Chapter 8 : Business Cycle Models with Flexible Prices and Wages

EE312

Macroeconomics, Stephen Wiliamson, Chapter 13

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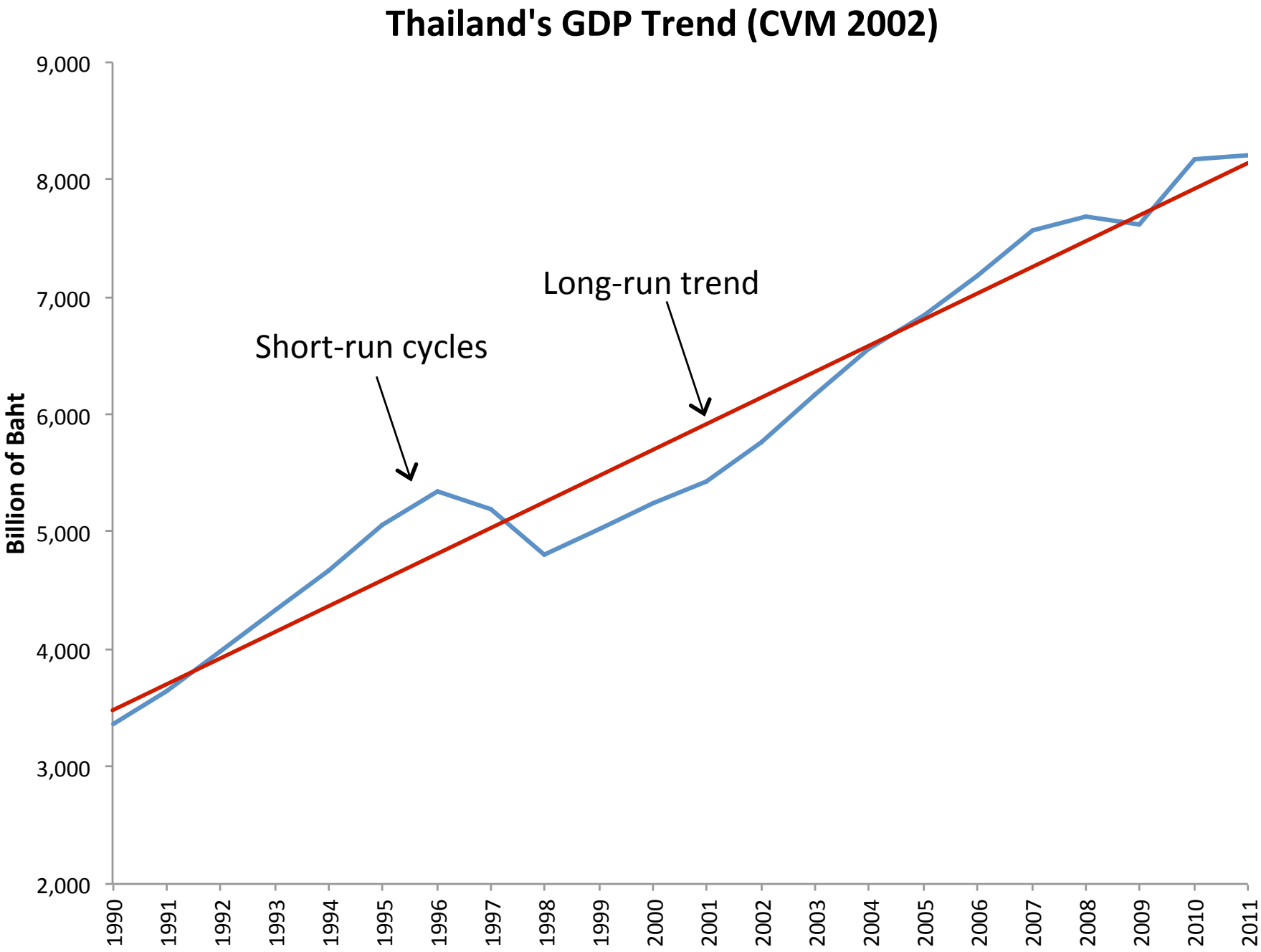
Short-run fluctuations

- The macro-economy is characterized by short-run fluctuations — business cycles.
- Two classes of models explaining **business cycles**:
  - **Market clearing equilibrium models**: real business cycles, segmented markets.
  - **Keynesian models**: equilibrium in which markets do not clear — sticky-wage and sticky-price models.


Thailand's GDP Trend (CVM 2002)
Billion of Baht
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
Short-run cycles
Long-run trend
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

History of macroeconomics

- John Maynard Keynes: '*The General Theory of Employment, interest and Money*' (1936).
  - Unemployment equilibrium and fiscal policy.
- **Keynesian macroeconomics** (1950s-1960s).
  - Sticky-price, sticky-wage models.
  - Short-run non-neutrality of money.
  - Markets are defective and slow to adjust.
  - Fiscal policy for economic stabilization.

- The crisis of Keynesianism of the 1970s.
  - High inflation and unemployment — stagflation.
- **Monetarism** (1970s-1980s): Milton Friedman.
  - Ineffective fiscal policy.
  - Short-run non-neutrality of money: the money surprise model.
  - The constant money growth rule and laissez-faire.
- **Robert Lucas's critique (1976)**: "Macroeconomic modeling should be based on microeconomic foundations."

Rational expectations revolution

- Both Keynesianism and monetarism assume the adaptive expectations hypothesis.
- Economic agents make repeated mistakes.
- John F. Muth, Robert Lucas.
  - Expectations are formed on the basis of all available relevant information on the variable being predicted.
  - Individuals use available information intelligently.

New classical macroeconomics

- Robert Lucas, Thomas Sargent, Neil Wallace, Robert Barro (the 1980s – present).
  - Macroeconomic models with micro-foundations.
  - Representative agent models.
  - The rational expectations hypothesis.
  - Competitive equilibrium: markets clear at all times.
  - New classical policy ineffectiveness proposition.

- Robert Emerson Lucas, Jr. (b1937), University of Chicago, Nobel Prize 1995.
- Thomas J. Sargent (b1943), New York University, Nobel Prize 2011.

New Keynesian responses

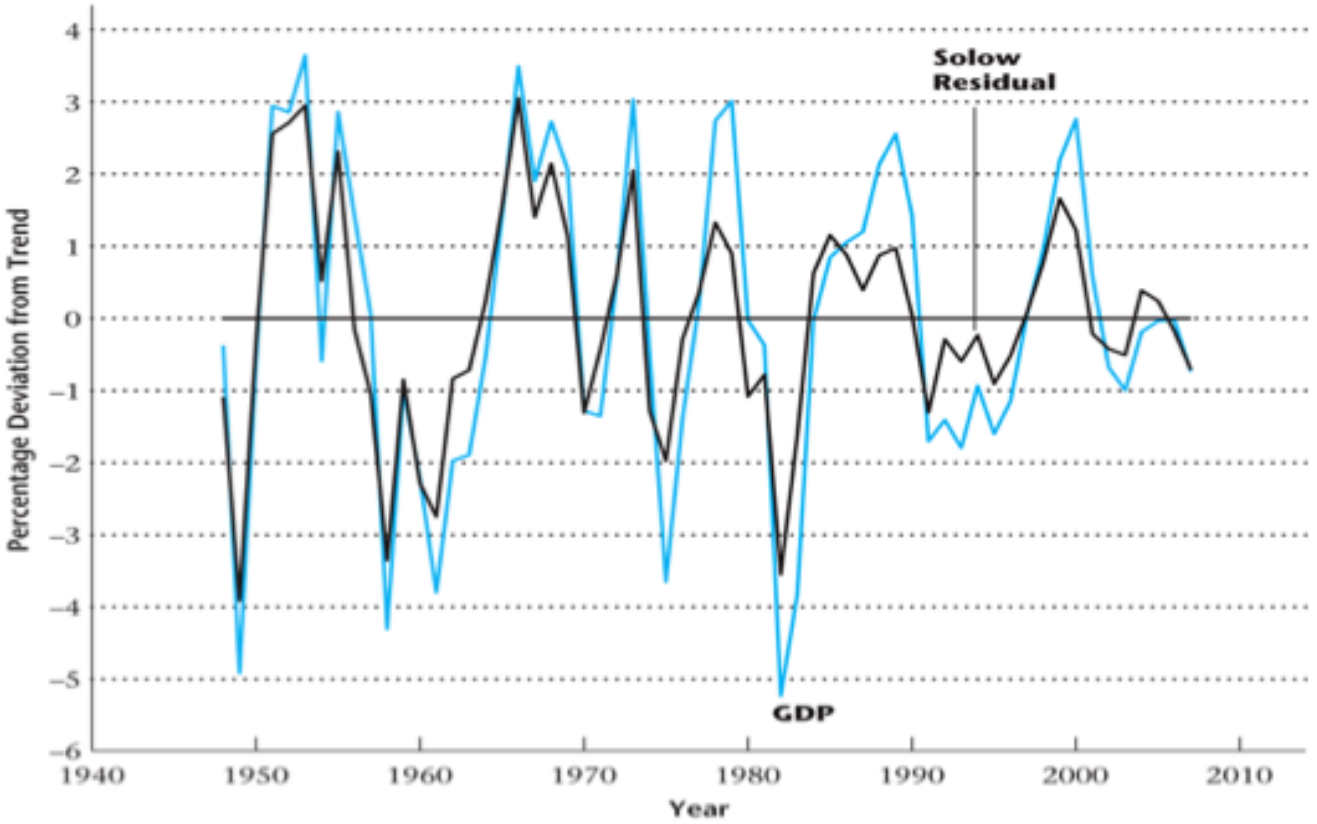
- New Keynesian economics (the 1990s-present): Gregory Mankiw, David Romer.
  - Micro-foundations and rational expectations.
  - Market failures and imperfect competition.
  - Price-wage stickiness; markets do not clear.
  - Menu cost models, efficiency wage models, insider-outsider models.
  - Fiscal and monetary policy for stabilization.

Real business cycle model

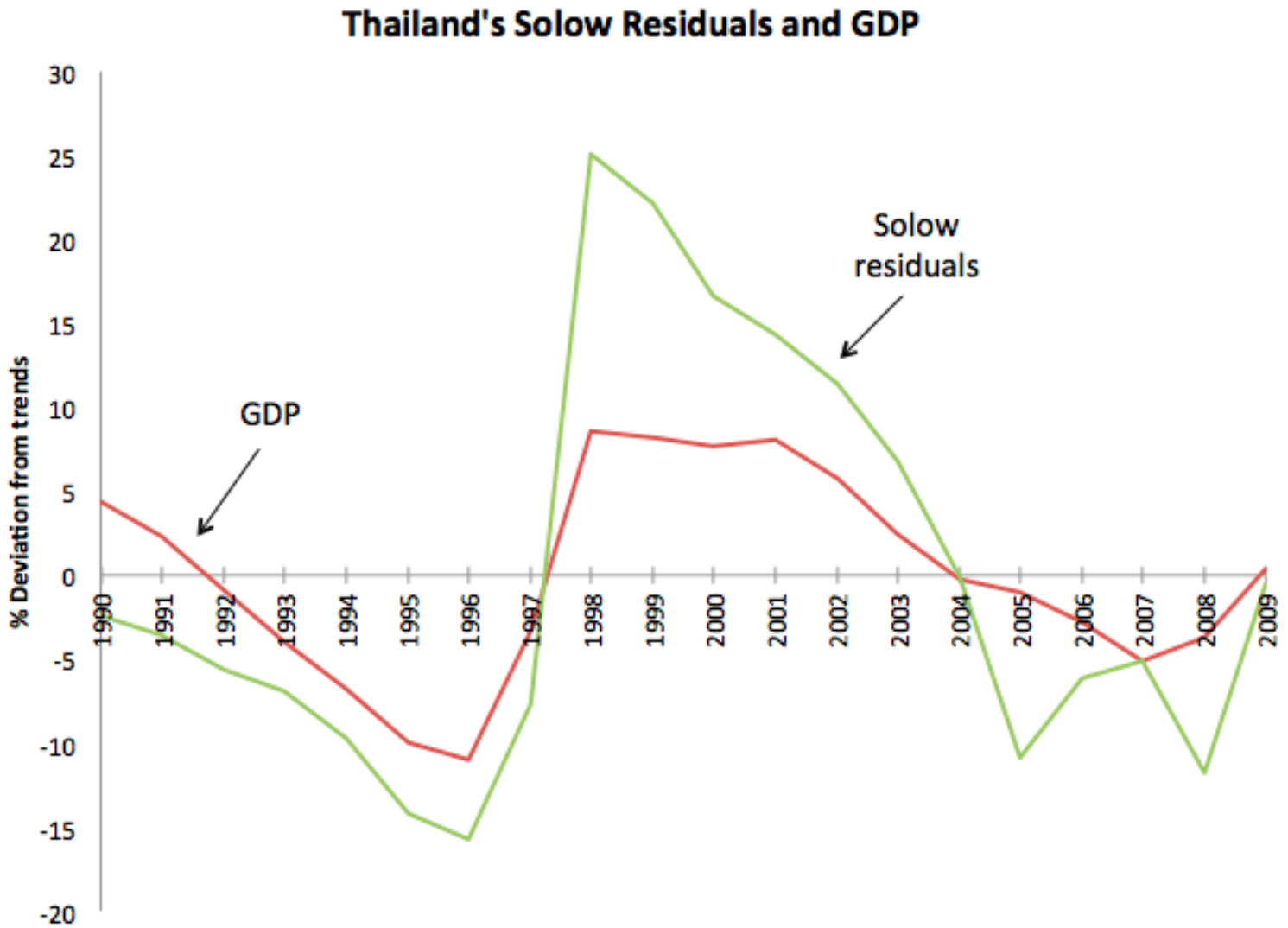
- New classical models of the business cycle.
- Finn Kydland and Edward Prescott (1982).
  - Uses of standard growth models subject to random productivity shocks.
- Short-run fluctuations are mainly results of random productivity (i.e., real) shocks.
  - Trends in Solow residuals tracked trends of real GDP.

- Finn E. Kydland (b1943), University of California, Santa Barbara. Edward C.
- Prescott (b1940), University of Chicago.
- Nobel Prize 2004.

The US's Solow residual and GDP



Thailand's Solow Residuals and GDP



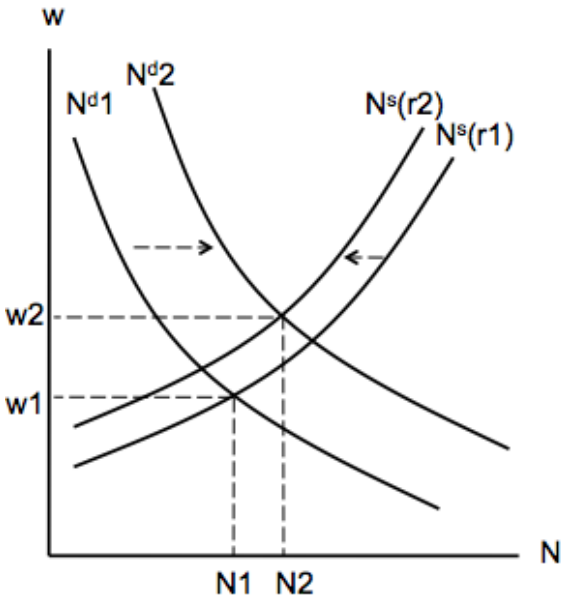
Changes in total factor productivity

- Changes in z: the same inputs produce more/less output.
  - Weather, technological innovations, changes in government regulations, energy prices, etc.
- Total factor productivity shocks are persistent in its initial trend.
  - A higher current z tends to be followed by a higher future z'.

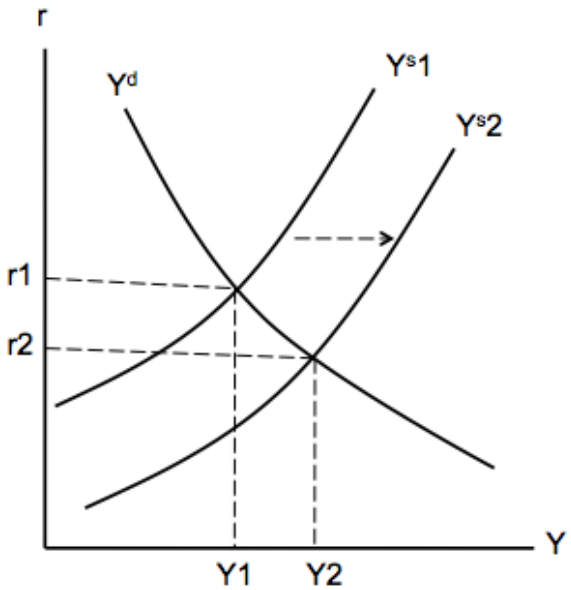
Increases in z and z'

- Increases in Z (For the details, read CH5 - **6 - 7**)

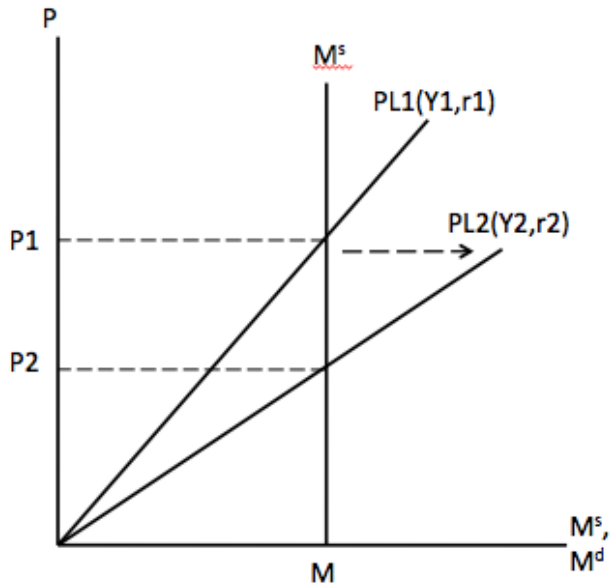
Labour Market



Output Market

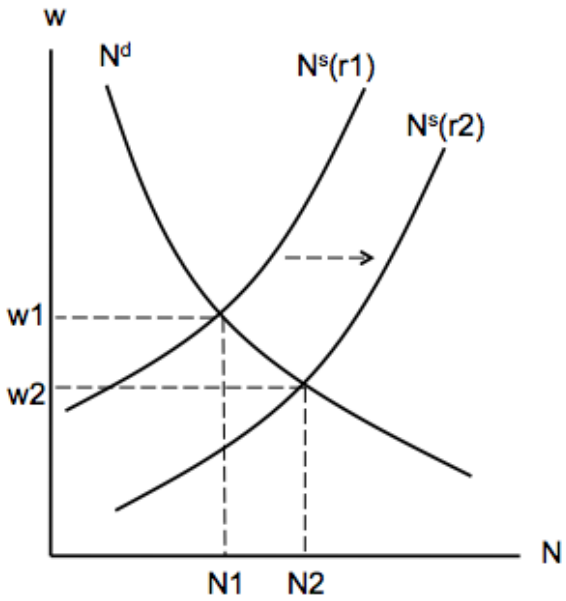


Money Market

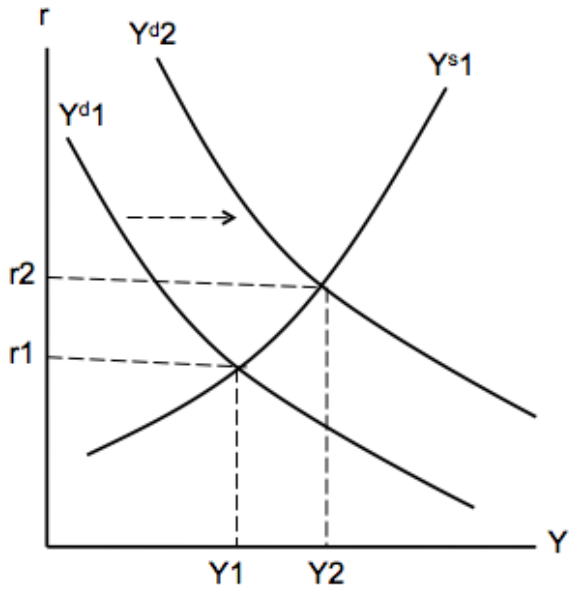


- Increase in Z' (For the details, read CH5 - **6 - 7**)

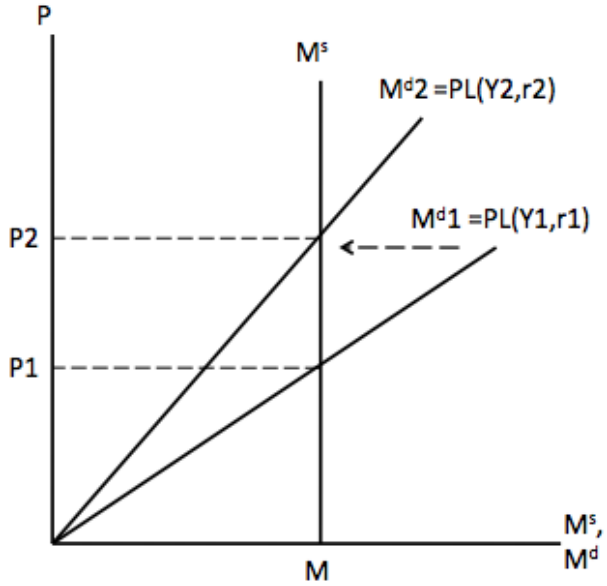
Labour Market



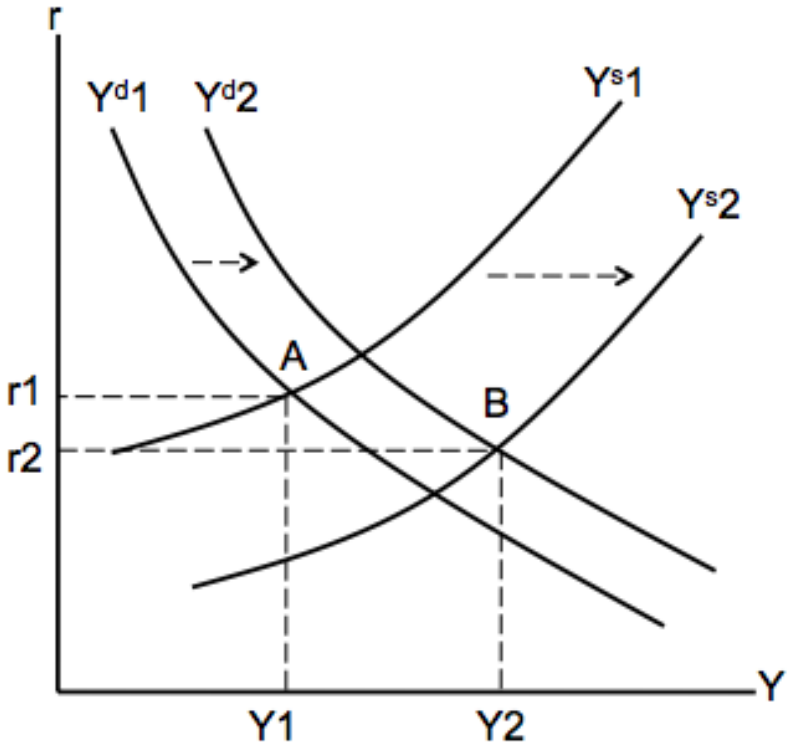
Output Market



Money Market



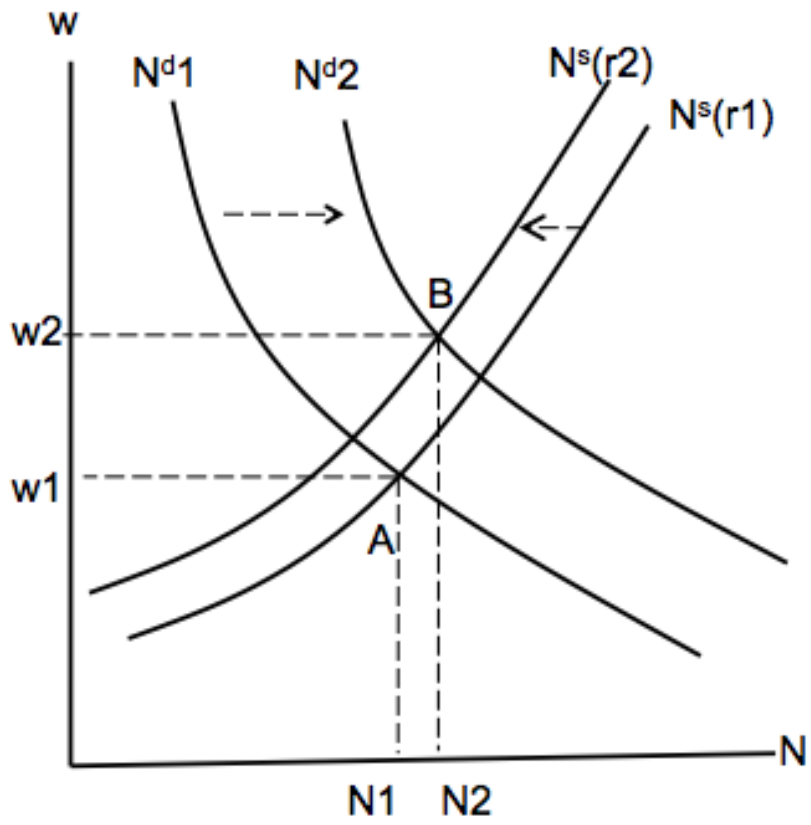
- **STEP 1 :**
- The effect of z is stronger than z', so the real interest rate falls.



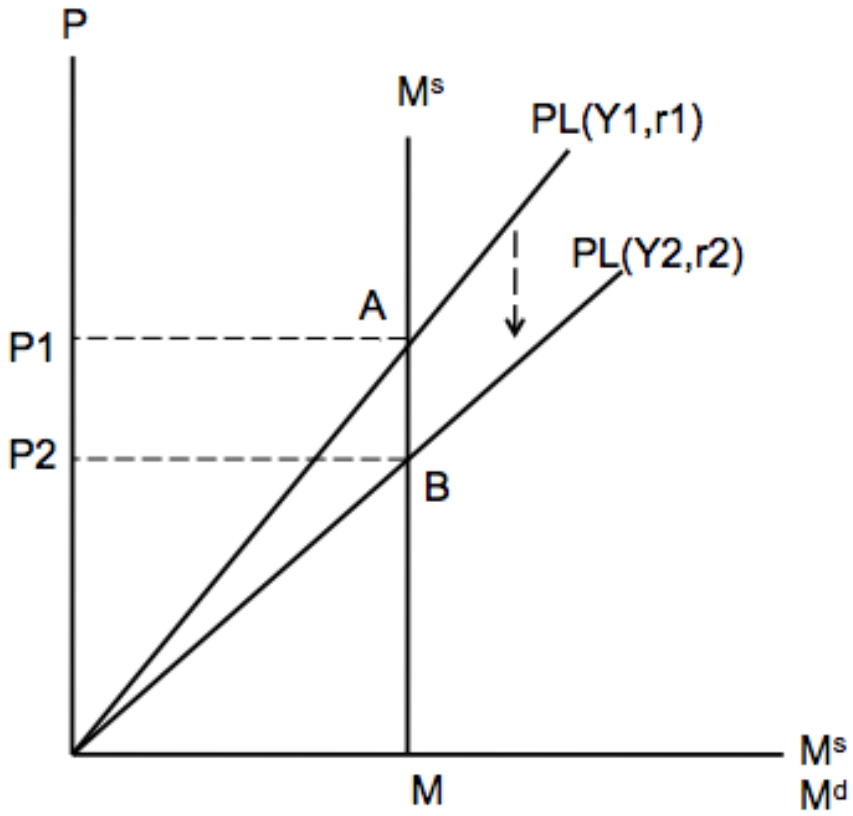
Stronger effect of current z

- The effect of the increase in current z (on Y^s) occurs in the current period.
- The effect of the expected increase in future z' on current investment (on Y^d) is weaker.
  - The increase in future real income is smaller than the increase in current real income.
  - Consumption smoothing results in a small increase in current consumption (and Y^d).

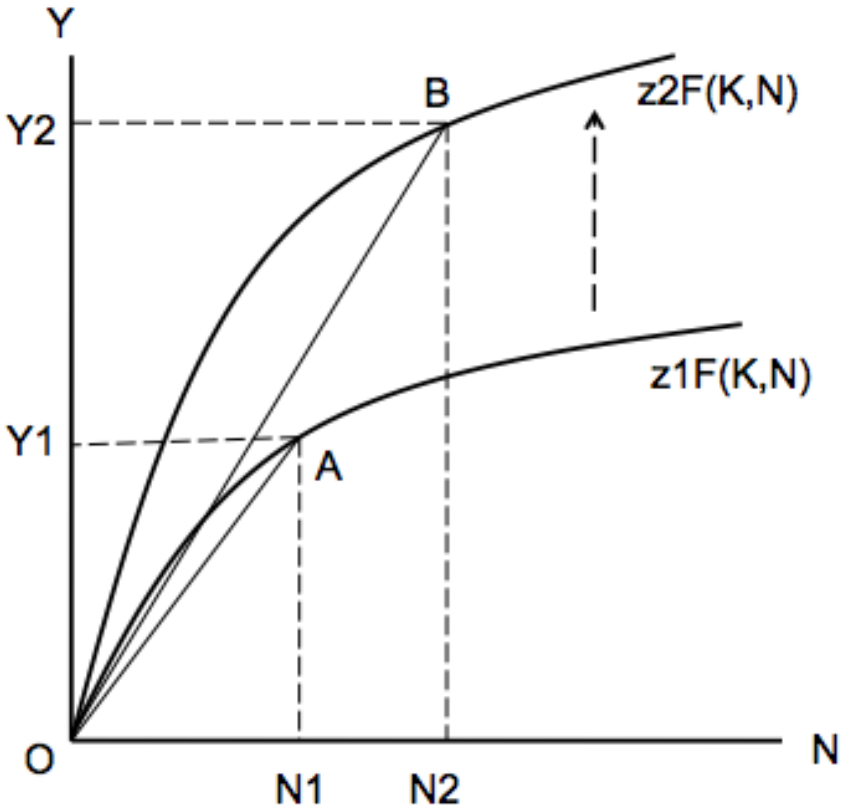
- **STEP 2 : effect of falling r on N^S**
- The lower real interest rate reduces labor supply.
- N^s shifts left and partially offsets w and N.
- Effect of r is small, so N^d dominates.



- **STEP 3 : effect on Money Market**
- Higher Y and lower r cause nominal M^d to shift right (increase).
- The price level drops.



- **STEP 4 : effect on average productivity**
- With rising z, higher Y and N, average labor productivity ($\frac{Y}{N}$) also increases (slope OB > slope OA).



Overall effects in the RBC model

- A persistent increase in z (and z') results in:
  - Higher employment and the real wage (strong Y^s).
  - Output increases; the real interest rate decreases (weaker effect of z' on C^d, I^dld and Y^d).
  - The price level decreases as M^d increases.
  - Higher consumption (rising current and future income and lower real interest rate).
  - Investment increases (higher MP'_K and lower r).
  - Average labor productivity increases.

The US's data and RBC model

Table 12.1 Data Versus Predictions of the Real Business Cycle Model with Productivity Shocks

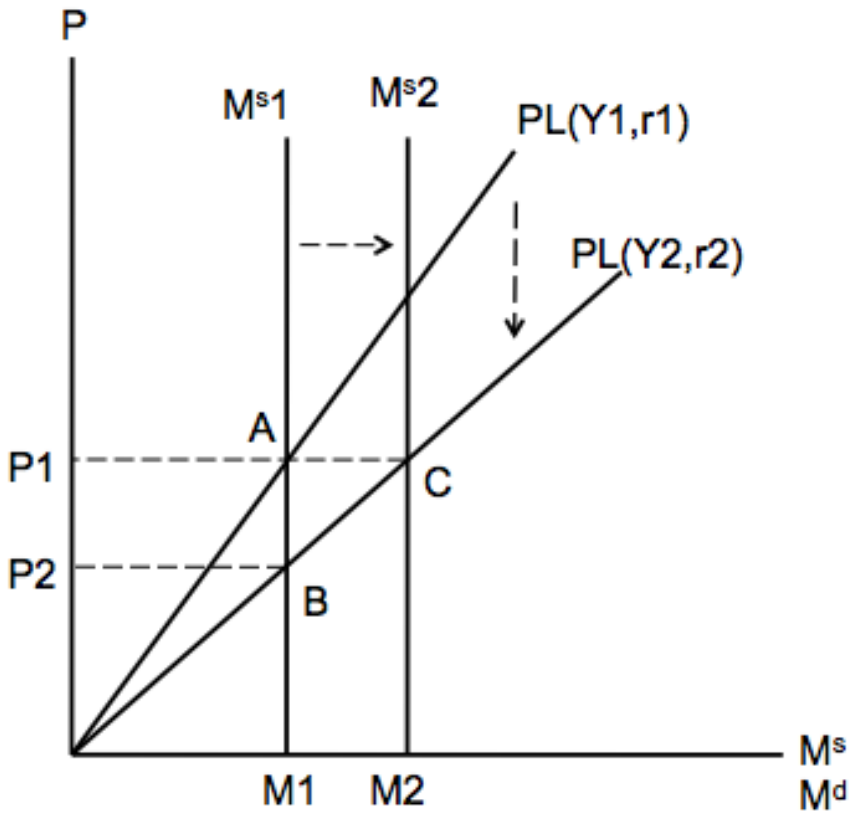
Variable	Data	Model
Consumption	Procyclical	Procyclical
Investment	Procyclical	Procyclical
Price Level	Countercyclical	Countercyclical
Money Supply	Procyclical	-
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Procyclical
Average Labor Productivity	Procyclical	Procyclical

Money in real business cycles

- Most business cycle models have neutral money: a level change in M^s has no effect on real variables; only the price changes.
- Thomas Cooley and Gary Hansen (1989) incorporates endogenous money.
  - The money supply includes bank deposits which vary with banking activity, output and income.
  - The central bank also varies the money supply to stabilize the price level.

Endogenous money

- A M^d right-shift causes the price to fall (P1 to P2).
- Endogenous money increases (M1 to M2) to stabilize the price at P1 (at C).



Money supply: cause or effect?

- The money supply trends lead trends in GDP.
  - The Keynesians and monetarists.
- The problem of statistical causality.
  - Real activity requires prior bank financing.
  - The money supply appears to lead real activity.
- The central bank correctly anticipates the real changes and adjusts the money supply to preempt the real effect.

Government role

- Money is neutral, so no role for monetary policy.
- Markets always clear, so no role for government to improve efficiency.
  - No shortages, no excess output.
  - The labor market is in equilibrium; all unemployment is ‘voluntary’.
- Short-run fluctuations are optimal responses to changes in total factor productivity.
  - Consumers continue to maximize utility while firms continue to maximize profits.
- Only government role in market failures and distortions (to reduce welfare loss).

Evaluation

- Real business cycle models fit the cycle data better than other models.
- RBC models are internally consistent and based on solid micro foundations.
- **Criticisms**: the measurement of total factor productivity (through the Solow residual) involves statistical errors.
  - Statistical calculation of z is not independent of Y.

$$Y = zF(K, N)$$

$$z = \frac{Y}{F(K, N)}$$

- During a boom, K and N are fully utilized.
  - Y is high, so z appears to be high. I
- n recession, K and N are not laid off but only underutilized.
  - The uses of K and N are artificially high.
  - But lower output (Y), so z appears to be low.
- z appears to be ‘procyclical’.

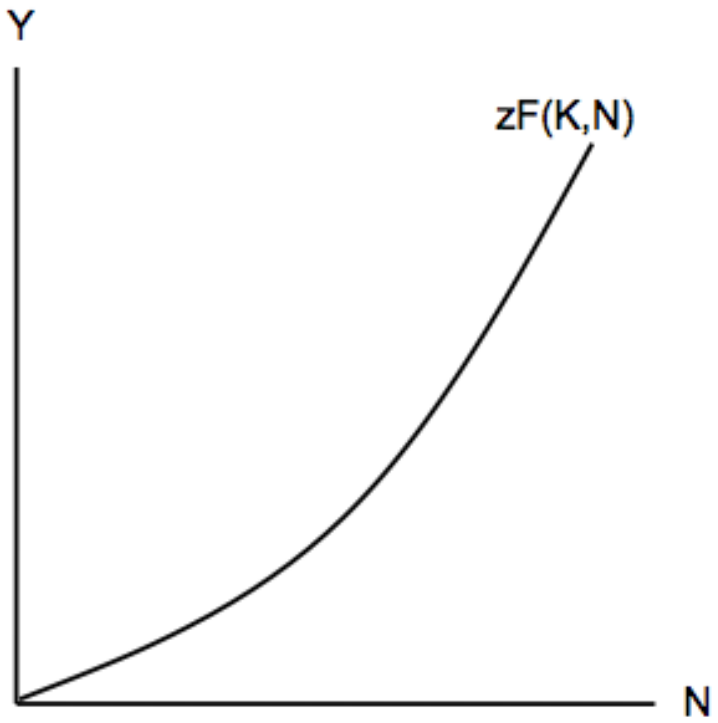
Keynesian Coordination Failure Model

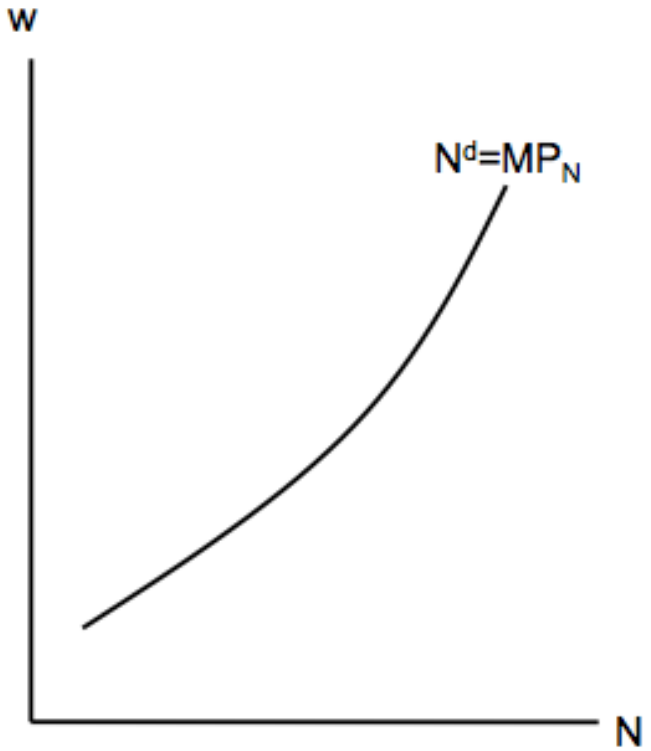
- Peter Diamond (1982), Russell Cooper and Andrew John (1988), Jess Benhabib and Roger Farmer (1994), Roger Farmer and Jang-Ting Guo (1994).
- Keynes' 'General Theory' (1936): failure of private-sector workers and producers to coordinate their actions results in chronic unemployment.

Strategic complementarities

- One person's willingness to engage in some activity increases with the number of other people engaged in that activity.
  - Going to a party, football match, concert, etc.
  - Two possible outcomes (multiple equilibria): no one goes or everyone goes.
- One producer's decision to produce depends on what other producers are doing.
- The economy with strategic complementarities yields multiple equilibria:
  - High output and employment versus low output and employment.
  - Individual firms have constant returns to scale.
  - But increasing returns to scale at the aggregate level.
- The aggregate production function is convex.
  - The marginal product of labor (and labor demand) has a positive slope.

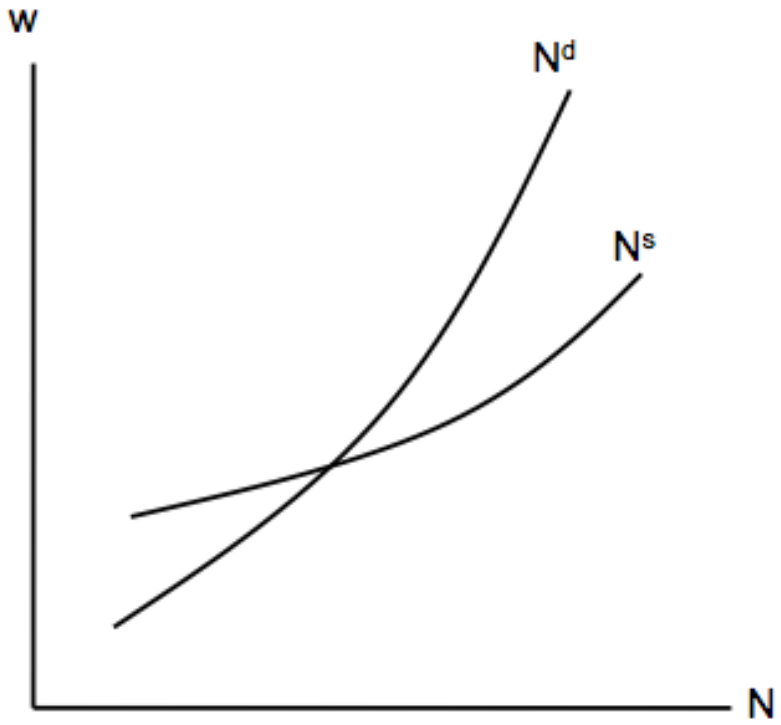
Production function with IRS





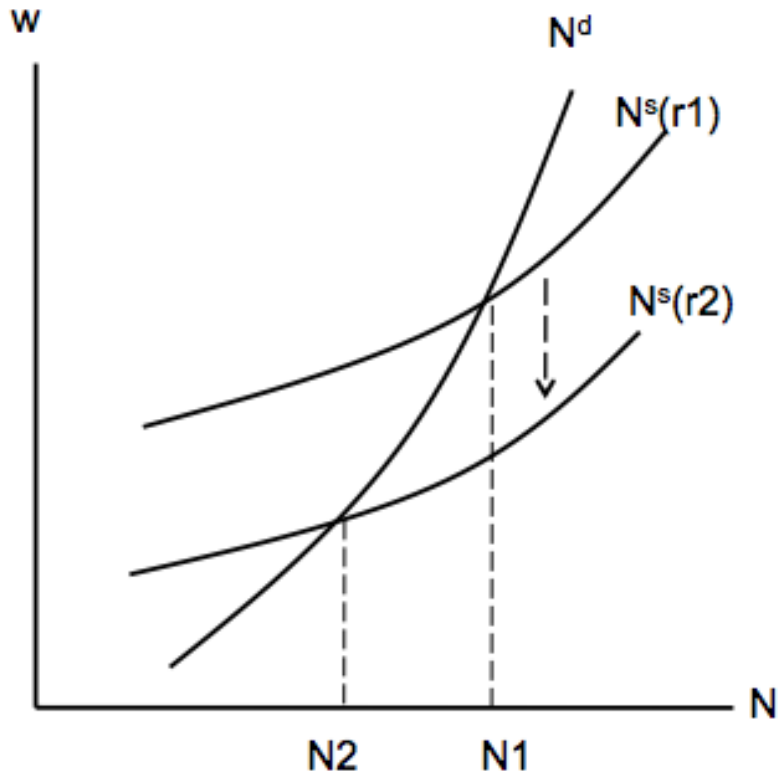
Labor market

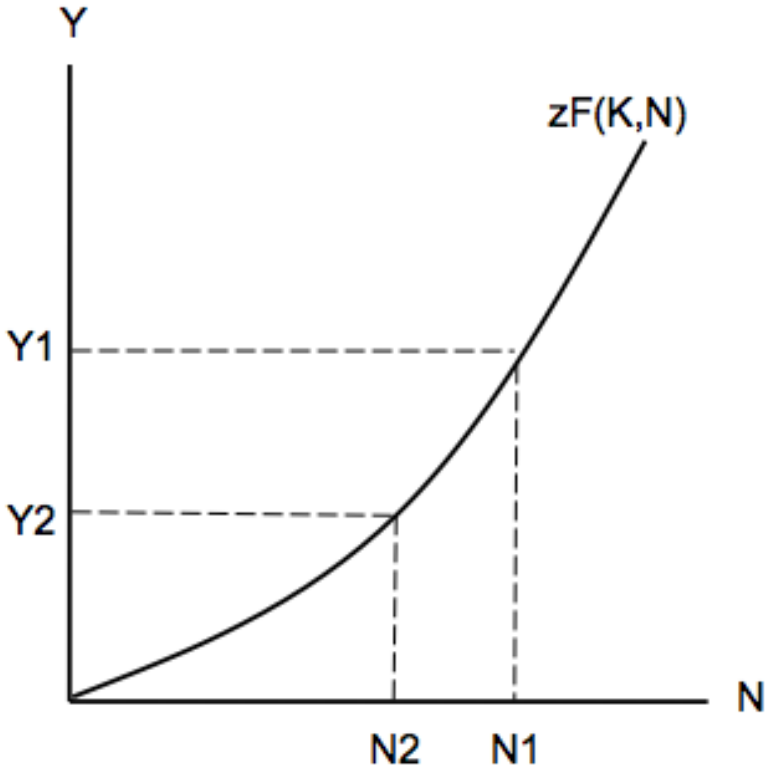
- With coordination failure, N^d must be steeper than N^S.

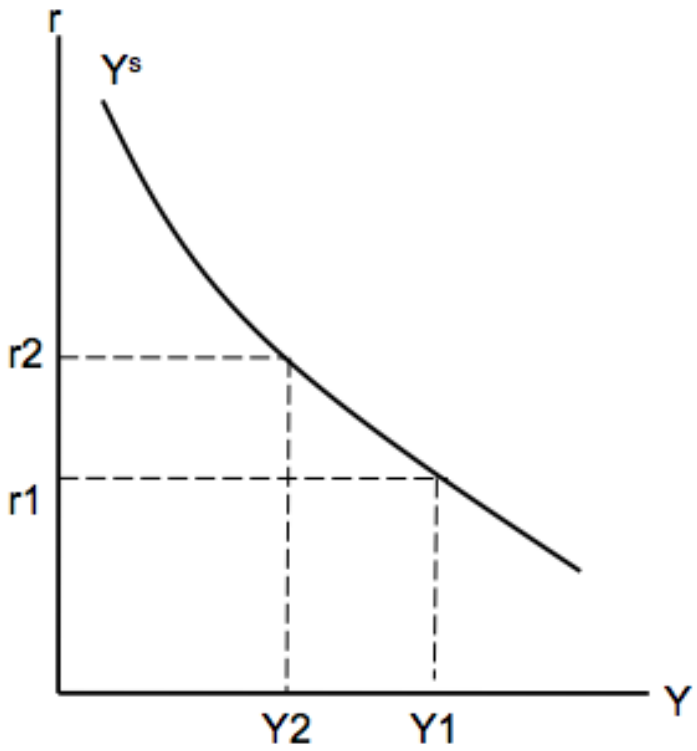


Output supply curve

- Assume ‘r’ to rise from r1 to r2.
- Labor supply increases; N^S shifts right.
- But employment decreases due to positively-sloped N^d.

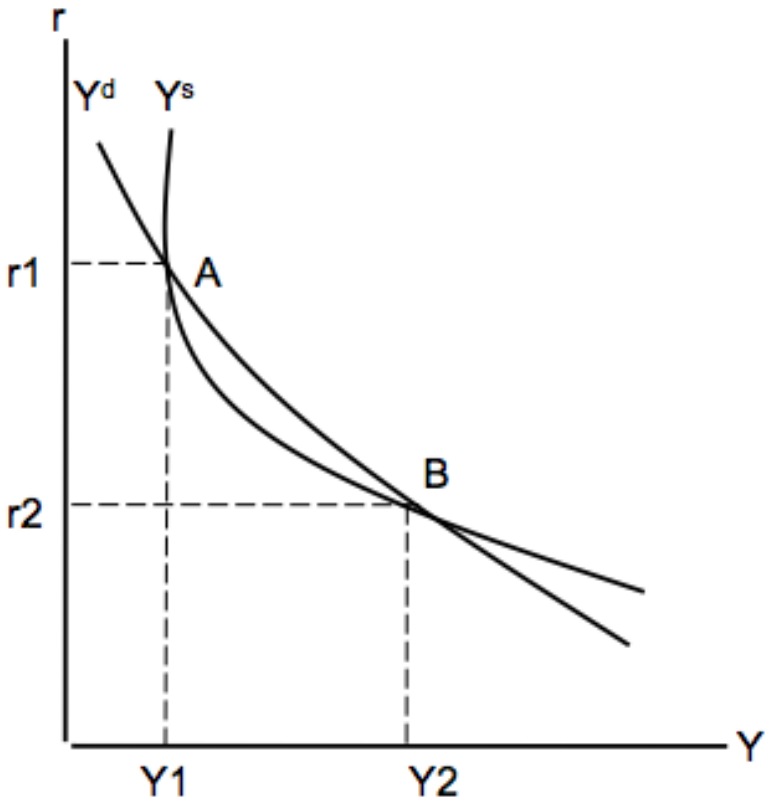



Y
zF(K,N)
Y1
Y2
N
N2
N1

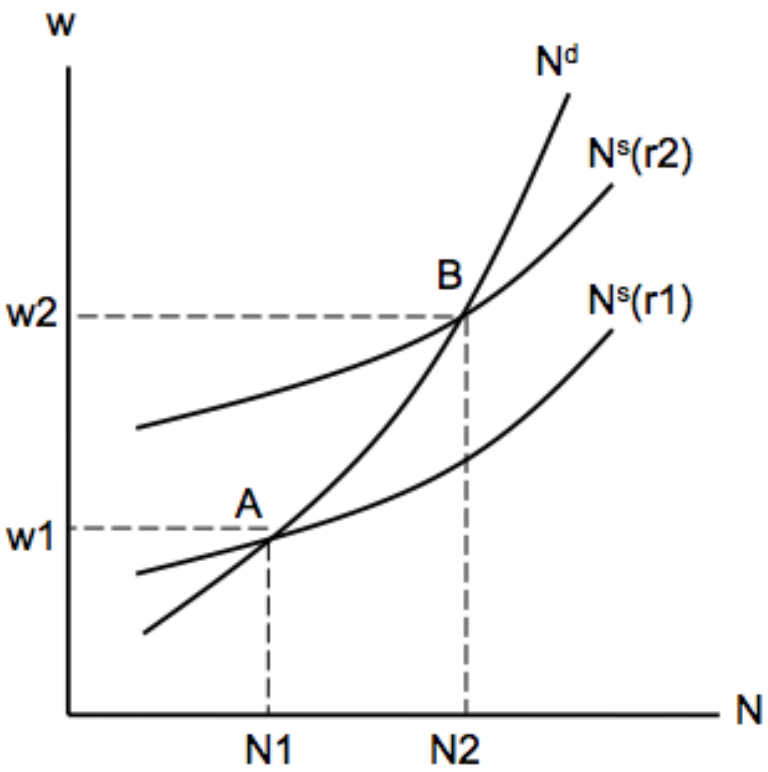

r
Y^s
r2
r1
Y
Y2
Y1

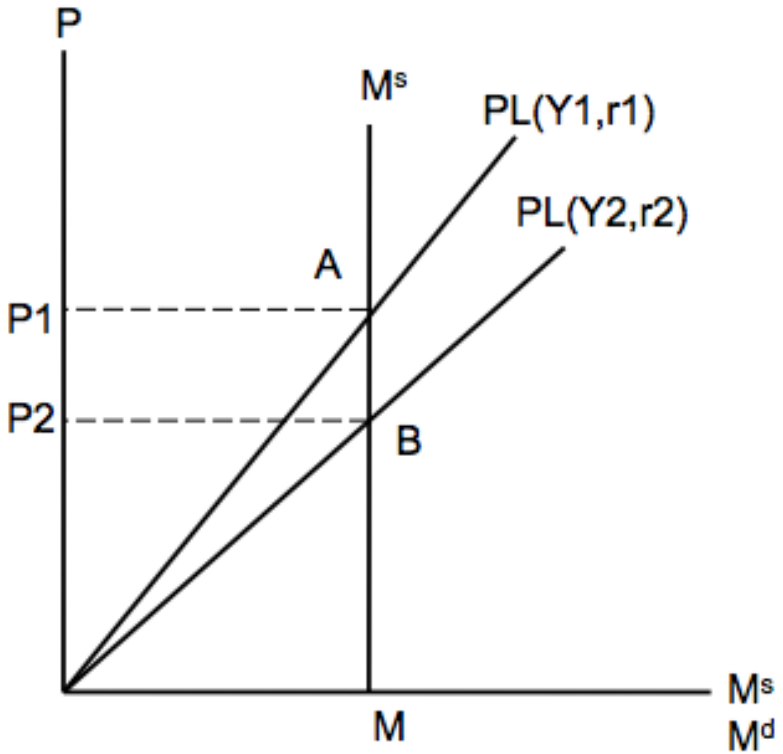
Example of coordination failure

- A = ‘bad’ equilibrium (high r and P but low y and w).
- B = ‘good’ equilibrium (low r and P but high y and w).



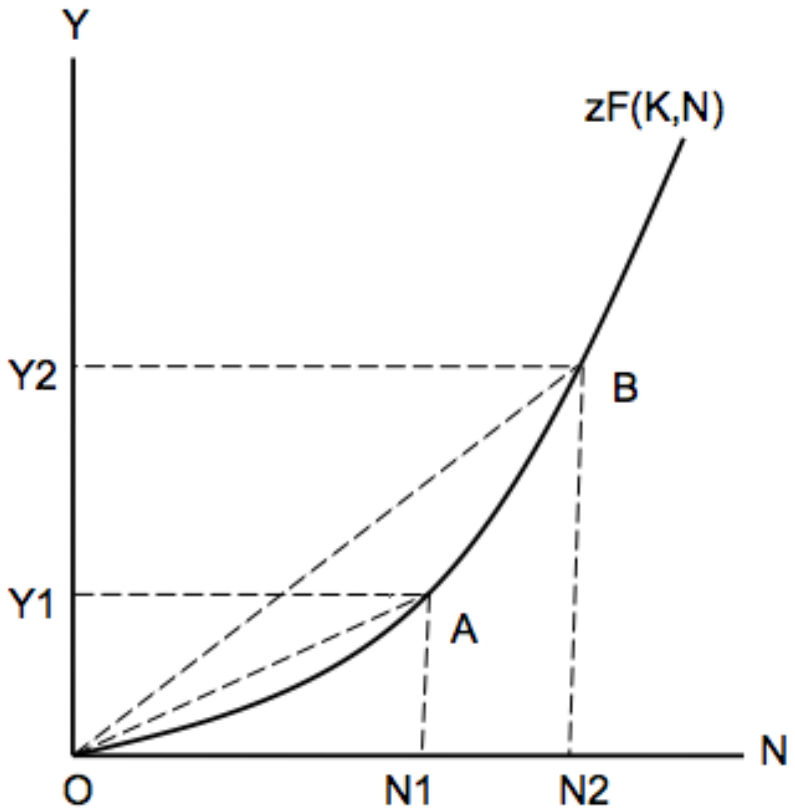
‘Bad’ and ‘good’ equilibria





Average labor productivity

- Slope of OA and OB = average labor productivity (AP_N).
- High AP_N at B but low at A.



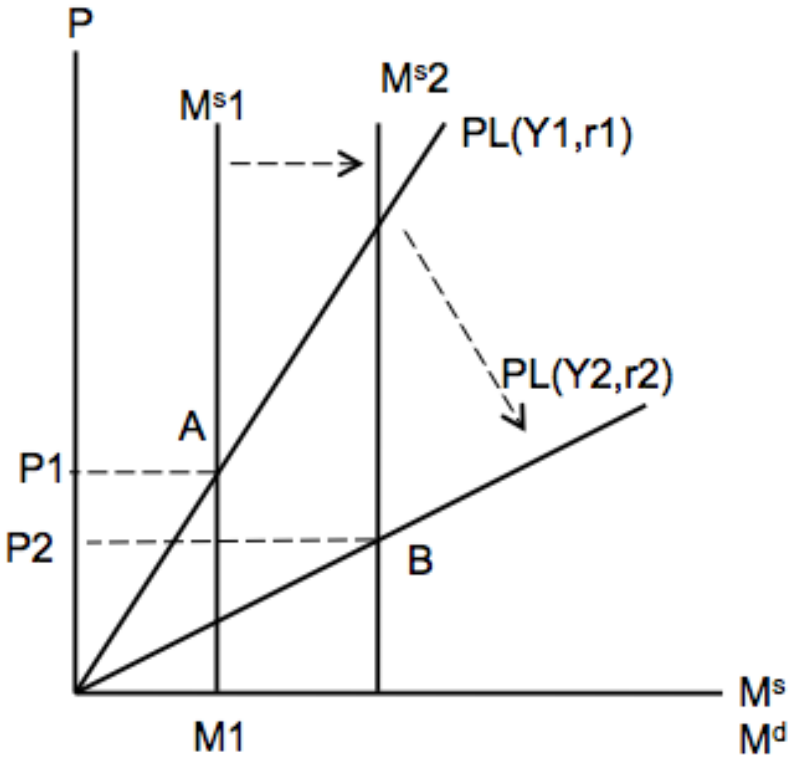
- The economy may get stuck at ‘bad’ equilibrium due to general pessimism and negative expectations.
- Business cycles result when firms and consumers are alternately optimistic and pessimistic.
  - The economy alternates between the ‘bad’ and the ‘good’ equilibria.
  - Keynes’ ‘General Theory’: investors’ animal spirits.

Sunspot behavior

- Extraneous events unrelated to the fundamentals (technology, preferences, endowments) may cause business cycles.
- Events trigger sudden changes in expectations and movement towards the other equilibrium.
- Changes in the money supply (monetary policy) may act as a sunspot variable.
    - High and low Ms triggers optimism and pessimism, respectively.

Money supply as a sunspot

- Changes in M^S trigger alternate movements between A and B.



The US's data and the coordination failure model

Variable	Data	Model
Consumption	Procyclical	Procyclical
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Price Level	Countercyclical	Countercyclical
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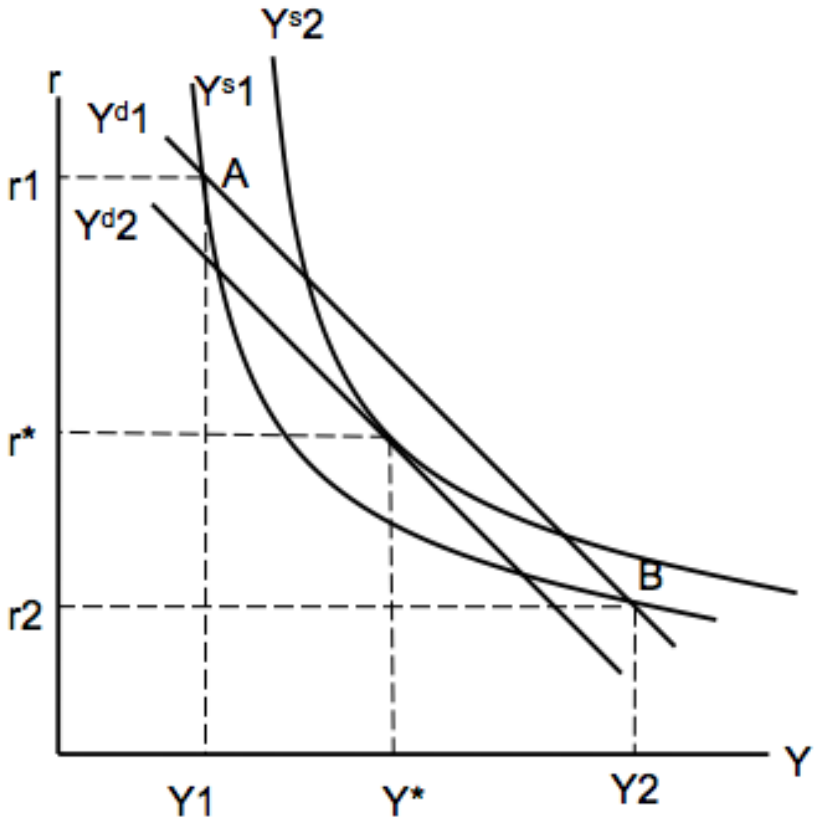
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Procyclical
Average Labor Productivity	Procyclical	Procyclical

Policy action

- Government action could affect the economy's movement towards 'good' equilibrium.
  - Government and the central bank encourage 'positive' sentiment among firms and consumers.
- Possibility for government to eliminate business cycles altogether.
  - Adjustment in government spending or taxes to achieve a unique equilibrium.

Business cycles eliminated

- A decrease in G shifts Y^d left and Y^S right.
- Multiple equilibria are eliminated.
- Single equilibrium (r*, Y*) results.



- A decrease in government spending (G) affects both output demand and output supply.
  - Current expenditure decreases, shifting Yd to the left.
  - The PV of taxes decreases and lifetime wealth increases; current labor supply decreases.
  - Y^s shifts right (due to IRS in the model).
- Social welfare is worse than 'good' equilibrium (B) but with less uncertainty and fluctuations.

Evaluation

- The model fits the cycle data well.
- Self-fulfilling expectations (optimism and pessimism) can generate business cycles.
- But the model rests on the IRS assumption.
  - labor demand is sloped upwards and steeper than labor supply.
  - Weak evidence of IRS in the economy.
- Expectations are the trigger, but they are unobservable.