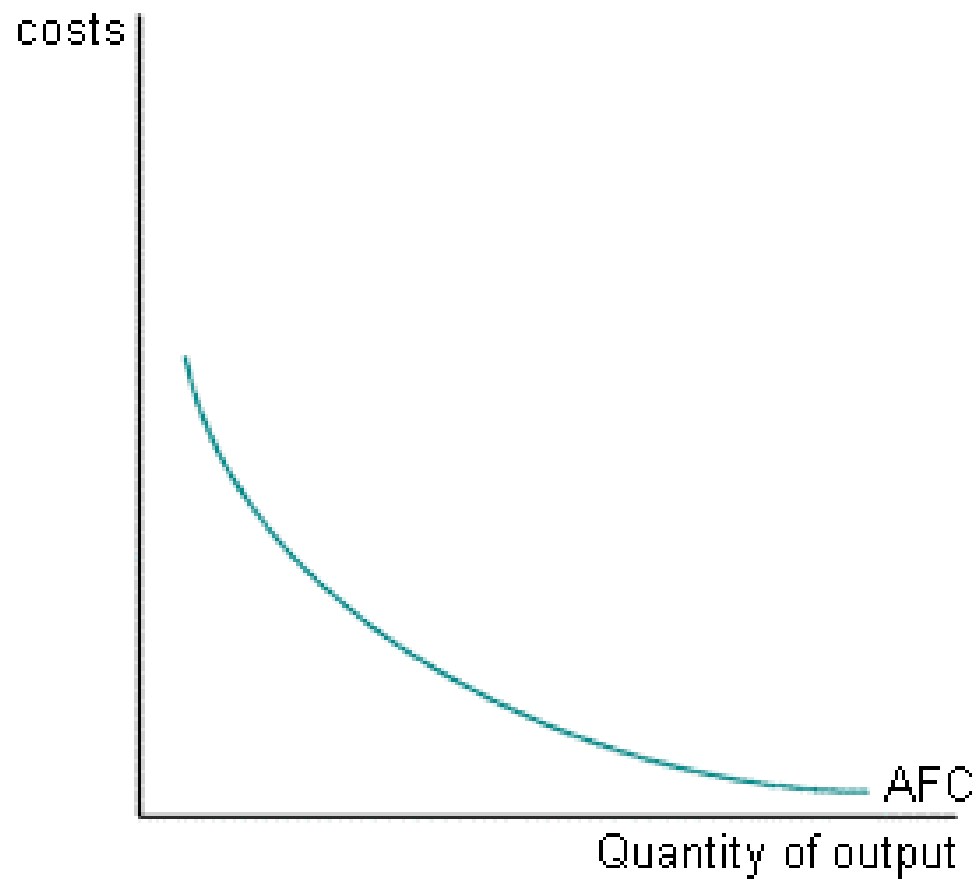
Marginal cost (MC)

- Marginal cost (MC) = cost of an additional unit of output

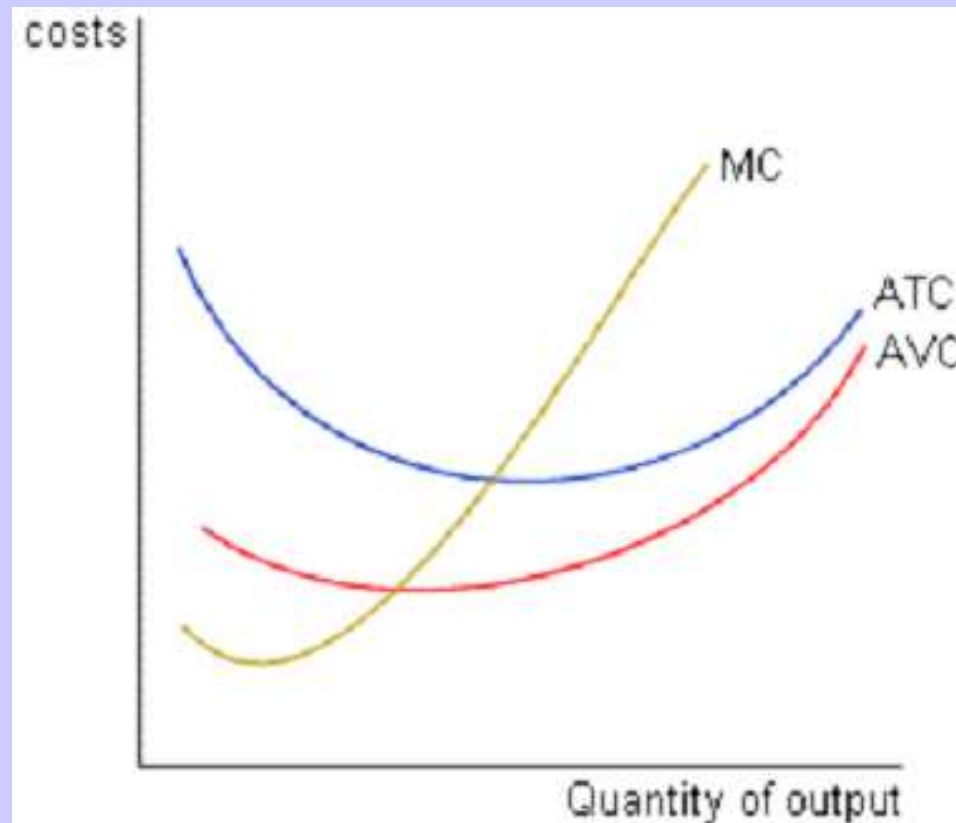
$$MC = \frac{\Delta \text{ in TC}}{\Delta \text{ in Q}}$$

Q	TFC	TVC	TC	MC
0	10	0	10	3
10	10	30	40	2
20	10	50	60	3
30	10	80	90	4
40	10	120	130	7
50	10	190	200	10
60	10	290	300	

Average fixed cost



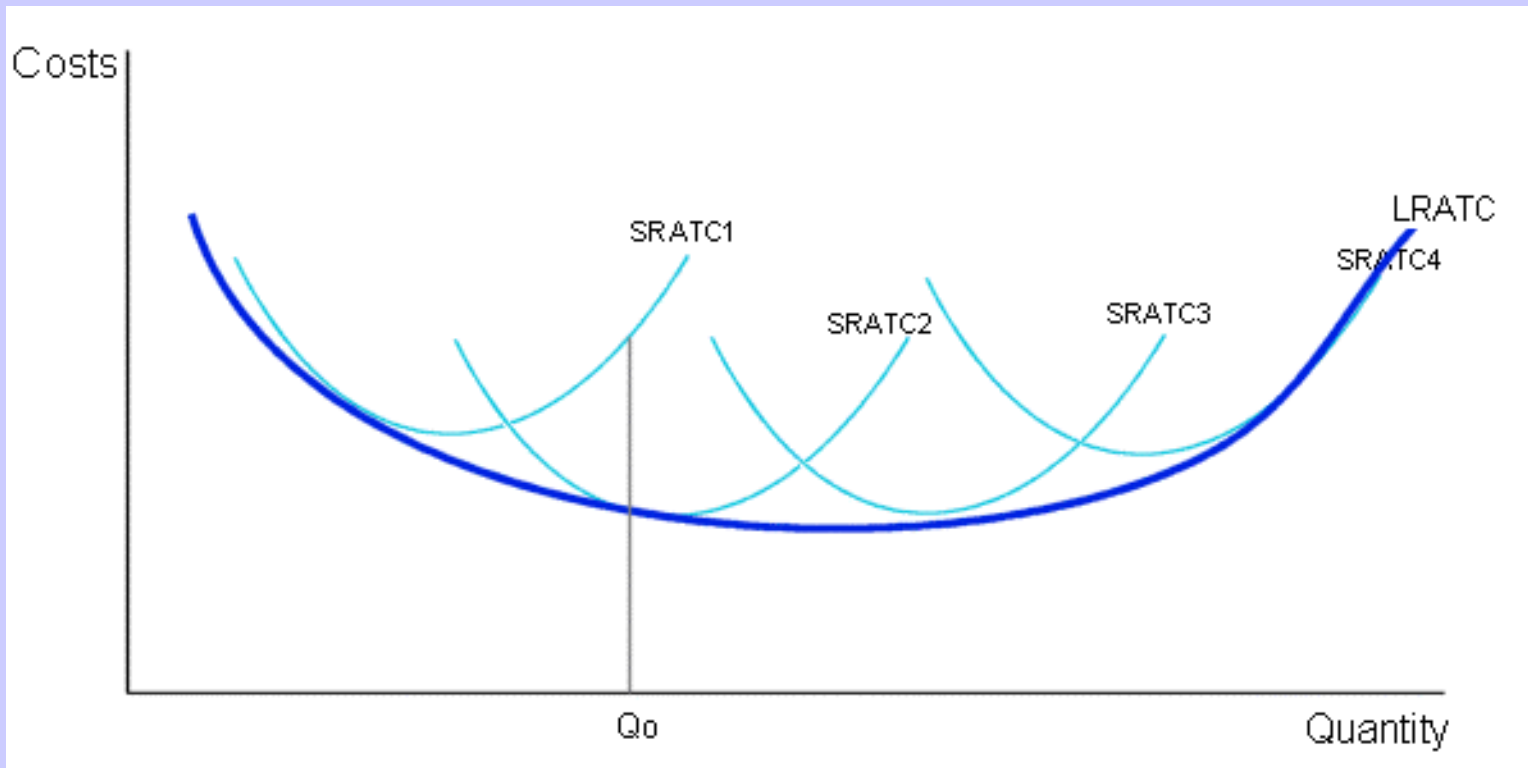
AVC, ATC, and MC



- Note that the MC curve intersects the AVC and ATC at their respective minimum points

Long-run costs

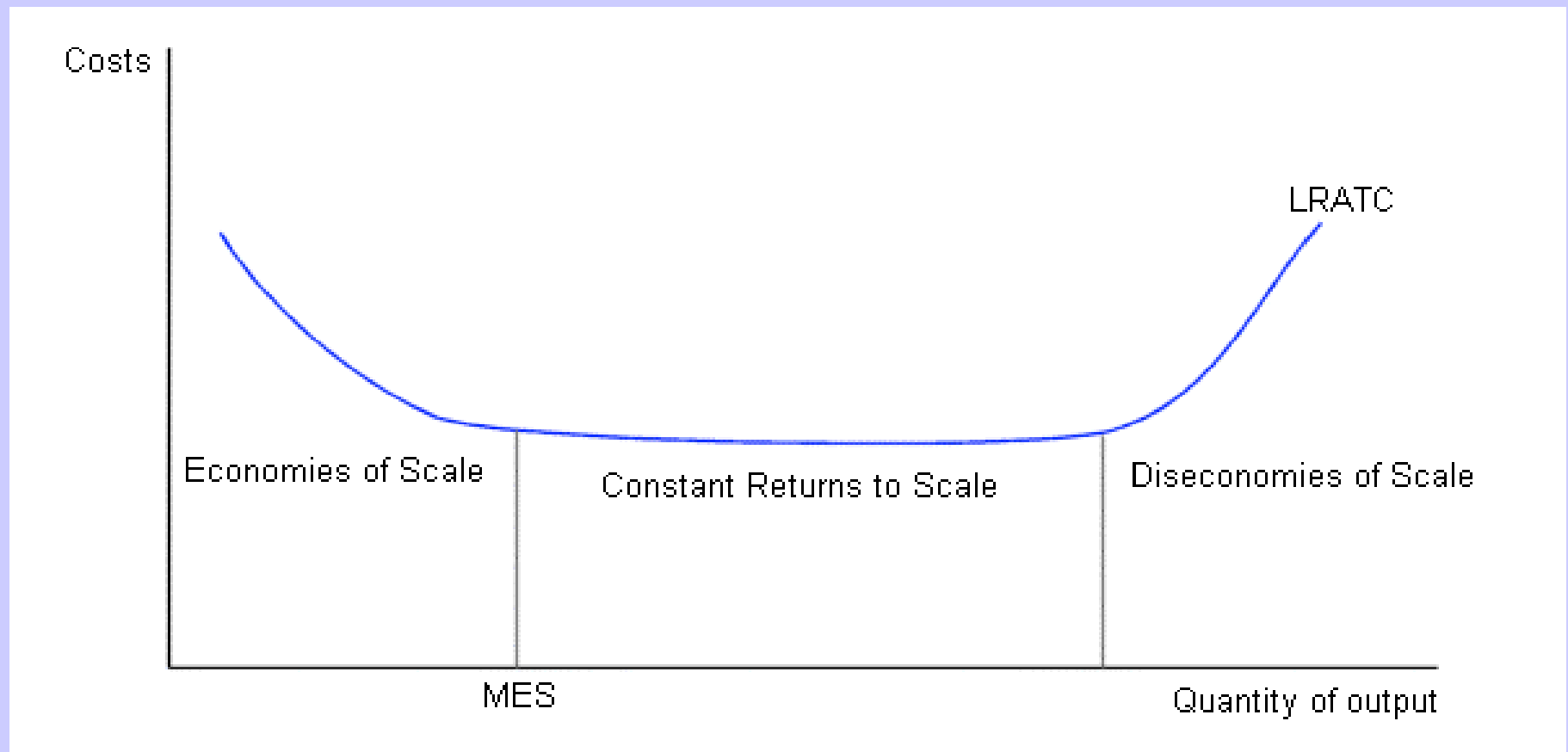
- In the long run, a firm may choose its level of capital, and will select a size of firm that provides the lowest level of ATC.



Economies and diseconomies of scale

- Economies of scale – factors that lower average cost as the size of the firm rises in the long run
 - Sources: specialization and division of labour, indivisibilities of capital, etc.
- Diseconomies of scale – factors that raise average cost as the size of the firm rises in the long run
 - Sources: increased cost of managing and coordination as firm size rises
- Constant returns to scale – average costs do not change as firm size changes

Long-run average total cost (LRATC)



Minimum efficient scale

- Minimum efficient scale = lowest level of output at which LRATC is minimized

