

Chapter 03: Theory Of Firms

Coursera Summary

Firms

- Firms hire or buy inputs and produce outputs. There are three types of firms.
 - Sole Proprietorship: Single owners
 - Partnership: Two or more joint owners (who share profits & losses)
 - Corporations: Independent entities created by the government i.e. these are incorporated. The owners are called shareholders

	Sole Proprietorships	Partnerships	Corporations
Number (millions)	23.4	3.3	5.8
Revenue (Trillions US\$)	1.26	4.45	25.12
Liability	FULL	FULL	LIMITED LIABILITY

2012 US Stats

Profit

- Total Revenue is the quantity of goods multiply by per unit value of goods.
- Explicit Costs: These are the costs that require direct monetary payment e.g. wages, rent, material costs etc.
- Implicit Cost: It is the opportunity cost of using resources. No actual payment is made for implicit cost.

- Accounting Profit

$$\pi = \text{Total Revenue (TR)} - \text{Total Explicit Costs}$$

- Economic Profit

$$\pi = \text{Total Revenue (TR)} - \text{Total Explicit Costs} - \text{Opportunity Costs}$$

Short & Long Run

- Q denotes total market output of a product, "q" denotes output of a single firm in industry.
- q can be represented as a production function.
- The function consists of fixed & variable inputs.

$$q = f(\text{inputs})$$

Assume 2 inputs

$$\left. \begin{array}{l} \text{LABOR (L)} \\ \text{CAPITAL (K)} \end{array} \right\} q = f(L, K)$$

↑
PRODUCTION FUNCTION

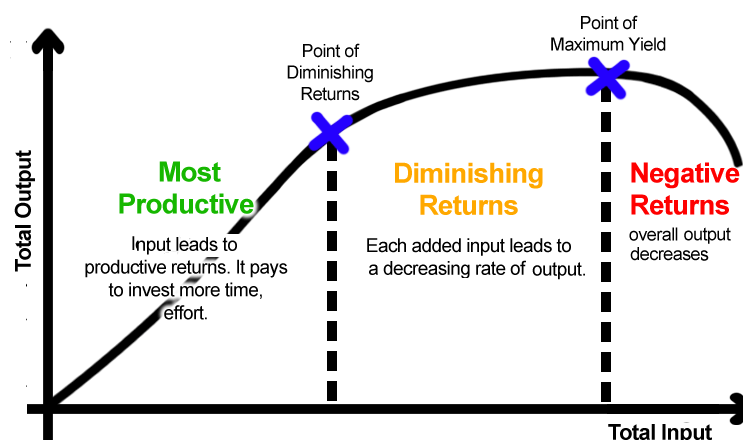
- Capital, for economists, is non-financial asset that is used in production. It can be fixed or circulating. Fixed is not consumed in the production of a product.
- Labor can be used as variable input. It is not a capital.
- **Short Run:** A firm is said to be in its *short run* when it can change its output by changing variable factors, such as by hiring more workers, but not by changing its fixed factors. Usually quantity of labor is variable but capital is fixed.
- **Long run:** A firm enters its *long run* when it changes its scale of operations i.e. no factor of production is fixed, and all are variable e.g. labor, capital etc. Firm changes production level in response to economic profits or losses..

Marginal Product & Law of Diminishing Returns

- Total Product is the output produced by using all inputs. Marginal product is the additional output that is generated when additional unit of a particular input is added assuming that other inputs are kept constant.

$$\text{Marginal Product} = \Delta Y / \Delta X$$

- ΔY is the change in quantity of output and ΔX is the change in quantity of input, usually a one unit change.
- Law of Diminishing Returns states: In a production process if one input is increased while all others are kept constant there is a point at which marginal per unit output will start to decrease.
- Diminishing returns occur in the short run.
- It is also known as law of diminishing marginal returns.



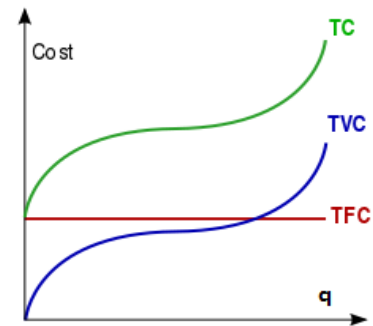
- In Most Productive region output is increasing at increasing rate, in Diminishing Return region it is increasing at decreasing rate and then starts decreasing.

Total Cost

- In short Run:

$$\text{Total Cost} = \text{Fixed Cost} + \text{Variable Cost}$$

$$TC = FC + VC$$
- Fixed Cost** => Associated with fixed input
- It is a cost that firm has to pay even when it doesn't produce anything. Therefore "fixed" tax on an item produced not a fixed cost. However franchise fee is a fixed cost.
- Variable Cost** => Associated with variable input



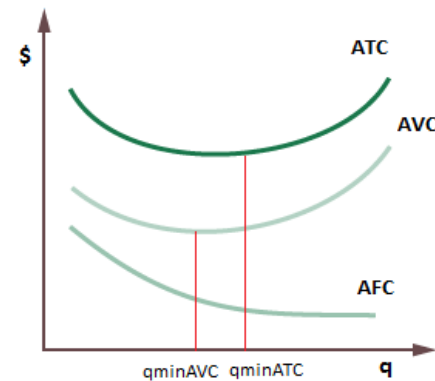
Average Total Cost

- It is per unit cost

$$\text{Average Total Cost} = \frac{TC}{q} = \frac{(FC + VC)}{q}$$

$$= \frac{FC}{q} + \frac{VC}{q}$$

$$ATC = AFC + AVC$$
- ATC and AVC converge as q rises.
- $q_{\min AVC} \leq q_{\min ATC}$



Marginal Cost

- It is the change in total cost for any change in output. It is therefore cost of producing one extra unit of output.

$$MC = \frac{dTc}{dq} = \frac{\Delta TC}{\Delta q} = \frac{\text{"change in TC"}}{\text{"change in q"}} = \text{"the slope of TC"}$$

- Marginal cost is the slope of Total Cost curve. Slope of Variable Cost curve is same as slope of Total Cost curve. Therefore MC is unaffected by changes in fixed costs.

$$TC = FC + VC$$

$$MC = \frac{dTc}{dq} = \frac{dFC}{dq} + \frac{dVC}{dq}$$

Marginal Product (MP) & Marginal Cost (MC)

- There is a reverse relationship between MP and MC. It means that as output decreases, MC increases.

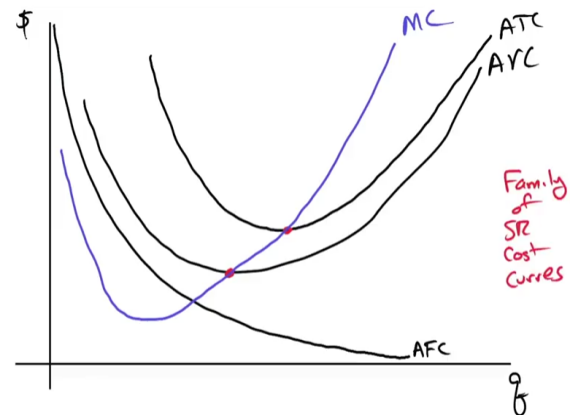
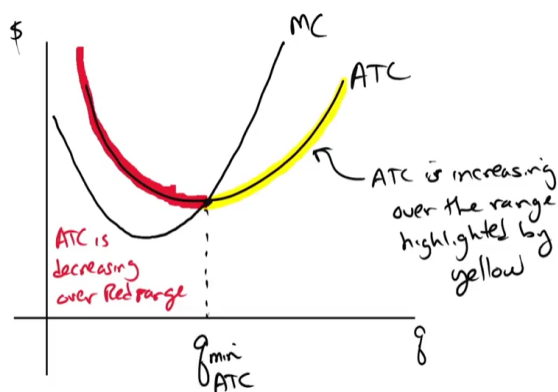
Quantity of Labor	Δ Total Product	Marginal Product	Δ Total Costs	Marginal Costs
0	0	-	0	-
1	5	5	\$10	\$2
2	15	10	\$20	\$1
3	17	2	\$30	\$5
4	18	1	\$40	\$10

Note: Each additional unit of labor adds \$10 to the Total Costs

- When MP is at a peak, MC is at a minimum.

Marginal Cost (MC) & Average Total Cost (ATC)

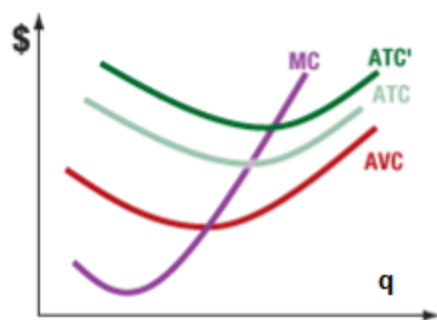
- Marginal cost and Average Total Cost are connected:
- Marginal cost will always cut average total cost from below.
- When *marginal cost is below average total cost*, average total cost will be *falling*, and when *marginal cost is above average total cost*, average total cost will be *rising*.
- A firm is most *productively efficient* at the minimum average total cost, which is also where *average total cost (ATC) = marginal cost (MC)*.



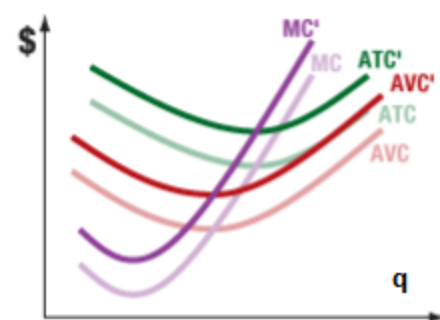
- Marginal Cost, Variable Cost and Total Cost are interlinked but not Fixed Cost.

Impact of Changing Costs on Cost Curves

- An **increase in the price of the variable input** results in the AVC, ATC and MC moving up together. The curves retain their shape and relative orientation.
- An **increase in the price of the fixed input** results in only the ATC moving up. The curves retain their shapes and MC continues to intersect the new ATC at its minimum.
- An **improvement in technology** shifts one or more of the cost curves down depending on the exact nature of the change. The MC continues to intersect ATC and AVC at their minimums and the difference between ATC and AVC is still AFC (average fixed cost).



Impact of rising fixed input cost



Impact of rising variable input cost

References:

Lectures by [Prof. Larry DeBrock](#)

<http://www.saudiaramco.com/content/dam/Publications/ CPP/WhytheMC.pdf>

https://courses.byui.edu/econ_150/econ_150_old_site/lesson_06.htm

https://en.wikipedia.org/wiki/Marginal_product