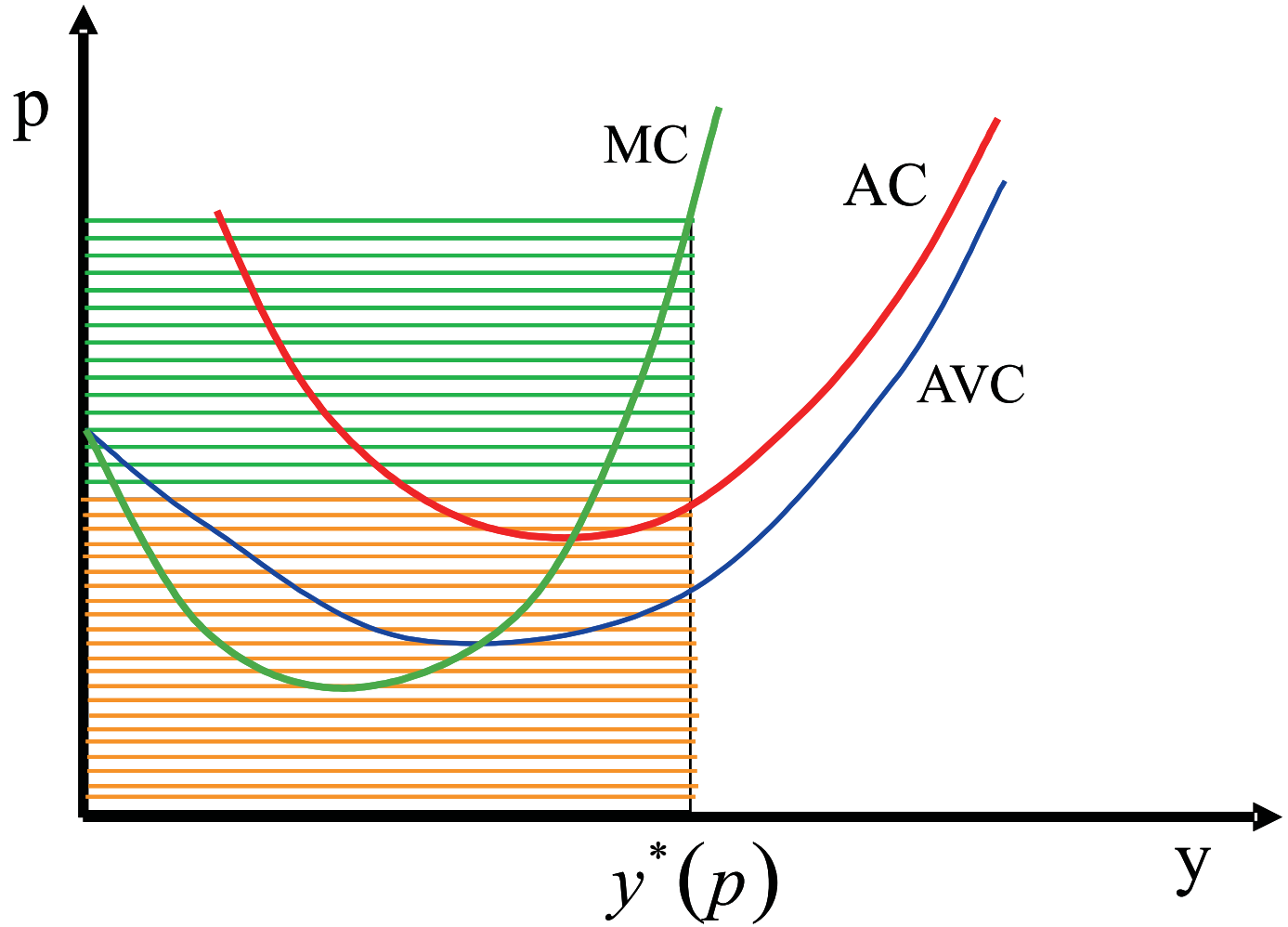
FRANKFURT UNIVERSITY OF APPLIED SCIENCES

Environmental Assessment

Fachbereich 2 Informatik und Ingenieurwissenschaften

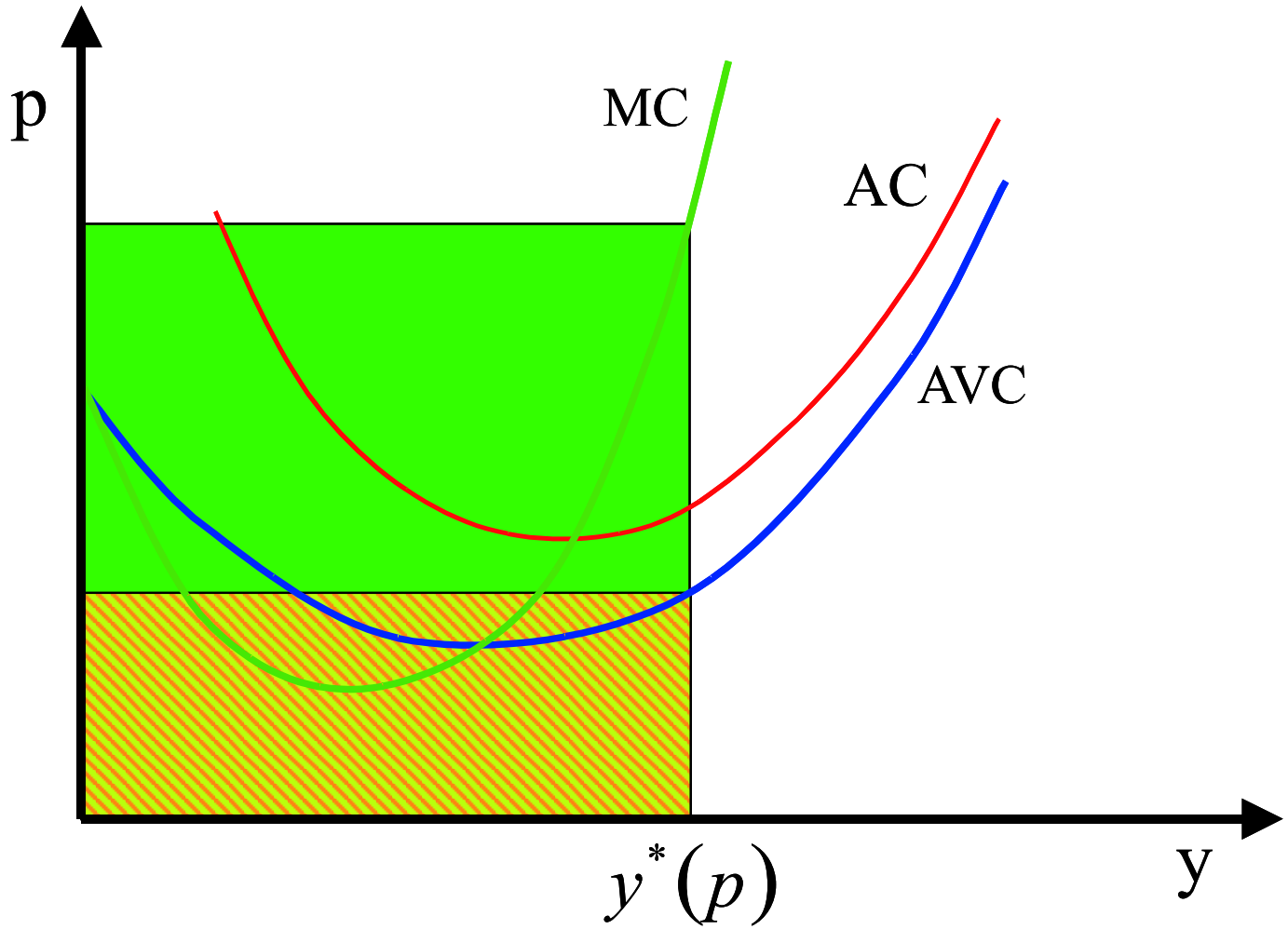
Profit

profit = revenue - costs



Producer surplus

producer surplus = revenue - variable costs



Profit and producer surplus

Example

The cost function shall be $C(y) = y^2 + 1$

supply: $p = MC(y)$

yields $\quad p = 2y \quad \hookrightarrow \quad y = S(p) = p/2$

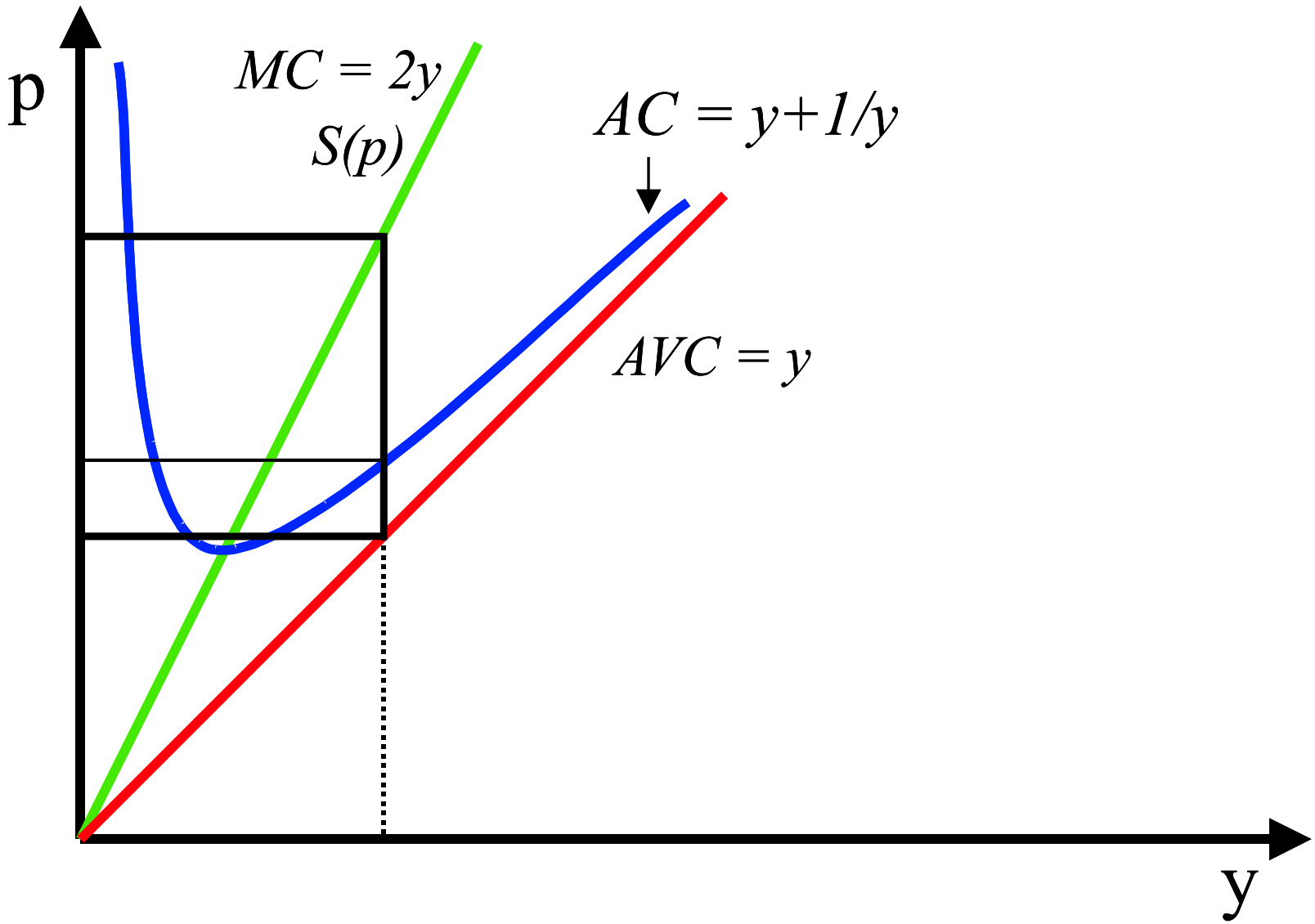
The profit: $\Pi = p \cdot y - C(y)$

yields $\quad \Pi = p \cdot p/2 - (p/2)^2 - 1 = p^2/4 - 1$

producer surplus: $p \cdot y - AVC(y) \cdot y$

yields $\quad p \cdot p/2 - (p/2)(p/2) = p^2/4$

Profit and 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:

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

and faces a market demand

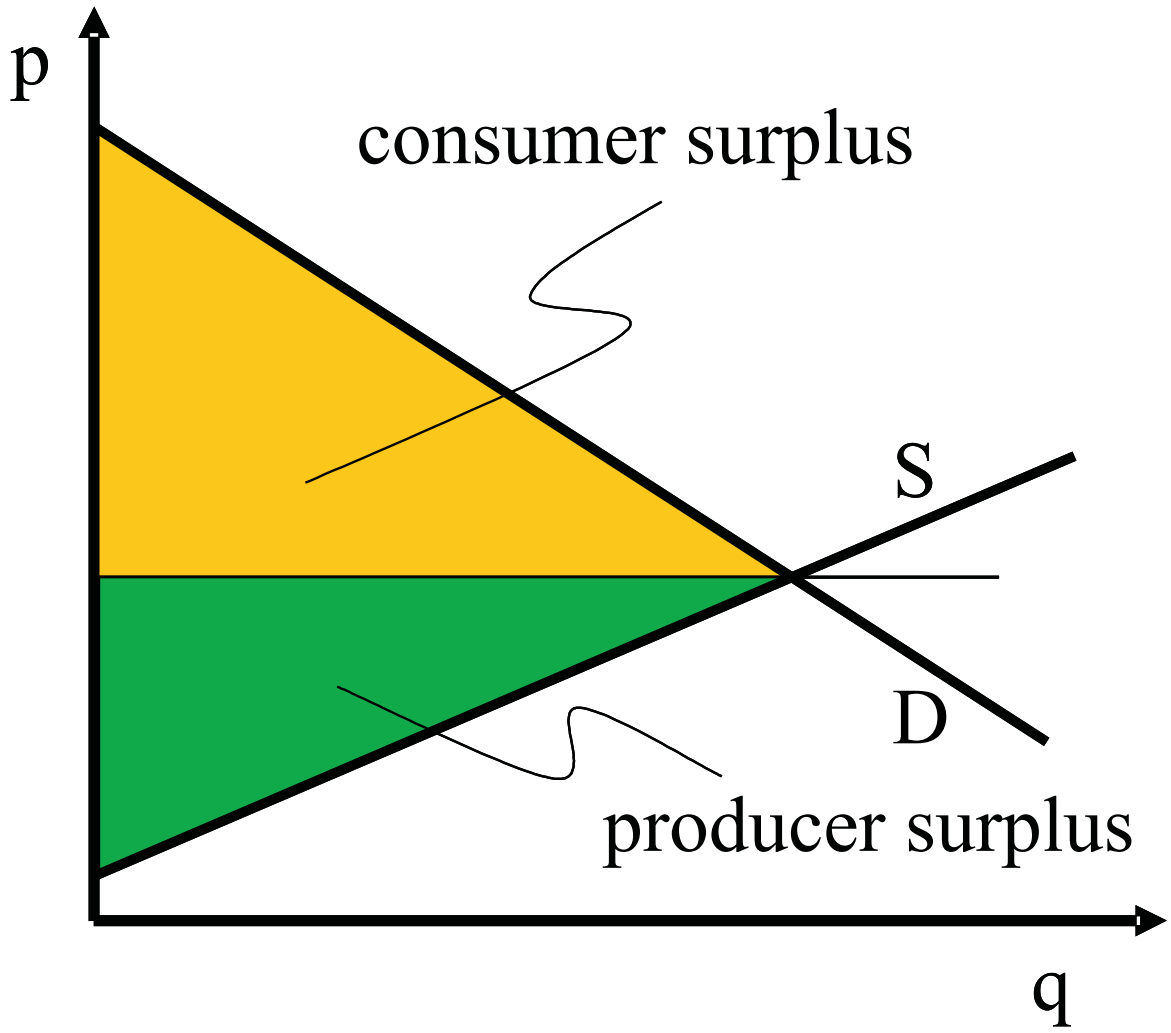
$$D(p) \quad = \quad 11 - \frac{1}{10}p$$

a) Show that the market price is $p = 75$

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

c) Assume the market consists of four identical companies. What is the result?

Welfare



Market interventions

- market interventions frequently occur

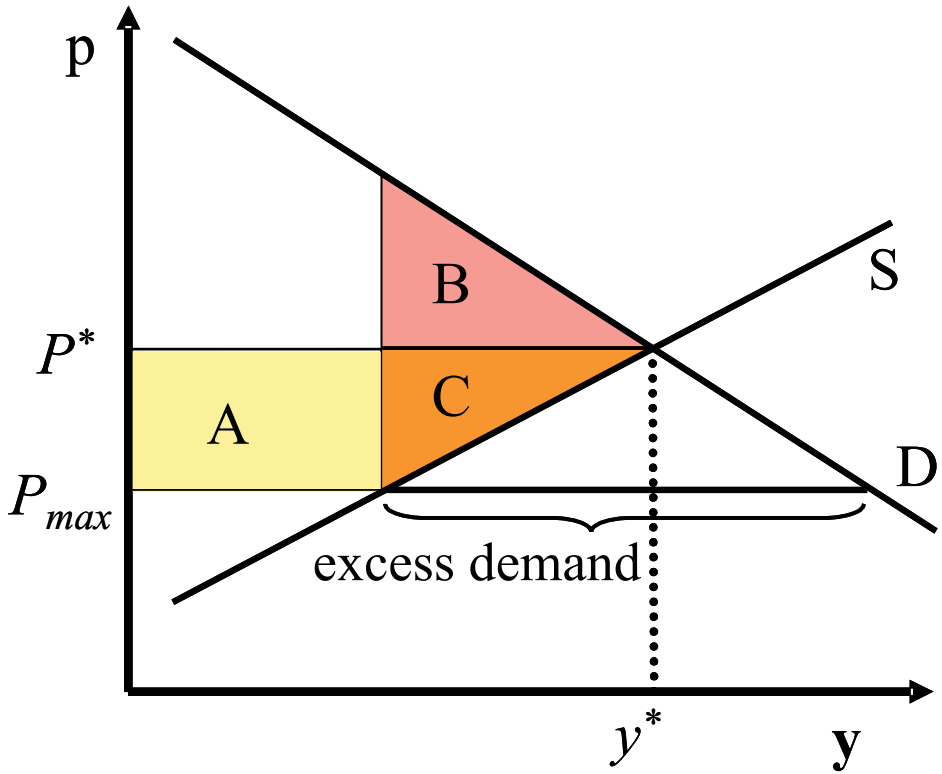
→ e.g. maximum prices e.g. for rents

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

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

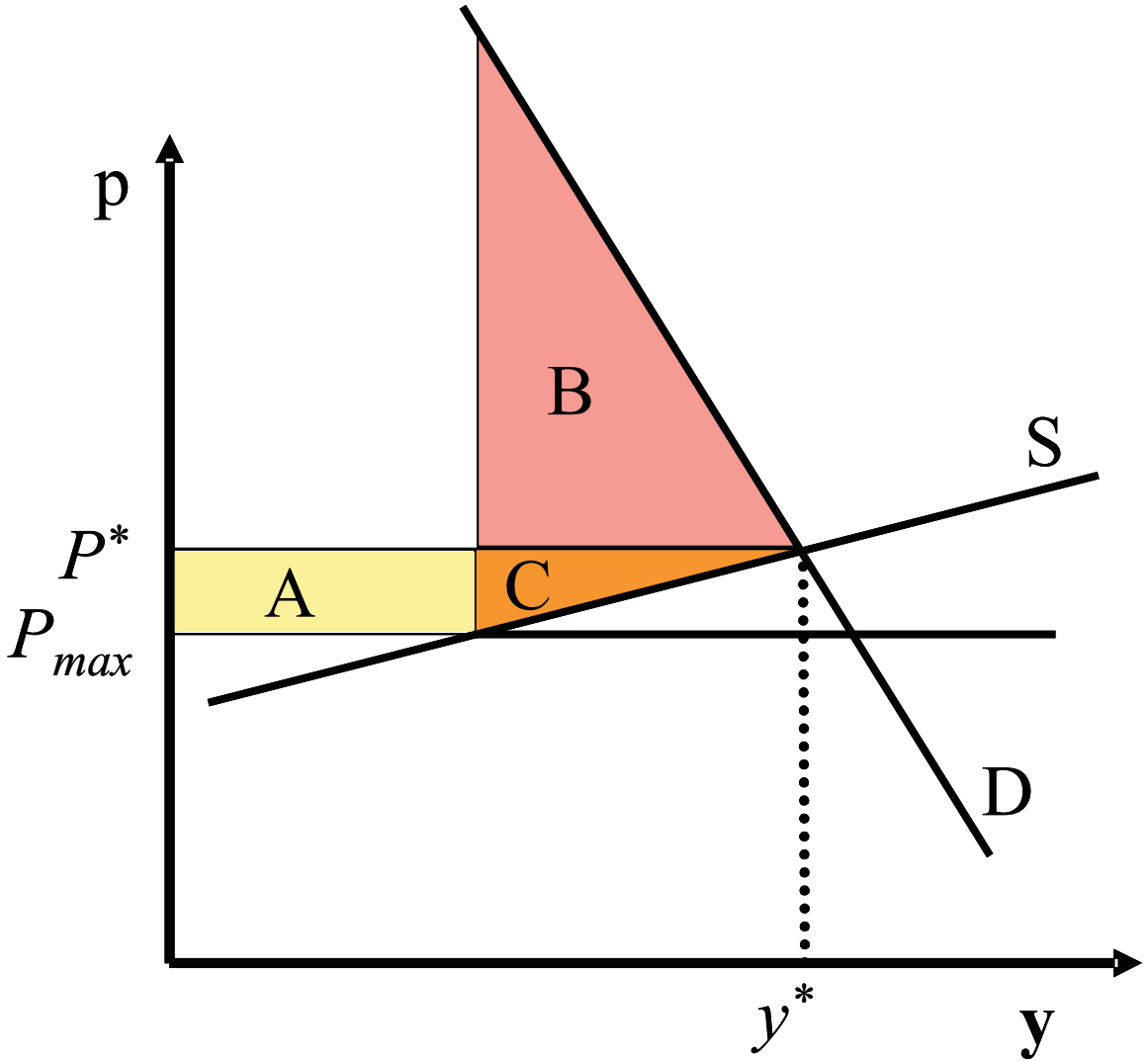
⇒ What are the effects of market interventions on welfare?

Maximum price

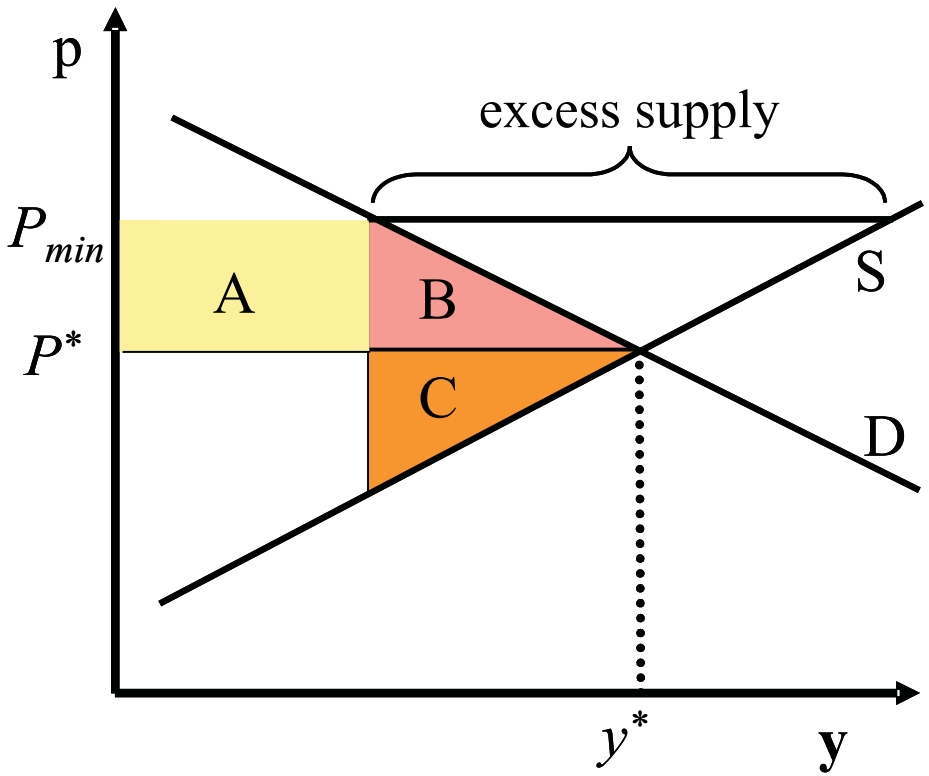


An administered maximum price p_{max} leads to excess demand. Former producer surplus A is redistributed to consumers. Consumers lose B, producers lose C summing up to the welfare loss $B + C$.

Elasticity dependency of welfare losses

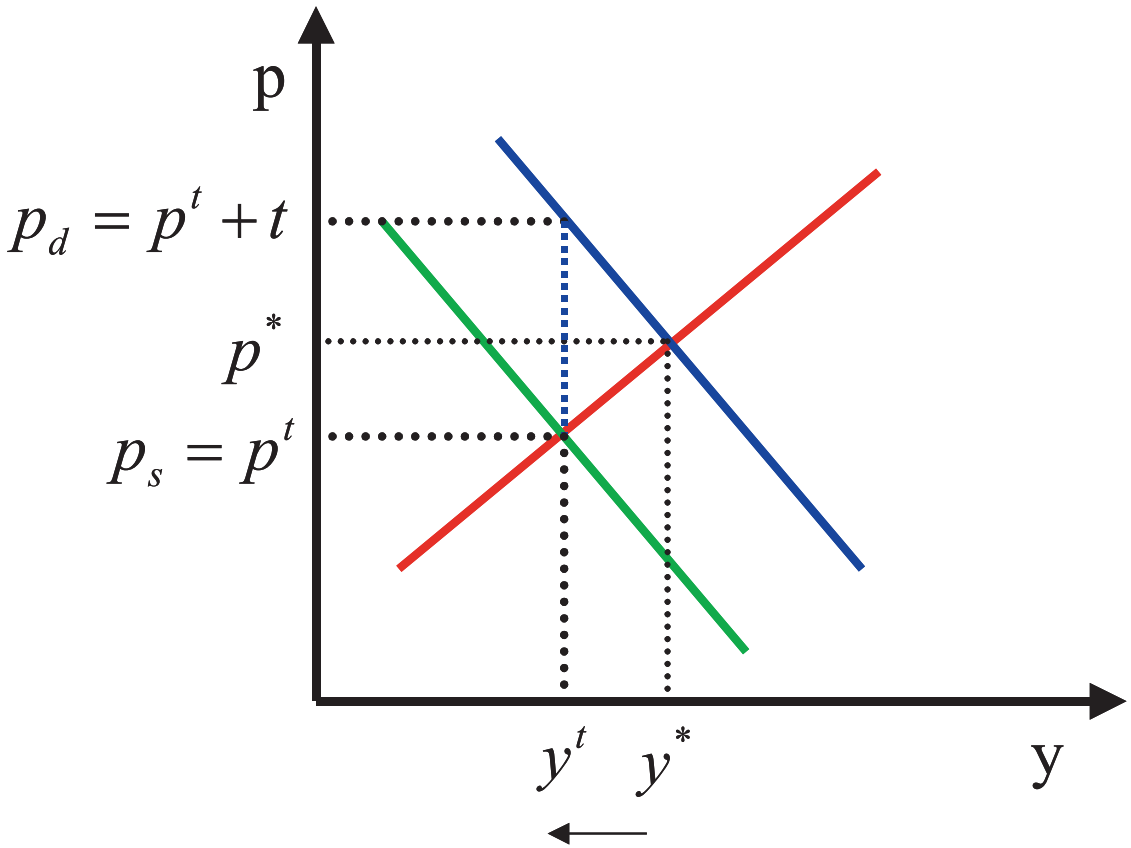


Minimum prices



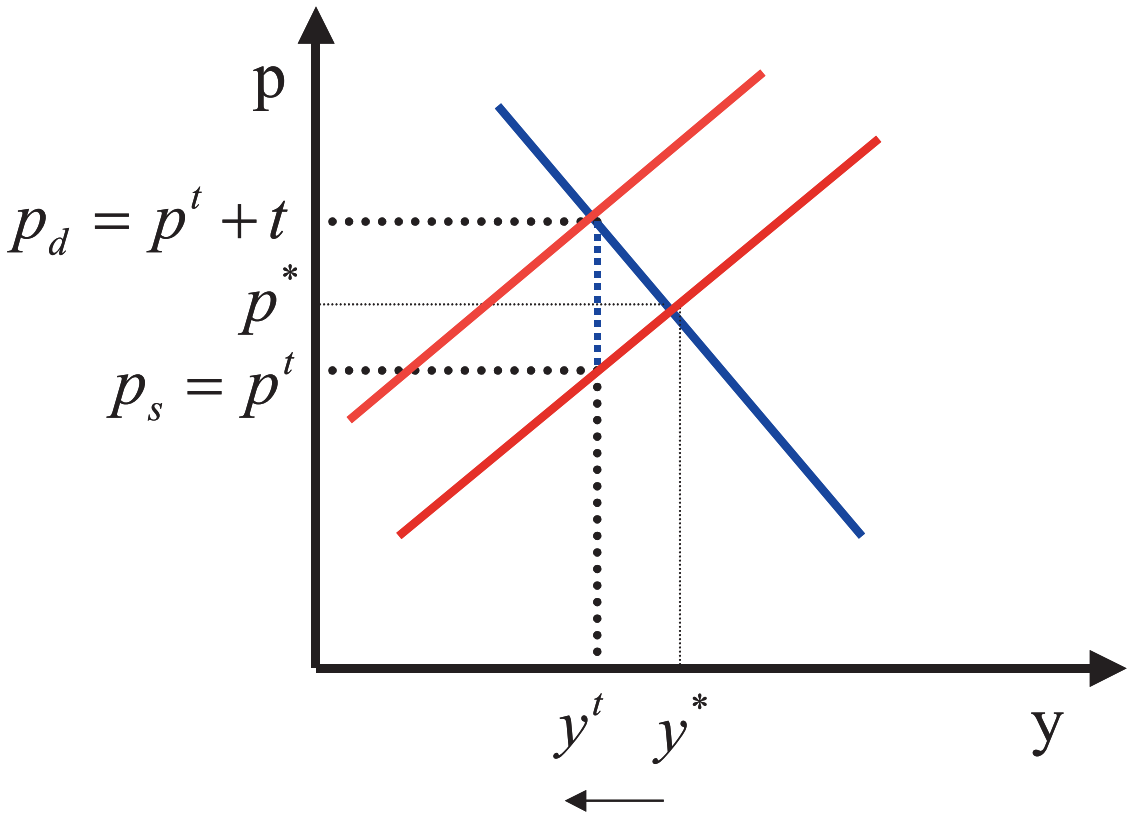
An administered minimum price p_{min} leads to excess supply. Former consumer surplus A is redistributed to producers. Consumers lose B, producers lose C summing up to the welfare loss $B + C$.

Consumption tax



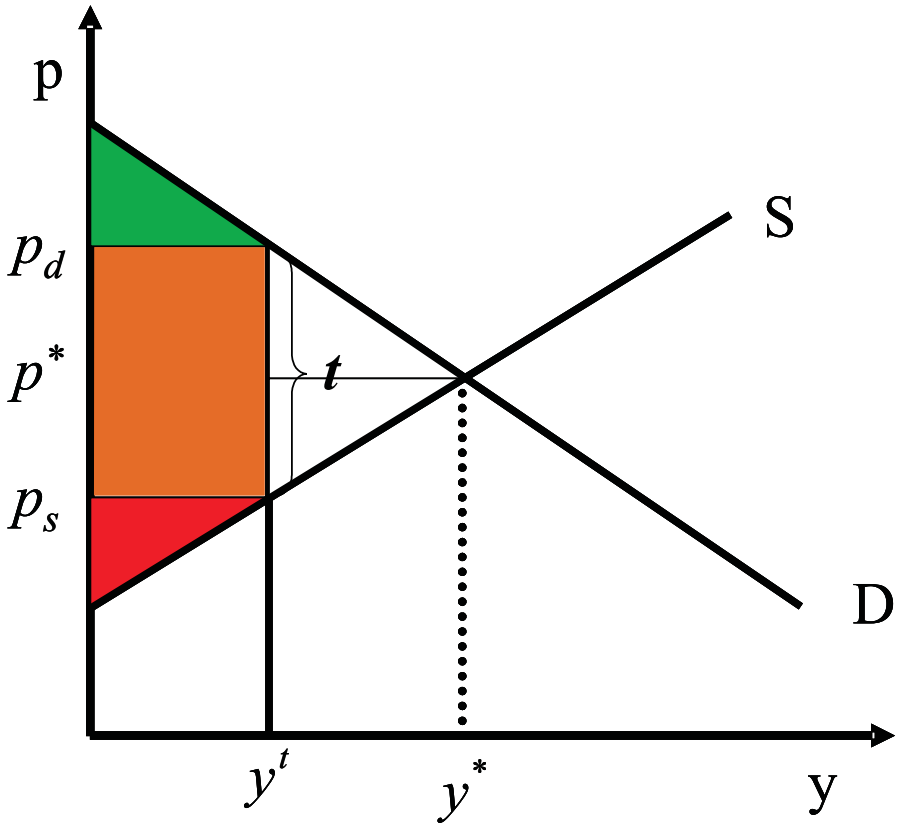
A consumption tax lowers the demand curve
$\Rightarrow$ demand and thus the price decrease.

Production tax



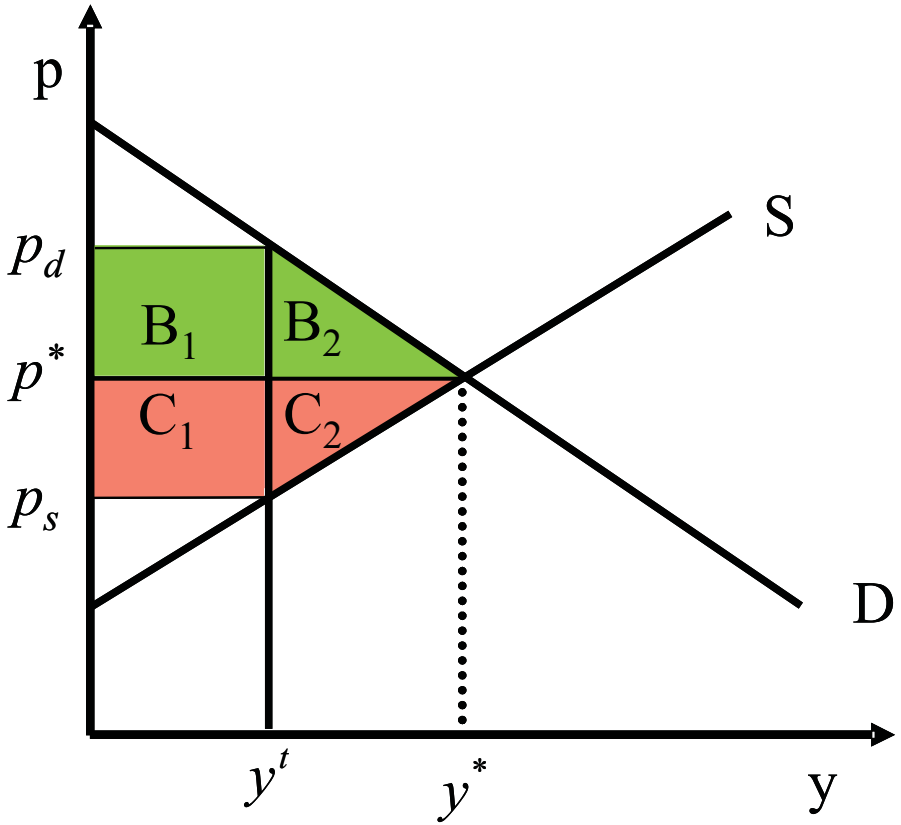
A production tax lifts the supply curve
$\Rightarrow$ supply and thus the price decrease.

Quantity effect of taxes



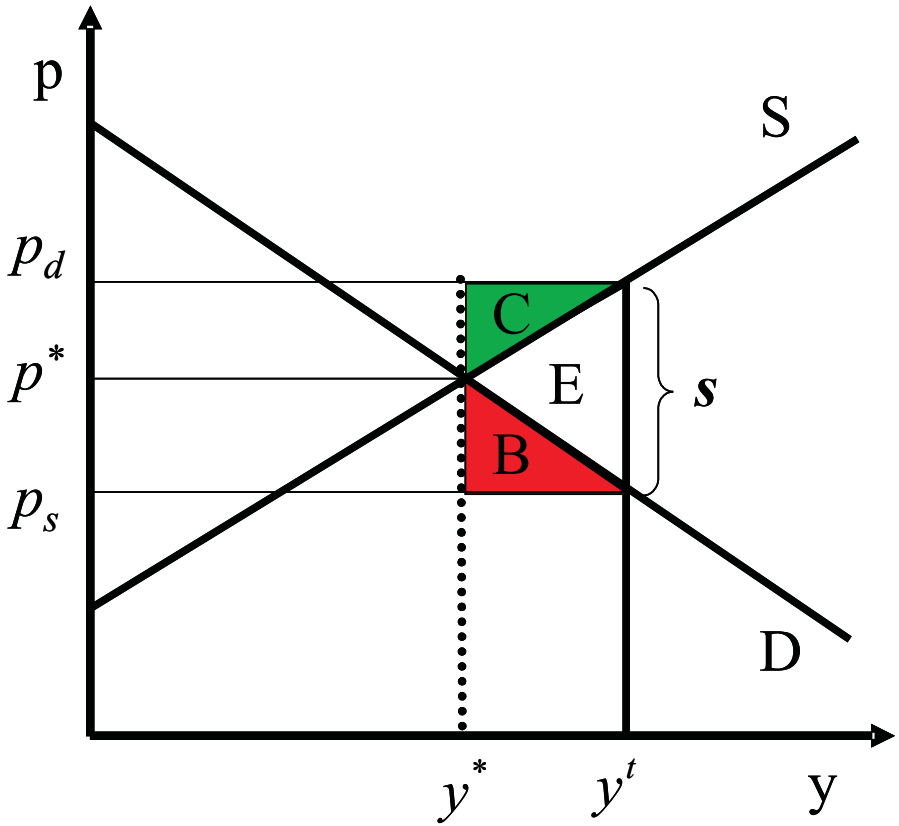
Production and consumption taxes both result in a quantity decrease.

Welfare effect of taxes



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

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

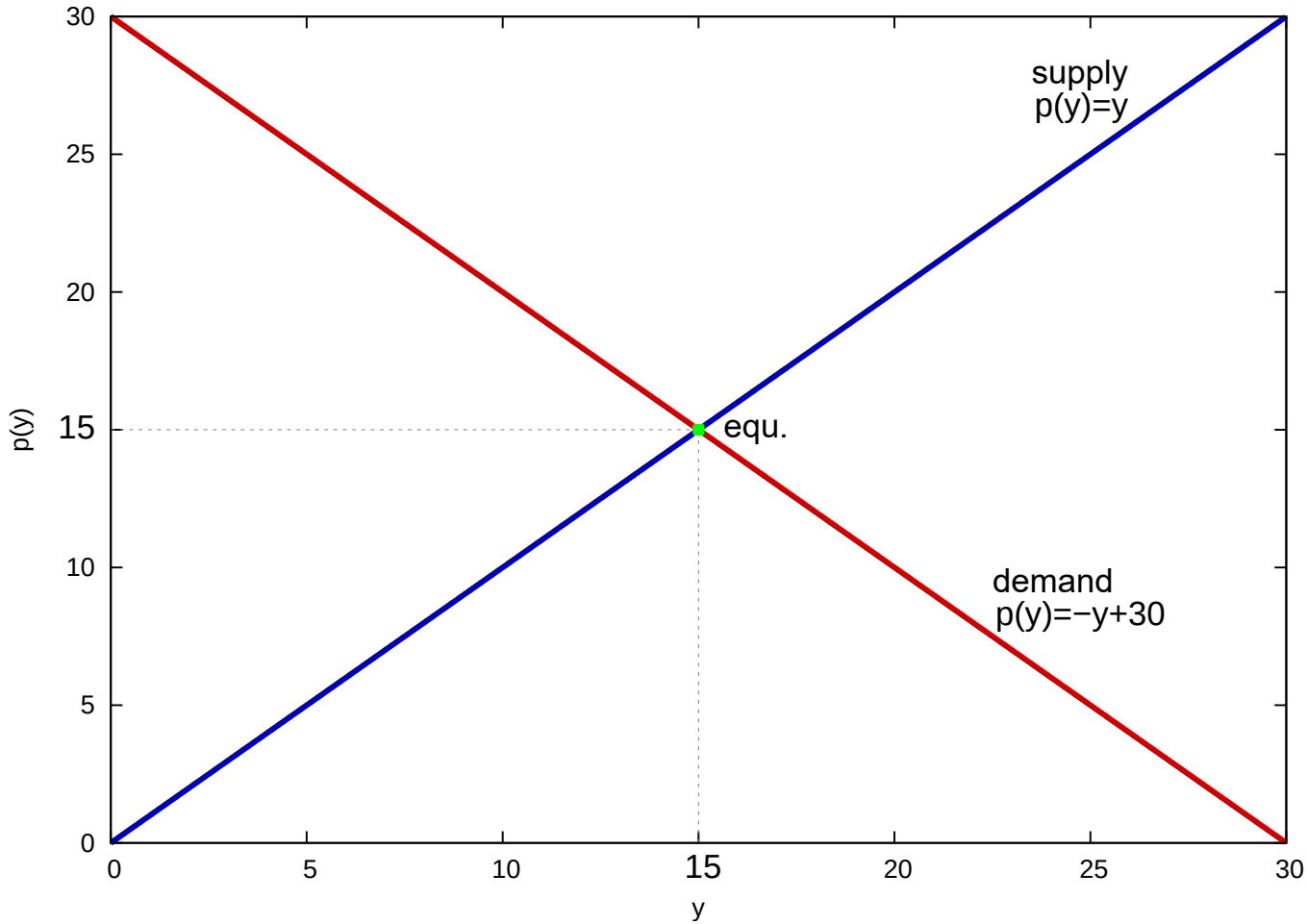
$$y = p$$

a) Calculate the market equilibrium and illustrate it.

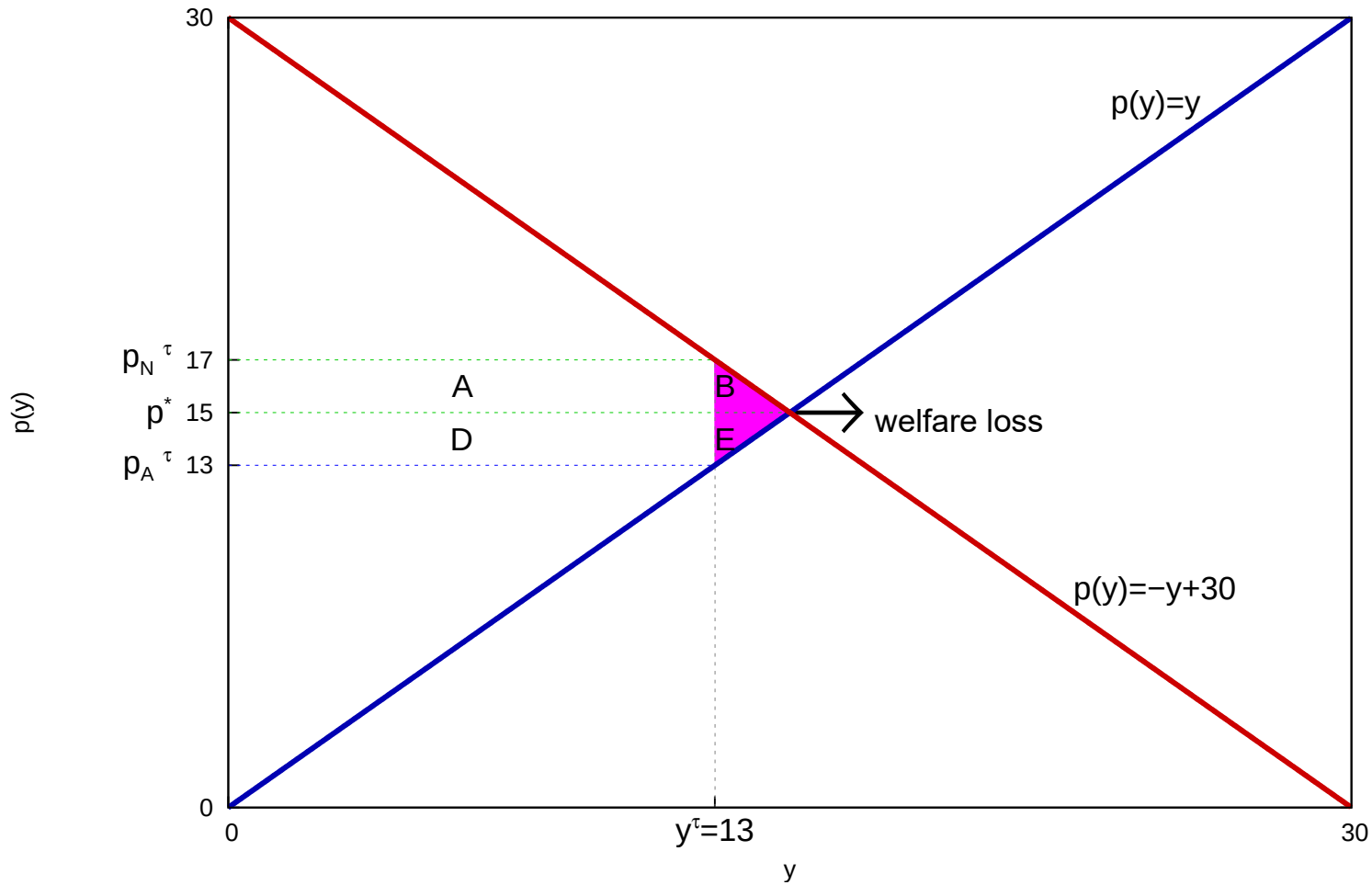
b) A consumption tax $\tau = 4$ € is introduced. Calculate the effect on the market equilibrium and illustrate it.

c) The 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?

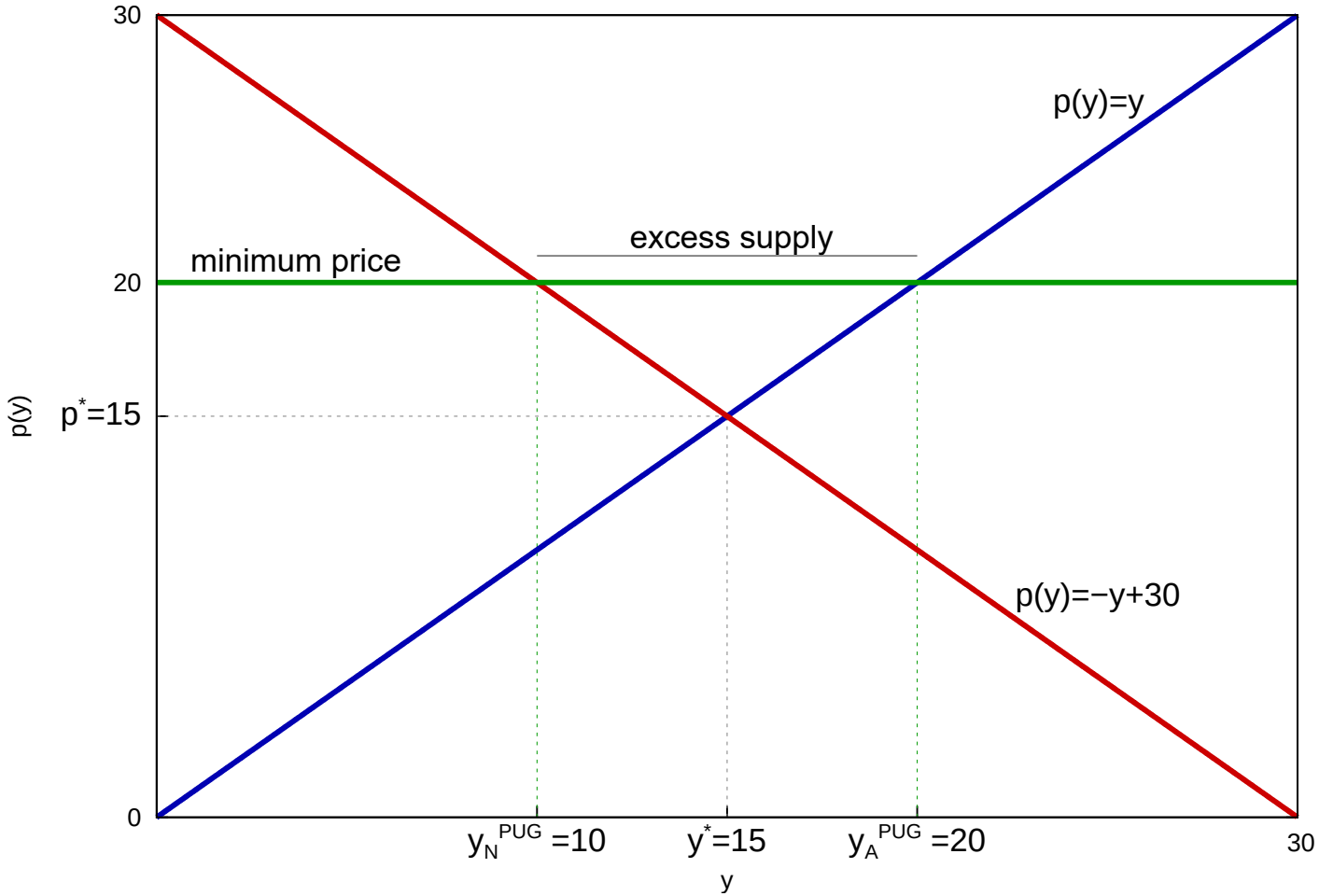
Exercise – solution



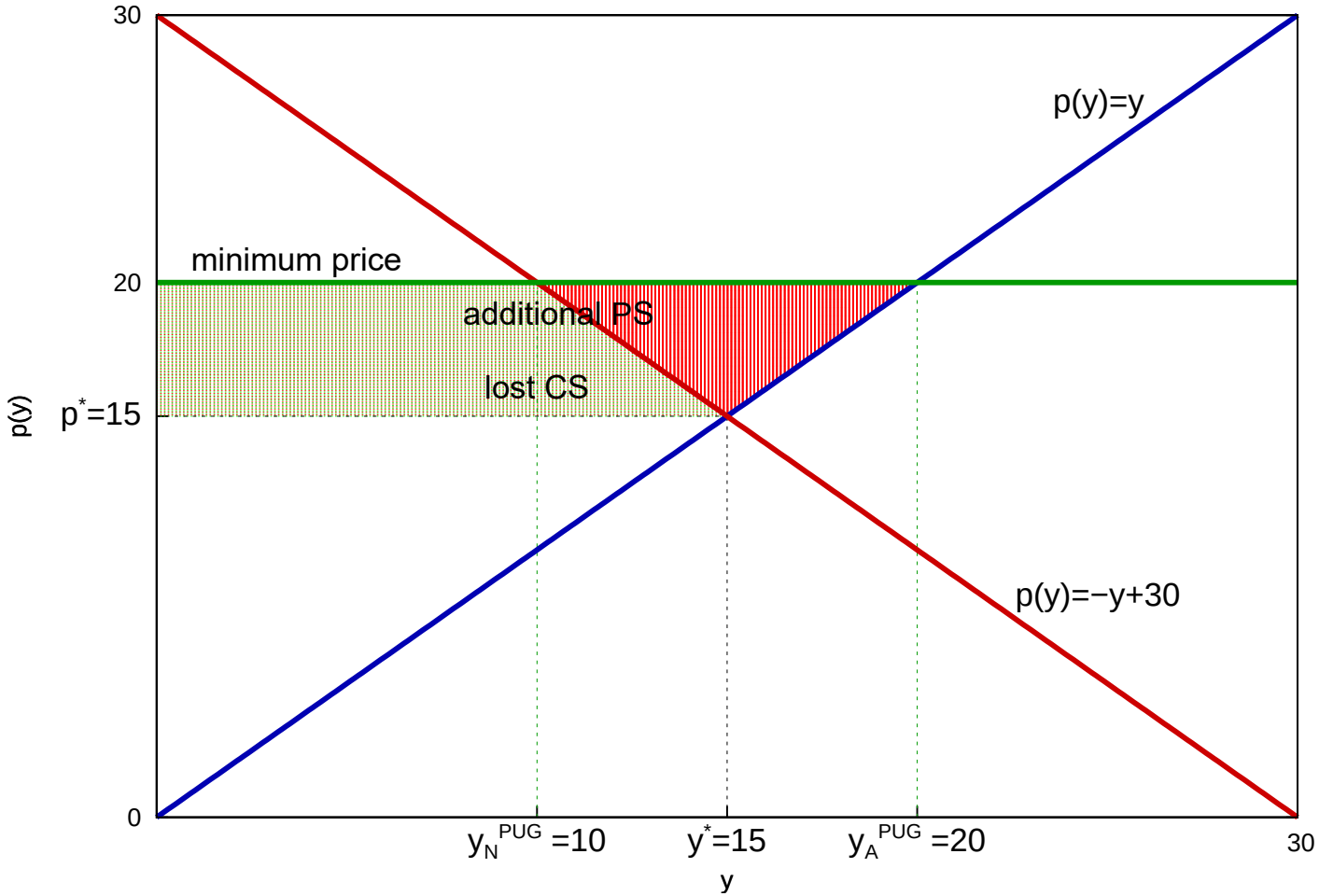
Exercise – solution



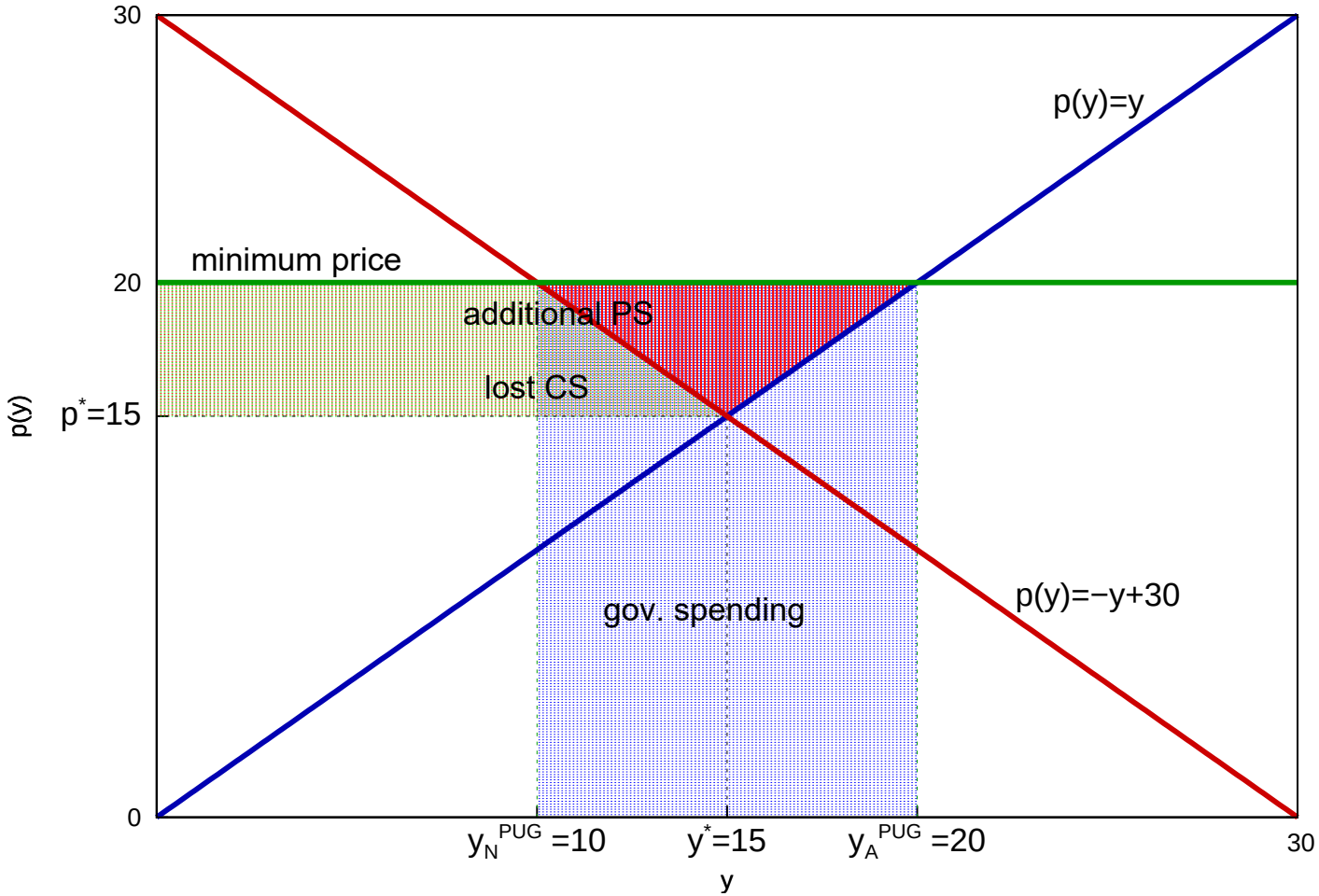
Exercise – solution



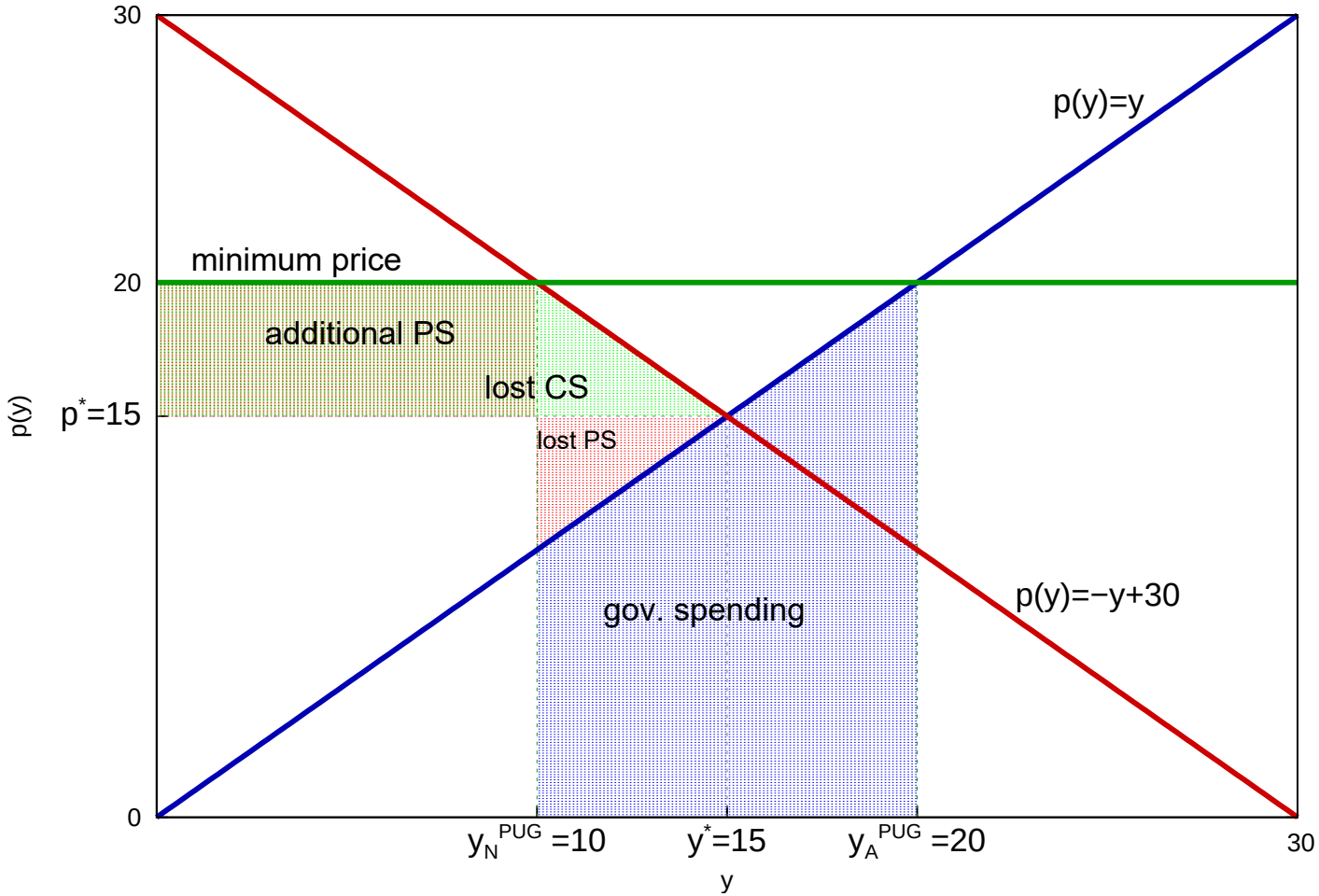
Exercise – solution



Exercise – solution



Exercise – solution



Market and fairness

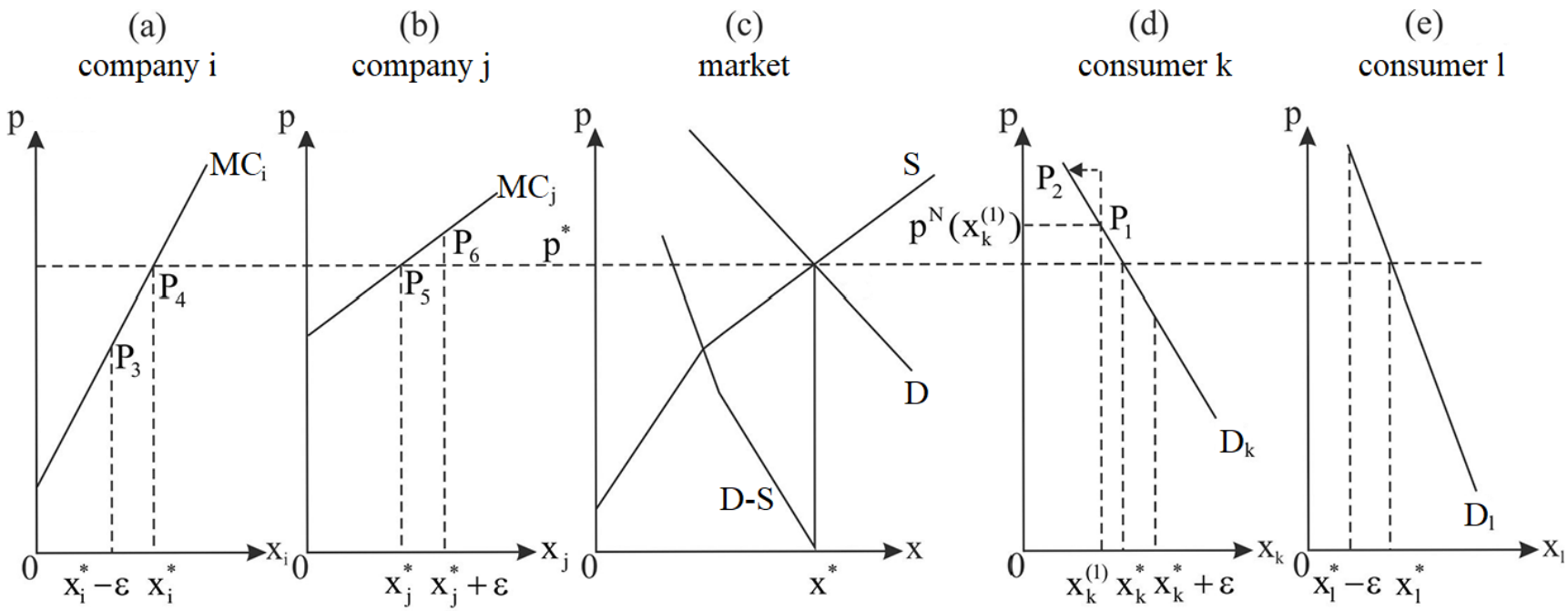


Figure: With adjustments taken from Endres (2022)

External effects

The described market mechanism is based on

- individual preferences
- income
- prices
- production technology
- market organization (e.g. perfect competition)
- rational behavior (utility and profit maximization)

Still, the impact of the market outcome on a third parties' (outside the market) utility or profit is not considered.
$\Rightarrow$ external effects

Market failure

Example

Assume a river with a factory upstream and a fisher downstream.

- waste water of the factory
- shrinking fish population

$\Rightarrow$ market failure

What does a reduction of the factory output cost (society)?

What does the emission of the factory cost?

Marginal abatement cost and marginal damage

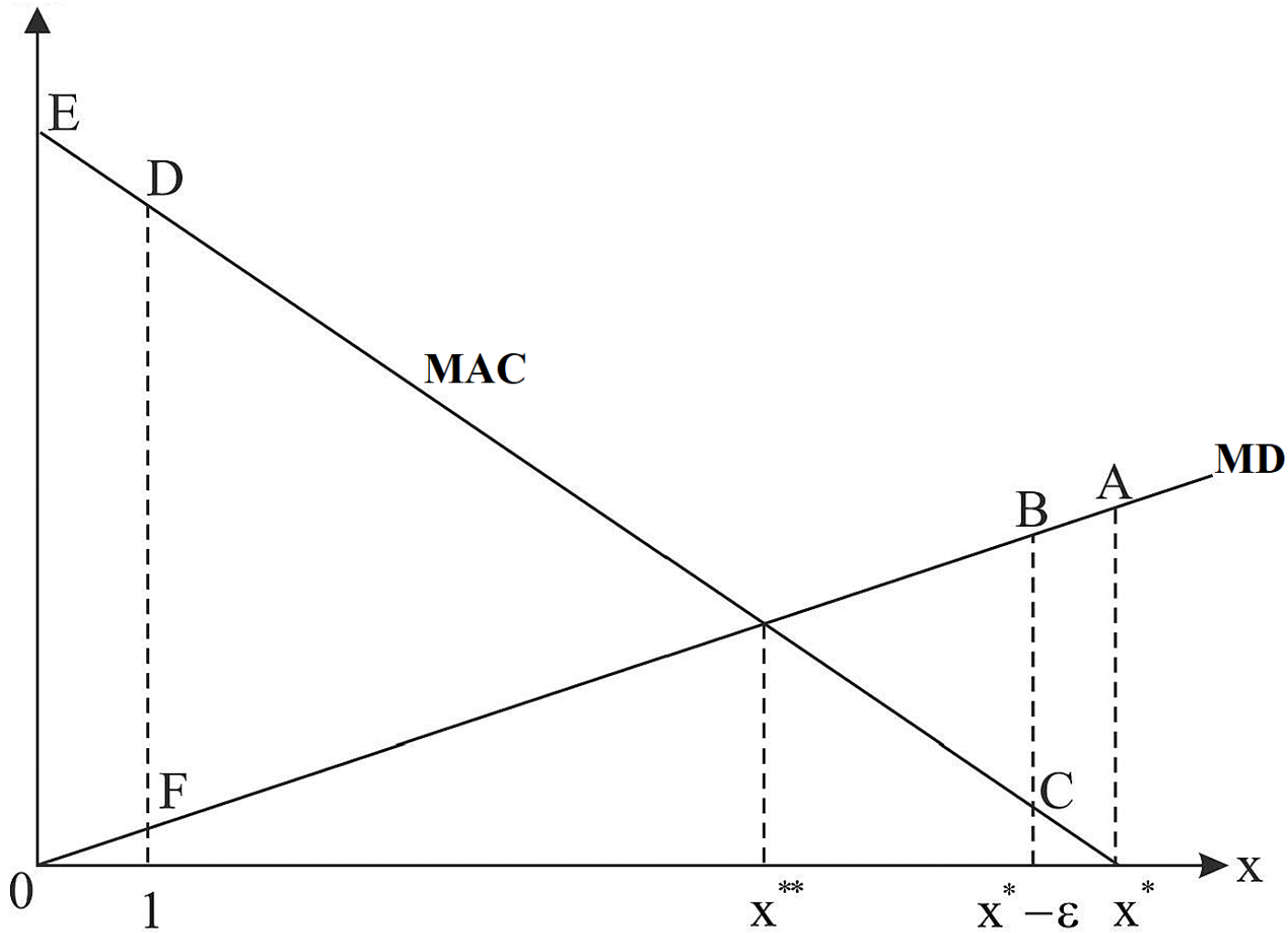


Figure: With adjustments taken from Endres (2022)

Marginal abatement cost and marginal damage

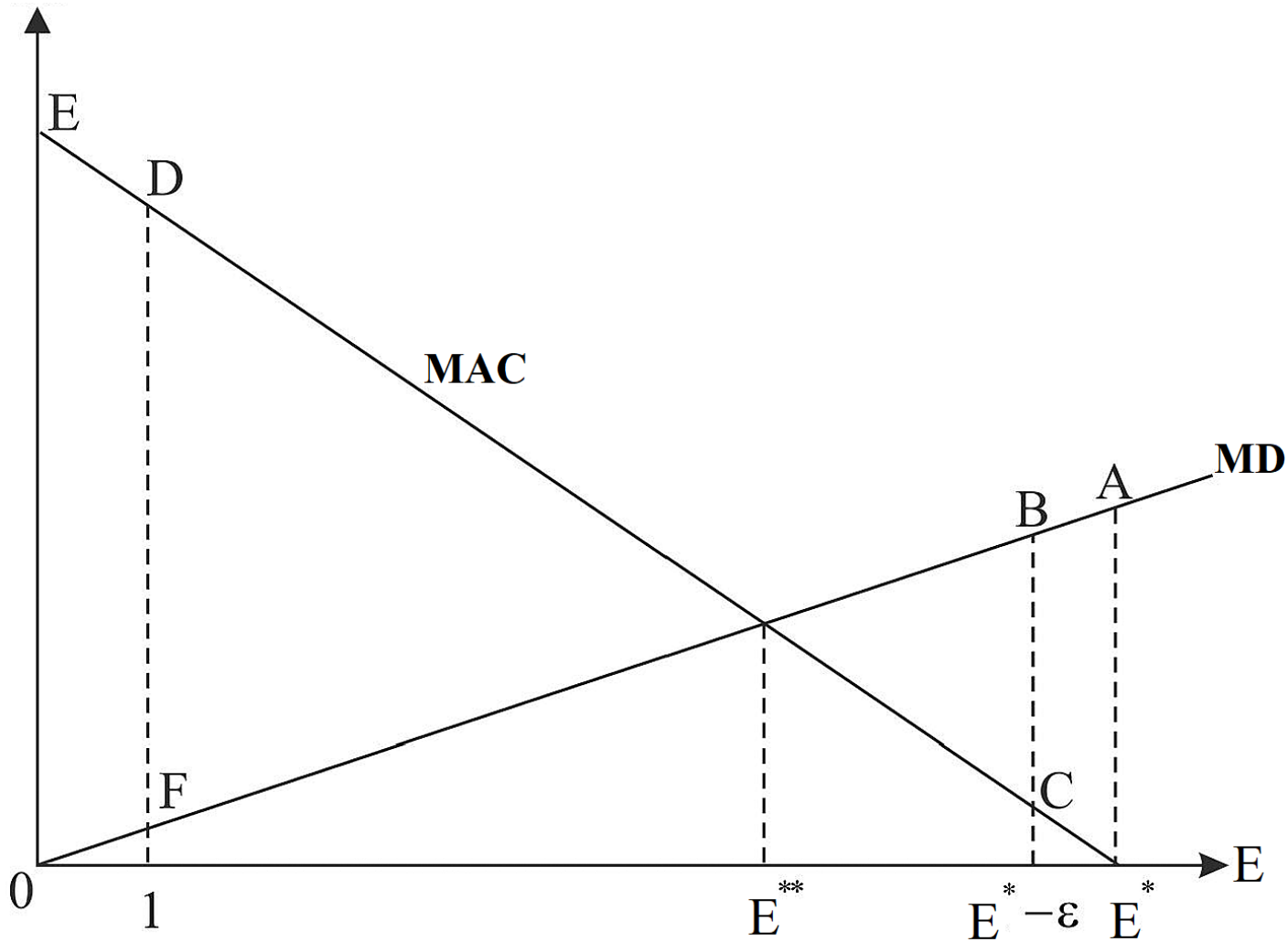


Figure: With adjustments taken from Endres (2022)

References

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