Production and Costs

Production
Short-Run Costs

Short-Run vs. Long-Run

• Technically, time does not determine the difference between “short-run” and “long-run”

The Short Run is defined by the presence of a factor of production that is fixed in quantity—typically, this is capital (K). In the short-run, firms can only change the amount of non-capital inputs (e.g. Labor)

The Long Run is defined by the ability for firms to vary the quantities of all factors of production. The time in which this takes a firm to do so may depend upon the firm as well as the industry.

SHORT-RUN PRODUCTION

• Graphically, we can analyze short-run production

Total Product (TP) (Q): describes how output varies in the SR as more of any variable input is used with the fixed input, under current technology

Marginal Product (MP): the increase in output from one more unit of an input when the quantity of all other inputs are unchanged

Average Product (AP): the total output produced divided by the number of units of the input used
Marginal/Average Product

• Formulas for MP and AP
• Since Kapital is fixed in quantity, we are concerned with Marginal and Average products of labor

\[ MP_L = \frac{\Delta TP}{\Delta L} \]
\[ AP_L = \frac{TP}{L} \]

What do the TP, MPL, and APL curves look like?
What is the relationship between MPL and APL?

Law of Diminishing Marginal Produce

• As a firm uses more a variable input, with a given quantity of fixed inputs, the MP of a variable input eventually diminishes.

Short Run Costs

• Short-run costs can be separated according to the nature of the input:
  - **Fixed Costs (Total Fixed Costs) (TFC):** total cost to all the fixed inputs (Overhead costs) - must be incurred in the short-run even if don't produce anything
  - **Total Variable Cost (TVC):** total cost to the variable inputs
  - **Total Cost (TC):** sum of all the costs of all inputs in the production process

\[ SO, \ TC=TFC+TVC \]
Marginal Costs
• However, when firms are choosing to maximize profit, they are more concerned with Marginal Costs – the cost of producing 1 more unit of output.

\[ MC = \frac{\Delta TC}{\Delta Q} \]

What do we know about the relationship between MC and MP?

Average Costs
• Firms are also concerned with Average Costs. In the short-run, there are 3 average costs:
  - Average Fixed Costs: \( AFC = \frac{TFC}{Q} \)
  - Average Variable Costs: \( AVC = \frac{TVC}{Q} \)
  - Average Costs: \( AC = \frac{TC}{Q} \)

Thus, \( AC = AVC + AFC \)  

What do these curves look like?  

Why are these curves important?

GRAPHICAL ANALYSIS OF SR COST

Graph 1: TC, TVC, TFC
1) Why is TVC upward sloping ?  
2) Why does TC slope upward ?

Graph 2: MC, ATC, AFC, AVC
1) Why is AFC downward sloping ?  
2) Why is AVC "U-shaped" ?  
3) Why is ATC "U-shaped" ?  
4) Why does MC curve slope upward ?  
5) Where does the MC curve intersect AVC ? ATC ?