

Factor Markets and the Distribution of Income

Krugman and Wells - Chapter 19

- Demand for factors of production (FoP) is derived demand.
- The amount of FoP demanded are based on the firm's output decision.
- Producers want to maximize profit \rightarrow produce the Q^* that maximizes profit.
- This means the firm wants to hire a quantity of the FoP that can produce Q^* .
- Determine the **profit-maximizing quantity of workers** using marginal analysis.

- Compare between the cost of hiring an additional unit of the factor with the benefit from hiring that additional unit.
- Assumption = labor markets are perfectly competitive (PC).
- Therefore, firms and workers are price takers.
- **The price of labor is wage (W).**
- As it's PC, the W is determined by the labor demand and labor supply in the market.

- Cost of hiring an additional worker = **MC = W**.
- Benefit of hiring an additional worker = **MB = value of the output that the extra worker produces.**
- First determine the marginal product of labor, MPL.
- Then the value of the MPL = what the firm earns by selling that MPL in the market = **value of the marginal product of labor (VMPL)**

$$\text{VMPL} = P \text{ of the good} \times \text{MPL}$$

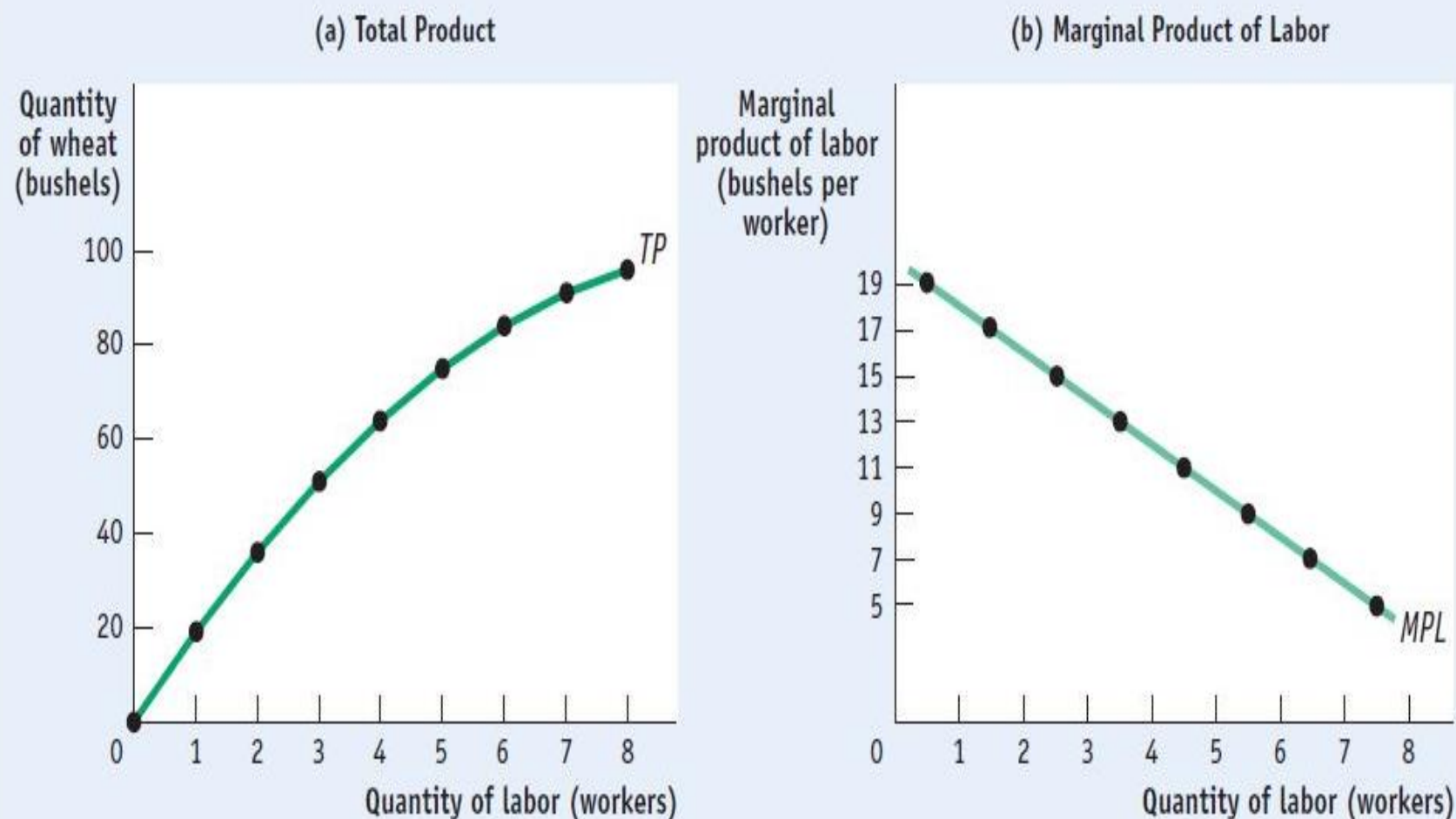
- The **value of the marginal product** of a factor is the value of the additional output generated by employing one more unit of that factor.
- We know that profit is maximized where $MC = MB$
- Hence, **at the profit maximizing quantity of labor $W = \text{VMPL}$.**

TABLE 19-1

Employment and Output for
George and Martha's Farm

Quantity of labor L (workers)	Quantity of wheat Q (bushels)	Marginal product of labor $MPL = \frac{\Delta Q}{\Delta L}$ (bushels per worker)
0	0	
1	19	19
2	36	17
3	51	15
4	64	13
5	75	11
6	84	9
7	91	7
8	96	5

FIGURE 19-2

The Production Function and Marginal Product of Labor Curve
for George and Martha's Farm

Panel (a) shows how the quantity of output of wheat on George and Martha's farm depends on the number of workers employed.

Panel (b) shows how the marginal product of labor depends on the number of workers employed.

- Keep hiring as long as $VMPL > W$
- Hence, if $VMPL > W \rightarrow$ hire
- Should not hire anymore if $VMPL < W$
- Hence, if $VMPL < W \rightarrow$ do not hire (in fact, fire)
- Employ up to the point where for the last worker employed,

$$VMPL = W$$

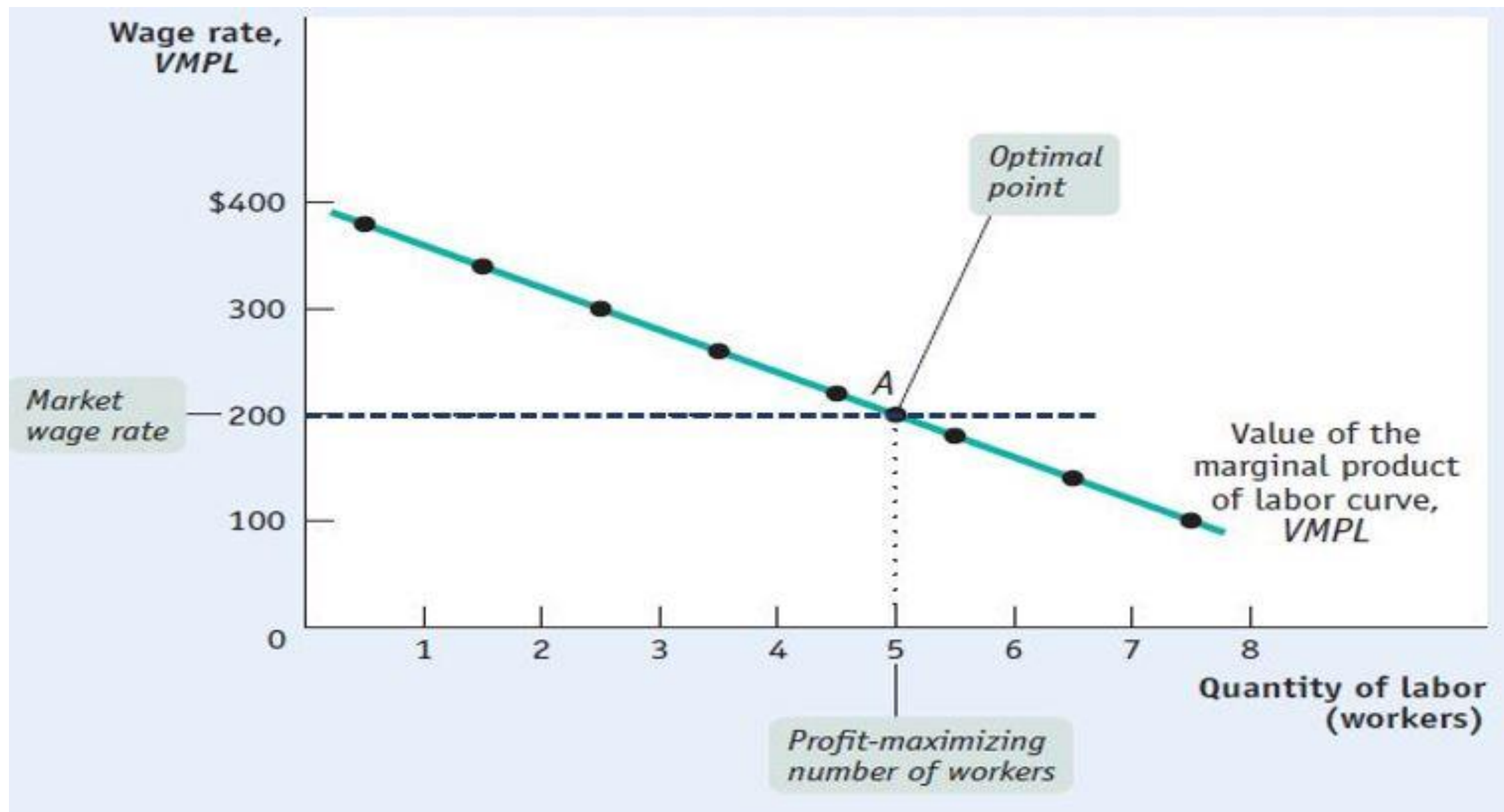
Therefore, do not hire anymore = optimal quantity of workers.

VMPL and Factor Demand

- The **value of the marginal product curve** of a factor shows how the value of the marginal product of that factor depends on the quantity of the factor employed.
- The VMPL curve shows the relationship between the number of workers employed and the VMPL.
- It's downward sloping because MPL is downward sloping due to **diminishing marginal returns to labor.**

P = \$20 per bushel of wheat and W = \$200 per worker

Q of Labor (L) (workers)	Q of Wheat (bushels)	MPL (bushels per worker)	VMPL (P x MPL) (\$) P = \$20	W (\$)	Additional Profit (\$) (VMPL – W)	Profit (TR – TC) (\$) TR = P x Q TC = W x L
0	0					-
1	19	19	380	200	180	(380 – 200) = 180
2	36	17	340	200	140	(720 – 400) = 320
3	51	15	300	200	100	(1020 – 600) = 420
4	64	13	260	200	60	(1280 – 800) = 480
5	75	11	220	200	20	(1500 – 1000) = 500
6	84	9	180	200	-20	(1680 – 1200) = 480
7	91	7	140	200	-60	(1820 – 1400) = 420
8	96	5	100	200	-100	(1920 – 1600) = 320



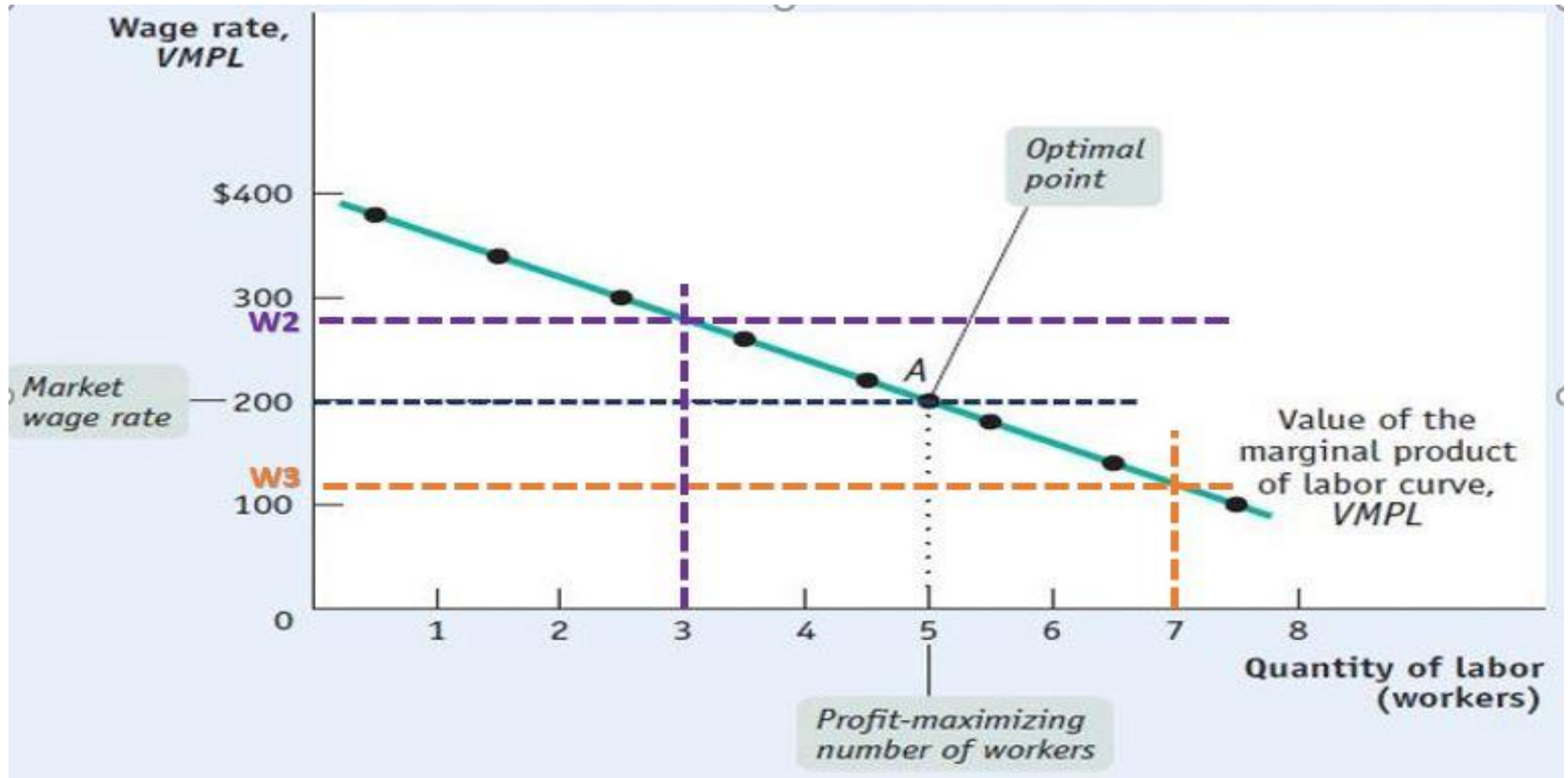
- *The VMPL curve is the individual producer's labor demand curve.*

- In general, a producer's value of the marginal product curve for any factor of production is that producer's individual demand curve for that factor of production.

- *W falls \rightarrow Q_d of L rises*

- *W rises \rightarrow Q_d of L falls*

What happens if the W falls/rises?



- Changes in W = **movement** along the labor demand curve.
- At a **lower W** \rightarrow profit maximizing quantity of labor **rises**
- At a **higher W** \rightarrow profit maximizing quantity of labor **falls**

Factors that Shift the Labor Demand Curve

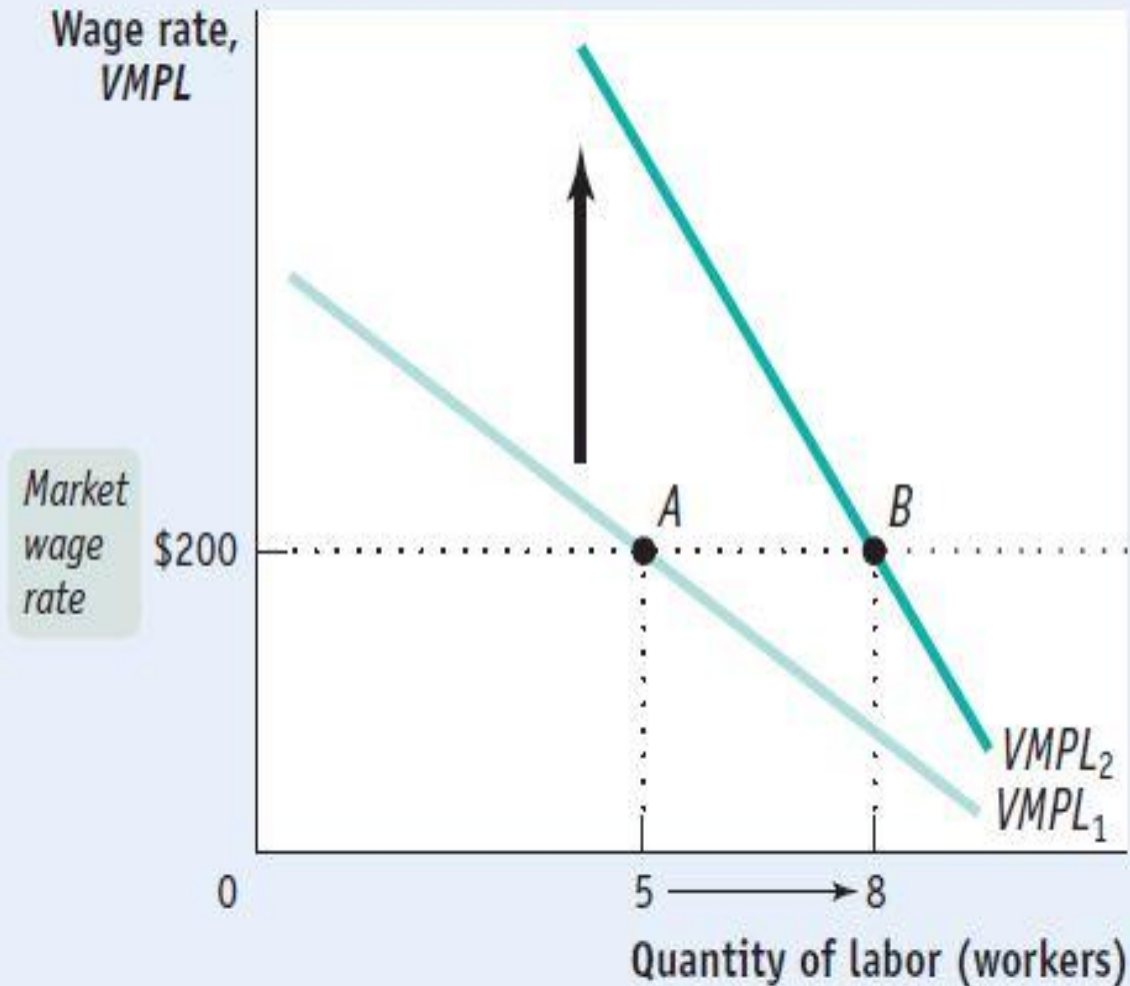
- 1) Changes in the Price of the Firm's Output*
- 2) Changes in the Supply of other FoP*
- 3) Changes in Technology*

1. Changes in the Price of the Firm's Output

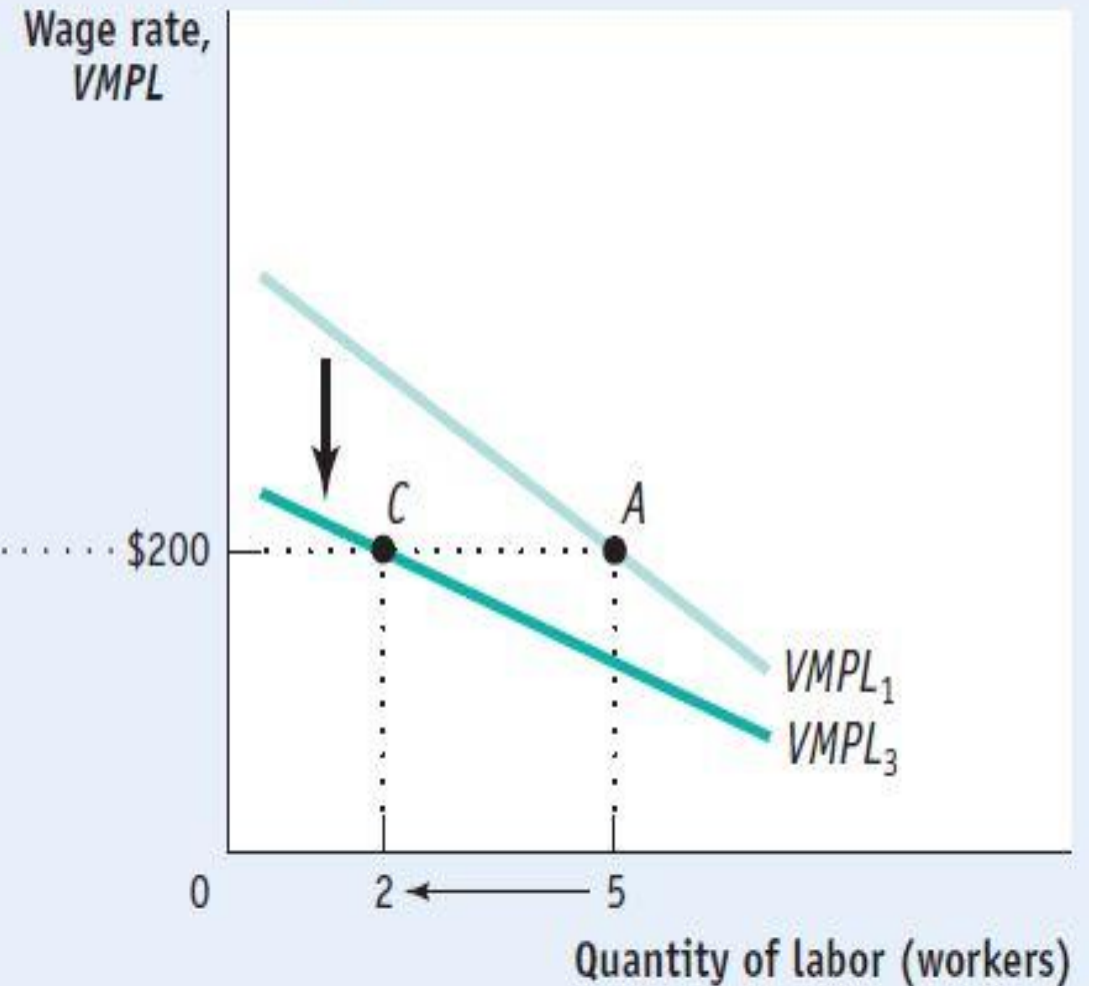
- As factor demand is derived demand if the **price of the good** that is produced with a factor **changes**, so will the VMP of the factor.
- That is, in the case of labor demand, if P changes, $VMPL = P \times MPL$ will change at any given level of employment.
- When the **P of the good rises** \rightarrow **VMPL rises** ($P \uparrow \times MPL = VMPL \uparrow$) at any given quantity of labor and the Labor Demand curve **shifts to the right**.
- When the **P of the good falls** \rightarrow **VMPL falls** ($P \downarrow \times MPL = VMPL \downarrow$) at any given quantity of labor and the Labor Demand curve **shifts to the left**.

At the same W, Qd of L changes = shift in D curve

(a) An Increase in the Price of Wheat



(b) A Decrease in the Price of Wheat



2. Changes in the Supply of other FoP

- Such as acquiring more land to cultivate or buying more machineries.
- Same effect on labor demand as a change in the price of wheat.
- **Effect on MPL.**
- **MPL rises** → **VMPL rises** ($P \times \text{MPL} \uparrow = \text{VMPL} \uparrow$) at any given quantity of labor and the Labor Demand curve **shifts to the right**.
- **MPL falls** → **VMPL falls** ($P \times \text{MPL} \downarrow = \text{VMPL} \downarrow$) at any given quantity of labor and the Labor Demand curve **shifts to the left**.

EXTRA NOTE – why didn't the L Demand Curve Shift Parallely? MPL falls at a faster rate as L increases

QL	MPL	VMPL at P = 5	VMPL at P = 8	Difference in VMPL
1	5	25	40	15
2	4	20	32	12
3	3	15	24	9

3. Changes in Technology

- The effect of technological progress on the demand for any given factor can go **either way:**
- **Improved technology can either increase or reduce the demand for a given factor of production.**
- So technological progress can increase the demand for certain types of labor whereas decrease the demand for other types.

- For e.g. an automated bread making machine can replace bakers, thus their demand falls whereas the demand for workers who produce these machines can rise as the manufacturers hire more workers.
- In, short, it depends on the type of the good being produced.
- However, throughout history technological progress has a positive impact on labor productivity = raising the demand for labor.

The Market Demand Curve for Labor

- We've seen the firm's individual labor demand curve and how it's derived.
- The market labor demand curve is downward sloping and is derived by adding all the quantities of labor demanded by all the firms in the market at each wage rate. (similar to deriving the market demand curve for a good/service)

The Individual Labor Supply

- **The individual labor supply curve** shows how the quantity of labor supplied by an individual depends on that individual's wage rate.
- How much labor I supply has to do with how I divide my time among different activities.
- People allocate their time between **two broad activities**:
 - **Labor (work)**
 - **Leisure** – It is a broad term that includes all activities other than supplying labor (watching a movie, doing household chores, etc).
- Assumption = people can choose to work as many hours as they wish to.

- As a rational individual I will supply one more hour in the labor market if the marginal utility enjoyed from consuming the goods/services using that one hour's wage is higher than the marginal utility received from that one hour of leisure, and vice-versa.
- **Opportunity cost (OC) of supplying labor = leisure**
- **OC of time spent on leisure = forgone wage/goods and services that could be afforded using that wage**

What happens when the wage rate goes up?

- Suppose, the wage rate doubles. Two possibilities,
 - 1) Will **work longer hours** as incentive to work has increased (as OC of not working an hour increased): by giving up an hour of leisure, can now gain twice as much money as before.
 - 2) Will **work fewer hours** because doesn't need to work as many hours to generate the income to pay for the goods wanted.
- The quantity of labor supplied by an individual either rise or fall when his/her wage rate rises.

- Individual labor supply decisions are influenced by the **substitution effect (SE)** and the **income effect (IE)** of changes in wages.
- **SE** – When the wage rate goes up workers supply more labor hours due to a higher wage → consuming less leisure → the OC of spending an hour more on leisure activities is much higher now = the forgone higher wage.
- When workers supply more labor hours in the labor market due to wage increases → substitution effect → the worker is substituting work in place of leisure.

- IE – A higher wage → higher income, holding everything else constant → consume more leisure. Why? → **leisure is a normal good** and can still earn the same income as before by working fewer hours and enjoying more leisure time.
- When workers supply fewer labor hours in the market and consume more leisure due to a wage increase → the income effect.

An increase in wage

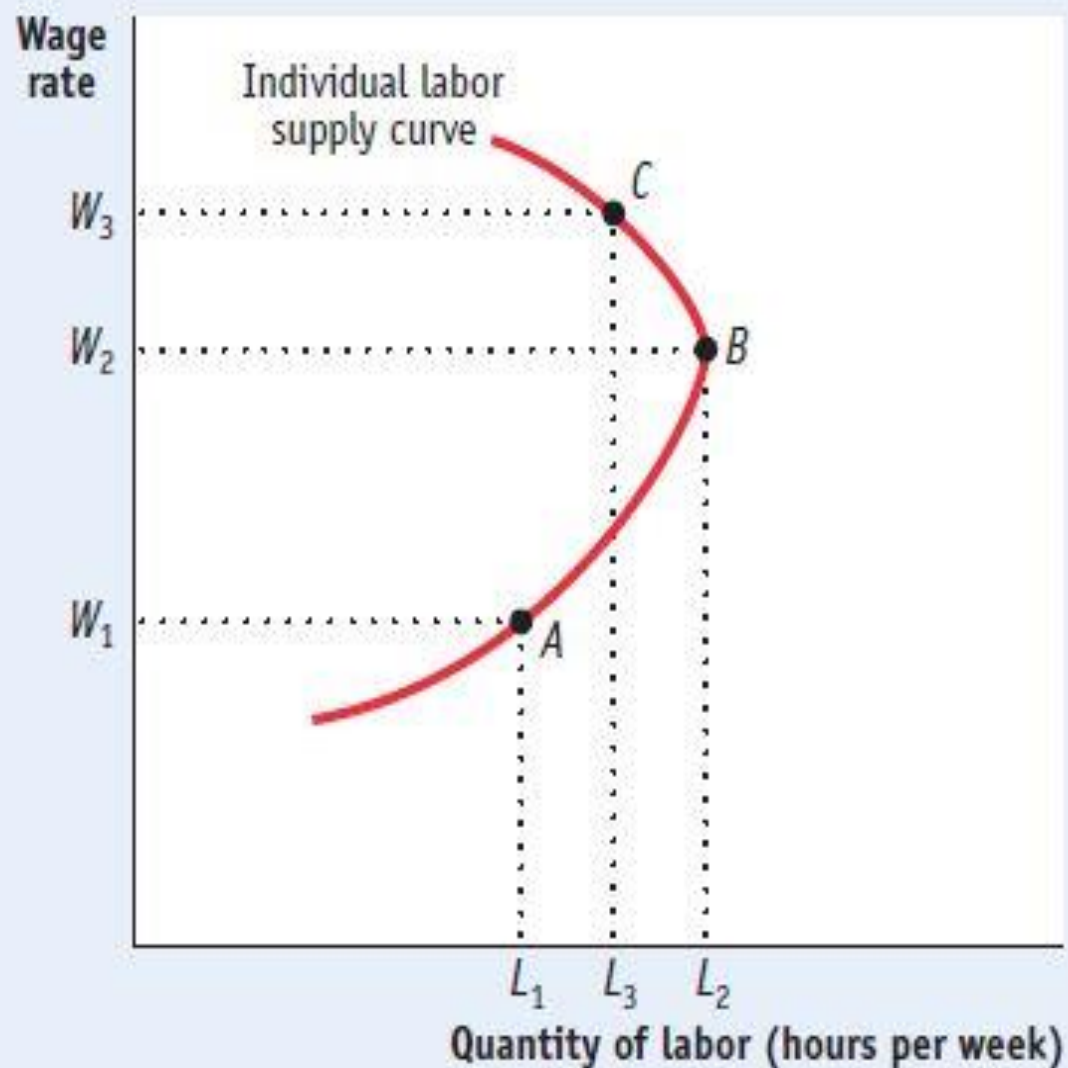
SE → consume *less* leisure and work *longer* hours.

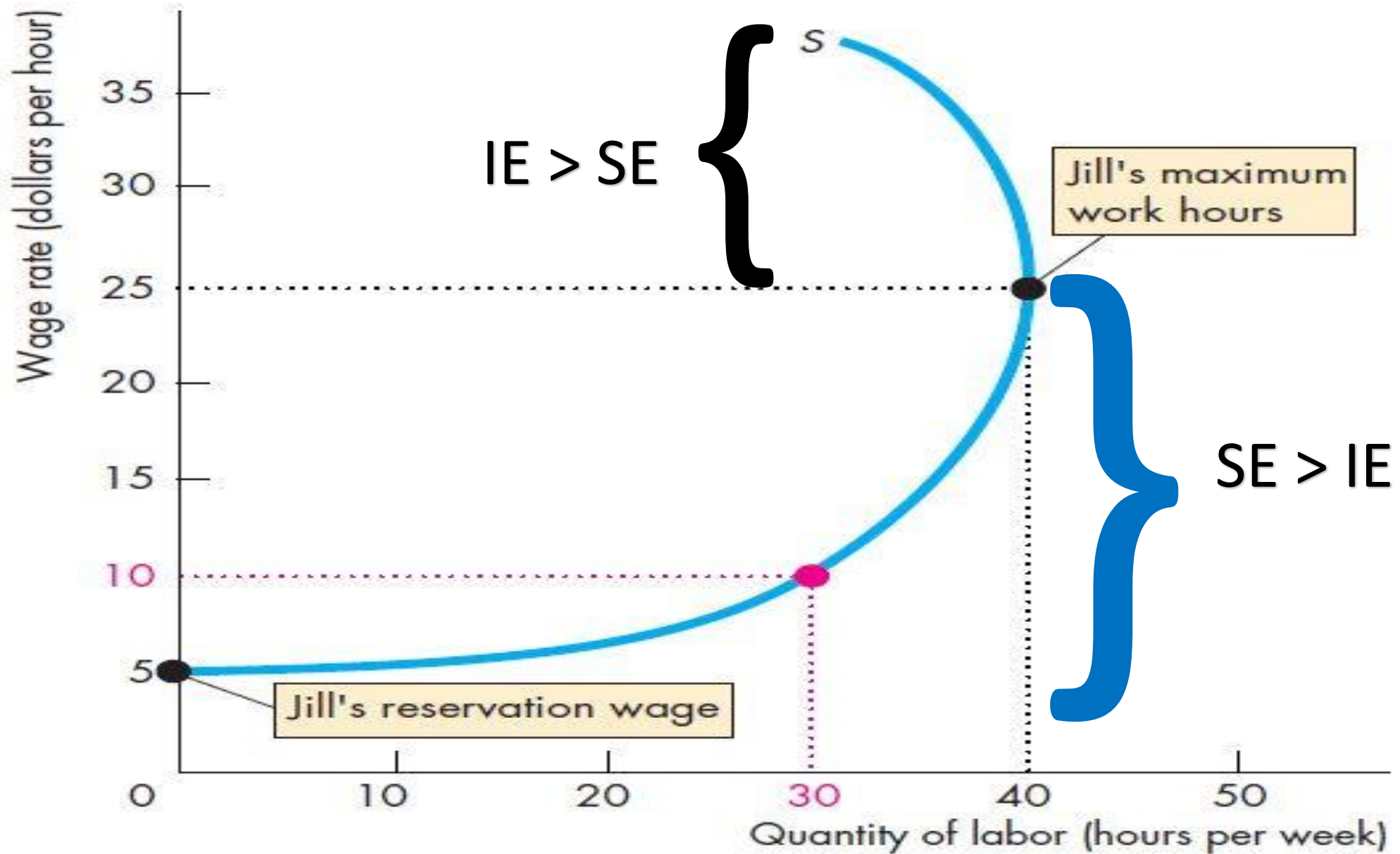
IE → consume *more* leisure and work *fewer* hours

- These two effects work in **opposite directions** and give the individual labor supply curve its unique shape.

FIGURE 19A-3 A Backward-Bending Individual Labor Supply Curve

At lower wage rates, the substitution effect dominates the income effect for this individual. This is illustrated by the movement along the individual labor supply curve from point *A* to point *B*: a rise in the wage rate from W_1 to W_2 leads the quantity of labor supplied to increase from L_1 to L_2 . But at higher wage rates, the income effect dominates the substitution effect, shown by the movement from point *B* to point *C*: here, a rise in the wage rate from W_2 to W_3 leads the quantity of labor supplied to decrease from L_2 to L_3 .





- A **backward - bending individual labor supply curve** is an individual labor supply curve that slopes upward at low to moderate wage rates and slopes downward at higher wage rates.

The Market Supply of Labor

- Derived from the supply of labor decisions made by individual households.
- A labor market supply curve shows the quantity of labor (workers) supplied by all households in a particular job market.
- It is found by adding together the quantities of labor supplied by all households to a given job market at each wage rate.
- Despite the fact that an individual's labor supply curve eventually bends backward, the market supply curve of labor slopes upward. ***The higher the wage rate the greater is the quantity of labor supplied in that labor market.***

Shifts of the Labor Supply Curve

1. Changes in Preferences and Social Norms

- Can lead workers to increase or decrease their willingness to work at any given wage. For e.g. more women are in the labor force than before → changes in people's views, technological progress to help in household chores, more support from partners at sharing home work, etc.

2. Changes in Population

- A **larger** population → **rightward shift** → more workers are available at any given wage
- A **smaller** population → **leftward shift** → less workers are available at any given wage
- Migration, birth rate, death rate, etc.

3. Changes in Opportunities

- New business sectors have opened up → more types of work/jobs available now.
- E.g. fitness industry, food industry, part-time jobs, internships, etc. in Bangladesh
- New opportunities raise the labor supply in that labor market whereas can decrease the labor supply in another market as workers shift away to newer and better opportunities.

4. Changes in Wealth

- An increase in one's wealth → consumes more normal goods, including leisure.
- Wealth can go up due to a stock market boom, a real estate boom, etc.
- A **wealth increase will shift the labor supply curve leftward** as workers consume more leisure and work less.
- A **wealth decrease will shift the labor supply curve rightward** as workers consume less leisure and work more.