Universidad de Valladolid

ECO - UVa

Topic 4

Markets

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Outline

1. Perfect competition:
   - Equilibrium of a competitive firm in the short run.
   - Short-run competitive industry equilibrium.

2. Monopoly:
   - Short-run monopolist equilibrium.

3. Comparison between perfect competition and monopoly.

Outline

1. Perfect competition:
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3. Comparison between perfect competition and monopoly.

Perfect competition

Remember Supply and Demand: in the competitive market **there** are **no** buyers and sellers who can **influence the price**.

- **Producers** are **price-taking**: producers whose actions have no effect on the market price of the good or service they sell.
- A price-taking producer **considers the market price as given**.
- **Consumers** are also **price-taking**: consumers whose actions have no effect on the market price of the good or service they buy. The **quantity** of a good or service bought by a **consumer** does not affect the market price.

Perfect competition

There is **perfect competition** when **all producers and consumers are price-taking**.

- A perfectly competitive market: it is a market in which all market participants are price-taking.
- A perfectly competitive industry: it is an industry in which all **producers** are price-taking.

In other words, **individual decisions of producers or consumers do not affect the market price**.

Perfect competition

Necessary conditions for perfect competition:

1. For an industry to be perfectly competitive, it must contain **many producers**, none of whom have a large **market share**.
   - Market share: fraction of the total industry output accounted for by a producer's output.
2. An industry can be perfectly competitive only if consumers regard the **products** of all producers as **equivalent**.
   - Standardized product: consumers consider the products of different producers to be the same. Also known as a **commodity**.
3. An industry has **free entry and exit**: although this is not strictly necessary for perfect competition.
   - New producers can easily enter into an industry and existing producers can easily leave that industry.

Perfect competition

Markets need to be identified:

The fish market may be perfect competition, but not necessarily the market for canned fish.

Note that there is no free entry into the fishing market due to fishing quotas, but it can be a perfectly competitive industry.

Production and profits

How does an industry that satisfies the criteria of perfect competition behave? First, let's look at its profits.

Total revenue: $TR = P \times Q$

Profit = TR – TC

- **Marginal profit** is the change in profit generated by the production and sale of an additional unit of output.

Production and profits

Quantity of output
0
10
20
30
40
50
60
70

Production and profits

Quantity of output	TR
0	0
10	180
20	360
30	540
40	720
50	900
60	1080
70	1260

P = 18

$$TR = P \times Q$$

Production and profits

Quantity of output	TR	TC
0	0	140
10	180	300
20	360	360
30	540	440
40	720	560
50	900	720
60	1080	920
70	1260	1160

Production and profits

Quantity of output	TR	TC	Profit
0	0	140	-140
10	180	300	-120
20	360	360	0
30	540	440	100
40	720	560	160
50	900	720	180
60	1080	920	160
70	1260	1160	100

Profit = TR – TC

Production and profits

Quantity of output	TR	TC	Profit
0	0	140	-140
10	180	300	-120
20	360	360	0
30	540	440	100
40	720	560	160
50	900	720	180
60	1080	920	160
70	1260	1160	100

Maximum profit:
Q = 50

Production and profits

How do you know what is the quantity that maximizes profit? Using the **optimal output rule**!

- **Optimal output rule**: profit is maximized by producing the quantity of output at which the marginal revenue of the last unit produced is equal to its marginal cost.
- **Marginal revenue** (**MR**): is the change in total revenue generated by an additional unit of output: $\mathrm{MR} = \frac{\Delta \mathrm{TR}}{\Delta \mathrm{Q}} = \frac{\partial \mathrm{TR(Q)}}{\partial \mathrm{Q}}$
- Therefore, **MR = MC** => $\frac{\partial \mathrm{TR(Q)}}{\partial \mathrm{Q}} = \frac{\partial \mathrm{TC(Q)}}{\partial \mathrm{Q}}$**. This is the optimal output rule**.

Production and profits

Quantity of output	TC
0	140
10	300
20	360
30	440
40	560
50	720
60	920
70	1160

Production and profits

Quantity of output	TC	MC
0	140	
		16
10	300	
		6
20	360	
		8
30	440	
		12
40	560	
		16
50	720	
		20
60	920	
		24
70	1160	

Production and profits

Quantity of output	TR
0	0
10	180
20	360
30	540
40	720
50	900
60	1080
70	1260

Production and profits

Quantity of output	TR
0	0
10	180
20	360
30	540
40	720
50	900
60	1080
70	1260

$$MR = \frac{\Delta TR}{\Delta Q}$$

Production and profits

Quantity of output	TR
0	0
10	180
20	360
30	540
40	720
50	900
60	1080
70	1260

$$\frac{180 - 0}{10 - 0} = 18$$

$$MR = \frac{\Delta TR}{\Delta Q}$$

Production and profits

Quantity of output	TR
0	0
10	180
20	360
30	540
40	720
50	900
60	1080
70	1260

$$\frac{180 - 0}{10 - 0} = 18$$

$$\frac{360 - 180}{20 - 10} = 18$$

$$MR = \frac{\Delta TR}{\Delta Q}$$

Production and profits

Quantity of output	TR
0	0
10	180
20	360
30	540
40	720
50	900
60	1080
70	1260

$$\frac{180-0}{10-0}=18$$

$$\frac{360-180}{20-10}=18$$

18

18

18

18

18

$$MR=\frac{\Delta TR}{\Delta Q}$$

Production and profits

- The MR is always 18 because 18 is the price, i.e. **MR = P**.
- **MR = P because the producer is price-taking**.
- In perfect competition, producers are price-taking.
- If there is no perfect competition, MR ≠ P.

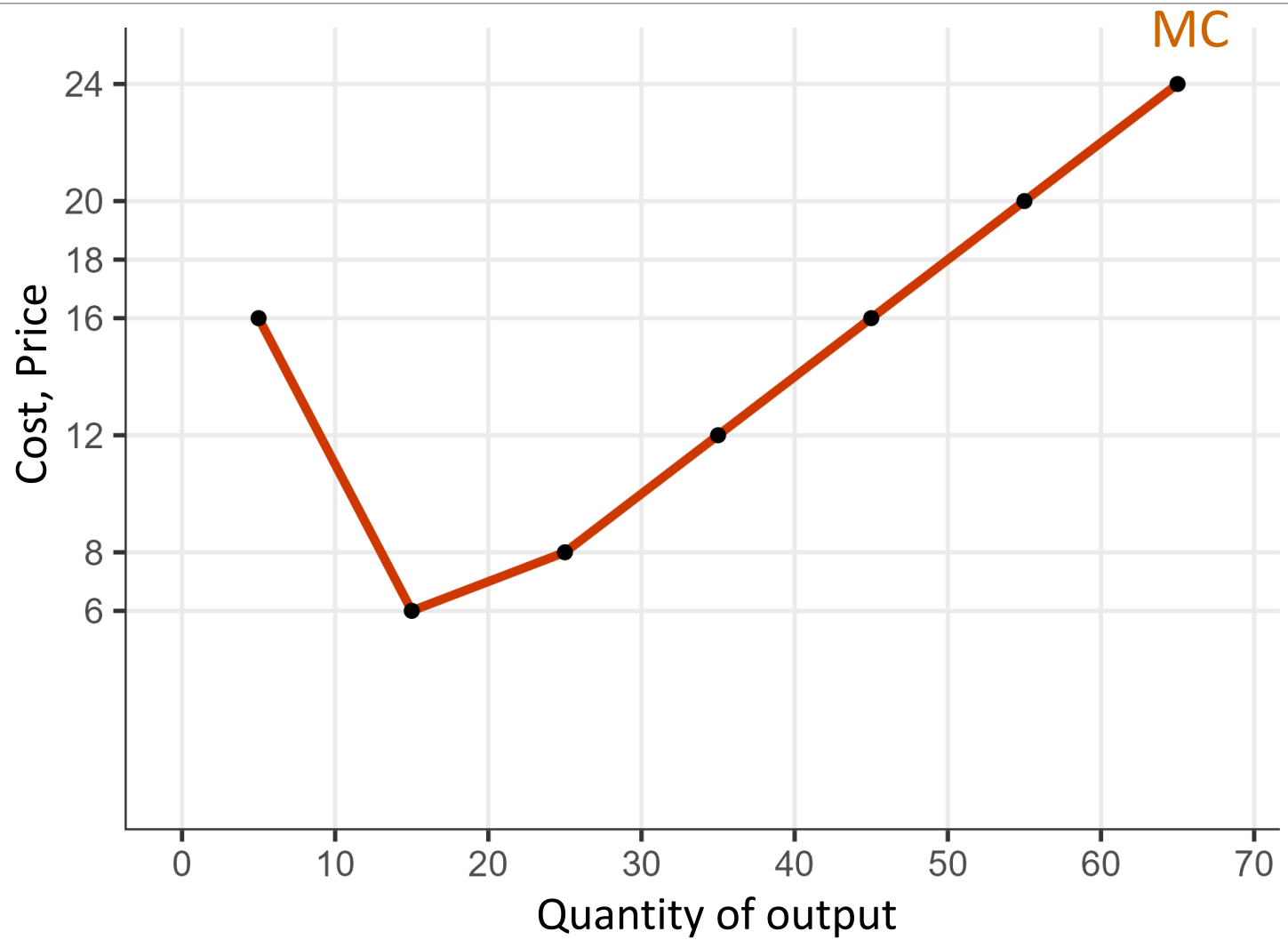
Produ

Q	MR	MC	Net gain MR – MC
0			
	18	16	2
10			
	18	6	12
20			
	18	8	10
30			
	18	12	6
40			
	18	16	2
50			
	18	20	–2
60			
	18	24	–2
70			

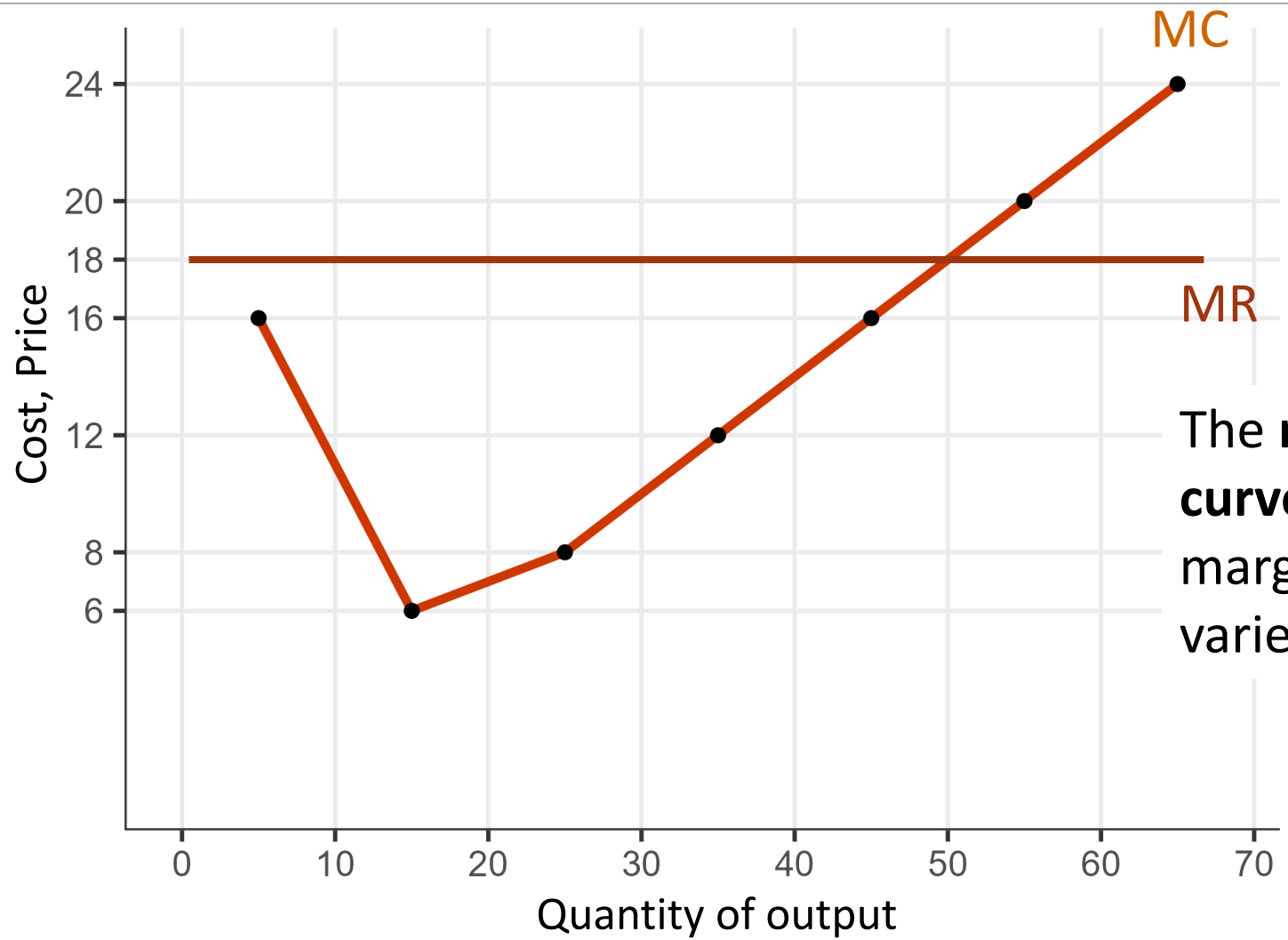
Produ

Q	MR	MC	Net gain MR – MC
0			
	18	16	2
10			
	18	6	12
20			
	18	8	10
30			
	18	12	6
40			
	18	16	2
50			
	18	20	–2
60			
	18	24	-6
70			

Marginal revenue and marginal cost

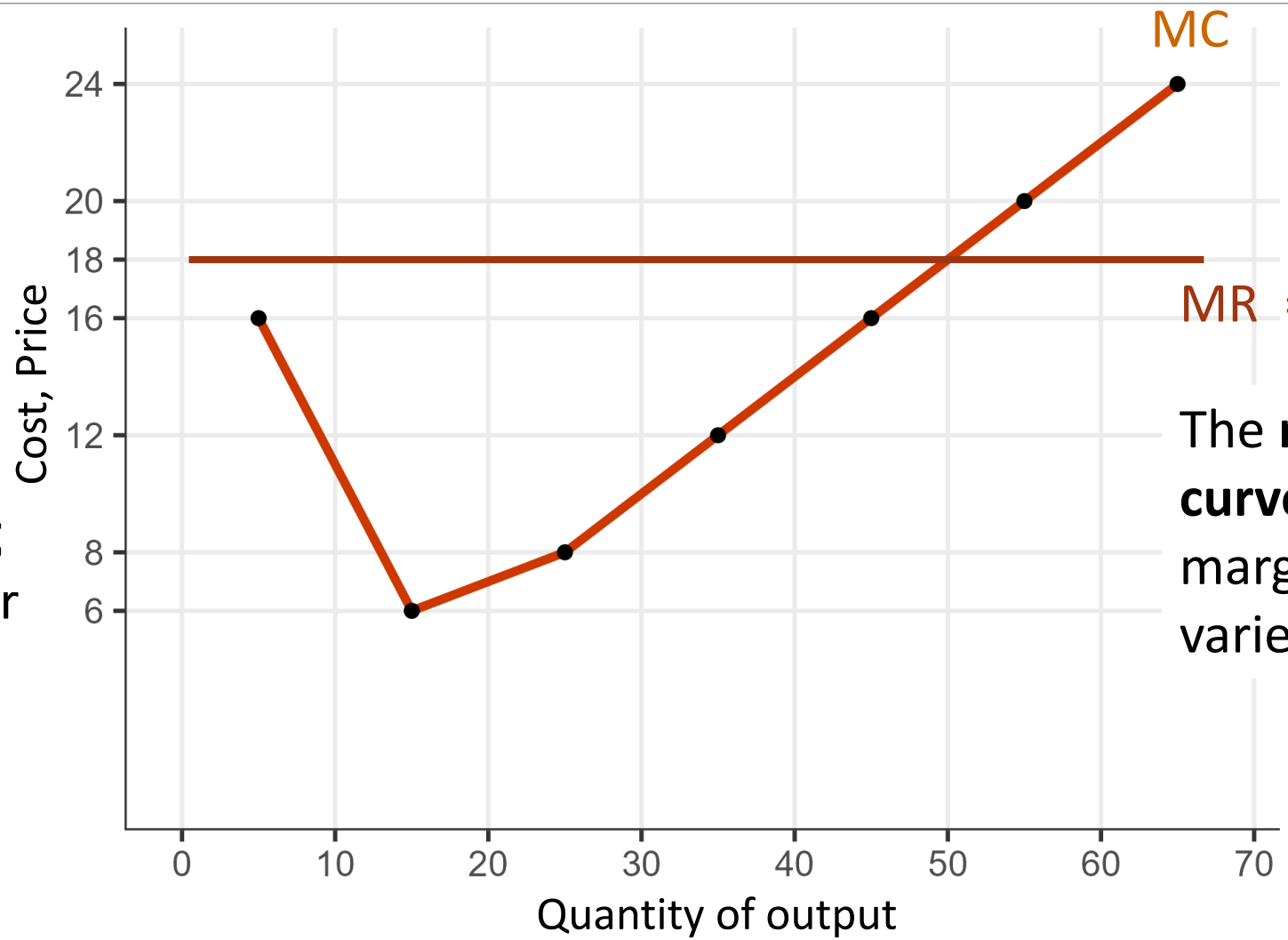


Marginal revenue and marginal cost



The **marginal revenue curve** shows how marginal revenue varies as output varies

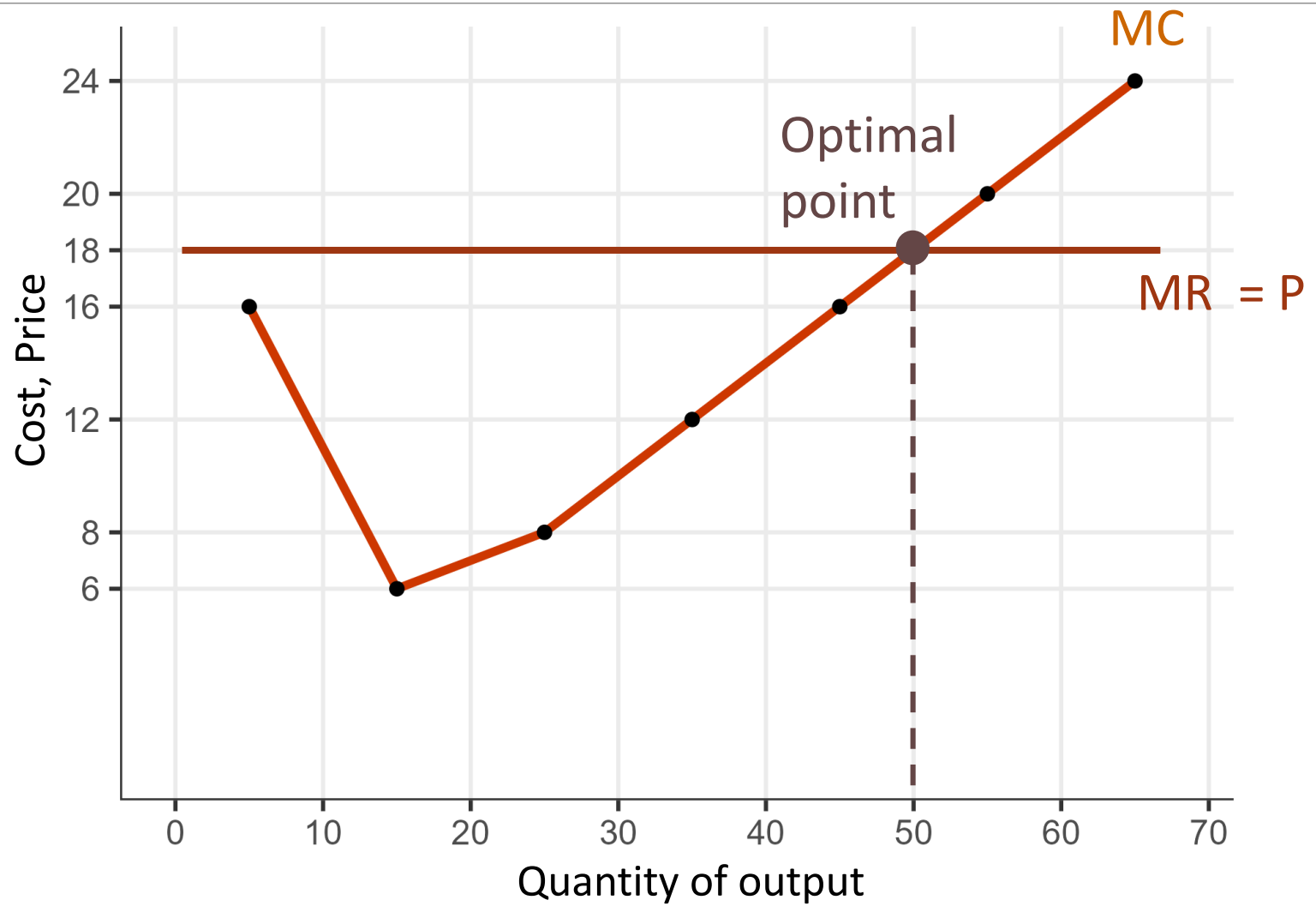
Marginal revenue and marginal cost



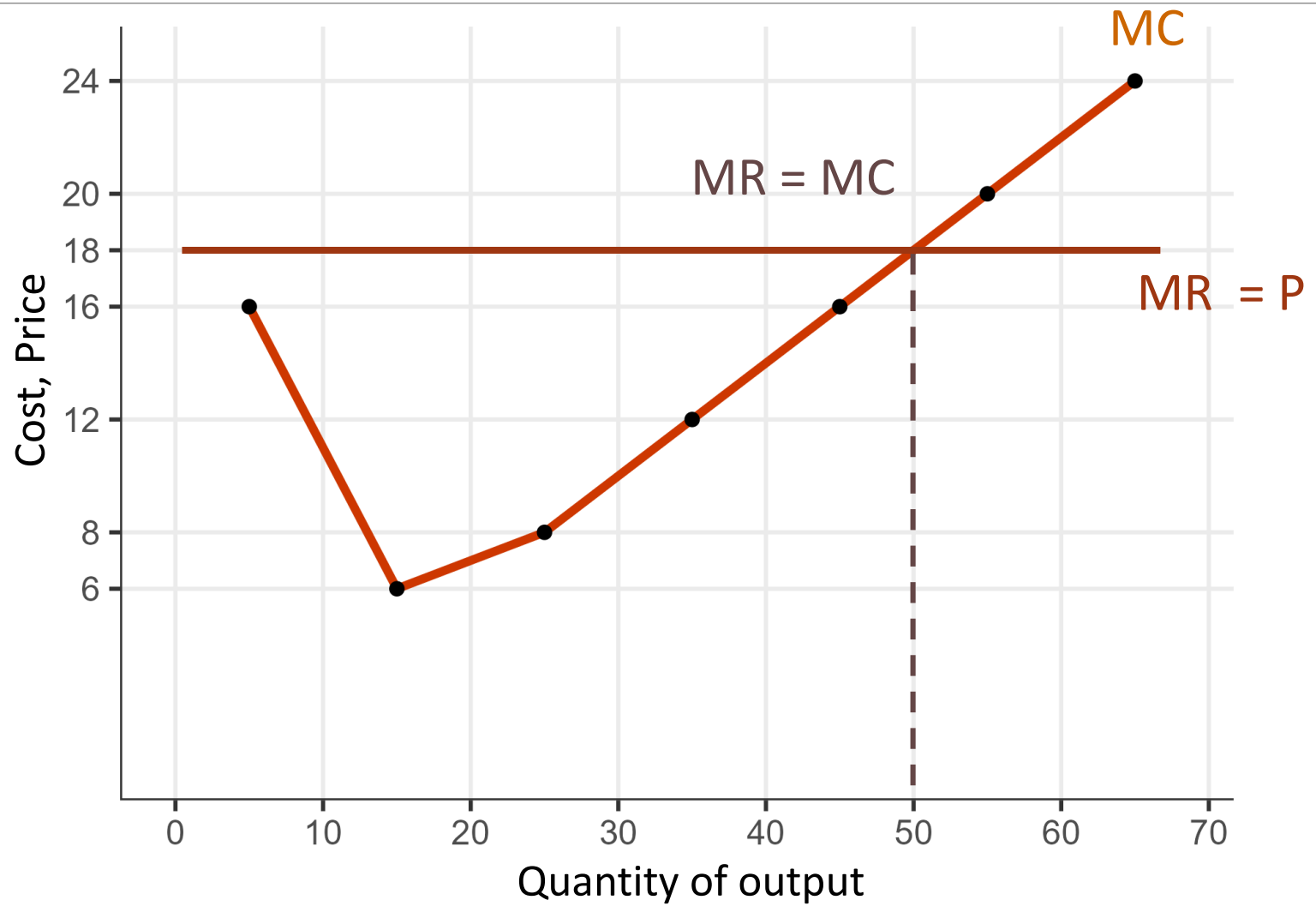
The MR curve is **horizontal** because firms are **price-taking** Regardless of whether it sells more or less, market price is unaffected.

The **marginal revenue curve** shows how marginal revenue varies as output varies.

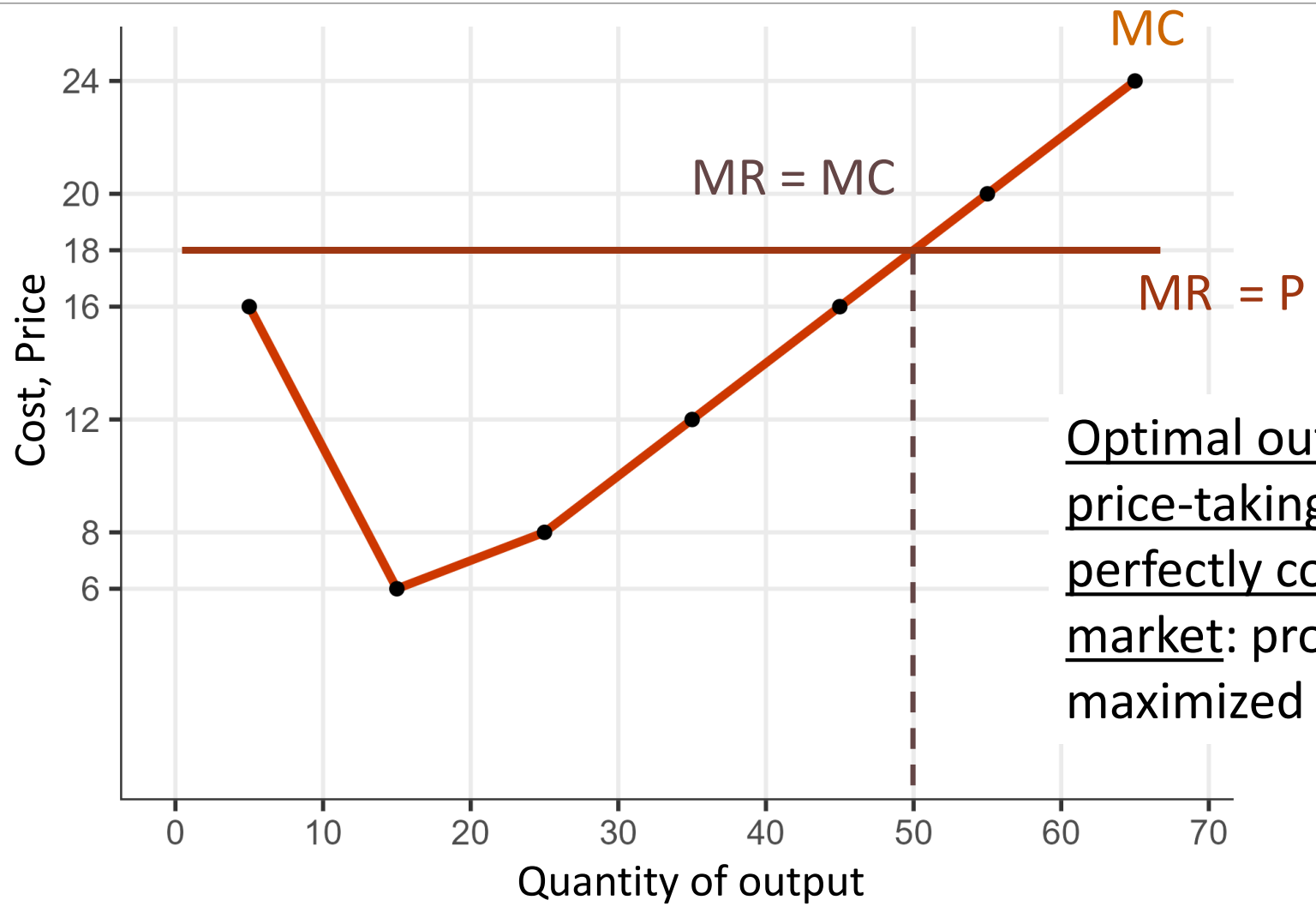
Marginal revenue and marginal cost



Marginal revenue and marginal cost



Marginal revenue and marginal cost



Optimal output rule of a price-taking firm in a perfectly competitive market: profit is maximized when **P = MC**

When is it profitable to produce?

- Production is profitable if the **economic profit** is positive.
  - Economic profit ≠ Accounting profit. Why?
  - We have assumed that the tables above refer to **economic costs**, so the profit calculated earlier is **economic profit**.

- Given the cost curves, making a profit depends on the market price. Since P = MC:
  - **There is a profit** if the market price **is higher** than the minimum-cost output (ATC).
  - **There is no benefit** if the market price **is lower** than the minimum-cost output (ATC).

When is it profitable to produce?

Quantity of output	TC
0	140
10	300
20	360
30	440
40	560
50	720
60	920
70	1160

When is it profitable to produce?

Quantity of output	TC
0	140
10	300
20	360
30	440
40	560
50	720
60	920
70	1160

How much is the FC?

When is it profitable to produce?

Quantity of output	TC	VC
0	140	0
10	300	160
20	360	220
30	440	300
40	560	420
50	720	580
60	920	780
70	1160	1020

FC = 140

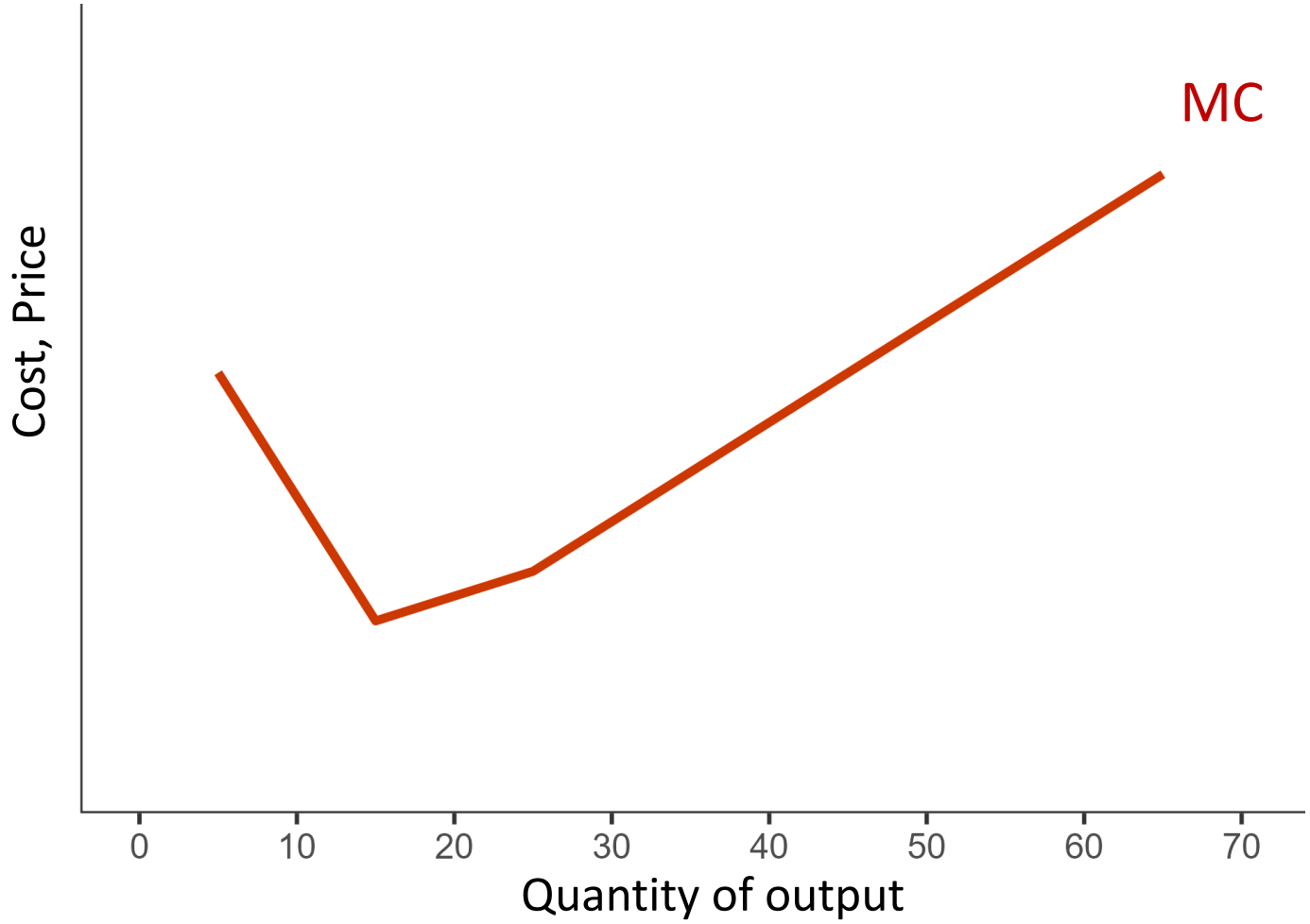
When is it profitable to produce?

Quantity of output	TC	VC	AVC
0	140	0	
10	300	160	16.0
20	360	220	11.0
30	440	300	10.0
40	560	420	10.5
50	720	580	11.6
60	920	780	13.0
70	1160	1020	14.6

When is it profitable to produce?

Quantity of output	TC	VC	AVC	ATC
0	140	0		
10	300	160	16.0	30.0
20	360	220	11.0	18.0
30	440	300	10.0	14.7
40	560	420	10.5	14.0
50	720	580	11.6	14.4
60	920	780	13.0	15.3
70	1160	1020	14.6	16.6

When is it profitable to produce?



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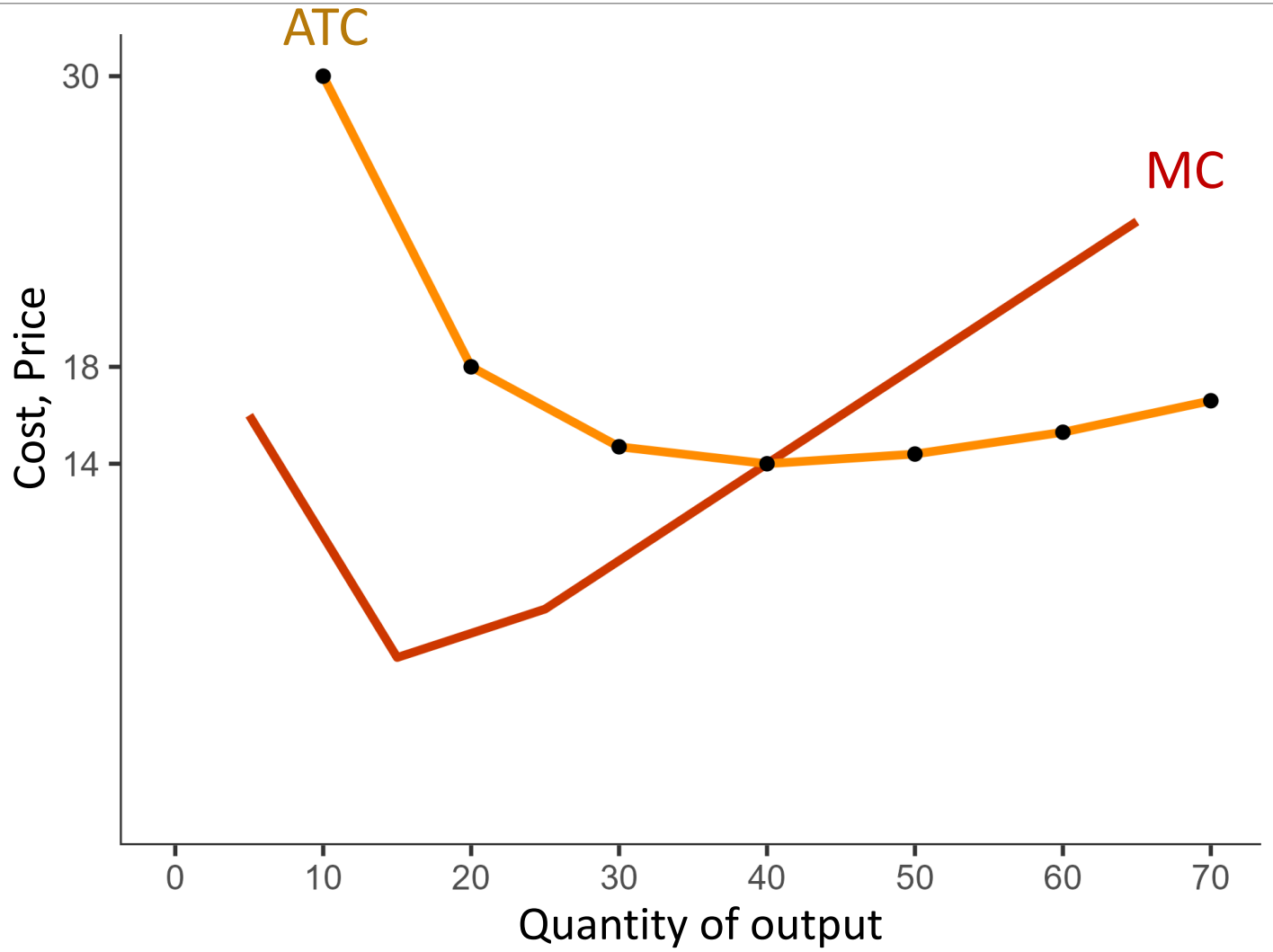

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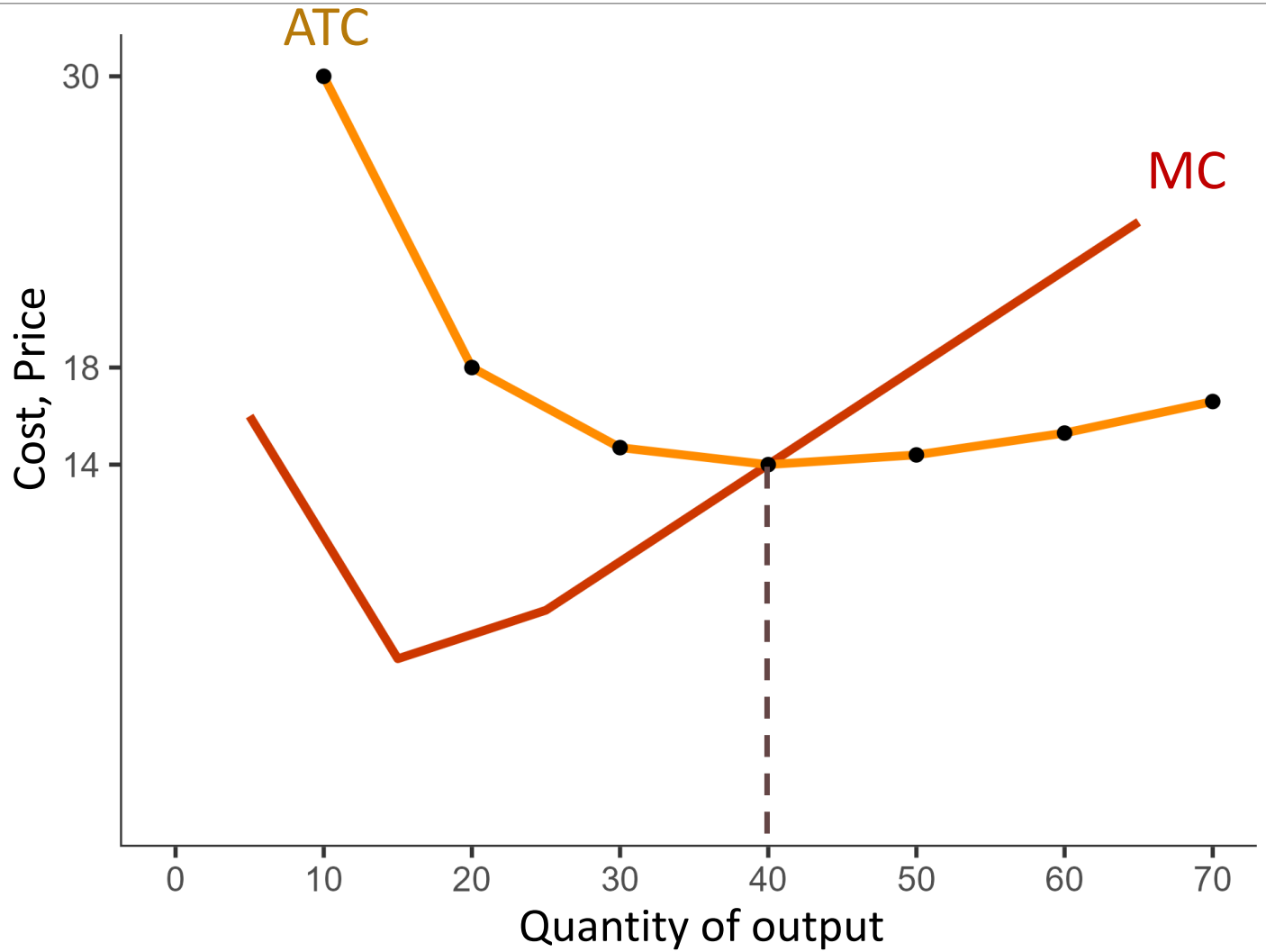

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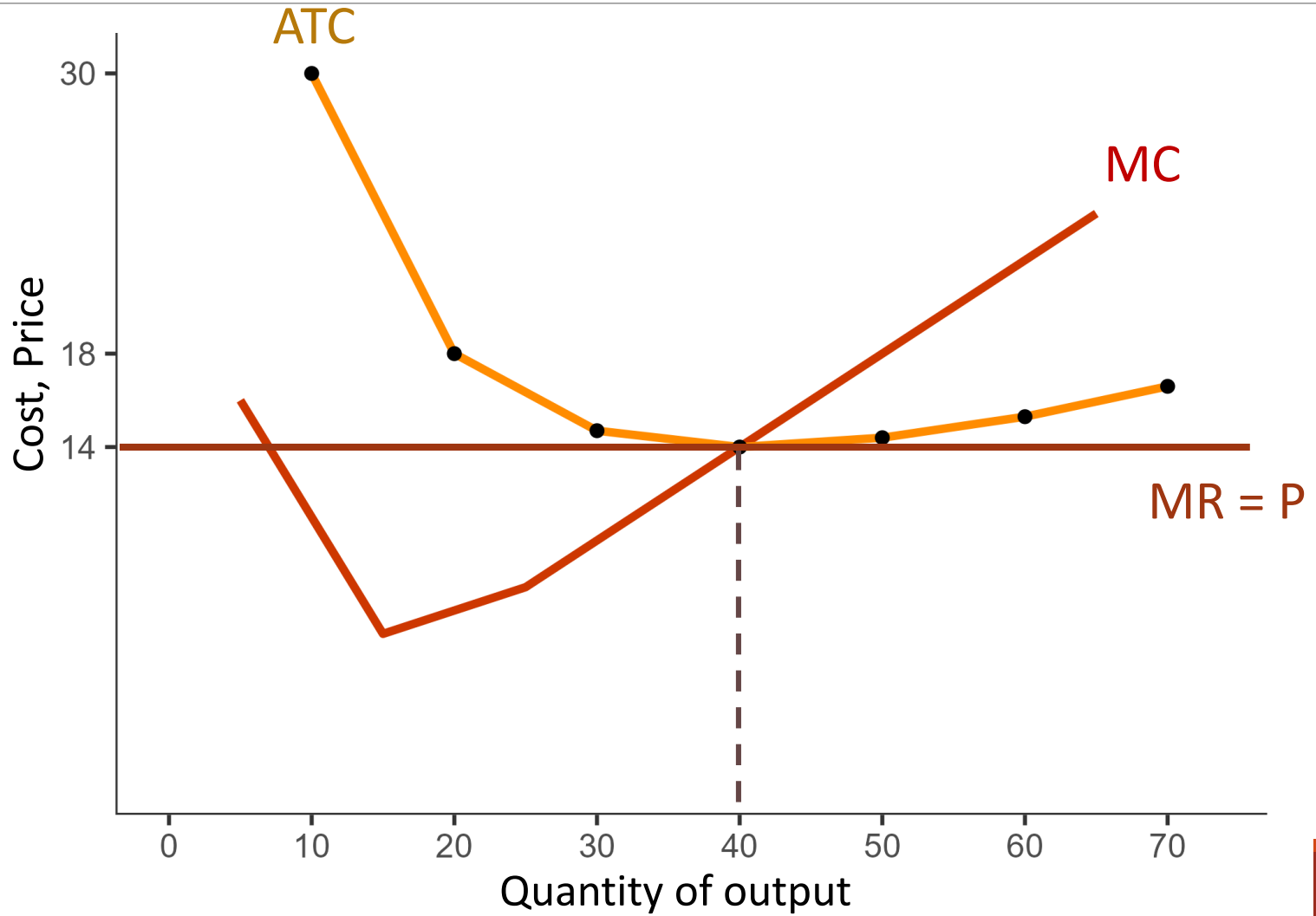

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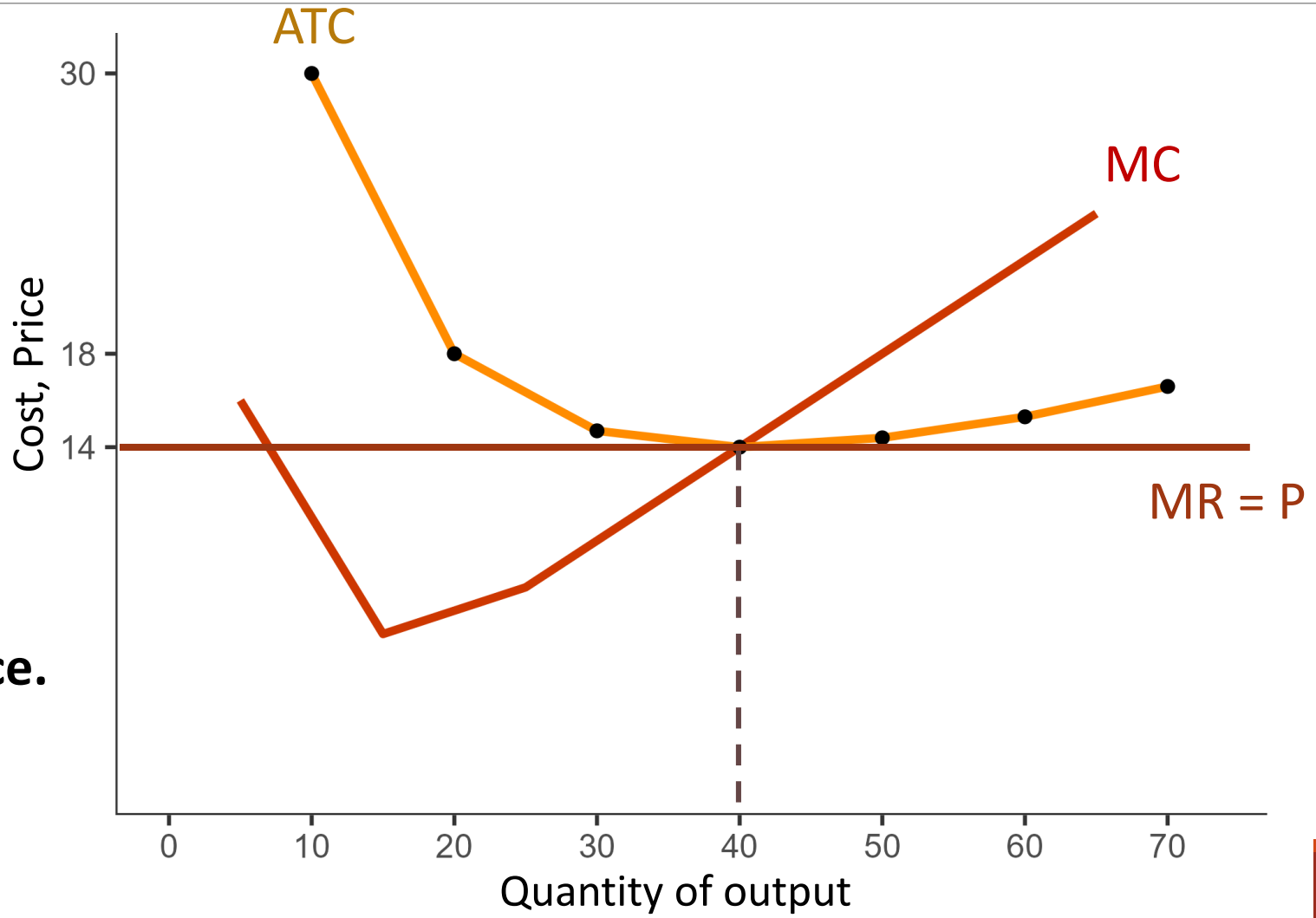
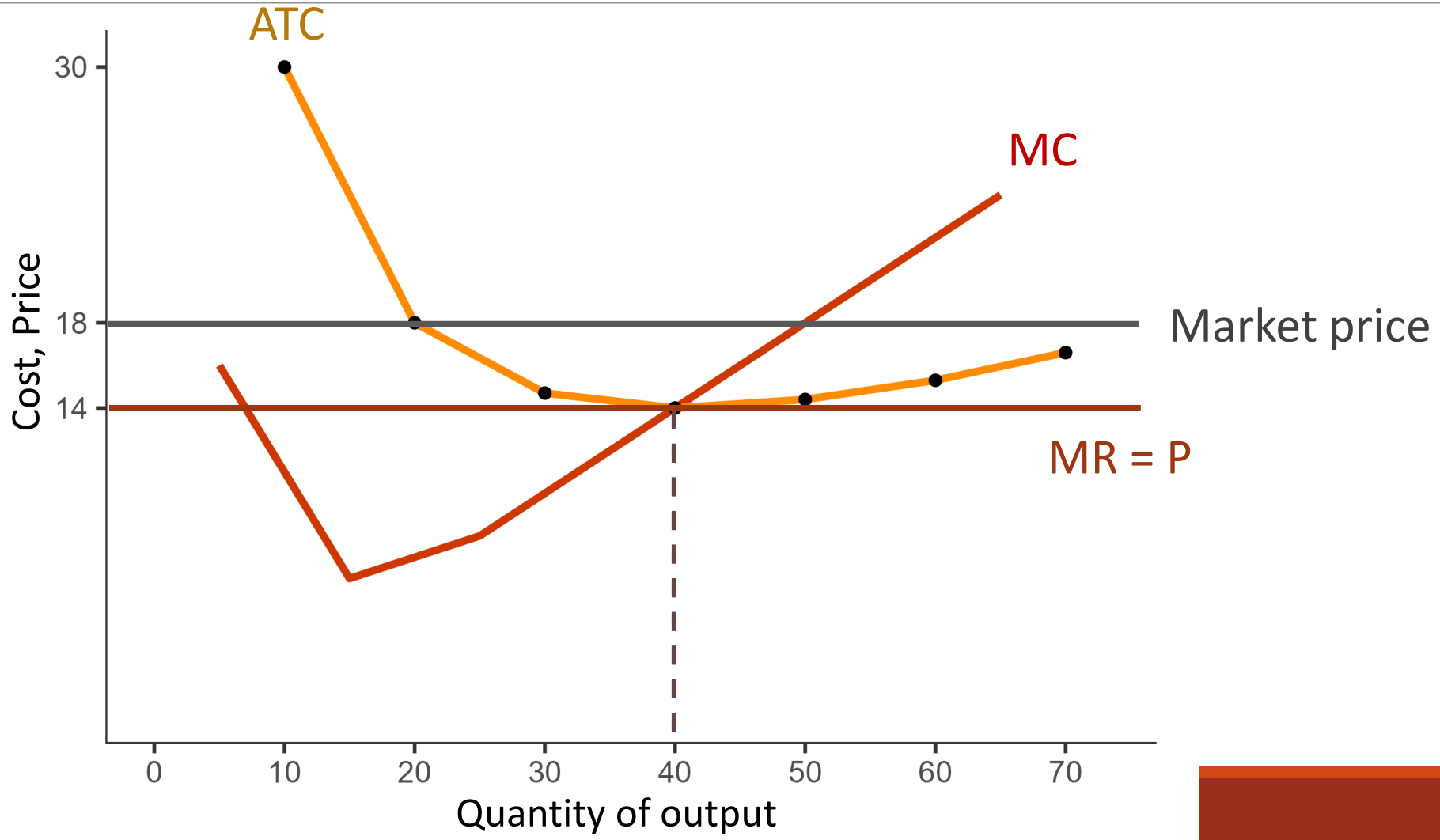


P = 14 is the **break-even price.**

The producer is willing to sell at a price of at least 14.

When is it profitable to produce?



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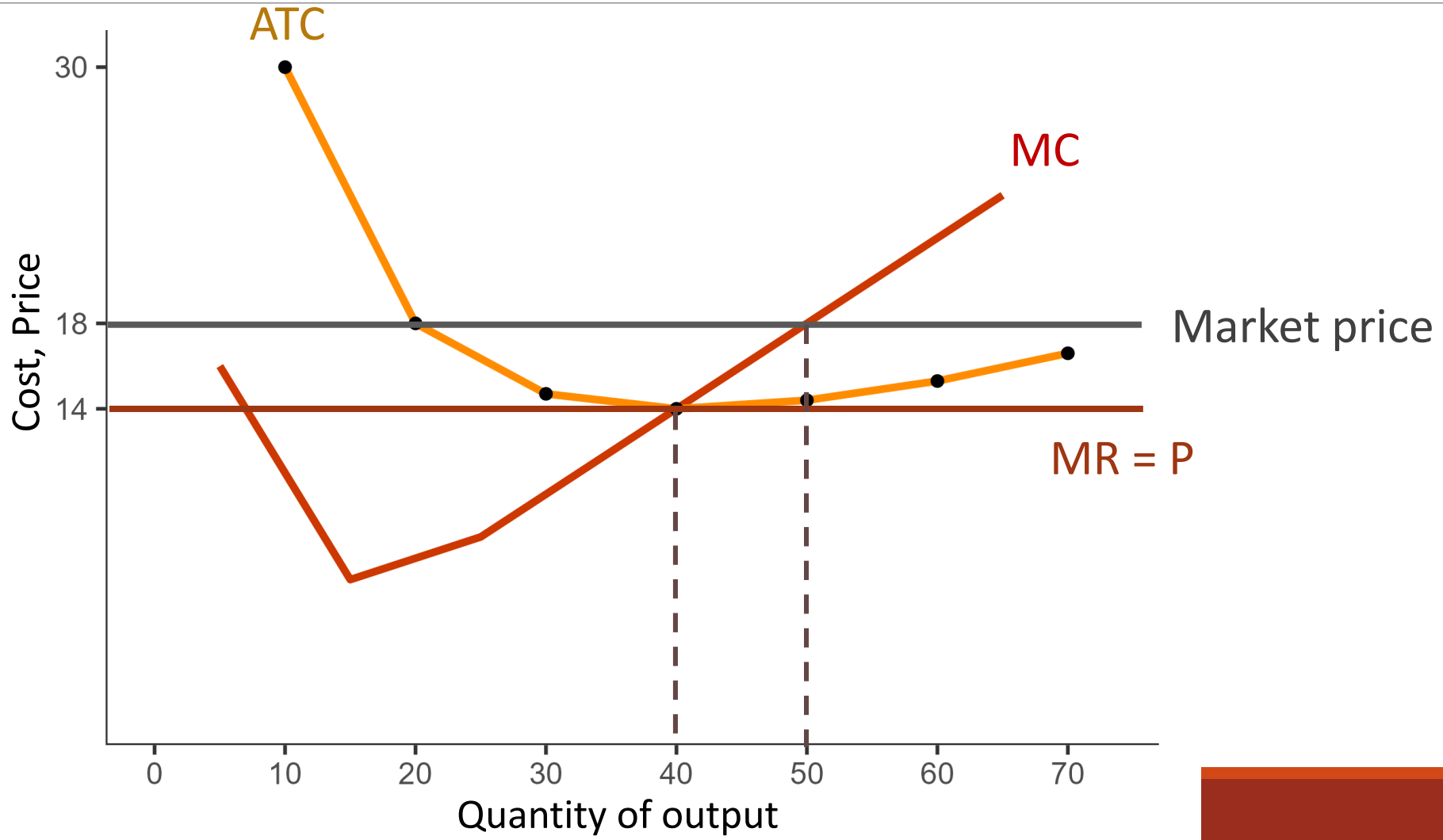

When is it profitable to produce?

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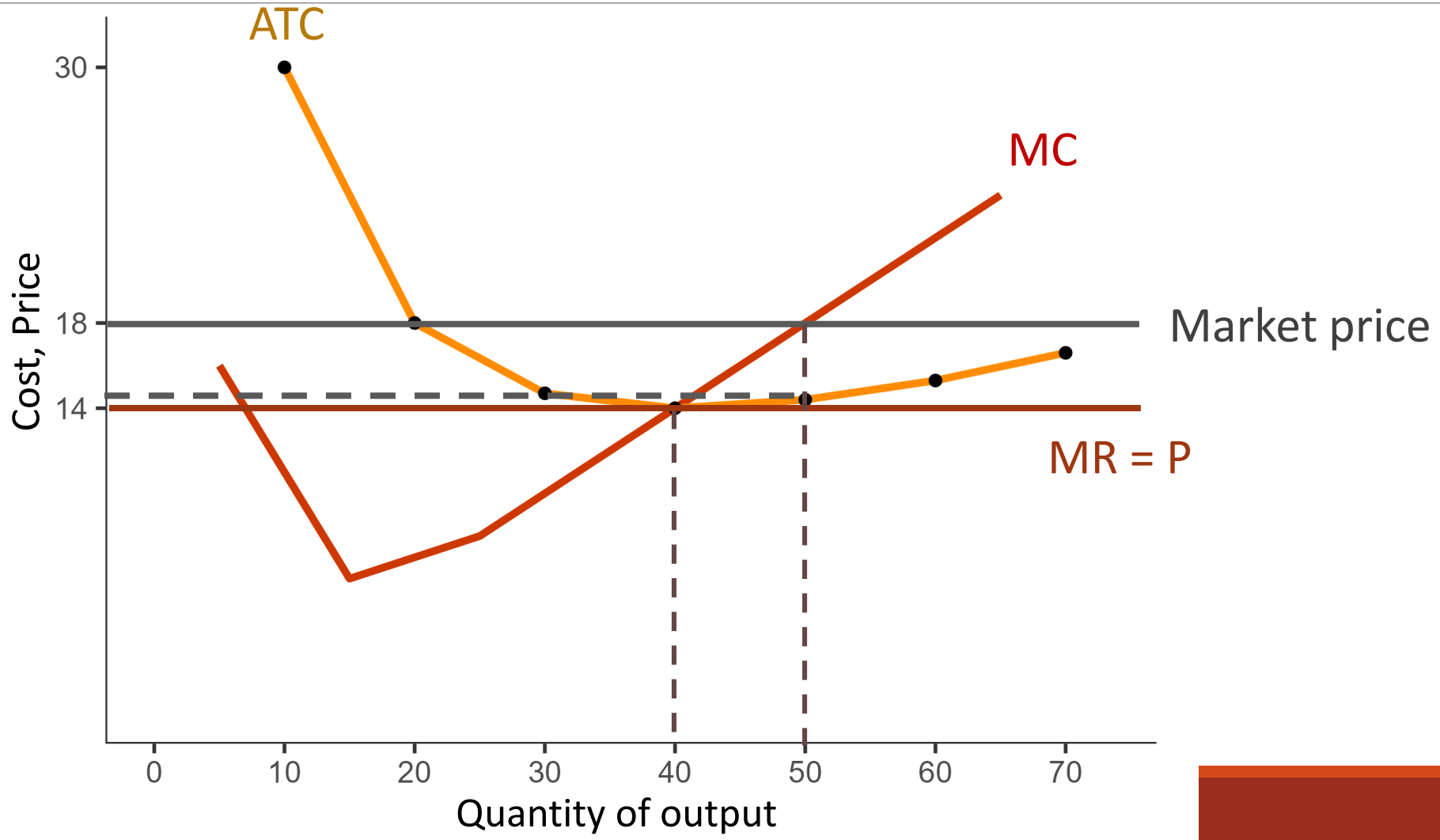
When is it profitable to produce?

ATC = P = 14.4



When is it profitable to produce?

Profit = TR – TC.

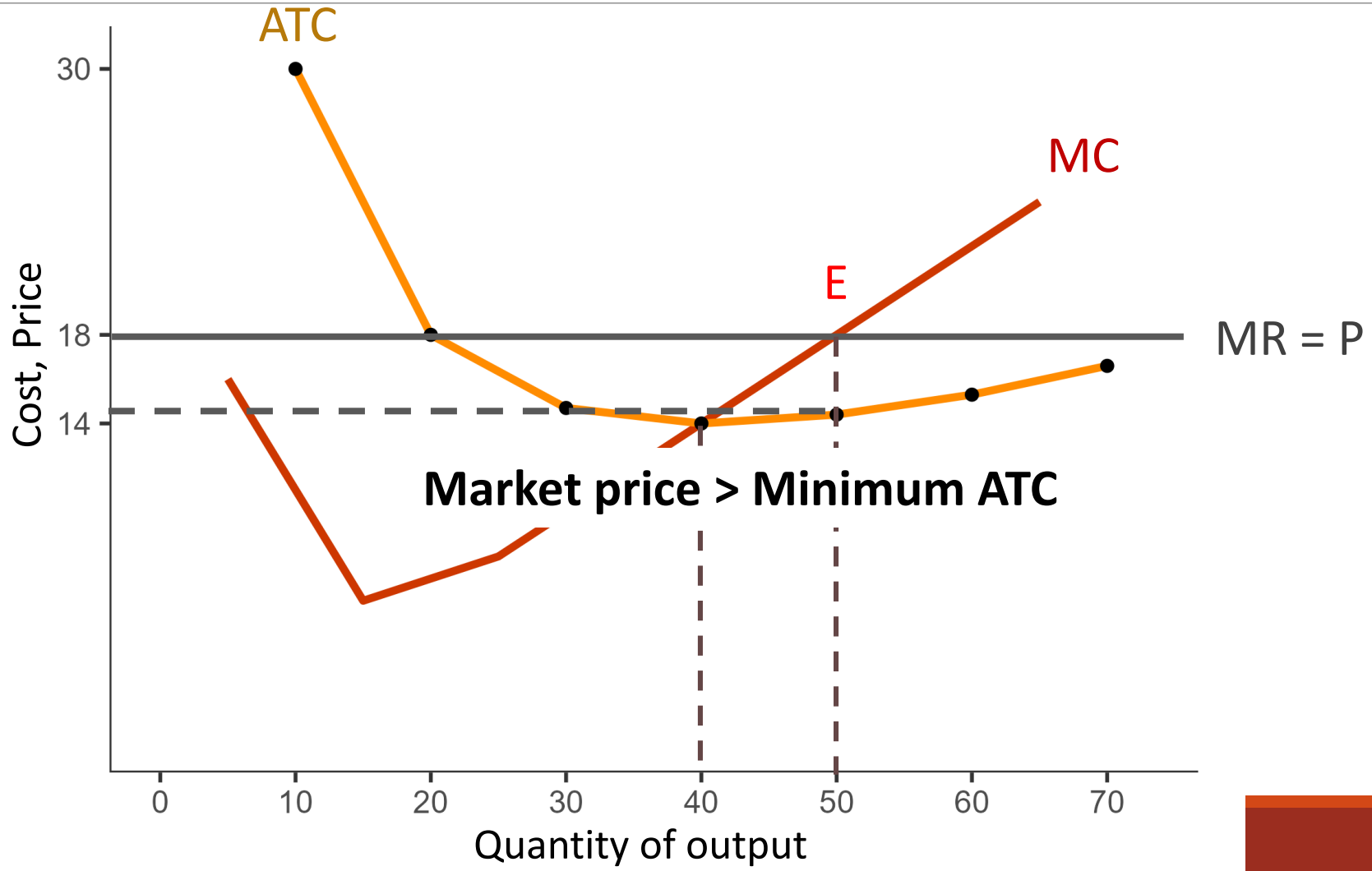
The firm produces if **profit ≥ 0.** For profit ≥ 0: **TR ≥ TC**.

- If **TR > TC**, then positive profit.
- If **TR = TC**, the firm is at the break-even price.

If **TR < TC**: there are losses and the firm does not produce.

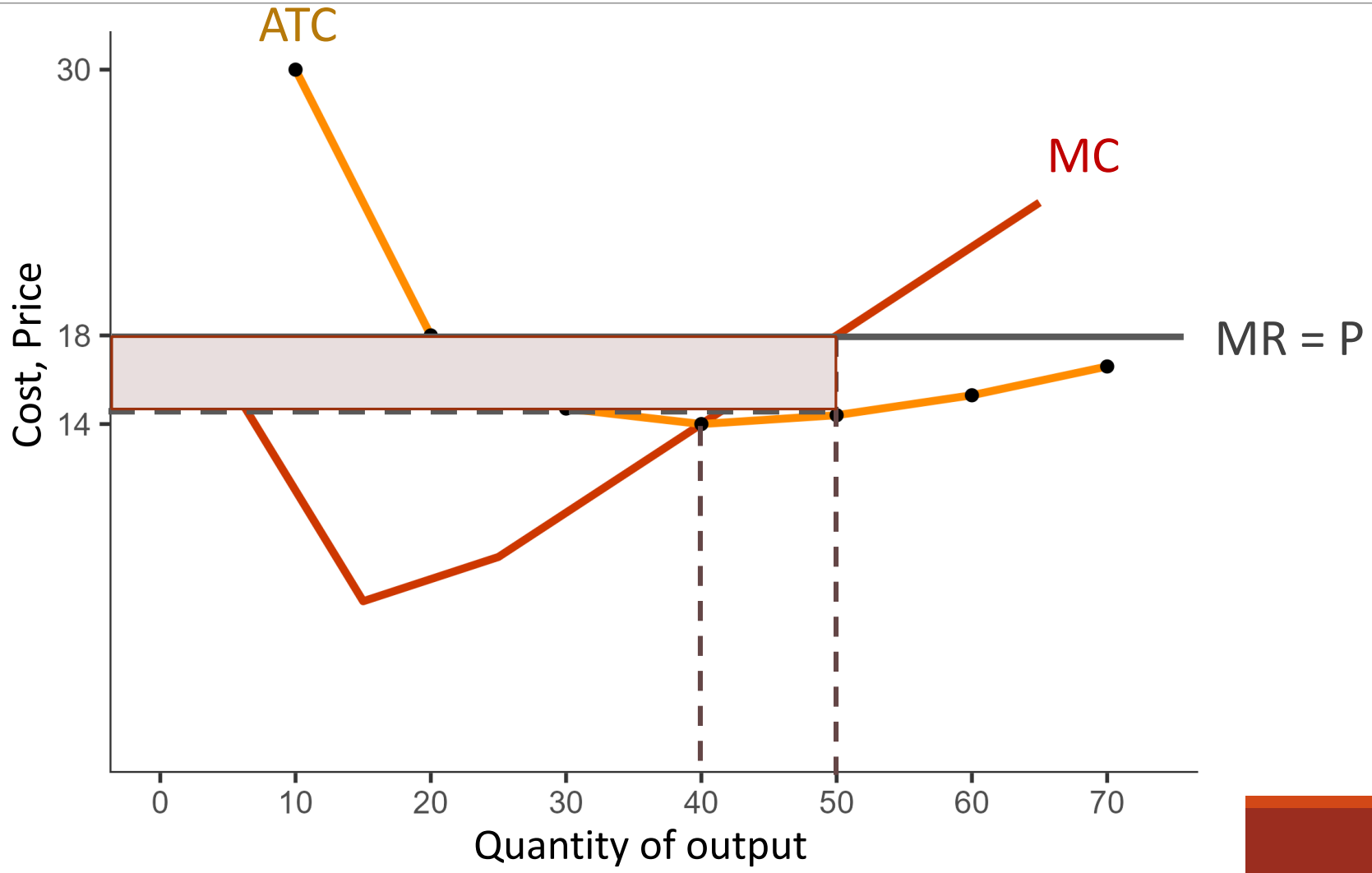
When is it profitable to produce?

ATC = P = 14.4



When is it profitable to produce?

ATC = P = 14.4



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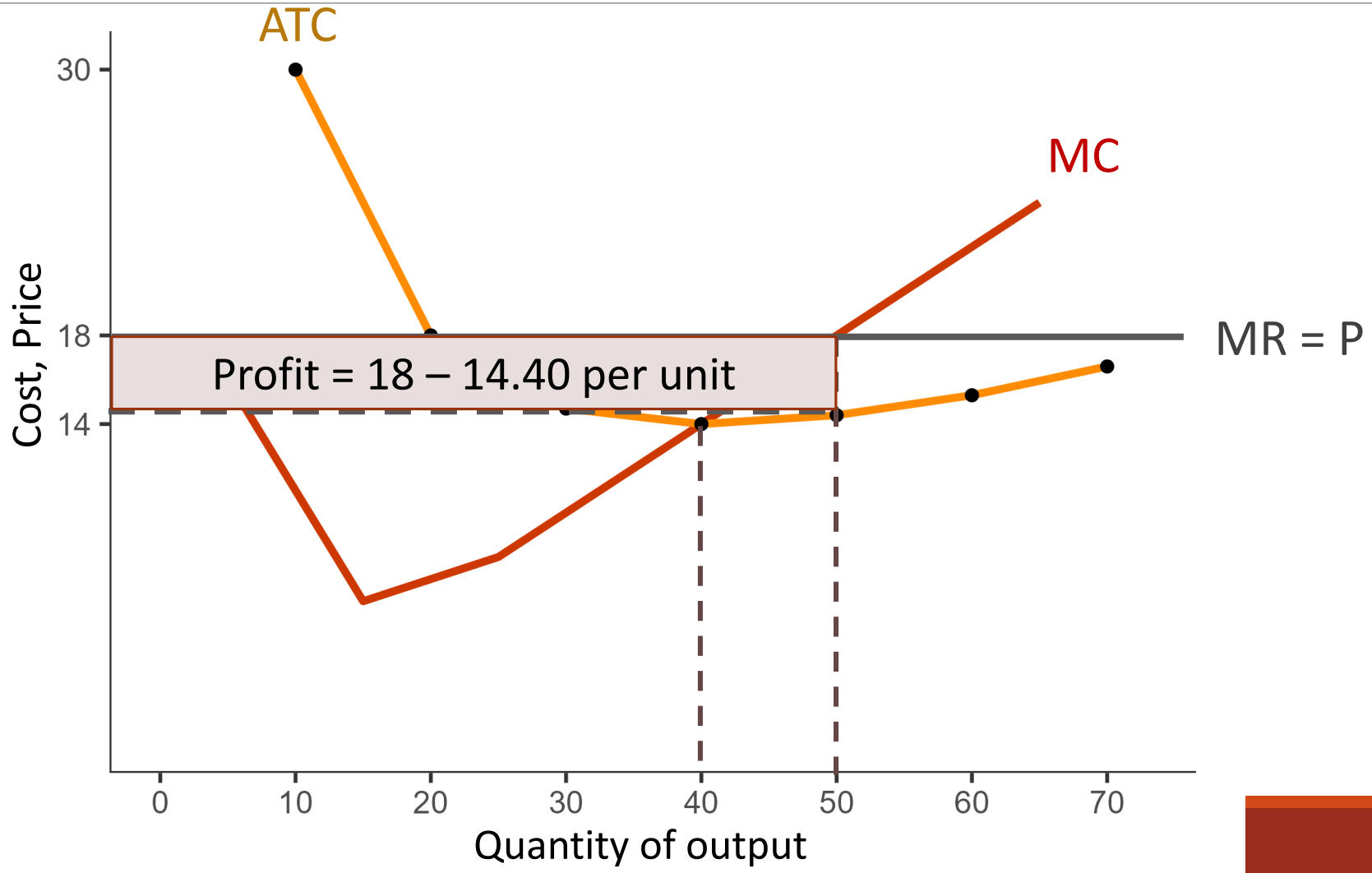
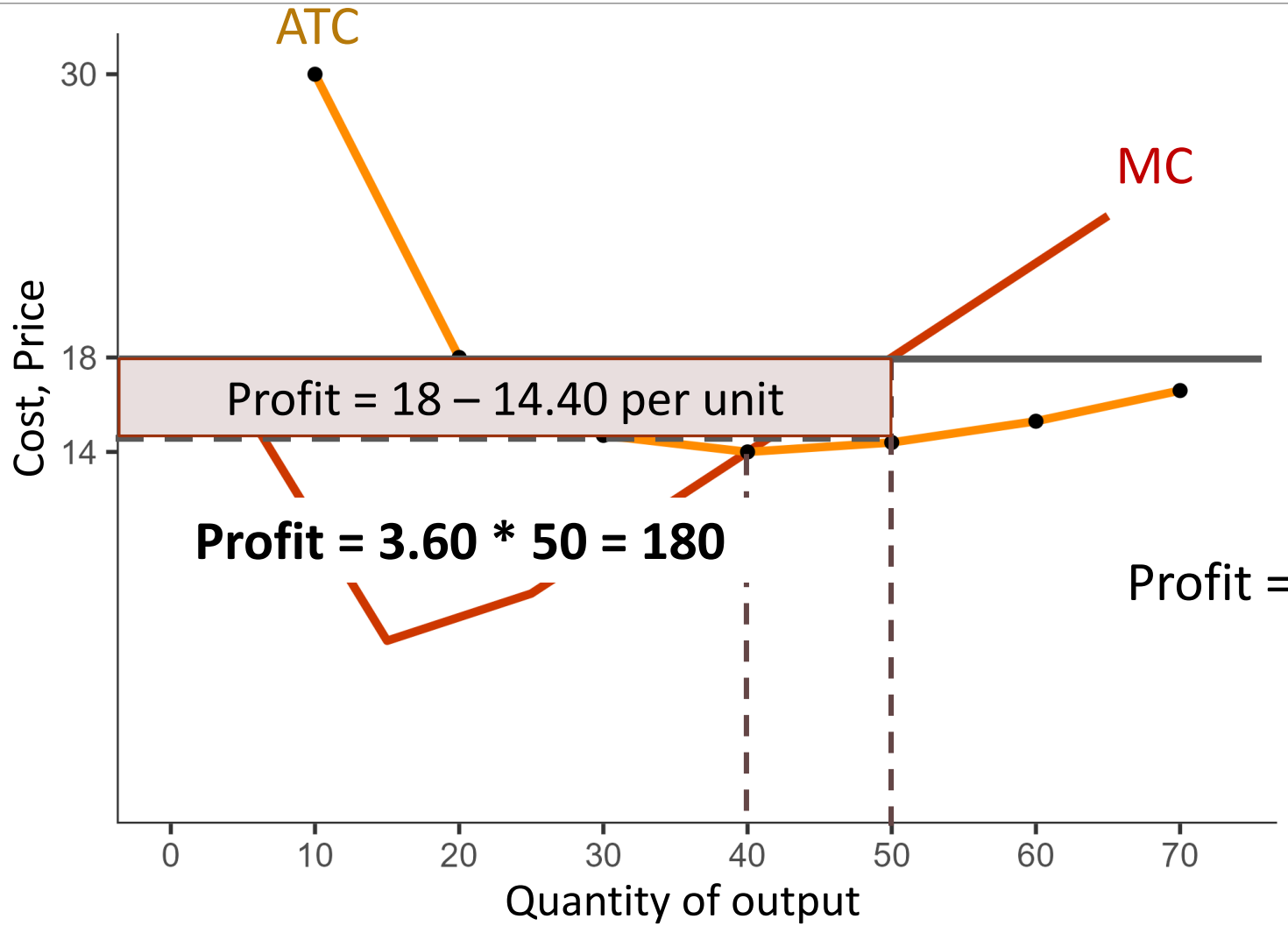


When is it profitable to produce?

ATC = P = 14.4

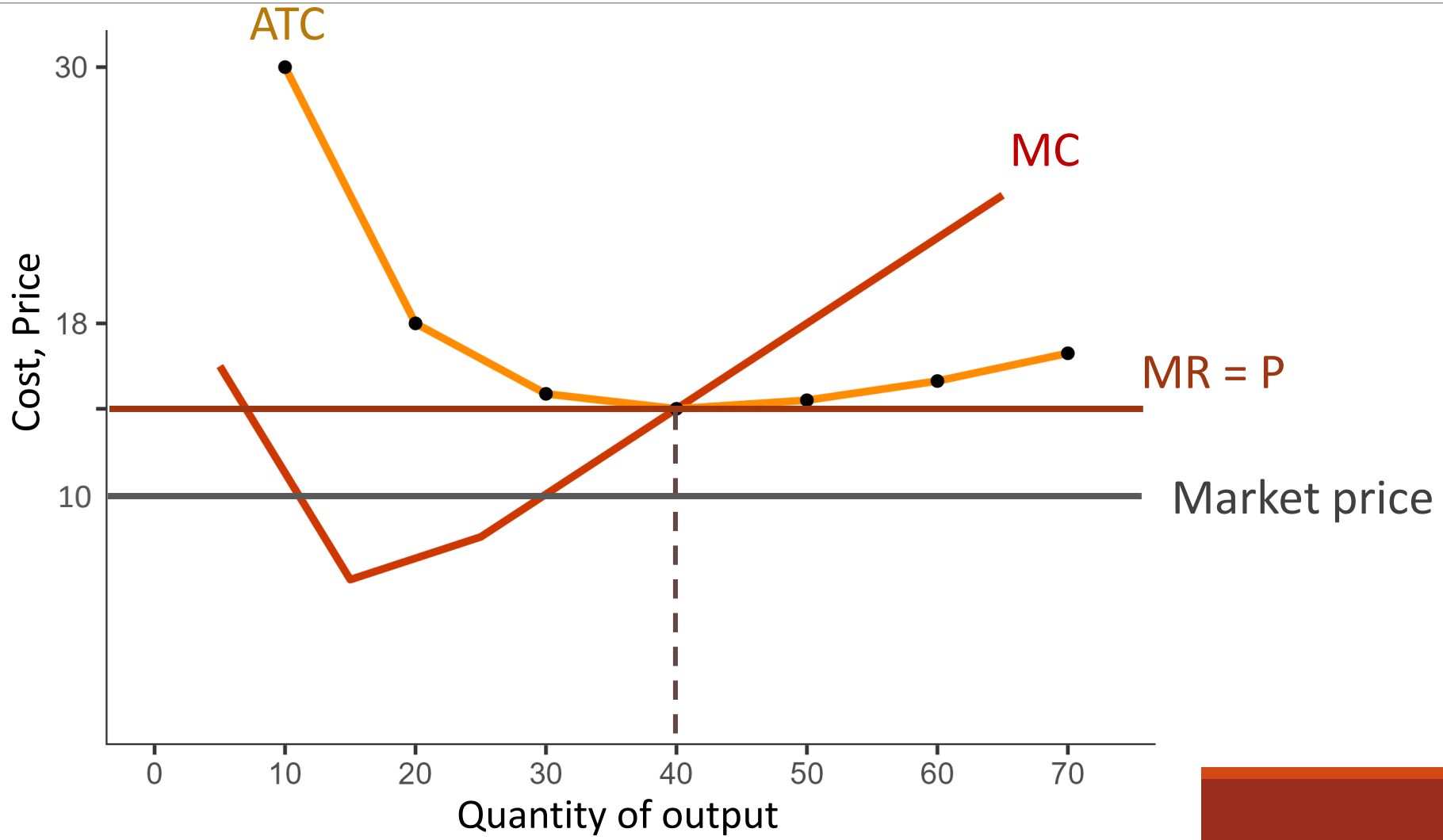


Profit = $(P - ATC) \times Q$

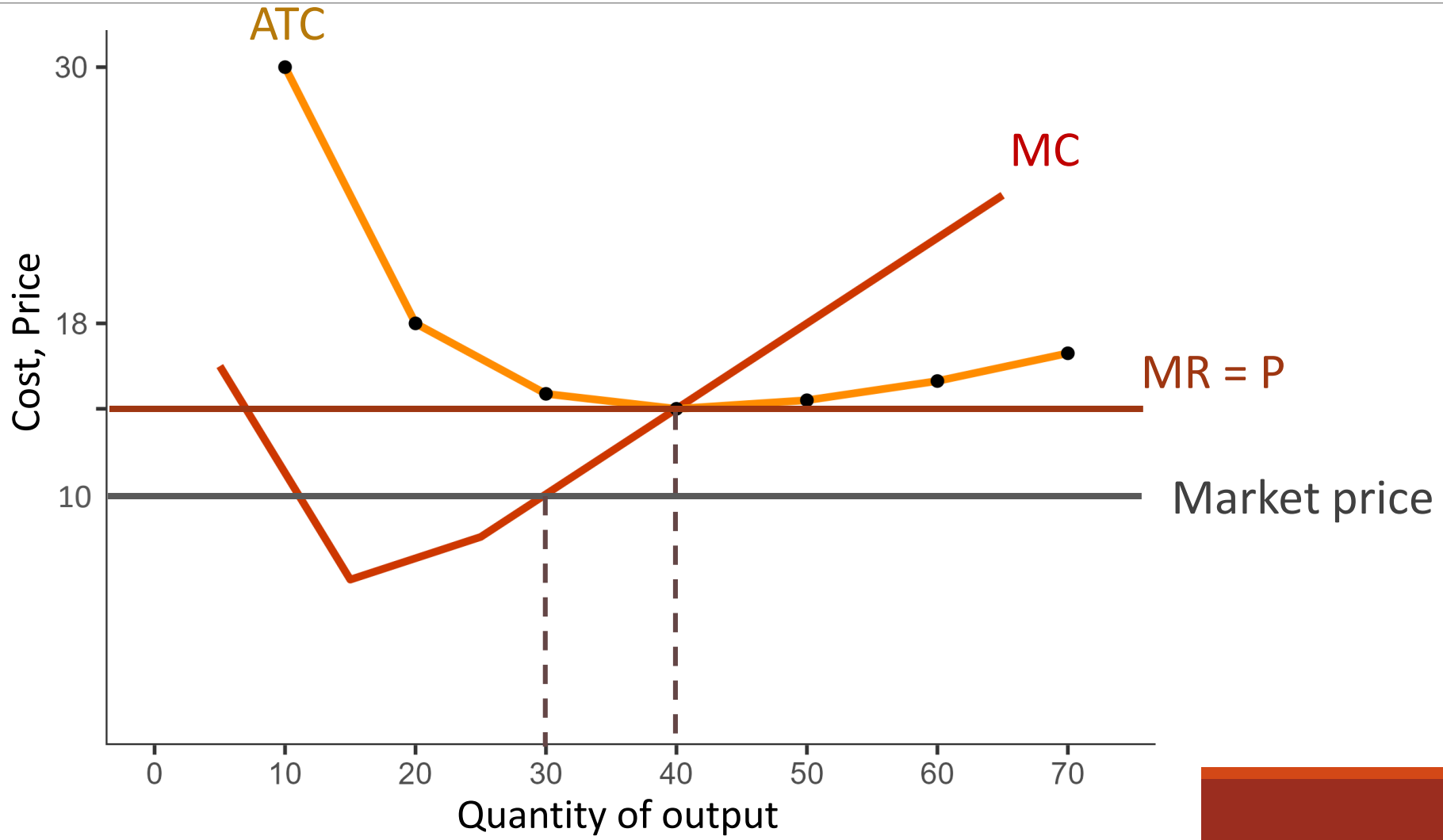
When is it profitable to produce?

What would happen if the market price falls to 10?

When is it profitable to produce?



When is it profitable to produce?

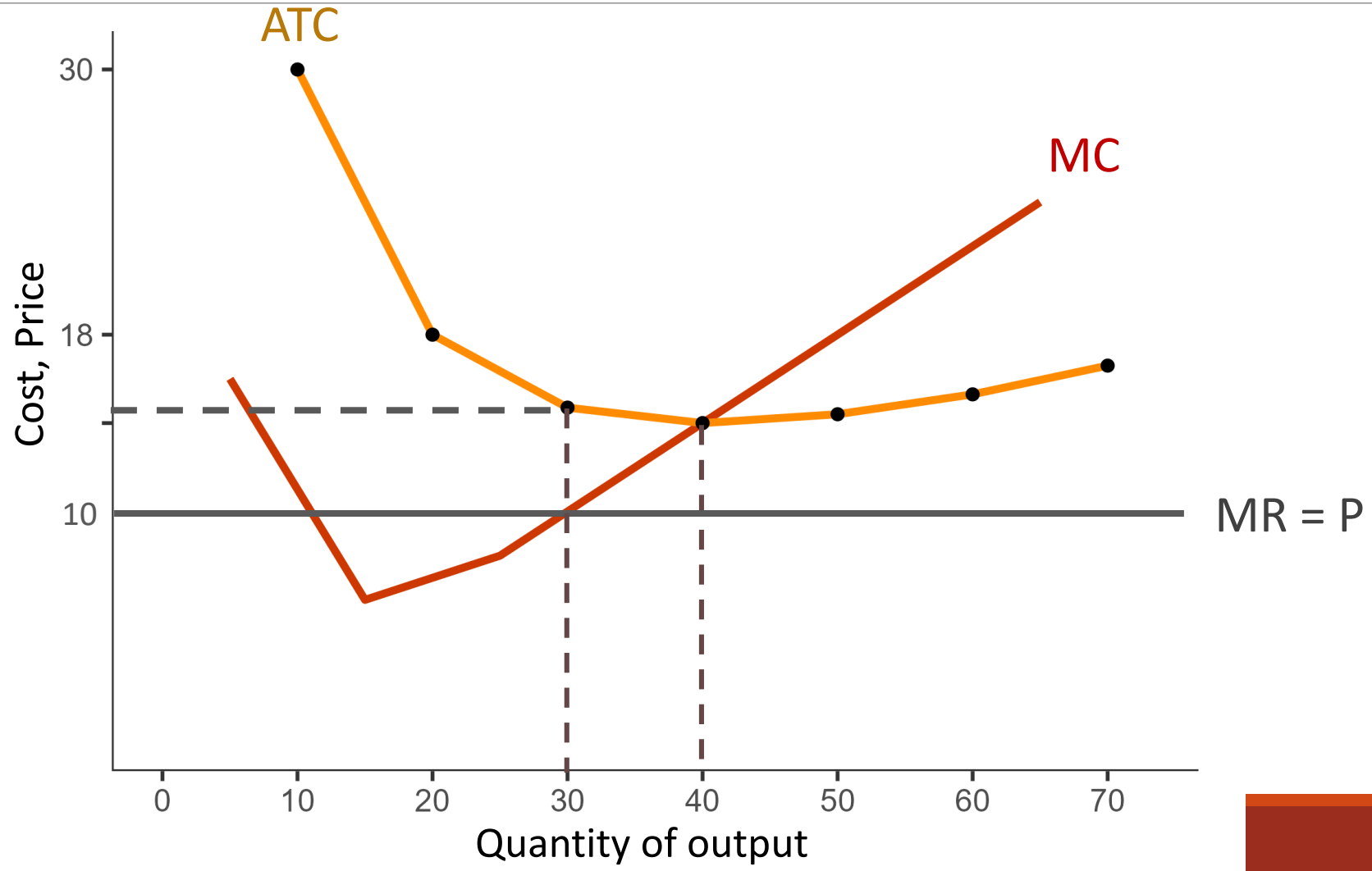


When is it profitable to produce?

Quantity of output	TC	VC	AVC	ATC
0	140	0		
10	300	160	16.0	30.0
20	360	220	11.0	18.0
30	440	300	10.0	14.7
40	560	420	10.5	14.0
50	720	580	11.6	14.4
60	920	780	13.0	15.3
70	1160	1020	14.6	16.6

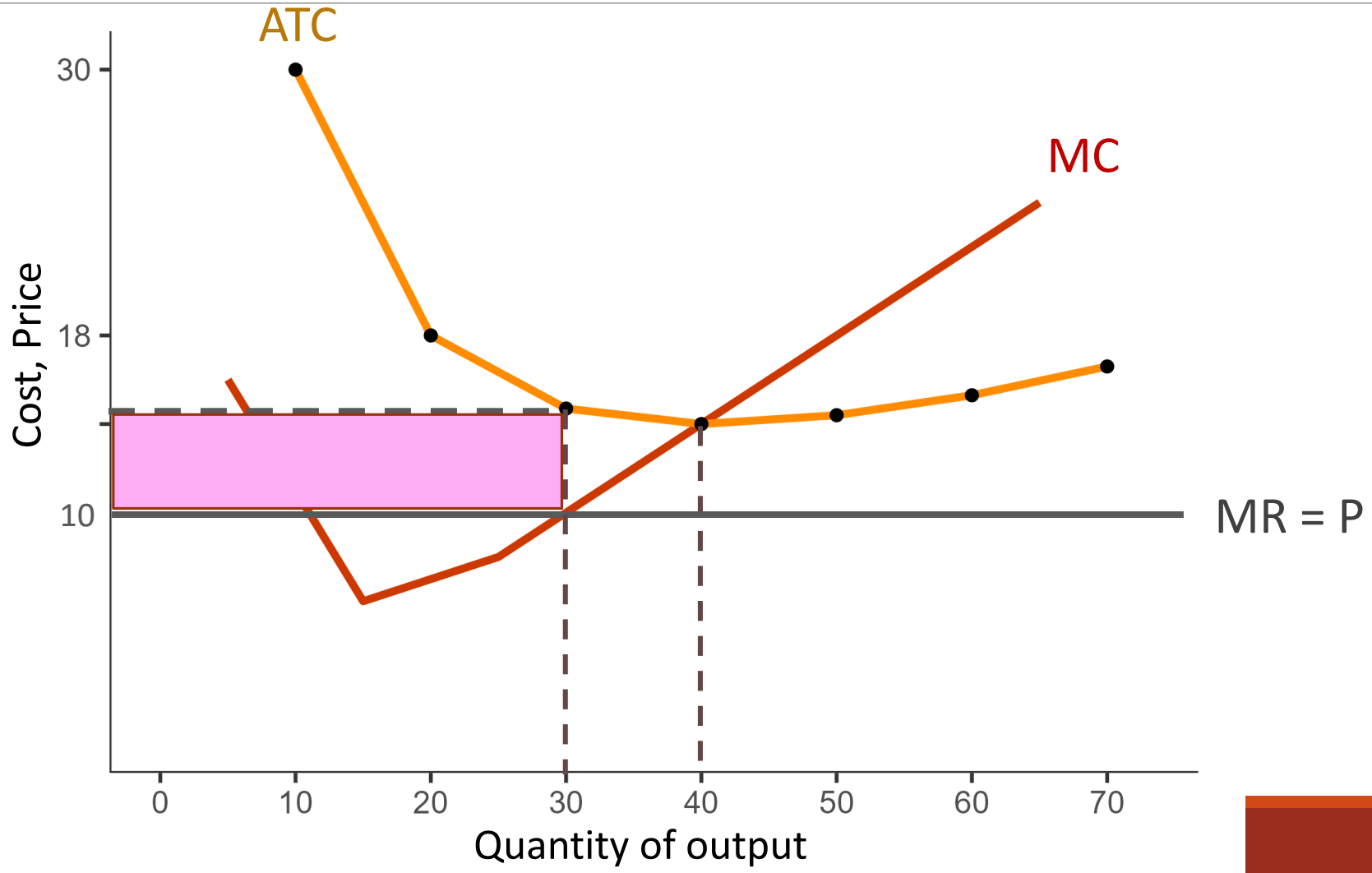
When is it profitable to produce?

ATC = P = 14.7



When is it profitable to produce?

ATC = P = 14.7



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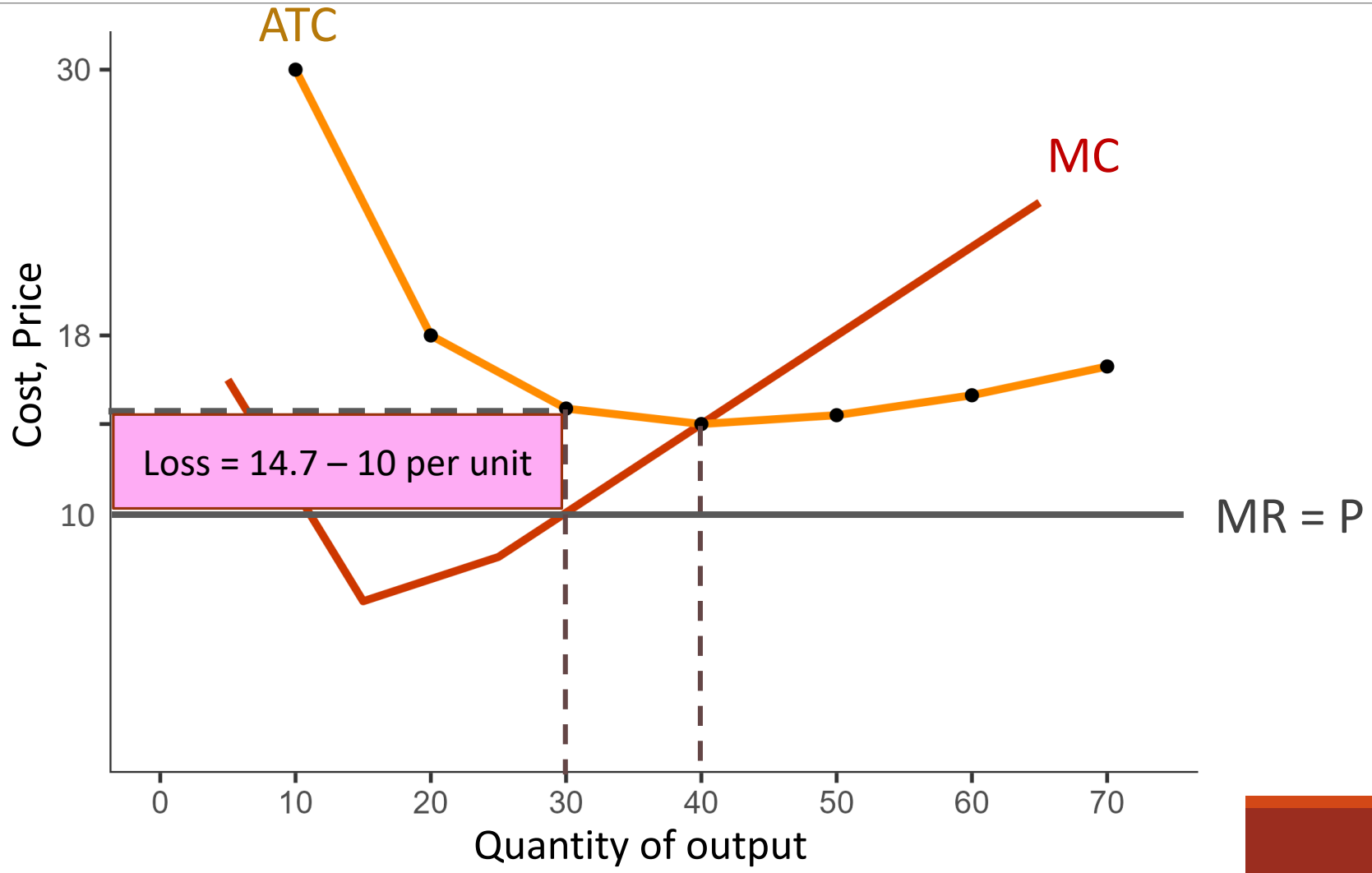
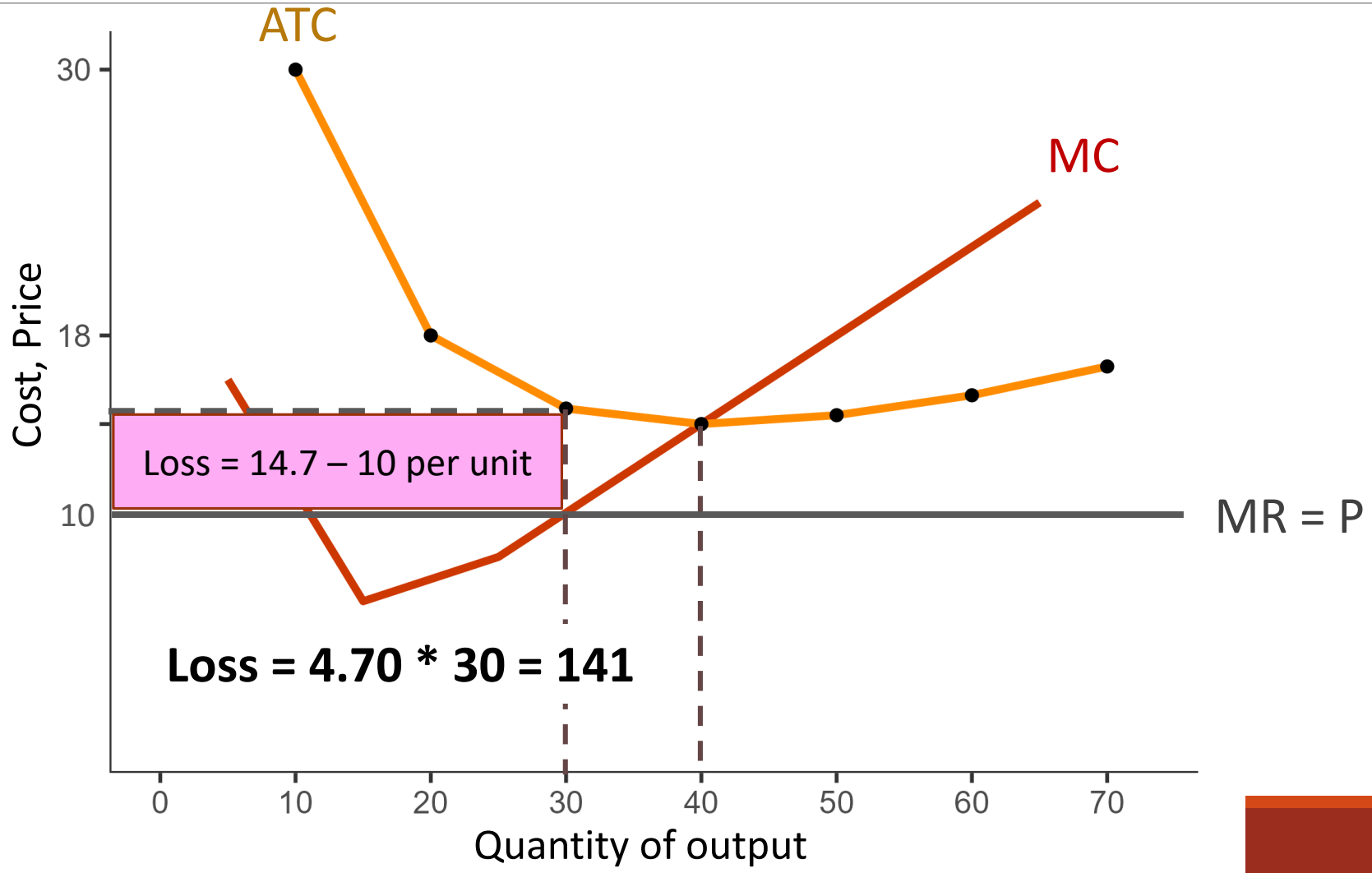


When is it profitable to produce?

ATC = P = 14.7



When is it profitable to produce?

In a nutshell:

- The **profit** can also be calculated as **(P – ATC) * Q**.
- **If P > ATC**, the firm is **profitable**.
- If **P = ATC**, the profit is **0** (break-even price).
- If **P < ATC**, there is a **loss**.

Short-run production decision

- One might think that if a firm does not make a profit then it should not produce. In the **SHORT RUN**, **this conclusion is not entirely true**.

- Sometimes, the firm must **continue to produce even if the market price is below the minimum ATC**.

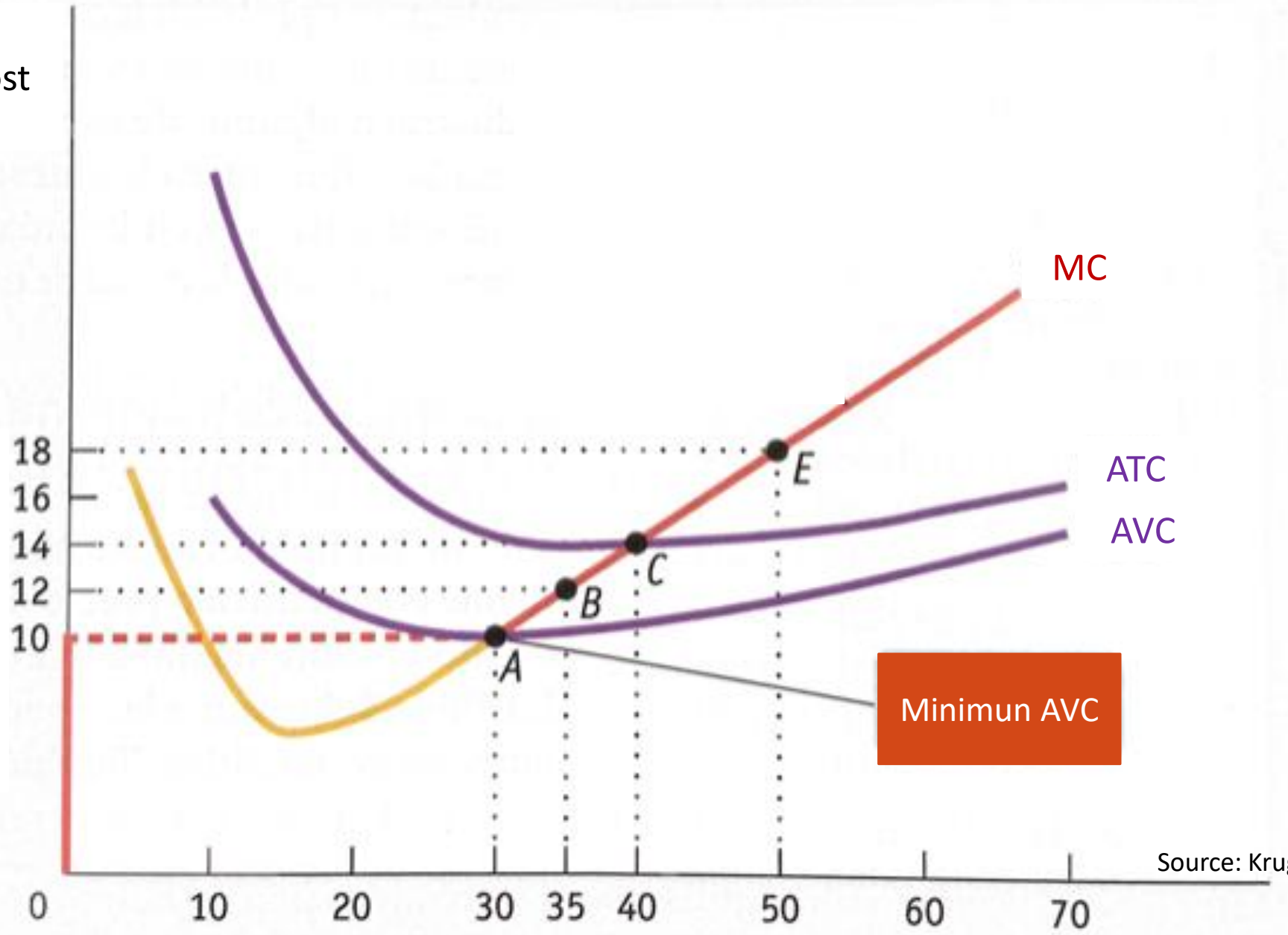
- The reason is **FC**: it is a cost that does not depend on production and **can only change in the long run**.

- Therefore, the FC is irrelevant to the decision, but the **VC is not**.

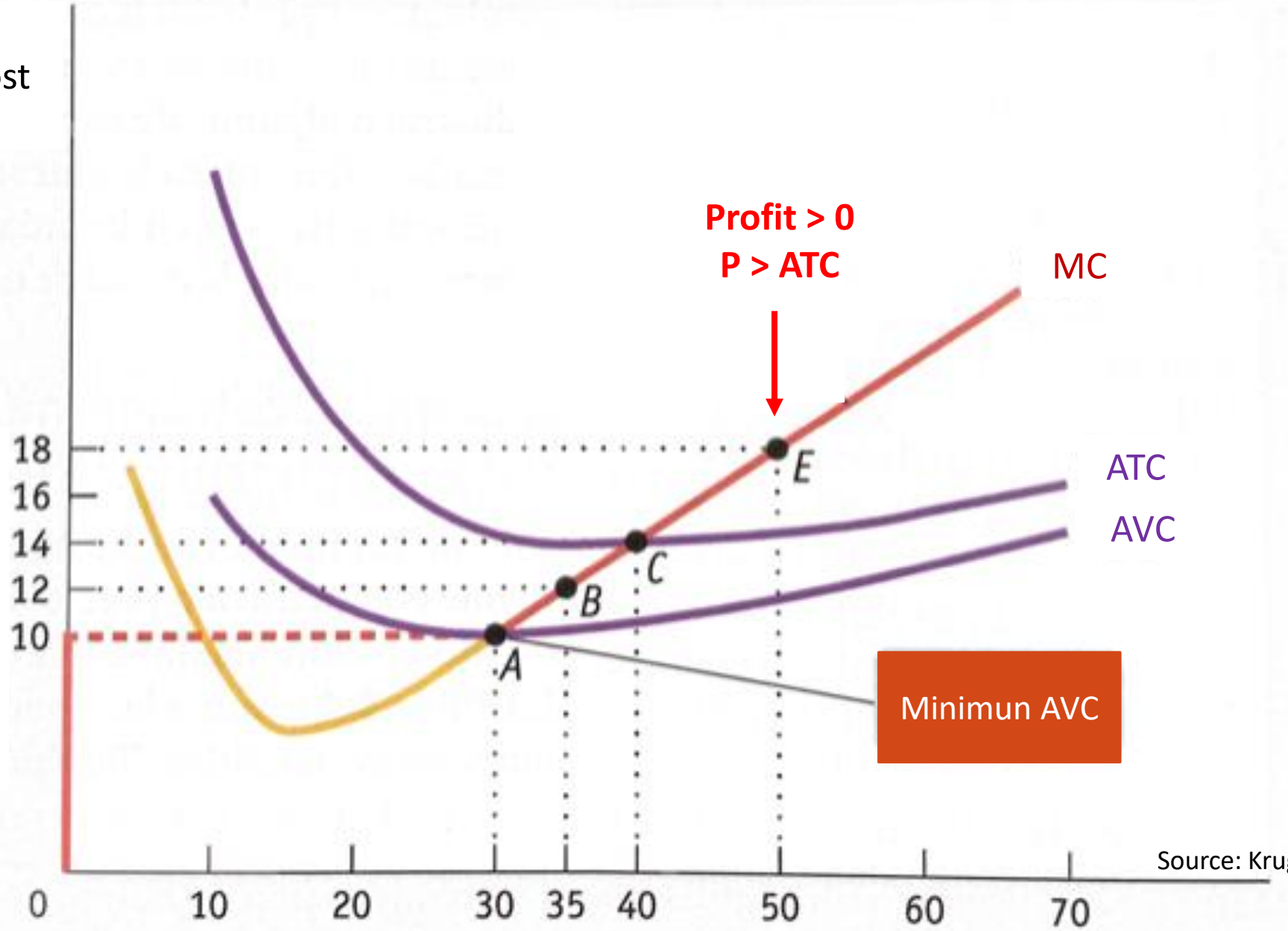
When is it profitable to produce?

Quantity of output	TC	VC	AVC	ATC
0	140	0		
10	300	160	16.0	30.0
20	360	220	11.0	18.0
30	440	300	10.0	14.7
40	560	420	10.5	14.0
50	720	580	11.6	14.4
60	920	780	13.0	15.3
70	1160	1020	14.6	16.6

Minimum AVC



Source: Krugman and Wells (2023)



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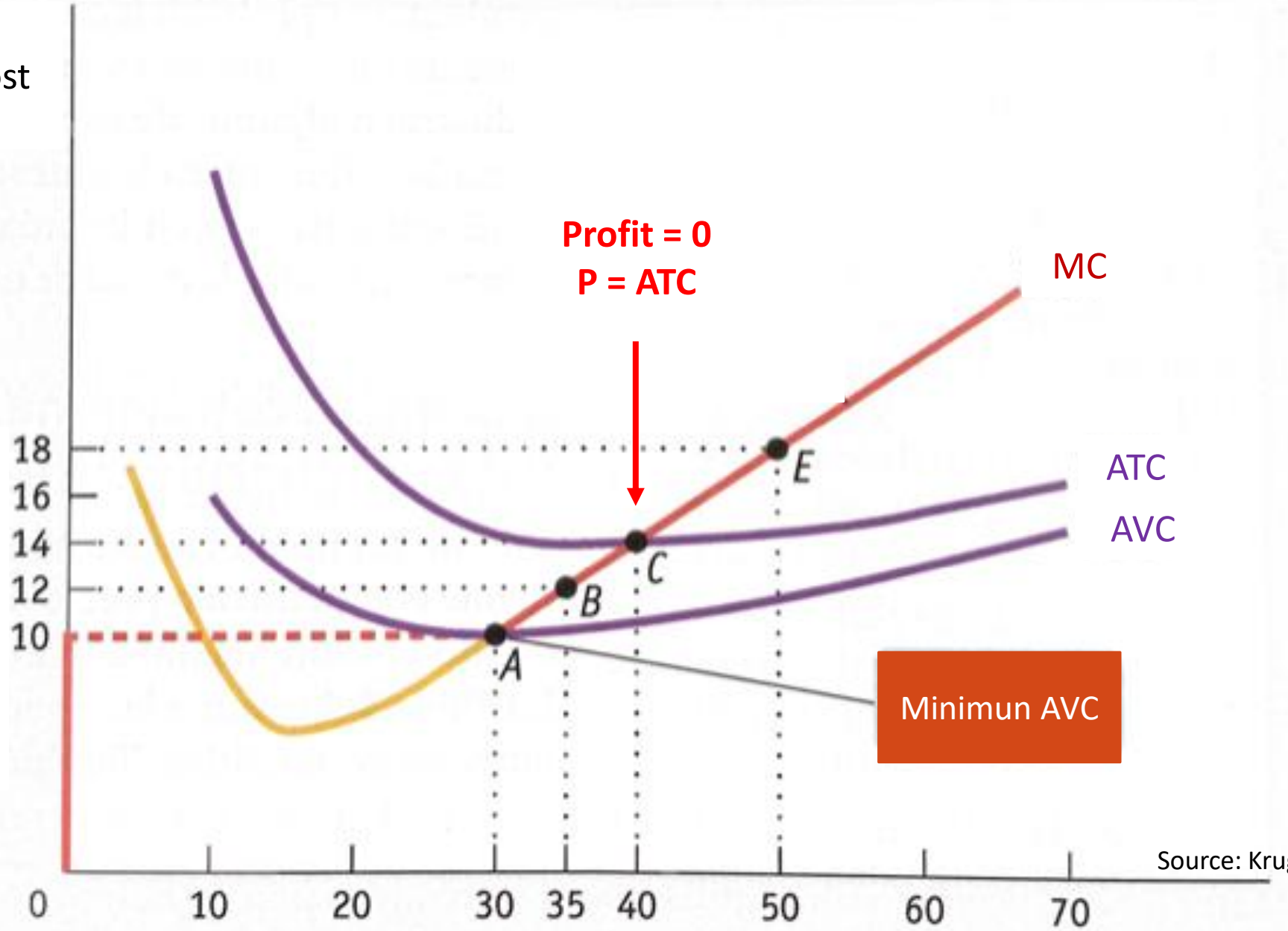

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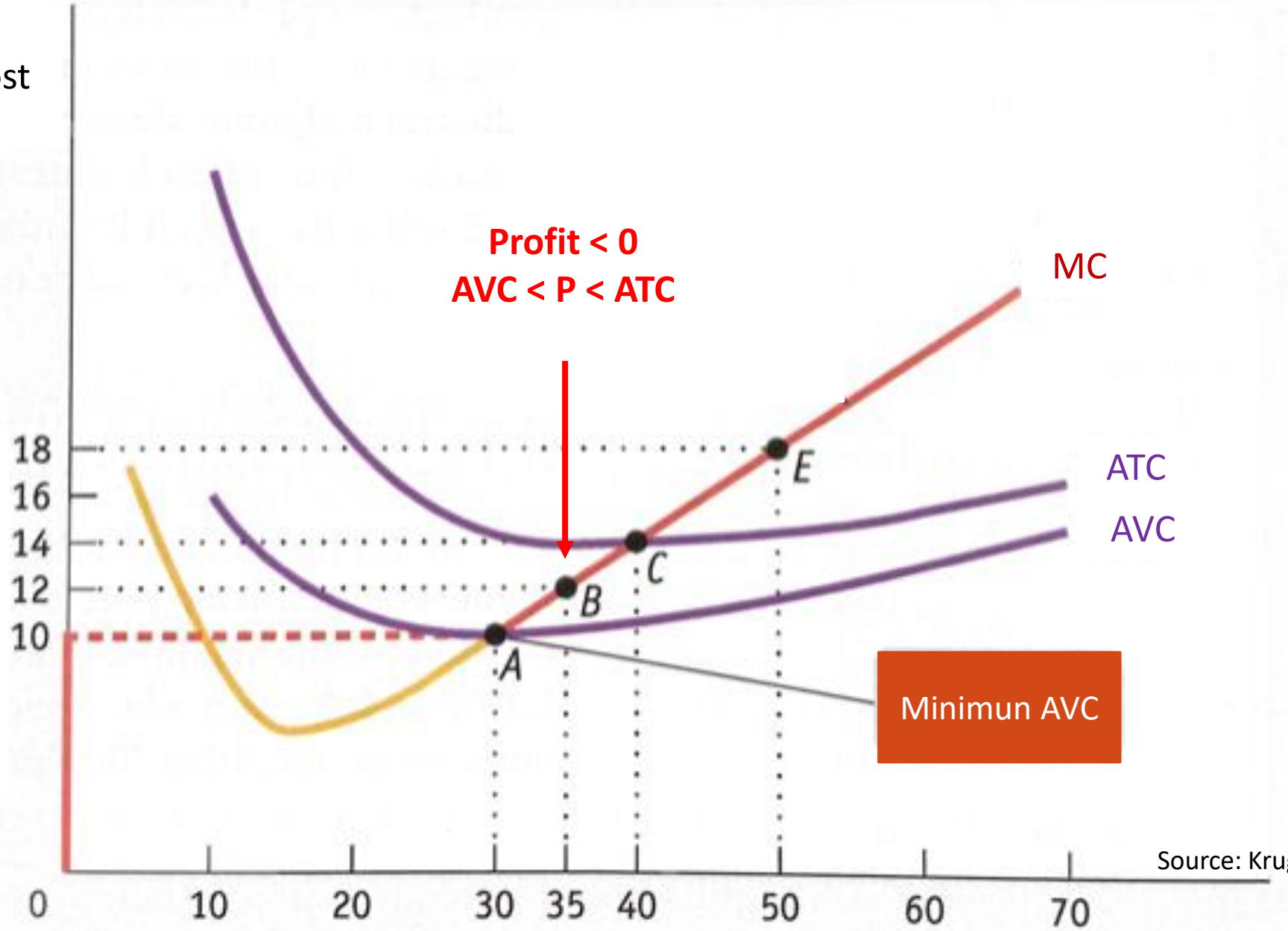
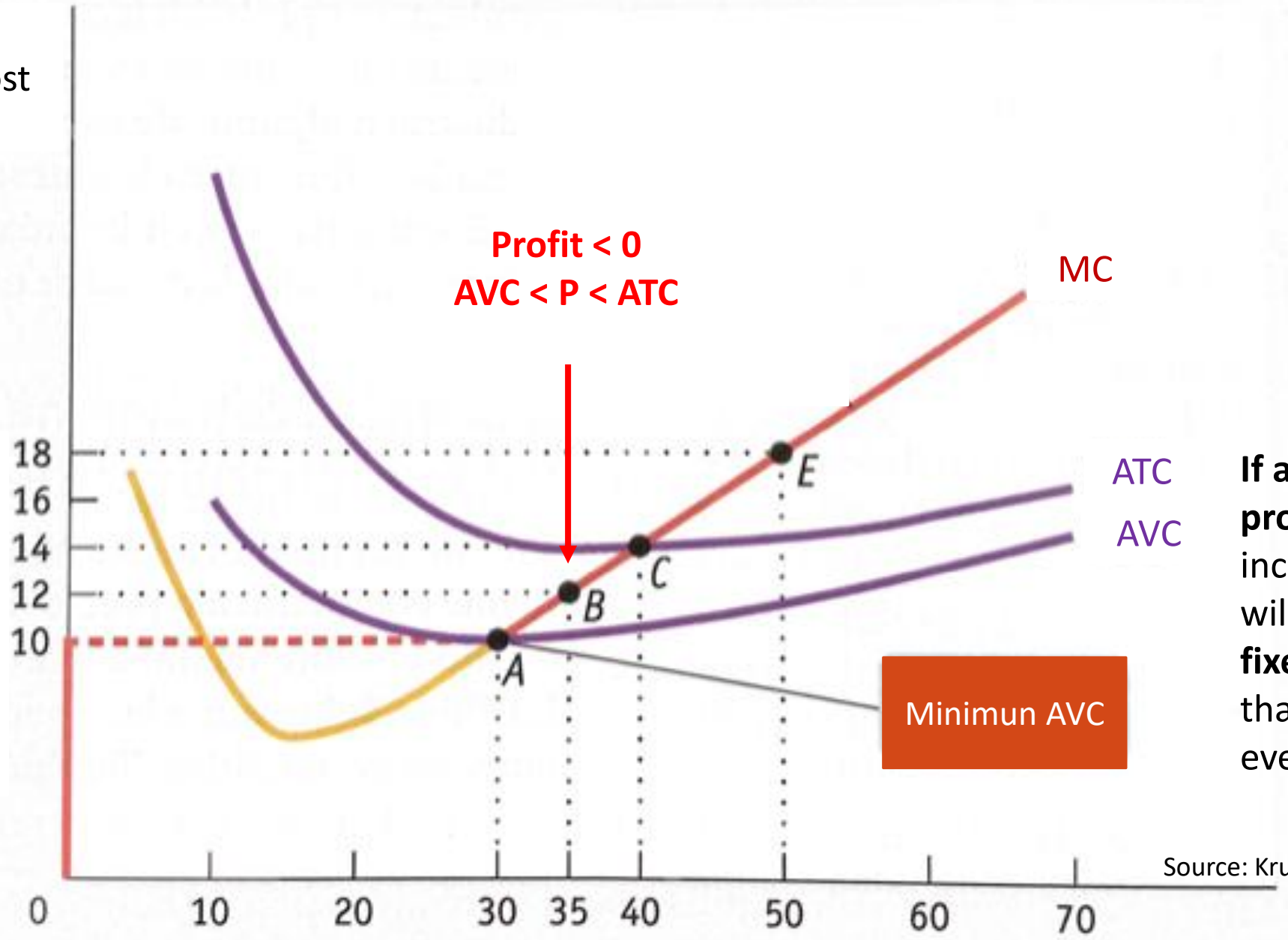


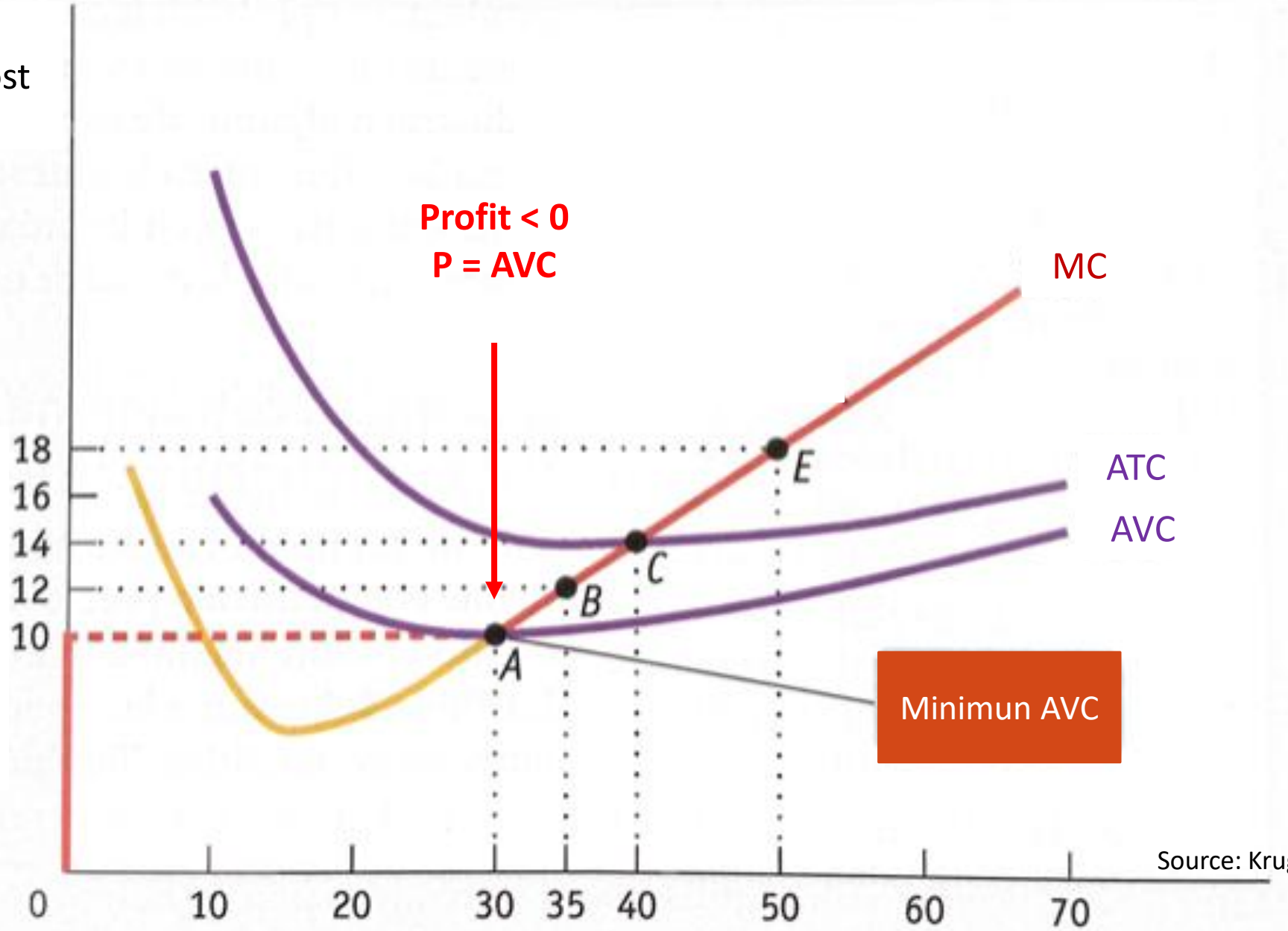
Source: Krugman and Wells (2023)

A firm will produce as it can cover its VC per unit and at least some of its FC, even though it is incurring a loss.



If a firm does not produce, it will incur no VC, but will incur **full fixed cost**, and that generates even greater loss.

Source: Krugman and Wells (2023)



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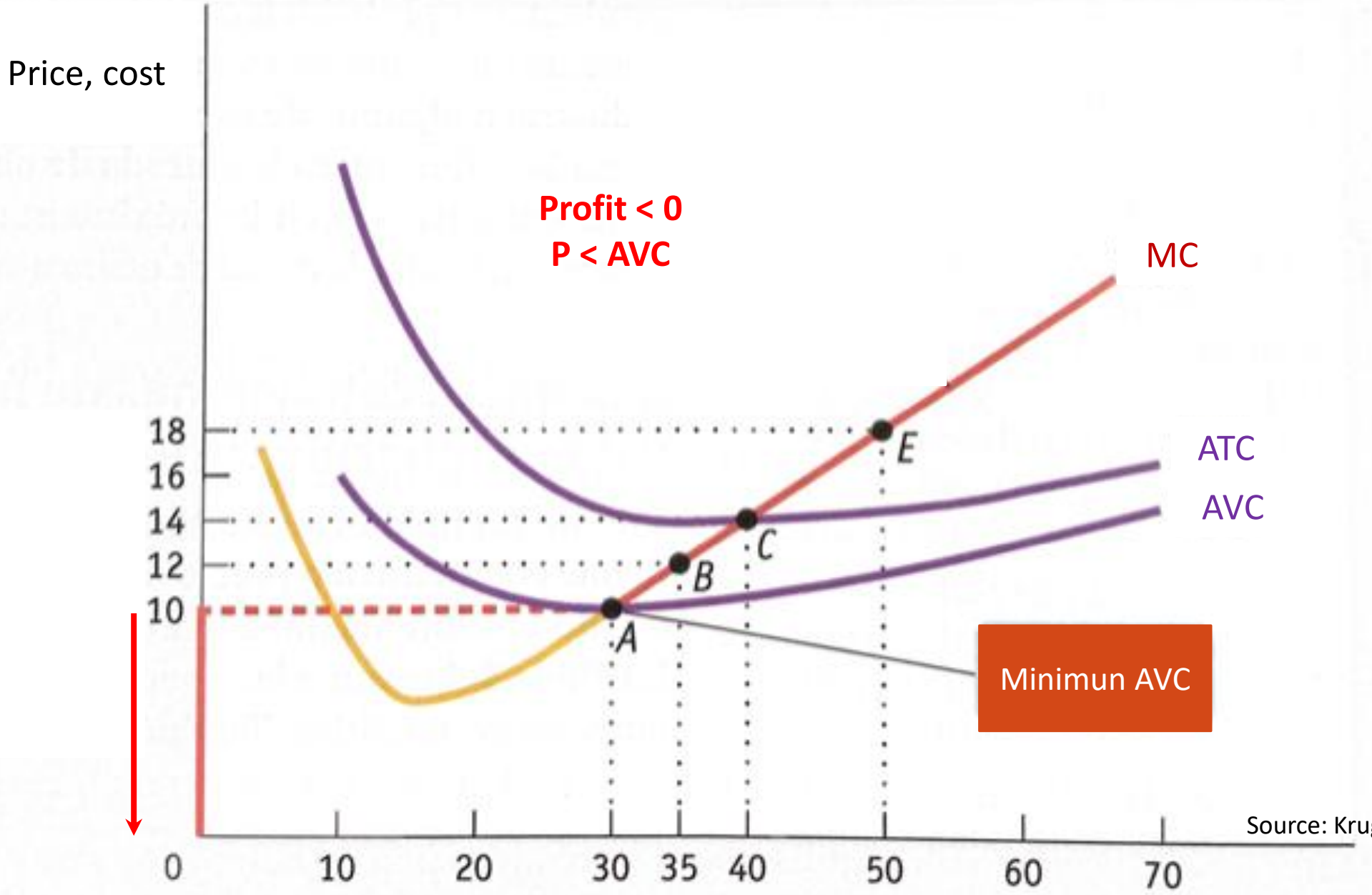
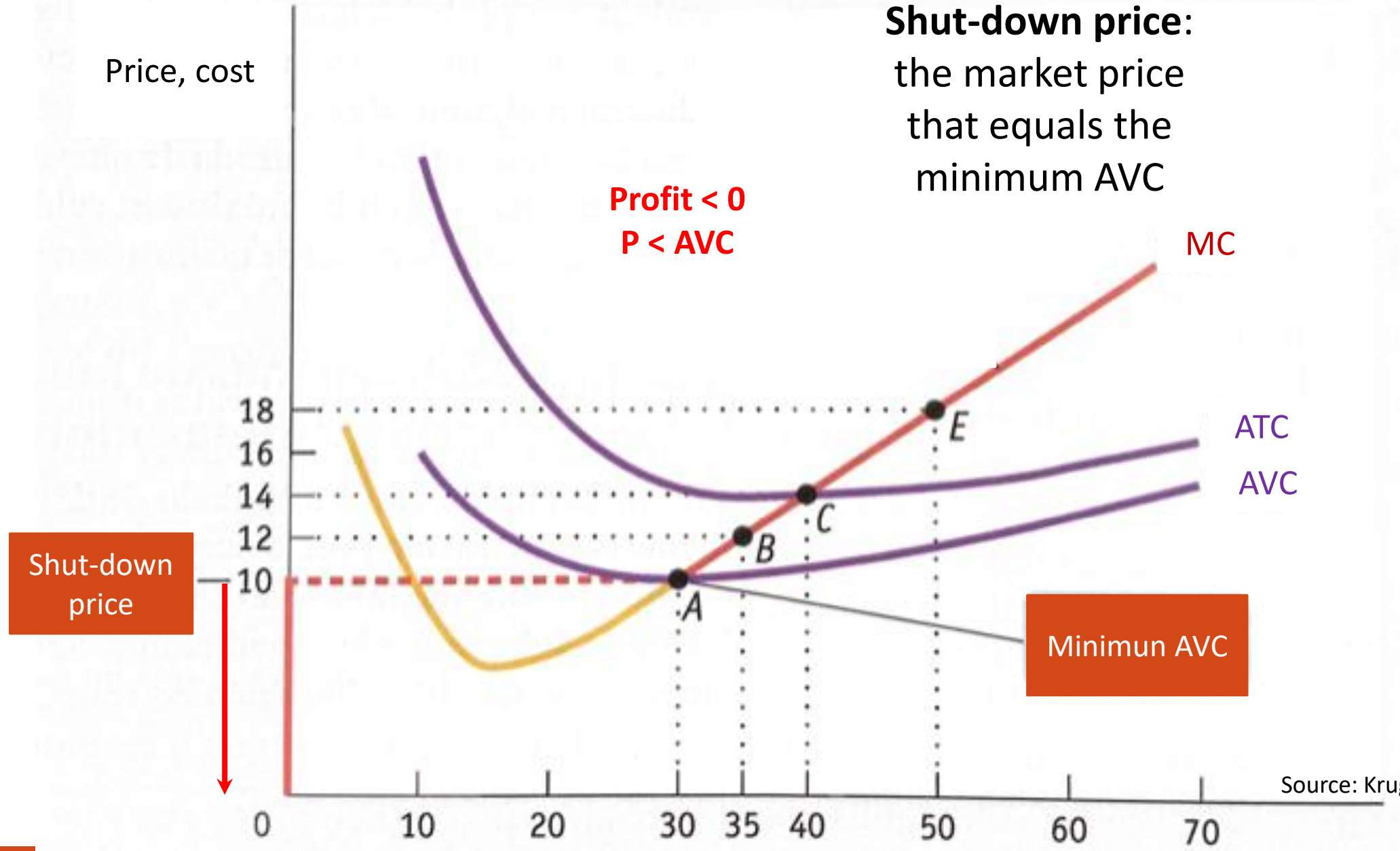


Source: Krugman and Wells (2023)

Shut-down price: the market price that equals the minimum AVC



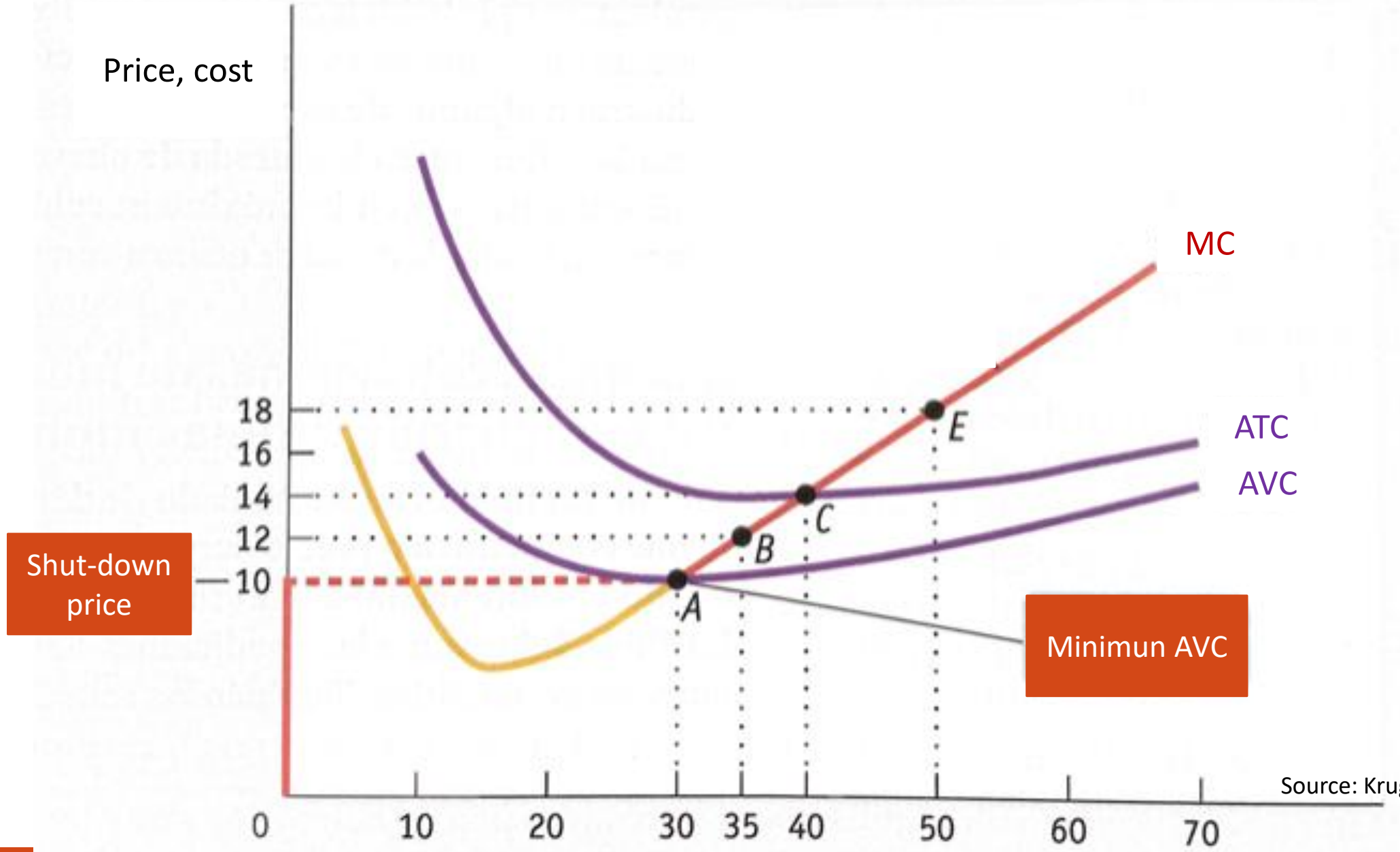
Source: Krugman and Wells (2023)

Short-run production decision

- A firm **will cease production** in **the short run** if the **market price is below the shut-down price**, which is equal to the **minimum AVC**.

- This means that **the firm will produce whenever market price is higher than shut-down price**.

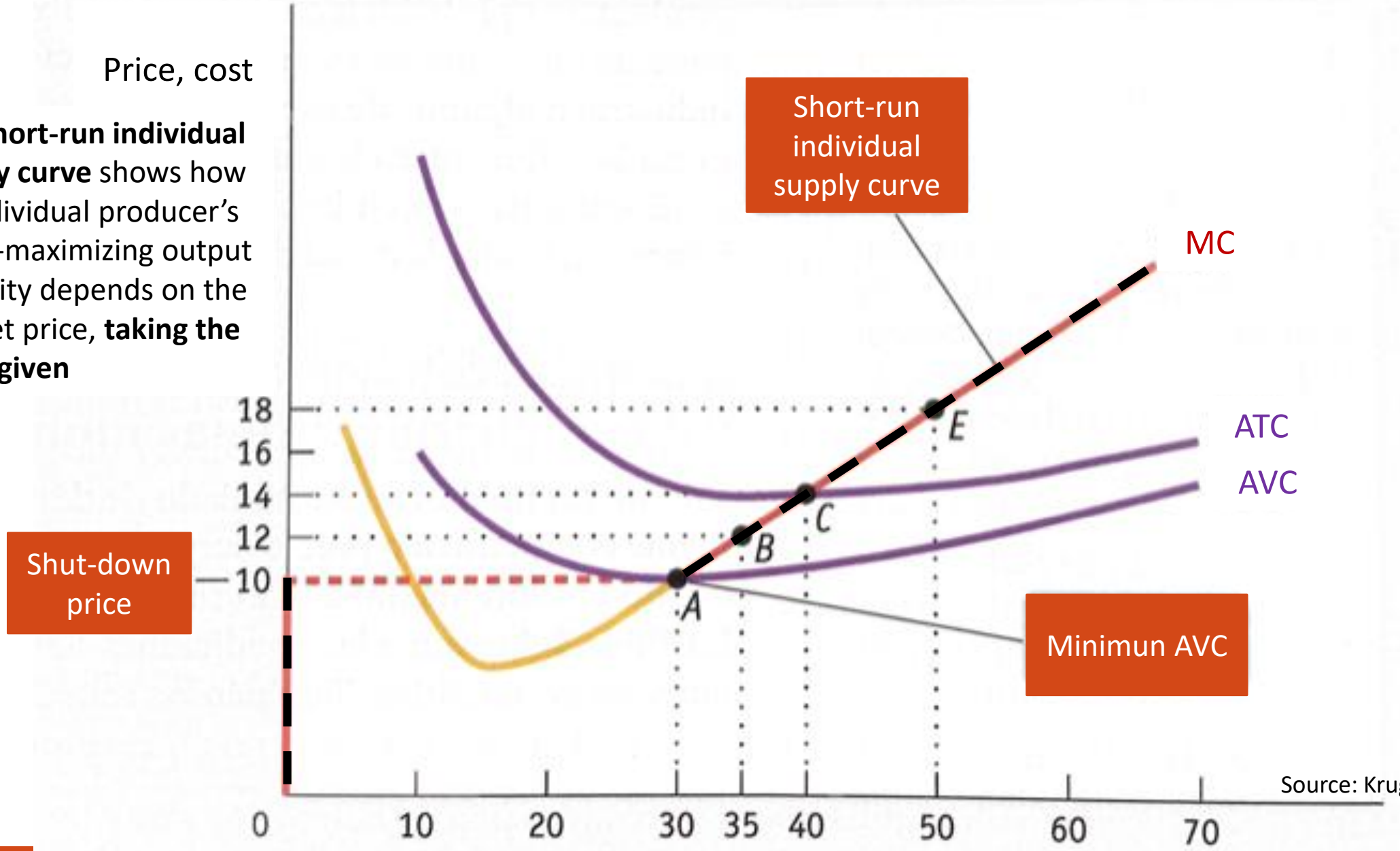
- And what is that called? “Relationship between quantity of output produced and price..."?



Source: Krugman and Wells (2023)

Price, cost

The s**hort-run individual supply curve** shows how an individual producer's profit-maximizing output quantity depends on the market price, **taking the FC as given**



Source: Krugman and Wells (2023)

Profitability and production conditions

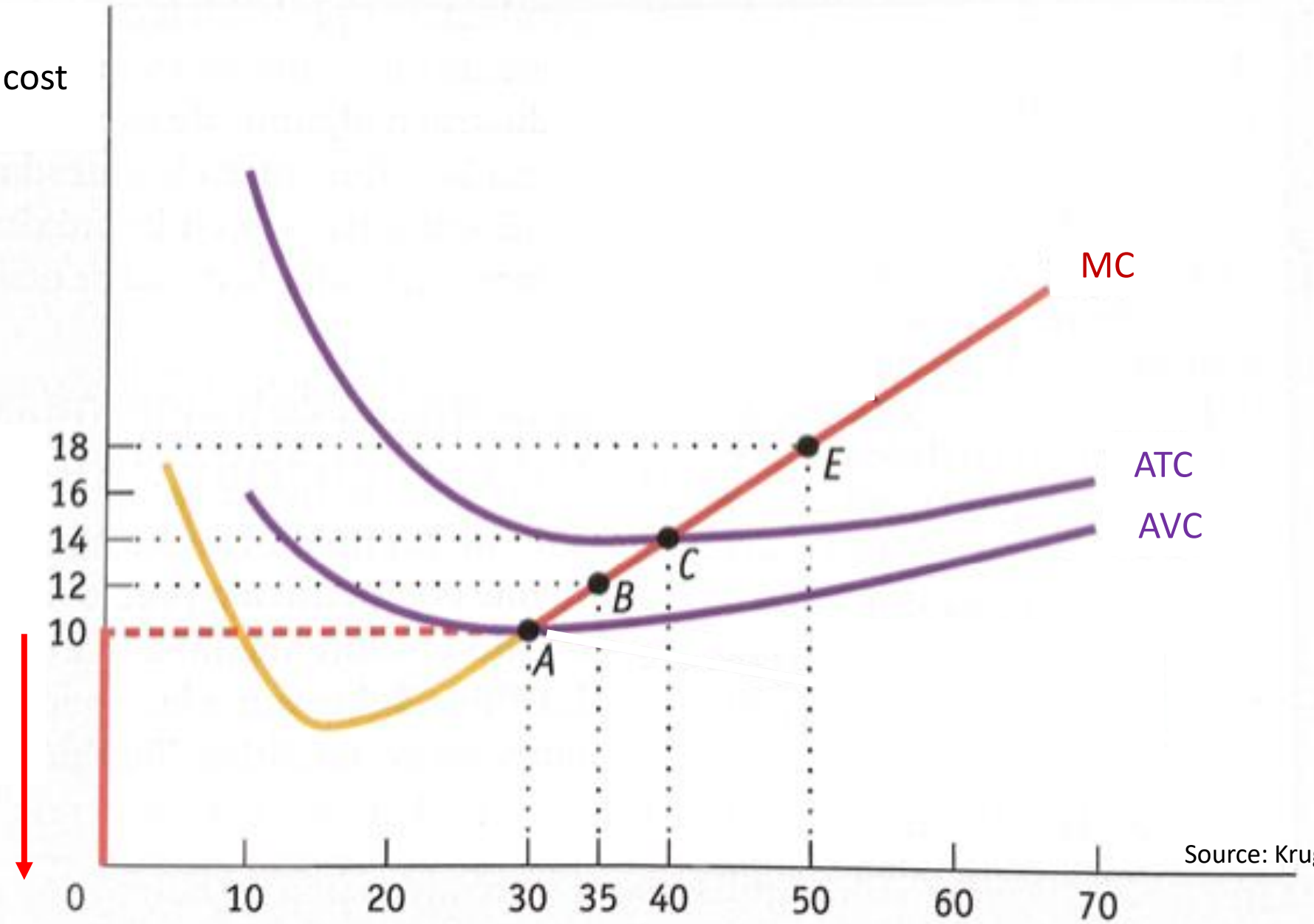
Profitability condition (minimum ATC = break-even price)	Result
P > minimum ATC	Firm profitable. Entry into the industry in the long run.
P = minimum ATC	Firm breaks even. No entry into or exit from the industry in the long run.
P < minimum ATC	Firm unprofitable. Exit from the industry in the run.
Profitability condition (minimum AVC = shut-down price)	**Result**
P > minimum AVC	Firm produces in the short run. If P < minimum ATC, firm covers VC and some but not all of FC. If P > minimum ATC, firm covers all VC and FC.
P = minimum AVC	Firm indifferent between producing in the short run or not. Just covers the VC.
P < minimum AVC	Firm shuts down in the short run. Does not cover VC.

Industry supply curve: short run

- The **industry supply curve** shows the relationship between the price of a good or service and the total output of the industry as a whole.

- The industry supply curve is what we used to call the supply curve. Caution: we need to distinguish it from the individual supply curve of a single firm.

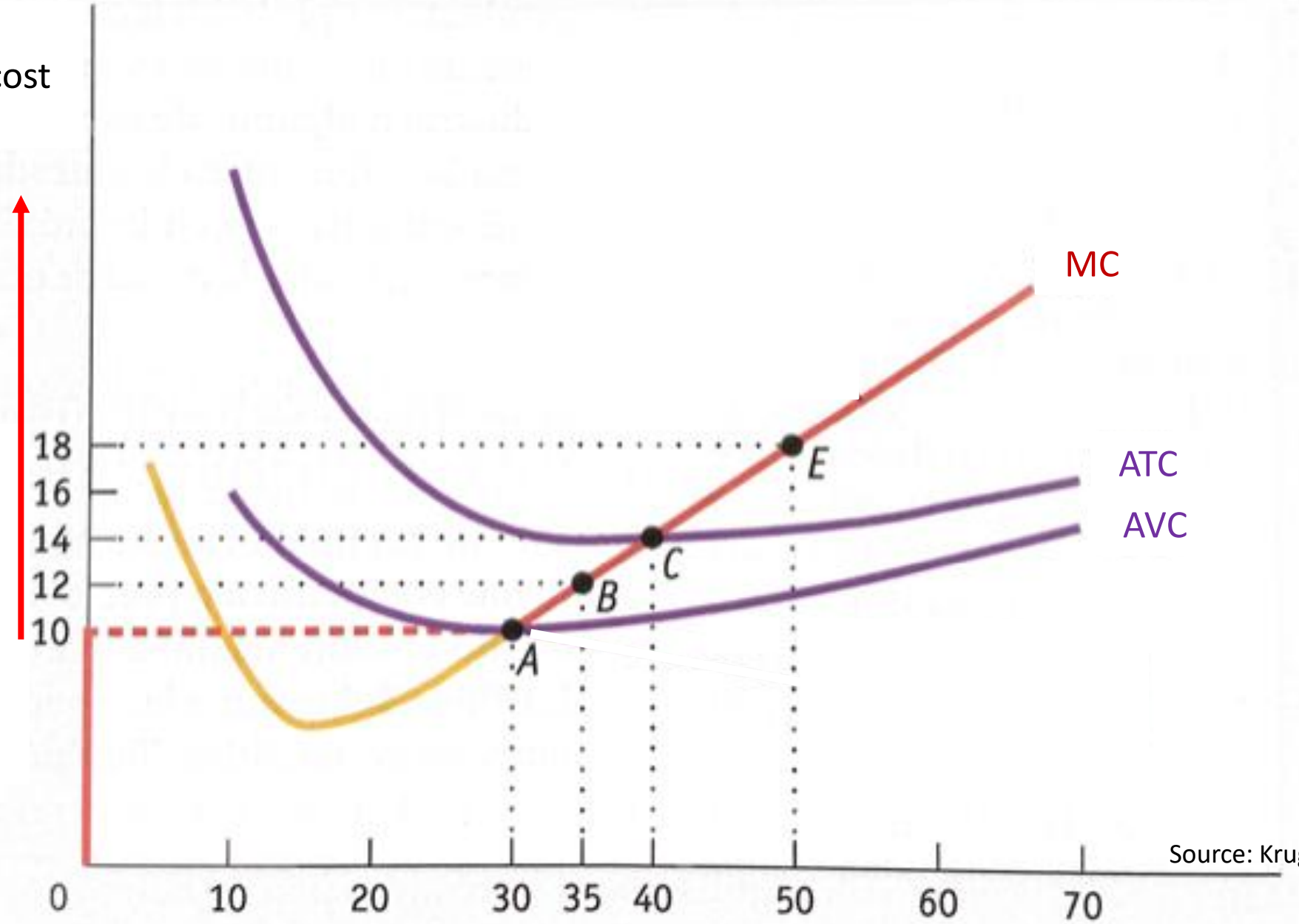
- Remember:
  - In the **short run** the number of producers in an industry is fixed: **no entry and no exit**.
  - The supply curve **is the horizontal sum** of the individual supply curves of all producers.
  - If we asume all firms are alike, then they all have the same costs:
    - All firms have an individual supply curve, such that if $P < 10$, there is no production. If $P \geq 10$, there is production at the level of $P = MC$.



P < 10: no production

Source: Krugman and Wells (2023)

P ≥ 10: the firm produces the Q at which P = MC



Source: Krugman and Wells (2023)

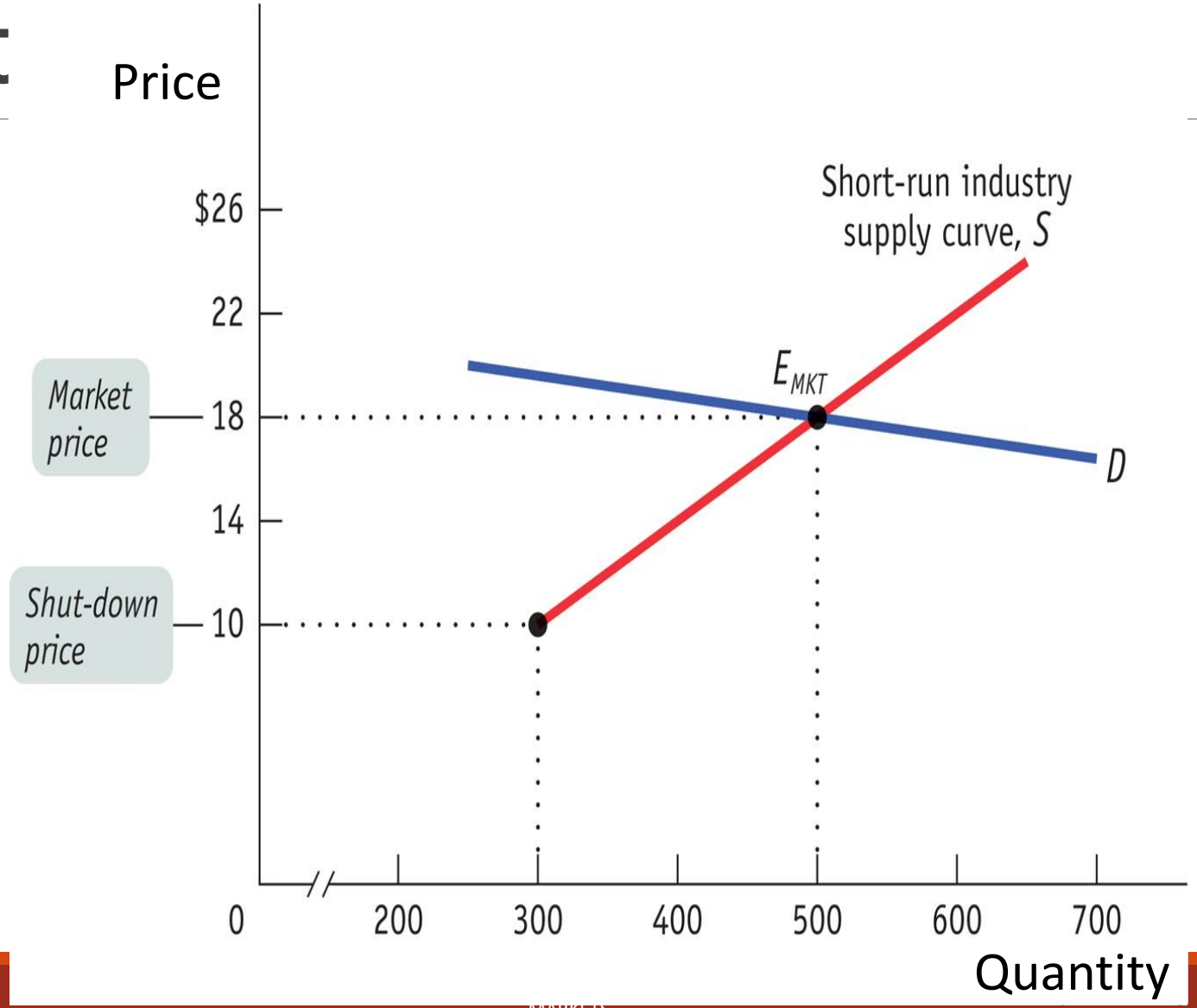
Industry supply curve: short run

- **Short-run industry supply curve**: it shows how the quantity supplied by an industry depends on the market price given a **fixed number of producers**.

- **Short-run market equilibrium** occurs when the quantity supplied equals the quantity demanded ($\mathbf{Q^S = Q^D}$), taking the number of producers as given.

- Using our current example, if there are 100 firms...

Indust



Source: Krugman and Wells (2023)

Outline

1. Perfect competition:
   - Equilibrium of a competitive firm in the short run.
   - Short-run competitive industry equilibrium.

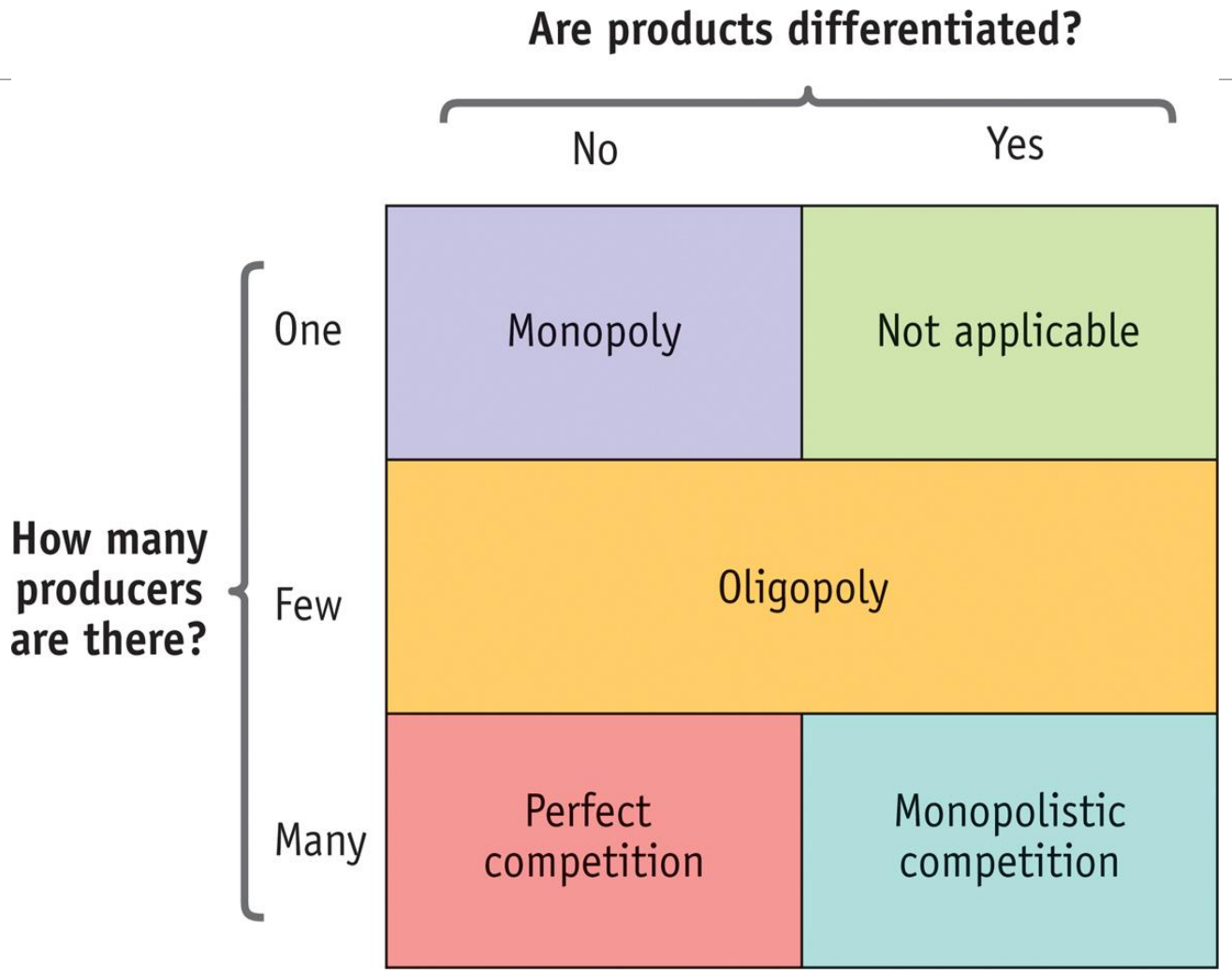
2. Monopoly:
   - Short-run monopolist equilibrium.

3. Comparison between perfect competition and monopoly.

The Monopoly

Monopoly and **perfect competition** are two types of market structures.

Types of Market Structure



Source: Krugman and Wells (2023)

The Monopoly

- We have seen perfect competition, now we will focus on **monopoly**.
- **Monopoly**: an industry controlled by a monopolist.
- A **monopolist** is a firm that is the only producer of a good or service that has no close substitutes.
- Monopoly is the **most extreme deviation** from perfect competition.

The Monopoly

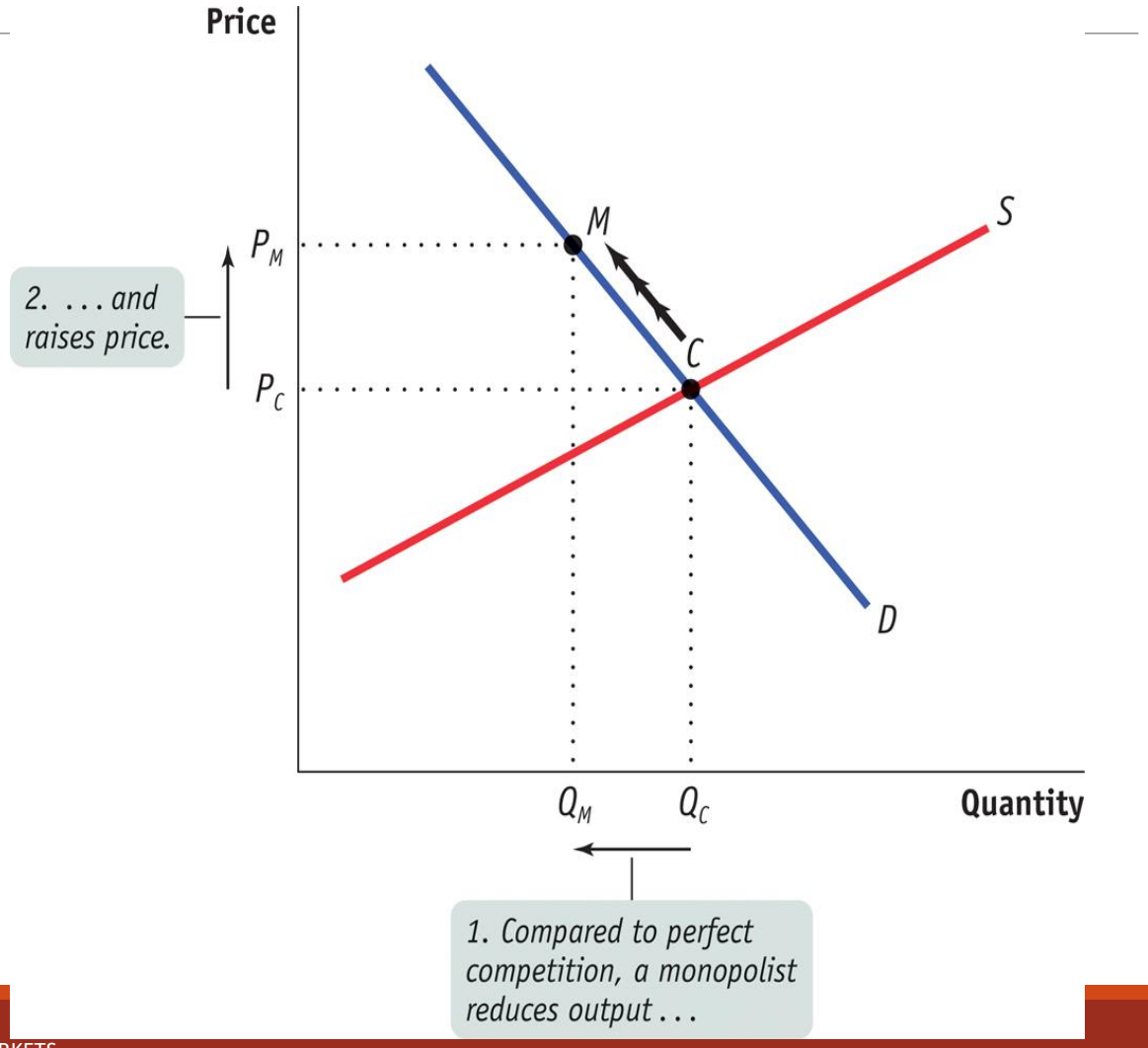
- Why would a company want to become the only supplier? To control the price.

- And what do you call that? Market power!
  - **Market power**: the ability of a firm to raise prices.

- In the long run, economic profits in perfect competition disappear, but **in monopoly they last.**

The Monopoly

- What does a monopolist usually look for? **To reduce Q,** so the **P can be raised**. In doing so, it **increases profit**.



Source: Krugman and Wells (2023)

Monopoly: Why?

Why does a monopolist appear in a market and not perfect competition? In theory, if there are profits, other firms would want to enter.

To earn economic profits, a monopolist must be protected by a **barrier to entry**.

Barrier to entry: something that prevents other firms from entering the industry.

Monopoly: Why?

1. **Control of** a **scarce** resource or **input**: no one else has access.
2. **Increasing returns to scale**: the production of certain goods or services entails very high fixed costs that can only be borne by one company, usually the government (gas, water, electricity). Natural monopoly: it exist when increasing returns to scale provide a large cost advantage to a single firm.
3. **Technological superiority**: more of a short-term barrier to entry.
4. **Network externalities**: when the value of a good or service to an individual is greater when other people also use the good or service as well. E.g., internet (worth nothing if there are not more people connected sharing things), roads, airports. Companies with larger networks attract more new users (whatsapp vs signal, visa vs diners club).
5. **Government-created barriers**: patents or copyrights.

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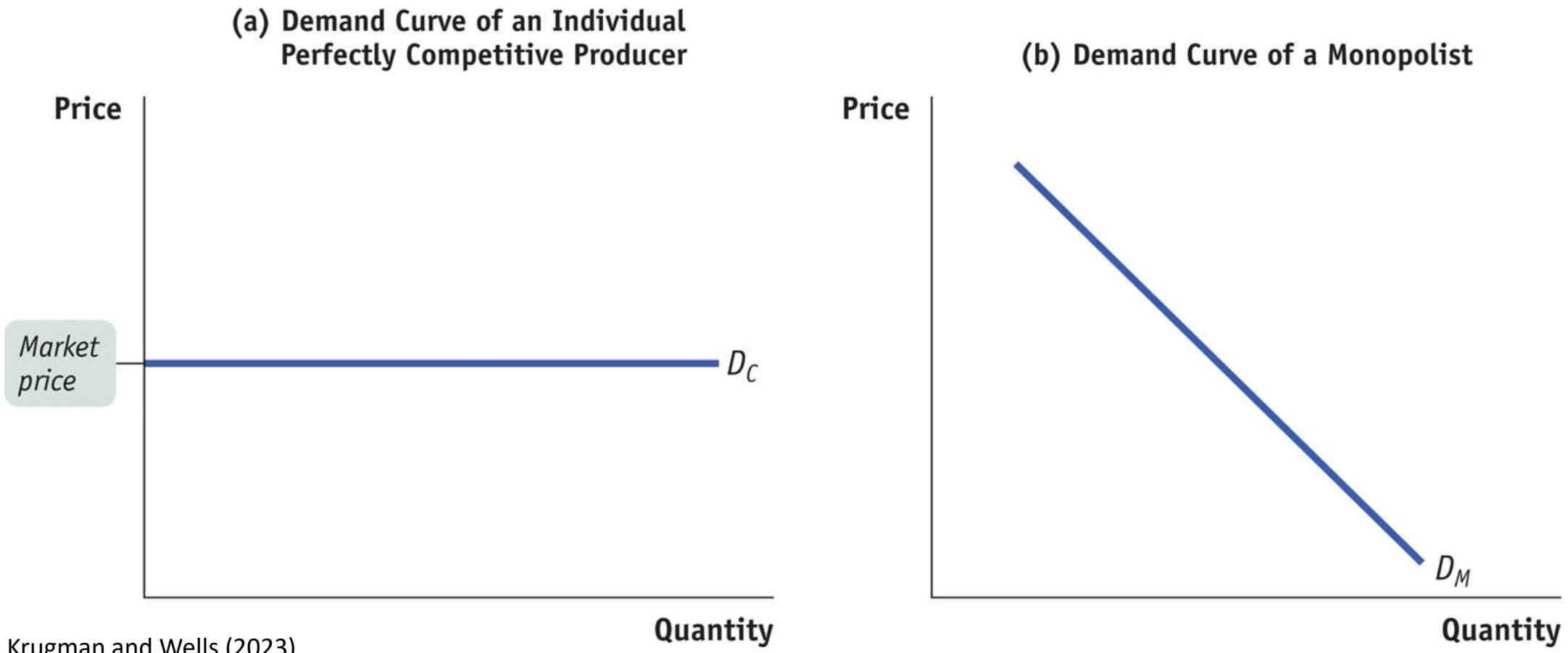
Monopoly: profit maximization

We know that Q decreases, but by how much?

Recall a company's optimal output rule: **MR = MC**.

The monopolist is no exception, but it is not price-taking. Therefore, **P ≠ MR**.

Monopoly: profit maximization



Source: Krugman and Wells (2023)

Monopoly maximization

P	Q
$1,000	0
950	1
900	2
850	3
800	4
750	5
700	6
650	7
600	8
550	9
500	10
450	11
400	12
350	13
300	14
250	15
200	16
150	17
100	18
50	19
0	20

Source: Krugman and Wells (2023)

Monopoly nization

P	Q	$TR = P \times Q$
$1,000	0	$0
950	1	950
900	2	1,800
850	3	2,550
800	4	3,200
750	5	3,750
700	6	4,200
650	7	4,550
600	8	4,800
550	9	4,950
500	10	5,000
450	11	4,950
400	12	4,800
350	13	4,550
300	14	4,200
250	15	3,750
200	16	3,200
150	17	2,550
100	18	1,800
50	19	950
0	20	0

Source: Krugman and Wells (2023)

Monopoly ... on

P	Q	TR = P × Q	MR = ΔTR/ΔQ
$1,000	0	$0	
			$950
950	1	950	
			850
900	2	1,800	
			750
850	3	2,550	
			650
800	4	3,200	
			550
750	5	3,750	
			450
700	6	4,200	
			350
650	7	4,550	
			250
600	8	4,800	
			150
550	9	4,950	
			50
500	10	5,000	
			−50
450	11	4,950	
			−150
400	12	4,800	
			−250
350	13	4,550	
			−350
300	14	4,200	
			−450
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200	16	3,200	
			−650
150	17	2,550	
			−750
100	18	1,800	
			−850
50	19	950	
			−950
0	20	0	

Source: Krugman and Wells (2023)

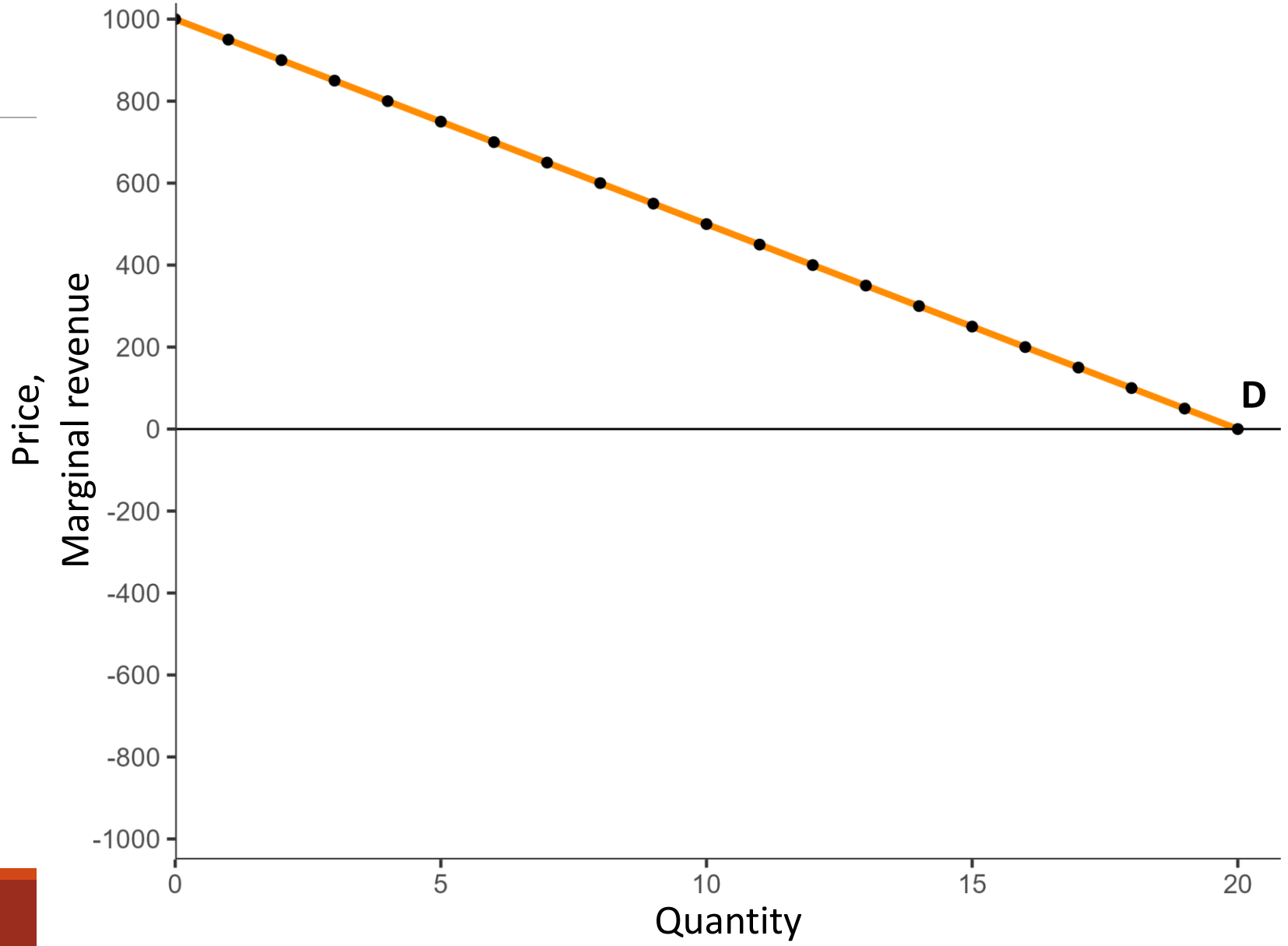
Monopoly ... on

P	Q	TR = P × Q	MR = ΔTR/ΔQ
$1,000	0	$0	
			$950
950	1	950	
			850
900	2	1,800	
			750
850	3	2,550	
			650
800	4	3,200	
			550
750	5	3,750	
			450
700	6	4,200	
			350
650	7	4,550	
			250
600	8	4,800	
			150
550	9	4,950	
			50
500	10	5,000	
			−50
450	11	4,950	
			−150
400	12	4,800	
			−250
350	13	4,550	
			−350
300	14	4,200	
			−450
250	15	3,750	
			−550
200	16	3,200	
			−650
150	17	2,550	
			−750
100	18	1,800	
			−850
50	19	950	
			−950
0	20	0	

Maximum total revenue

Source: Krugman and Wells (2023)

Monopoly: profit maximization



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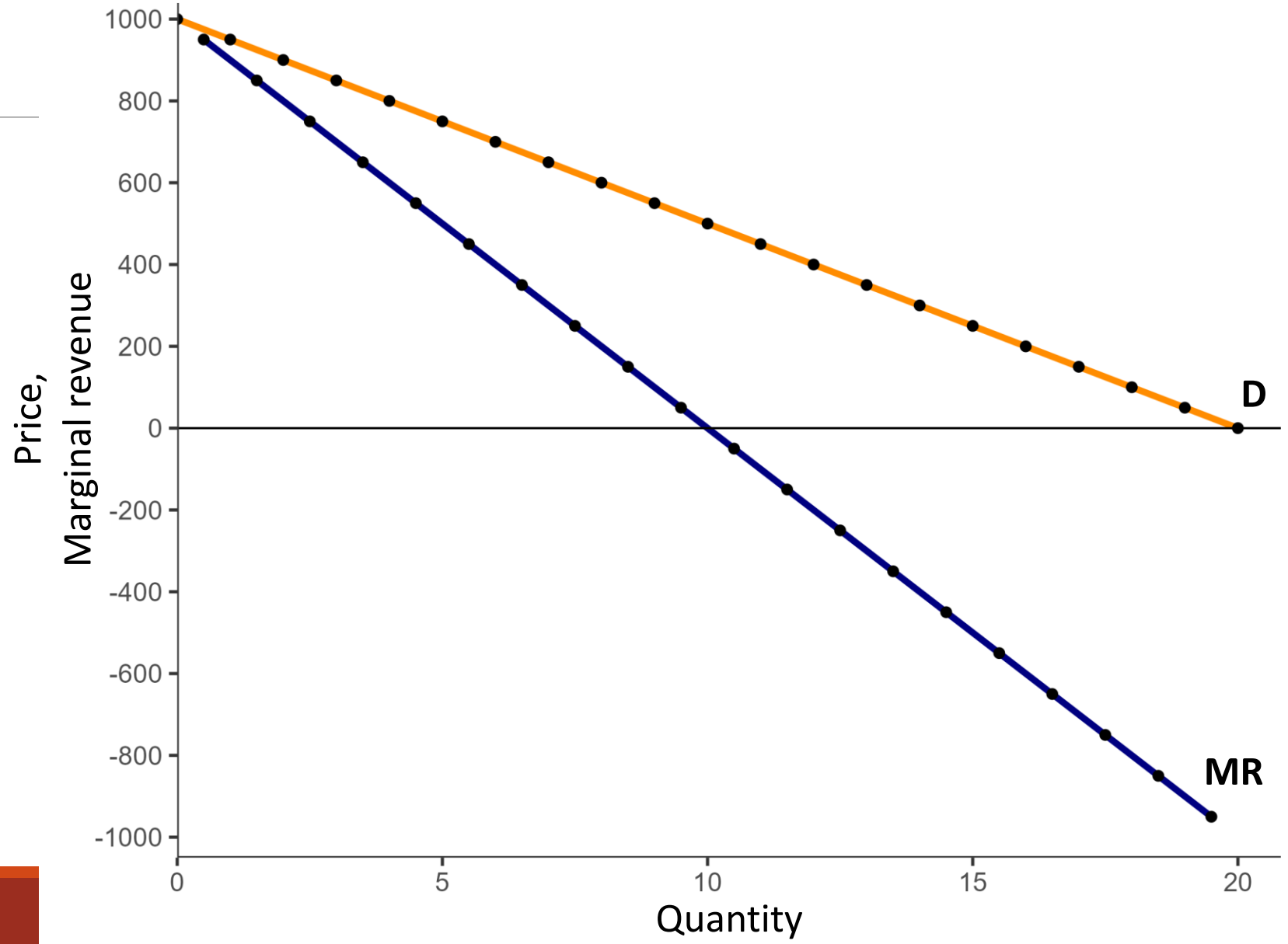

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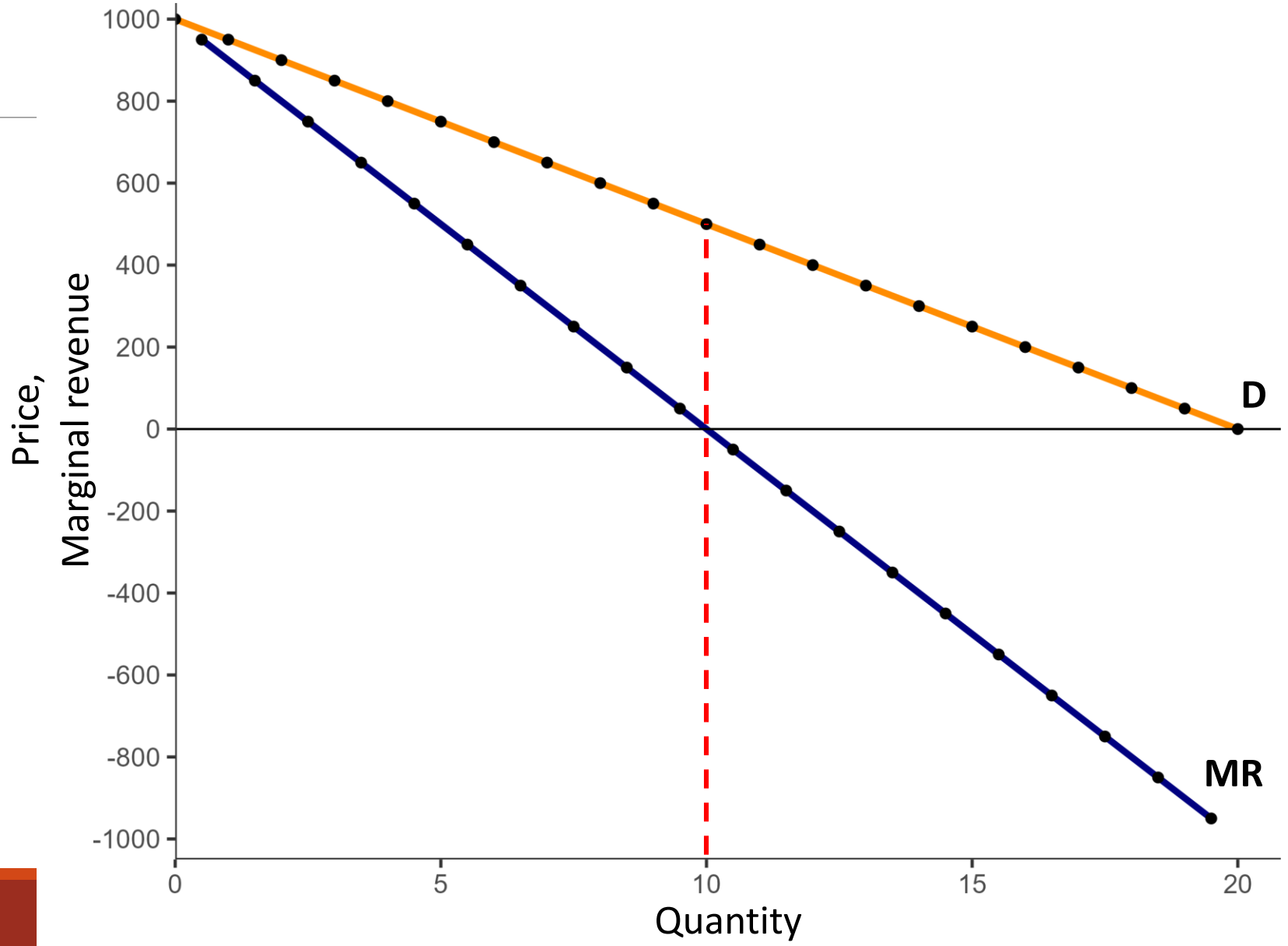

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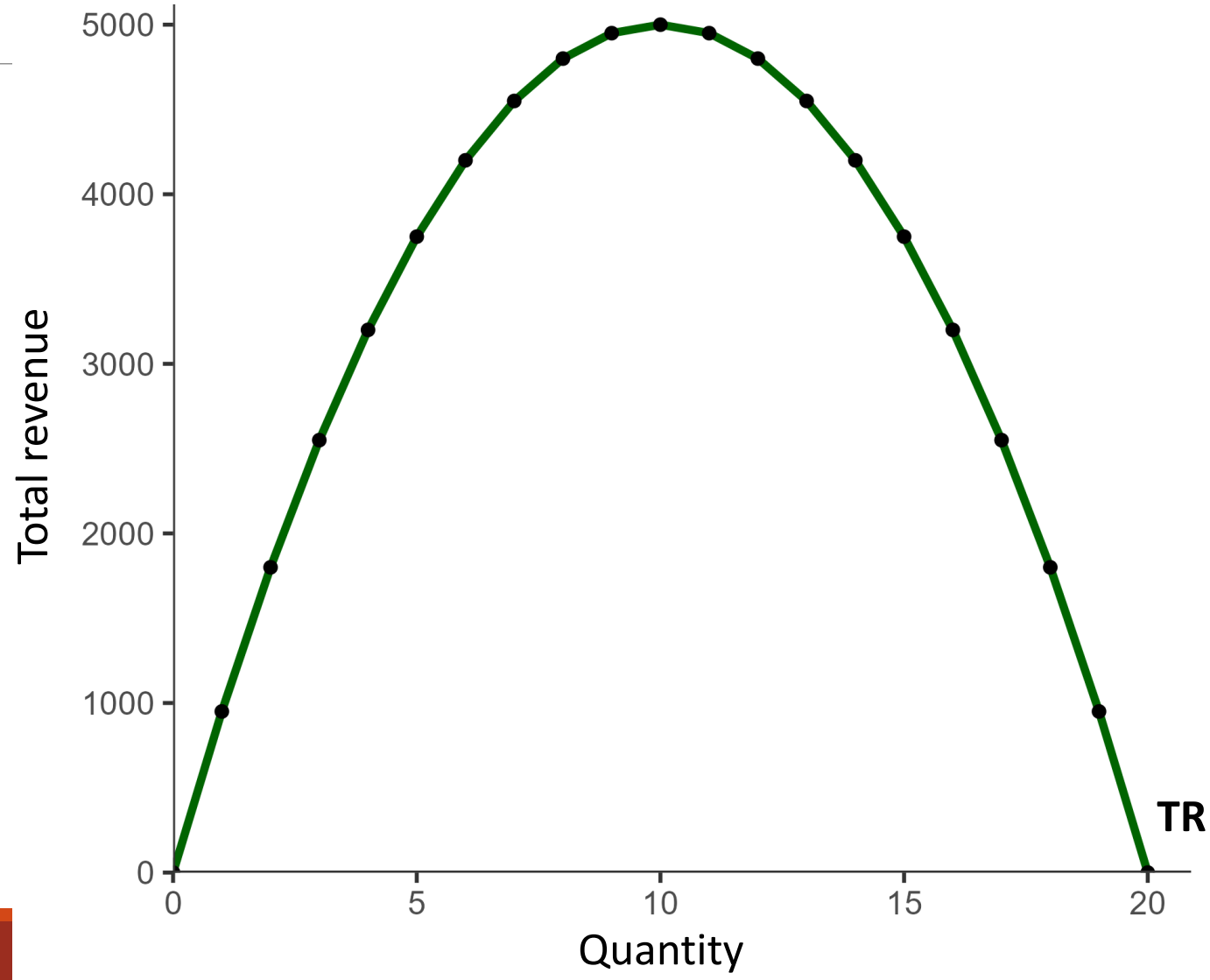

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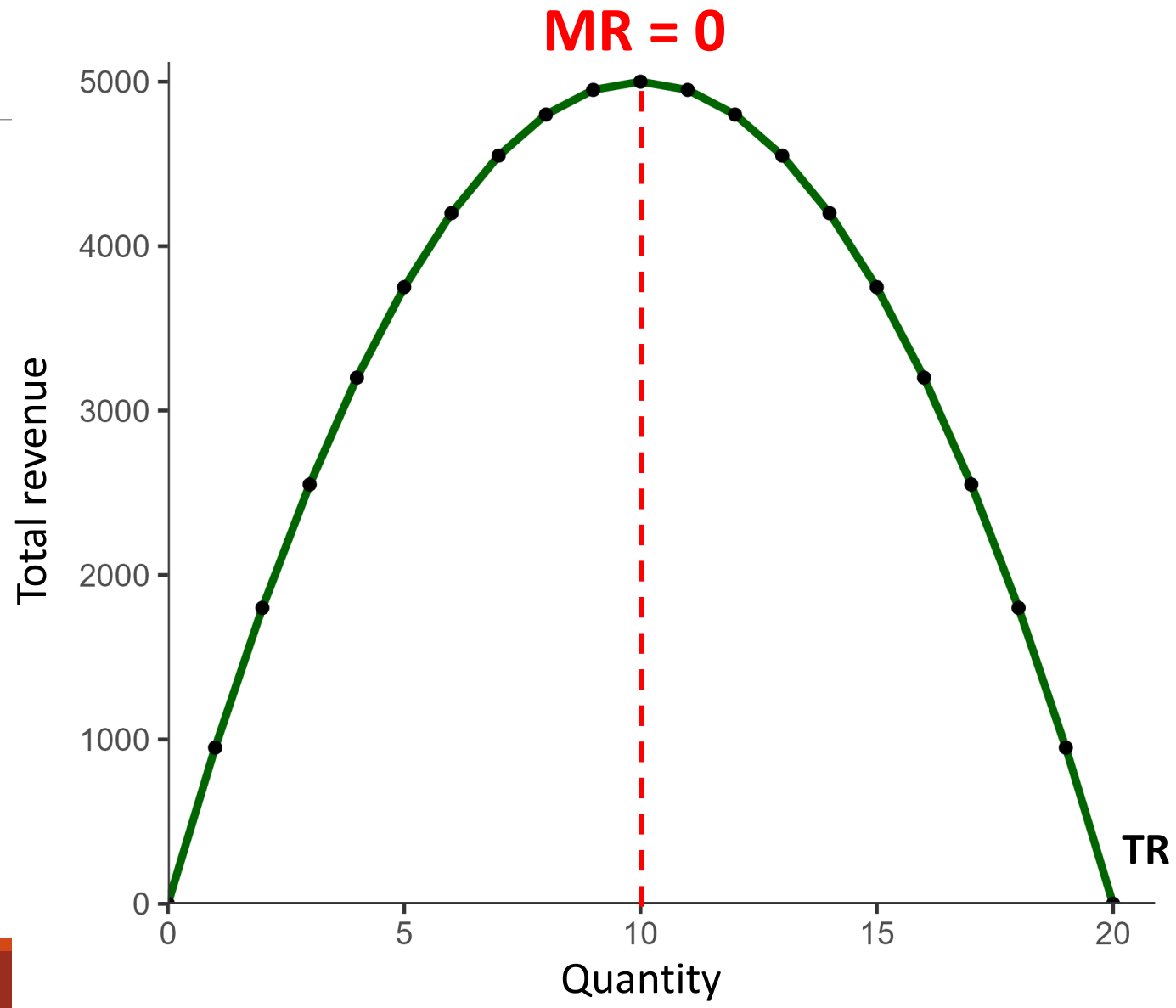

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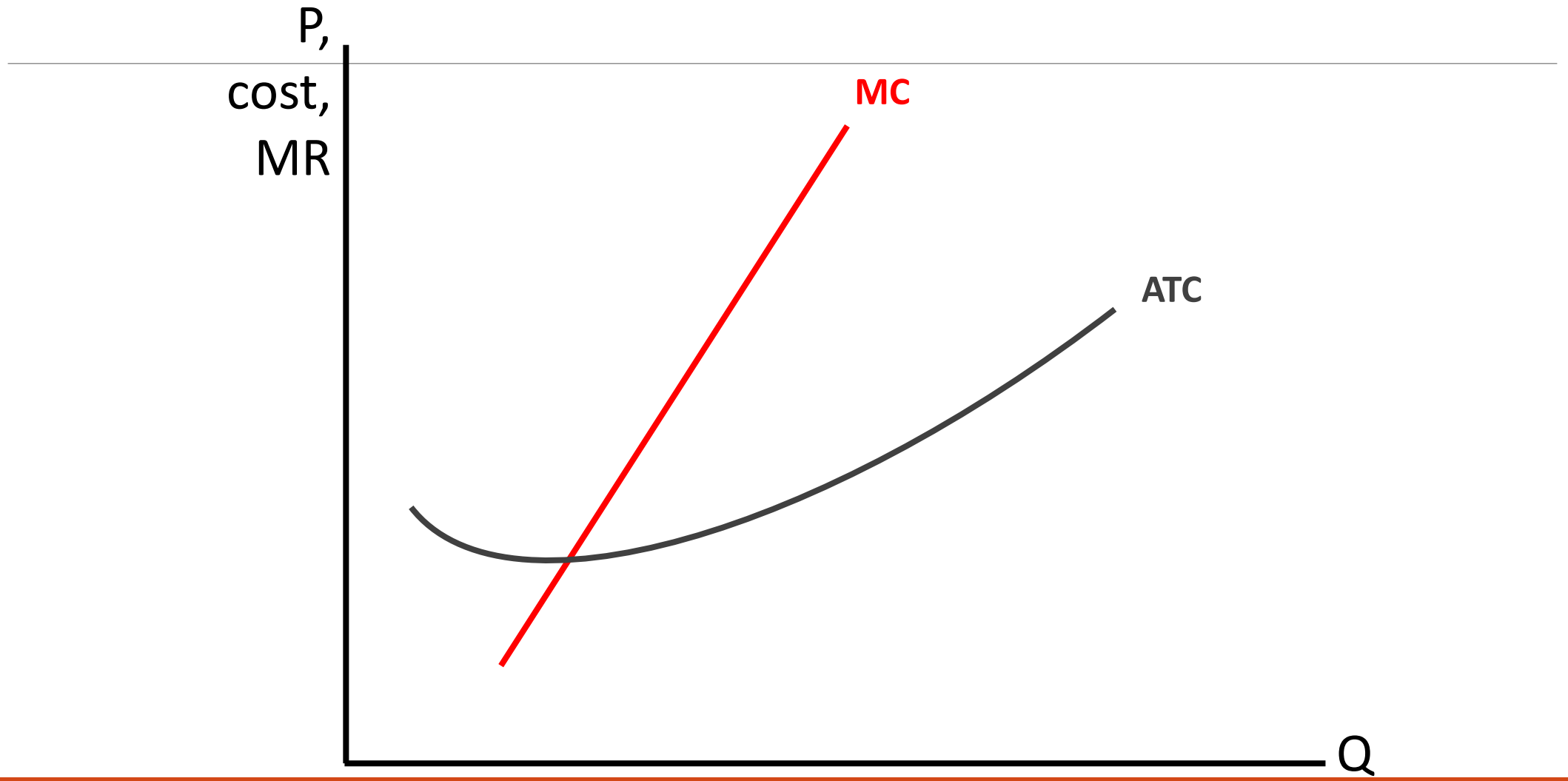

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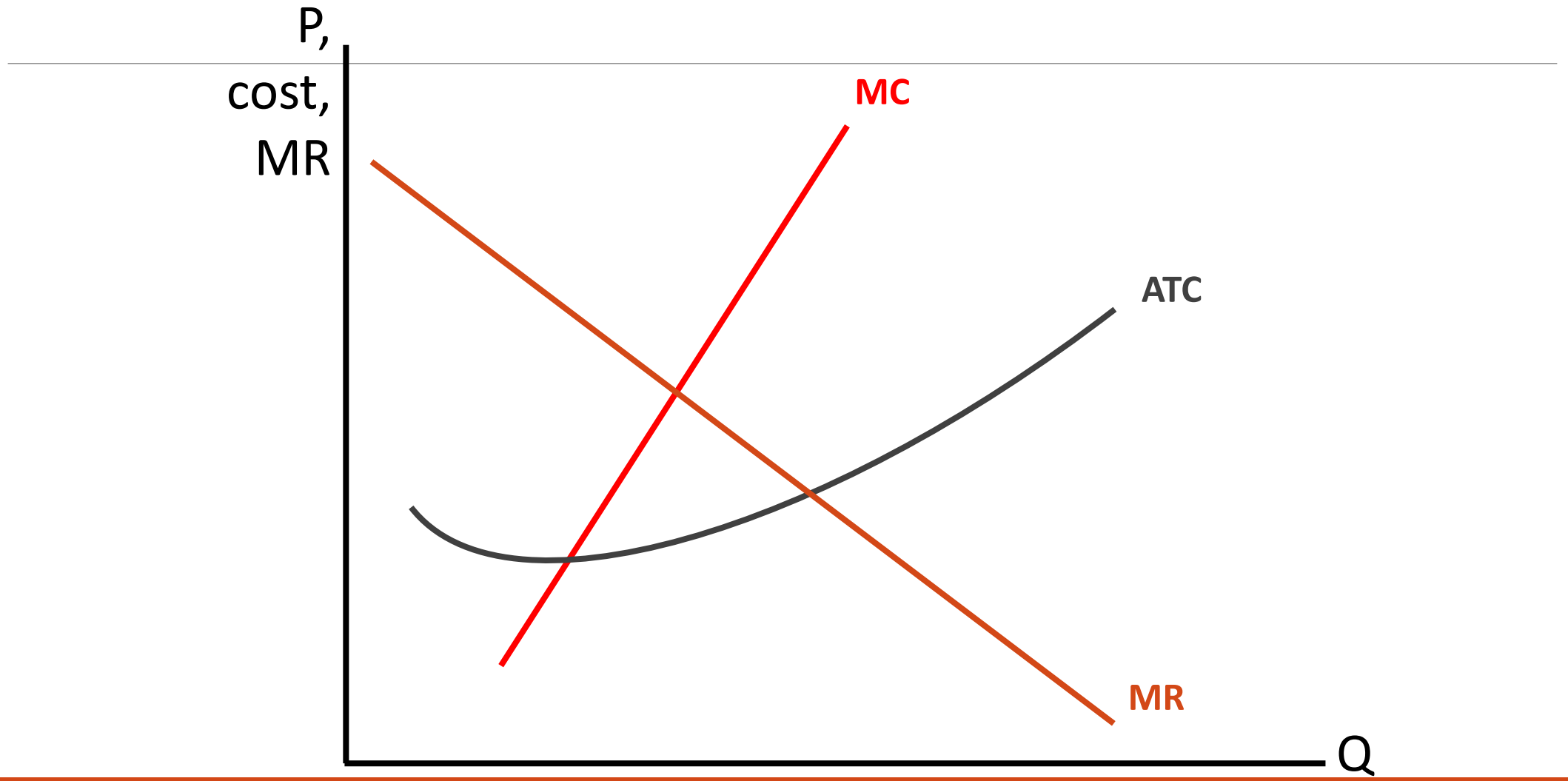

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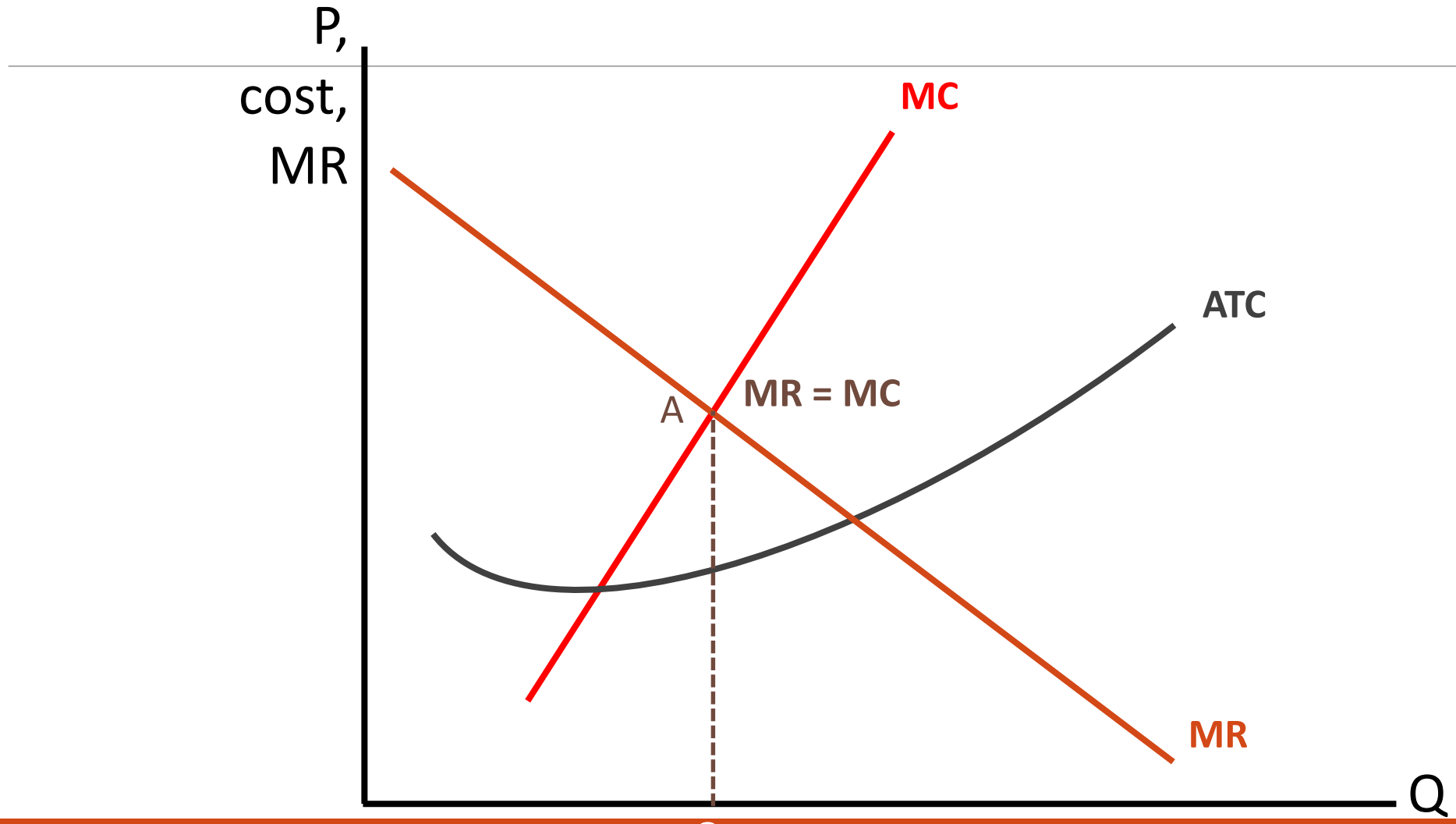

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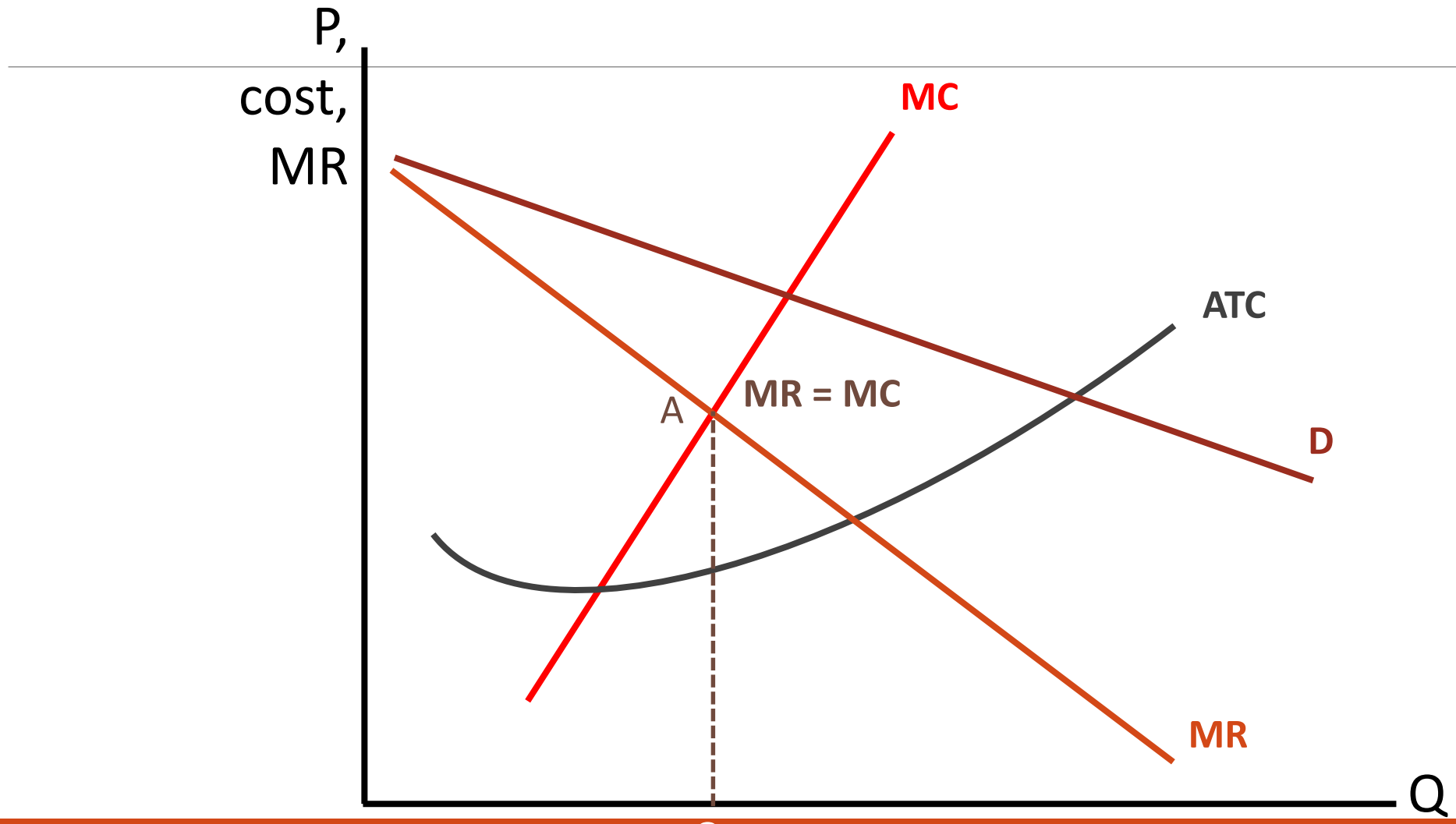

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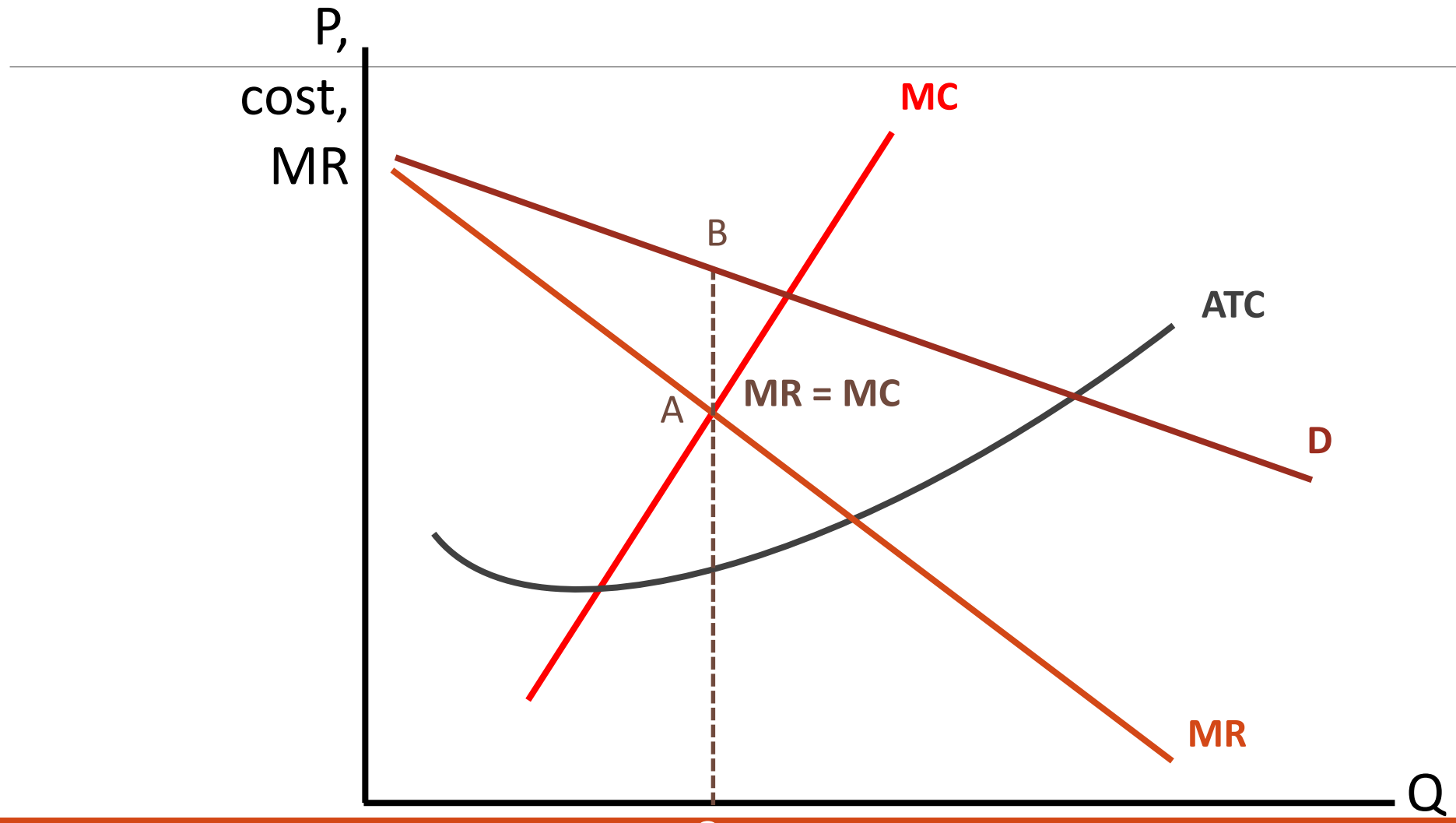

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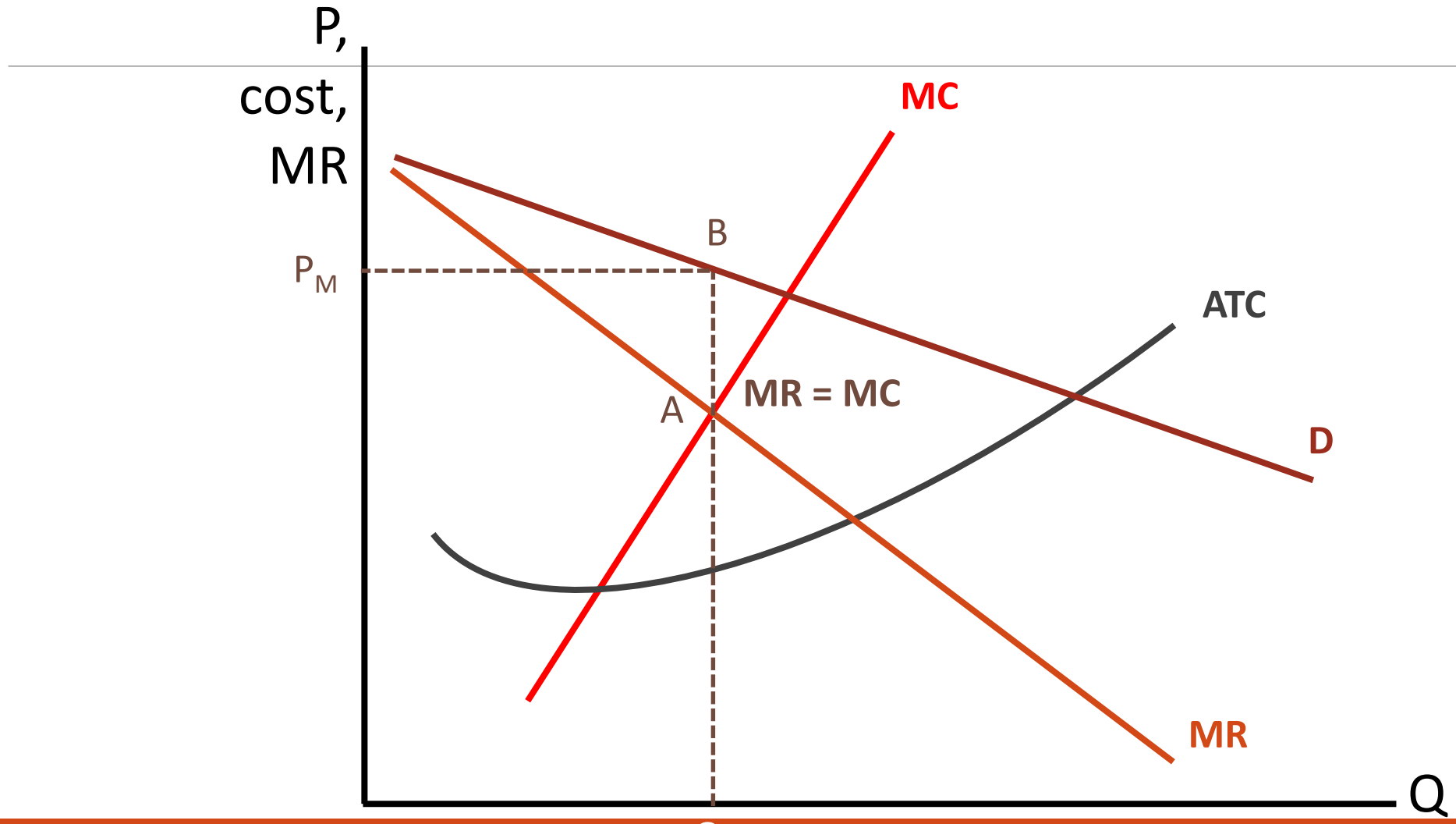

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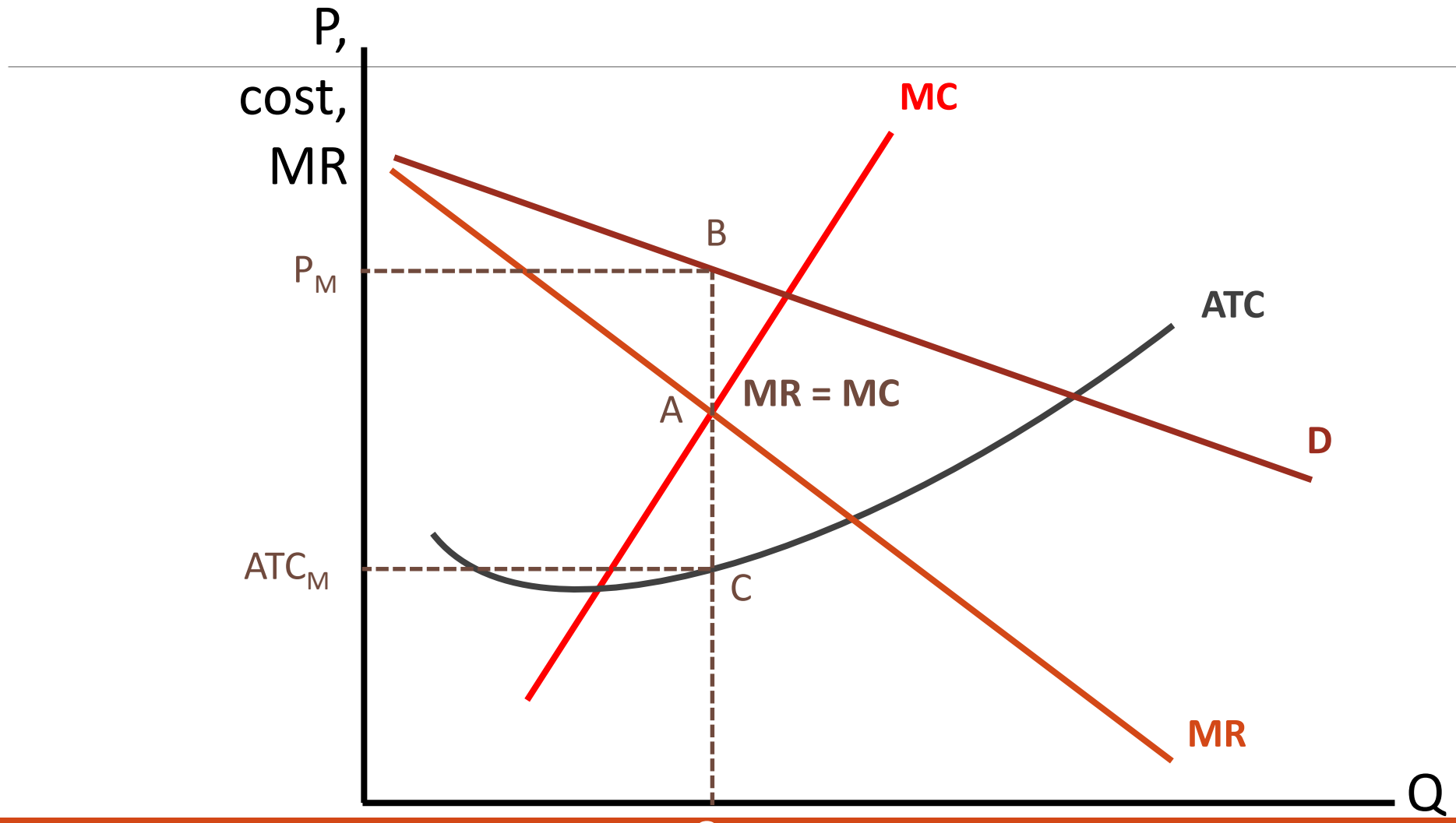

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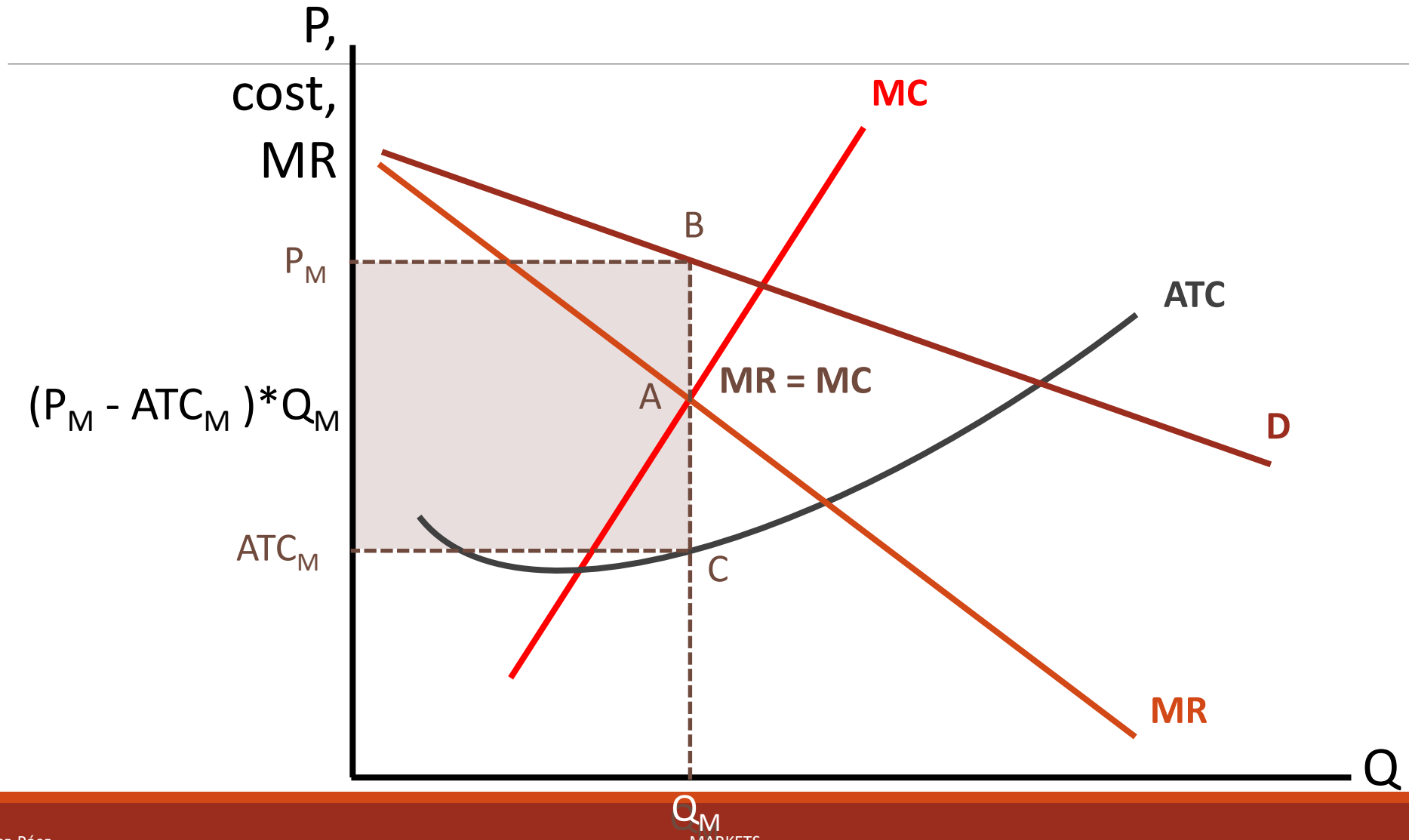

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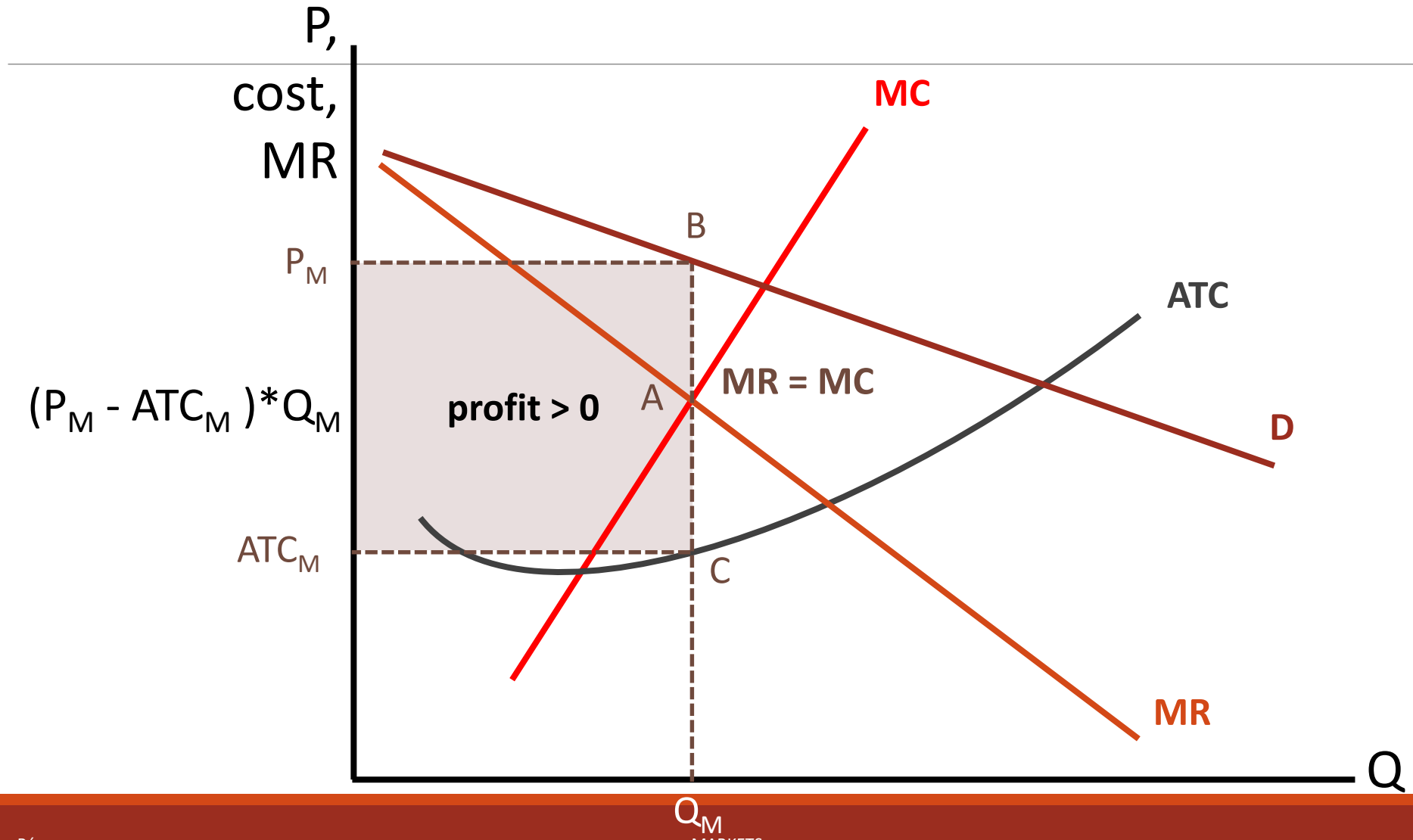

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Monopoly versus perfect competition

PERFECT COMPETITION	MONOPOLY
MR = MC	MR = MC
P_{PC} = MR	$P_M \neq$ MR
P_{PC} = MC	$P_M >$ CM
There are no long-run economic profit.	There are long-run economic profit.

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$$\mathbf{Q_M < Q_{PC}}$$

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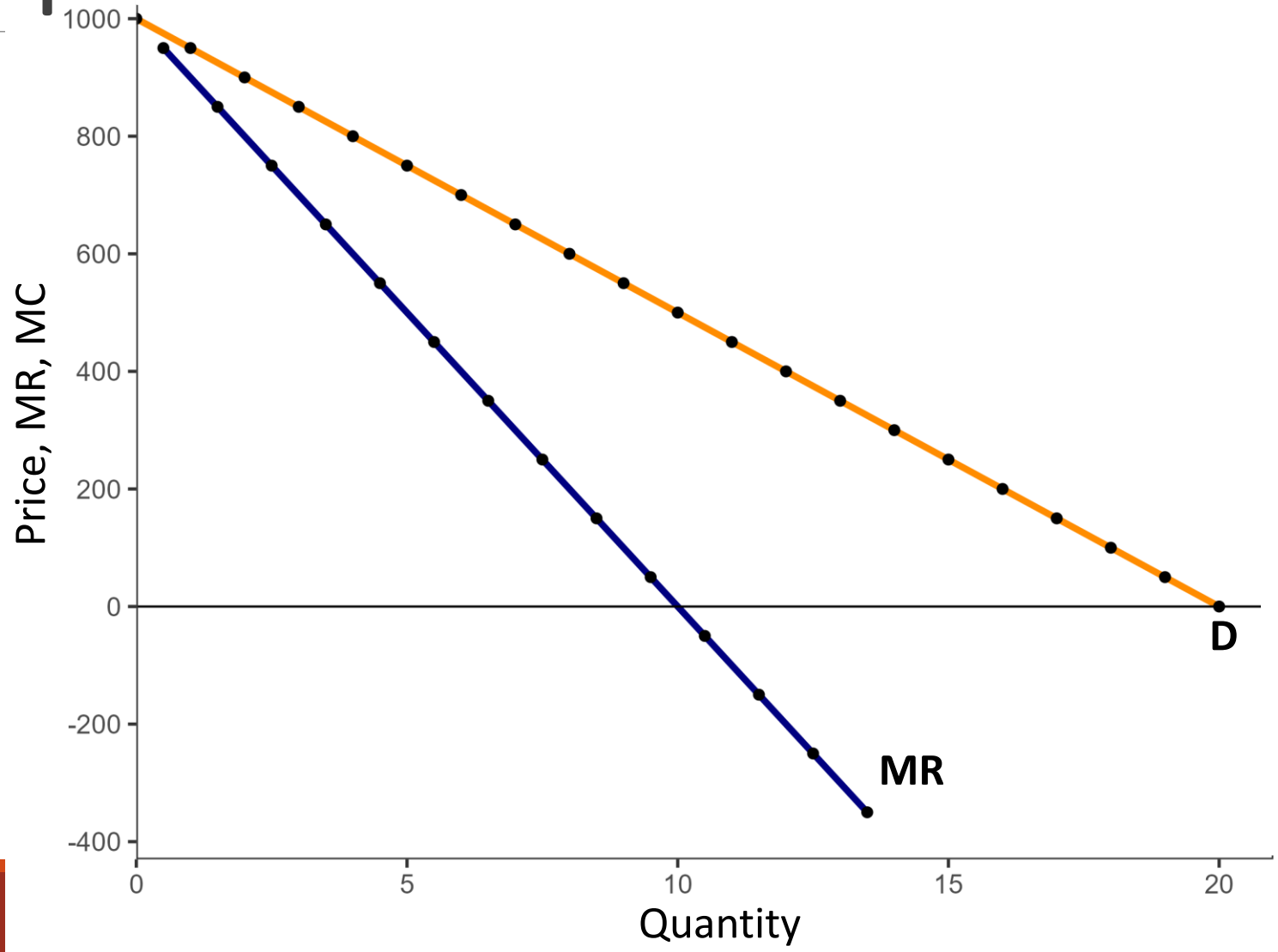

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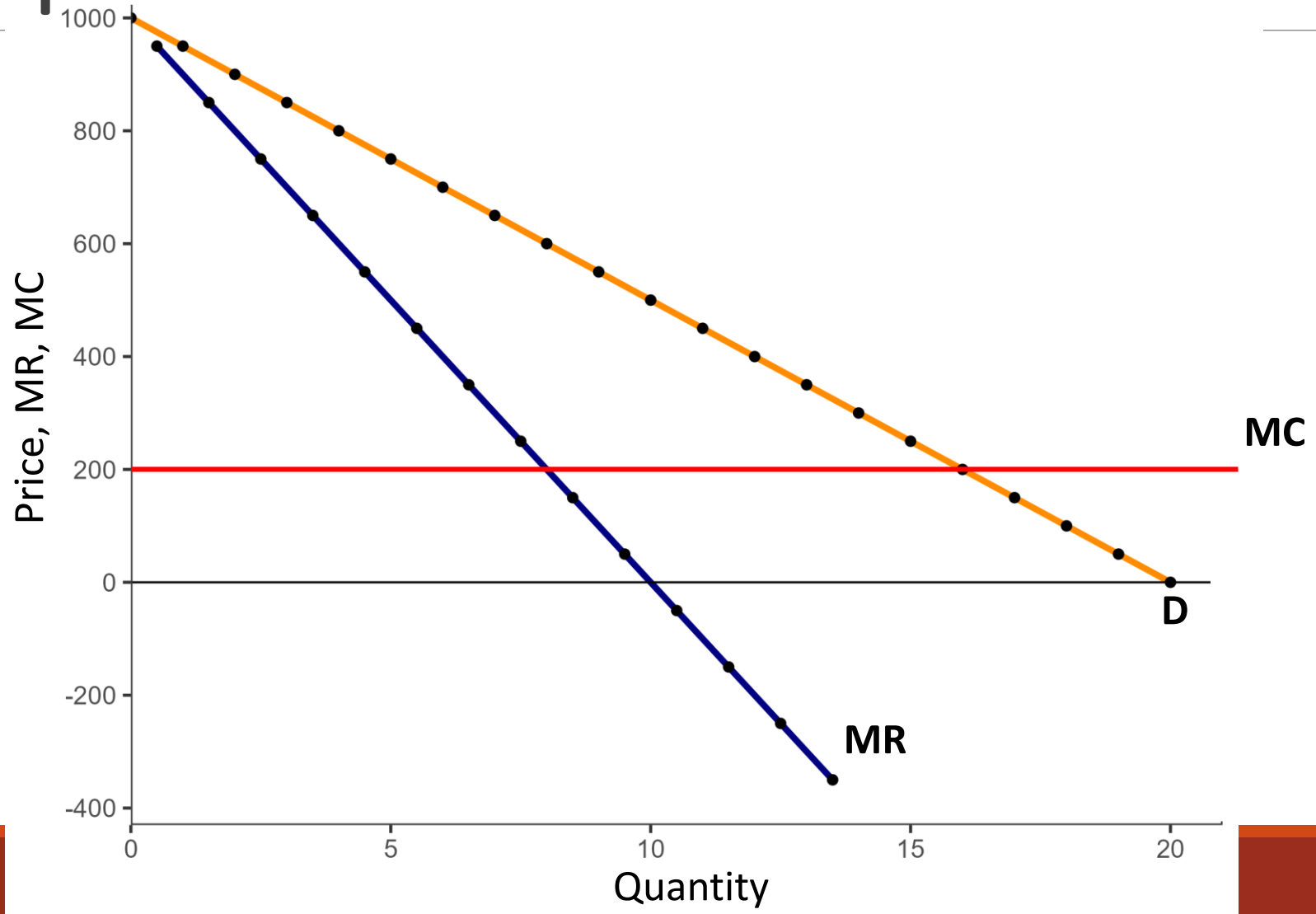

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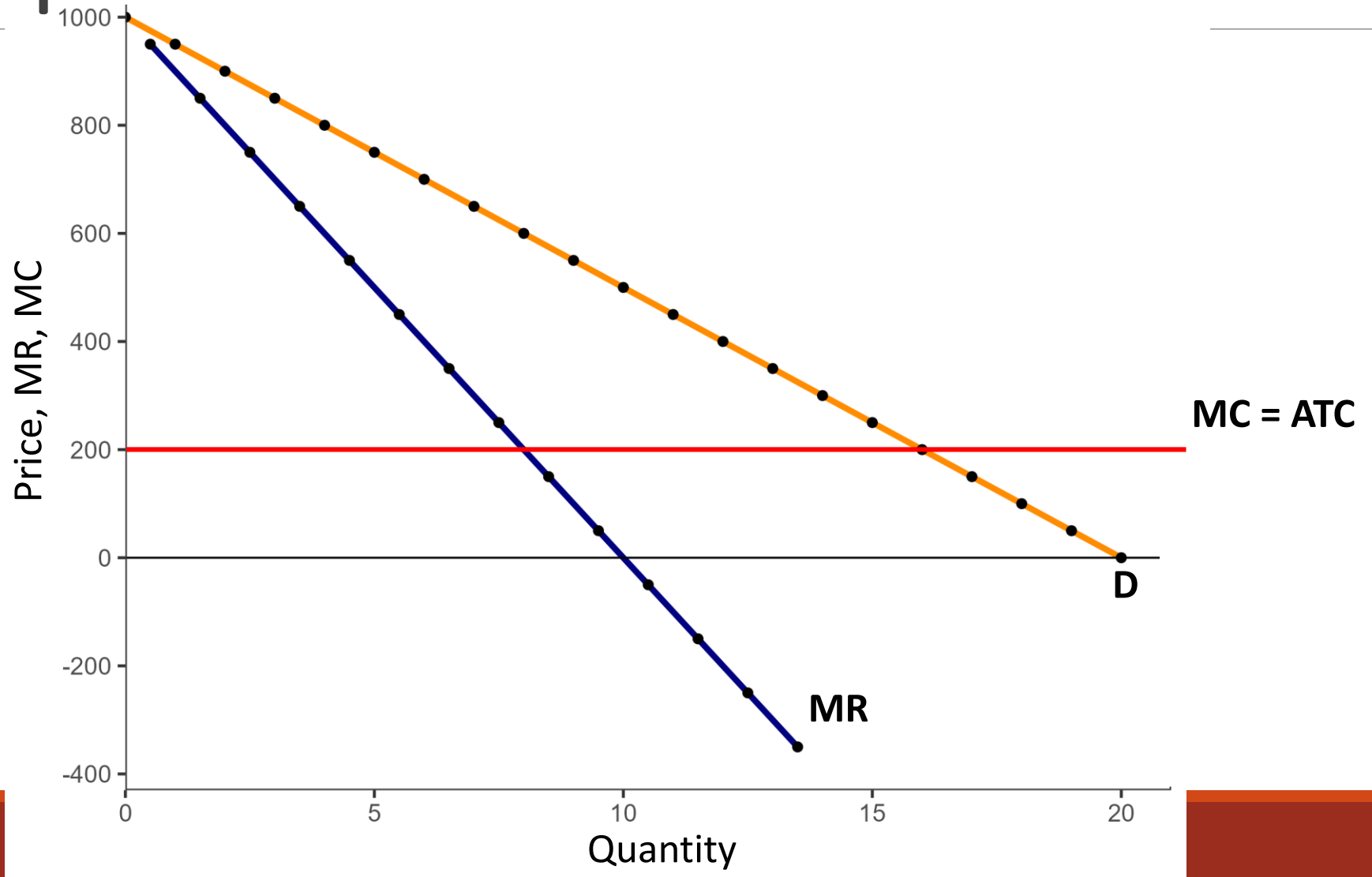

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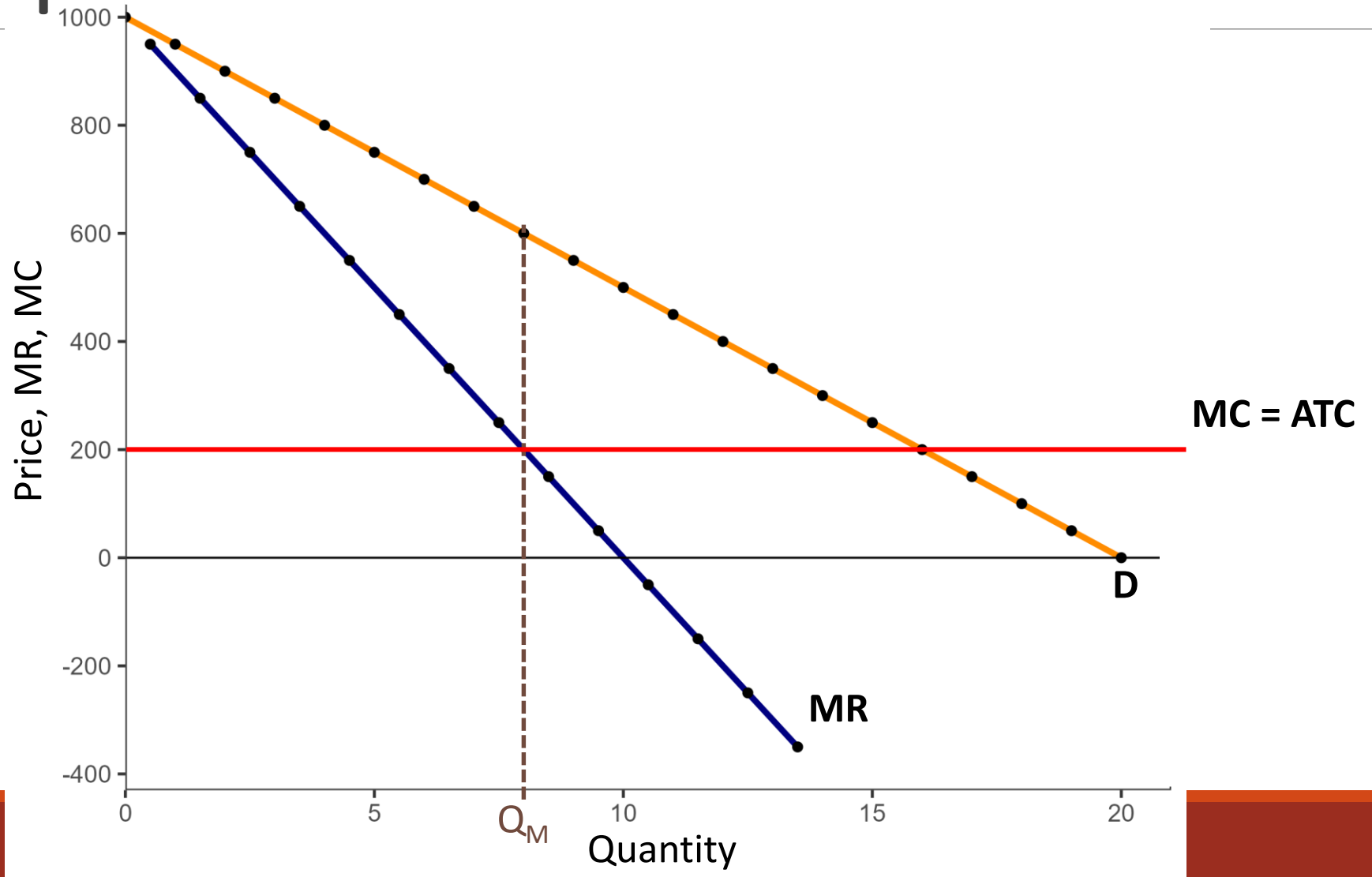

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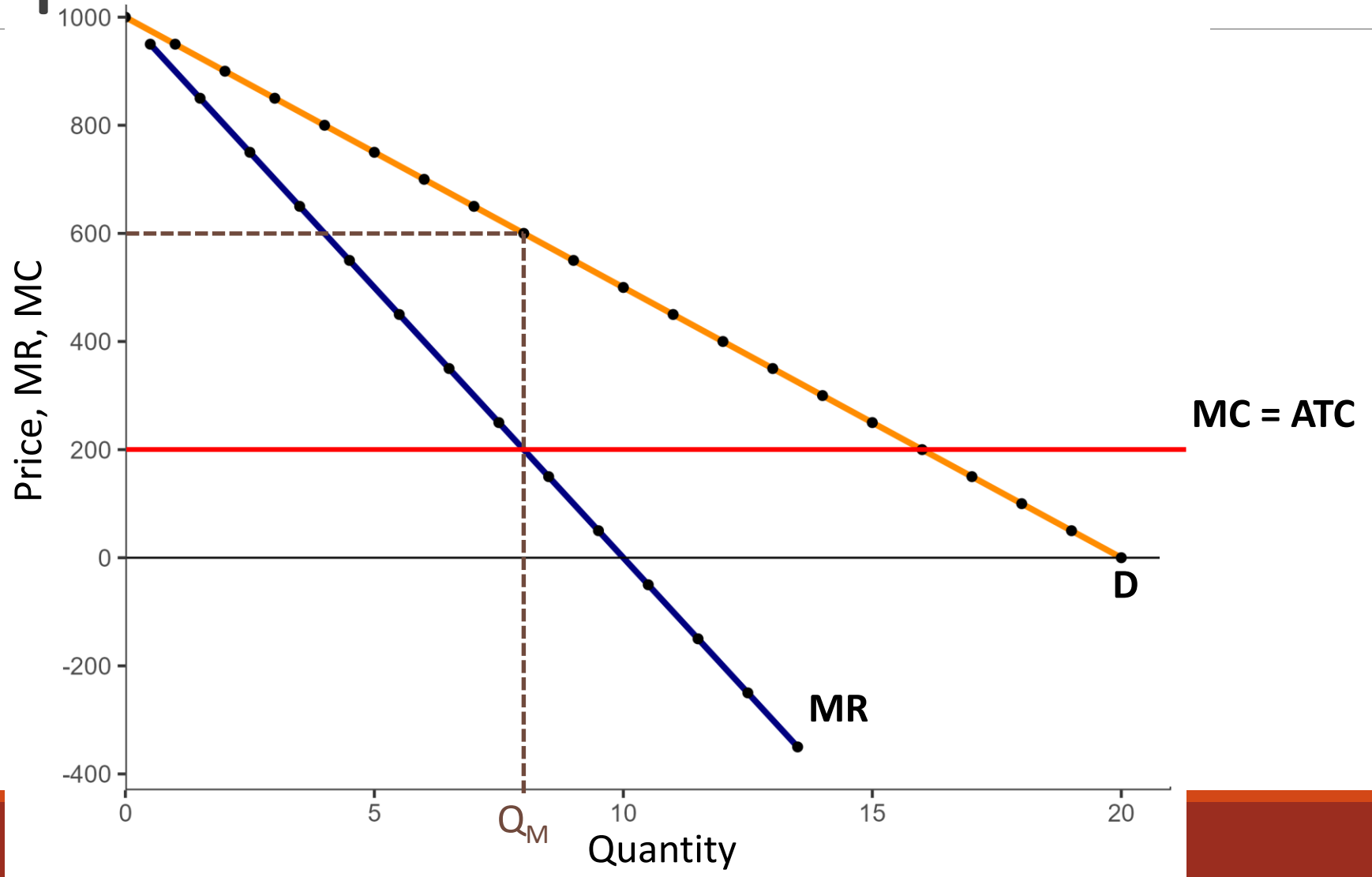

Monopoly ...on

P	Q	TR = P × Q	MR = ΔTR/ΔQ
$1,000	0	$0	
			$950
950	1	950	
			850
900	2	1,800	
			750
850	3	2,550	
			650
800	4	3,200	
			550
750	5	3,750	
			450
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			250
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			150
550	9	4,950	
			50
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			−50
450	11	4,950	
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100	18	1,800	
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50	19	950	
			−950
0	20	0	

Source: Krugman and Wells (2023)

Monopoly ... on

P_M and Q_M

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			450
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			250
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			150
550	9	4,950	
			50
500	10	5,000	
			−50
450	11	4,950	
			−150
400	12	4,800	
			−250
350	13	4,550	
			−350
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Source: Krugman and Wells (2023)

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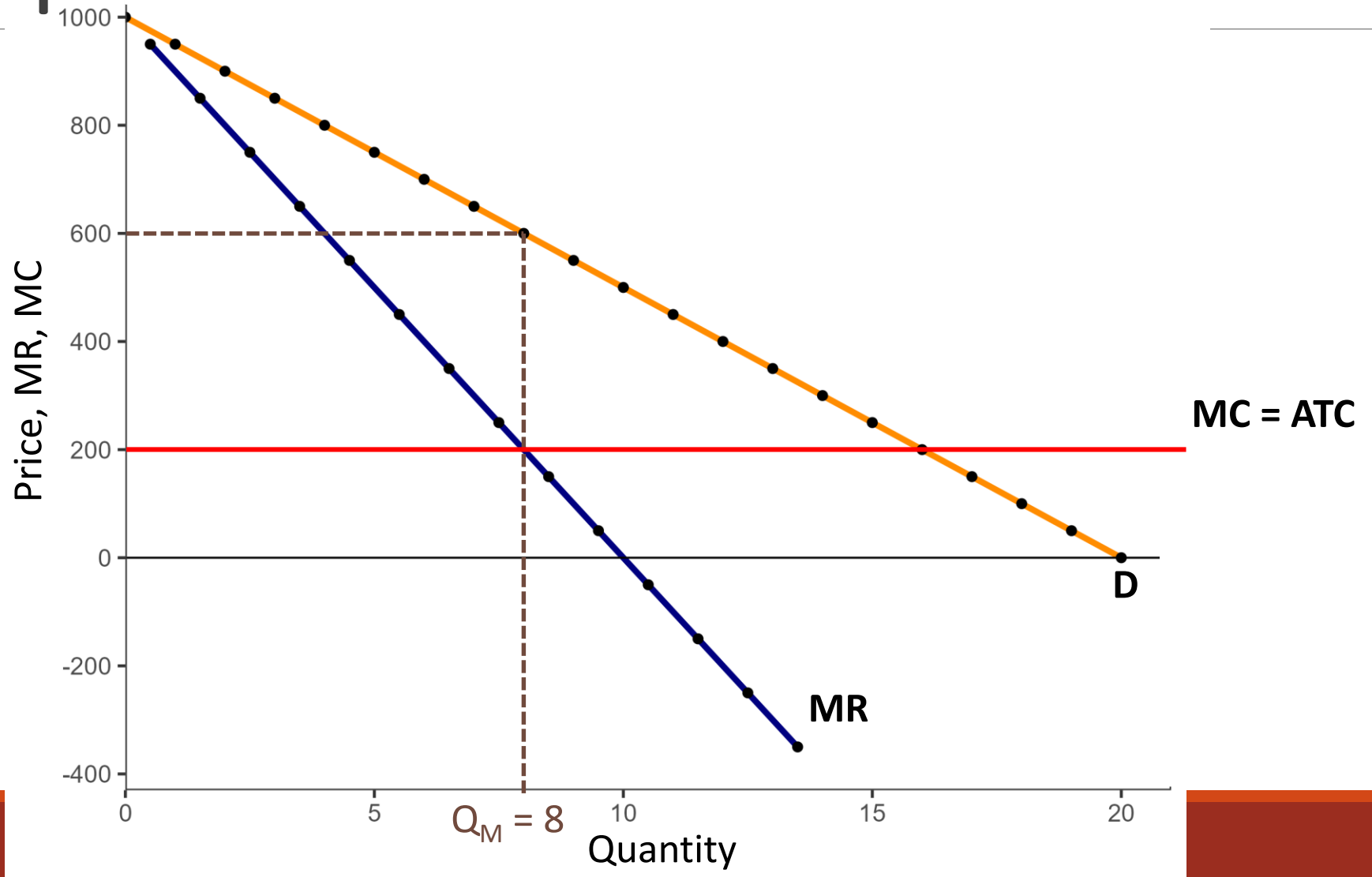

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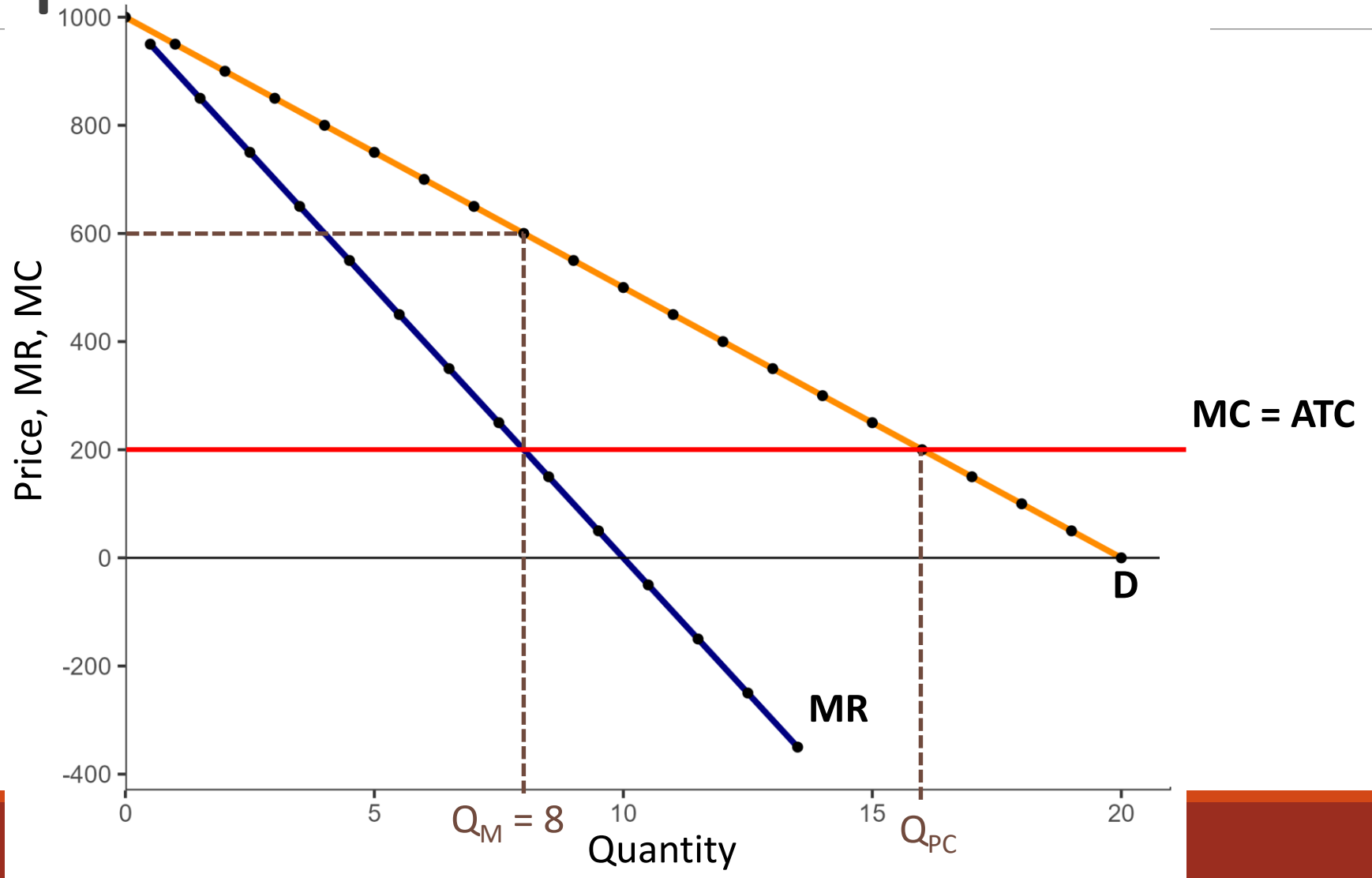

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800	4	3,200	
			550
750	5	3,750	
			450
700	6	4,200	
			350
650	7	4,550	
			250
600	8	4,800	
			150
550	9	4,950	
			50
500	10	5,000	
			−50
450	11	4,950	
			−150
400	12	4,800	
			−250
350	13	4,550	
			−350
300	14	4,200	
			−450
250	15	3,750	
			−550
200	16	3,200	
			−650
150	17	2,550	
			−750
100	18	1,800	
			−850
50	19	950	
			−950
0	20	0	

Source: Krugman and Wells (2023)

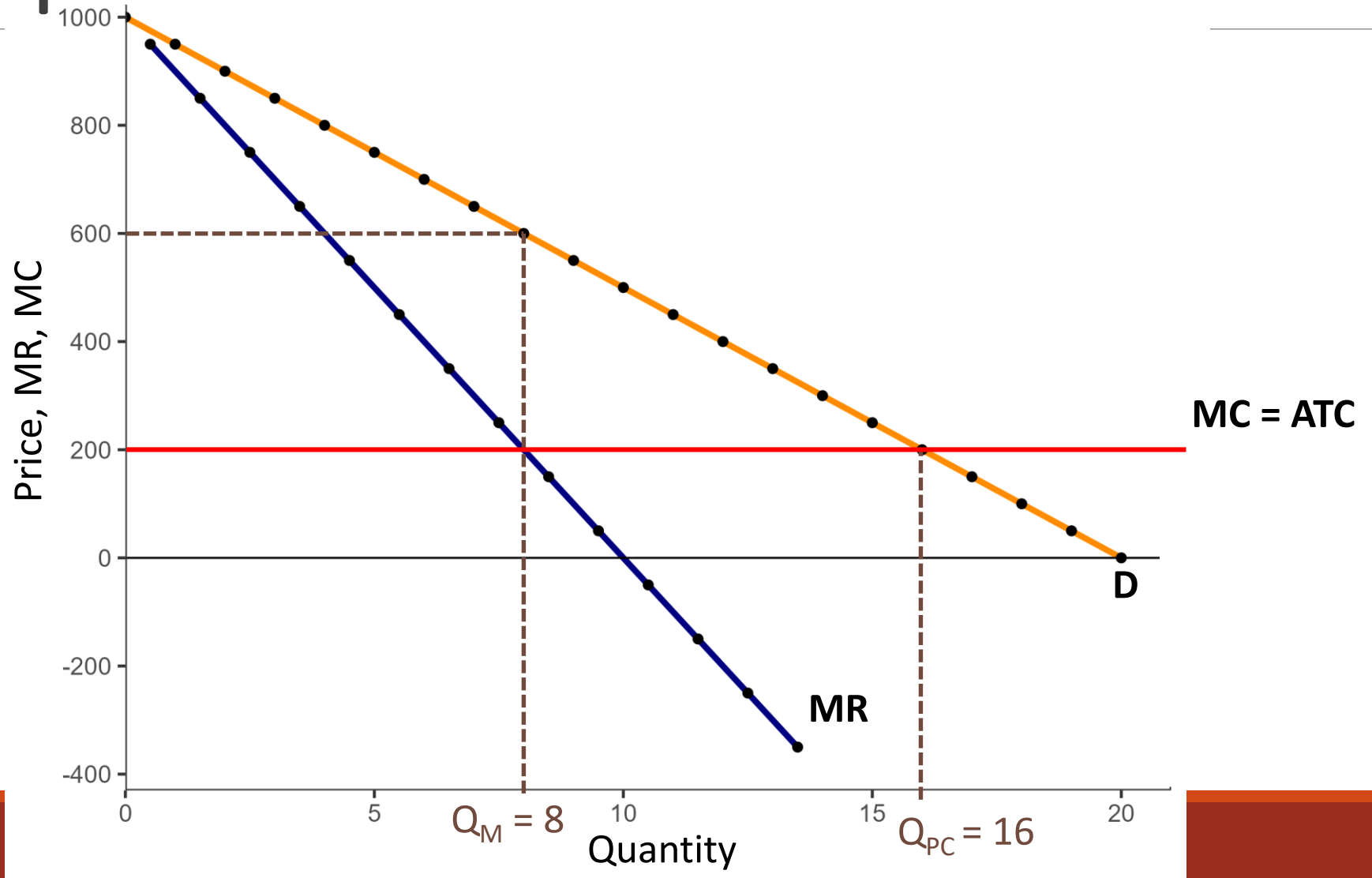
Monopoly ... on

P	Q	TR = P × Q	MR = ΔTR/ΔQ
$1,000	0	$0	
			$950
950	1	950	
			850
900	2	1,800	
			750
850	3	2,550	
			650
800	4	3,200	
			550
750	5	3,750	
			450
700	6	4,200	
			350
650	7	4,550	
			250
600	8	4,800	
			150
550	9	4,950	
			50
500	10	5,000	
			−50
450	11	4,950	
			−150
400	12	4,800	
			−250
350	13	4,550	
			−350
300	14	4,200	
			−450
250	15	3,750	
			−550
200	16	3,200	
			−650
150	17	2,550	
			−750
100	18	1,800	
			−850
50	19	950	
			−950
0	20	0	

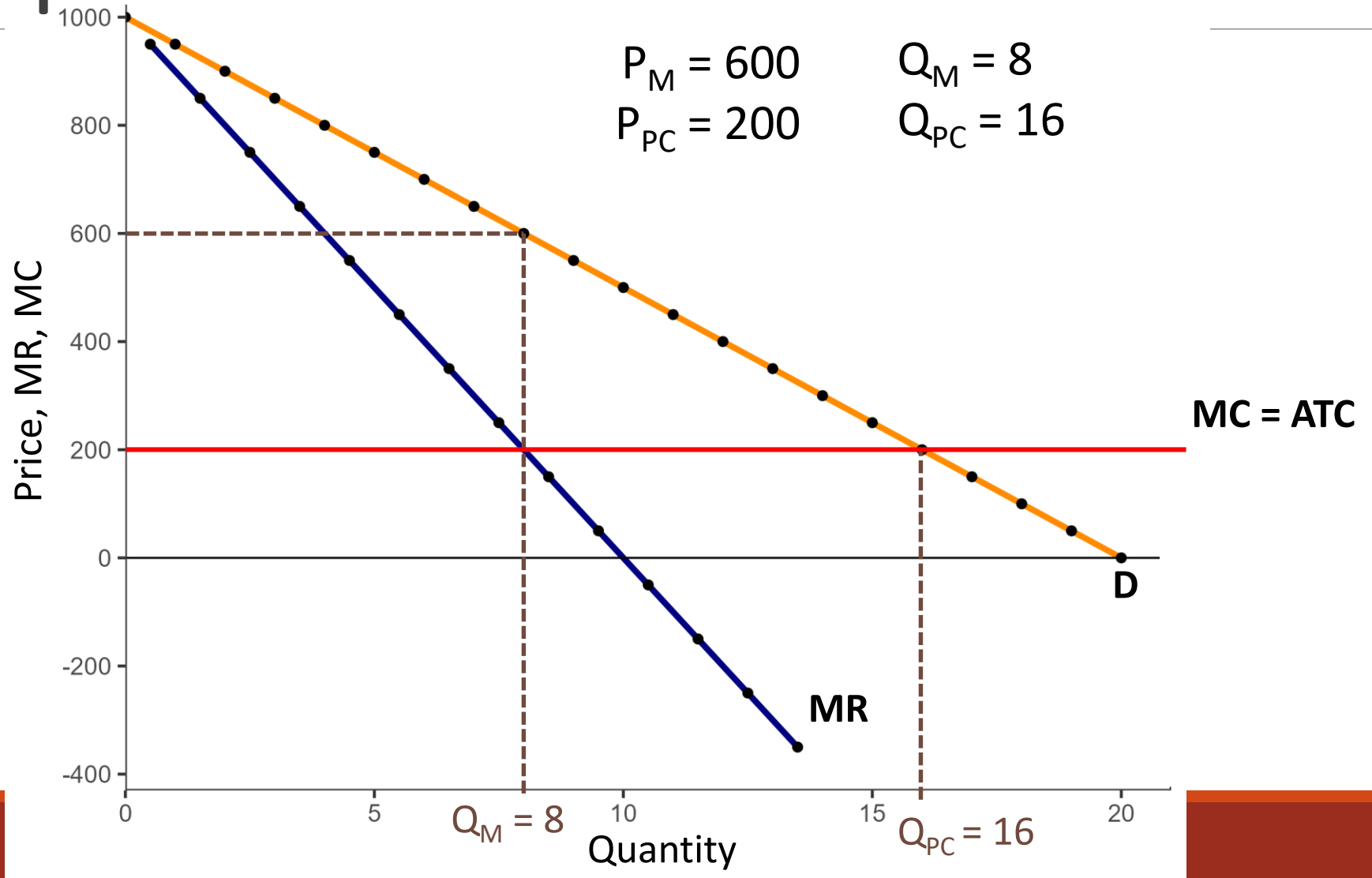
P_{PC} and Q_{PC}

Source: Krugman and Wells (2023)

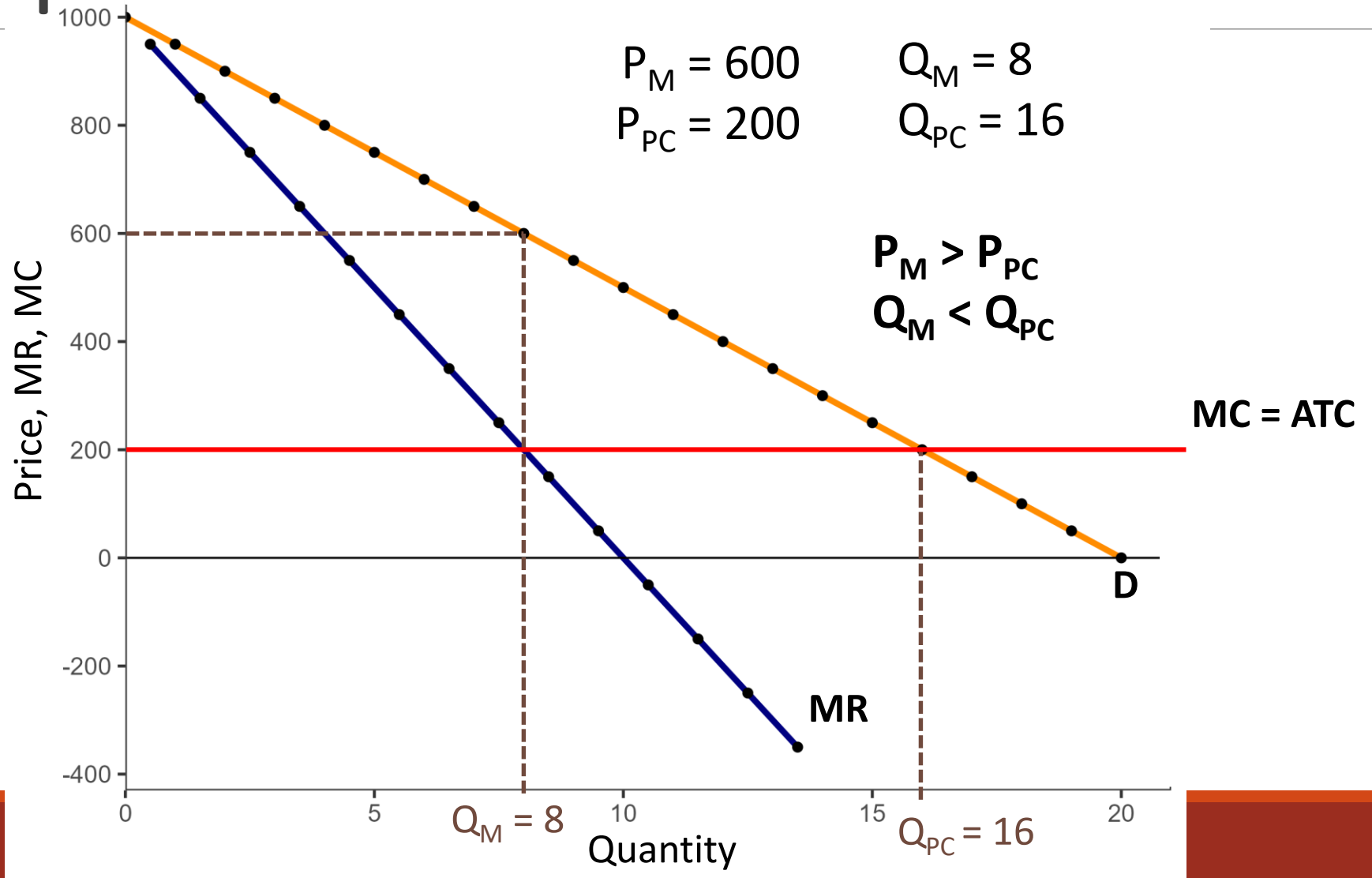
Monopoly versus perfect competition



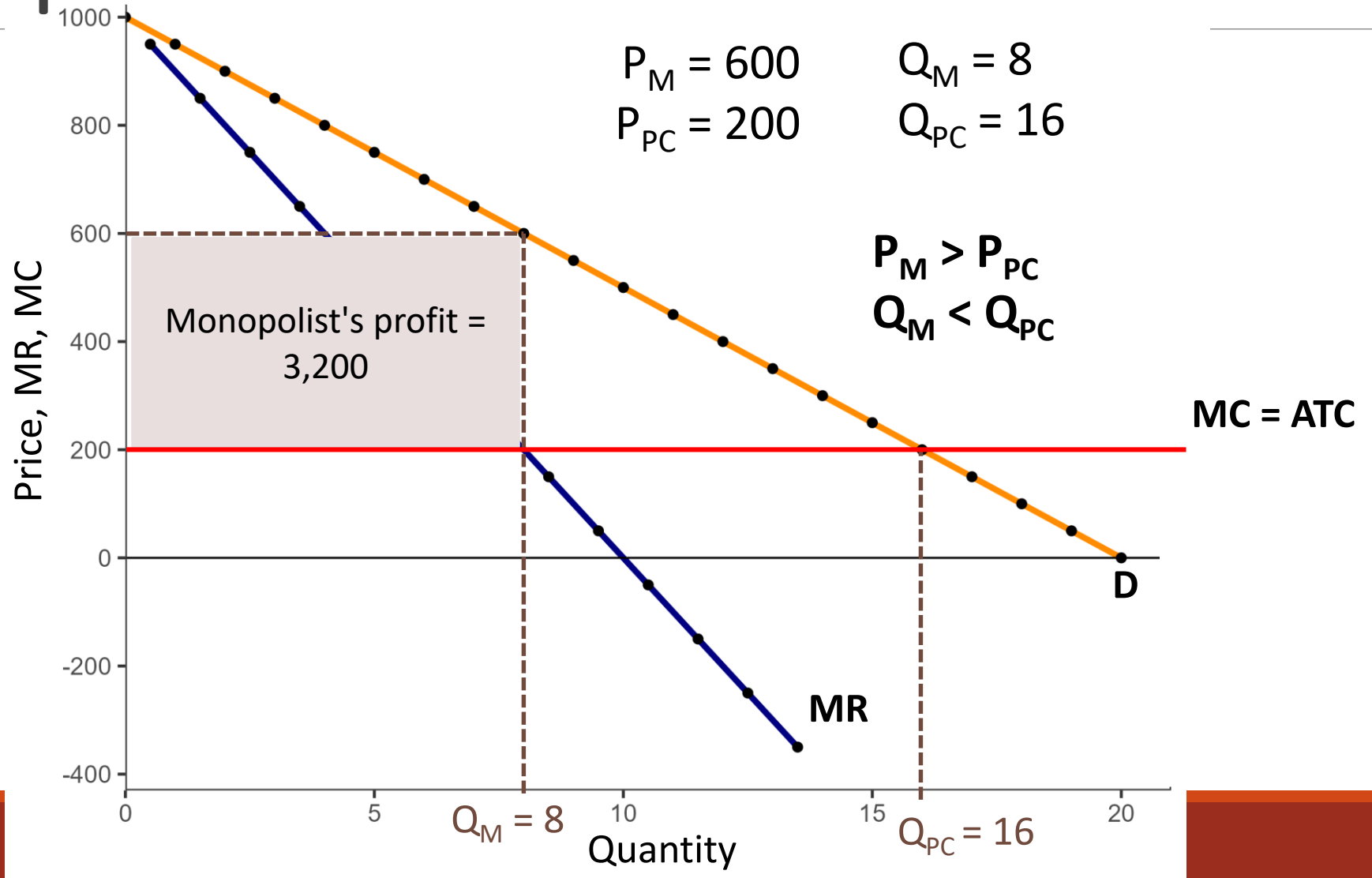
Monopoly versus perfect competition



Monopoly versus perfect competition



Monopoly versus perfect competition



Mandatory readings

- Krugman, P. and Wells, R. (2023). *Essentials of Economics*. MacMillan Learning. 6th edition.
  - Chapter 7: Perfect competition and the supply curve.
  - Chapter 8: Monopoly.

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End of Topic 4

Markets

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