

Chapter 13: Labor Markets, Poverty, and Income Distribution

Wednesday, July 21

ANOTHER PIZZA RESTAURANT

N	Q
1	21
2	38
3	51
4	60
5	65
6	67
7	67

Again, I own a pizza restaurant. Each slice sells for \$2...

N: The number of workers I hire

Q: The number of pizza slices that I sell

MP AND VMP OF LABOR

N	Q	MP	R	VMP
1	21	21	42	42
2	38	17	76	34
3	51	13	102	26
4	60	9	120	18
5	65	5	130	10
6	67	2	134	4
7	67	0	134	0

Again, I own a pizza restaurant. Each slice sells for \$2...

N: The number of workers I hire

Q: The number of pizza slices that I sell

R: My revenue

MP: The marginal product of labor, $\Delta Q/\Delta N$

VMP: The value of the marginal product of labor, $P \times (\Delta Q/\Delta N)$ or $\Delta R/\Delta N$

QUESTION 1 (my demand for labor)

N	Q	MP	R	VMP
1	21	21	42	42
2	38	17	76	34
3	51	13	102	26
4	60	9	120	18
5	65	5	130	10
6	67	2	134	4
7	67	0	134	0

Again, I own a pizza restaurant. Each slice sells for \$2...

N: number of workers

Q: quantity

R: revenue

MP: marginal product of labor, $\Delta Q/\Delta N$

VMP: value of MP, $P \times (\Delta Q/\Delta N)$ or $\Delta R/\Delta N$

If the wage is \$30 (so I must pay \$30 to hire each worker), how many workers should I employ, to maximize my profit?

A) 1

B) 2

C) 3

D) 4

E) 5

answer to question 1

N	Q	MP	R	VMP
1	21	21	42	42
2	38	17	76	34
3	51	13	102	26
4	60	9	120	18
5	65	5	130	10
6	67	2	134	4
7	67	0	134	0

Again, I own a pizza restaurant. Each slice sells for \$2...

N: number of workers

Q: quantity

R: revenue

MP: marginal product of labor, $\Delta Q/\Delta N$

VMP: value of MP, $P \times (\Delta Q/\Delta N)$ or $\Delta R/\Delta N$

If the wage is \$30 (so I must pay \$30 to hire each worker), how many workers should I employ, to maximize my profit?

A) 1

B) 2

C) 3

D) 4

E) 5

QUESTION 2 (my demand for labor)

N	Q	MP	R	VMP
1	21	21	42	42
2	38	17	76	34
3	51	13	102	26
4	60	9	120	18
5	65	5	130	10
6	67	2	134	4
7	67	0	134	0

Again, I own a pizza restaurant. Each slice sells for \$2...

N: number of workers

Q: quantity

R: revenue

MP: marginal product of labor, $\Delta Q/\Delta N$

VMP: value of MP, $P \times (\Delta Q/\Delta N)$ or $\Delta R/\Delta N$

If the wage is \$5 (so I must pay \$5 to hire each worker), how many workers should I employ, to maximize my profit?

A) 1

B) 2

C) 3

D) 4

E) 5

answer to question 2

N	Q	MP	R	VMP
1	21	21	42	42
2	38	17	76	34
3	51	13	102	26
4	60	9	120	18
5	65	5	130	10
6	67	2	134	4
7	67	0	134	0

Again, I own a pizza restaurant. Each slice sells for \$2...

N: number of workers

Q: quantity

R: revenue

MP: marginal product of labor, $\Delta Q/\Delta N$

VMP: value of MP, $P \times (\Delta Q/\Delta N)$ or $\Delta R/\Delta N$

If the wage is \$5 (so I must pay \$5 to hire each worker), how many workers should I employ, to maximize my profit?

A) 1

B) 2

C) 3

D) 4

E) 5

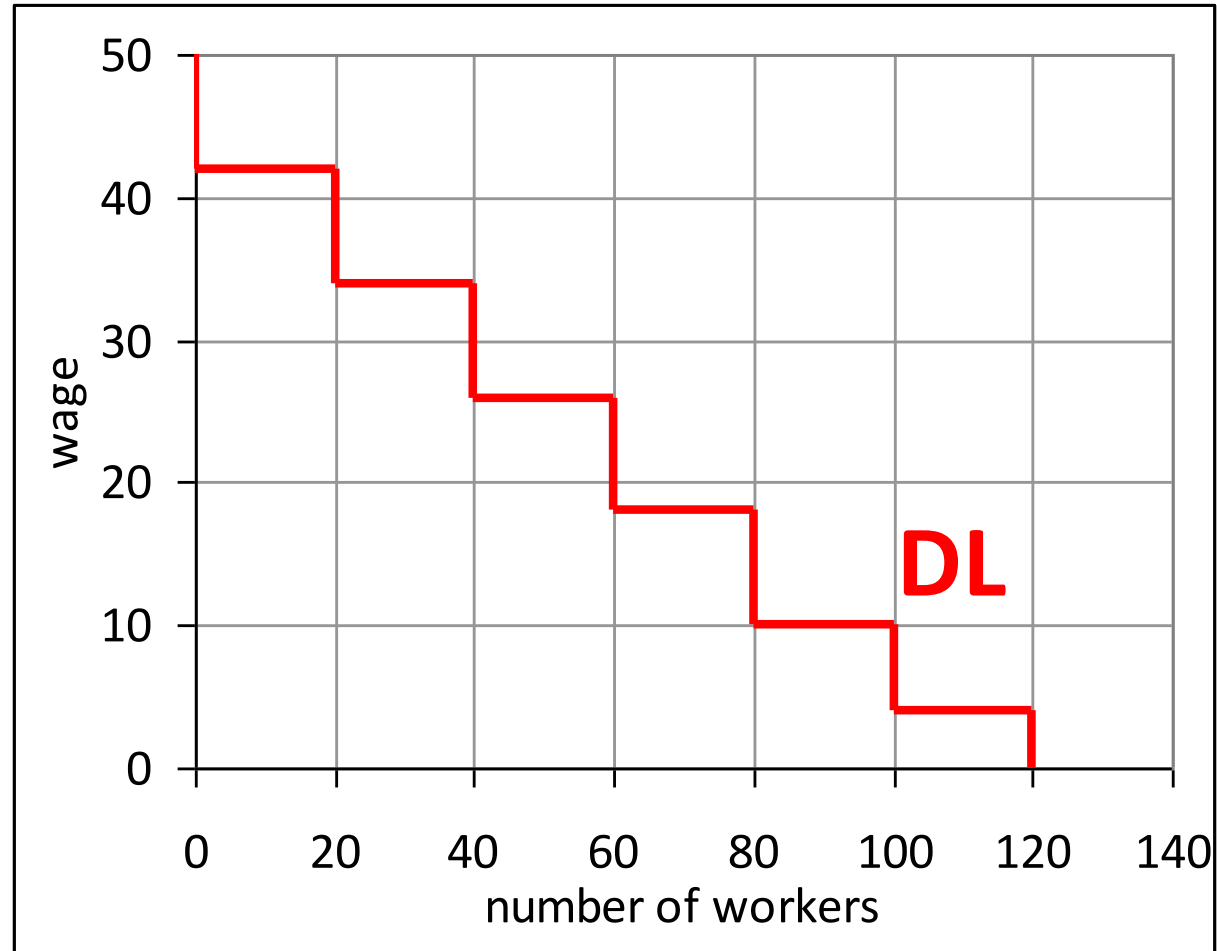
DEMAND FOR LABOR SCHEDULE

N	VMP	W	DL_i	DL
1	\$42	>\$42	0	0
2	\$34	\$34 - \$42	1	20
3	\$26	\$26 - \$34	2	40
4	\$18	\$18 - \$26	3	60
5	\$10	\$10 - \$18	4	80
6	\$4	\$4 - \$10	5	100
7	\$0	\$0 - \$4	6	120

Suppose that there are 20 pizza restaurants in town just like mine. Let DL_i be the quantity that each restaurant would choose given each wage, and let **DL** be the total demand for labor in the pizza worker market.

DEMAND FOR LABOR GRAPH

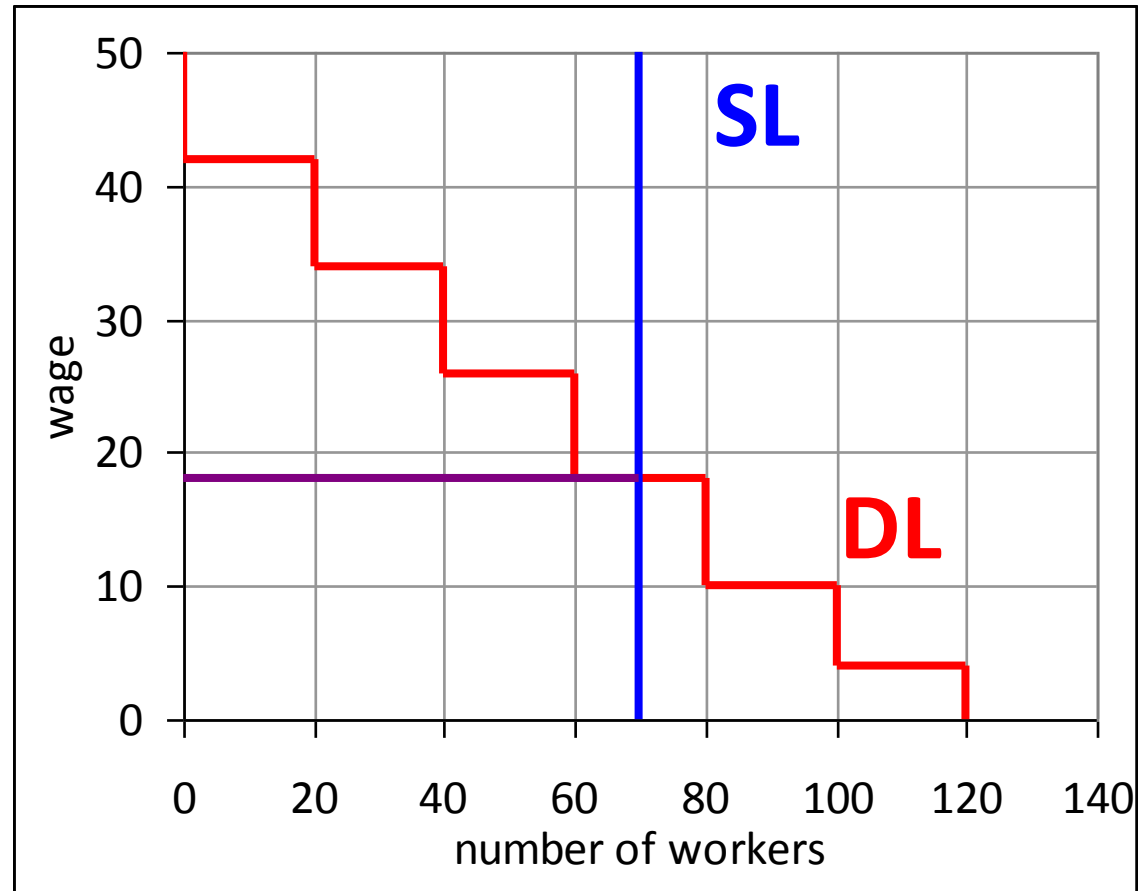
W	DL
>\$42	0
\$34 - \$42	20
\$26 - \$34	40
\$18 - \$26	60
\$10 - \$18	80
\$4 - \$10	100
\$0 - \$4	120



If workers' value of marginal product decreases as more are hired, then at higher wages, firms will choose to hire fewer workers.

LABOR MARKET EQUILIBRIUM

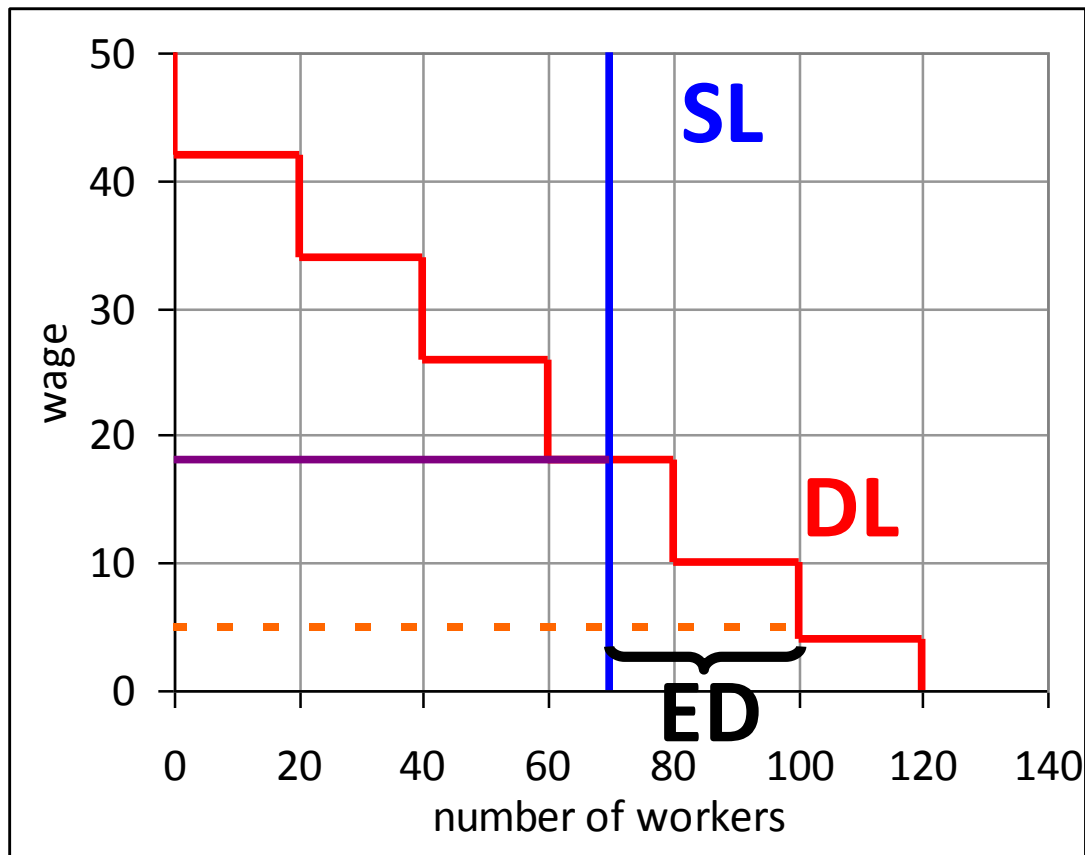
W	DL _i	DL
>\$42	0	0
\$34 – \$42	1	20
\$26 – \$34	2	40
\$18 – \$26	3	60
\$10 – \$18	4	80
\$4 – \$10	5	100
\$0 – \$4	6	120



Suppose that the supply of pizza workers is perfectly inelastic at $SL = 70$. Then, all workers will be hired at a wage of \$18, which is the VMP for each firm's 4th worker. Each firm will hire 3 or 4 workers.

LABOR MARKET: EXCESS DEMAND

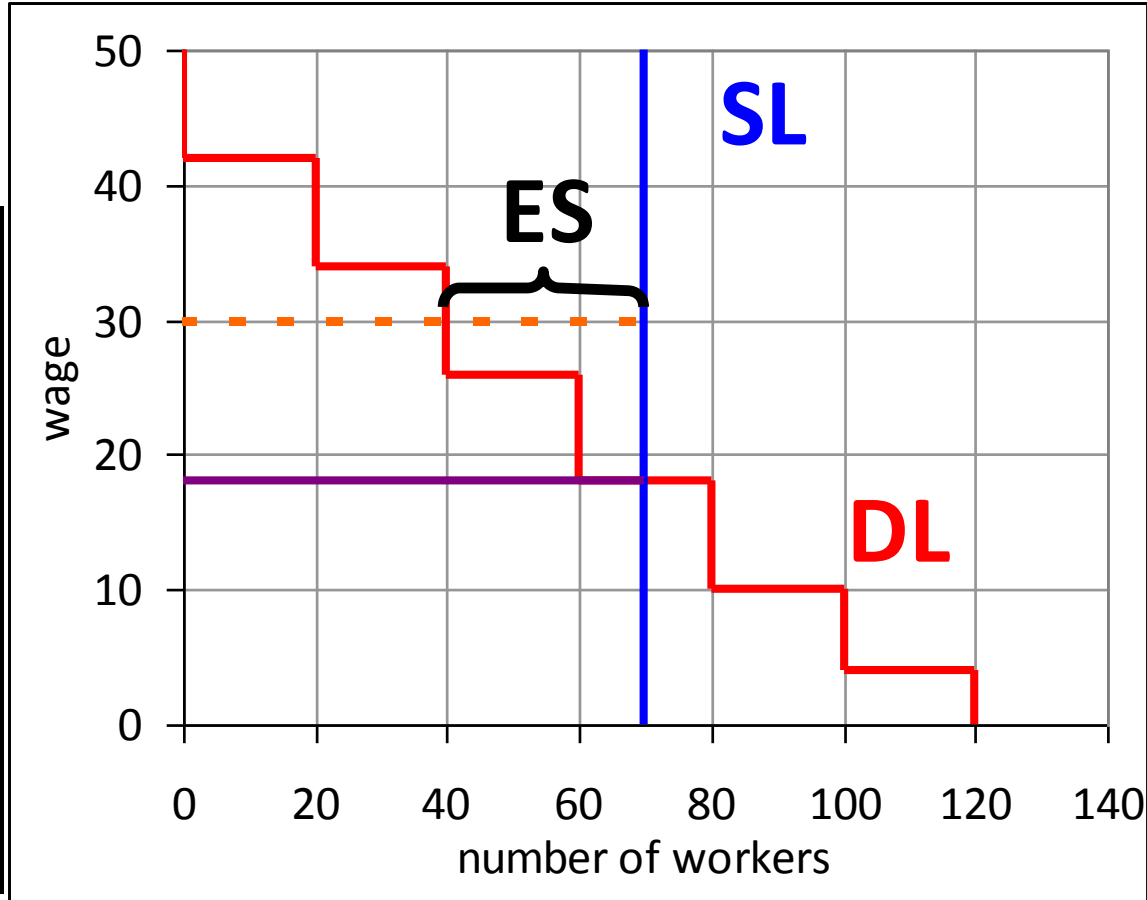
W	DL _i	DL
>\$42	0	0
\$34 – \$42	1	20
\$26 – \$34	2	40
\$18 – \$26	3	60
\$10 – \$18	4	80
\$4 – \$10	5	100
\$0 – \$4	6	120



If the wage is \$5, then each firm will want to hire 5 workers, for a total of 100, but only 70 are available. Thus, firms will compete for workers by offering higher wages.

LABOR MARKET: UNEMPLOYMENT (EXCESS SUPPLY)

W	DL _i	DL
>\$42	0	0
\$34 – \$42	1	20
\$26 – \$34	2	40
\$18 – \$26	3	60
\$10 – \$18	4	80
\$4 – \$10	5	100
\$0 – \$4	6	120



If the wage is \$30, then each firm will only want to hire 2 workers, for a total of 40, but 70 will be looking for work. The 30 unemployed workers will offer their services at lower wages, until there is no more unemployment.

QUESTION 3 (marginal product)

N	Q
1	17
2	32
3	45
4	55
5	62
6	66
7	66

Suppose that each pizza slice sells for \$5, and the quantity of pizza that I produce depends on the number of workers I have as shown in the table to the left.

What is the marginal product of the 3rd worker?

A) 17

B) 32

C) 45

D) 15

E) 13

answer to question 3

N	Q	MP
1	17	17
2	32	15
3	45	13
4	55	10
5	62	7
6	66	4
7	66	0

Suppose that each pizza slice sells for \$5, and the quantity of pizza that I produce depends on the number of workers I have as shown in the table to the left.

What is the marginal product of the 3rd worker?

A) 17

B) 32

C) 45

D) 15

E) 13

QUESTION 4 (value of marginal product)

N	Q
1	17
2	32
3	45
4	55
5	62
6	66
7	66

Suppose that each pizza slice sells for \$5, and the quantity of pizza that I produce depends on the number of workers I have as shown in the table to the left.

What is the the 4th worker's value of marginal product (VMP)?

A) 65

B) 85

C) 75

D) 50

E) 20

answer to question 4

N	Q	MP	VMP
1	17	17	85
2	32	15	75
3	45	13	65
4	55	10	50
5	62	7	35
6	66	4	20
7	66	0	0

Suppose that each pizza slice sells for \$5, and the quantity of pizza that I produce depends on the number of workers I have as shown in the table to the left.

What is the the 4th worker's value of marginal product (VMP)?

A) 65

B) 85

C) 75

D) 50

E) 20

QUESTION 5

N	Q	MP	VMP
1	17	17	85
2	32	15	75
3	45	13	65
4	55	10	50
5	62	7	35
6	66	4	20
7	66	0	0

Price of pizza: $P = \$5$

If the wage is \$10, then how many workers should I hire, to maximize my profit?

A) 2

B) 3

C) 4

D) 5

E) 6

answer to question 5

N	Q	MP	VMP
1	17	17	85
2	32	15	75
3	45	13	65
4	55	10	50
5	62	7	35
6	66	4	20
7	66	0	0

Price of pizza: $P = \$5$

If the wage is \$10, then how many workers should I hire, to maximize my profit?

A) 2

B) 3

C) 4

D) 5

E) 6

DEMAND FOR LABOR SCHEDULE

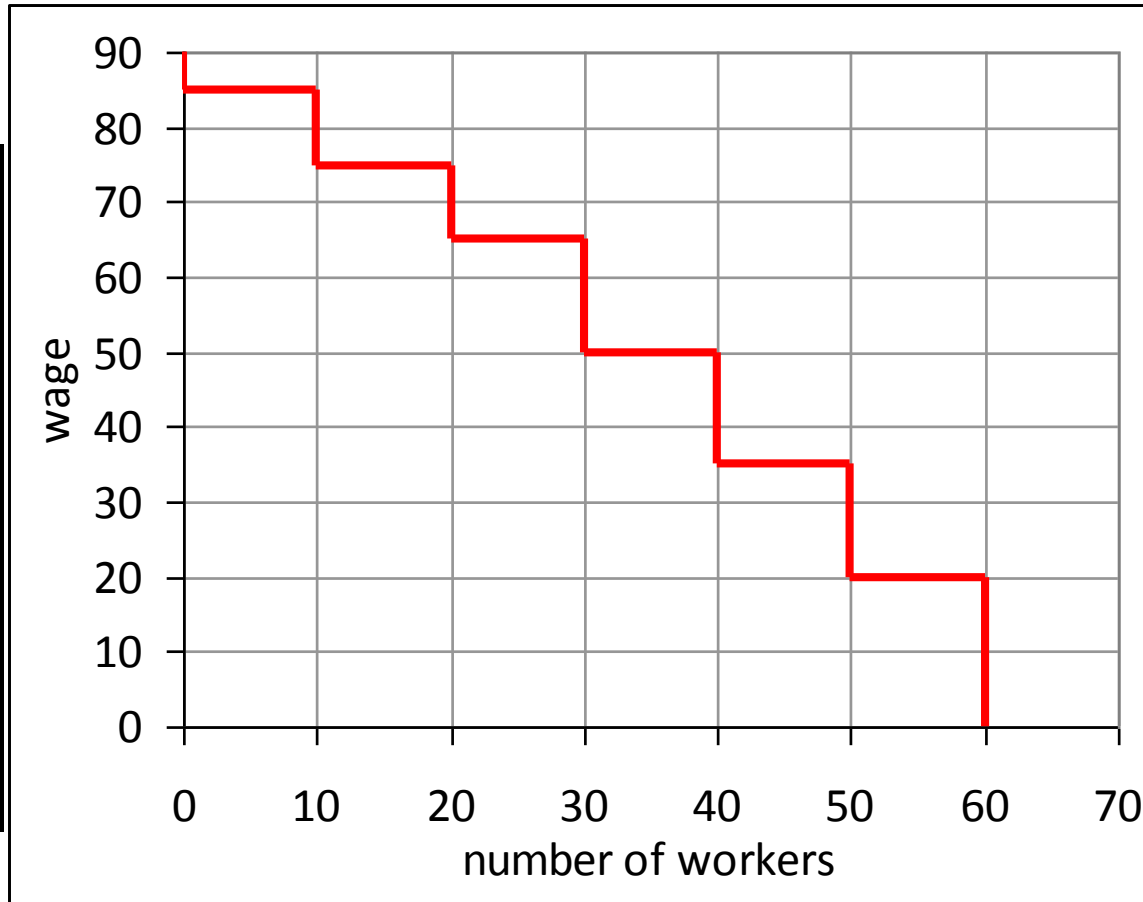
N	Q	MP	VMP
1	17	17	\$85
2	32	15	\$75
3	45	13	\$65
4	55	10	\$50
5	62	7	\$35
6	66	4	\$20
7	66	0	\$0

W	DL _i	DL
>\$85	0	0
\$75 – \$85	1	10
\$65 – \$75	2	20
\$50 – \$65	3	30
\$35 – \$50	4	40
\$20 – \$35	5	50
\$0 – \$20	6	60

If there are **10** firms just like mine, then the firm-level and market-wide demand for labor schedules are shown above.

QUESTION 6 (labor market equilibrium)

W	DL_i	DL
>\$85	0	0
\$75 – \$85	1	10
\$65 – \$75	2	20
\$50 – \$65	3	30
\$35 – \$50	4	40
\$20 – \$35	5	50
\$0 – \$20	6	60



If the supply of labor is perfectly inelastic at $SL = 35$, then what is the equilibrium wage?

A) 20

B) 75

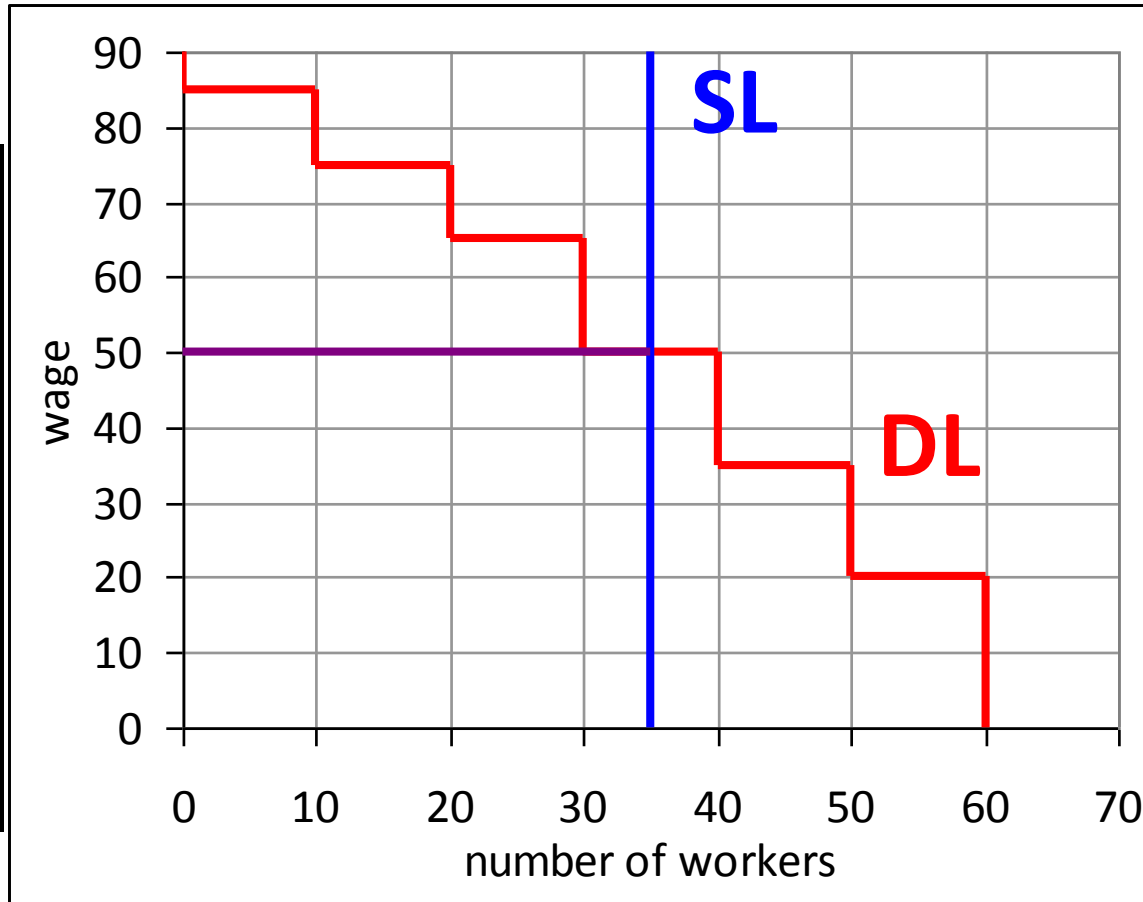
C) 65

D) 50

E) 2

answer to question 6

W	DL_i	DL
>\$85	0	0
\$75 – \$85	1	10
\$65 – \$75	2	20
\$50 – \$65	3	30
\$35 – \$50	4	40
\$20 – \$35	5	50
\$0 – \$20	6	60



If the supply of labor is perfectly inelastic at $SL = 35$, then what is the equilibrium wage?

A) 20

B) 75

C) 65

D) 50

E) 2

DEMAND FOR LABOR: CONTINUOUS

Suppose that there are 100 firms, each with the production function $Q(N) = 100N - N^2$, and the marginal product function $MP(N) = 100 - 2N$.

Suppose that the price of the good produced is 3.

How do we find the demand for labor as a function of the wage?

reminders...

P: price of the good produced

N: number of workers

Q: quantity produced

R: revenue

MP: marginal product of labor, $\Delta Q/\Delta N$

VMP: value of MP, $P \times (\Delta Q/\Delta N)$ or $\Delta R/\Delta N$

DEMAND FOR LABOR

$$Q(N) = 100N - N^2$$

$$MP(N) = 100 - 2N$$

$$P = 3$$

How do we find the demand for labor as a function of the wage?

$$VMP = P \times MP = 300 - 6N$$

Suppose that the wage (W) is **\$30**. For firms, the marginal benefit from an extra unit labor is the VMP, and the marginal cost of an extra unit of labor is the wage. Thus, firms should continue hiring up to the point where **VMP = W**

$$VMP = W \rightarrow 300 - 6N = 30 \rightarrow 6N = 270 \rightarrow N = 45$$

This gives each firm's demand for labor when $W = \$30$.

DEMAND FOR LABOR

$$Q(N) = 100N - N^2$$

$$MP(N) = 100 - 2N$$

$$P = 3$$

$$VMP(N) = P \times MP(N) = 300 - 6N$$

Given the VMP function, we can find the complete labor demand function for each firm.

$$\begin{aligned} VMP = W &\rightarrow 300 - 6N = W \rightarrow 6N = 300 - W \\ &\rightarrow N = 50 - W/6 \end{aligned}$$

If there are 100 identical firms, then the total demand for labor function is $DL(W) = 5000 - 16.67W$

SUPPLY AND DEMAND FOR LABOR

$$Q(N) = 100N - N^2$$

$$MP(N) = 100 - 2N$$

$$P = 3$$

$$VMP(N) = P \times MP(N) = 300 - 6N$$

$$DL(W) = 5000 - 16.67W$$

Suppose that the supply of labor curve is upward-sloping, and is given by the equation

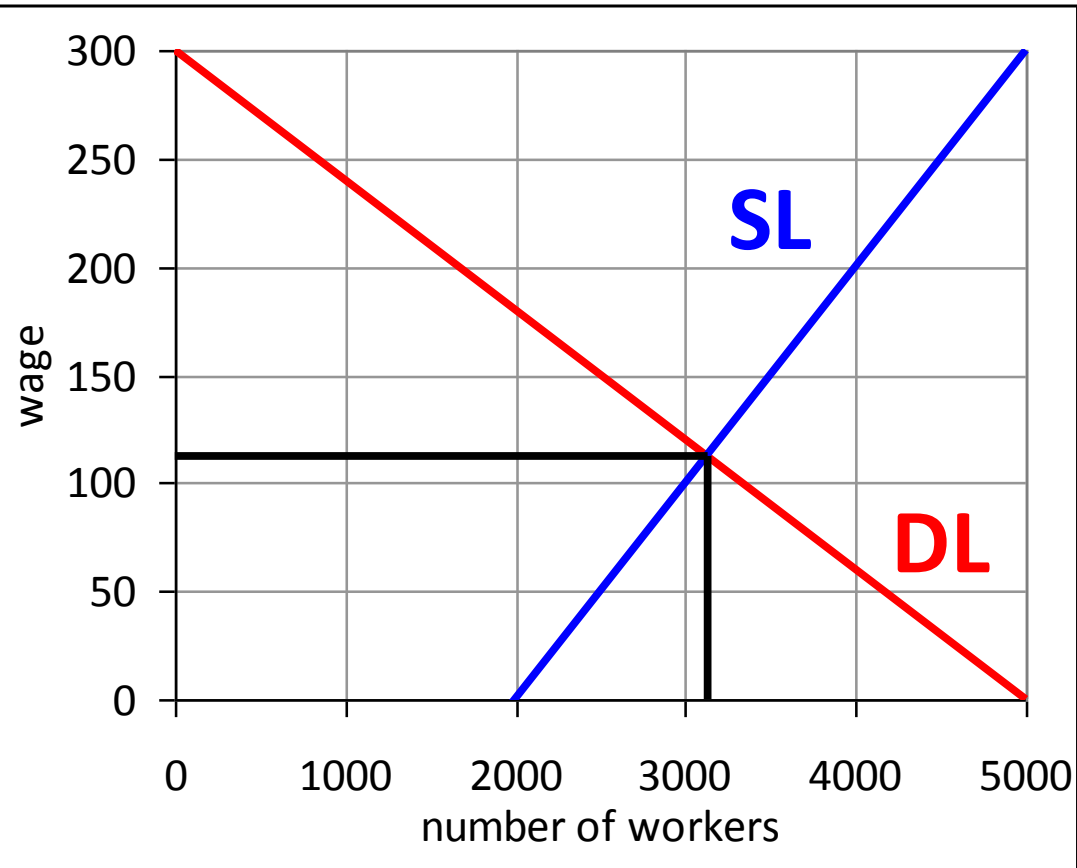
$$SL(W) = 2000 + 10W.$$

Market equilibrium, requires that supply and demand for labor are equal to each other, so we have

$$DL = SL \rightarrow 5000 - 16.67W = 2000 + 10W$$

$$\rightarrow 26.67W = 3000 \rightarrow W = 112.5, N = 3125$$

SUPPLY AND DEMAND FOR LABOR: GRAPH



$$Q(N) = 100N - N^2$$

$$MP(N) = 100 - 2N$$

$$P = 3$$

$$VMP(N) = 300 - 6N$$

100 firms

$$DL(W) = 5000 - 16.67W$$

$$SL(W) = 2000 + 10W$$

$$W = 112.5$$

$$N = 3125$$

QUESTION 7 (labor demand)

$$Q(N) = 60N - .25N^2$$

$$MP(N) = 60 - .5N$$

$$P = \$4$$

10 firms

If $W = \$200$, what is the total demand for labor (the demand by all 10 firms combined)? (Hint: start by finding the VMP(N) function, and setting it equal to something...)

A) 75

B) 100

C) 125

D) 150

E) 200

answer to question 7

$$Q(N) = 60N - .25N^2$$

$$MP(N) = 60 - .5N$$

$$P = \$4$$

10 firms

$$W = \$200$$

$$VMP(N) = 240 - 2N$$

$$VMP = W \rightarrow 240 - 2N = 200 \rightarrow 2N = 40 \rightarrow N = 20$$

$DL_i = 20$ (individual firm demand), so $DL = 200$.

A) 75

B) 100

C) 125

D) 150

E) 200

QUESTION 8 (labor demand)

$$Q(N) = 60N - .25N^2$$

$$MP(N) = 60 - .5N$$

$$P = \$4$$

10 firms

$$VMP(N) = 240 - 2N$$

Which of the following gives the correct market-wide demand for labor function?

A) $DL = 240 - 2W$

B) $DL = 600 - .2W$

C) $DL = 2400 - W$

D) $DL = 1200 - 5W$

E) $DL = 800 - 4W$

answer to question 8

$$Q(N) = 60N - .25N^2$$

$$MP(N) = 60 - .5N$$

$$P = \$4$$

10 firms

$$VMP(N) = 240 - 2N$$

$$VMP = W \rightarrow 240 - 2N = W \rightarrow 2N = 240 - W$$

$$\rightarrow N = 120 - .5W \text{ (individual firm demand)}$$

$$\rightarrow DL = 1200 - 5W \text{ (market-wide demand for labor)}$$

(answer choice D)

QUESTION 9 (labor market equilibrium)

$$Q(N) = 60N - .25N^2$$

$$MP(N) = 60 - .5N$$

$$P = \$4$$

10 firms

$$VMP(N) = 240 - 2N$$

$$DL = 1200 - 5W$$

Suppose that the supply of labor curve is given by the equation $SL = 600 + W$. What is the equilibrium wage?

A) 200

B) 240

C) 5

D) 100

E) 600

answer to question 9

$$Q(N) = 60N - .25N^2$$

$$MP(N) = 60 - .5N$$

$$P = \$4$$

10 firms

$$VMP(N) = 240 - 2N$$

$$DL = 1200 - 5W$$

$$SL = 600 + W$$

$$DL = SL \rightarrow 1200 - 5W = 600 + W \rightarrow 6W = 600$$

$$\rightarrow W = 100$$

A) 200

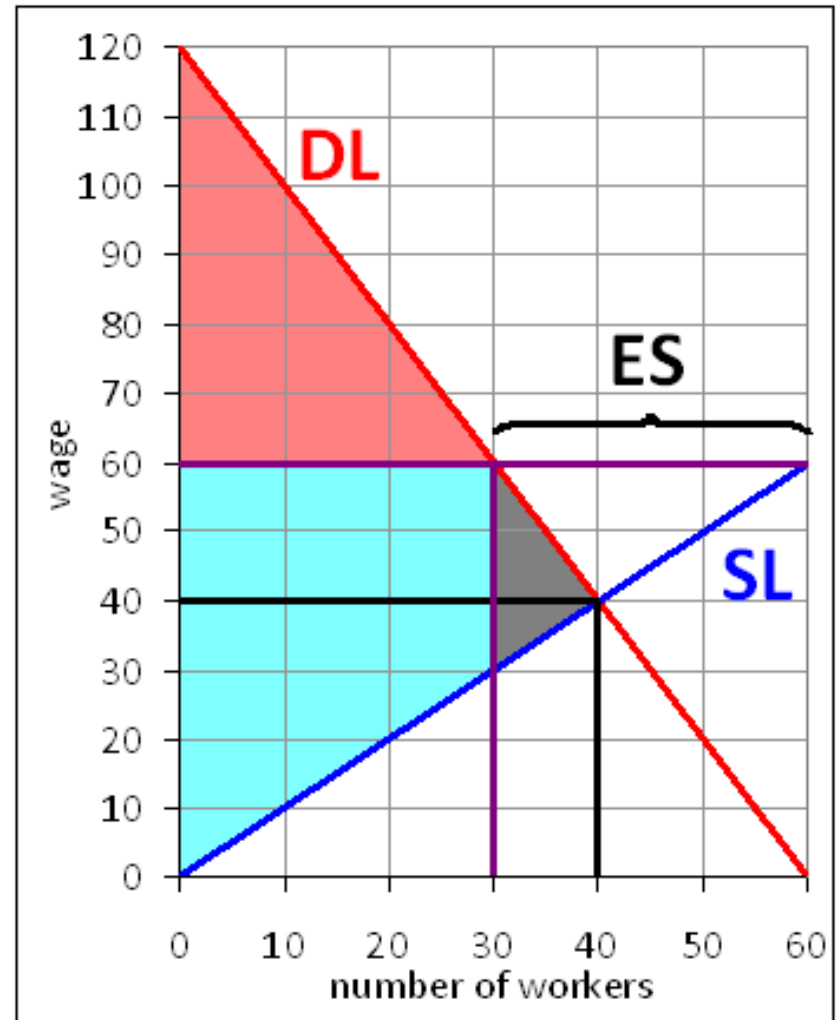
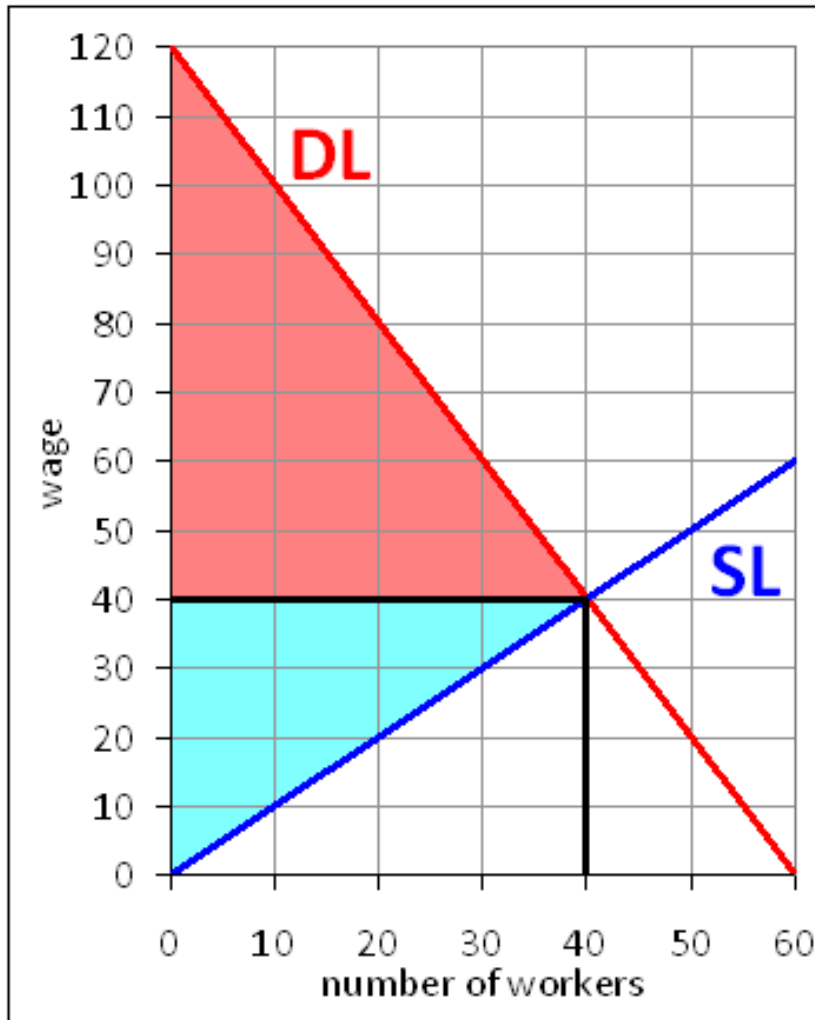
B) 240

C) 5

D) 100

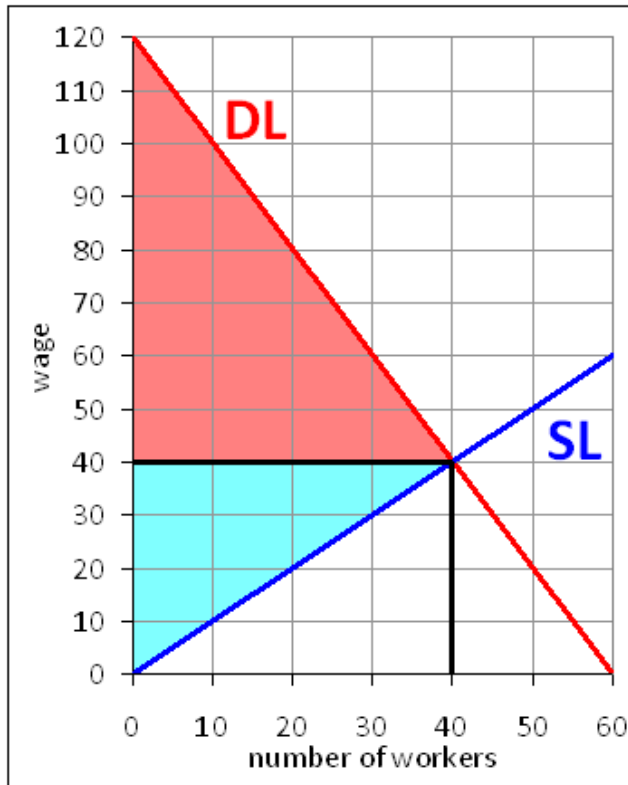
E) 600

MINIMUM WAGE



The minimum wage is a kind of price floor. If it's binding, then it may cause deadweight loss as well as unemployment.

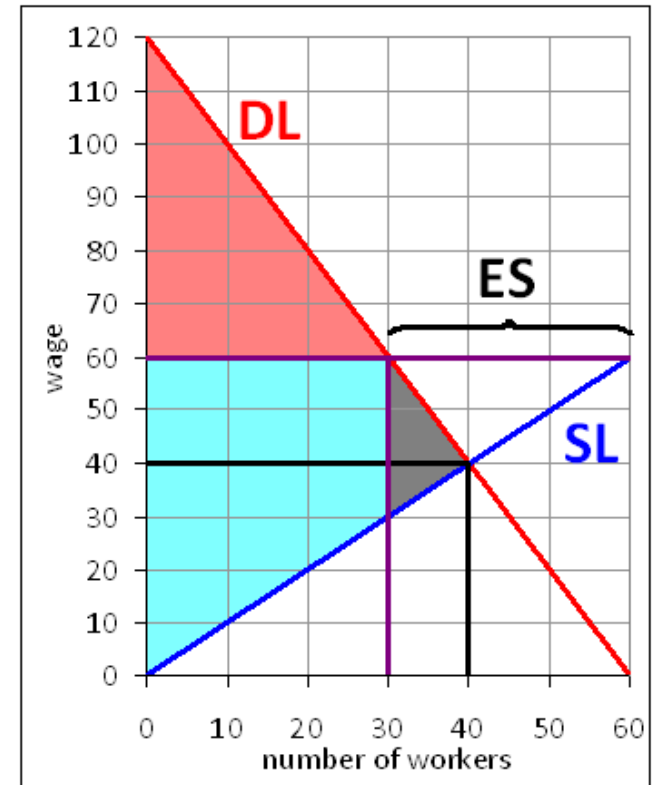
MINIMUM WAGE: WORKER AND FIRM SURPLUS



$$PS = .5(40)(40) = 800$$

$$CS = .5(40)(80) = 1600$$

$$TES = 2400$$



$$PS = (30)(60+30)/2 = 1350$$

$$CS = .5(30)(60) = 900$$

$$TES = 2250$$

$$DWL = 150$$

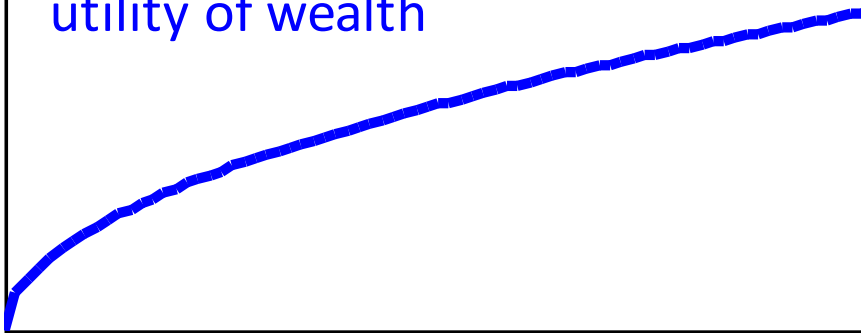
WHY ARE WAGES UNEQUAL?

- Human capital theory**
- Labor unions**
- Compensating wage differentials**
- Labor market discrimination**
- Winner-take-all markets**

INEQUALITY AND UTILITY

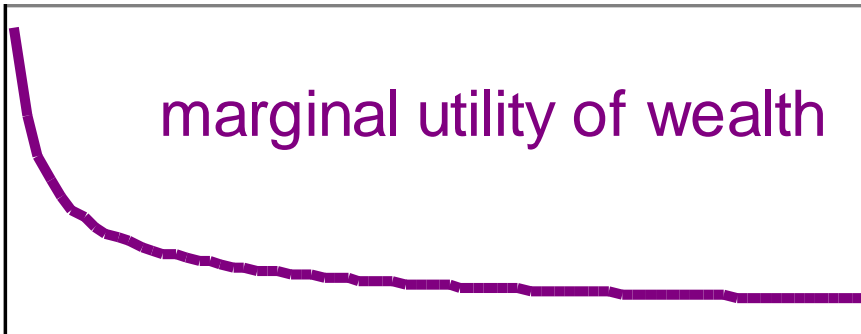
- **Rawls: 'veil of ignorance' theory of justice**
- **Decreasing marginal utility of wealth theory**

utility of wealth



Giving \$1000 to a very poor person is likely to increase the happiness of a very poor person by more than it would increase the happiness of a very rich person.

marginal utility of wealth



The marginal value of each additional dollar declines as we have more and more wealth.

INEQUALITY AND EFFICIENCY

So, if total wealth was constant, and there were no issues of fairness to worry about, then perfect equality might maximize *social welfare*.

utility of wealth

A graph with a white background and a black border. A blue curve starts at the origin (0,0) and rises steeply, then gradually flattens out as it moves to the right, illustrating a concave relationship between wealth and utility.

However, ongoing redistribution of wealth can weaken the incentives that people have to create wealth, and thus decrease the total amount of wealth to be divided.

marginal utility of wealth

A graph with a white background and a black border. A purple curve starts at a high point on the y-axis and drops sharply, then levels off as it moves to the right, illustrating a convex relationship between wealth and marginal utility.

Thus, there are tradeoffs between equality and efficiency.

VARIOUS METHODS OF INCOME REDISTRIBUTION

Assuming that equality is desirable in itself, there is still a tradeoff between equality and total wealth / income, because people create more wealth when given stronger incentives to do so.

- Progressive taxation**
- Welfare payments and in-kind transfers**
- Minimum wage**
- Earned-income tax credit**
- Public employment for the poor**

PROGRESSIVE AND REGRESSIVE INCOME TAXES

progressive tax: one in which the proportion of income paid in taxes rises as income rises

regressive tax: the proportion of income paid in taxes declines as income rises

proportional tax: all taxpayers pay the same proportion of their income in taxes

INEQUALITY AS MARKET FAILURE

In the first analysis, we equate a consumer's willingness to pay for a good with the social benefit of that good, but, partly because the marginal utility of money is variable, willingness to pay does not provide a perfect measurement of actual gains in happiness.

INEQUALITY AS MARKET FAILURE

rationing function of price: to distribute scarce goods to those consumers who value them most highly

allocative function of price: to direct resources away from overcrowded markets and toward markets that are underserved

Suppose that a person with \$100 million in wealth is willing to pay a maximum of \$10 thousand for a property, and a person with \$5 thousand in wealth is willing to pay a maximum of \$4 thousand for the property? Who values it most highly?

It is Pareto-efficient for the wealthier person to have the property, but is it morally best?

INEQUALITY AS MARKET FAILURE

***rationing function of price:* to distribute scarce goods to those consumers who value them most highly**

***allocative function of price:* to direct resources away from overcrowded markets and toward markets that are underserved**

Suppose that making anti-baldness treatments or anti-impotence treatments generates more profits than research into medicine that fights disease in impoverished nations. Which way should resources be directed?

QUESTION 10

True or false: “If person A is willing to pay more for a particular good than person B, person A must value that good more highly than person B. Therefore, the socially best outcome is necessarily for person A to receive the good.”

A) True

B) False

answer to question 10

True or false: “If person A is willing to pay more for a particular good than person B, person A must value that good more highly than person B. Therefore, the socially best outcome is necessarily for person A to receive the good.”

A) True

B) False

QUESTION 11

True or false: “Business that generate more revenue are necessarily more socially valuable than businesses that generate less revenue.”

A) True

B) False

answer to question 11

True or false: “Business that generate more revenue are necessarily more socially valuable than businesses that generate less revenue.”

A) True

B) False