The Many Faces of Marginal Analysis

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“How many of you will…

“How many of you will do all you can to earn an A in my Economics course?”

Coins in an Envelope

Coins in an Envelope

If your marginal benefit is greater than your marginal cost, say “yes.”

If your marginal benefit is less than your marginal cost, say “no.”

Marginal analysis: utility

Q	TU	MU	AU
0 units	0 utils	xxx	xxx
1 unit	100 utils	+100 utils	100 utils
2 units	190 utils	+ 90 utils	95 utils
3 units	270 utils	+ 80 utils	90 utils
4 units	340 utils	+ 70 utils	85 utils
5 units	400 utils	+ 60 utils	80 utils

Utility relationships

- 1. If MU > 0, then TU increases.
- 2. If MU < 0, then TU decreases.
- 3. If MU = 0, then TU does not change; TU is maximized.
- 4. If MU > AU, then AU increases.
- 5. If MU < AU, then AU decreases.
- 6. If MU = AU, then AU does not change; AU is maximized.

Marginal analysis: productivity

L	Q	MP	AP
0 units	0 units	xxx	xxx
1 unit	100 units	+100 units	100 units
2 units	190 units	+ 90 units	95 units
3 units	270 units	+ 80 units	90 units
4 units	340 units	+ 70 units	85 units
5 units	400 units	+ 60 units	80 units

Productivity relationships

- 1. If MP > 0, then Q increases.
- 2. If MP < 0, then Q decreases.
- 3. If MP = 0, then Q does not change; Q is maximized.
- 4. If MP > AP, then AP increases.
- 5. If MP < AP, then AP decreases.
- 6. If MP = AP, then AP does not change; AP is maximized.

Marginal analysis: revenue

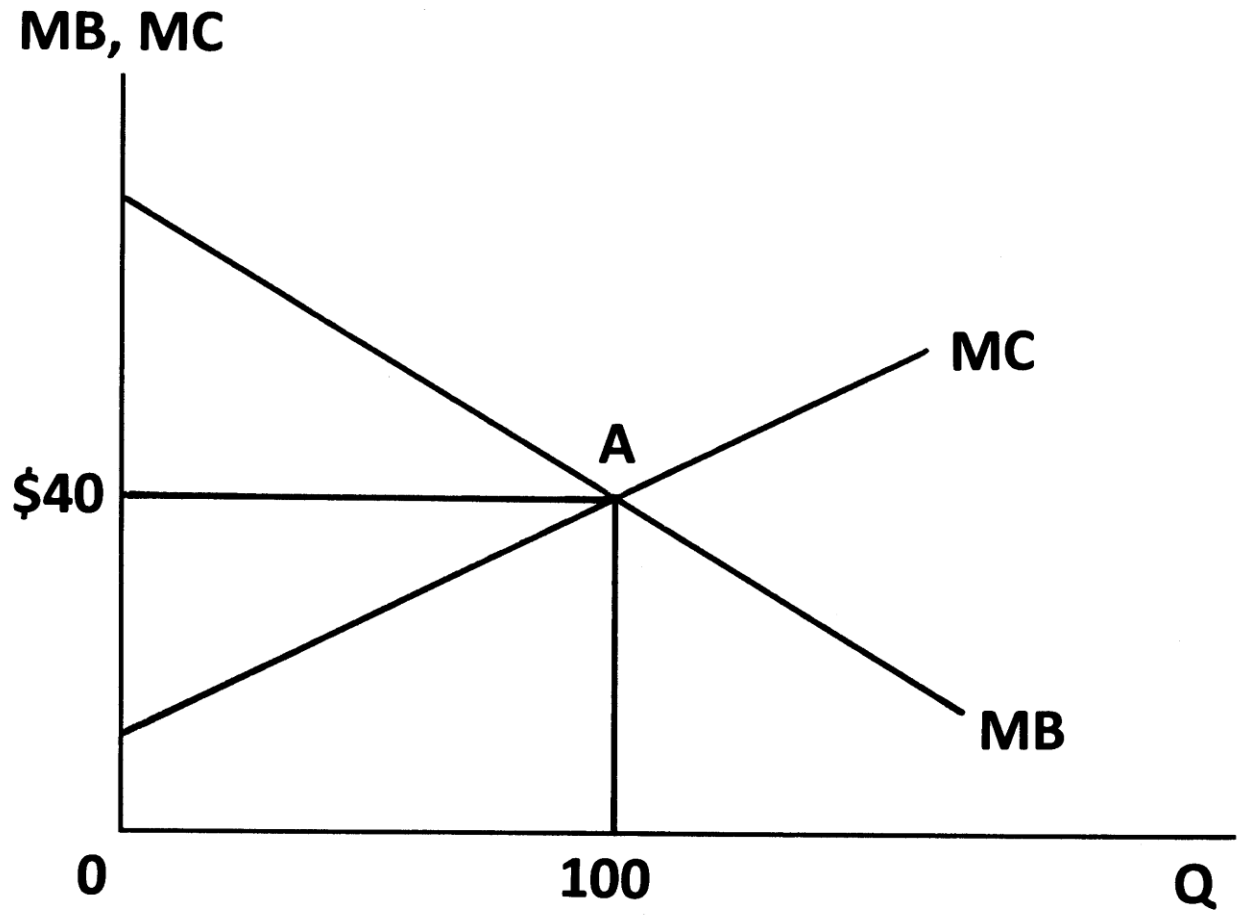
Q	TR	MR	AR
0 units	$ 0	xxx	xxx
1 unit	$100	+$100	$100
2 units	$190	+$ 90	$ 95
3 units	$270	+$ 80	$ 90
4 units	$340	+$ 70	$ 85
5 units	$400	+$ 60	$ 80

Revenue relationships

- 1. If MR > 0, then TR increases.
- 2. If MR < 0, then TR decreases.
- 3. If MR = 0, then TR does not change; TR is maximized.
- 4. If MR > AR, then AR increases.*
- 5. If MR < AR, then AR decreases.
- 6. If MR = AR, then AR does not change; AR is maximized.*

*For a perfectly competitive firm, MR=AR. For a monopoly and for a monopolistically competitive firm, MR<AR. There are no cases in which MR>AR.

Basic Graph of Optimal Amount of an Activity



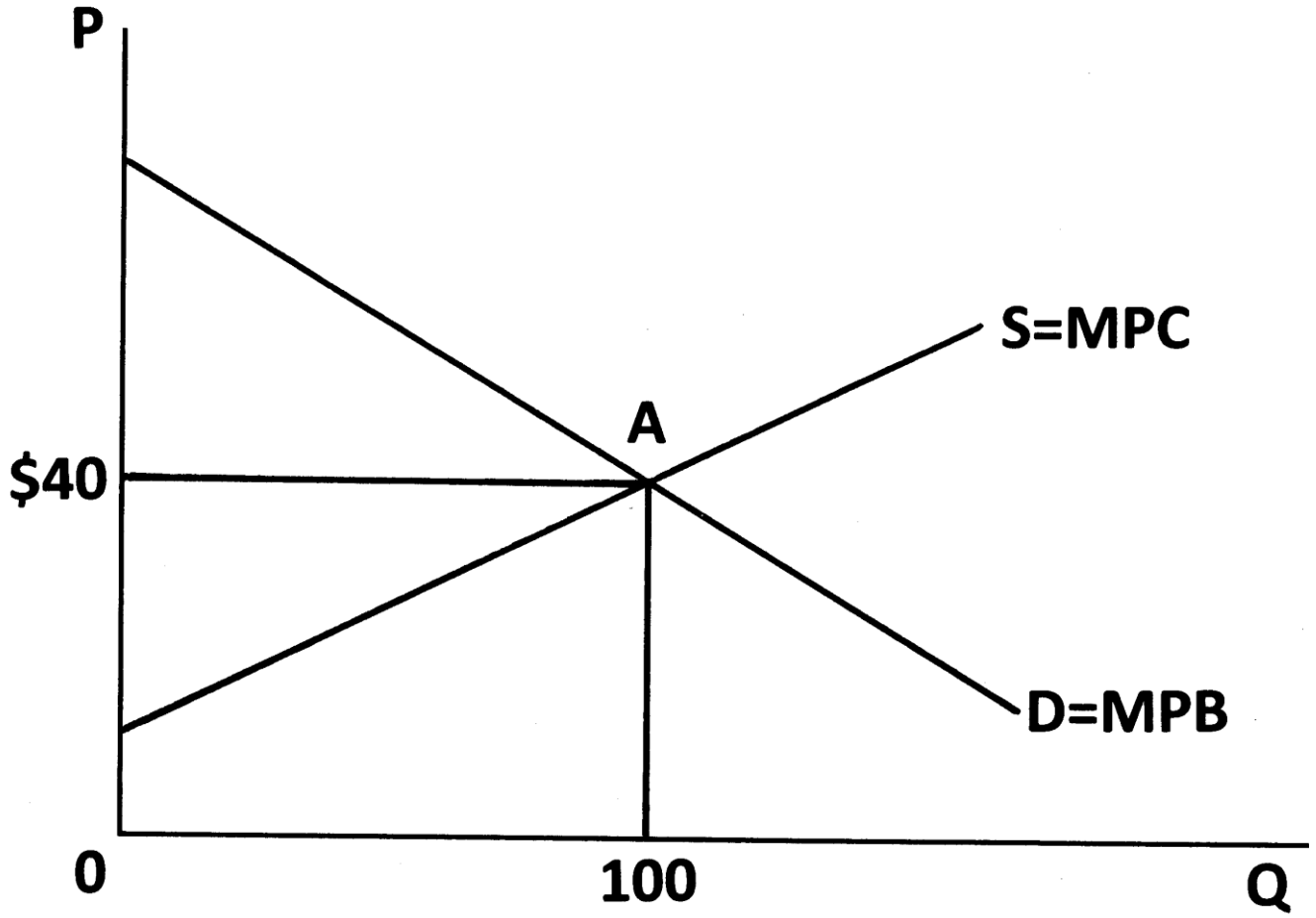
Why MB=MC works

The optimal amount of this activity is 100 units. By providing/consuming this quantity, the net total benefit from the activity is maximized. Here is the logic of choosing the quantity at which MB=MC. As shown in this chart, by providing 100 units we are providing all those units which have MB > MC and stopping before providing units which have MB < MC.

Why MB=MC works

Units	MB compared to MC	Net Marginal Benefit	Net Total Benefit
#1-99	MB > MC	NMB > 0	NTB increases
#100	MB = MC	NMB = 0	NTB is maximized
#101 and above	MB < MC	NMB < 0	NTB decreases

Private Decision Maker's Optimal Amount of an Activity



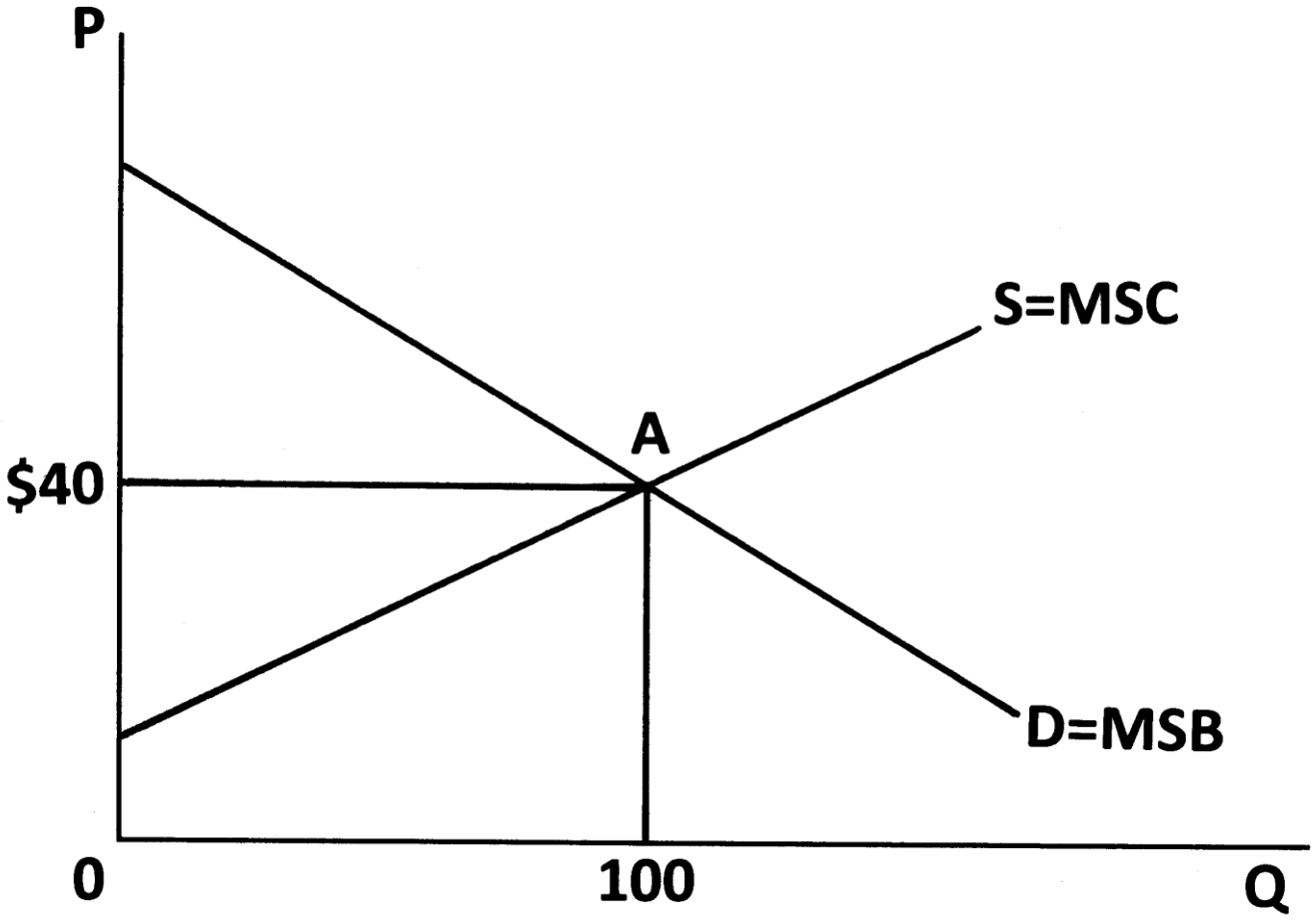
Why MPB=MPC works

The optimal amount of this activity is 100 units. By providing/consuming this quantity, the net total benefit from the activity is maximized. Here is the logic of choosing the quantity at which MPB=MPC. As shown in this chart, by providing 100 units we are providing all those units which have MPB > MPC and stopping before providing units which have MPB < MPC.

Why MPB=MPC works

Units	MPB compared to MPC	Net Marginal Benefit	Net Total Benefit
#1-99	MPB > MPC	NMB > 0	NTB increases
#100	MPB = MPC	NMB = 0	NTB is maximized
#101 and above	MPB < MPC	NMB < 0	NTB decreases

The Socially Optimal Amount of an Activity



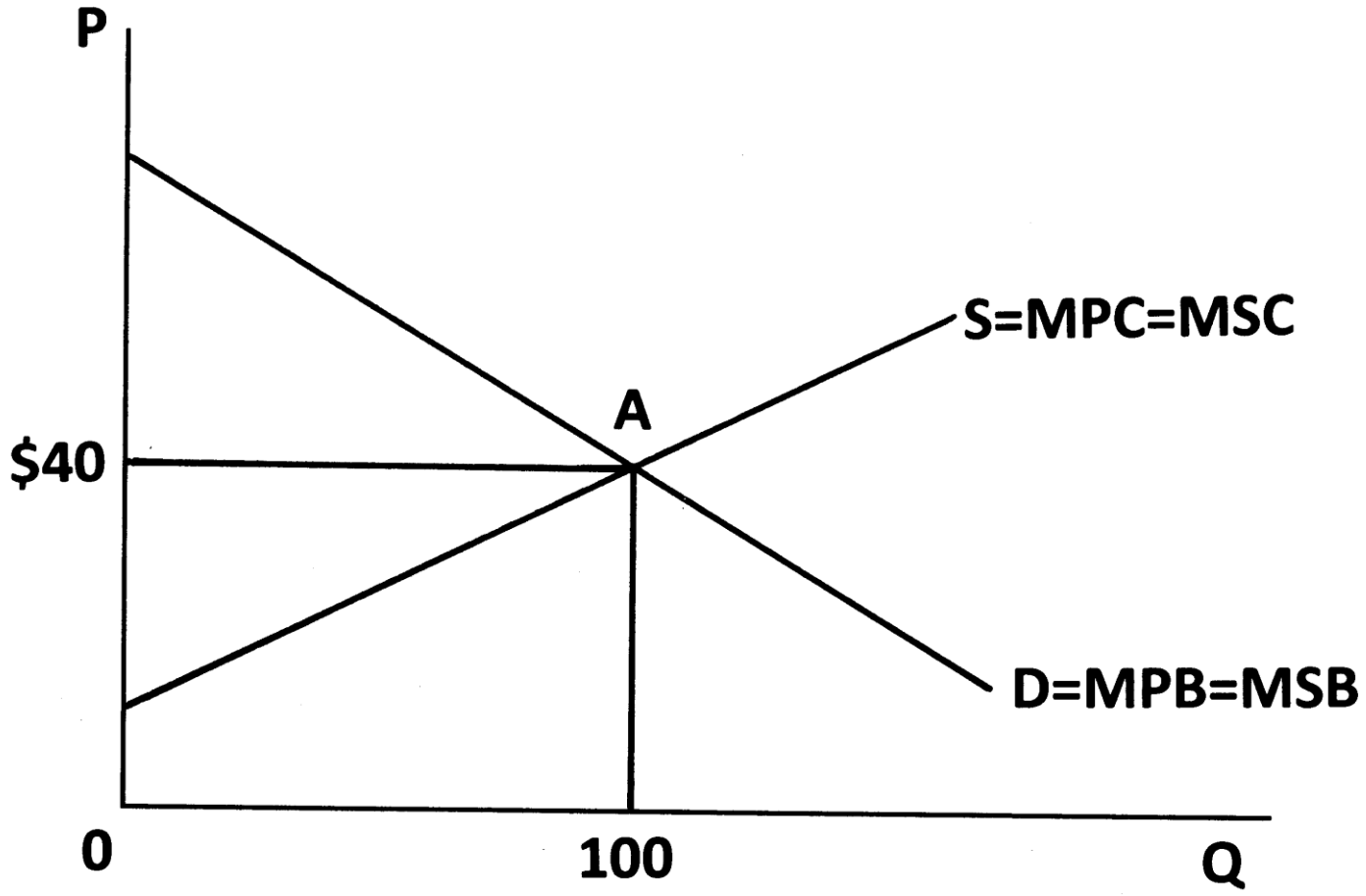
Why MSB=MSC works

The socially optimal amount of this activity is 100 units. By providing/consuming this quantity, the net total benefit from the activity is maximized. Here is the logic of choosing the quantity at which MSB=MSC. As shown in this chart, by providing 100 units we are providing all those units which have MSB > MSC and stopping before providing units which have MSB < MSC.

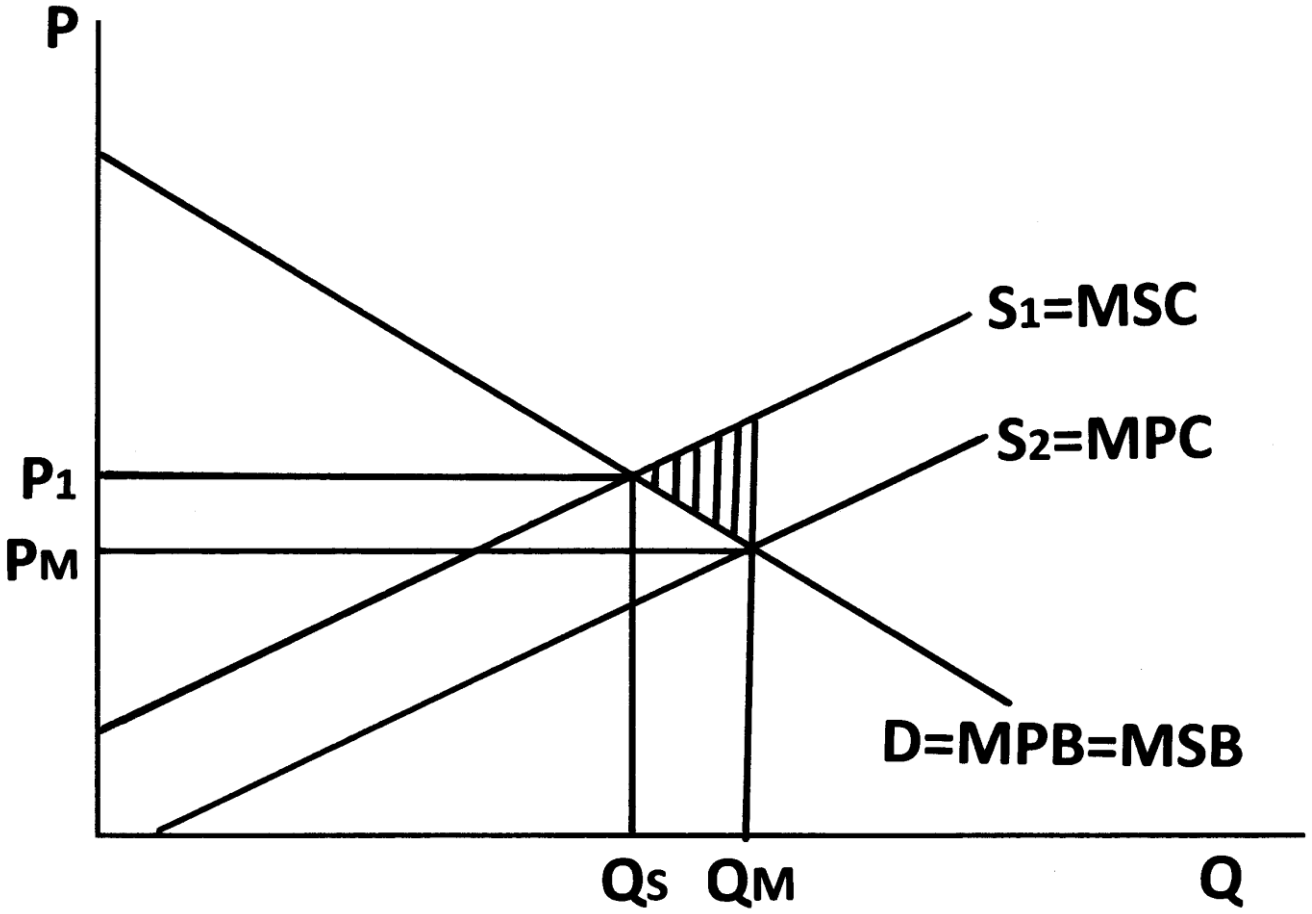
Why MSB=MSC works

Units	MSB compared to MSC	Net Marginal Benefit	Net Total Benefit
#1-99	MSB > MSC	NMB > 0	NTB increases
#100	MSB = MSC	NMB = 0	NTB is maximized
#101 and above	MSB < MSC	NMB < 0	NTB decreases

The Market Quantity as the Socially Optimal Quantity (no externalities)



A Market Failure: A Negative Externality (polluters)



A Market Failure: A Negative Externality (polluters)

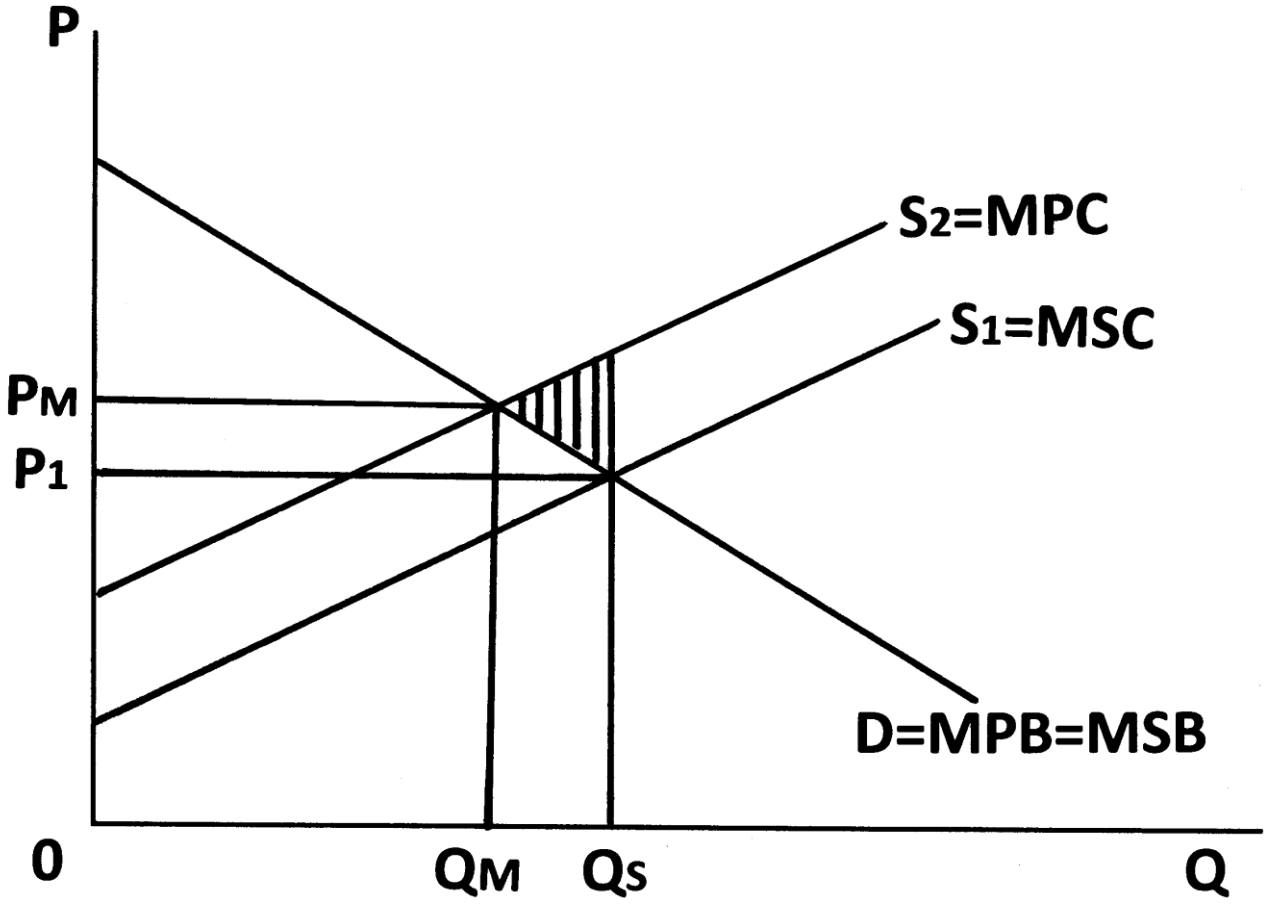
- When there is no pollution, the market results in the socially optimal quantity Q_S and the price P_1. When some firms decide to stop cleaning their wastes, they reduce their marginal private costs (MPC) which results in an increase in the market supply to S_2. This increase in supply results in an increase in market quantity to Q_M and a reduction in price to P_M. The shaded area is the deadweight loss caused by the increased output from Q_S to Q_M.

Negative Externality: polluters

This chart explains why those units between QS and QM are produced by the polluting firms despite society's desire that they not be produced.

Units between Q_S and Q_M	Key comparisons	Result of comparisons
From the polluting firms' perspective	MPB > MPC	The firms want to produce these units.
From society's perspective	MSB < MSC	Society does not want these units produced.

A Market Failure: A Negative Externality (pollutees)



Negative Externality: pollutees

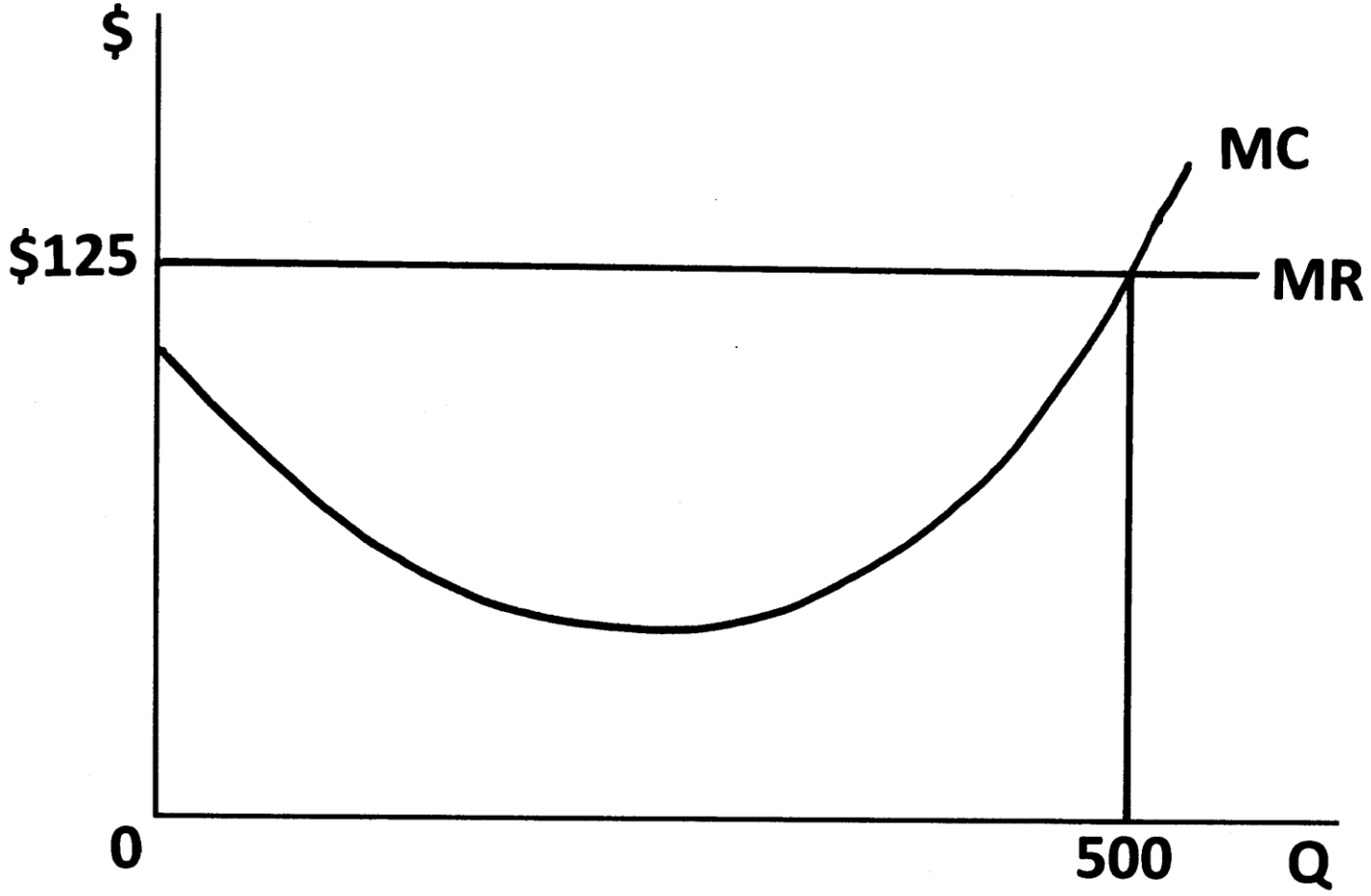
When there is no pollution, the market results in the socially optimal quantity Q_S and the price P_1. When some firms decide to stop cleaning their wastes, other firms are harmed because they must clean the environment so they can continue to use clean resources (e.g., water from a river). These firms which are negatively impacted by the pollution have an increase in their marginal private costs (MPC) which results in a decrease in the market supply to S_2. This decrease in supply results in a decrease in market quantity to Q_M and an increase in price to P_M. The shaded area is the deadweight loss in this market caused by the decreased output from Q_S to Q_M pollution.

Negative Externality: pollutees

This chart explains why those units between QM and QS are not produced by the harmed firms despite society's desire that they be produced.

Units between Q_M and Q_S	Key comparisons	Result of comparisons
From the polluting firms' perspective	MPB < MPC	The firms do not want to produce these units.
From society's perspective	MSB > MSC	Society does want these units produced.

The Profit-Maximizing Quantity: A Perfectly Competitive Firm



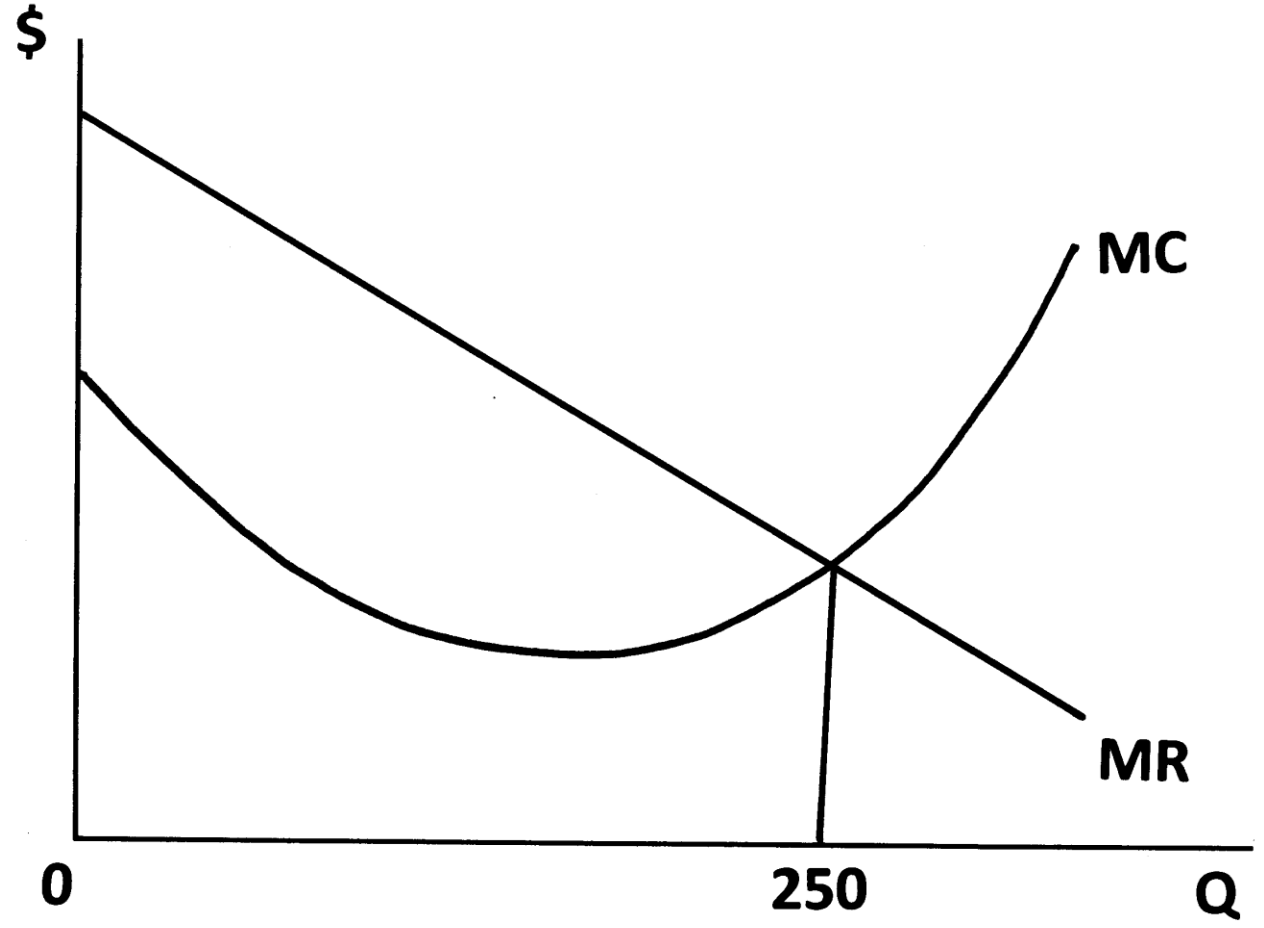
The Profit-Maximizing Quantity: A Perfectly Competitive Firm

As shown in this chart, by providing 500 units the firm is producing all those units which have MR > MC and stopping before producing units which have MR < MC. It is producing all the units with positive MΠ which increase TΠ and not producing any units with negative MΠ which decrease TΠ. Producing 500 units where MR=MC is a convenient rule of thumb to follow to find the profit-maximizing quantity.

The Profit-Maximizing Quantity: A Perfectly Competitive Firm

Units	MR compared to MC	Marginal Profit	Total Profit
#1-499	MR > MC	MΠ > $0	TΠ increases
#500	MR = MC	MΠ = $0	TΠ is maximized
#501 and above	MR < MC	MΠ < $0	TΠ decreases

The Profit-Maximizing Quantity: A Monopoly



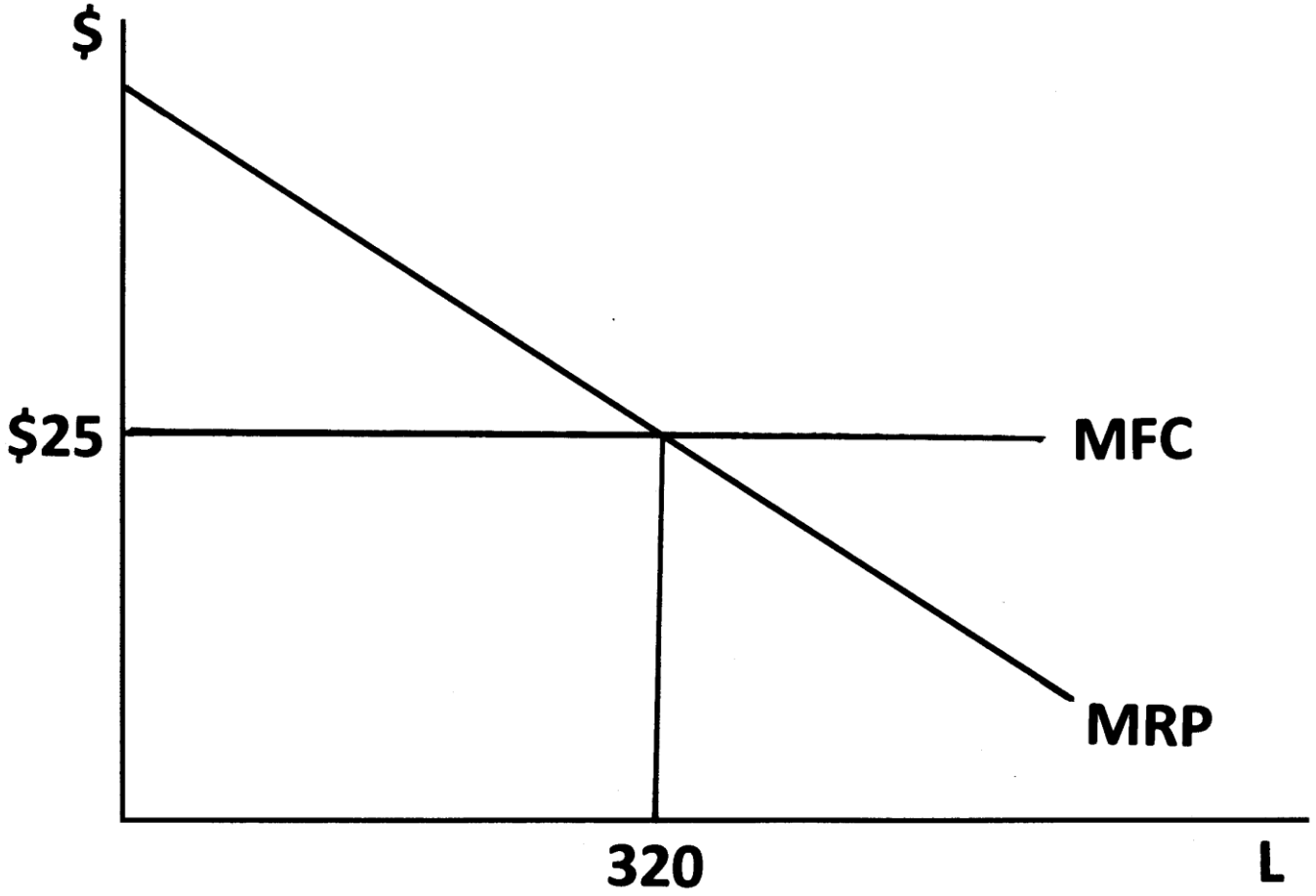
The Profit-Maximizing Quantity: A Monopoly

As shown in this chart, by providing 250 units the firm is producing all those units which have MR > MC and stopping before producing units which have MR < MC. It is producing all the units with positive MΠ which increase TΠ and not producing any units with negative MΠ which decrease TΠ. Producing 250 units where MR = MC is a convenient rule of thumb to follow to find the profit-maximizing quantity.

The Profit-Maximizing Quantity: A Monopoly

Units	MR compared to MC	Marginal Profit	Total Profit
#1-249	MR > MC	MΠ > $0	TΠ increases
#250	MR = MC	MΠ = $0	TΠ is maximized
#251 and above	MR < MC	MΠ < $0	TΠ decreases

The Profit-Maximizing Quantity of Labor: A Perfectly Competitive Employer



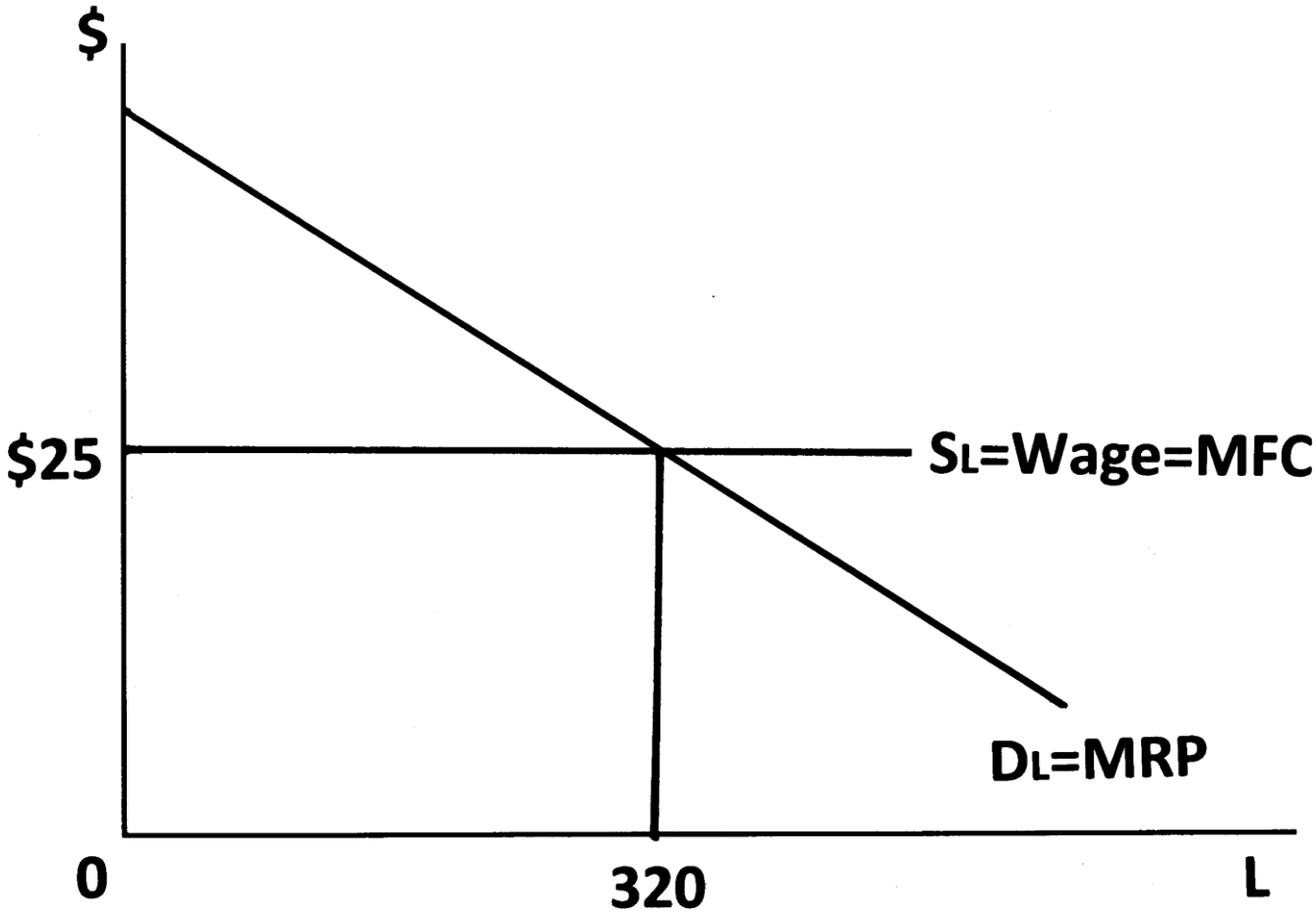
The Profit-Maximizing Quantity of Labor: A Perfectly Competitive Employer

As shown in this chart, by hiring 320 labor units the firm is using all those labor units which have MRP > MFC and stopping before using labor units which have MRP < MFC. It is hiring all the labor units with positive MP which increase $T\Pi$ and not hiring any units with negative $M\Pi$ which decrease $T\Pi$. Hiring 320 labor units where MRP = MFC is a convenient rule of thumb to follow to find the profit-maximizing quantity of labor.

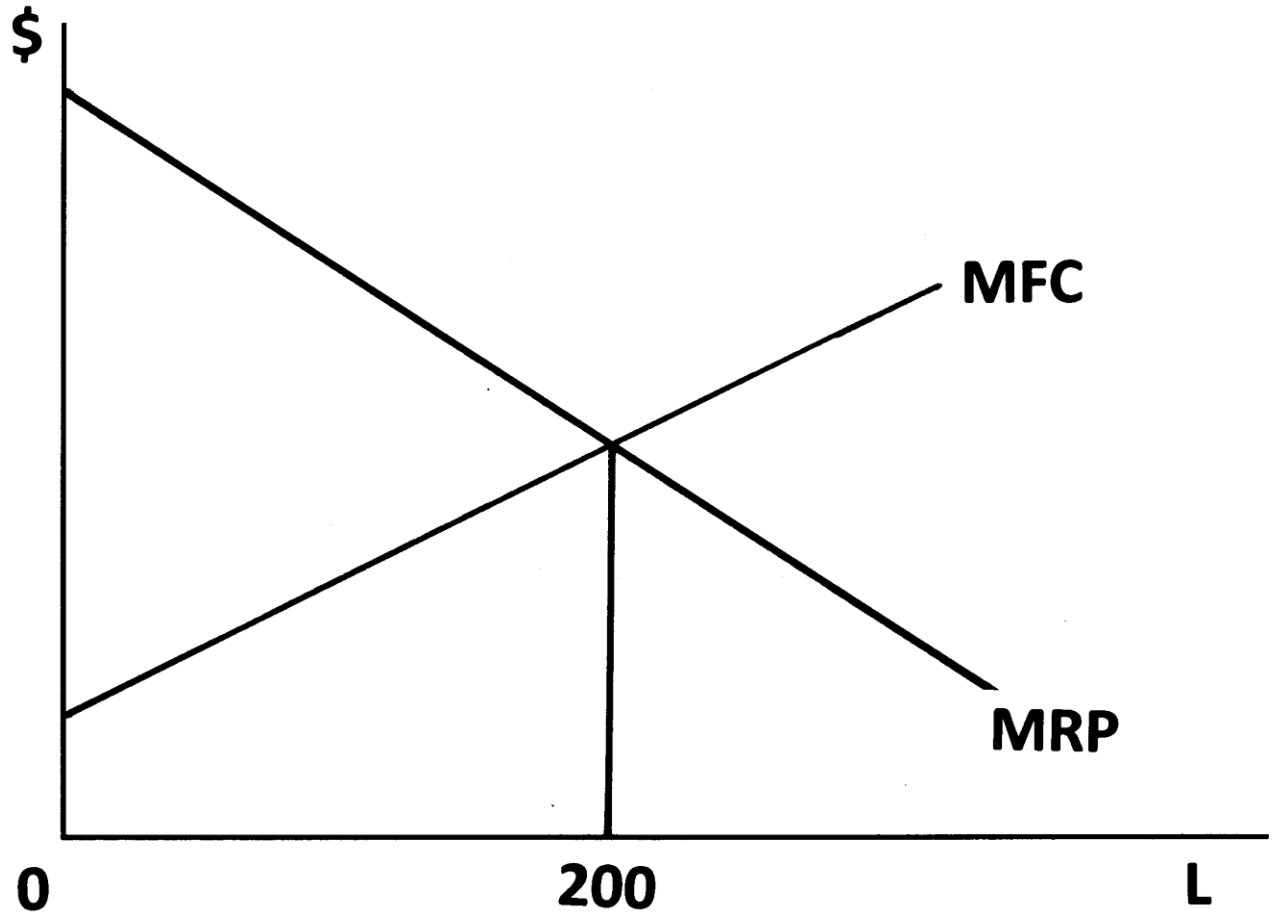
The Profit-Maximizing Quantity of Labor: A Perfectly Competitive Employer

Labor Units	MRP compared to MFC	Marginal Profit	Total Profit
#1-319	MRP > MFC	MΠ > $0	TΠ increases
#320	MRP = MFC	MΠ = $0	TΠ is maximized
#321 and above	MRP < MFC	MΠ < $0	TΠ decreases

The Profit-Maximizing Quantity of Labor: A Perfectly Competitive Employer



The Profit-Maximizing Quantity of Labor: A Monopsonistic Employer



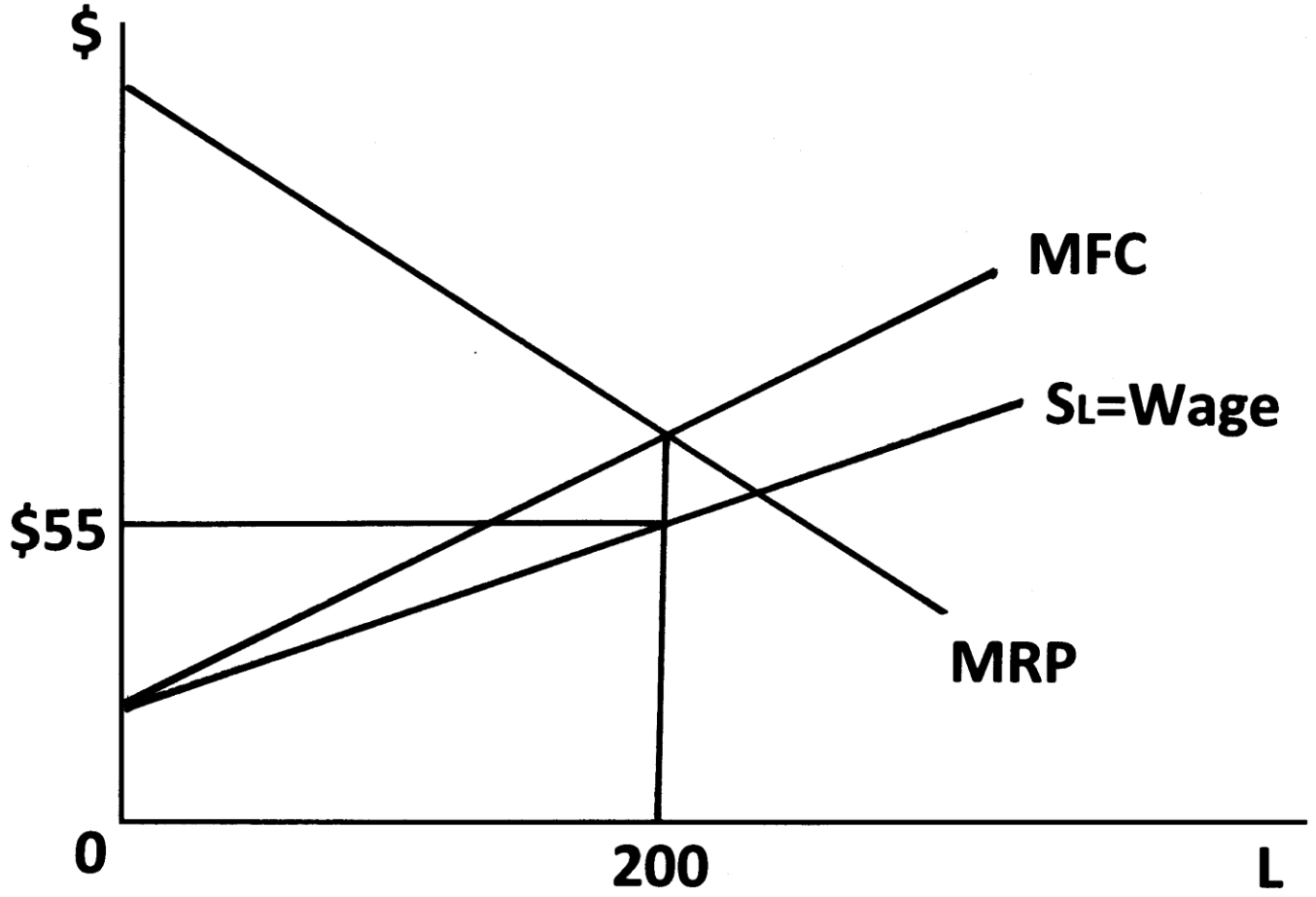
The Profit-Maximizing Quantity of Labor: A Monopsonistic Employer

As shown in this chart, by hiring 200 labor units the firm is using all those labor units which have MRP > MFC and stopping before using labor units which have MRP < MFC. It is hiring all the labor units with positive MΠ which increase TΠ and not hiring any units with negative MΠ which decrease TΠ. Hiring 200 labor units where MRP = MFC is a convenient rule of thumb to follow to find the profit-maximizing quantity of labor.

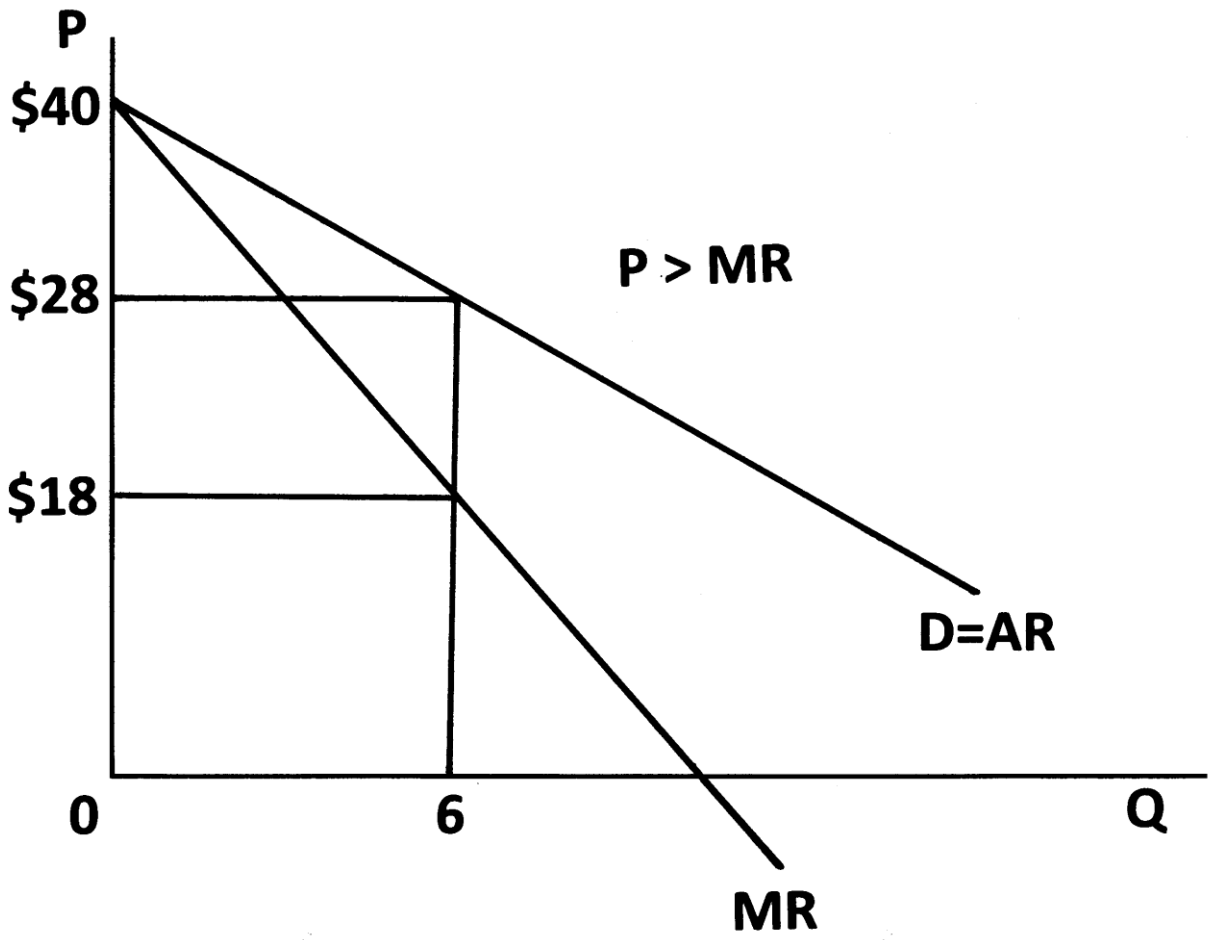
The Profit-Maximizing Quantity of Labor: A Monopsonistic Employer

Labor Units	MRP compared to MFC	Marginal Profit	Total Profit
#1-199	MRP > MFC	MΠ > $0	TΠ increases
#200	MRP = MFC	MΠ = $0	TΠ is maximized
#201 and above	MRP < MFC	MΠ < $0	TΠ decreases

The Profit-Maximizing Quantity of Labor: A Monopsonistic Employer



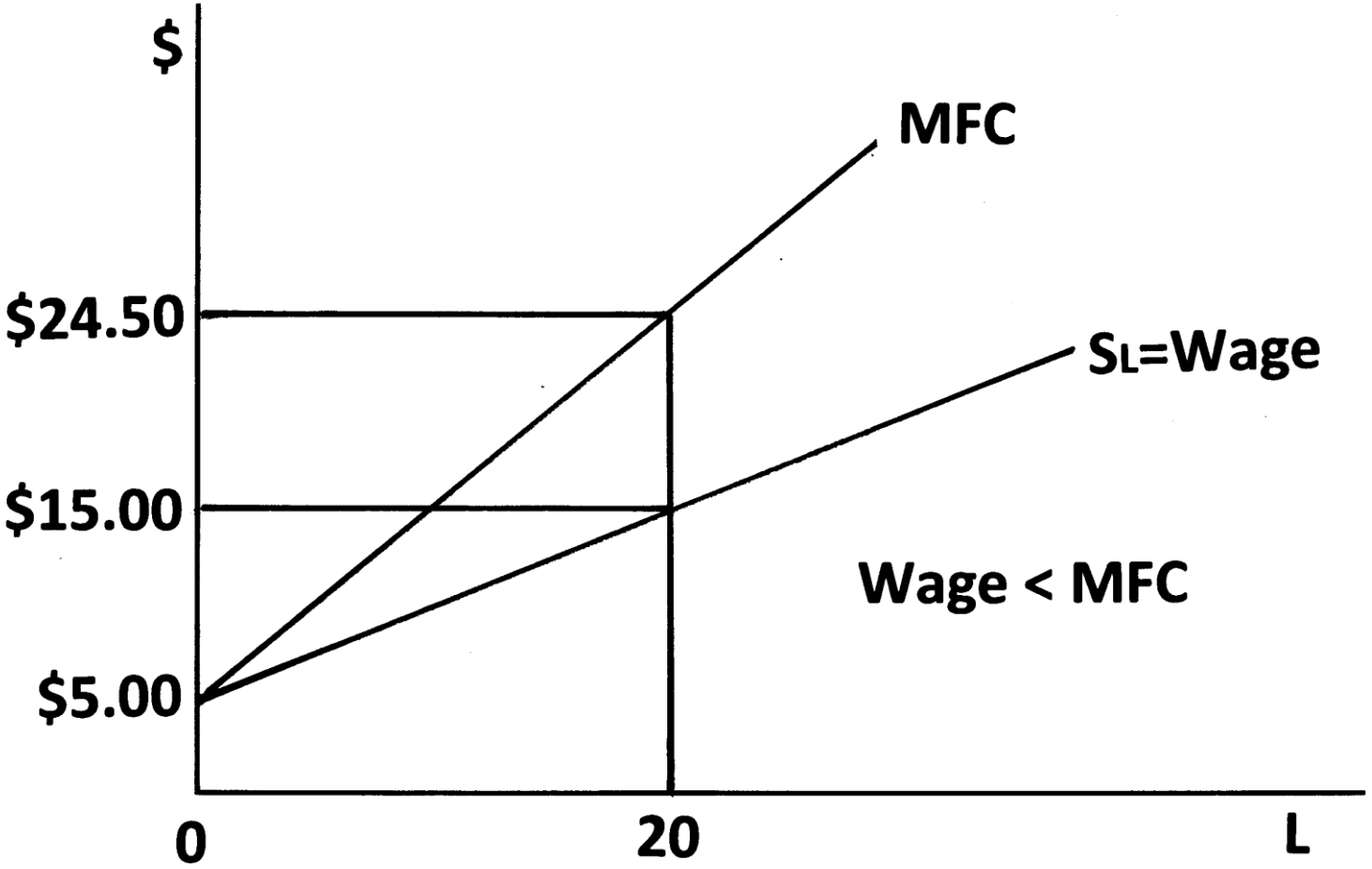
The Monopolist's Product Demand Curve is Above its MR Curve



The Monopolist's Product Demand Curve is Above its MR Curve

Quantity	Price	Total Revenue	Marginal Revenue
5 units	$40	$150	
6 units	$28	$168	$18

The Monopsonist's Labor Supply Curve is Below its MFC Curve



The Monopsonist's Labor Supply Curve is Below its MFC Curve

Labor Units	Wage	Total Labor Cost	Marginal Factor Cost
19 units	$14.50	$275.50	
20 units	$15.00	$300.00	$24.50

Q* and L* Are Connected!

- The profit-maximizing quantity is Q* where MR=MC.
- The profit-maximizing labor is L* where MRP=MFC.
- The quantity produced by L* is Q*.

One more marginal look-alike

Consumer equilibrium occurs when

$$\frac{MUx}{Px} = \frac{MUy}{Py}$$

Economic efficiency occurs when

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K}$$

Bottom line….

Tell your students there really are not that many different things to memorize!