

MACROECONOMICS

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Intertemporal model

RBC II

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What have we got?

- Consumer: we have for behavioral equations

$N^s(w, r, w', \pi, \pi', T, T')$

$N^{s'}(\dots)$

$C(\dots)$

$C'(\dots)$

Producer

- Five definitions:

$Y = zF(K, N^d), Y' = z'F(K', N^{d'})$,

$$\Pi = Y - wN^d - I, \quad \Pi' = Y' - w'N^{d'} + (1 - d)K'$$

$$I = K' - (1 - d)K,$$

- And three behavioral equations:

$$MPK' - d = r,$$

$$MPL(N^d, K, z) = w, \quad MPL'(N^{d'}, K', z') = w'$$

Government and equilibrium

- Three equilibrium conditions

$$N^d = N^s, \quad N^{d'} = N^{s'}$$

$$Y = C + I + G,$$

- The government budget constraint

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

The system

- Sixteen equations altogether

To be solved for sixteen endogenous variables

$N^d, N^s, N^{d'}, N^{s'}, C, C', Y, Y', \Pi, \Pi', r, w, w', K, I$, and the present value of taxes $T + T'/(1+r)$

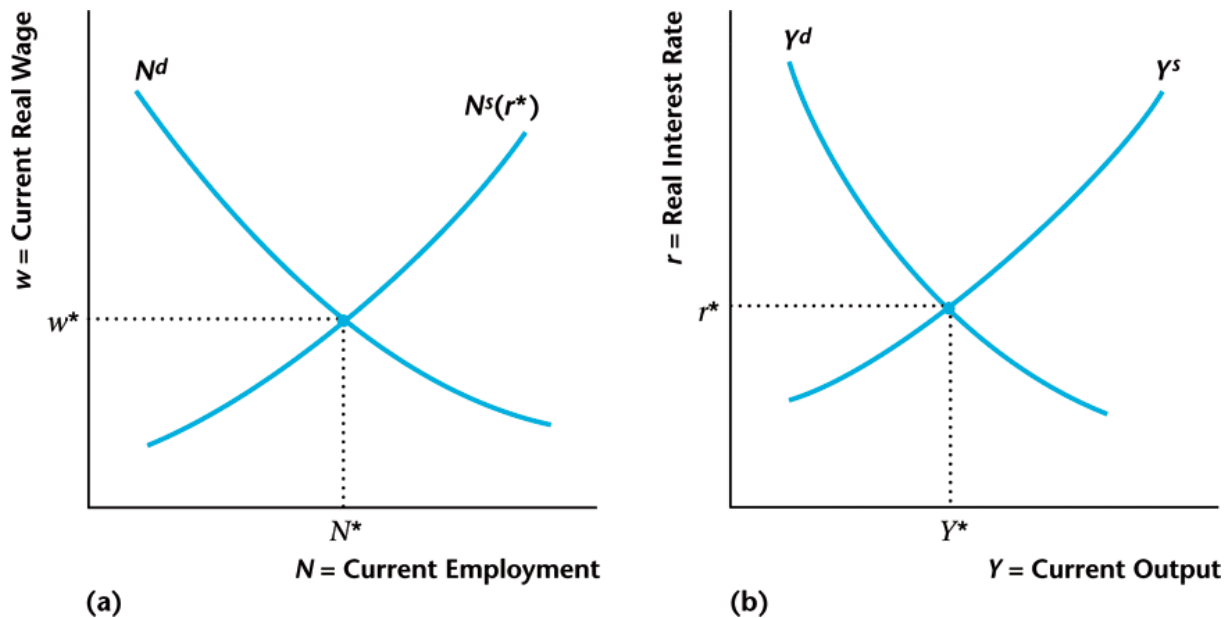
- Exogenous parameters: h, z, z', G, G', K, d , and the parameters of the utility function as well as the production technology. For any given set of the exogenous parameters, the equilibrium values of the endogenous variables can be determined.

Solution

- The system can be solved, although computer is needed. The technology and the utility function are mostly non-linear
- Using the model: searching for the new equilibrium values in case of changes in the exogenous parameters. These define causation

- It is quite complicated, not easy to catch the intuition behind. We simplify it to some diagrams and try to find the intuitions

The complete model



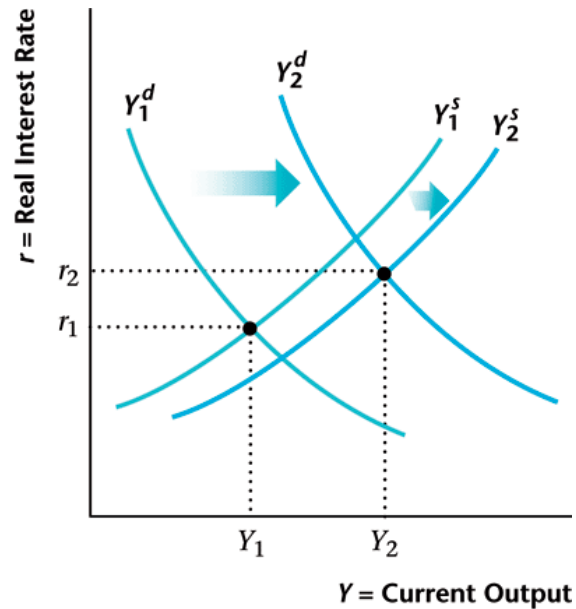
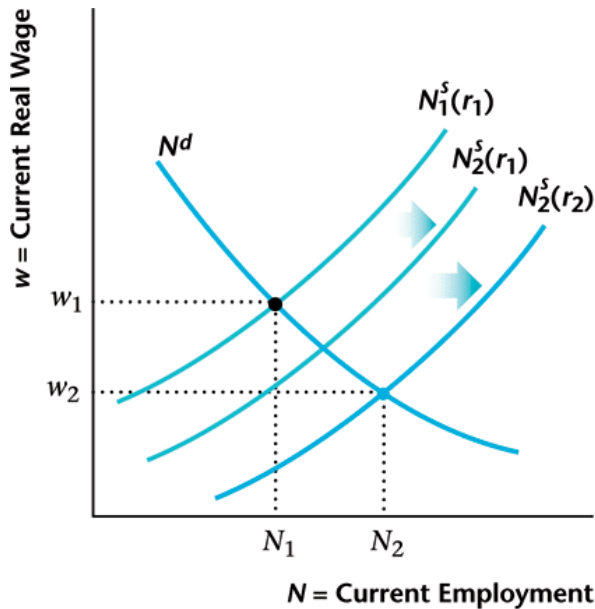
Using the model

- We introduce shocks and follow the adjustment
- Shocks: permanent or temporary
- We have more than one periods, therefore we can illustrate the difference
- Events, expected in the future can influence behavior in the present

Temporary increase in G

- Temporary, for example war efforts, reparation, large scale development programs etc.
- Present value of taxes has also got to increase (Ricardian equivalence holds)
- Supply effect: through the increase in taxes, reduction in consumers incomes
- Demand effect: through the increasing government demand and decreasing consumers demand

Temporary increase in G



- Labor market: due to the increase in the present value of taxes life time income decreases and labor supply increases. Higher employment, lower real wage, output supply curve shifts out
- Output demand: T increases C decreases G increases. Measure of output demand shift altogether is dG
- Balanced budget multiplier
- Y increases, both the demand and the supply curves shift right. How about r ?
- The representative consumer tries to smooth, no one to borrow from. r has to

increase, consumer saving makes room for G to increase

- Open economy is different, consumer can borrow from abroad, current account turns negative, twin deficits
- Closed economy: r increases, current consumption gets more expensive, current leisure is also more expensive, through intertemporal substitution the consumer wants to work more. Labor supply shifts further to the right, w decreases Y increases further
- G crowds out investment and consumption

No free lunch

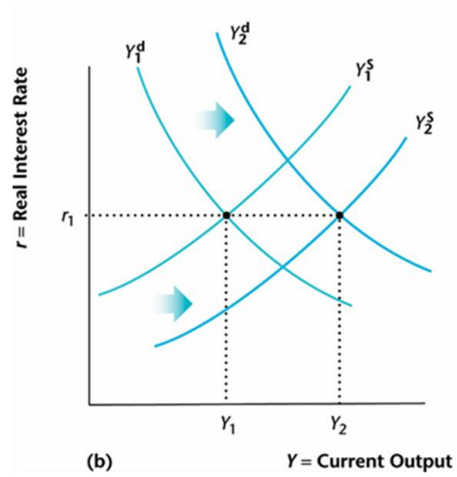
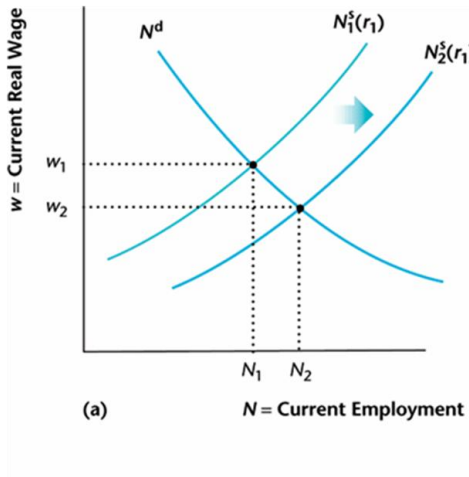
- Y increases
- C decreases
- Investment decreases
- w decreases
- Leisure decreases
- Due to the decrease in investment, future capital stock gets smaller

RBC model

- Reminder: we have a perfect market, prices adjust instantaneously
- There are no unutilized capacities, we are always at the PPF
- Therefore the supply counts only. Models allowing demand effects emphasize unutilized capacities due to some market imperfections

Permanent increase in G

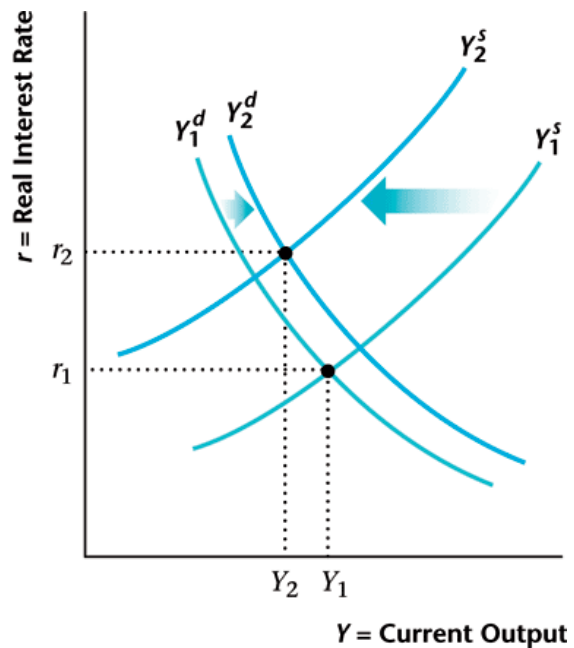
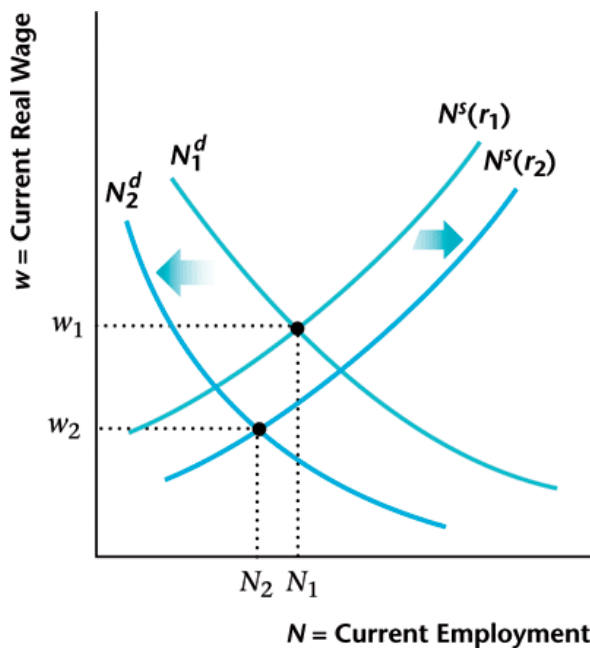
- The main difference is, that the position of the consumer is influenced equally in each time periods, therefore no reason to tilt her consumption demand
- The size in the decrease in consumer income is larger as more financing is needed for a permanent G increase. The shift in the supply curve is larger



A decrease in current K

- War, natural disaster etc.
- Unlike in the Solow model, here we can interpret the effect on wages and labor as well
- Labor market: marginal product of labor decreases, labor demand shifts, w decreases, N decreases
- Marginal product of capital increases, investment demand increases

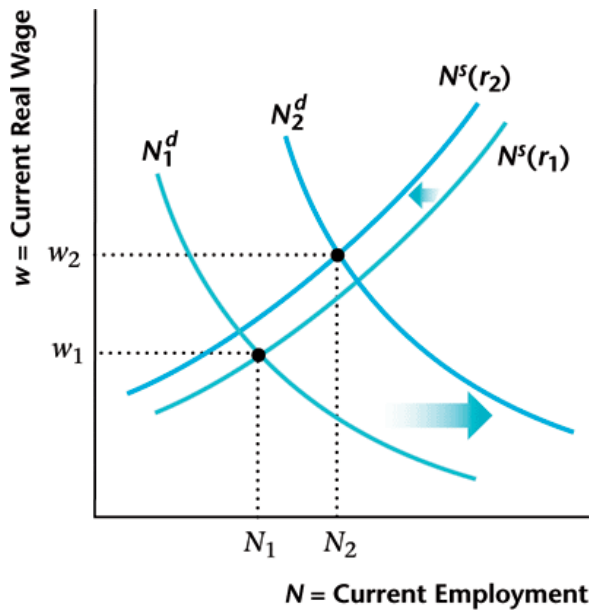
Decrease in K



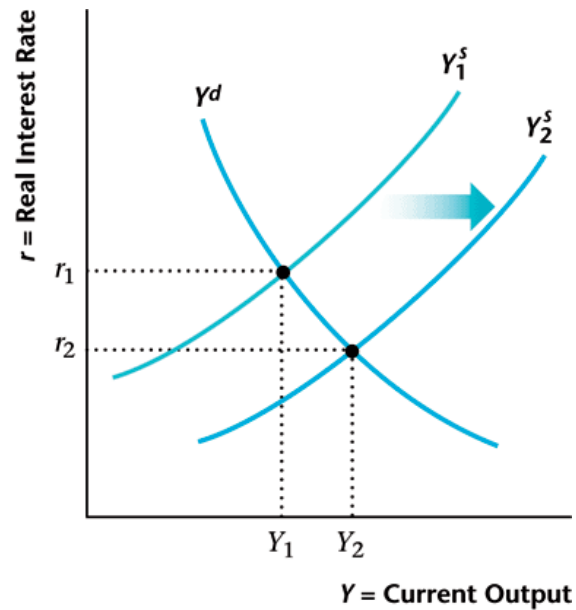
- Due to the decrease in demand for labor real wage and employment would decrease
- Output decreases, supply curve shifts back
- Increase in future marginal product of capital shifts demand out due to increase in investment
- r increases, Y uncertain

Temporary increase in z

- Good weath, government regulation, temporary decrease is energy prices.
 z decreases, z' does not
- Labor market: MPL increase, labor demand increases, w increases
- Larger productivity and employment both increase output
- r decreases, consumers want to spend more now



(a)



(b)

Summary

- Output increases
- Consumption increases (Y increases, r decreases)
- Investment increases
- Employment and real wage increase
- Average productivity increases

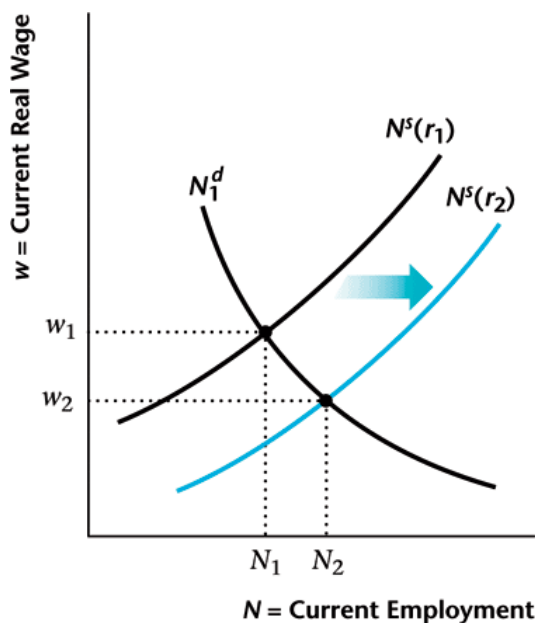
Cyclical co-movements

- These results by and large mimic the stylised facts we collected from business cycle descriptions
- Fluctuations in TFP must have significant role in causing cyclical macroeconomic behavior. This is the main message of the RBC school
- Consumers try to smooth, this fluctuates r . This is the reason for the significant fluctuation in investment

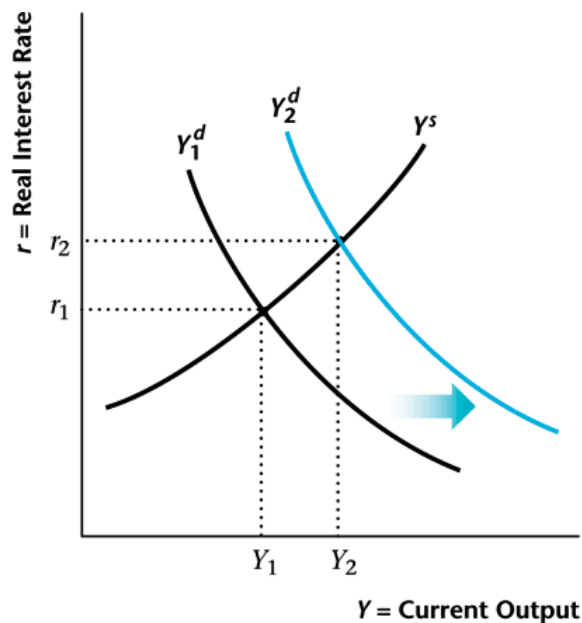
An expected increase in z'

- Optimism generated by expected future effect of certain inventions. Dot com bubble etc.
- Current technology, production function is not affected
- Future MPK increases, investment demand increases, demand shifts to the right

Expected increase in TFP



(a)



(b)