Short-Run Costs

AP Microeconomics | Unit 3 | fixed, variable, marginal and average cost; the cost curves

Running example. A bakery pays $100 a day in rent whatever it bakes. Output is measured in batches per day.

1. Fixed, variable, total

Total cost

Fixed cost (FC): does not change with output; paid even at zero output.
Variable cost (VC): rises with output.
$TC = FC + VC$

Q	FC	VC	TC	MC	AFC	AVC	ATC
0	100	0	100	–	–	–	–
1	100	50	150	50	100	50	150
2	100	80	180	30	50	40	90
3	100	120	220	40	33.3	40	73.3
4	100	180	280	60	25	45	**70**
5	100	270	370	90	20	54	74
6	100	400	500	130	16.7	66.7	83.3

2. Marginal cost

Marginal cost

$$MC = \frac{\Delta TC}{\Delta Q}$$ the cost of one more unit

It falls at first (50, 30) and then rises (40, 60, 90, 130). Rising marginal cost is diminishing marginal returns seen from the cost side: when each extra worker adds less output, each extra unit of output costs more.

3. The three averages

$$AFC = \frac{FC}{Q} \qquad AVC = \frac{VC}{Q} \qquad ATC = \frac{TC}{Q} = AFC + AVC$$

AFC only ever falls: the same fixed cost is spread over more units.

Why ATC is U-shaped. At low output, spreading the fixed cost pulls it down. At high output, diminishing returns push it up.

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4. The cost curves

What a correct cost-curve graph shows

- ATC is a U; AVC is a lower, flatter U below it.
- The gap between ATC and AVC is AFC, so the two curves get **closer** as output rises.
- **MC crosses AVC and ATC at their minimum points.**
- The minimum of AVC is to the *left* of the minimum of ATC.

While MC is below an average, it pulls the average down; once it is above, it pulls the average up. So MC meets each average curve at the bottom of its U.

5. Higher fixed cost, and between the minimums

If the rent doubles from \$100 to \$200, MC and AVC do not change, AFC rises at every quantity (so the gap between ATC and AVC widens everywhere), and the minimum of ATC moves right: from \$70 at $Q = 4$ to \$94 at $Q = 5$.

Between the AVC minimum and the ATC minimum, MC is above AVC but below ATC: from 3 to 4 batches $MC = \$60$, so AVC rises (\$40 → \$45) while ATC still falls (\$73.33 → \$70). $MC = \frac{\text{wage}}{MP}$: a \$120-a-day worker who adds 4 batches gives $MC = \$30$; MC starts rising where marginal product starts falling.

Where students lose points

1. MC that does not pass through the minimum of AVC and of ATC.
2. Saying fixed cost is zero when output is zero.
3. MC from the average: it is the change in total cost.
4. ATC and AVC drawn parallel: the gap (AFC) must shrink.
5. AVC minimum to the right of the ATC minimum: it is to the left.

Now practise it

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