Chapter 6 : A Real Intertemporal Model with Investment (Part 3)

EE312

Macroeconomics, Stephen Wiliamson, Chapter 11

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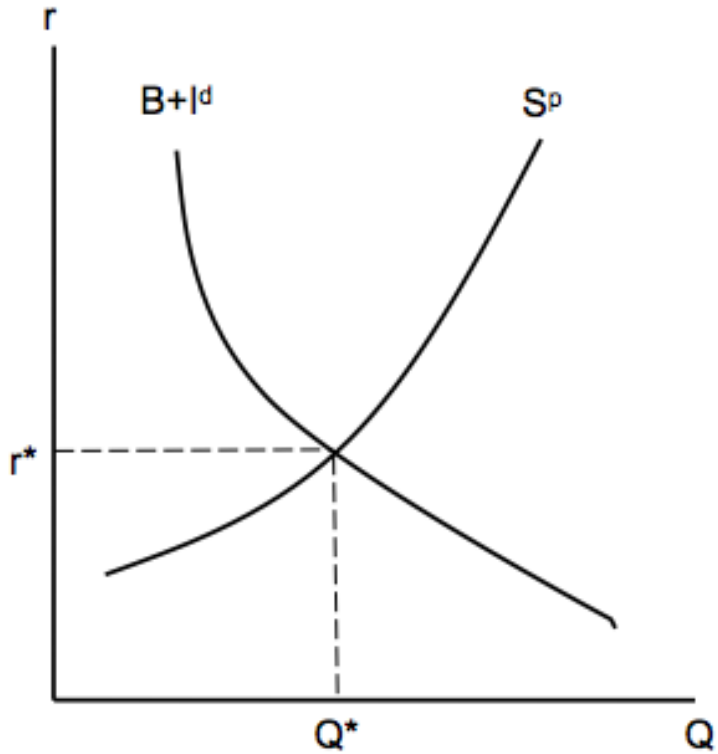
Outline

- Real Intertemporal Model (Introduciton) (Part 1)
- Competitive Equilibrium (Part 2)
- The credit market (Part 3)
  - Credit Market
  - Shocks Experiments
    - Current government purchases increase temporarily (G);
    - Current capital stock decreases due to a natural disaster or war (K);
    - A temporary increase in current total factor productivity (z);
    - An increase in future total factor productivity (z').

The credit market

- The supply of credit is the consumer's private saving.
- The demand for credit is government's borrowing and the firm's investment demand (I^d).



Exogenous shocks in the model

- A shock in the model occurs when one of exogenous variable changes, causing endogenous variables to change accordingly.
- The macro effect depends on whether it is temporary or permanent.
- An expected shock in the future has effects in the current period.

Shock experiments

- Current government purchases increase temporarily (G);
- Current capital stock decreases due to a natural disaster or war (K);
- A temporary increase in current total factor productivity (z);
- An increase in future total factor productivity (z').

A temporary increase in G

- Assume an increase in G with G' unchanged.
- **Keynesian (EE212) analysis:**
  - A higher G causes the demand for goods to increase.
  - Output and income increases.
  - Part of the increase in income is spent on consumption goods — more demand for output.
  - Direct and indirect increases in the demand for output — **the multiplier effect.**

The Keynesian Yd multiplier

$$\Delta Y^d = \Delta G$$

$$\Delta C = MPC \times \Delta Y^d \quad \text{,where } 0 < MPC < 1$$

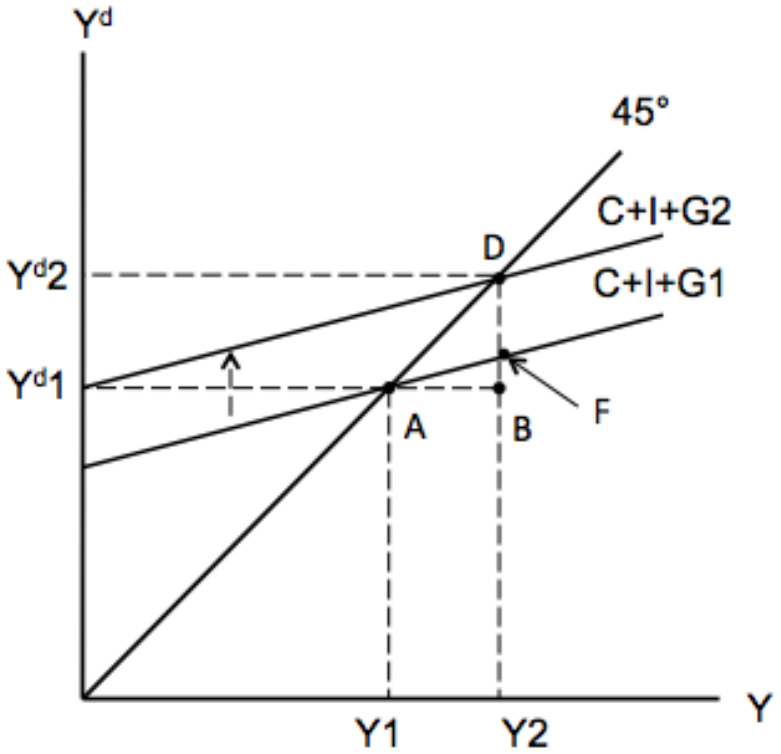
$$\Delta Y^d = \Delta G + \left(MPC \times \Delta Y^d\right)$$

$$\Delta Y^d = \frac{1}{1 - MPC} \Delta G$$

- The larger is MPC, the larger the Yd multiplier, and the more powerful ΔG!

The Keynesian Yd multiplier > 1

- Assume constant MPC.
- ΔG=DF
- $\Delta Y = \Delta Y^d = AB = DB$.
- But DB > DF
- $\frac{\Delta Y}{\Delta G} > 1$



Keynesian assumptions

- The increase in G has no negative effect on lifetime wealth and consumption spending.
  - But PV of taxes must rise and lifetime wealth falls.
- Total income or output (Y) increases by the same amount as the demand for goods (Y^d).
- The effect on the real interest rate?
- Increases in C and Y come as a free lunch!

Demand multiplier = 1

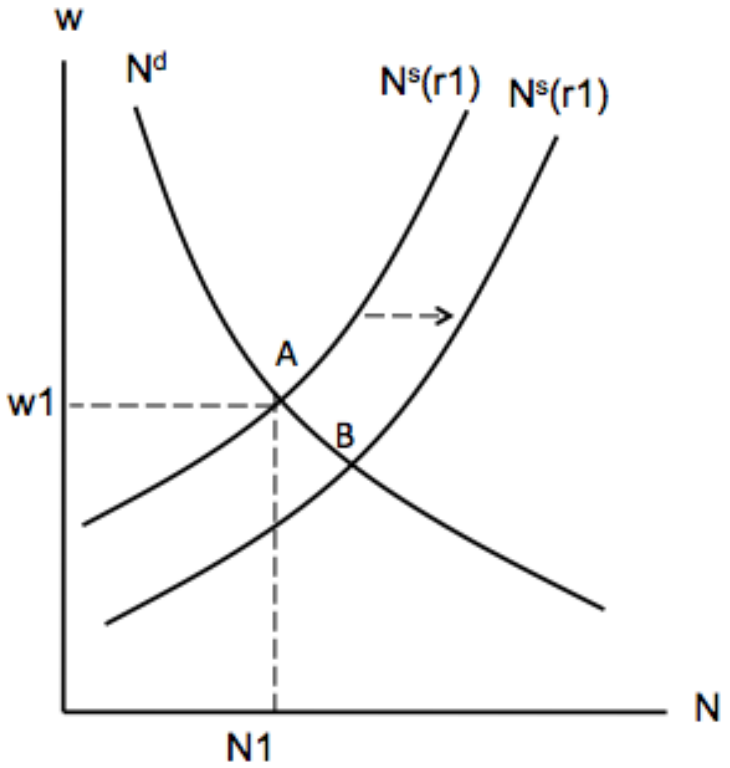
- The increase in total current demand for goods $\left(Y^d\right)$.
  - The increase in government spending (ΔG).
  - The multiplier effect = $MPC\Delta G$.
  - Lifetime wealth drops = PV of taxes = ΔG. ; so current consumption **falls** by $MPC\Delta G$.

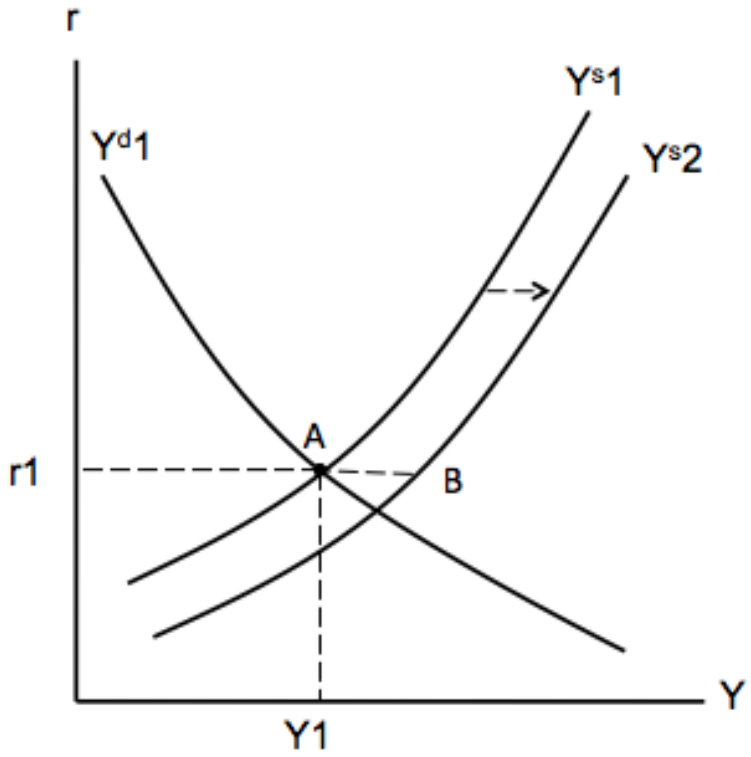
$$\begin{aligned} \Delta Y^d &= \Delta G + MPC\Delta G - MPC\Delta G \\ \Delta Y^d &= \Delta G \end{aligned}$$

Intertemporal model analysis

- Step 1: direct effect of ΔG:
- Effects on Y^s:
  - The PV of taxes rises; the consumer's lifetime wealth falls.
  - Leisure decreases and labor supply increases, given the real wage.
  - The output supply curve shifts rightwards.

Step 1 An increase in G: Ys shift

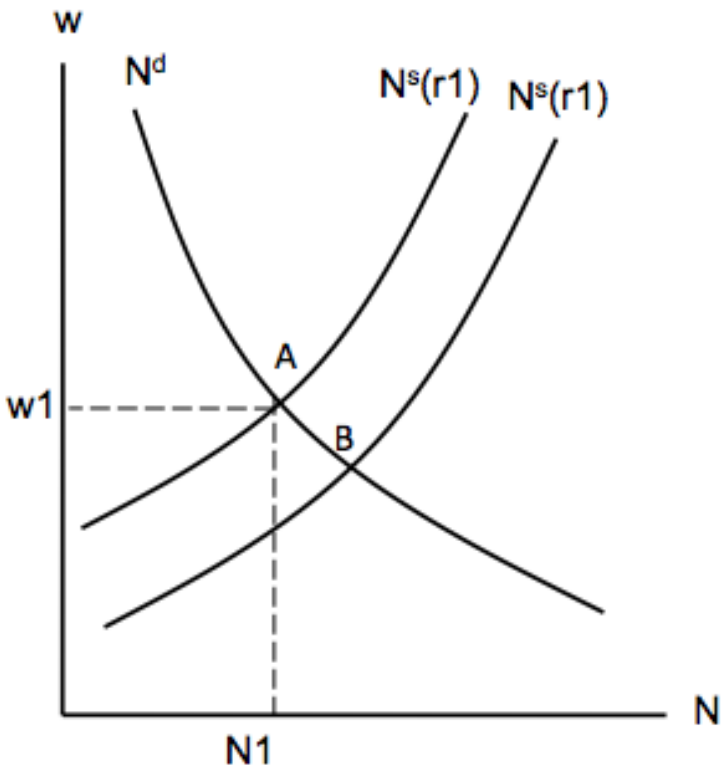


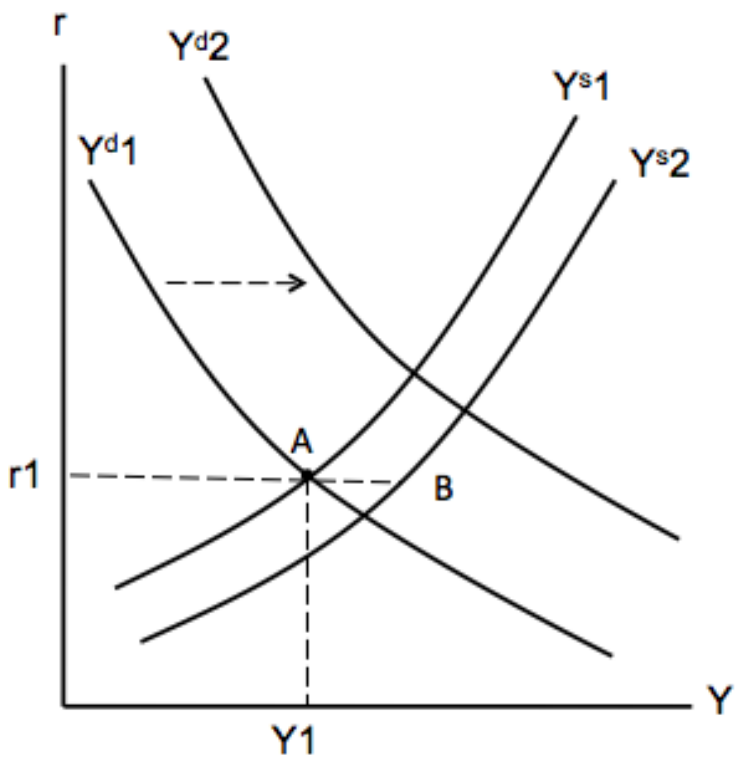


Effects on Yd

- Government's demand for output (G) increases.
- Falling lifetime wealth reduces the consumer's demand for current consumption goods (C^d).
- Current demand for goods increases by the amount of $\Delta Y^d = \Delta G$; the Y^d multiplier = 1 .
- Y^d shifts rightwards by the amount of ΔG.
- Both Y^s and Y^d shift to the right; what happens to the real interest rate?

Step 1 An increase in G: Yd shift

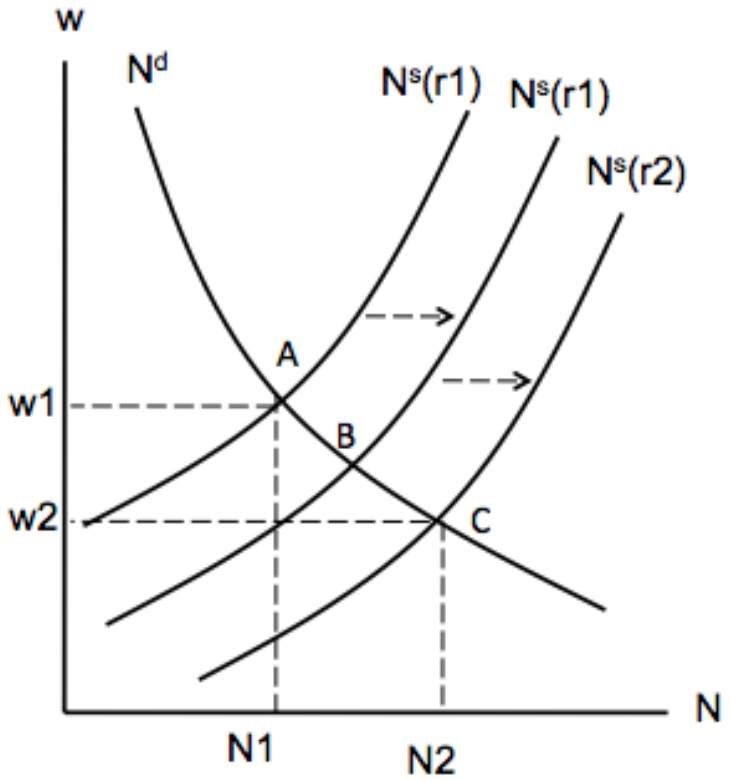


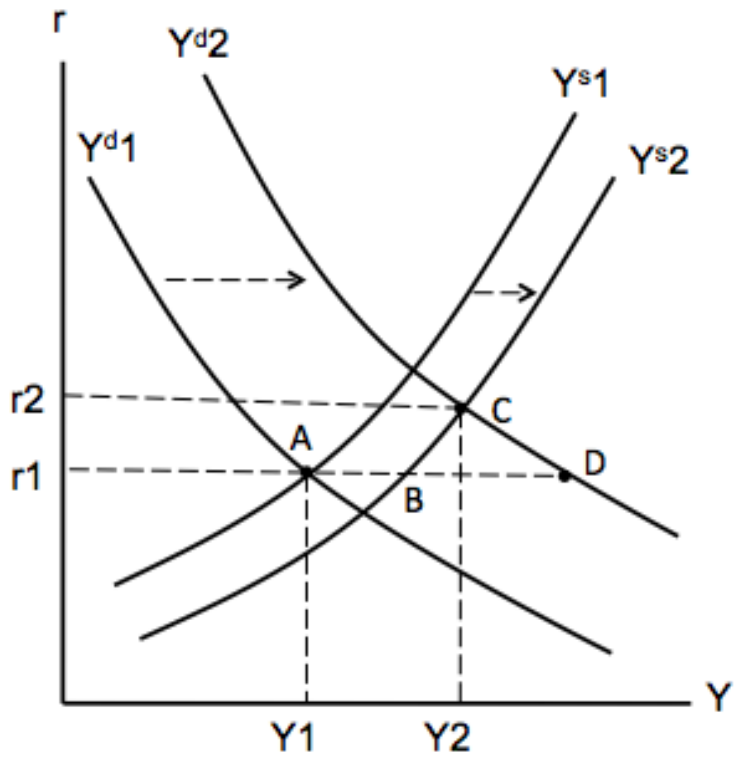


- The real interest rate increases as Y^d **shifts more than** Y^s.
  - ΔG is temporary and has a small negative effect on lifetime wealth.
  - A small decrease in leisure, and small increases in labor supply and output supply (small Y^s shift).
  - A small decrease in current consumption while the increase in G remains large (larger Y^d shift).
- Step 2: effect of the rising r.
  - A higher r reduces leisure, current consumption and investment.

- Leisure falls and labor supply increases again.
  - The real wage falls further; employment and output increase — a movement along the Ys.
- Investment decreases due to the higher real interest rate.
- Current consumption falls:
  - Falling lifetime wealth reduces current consumption while higher income raises it — small net effect.
  - The higher r also reduces it — dominant effect.

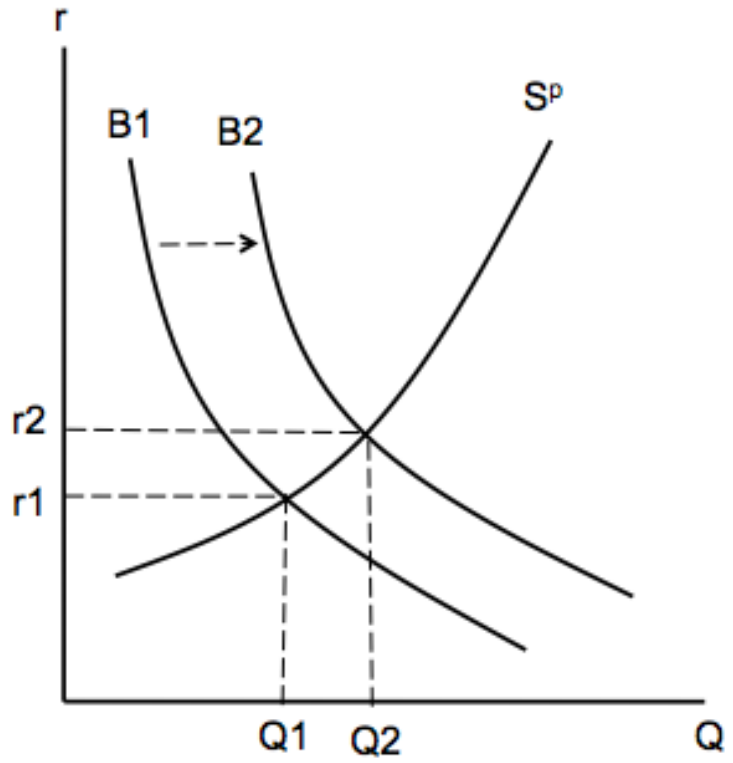
Step 2 An increase in G: rising r





Rising r and the credit market

- The government increases current borrowing (bond sale).
- The real interest rate increases.



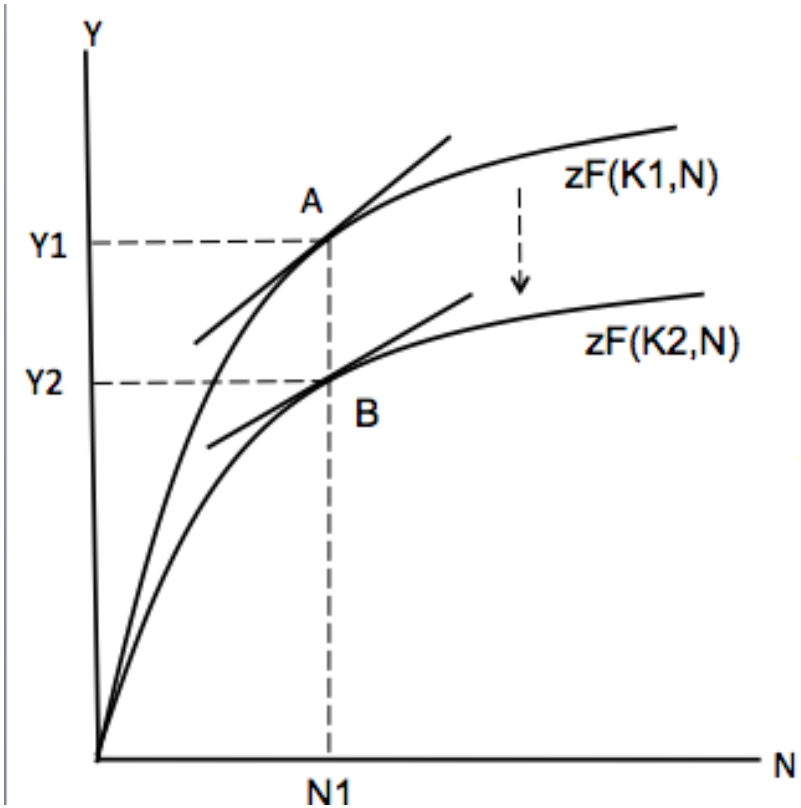
- The government increases borrowing in the current period.
  - The increased bond sale raises the real interest rate.
- A temporary increase in G **crowds out** both current consumption and investment by raising the real interest rate.
  - The consumer works more for a lower real wage and consumes less.
  - Lower investment means lower future capital stock and future productive capacity.

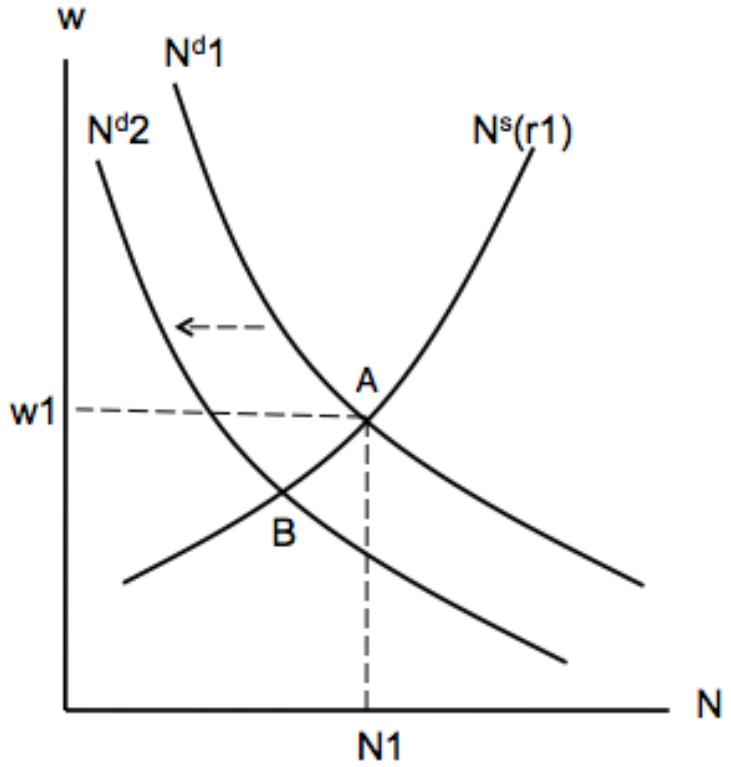
- The total expenditure multiplier is less than 1.
  - $\Delta Y^d = \Delta G = AD > Y1Y2$.
  - So $\frac{\Delta Y}{\Delta G} < 1$.
  - The higher real interest rate results in the crowding-out effect on private spending (C^d and I^d).
- Higher government spending and larger output come at a cost — no free lunch!

A decrease in current capital stock

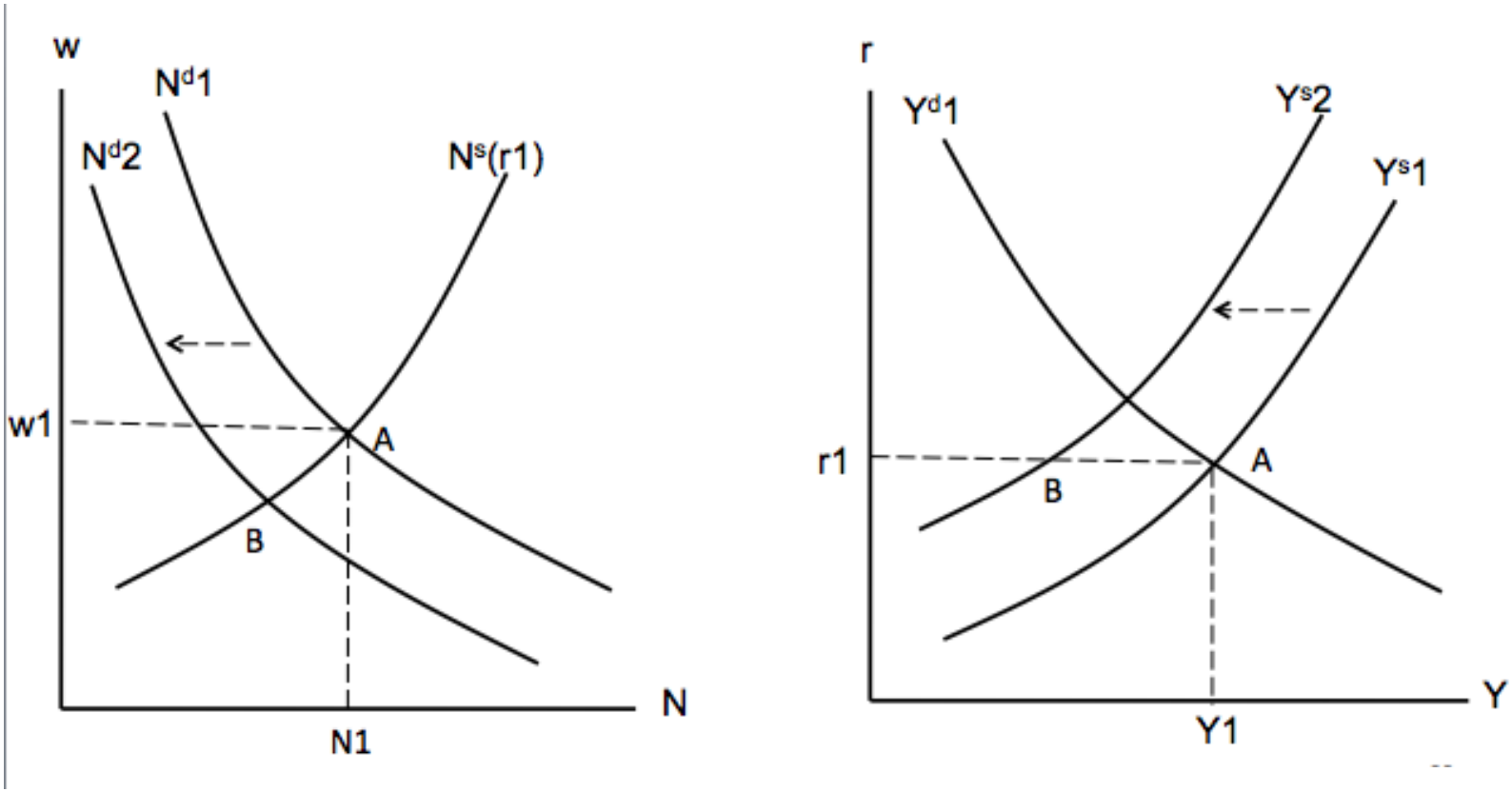
- Reduction in current capital stock (K) due to a natural disaster, war, etc.
- **Step 1: Effect on Y^s:**
  - A smaller K with the same N, current MP_N drops.
  - The firm reduces its demand for labor.
  - The labor demand curve shifts left (given w).
  - the output supply curve (Y^s) shifts left.

Step 1 A lower K reduces MPN



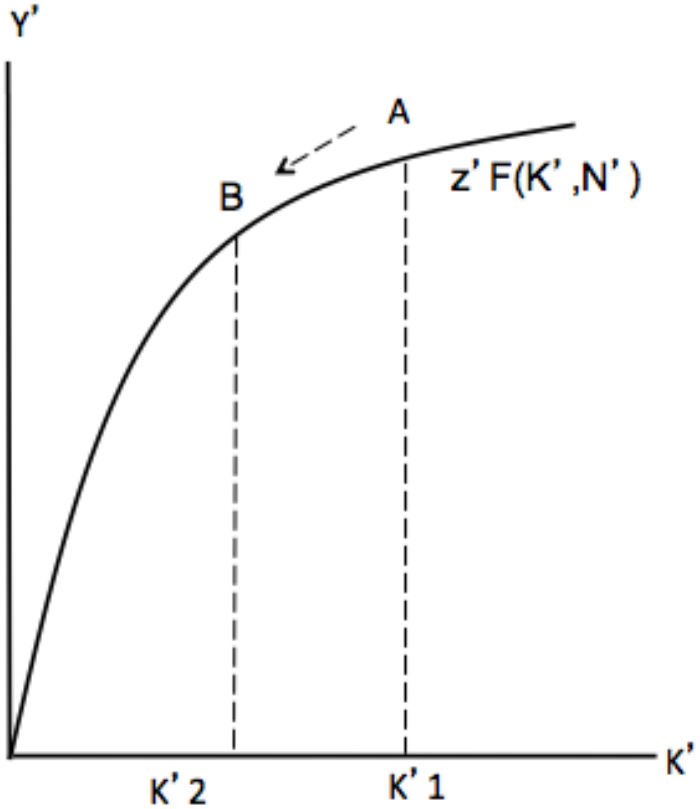


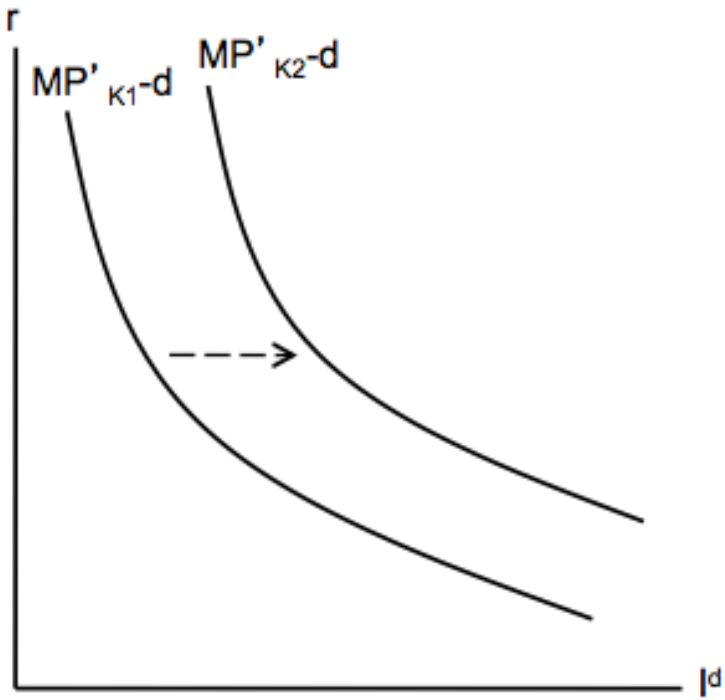
Step 1 Lower Nd: Ys shifts left.



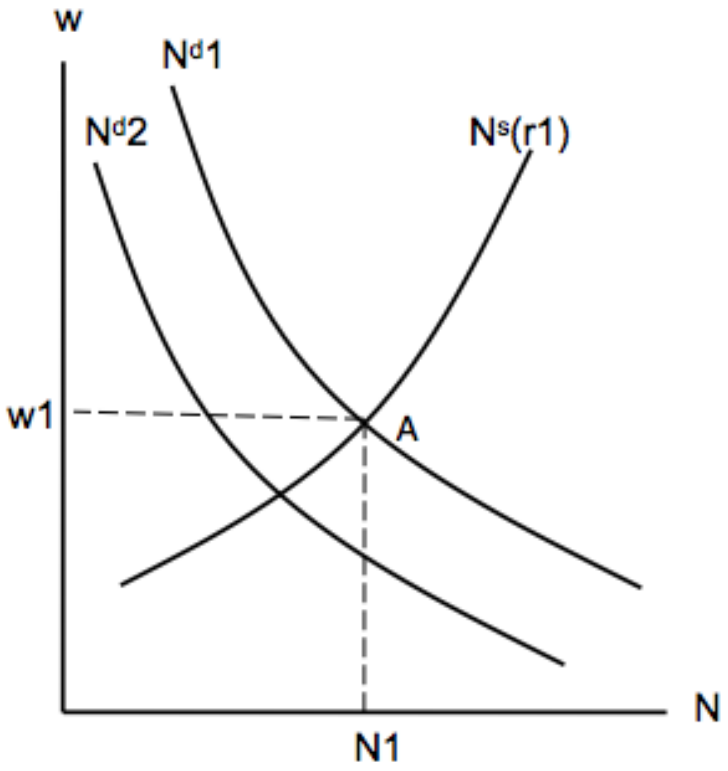
- **Effect on Y^d**:
  - A smaller current K means a smaller future K'.
  - Future MP'_K rises; investment increases, given r.
  - The optimal investment curve (I^d) shifts right.
  - The output demand curve (Y^d) shifts right.
- The real interest rate must rise.
- **Step 2**: the higher real interest rate reduces leisure (increases labor supply), current consumption and investment.

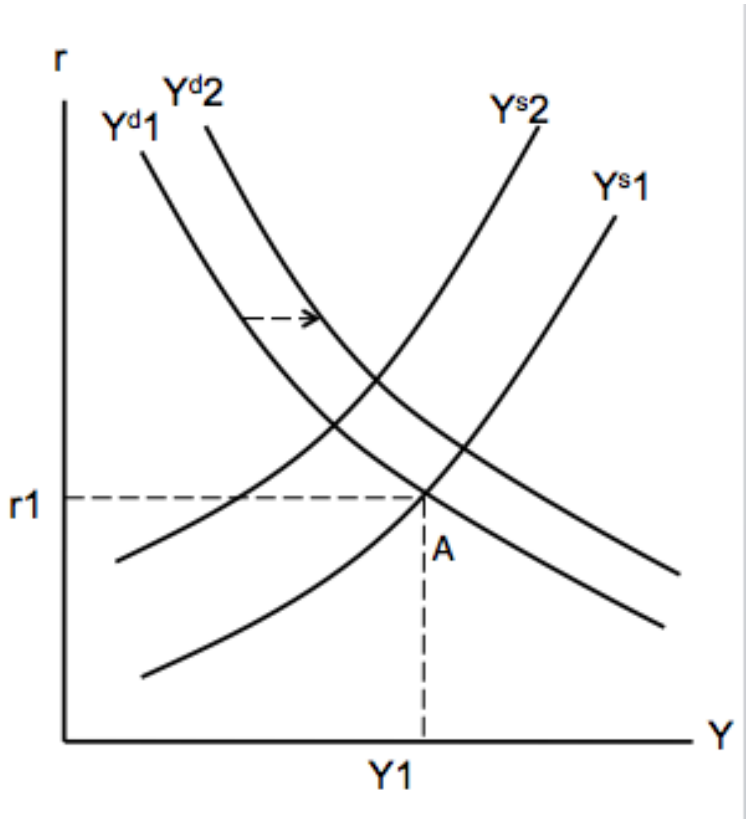
Step 1 Higher MP'K and rising Id





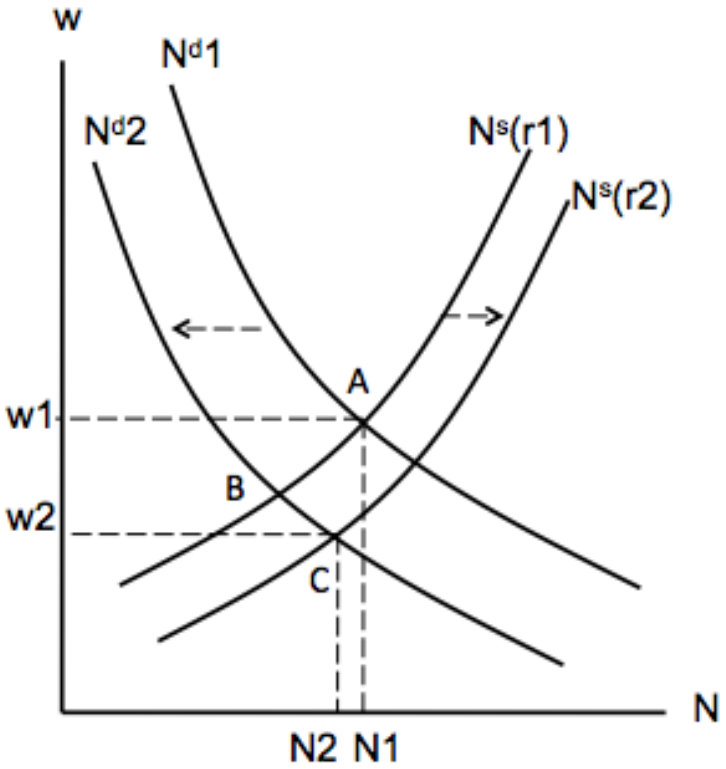
Step 1 A rising Id shifts Yd right.

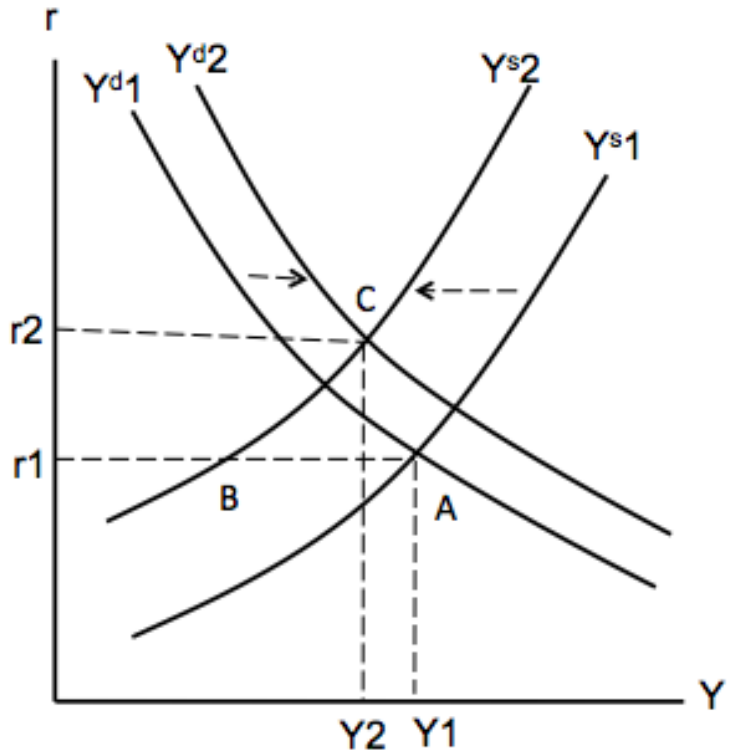




- Leisure decreases and labor supply increases.
  - The labor supply curve shifts to the right.
  - The real wage drops further.
  - A movement on the Ys curve.
- Investment increases to make up for the decline in the capital stock:
  - The higher real interest rate depresses investment, but higher MP'_K raise it.
  - If investment finally decreases, current K will be falling indefinitely — impossible.

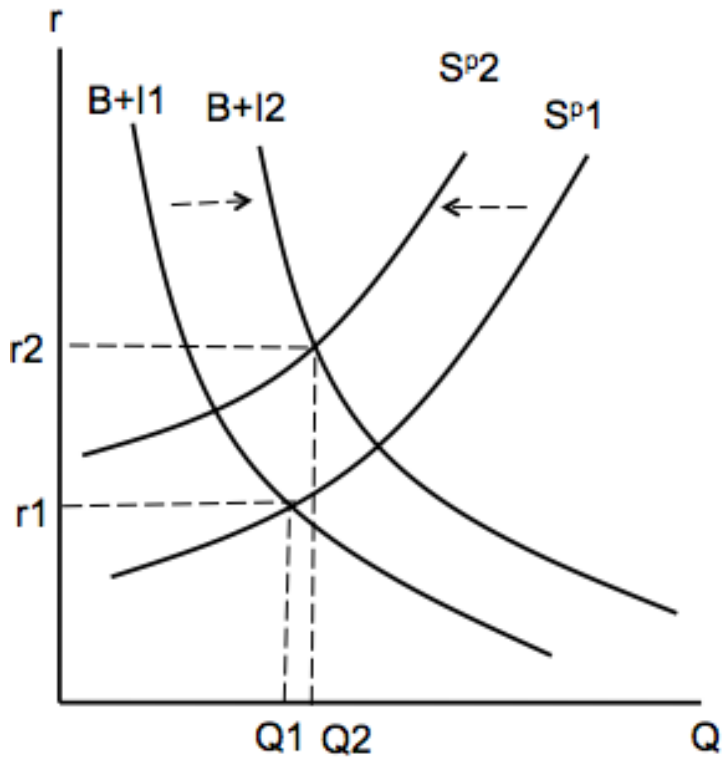
Step 2 A decrease in current K: rising r





The credit market

- Lower current income reduces consumption and private saving.
- Investment increases (net effect).
- The real interest rate increases, given B.



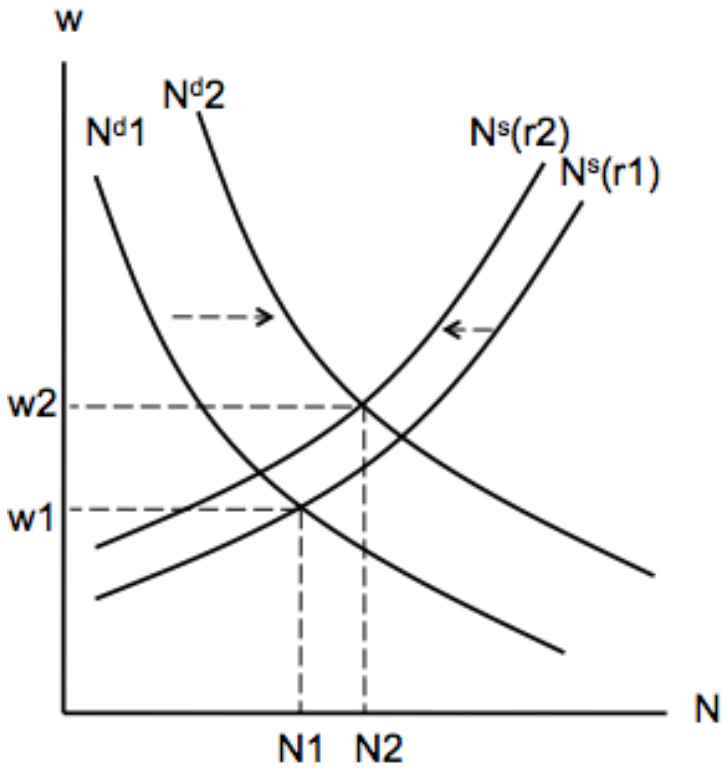
Overall effect of a drop in K

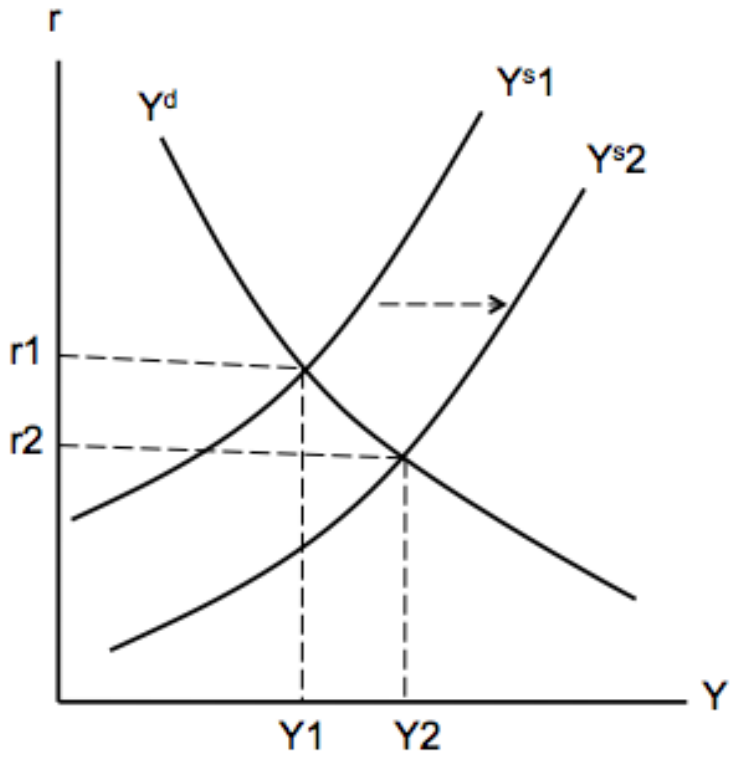
- A decrease in current K raises the real interest rate but may increase or reduce output.
  - Current consumption and leisure decrease.
  - Investment increases.
  - The real wage decreases.
  - Employment and output may increase or decrease.
- Destruction of K tends to reduce output; but higher investment increases output.

A temporary increase in z

- Step 1: An increase in current total factor productivity (z) raises MPN.
  - Labor demand and output supply shift right.
  - The real interest rate decreases.
- Step 2: the lower r raises current consumption, investment and leisure.
  - Labor supply decreases; the labor supply curve shifts left.
  - Employment, output and the real wage increase.

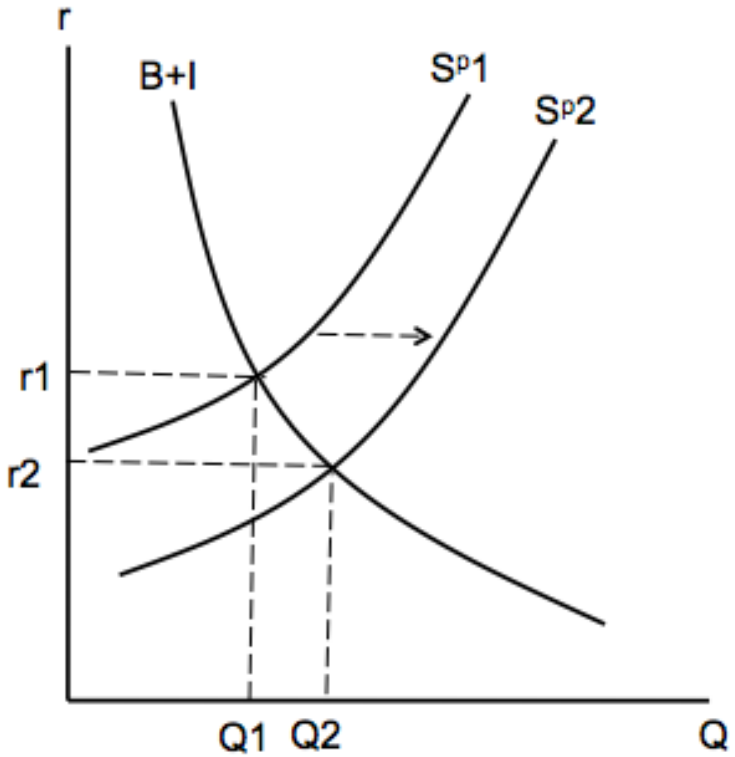
An increase in z





The credit market

- Higher current income raises both consumption and private saving.
- The real interest rate decreases, given B.



Overall effect of $\triangle$ z

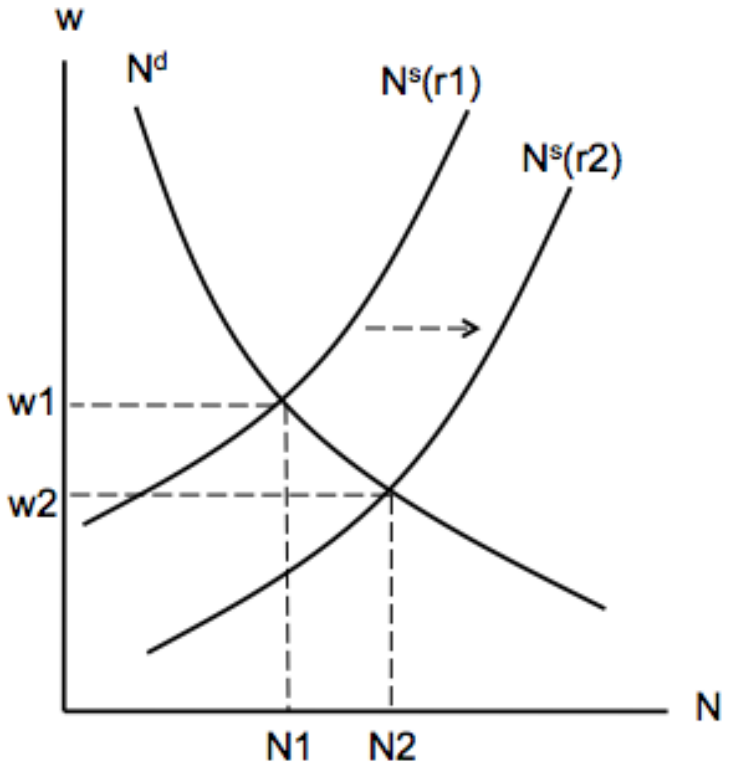
- An increase in the current z reduces the real interest rate but increases output.
  - Employment and output increase.
  - The real wage increases.
  - This is partly offset by the increase in leisure (with lower r and higher current income).
  - Investment increases (with lower r).
  - Current consumption increases with lower r and larger Y.

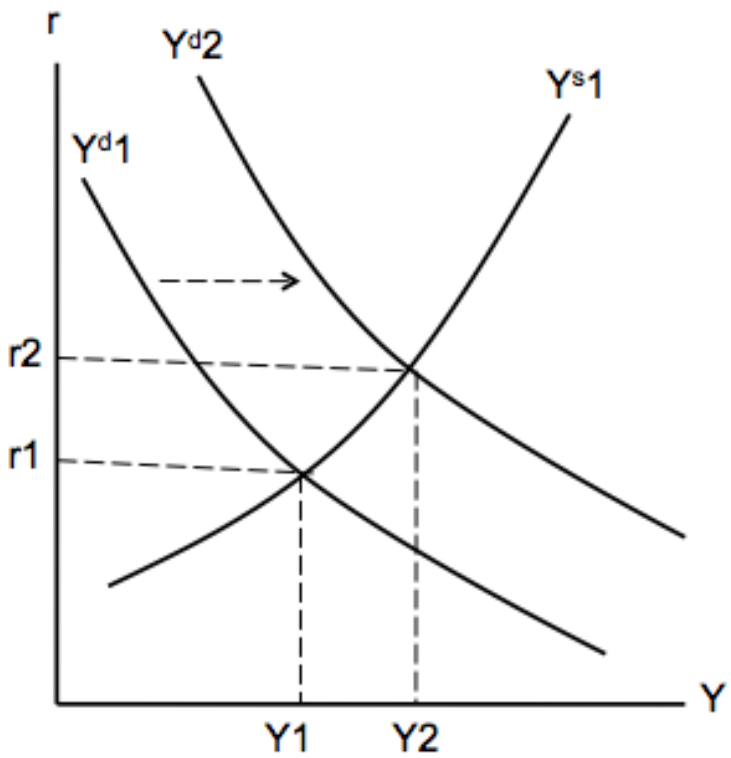
An increase in future z'

- Step 1: Future z' is expected to rise; future MP'_K increases.
- Investment (I^d) increases; output demand shifts right.
  - The real interest rate increases.
- Step 2: the higher r reduces consumption, investment and leisure.

- The labor supply curve shifts right; the real wage drops.
- Employment and output increase.
- Higher current income raises consumption, but the higher real interest rate depresses it.
- The higher investment from higher MP'_K is partially offset by the higher real interest rate.
    - Investment increases as the effect of MP'_K is stronger .

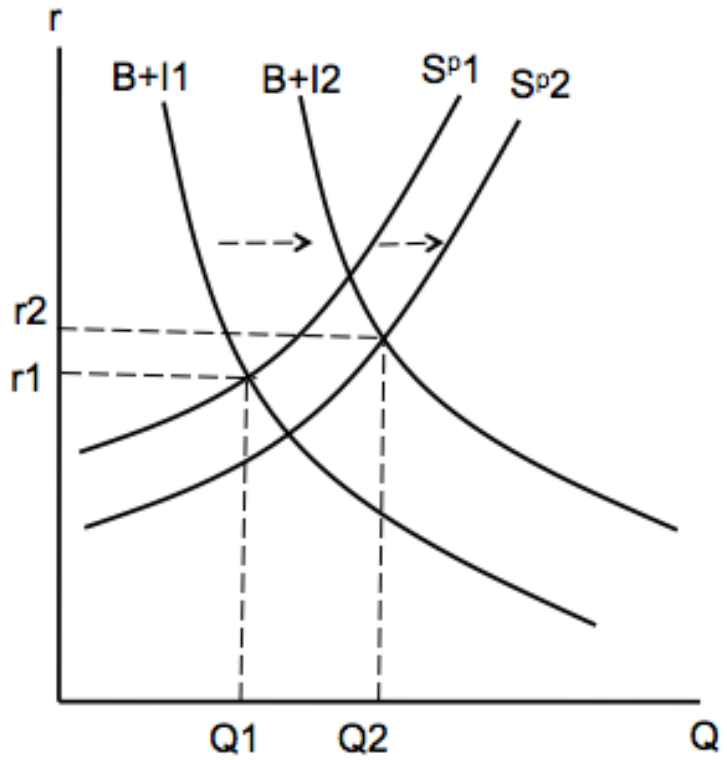
An expected increase in z'





The credit market

- Higher current income raises both consumption and private saving.
- Investment also increases.
- The real interest rate increases.



Overall effect of $\triangle$z'

- Investment increases with higher expected MP'_K, partly offset by the higher r.
  - A larger future capital stock due to higher expected z'.
- Both real interest rate and output increase.
- Current consumption may rise or fall due to higher income but higher real interest rate.
- Employment increases with falling real wage.