EE312 Macroeconomic Theory

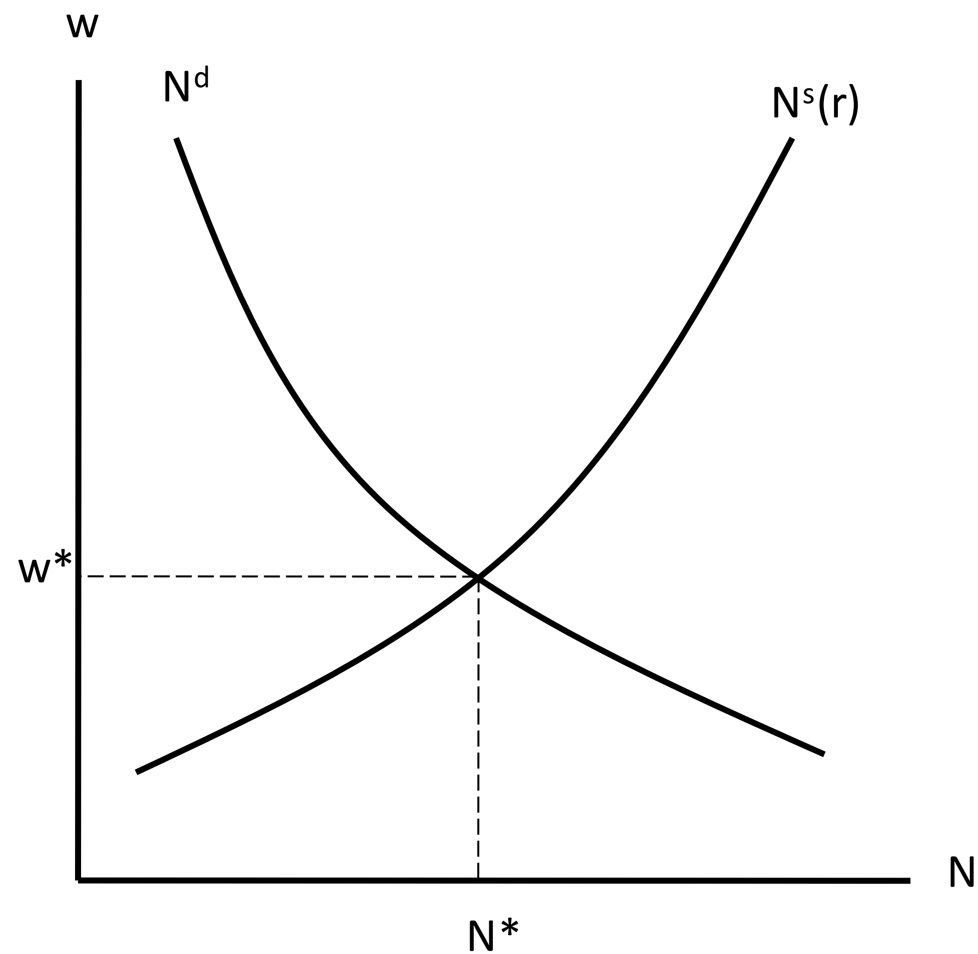
Chapter 8
A Real Intertemporal Model with Investment (Part 2)

Competitive equilibrium

- **The labor market**:
  - The consumer supplies labor service.
  - The firm demands labor service.
  - The real wage and the level of employment.
- **The goods market**:
  - The consumer, the firm and government purchase output.
  - The firm supplies the goods.
  - The real interest rate and the level of aggregate output.

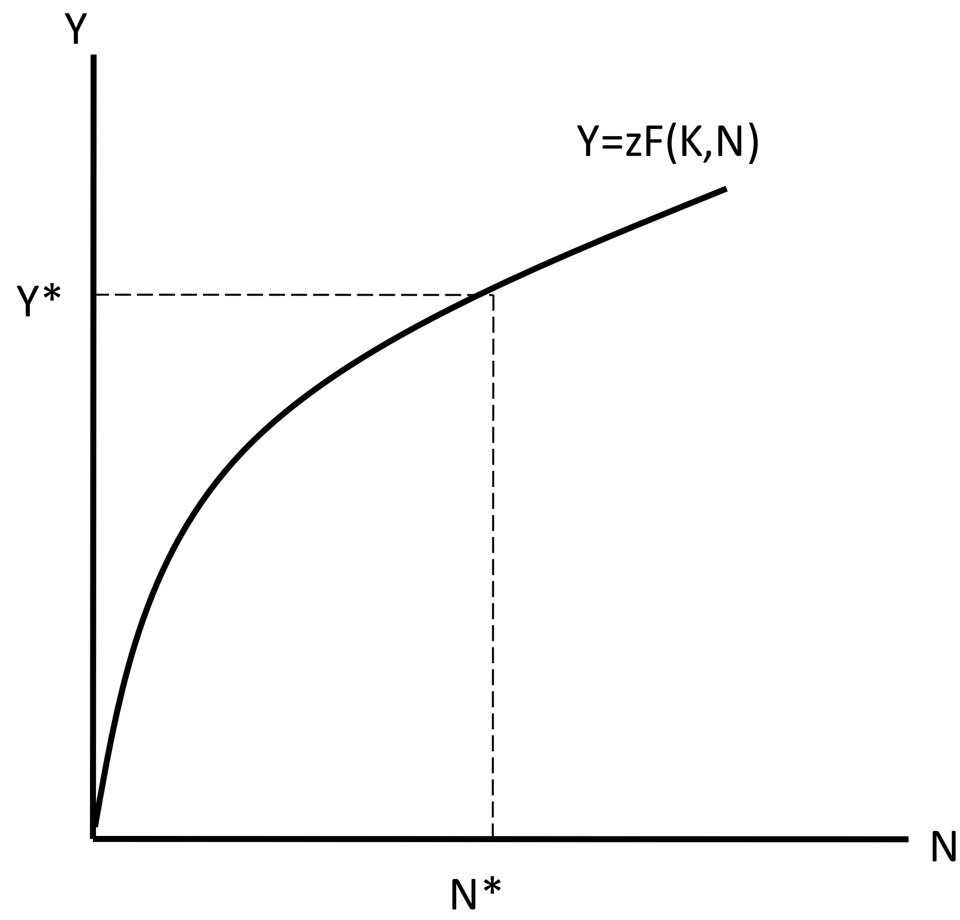
Equilibrium in the labor market

- N^s is sloped upwards with dominant substitution effect, given r.
- N^d is MP_N for the firm.
- N*= equilibrium employment.



Aggregate output supplied

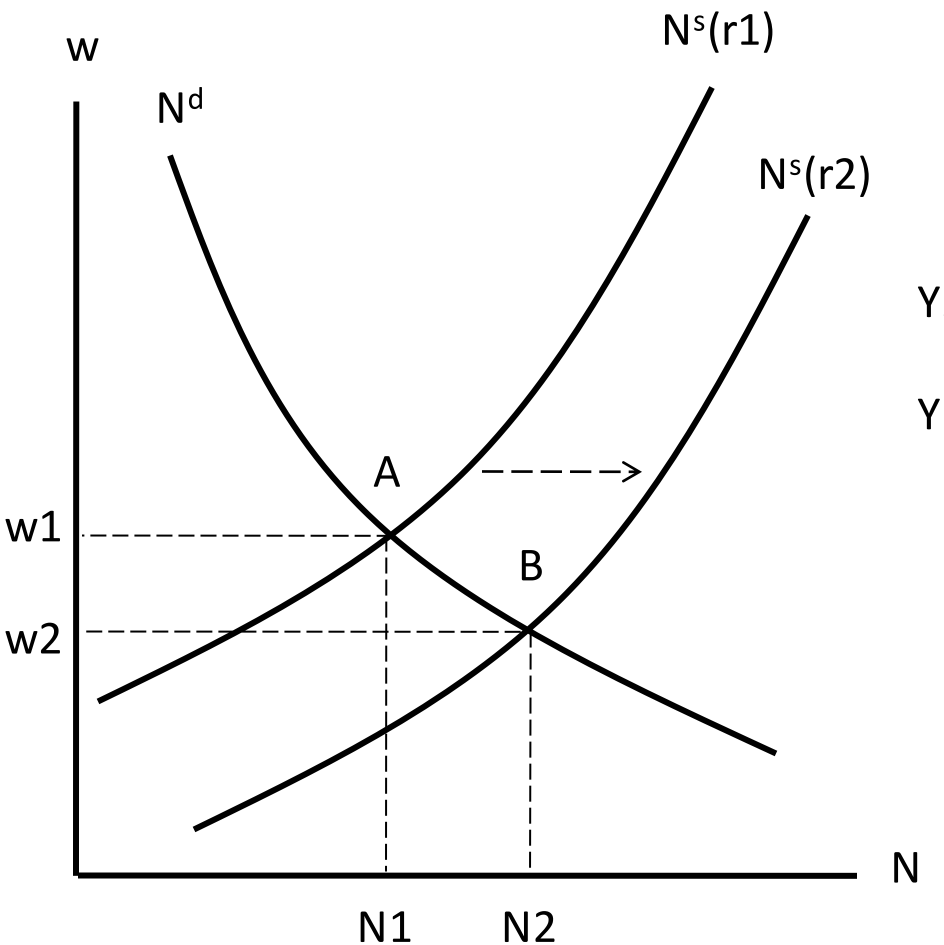
- With N* input, Y* is the quantity of aggregate output supplied, given z and K.

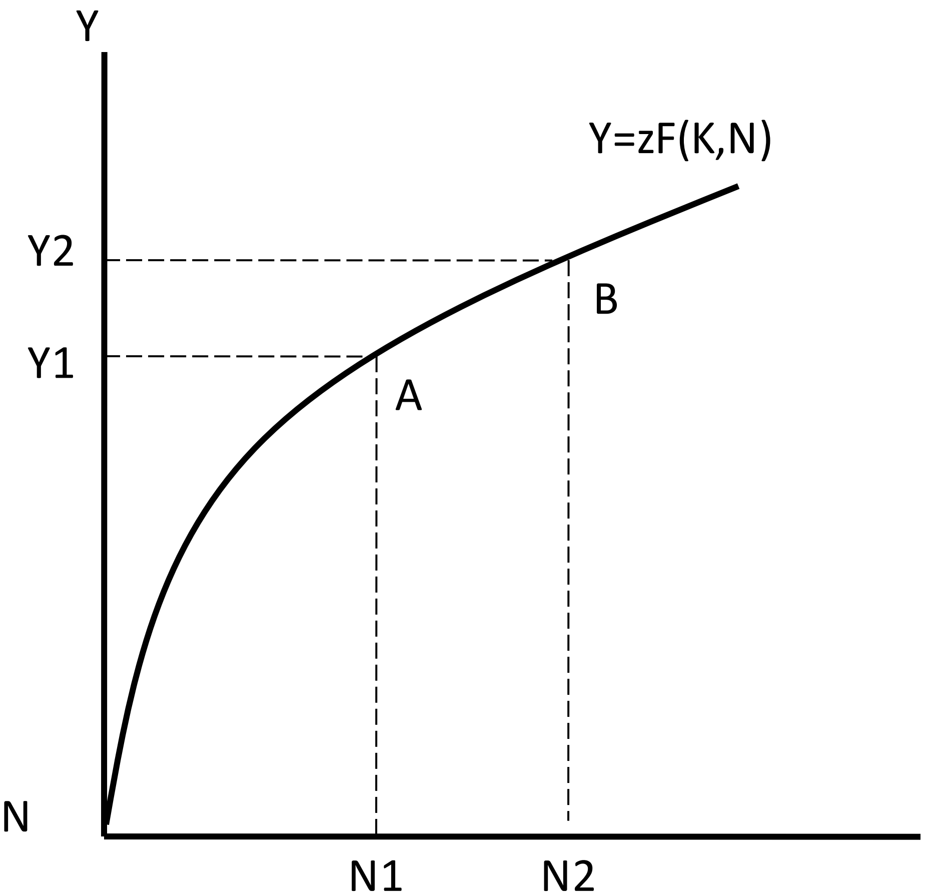


Output supply and real interest rate

- The relationship between the real interest rate and the level of aggregate output.
- An increase in the real interest rate causes a reduction in current consumption and leisure.
  - **The labor market**: current labor supply increases.
  - **The production function**: current aggregate output increases.
- The output supply curve is sloped upwards.

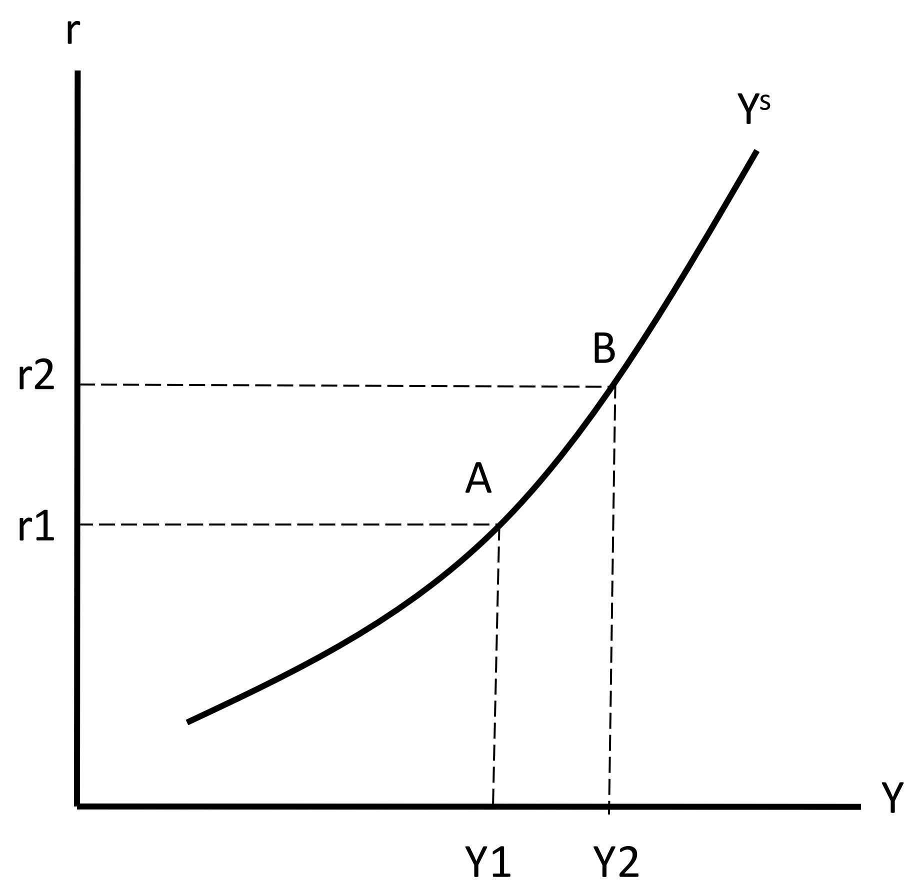
Employment and output





Output supply curve

- The higher r causes more labor supply, employment and output.
- The labor market is in equilibrium at each level of r.



Output supply shifts

- Changes in **exogenous variables** shift the output supply curve.
  - Lifetime wealth (labor supply shift);
  - Current total factor productivity or current capital stock (labor demand and production function shifts).
- Changes in the real interest rate move along the output supply curve.

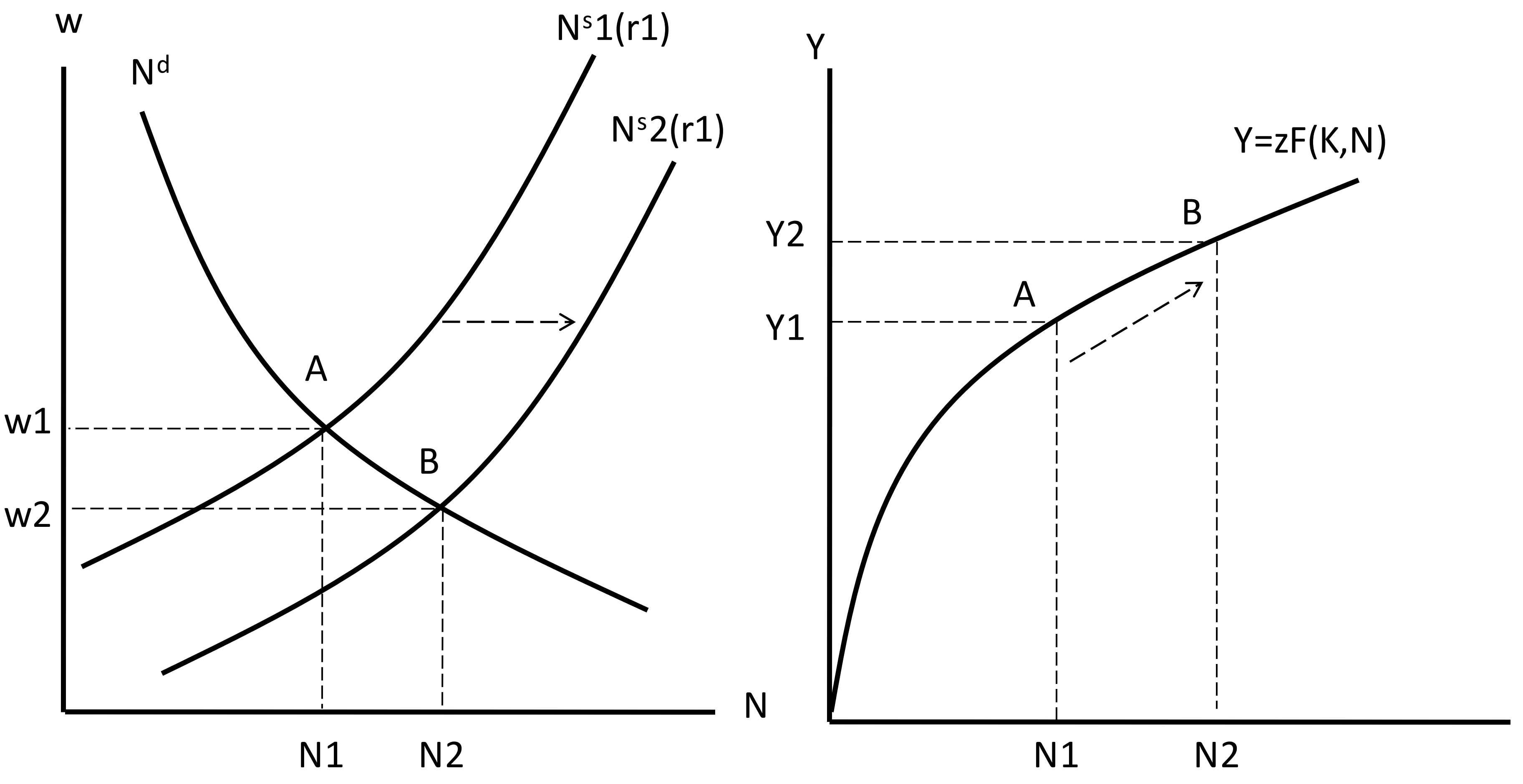
Changes in lifetime wealth

- A decrease in **lifetime wealth** reduces leisure (income effect) and increases labor supply, given the real wage.
  - An increase in **current or future government spending** reduce lifetime wealth..
  - The government PV budget constraint implies increases in the PV of taxes.

$$G+\frac{G'}{1+r}=T+\frac{T'}{1+r}$$

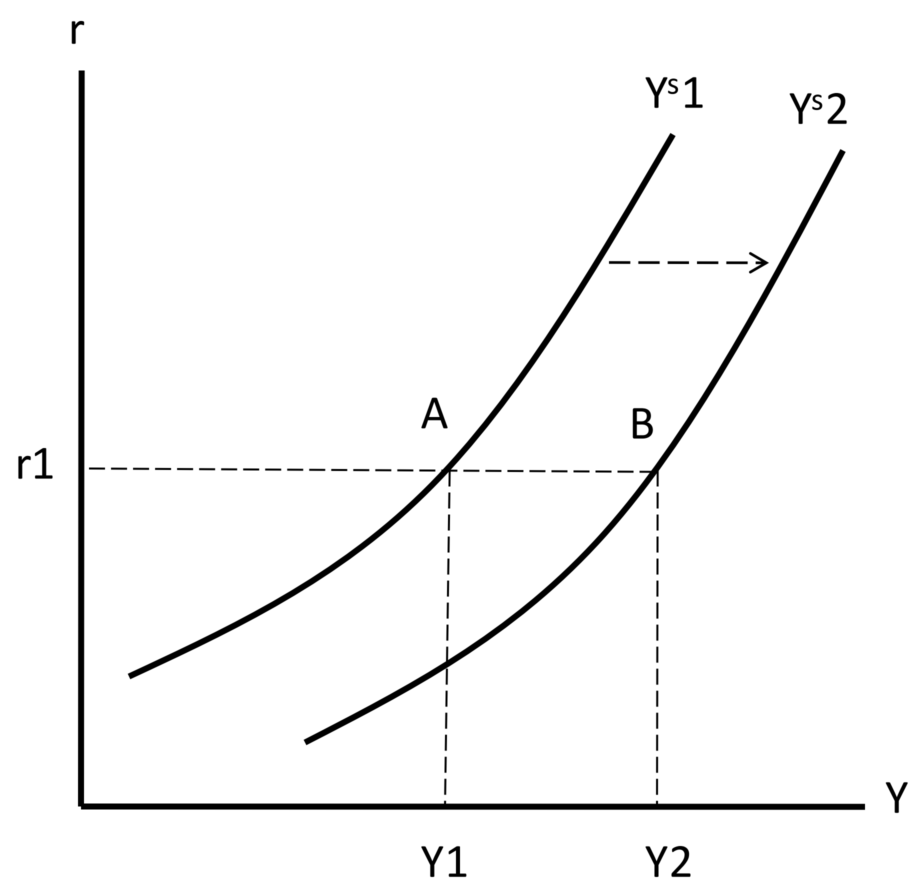
- **The labor market**:
  - The labor supply curve shifts to the right.
  - The real wage falls while employment increases
- **The production function**:
  - More labor input increases production.
  - Output increases, given r.
- The output supply curve shifts to the right.

A decrease in lifetime wealth



Rising output supply for lower we

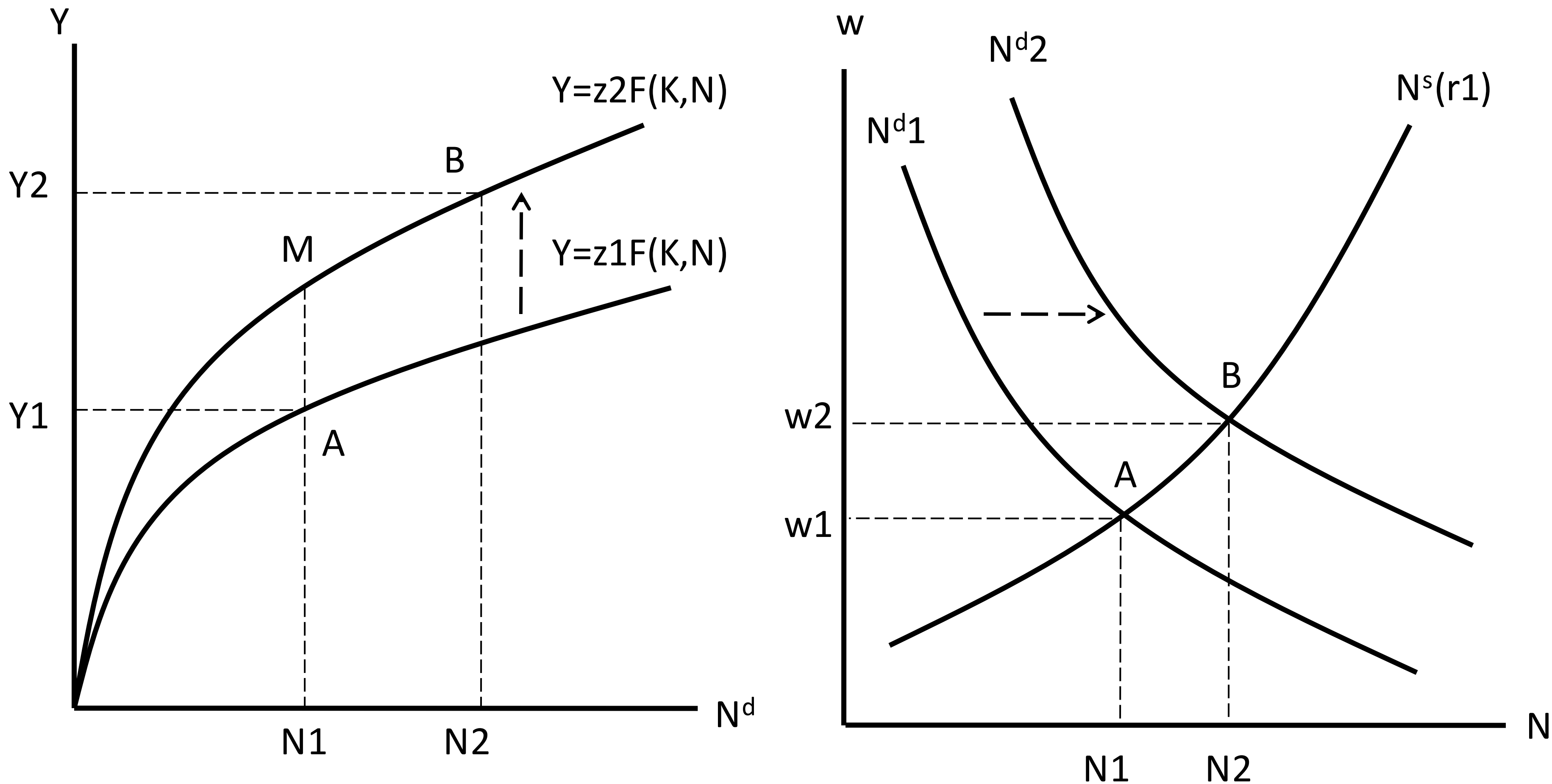
- Output supply increases, given r, when lifetime wealth decreases and labor supply increases.



Changes in z or current K

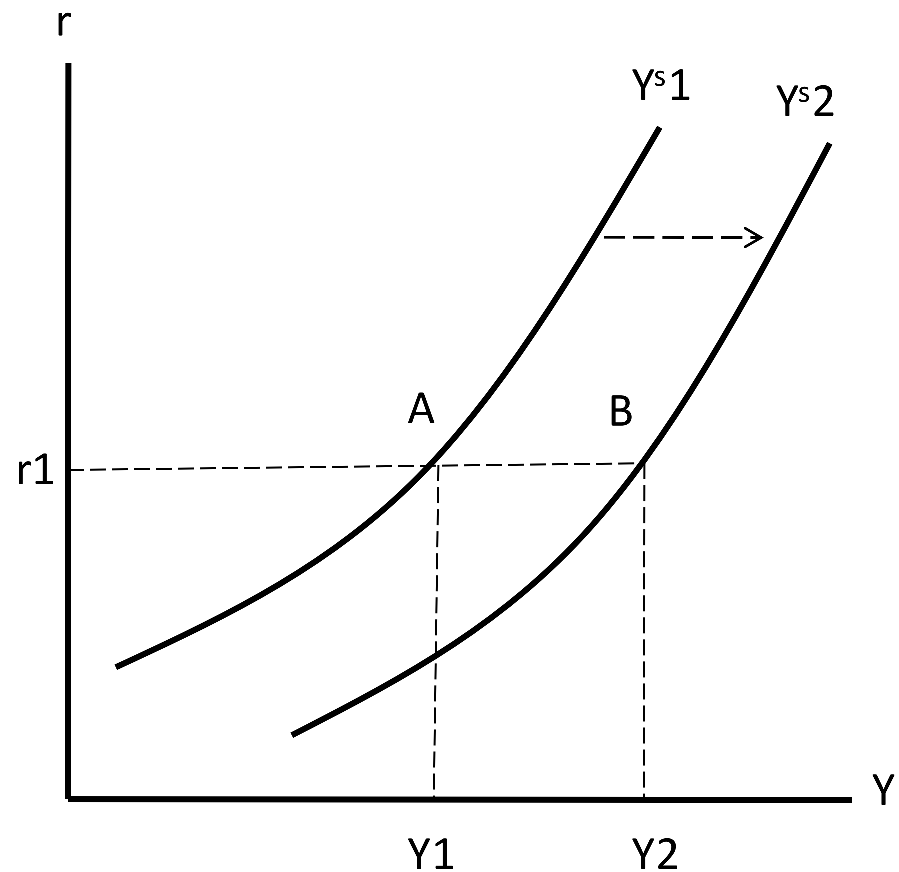
- An increase in total factor productivity or current capital stock.
  - The production function shifts up.
  - Marginal product of labor (MP_N) increases.
  - The labor demand curve shifts to the right.
  - Employment increases with the real wage.
  - Output increases, given the real interest rate.
- The output supply curve shifts to the right.

An increase in z or K



Rising output supply for higher z, K

- Higher z or K raises labor demand and the real wage.
- Rising employment and output supply, given r.

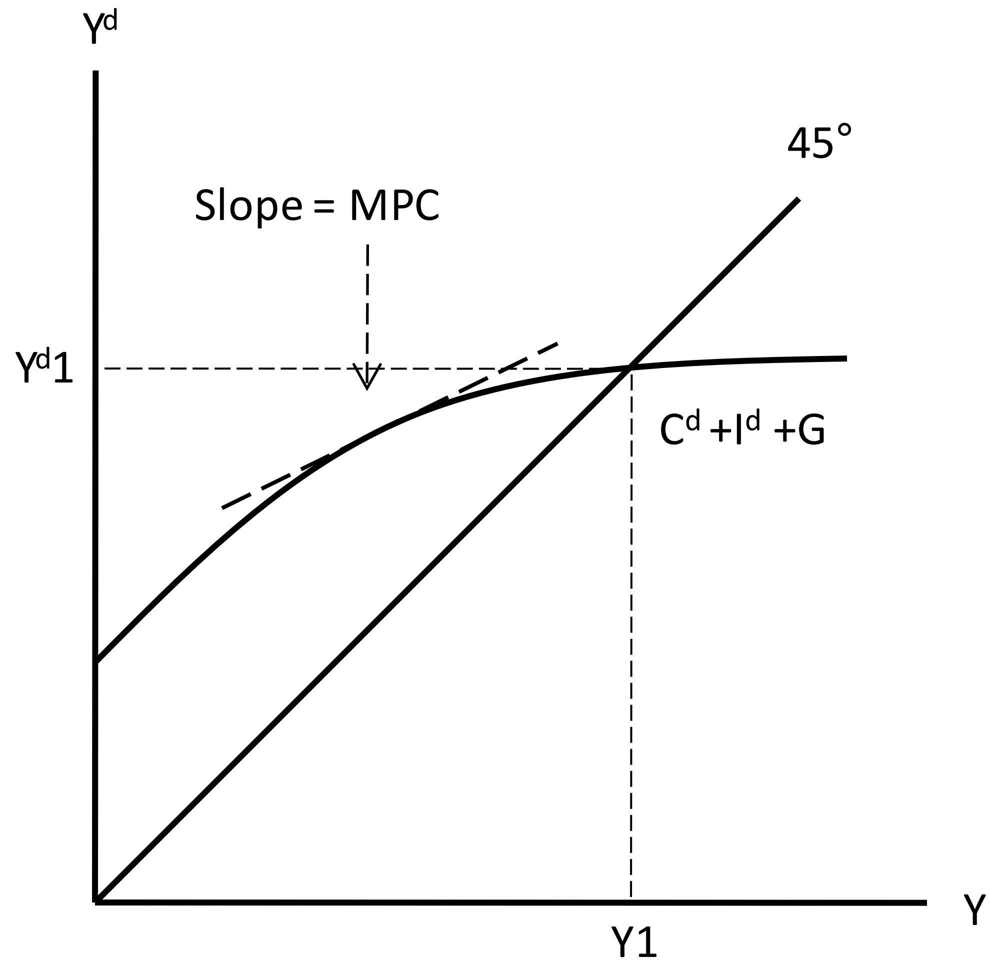


Total current demand for goods

- **Total current demand for goods** (Y^d) equals the sum of:
  - The consumer's demand for current consumption goods (C^d);
  - The firm's demand for investment goods (I^d);
  - The government purchases of current goods (G).
- C^d and I^d are negatively related to the real interest rate.

$$Y^d = C^d(r) + I^d(r) + G$$

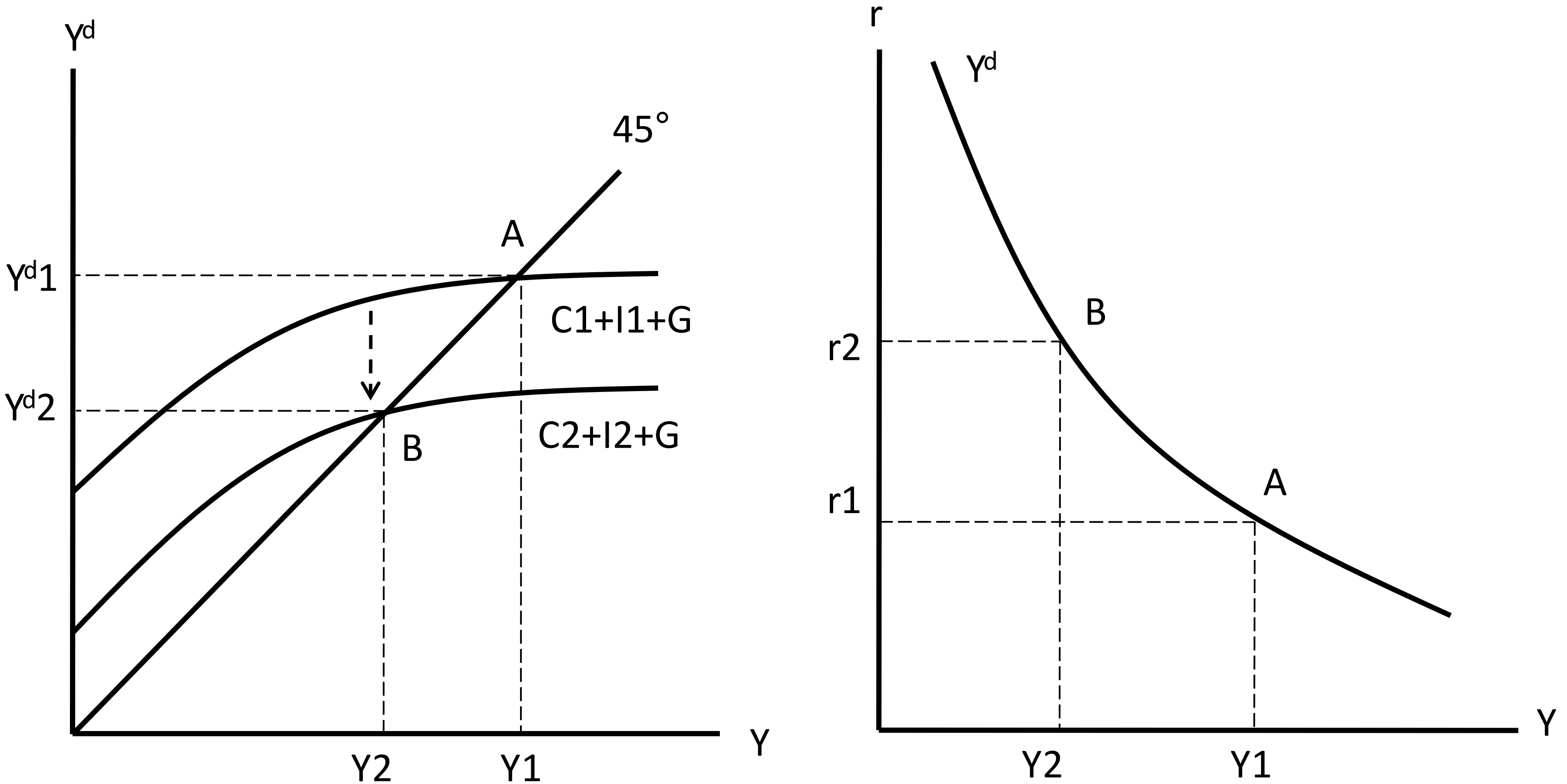
- I and G are not related to Y.
- The slope = MPC.
- Equilibrium Y^d = Y1.



Output demand and real interest rate

- An increase in the real interest rate causes a reduction in demand for current output.
  - Shifts towards future consumption: falling demand for current consumption goods.
  - Lower optimal investment: higher opportunity cost of capital.
- The output demand curve is sloped downwards.

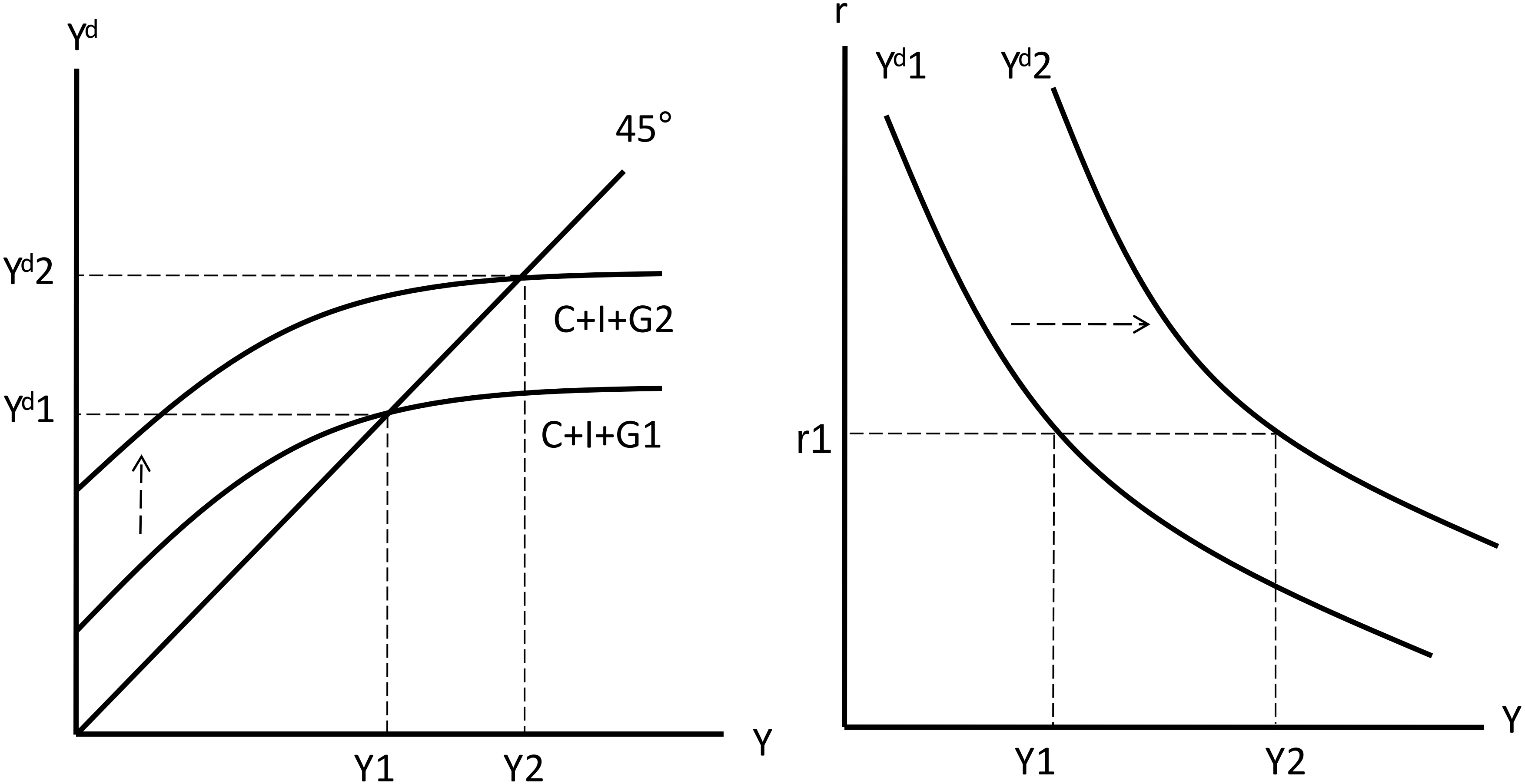
Output demand curve



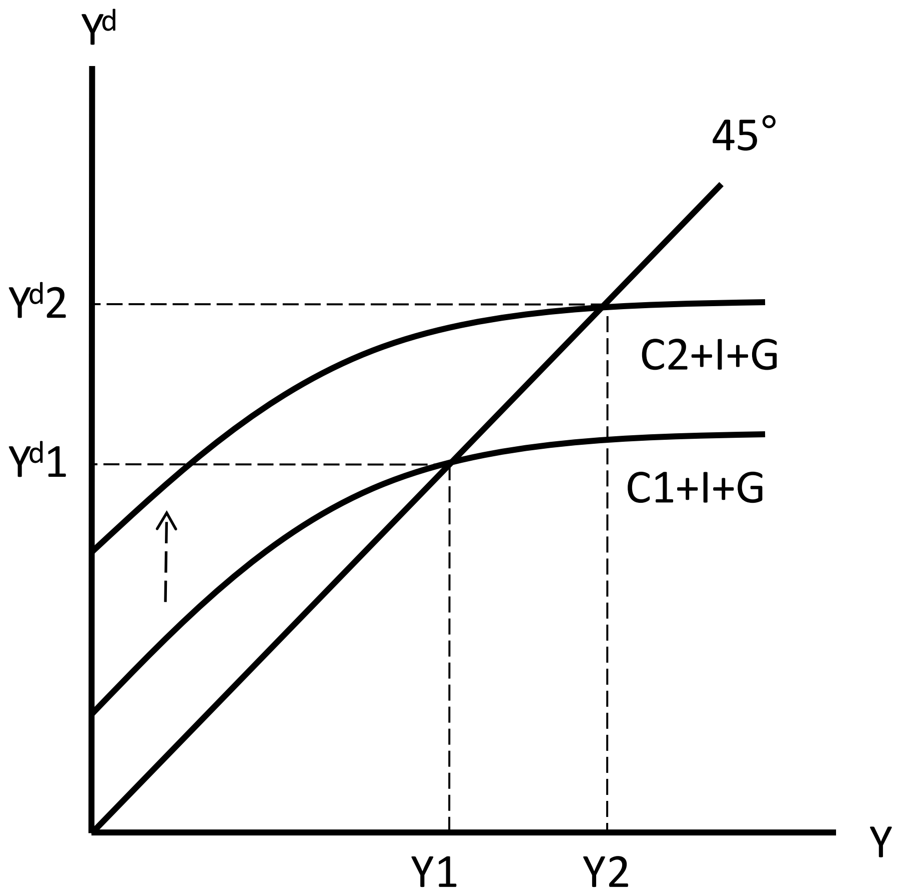
Rightward shifts in output demand curve

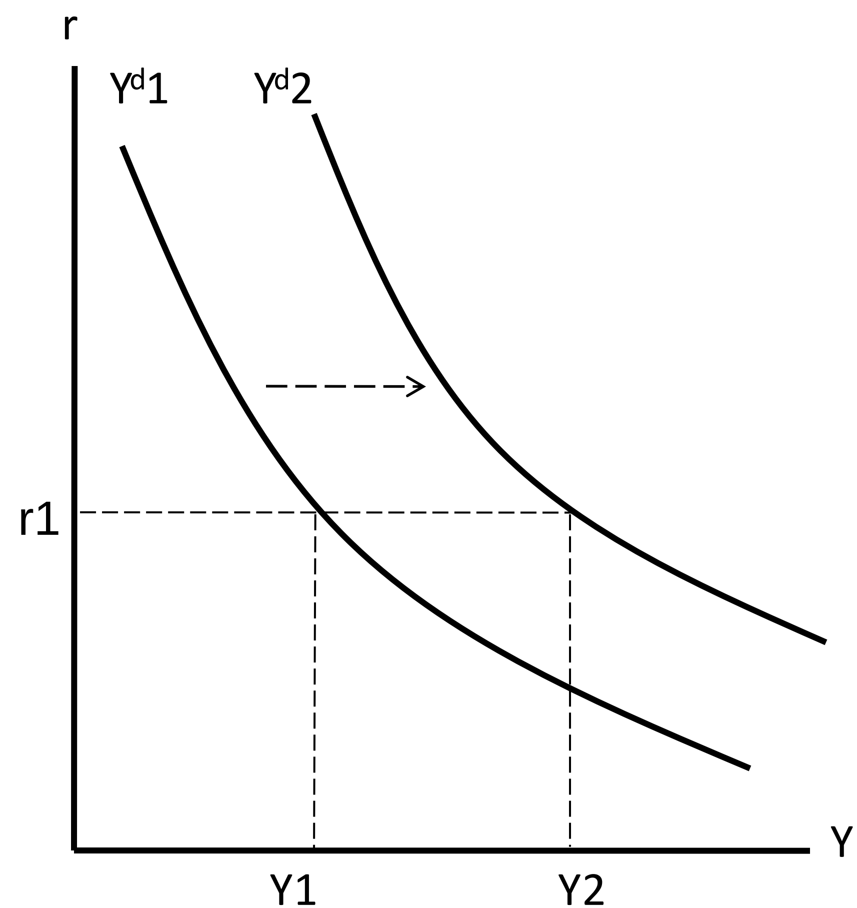
- An increase in current government purchases (G);
- A decrease in the PV of taxes (T or T');
- A decrease in current capital stock (K) or an increase in future total factor productivity (z').
  - Higher future MP'_K and rising current I^d;
- An increase in future income (Y').

An increase in current G

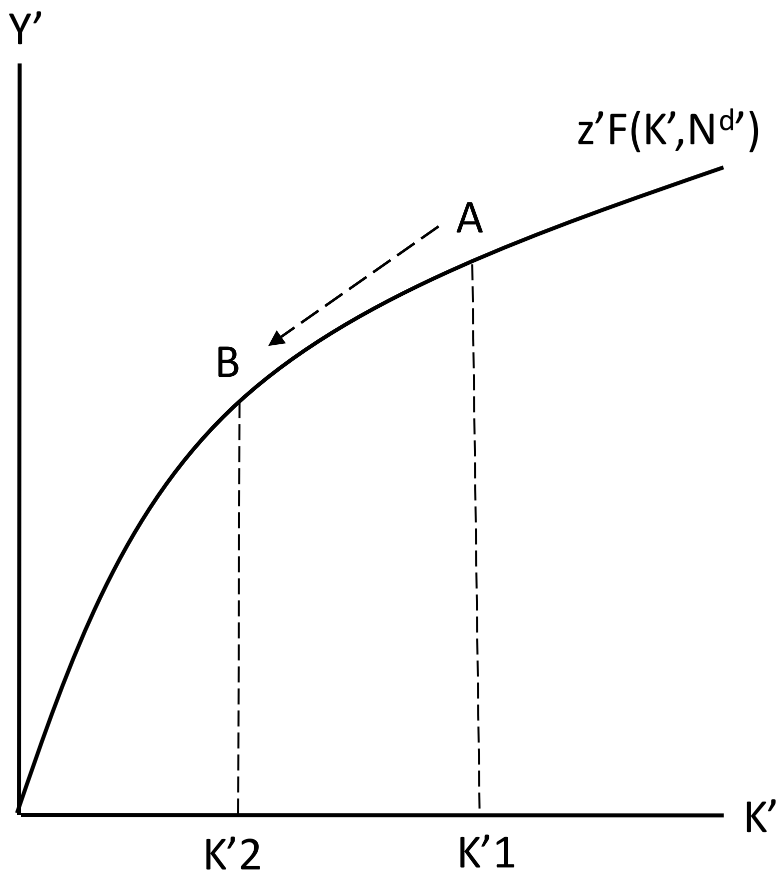


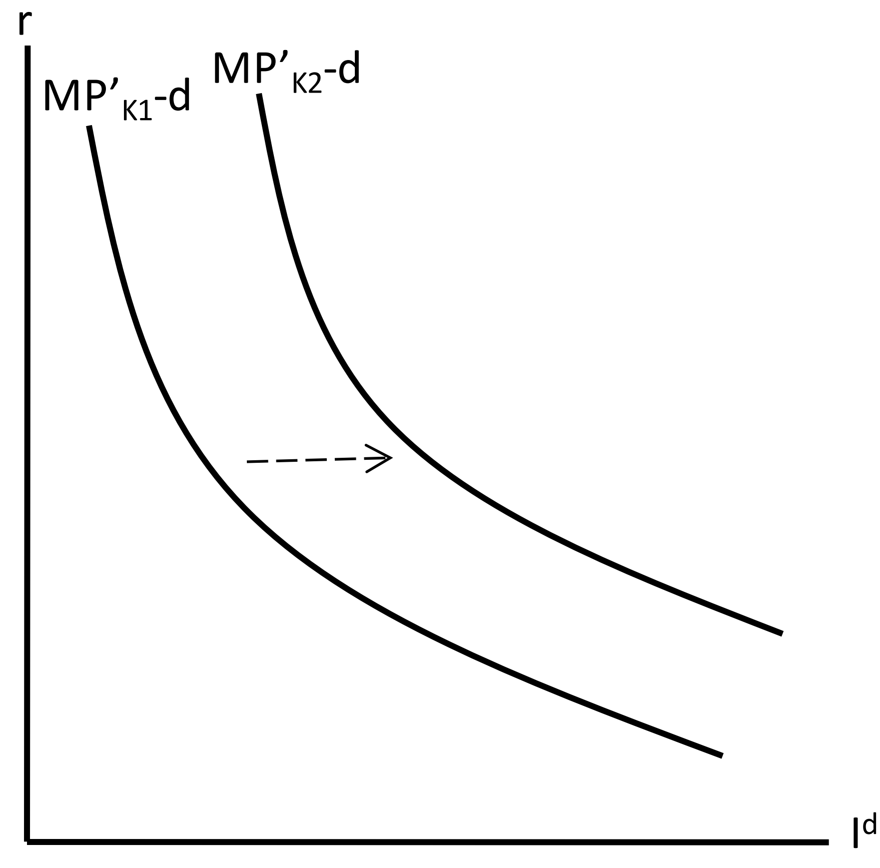
A decrease in PV of taxes or an increase in future income



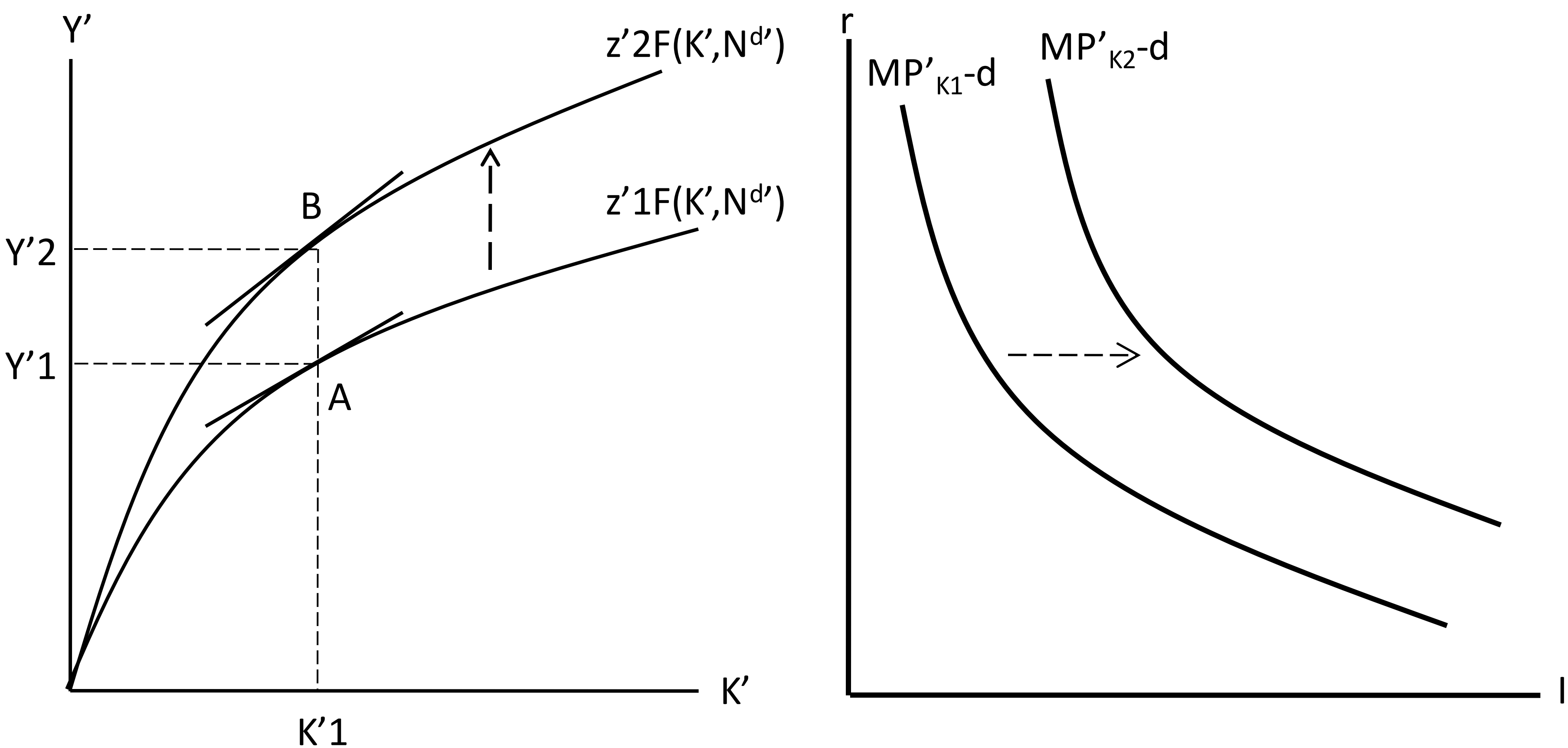


Lower current K and higher MP'_K

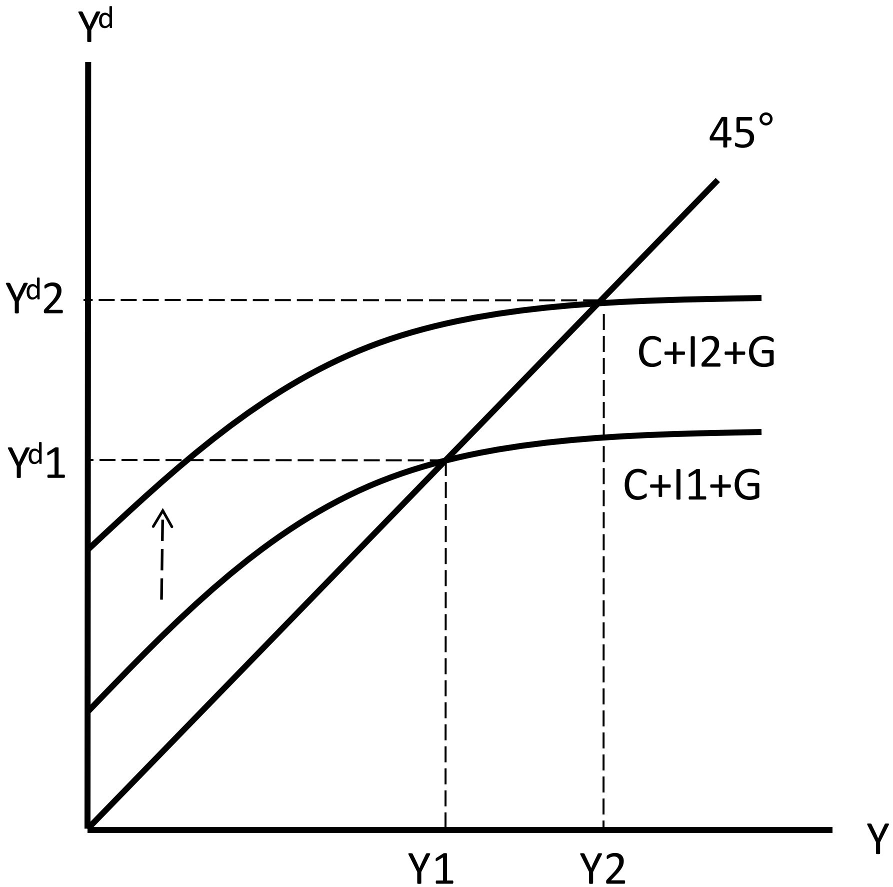


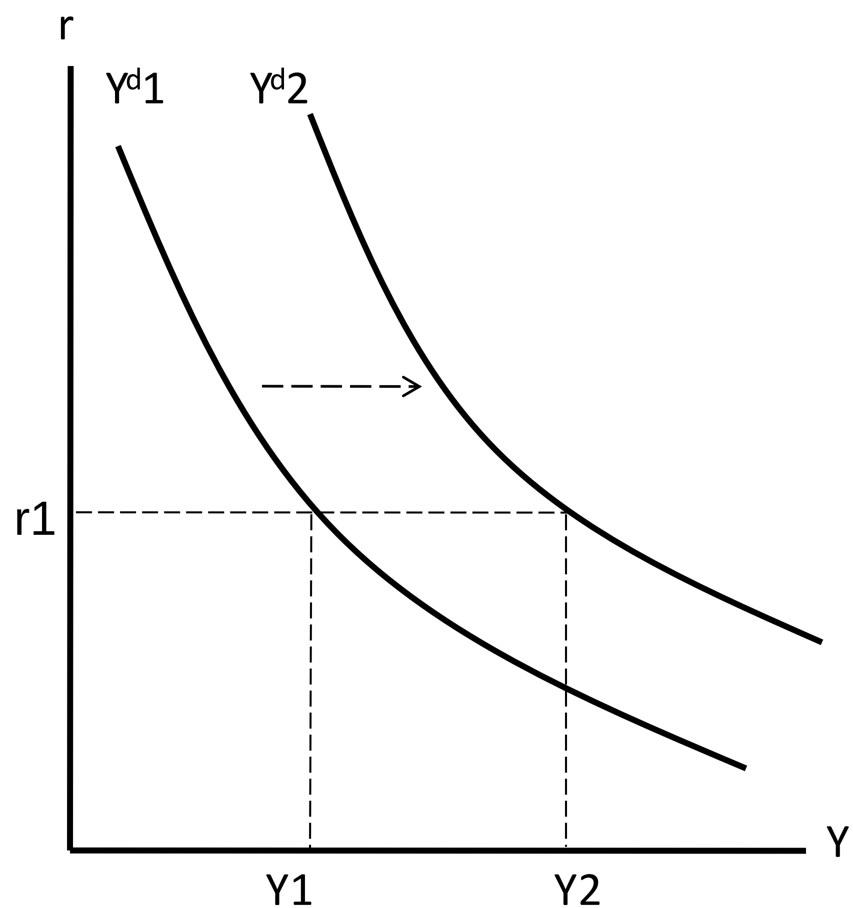


Higher z' and MP'_K

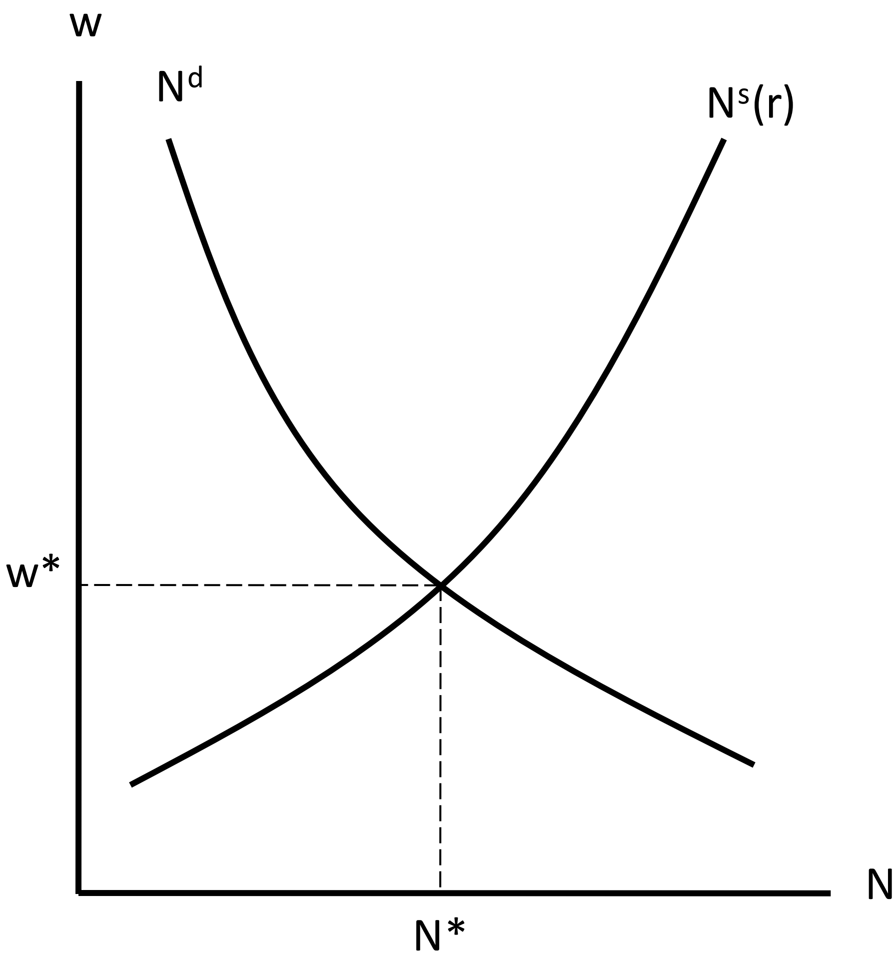


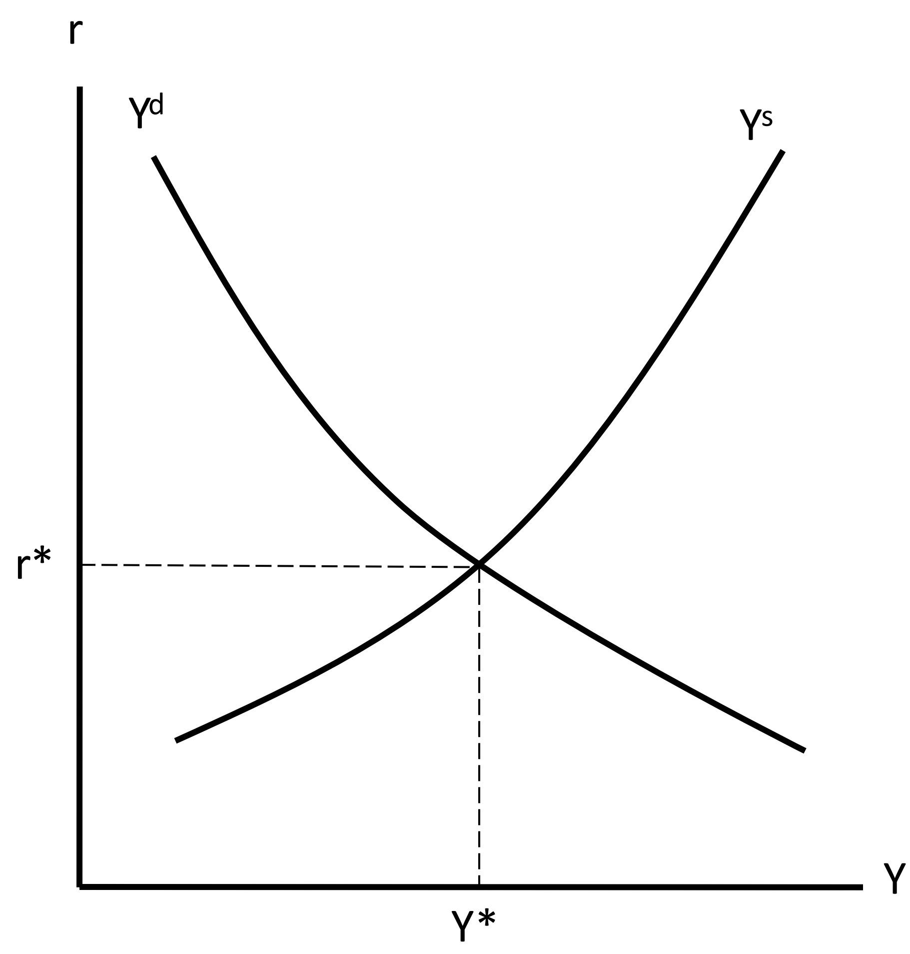
An increase in future income





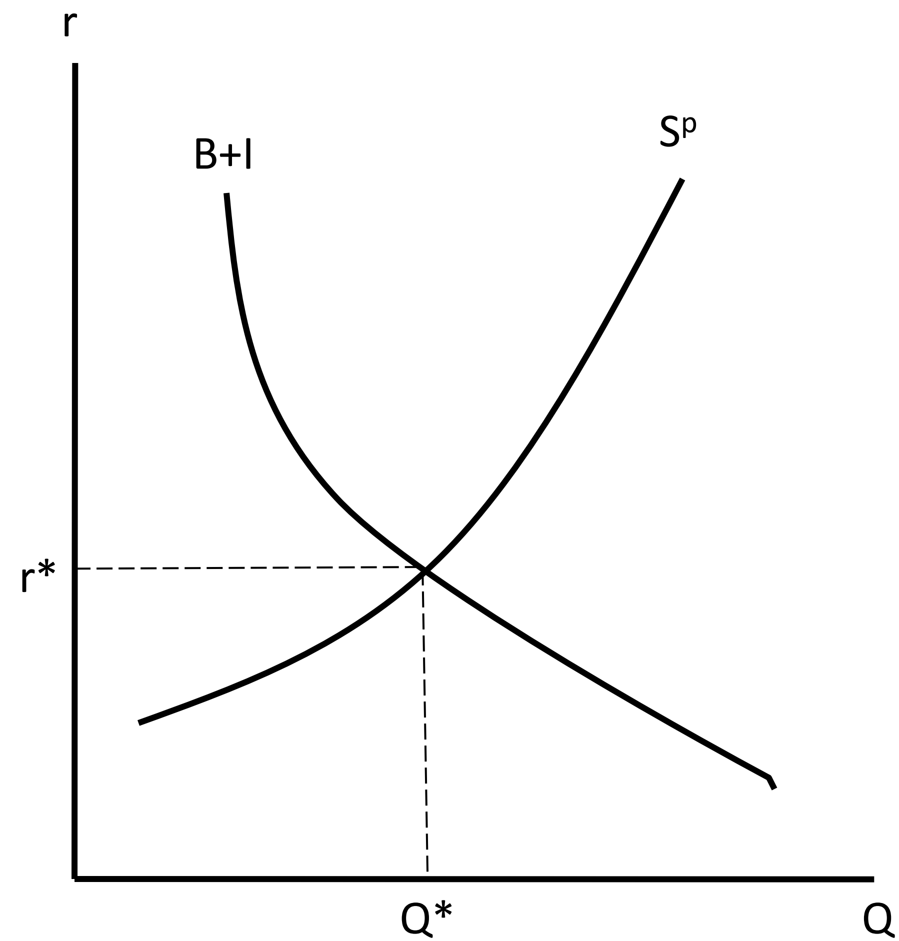
Complete real intertemporal model





The credit market

- The supply of credit is the consumer's private savings.
- The demand for credit is government's borrowing and the firm's investment demand.



- Investment is made out of current profit:
  - $\pi = Y - wN - I$
- But the firm can also finance its investment by borrowing in the credit market.
  - The real interest rate is the cost of capital.
  - The firm borrows by the amount of I^d in the current period and pays back $I^d (1+r)$ in the future period.