The Firm and Its Customers

BCPM0058. Economics

Dr. Kumar Aniket

Bartlett School of Construction & Project Management

Lecture 7

Previously

How workers decide how much they would like to trade off work and leisure (Unit 3)

How institutions affect to the relative bargaining power and distribution of surplus in society (Unit 5)

How firms use contract to get workers to supply different kinds of labour? (Unit 6)

This Unit

Model of interactions between customers and profit- maximising firms producing differentiated products

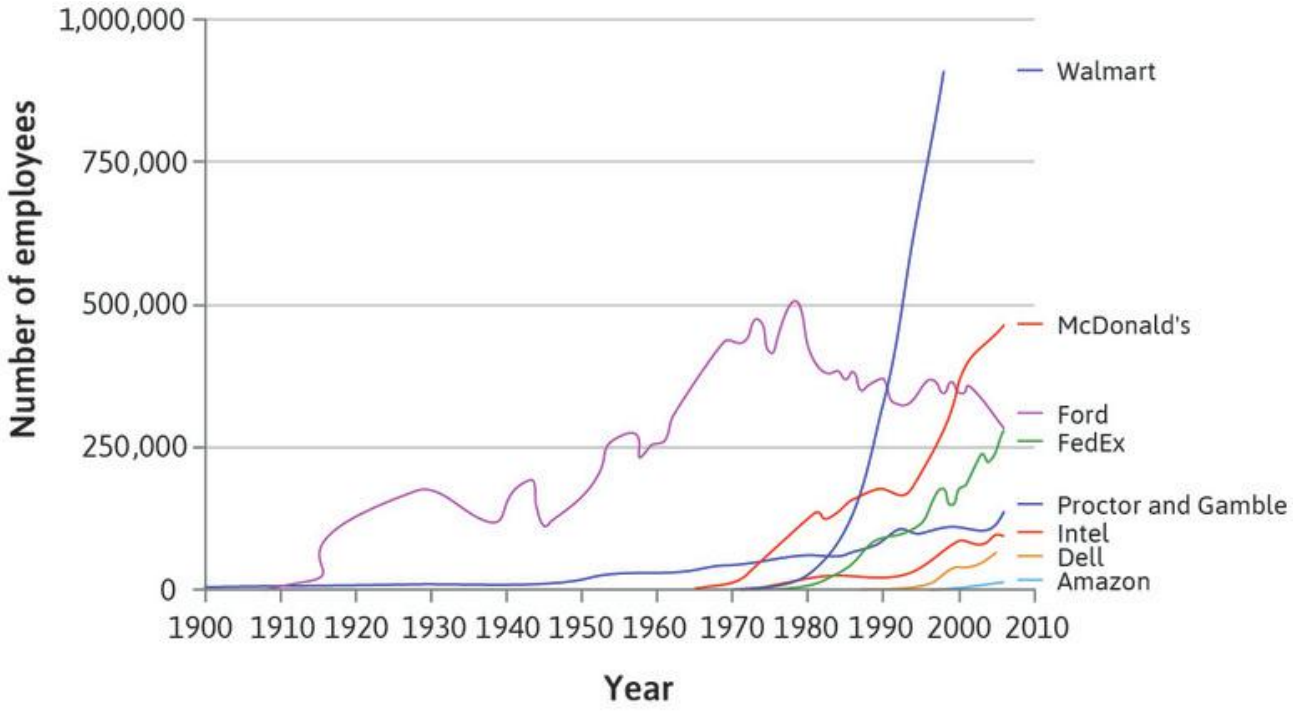
Factors that affect the firm's choice of price and quantities produced (costs, price elasticity, market power)

Surplus: measuring the gains from trade

In all developed countries, *most people work for large firms*.

Why is it so?

A firm's success and ability to grow depends on *customer's demand* and their *production* and *pricing decisions*.



Firm size

in the US: Number of employees

Customers

Customers decide on how to spend their *income* after observing the *available products* and their *prices*.

How much they buy of a particular product depends on how they *trade-off preference* for a product with its *own price* and *price of other goods*

i.e., How much they want a particular good and what are the available *alternatives*.

Price of the particular good and price of its *alternatives*.

Customer's Demand

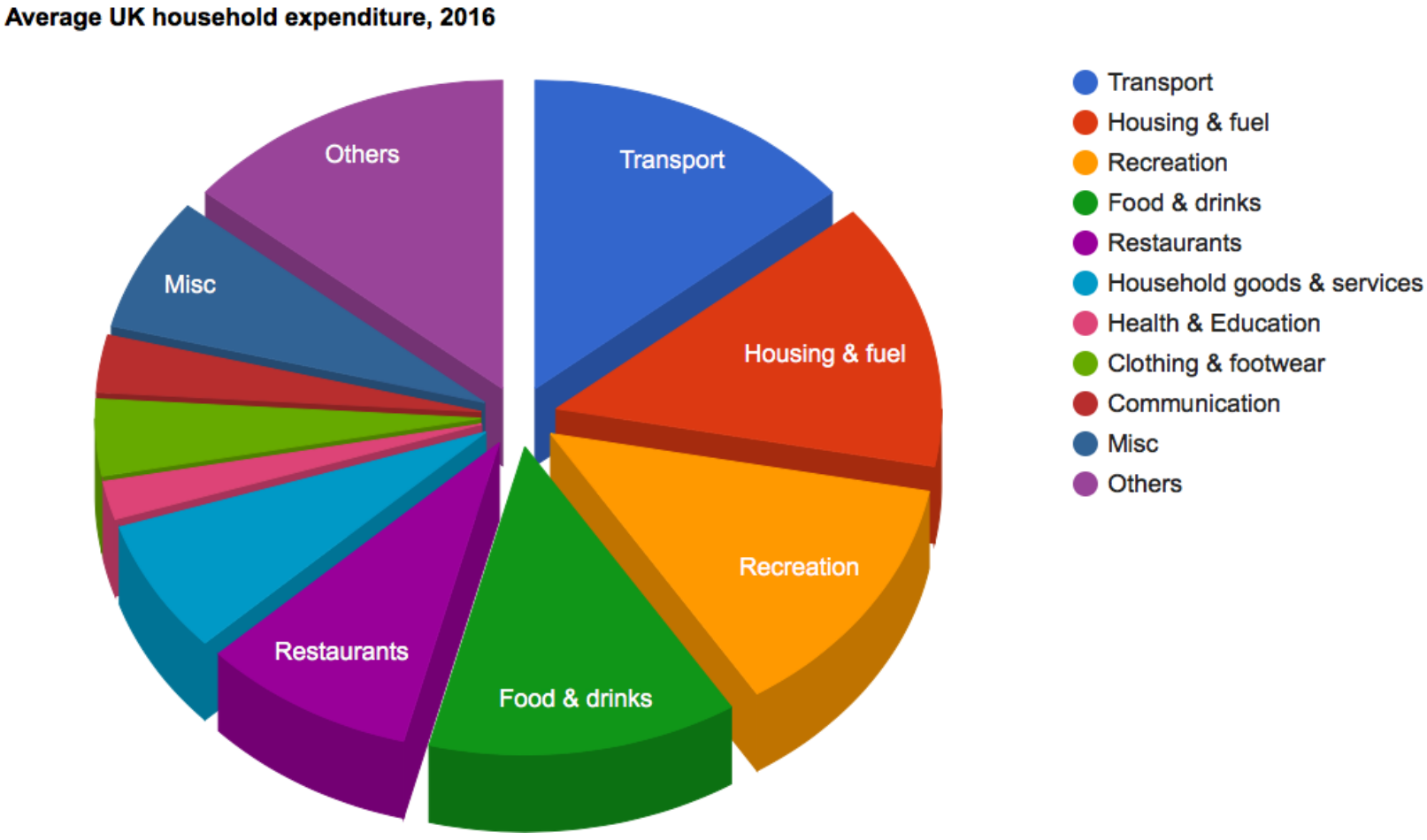
How do consumers *decide what to buy* and how much to buy?

- *Work versus leisure choice* gives them *income*
- They spend their *income* on a *variety of goods*
- How does *price* affect their choices

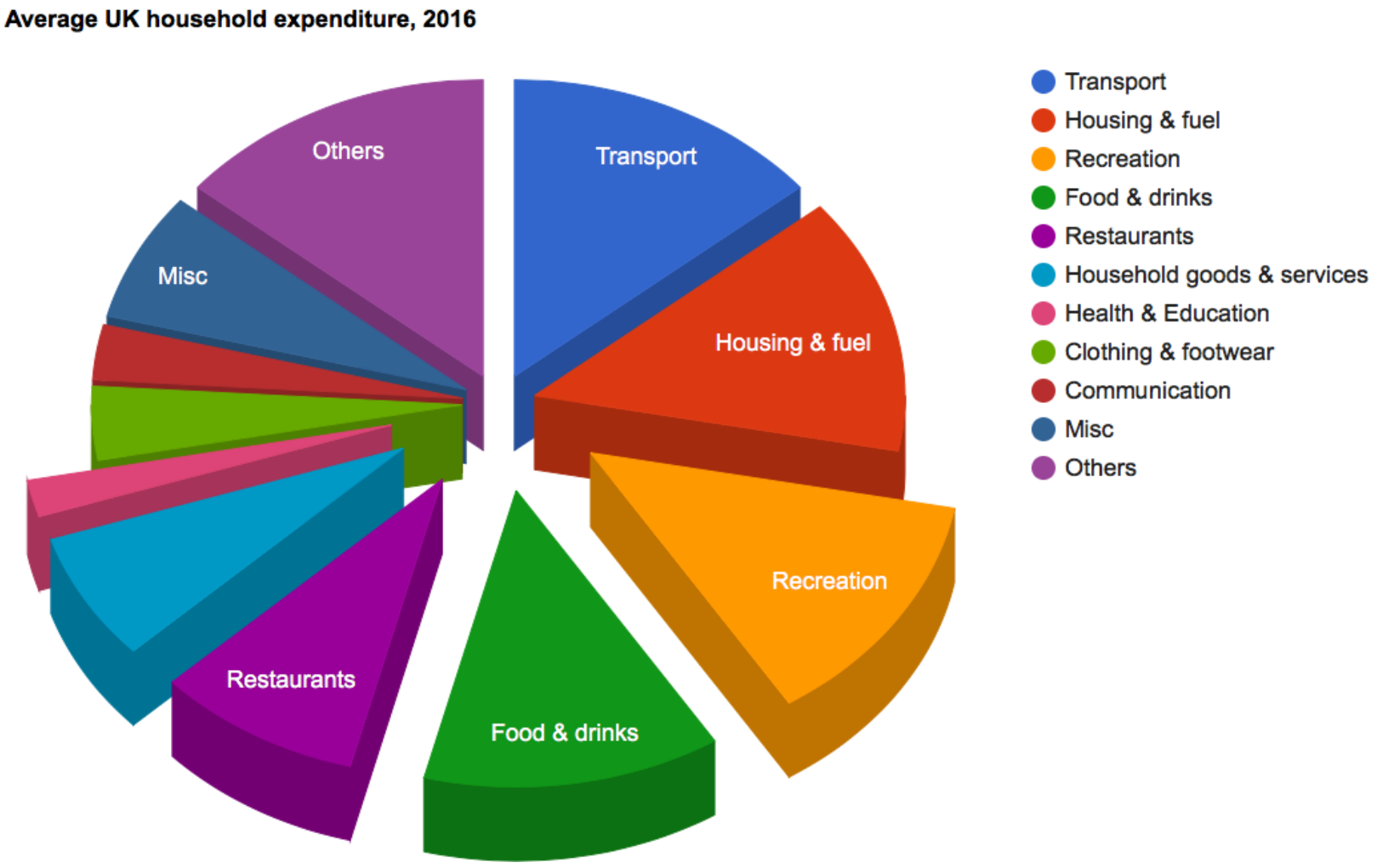
Pattern of demand

- How does demand of *good 1* depend on *price of good 1*?
- How does demand of *good 1* depend on *price of good 2, 3, . . .*
  - What if good 1 and good 2 are *substitutes*?
    - e.g., beer and cider, car and public transport
  - What if good 1 and good 3 are *complements*?
    - e.g., beer and crisps, car and petrol

UK Expenditure Data 2016



UK Expenditure Data 2016



Firms

Firms make decisions on two types of research.

Marketing research: products to produce and the price customers will buy it given available alternatives

Production decisions: How much will it cost to produce

What *technology* can they use and what technology their competitors are using.

Recall: Technology determines how a firm combines ideas, capital and workers to produce a product.

With all the information, they make decisions products, price and technology.

Concepts

Marginal rate of Substitution (MRS)

the rate at which a person is *willing to trade-off* one good for another

slope of the indifference curve

Marginal rate of transformation (MRT)

the rate at which quantity of one good can be *transformed* into another good

slope of the feasible frontier

Pareto Optimality

You can can't make someone better off without making someone else worse-off

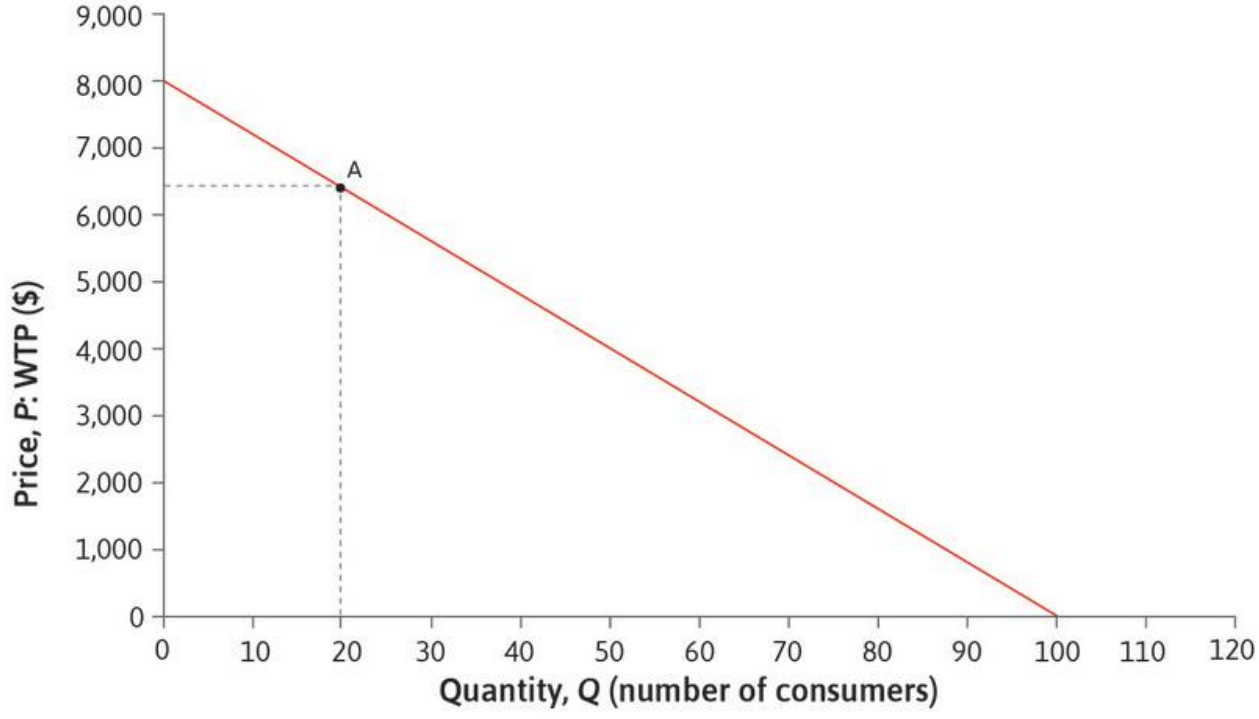
All *opportunities* that create *surplus* are exploited.

condition: MRS=MRT

Demand Curve

Demand curve: quantity that consumers will buy at each price

describes consumer's quantity-price trade-off



Firms can estimate the shape of the demand curve for products through market research.

Elasticity of Demand

Elasticity of demand convey information about consumers quantity price trade-off succinctly.

ε, the elasticity of demand measures how responsive the *quantity demanded* is to the *price of the good*.

$$\varepsilon = -\left(\frac{\%\text{ change in demand}}{\%\text{ change in price}}\right)$$

Demand is *elastic* if $\varepsilon > 1$ Demand is *inelastic* if $\varepsilon < 1$

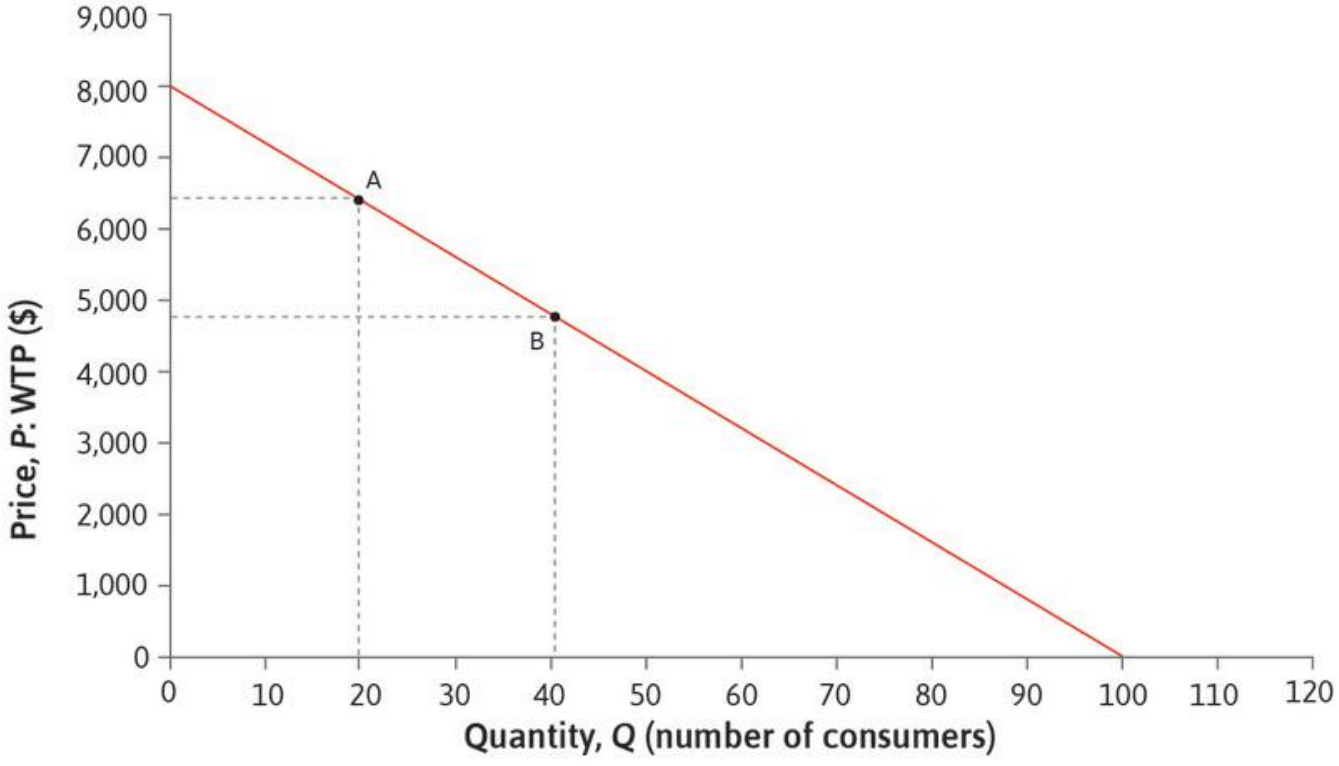
Calculating the *% change in quantity* and *% change in price*.

	A
P	6400
ΔP	-80
% change in P	-1.25%
	$\left(= \frac{-80}{6400} \times 100\right)$

	A
Q	20
ΔQ	1
% change in Q	5%
	$\left(= \frac{1}{20} \times 100\right)$

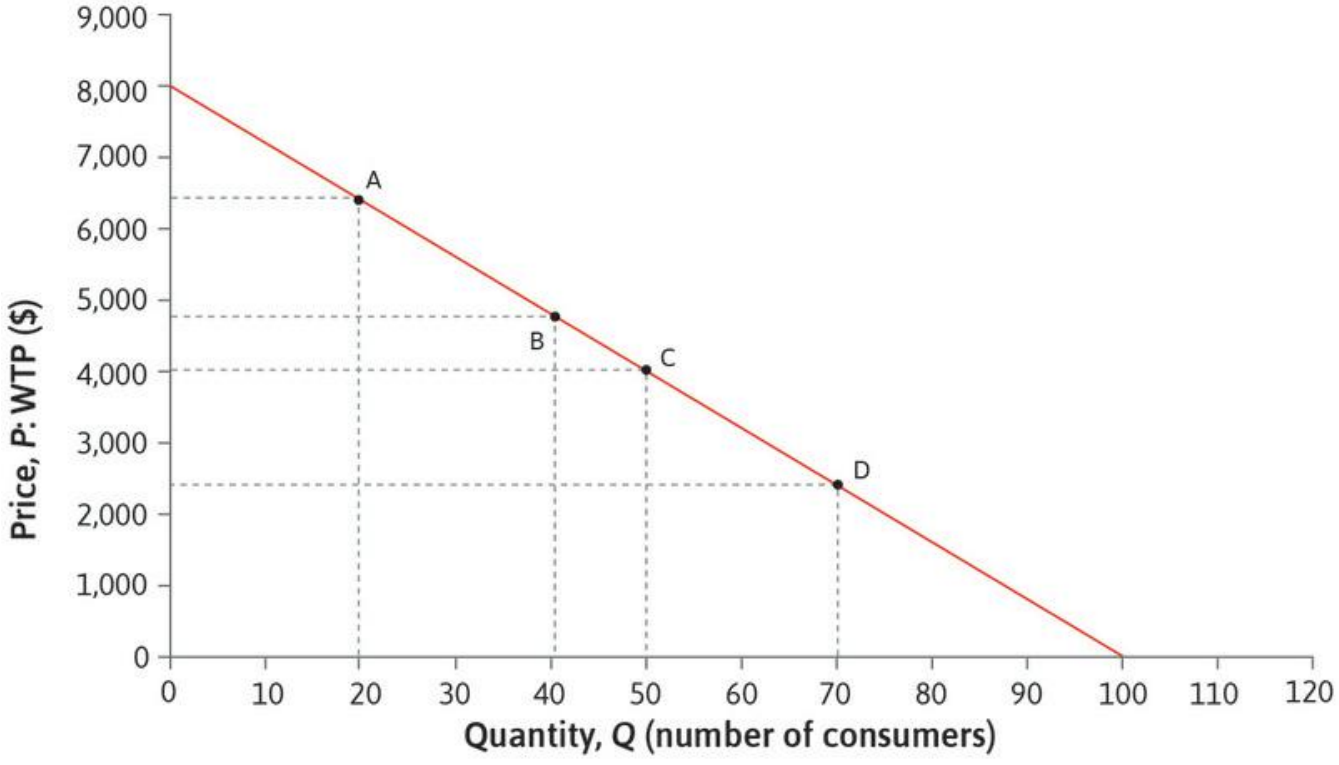
Calculating ε, *elasticity of demand* from *% change in quantity* and *% change in price*.

	A
ε, elasticity of demand	4.00
	$\left(= -\frac{5}{-1.25}\right)$



Why is elasticity of demand decreasing in quantity demanded?

	A	B
% change in Q	5.00	2.50
% change in P	-1.25	-1.67
Elasticity of Demand	4.00	1.50



Why is elasticity of demand decreasing in quantity demanded?

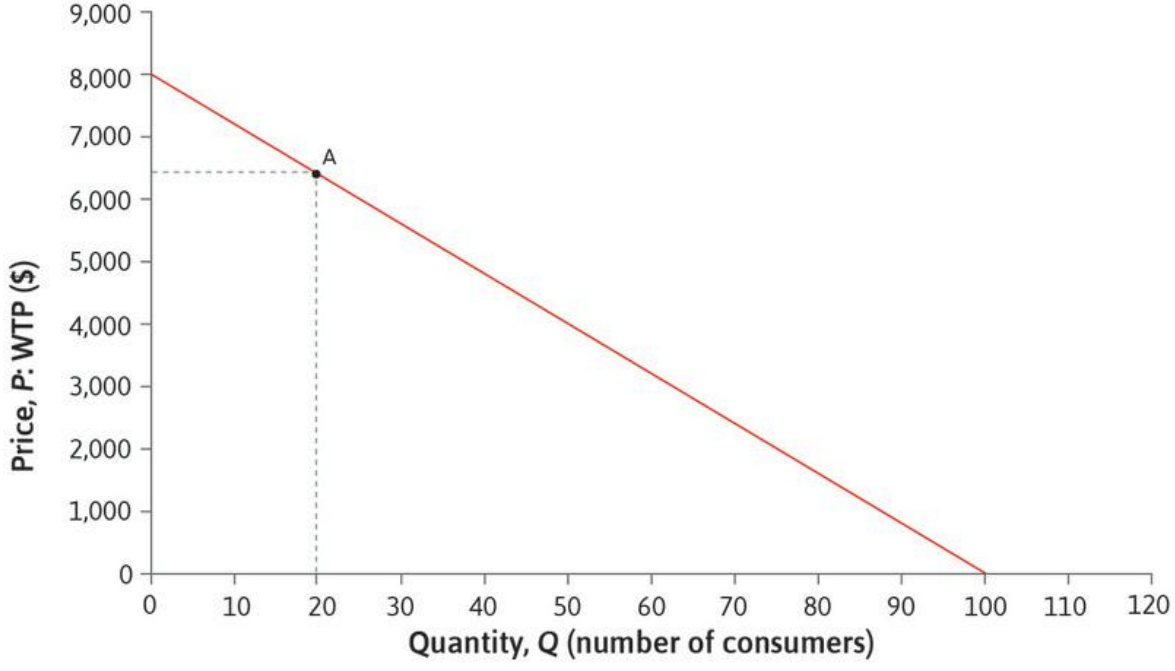
	A	B	C	D
% change in Q	5.00	2.50	2.00	1.43
% change in P	-1.25	-1.67	-2.00	-3.33
Elasticity of Demand	4.00	1.50	1.00	0.43

Marginal Revenue

Marginal revenue is the increase in seller's revenue if she sells an additional unit.

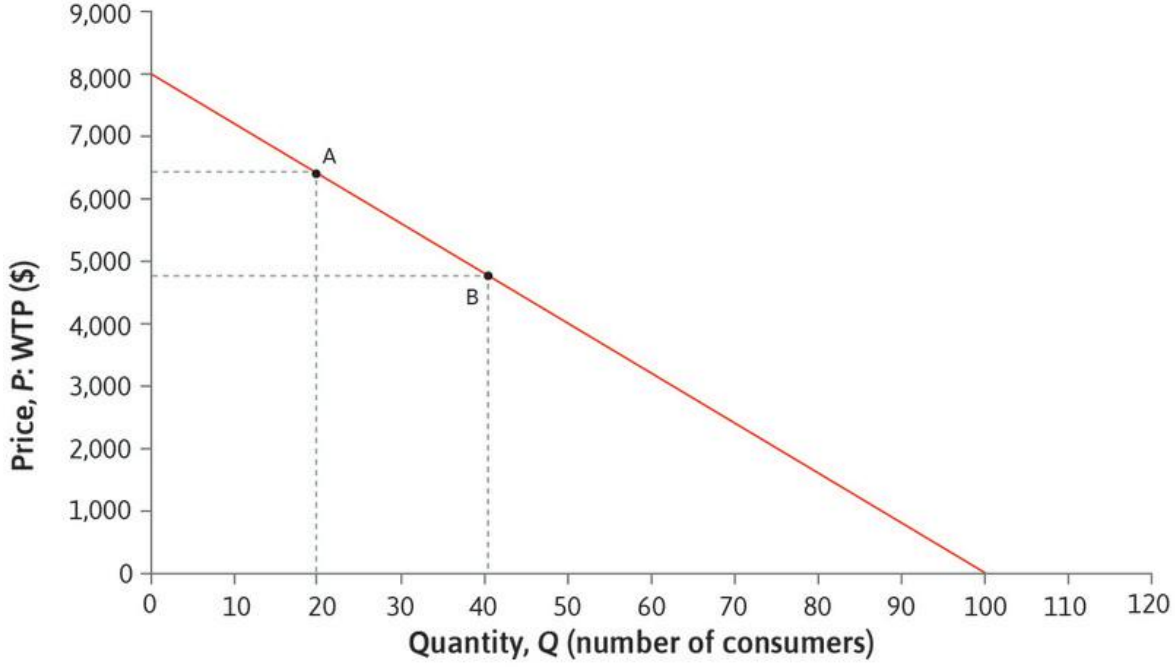
Marginal revenue	
positive	total revenue is *increasing* in quantity
zero	total revenue is *constant*
negative	total revenue is decreasing in quantity

Marginal Revenue



		A	
Price	6,480	6,400	6,320
Quantity	19	20	21
Total Revenue	123,120	128,000	132,720
Marginal Revenue		4880	4720

Marginal Revenue



		B	
Price	4,880	4,800	4,720
Quantity	39	40	41
Total Revenue	190,320	192,000	193,520
Marginal Revenue		1,680	1,520

Marginal Revenue and Elasticity

Marginal revenue is the increase in seller's revenue if she sells an additional unit.

MR		Elasticity
positive	total revenue is *increasing* in quantity	$\varepsilon > 1$
zero	total revenue is *constant*	$\varepsilon = 0$
negative	total revenue is decreasing in quantity	$\varepsilon < 1$

Marginal Revenue and Elasticity

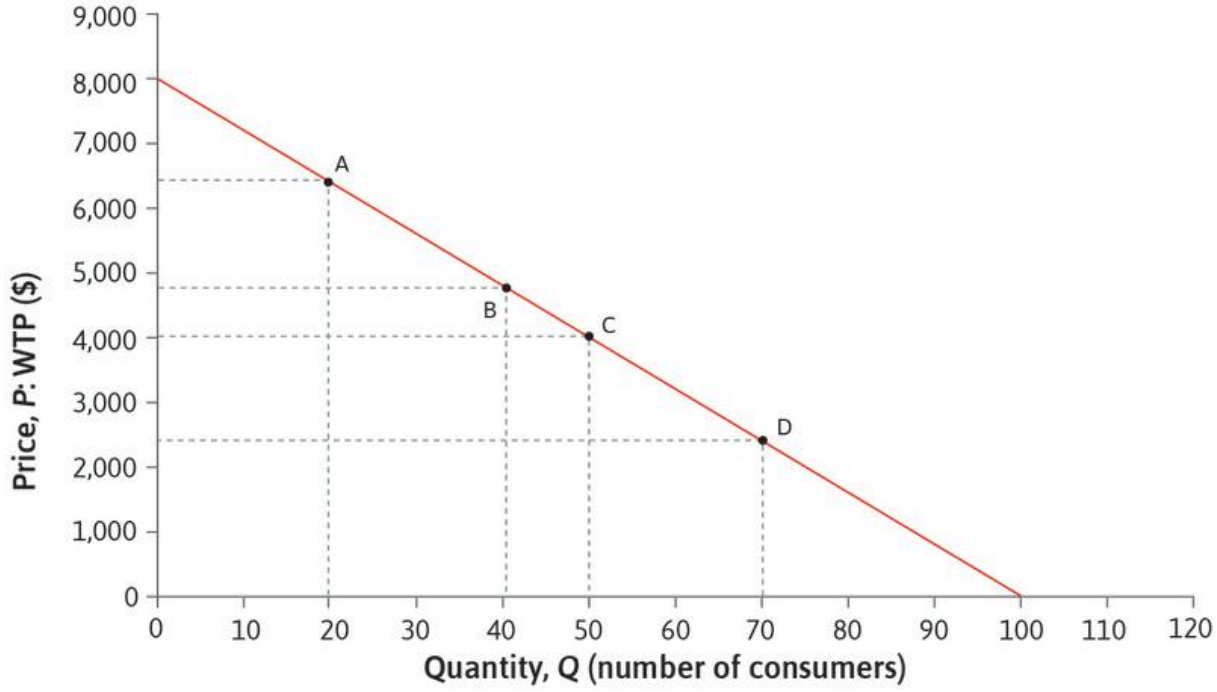
MR		Elasticity
positive	total revenue is *increasing* in quantity	$\varepsilon > 1$
zero	total revenue is *constant*	$\varepsilon = 0$
negative	total revenue is decreasing in quantity	$\varepsilon < 1$

$$\varepsilon = -\left(\frac{\%\text{ change in demand}}{\%\text{ change in price}}\right)$$

Intuition: if elasticity is 1, % change in price and % change in quantity are equal, implying *revenue change from decreasing price* will *equal revenue change from increasing quantity*. Hence, marginal revenue would be zero.

If $\varepsilon > 1$, revenue change from increasing quantity is greater than revenue changes from decreasing price. Hence, marginal revenue is positive.

Elasticity of Demand and Marginal Revenue



	A	B	C	D
% change in Q	5.00	2.50	2.00	1.43
% change in P	-1.25	-1.67	-2.00	-3.33
Elasticity of Demand	*4.00*	*1.50*	*1.00*	0.43
Marginal Revenue	*4,880*	*1,680*	*80*	-3,210

Scale of Production

Small scale: something that is done in a limited manner.

e.g., making cake at home

Large scale: something was done in a grand or big manner.

e.g., making cake in a large factory

Fixed costs: Costs that are sunk before you start producing something. These costs don't vary with the quantity produced

e.g. buying a oven, cake pans.

Variable costs: Costs that vary closely with quantity produced

e.g. flour, eggs, cream.

Returns to Scale

Constant returns to scale: if you increase all inputs by a certain proportion, the *output increases by the same proportion*.

e.g., if you double the inputs, the *output also doubles*

Increasing returns to scale: if you increase all inputs by a certain proportion, the *output increases by a greater proportion*.

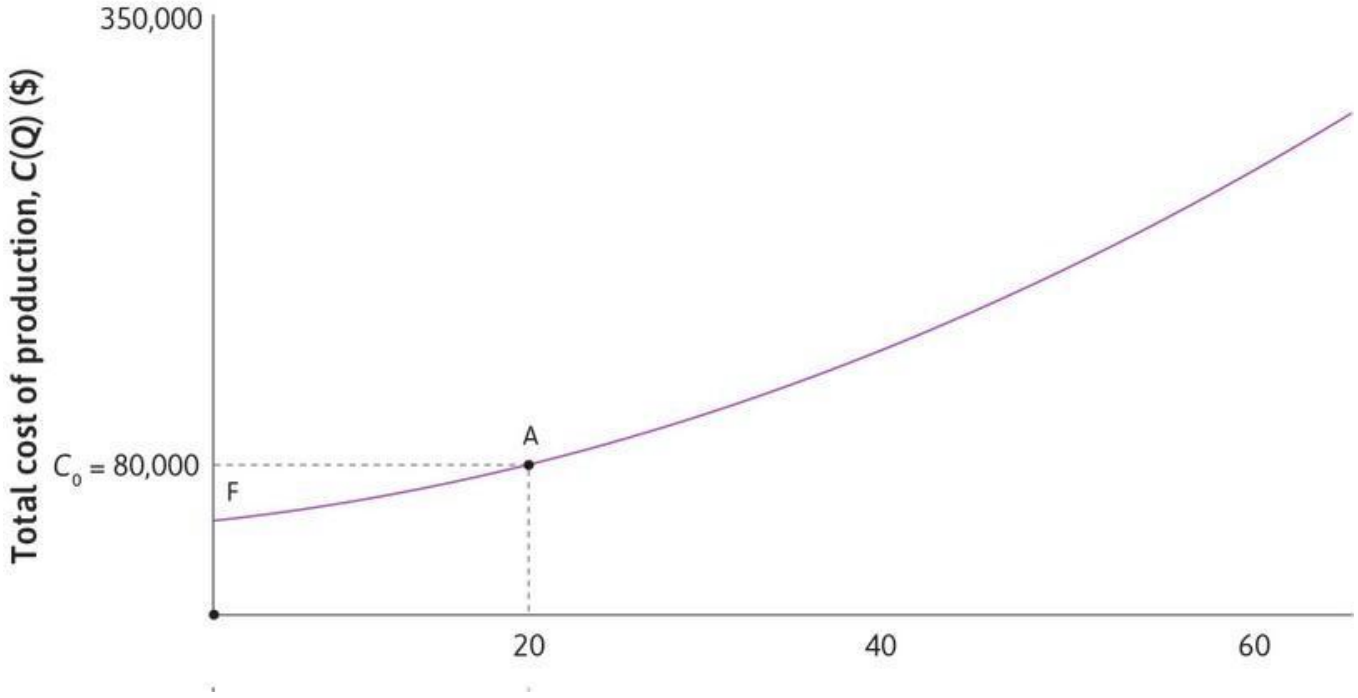
e.g., if you double the inputs, the *output more than doubles*

Decreasing returns to scale: if you increase all inputs by a certain proportion, the *output increases by a lesser proportion*.

e.g., if you double the inputs, the *output less than doubles*

Cost Function

Cost functions show how total production cost varies with quantity produced.



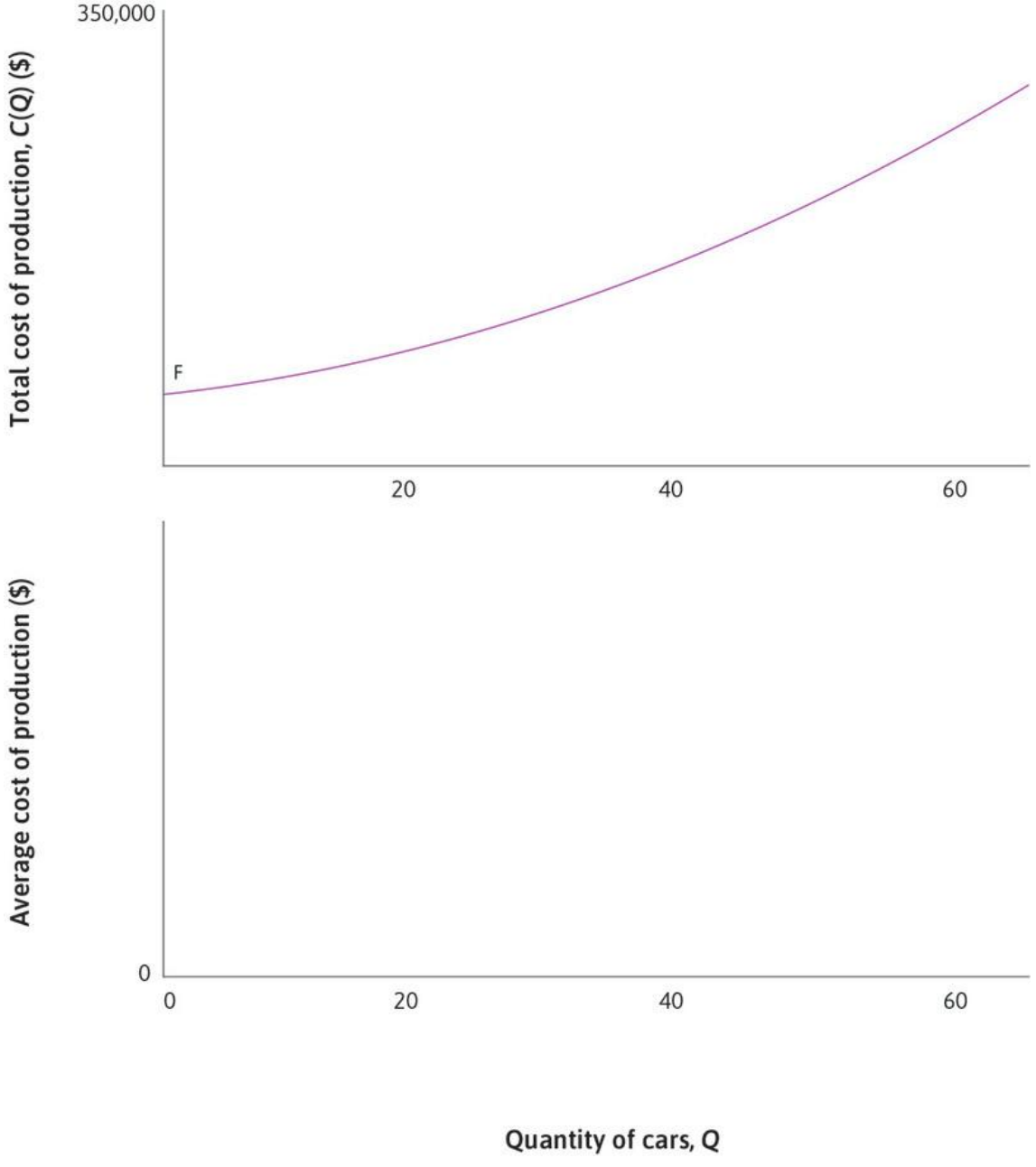
Cost Function

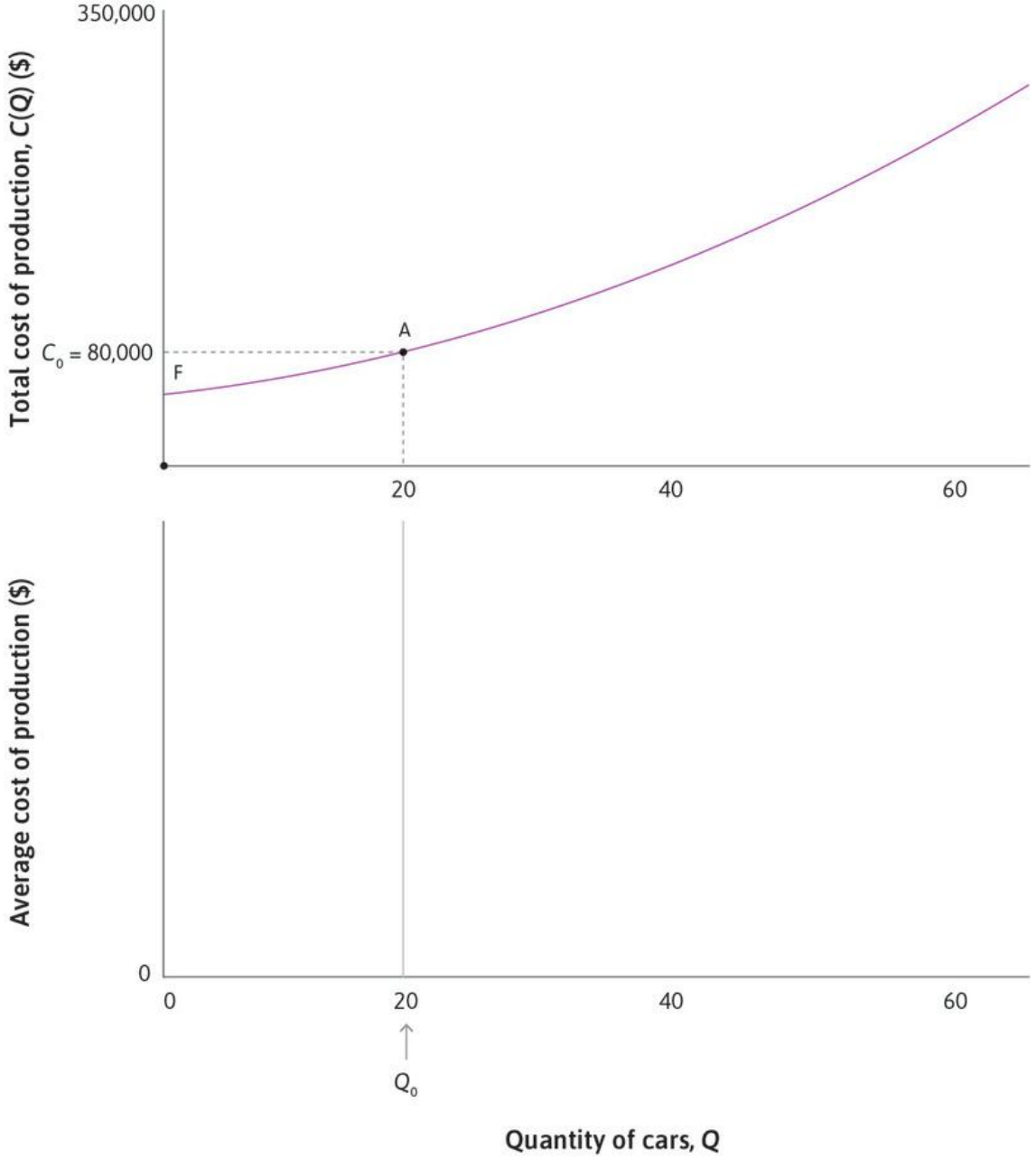
Cost functions show how total production cost varies with quantity produced.

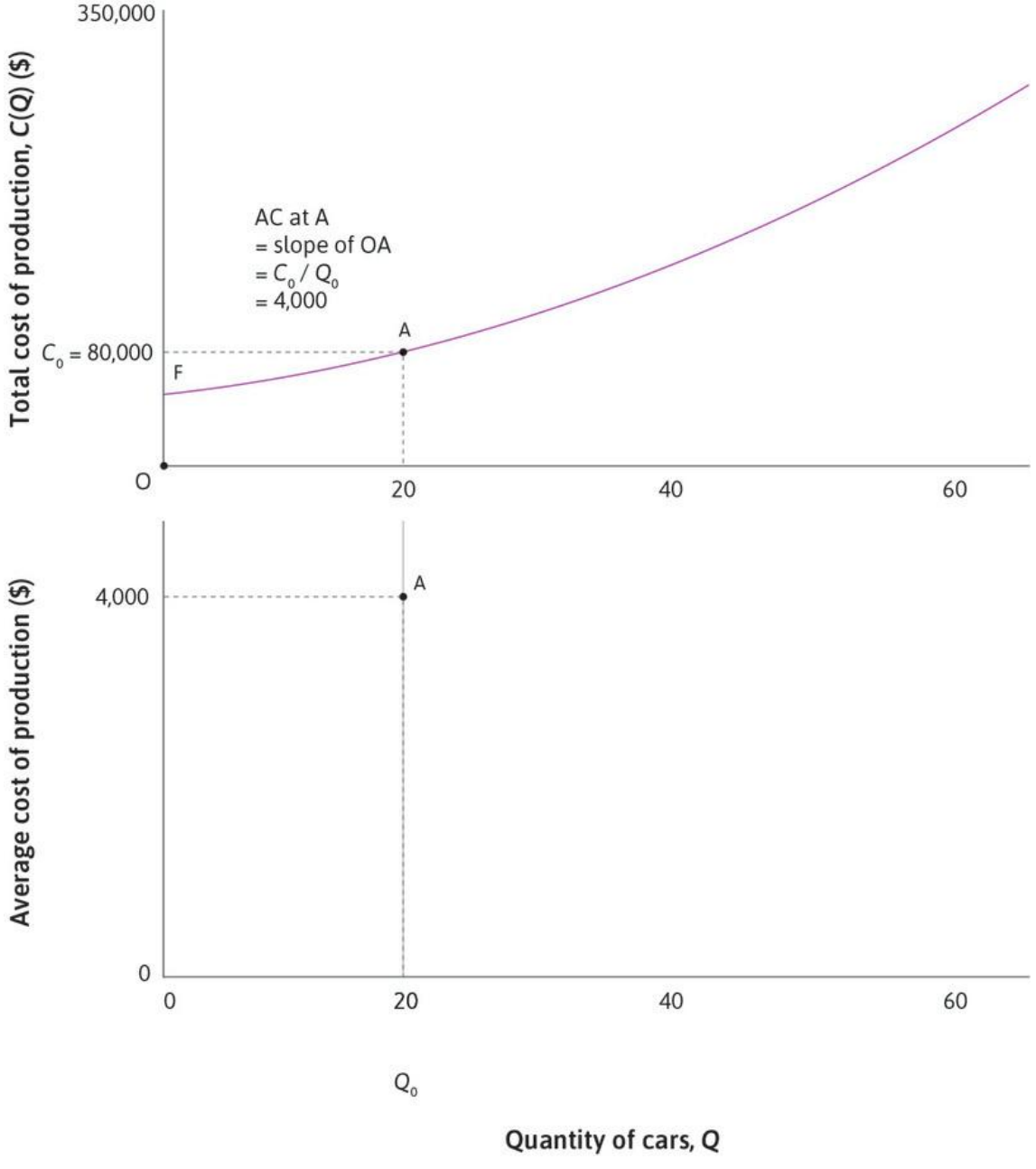
Average cost (AC) is the average cost per unit produced.

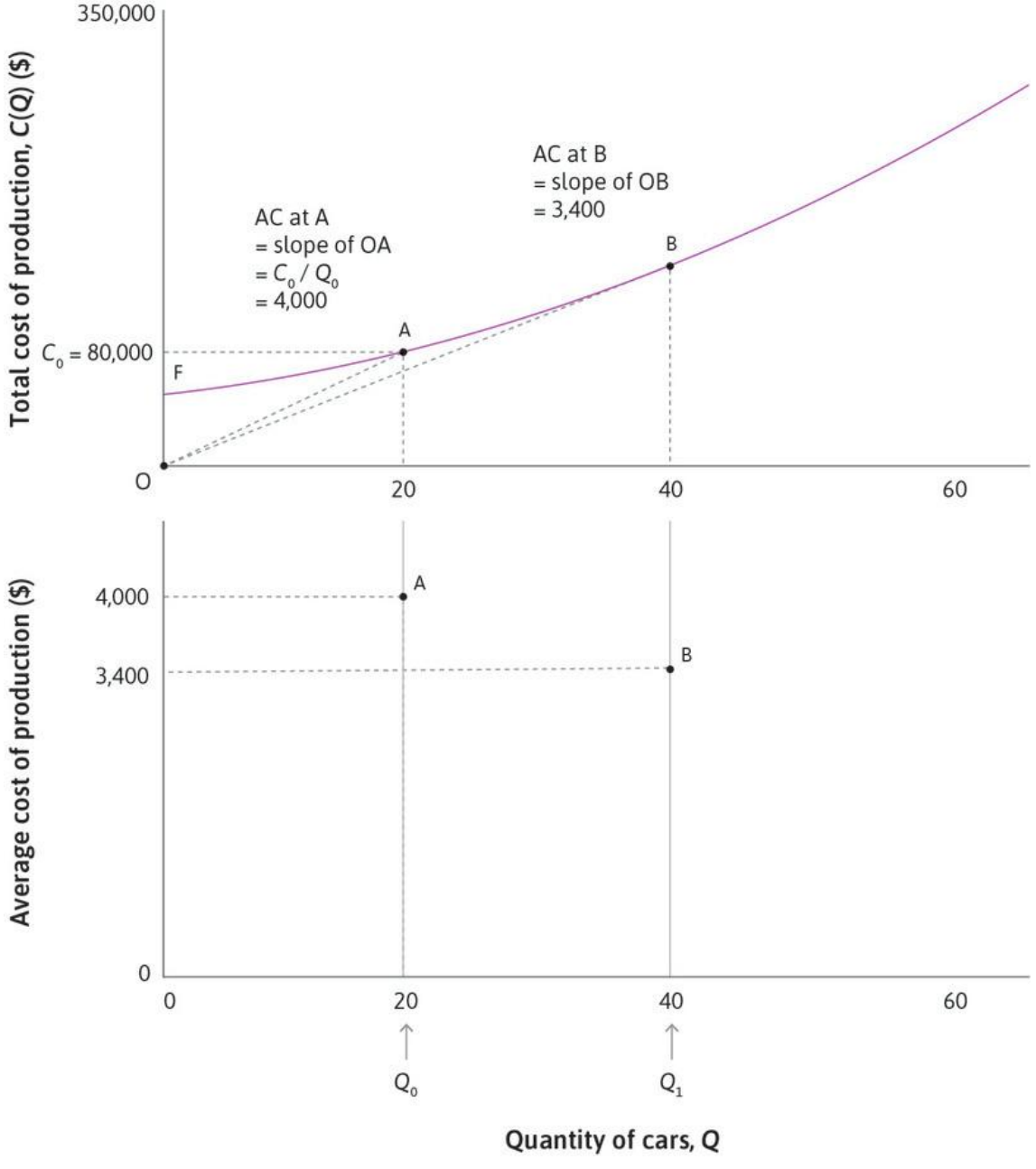
given by slope of the ray from origin to a given point on cost function.

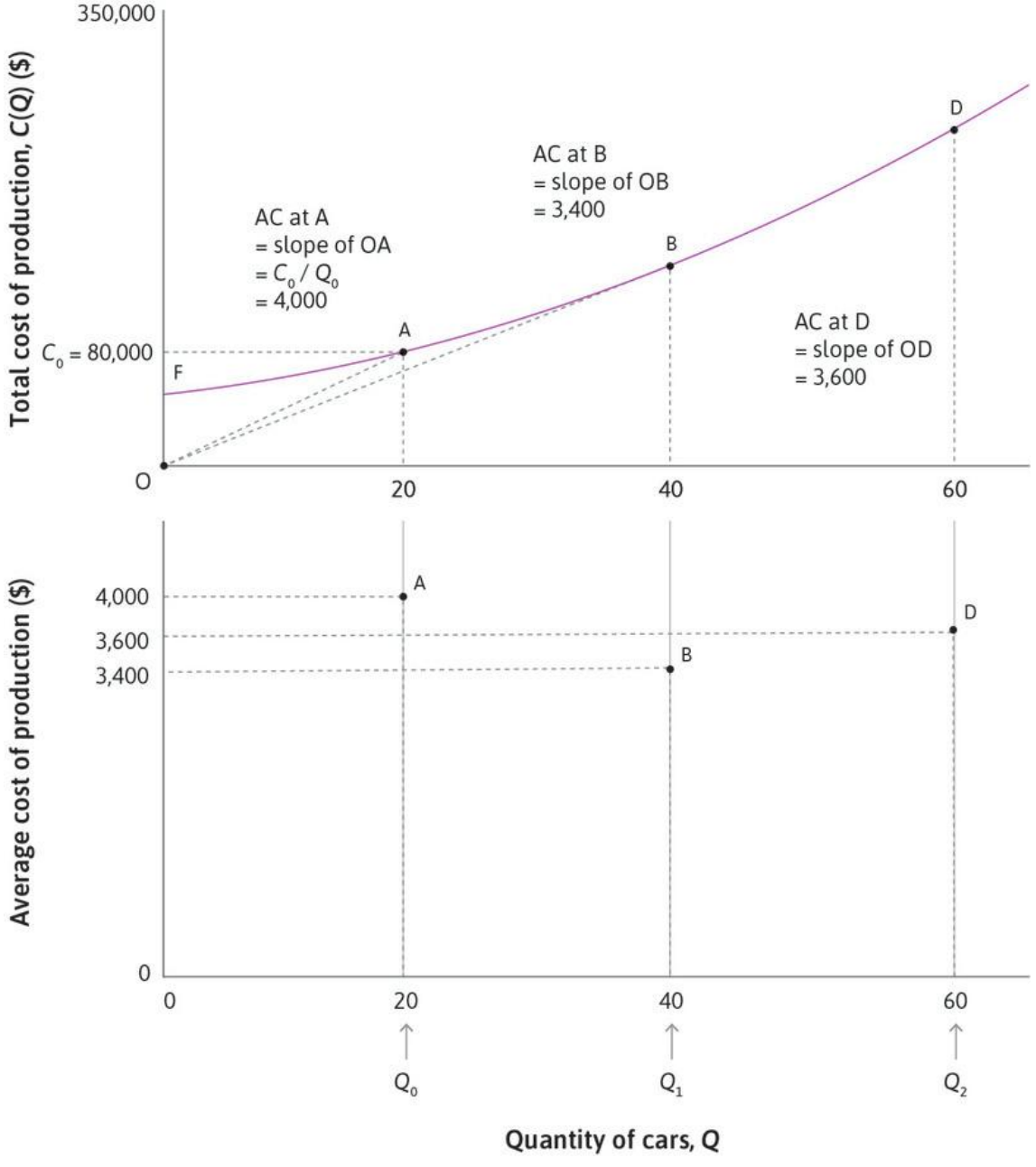
In this example, as quantity produced increases, average costs decrease at first (as fixed costs are divided by large quantities) but increase latter on (e.g. overworked labour, machine breakdown, management costs increase).

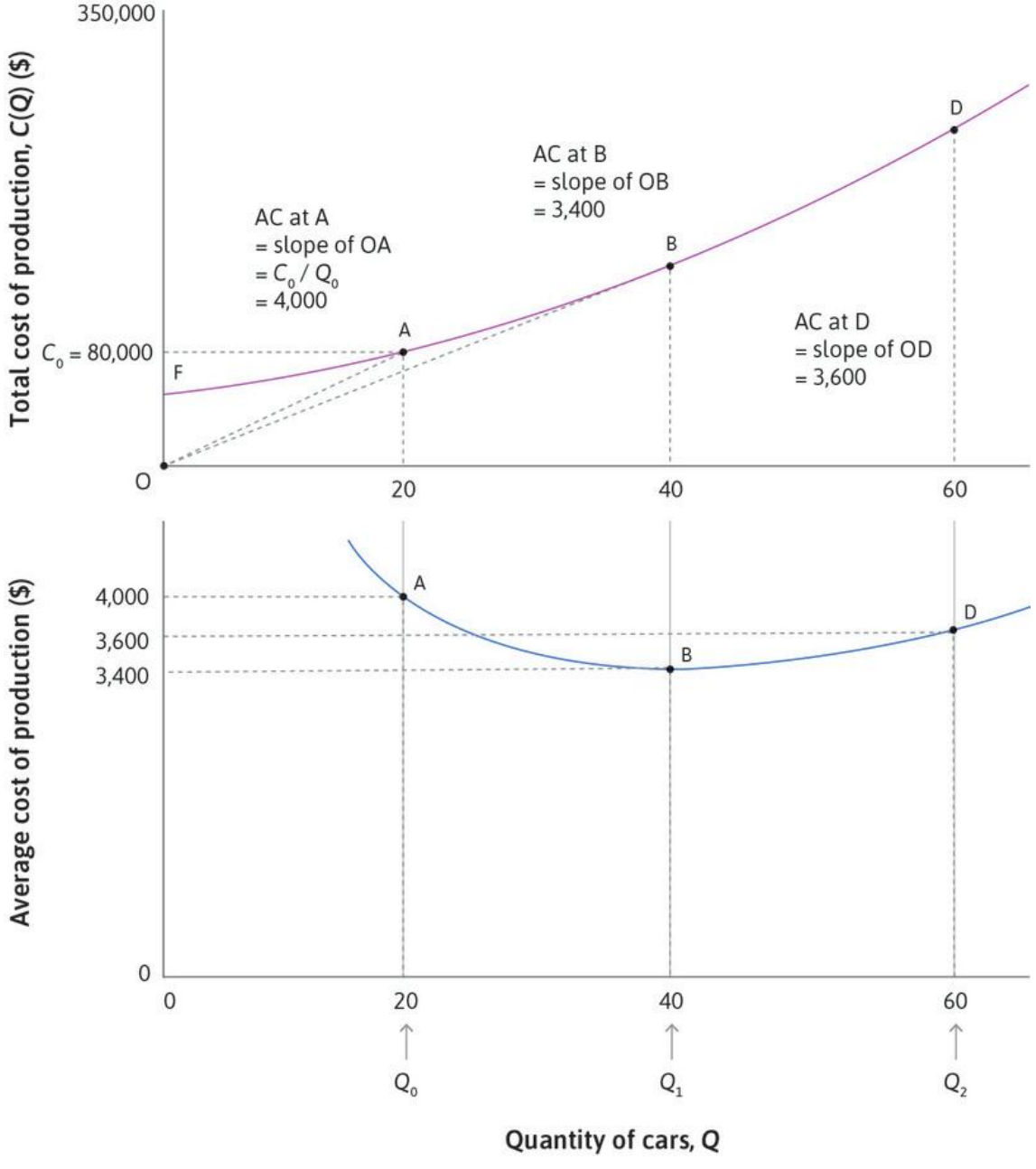

350,000
Total cost of production, C(Q) ($)
F
20
40
60
Average cost of production ($)
0
0
20
40
60
Quantity of cars, Q


350,000
Total cost of production, C(Q) ($)
C_0 = 80,000
A
F
20
40
60
Average cost of production ($)
0
0
20
40
60
Q_0
Quantity of cars, Q


350,000
Total cost of production, C(Q) ($)
AC at A
= slope of OA
= C_0 / Q_0
= 4,000
A
C_0 = 80,000
F
O
20
40
60
4,000
A
Average cost of production ($)
0
0
20
40
60
Q_0
Quantity of cars, Q


350,000
Total cost of production, C(Q) ($)
AC at A
= slope of OA
= C_0 / Q_0
= 4,000
AC at B
= slope of OB
= 3,400
B
A
C_0 = 80,000
F
O
20
40
60
Average cost of production ($)
4,000
3,400
A
B
0
0
20
40
60
Q_0
Q_1
Quantity of cars, Q


350,000
Total cost of production, C(Q) ($)
AC at A
= slope of OA
= C_0 / Q_0
= 4,000
AC at B
= slope of OB
= 3,400
AC at D
= slope of OD
= 3,600
D
B
A
C_0 = 80,000
F
O
20
40
60
Average cost of production ($)
4,000
3,600
3,400
0
Q_0
Q_1
Q_2
Quantity of cars, Q


350,000
Total cost of production, C(Q) ($)
AC at A
= slope of OA
= C_0 / Q_0
= 4,000
AC at B
= slope of OB
= 3,400
AC at D
= slope of OD
= 3,600
D
B
A
F
C_0 = 80,000
O
20
40
60
Average cost of production ($)
4,000
3,600
3,400
0
Q_0
Q_1
Q_2
Quantity of cars, Q

Cost Function

Cost functions show how total production cost varies with quantity produced.

Average cost (AC) is the average cost per unit produced.

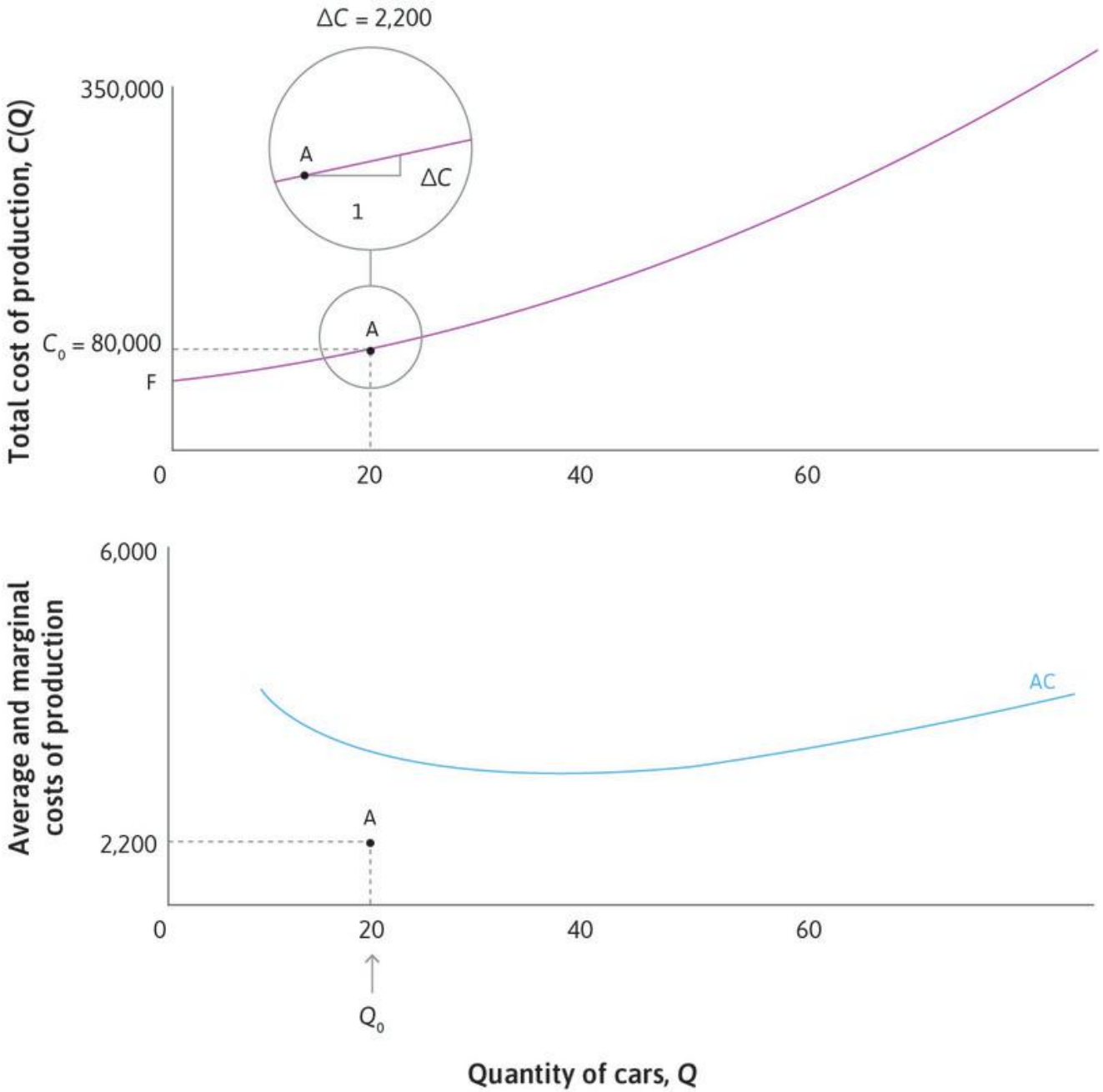
given by slope of the ray from origin to a given point on cost function.

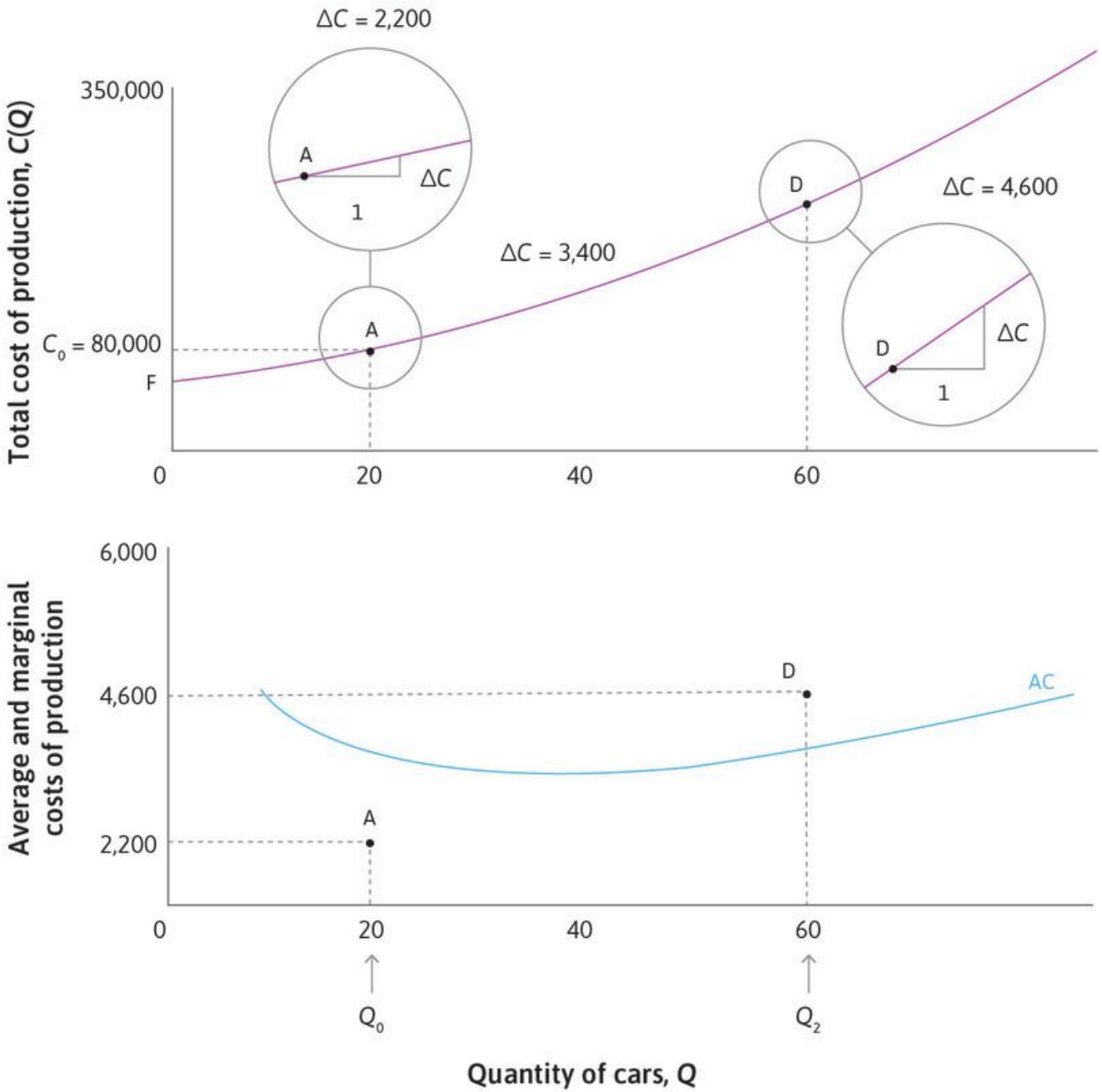
In this example, as quantity produced increases, average costs decrease at first (as fixed costs are divided by large quantities) but increase latter on (e.g. overworked labour, machine breakdown, management costs increase).

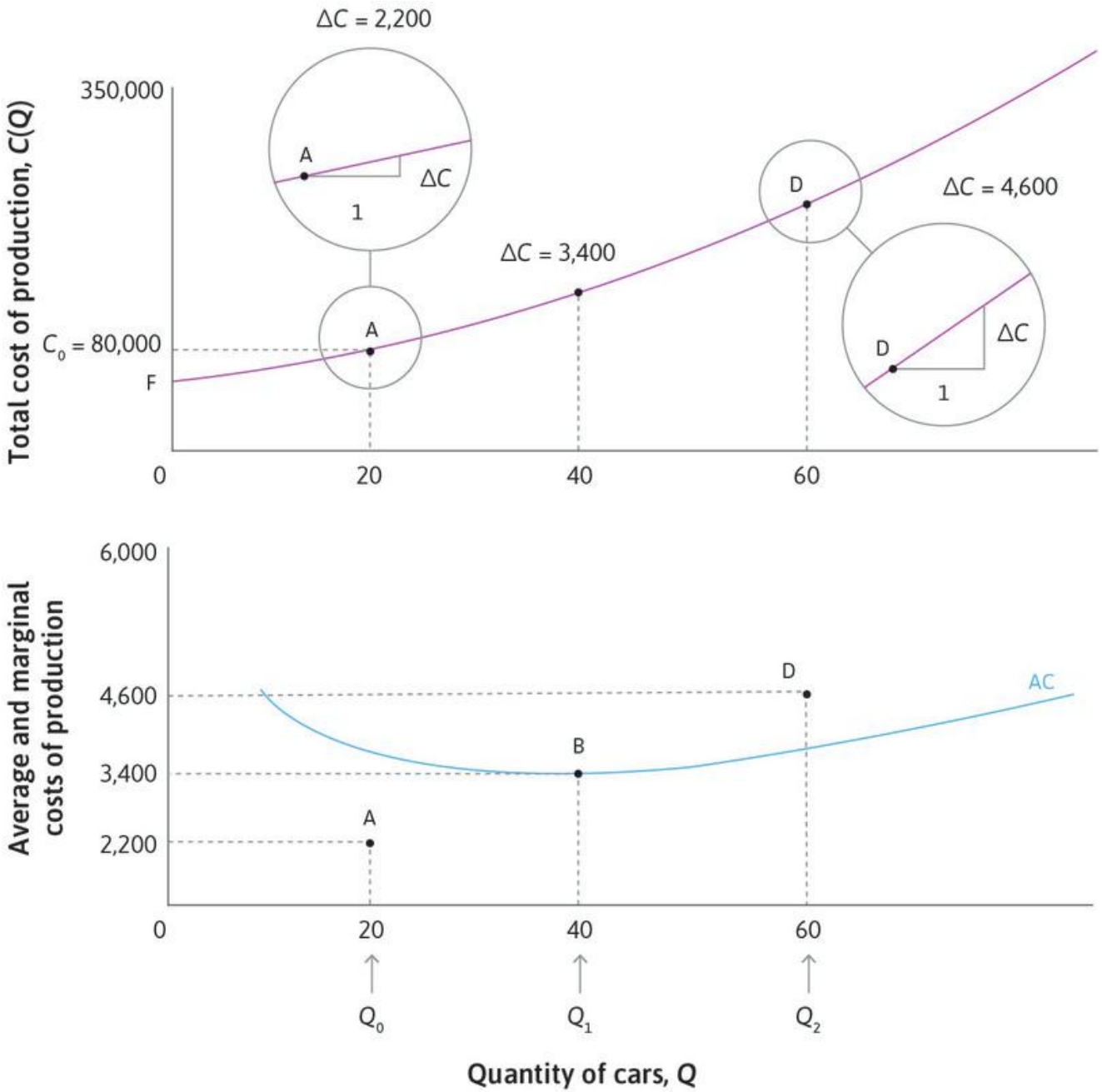
Marginal cost (MC): the effect on total cost of producing one additional unit of output.

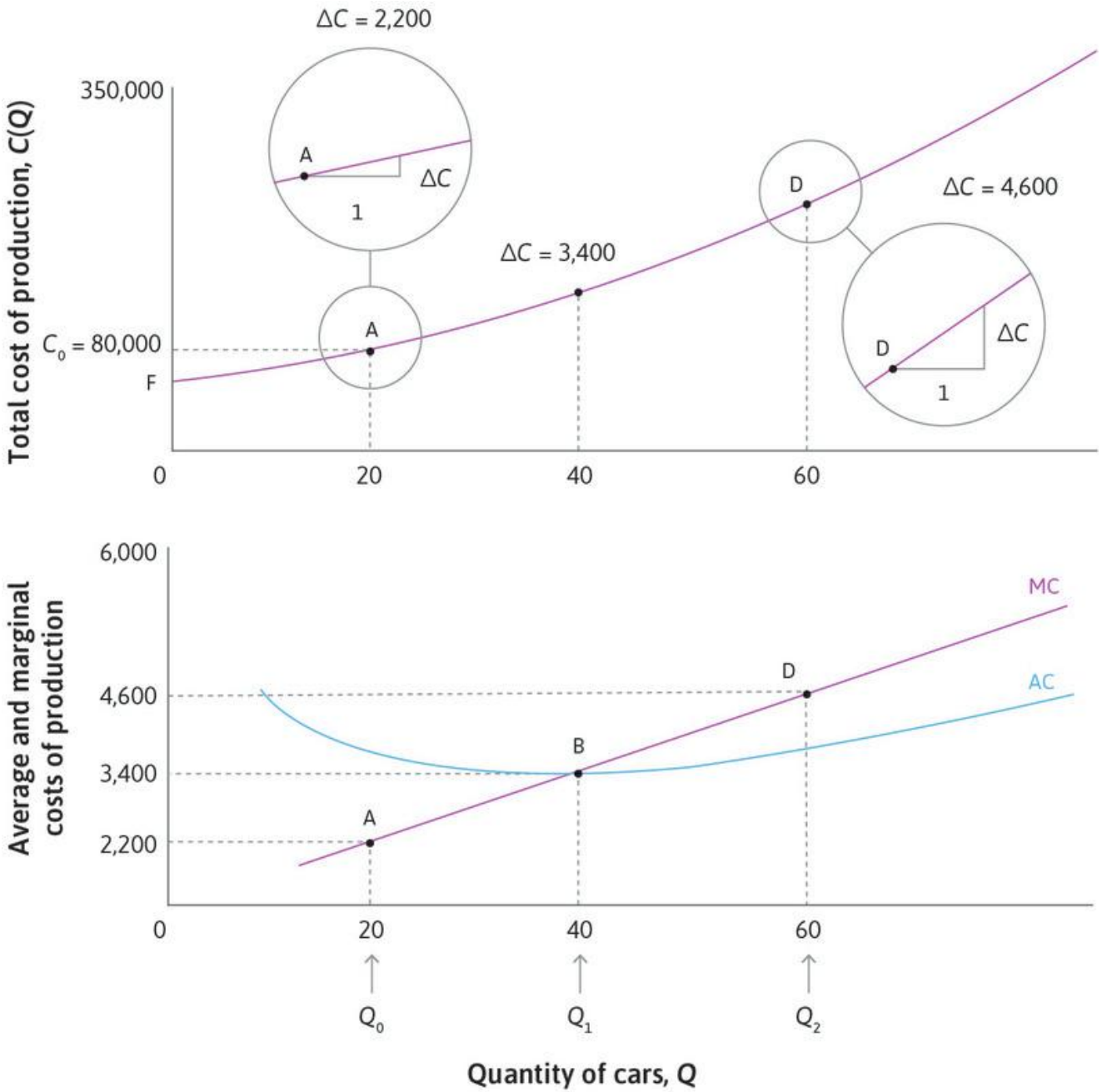
given by slope of the cost function at a given point.

In this example, marginal costs increases as quantity produced increases.

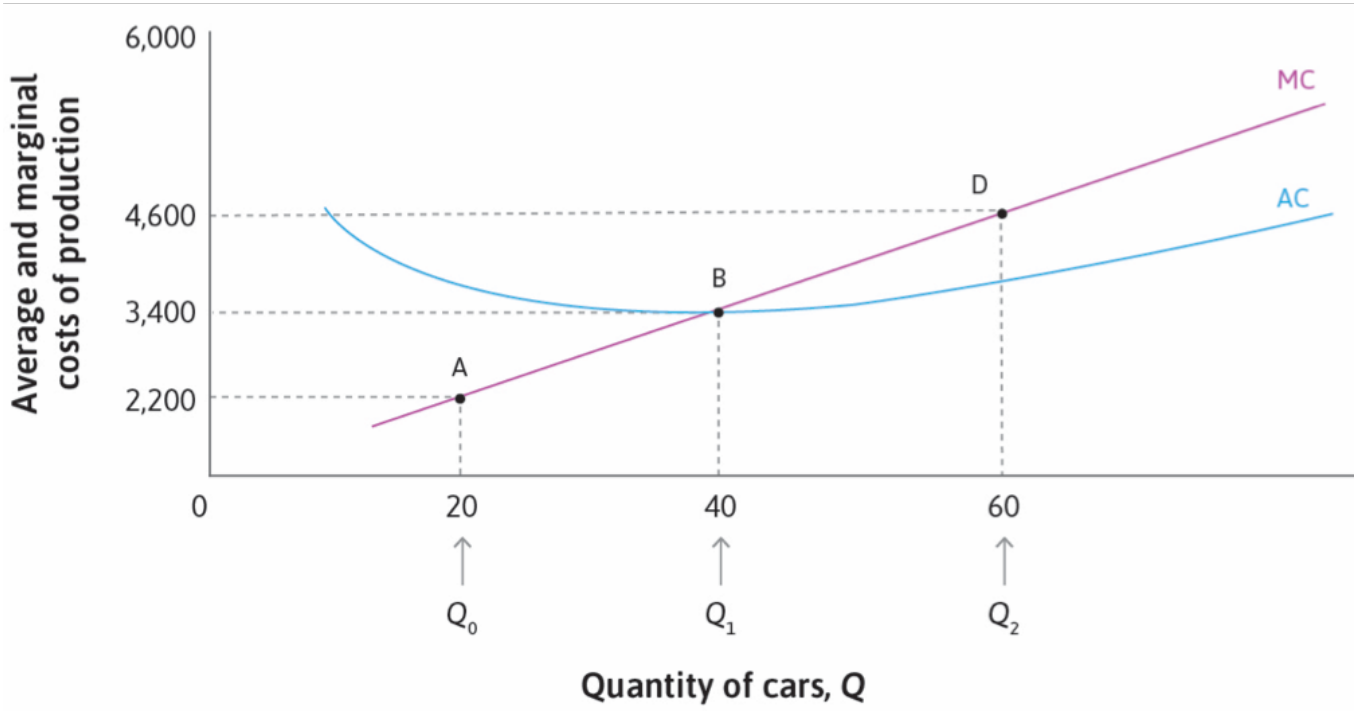

ΔC = 2,200
350,000
A
ΔC
1
A
C_0 = 80,000
F
Total cost of production, C(Q)
0
20
40
60
6,000
AC
A
2,200
Average and marginal costs of production
0
20
40
60
Q_0
Quantity of cars, Q


ΔC = 2,200
350,000
A
ΔC
1
ΔC = 3,400
D
ΔC = 4,600
A
D
ΔC
1
Total cost of production, C(Q)
C0 = 80,000
F
0
20
40
60
6,000
4,600
2,200
D
AC
A
Average and marginal costs of production
0
20
40
60
Q0
Q2
Quantity of cars, Q


ΔC = 2,200
350,000
A
ΔC
1
ΔC = 3,400
D
ΔC = 4,600
A
C_0 = 80,000
F
D
ΔC
1
Total cost of production, C(Q)
0
20
40
60
6,000
4,600
3,400
2,200
D
AC
B
A
0
20
40
60
Q_0
Q_1
Q_2
Average and marginal costs of production
Quantity of cars, Q


ΔC = 2,200
350,000
A
ΔC
1
ΔC = 3,400
D
ΔC = 4,600
A
C_0 = 80,000
F
D
ΔC
1
Total cost of production, C(Q)
0
20
40
60
6,000
MC
AC
4,600
D
B
3,400
A
2,200
Average and marginal costs of production
0
20
40
60
Q_0
Q_1
Q_2
Quantity of cars, Q

Relationship between MC and AC



Marginal cost pulls average cost towards itself

If MC < AC	*If MC > AC*
then AC is decreasing in Q	*then AC is increasing in Q*

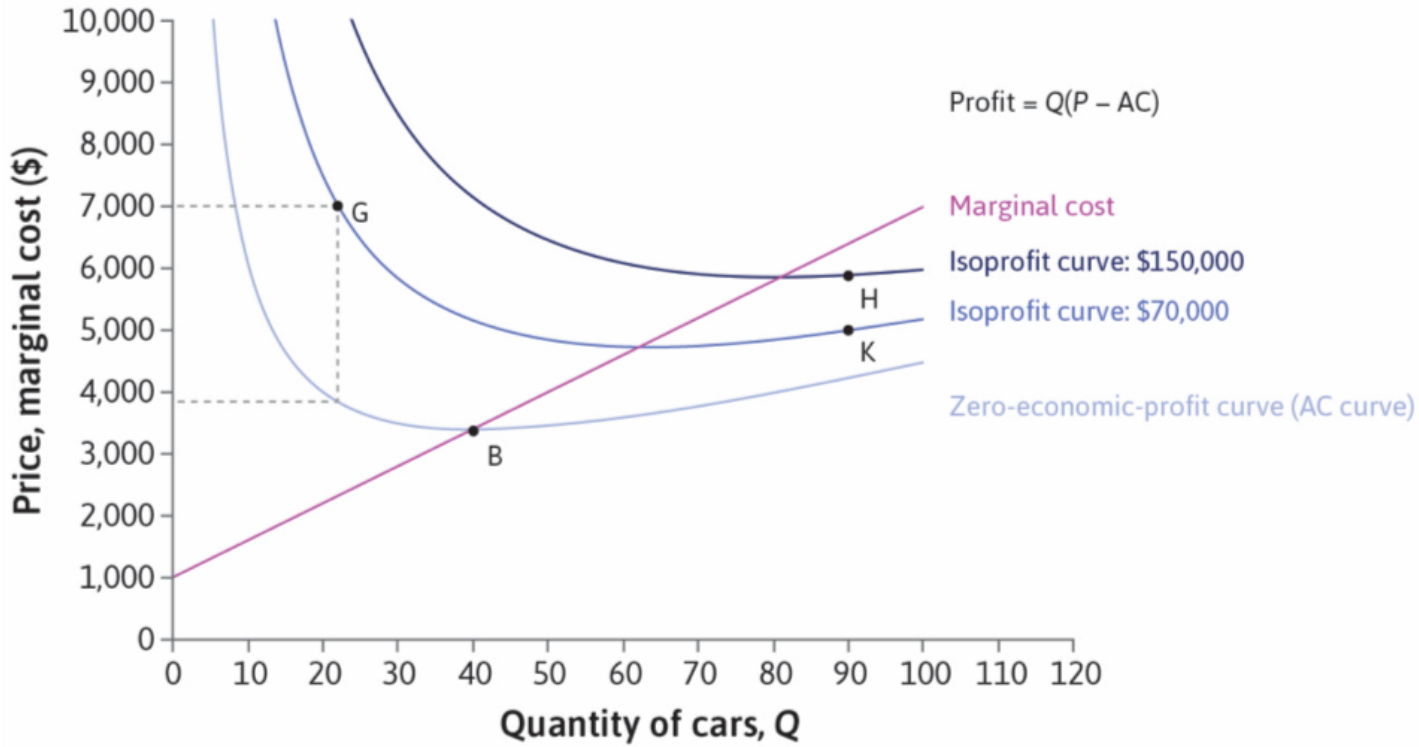
Profit Function

$$\begin{aligned}\text{Economic Profits} &= \textit{Total revenue} - \textit{Total costs} \\ &= \textit{Total revenue}\,(Q) - \textit{Total costs}\,(Q)\end{aligned}$$

Total Revenue	*Total Costs*	
	Fixed costs	*Variable costs*
Price $\times$ Quantity	Cost (opportunity) of capital	Wages cost of material

Iso-profit Curves

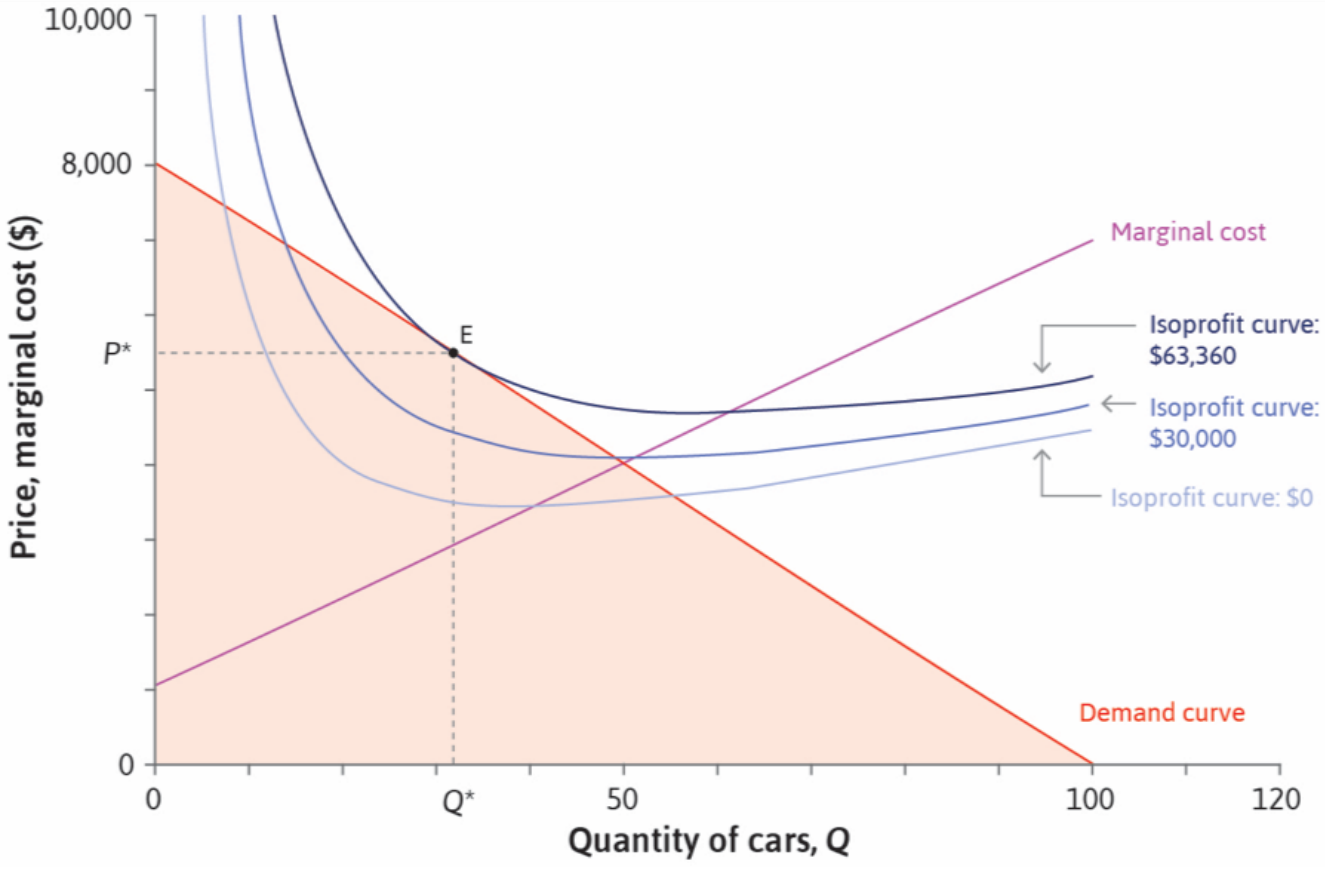
Iso-profit curves show *price-quantity combinations* that gives the producer a constant profit level.



Cost & revenue functions influences shape of iso-profit curves.

Demand curve	*Iso-profit curves*
firm's feasible frontier	*firm's* indifference curves
slope: MRT	*slope:* MRS

Firm maximises profit by choosing MRS=MRT

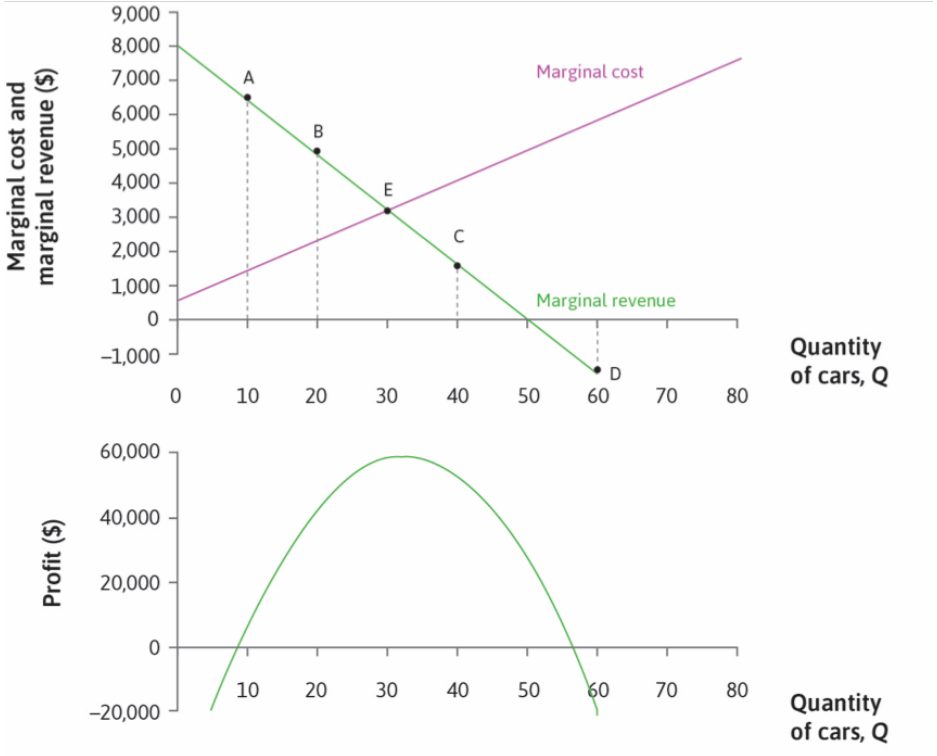


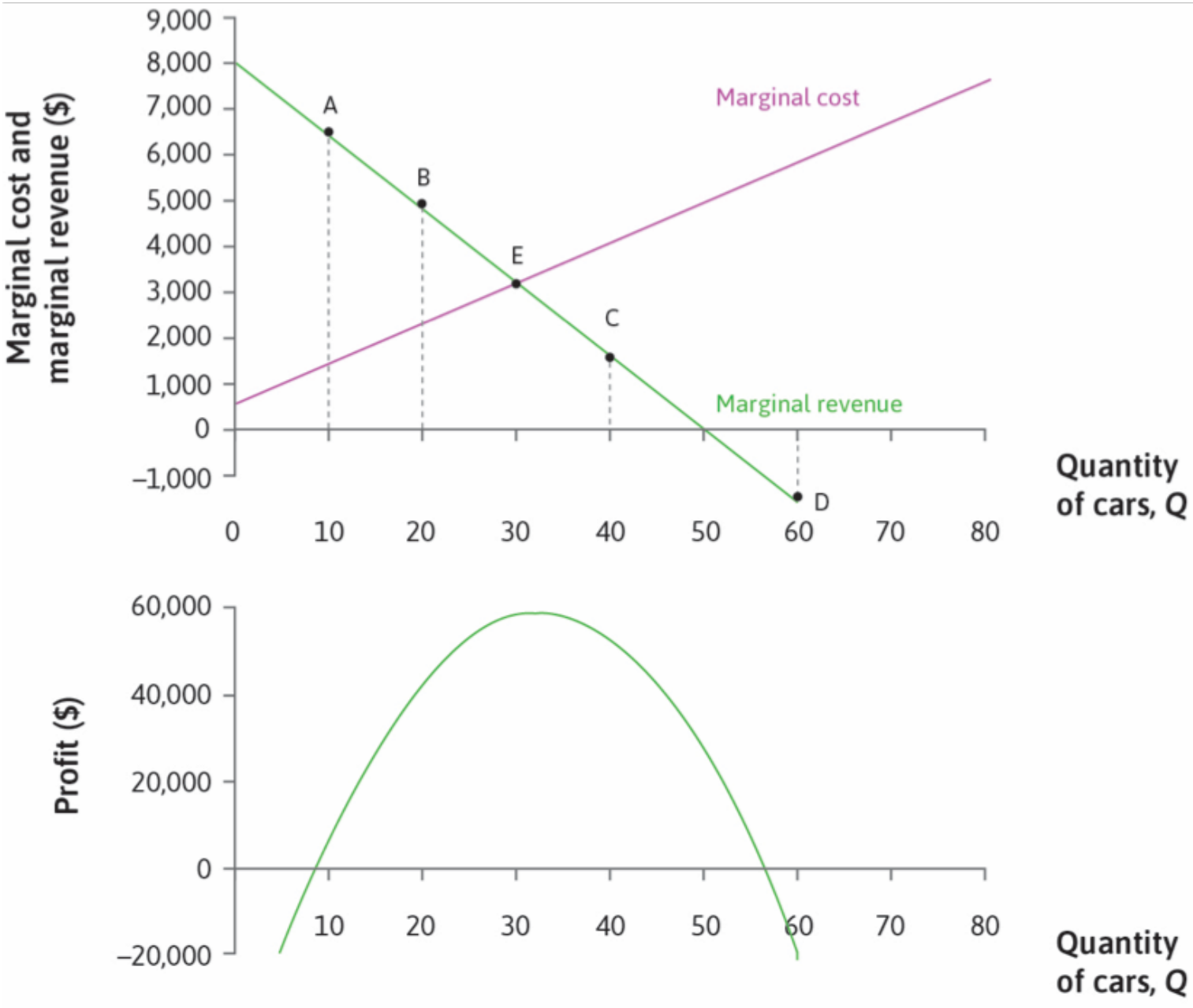
Profit maximisation from another perspective

Marginal revenue (MR) is the increase in revenue from selling an additional unit

Marginal cost (MC) is the cost of producing an additional unit.

Firm maximises profit by choosing MR=MC

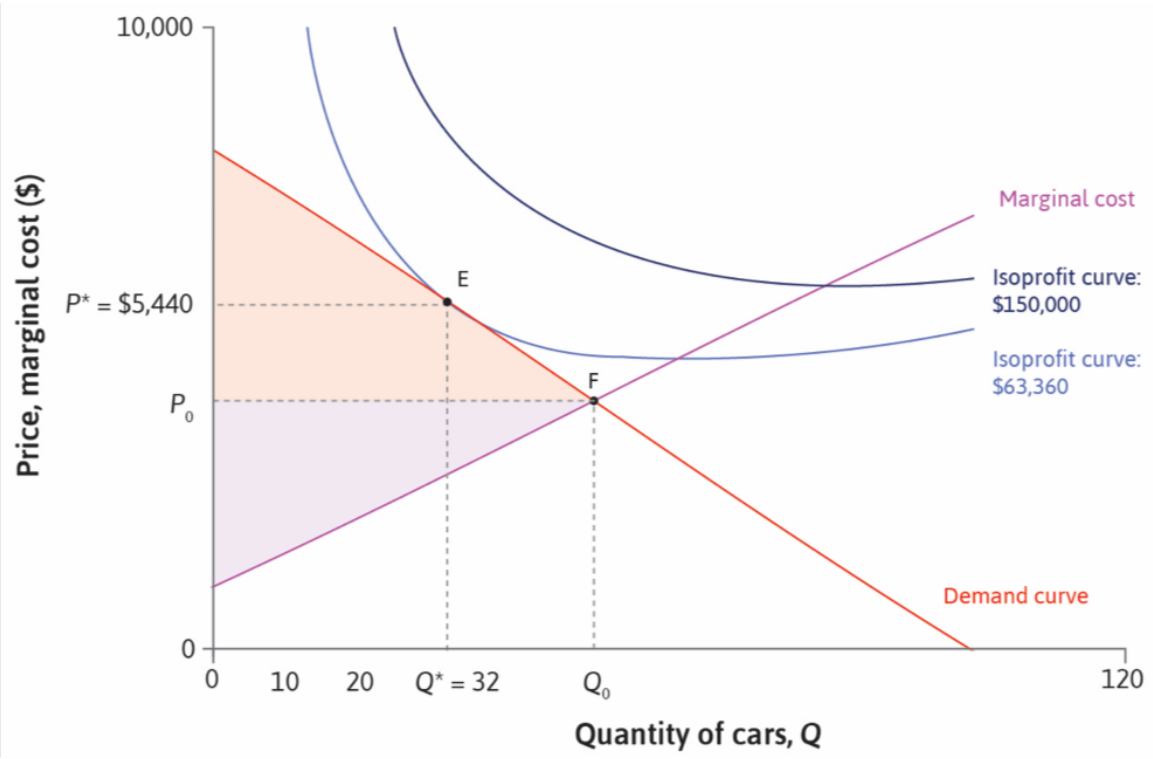



Marginal cost and marginal revenue ($)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
–1,000
A
B
E
C
D
Marginal cost
Marginal revenue
0
10
20
30
40
50
60
70
80
Quantity of cars, Q
Profit ($)
60,000
40,000
20,000
0
–20,000
10
20
30
40
50
60
70
80
Quantity of cars, Q

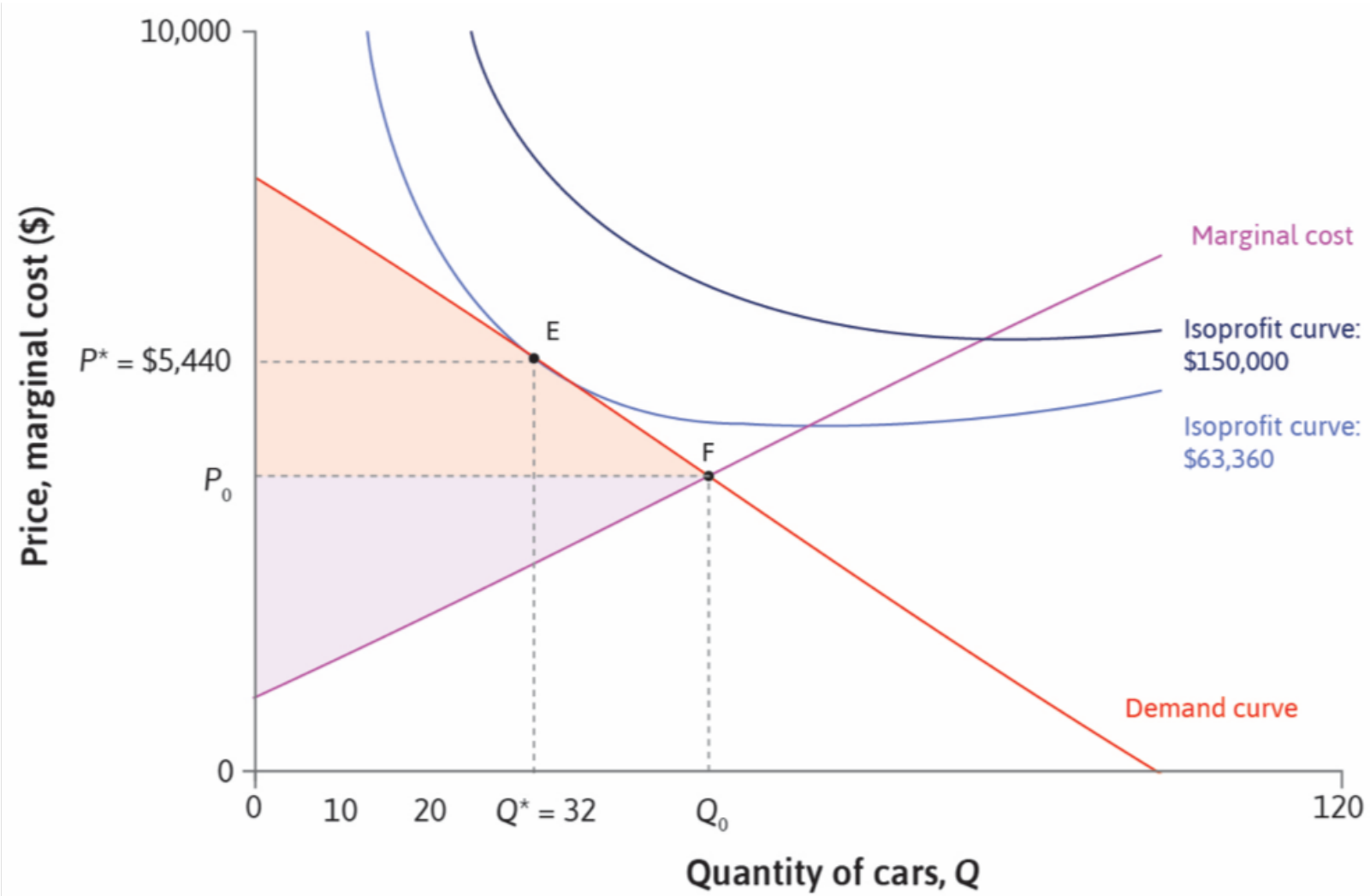
Consumer surplus (CS): the total difference between willingness-to-pay and purchase price

Producer surplus (PS): the total difference between revenue and marginal cost

$$\begin{aligned} \textit{Total surplus} &= \textit{Consumer surplus} + \textit{Producer surplus} \\ &= \textit{Total gains from trade} \end{aligned}$$

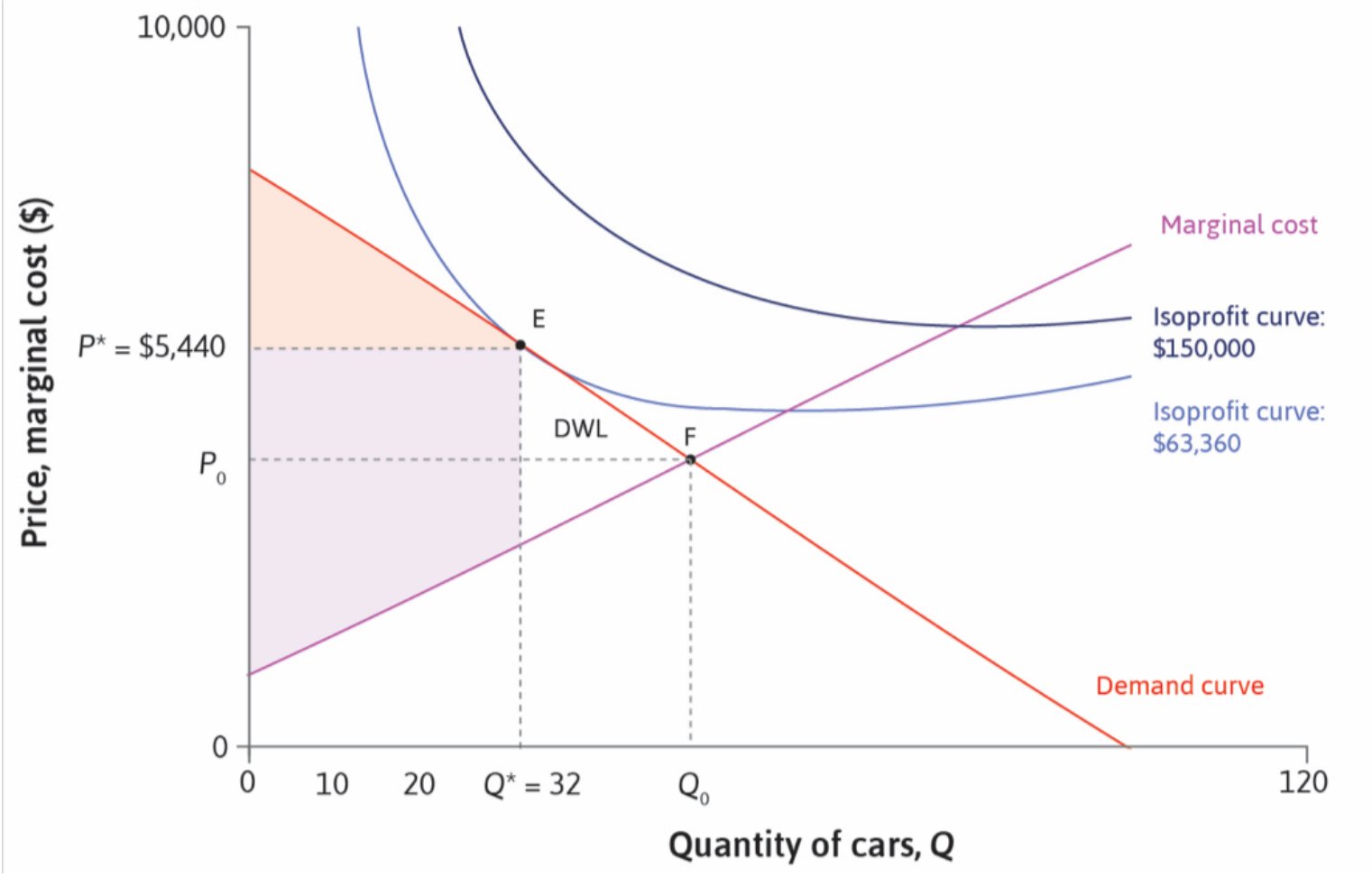


Gain from Trade



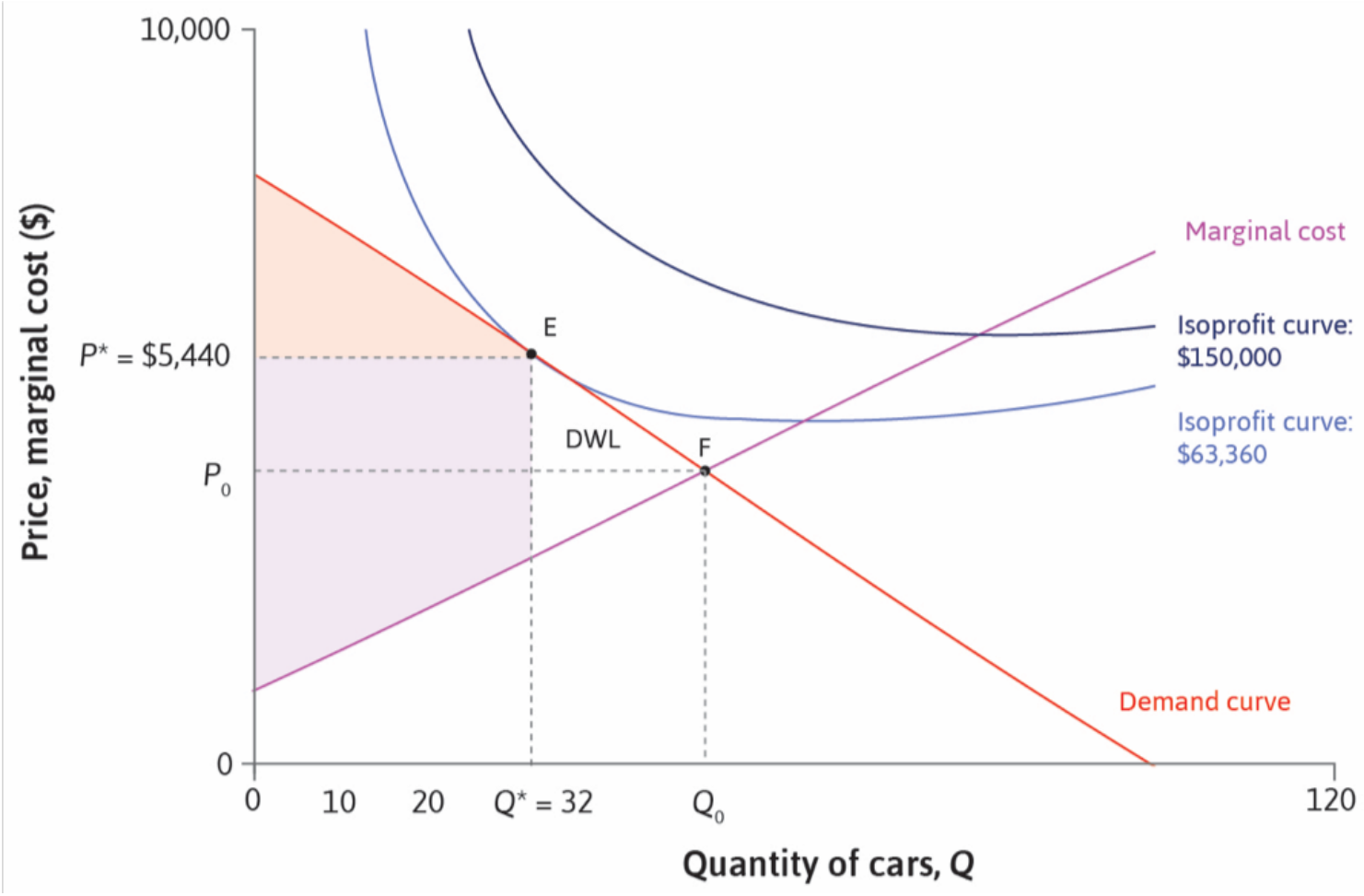
Deadweight loss is difference between current surplus (E) and the surplus in a *Pareto efficient allocation* (F)

Pareto efficient allocation is where demand meets the marginal cost



F is where society's surplus is maximised (*perfect competition*)

E is where the firm's profits are maximised (*monopoly*)

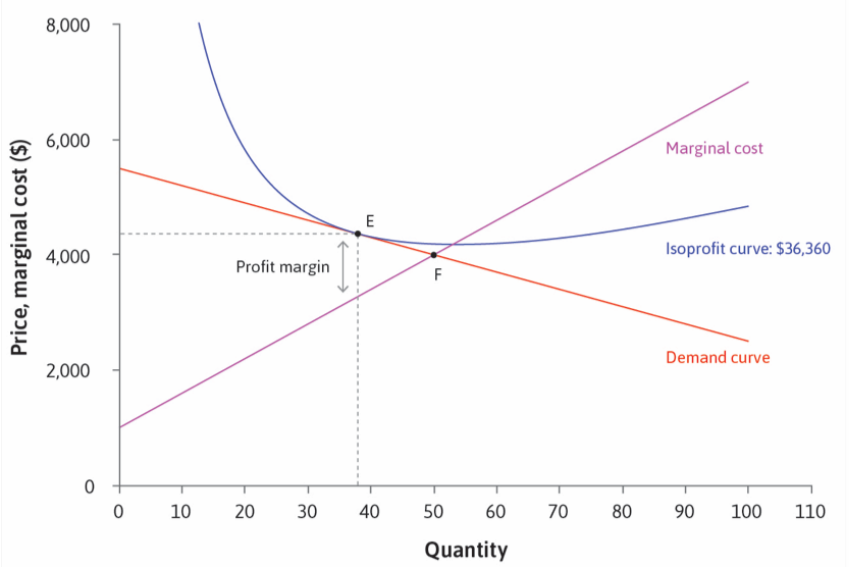


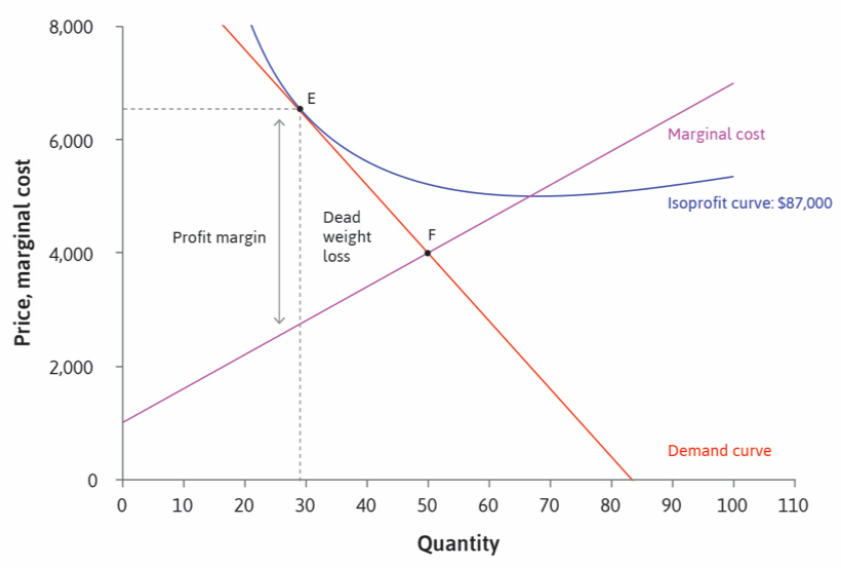
Elasticity and Deadweight loss

The *flatter* (more *elastic*) the *demand curve*,

the lower *firm's profit in monopoly* and

lower the *dead-weight loss*.





Market Power: Specialised Products

Example of market power: A firm selling specialised products.

They face *little competition* and hence have *inelastic demand*.

They can *set price above marginal cost* without losing customers, thus *earning monopoly rents*.

Deadweight loss results from the *inelasticity* of demand

Market Power: Innovator

Example of market power: A firm selling innovative products.

Innovation: Technological innovation can allow firms to differentiate their products from competitors' e.g. hybrid cars

Firms that invent a *completely new product* may prevent competition altogether through patents or copyright laws, e.g. iphone in 2007

Advertising: Firms can attract consumers away from competing products and create brand loyalty.

Both of these tactics can shift the firm's demand curve.

Market Power: Natural Monopolies

Example of market power: A natural monopoly

A *natural monopoly* arises when one firm can produce at lower average costs than two or more firms e.g. utilities like electricity, water.

Instead of encouraging competition, policymakers may put price controls or make these firms publicly owned or publicly regulated, e.g., railways.

Summary

Model of a *firm with market power*

- *Price* and *production* decisions depend on a firm's *demand curve* and *cost function*.
- *Profit-maximising choice* where MRS = MRT
- Or, in terms of *revenue* and *costs*, where MR = MC

Surplus measures the *gains from trade*

- Total surplus = Producer surplus + Consumer surplus
- Price elasticity of demand affects surplus and profits
- *Deadweight loss* when allocation is not Pareto efficient