

# ECONOMICS 2





NEW

SZÉCHENYI PLAN

# ECONOMICS 2

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# ECONOMICS 2

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## Week 2

# **GDP: production, distribution, consumption**

## Chapter 3

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# Outline

- GDP production
- GDP distribution
- GDP consumption

# Model

- Supply side: production and factors of production.
- Demand side: consumption, investment and governmental purchases.
- Equilibrium: on the markets of goods and capital.

# Production factors

The **production factors** are such resources which are used for producing goods and services.

- **K:** Capital (tractors, tools, factories etc.)
- **L:** Labor (physical and mental capacities)



# Production function

$$Y = F(K, L)$$

The **production function** shows how much income is produced in the economy, given **K** amount of capital and **L** amount of labor.

(The arguments of the function can be extended.)

# Production function

We generally assume that the function is of **constant returns to scale!**

$$zY = F(zK, zL)$$

# Given output

Assumptions:

- The available capital is given

$$\mathbf{K} = \bar{\mathbf{K}}.$$

- The available labor is given

$$\mathbf{L} = \bar{\mathbf{L}}.$$

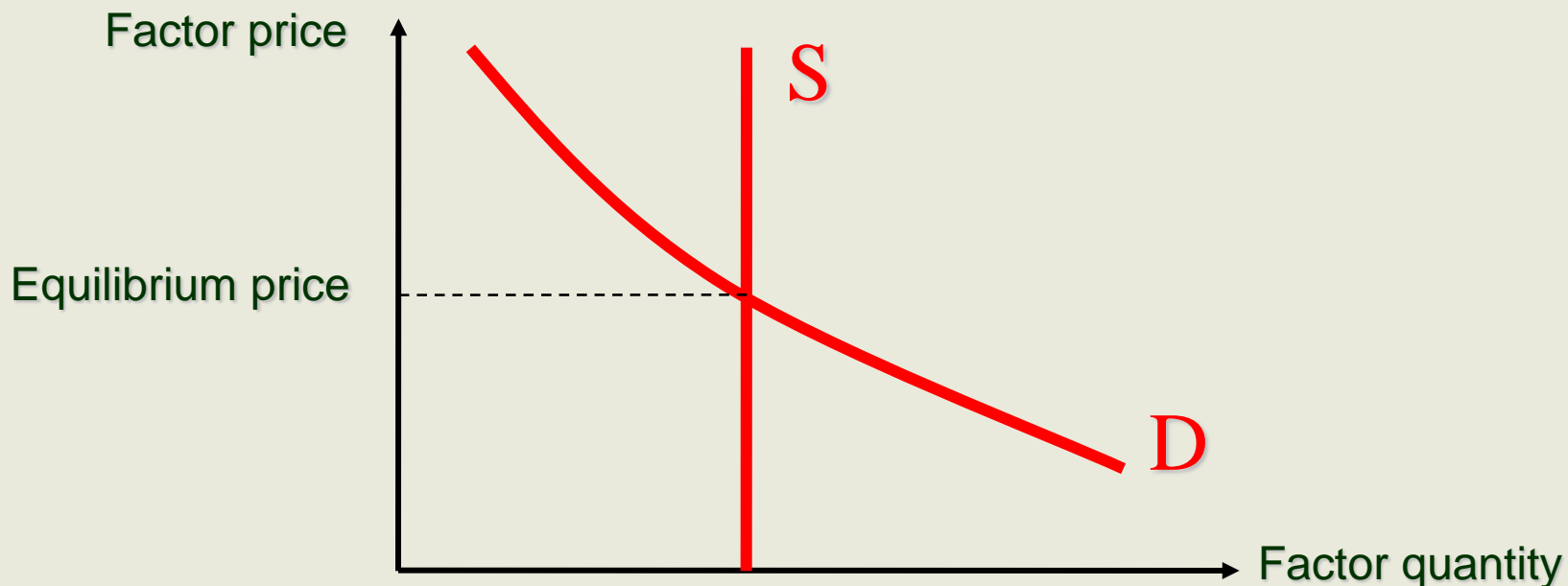
- Hence the available income is also given:

$$\bar{\mathbf{Y}} = \mathbf{F}(\bar{\mathbf{K}}, \bar{\mathbf{L}}).$$

# Market of the production factors

Price of the production factors:

- The price of the labor is the **wage (W)**.
- The price of the capital is the **interest rate (R)**.



# Decision of the firm

$$\begin{aligned}\text{Profit} &= \text{income} - \text{labor cost} - \\ &\quad - \text{capital cost} = PY - WL - RK = \\ &= PF(K,L) - WL - RK\end{aligned}$$

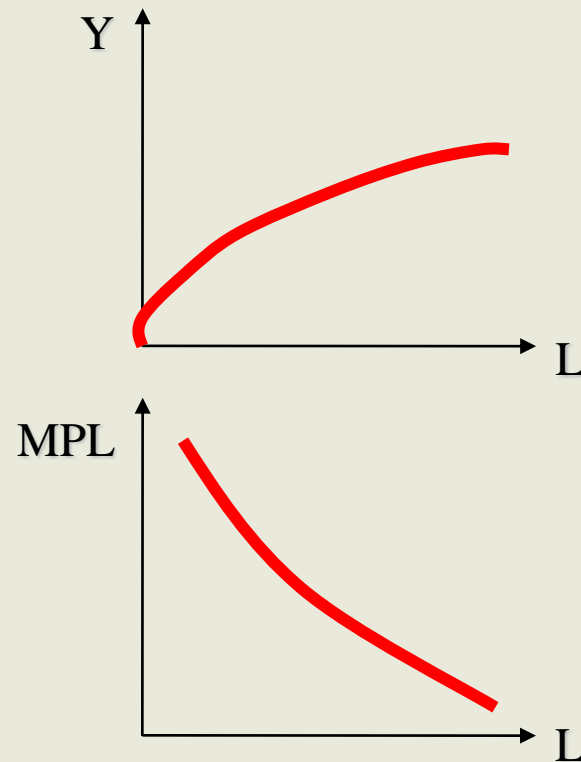
Question:

How much labor does a profit maximizing firm use?

# Marginal product

Marginal product of labor:

$$\text{MPL} = F(K, L+1) - F(K, L)$$



# Optimal decision

$$\begin{aligned}\Delta \text{profit} &= \Delta \text{income} - \Delta \text{cost} = \\ &= P \text{ MPL} - W\end{aligned}$$

In case of optimal decision:

$$P \text{ MPL} = W$$

$$\text{MPL} = W/P$$

The marginal product of labor equals the **real wage**.

# Optimal decision – capital

$$\begin{aligned}\Delta\text{profit} &= \Delta\text{income} - \Delta\text{cost} = \\ &= P \text{ MPK} - R\end{aligned}$$

In case of optimal decision :

$$P \text{ MPK} = R$$

$$\text{MPK} = R/P$$

The marginal product of capital equals the **real interest rate**.

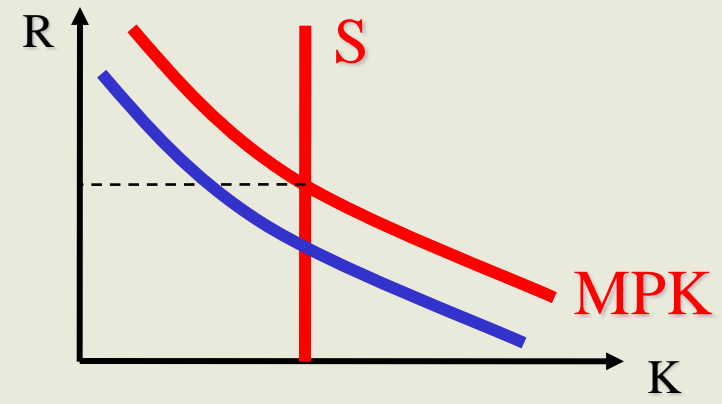
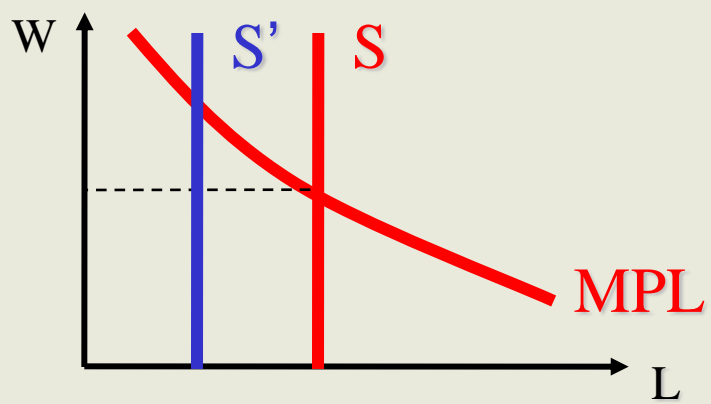
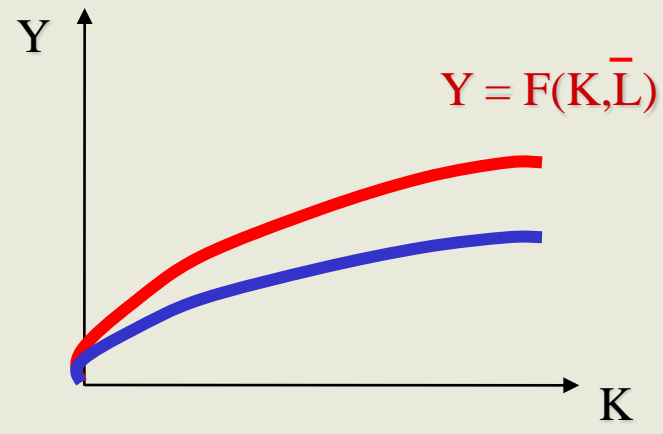
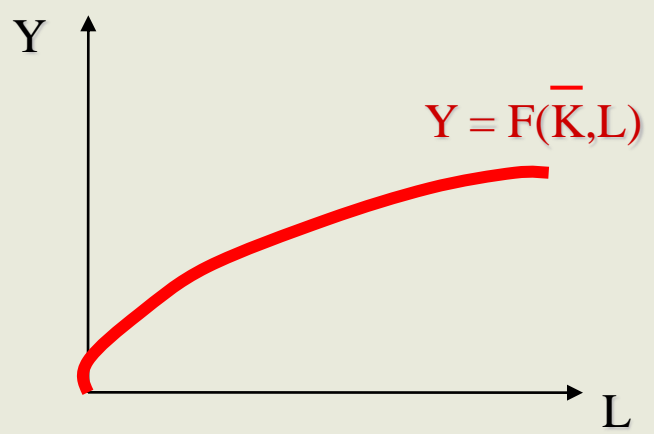


# Distribution of the national income

$$\text{Economic profit} = Y - \text{MPL} L - \text{MPK} K$$

If we assume that the production function is of constant returns to scale, then it can be proven (Euler theorem) that the economic profit = 0.

# Effect of decreasing labor force quantity on the interest rate



# Demand for goods and services

- **Consumption: (C)** Goods and services purchased by households.
- **Investment: (I)** Goods which will be utilized in the future.
- **Governmental purchases: (G)** Goods and services purchased by the central and local governments.
- **Net export: (NX)** Trade with other countries.

# Income composition

$$Y = C + I + G + (NX)$$

# Consumption

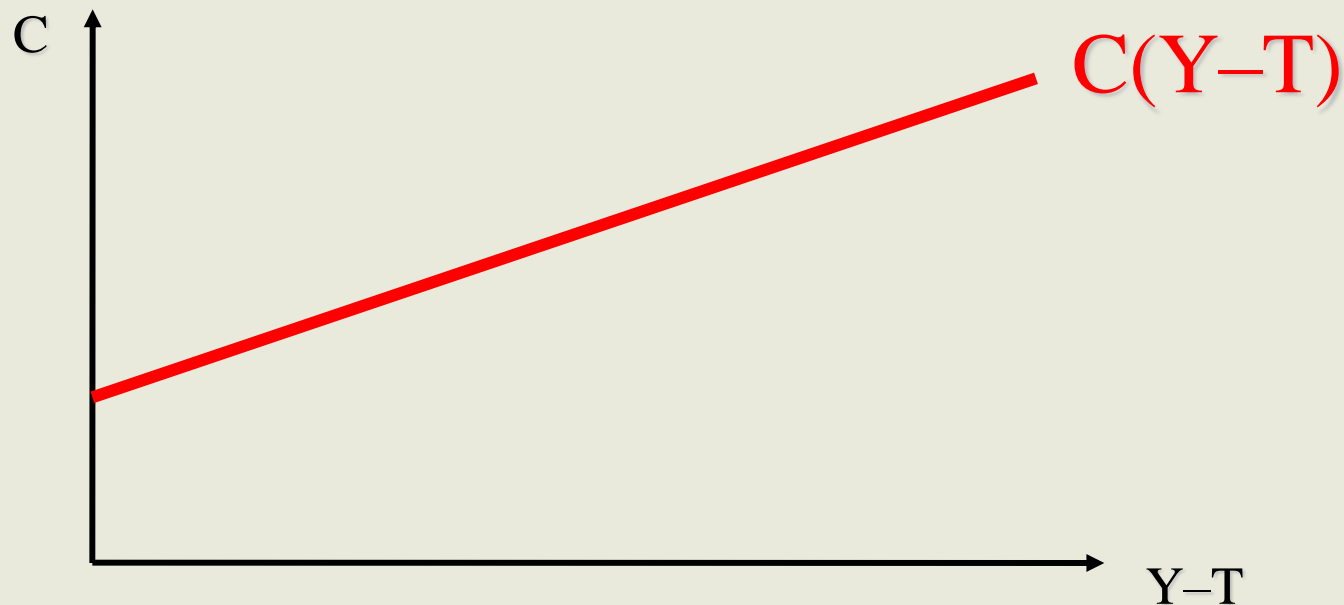
The households receive income ( $Y$ ) in exchange for their labor and capital. They pay part of it to the government in the form of taxes ( $T$ ).

The **disposable income**:  $Y - T$ .

In our model the consumption depends solely on the disposable income:

$$C = C(Y - T).$$

# Consumption function



The **marginal propensity to consume (MPC)** shows how much does the consumption change if the income increases by one unit.

$$0 < \text{MPC} < 1$$

# Example of consumption functions

If people need 250 pence to survive, and out of each additional penny they spend 0.75 on consumption, then the consumption function is:

$$C = 250 + 0,75(Y - T)$$

# Investment

Question:

How do we decide whether to borrow money from the bank for investment?

How do we decide whether we invest our money in an enterprise or we rather deposit it in a bank?

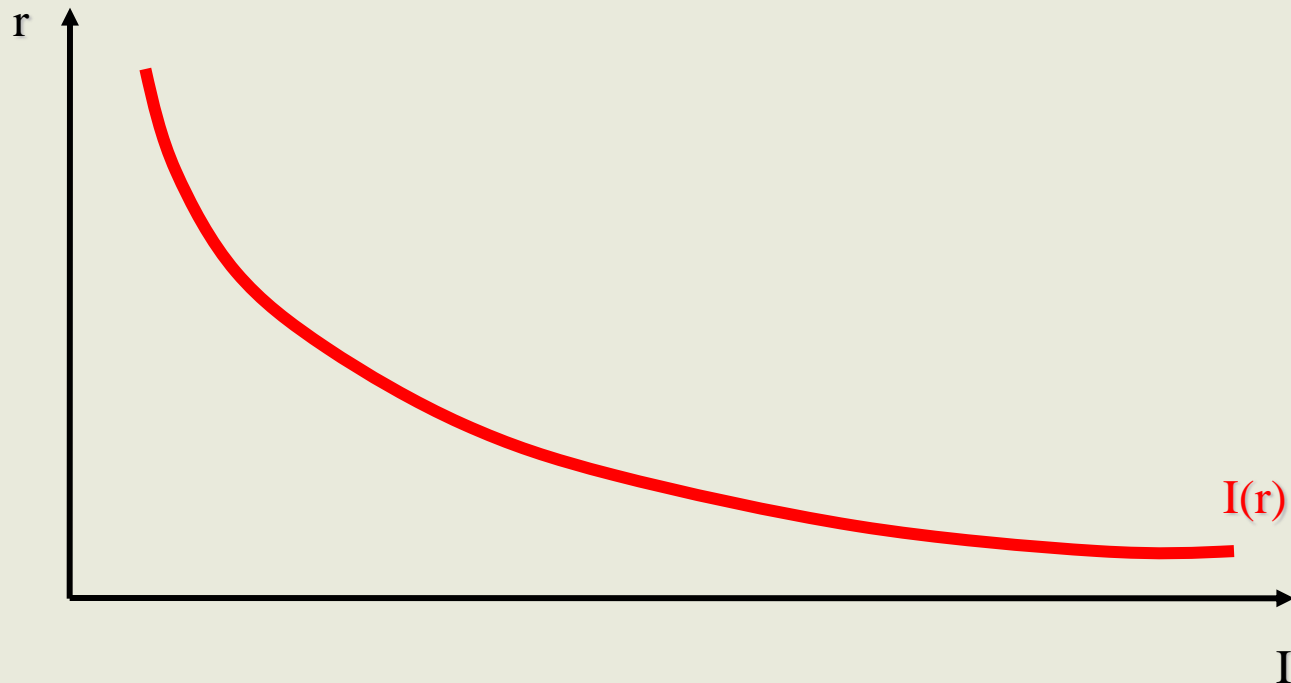
Answer:

The real rate of interest ( $r$ ).



# Investment function

The higher the real interest rate is, the lower is the investment propensity.



# Governmental expenditures

What kind of expenditures does the government have?

The government purchases some types of goods (G): e.g. school buildings, tanks.

Gives welfare **transfers** to the citizens. These increase the disposable income of the households, therefore can be considered as negative taxes.

# The public budget

If  $G = T$  then the budget is in equilibrium.

If  $G > T$  then there is **public deficit** which can be financed by **public debt**. **Public surplus** is also possible:  $G < T$ .

The decisions on the public budget are not the results of market processes, therefore we consider these variables as exogenous.

# Equilibrium on the market of goods

Supply:  $\bar{Y} = F(\bar{K}, \bar{L})$

Demand:

Consumption:  $C(\bar{Y} - \bar{T})$

Investment:  $I(r)$

Governmental purchases:  $\bar{G}$

Equilibrium:  $\bar{Y} = C(\bar{Y} - \bar{T}) + I(r) + \bar{G}$

# Savings

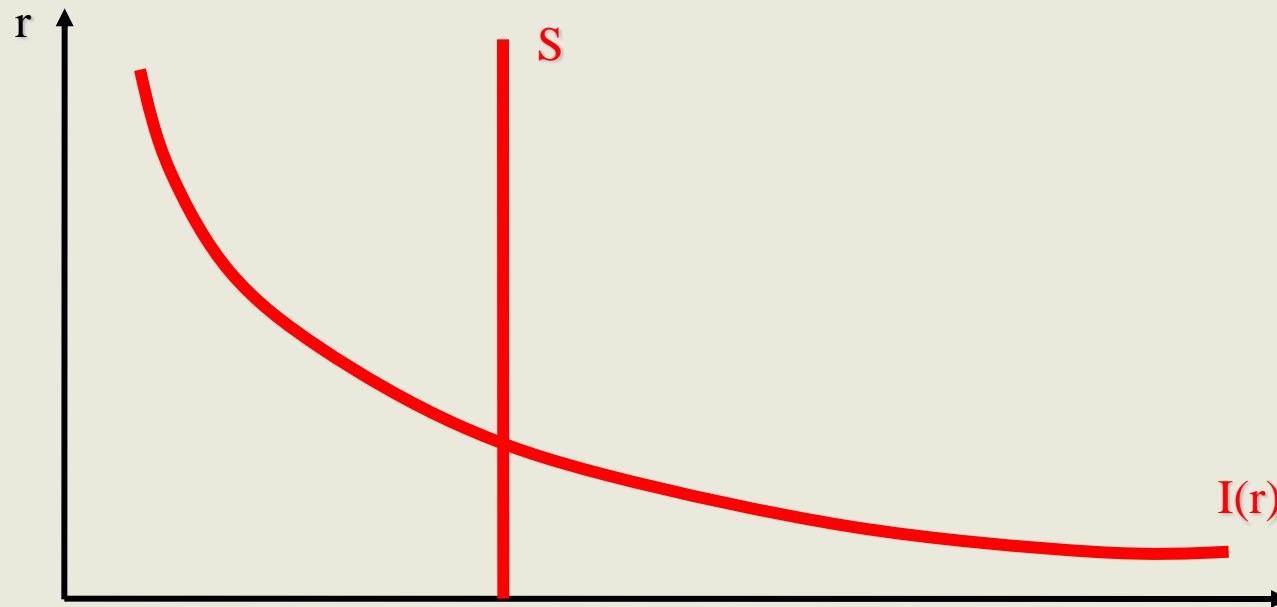
(National) savings:

$$S = (Y - T - C) + (T - G);$$

$$S = Y - C - G.$$

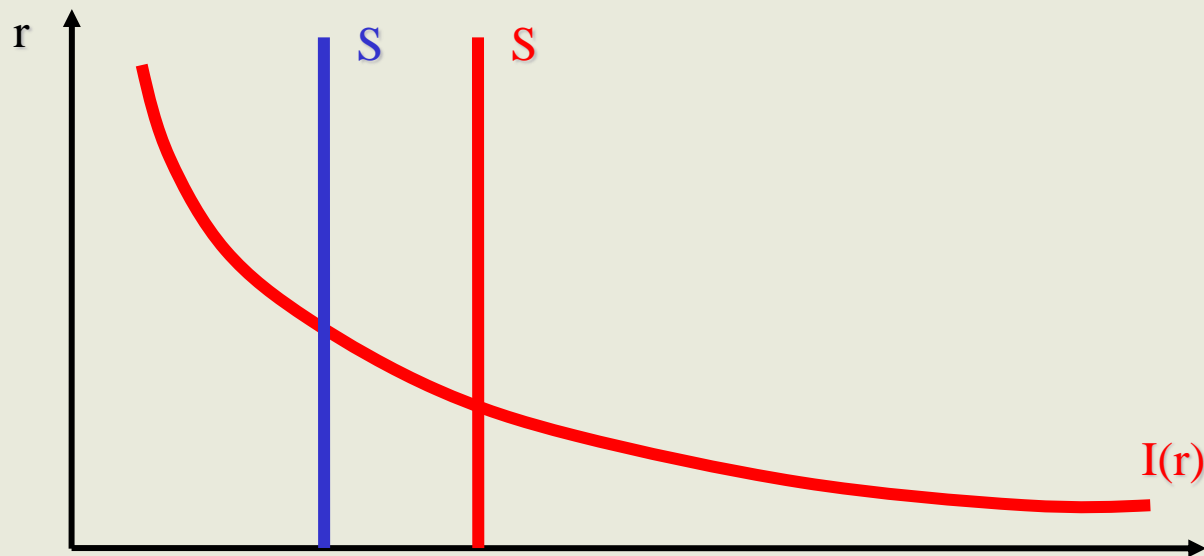
Equilibrium condition:  $\bar{S} = I(r)$ .

# Equilibrium on the capital market



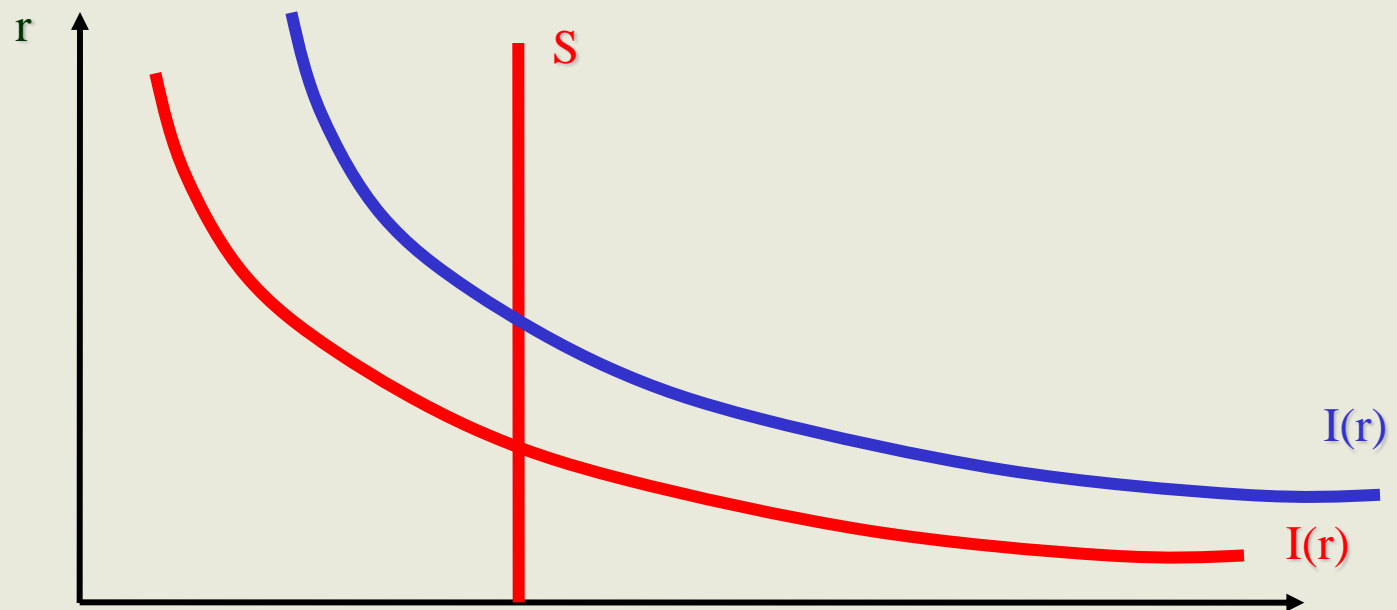
# The effect of increasing governmental expenditures

$$Y = C + I \downarrow + G \uparrow$$



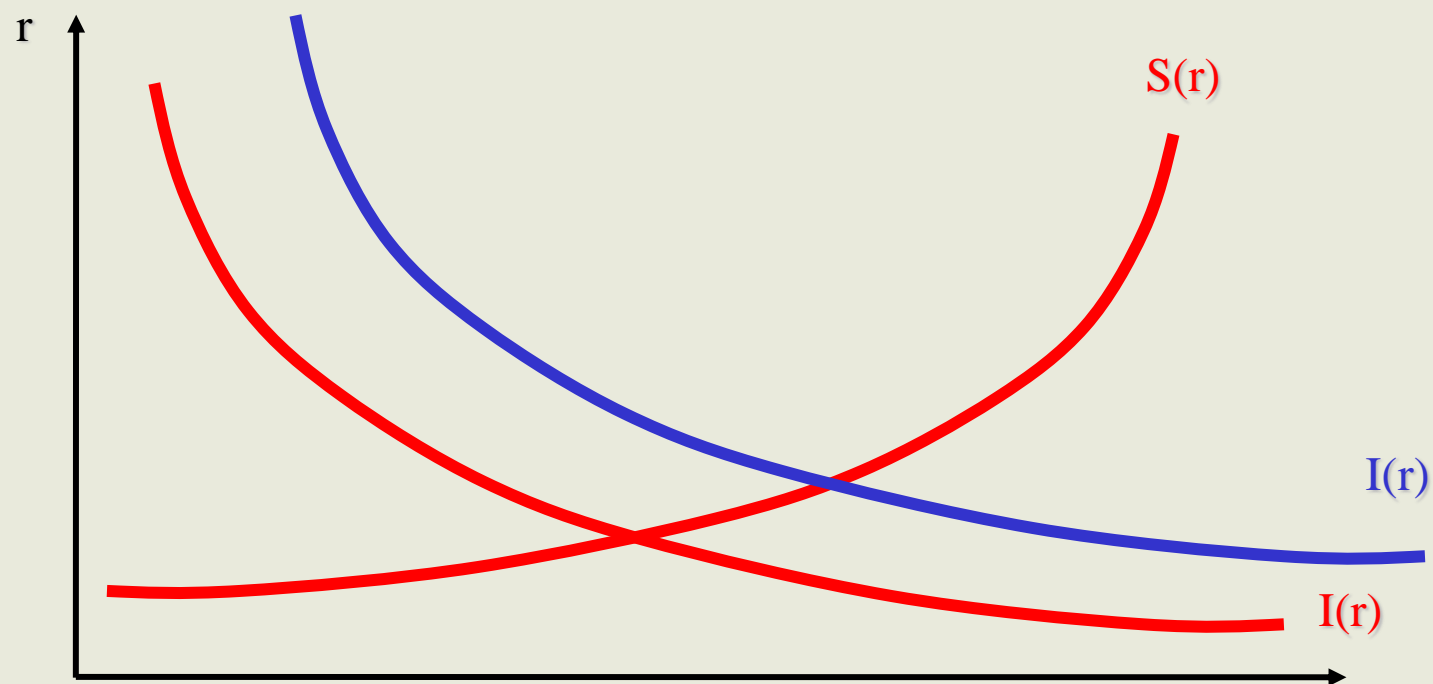
The governmental expenditures crowd out the investments!

# Change in the propensity to invest





# Extension of the model



# Numerical example

Let

$$Y = 5000; G = 1000; T = 1000;$$

and

$$C = 250 + 0,75(Y - T);$$

$$I = 1000 - 50r.$$

- a) Define the amount of investment.
- b) Define the equilibrium interest rate.

# Solution

$$\begin{aligned} \text{a) } C &= 250 + 0,75(5000 - 1000) = \\ &= 250 + 3000 = 3250 \end{aligned}$$

$$I = Y - C - G$$

$$I = 5000 - 3250 - 1000 = 750$$

$$\text{b) } 750 = 1000 - 50r$$

$$r = 5$$