1 Lecture 10: Production and Supply Continued

The Short and the Long Run

2 Decision 1: How much of a single input to employ.

- ***What level of inputs does a profit maximizing firm employ***?
- Profit maximization implies that an input will be employed up until the point where

MRP of an input = P of the input

3 How many inputs to employ?

For a profit-maximizing firm, the optimal quantity of an input is that at which its marginal revenue product equals its price.

If ***MRP > P of input***, then there is more revenue to be obtained by expanding output, and employing more inputs. Then MRP falls, until ***MRP = P of input.***

This is the solution to Decision 1.

4 Marginal Revenue Product

The marginal revenue product (MRP) of an input is the additional revenue that the producer earns from the increased sales when it uses an additional unit of the input.

Since MPP declines with inputs, so does MRP.

5 Marginal Physical Product

6 The "Law" of Diminishing Marginal Returns

- When an input is increased by one unit,
  - holding all other inputs constant,
  - the added output eventually begins to fall.
- MPP begins to decline beyond some point.

7 Decision 2: How much output to produce?

- Answer: A firm will produce output up until the point where

Marginal Cost = Marginal Revenue

- What are marginal cost and marginal revenue?

8 The Cost Curves

- Fixed costs
  - cost of an input whose quantity does not rise when output goes up.
- Variable Costs
  - costs of an input whose quantity rises with output
- Total Cost is the sum of the two.
  - These costs are derived from the optimal input decisions.

9 Total Fixed Costs

10 Total Variable Cost Curve

11 Total costs

- *TC = TFC + TVC*

12 Total and Average Fixed Cost

13 Average Fixed Costs

14 Average Variable Costs

- More output requires more variable input.
- Corn costs $10 per bag.

15 Average Variable Cost Curve

- For any given output, average cost is defined as total variable cost divided by quantity produced.

16 Shape of the Average Cost Curve

- A typical average cost curve declines at first.
  - This is because declining average fixed costs dominate.
- It then reaches a minimum.
- And then it begins to rise.
  - Because of decreasing marginal returns and also rising administrative costs.

17 Marginal Costs

- More output requires more variable input.
- Corn costs $10 per bag.

18 Marginal Cost Curves

- The marginal cost is defined as the increase in total cost that results from the production of an additional unit of the good.

19 Average and Marginal Costs

- *AC =AFC + AVC*

20 The Short and Long Run

- Short-run
  - a time period in which at least one input is fixed at a certain level.
    - the machines are in place, and can t sell them easily.
    - labor contracts for the next year have been signed.
    - Usually, capital stock is fixed in SR, while labor is variable in SR.
- Long-run
  - the firm can change all inputs and any other choices (for example, completely closing operations (shutting down)).
    - Both capital and labor are variable in LR.
- Costs differ in the short and long run
  - more adjustments can be made in the long run.

21 The Average Cost Curve in the Short and Long Run

- The long-run average cost curve shows the lowest possible short-run average cost corresponding to each output level.

22 Returns to Scale

- Recall the Law of Diminishing Returns
  - As we added an extra unit of a variable input to a fixed input (say, the capital stock), the marginal product declined.
  - Short run phenomenon
- Returns to (or Economies of) Scale
  - As we increase the all the inputs proportionately,
  - output rises faster than the rate of growth of all the inputs
  - Long run issue.

23 Economies of Scale

- Economies of scale lead to declining long run average cost curves.

24 Economies of Scale

25 Diseconomies of Scale

26 Diminishing Returns and Economies of Scale

- Diminishing Returns
  - how much does output expand if a firm increases the quantity of just *one* input, *holding all other input quantities unchanged*.
- Economies of Scale
  - how much does output expand if all inputs are increased *simultaneously* by the same percentage.