National Income

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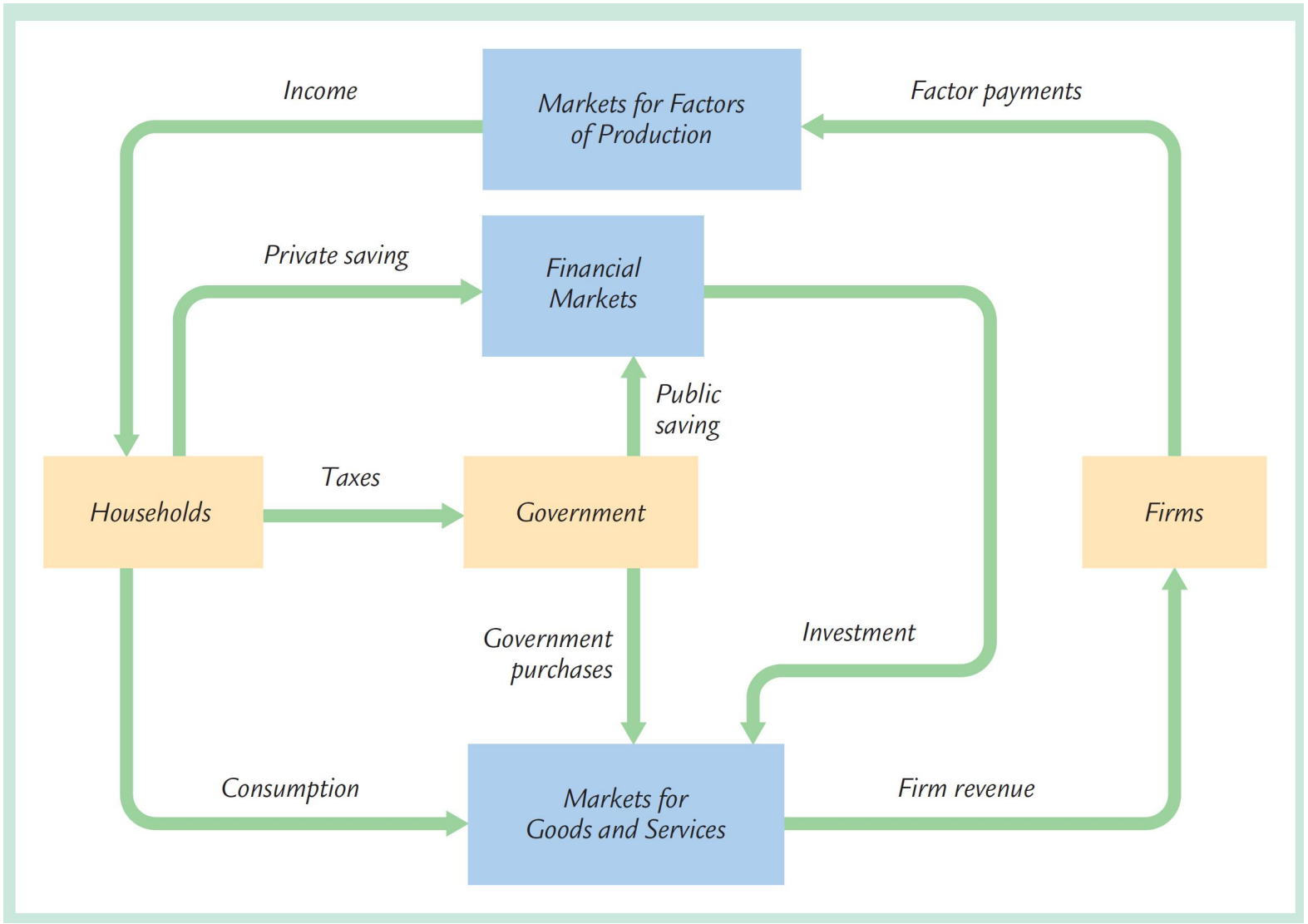

Income
Markets for Factors of Production
Factor payments
Private saving
Financial Markets
Public saving
Households
Taxes
Government
Firms
Government purchases
Investment
Consumption
Markets for Goods and Services
Firm revenue

Basic Classical Model

1. Production technology
2. Markets for factors of production
3. How income is spent
4. Demand-Supply equilibrium

Production

Factors of production: capital and labor. We could *assume* that capital and labor are fixed for a given moment in time.

$$K = \bar{K}$$

$$L = \bar{L}$$

Production function:

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

Production Function

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

Properties:

1. Increasing in K and L

$$\frac{\delta F}{\delta K} > 0, \qquad \frac{\delta F}{\delta L} > 0$$

2. Constant returns to scale in (K, L)

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

3. Diminishing marginal product

$$\frac{\delta^2 F}{\delta K^2} < 0, \qquad \frac{\delta^2 F}{\delta L^2} < 0$$

Examples of Production Functions

$$Y = AK^{0.6}L^{0.6}$$

$$Y = AK + BL$$

$$Y = min[AK, BL]$$

$$Y = AK^{0.4}L^{0.6}$$

Cobb-Douglas production function:

$$Y = AK^{\alpha}L^{1-\alpha}$$

The Problem of The Firm

The goal of the firm is to maximize profits given prices. When a firm hires more capital (or labor):

1. Output and revenues go up
2. Expenditures on factor payments go up

$$\max_{K,L}[PF(K,L) - WL - RK]$$

First order conditions:

$$P\frac{\delta F}{\delta K} - R = 0$$

$$P\frac{\delta F}{\delta L} - W = 0$$

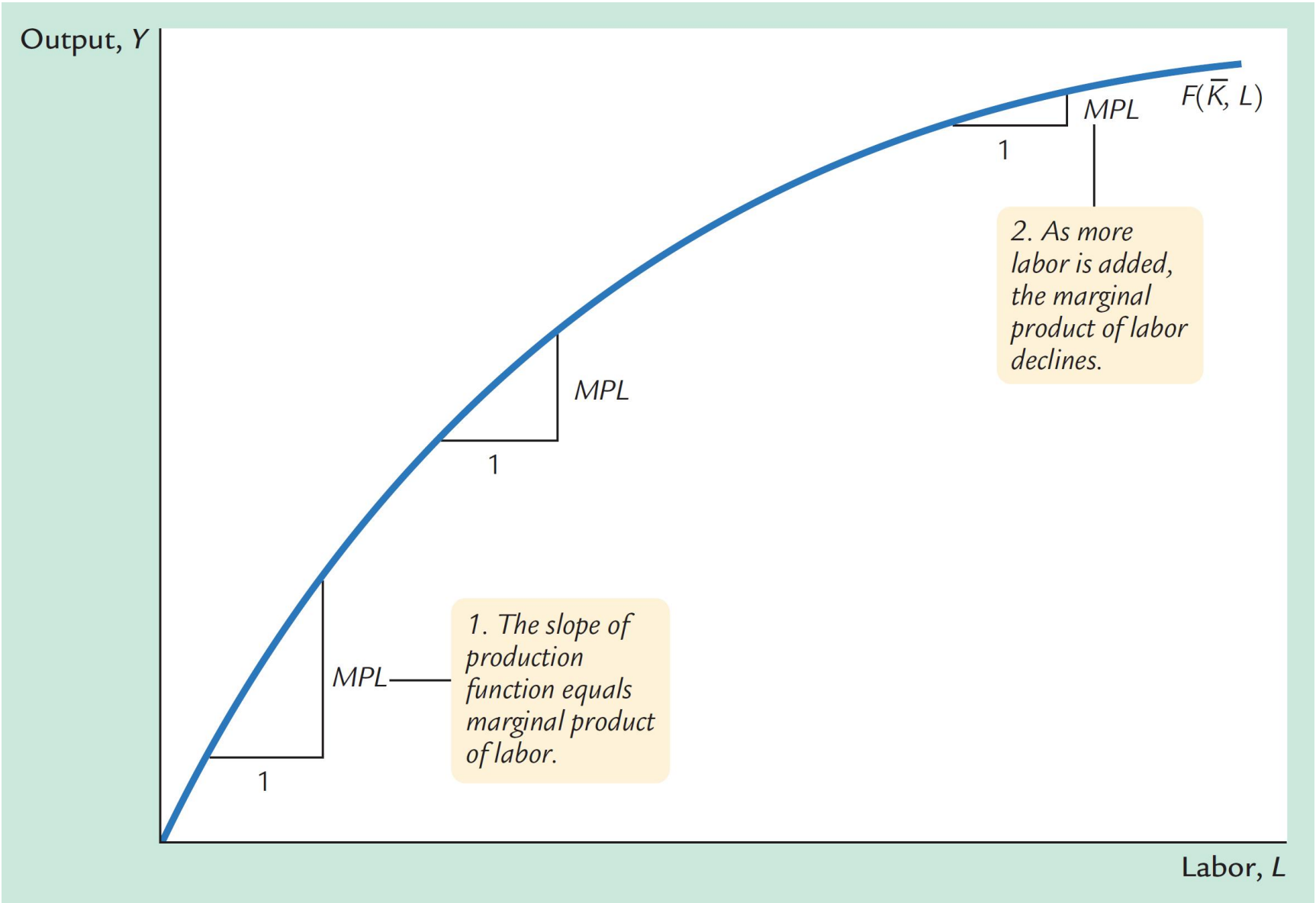
Demand for Factors of Production

Marginal product of the factor should be equal to its real price.

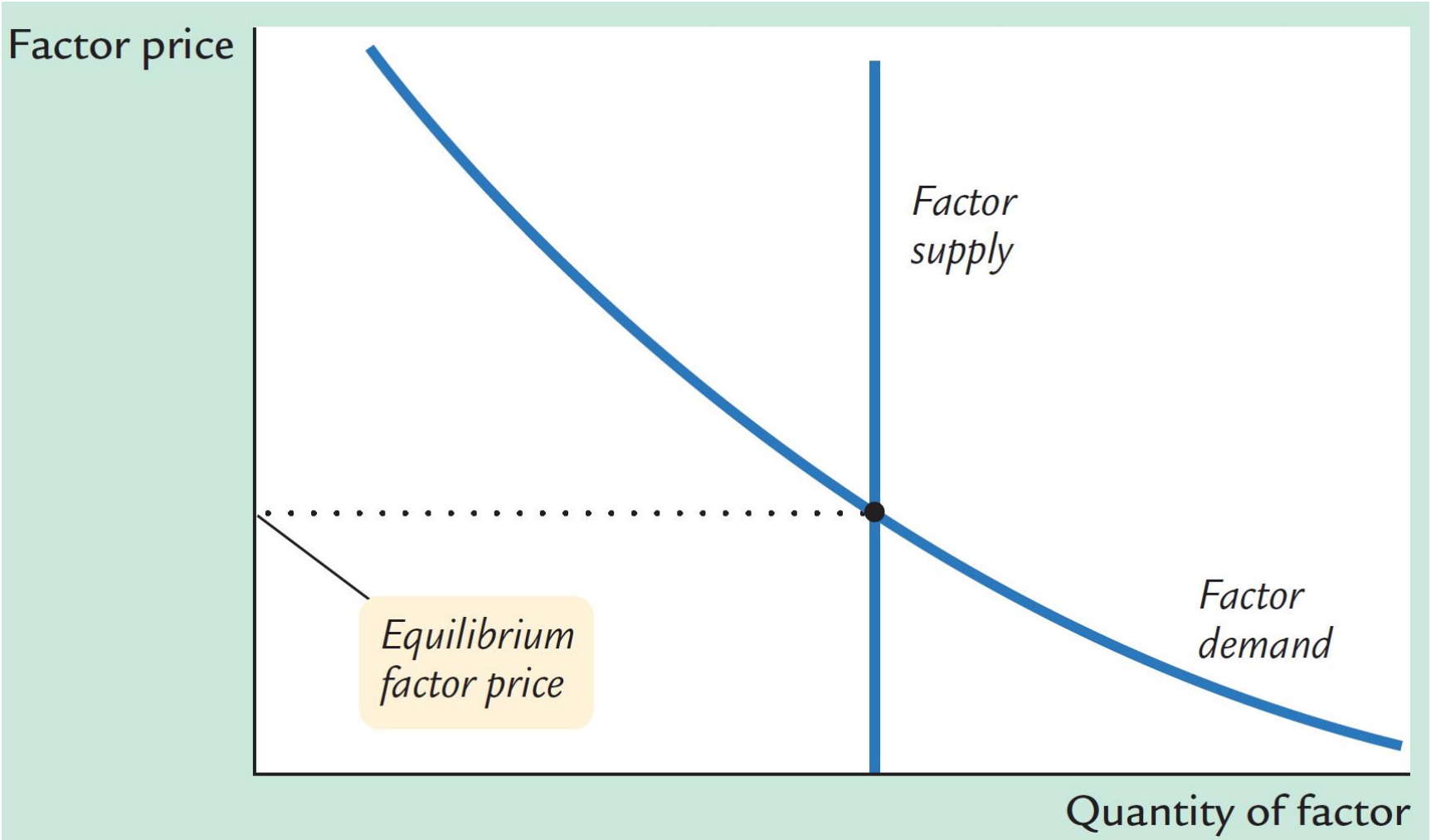
$$MPK = R/P = r$$

$$MPL = W/P = w$$

Diminishing marginal productivity $\Rightarrow$ demand for a factor would be decreasing in its price.


Output, Y
F(K̄, L)
MPL
1
2. As more labor is added, the marginal product of labor declines.
MPL
1
MPL
1. The slope of production function equals marginal product of labor.
1
Labor, L

Factor Market



How income is divided

Euler theorem:

$$F(K, L) = \frac{\delta F}{\delta K} K + \frac{\delta F}{\delta L} L$$

Profits are zero. But economic profits are different from accounting profits.

- Payments to entrepreneur abilities
- Interest on capital

Experiments in the Factor Model

War: part of capital stock is destroyed.

$$K \downarrow \quad \Rightarrow \quad \frac{\delta F}{\delta K} \uparrow, \frac{\delta F}{\delta L} \downarrow \quad \Rightarrow \quad r \uparrow, w \downarrow$$

Epidemics: part of labor force is destroyed.

$$L \downarrow \quad \Rightarrow \quad \frac{\delta F}{\delta K} \downarrow, \frac{\delta F}{\delta L} \uparrow \quad \Rightarrow \quad r \downarrow, w \uparrow$$

Demand

Assuming closed economy we may write:

$$Y = C + I + G$$

Consumption

This model takes a simplified view of consumption decisions by imposing a consumption function. The argument is disposable income $Y - T$.

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

Marginal propensity to consume (MPC): change in consumption corresponding to a unit change in disposable income.

Investment

Investment is dynamic solution. Difficult to model in a static model, but lets take a shortcut. Assume investment demand is a decreasing function of *real interest rate*.

$$I = I(r); \qquad \frac{\delta I}{\delta r} < 0$$

Government

Let's assume government is exogenous to the model, so we may treat its actions as given constants.

$$G = \bar{G}$$

$$T = \bar{T}$$

Equilibrium on the Goods Market

Demand:

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

$$I = I(r)$$

$$G = \bar{G}$$

$$T = \bar{T}$$

Supply:

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

Equilibrium:

$$C(\bar{Y} - \bar{T}) + I(r) + \bar{G} = Y = \bar{Y} = F(\bar{K}, \bar{L})$$

The Interest Rate

Demand and supply are brought into equilibrium due to the changes in the interest rate.

At the *equilibrium interest rate*, the demand for goods and services equals the supply.

Equilibrium on the Financial Market

Private savings:

$$Y - C - T$$

Public savings:

$$T - G$$

Aggregate savings:

$$Y - C - G = \bar{S}$$

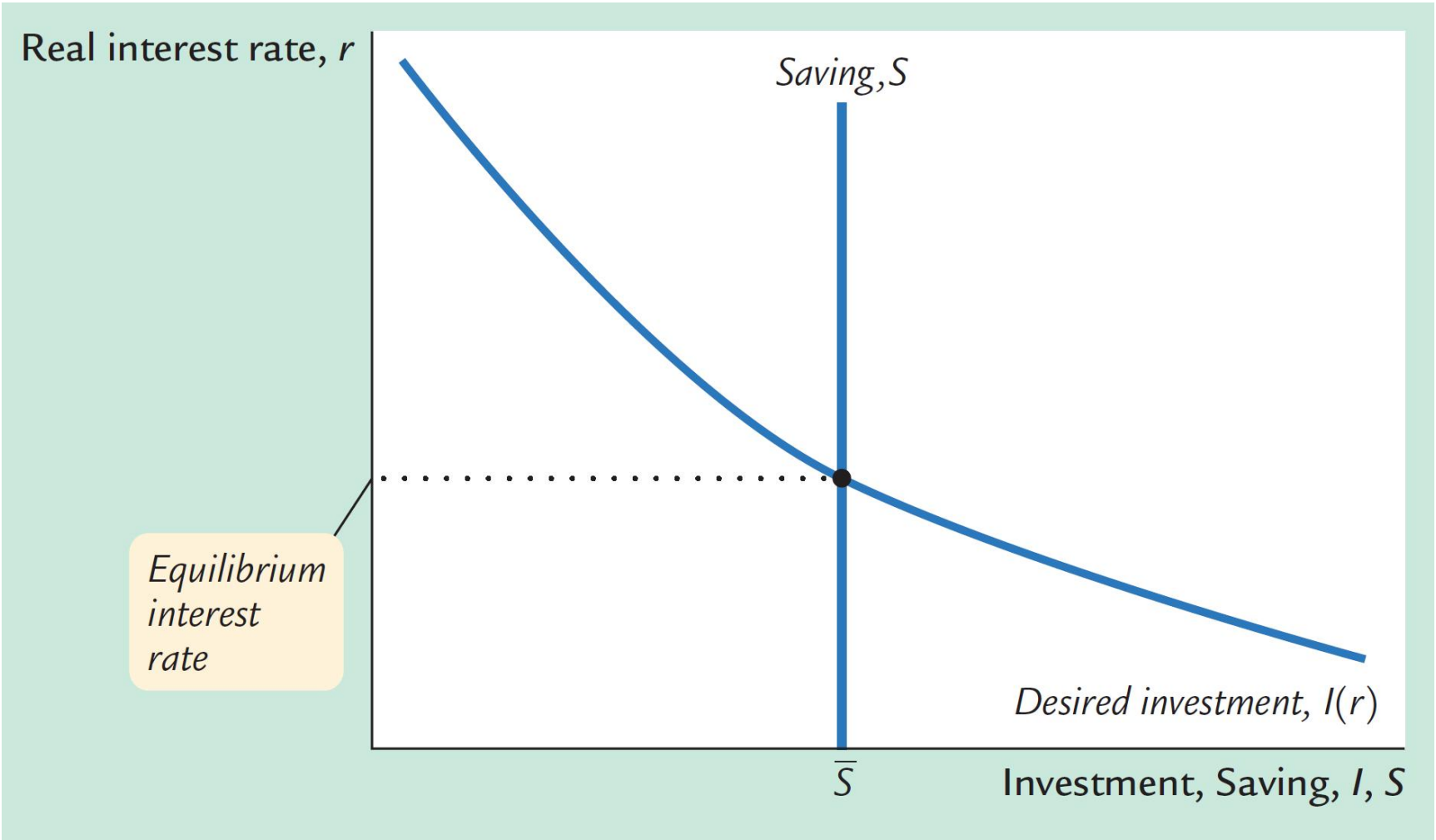
Equilibrium:

$$Y - C - G = I$$

Walras Law

If you have n interrelated markets, and $n-1$ of them clear, then the nth market also clears.

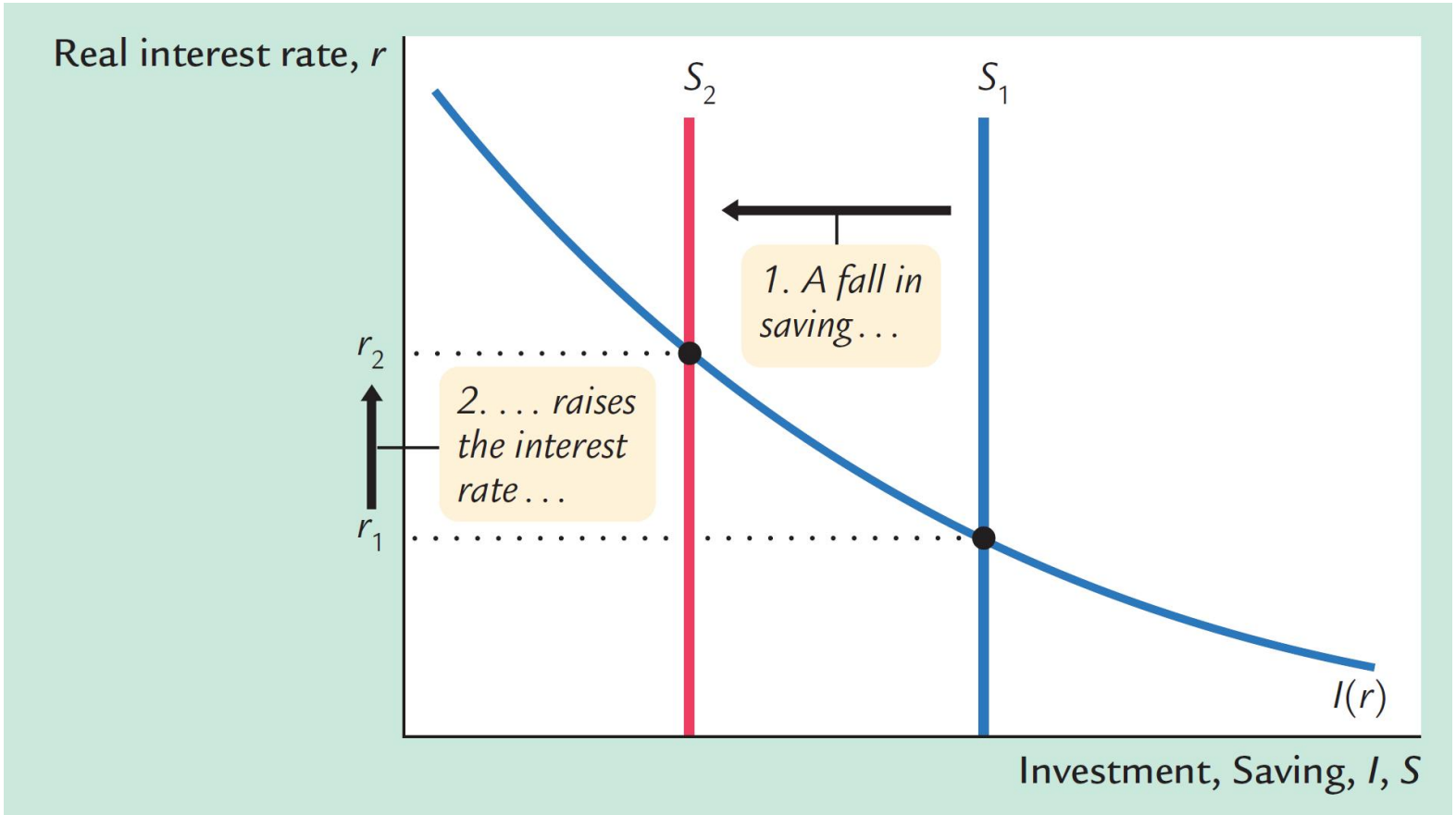
Savings=Investment



Crowding out

Another experiment: government expenses go up.

$$G \uparrow \quad \Rightarrow \quad Y - C - G \downarrow, \bar{S} \downarrow \quad \Rightarrow \quad r \uparrow$$



Assumptions of the Basic Model

- Markets clear
- Markets are competitive (everybody takes prices as given)
- Representative firm
- Non-optimizing consumer behavior
- Perfect financial markets (savings are equal to investment)
- Closed economy

Identification problem

Assume we want to test our predictions with the data. Will we observe the investment demand (negative relationship of investment and interest rate)? No.

What we observe are equilibrium points. Results of interaction of supply and demand. So we may observe negative, positive or no relationship at all.