The Firm and Its Customers

Module BCPM 0052: Projects, Economics and Behaviour

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This Lecture

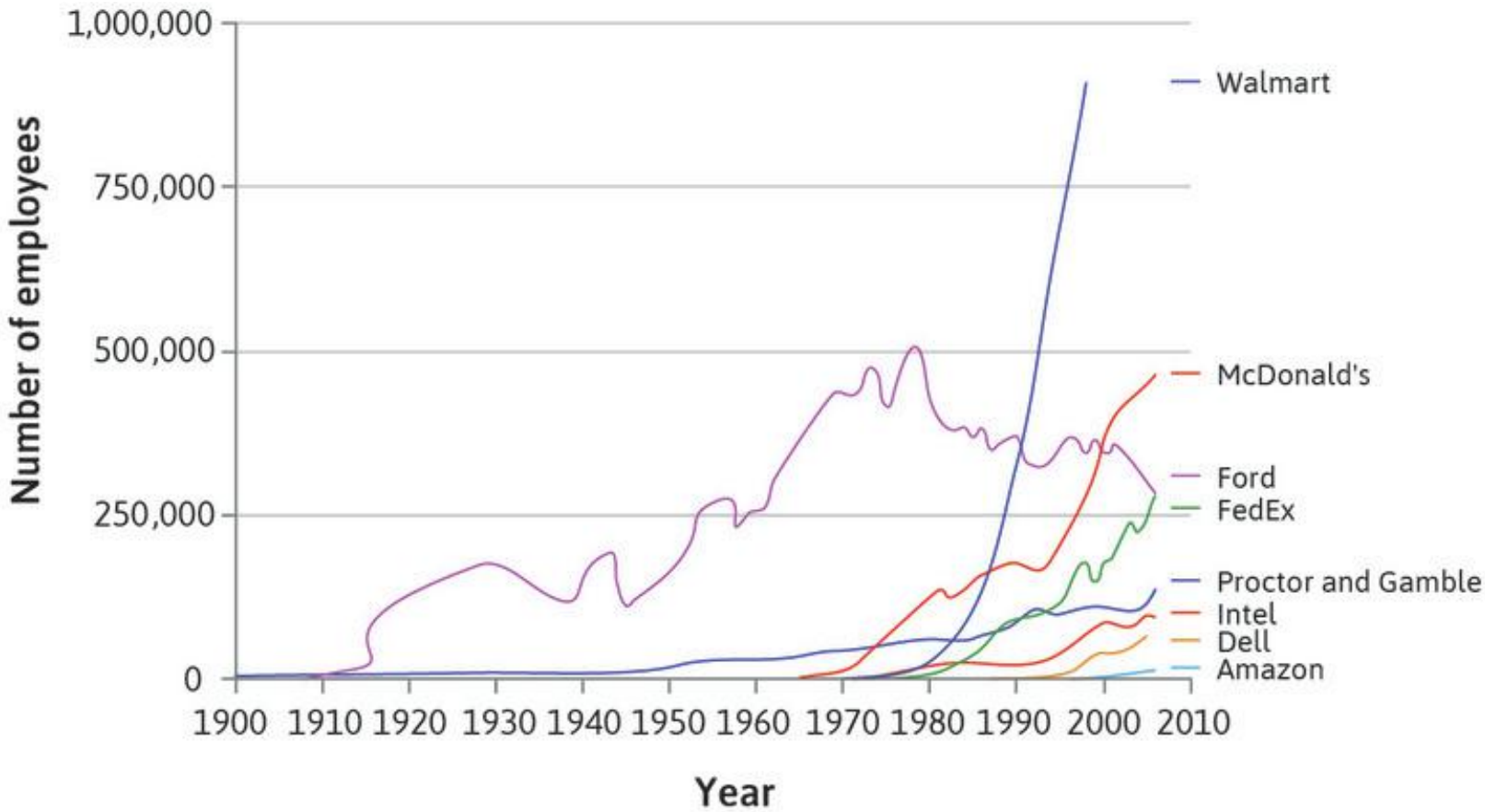
Model of interaction between customers and profit-maximising firms that produce *differentiated products*

Factors that affect the supply side, i.e., 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?*

Why are the firms able to acquire *market power*?



US: Number of employees working for large firms

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*

Market segment

Firms decision process:

Consumer's *willingness to pay* in a particular market segment?

Given available technology, what is the *fixed* and *variable cost* of production in the market segment?

Competitors in the *market segment*?

Cost and benefits of *creating an entirely new market segment* through innovation?

> *Market segment: consumers* buying a particular set of products and the *firms* that produce those of products.

Concepts

Pareto Optimality

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

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

Examples

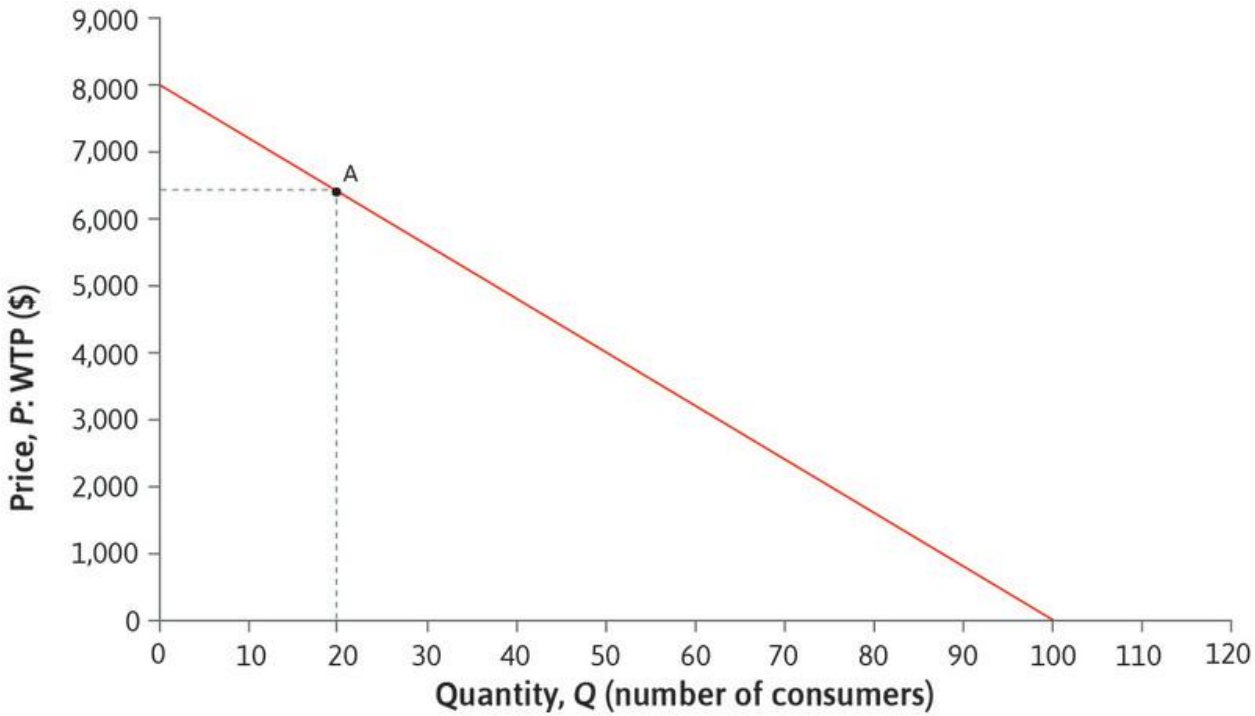
Splitting a sandwich

Building a new road

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 conveys 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 $\varepsilon < 1$

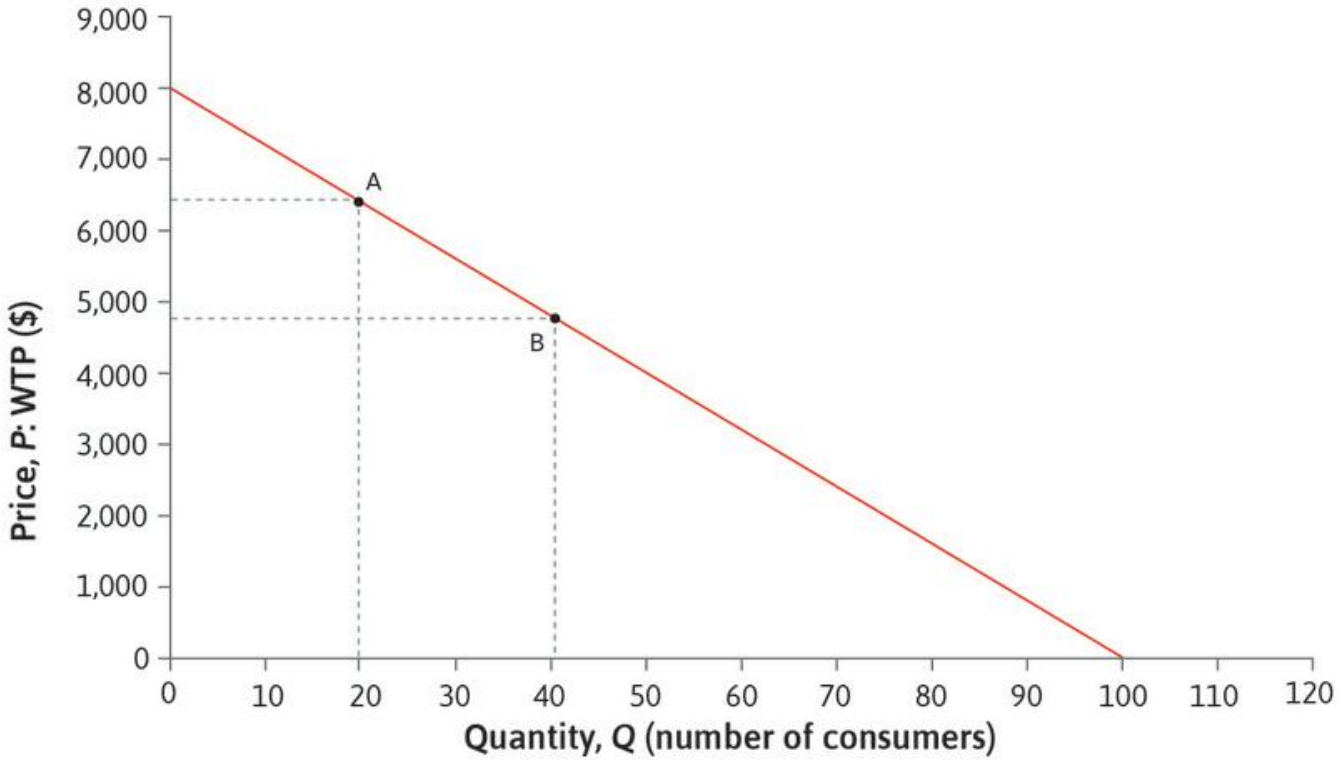
Calculating the *% change in quantity* and *% change in price*.

	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%
	$\left(= \frac{1}{20} \times 100\right)$

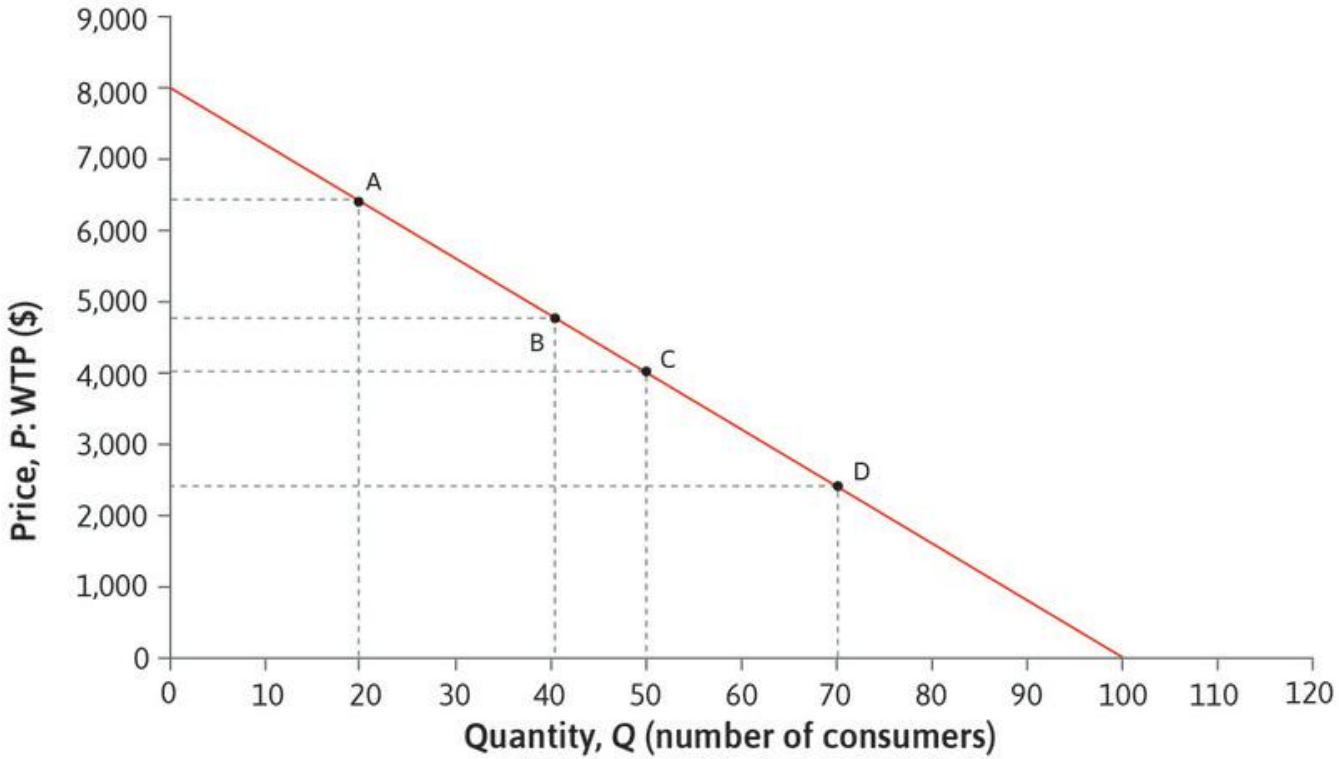
Calculating ε, *elasticity of demand* from *% change in quantity* and *% change in price*.

	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?

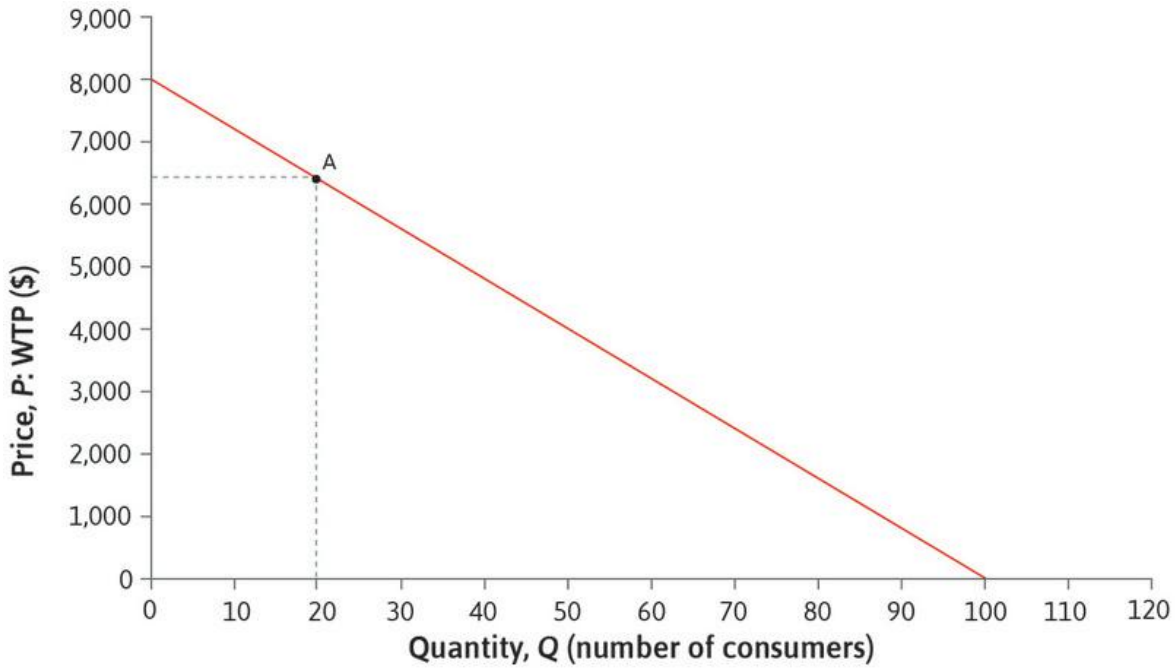
	A	B	C	D
% change in Q	5.00	2.50	2.00	1.43
% change in P	-1.25	-1.67	-2.00	-3.33
Elasticity of Demand	4.00	1.50	1.00	0.43

Marginal Revenue

Marginal revenue is the increase in firms's revenue if it sells an additional unit.

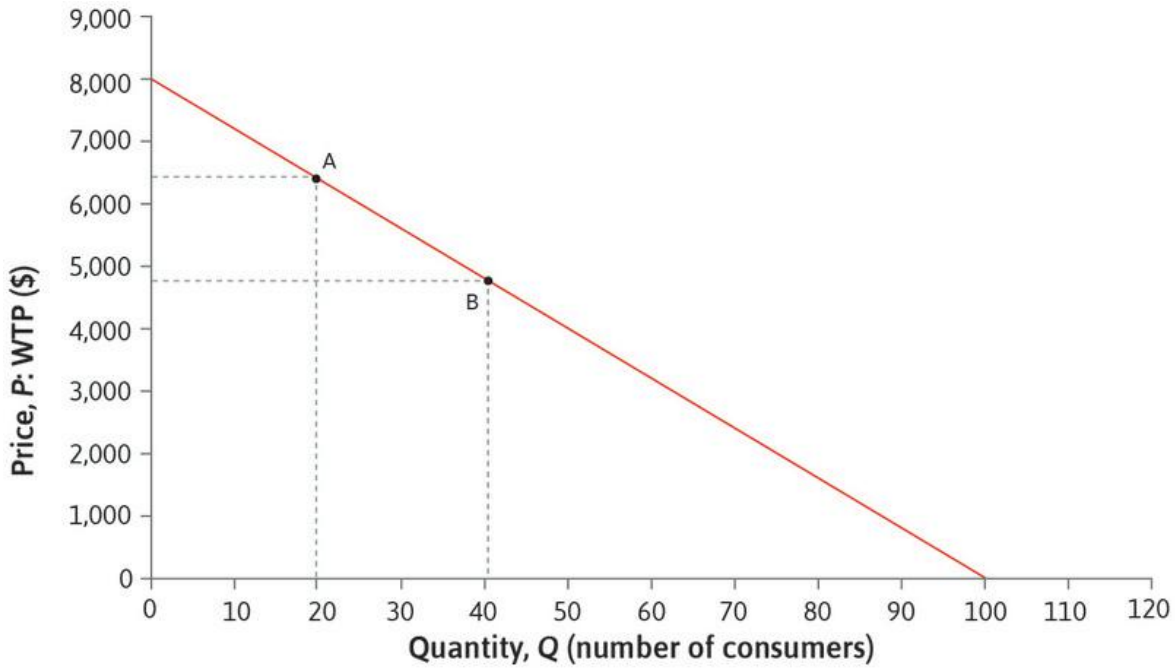
Marginal revenue	
positive	total revenue is *increasing* in quantity
zero	total revenue is *constant*
negative	total revenue is decreasing in quantity

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*	$\varepsilon = 1$
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*	$\varepsilon = 1$
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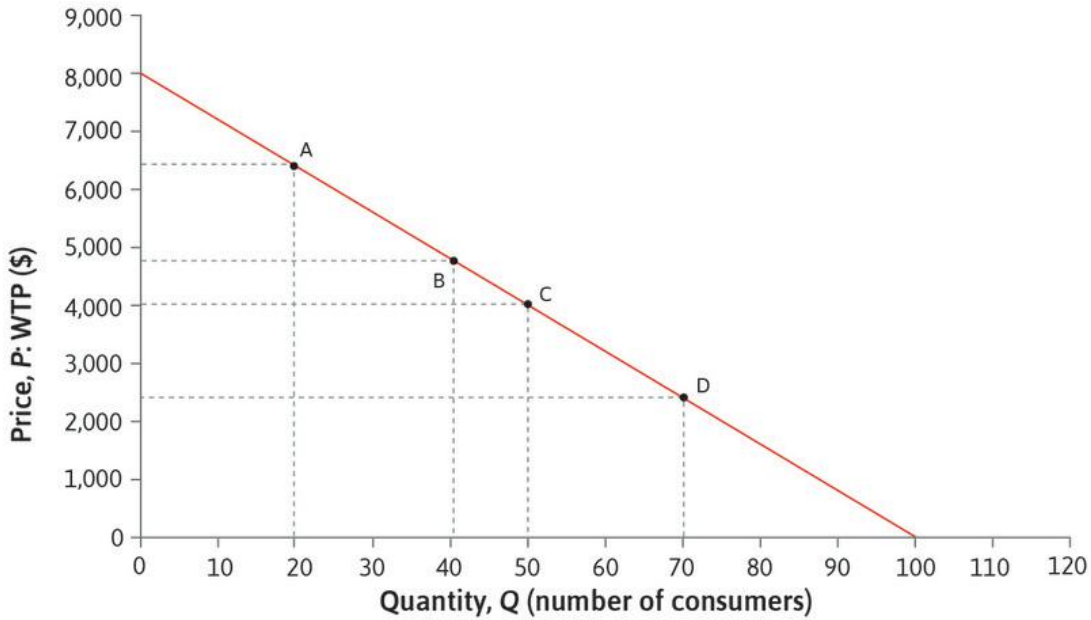
$$\varepsilon = -\left(\frac{\%\text{ change in demand}}{\%\text{ change in price}}\right)$$

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.

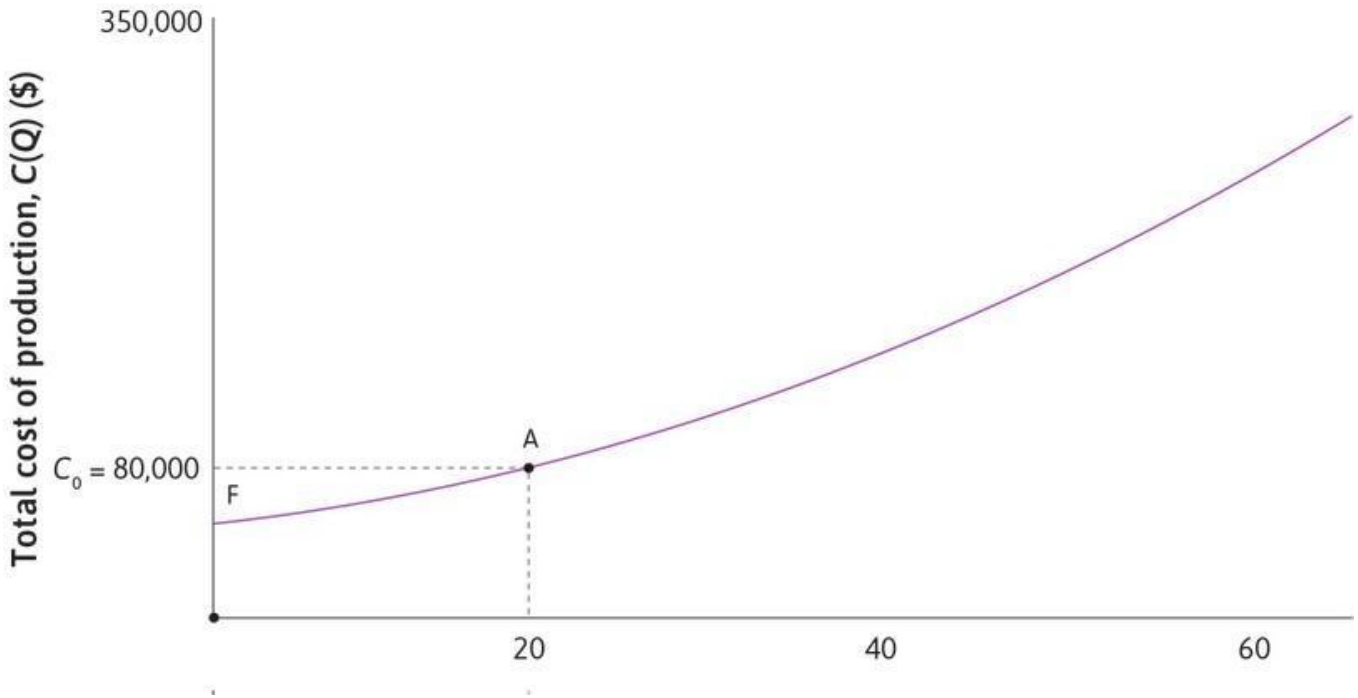
Elasticity of Demand and Marginal Revenue



	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

Cost Function

Cost functions shows how total production cost (*fixed* and *variable*) varies with quantity produced.



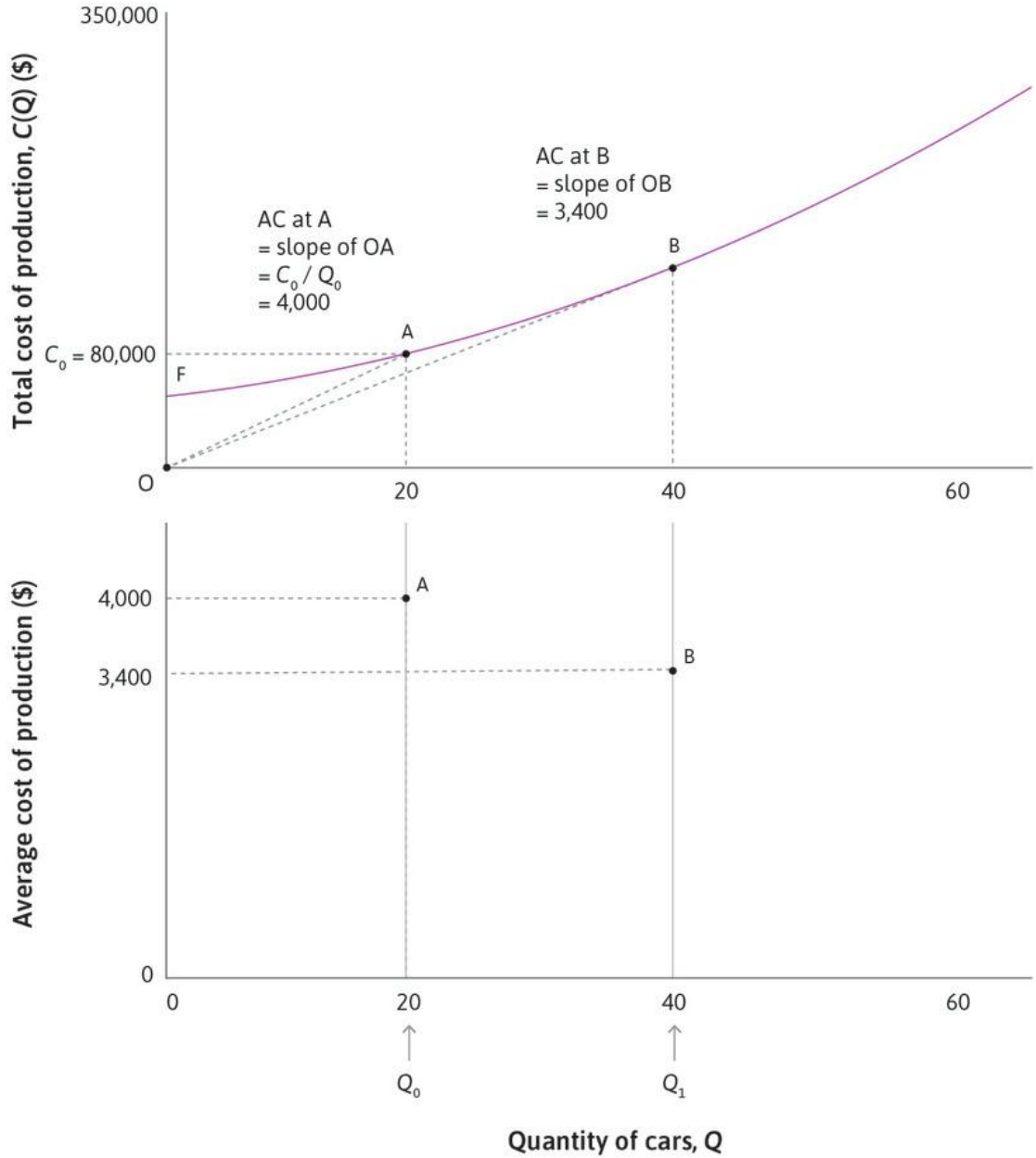
Cost Function

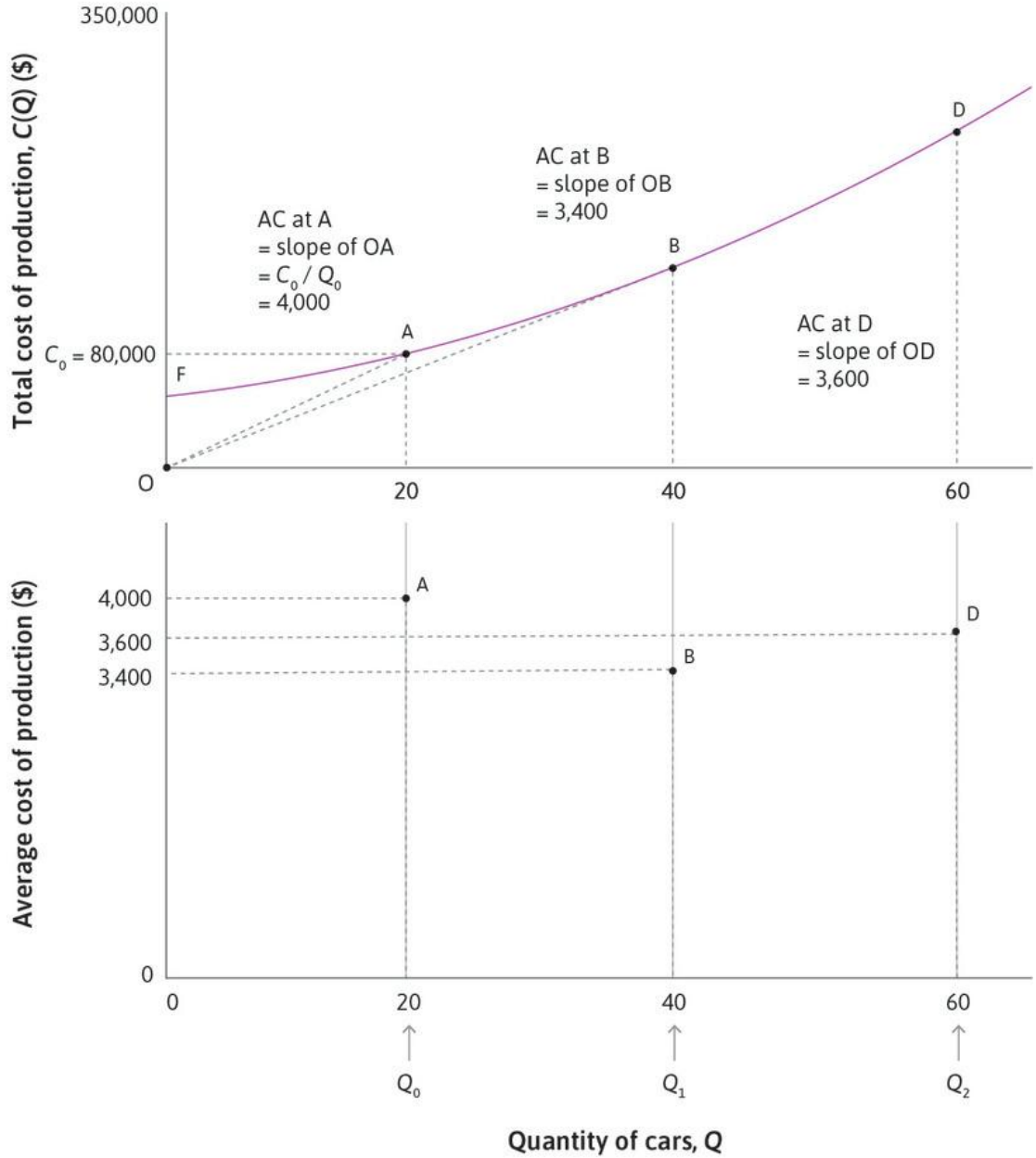
Cost functions show how total production cost varies with quantity produced.

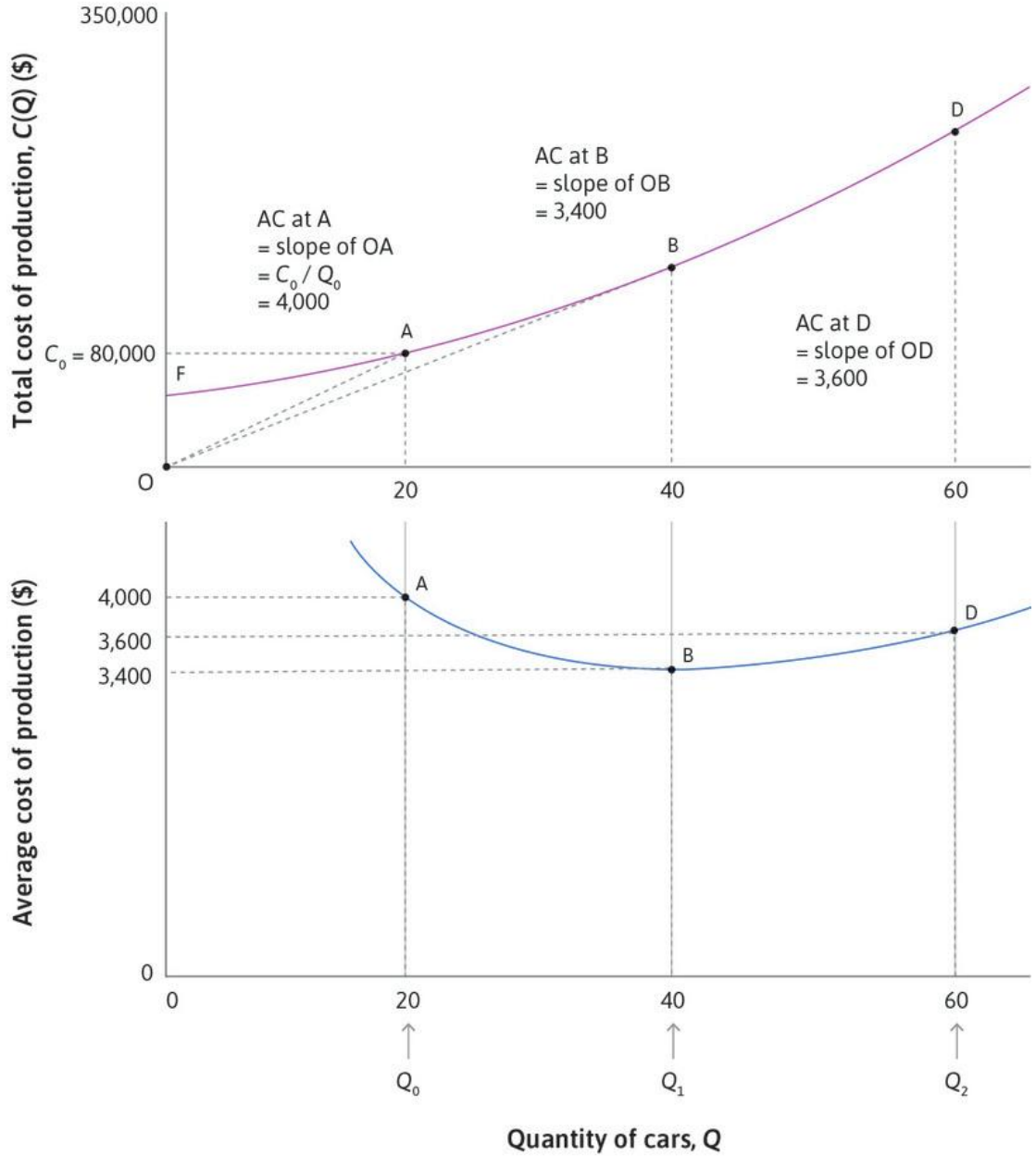
Average cost (AC) is the average cost per unit produced.

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).







Cost Function

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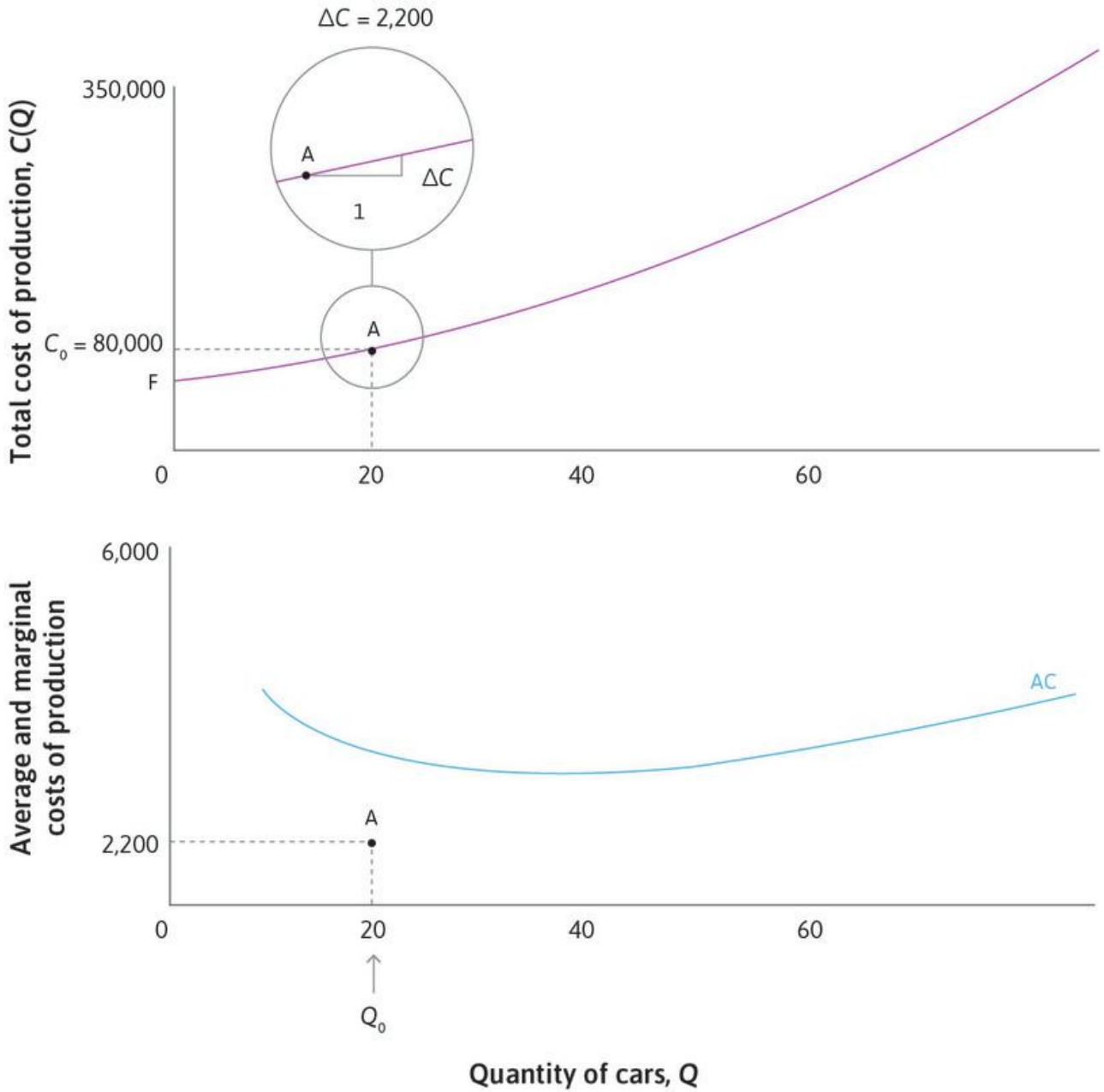
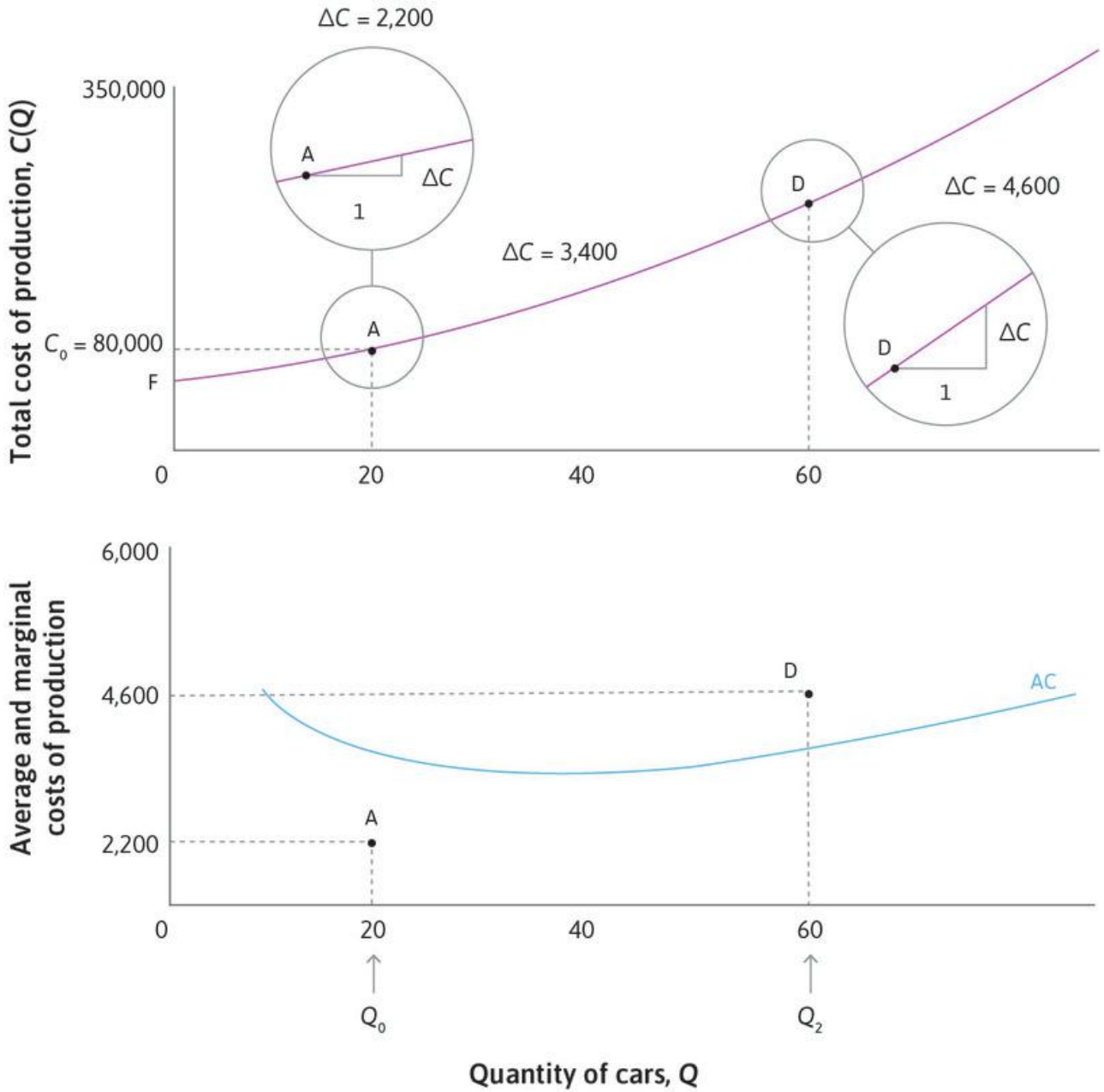
In this example, as quantity produced increases, average costs decrease at first (as fixed costs are divided by large quantities) but increase latter on (e.g. overworked labour, machine breakdown, management costs increase).

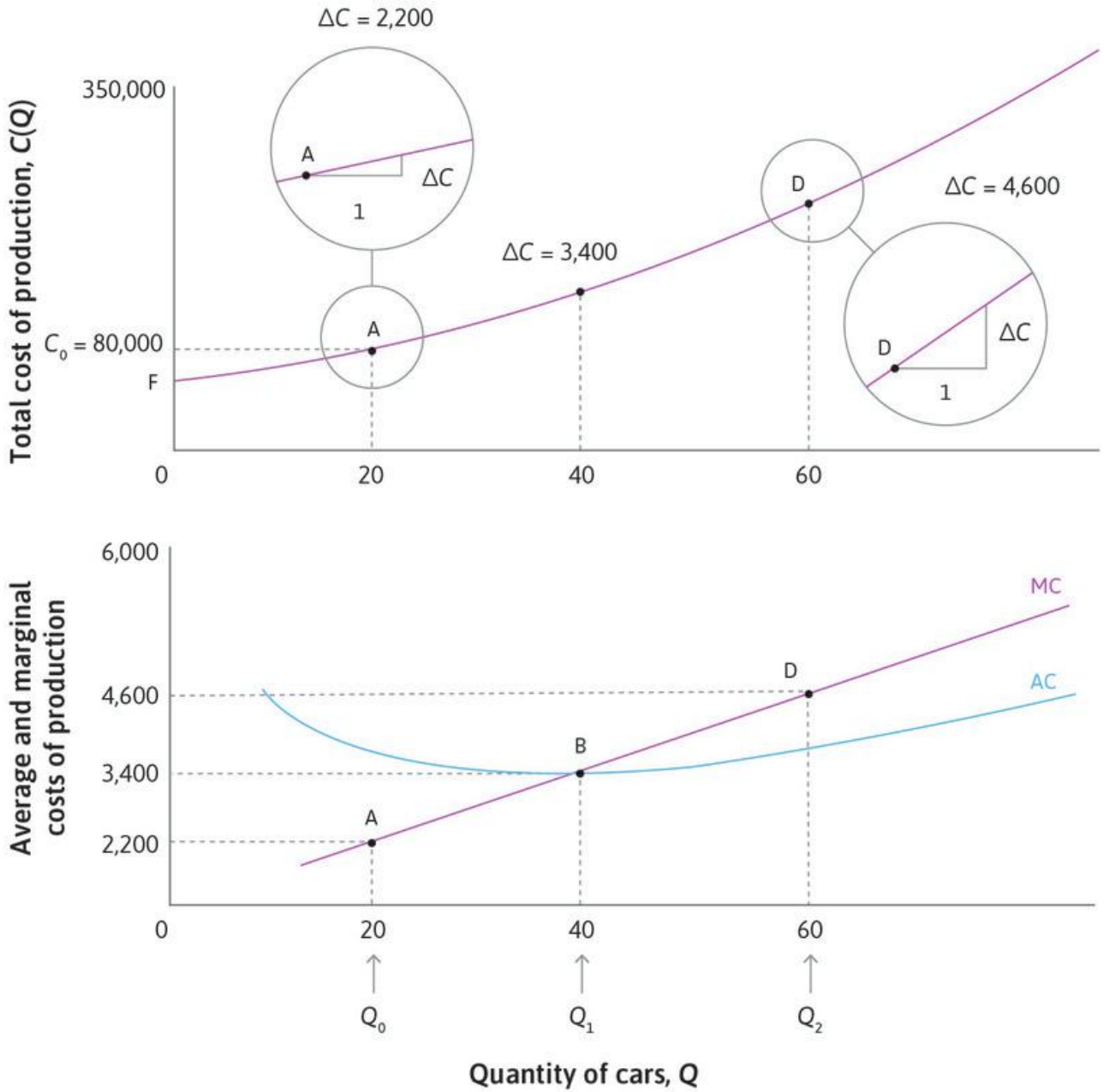
Marginal cost (MC): the effect on total cost of producing one additional unit of output.

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

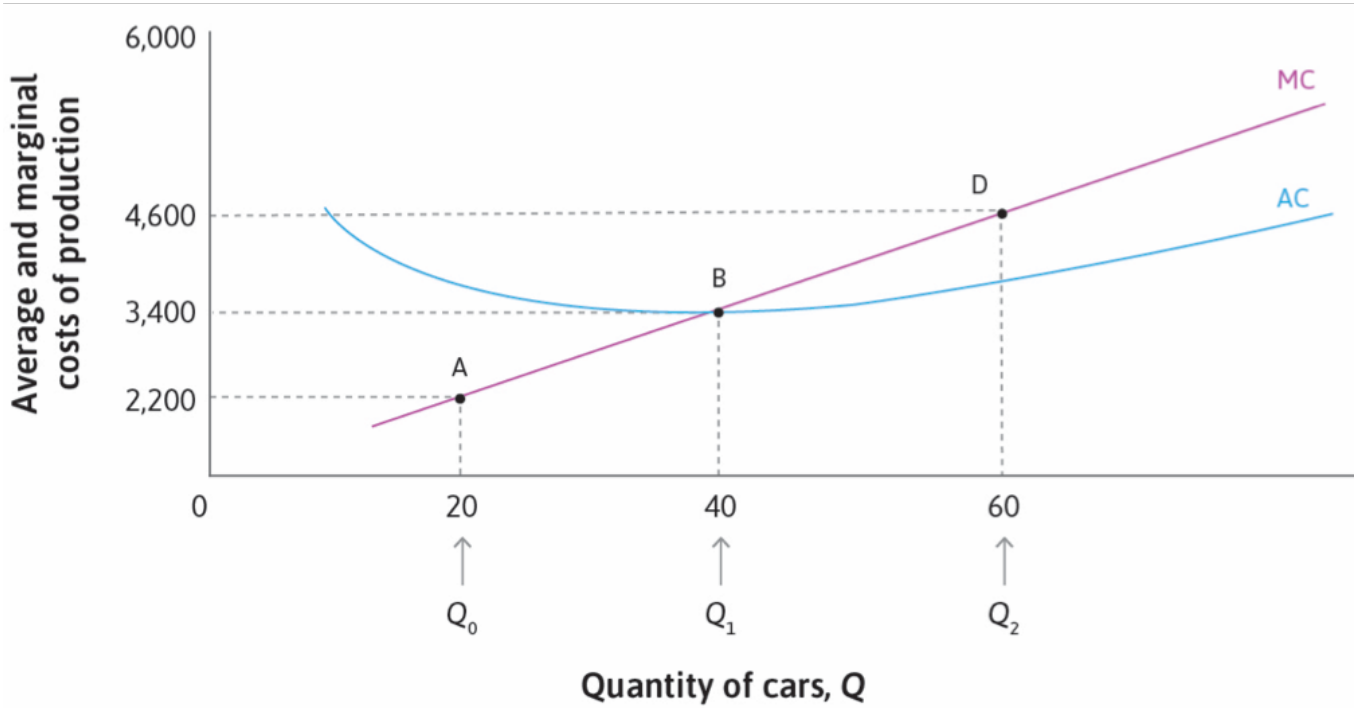
In this example, marginal costs increases as quantity produced increases.







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 of capital (investment)	Wages and cost of material

Iso-profit lines

$$\begin{aligned}\text{Profits} &= \text{Total Revenue} - \text{Total Cost}\\ &= \text{Price} \times \text{Quantity} - \text{Total Cost}\end{aligned}$$

Divide both sides with Quantity

$$\frac{\text{Profits}}{\text{Quantity}} = \text{Price} - \frac{\text{Total Cost}}{\text{Quantity}}$$

$$\frac{\text{Profits}}{\text{Quantity}} = \text{Price} - \text{Average Cost}$$

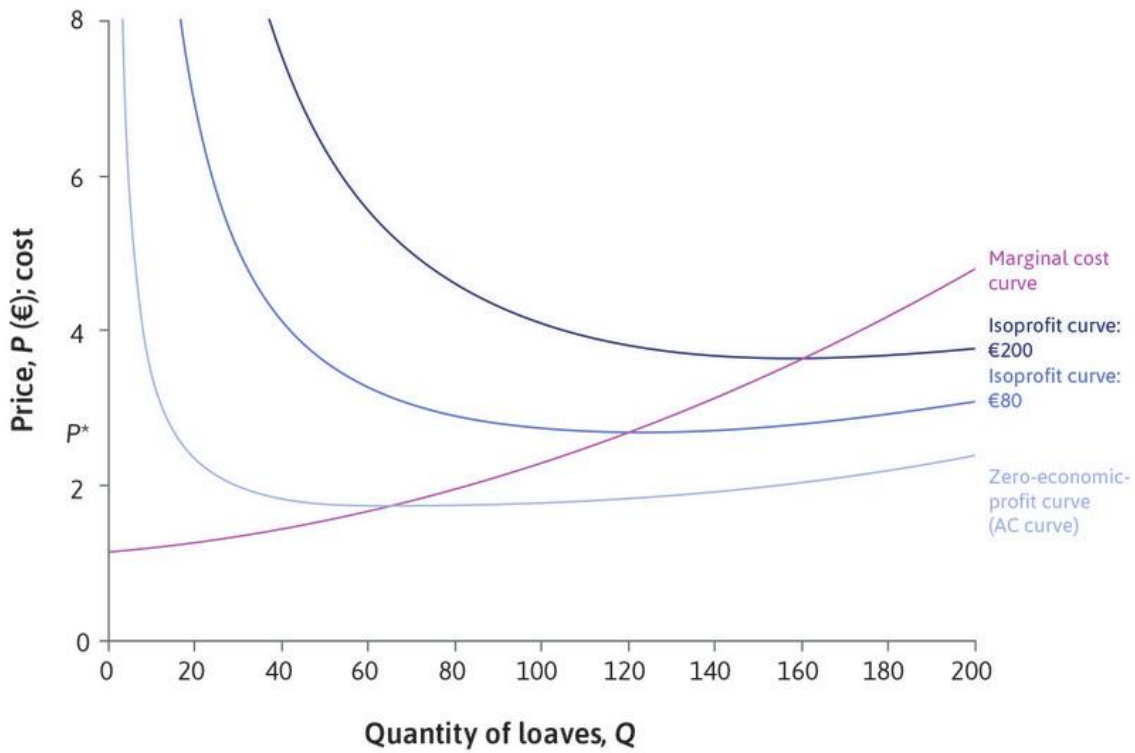
For constant level of profits:

$$\text{Price} = \frac{\text{Constant Profits}}{\text{Quantity}} + \text{Average Cost}$$

Iso-profit lines

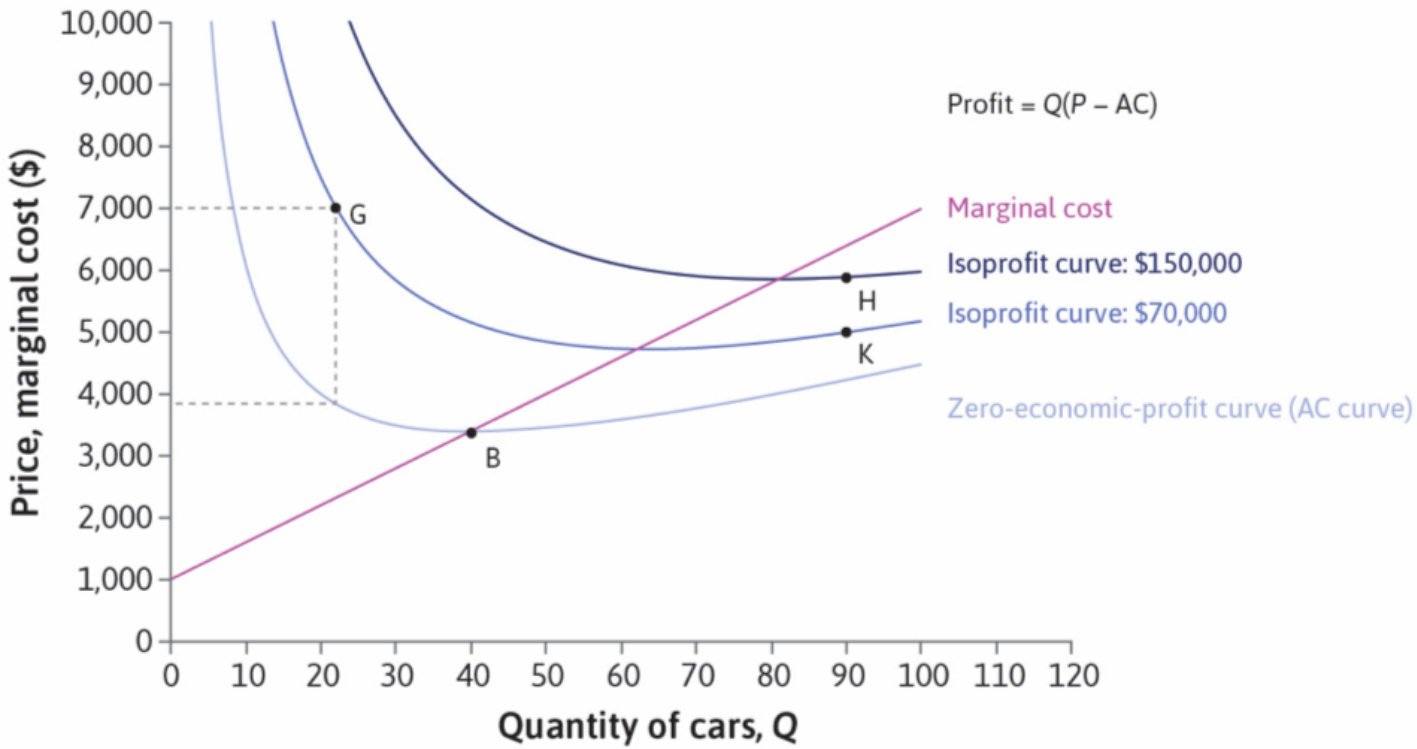
Price is *profit per unit produced* plus *average cost*

$$\text{Price} = \frac{\text{Constant Profits}}{\text{Quantity}} + \text{Average Cost}$$



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.

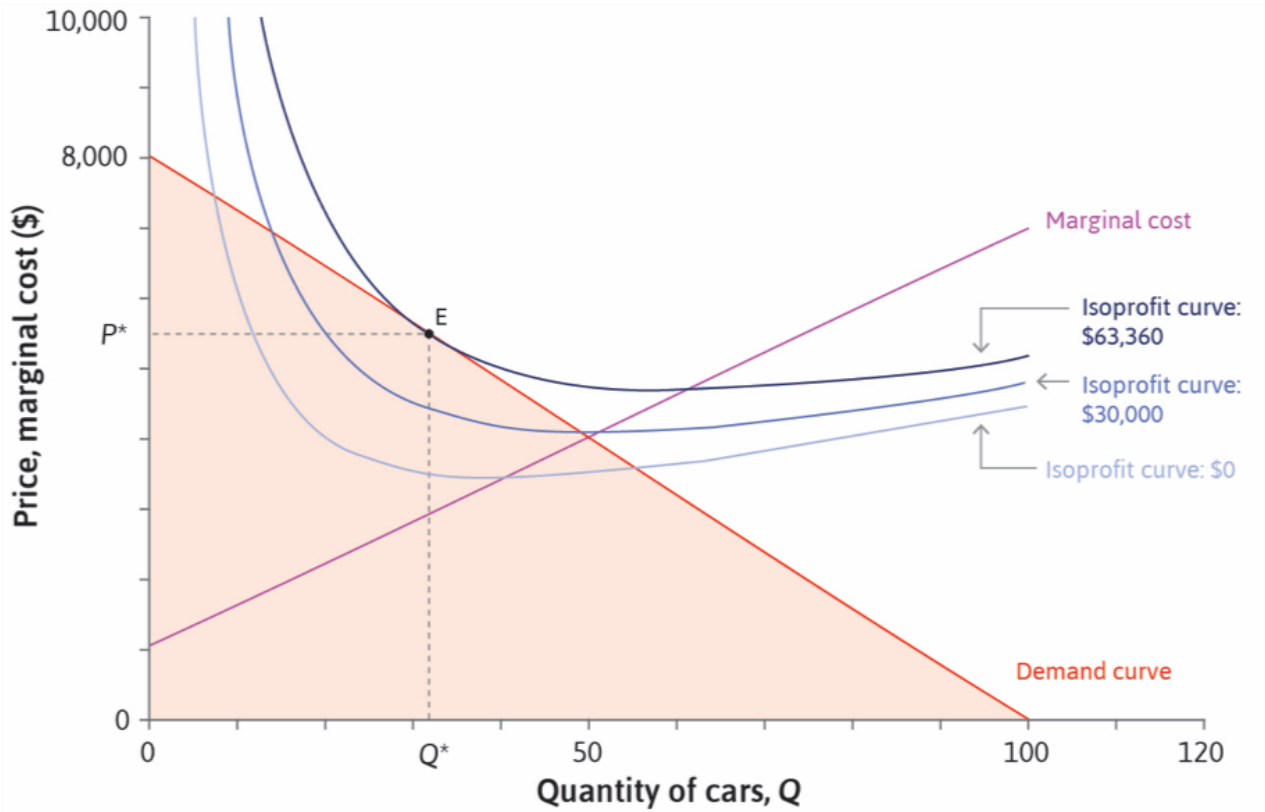
Demand curve

firm's feasible area

Iso-profit curves

firms profit increases with iso-profit curves

Firm maximises by choosing the highest feasible indifference curve

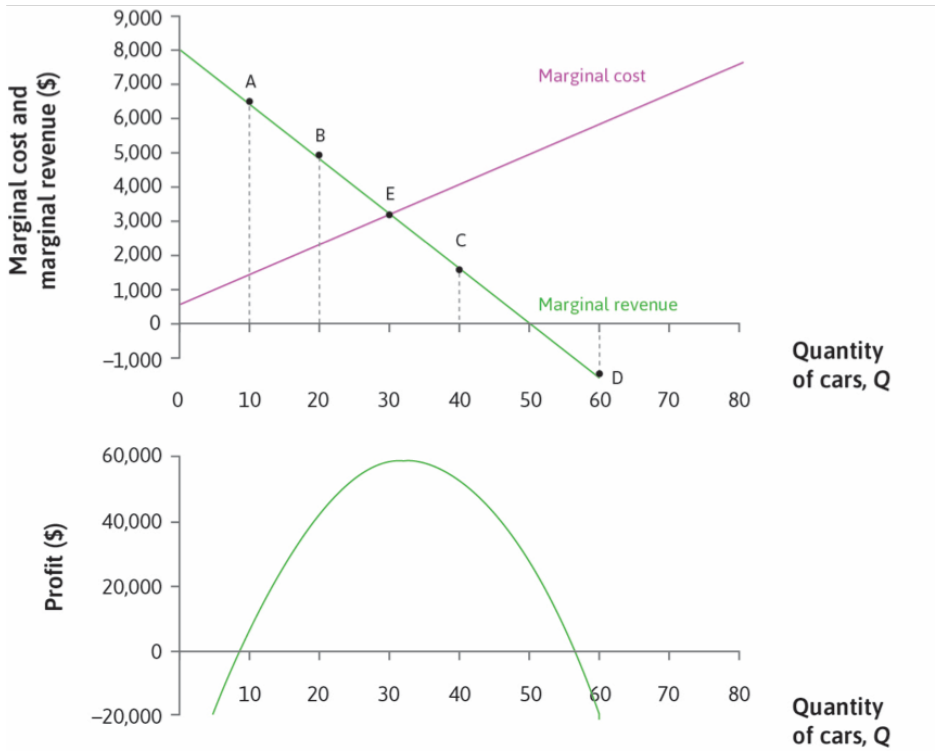


Profit maximisation from another perspective

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

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

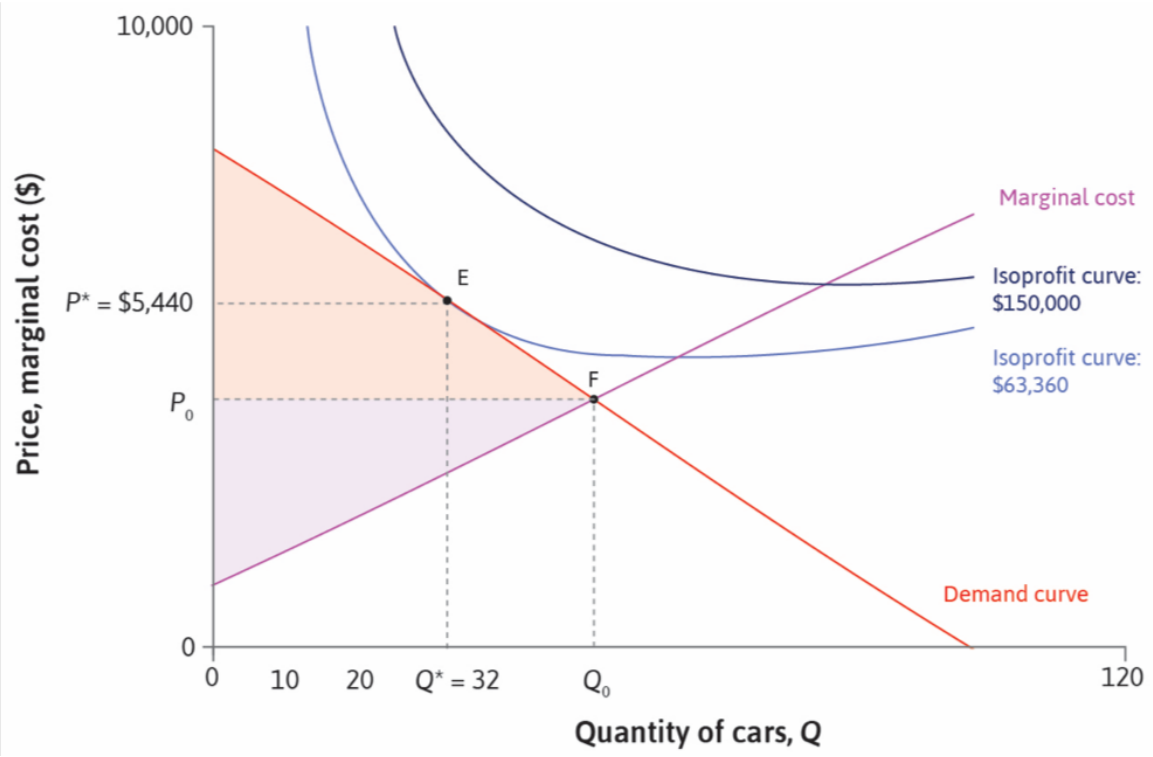
Firm maximises profit by choosing MR=MC



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

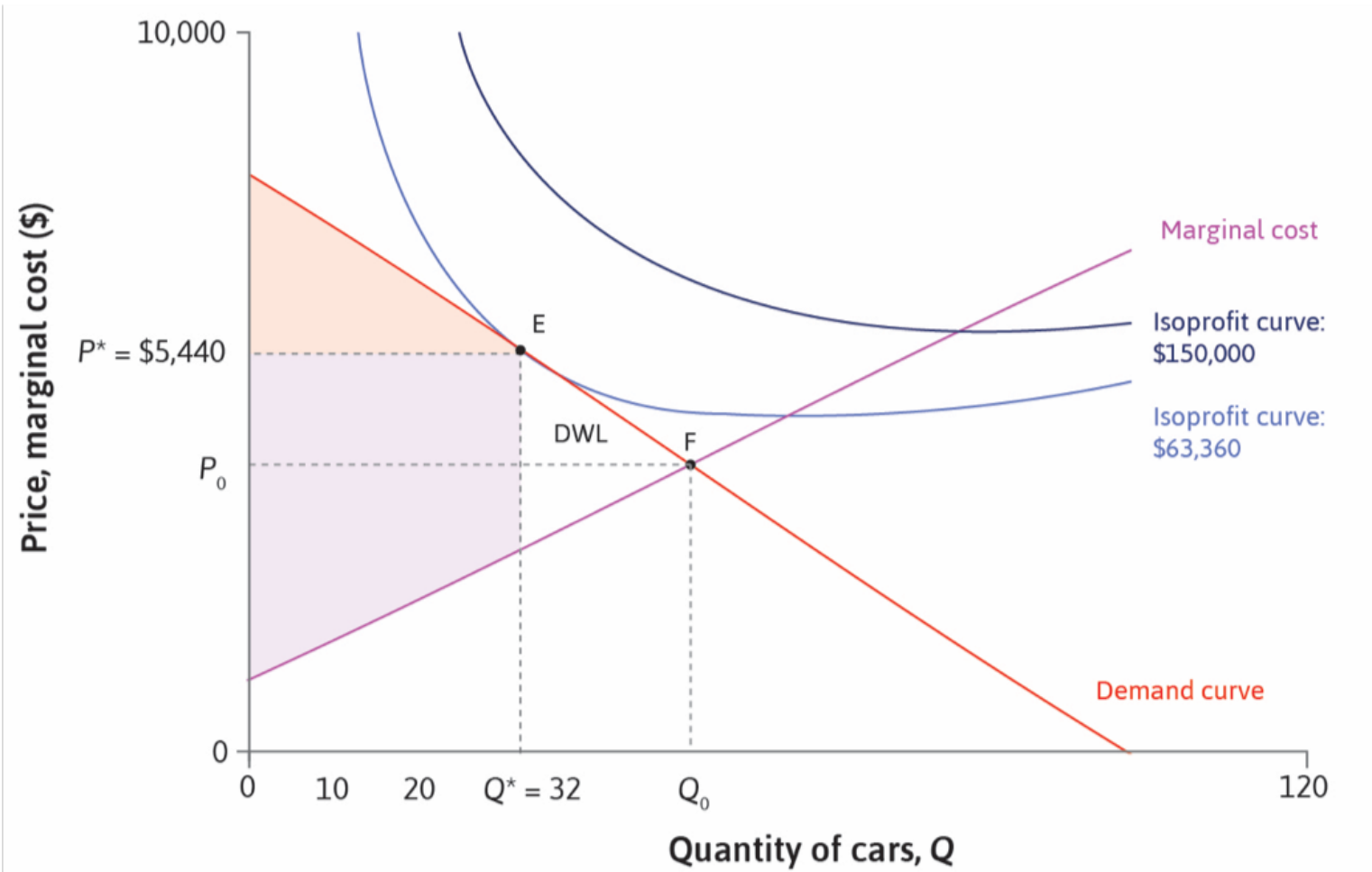
Producer surplus (PS): the total difference between revenue and marginal cost

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



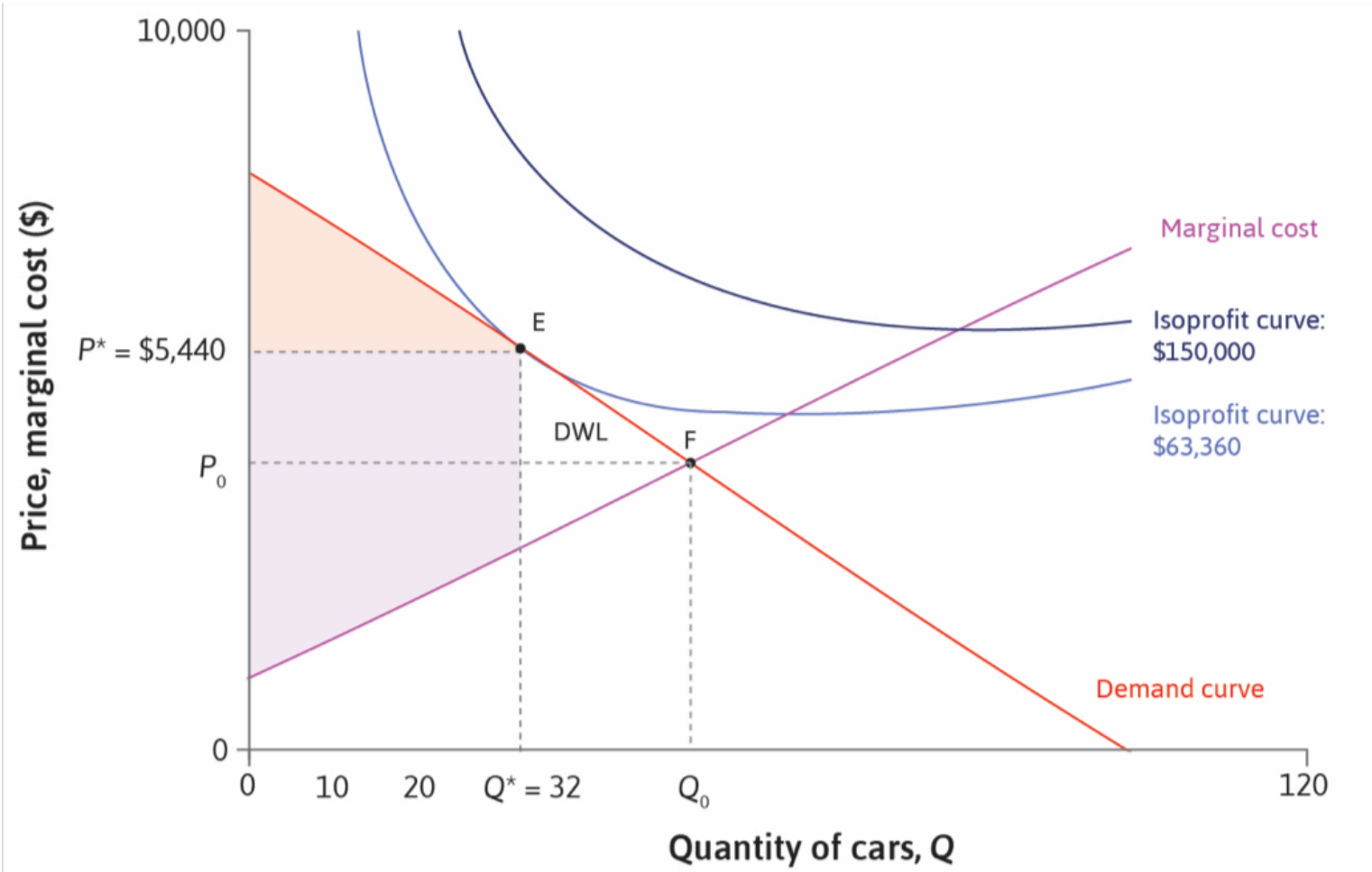
Deadweight loss is difference between current surplus (E) and the surplus in a *Pareto efficient allocation* (F)

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*)

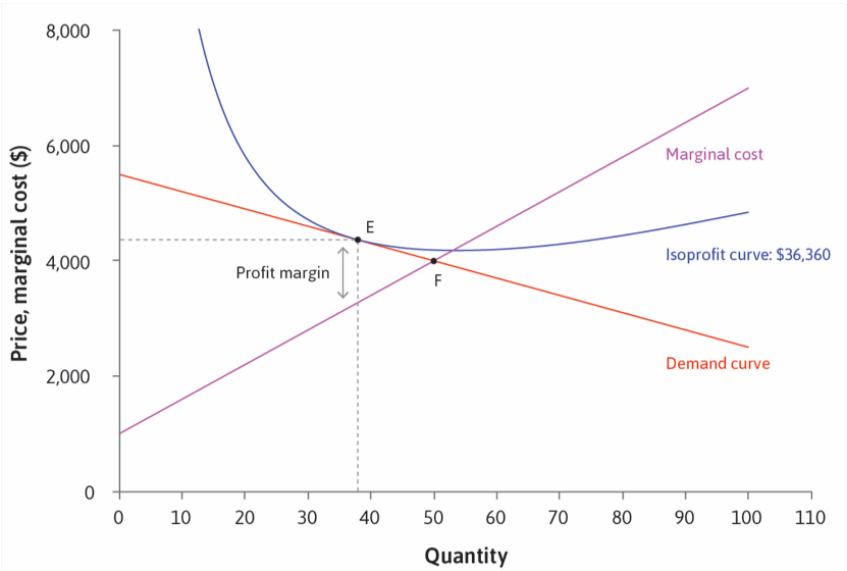


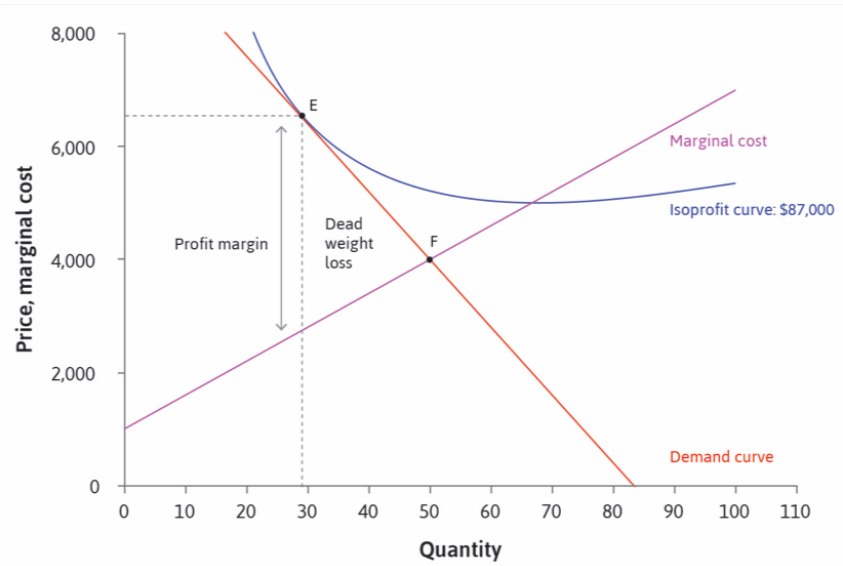
Elasticity and Deadweight loss

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*.

Firms produce an output that *maximises their profits* and where *marginal revenue equals marginal cost*.

Surplus measures the *gains from trade*

Total surplus = Producer surplus + Consumer surplus

Price elasticity of demand affects surplus and profits

Deadweight loss occurs when allocation is not Pareto efficient and measures the loss of surplus lost from society due to market power