“Why is chicken cheaper than steak?”

“Why are apples cheaper (per pound) than grapes?”

We know how to answer these questions.

What about:

♦ “Why do airline pilots earn more than school bus drivers?”

♦ “Why is land on the Boardwalk in Atlantic City more expensive than land fifty miles southwest of Atlantic City?”

We can use same tools to answer these questions.

**Factors of Production**

What are factors of production?

The inputs used to produce goods and services.

The markets for factors are similar to the markets for goods and services, but different in one important way:

The demand for a factor of production is a derived demand.

This means that the firm's demand for a factor of production is derived from its decision to supply a good in another market.

♦ Demand for gas station attendents is tied to supply of gasoline.
♦ Demand for professors is tied to supply of students.
♦ Demand for apple pickers tied to supply of apples
Question for analysis: how does a competitive, profit-maximizing firm decide how much of any factor to buy?

What will we (begin) to learn by studying markets for factors of production?

◆ Explains how income is divided among workers, landowners, and owners of capital

◆ Can use this analysis to understand why some workers earn more than others

**The Demand for Labor**

Most important factor of production (workers receive most of total income earned in the U.S. economy).

Important:

In the market for labor, households are the suppliers while firms are the demanders.

The wage of workers is determined by the supply and demand for workers.
The Competitive Profit-Maximizing Firm

Example: A firm that owns an orchard must decide how many apple pickers to hire.

Assume:

- firm operates in a competitive output market $\Rightarrow$ firm is a price taker in the apple market
- firm operates in a competitive labor market $\Rightarrow$ firm is a price taker in the labor market $\Rightarrow$ it has no control over the wage that it must pay its apple pickers.
- firm's goal is to maximize profit (total revenue $-$ total cost).
The Production Function

The firm must ask: How does size of my workforce affect how many apples I can produce?

Wants to look at relationship between inputs and outputs.

Input is number of apple pickers.

Output is number of apples.

This relationship is shown by a function called the production function.

**Production Function:** the relationship between quantity of inputs used to make a good and the quantity of output of that good.

\[ Q = F(L) \quad \text{or} \quad Q = F(K, L) \]
Marginal Product of Labor

We want to think, as usual, on the margin.

How many apples will an additional picker be able to pick?

**Marginal Product of Labor**: the increase in the amount of output from an additional unit of labor.

<table>
<thead>
<tr>
<th>L</th>
<th>Q</th>
<th>MPL</th>
<th>VMPL (= P X MPL)</th>
<th>W</th>
<th>Marginal Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>100</td>
<td>$ 1,000</td>
<td>$ 500</td>
<td>$ 500</td>
</tr>
<tr>
<td>2</td>
<td>180</td>
<td>80</td>
<td>800</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>240</td>
<td>60</td>
<td>600</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>280</td>
<td>40</td>
<td>400</td>
<td>500</td>
<td>–100</td>
</tr>
<tr>
<td>5</td>
<td>300</td>
<td>20</td>
<td>200</td>
<td>500</td>
<td>–300</td>
</tr>
</tbody>
</table>

What relationship between Q and MP do we see?

**Diminishing Marginal Product**: the property whereby the marginal product of an input declines as the quantity of the input increases.

Why?

◆ First apple pickers go to the best trees.
◆ As more hired, additional workers have to go to inferior trees with less apples.
◆ As more and more hired, each adds less and less to production of apples.
The Value of Marginal Product and the Demand for Labor

How should the profit-maximizing firm decide how many workers to hire?

Look at how much profit each worker brings in.

Profit = Total Revenue - Total Cost

♦ An additional worker will contribute to revenue (since he or she will pick more apples)

♦ But, an additional worker will also contribute to costs (must be paid a wage!)

Value of the Marginal Product

**Value of the Marginal Product**: the marginal product of an input times the price of the output.

\[ VMPL = P \times MPL \]

♦ measures the additional amount of revenue the firm receives when it hires an additional unit of labor.

♦ diminishes as number of workers rises. why? (because \( P \) is constant for competitive firm)
Go back to our example.

Assume that wage =$500 per week

**How many workers will the firm hire?**

3 workers

Why?

Would not hire less --- hiring more will increase profit (VMP＞w)

Would not hire more --- hiring more decreases profit (VMP＜w)

We can show the firm’s decision graphically.

Note 1: The value of the marginal product curve will slope downward because of the diminishing marginal product of labor.

Note 2: The wage is depicted by a horizontal line because the firm is a price taker in the labor market.

**Lesson 1:** A competitive, profit-maximizing firm hires workers up to the point where the value of the marginal product of labor is equal to the wage.

**Lesson 2:** Because the firm chooses the quantity of labor at which the value of the marginal product equals the wage, the value-of-marginal-product curve is the firm’s labor demand curve.

**Lesson 3:** The value of the marginal product involves both the marginal product and the price of the good, any change in these two elements will lead to a change in the demand for labor.
What Causes the Labor Demand Curve to Shift?

1. The Output Price
2. Technological Change
3. The Supply of Other Factors

The Supply of Labor

The Tradeoff between Work and Leisure

1. Any hours spent working are hours that could be devoted to something else like studying, or watching television.

   Economists refer to all time not spent working for pay as “leisure.”

2. The opportunity cost of an hour of leisure is the amount of money that would have been earned if that hour was spent at work.

   Therefore, as the wage ↑, the opportunity cost of leisure ↑.

3. The labor supply curve shows how individuals respond to changes in the wage in terms of the labor-leisure tradeoff.

   An upward-sloping labor supply curve means that an increase in the wage induces workers to increase the quantity of labor they supply.
What Causes the Labor Supply Curve to Shift?

1. Changes in Tastes (for leisure vs. working)
2. Changes in Alternative Opportunities (other occupations)
3. Immigration

Labor-Market Equilibrium

Marginal Product in Equilibrium

(Supply and demand analysis)

♦ wage adjusts to balance the supply and demand for labor.

♦ wage = VMPL value of the marginal product of labor.

♦ in equilibrium, each firm has bought as much labor as it finds profitable at the equilibrium wage.

(any event that changes the supply or demand for labor must change the equilibrium wage and the value of the marginal product by the same amount, because these must always be equal.)

Shifts in Labor Supply (do graphically)

Shifts in Labor Demand (do graphically)
Case Study: Productivity and Wages

1. Principle #7: Our standard of living depends on our ability to produce goods and services.

2. This means that highly productive workers are highly paid, and less productive workers are less highly paid.

3. Table 18-2 shows data on the growth rates of both productivity and wages in the United States from 1959 to 1997.

4. Table 18-3 shows data on the growth rate of productivity and wages from 1980 to the early 1990s for 12 countries around the world.

5. Wages and productivity differ between the countries because of three key determinants of productivity.
   a. Physical capital
   b. Human capital
   c. Technological knowledge
The Other Factors of Production: Land and Capital

Capital = the equipment and structures used to produce goods and services.

Equilibrium in the Markets for Land and Capital

Purchase price of land or capital = price a person pays to own that factor of production indefinitely

Rental price of land or capital = price a person pays to use that factor for a limited amount of time

Note:

Wage = the rental price of labor

Thus, what we know about wage determination also applies to the rental prices of land and capital.

What we know:

♦ The rental price of land is determined by the supply and demand for land; the rental price of capital is determined by the supply and demand for capital.

♦ For both land and capital, the firm increases the quantity hired until the value of the factor’s marginal product equals the factor’s rental price.

♦ This means that, as long as the firms using the factors of production are competitive and profit-maximizing, land, labor and capital each earn the value of their marginal contribution to the production process.

♦ The purchase price of land and capital depend on the current value of the marginal product and the expected future value of the marginal product.
Linkages among the Factors of Production

In most situations, factors of production are used together in a way that makes the productivity of each factor dependent on the quantities of the other factors available.

This means that a change in the supply of any one factor can change the earnings of all of the other factors.

**Example:**

Hurricane destroys ladders workers use to pick apples.

S of ladders ↓ ⇒ P of ladders ↑ (rental price goes up so owners of ladders get higher returns)

Less ladders ⇒ smaller marginal product for apple pickers ⇒ less demand for apple pickers ⇒ W ↓ (rental price of labor)