Monopoly

Monopoly: Why?

- **Natural monopoly (increasing returns to scale), e.g. (parts of) utility companies?**
- **Artificial monopoly**
  - **a patent; e.g. a new drug**
  - **sole ownership of a resource; e.g. a toll bridge**
  - **formation of a cartel; e.g. OPEC**

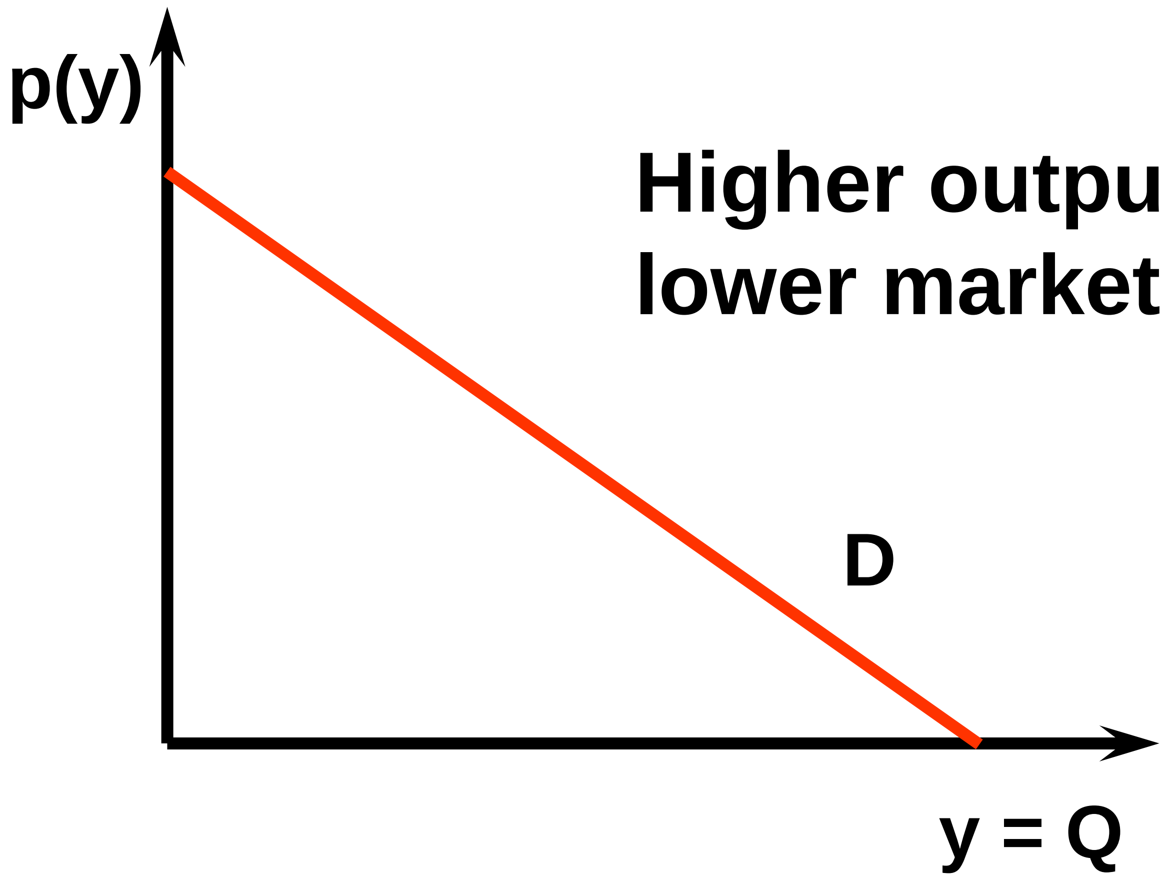
Monopoly: Assumptions

- **Many buyers**
- **Only one seller i.e. not a price-taker**
- **(Homogeneous product)**
- **Perfect information**
- **Restricted entry (and possibly exit)**

Monopoly: Features

- **The monopolist's demand curve is the (downward sloping) market demand curve**
- **The monopolist can alter the market price by adjusting its output level.**

Monopoly: Market Behaviour



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

Monopoly: Market Behaviour

Suppose that the monopolist seeks to maximize economic profit

$$\Pi(y) = p(y)y - c(y)$$

$$\Pi = TR - TC$$

What output level y* maximizes profit?

Monopoly: Market Behaviour

At the profit-maximizing output level, the slopes of the revenue and total cost curves are equal, i.e.

$$MR(y^*) = MC(y^*)$$

Marginal Revenue: Example

$p = a - by$ (inverse demand curve)

$TR = py$ (total revenue)

$TR = ay - by^2$

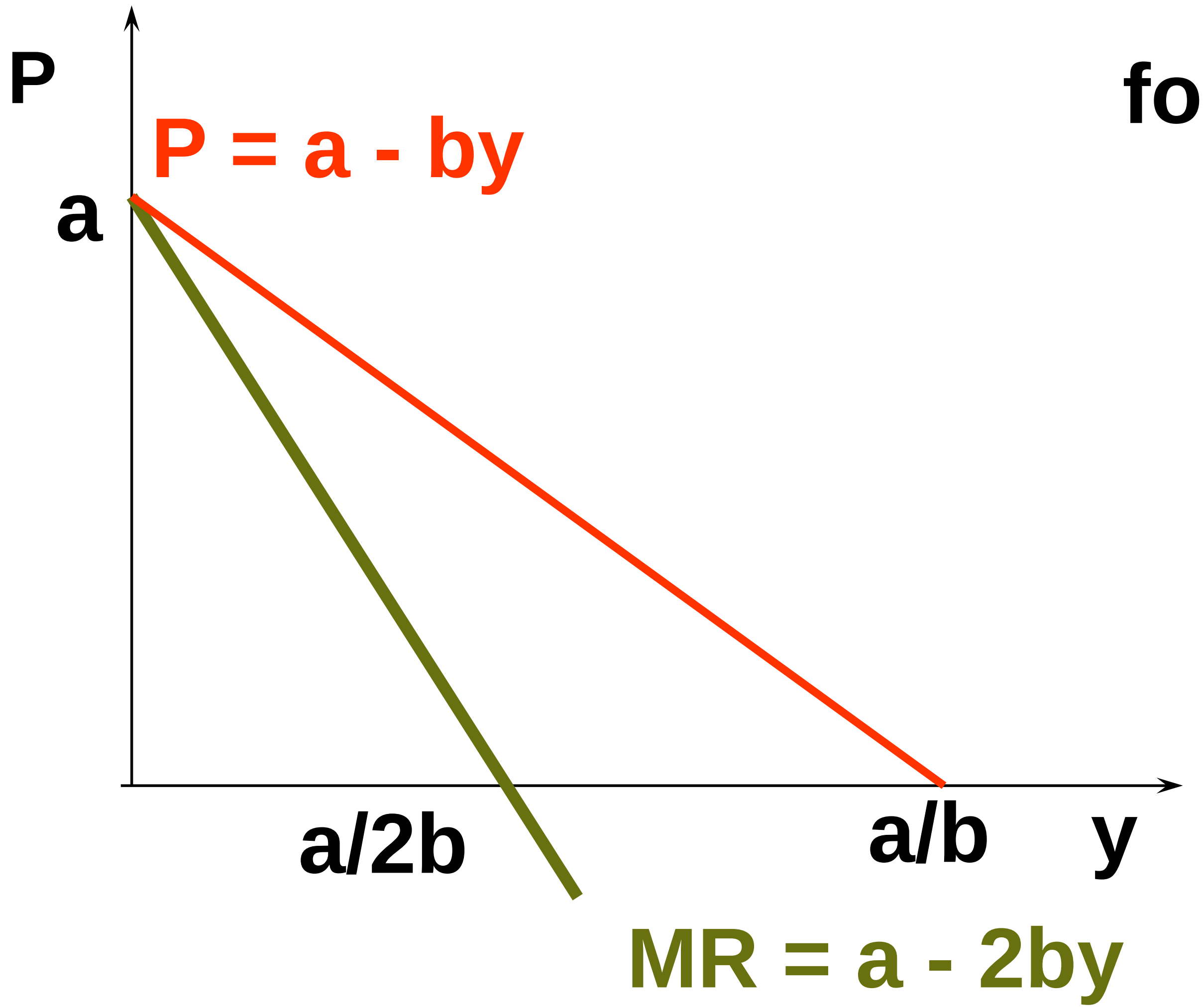
Therefore,

$MR(y) = a - 2by < a - by = p$ for $y > 0$

Marginal Revenue: Example

$MR = a - 2by < a - by = p$

for $y > 0$



Monopoly: Market Behaviour

The aim is to maximise profits MC = MR

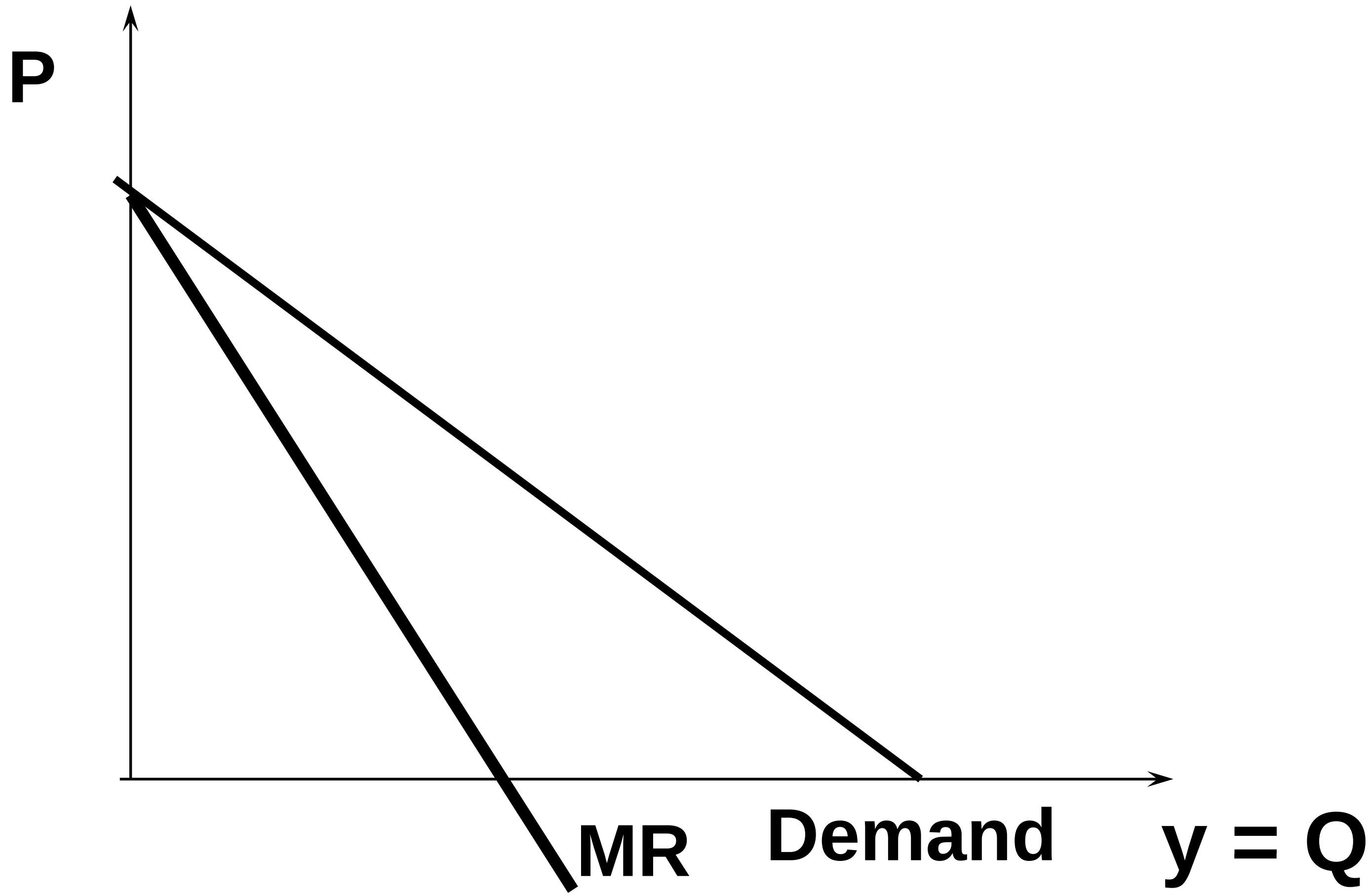
$$MR = p + y\frac{\partial p}{\partial y} < p$$

< 0

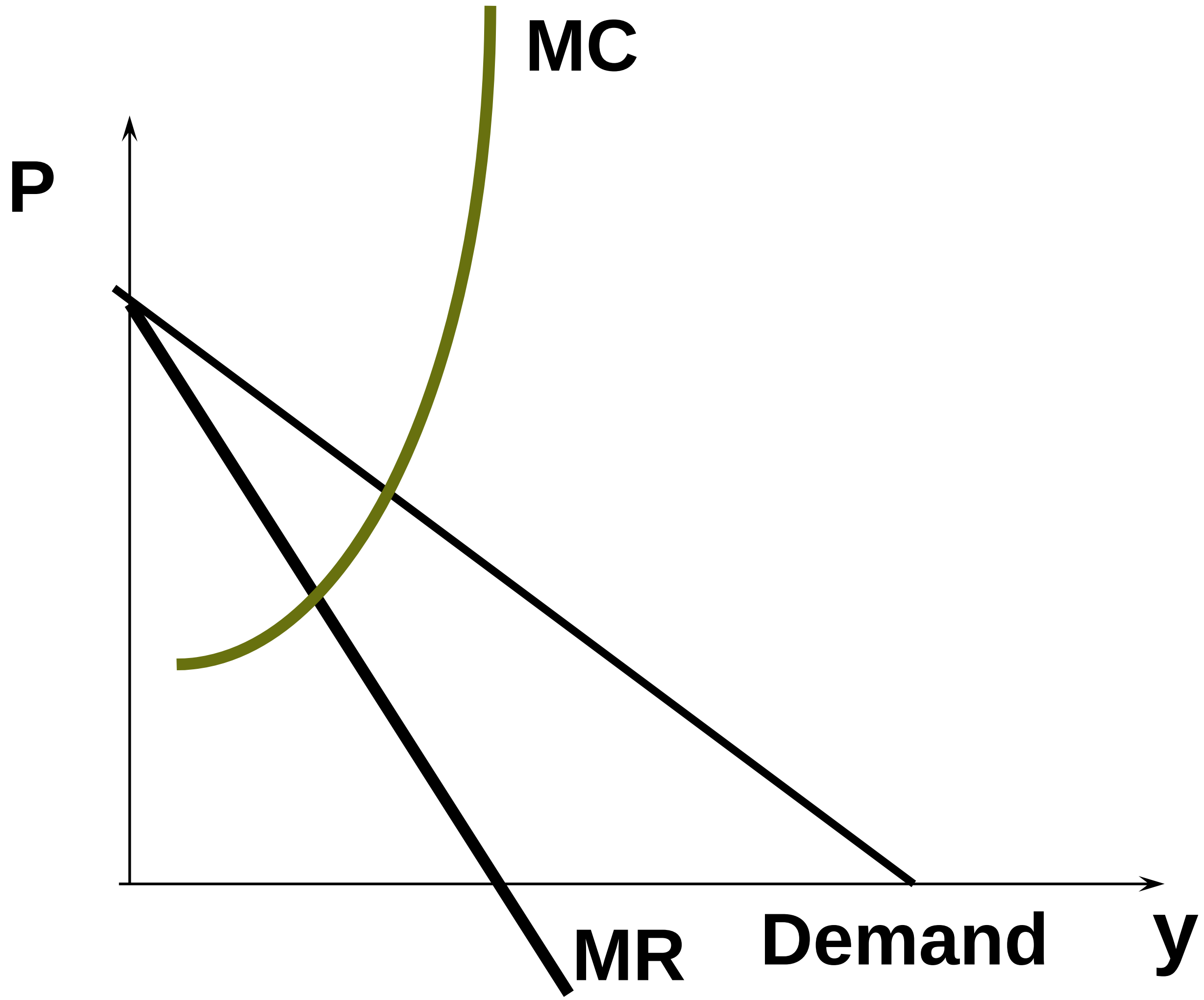
MR lies inside/below the demand curve

Note: Contrast with perfect competition (MR = P)

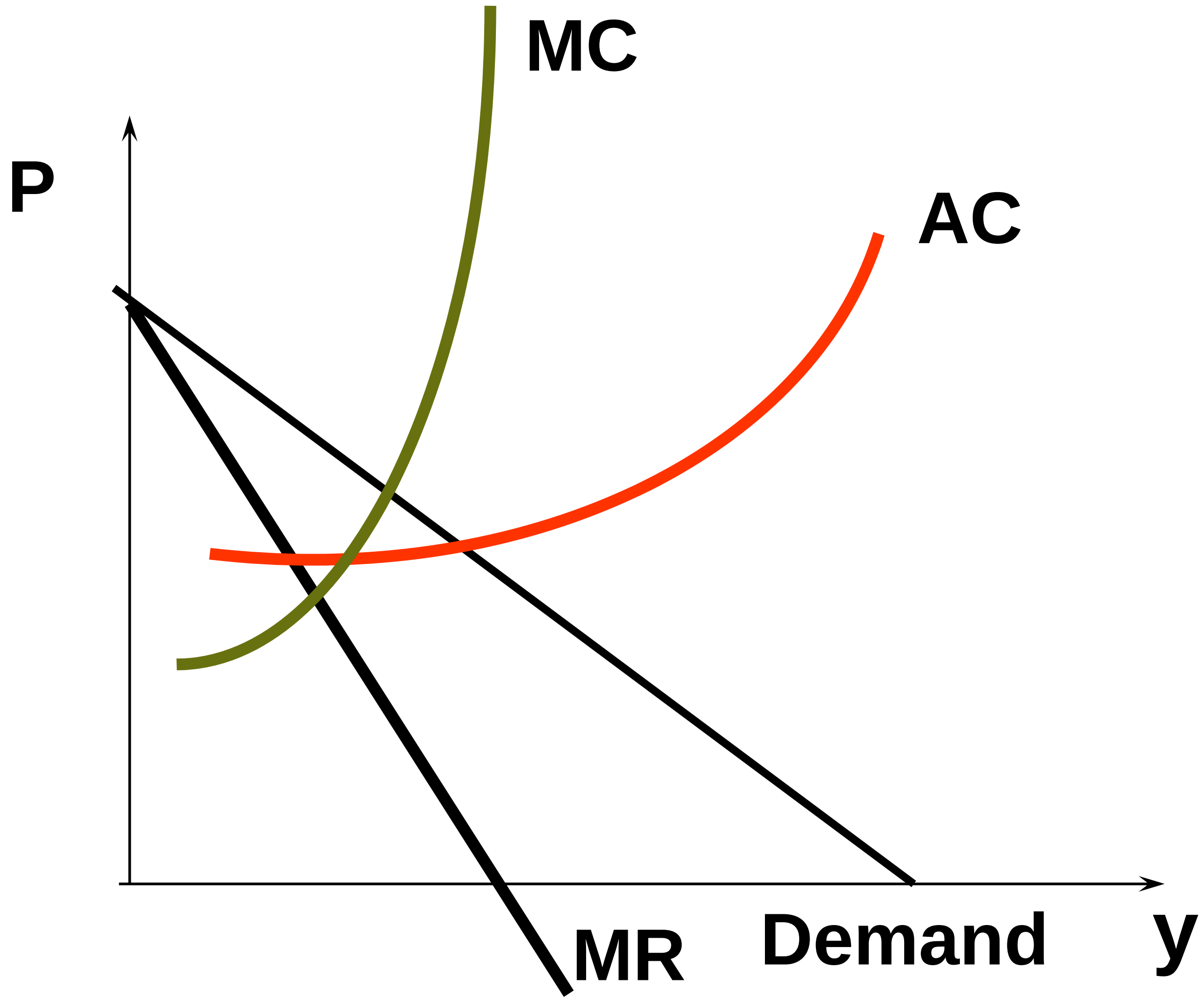
Monopoly: Equilibrium



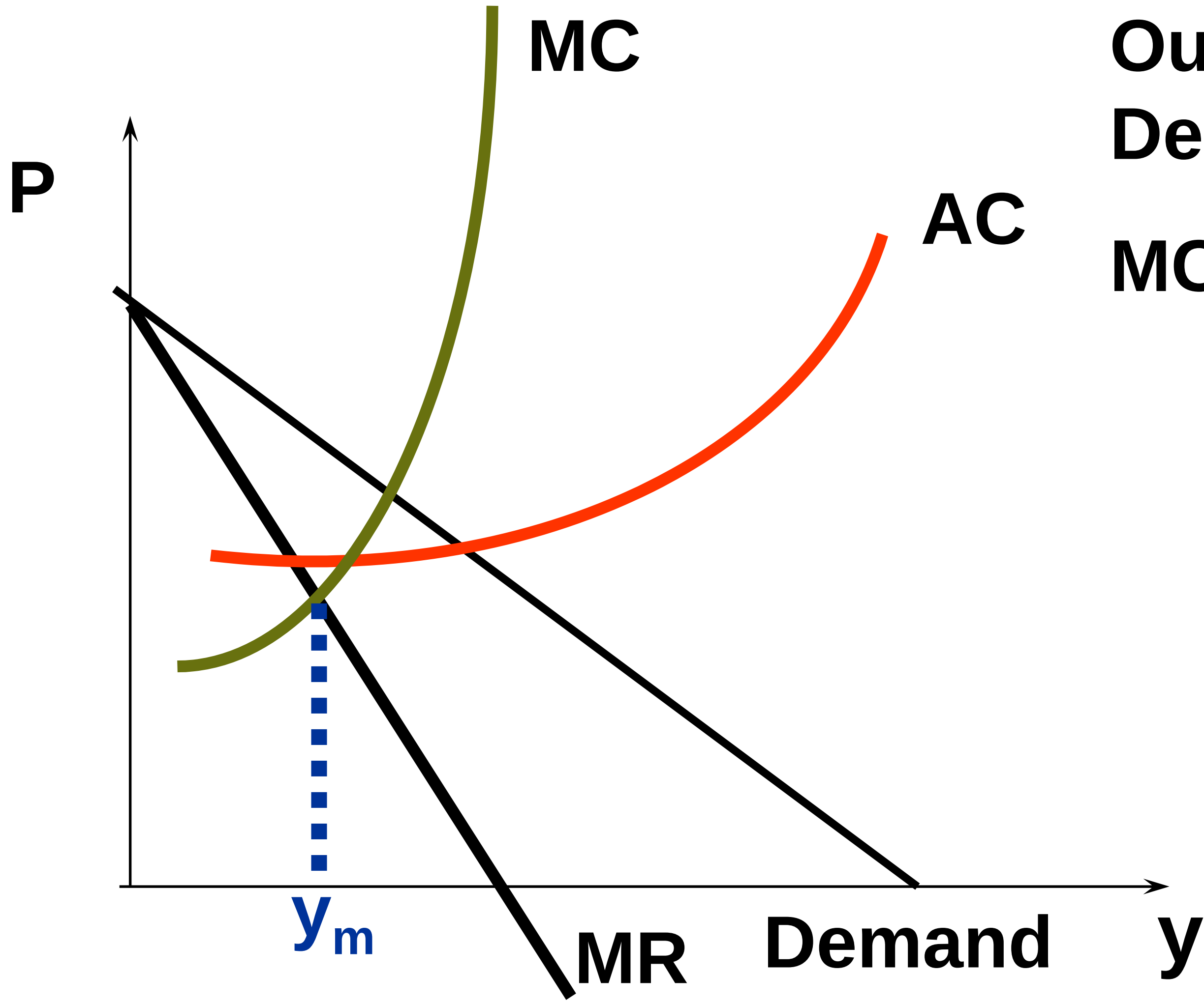
Monopoly: Equilibrium



Monopoly: Equilibrium



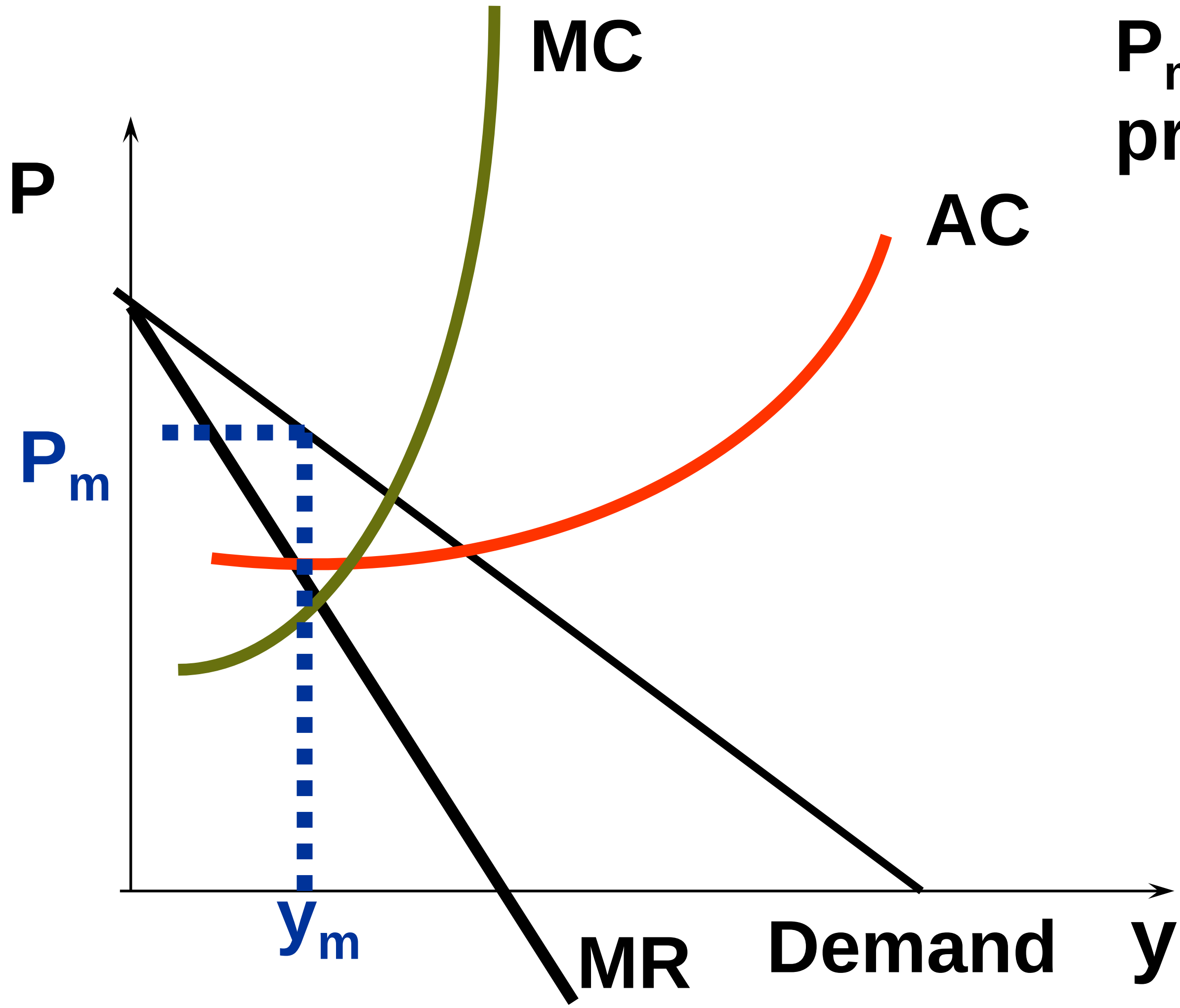
Monopoly: Equilibrium



Output Decision

MC = MR

Monopoly: Equilibrium

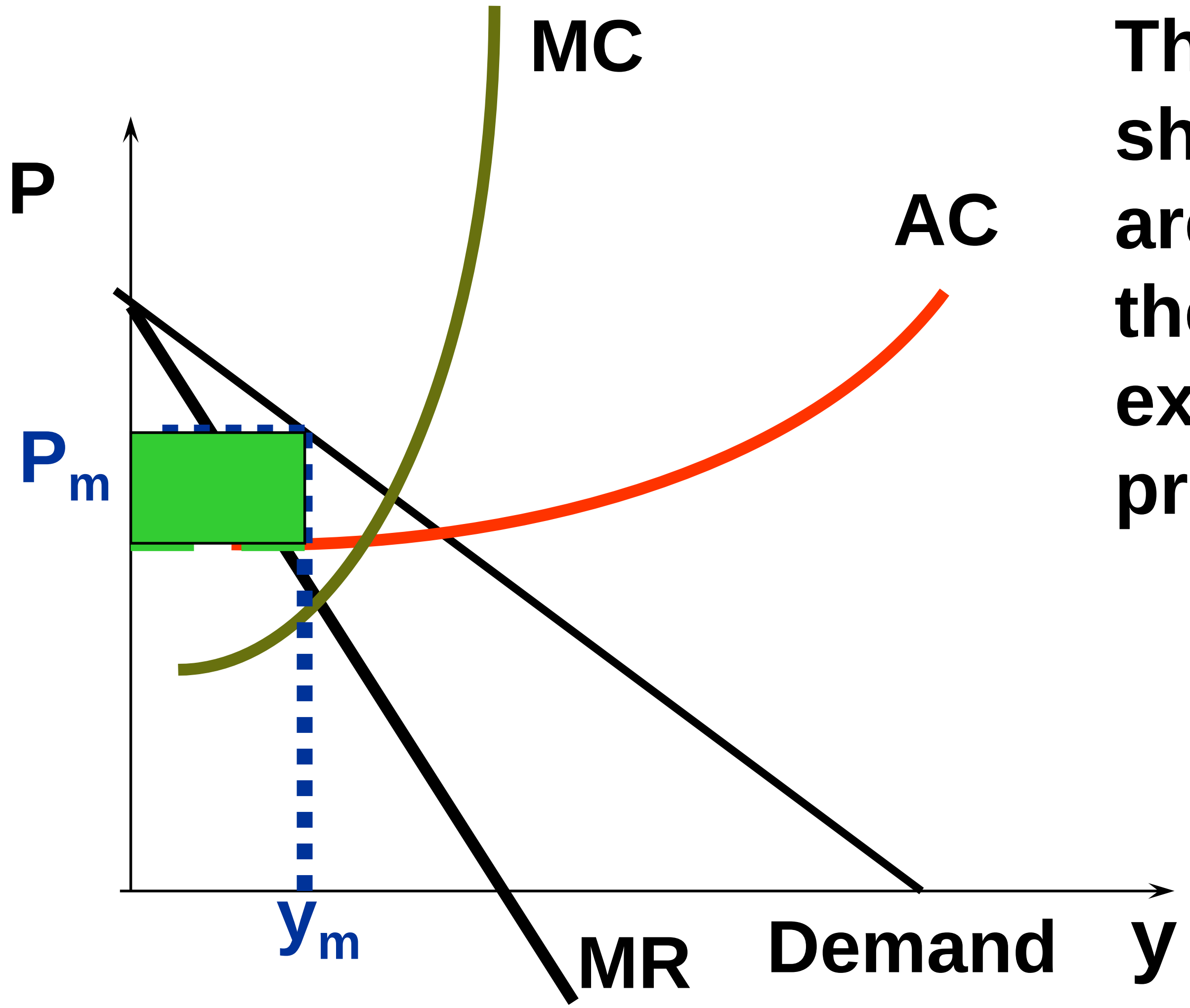


P_m = the price

Monopoly: Equilibrium

- **Firm = Market**
- **Short run equilibrium diagram = long run equilibrium diagram (apart from shape of cost curves)**
- **At q_m: $p_m > AC$ therefore you have excess (abnormal, supernormal) profits**
- **Short run losses are also possible**

Monopoly: Equilibrium



The shaded area is the excess profit

Monopoly: Elasticity

$$\Delta TR = p\Delta y + y\Delta p$$

WHY? Increasing output by Δy will have two effects on profits

1) **When the monopoly sells more output, its revenue increase by pΔy**

2) **The monopolist receives a lower price for all of its output**

Monopoly: Elasticity

$$\Delta TR = p\Delta y + y\Delta p$$

Rearranging we get the change in revenue when output changes i.e. MR

$$MR = \frac{\Delta TR}{\Delta y} = p + \frac{\Delta p}{\Delta y} y$$

$$MR = \frac{\Delta TR}{\Delta y} = p\left(1 + \frac{y\Delta p}{p\Delta y}\right)$$

Monopoly: Elasticity

$$MR = \frac{\Delta TR}{\Delta y} = p\left(1 + \frac{y \Delta p}{p \Delta y}\right)$$

$$= \frac{1}{\varepsilon}$$

ε = elasticity of demand

$$MR = \frac{\Delta TR}{\Delta y} = p\left(1 + \frac{1}{\varepsilon}\right)$$

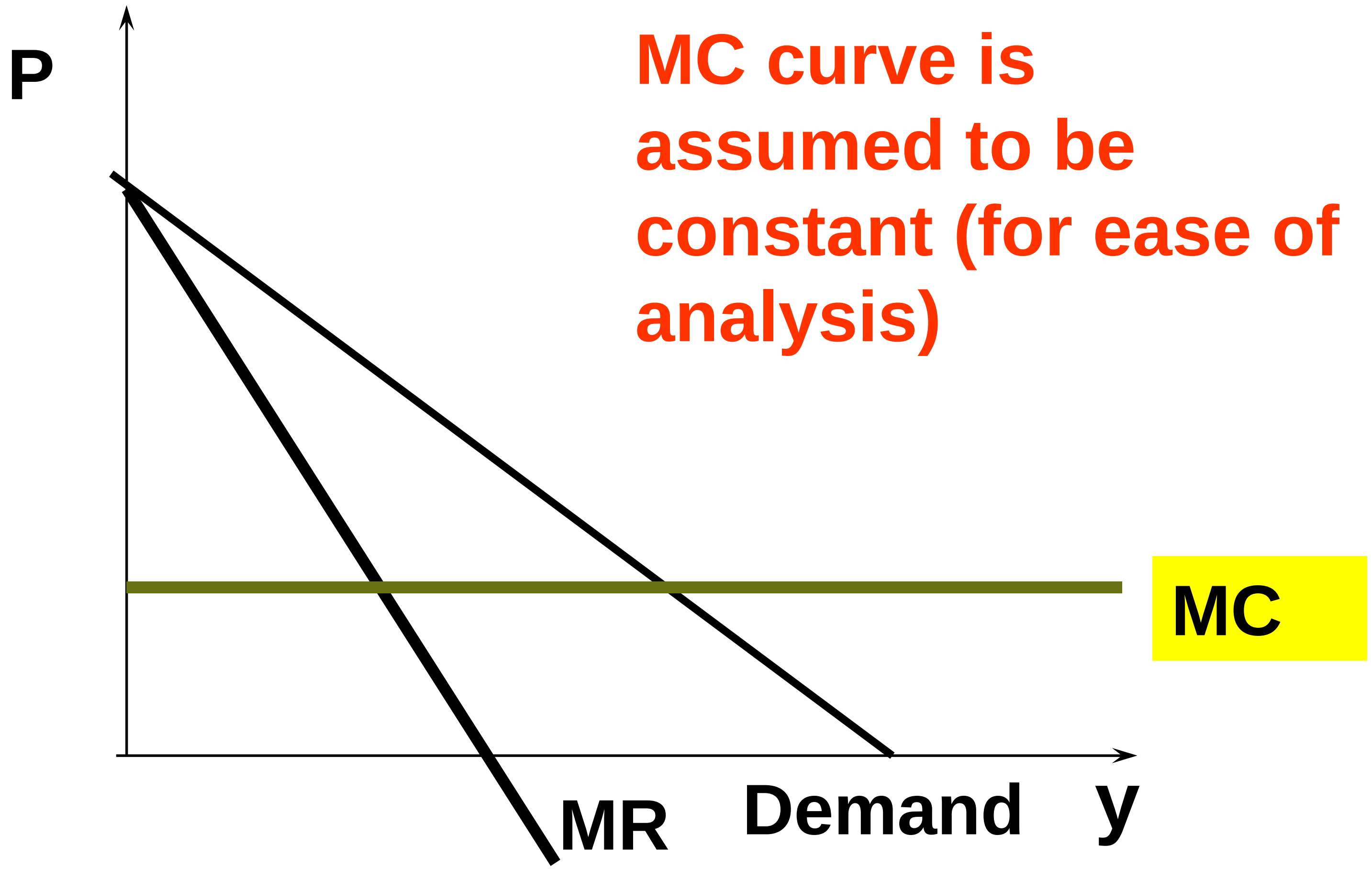
Monopoly: Elasticity

Recall MR = MC, therefore,

$$MR = \frac{\Delta R}{\Delta y} = p\left(1 + \frac{1}{\varepsilon}\right) = MC > 0$$

Therefore, in the case of monopoly, $\varepsilon < -1$, i.e. $|\varepsilon| \geq 1$. The monopolist produces on the elastic part of the demand curve.

Application: Tax Incidence in Monopoly



Application: Tax Incidence in Monopoly

- **Claim**

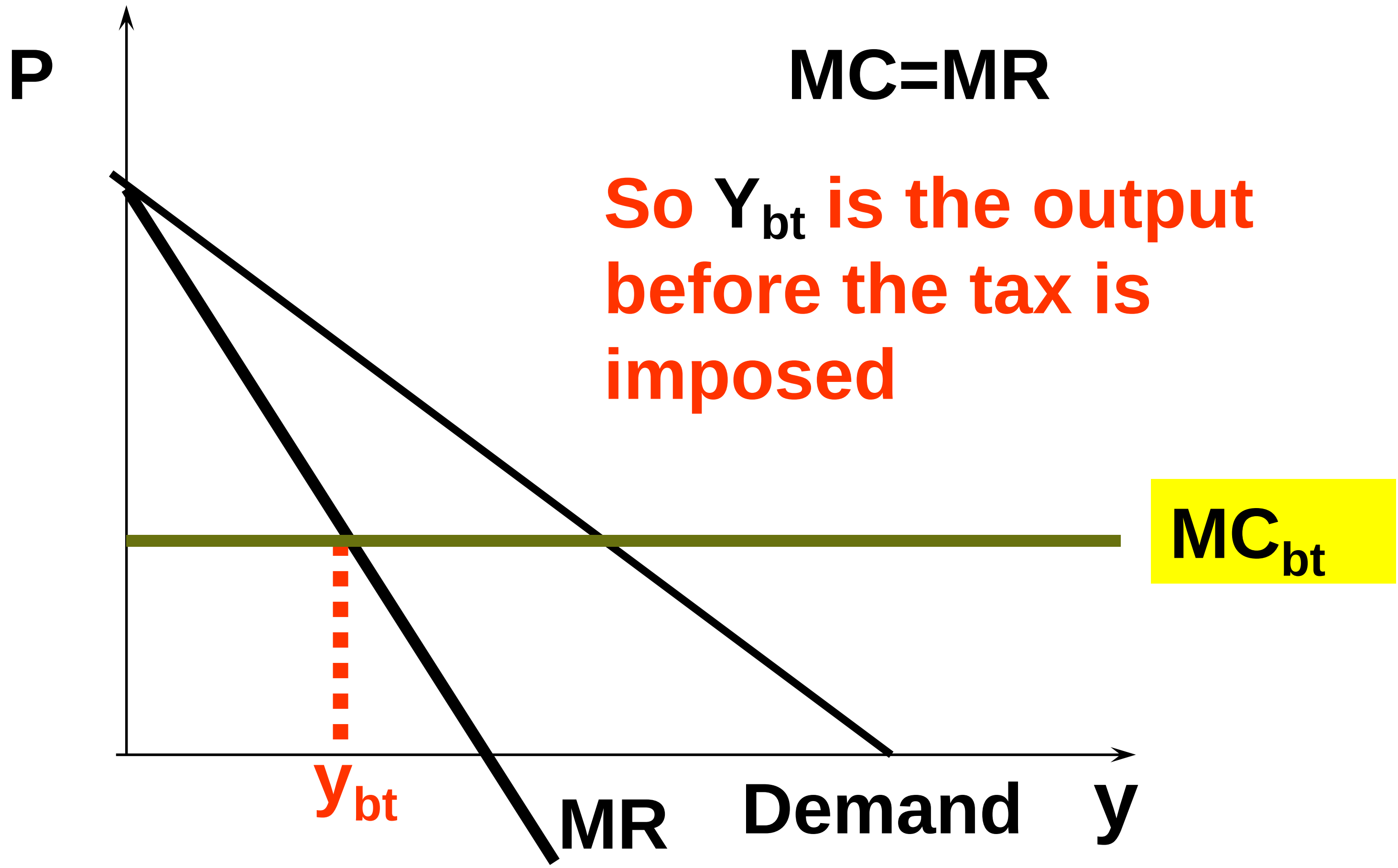
  When you have a linear demand curve, a constant marginal cost curve and a tax is introduced, price to consumers increases by "only" 50% of the tax, i.e. "only" 50% of the tax is passed on to consumers

Application: Tax Incidence in Monopoly

Output decision is as before, i.e.

MC=MR

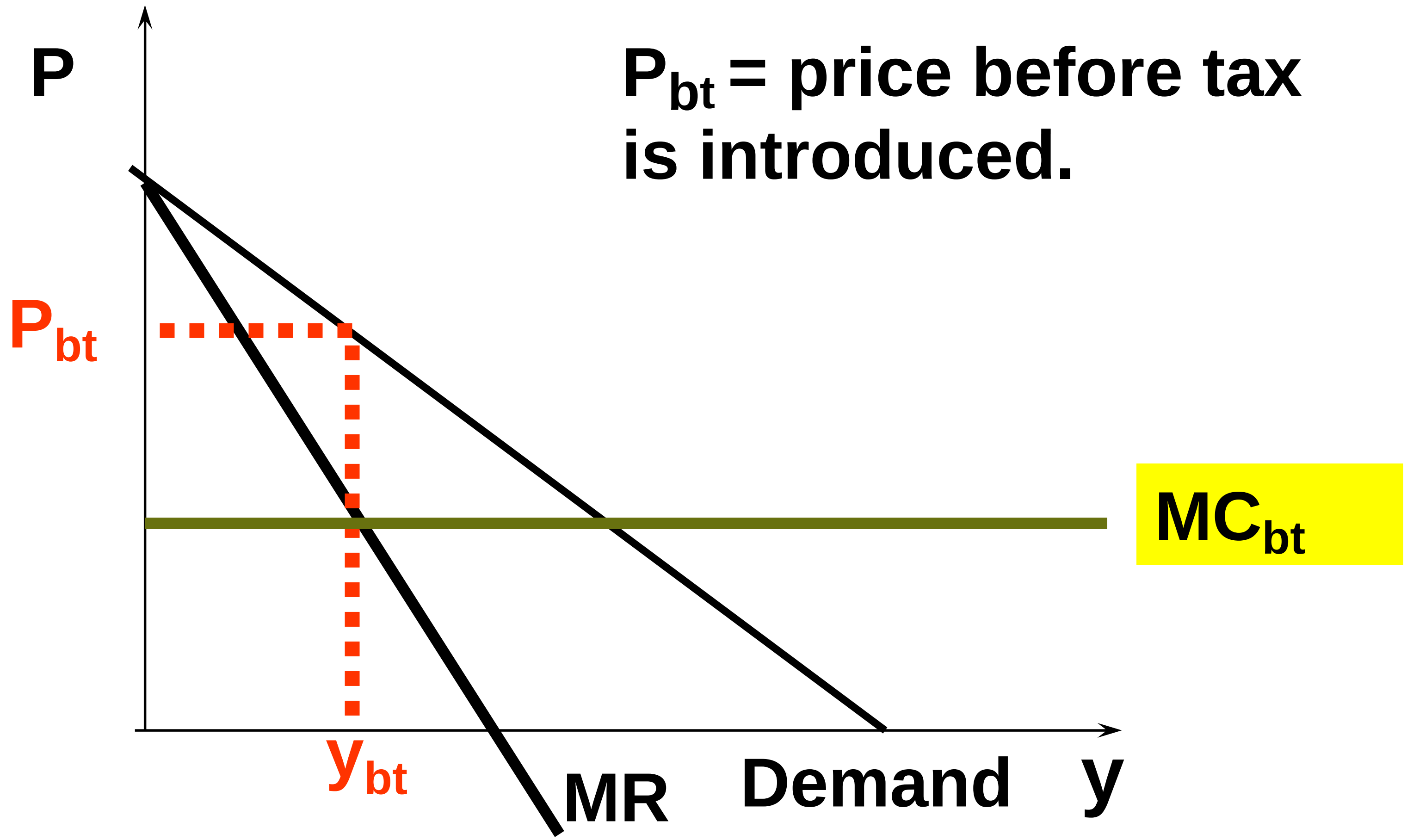
So Y_{bt} is the output before the tax is imposed



Application: Tax Incidence in Monopoly

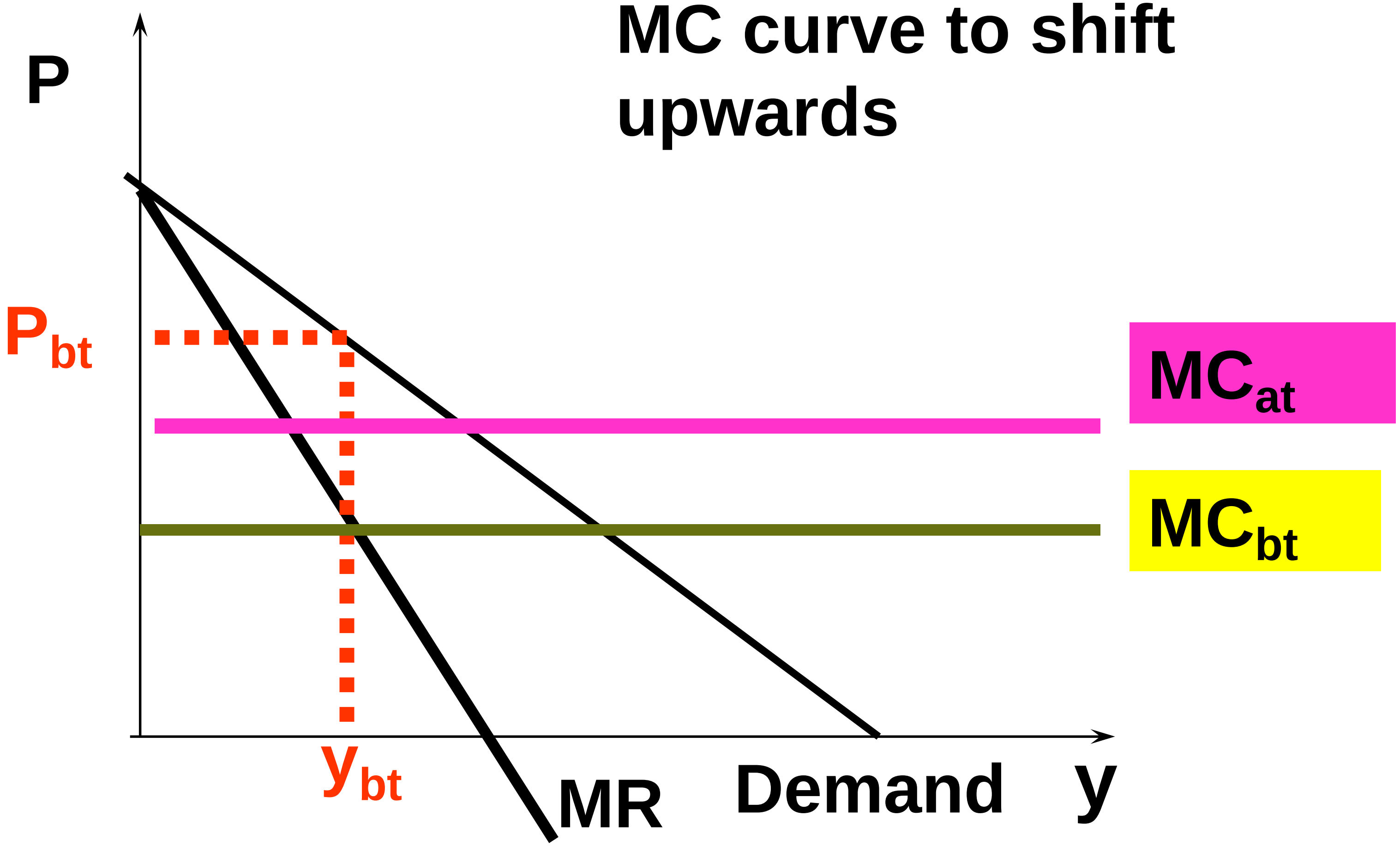
Price is also the same as before

P_{bt} = price before tax is introduced.



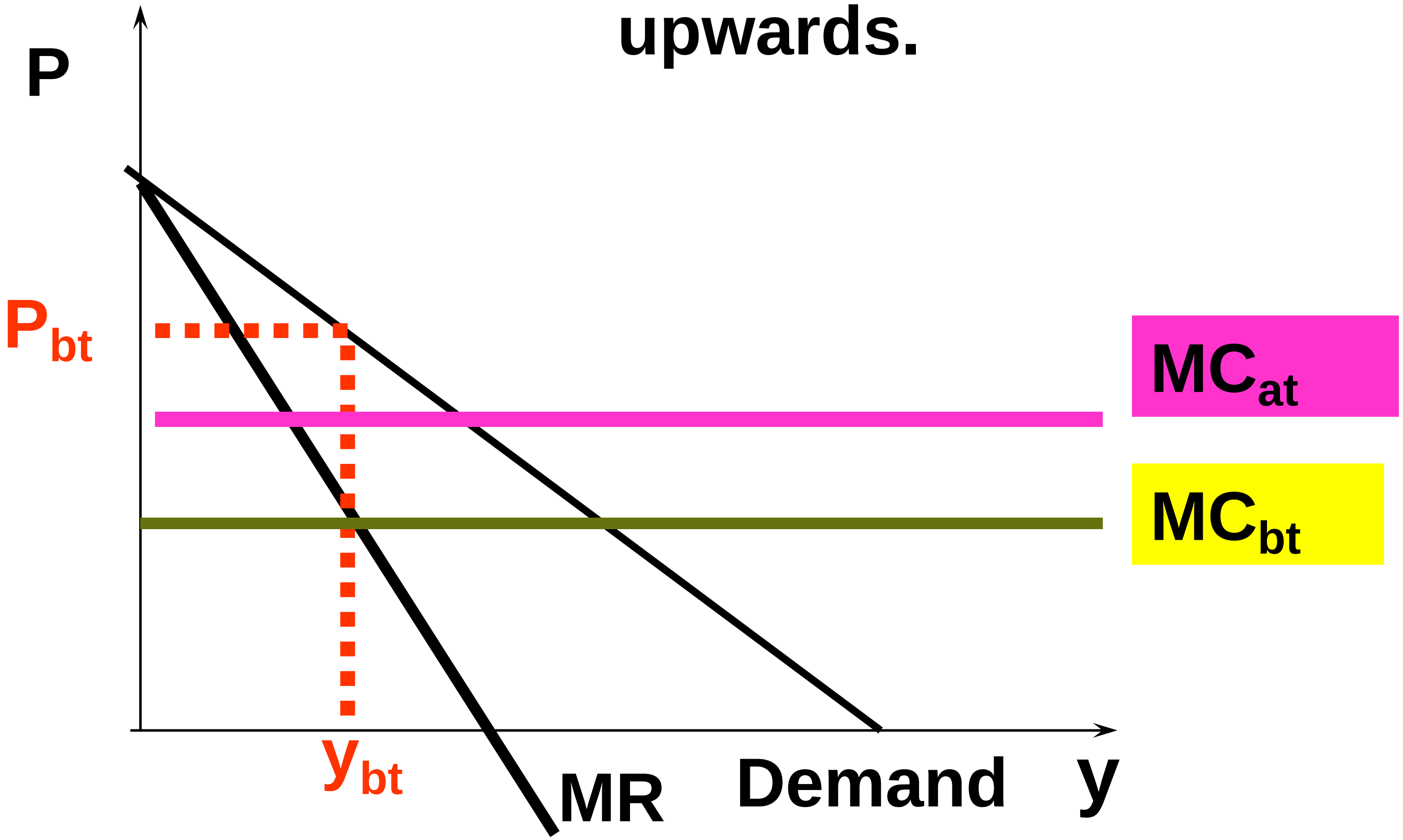
Application: Tax Incidence in Monopoly

The tax causes the MC curve to shift upwards



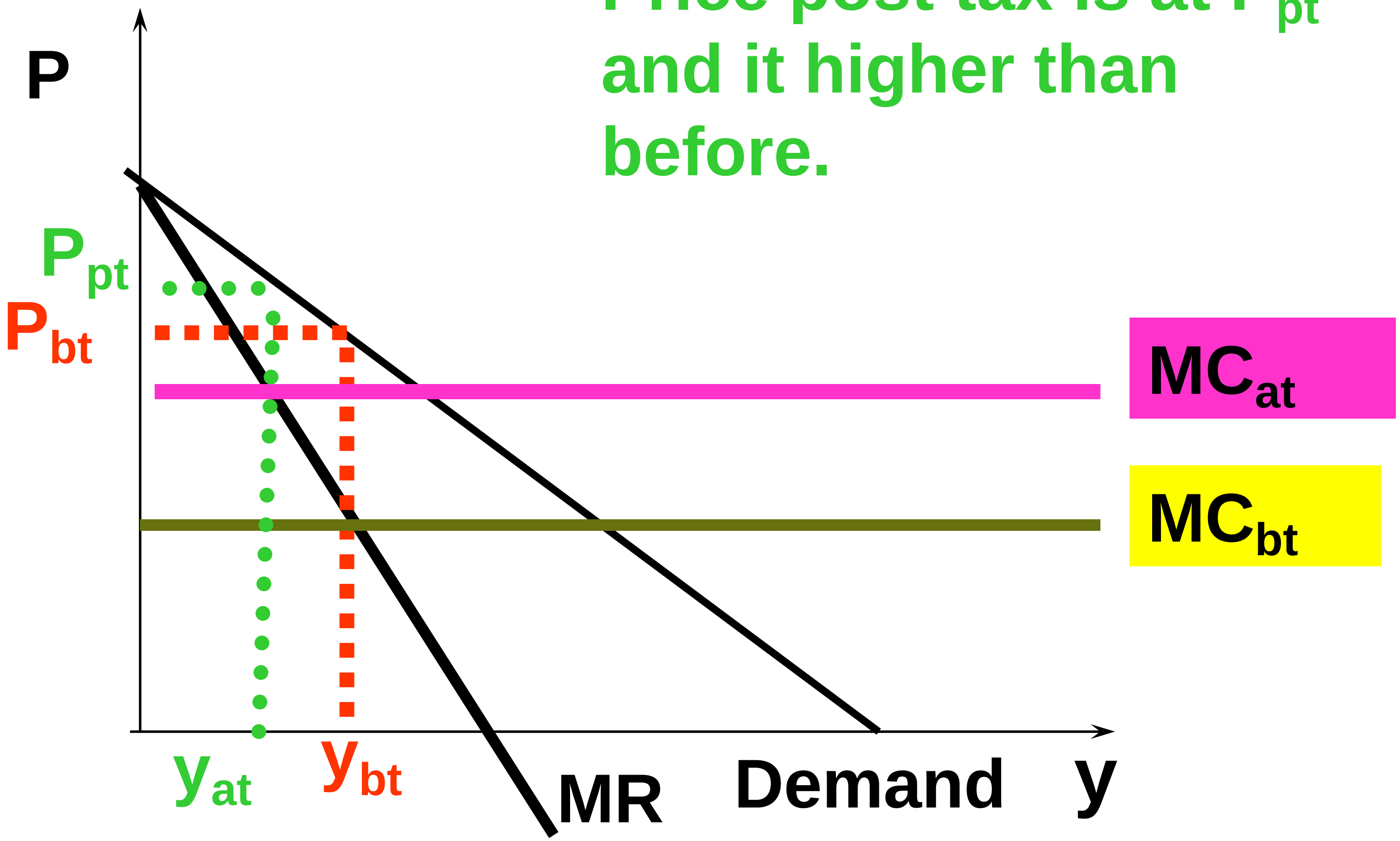
Application: Tax Incidence in Monopoly

The tax will cause the MC curve to shift upwards.



Application: Tax Incidence in Monopoly

Price post tax is at P_{pt} and it higher than before.



Application: Tax Incidence in Monopoly

Formal Proof

Step 1: Define the linear (inverse) demand curve

$$P = a - bY$$

Step 2: Assume marginal costs are constant

$$MC = C$$

Step 3: Profit is equal to total revenue minus total cost

$$\Pi = TR - TC$$

Application: Tax Incidence in Monopoly

Formal Proof

Step 4: Rewrite the profit equation as

$$\Pi = PY - CY$$

Step 5 : Replace price with P=a-bY

$$\Pi = (a - bY)Y - CY$$

Profit is now a function of output only

Application: Tax Incidence in Monopoly

Formal Proof

Step 6: Simplify

$$\Pi = Ya - bY^2 - CY$$

Step 7: Maximise profits by differentiating profit with respect to output and setting equal to zero

$$\Pi'_{\{Y\}} = a - 2bY - C = 0$$

Application: Tax Incidence in Monopoly

Formal Proof

Step 8: Solve for the profit maximising level of output (Y_{bt})

$$-2bY = C - a$$

$$Y_{bt} = \frac{a - C}{2b}$$

Application: Tax Incidence in Monopoly

Formal Proof

Step 9: Solve for the price (P_{bt}) by substituting Y_{bt} into the (inverse) demand function

$$Y_{bt} = \frac{a - C}{2b}$$

Recall that P = a - bY therefore

$$P_{bt} = a - b\left(\frac{a - C}{2b}\right)$$

Application: Tax Incidence in Monopoly

Formal Proof

Step 10: Simplify

$$P_{bt} = a - b\left(\frac{a - C}{2b}\right)$$

$$P_{bt} = a + \left(\frac{-ba + bC}{2b}\right)$$

Multiply by - b

$$P_{bt} = a + \left(\frac{-a + C}{2}\right)$$

b cancels out

Application: Tax Incidence in Monopoly

Formal Proof

$$P_{bt} = a + \left(\frac{-a}{2} + \frac{C}{2} \right)$$

$$P_{bt} = a + \left(-\frac{1}{2}a + \frac{C}{2} \right)$$

$$P_{bt} = \frac{1}{2}a + \frac{C}{2}$$

$$P_{bt} = \frac{a + C}{2}$$

Application: Tax Incidence in Monopoly

Formal Proof

Step 11: Replace C = MC with C = MC + t (one could repeat all of the above algebra if unconvinced)

$$P_{bt} = \frac{a + C}{2}$$

Price before tax

$$P_{at} = \frac{a + C + t}{2}$$

So price after the tax P_{at} increases by t/2