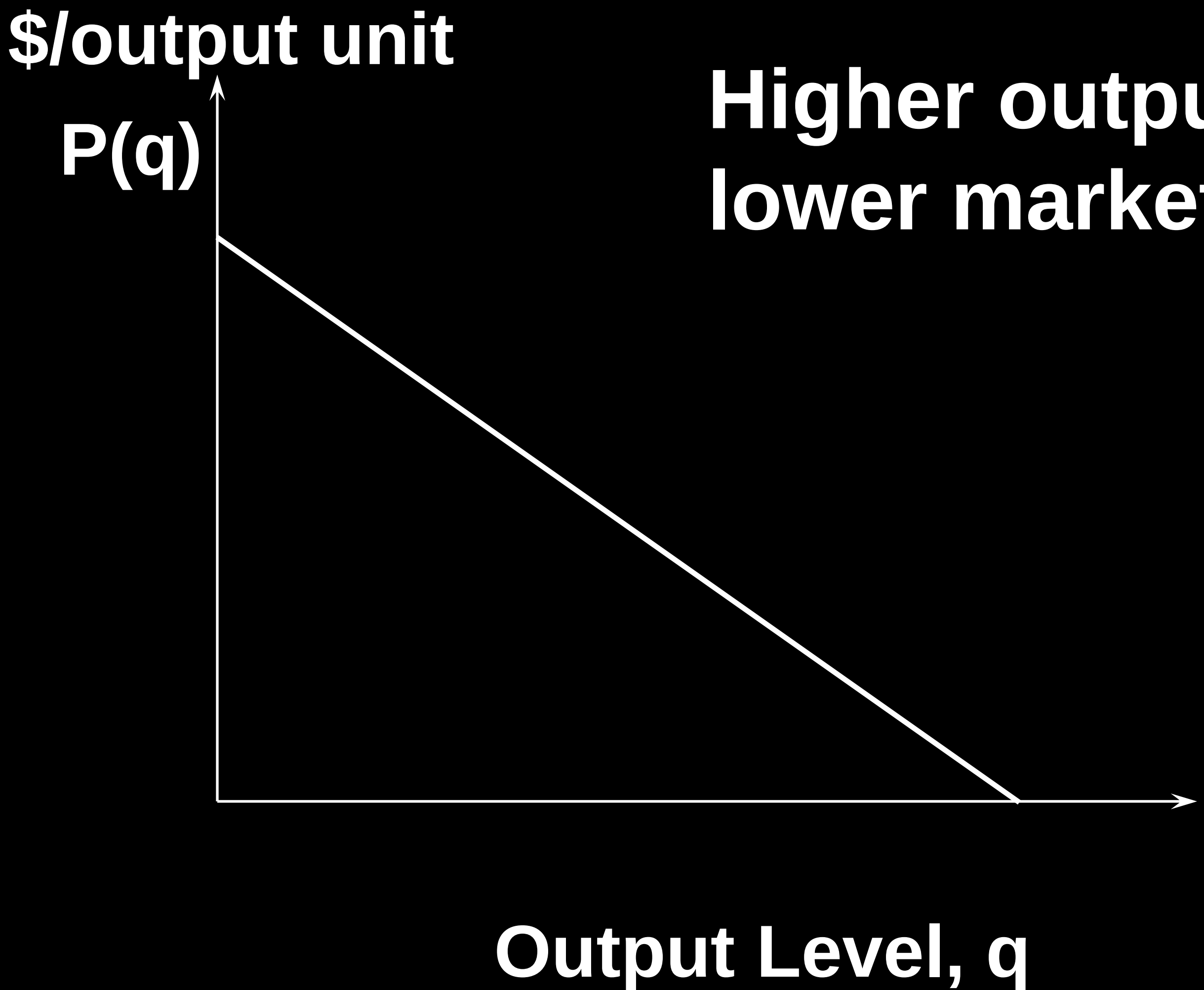
Monopoly

Pure Monopoly

- A monopolized market has a single seller.
- The monopolist's demand curve is the (downward sloping) market demand curve.
- So the monopolist can alter the market price by adjusting its output level.

Pure Monopoly



Higher output q causes a lower market price, p(q).

Why Monopolies?

- **What causes monopolies?**
  - **a legal fiat; e.g. US Postal Service**
  - **a patent; e.g. a new drug**
  - **sole ownership of a resource; e.g. a toll highway**
  - **formation of a cartel; e.g. OPEC**
  - **large economies of scale; e.g. local utility companies.**

Pure Monopoly

- **Suppose that the monopolist seeks to maximize its economic profit,**

$$\Pi(q) = p(q)q - c(q).$$

- **What output level q* maximizes profit?**

Profit-Maximization

$$\Pi(q) = p(q)q - c(q).$$

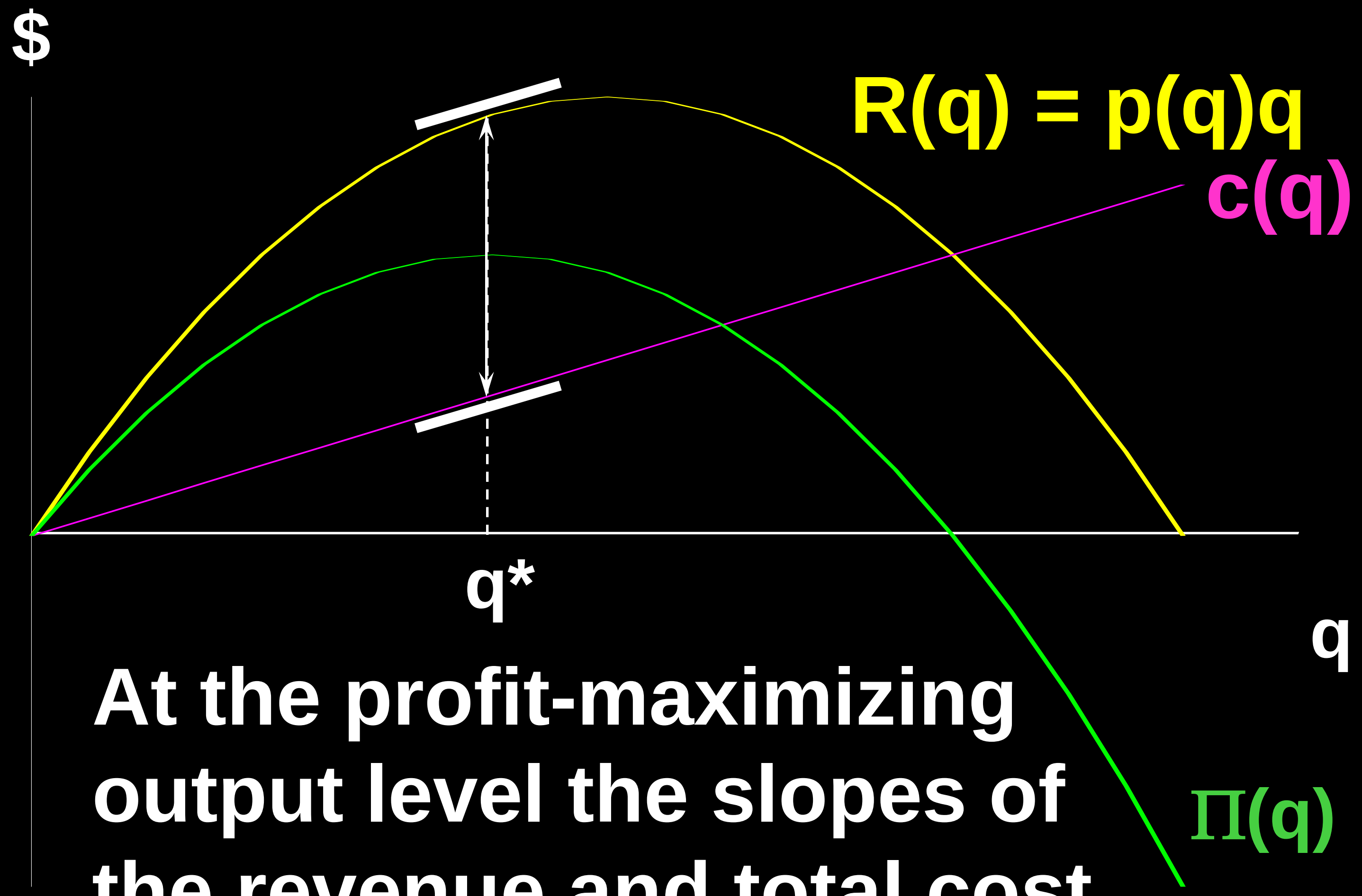
At the profit-maximizing output level q*

$$\frac{d\Pi(q)}{dq} = \frac{d}{dq}\left(p(q)q\right) - \frac{dc(q)}{dq} = 0$$

so, for q = q*,

$$\frac{d}{dq}\left(p(q)q\right) = \frac{dc(q)}{dq}.$$

Profit-Maximization



At the profit-maximizing output level the slopes of the revenue and total cost curves are equal; MR(q*) = MC(q*).

Marginal Revenue

Marginal revenue is the rate-of-change of revenue as the output level q increases;

$$MR(q) = \frac{d}{dq}\left(p(q)q\right) = p(q) + q\frac{dp(q)}{dq}.$$

dp(q)/dq is the slope of the market inverse demand function so dp(q)/dq < 0. Therefore

$$MR(q) = p(q) + q\frac{dp(q)}{dq} < p(q)$$

for q > 0.

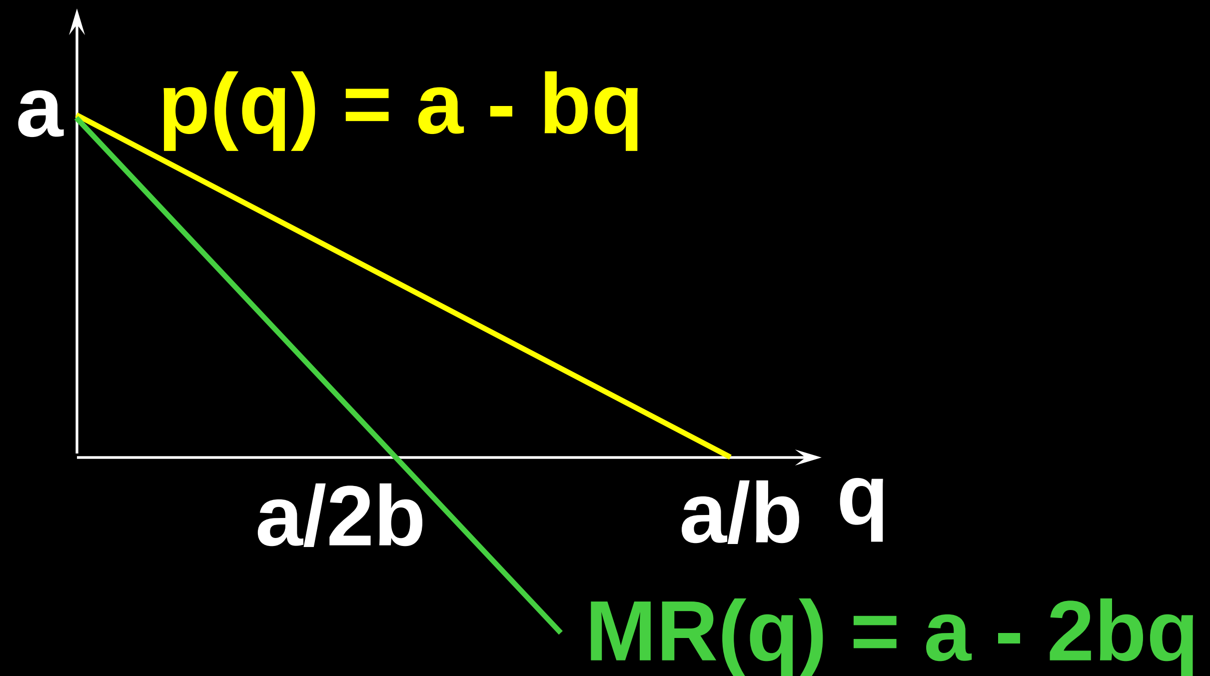
Marginal Revenue

E.g. if $p(q) = a - bq$ then

$$R(q) = p(q)q = aq - bq^2$$

and so

$$MR(q) = a - 2bq \; < \; a - bq = p(q) \quad \text{for } q > 0.$$



Marginal Cost

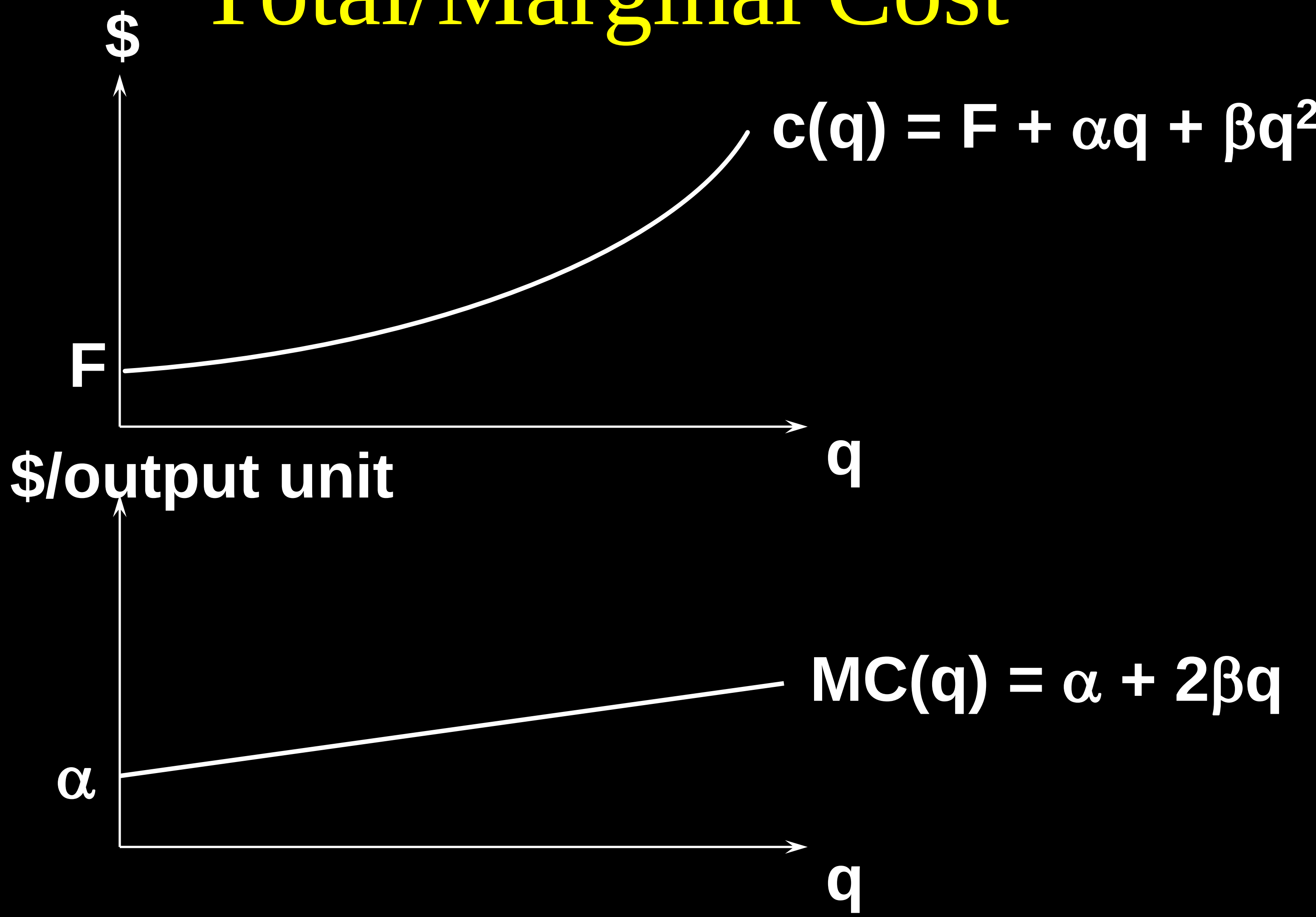
Marginal cost is the rate-of-change of total cost as the output level q increases;

$$MC(q) = \frac{dc(q)}{dq}.$$

E.g. if c(q) = F + αq + βq^2 then

$$MC(q) = \alpha + 2\beta q.$$

Total/Marginal Cost



Profit-Maximization; An Example

At the profit-maximizing output level q*, MR(q*) = MC(q*). So if p(q) = a - bq and if c(q) = F + αq + βq^2 then

$$MR(q^*) = a - 2bq^* = \alpha + 2\beta q^* = MC(q^*)$$

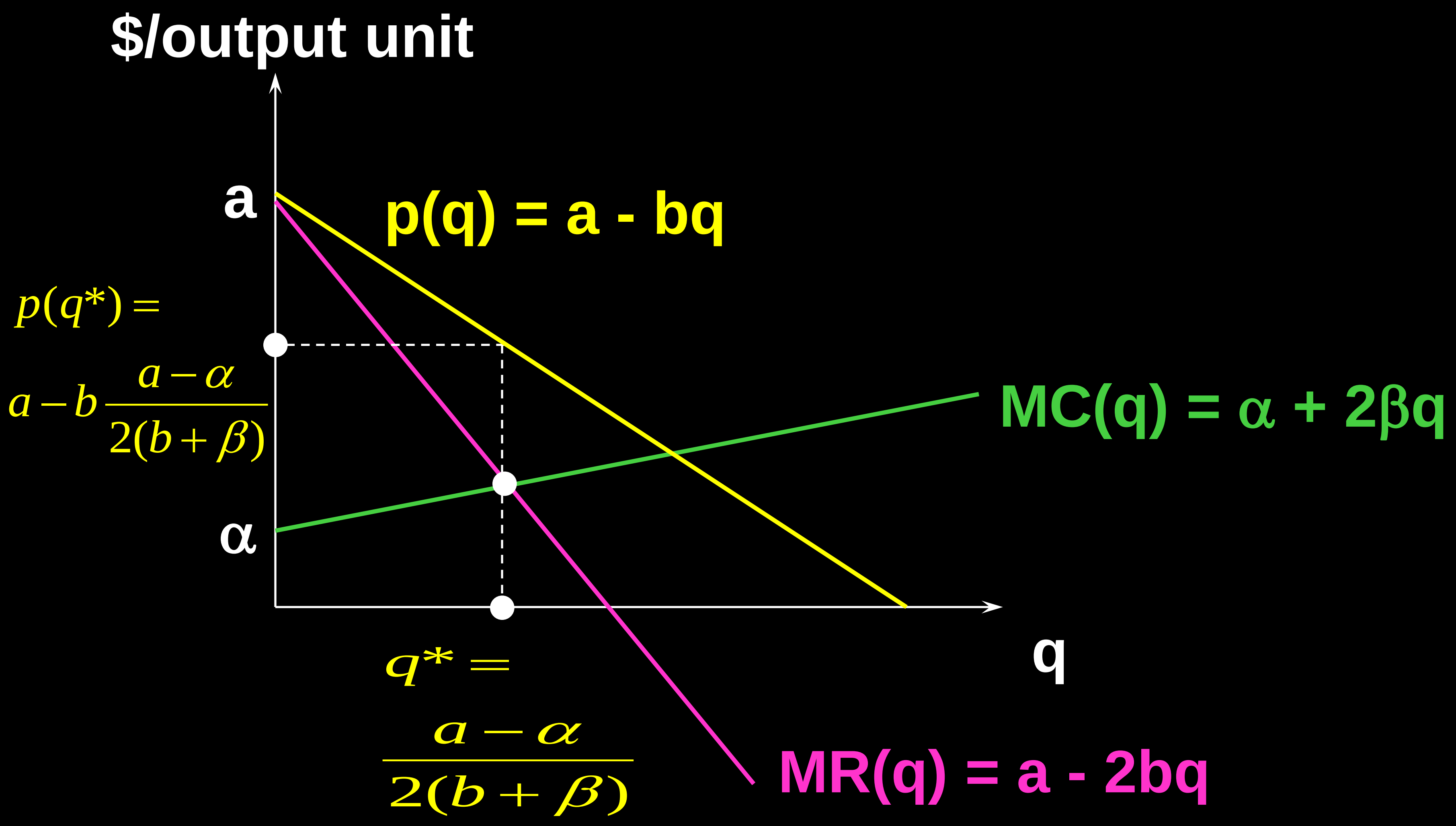
and the profit-maximizing output level is

$$q^* = \frac{a-\alpha}{2(b+\beta)}$$

causing the market price to be

$$p(q^*) = a - bq^* = a - b\frac{a-\alpha}{2(b+\beta)}.$$

Profit-Maximization; An Example



Monopolistic Pricing & Own-Price Elasticity of Demand

- **Suppose that market demand becomes less sensitive to changes in price (*i.e*. the own-price elasticity of demand becomes less negative). Does the monopolist exploit this by causing the market price to rise?**

Monopolistic Pricing & Own-Price Elasticity of Demand

$$MR(q) = \frac{d}{dq}\left(p(q)q\right) = p(q) + q\frac{dp(q)}{dq}$$

$$= p(q)\left[1 + \frac{q}{p(q)}\frac{dp(q)}{dq}\right].$$

Own-price elasticity of demand is

$$\varepsilon = \frac{p(q)}{q}\frac{dq}{dp(q)}$$ **so** $$MR(q) = p(q)\left[1 + \frac{1}{\varepsilon}\right].$$

Monopolistic Pricing & Own-Price Elasticity of Demand

$$MR(q) = p(q)\left[1 + \frac{1}{\varepsilon}\right].$$

Suppose the monopolist's marginal cost of production is constant, at $k/ unit.
For a profit-maximum

$$MR(q^*) = p(q^*)\left[1 + \frac{1}{\varepsilon}\right] = k$$

or

$$p(q^*) = \frac{k}{1 + \frac{1}{\varepsilon}}$$

$$\frac{p(q^*) - k}{p(q^*)} = -\frac{1}{\varepsilon}$$

Monopolistic Pricing & Own-Price Elasticity of Demand

$$p(q^*) = \frac{k}{1 + \dfrac{1}{\varepsilon}}.$$

E.g. if ε = -3 then p(q*) = 3k/2,
and if ε = -2 then p(q*) = 2k.
So as ε rises towards -1 the monopolist alters its output level to make the market price of its product to rise.

Monopolistic Pricing & Own-Price Elasticity of Demand

Notice that, since $MR(q^*) = p(q^*)\left[1 + \frac{1}{\varepsilon}\right] = k,$

$$p(q^*)\left[1 + \frac{1}{\varepsilon}\right] > 0 \Rightarrow 1 + \frac{1}{\varepsilon} > 0$$

That is, $\frac{1}{\varepsilon} > -1 \quad \Rightarrow \quad \varepsilon < -1.$

So a profit-maximizing monopolist always selects an output level for which market demand is own-price elastic.

A Profits Tax Levied on a Monopoly

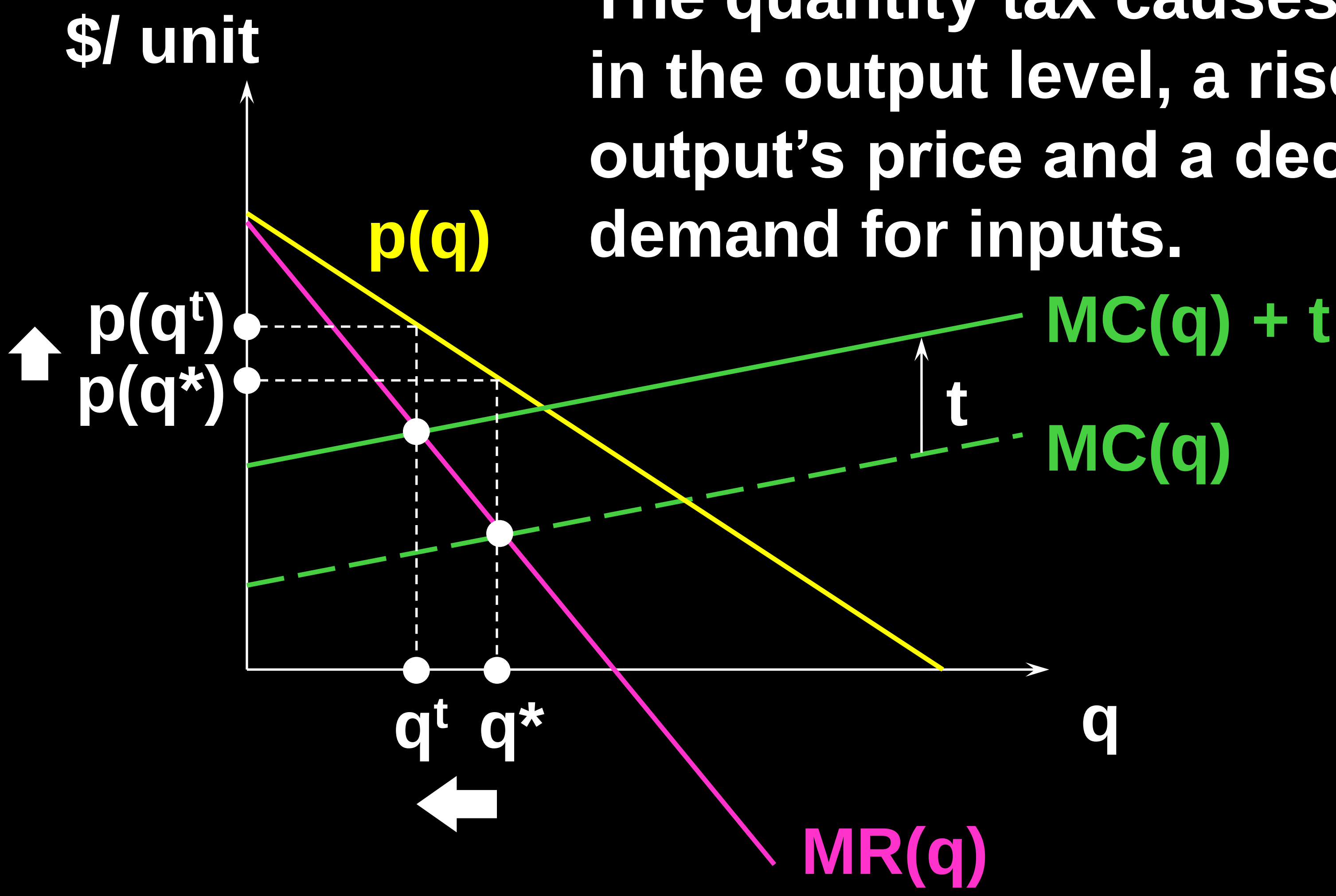
- A profits tax levied at rate t reduces profit from $\Pi(q^*)$ to $(1-t)\Pi(q^*)$.
- Q: How is after-tax profit, $(1-t)\Pi(q^*)$, maximized?
- A: By maximizing before-tax profit, $\Pi(q^*)$.
- So a profits tax has no effect on the monopolist's choices of output level, output price, or demands for inputs.
- I.e. the profits tax is a **neutral tax**.

Quantity Tax Levied on a Monopolist

- A quantity tax of $t/ unit raises the marginal cost of production by $t.
- So the tax reduces the profit-maximizing output level, causes the market price to rise, and input demands to fall.
- The quantity tax is **distortionary**.

Quantity Tax Levied on a Monopolist

The quantity tax causes a drop in the output level, a rise in the output's price and a decline in demand for inputs.



Quantity Tax Levied on a Monopolist

- Can a monopolist "pass" all of a $t quantity tax to the consumers?
- Suppose the marginal cost of production is constant at $k/ unit.
- With no tax, the monopolist's price is

$$p(q^*) = \frac{k\varepsilon}{1+\varepsilon}.$$

Quantity Tax Levied on a Monopolist

- **The tax increases marginal cost to \$(k+t)/ unit, changing the profit-maximizing price to**

$$p(q^t) = \frac{(k+t)\varepsilon}{1+\varepsilon}.$$

- **The amount of the tax paid by buyers is**

$$p(q^t) - p(q^*).$$

Quantity Tax Levied on a Monopolist

$$p(q^t) - p(q^*) = \frac{(k+t)\varepsilon}{1+\varepsilon} - \frac{k\varepsilon}{1+\varepsilon} = \frac{t\varepsilon}{1+\varepsilon}$$

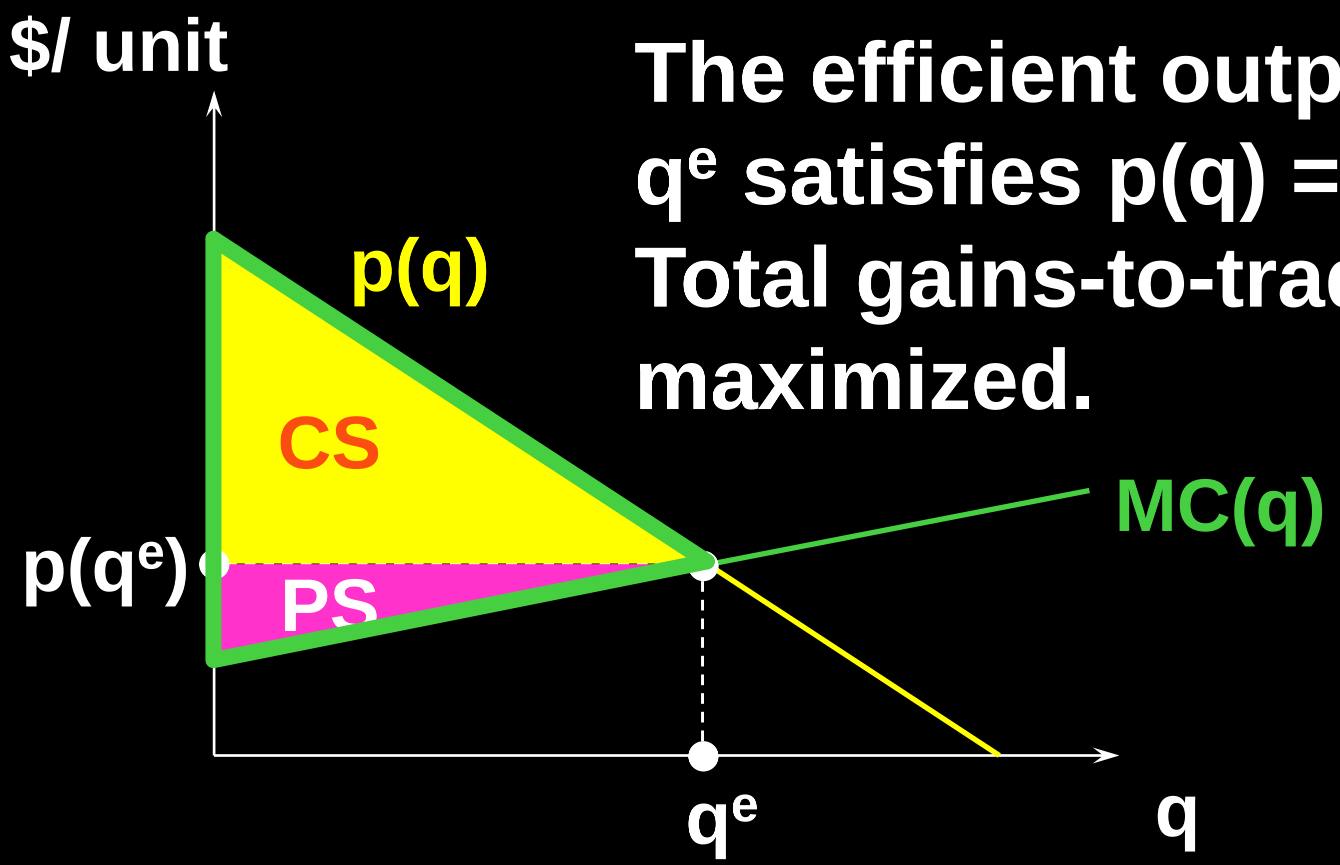
is the amount of the tax passed on to buyers. E.g. if ε = -2, the amount of the tax passed on is 2t.

Because ε < -1, ε /(1+ε) > 1 and so the monopolist passes on to consumers more than the tax!

The Inefficiency of Monopoly

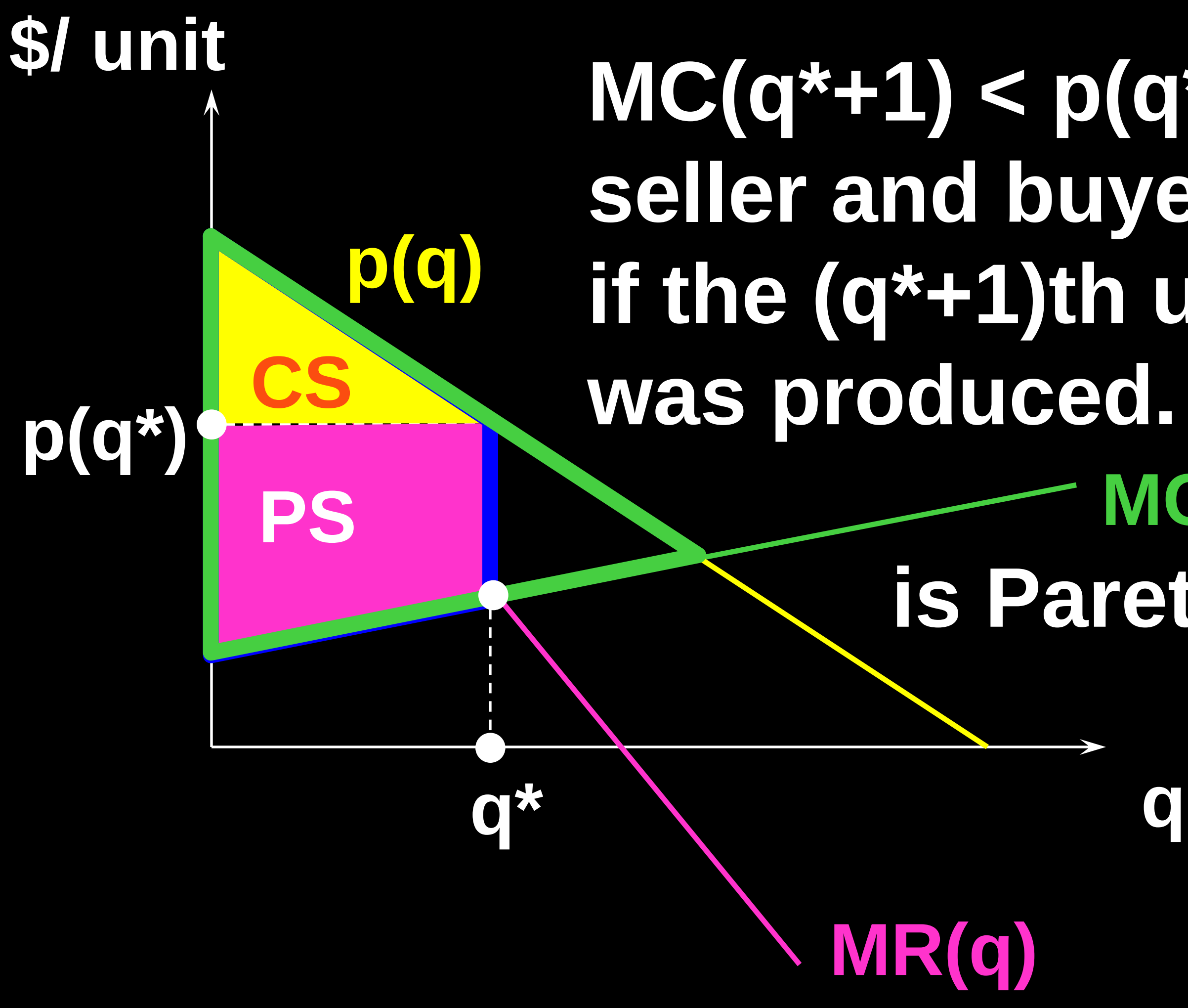
- A market is Pareto **efficient** if it achieves the maximum possible total gains-to-trade.
- Otherwise a market is Pareto **inefficient**.

The Inefficiency of Monopoly



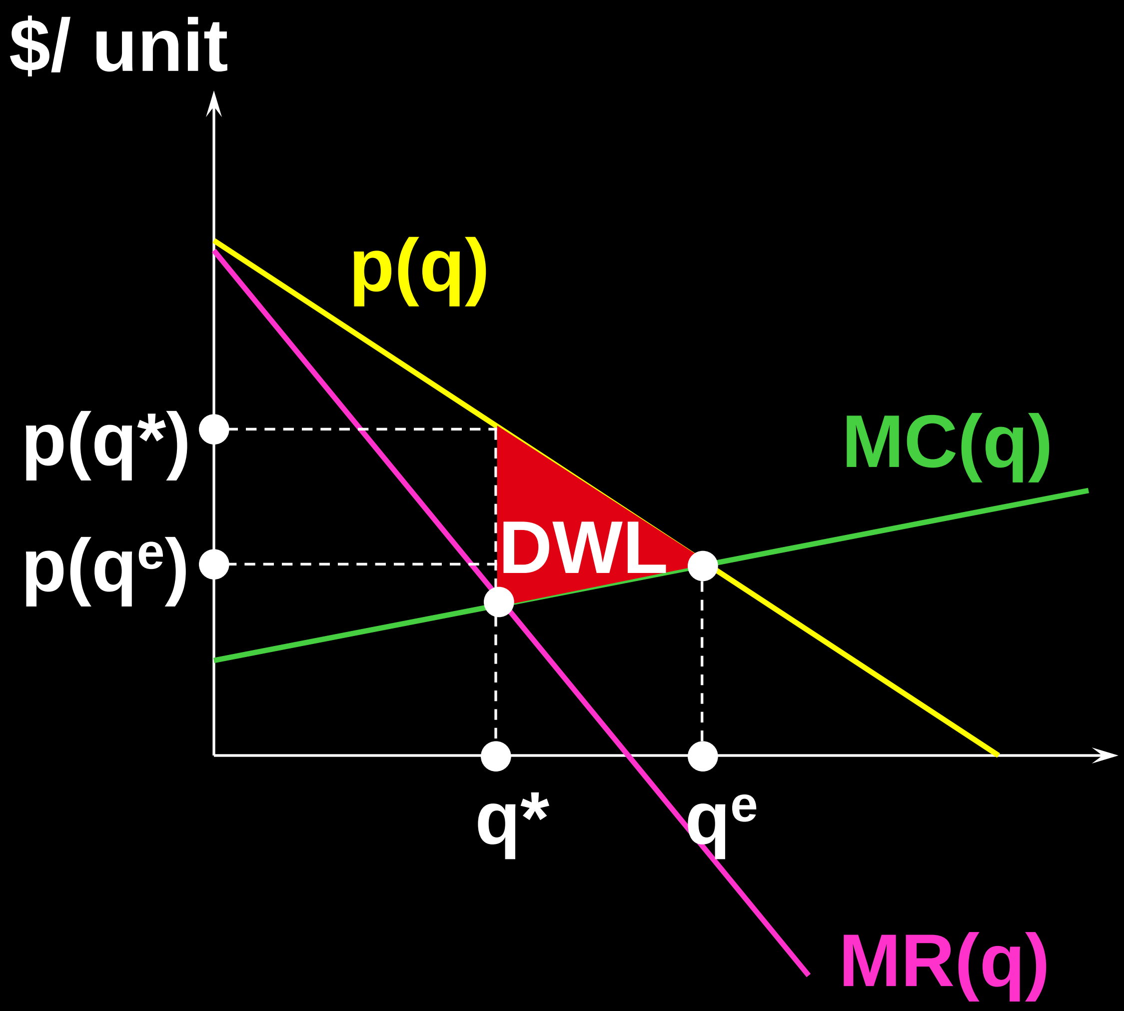
The efficient output level q^e satisfies p(q) = MC(q). Total gains-to-trade is maximized.

The Inefficiency of Monopoly



MC(q*+1) < p(q*+1) so both seller and buyer could gain if the (q*+1)th unit of output was produced. Hence the MC(q) market is Pareto inefficient.

The Inefficiency of Monopoly

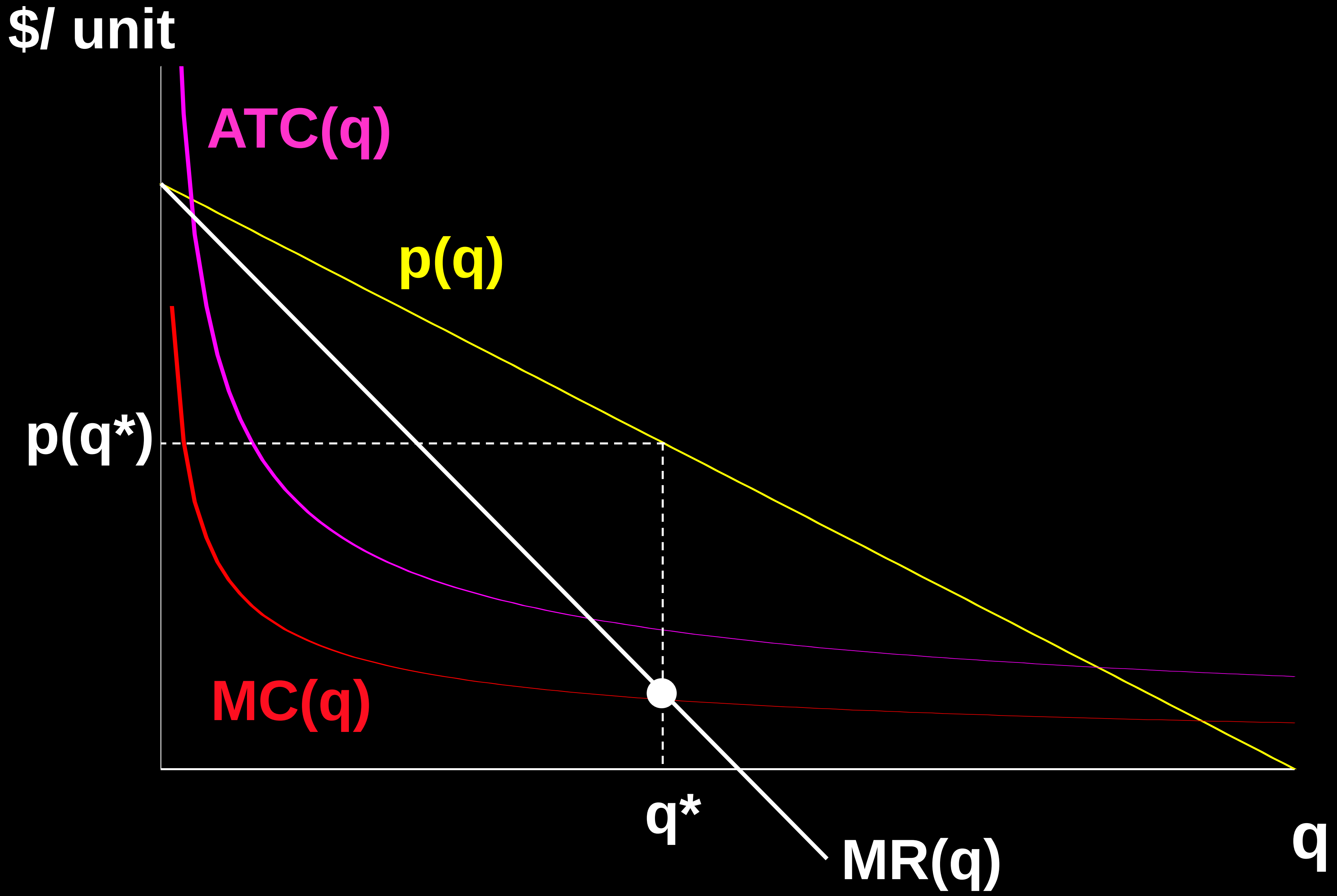


The monopolist produces less than the efficient quantity, making the market price exceed the efficient market price.

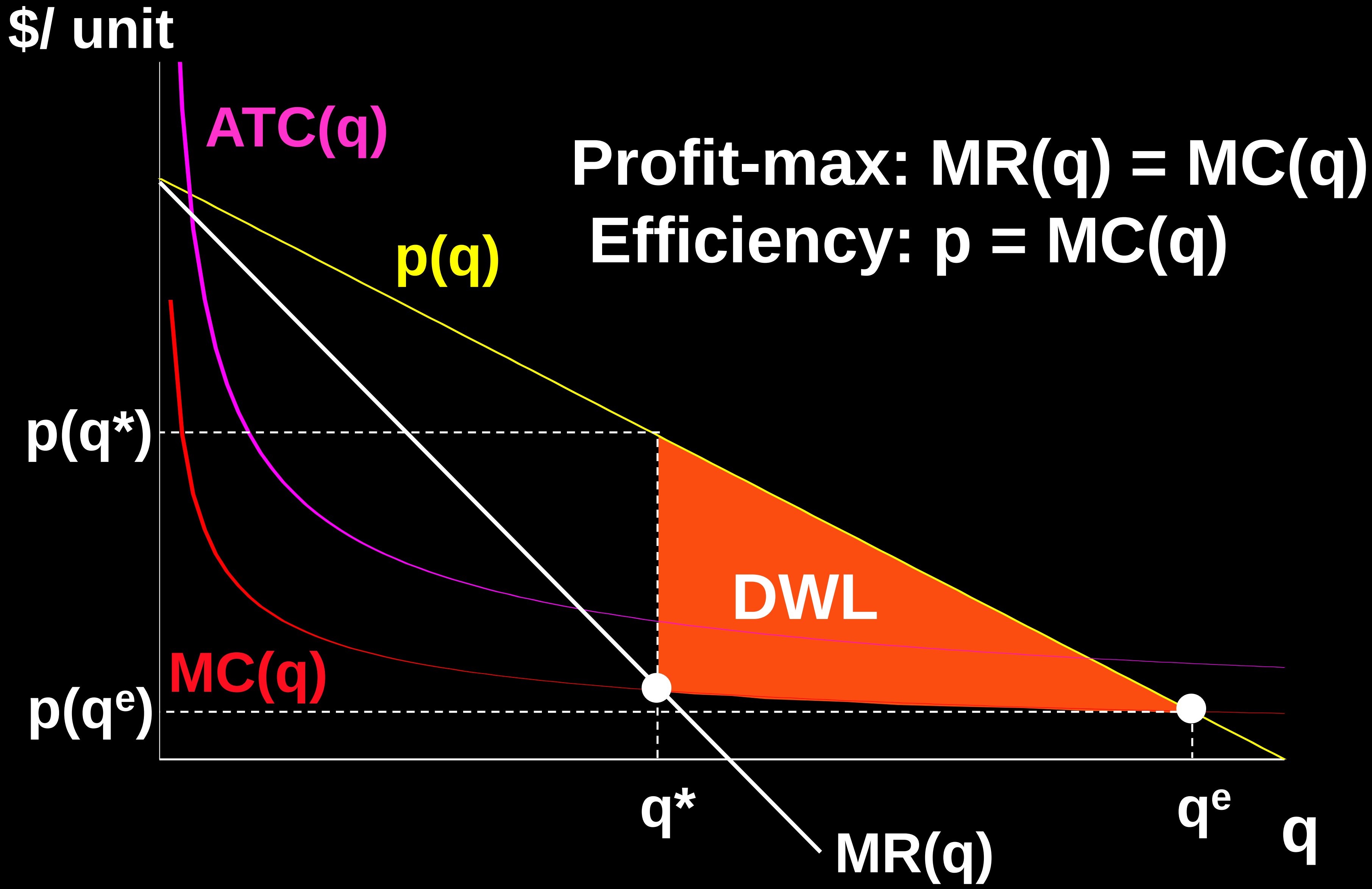
Natural Monopoly

- A natural monopoly arises when the firm’s technology has economies-of-scale large enough for it to supply the whole market at a lower average total production cost than is possible with more than one firm in the market.

Natural Monopoly



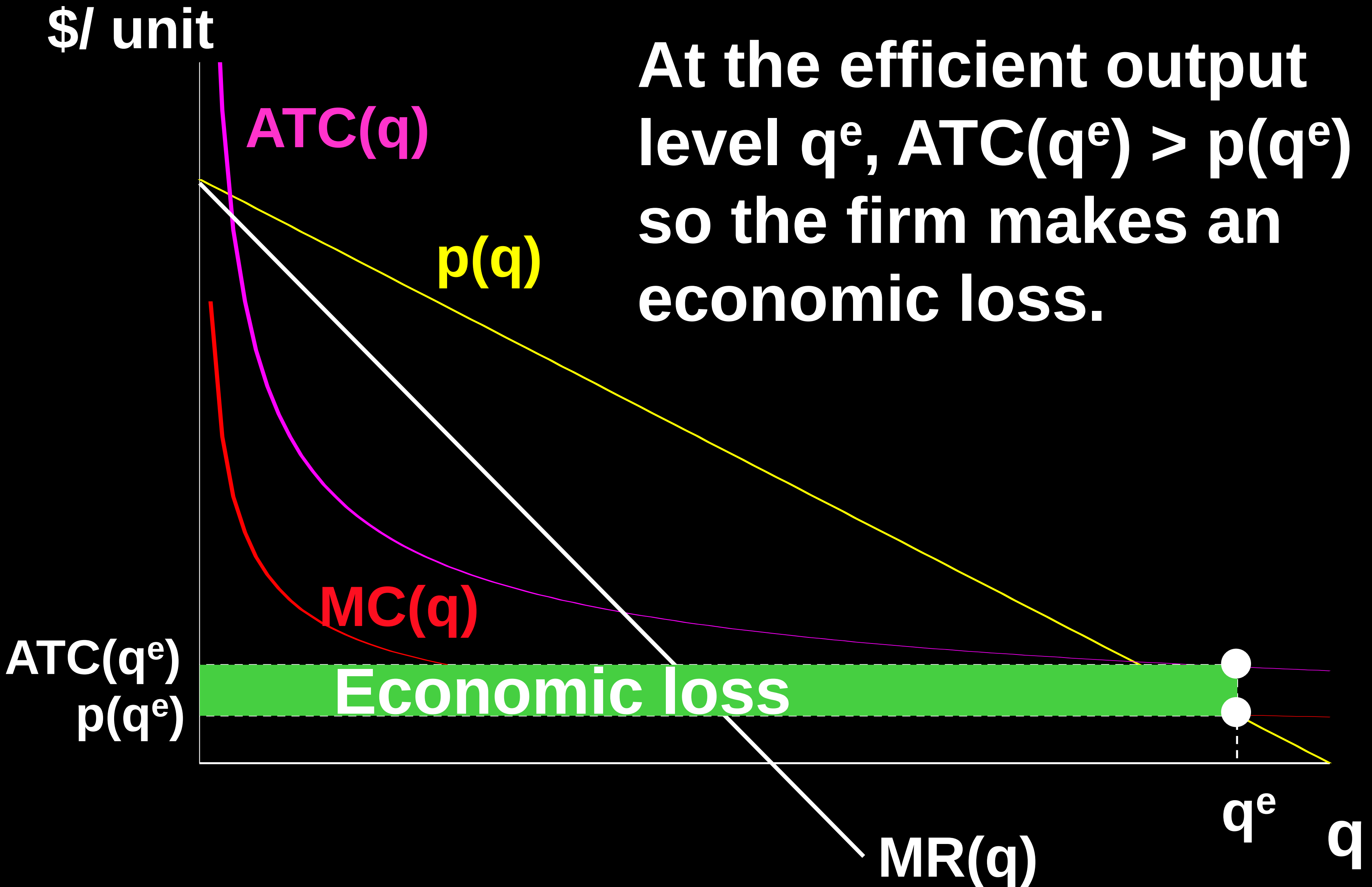
Inefficiency of a Natural Monopoly



Regulating a Natural Monopoly

- Why not command that a natural monopoly produce the efficient amount of output?
- Then the deadweight loss will be zero, won’t it?

Regulating a Natural Monopoly



At the efficient output level q^e, $ATC(q^e) > p(q^e)$ so the firm makes an economic loss.

Regulating a Natural Monopoly

- **So a natural monopoly cannot be forced to use marginal cost pricing. Doing so makes the firm exit, destroying both the market and any gains-to-trade.**
- **Regulatory schemes can induce the natural monopolist to produce the efficient output level without exiting.**