

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

EE312

Macroeconomics, Stephen Williamson, Chapter 11

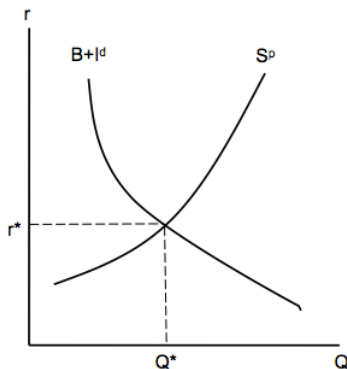
2015

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- Real Intertemporal Model (Introducton) (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 Y^d multiplier

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

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

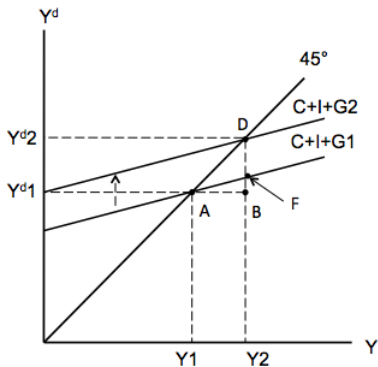
$$\Delta Y^d = \Delta G + (MPC \times \Delta Y^d)$$

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

- The larger is MPC, the larger the Y^d multiplier, and the more powerful ΔG !

The Keynesian Y^d multiplier > 1

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



- 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!

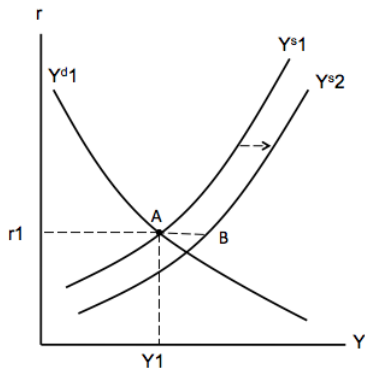
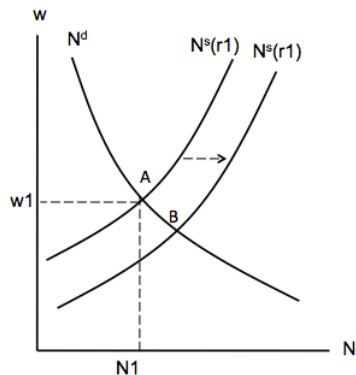
- The increase in total current demand for goods (Y^d).
 - The increase in government spending (ΔG).
 - The multiplier effect = $MPC\Delta G$.
 - Lifetime wealth drops = PV of taxes = ΔG . ; so current consumption **falls** by $MPC\Delta G$.

$$\Delta Y^d = \Delta G + MPC\Delta G - MPC\Delta G$$

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

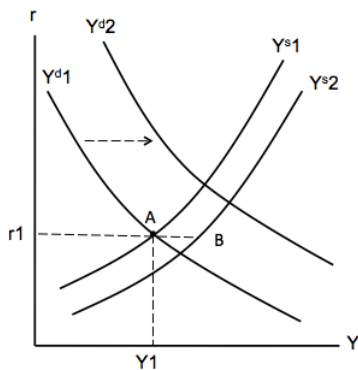
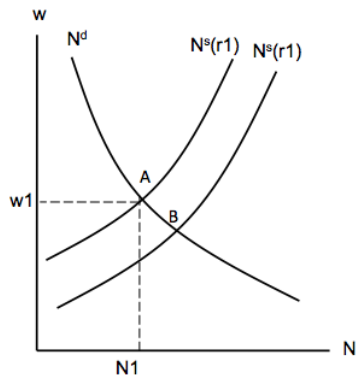
- Step 1: direct effect of ΔG :
- Effects on Y^S :
 - The PV of taxes rises; the consumer's lifetime wealth falls.
 - Leisure decreases and labor supply increases, given the real wage.
 - The output supply curve shifts rightwards.

Step 1 An increase in G: Y^s shift



- 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?

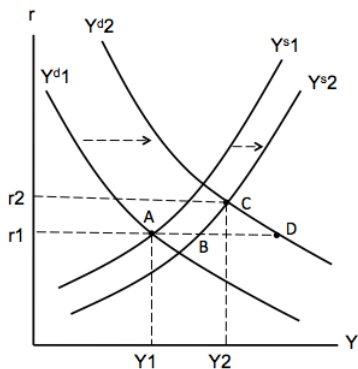
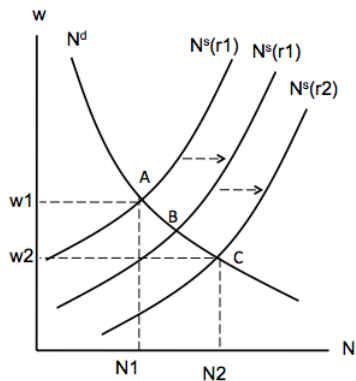
Step 1 An increase in G: Y^d shift



- 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.

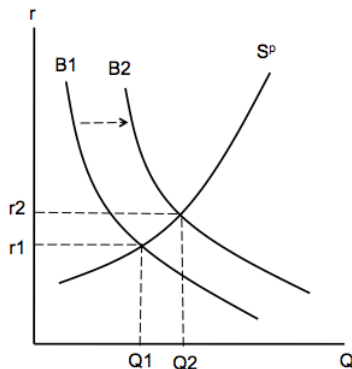
- Leisure falls and labor supply increases again.
 - The real wage falls further; employment and output increase — a movement along the Y_s .
- Investment decreases due to the higher real interest rate.
- Current consumption falls:
 - Falling lifetime wealth reduces current consumption while higher income 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.



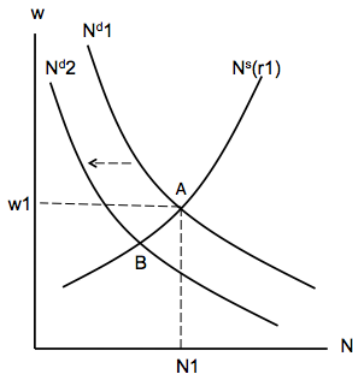
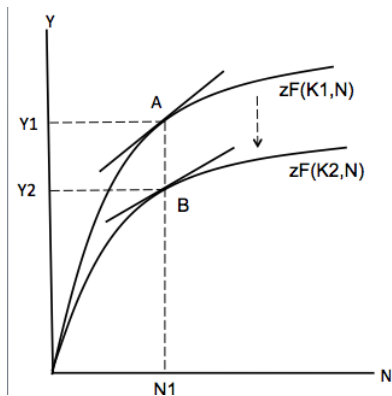
- The government increases borrowing in the current period.
 - The increased bond sale raises the real interest rate.
- A temporary increase in G **crowds out** both current consumption and investment by raising the real interest rate.
 - The consumer works more for a lower real wage and consumes less.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

- The total expenditure multiplier is less than 1.
 - $\Delta Y^d = \Delta G = AD > Y_1 Y_2$.
 - 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!

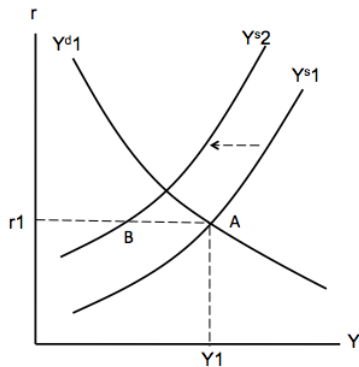
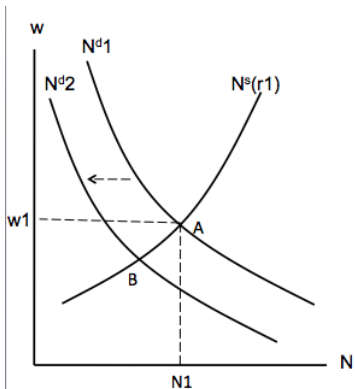
A decrease in current capital stock

- 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

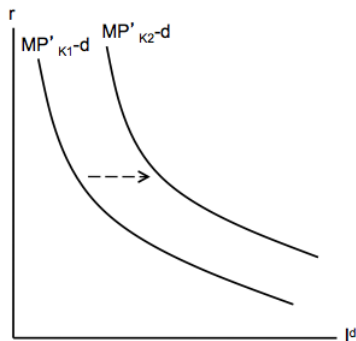
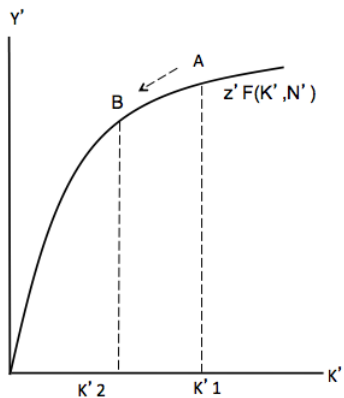


Step 1 Lower Nd: Ys shifts left.

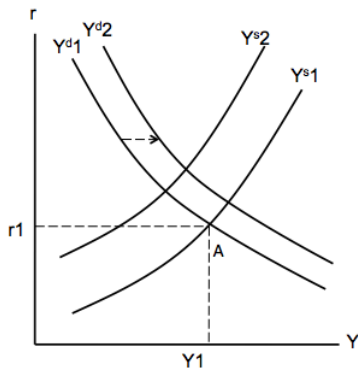
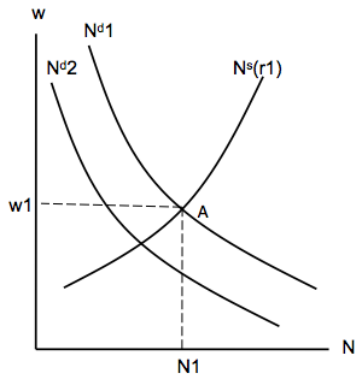


- **Effect on Y^d :**
 - A smaller current K means a smaller future K' .
 - Future MP'_K rises; investment increases, given r .
 - The optimal investment curve (I^d) shifts right.
 - The output demand curve (Y^d) shifts right.
- The real interest rate must rise.
- **Step 2:** the higher real interest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

Step 1 Higher MP'K and rising I^d

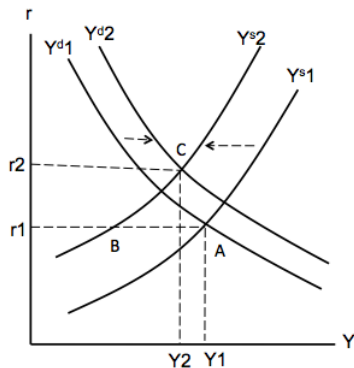
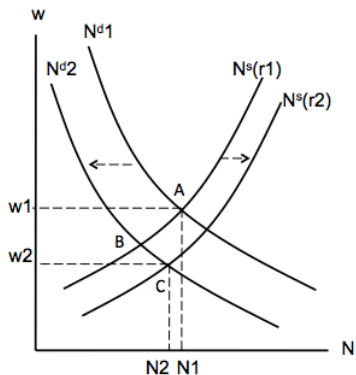


Step 1 A rising Id shifts Yd right.



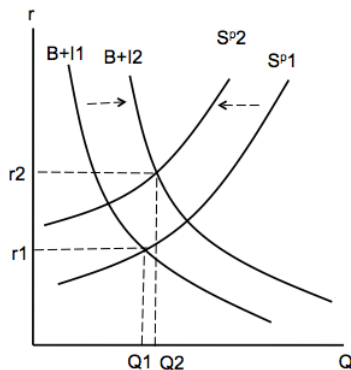
- Leisure decreases and labor supply increases.
 - The labor supply curve shifts to the right.
 - The real wage drops further.
 - A movement on the Y_s curve.
- Investment increases to make up for the decline in the capital stock:
 - The higher real interest rate depresses investment, but higher MP'_K 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 .



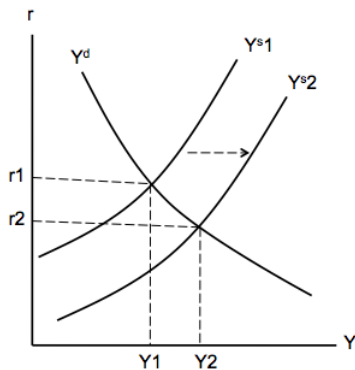
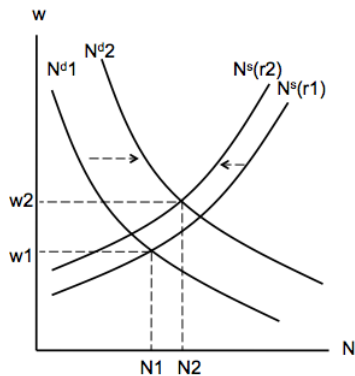
Overall effect of a drop in K

- 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

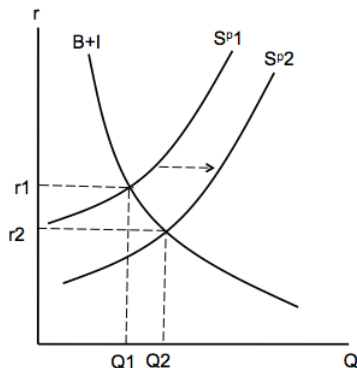
- Step 1: An increase in current total factor productivity (z) raises MPN.
 - Labor demand and output supply shift right.
 - The real interest rate decreases.
- Step 2: the lower r raises current consumption, investment and leisure.
 - Labor supply decreases; the labor supply curve shifts left.
 - Employment,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



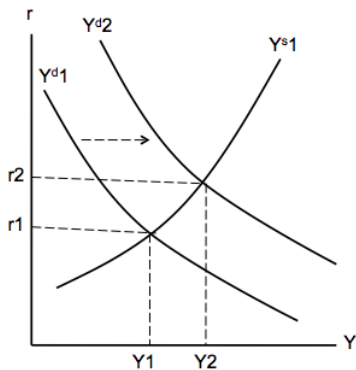
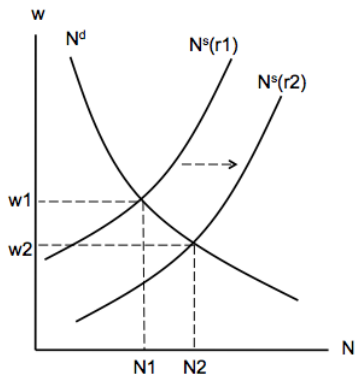
- An increase in the current z reduces the real interest rate but increases output.
 - Employment and output increase.
 - The real wage increases.
 - This is partly offset by the increase in leisure (with lower r and higher current income).
 - Investment increases (with lower r).
 - Current consumption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

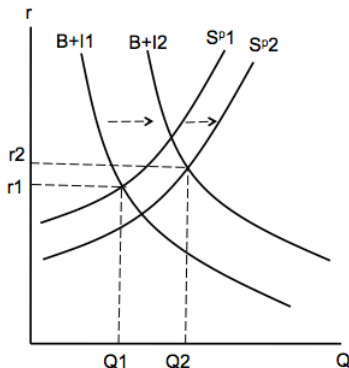
- The labor supply curve shifts right; the real wage drops.
- Employment and output increase.
- Higher current income raises consumption, but the higher real interest rate depresses it.
- The higher investment from higher MP'_K is partially offset by the higher real interest rate.
 - Investment increases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

- 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.