Chapter 5

Supply Decisions
In this chapter, we focus on how supply decisions are made. Specifically:

- What limits a firm’s ability to produce?
- What costs are incurred in producing a good?
- How do costs affect supply decisions?
Learning Objectives

After completing this chapter, you should know:
1. What the production function reveals.
2. Why the law of diminishing returns applies.
3. The nature of fixed, variable, and marginal costs.
Learning Objectives

After completing this chapter, you should know:

4. The difference between production and investment decisions.

5. How accounting costs and economic costs differ.
Supply

- Supply is the ability and willingness to sell (produce) specific quantities of a good at alternative prices in a given time period, *ceteris paribus*. 
Factors of production are the resource inputs used to produce goods and services. Such factors include land, labor, capital, and entrepreneurship.
The Production Function

• A technological relationship expressing the maximum quantity of a good attainable from different combinations of factor inputs.
The Production Function

• Its purpose is to tell just how much output can be produced as the amount of inputs, such as labor, are varied.
Figure 5.1

The rate of output depends on how many inputs are used.
Efficiency

- Efficiency means achieving the maximum output attainable from a specific amount of inputs.
- Every point on the production function represents the *most* output that can be produced with a given number of workers.
- Producing any less means production is *inefficient*.
Capacity

• A production function has a specific amount of land and capital inputs, which place a ceiling on potential output.

• As labor is increased, output is increased up to a point – maximum capacity.
Marginal Physical Product (MPP)

- The MPP is the change in total output associated with one additional unit of input.

\[
\text{Marginal physical product (MPP)} = \frac{\text{change in total output}}{\text{change in input quantity}}
\]
A worker’s productivity (MPP) depends in part on the amount of other resources (the fixed land and capital inputs) in the production process.
The marginal physical product of a variable input eventually declines or *diminishes* as more of it is employed with a given quantity of other (fixed) inputs.

The additional units of resources (inputs) are less valuable to the firm.
Resource Constraints

• Why a decline in MPP?
• Marginal physical product may initially increase due to specialization of labor.
• As more labor is hired, each new worker has less capital and land to work with.
• As a result, marginal physical product begins to decline.
• Marginal physical product may become *negative* if too much labor is added to a fixed level of capital and land.
• Traditional accounting periods (short run up to a year and long run beyond that time) aren’t always useful in economics.

• Short run is the period in which quantity of some inputs, usually land and capital, can’t be changed.

• Long run is the period of time long enough for all inputs to be varied.
A Firm’s Goal

• A production function tells us how much a firm *could* produce but not how much it will *want* to produce.

• The most desired rate of output is the one that maximizes total profit.
  — Profit is the difference between total revenue and total cost.
Total Profit and Total Cost

• Total profit is the difference between total revenue and total cost.
• Total cost is the market value of all resources used to produce a good or service.
Fixed Costs

• Costs of production that do not change with the rate of output.

• Fixed costs cannot be avoided in the short run.

• Examples of fixed costs include plant, equipment, and property taxes.
Variable Costs

- Costs of production that *change* when the rate of output is altered.
- Any short-run change in total costs is a result of changes in variable costs.
- Examples of variable costs include labor and materials.
Figure 5.2

Total cost includes variable and fixed costs.

Production costs (dolllars per day)

Rate of output (pairs of jeans per day)

Fixed costs

Variable costs

Total cost

Points A, B, G
Which Costs Matter?

• Should the firm consider both fixed and variable costs when making production and pricing decisions?
• To answer this question, the concepts of average and marginal cost need to be introduced.
Average Total Cost (ATC)

- Total cost divided by the quantity produced in a given time period:

\[
\text{Average total cost (ATC)} = \frac{\text{total cost}}{\text{total output}}
\]
Average costs start high, fall, then rise once again, giving the ATC curve a distinctive **U-shape**.

Eventually, the variable cost overtakes the fixed component resulting in such U-shaped curves.
Figure 5.3

ATC varies with the rate of output.
Marginal Cost (MC)

• The increase in total cost when one more unit of output is produced:

\[
\text{Marginal Cost (MC)} = \frac{\text{change in total cost}}{\text{change in total output}}
\]
Marginal cost rises because of the law of diminishing marginal product.

As more workers have to share limited space and equipment in the short run, this “crowding” increases MC and reduces MPP.
Figure 5.4

Graph showing the relationship between marginal cost (MC) and rate of output. The graph indicates that added output is increasingly expensive to produce when marginal costs are rising.
The supply decision has two dimensions:

- A short-run horizon, which concerns the *production* decision.
- A long-run horizon, which concerns the *investment* decision.
The short-run production decision is the selection of the short-run rate of output (with existing plant and equipment).

The short run is characterized by the existence of fixed costs.
Short Run: Focus on Marginal Cost

• Marginal cost is a basic determinant of short-run supply (production) decisions.

• Covering marginal cost is a *minimal* condition for supplying additional output.
Fixed costs are unavoidable in the short run. They must be paid.

Additional production will increase variable costs; this increase is indicated by MC.
The Long-Run Investment Decision

• This is the decision to build, buy, or lease plant and equipment; the decision to enter or exit an industry.

• There are *no fixed costs* in the long run.

• The scale or size of the firm is a long-run investment decision.
Economic versus Accounting Costs

• The essential economic question for production is how many resources are used (and must be paid for).
• Accountants count dollar costs only and ignore any resource use that doesn’t result in an explicit dollar cost.
• Economists do not ignore the cost of any resource used.
Accounting Costs

• Accounting costs are the direct dollar costs of producing goods or services.
• This includes any actual out-of-pocket expenses; payments for resources coming in from outside the firm.
Economic Costs

• There are opportunity costs connected to resources already inside the firm that are being used.

• *Economic costs* – the dollar value of all resources used to produce a good or service; the opportunity cost of resource use.
• Opportunity costs of resources coming from inside the firm are counted by economists but not by accountants.

• Economic costs and accounting costs will diverge whenever any factor of production is not paid an explicit cost.
Whereas accounting costs considering only those that are explicit, the economist considers both explicit and implicit costs.

- Economic cost = explicit costs + implicit costs
- Accounting cost = explicit costs only
• In economic terms, profit is the difference between total revenue and total **economic** costs:

\[
Profit = \text{total revenue} - \text{total cost}
\]

• Economists keep a consistent eye on profit by keeping track of *both* explicit and implicit costs.
Can We Outrun Diminishing Returns?

• The U.S. labor force continues to grow by more than a million workers per year.
• If capital investments don’t keep pace, these added workers will strain production facilities.
  – If this occurs, the law of diminishing marginal productivity will push wages lower and reduce living standards.
Some possible ways of increasing productivity include the following:

- Increasing education.
- Vocational training.
- Increased capital investment.

Improvements in productivity reduce costs.

The ATC and MC curves shift down when productivity increases.
Can We Outrun Diminishing Returns?

(a) When the production function shifts up...

(b) Cost curves shift down.

- Total Output (units per time period)
- Resource Inputs (units per time period)
- Cost (dollars per unit)
- Rate of Output (units per time period)
What We Learned

1. The production function shows how much output can be produced from available facilities (fixed input) using different amounts of labor (variable input).
2. Diminishing marginal returns apply because output increases at a diminishing rate when more workers are added to a facility. Each worker has less space and machinery to work with.
What We Learned

3. Fixed costs do not change as output increases. Variable costs increase as output increases. Marginal cost shows the increase in total costs when one more unit of output is produced.
4. Production decisions occur in the short run and decide how much to produce in an existing facility. Investment decisions occur in the long run and decide how to change the size (scale) of the facility.
What We Learned

5. Economic costs include the value of all resources used, explicit and implicit. Accounting costs include only explicit costs.