Unit 11: The Markets for Factors of Production

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Objectives

In this unit, look for the answers to these questions:

- What determines a competitive firm's demand for labor?
- How does labor supply depend on the wage? What other factors affect labor supply?
- How do various events affect the equilibrium wage and employment of labor?
- How are the equilibrium prices and quantities of other inputs determined?

Factors of Production and Factor Markets

- **Factors of production**: the inputs used to produce goods and services.
  - Labor
  - Land
  - **Capital**: the equipment and structures used to produce goods and services.

- Prices and quantities of these inputs are determined by supply & demand in factor markets.

Derived Demand

- Markets for the factors of production
  are like markets for goods & services, except:

- Demand for a factor of production
  is a **derived demand** – derived from a firm's decision
  to supply a good in another market.

Two Assumptions

1. We assume all markets are competitive.

   The typical firm is a price taker
   - in the market for the product it produces
   - in the labor market

2. We assume that firms care only about maximizing profits.
   - Each firm's supply of output and demand for inputs are derived from this goal.

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Our Example: Farmer Jack

- Farmer Jack sells wheat in a perfectly competitive market.
- He hires workers in a perfectly competitive labor market.
- When deciding how many workers to hire, Farmer Jack maximizes profits by thinking at the margin:
  - If the benefit from hiring another worker exceeds the cost, Jack will hire that worker.

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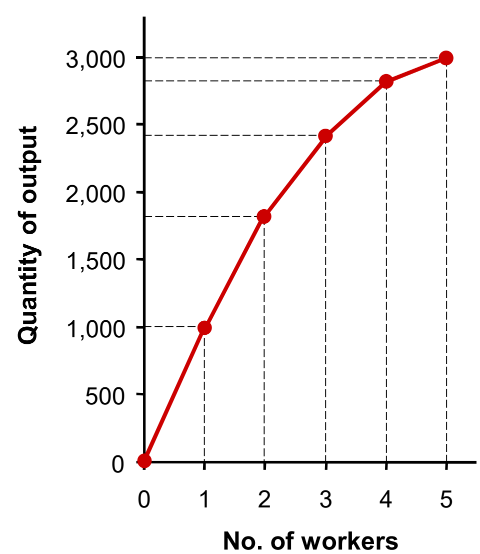
Our Example: Farmer Jack

- Cost of hiring another worker:
  the wage – the price of labor
- Benefit of hiring another worker:
  Jack can produce more wheat to sell, increasing his revenue.
- The size of this benefit depends on Jack's **production function**: the relationship between the quantity of inputs used to make a good and the quantity of output of that good.

Farmer Jack's Production Function

L (no. of workers)	***Q*** (bushels of wheat per week)
0	0
1	1000
2	1800
3	2400
4	2800
5	3000



Marginal Product of Labor (MPL)

- **Marginal product of labor:** the increase in the amount of output from an additional unit of labor

$$MPL = \frac{\Delta \boldsymbol{Q}}{\Delta \boldsymbol{L}}$$

where

Δ*Q* = change in output
Δ*L* = change in labor

The Value of the Marginal Product

- Problem:
  - Cost of hiring another worker (wage) is measured in dollars
  - Benefit of hiring another worker (*MPL*) is measured in units of output
- Solution: convert *MPL* to dollars
- **Value of the marginal product**: the marginal product of an input times the price of the output

VMPL = value of the marginal product of labor
= *P* x *MPL*

ACTIVE LEARNING *1*

Computing MPL and VMPL

P = $5/bushel.

Find ***MPL***
and ***VMPL***,
fill them in the blank spaces of the table.

Then graph
a curve with ***VMPL*** on the vertical axis,
L on horizontal axis.

L (no. of workers)	***Q*** (bushels of wheat)	*MPL*	*VMPL*
0	0		
1	1000		
2	1800		
3	2400		
4	2800		
5	3000		

Farmer Jack's Labor Demand

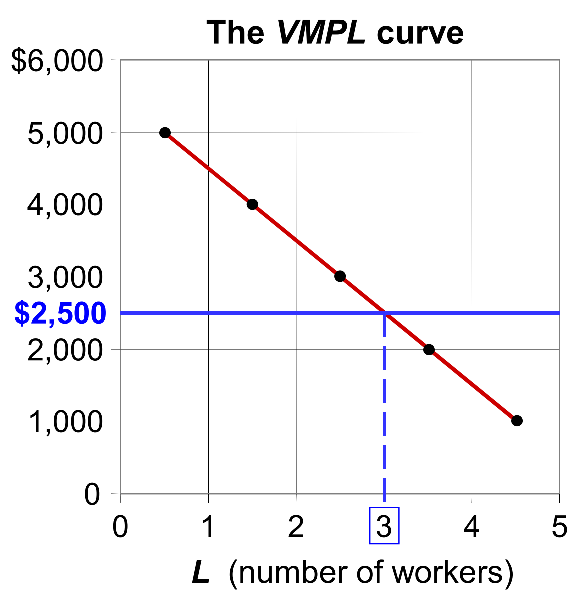
Suppose wage
W = $2500/week.

How many workers should Jack hire?

Answer: ***L*** = 3

At any smaller *L*, can increase profit by hiring another worker.

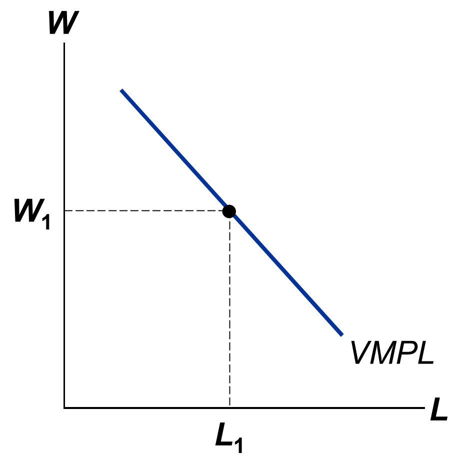
At any larger *L*, can increase profit by hiring one fewer worker.



VMPL and Labor Demand

For any competitive, profit-maximizing firm:

- To maximize profits, hire workers up to the point where *VMPL* = *W*.
- The *VMPL* curve is the labor demand curve.



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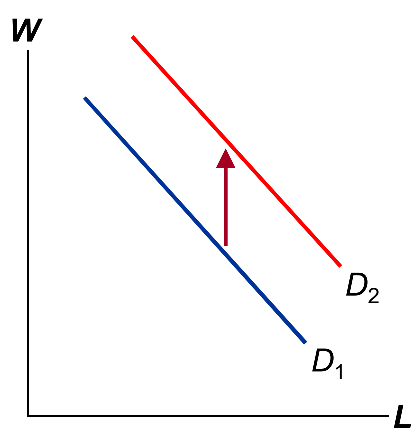
Shifts in Labor Demand

Labor demand curve
= *VMPL* curve.

VMPL = *P* x *MPL*

Anything that increases *P* or *MPL* at each *L*
will increase
VMPL and shift
labor demand curve upward.



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Things that Shift the Labor Demand Curve

- Changes in the output price, *P*
- Technological change (affects *MPL*)
- The supply of other factors (affects *MPL*)
  - Example:
    If firm gets more equipment (capital),
    then workers will be more productive;
    MPL and *VMPL* rise, labor demand shifts upward.

Labor Supply

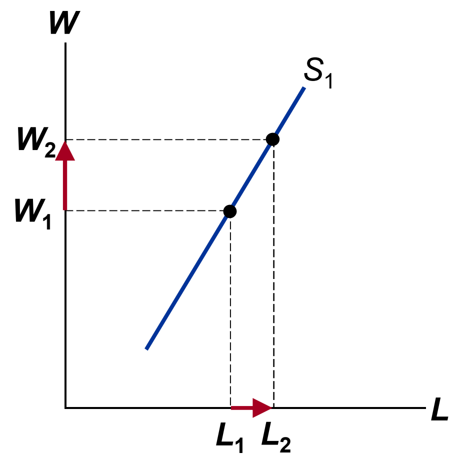
- Trade-off between work and leisure:
  The more time you spend working,
  the less time you have for leisure.
- The opportunity cost of leisure is the wage.

Wage = Opportunity Cost of Leisure

The Labor Supply Curve

An increase in *W*
is an increase in the opp. cost of leisure.

People respond by taking less leisure and by working more.



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Things that Shift the Labor Supply Curve

- Changes in tastes or attitudes regarding the labor-leisure trade-off
- Opportunities for workers in other labor markets
- Immigration

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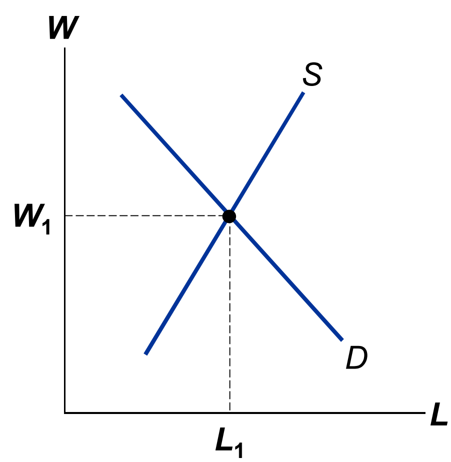
Equilibrium in the Labor Market

The wage adjusts to balance supply and demand for labor.

The wage always equals *VMPL*.



A C T I V E L E A R N I N G ***2***

Changes in labor-market equilibrium

In each of the following scenarios, use a diagram of the market for (domestic) auto workers to find the effects on their wage and employment.

A. Baby Boomers who worked in the auto industry retire.

B. Car buyers’ preferences shift toward imported autos.

C. Technological progress boosts productivity in the auto manufacturing industry.

The Other Factors of Production

- With land and capital, must distinguish between:
  - **purchase price** – the price a person pays to own that factor indefinitely
  - **rental price** – the price a person pays to use that factor for a limited period of time
- The wage is the rental price of labor.
- The determination of the rental prices of capital and land is analogous to the determination of wages…

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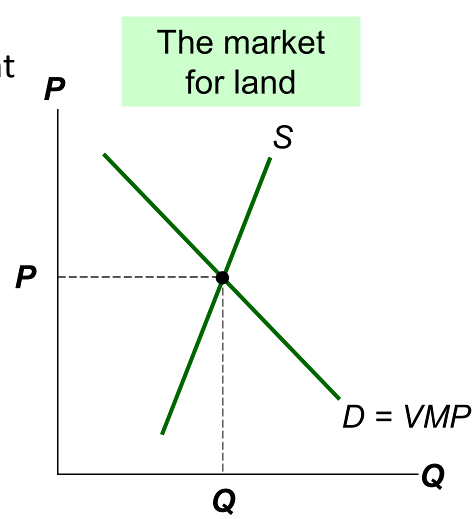
How the Rental Price of Land Is Determined

Firms decide how much land to rent by comparing the price with the value of the marginal product (*VMP*) of land.

The rental price of land adjusts to balance supply and demand for land.



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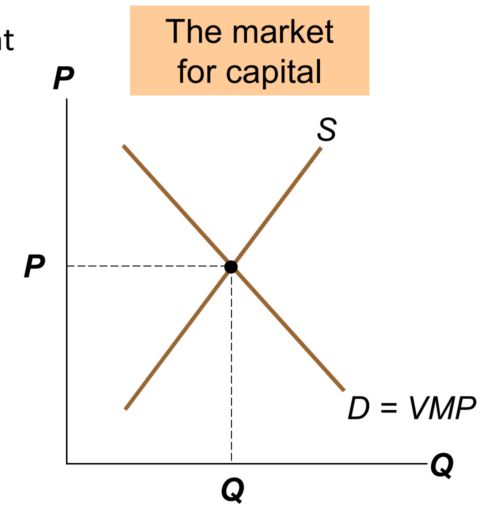
How the Rental Price of Capital Is Determined

Firms decide how much capital to rent by comparing the price with the value of the marginal product (*VMP*) of capital.

The rental price of capital adjusts to balance supply and demand for capital.



Rental and Purchase Prices

- Buying a unit of capital or land yields a stream of rental income.
- The rental income in any period equals the value of the marginal product (*VMP*).
- Hence, the equilibrium purchase price of a factor depends on both the current *VMP* and the *VMP* expected to prevail in future periods.

Linkages Among the Factors of Production

- In most cases, factors of production are used together in a way that makes each factor's productivity dependent on the quantities of the other factors.

- Example: an increase in the quantity of capital
  - The marginal product and rental price of capital fall.
  - Having more capital makes workers more productive, *MPL* and *W* rise.

CONCLUSION

- The theory in this unit is called the **neoclassical theory of income distribution**.
- It states that
  - factor prices determined by supply and demand
  - each factor is paid the value of its marginal product
- Most economists use this theory a starting point for understanding the distribution of income.
- The next two chapters explore this topic further.