Basics of Economics

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1 Output and Costs

1.1 Factors of Production

Factors of production are the raw materials and various other components required to produce a good. These can include factories and machines, workers, physical resources, time, and technology.

1.2 The Time Horizon

When we look at the time horizon, there are two distinct segments: the "short run", and the "long run". The factor which seperates these two segments is simple: in the short run, at least one factor of production is firm, meaning its effect on production is unchangeable. In the long run, however, all factors are variable, meaning there are no permanent restrictions on the flow of production.

1.2.1 Example

Say we want to produce muffins. We would require the following:

- A factory building, which takes six months to build or procure.

- At least one worker, which takes at least two weeks to find and hire.

- Ovens, which take three days to ship from the manufacturer to your location.

In this scenario, the short run horizon is six months, as after six months all of this listed factors will be, or at least could be, developed, meaning they are no longer fixed and we have entered the long run portion of the time horizon.

1.3 Fixed Costs

A fixed cost is a cost that must be paid regardless of the quantity produced, and does not increase or decrease according to this quantity. The lease on the factory from the previous example is an example of a fixed cost. This is the cost of any firm factor of production.

1.3.1 Total Fixed Cost (TFC)

Total Fixed Cost is the sum of all fixed costs in the production process.

1.4 Variable Costs

Variable costs are dynamic costs which vary according to the quantity of a good produced. The flour required to produce a single muffin in the previous example represents a factor which has a variable cost, as each additional muffin produced requires another bit of flour to produce.

1.4.1 Total Variable Costs (TVC)

Total Variable Cost is the sum of all variable costs in the production process at a certain level p.
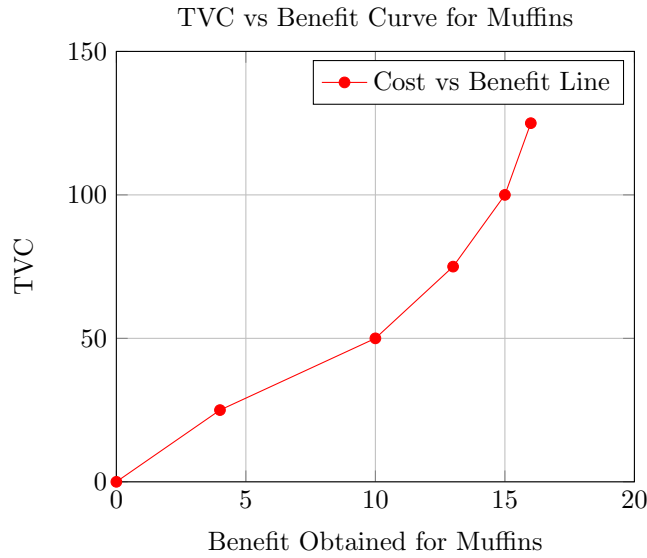
1.5 Total Cost

The total cost of the production process is:

$$TC(p) = TFC + TVC(p)$$

1.5.1 Example

Laborers	Muffins	TFC	TVC	TC
0	0	25	0	25
1	4	25	25	50
2	10	25	50	75
3	13	25	75	100
4	15	25	100	125
5	16	25	125	150

In this chart, marginal benefit applies with the principle of diminishing returns. The threshold is at three workers, after which the marginal contribution of additional workers begins to decrease.

TVC vs Benefit Curve for Muffins

1.6 Average Total Cost (ATC)

The average total cost of the production process is:

$$ATC(p) = \frac{TVC(p)}{p}$$

On the graph, the slope of the tangent line to the curve represents the average total cost. As p becomes larger, $ATC(p)$ converges on $TVC(p)$, until they eventually become arbitrarily close. At first, ATC will be decreasing, because additional workers will still have an increasing marginal contribution. However, there exists a point p^*, where $AVC = TVC$. This point represents the point at which additional workers yield a diminishing return.

1.7 Marginal Cost Rules

The marginal cost is the increase in total cost at the pth unit.

1. If $ATC > MC$, then ATC is decreasing.

2. If $AVC > MV$, then AVC is decreasing.

3. If $ATC < MC$, then ATC is increasing.

4. If $AVC < MC$, then AVC is increasing.

5. If ATC is minimized, then $ATC = MC$.

6. If AVC is minimized, then $AVC = MC$.

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech