

Why does a Firm Maximize its Profit where Marginal Revenue equals Marginal Cost?

If a firm is operating in a competitive industry, then its total revenue is simply equal to the market price times the quantity it produces, so we can depict Total Revenue as a linear function of output (a straight line) in the graph on the next page (i.e. $TR = pQ$).

In the graph, I've assumed that the firm's Total Cost is increasing at an increasing rate (due to diminishing marginal product of labor).

Notice that if the firm produces a very low level of output (quantity produced), it will not be profitable. If it produces too much, its costs will once again exceed its revenues and it will not be profitable.

Over the range of output where the firm's total revenue exceeds its total cost, the firm is making positive profit (in the short-run anyway).

The firm maximizes its profit in the middle of that range, but at what point specifically?

In the range of output where the slope of the Total Revenue curve is greater than the slope of the Total Cost curve, the firm could increase its profit by producing more output.

In the range of output where the slope of the Total Revenue curve is less than the slope of the Total Cost curve, the firm could increase its profit by producing less output.

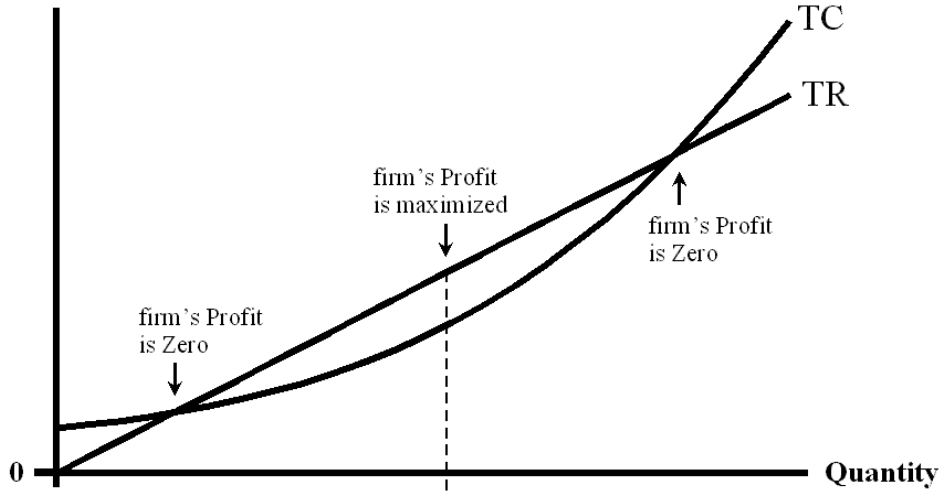
When the slope of the Total Revenue curve is equal to the slope of the Total Cost curve, the firm's profit is maximized.

Since Marginal Revenue is the slope of the Total Revenue curve and since Marginal Cost is the slope of the Total Cost curve, the point at which the firm maximizes its profit corresponds to the point where Marginal Revenue equals Marginal Cost.

Since we've assumed that the firm is operating in a competitive industry, the firm's Marginal Revenue is simply equal to the market price over all ranges of output because it faces an infinitely elastic (horizontal) demand curve.

Because the firm produces up to the point where Marginal Revenue equals Marginal Cost (in order to maximize its profit), the Marginal Cost curve is the firm's Supply curve.

Total Revenue and Total Cost



$$\frac{dTR}{dQ} > \frac{dTC}{dQ}$$

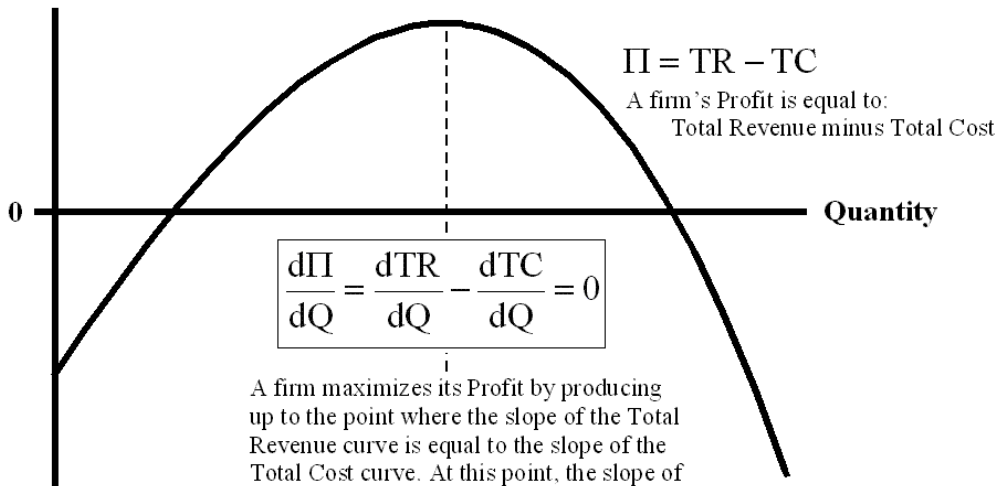
in this range, the slope of the Total Revenue curve is greater than the slope of the Total Cost curve

$$\frac{dTR}{dQ} = \frac{dTC}{dQ}$$

$$\frac{dTR}{dQ} < \frac{dTC}{dQ}$$

in this range, the slope of the Total Revenue curve is less than the slope of the Total Cost curve

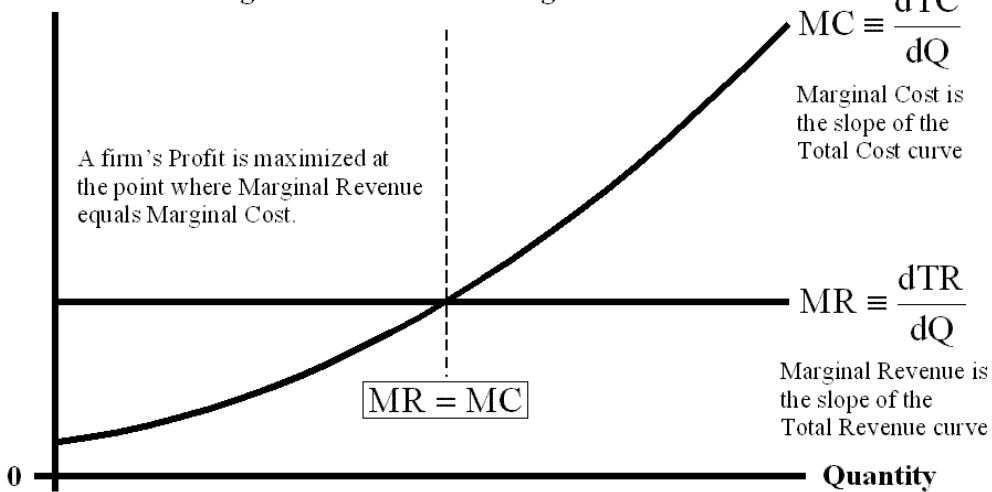
Profit



$$\frac{d\Pi}{dQ} = \frac{dTR}{dQ} - \frac{dTC}{dQ} = 0$$

A firm maximizes its Profit by producing up to the point where the slope of the Total Revenue curve is equal to the slope of the Total Cost curve. At this point, the slope of the Profit curve is Zero.

Marginal Revenue and Marginal Cost



$$MC \equiv \frac{dTC}{dQ}$$

Marginal Cost is the slope of the Total Cost curve

$$MR \equiv \frac{dTR}{dQ}$$

Marginal Revenue is the slope of the Total Revenue curve

$$MR = MC$$

A firm's Profit is maximized at the point where Marginal Revenue equals Marginal Cost.