The Markets for Factors of Production

Topic 4

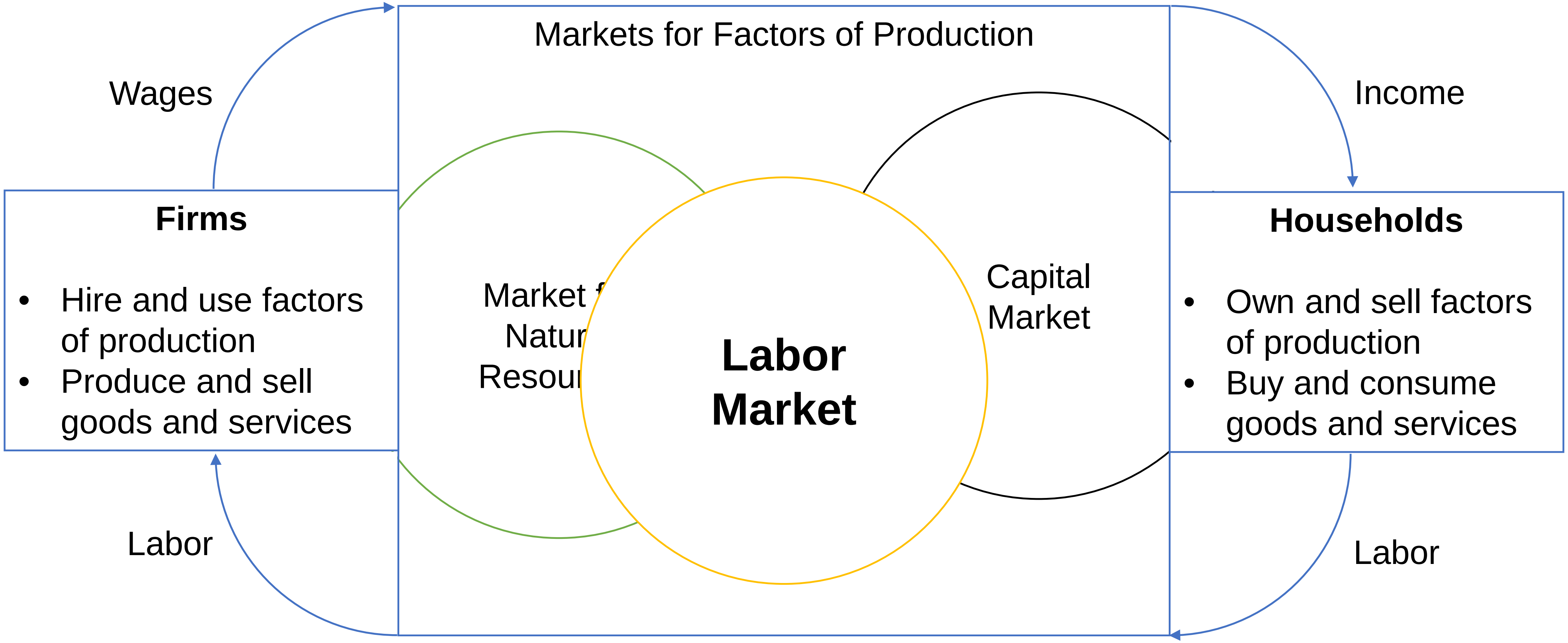
Learning Objectives

- Explain how firms choose the profit-maximizing quantity of labor to employ
- Understand how people choose the quantity of labor to supply
- Show how equilibrium wages are determined in labor markets
- Use the demand and supply model to analyze why wages differ
- Show how equilibrium prices are determined in markets for capital and natural resources

Recall

- Factors of Production
  - Labor, capital, natural resources
- Demand/ Market Demand
  - A curve that shows the relationship between the price of a product and the quantity of the product demanded
  - The demand by all consumers of a given good or service
- Supply/ Market Supply
  - A curve that shows the relationship between the price of a product and the quantity of the product supplied
  - The supply by all producers of a given good or service
- Market equilibrium
  - A stable price/quantity pair for which no individual market participant could improve the outcome for herself by altering her own behavior.

The Labor Market



The Demand for Labor

- Assumptions
  - In the short-run production can only be increased by increasing the quantity of labor
  - Firms and households are perfect competitors (price-takers)
- Derived demand
  - The demand for a factor of production, i.e. labor, depends on the demand for the good that the factor produces
- A firm’s demand for labor depends primarily on two factors:
  - The additional units it can produce when hiring one more worker
  - The additional revenue it receives from selling the additional units

The Demand for Labor – Ctd.

- The marginal product of labor (MP)
  - The additional units (output) a firm can produce when hiring one more worker
  - Due to the law of diminishing returns, the marginal product of labor declines as more workers are hired
- The marginal revenue product of labor (MRP)
  - The additional revenue a firm receives from selling the additional units
- How many workers will a firm now hire?

The Profit-Maximizing Quantity of Labor Example

- Penny had the wonderful idea to create “Penny Blossoms,” small hair barrettes.
- To decide, how many workers to hire, Penny wants to know:
  - How much will revenue increase as I hire another worker and sell their output?
- Let’s see if we can help her decide!

The Profit-Maximizing Quantity of Labor Example

Workers	$\frac{\text{Wage}}{\text{Worker}}$	Product Price	$\frac{\text{Output}}{\text{Hour}}$	Marginal Product of Labor	Marginal Revenue Product	Additional Profit per Worker
L	W	P	Q	$Q_L - Q_{L-1} = MP$	$P \times MP = MRP$	$MRP - W$
0	10	5	0			
1	10	5	5			
2	10	5	9			
3	10	5	12			
4	10	5	14			
5	10	5	15			

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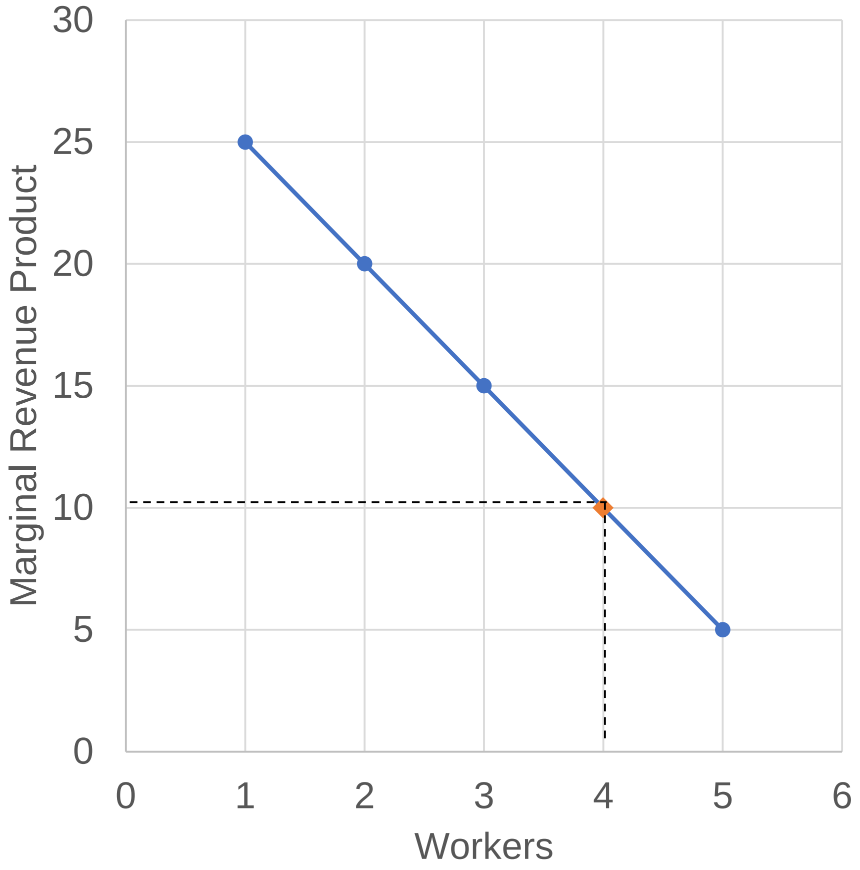
L	W	Q	P	$Q_L - Q_{L-1} = MP$	$P \times MP = MRP$	$MRP - W$
0	10	0	5	-	-	-
1	10	5	5	5	25	15
2	10	9	5	4	20	10
3	10	12	5	3	15	5
4	10	14	5	2	10	0
5	10	15	5	1	5	-5

The Demand for Labor – Ctd.

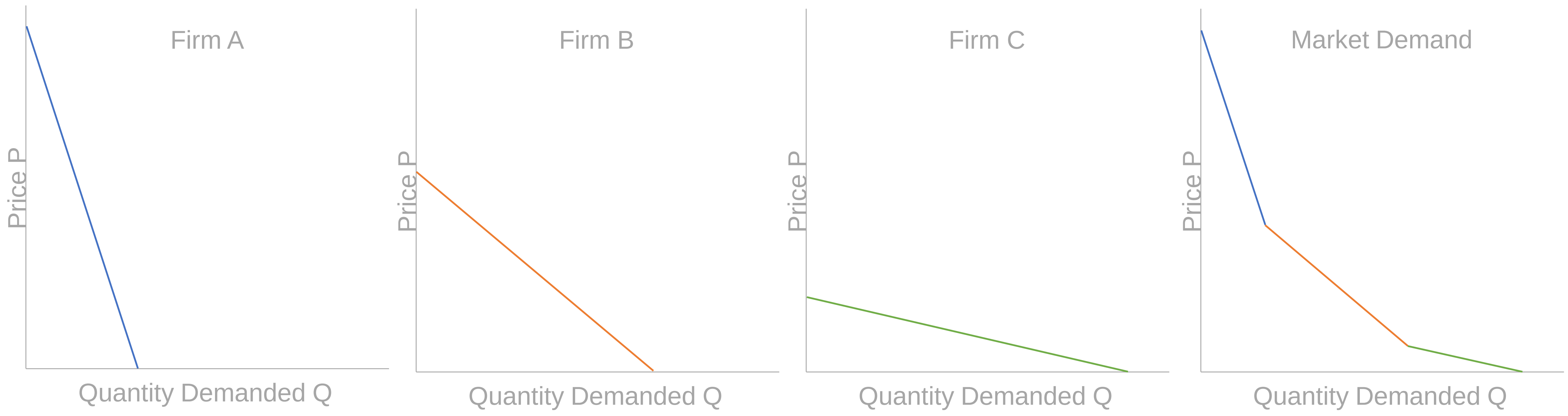


A firm's demand for labor

- A firm's demand for labor equals its marginal revenue product of labor.
- It tells the firm the profit-maximizing quantity of workers at each wage.
- At the example's hourly wage of W=10, the profit-maximizing quantity of workers is L*=4.

The Demand for Labor – Ctd.

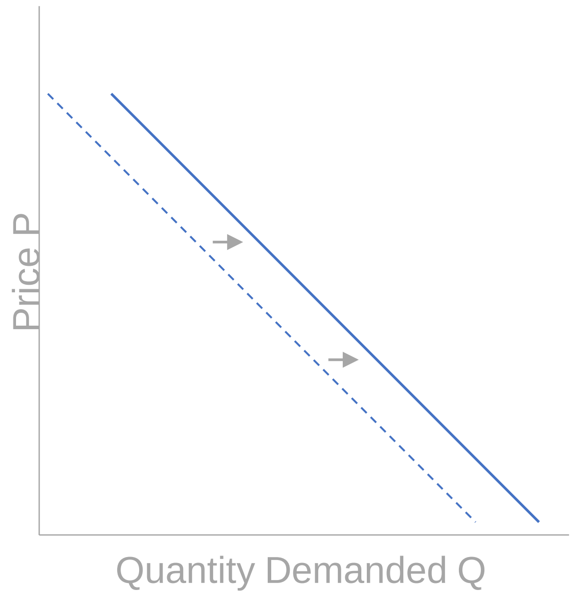
The Market Demand for Labor



Determinants of the Market Demand for Labor

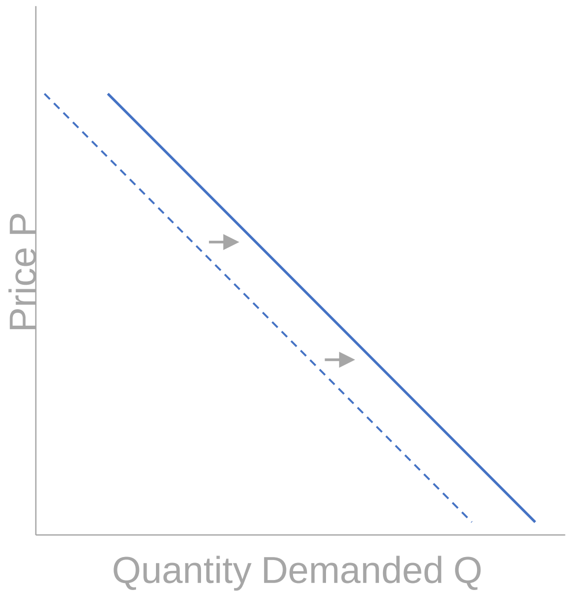
Human Capital

- The accumulated knowledge and skills that workers acquire from formal training and education or from life experience



Technology

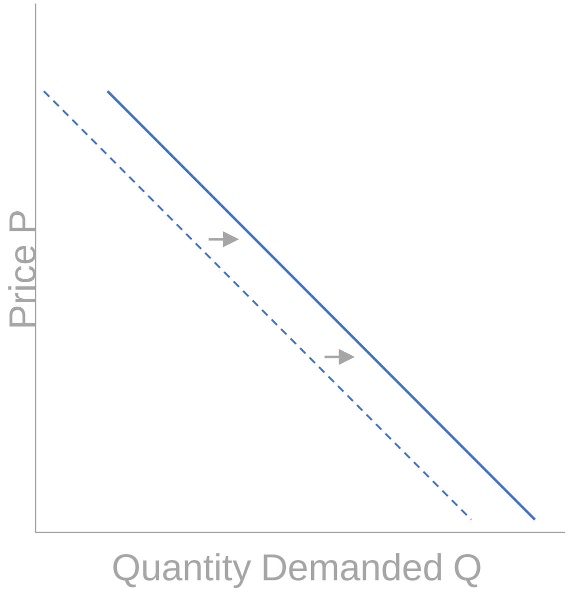
- Research and development towards enhancing pre-existing products or processes



Determinants of the Market Demand for Labor

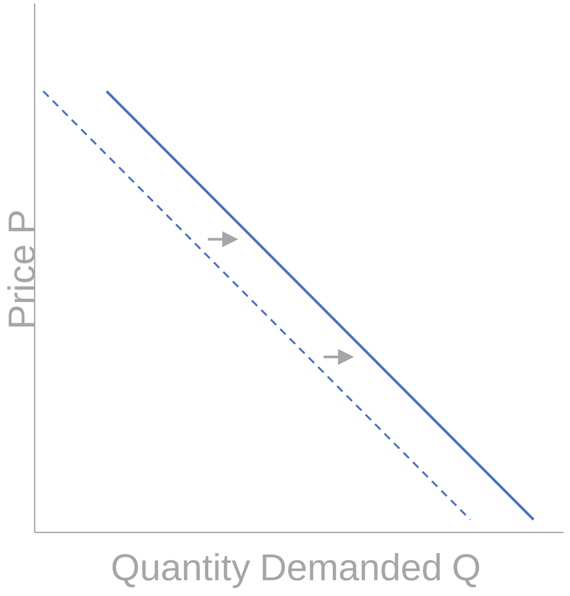
Price of the Product

- Increase in the product price



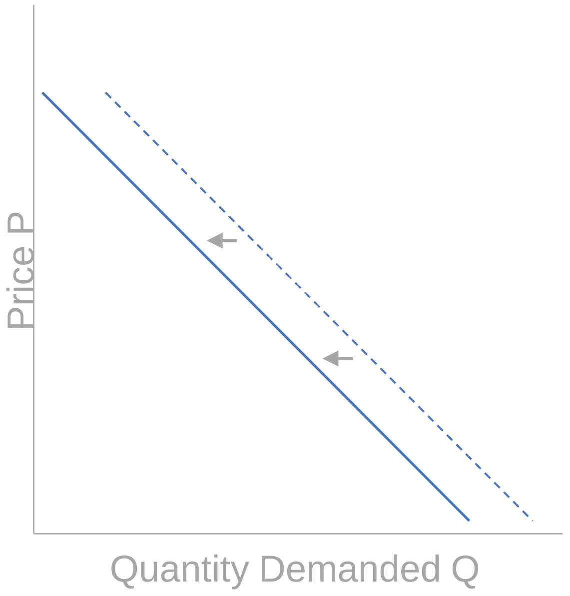
Quantity of other Inputs

- E.g. more efficient machinery



Number of Firms in the Market

- Firms leaving the market due to bankruptcy



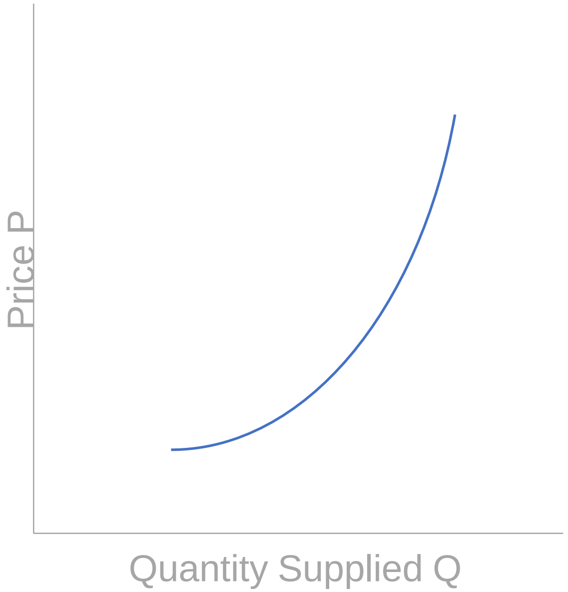
The Supply of Labor

- Trade-Offs
  - One of the most important trade-offs everyone faces is how to divide up the 24 hours in a day between labor and leisure
- Wage
  - Devoting an hour to leisure, we give up an hour's earnings from working.
  - Thus, the opportunity cost of leisure is the wage

The Supply of Labor

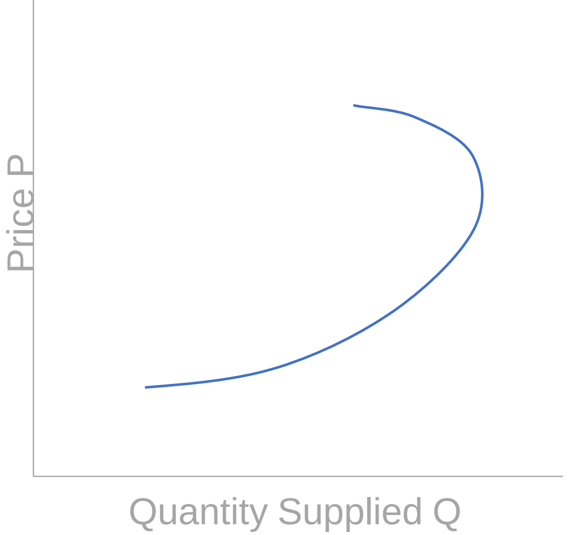
The Labor Supply Curve

- As wage increases, the opportunity cost of leisure increases



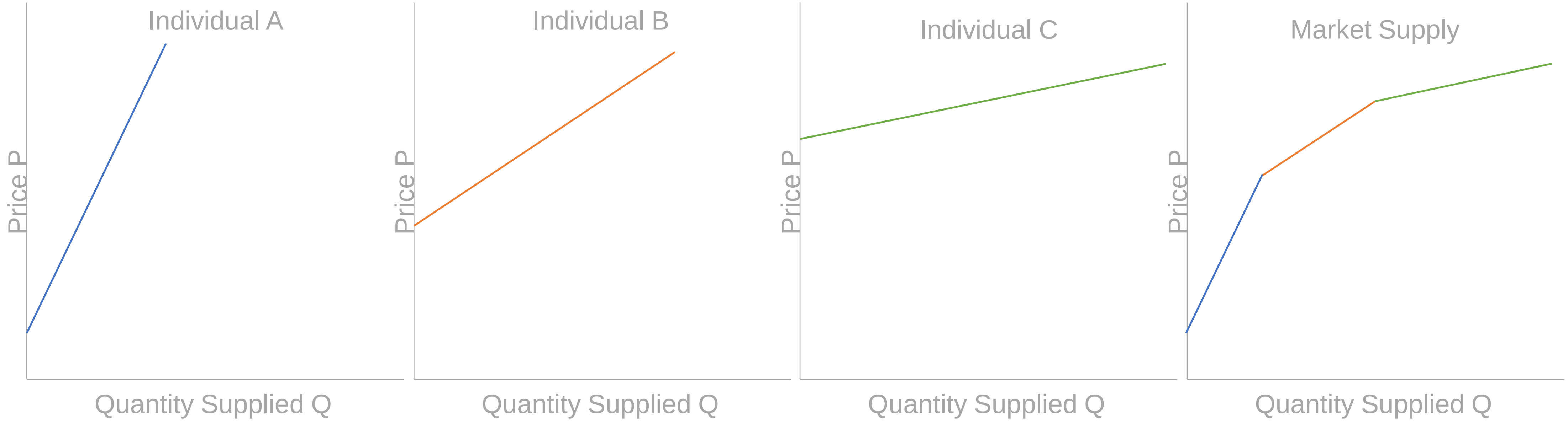
Backward-bending Labor Supply Curve

- As the wage rises above a certain level, the individual can afford more leisure even though the opportunity cost of leisure is higher



The Supply of Labor – Ctd.

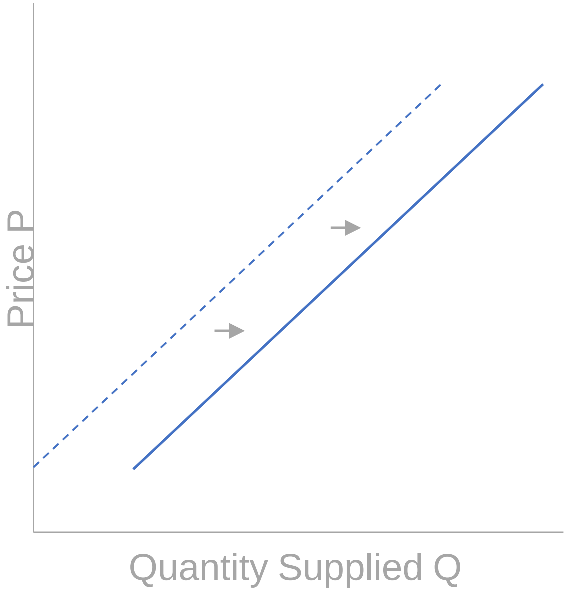
The Market Supply for Labor



Determinants of the Market Supply of Labor

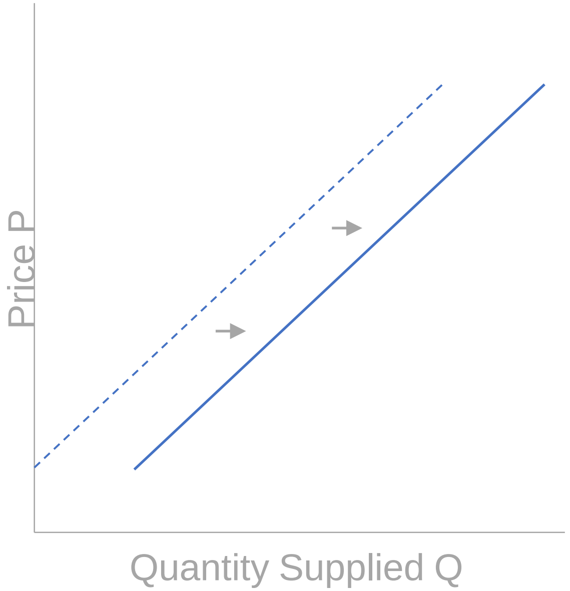
Increasing Population

- Number of births exceeding number of deaths



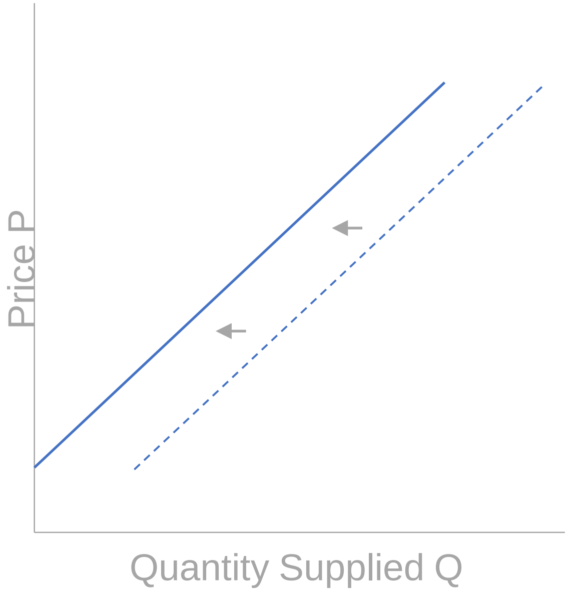
Changing Demographics

- E.g. increasing female labor force



Changing Alternatives

- E.g. unemployment benefits



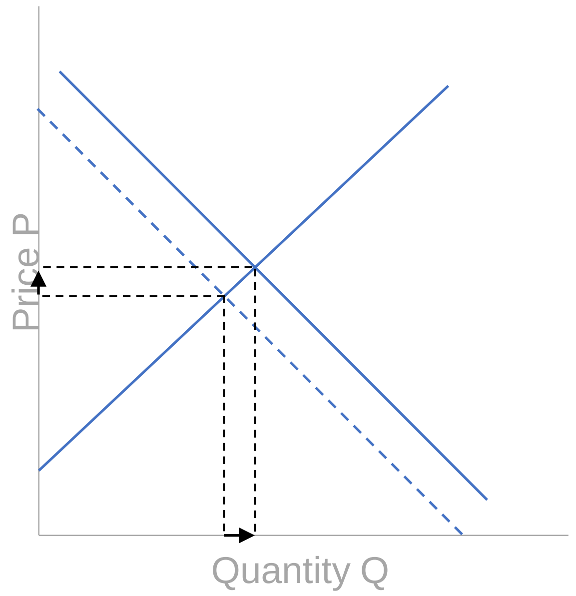
The Equilibrium in the Labor Market

- As in other markets, equilibrium in the labor market occurs where the demand curve for labor and the supply curve of labor intersect.
- The equilibrium wage equals the marginal revenue product of labor.

The Equilibrium in the Labor Market – Ctd.

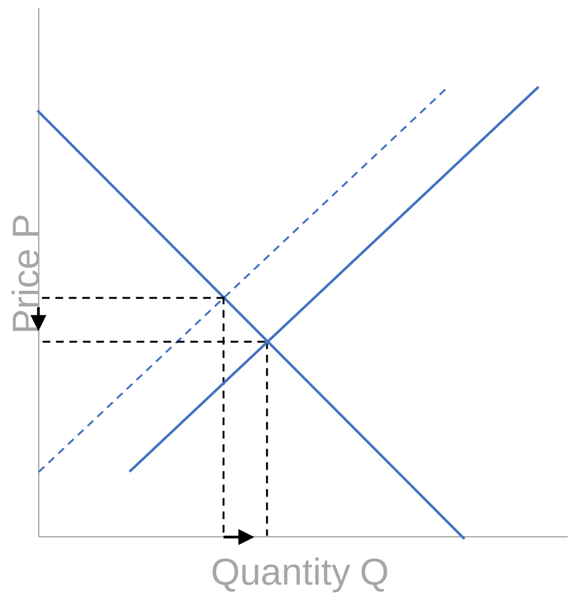
Changes in Demand

- What are the determinants of Demand?



Changes in Supply

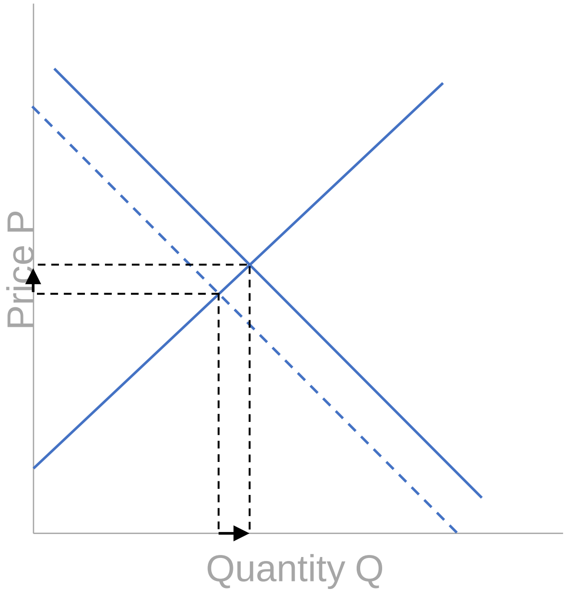
- What are the determinants of Supply?



Recent Developments in the Labor Market

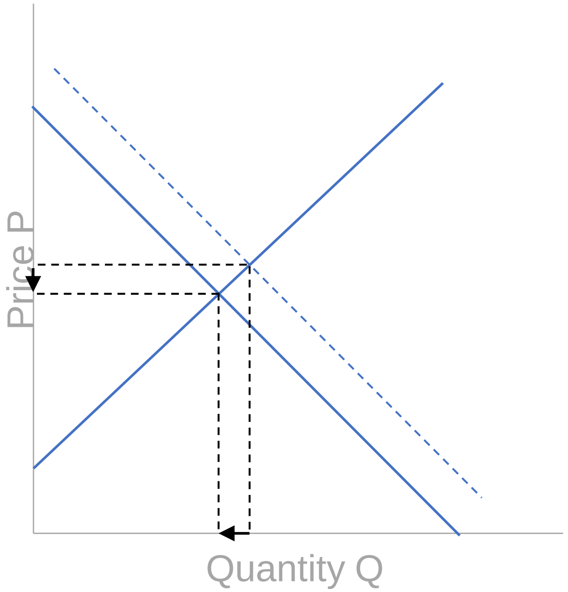
Highly Skilled Workers

- E.g. doctors, lawyers, software engineers



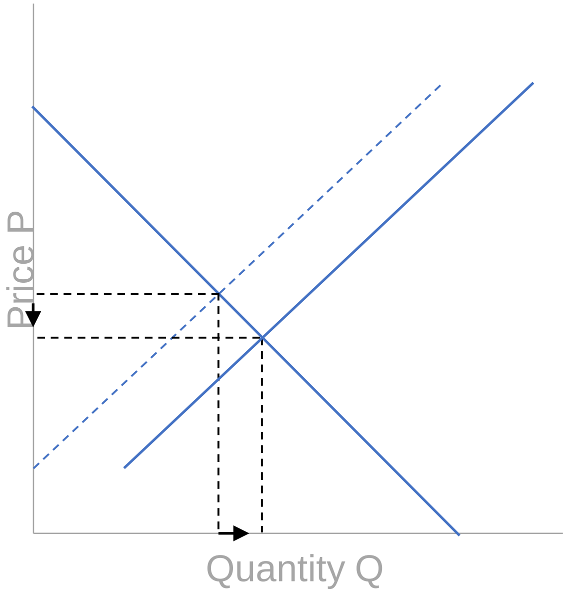
Middle-skilled Workers

- E.g. salespeople, factory workers, office workers



Lower-skilled workers

- E.g. food workers, janitors, flight attendants



The Market for Capital

- Derived demand
  - The demand for a factor of production, i.e. capital, depends on the demand for the good that the factor produces
- A firm’s demand for capital depends primarily on two factors:
  - The additional units it can produce when employing another machine
  - The additional revenue it receives from selling the additional output
- The Marginal Revenue Product of Capital
  - The additional revenue a firm receives from selling the additional units
  - The demand for capital

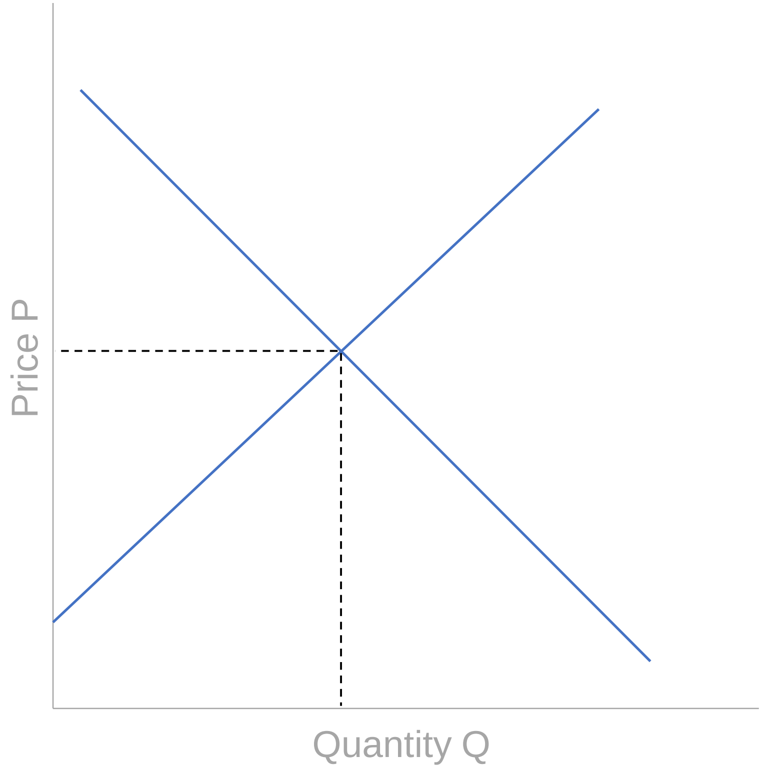
The Market for Natural Resources

- Derived Demand
  - — The demand for a factor of production, i.e. natural resources, depends on the demand for the good that the factor produces
- A firm’s demand for natural resources depends primarily on two factors:
  - — The additional units it can produce when employing one more acre of land
  - — The additional revenue it receives from selling the additional output
- The Marginal Revenue Product of Natural Resources
  - — The change in a firm’s revenue as a result of employing one more unit of natural resources
  - — The demand for natural resources

The Market for Natural Resources – Ctd.

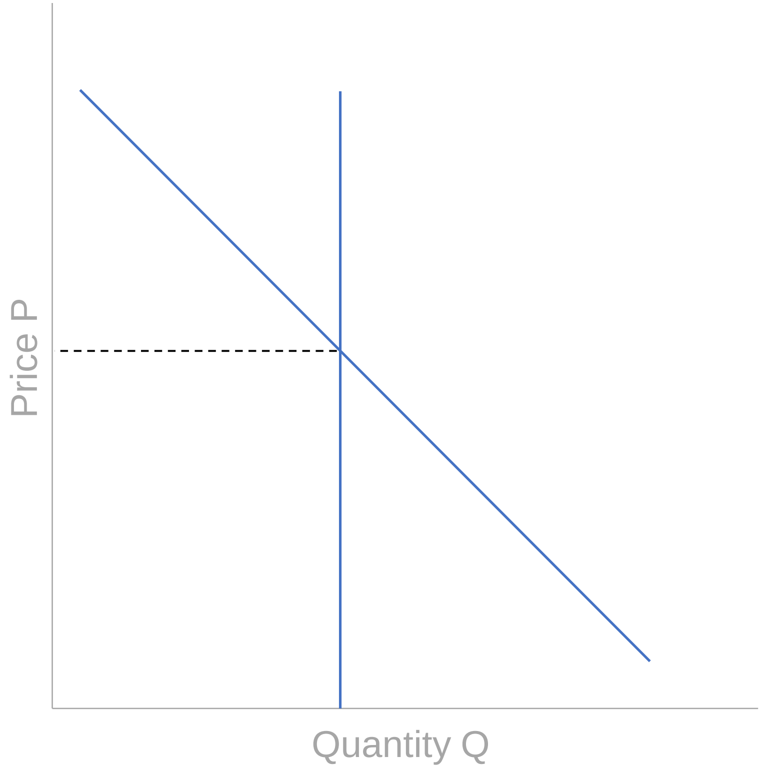
Upward-sloping supply

e.g. gas supplied during a certain period



Fixed Supply

e.g. Land



Summary

- The demand for factors of production (labor, capital, natural resources) is a **derived demand**.
- The additional output a firm can produce when employing one more unit of a factor of production is called the **marginal product** of the respective factor of production.
- The **marginal revenue product** of a factor or production refers to the additional revenue a firm receives from selling the additional units of output.
- The marginal revenue product curve is equal to the demand for the respective factor of production.