

Cost of Production

I. Cost as a Function of Output

For every output level cost minimization tells us what the lowest possible cost is. Since firms are profit maximizing by assumption, naturally it is in their interest to always produce at the lowest cost. We can thus express a firm's production cost as a function of *output* instead of input quantities.

II. Basics

Total Cost $TC(Q)$

Total cost is just what its name implies—the total cost of production. This is the equation you get from cost minimization without an exact output level.

Fixed Cost FC

The part of total cost that does not depend on output level.

Variable Cost $VC(Q)$

The part of total cost that change with output level. Note that fixed cost and variable cost *always* add up to total cost.

Average Cost $AC(Q)$

As its name implies, $AC(Q) = \frac{TC(Q)}{Q}$

Marginal Cost $MC(Q)$

$$MC(Q) = \frac{dTC(Q)}{dQ}$$

Measures how costly the last unit/one extra unit of output is. Marginal Cost always passes through the minimum of average cost.

III. Short Run and Long Run

Short Run—Some Input Quantities are unchangeable

Long Run—All Input Quantities are changeable

Short run (SR) and long run (LR) has no absolute relation with time. The two concepts are defined as a description of whether all variables are changeable or not. The best way to think of the two concepts is to take short run as sudden change and long run as planned change. In this class we almost always assume firms use only two inputs—labor (L) and capital (K). We usually assume K to be fixed and L variable in the short run. Example: A factory decides to add another shift.

Because some input quantities are fixed, a firm cannot make the most efficient adjustment in responds to a change in output the short run—it is just like working with one hand tied. Efficiency can be reached in the long run when all inputs quantities are freely adjustable.

Punch Line:

$$\text{Short Run Total Cost} \geq \text{Long Run Total Cost}$$