FRANKFURT UNIVERSITY OF APPLIED SCIENCES

Energy Economics

Fachbereich 2 Informatik und Ingenieurwissenschaften

Cost curves – exercise

A company under perfect competition produces with the cost curve

$$C(y) = 10y^2 + 5y + 40$$

a) Which output level minimizes average cost?

b) Which market price is necessary to allow the company to produce this output level (cost minimum)?

c) Calculate the price level at which the company will stay in the market in the long-run and in the short-run.

d) Determine the company's output level for a market price $p = 75$.

e) Draw AVC, AC and MC in one graph together with the producer surplus.

Perfect competition

Market equilibrium

A market equilibrium is a system of equilibrium prices along with rational supply and demand decisions which clear markets.
The respective quantities of input and output determine the equilibrium allocation

- Market forces cause an adjustment of prices until the equilibrium is achieved.
- in the equilibrium market participants have no incentive to change their behavior

Equilibrium – exercise

The company under perfect competition still produces with the cost curve

$$C(y) = 10y^2 + 5y + 40$$

and faces a market demand

$$D(p) = 11 - \frac{1}{10}p$$

a) Assume another company with identical production technology and cost structure enters the market. What are the consequences?

Equilibrium – exercise

Technological progress allows the companies under perfect competition to produce with the improved cost curve

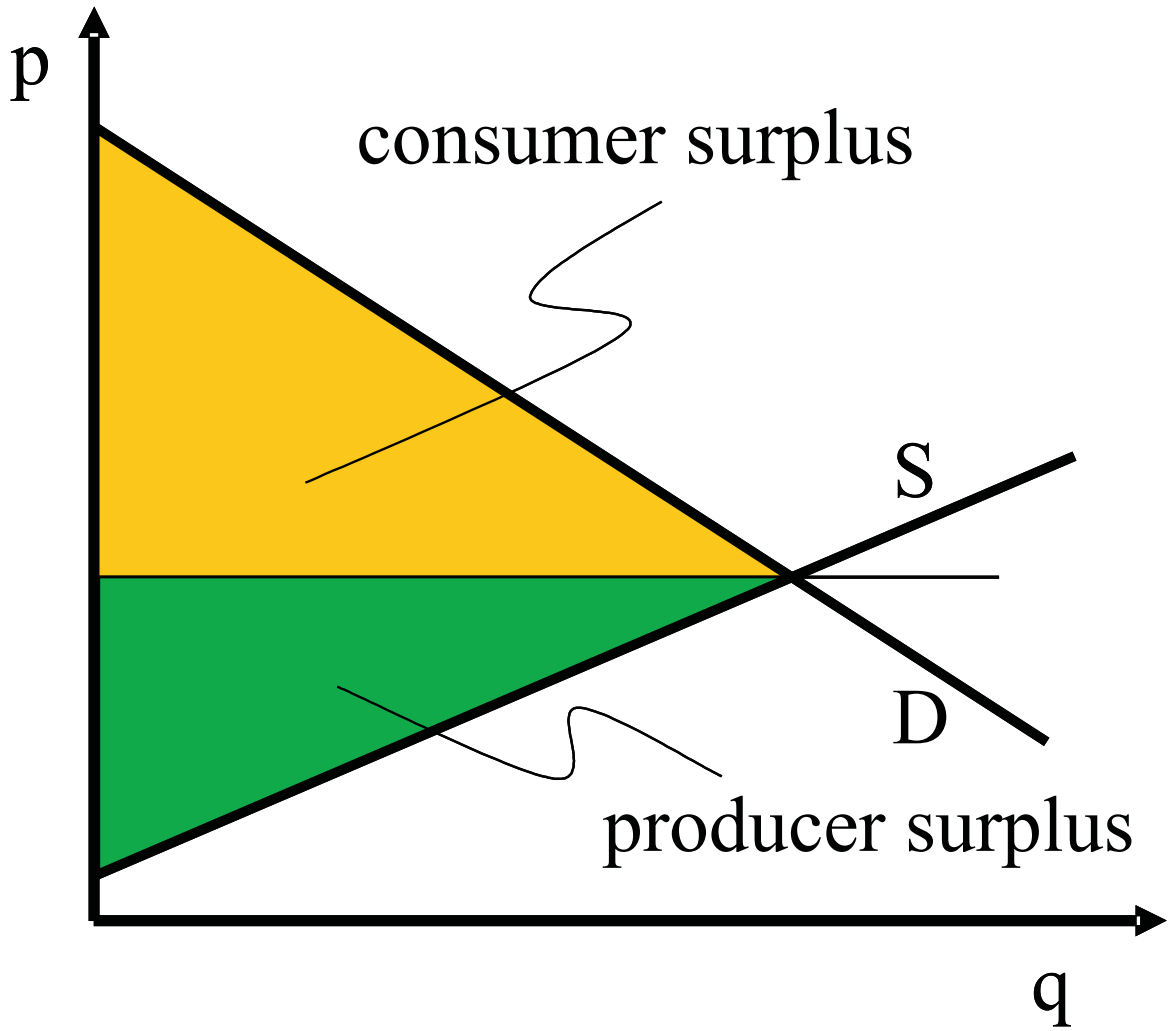
$$C(y) \quad = \quad y^2 + 4y + 16.$$

They face a significant higher market demand

$$D(p) \quad = \quad 110 - \frac{1}{2}p$$

a) Calculate the number of companies, market price and quantity, the profit of each company and quantity for the long-run equilibrium.

Welfare



Market interventions

- market interventions frequently occur

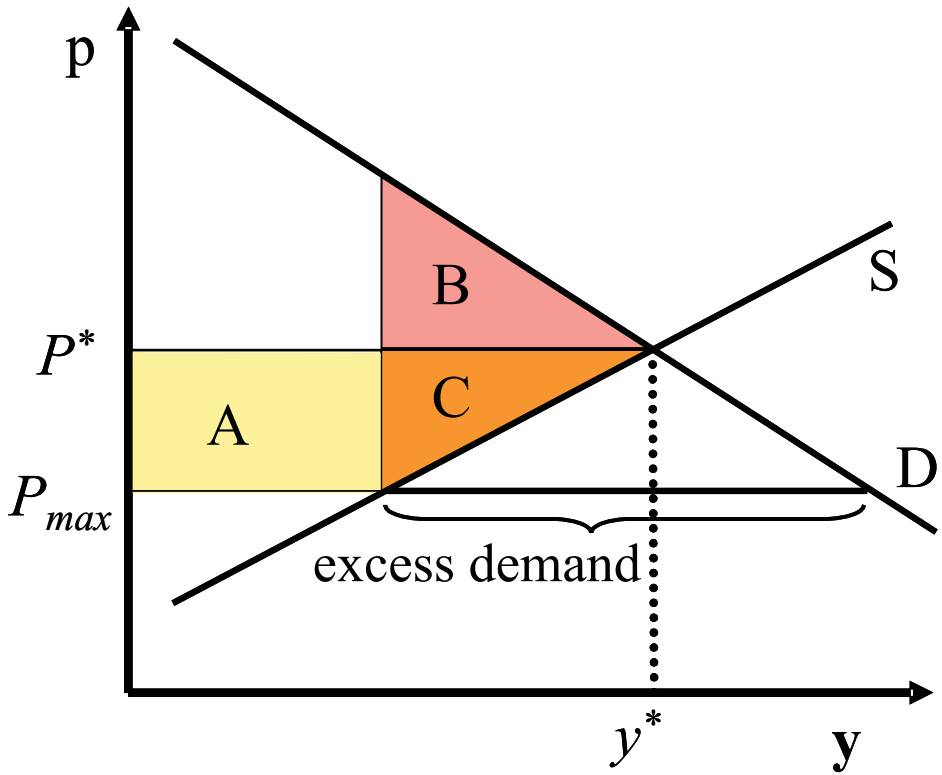
→ e.g. maximum rents, oil and gas price caps

→ e.g. minimum prices for electricity generated by RES or minimum wages

- consumption taxes are frequently used e.g. to finance governmental purposes
- sometimes also subsidies are paid

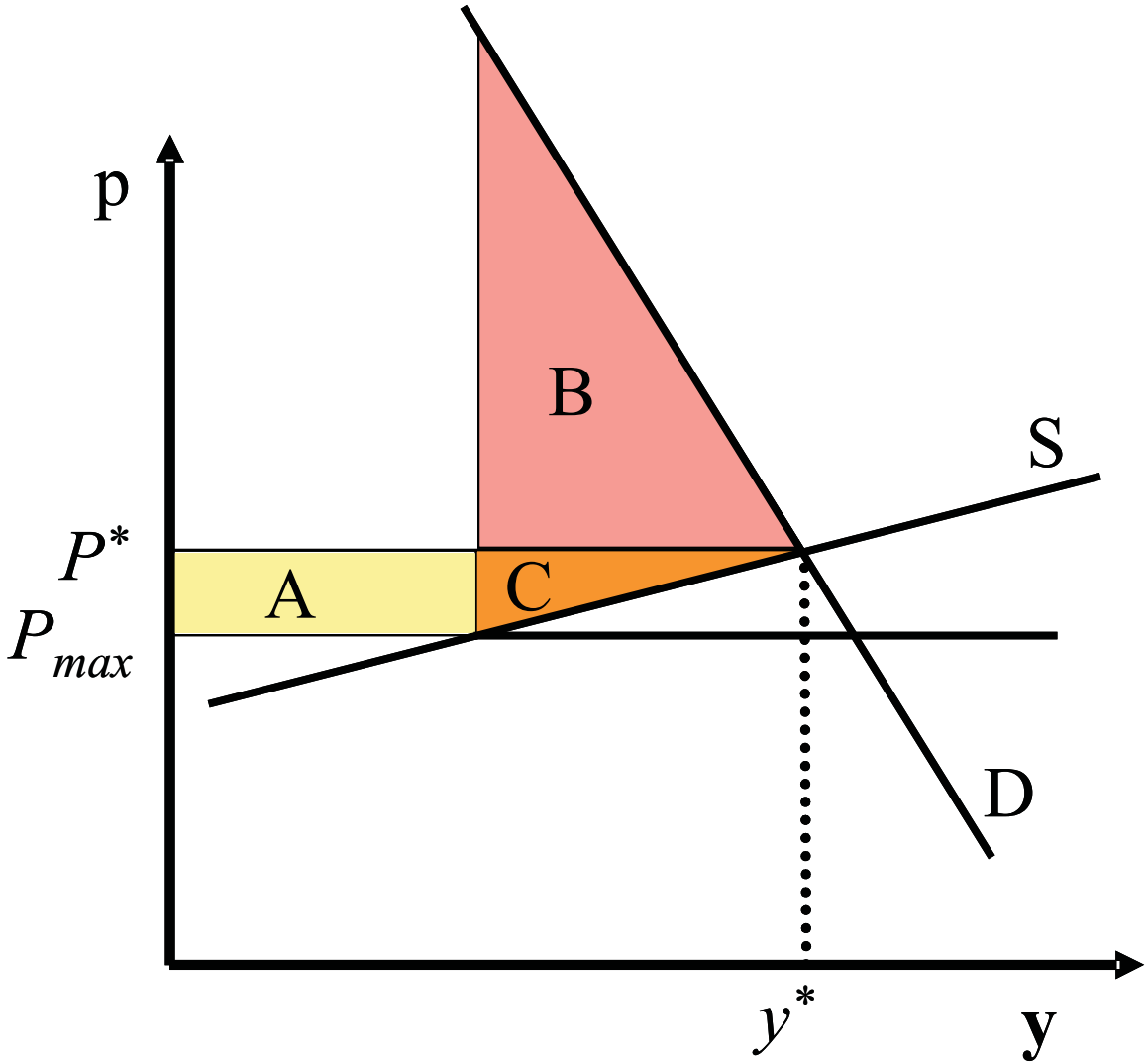
⇒ What are the effects of market interventions on welfare?

Maximum price

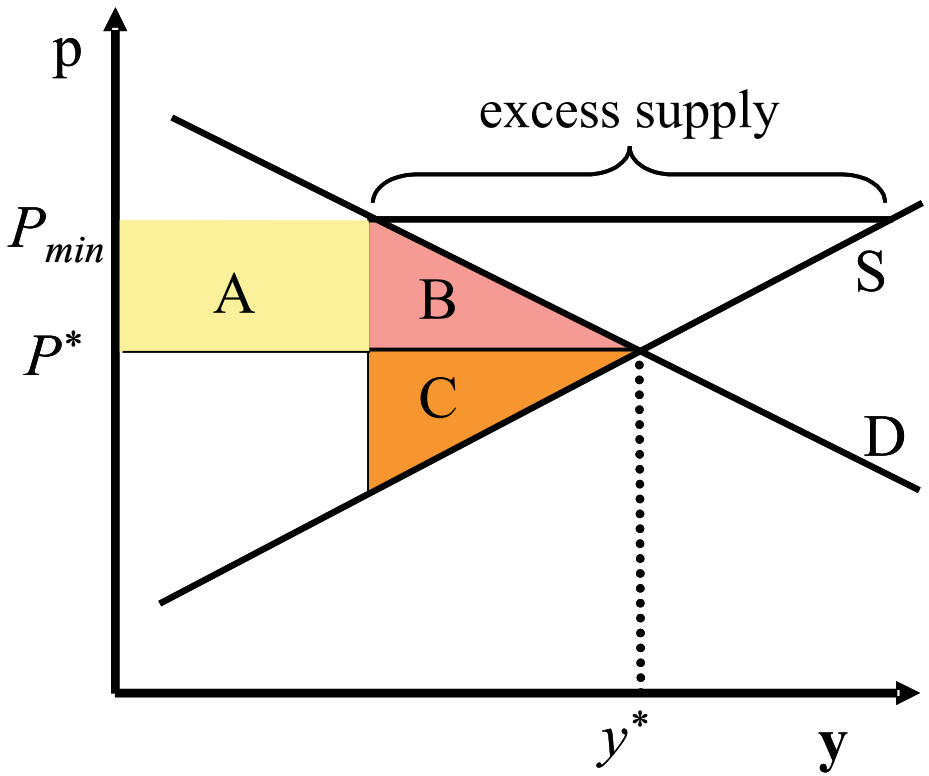


An administered maximum price p_{max} leads to excess demand.
Former producer surplus A is redistributed to consumers who lose C.
B and C yield the loss in welfare.

Elasticity dependency of welfare losses

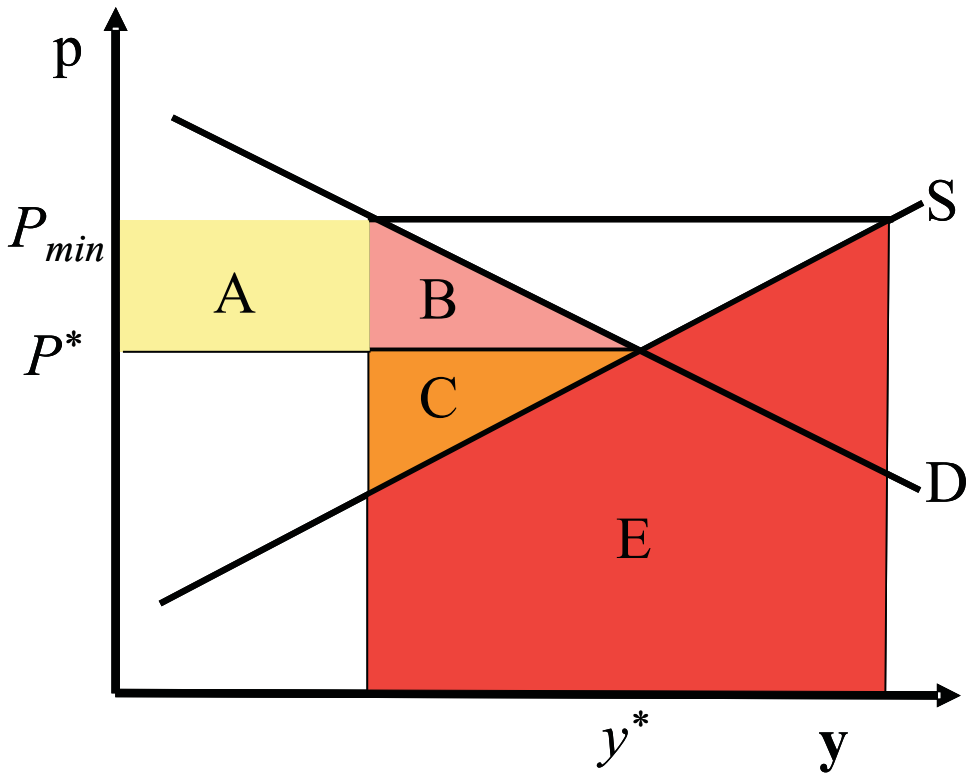


Minimum prices



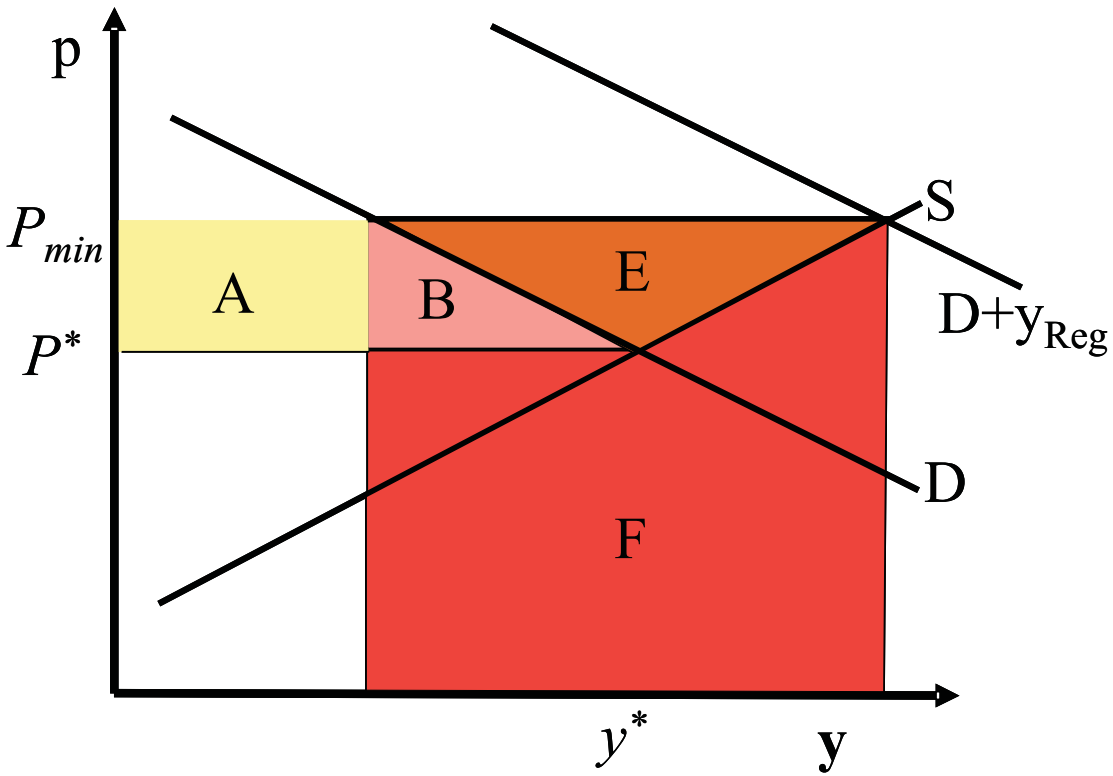
An administered minimum price p_{min} leads to excess supply. Former consumer surplus A is redistributed to producers who lose C. B and C yield the loss in welfare.

Excess supply



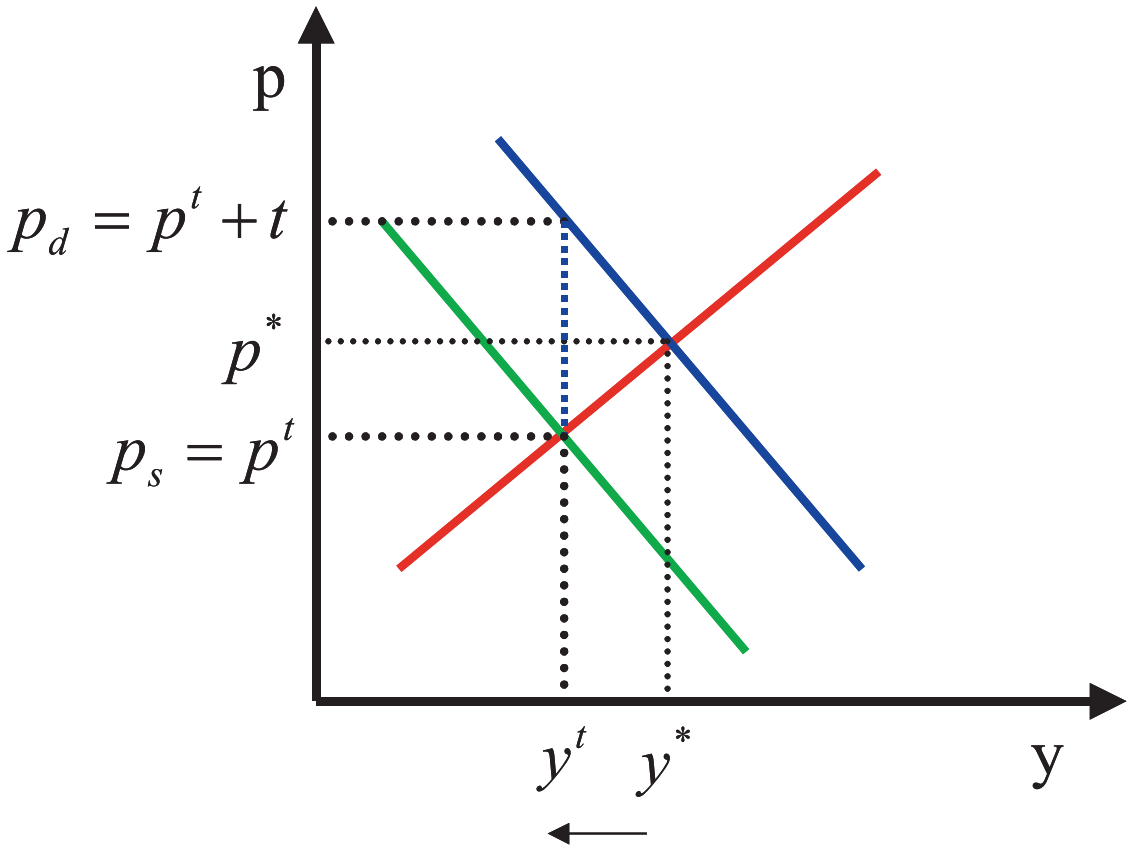
If producers produce according to the administered price p_{min}, an excess supply arise resulting in additional losses equal to E.

Price support



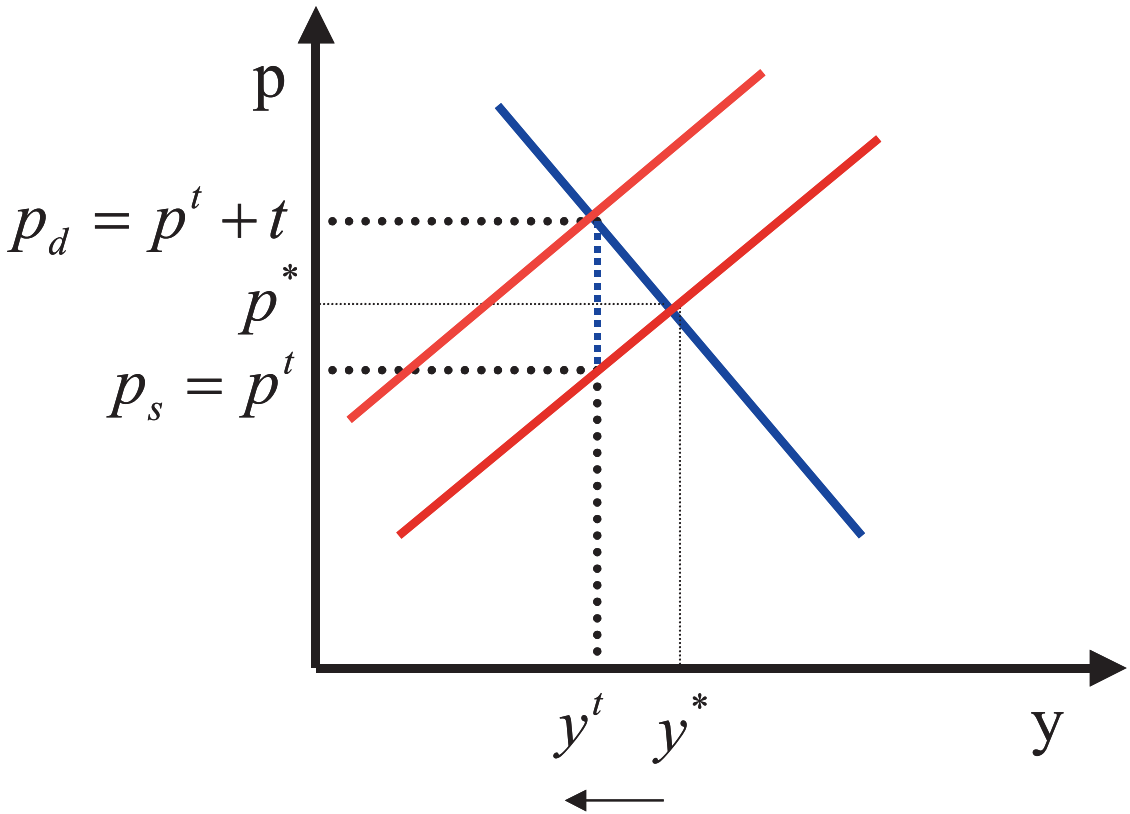
If the government supports the administered price p_{min} by buying the quantity y_{gov}, consumers lose $A + B$, producers gain $A + B + E$ and the government faces cost amounting to F.

Consumption tax



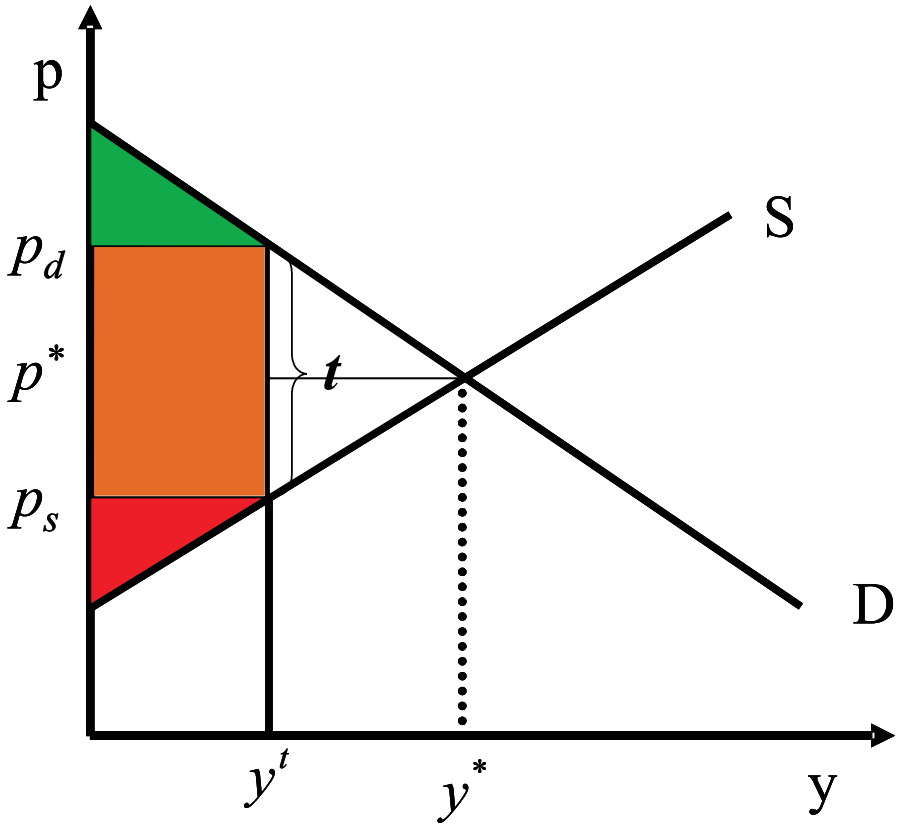
A consumption tax lowers the demand curve $\Rightarrow$ demand and thus the price decrease.

Production tax



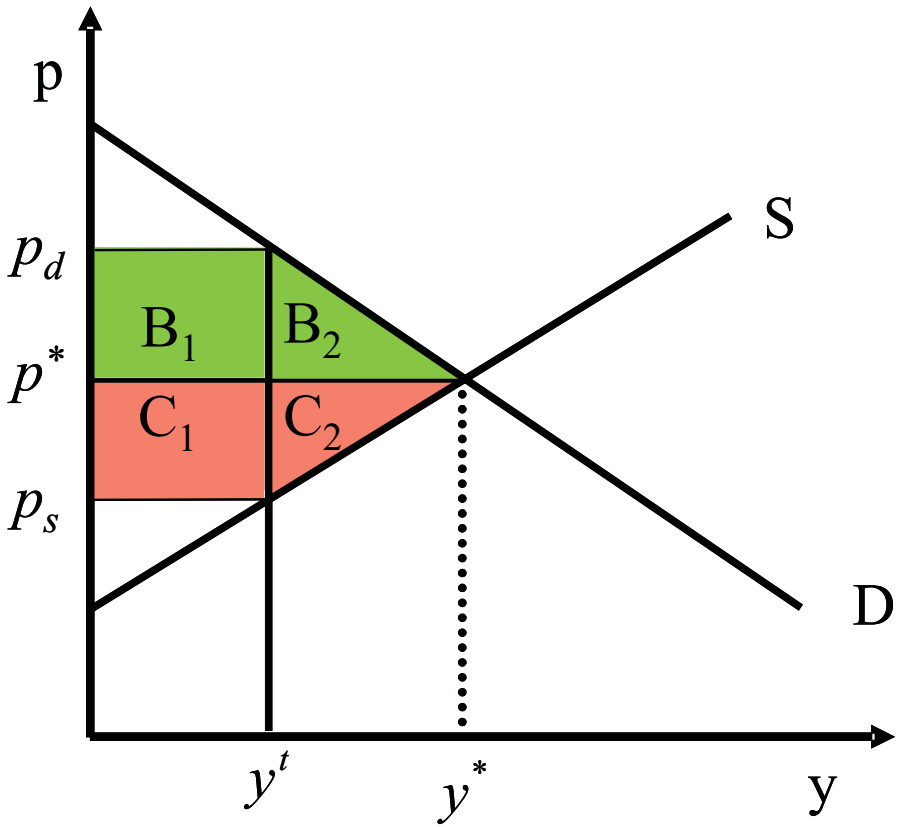
A production tax lifts the supply curve $\Rightarrow$ supply and thus the price decrease.

Quantity effect of taxes



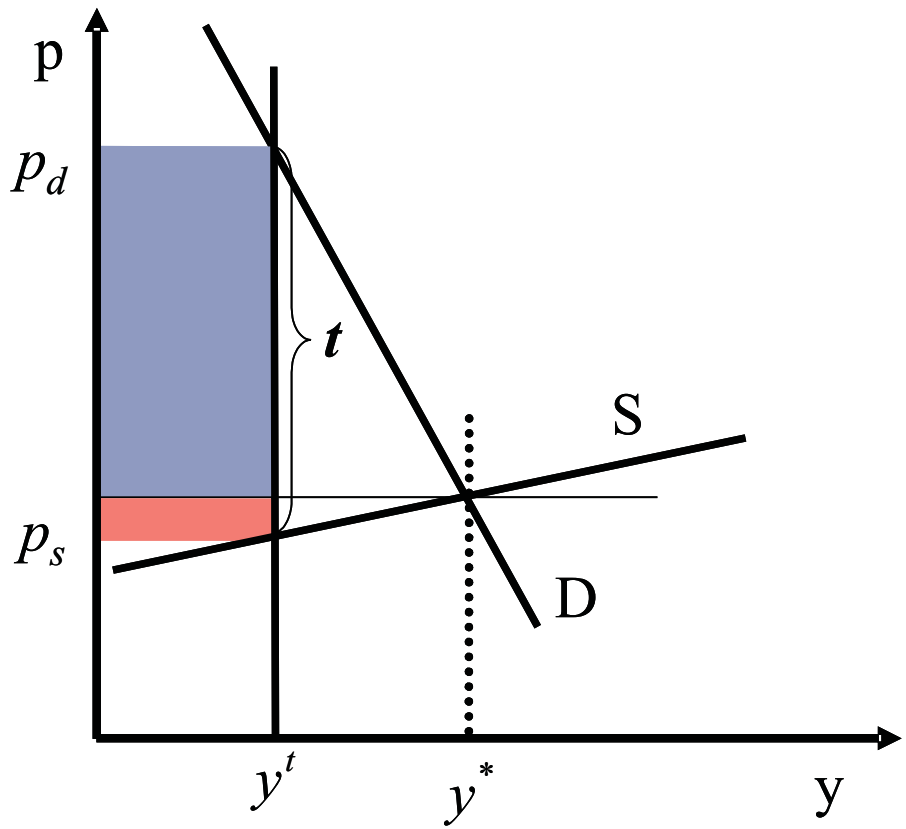
Production and consumption taxes both result in a quantity decrease.

Welfare effect of taxes



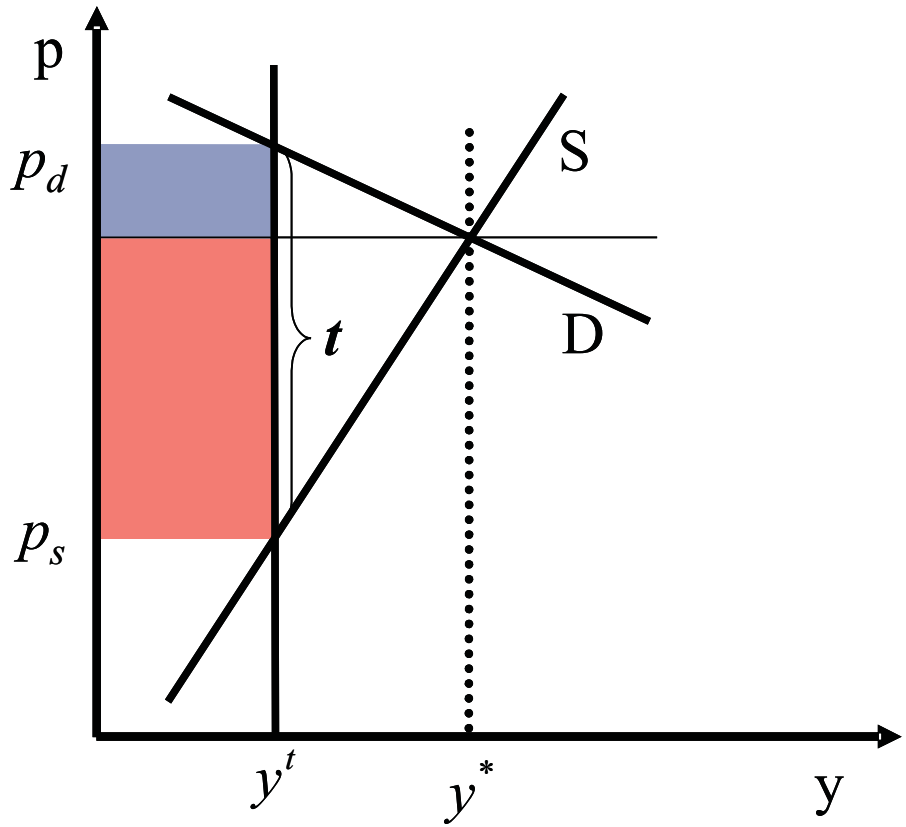
The loss of consumer surplus is $B_1 + B_2$, the loss of producer surplus is $C_1 + C_2$.

Distribution effects of taxes



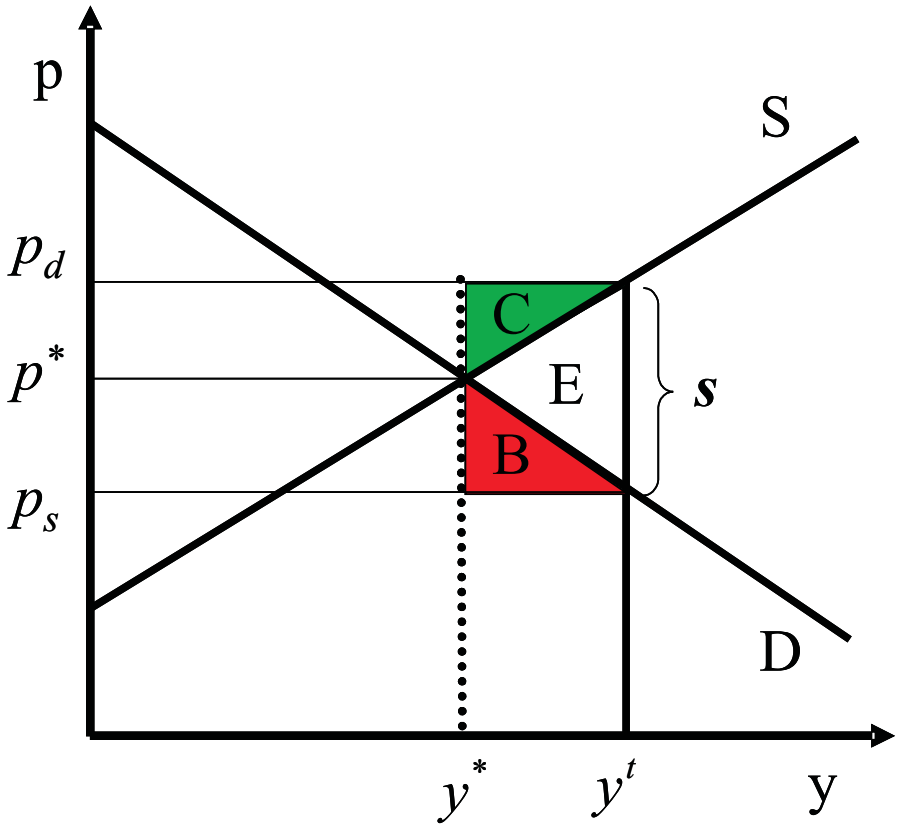
For inelastic demand demand consumers bear the brunt of taxes.

Distribution effects of taxes



For inelastic supply producers bear the brunt of taxes.

Subsidies



A subsidy has the converse effect of a tax $\rightarrow$ sold quantity increases.
Producer surplus increases by C, consumer surplus increases by B.
However, the government faces expenses equal to $B + C + E$.

Welfare effects – exercise

Assume perfect competition for the market for garden gnomes. Inverse demand is given by

$$p(y) = 30 - y$$

while supply equals

$$y = p$$

a) Calculate the market equilibrium and illustrate it?

b) A consumption tax $\tau = 4$ € is introduced. Calculate the effect on the market equilibrium and illustrate it.

c) The government decides to increase the tax rate to a value which limits welfare losses to 10 % of the tax revenue T. Calculate the tax rate.

Welfare effects – exercise

Assume perfect competition for the market for garden gnomes. Inverse demand is given by

$$p(y) = 30 - y$$

while supply equals

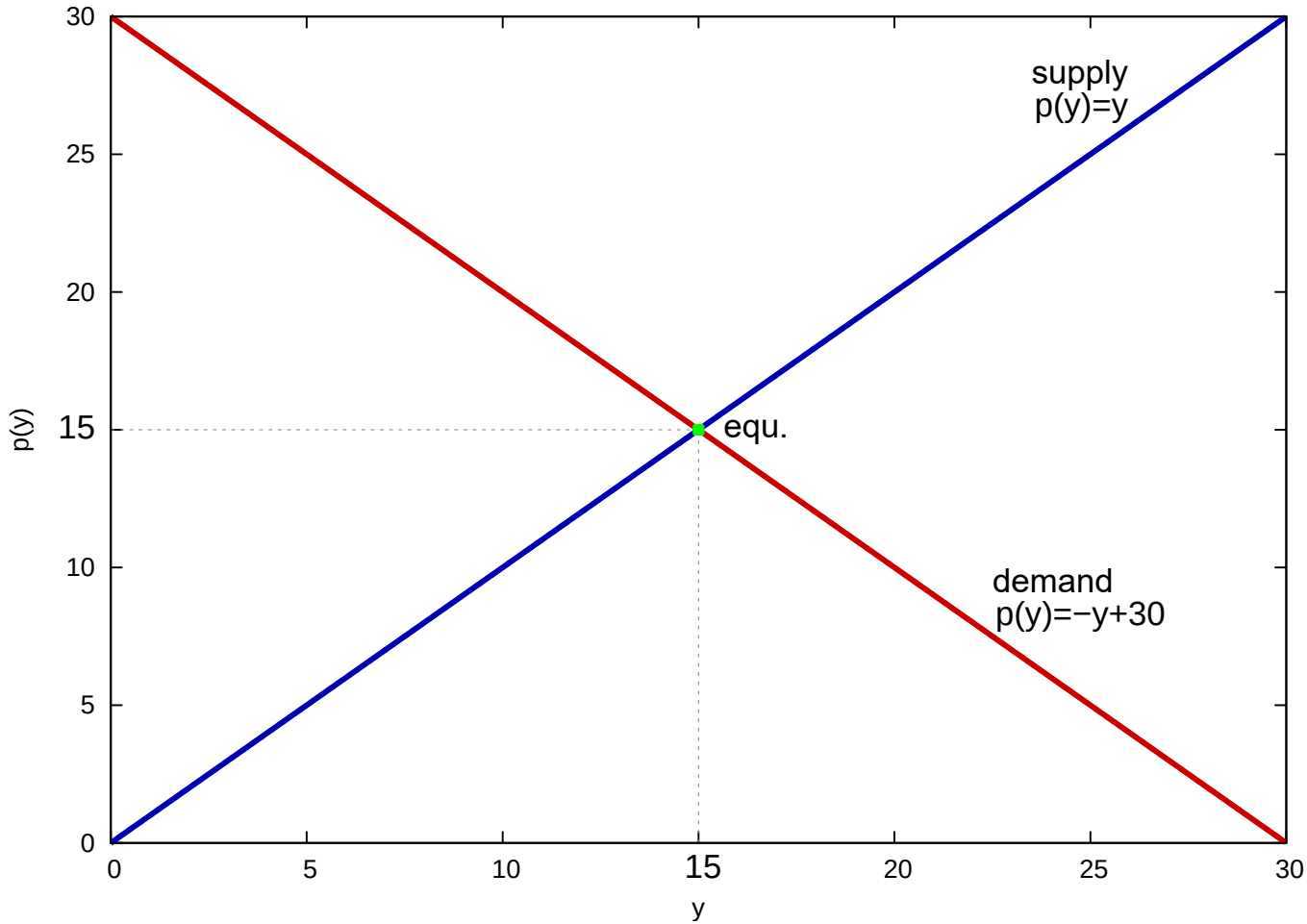
$$y = p$$

d) The next government abolishes the tax and introduces a minimum price of 20 € instead. What are the effects on welfare if the government buys the excess demand

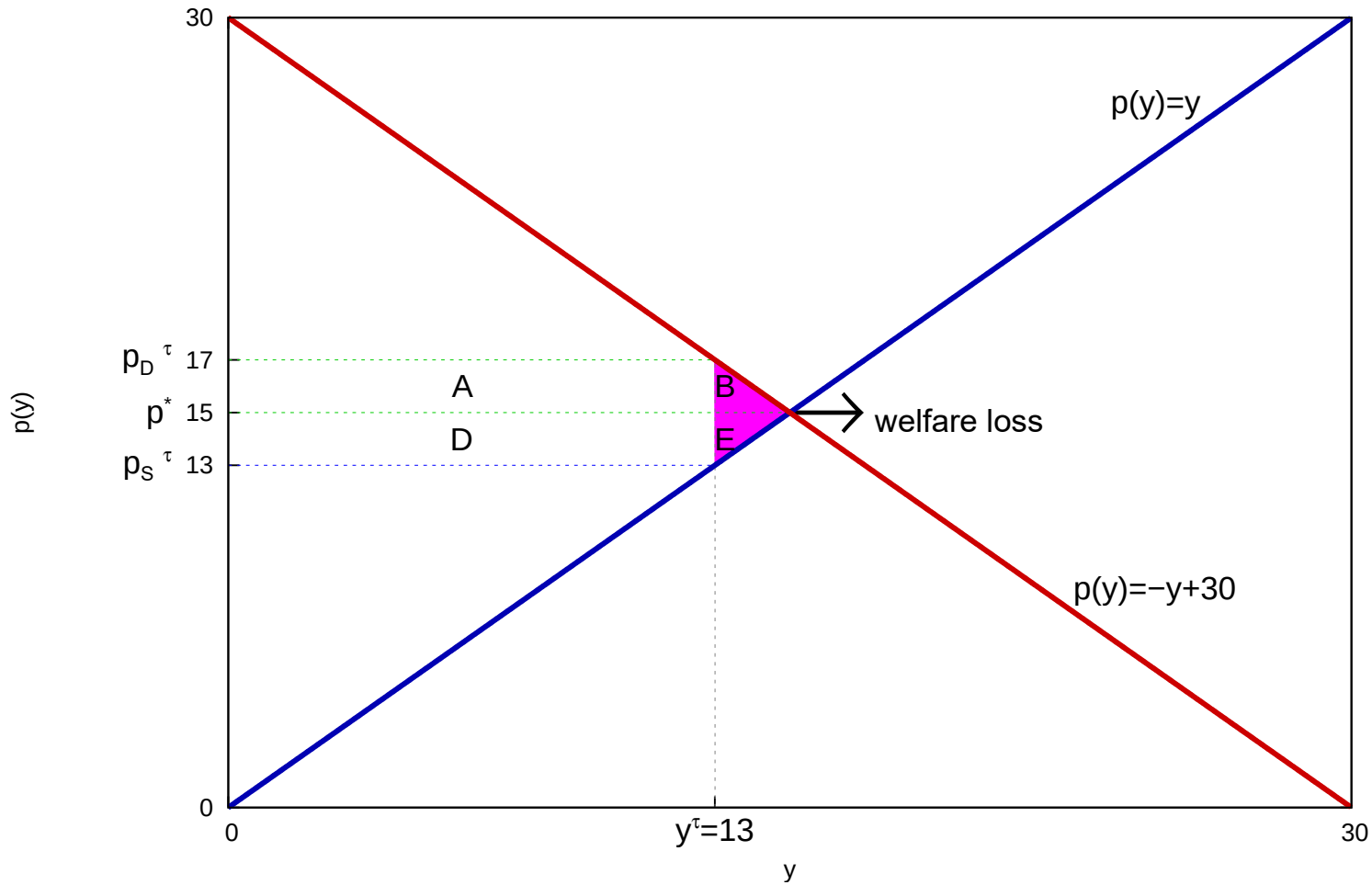
   a) for the minimum price or

   b) for marginal cost?

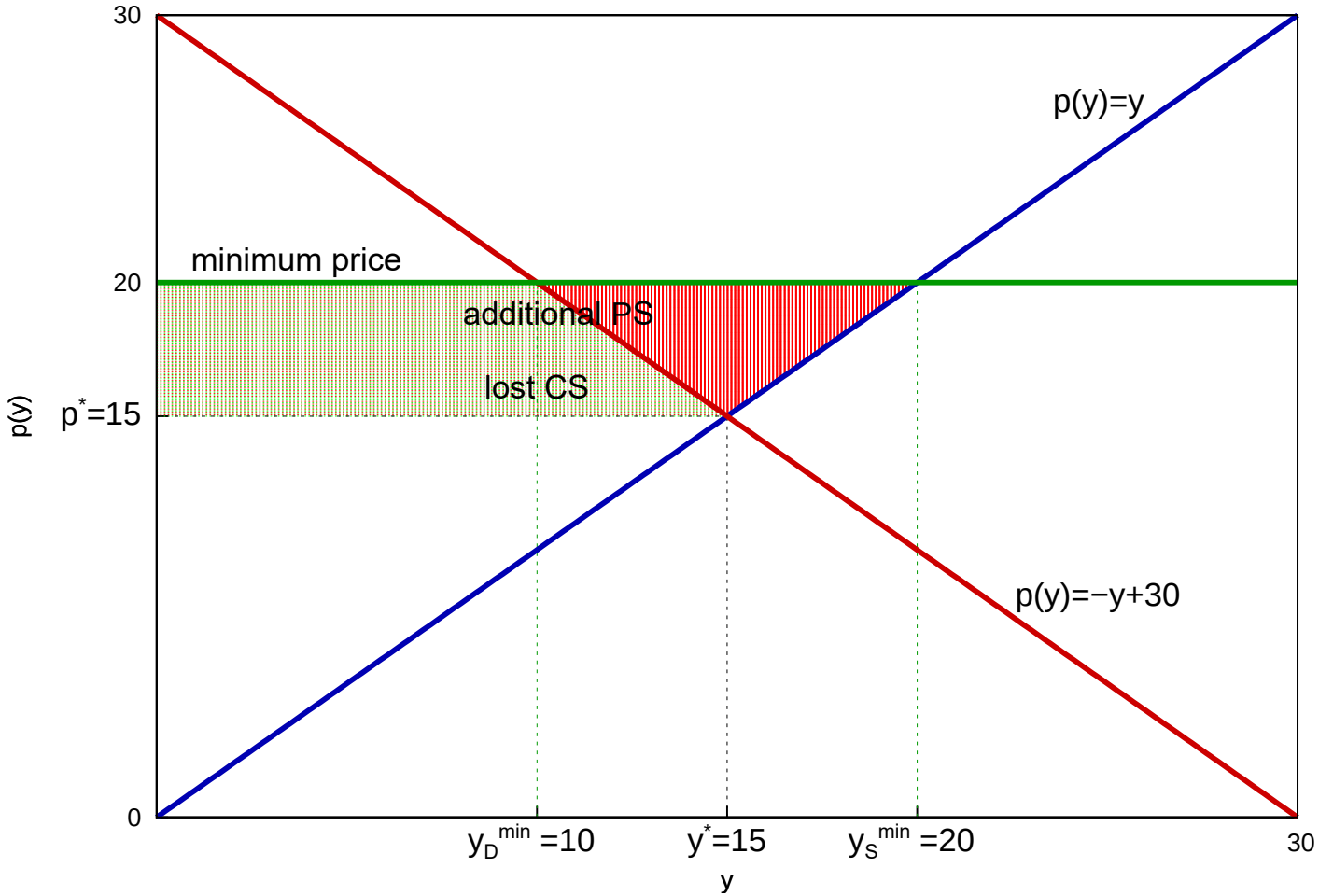
Exercise – solution



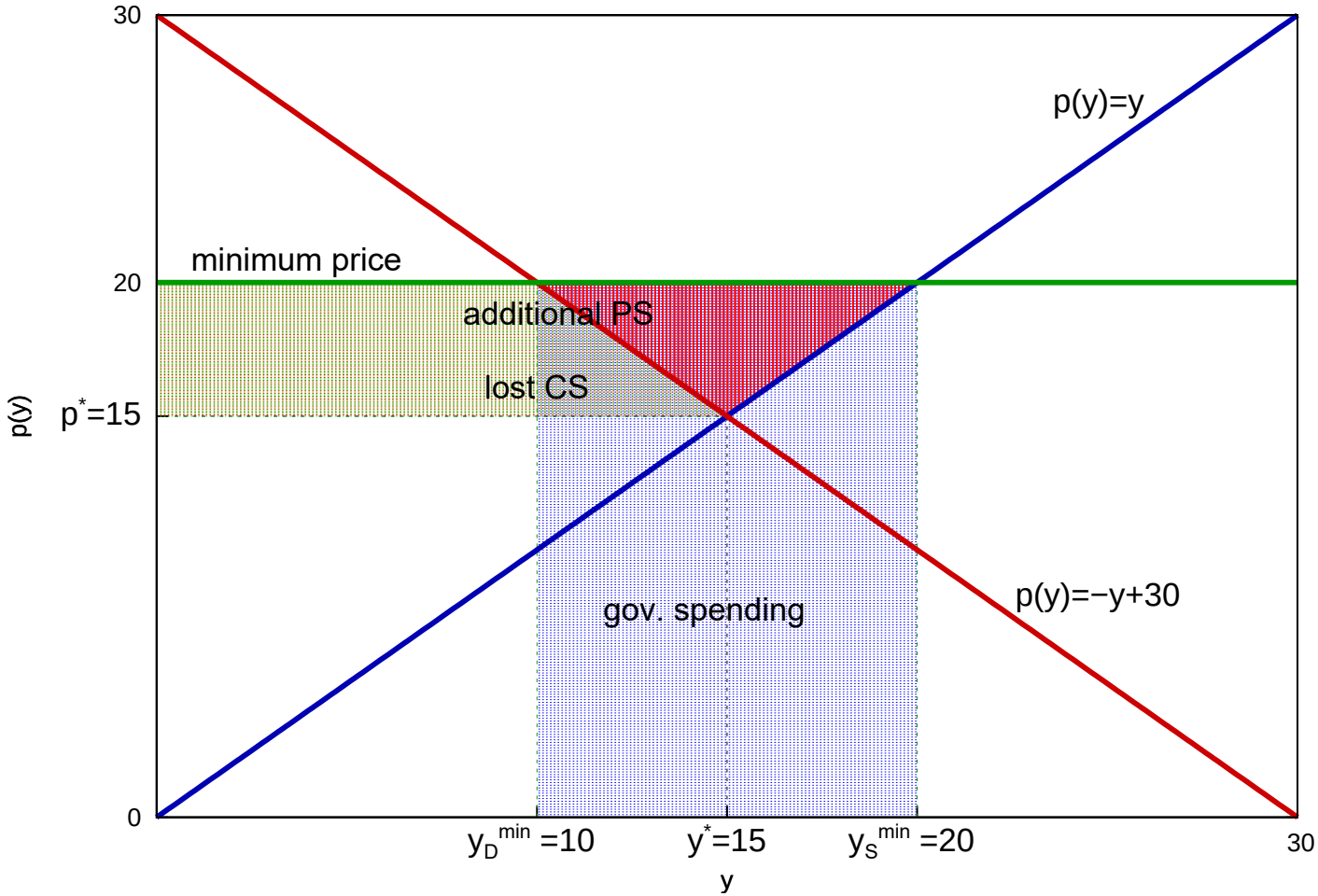
Exercise – solution



Exercise – solution



Exercise – solution



Exercise – solution