Exercises for Topics 2-3

MICRO- AND MACROECONOMICS

Exercise 1: Tax Incidence

- In the market for cigarettes, the demand function can be described by the equation $D(p) = 100 - p$, while the supply function is $S(p) = p - 10$. The government introduces a specific tax of 10 \$/unit on cigarettes, which is collected from the producers.

a) Calculate the pre-tax equilibrium price and quantity and the consumer and producer surpluses!

b) How would these change after the tax is introduced? Calculate the post-tax price and quantity traded!

c) Calculate the tax revenue and the post-tax consumer and producer surpluses & the deadweight loss!

d) Now suppose that the tax is collected from the consumers instead of the producers. Calculate the (new) post-tax price and quantity traded!

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közgazdaságtan tanszék

Exercise 1: Tax Incidence
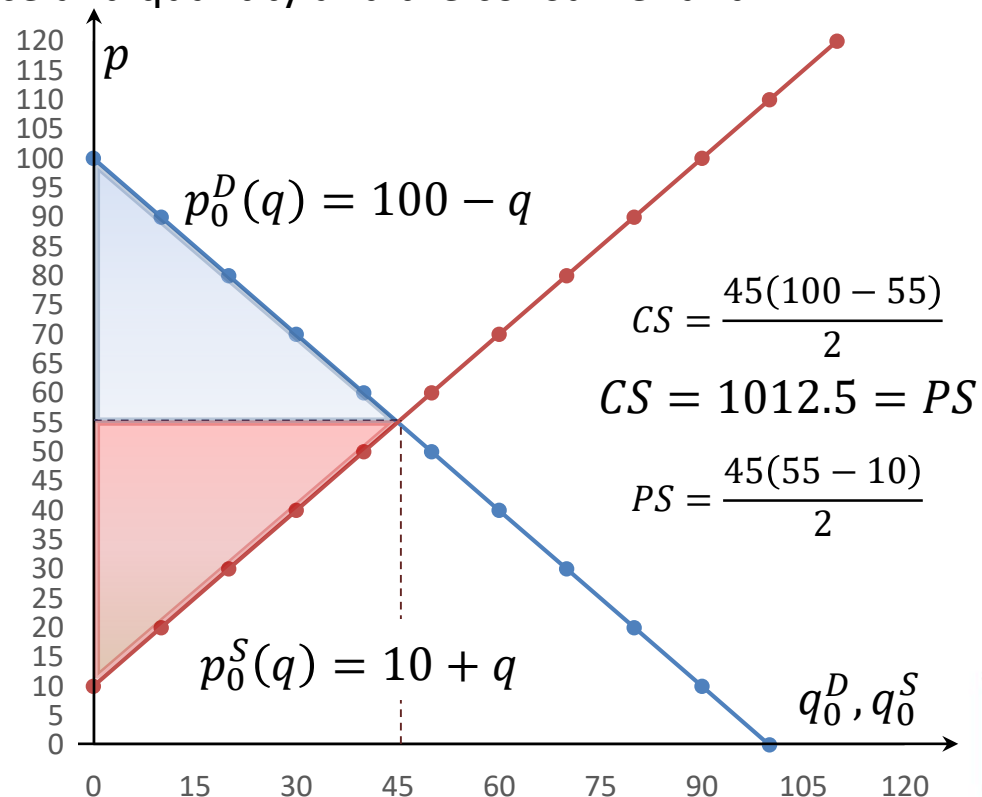# Pre-tax Equilibrium Price and Quantity

- In the market for cigarettes, the demand function can be described by the equation $D(p) = 100 - p$, while the supply function is $S(p) = p - 10$.
- The government introduces a specific tax of 10\$/unit on cigarettes, which is collected from the producers.

a) Calculate the pre-tax equilibrium price and quantity and the consumer and producer surpluses*

- $p_0^*: D(p) = S(p)$

- $100 - p = p - 10$

- $2p = 110$

- $p_0^* = 55$

- $q_0^* = S(p_0^*) = 45;$

Consumer surplus is a measure of consumer welfare, the difference between the price that **consumers** pay and the price that they are willing to pay.

Conversely, the **producer surplus** is the difference between how much a producer would be willing to accept for given quantity of a good versus how much they can receive by selling the good at the market price.
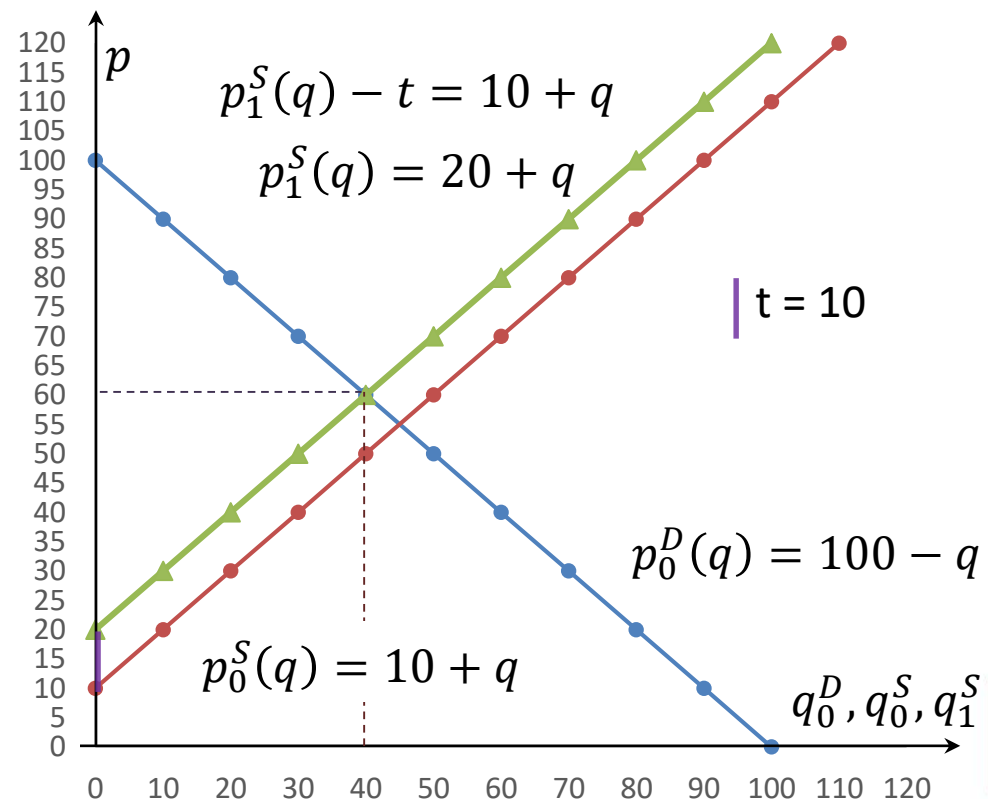
$$p_0^D(q) = 100 - q$$

$$p_0^S(q) = 10 + q$$

$$CS = \frac{45(100 - 55)}{2}$$

$$CS = 1012.5 = PS$$

$$PS = \frac{45(55 - 10)}{2}$$

$$q_0^D, q_0^S$$

Exercise 1: Tax Incidence
Post-Tax Price and Quantity Traded

b) How would these change after the tax is introduced? Calculate the post-tax price and quantity traded!

- $p_{Gr}^*: D(p) = S(p - 10)$

- $100 - p = 1(p - 10) - 10$

- $2p = 120$

- $p_{Gr}^* = 60$ (market price) $\rightarrow$
  $p_N^* = 50$ (revenue/unit)

- $q_1^* = D(p_{Gr}^*) = S(p_N^*) = 40;$

$p_1^S(q) - t = 10 + q$

$p_1^S(q) = 20 + q$

$t = 10$

$p_0^D(q) = 100 - q$

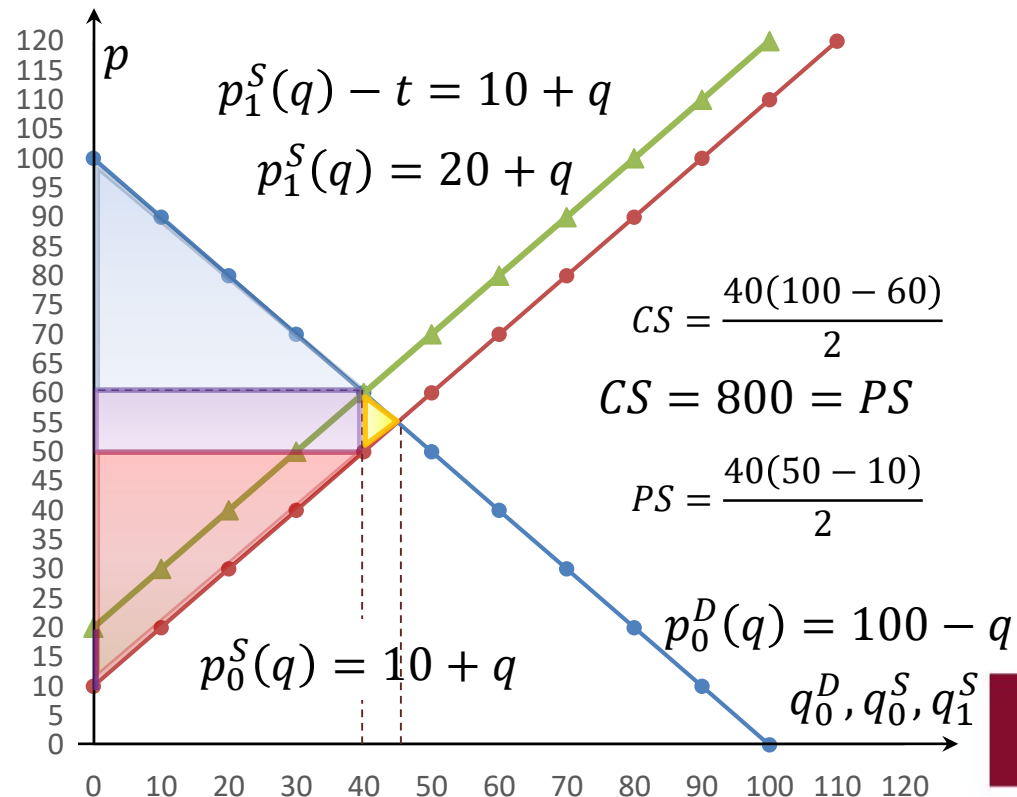$p_0^S(q) = 10 + q$

q_0^D, q_0^S, q_1^S

Exercise 1: Tax Incidence Welfare implications

c) Calculate the tax revenue and the post-tax consumer and producer surpluses & the deadweight loss!

- $p_{Gr}^*: D(p) = S(p - 10)$

- $100 - p = 1(p - 10) - 10$

- $2p = 120 \qquad DWL = \dfrac{t\Delta q}{2} = 25$

- $p_{Gr}^* = 60 \ \rightarrow p_N^* = 50$

- $q_1^* = D(p_{Gr}^*) = S(p_N^*) = 40;$

- Tax Revenue: $T = t \cdot q_1^* = 400$

$p_1^S(q) - t = 10 + q$

$p_1^S(q) = 20 + q$

$CS = \dfrac{40(100 - 60)}{2}$

$CS = 800 = PS$

$PS = \dfrac{40(50 - 10)}{2}$

$p_0^D(q) = 100 - q$

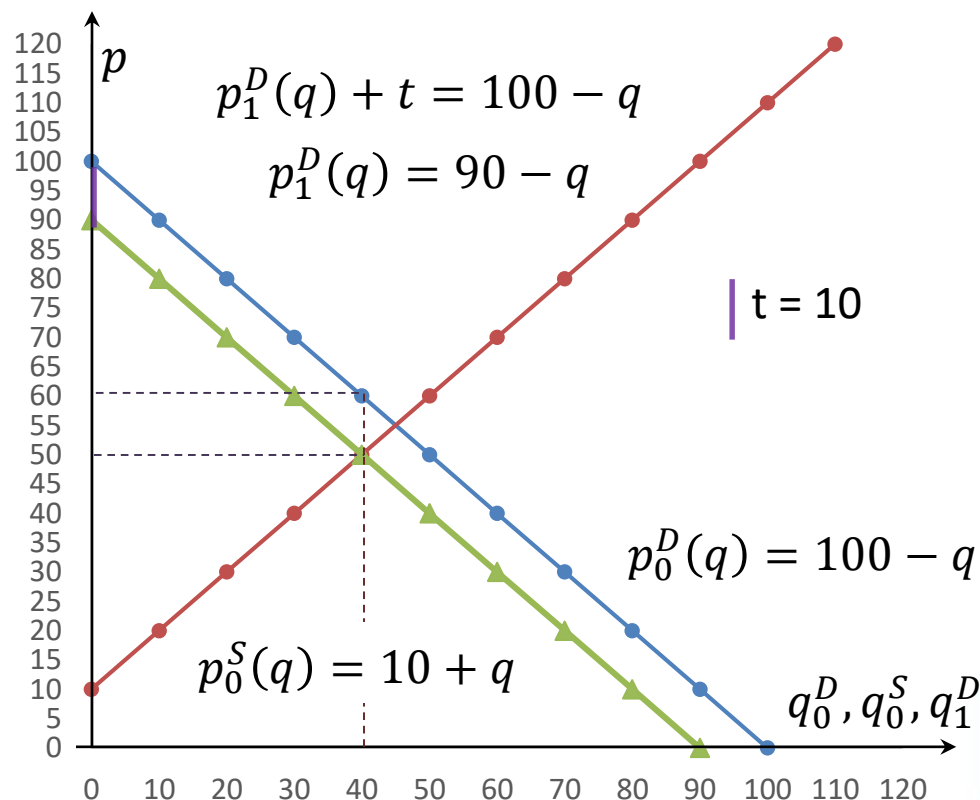$p_0^S(q) = 10 + q$

q_0^D, q_0^S, q_1^S

Exercise 1: Tax Incidence
Tax Collected from the Consumers

d) Now suppose that the tax is collected from the consumers instead of the producers. Calculate the (new) post-tax price and quantity traded!

- $p_N^*:\ D(p + 10) = S(p)$

- $100 - 1(p + 10) = p - 10$

- $2p = 100 \rightarrow p_N^* = 50$ (price)

- $p_{Gr}^* = 60$ (cost for consumers)

- $q_1^* = D(p_{Gr}^*) = S(p_N^*) = 40;$

- CS, PS, DWL do not change.

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$p_1^D(q) + t = 100 - q$

$p_1^D(q) = 90 - q$

$t = 10$

$p_0^D(q) = 100 - q$

$p_0^S(q) = 10 + q$

q_0^D, q_0^S, q_1^D

Thank you for your attention!

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