

**DEPARTMENT OF FINANCE**  
**University Of Dar Es Salaam**  
**Business School**

**FN 101: Principles of Macroeconomics**

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**Lecture 4:**  
**Equilibrium in Money**  
**Markets**

# Definition of Money

- **Money** is anything serving as a **commonly** and **generally accepted medium of exchange** and **repayment of debts**.
- It is distinct from income and wealth.
- **Wealth:** total collection of pieces of property that serve to store value, e.g. houses, cars, land, etc..
- **Income:** flow of earnings per unit of time, e.g. salary, wages, profits, etc.

# Definition of Money

- **Stages in Human Development:**
- **1. Direct Production** – people produced all their needs themselves.
- No need for exchange.
- **2. Specialization** – a need for exchange (trade) arose.

# Evolution of Money and Payment System

- **A) Barter:** exchange of goods for goods.
- Where division of labour and specialization were very limited.
- **Central limitations:** 1) many goods and services and many prices.
- **2) Double coincidence of wants:** if you have apples and want nuts, need to find someone with nuts, and at the same time needs apples.
- This complicated time and transactions.
- With specialization and trade, a better medium was needed.

# Evolution of Money and Payment System

- **B) Central Allocation** – government collects output from producers and allocates it to consumers.

# Evolution of Money and Payment System

- **C) Commodity Money:** money first came in form of commodities, e.g. cattle, olive oil, beer, wine, copper, iron, gold, silver, rings, diamonds, cigarettes.
- **Problems:** Divisibility, portability, durability.
- Thus, commodity money was restricted to **valuable metals** like silver and gold (had intrinsic value of their own).
- **D) Modern Money:** with **central banks**, government could guarantee value of money, and intrinsic feature was less important.

# Evolution of Money and Payment System

- Came, **paper** currency and **coins**.
- Most today money is **bank money** (checking deposits, savings deposits), etc.
- More advanced methods of payment: checks, wire transfers, ATMs, mobile money.
- **1) Fiat Money:** paper currency decreed by governments as **legal tender** (legally accepted for payment of debts) but not convertible into coins / precious metals.
- To be used, there has to be **TRUST** in issuing authorities, and counterfeiting is difficult.

# Evolution of Money and Payment System

- **Problems:** currency and coins can be stolen, expensive to transport large amounts (bulkiness).
- **2) Checks:** instruction by the drawer to transfer money from drawer's account to someone else's account or being paid in cash when cheque is deposited.
- Allows transactions without carrying large amount of currency.
- Can be written for any amount (<10 million

# Evolution of Money and Payment System

- Loss from theft is reduced.
- **Problems:** challenge if payee is at distant location, takes days to clear and get money (closed cheque), attracts fees, can bounce back in case of insufficient funds.
- **3) Electronic Payment:** with computers and internet, bills can be paid electronically via online and internet banking, or mobile phone banking.

# Evolution of Money and Payment System

- **4) E-Money:** cash is stored and held in electronic form in a way of debit, credit and ATM cards (Visa, MasterCard, Electron).
- **Debit Cards:** don't allow to overdraw the account.
- Enable consumers to purchase goods/services electronically by transferring funds from their bank accounts to merchant accounts (POS).
- **Credit Cards:** overdrawing/borrowing from your account is permitted.

# Evolution of Money and Payment System

- **Master Card:** more advanced form of e-money.
- It stores value in it.
- It has a chip with that be loaded with cash whenever cash is needed and used to make purchases even with cell phones.
- **E-Cash:** used on internet to purchase goods/services.
- With these inventions, are moving to a cashless society???

# Evolution of Money and Payment System

- 1) Very expensive to set up computers, card readers, telecom networks, and other technologies.
- 2) Electronic means of payment raise security and privacy concerns.

# ANNOUNCEMENT

- **First Test is Schedule to take place after topic four is completed.**
- Thus, will be after next week.
- Date: 28<sup>th</sup> April, 2013.
- Venue: Yombo 4 and Yombo 5.
- Yombo 4: Accounting + HR + THM.
- Yombo 5: Banking + Finance + Marketing.
- Time: 1200 – 1400.
- Day: Sunday

# Functions of Money

- **1) Medium of Exchange:** money facilitates exchange of goods and services.
- During barter system, a **double coincidence of wants** was needed.
- **2) Unit of Account:** money is the basis of measuring value of disparate components in the economy.
- Aggregate values can be measured and compared using a common measure (**monetary prices**).

# Functions of Money

- **3) Store of Value:** money allows individuals to save their current income and store wealth in paper money, bank accounts, MM instruments and other forms of money.
- **4) Standard of Deferred Payment:** money allows settlement of debts and contracts in the future, e.g. hire purchase, mortgages, long-term construction works, etc.

# Qualities of Good Money

- For any asset to be considered as money and fulfil the functions above, it must possess following qualities:
- **1) Acceptability:** readily and generally acceptable as a medium of exchange, unit of account, and means of settling debts and contracts.
- **2) Durability:** money should not wear out quickly.
- This is a problem with paper money.

# Qualities of Good Money

- **3) Homogeneity:** money should be uniform and easily recognized.
- **4) Divisibility:** modern notes and coins allow many permutations of divisibility:
  - Notes: 10000, 5000, 2000, 1000 and 500.
  - Coins: 200, 100, 50, 20, 10, 5.

# Qualities of Good Money



# Qualities of Good Money



# Qualities of Good Money



# Qualities of Good Money



# Qualities of Good Money



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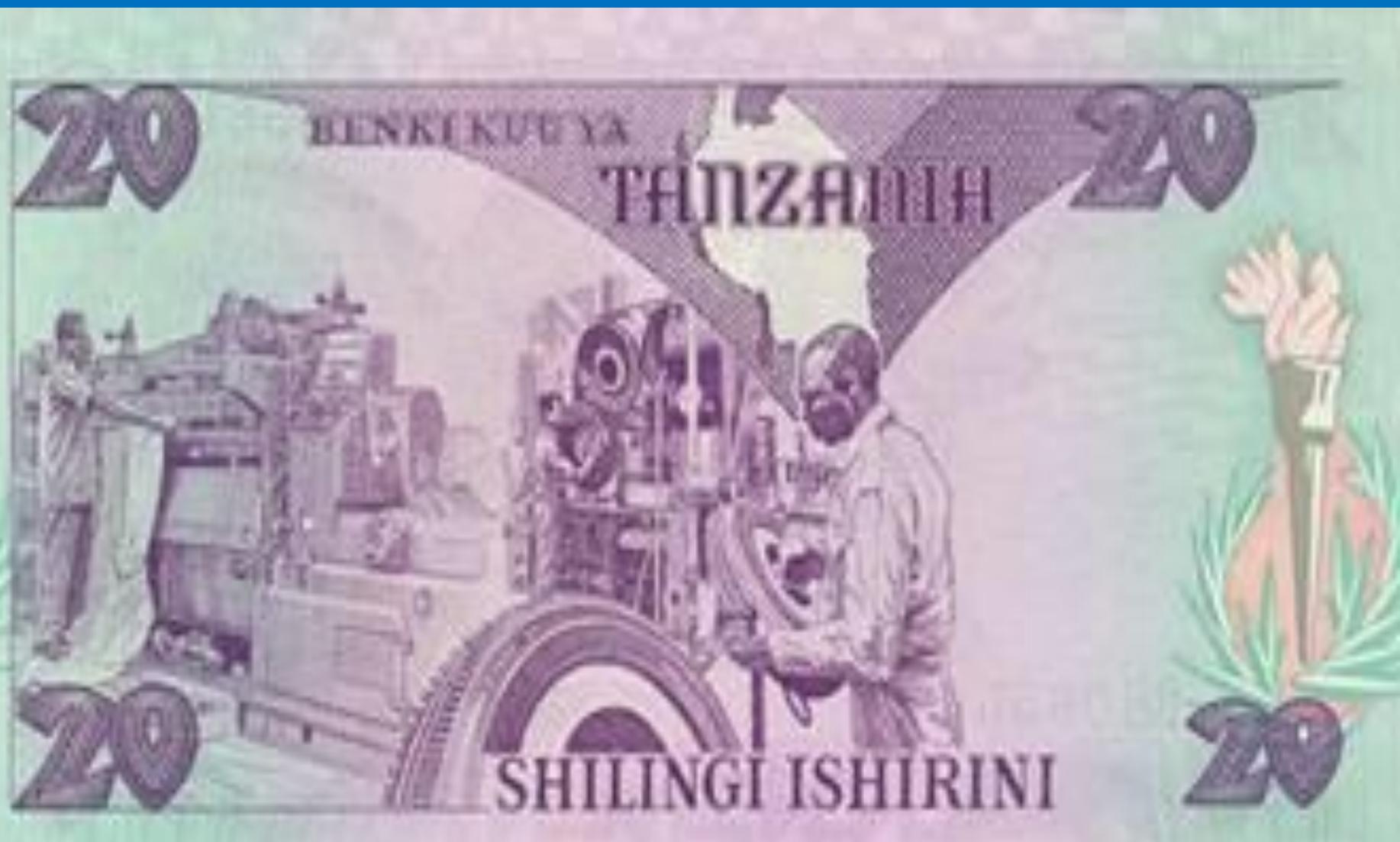
# Qualities of Good Money



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# Qualities of Good Money



# Qualities of Good Money



# Qualities of Good Money



# Qualities of Good Money

- **5) Portability:** paper money and coins are difficult to transport when bulky.
- Modern bank accounts and checks allow electronic transmission from account to account.
- **6) Stability of Value:** money should retain its value.
- Stability with **modest inflation**.
- During **hyperinflationary** times, money can lose its function as a store of value.

# Qualities of Good Money

- **7) Difficult to Counterfeit:** since money has only exchange value and not intrinsic value, it is essential that possibilities of fraud and counterfeit are kept at minimum.
- **8) Scarcity:** to be valuable, money should be relatively and reasonably scarce.
- Otherwise it would lose its value, e.g. hyperinflationary case of Zimbabwe.

# Central Banking Systems

- Central banks are among most important players in financial system.
- In charge of monetary policy.
- Its actions affect interest rate, amount of credit, money supply which ultimately affects aggregate output and inflation.

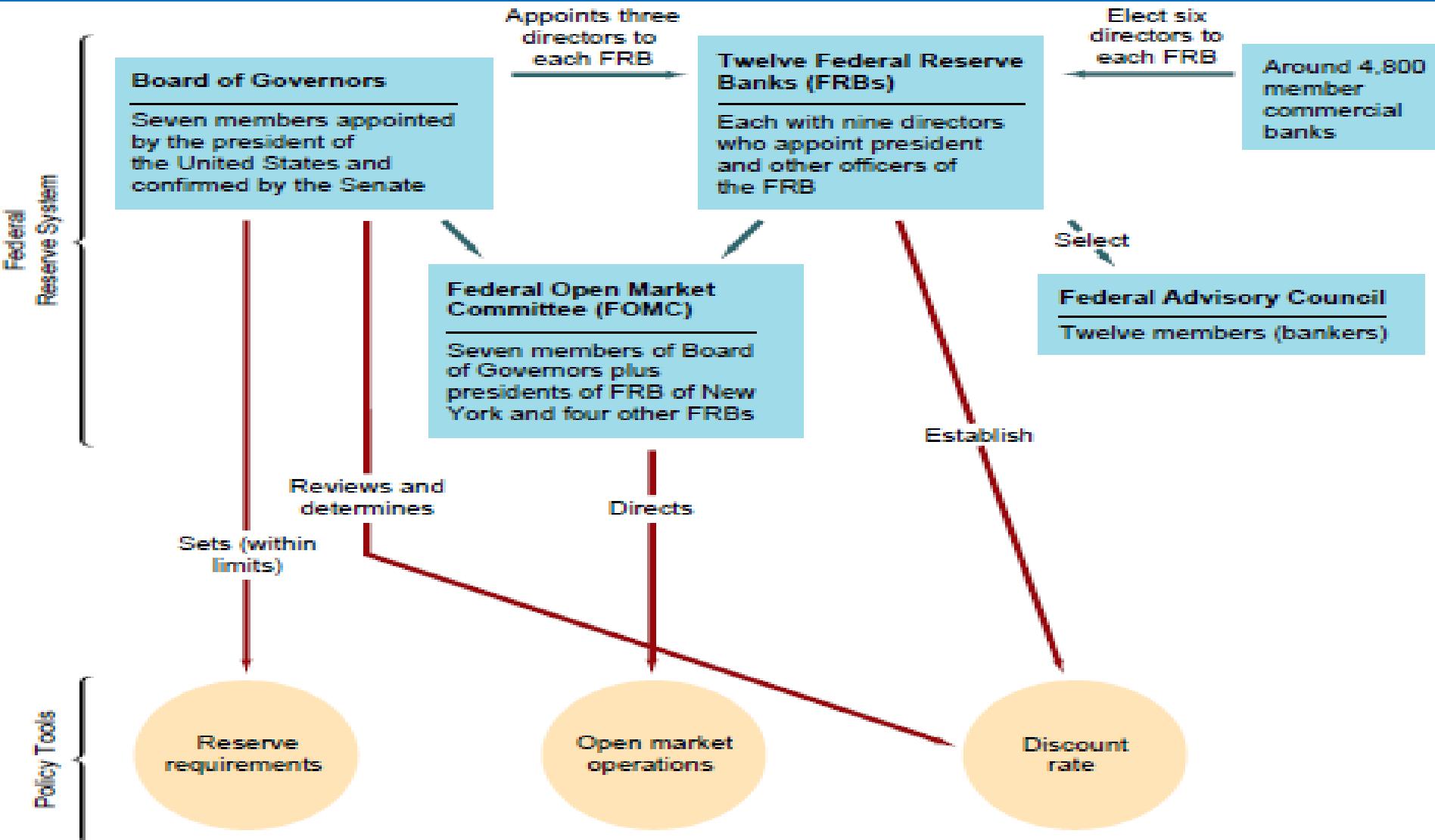
# Federal Reserve System

- Most powerful of all central banks.
- Has most **unusual structure**.
- **American Politics:** fear of centralized power before 20<sup>th</sup> century.
- Traditional distrust of moneyed interests of the Wall Street.
- Attempts to establish central banks in 1811 and 1836 failed.
- Financial panics flowed in 1907 with widespread bank failures.

# Federal Reserve System

- Congress wrote in 1913 elaborate system of **checks and balances** into Federal Reserve Act.
- Fed has **twelve** Federal Reserve banks.
- Power is diffused in regional lines, btn private sector and government, and in bankers, business people, and public.
- **Entities:** Federal Reserve banks, the Board of Governors of the Federal Reserve System, the Federal Open Market Committee (FOMC), the Federal Advisory Council, and 2,800 member commercial banks.

# Federal Reserve System



# Functions of the Fed

The Fed performs important functions for banks including:

- Clearing interbank payments.
- Regulating the banking system.
- Assisting banks in a difficult financial position.
- Managing exchange rates and the nation's foreign exchange reserves.

# Functions of the Fed

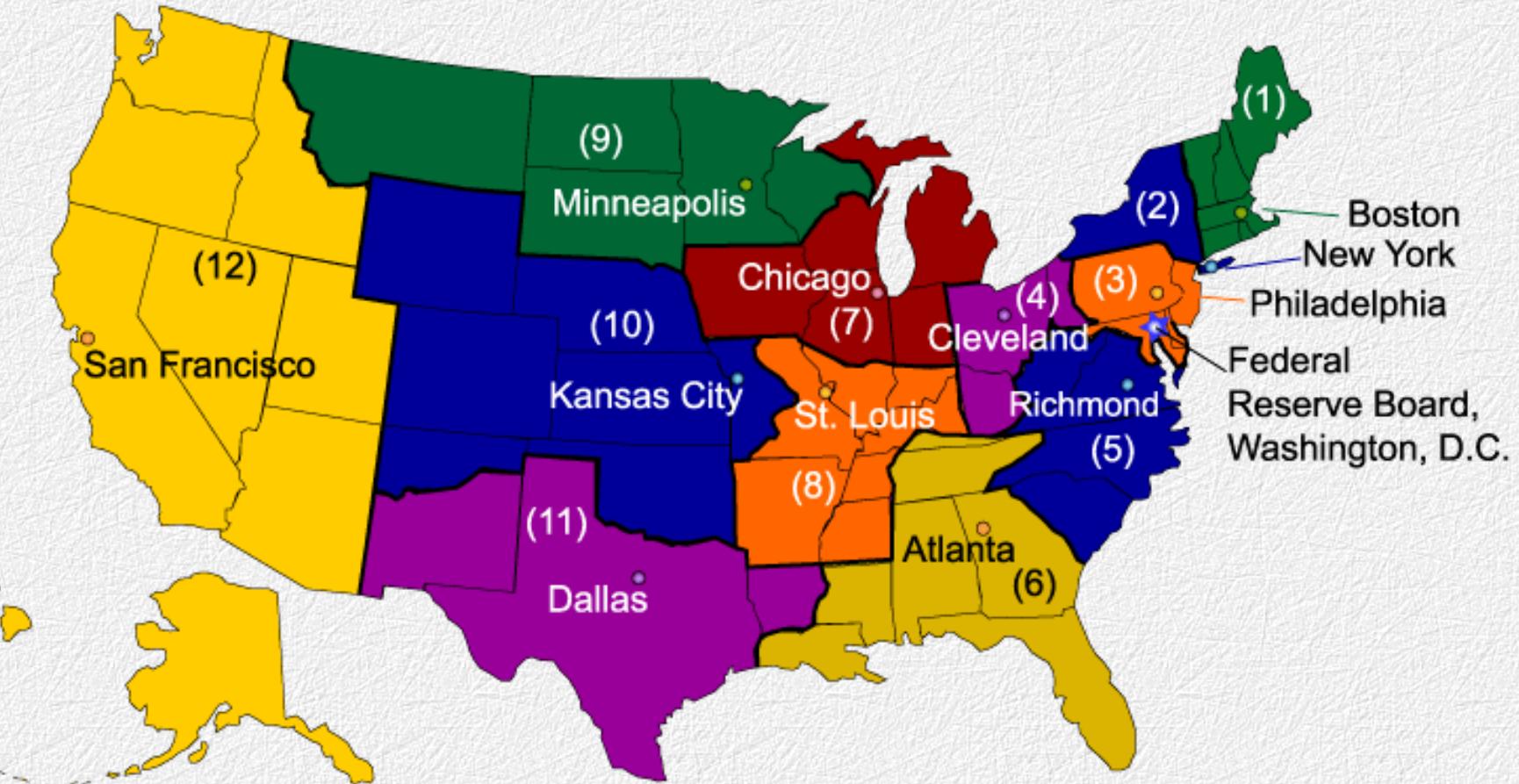
The Fed performs important functions for banks including:

- Control of mergers between banks.
- Examination of banks to ensure that they are financially sound.
- Setting of reserve requirements for all financial institutions.
- *Lender of last resort.*

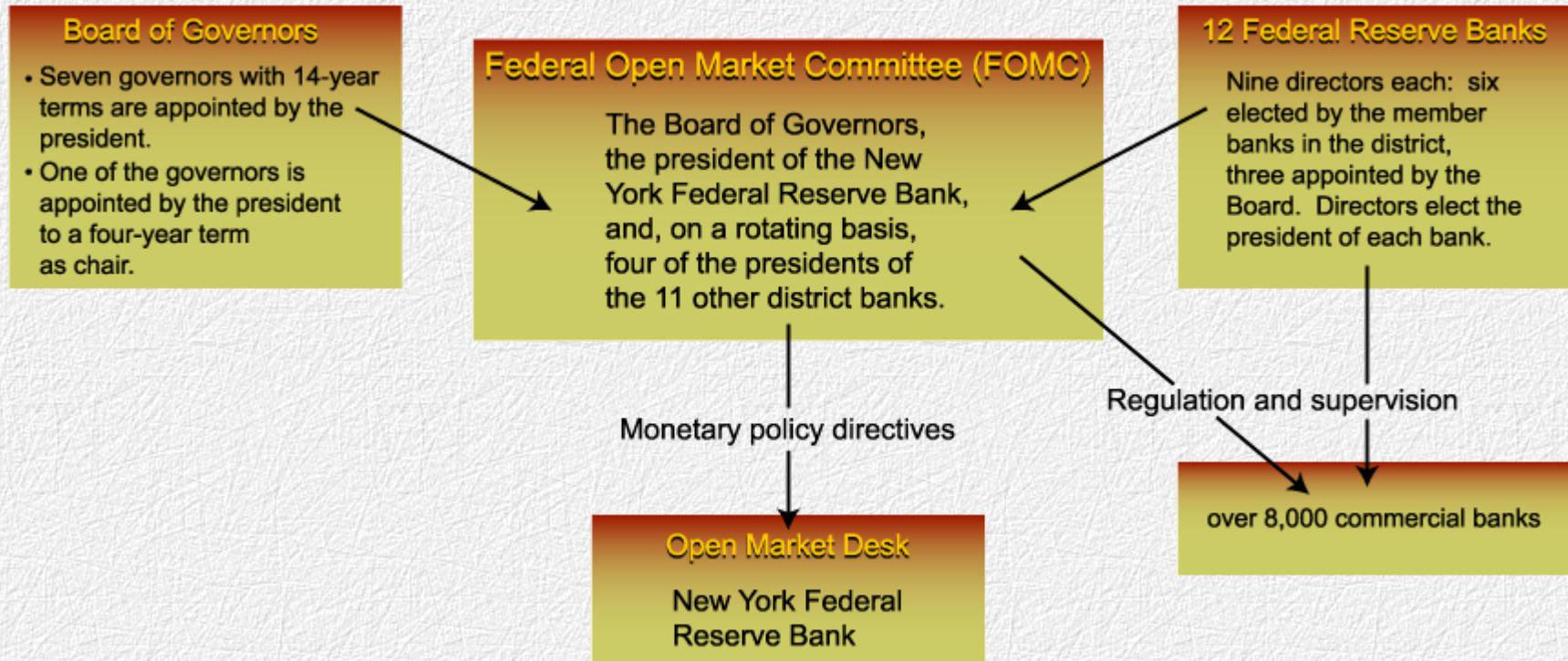
# Structure of the Federal Reserve System

- **Federal Reserve Banks:**
- Are in twelve Federal Reserve districts.
- A quasi-public (private and government), owned by private commercial banks.

# The Federal Reserve System



# The Federal Reserve System



# Structure of the Federal Reserve System

- They clear checks, issue new currency, withdraw damaged currency, administer and make discount loans in their district, evaluate proposed mergers and acquisitions, liaison b/t business community and Fed, examine bank holding companies and state chartered member banks, collect data on local business conditions, and research on monetary policy.
- Their influence on monetary policy:
- 1) Directors establish discount rate in their district.

# Structure of the Federal Reserve System

- 2) Decide which banks to obtain discount loans.
- 3) Directors select one commercial banker to serve on Fed Advisory Council (consults with the Board).
- 4) Five of 12 bank presidents, each has a vote on the FOMC.
- **Member Banks**
- All national banks and depository institutions.
- Keep deposits at the Fed (reserve requirements).

# Structure of the Federal Reserve System

- Access the discount window.
- **Board of Governors of the Federal Reserve System**
- Has seven members appointed by the President and confirmed by the Senate.
- They head the Fed system.
- President's control over the Fed is limited.
- Governors serve one full non-renewable fourteen year term plus another term.
- Chairman is chosen among the governors and serves a four-year renewable term.

# Structure of the Federal Reserve System

- Seven governors are among twelve members of the FOMC (plus five presidents of federal banks).
- Board makes monetary policy, sets reserve requirements, and controls discount rate.
- Chairman advises president on economic policy, testifies in Congress and speak for the Fed in the media.
- **Federal Open Market Committee (FOMC)**
- Meets eight times per year.

# Structure of the Federal Reserve System

- Makes decisions regarding conduct of OMOs that influence money supply and interest rate.
- Consists of seven governors of Fed, president of Federal Reserve Bank of NY, and four other presidents of Federal Reserve Banks.
- Chair of Fed is also the Chair of FOMC.
- FOMC advises on setting reserve requirements and discount rate.
- Given these checks and balances, whey then the Chairman of the Fed really runs the show?

# Structure of the Federal Reserve System

- 1) The media pays attention to every word the chairman speaks.
- He is the most powerful economic policy maker in the world.
- Ron Paul says: “Even more powerful than the President”
- 2) Spokesperson for the Fed, and negotiates with Congress and the President.
- 3) He sets agenda for the Board and the FOMC meetings.

# Structure of the Federal Reserve System

- 4) He is first to speak and first to vote in meetings.
- 5) He influences the board through force of stature and personality.
- Chairmen of the Board (Marriner Eccles, William Martin, Jr, Arthur Burns, Paul Volcker, and Alan Greenspan) have been men of exceptional personalities and have wielded great power.

# Structure of the Federal Reserve System

- 6) Chairman supervises staff of professional economists and advisers, some of which will become future leaders of the Fed.
- Should the Fed be **Independent?**
- The Fed is probably the most independent government agency in the US.
- **Proponents** argue for this independence because:
- 1) Subjecting the Fed to more political pressures would impart an inflationary bias to monetary policy.

# Structure of the Federal Reserve System

- Politicians are short-sighted, driven by need to win election, are unlikely to focus on long-run objectives such as price stability.
- Political process leads to political business cycles.
- **Before Election:** expansionary policies to lower unemployment and interest rate.
- **After Election:** bad effects (high inflation, high interest rates) set in requiring contractionary policies, hoping the public will forget.

# Structure of the Federal Reserve System

- 2) Putting the Fed under control of President, will make it instrument of financing large budget deficits (purchasing T.Bonds).
- 3) Politicians lack expertise of making hard monetary policy decisions of great economic important, e.g. reducing budget deficit, reforming the banking sector, etc.
- **Opponents** argue that:

# Structure of the Federal Reserve System

- 1) Undemocratic to have monetary policy which affects everyone in the economy controlled by elite group of people that are responsible to no one.
- The public holds the President and the Congress responsible for economic well being of the country, yet they lack control over a government agency most important in determining health of the economy.

# Structure of the Federal Reserve System

- 2) To promote economic stability, monetary policy must be coordinated with fiscal policy, need to put monetary policy under politicians.
- 3) The Fed failed to use its freedom to prevent the Great Depression, and in 1960s and 1970s, it pursued overly expansionary policies.

# Bank of Tanzania (BOT)

- Monetary history started with establishment of the East African Currency Board in 1919.
- Main function was to provide for and control supply of currency in East Africa.
- Bank of Tanzania was established in 1965 (**Bank of the Tanzania Act**).
- Performed all traditional central banking functions.
- **Arusha Declaration 1967:** most instruments of monetary policy were inoperative.

# Bank of Tanzania (BOT)

- Act amended in 1978, 1995, and now the 2006 Act is in force.
- **Primary Objectives of BOT:**
- Due to negative effects of inflation in 1980s, 1990s, **PRICE STABILITY** was made the longer term single objective.
- **Why?**
- Inflation is caused by excessive creation of money (especially during Kagera war), and central bank can regulate quantity of money through monetary policy.

# Bank of Tanzania (BOT)

- Other **subsidiary objectives** were:
- **1) Bank of Issue:** sole right to issue notes and coins in Tanzania for purpose of influencing amount of currency in circulation, and provide economy with sufficient non-inflationary liquidity.
- **2) Banker's Bank:** accepts deposits from banks (required, and excess reserves), discounts commercial and government paper, and lender of last resort.

# Bank of Tanzania (BOT)

- **3) Government's Bank:** banker and fiscal agent of the government, lends and is depository of the Government.
- **4) Advisor to the Government:** advises the government on its functions, powers and duties; credit conditions, any proposal, measures and transactions related to it.
- **5) Guardian of Country's International Reserves:** depository of official external assets (gold and foreign currency reserves).

# **Bank of Tanzania (BOT)**

- **6) Supervision of Banks and Financial Institutions:** ensuring commercial banks and other FIs conduct business on sound prudential basis and according to various laws and regulations in force.
- **7) Promotion of Financial Development:** establishment of effective financial system for smooth functioning of economy, and transactions carried out at minimum cost and time.

# Organization of BOT

- **Board of Directors:** supreme policy decision making body.
- Has ten members: four ex-officio, and six appointed by the Minister for Finance and Economic Affairs.
- **Ex-Officio members:** Governor, Deputy Governor (both appointed by President for five years term) and two principal secretaries of ministries of finance (Tanganyika & Zanzibar).

# Organization of BOT

- It has **11 Directorates**: Banking, Bank Supervision, Economic Policy, Finance, Financial Markets, MIS, Personnel and Administration, Training Institute, NPS, Microfinance, and Secretary of the Bank.

# Conduct of Monetary Policy at BOT

- Bank uses combination of **monetary targets** (e.g.  $M_3$  growth rate) and **inflation targets** to set monetary policy.
- BOT announces policy targets and explains monetary policy to the public.
- It focuses exclusively on rate of change of **CPI** excluding food prices (**non-food inflation rate**).
- Food prices are affected by **non-monetary factors** like drought and floods.
- **Monetary Policy Tools:**

# Conduct of Monetary Policy at BOT

- **1) Open Market Operations (OMO):**  
management of money supply by selling or buying government securities (T-bills, T-bonds) in open market to influence the monetary base.
- The **purchase** of securities (expansionary) from commercial banks and nonbanks results to increase in central bank securities and money supply respectively.
- Liquidity of banks increases thus pushing down interest rates.

# Conduct of Monetary Policy at BOT

- **Sale** of securities (contractionary policy) reduces central bank's securities and money supply, bank liquidity decreases, and interest rate rises.
- **2) Minimum Reserves Policy:** banks hold percentage of liabilities (DD, SD, TD, FCD, short and medium term borrowing) as required reserves (SMR) with central bank.
- **Decrease** of SMR (**expansionary**) increases bank liquidity, increases multiplier and increases money supply that pushes down interest rates.

# Conduct of Monetary Policy at BOT

- **Increase** in SMR (**restrictive**) reduces bank liquidity, multiplier and that decreases money supply and pushes up interest rates.
- **3) Foreign Exchange Market Operations (FEMO)**: central bank sale and purchase of foreign currency to maintain **fixed exchange rate** (fixed exchange rate regimes) or **smoothen** undesirable fluctuations in exchange rates (flexible exchange rate regime).

# Conduct of Monetary Policy at BOT

- Thus influence international flow of funds to reduce disruptions to monetary policy from FX markets.
- **Purchase** of FX (**expansionary**) increases central bank FX and increase local currency supply thus decreasing interest rate.
- **Sale** of FX (**restrictive**) reduces central bank FX and reduce local currency supply thus increasing interest rates.
- **4) Direct Credit Controls:** upper limit of credit by banks to nonbanks set by central bank.

# Conduct of Monetary Policy at BOT

- Can be absolute amount or growth rate.
- Sharpest weapon of restrictive monetary policy.
- Only effective if extensive controls are introduced bse of frequent evasions.
- Against the market oriented economy.
- **5) Selective Monetary Controls:** use of certain types of bills or differentiated discount rates to certain sectors.
- Against market oriented economy.
- Endangers independence of the central bank.

# Conduct of Monetary Policy at BOT

- **6) Moral Suasions:** attempts of central bank to influence behaviour economic units (government, banks, nonbanks) using means of communications (reports, studies, speeches).
- Works well with more central bank independence.
- **7) Gentlemen's Agreements:** voluntary agreements btn central bank and government, banks, nonbank, e.g. restrained wage policy.

# Measuring Money Supply

- **Different assets** have been used as money.
- With financial innovation, more products that constitute money are in place.
- Which assets precisely define money?
- **Approaches:** transaction and liquidity.
- **Transaction Approach:** money as medium of exchange.
- **Liquidity Approach:** money as store of value.
- Why measure money supply?

# Measuring Money Supply

- Relationship exists btn money supply and economic variables (output, prices, interest rate, etc.)
- How to use money supply to influence this relationship.
- **Monetary Aggregates:** measures of money supply.
- **Federal Reserve Definitions:**
- $M_1$  is the narrowest definition (transactions approach): money as medium of exchange).

# Measuring Money Supply

- $M_2$  is a broader medium of exchange (liquidity approach).
- $M_3$  and L are broader medium of exchange and very short-term store of value.
- **Symbols:**
- CC = currency in circulation,
- DD = demand deposits,
- TC = travellers' cheques,
- STD (small-denomination time deposits up to \$100,000),
- SD = savings deposits,

# Measuring Money Supply

- MM = money market deposit accounts,
- NMM = non-institutional money market fund shares, REPO = overnight repurchase agreements,
- OED = overnight Eurodollars,
- LTD = large denomination time deposits (negotiable time deposits),
- IMM = institutional money market funds,
- TREPO = term repurchase agreements,
- TED = term Eurodollars,
- TB = treasury bills,

# Measuring Money Supply

- CP = commercial papers,
- SB = savings bonds,
- BA = bankers acceptances,
- L = money market non-bank fund holdings.
- $M_1 = CC + DD + TC$ ,
- $M_2 = M_1 + STD + SD + MM + NMM + REPO + OED$ ,
- $M_3 = M_2 + LTD + IMM + TREPO + TED$ ,
- $L = M + TB + CP + SB + BA$
- **Bank of Tanzania Definitions:**
- **Symbols:**

# Measuring Money Supply

- CC = currency outside the banking system (outside BoT and banks),
- DD = demand deposits (quasi money),
- TD = time deposits,
- SD = savings deposits,
- FCD = foreign currency deposits.
- $M_1 = CC + DD$ ,
- $M_2 = M_1 + TD + SD$ ,
- $M_3 = M_2 + FCD$ .
- Comparing and contrasting Fed and BoT

# Measuring Money Supply

- **Incremental** approach is used in both cases, e.g. M2 contains all items in M1 and additional.
- Different aggregates are used due to their **purposes** (means of payment, or store of value).
- Different aggregates have different **impacts** on some economic variables.
- In SR, aggregate grows at **different rates** and in different directions.
- Over LR, aggregates broadly move together.
- Definitions are thus more relevant in SR.

# Measuring Money Supply

- **Monetary policy objective:** how aggregates affect GDP, inflation and employment, thus focus on best definition to use.
- In most economies,  $M_2$  is the best measure.
- 1) Explains better relationship btn money and economic variables.
- 2) Can be estimated/measures with good degree of accuracy.
- 3) Easy to manage.
- 4) Balances the transactions and liquidity definitions.



# Money Creation and Deposit Multipliers

- Deposits of banks are largest component of money supply.
- Important to understand how they are created.
- **Four Players** in Money Supply Process:
- **1) Central Bank:** oversees banking system and conducts monetary policy.
- **2) Depository Institutions:** accept deposits and make loans.
- Include: banks, savings and loans associations, mutual savings banks, and credit unions.

# Money Creation and Deposit Multipliers

- **3) Depositors:** individuals and institutions that hold deposits in banks.
- **4) Borrowers:** individuals and institutions that borrow from banks and issue bonds to depository institutions.
- Of the four players, central bank is the most important since it conducts monetary policy.

# Central Bank Balance Sheet

- Increase in either currency in circulation or reserves (liabilities) increases money supply.
- Sum of CC and R is monetary base.
- $MB = CC + R$ .
- **Currency in Circulation (CC):** amount of currency in hands of public.
- Excludes currency in depository institutions.
- **Reserves (R):** cash in hands of depository institutions (vault cash plus balances at central bank).

# Central Bank Balance Sheet

| Central Bank Balance Sheet |                         |
|----------------------------|-------------------------|
| Assets                     | Liabilities             |
| Government Securities      | Currency in Circulation |
| Discount Loans             | Reserves                |

- $R = RR + ER$ .
- **Required Reserves (RR)** – reserves banks are required to hold at central bank.
- **Excess Reserves (ER)** – additional reserves banks choose to hold.
- Fraction of R held at central bank is **required reserve ratio**, don't earn interest.



# Central Bank Balance Sheet

- **Assets:** treasury papers and discount loans.
- Changes in assets lead to change in reserves and money supply.
- Also, central banks assets earn interest, while liabilities don't, central bank makes a lot of money when acquiring these assets.
- **Government Securities:** holding of treasury bills, bonds and notes.
- **Discount Loans:** loans made to banks by central bank.
- Attract interest rate (discount rate).

# Central Bank Balance Sheet

- MB (**high-powered money**) = CC + R.
- When real GDP increases, economy needs to increase money supply.
- Central bank therefore prints money.
- To whom does this money belong?
- Additional money belongs to government (**issuing authority**).
- Printing creates more revenue for the government (**seigniorage**).
- How? Application fee when government borrows money, rolling over (interest difference)



# OMO and Discount Loans

- OMO and discount loans change assets and liabilities.
- OMO increase government securities (non-borrowed monetary base, **MBN**).
- Discount Loans increase borrowed monetary base (**MBB**).
- To banks, proceeds from discount loans (**borrowed reserves**), and from government securities (**non-borrowed reserves**).
- Central bank has **complete control** over OMO (sets price, and auctions the trade).



# OMO and Discount Loans

- For discount loans, it sets the rate and terms and conditions, banks decide how much to borrow.
- OMO is a preferred tool of choice.

# Deposit and Money Multiplication

- Money multiplier links MB and MS ( $\Delta M^S / \Delta MB$ ).
- $\Delta M^S / \Delta MB > 1$ , ***multiple deposit creation process.***
- **Stage One:** no currency or excess reserves (**simple deposit multiplier**).
- **Stage Two:** introduce currency and excess reserves (**complex deposit multiplier**).

# Multiple Deposit Creation: A Simple Model

- To develop a simple model, following assumptions are key:
- 1) All transactions are conducted in banking system (**no CC**).
- 2) Banks maintain a percent of DD as required reserve (**required reserve ratio**).
- 3) Banks don't hold excess reserves since no interest is earned.
- 4) Borrowers don't hold proceeds of loans as currency but deposit them back into the banking system.

# Simple Deposit Multiplier

- Shows maximum change in bank deposits for a given change in bank reserves ( $\Delta D / \Delta R$ ).
- **Case of OMO (Symbols):**
- $B$  = Monetary Base
- $R$  = Total Reserves
- $D$  = Checkable/Demand Deposits

# Simple Deposit Multiplier

- C = Currency in Circulation
- RR = Required Reserves
- $r = RR/D =$  Required Reserve Ratio
- ER = Excess Reserves

# Steps/Arguments in OMO Purchase:

- 1. Central bank buys government security from a bank – B increases.
- 2. Bank receives central bank cheque, reserves increase – all proceeds are ER.
- 3. Bank gives loans equal to ER.
- 4. The loan is spent by borrower.
- 5. Borrower's cheque recipients deposit money in banking system (D increases).

# Steps/Arguments in OM

## Purchase:

- 6. Banks are required to hold fraction of deposits as RR ( $R/D = r$ ).
- 7.  $[1 - r]$  is excess reserve (ER).
- 8. Banks lend out ER, taking us back to step (4) and process repeats.

# T-Accounts – OM Purchase from a Bank (Tshs. 100 bn)

| Banking System |      |             |  |
|----------------|------|-------------|--|
| Assets         |      | Liabilities |  |
| Securities     | -100 |             |  |
| Reserves       | 100  |             |  |

| Central Bank |     |             |     |
|--------------|-----|-------------|-----|
| Assets       |     | Liabilities |     |
| Securities   | 100 | Reserves    | 100 |

- MB increases by Tshs. 100 bn.

# T-Accounts – OM Purchase from Public (Tshs. 100 bn)

- Non-bank public deposits the proceeds to banks.

| Nonbank Public     |      |             |  |
|--------------------|------|-------------|--|
| Assets             |      | Liabilities |  |
| Securities         | -100 |             |  |
| Checkable Deposits | 100  |             |  |

| Banking System |     |                    |     |
|----------------|-----|--------------------|-----|
| Assets         |     | Liabilities        |     |
| Reserves       | 100 | Checkable Deposits | 100 |

| Central Bank |     |             |     |
|--------------|-----|-------------|-----|
| Assets       |     | Liabilities |     |
| Securities   | 100 | Reserves    | 100 |

# T-Accounts – OM Purchase from Public (Tshs. 100 bn)

- Non-bank public keeps proceeds as cash.

| Nonbank Public |      |             |  |
|----------------|------|-------------|--|
| Assets         |      | Liabilities |  |
| Securities     | -100 |             |  |
| Currency       | 100  |             |  |

| Central Bank |     |                         |     |
|--------------|-----|-------------------------|-----|
| Assets       |     | Liabilities             |     |
| Securities   | 100 | Currency in Circulation | 100 |

- Effect on MB is the same ( $MB = C + R$ )

# Analyzing Multiple Deposit Creation

- CB purchase of Tshs. 100 bn bond from Bank A.

| Bank A     |      |             |  |
|------------|------|-------------|--|
| Assets     |      | Liabilities |  |
| Securities | -100 |             |  |
| Reserves   | 100  |             |  |

- ER increase by 100, Bank A makes a loan out of these ER.

| Bank A     |      |                    |     |
|------------|------|--------------------|-----|
| Assets     |      | Liabilities        |     |
| Securities | -100 | Checkable Deposits | 100 |
| Reserves   | 100  |                    |     |
| Loan       | 100  |                    |     |

# Analyzing Multiple Deposit Creation

- Bank A creates a checkable account for the borrower (DD of 100 are created).
- Bank lending created money,  $M_1 = CC + DD$ .
- Borrower draws the money to do business and make purchases.
- The payment is deposited to Bank B after leaving Bank A.

| Bank A     |             |
|------------|-------------|
| Assets     | Liabilities |
| Securities | -100        |
| Loan       | 100         |

# Analyzing Multiple Deposit Creation

- Borrower payment deposited at Bank

B.

| Bank B   |     |                    |     |
|----------|-----|--------------------|-----|
| Assets   |     | Liabilities        |     |
| Reserves | 100 | Checkable Deposits | 100 |

- Bank B keeps  $r\%$  of the DD (say 10%), before lending, i.e. required reserves.

| Bank B   |    |                    |     |
|----------|----|--------------------|-----|
| Assets   |    | Liabilities        |     |
| Reserves | 10 | Checkable Deposits | 100 |
| Loans    | 90 |                    |     |

# Analyzing Multiple Deposit Creation

- Money spent by borrower from Bank B is deposited to another Bank C.

| Bank C   |    |                    |    |
|----------|----|--------------------|----|
| Assets   |    | Liabilities        |    |
| Reserves | 90 | Checkable Deposits | 90 |

- Bank C keeps  $r\%$  of the DD (say 10%), before lending, i.e. required reserves.

| Bank C   |    |                    |    |
|----------|----|--------------------|----|
| Assets   |    | Liabilities        |    |
| Reserves | 9  | Checkable Deposits | 90 |
| Loans    | 81 |                    |    |

# Analyzing Multiple Deposit Creation

- Money spent by borrower from Bank C is deposited to another Bank D.

| Bank D   |    |                    |    |
|----------|----|--------------------|----|
| Assets   |    | Liabilities        |    |
| Reserves | 81 | Checkable Deposits | 81 |

- Bank D keeps  $r\%$  of the DD (say 10%), before lending, i.e. required reserves.

| Bank D   |      |                    |    |
|----------|------|--------------------|----|
| Assets   |      | Liabilities        |    |
| Reserves | 8.1  | Checkable Deposits | 81 |
| Loans    | 72.9 |                    |    |

# Analyzing Multiple Deposit Creation

- Money spent by borrower from Bank D is deposited to another Bank E.

| Bank E   |      |                    |      |
|----------|------|--------------------|------|
| Assets   |      | Liabilities        |      |
| Reserves | 72.9 | Checkable Deposits | 72.9 |

- Bank E keeps r% of the DD (say 10%), before lending, i.e. required reserves.

| Bank E   |       |                    |      |
|----------|-------|--------------------|------|
| Assets   |       | Liabilities        |      |
| Reserves | 7.29  | Checkable Deposits | 72.9 |
| Loans    | 65.61 |                    |      |

# Analyzing Multiple Deposit Creation

- Money spent by borrower from Bank E is deposited to another Bank F.

| Bank F   |       |                    |       |
|----------|-------|--------------------|-------|
| Assets   |       | Liabilities        |       |
| Reserves | 65.61 | Checkable Deposits | 65.61 |

- Bank F keeps  $r\%$  of the DD (say 10%), before lending, i.e. required reserves.

| Bank F   |       |                    |       |
|----------|-------|--------------------|-------|
| Assets   |       | Liabilities        |       |
| Reserves | 6.56  | Checkable Deposits | 65.61 |
| Loans    | 59.05 |                    |       |

# Summary ( $r = 10\%$ ) in Billion Shillings

| Bank         | $\Delta DD$     | $\Delta \text{Loans (ER)}$ | $\Delta \text{R.Reserves}$ |
|--------------|-----------------|----------------------------|----------------------------|
| Bank A       | 0.00            | 100.00                     | 0.00                       |
| Bank B       | 100.00          | 90.00                      | 10.00                      |
| Bank C       | 90.00           | 81.00                      | 9.00                       |
| Bank D       | 81.00           | 72.90                      | 8.10                       |
| Bank E       | 72.90           | 65.61                      | 7.29                       |
| Bank F       | 65.61           | 59.05                      | 6.56                       |
| Bank G       | 59.05           | 53.14                      | 5.91                       |
| .            | .               | .                          | .                          |
| .            | .               | .                          | .                          |
| <b>Total</b> | <b>1,000.00</b> | <b>1,000.00</b>            | <b>100.00</b>              |

# Deposit Multiplication Formula

- Shows maximum total change in deposits resulting from given change in monetary base.
- Focus on initial change in excess reserves (ER) which is also MB.
- But after receiving deposits, a change in ER is  $(1 - r) \times R$ .
- $\Delta D = \Delta R + \Delta R (1-r) + \Delta R (1-r)^2 + \Delta R (1-r)^3 + \dots$

# Deposit Multiplication Formula

- Let required reserve ratio,  $r = R/D$
- $\Delta D = \Delta R + \Delta R (1-r) + \Delta R (1-r)^2 + \Delta R (1-r)^3 + \dots$
- $\Delta D = \Delta R \{1 + (1-r) + (1-r)^2 + (1-r)^3 + \dots\}$
- Using infinite geometric power series expansion formula:
- $\Delta D = (1/r) \times \Delta R$  where  $0 < r < 1$

# Deposit Multiplication Formula

- Where  $1/r$  is the deposit multiplier.
- **Note:** Decrease in required reserve ratio ( $r$ ) increases deposit multiplier since banks can lend more of the deposits they receive.
- For case of selling government securities, we have multiplier deposit contraction instead.

# Deposit Multiplication Formula

- The bank will buy government securities using reserves.
- If reserves fall below required level (no excess reserves), bank will call in loans where other banks will start losing its deposits.

# Behavior of Banks and Non-bank Public

- The simple model incorrectly assumes no C and no ER.
- We now relax these, incorporate banks and nonbank public in analysis.
- Holding ER and C are **leakages** in multiple deposit creation process.
- This leads to actual (real) world multiplier being smaller than simple multiplier.

# Bank Behavior

- **Bank Behavior** – influences both MB and deposit multiplier.
- Influence MB via **level of discount loans** to take (discount rate & terms and conditions).
- Banks maintain **excess reserves** because of:

# Bank Behavior

- 1. **Cost-benefit analysis**, ER forgoes interest income.
- 2. Enable bank to maintain **buffer/cushion** for unexpected withdrawals.
- 3. **Estimation error** (deposits – withdrawals forecasting).
- Holding ER affects proportion of deposits banks are ready to lend.

# Determinants of ER and Discount Loans

| Increase in ...                                 | Causes ...              | Because ...                                    |
|---|-------------------------|--|
| Market interest rates                           | ER to fall              | Rising opportunity cost of holding ER          |
| Variability of deposit outflows                 | Excess reserves to rise | Greater cushion against outflows               |
| Market interest rates relative to discount rate | Discount loans to rise  | Banks' profit from discount borrowing increase |

# Nonbank Public Behavior

- Decides to hold currency or deposits.
- Currency/Deposit Ratio (C/D) or estimated currency-income or currency-wealth ratio.
- Amount of currency doesn't contribute to multiple deposit creation (**leakage**).
- C/D ratio doesn't affect the effect of central bank on MB (C + R).
- Effect of OMO on monetary base is same whether seller deposits the proceeds in account or keeps cash (**currency**).

# Determinants of Currency-Deposit (C/D) Ratio

- **Wealth** – higher wealth, higher income, cash may increase but C/D tends to fall.
- **Riskiness of Deposits** – bank instability and panic – C/D increases.
- **Expected Return on Deposits** – increase in interest on D, D will increase, and C/D will decrease.

# Determinants of Currency-Deposit (C/D) Ratio

- **Information Cost and Desired Anonymity** – Increase in underground/illegal activities (tax evasion) increase C/D ratio.
- **Liquidity** – When cheques are less acceptable (developing countries), C/D is higher because people hold currency to make payments.

# Summary of Players

- **Central bank** – decision on required reserve ratio ( $R/D$ ) is fixed.
- **Banks** – decision on  $ER/D$  ratio is constant over time.
- **Nonbank public** –  $C/D$  is not necessarily constant but at a given point it can be estimated.

# Complex Deposit Multiplier

- More **realistic multiplier**.
- Recognizes existence of cash outside banks and excess reserves kept by banks.
- Monetary Base,  $B = C + R$  (1)
- $B = C + RR + ER$  (2)
- $B = (C/D)D + (RR/D)D + (ER/D)D$  (3)

# Complex Deposit Multiplier

- $B = (c + r + e) \times D$  (4)

- Making D the subject of (4)

- $D = B \times \{1/(c + r + e)\}$  (5)

- $D = B \times m_d$  (6)

- Where  $m_d = 1/(c + r + e)$  is complex deposit multiplier

# Complex Deposit Multiplier

- Note: unless stated otherwise, **deposit multiplier** refers to **complex deposit multiplier**.

# Money Multiplier and Money Supply

- Assume Money Supply,  $M = M_1 = (C + D)$ , i.e. earns no interest.
- $M = D + (C/D)D \quad (7)$
- $M = (1 + c)D \quad (8)$
- Substitute (5) into (8);
- $M = (1 + c) \times \{B/(c + r + e)\}$  giving;

# Money Multiplier and Money Supply

$$M = \left( \frac{1 + c}{c + r + e} \right) B$$

- $M = m \times B$
- Where:
- Money Multiplier,  $m = \{(1 + c)/(c + r + e)\}$

# Money Multiplier and Money Supply

- **Example:** Where required reserve ratio is 10%, currency in circulation is 400 billion shillings, checkable deposits are 800 billion shillings, and excess reserves are 0.8 billion shillings. The money multiplier will be:
  - Currency Ratio,  $c = 400/800 = 0.5$
  - Excess Reserves Ratio,  $e = 0.8/800 = 0.001$
  - Money Multiplier,  $m = \{(1 + c)/(c + r + e)\}$

$$m = \frac{1 + 0.5}{0.1 + 0.001 + 0.5} = 2.5$$

# Variables in Money Supply Process

| Increase in ...                 | Based on Actions of ... | Money Supply ... | Because ...  |
|---------------------------------|-------------------------|------------------|--|
| Non-borrowed base ( $B_{NON}$ ) | Central Bank (OMO)      | Rises            | Monetary base rises, and more reserves are available for deposit expansion             |
| Reserve requirements (RR/D)     | Central Bank            | Falls            | Fewer reserves can be lent out, and the money multiplier falls                         |
| Discount rate                   | Central Bank            | Falls            | Discount loans become more expensive, reducing borrowed reserves and the monetary base |
| Currency Deposit ratio (C/D)    | Non-bank public         | Falls            | The money multiplier falls reducing deposit expansion                                  |

# Variables in Money Supply Process

| Increase in ...                             | Based on Actions of ...                          | Money Supply ... | Because ...  |
|---|--|------------------|--|
| Excess reserves relative to deposits (ER/D) | Banks  | Falls            | The money multiplier falls reducing deposit expansion  |
| Expected deposit outflows                   | Non-bank public (transactions)                   | Falls            | Excess reserves rise relative to deposits, reducing the money multiplier and deposit expansion |
| Variability of deposit outflows             | The non-bank public (transactions and portfolio) | Falls            | Excess reserves rise relative to deposits, reducing the money multiplier and deposit expansion |

# Money Market and Interest Rates

- **Interest rate** is **price** of liquidity (money) – aggregate variable.
- Interest rate is determined by **supply (SSU)** and **demand (DSU)** forces in the **loanable funds market**.
- **LM Model:** Equates demand for money (L) and money supply (M).
- LM has its foundation in **theory of liquidity preference** originally developed by **Keynes**.
- It was an enhancement of earlier **quantity theory of money** by **Fisher**.

# Demand for Money

- **Supply** of money is essential building block to understand how monetary policy affects economy.
- Suggests factors that influence quantity of money in economy.
- Another essential part of monetary theory is **demand** for money.

# Quantity Theory of Money

- How much money is **held** for given amount of aggregate income.
- **Interest rates** have no effect on money demand.
- Also called “**Equation of Exchange**”
- Developed by **Irving Fisher** in 1911.
- Examines the link btn total **quantity of money (M)** and total **spending in economy (PxY)** via **velocity of money**.

# Quantity Theory of Money

- **Velocity of money:** average number of times per year a shilling is spent in buying total goods and services produced in economy.

$$V = \frac{P \times Y}{M}$$

- Where: M = money supply, P = price level, Y = aggregate output/income (GDP)
  - $M \times V = P \times Y$
  - It is an **identity** (relationship is true by definition; not causation).
- 13  
What determines velocity?

# Quantity Theory of Money

- Its a function of **economic institutions** and **technology** that affect conduct of transactions.
- If credit cards are used, people hold less cash (M) and velocity increases.
- But these factors change **slowly** over time, thus V is **constant** in SR.
- Thus, quantity of money (M) is determined by changes in nominal income.
- Classical economics assume **flexible wages and prices**, and real output (Y) in normal times is at FE.

# Quantity Theory of Money

- Y is constant in SR.
- Thus, V and Y are constant.
- If M doubles, then P also doubles in SR.
- Price level results from changes in money supply (inflation is **monetary phenomenon**).

$$M \times \bar{V} = P \times \bar{Y}$$

- Theory also tells how much money is held at given aggregate income, make M the subject.

$$M = \frac{1}{V} X PY$$

$$M^d = k X PY$$

- Since V is constant,  $1/V = k$ ;

# Quantity Theory of Money

- Where PY is nominal income.
- Thus: “***Level of transactions generated by fixed level of nominal income PY determines quantity of money  $M^d$  that people demand***”.
- In summary, demand for money is determined by:
  - 1) Level of transactions generated by nominal income (**PY**).
  - 2) Institutions in the economy that affect the way people conduct transactions and determine velocity of money (**1/V**).

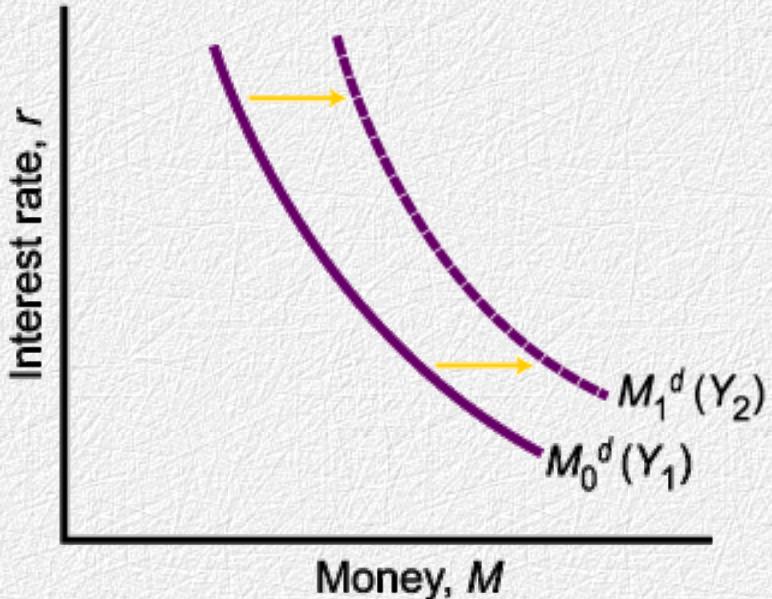
# Quantity Theory of Money

- Strength of theory rests in **constancy of velocity of money**. However:
- 1) Velocity of money has experienced large up and down swings even in SR with economic cycles. It declines sharply in severe economic contractions.
- Don't blame classical.
- Was a period of lack of accurate data on GDP and money supply.
- 2) Further, theory assumes interest rates don't play a role in influencing demand for money.

# Keynes Liquidity Preference Theory

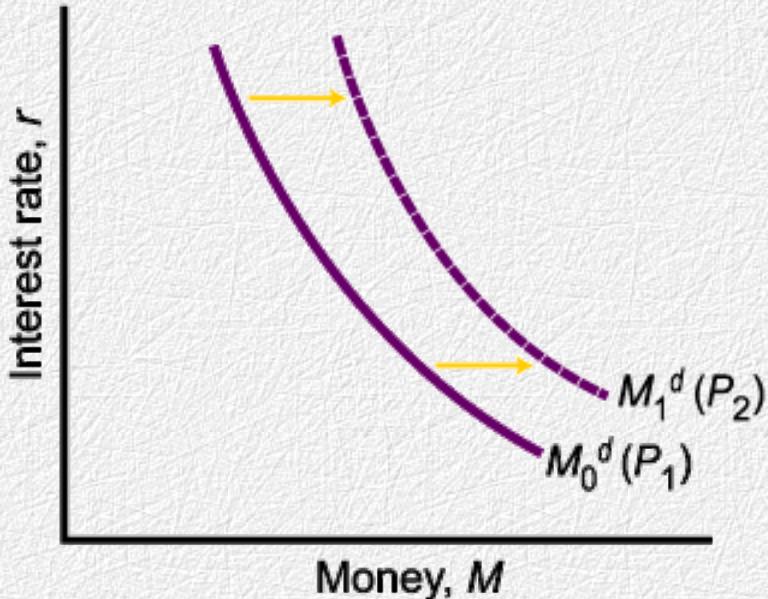
- Abandoned the idea of constant velocity of money.
- Emphasized importance of **interest rate**.
- Postulated three motives why people hold money:
  - **1) Transactions Motive:** individuals hold money as a medium of exchange, to use it in making transactions.
  - It is **proportional** to the level of income.
  - **2) Precautionary Motive:** people carry money as a cushion against unexpected need.

# Transactions Volume and the Level of Output



- When output (income) rises, the ***total number of transactions rises***, and the demand for money curve shifts to the right.

# Transactions Volume and the Price Level

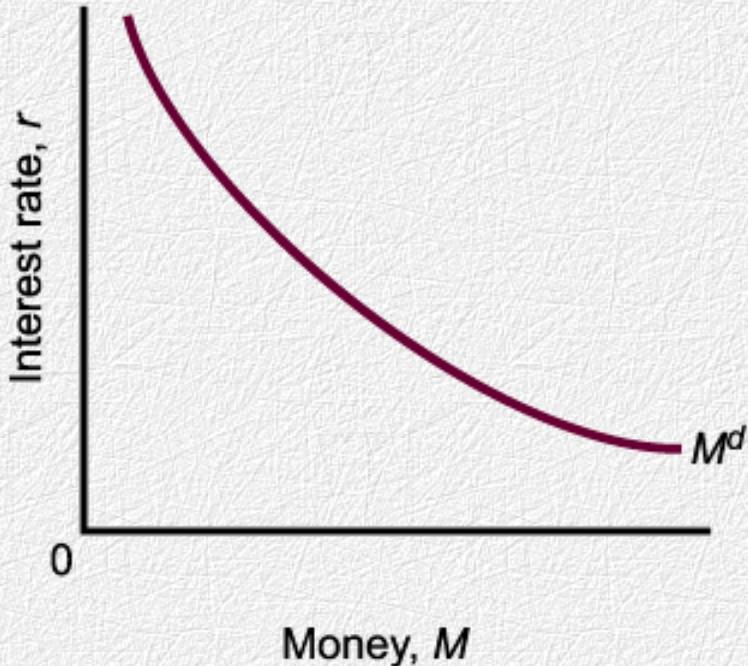


- When the price level rises, the *average* shilling amount of each transaction rises; thus, the quantity of money needed to engage in transactions rises, and the demand for money curve shifts to the right.

# Keynes Liquidity Preference Theory

- Determined by levels of transactions people expect to make.
- And these transactions are **proportional** to income.
- **3) Speculative Motive:** people hold money as source of wealth.
- **Portfolio allocation:** money or bonds.
- **Gain on bonds:** expected interest, and expected capital gain.

# The Speculation Motive



- The **speculation motive** is one reason for holding bonds instead of money: When interest rate rises, bonds give **greater return**, and individuals hold more bonds and less money.

# Keynes Liquidity Preference Theory

- If interest rate goes up, holding money implies greater opportunity cost, and people hold more bonds and less money.
- **Negative relationship** between money demand and interest rates.
- Therefore, demand for real money balances is a positive function of real income and negative function of interest rate.

$$\frac{M^d}{P} = f(i, Y)$$

# Friedman's Modern Quantity Theory of Money

- Developed in **1956** by **Milton Friedman**.
- Demand for money is a function ***expected return on individuals' resources relative to money.***
- Money also **earns interest/return**: some current accounts earn interest, and it is convenient to hold money (easily available).

$$\frac{M^d}{P} = f(Y_p^+, r_b^- - r_m, r_e^- - r_m, \pi^e^- - r_m)$$

- Where:  $M^d/P$  = demand for money balances,  
  $Y_p^+$  = permanent income,

# Friedman's Modern Quantity Theory of Money

- $r_m$  = expected return on money,
- $r_b$  = expected return on bonds,
- $r_e$  = expected return in stocks,
- $\pi^e$  = expected inflation rate.
- Money demand is a **positive function** of wealth (permanent income) i.e. present value of future stream of income flows.
- When relative returns on bonds to money increases, individuals hold more bonds and less money.

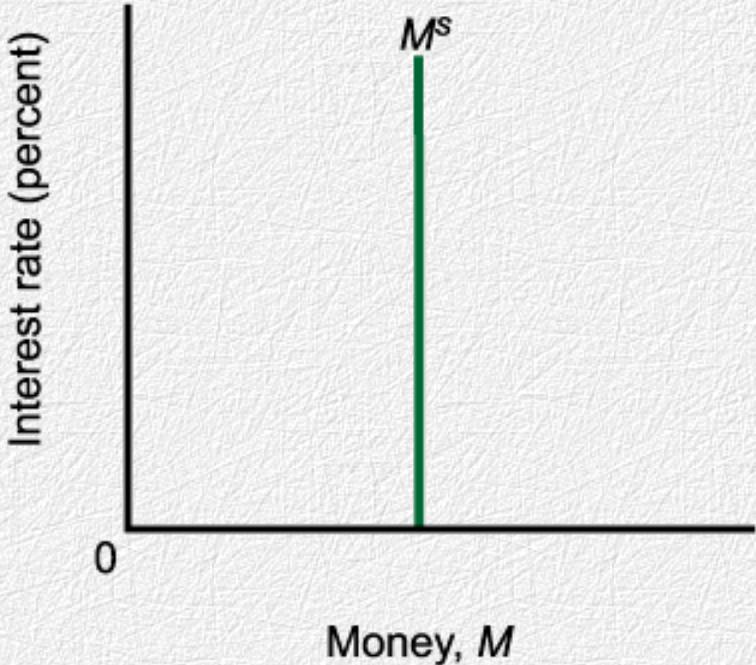
# Friedman's Modern Quantity Theory of Money

- When relative returns on stocks to money increases, individuals hold more stocks and less money.
- If expected returns from holding goods (capital gains or expected inflation) rises relative to expected return on money, people hold wealth in real estate and less in money.

# Money Supply, Money Demand and *LM* curve

- Supply of **currency** is largely controlled by **monetary authority – central bank**.
- Supply of **credit money (other forms)** is influenced by monetary authority, banks, non-bank FIs and general public.
- Monetary authority influences both currency and credit money, thus money supply is regarded as a policy variable.
- Thus in SR, nominal money supply ( $M$ ) is given ( $M=M^0$ ), i.e. exogenous variable.  
 But real money supply is  $(M^0/P)^s$

# The Supply Curve for Money



- A **vertical money supply** curve says the BOT sets the money supply independent of the interest rate.

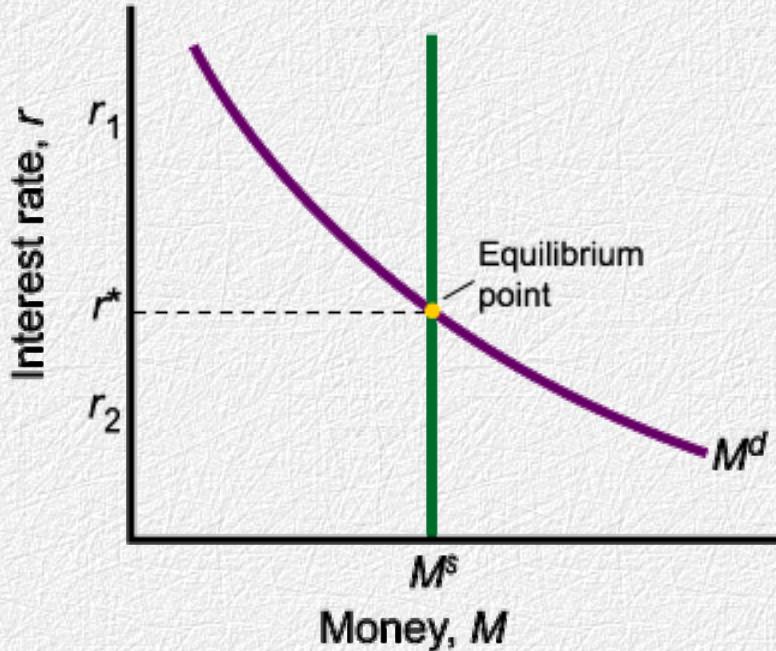
# Money Supply, Money Demand and *LM* curve

- Nominal money supply changes with effect of **monetary policy**.
- If  $P$  is assumed to be flexible, **real money supply** is affected by changes in  $P$ .
- With real money demand (liquidity) is given as  $(M/P)^d = L(Y, r)$ ,
- Money market equilibrium is achieved at level of interest rate where:  $(M/P)^d = L(Y, r) = (M^o/P)^s$ .

# Money Supply, Money Demand and *LM* curve

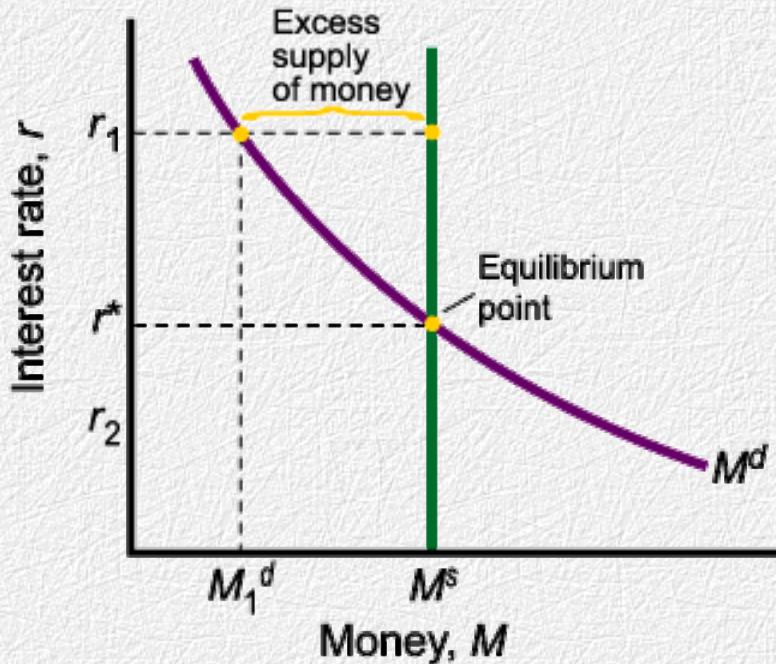
- Two dimensional Cartesian plane (**r-M/P plane**), money demand  $(M/P)^d = L(Y, r)$  is **negatively sloped** for a given level of income ( $Y^0$ ).
- With given nominal money supply ( $M^0$ ) and **sticky prices** ( $P^0$ ), real money supply  $(M/P)^s$  is **fixed** at  $(M^0/P^0)$  - **vertical money supply function**.
- Money market equilibrium is presented in panel 1.
- Suppose real income increases from  $Y^0$  to  $Y^1$

# The Equilibrium Interest Rate



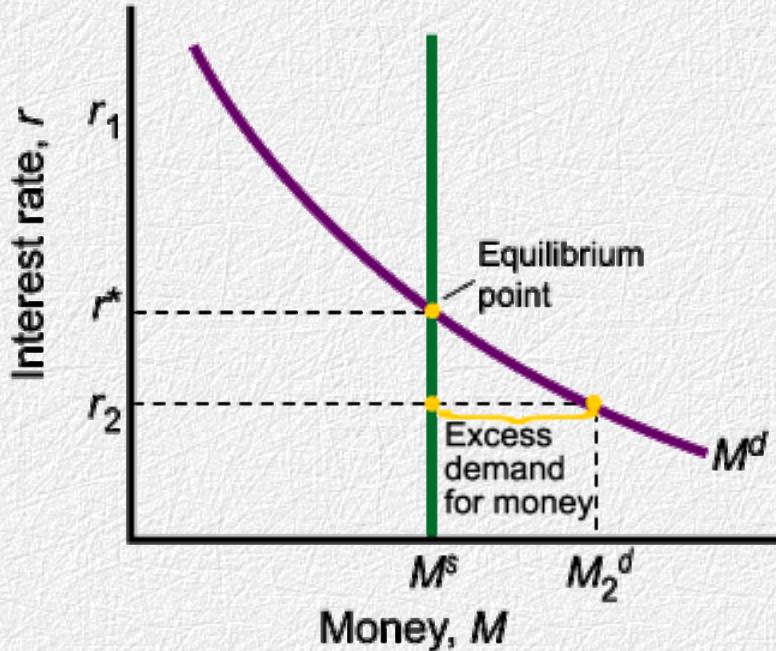
- The point at which the quantity of money demanded equals the quantity of money supplied determines the **equilibrium interest rate** in the economy.

# The Equilibrium Interest Rate



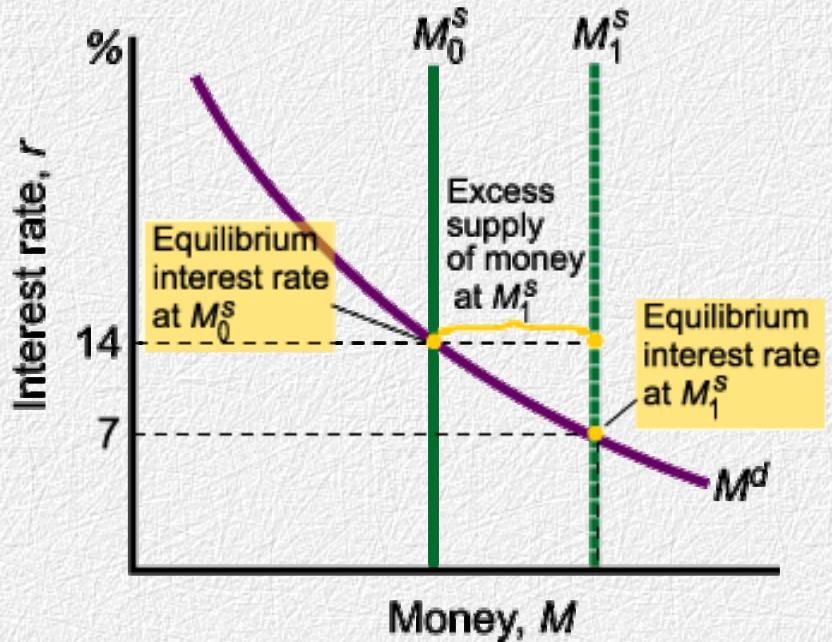
- At  $r_1$ , amount of money in circulation is higher than households and firms want to hold. They will attempt to **reduce their money** holdings by buying bonds.

# The Equilibrium Interest Rate



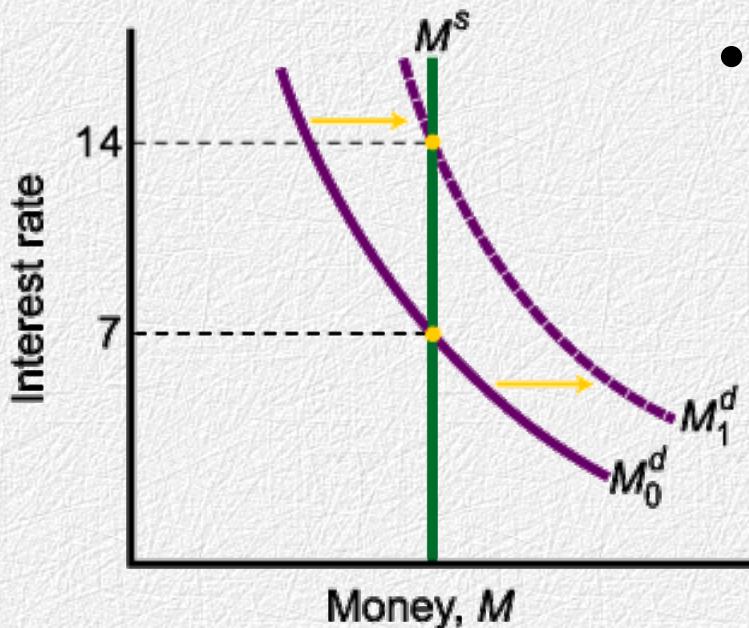
- At  $r_2$ , households don't have enough money to facilitate ordinary transactions. They will shift assets out of bonds and into their **checking accounts**.

# Changing the Money Supply to Affect the Interest Rate



- An increase in the supply of money **lowers** the rate of interest.

# Increases in $Y$ and Shifts in the Money Demand Curve



- An increase in aggregate output (income) shifts the money demand curve, which raises the equilibrium interest rate from 7 percent to 14 percent.
- An increase in the price level has the same effect.

# Money Supply, Money Demand and *LM* curve

- Real money demand will increase,  $(M/P)^d$  curve shifts **upwards**.
- With sticky prices and fixed nominal supply (**supply curve doesn't shift**), higher money demand forces interest rate up to  $r^1$ .
- ***Thus, increase in income coupled with constant money supply leads to increase in equilibrium level of interest rates.***

# The LM Curve

Now let's put  $Y$  back into the money demand function:

$$(\mathbf{M}/\mathbf{P})^d = \mathbf{L}(r, Y)$$

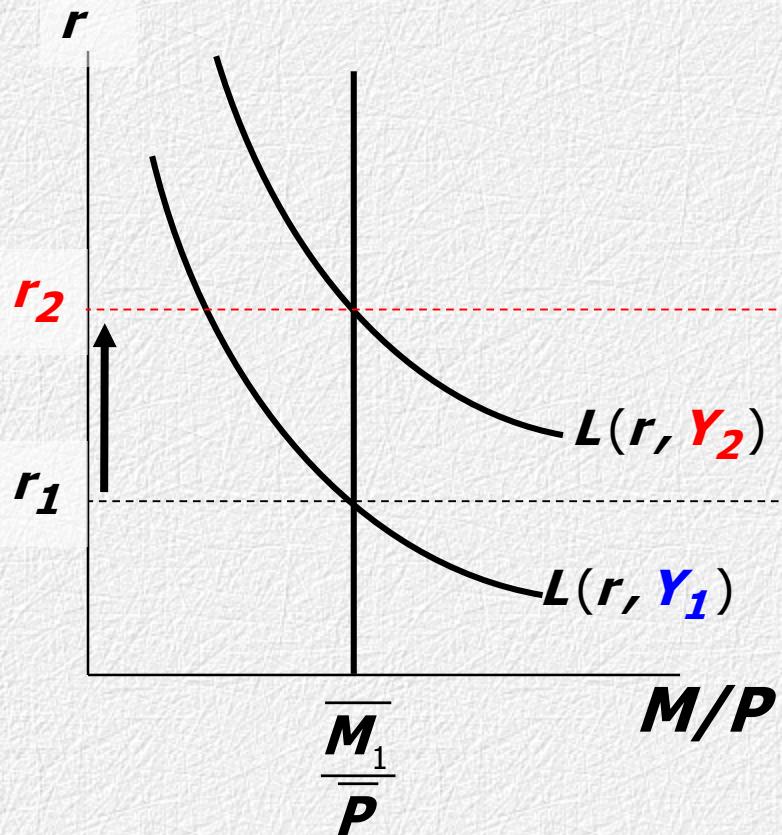
The  **$LM$  curve** is a graph of all combinations of  $r$  and  $Y$  that equate the supply and demand for real money balances.

The equation for the  $LM$  curve is:

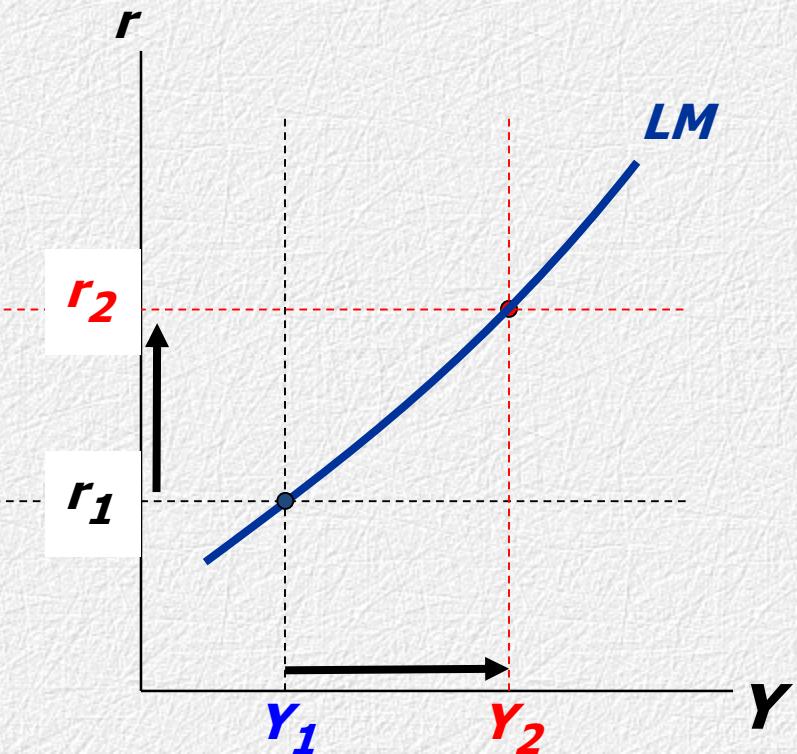
$$\bar{\mathbf{M}}/\bar{\mathbf{P}} = \mathbf{L}(r, Y)$$

# Deriving the LM Curve

(a) The market for real money balances



(b) The LM Curve



# Understanding the *LM* Curve's Slope

- The *LM* curve is ***positively sloped***.
- **Intuition:** An increase in income raises money demand.
- Since the supply of real balances is **fixed**, there is now excess demand in the money market at the initial interest rate.
- The interest rate must **rise to restore equilibrium in the money market**.

# Deriving LM Curve with Algebra

Suppose a money demand:  $(M/P)^d = eY - fr$

- Where  $e$  describes the responsiveness of money demand to changes in income.
- And  $f$  describes responsiveness to interest rate.

$$(M/P)^s = \bar{M}/\bar{P}$$

Suppose money supply:

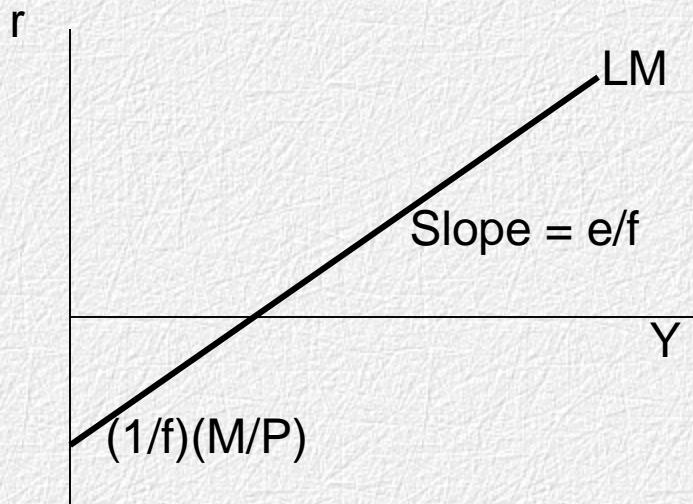
$$(M/P)^s = (M/P)^d$$

Use money market equilibrium condition:

So:  $M/P = eY - fr$

or write as:  $r = \left(\frac{e}{f}\right)Y - \left(\frac{1}{f}\right)\frac{\bar{M}}{\bar{P}}$

# Graph the LM curve



$$r = \left(\frac{e}{f}\right)Y - \left(\frac{1}{f}\right)\frac{\bar{M}}{\bar{P}}$$

A **steep LM curve** ( $e/f$  large) means that a rise in output implies a **big rise in interest rate** to maintain equilibrium.

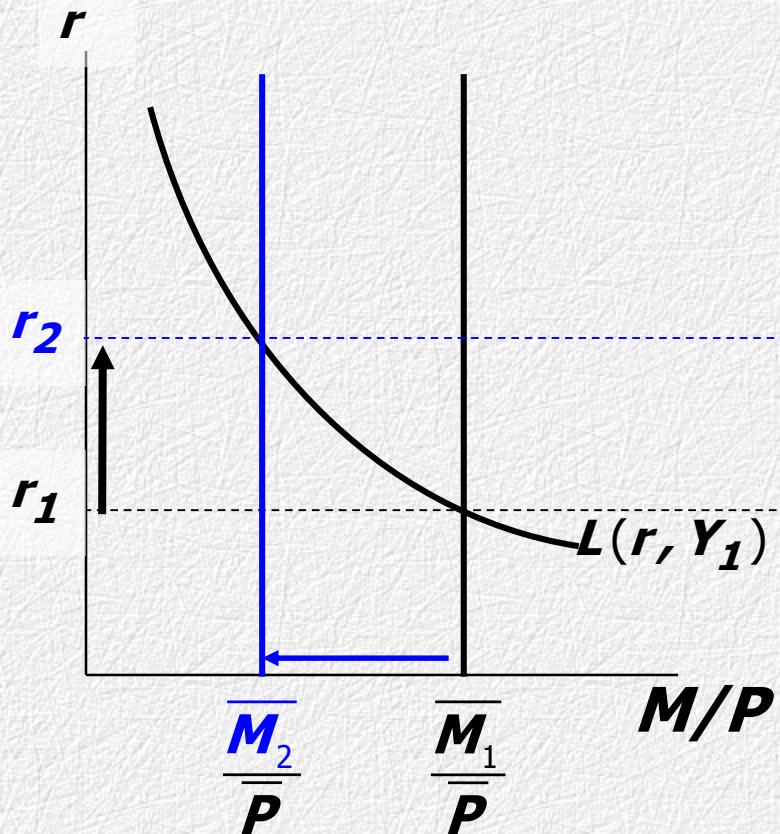
## Causes of this:

Money demand is **not very responsive** to interest rate ( $f$  is small)

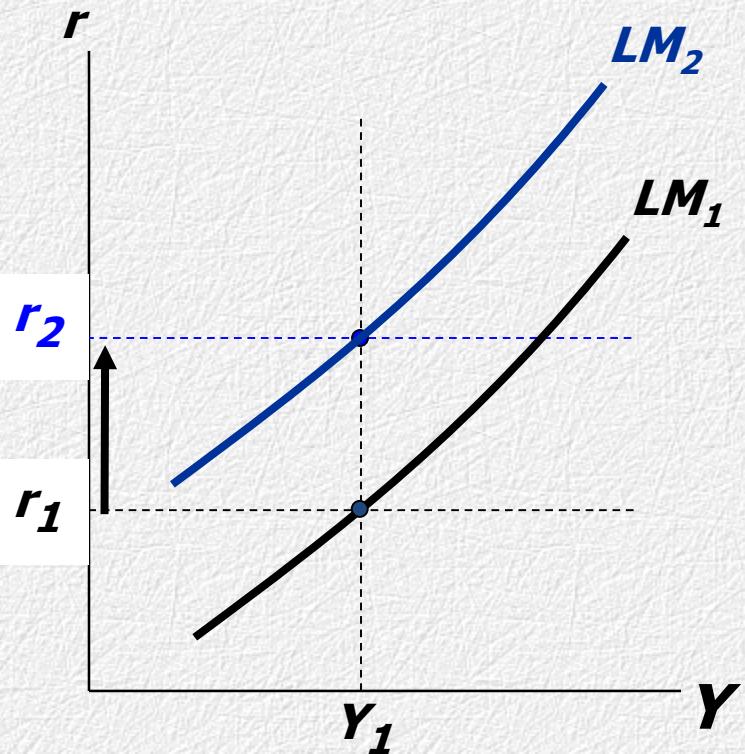
Money demand is **very responsive to output** ( $e$  large)

# How $\Delta M$ Shifts the LM curve

(a) The market for real money balances



(b) The LM curve



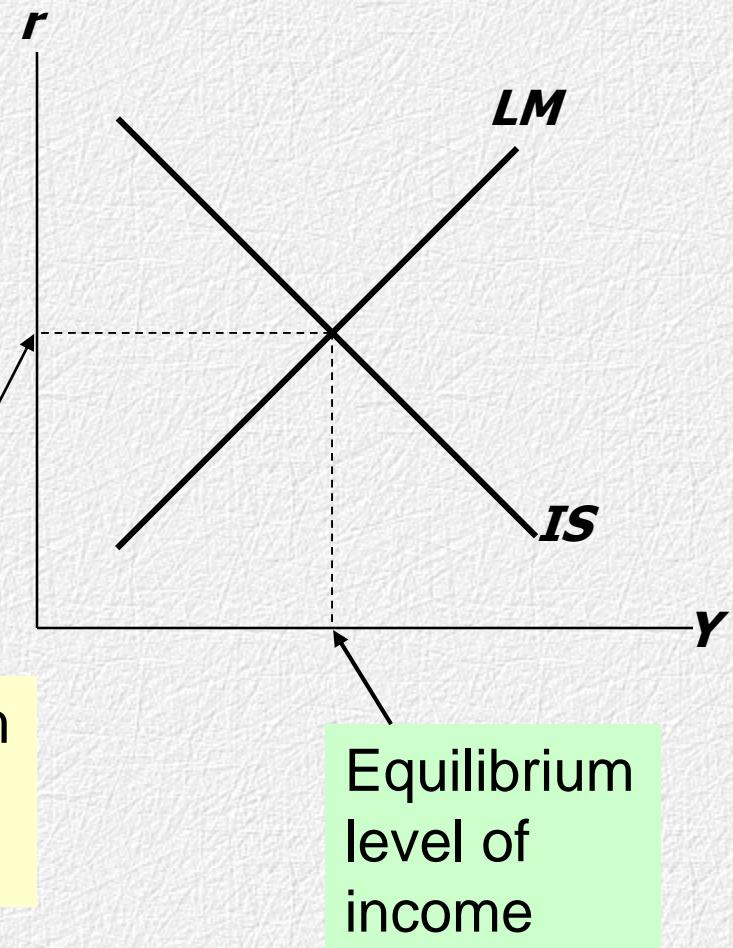
# The Short-Run Equilibrium

The **short-run equilibrium** is the combination of  $r$  and  $Y$  that simultaneously satisfies the equilibrium conditions in the goods & money markets:

$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$

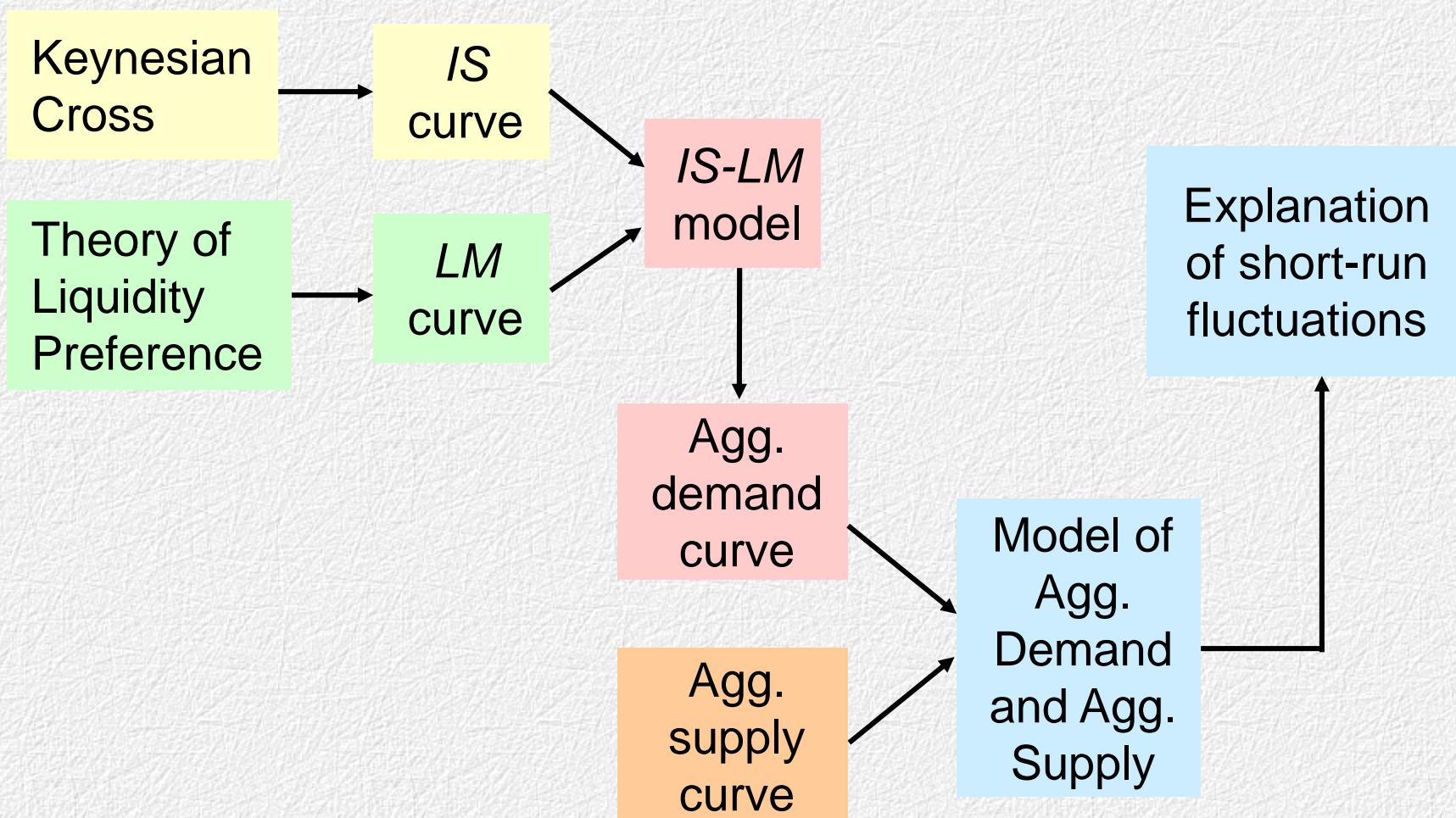
$$\bar{M}/\bar{P} = L(r, Y)$$

Equilibrium  
interest  
rate

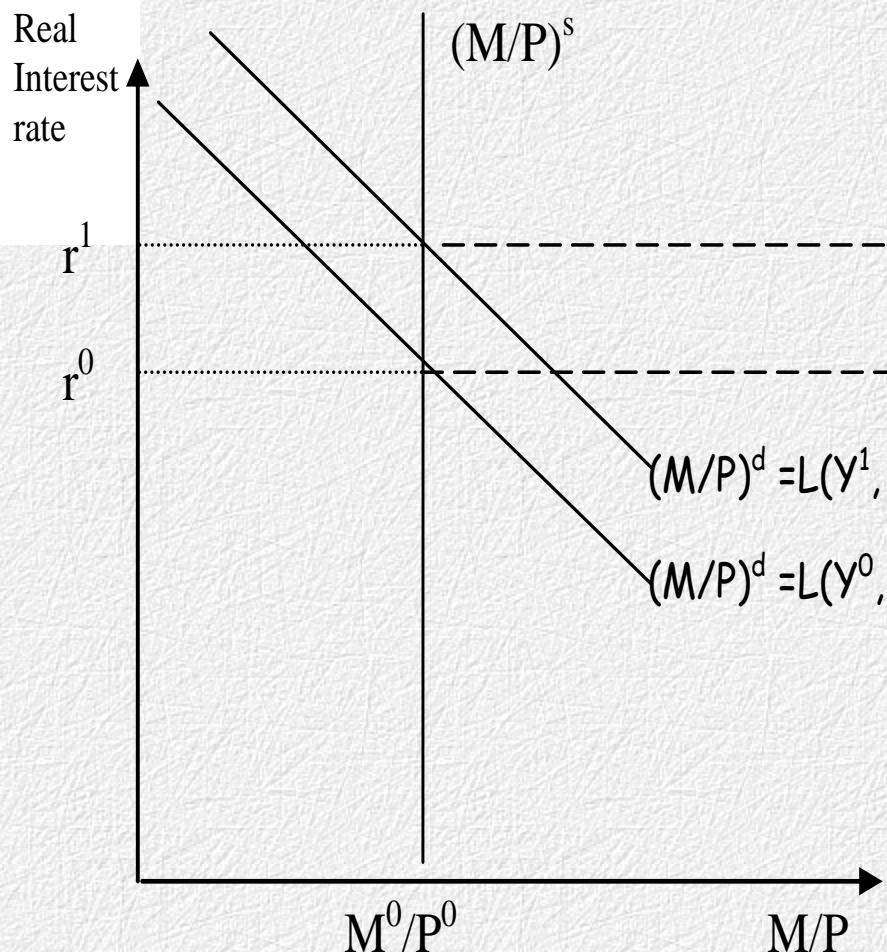


Equilibrium  
level of  
income

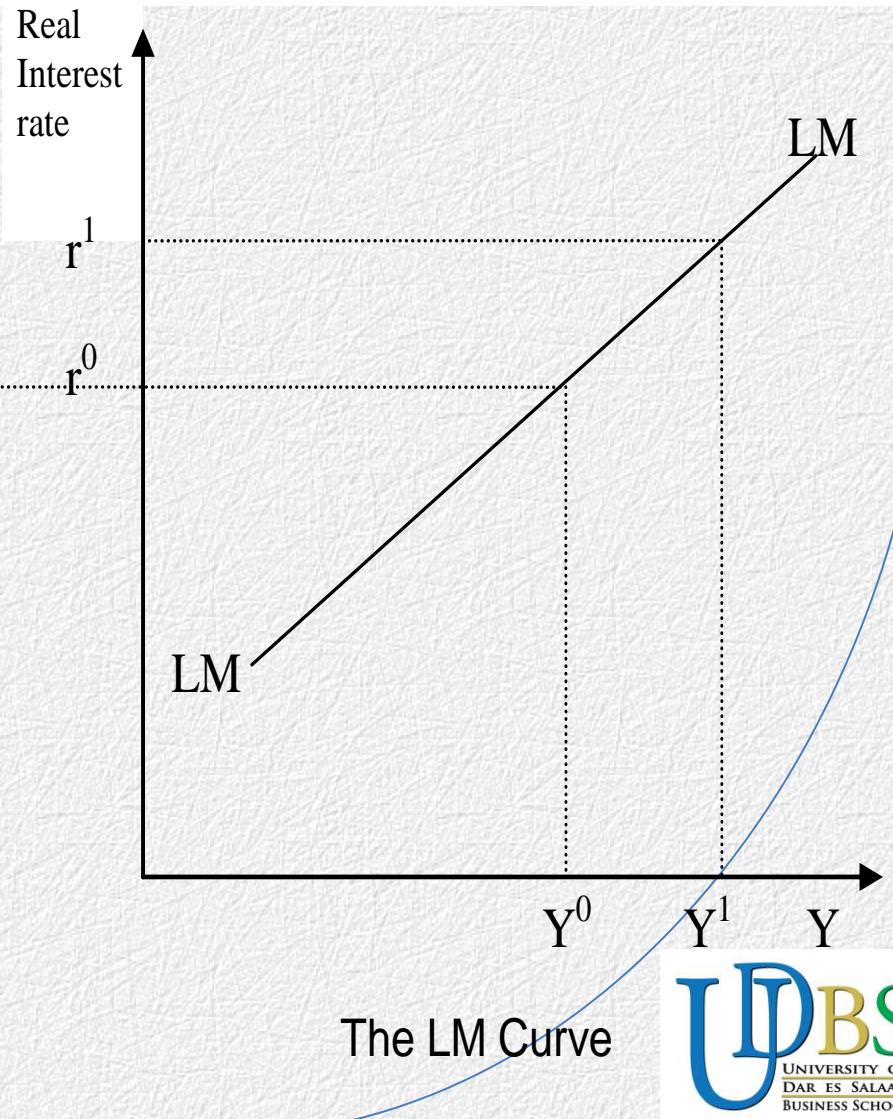
# The Big Picture



# Plane 1: MM Equilibrium and LM Curve



Money Market Equilibrium



The LM Curve

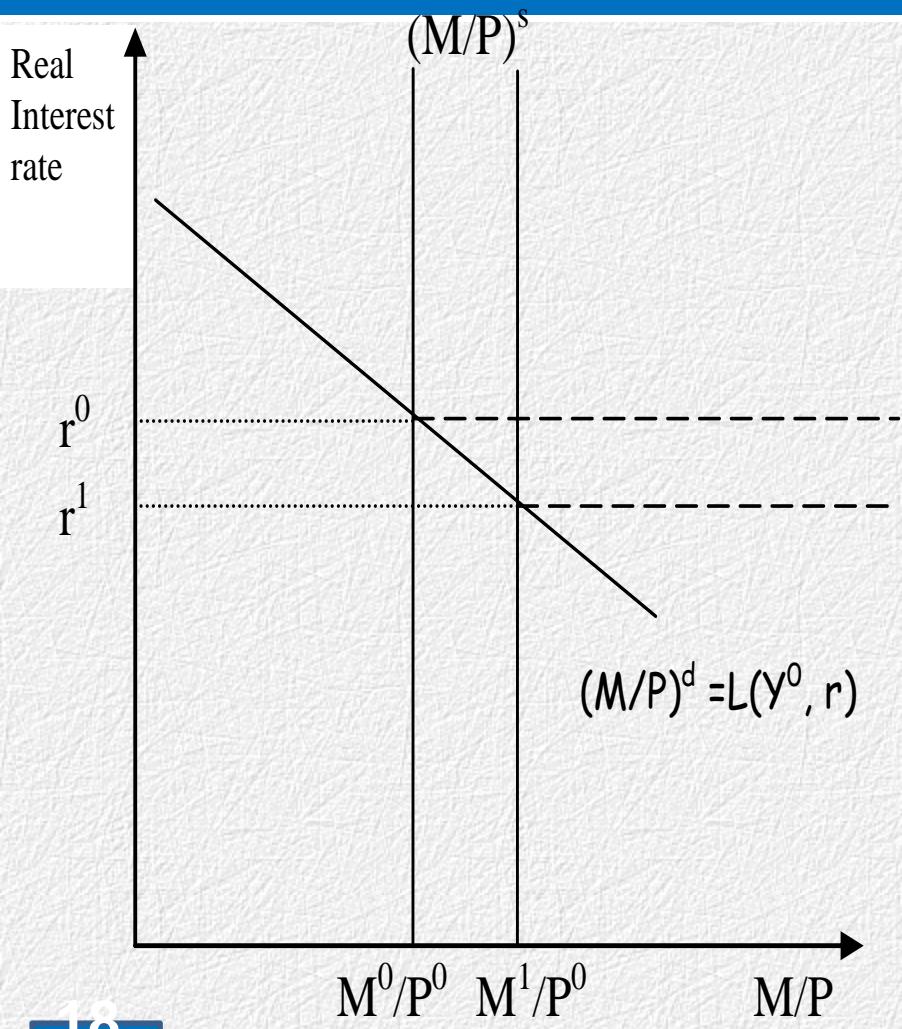
# Money Supply, Money Demand and *LM* curve

- Relationship between real income and **interest rates** defines the LM curve.
- That is, prevailing interest rates and level of incomes ensures that demand for liquidity (L) and money supply ( $M/P)^s$ .
- LM Curve is a set of combinations of current output and real interest rate for which money market is in equilibrium.
- LM curve slopes upward to the right, because higher real interest rate is associated with higher level of output in money market equilibrium.

# Money Supply, Money Demand and *LM* curve

- Points above LM curve represent excess money supply and points below LM represent excess demand for money.
- Caused by change in real money supply.
- E.g. nominal money balances increase from  $M^0$  to  $M^1$ , or decrease in expected prices from  $P^0$  to  $P^1$  will increase real money balances.
- But in SR, we assume sticky prices (fixed)

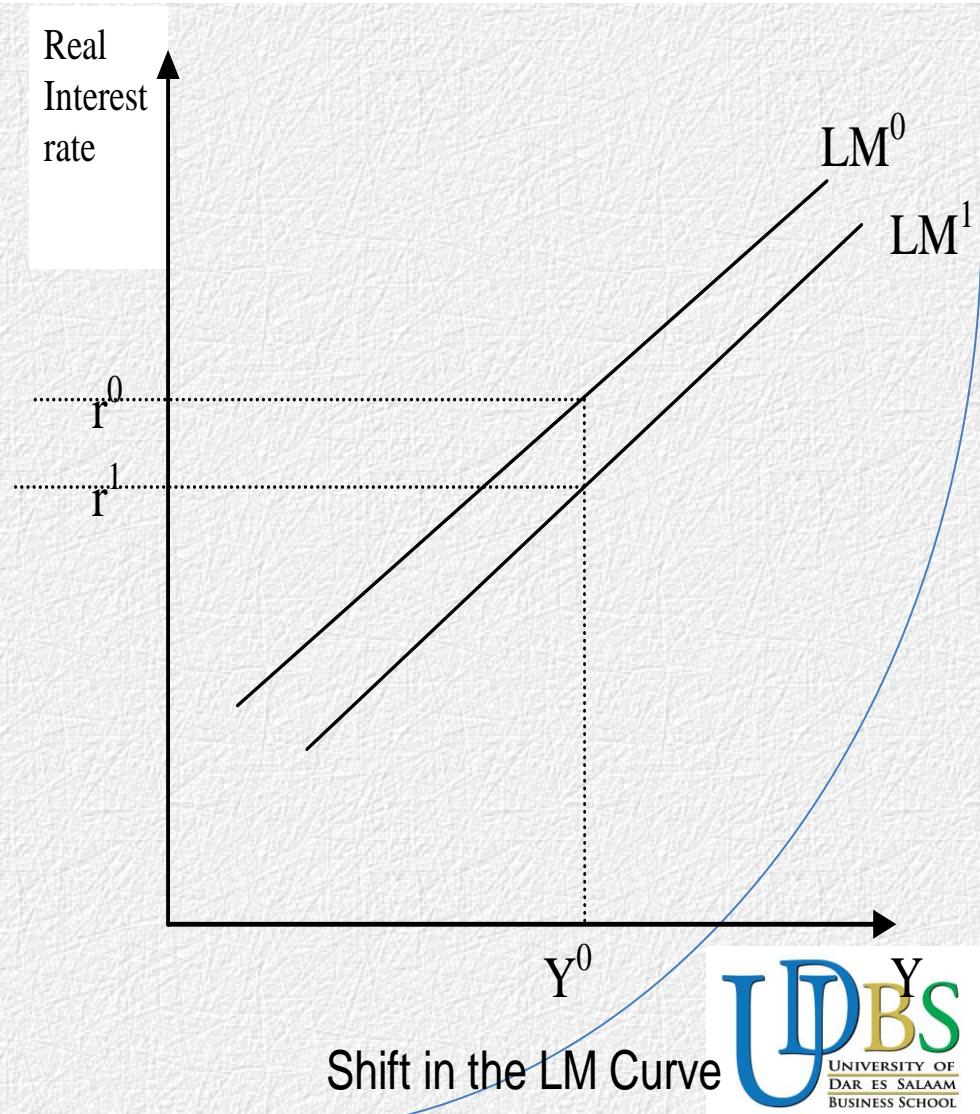
# Plane 2: Shift in the LM Curve



10

7

Increase in Nominal Money Supply



**DEPARTMENT OF FINANCE**  
**University Of Dar Es Salaam**  
**Business School**

**FN 101: Principles of Macroeconomics**

Genuine Martin  
B.Com, M.A. (Economics)

**Lecture 7:**  
**Government and Fiscal**  
**Policy**

# Role of Government in the Economy

- Ideal **market system** without government intervention is best.
- **Producer surplus (welfare)** is maximized.
- **Problems with markets:** pollution, unemployment, income inequality, unfair competition, etc.
- No government keeps its hands off.
- Intervenes if **voluntary agreements** don't work.
- Collects taxes, enforces laws, produce public goods, etc.

# Role of Government in the Economy

- **Three main economic functions:**
- 1) Increase **efficiency**: promote competition, curb externalities, and provide public goods.
- 2) Promote **equity**: tax and expenditure programs to redistribute income.
- 3) Foster **macroeconomic growth** and **stability**: reduce unemployment, inflation, encourages growth.

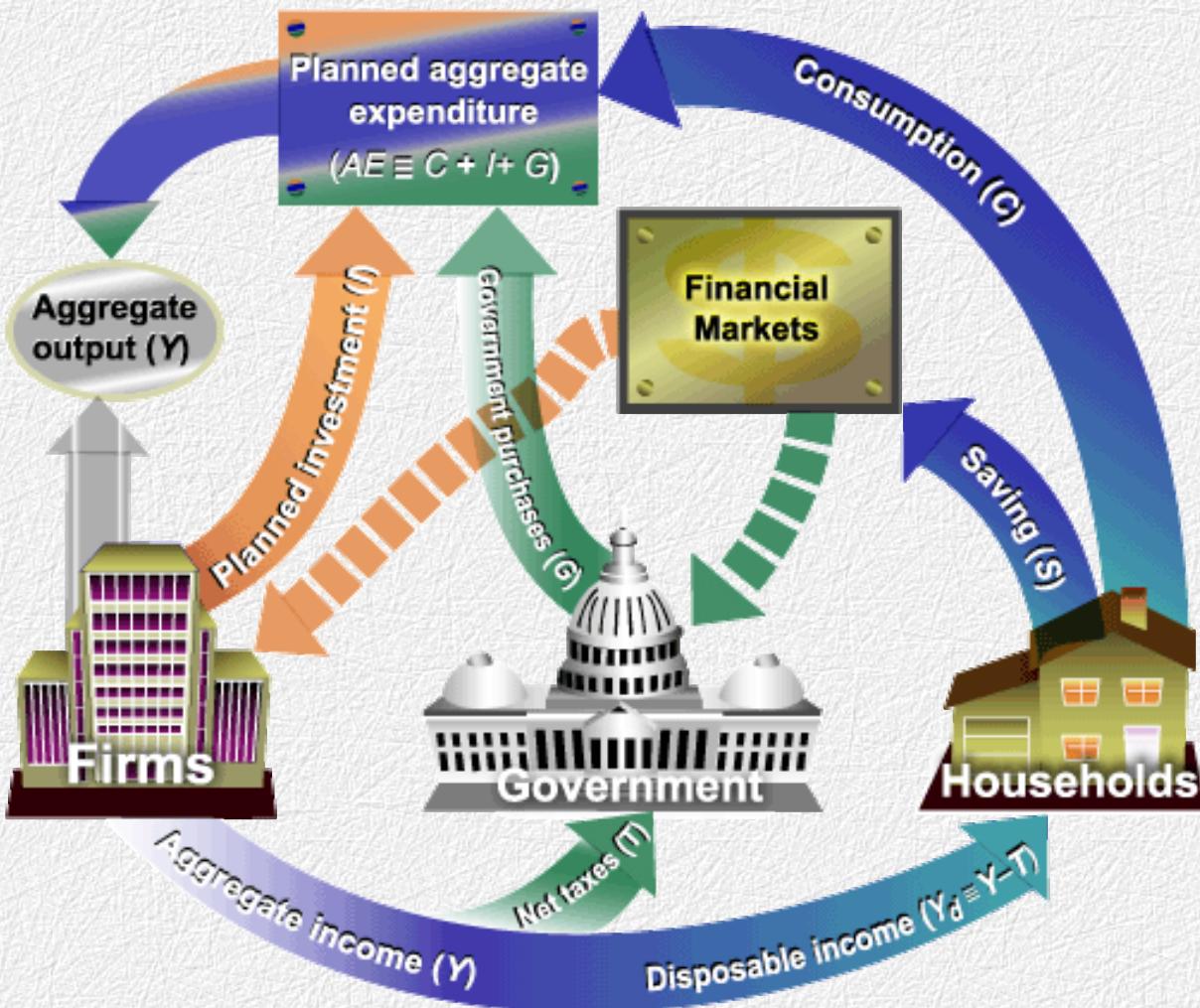
# **What is the Role of Government?**

- Providing a stable set of institutions, laws and rules.
- Promoting effective and workable competition.
- Correcting for externalities.
- Creating an environment that fosters economic stability and growth.
- Providing public goods.
- Adjusting for undesirable market results.

# Government in the Economy

- Nothing arouses as much **controversy** as the role of government in the economy.
- Government can affect the macroeconomy through two policy channels: fiscal policy and monetary policy.
  - ***Fiscal policy*** is the manipulation of government spending and taxation.
  - ***Monetary policy*** refers to the behavior of the Bank of Tanzania regarding the nation's money supply.

# Adding Net Taxes ( $T$ ) and Government Purchases ( $G$ ) to the Circular Flow of Income



# Fiscal Policy

- Part of **demand management**.
- Use of government **spending**, **taxes**, and **income transfers** to influence macroeconomic outcomes (employment, prices and GDP).
- G directly affects AD.
- Income transfers and T affect disposable income.
- **Budget Deficit:**  $G > T$
- **Budget Surplus:**  $T > G$
- **Types of Tools:** **discretionary** fiscal policy & **automatic stabilizers**.

# Fiscal Policy

- **Discretionary Fiscal Policy:** deliberate changes in G, T and transfers to achieve particular goals.
- **Automatic Stabilizers:** measures **inbuilt** into fiscal system (progressive tax & unemployment benefits) to **smooth fluctuations** in disposable income over business cycle.
- Boost AD during recession, and dampen it during expansion.

# Fiscal Policy

- As a result, real GDP fluctuates less over a business cycle, and disposable income varies proportionally less than does real GDP.

# Challenges in Implementing Fiscal Policy

- **1) Inflexibility of government spending:** major portion is wages and salaries (**difficult to adjust**), social projects are **long-run**, cuts in expenditure is **political process**, interest on national debt, unemployment benefits and old age pensions are difficult to adjust.
- **2) Lengthy budget process** – average recessions last less than a year, budget preparations begin about a year before effect, planning discretionary measures is difficult.

# Challenges in Implementing Fiscal Policy

- **3) Political problems** – politicians want to **maximize votes**, and voters like **public spending** and **hate** to pay taxes, contractionary fiscal measures are a challenge before election.
- **4) Information** – assembling **accurate information** quickly and use in short-run AD management is a challenge.
- **5) Time lags** – takes time to assimilate information, appreciate an economic situation, formulate policy, implement it, and taking effect.
- Possibility of policy working in a wrong time.

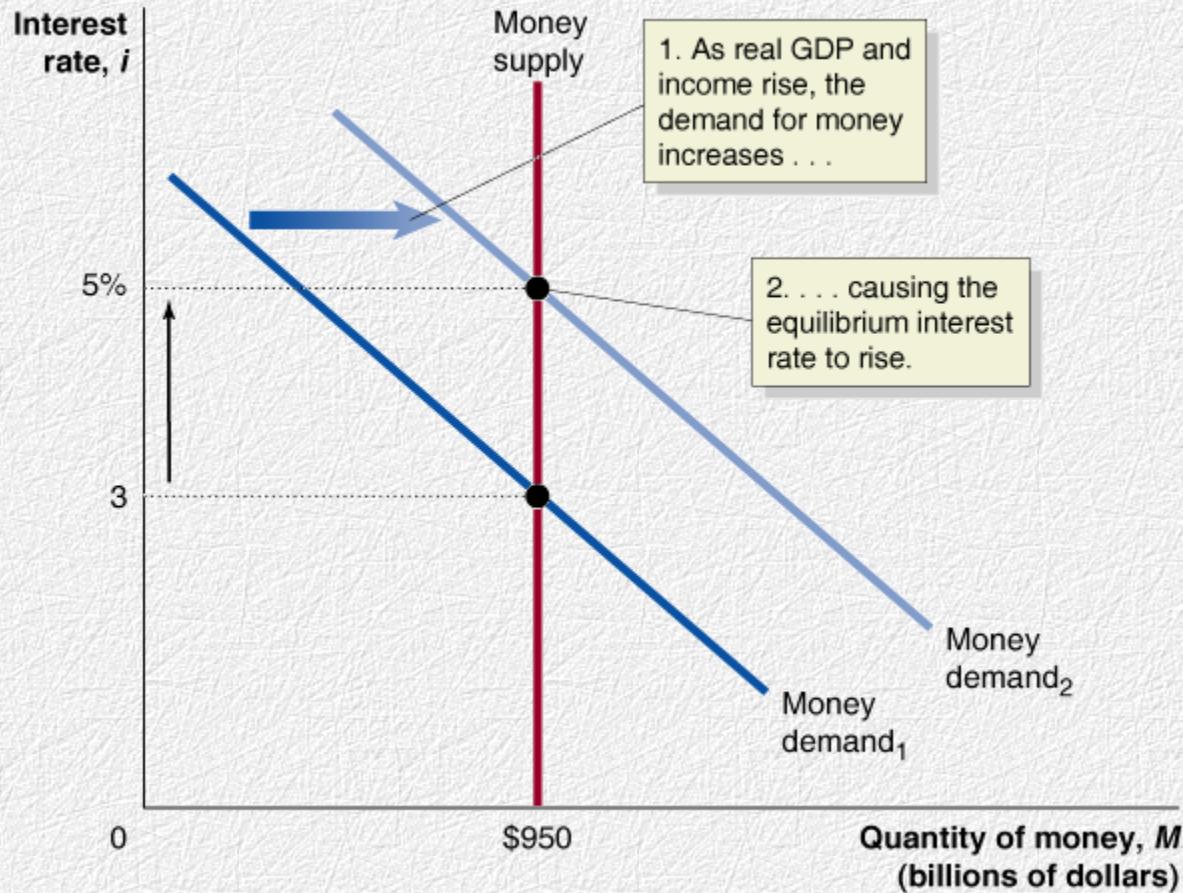
# Challenges in Implementing Fiscal Policy

- Takes about **six months** to identify a recession.
- **Data lags** – time needed to gather data on economic variables.
- **Recognition lag** – time needed to analyze trends suggested by economic variables.
- **Legislative lag** – legislative approval is a long process.
- **Implementation lag** – time to put tax and expenditure policy into effect.

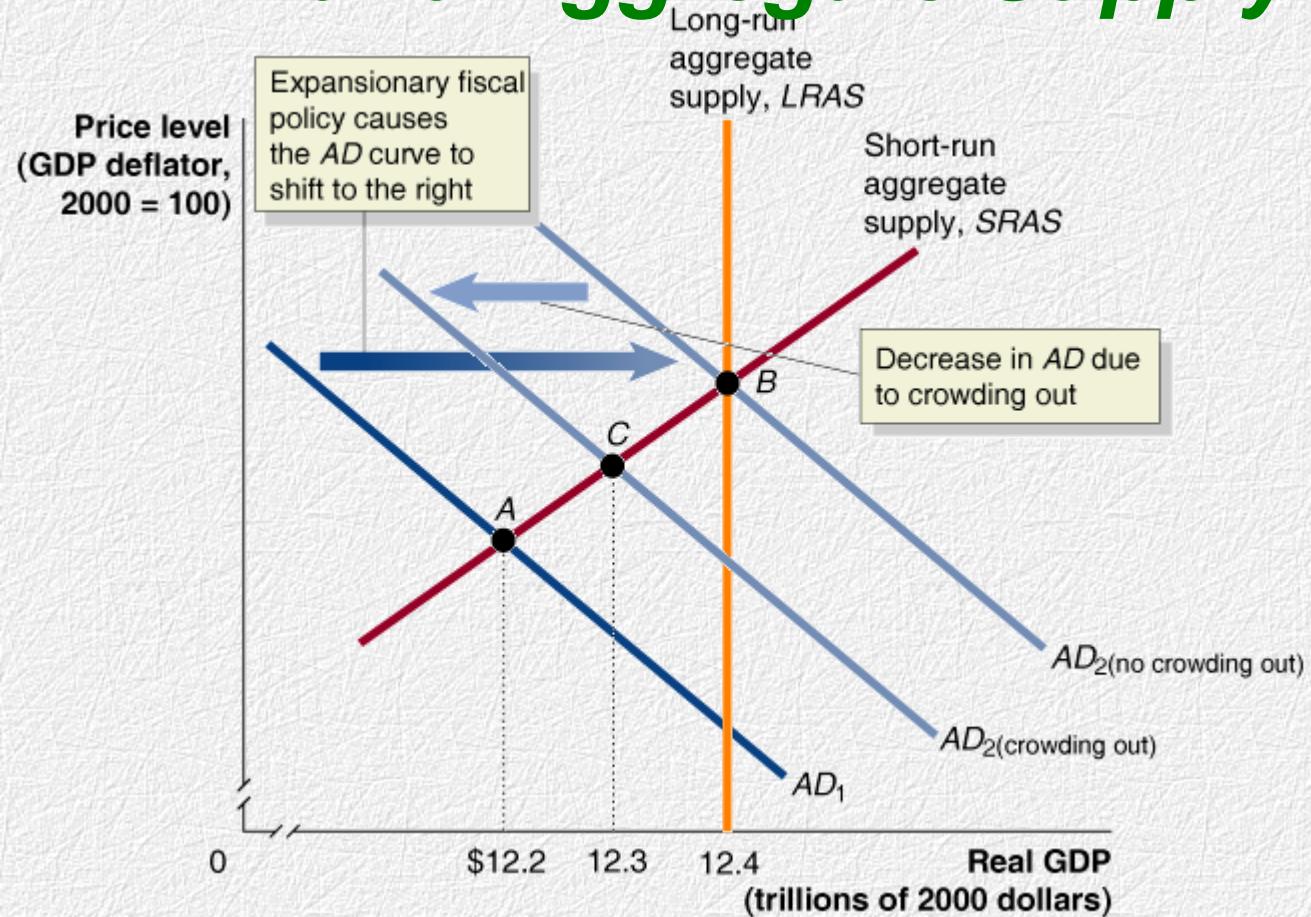
# Challenges in Implementing Fiscal Policy

- **Impact lag** – time for policy to take effect on the economy after implementation.
- **6) Crowding Out** – government borrowing starves the real sector and forces interest up.
- This discourages investment and consumption, and slowing economic activities.

# Crowding Out Limits Fiscal Policy in the Short Run



# *Crowding Out in the Aggregate Demand and Aggregate Supply Diagram*



*In the long run, the economy returns to potential GDP*

# Budgetary Issues

- **A. Budget Deficits:**  $G + TP$  exceed  $T$ .
- Deficit financing is justified if it increases **productivity** (highways, waterways, dams), etc.
- Increase during recession bse of higher TP and less taxes.
- **B. Crowding Out and In:** Financing deficits by borrowing increases demand for credit, less available for real investments and pushes interest up (**Crowding Out**).

# Budgetary Issues

- If operating below capacity, deficit financing could increase AD, boost employment, and increasing business confidence leading to more investments (**crowding in**).
- **C. Twin Deficit:** budget deficit financing thru borrowing pushes up interest rate, encouraging new capital inflow that causes appreciation.
- Makes imports cheaper and exports dearer, leading to current account deficit (**twin deficit**).
- **Budget Balance and Government Debt**
- Budget deficit is a **flow** variable.

# Budgetary Issues

- **National debt** is a **stock** variable.
- **Gross Debt:** all outstanding government liabilities.
- **Net Debt:** Gross debt minus government assets.
- When the current generation borrows, does it pass the budget to the future generations?
- 1) **We owe to selves (internal borrowing)**, same future generations will service the debt and same will receive the payments.

# Budgetary Issues

- 2) If **borrowed from outside**, it increases burden of debt on future generations.
- LR effects depend on where the borrowed funds are used.
- If on **productive investments** (infrastructure, education, etc), economy's productive capability will increase in the LR.
- However, if used towards **current consumption** (retirement benefits, salaries, wages), future generations will pay great price.

# Public Debt/GDP Ratio of Some Countries in 2010 (CIA)

| Country        | % of GDP | Rank |
|----------------|----------|------|
| Zimbabwe       | 304.30   | 1    |
| Japan          | 192.10   | 2    |
| Italy          | 115.20   | 7    |
| Greece         | 113.40   | 8    |
| Sudan          | 104.50   | 9    |
| United Kingdom | 68.50    | 22   |
| India          | 59.60    | 31   |
| Malawi         | 58.00    | 35   |

# Public Debt/GDP Ratio of Some Countries in 2010 (CIA)

| Country         | % of GDP    | Rank      |
|-----------------|-------------|-----------|
| Kenya           | 54.10       | 40        |
| United States   | 52.90       | 42        |
| South Africa    | 35.70       | 72        |
| Zambia          | 31.50       | 84        |
| Mozambique      | 26.10       | 93        |
| <b>Tanzania</b> | <b>24.8</b> | <b>95</b> |

# Public Debt/GDP Ratio of Some Countries in 2010 (CIA)

| Country  | % of GDP | Rank |
|----------|----------|------|
| Uganda   | 19.30    | 105  |
| China    | 18.20    | 107  |
| Botswana | 17.90    | 109  |
| Angola   | 16.80    | 111  |
| Libya    | 6.50     | 125  |

# Public Debt Stock Ranking of Some Countries in 2010 (IMF)

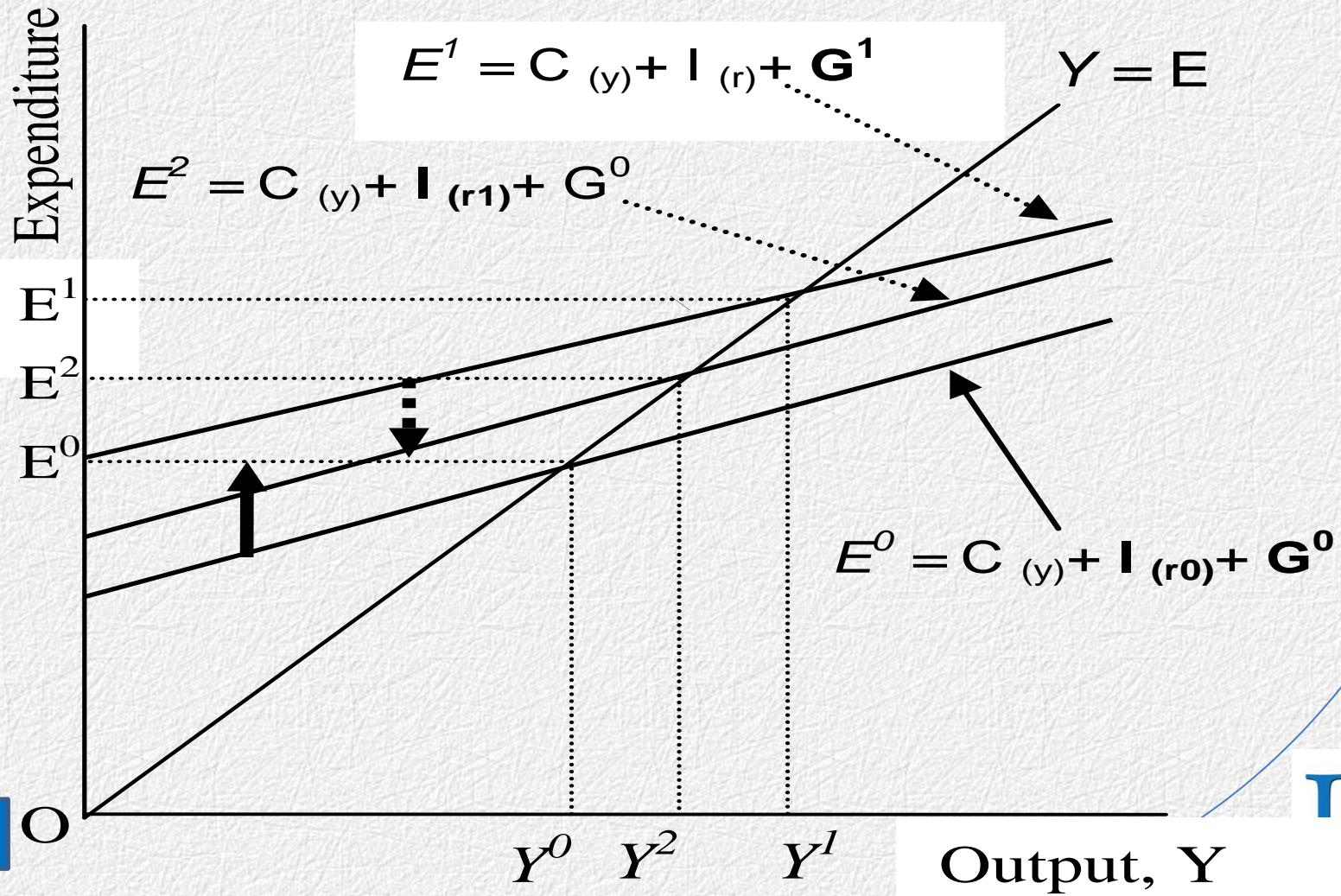
| Country      | Debt Stock<br>in million \$ | Rank | Country  | Debt Stock<br>in million \$ | Rank |
|--------------|-----------------------------|------|----------|-----------------------------|------|
| Russia       | 162,924                     | 1    | Botswana | 1,352                       | 89   |
| China        | 90,180                      | 7    | Zambia   | 1,309                       | 91   |
| South Africa | 17,753                      | 21   | Rwanda   | 766                         | 103  |
| Kenya        | 6,978                       | 38   | Malawi   | 715                         | 105  |
| Tanzania     | 5,572                       | 46   | Burundi  | 412                         | 112  |
| Zimbabwe     | 3,686                       | 59   | Liberia  | 184                         | 123  |
| Mozambique   | 2,960                       | 65   | Rwanda   | 766                         | 103  |
| Uganda       | 2,671                       | 70   |          |                             |      |

# Fiscal Policy and IS Curve

- Factors **other than interest rates** that change AE cause a shift of IS curve
- **Include:**  $C_0$ ,  $G$ , foreign demand, willingness to save, expected future profitability.
- Case of expansionary fiscal policy (**Keynesian Cross**).
- Government increases spending from  $G^0$  to  $G^1$
- At  $r^0$ , aggregate spending increases from  $E^0$  to  $E^1$ .
- As a result, output required to maintain equilibrium in goods market is higher as well.

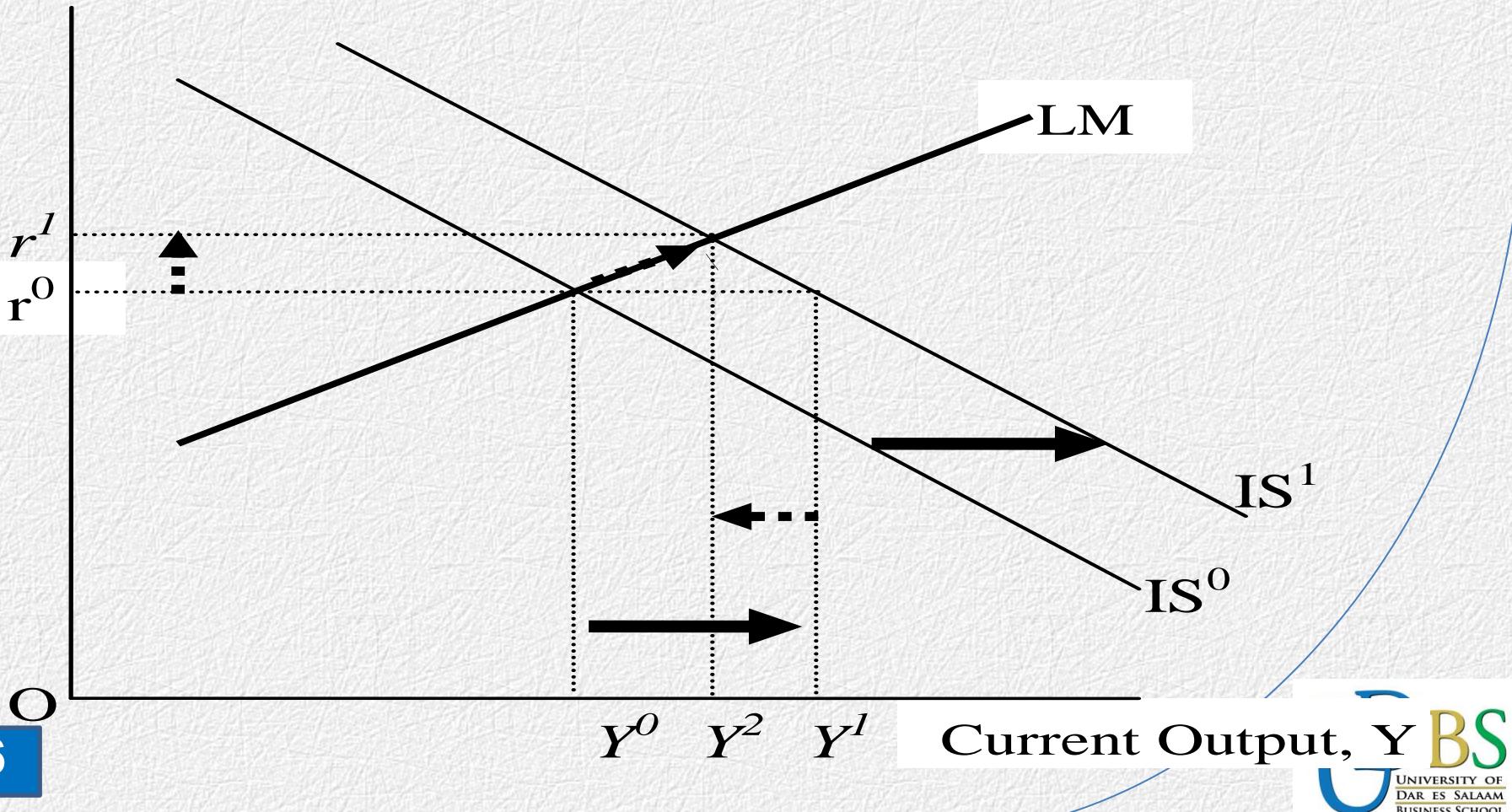
# Fiscal Policy and IS Curve

- Increases from  $Y^0$  to  $Y^1$ .



# Fiscal Policy and IS Curve

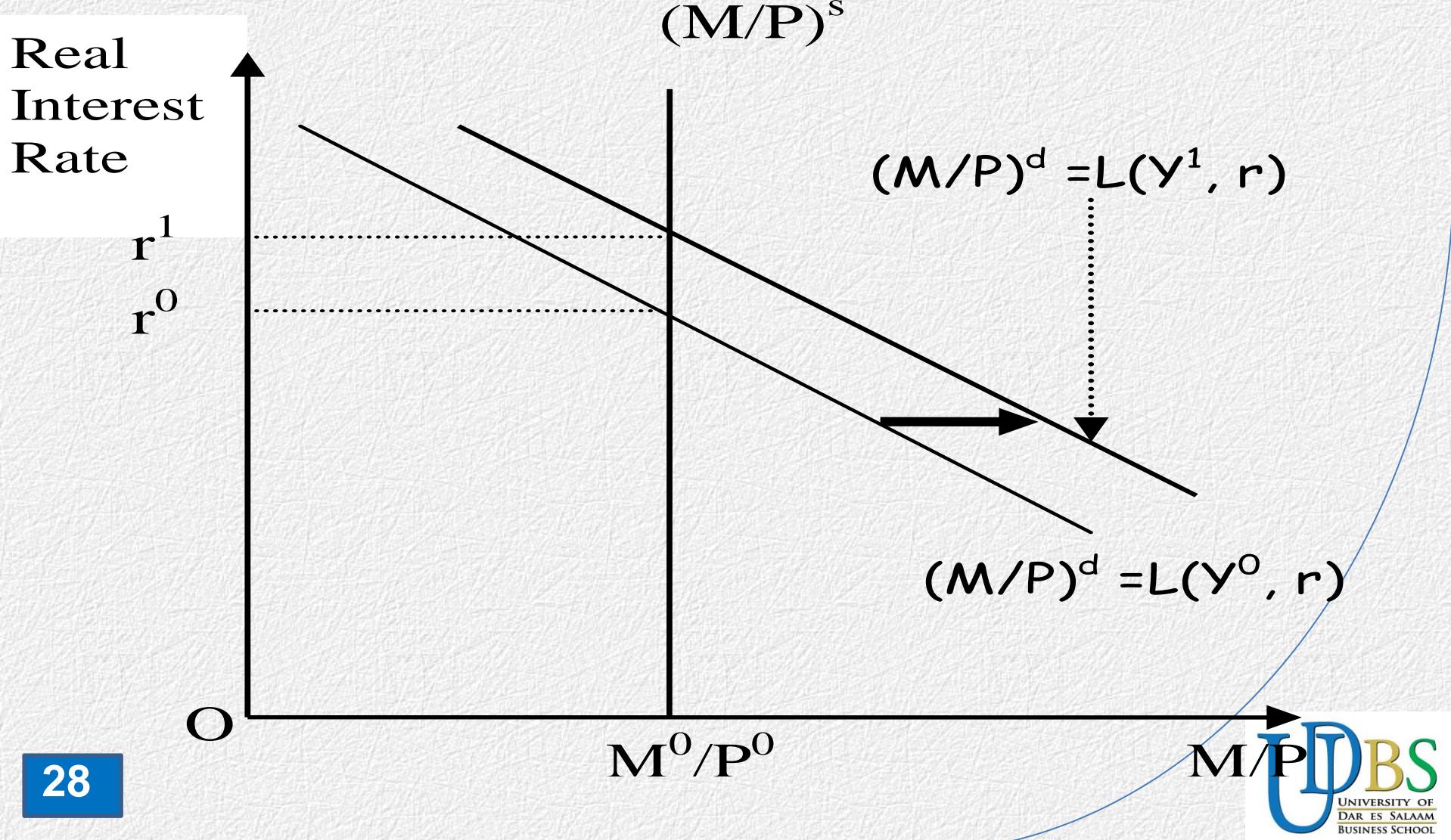
- IS curve shifts rightward ( $Y^0$  to  $Y^1$ , at  $r^0$ ).  
Real Interest Rate



# Fiscal Policy and IS Curve

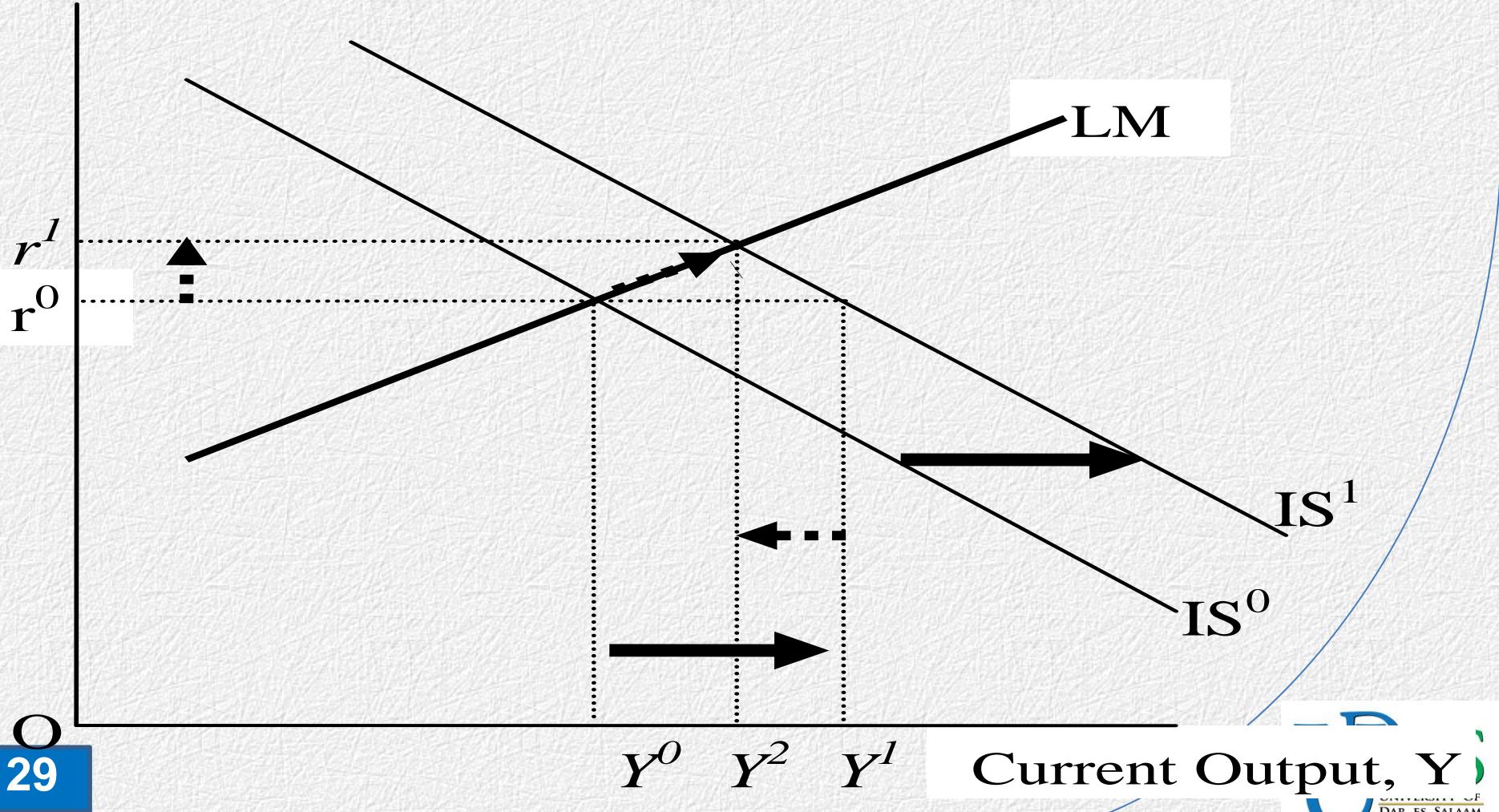
- As  $Y$  increases, demand for money increases as well.
- With fixed nominal money supply, interest rate increases causing a movement along same LM curve.

# Fiscal Policy and IS Curve



# Fiscal Policy and IS Curve

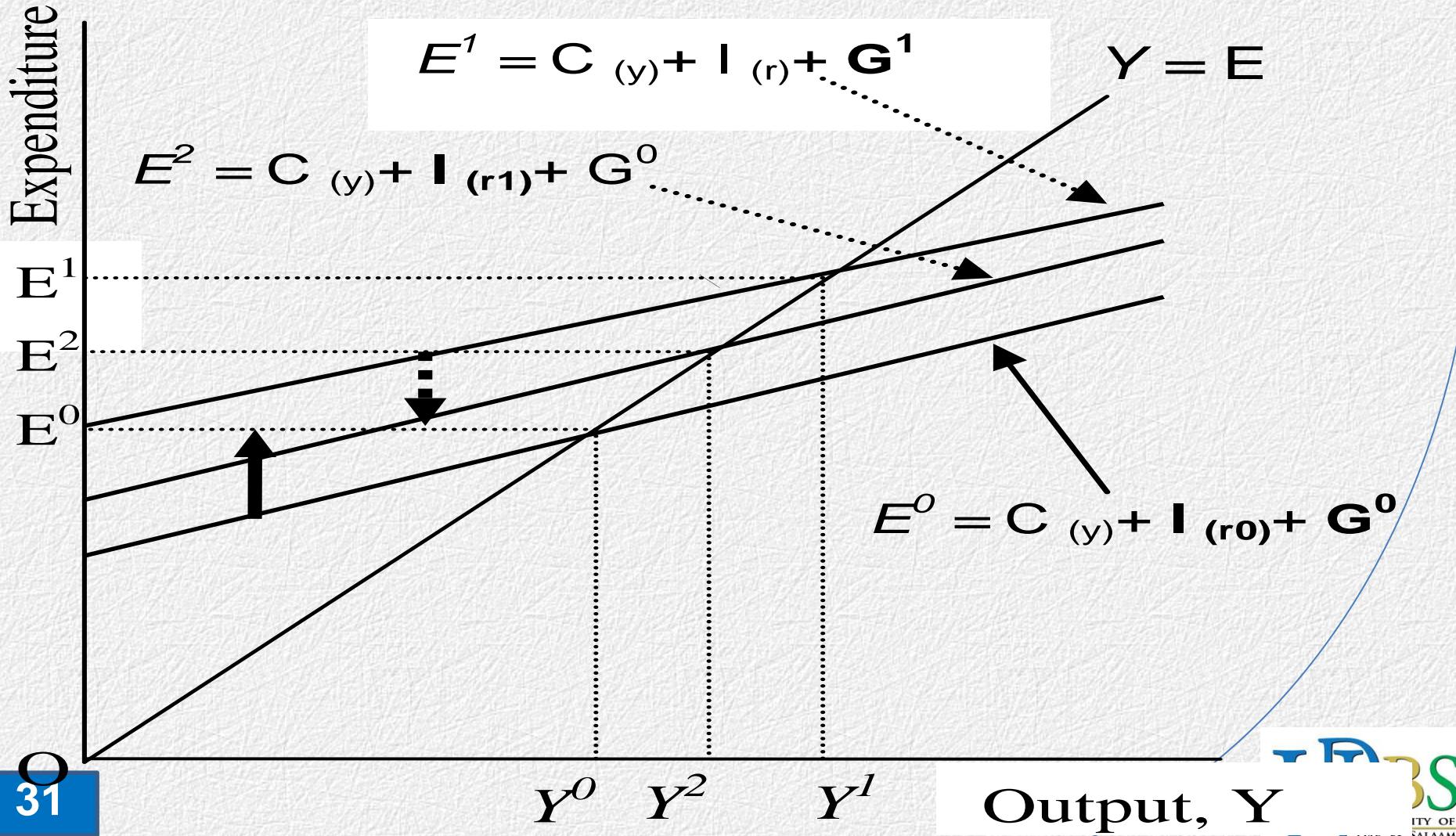
Real Interest Rate



# Fiscal Policy and IS Curve

- Increase in interest rate causes investment expenditure to decrease.
- Planned expenditure starts to decline.
- Causing income to decline to  $Y^2$

# Fiscal Policy and IS Curve

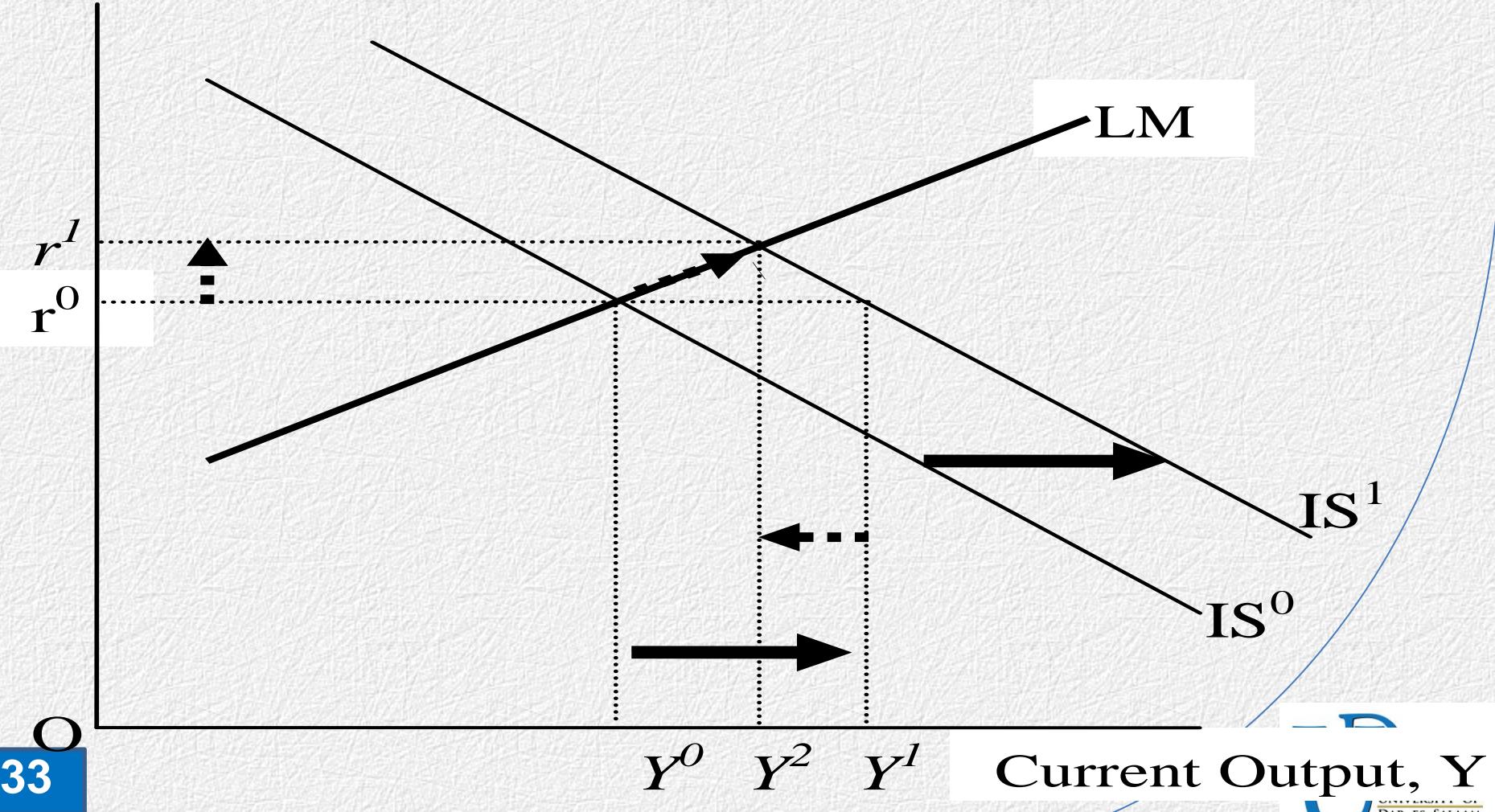


# Fiscal Policy and IS Curve

- Adjustment continues until new equilibrium is established at  $(Y^2, r^1)$ .

# Fiscal Policy and IS Curve

Real Interest Rate



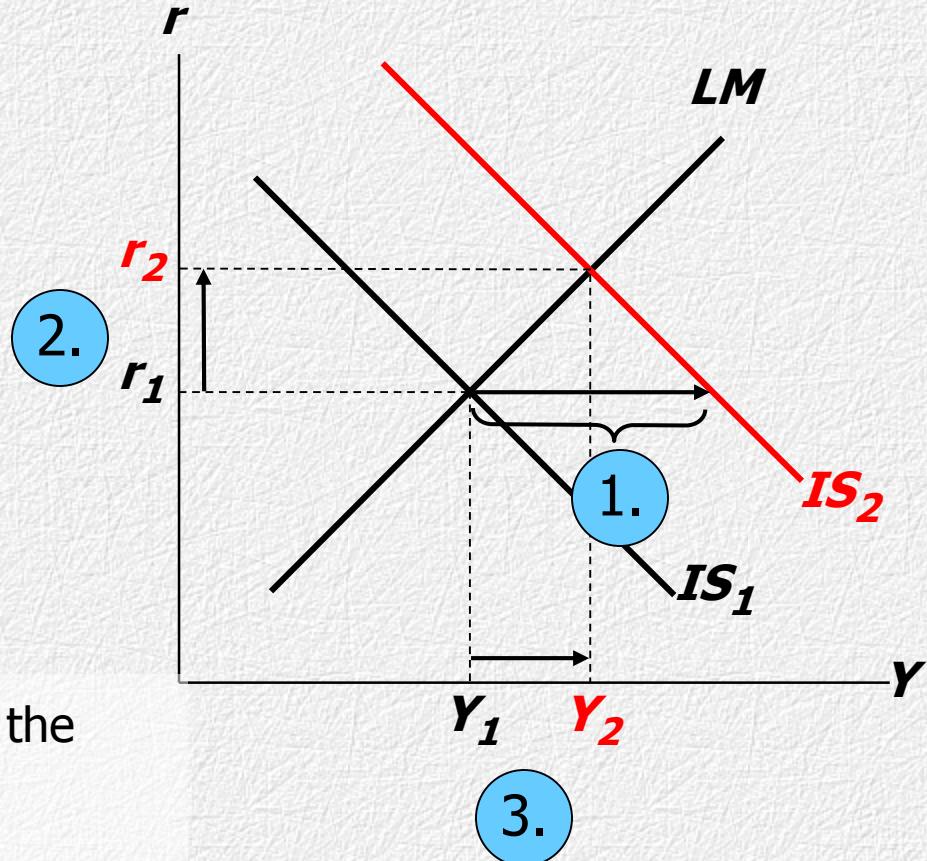
# An Increase in Government Purchases

1.  $IS$  curve shifts right

by  $\frac{1}{1-MPC} \Delta G$   
causing output & income  
to rise.

2. This raises money demand,  
causing the interest rate to  
rise...
3. ...which reduces investment, so the  
final increase in  $Y$

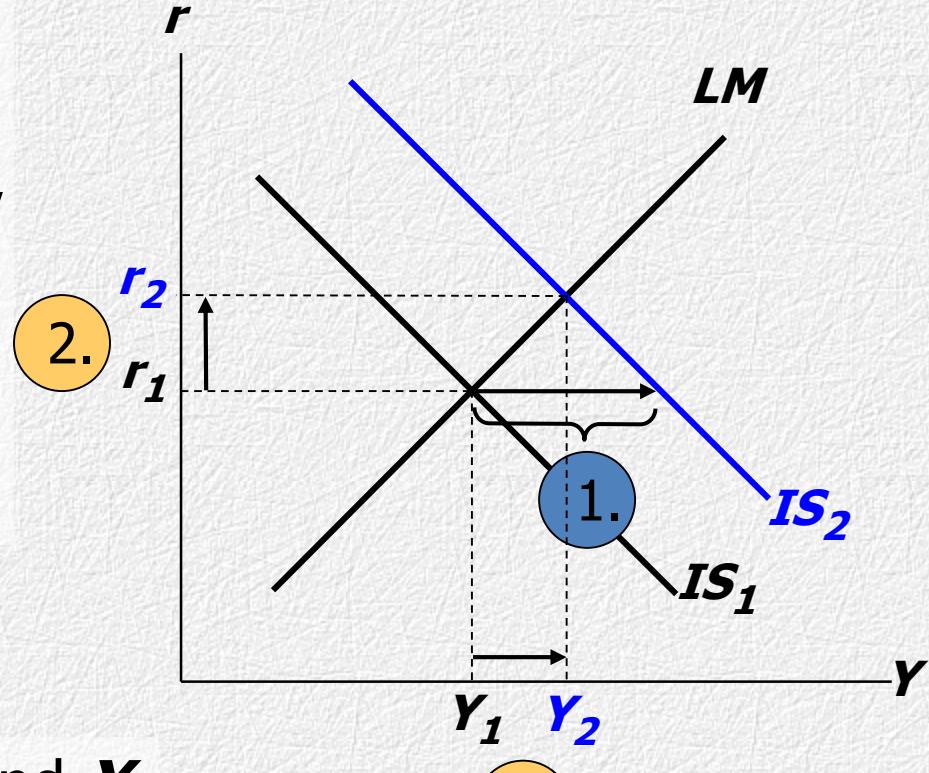
is smaller than  $\frac{1}{1-MPC} \Delta G$



# A Tax Cut

Because consumers save  $(1 - MPC)$  of the tax cut, the initial boost in spending is smaller for  $\Delta T$  than for an equal  $\Delta G$ ... and the *IS* curve shifts by

$$1. \quad \frac{-MPC}{1-MPC} \Delta T$$



2. ...so the effects on  $r$  and  $Y$  are smaller for a  $\Delta T$  than for an equal  $\Delta G$ .

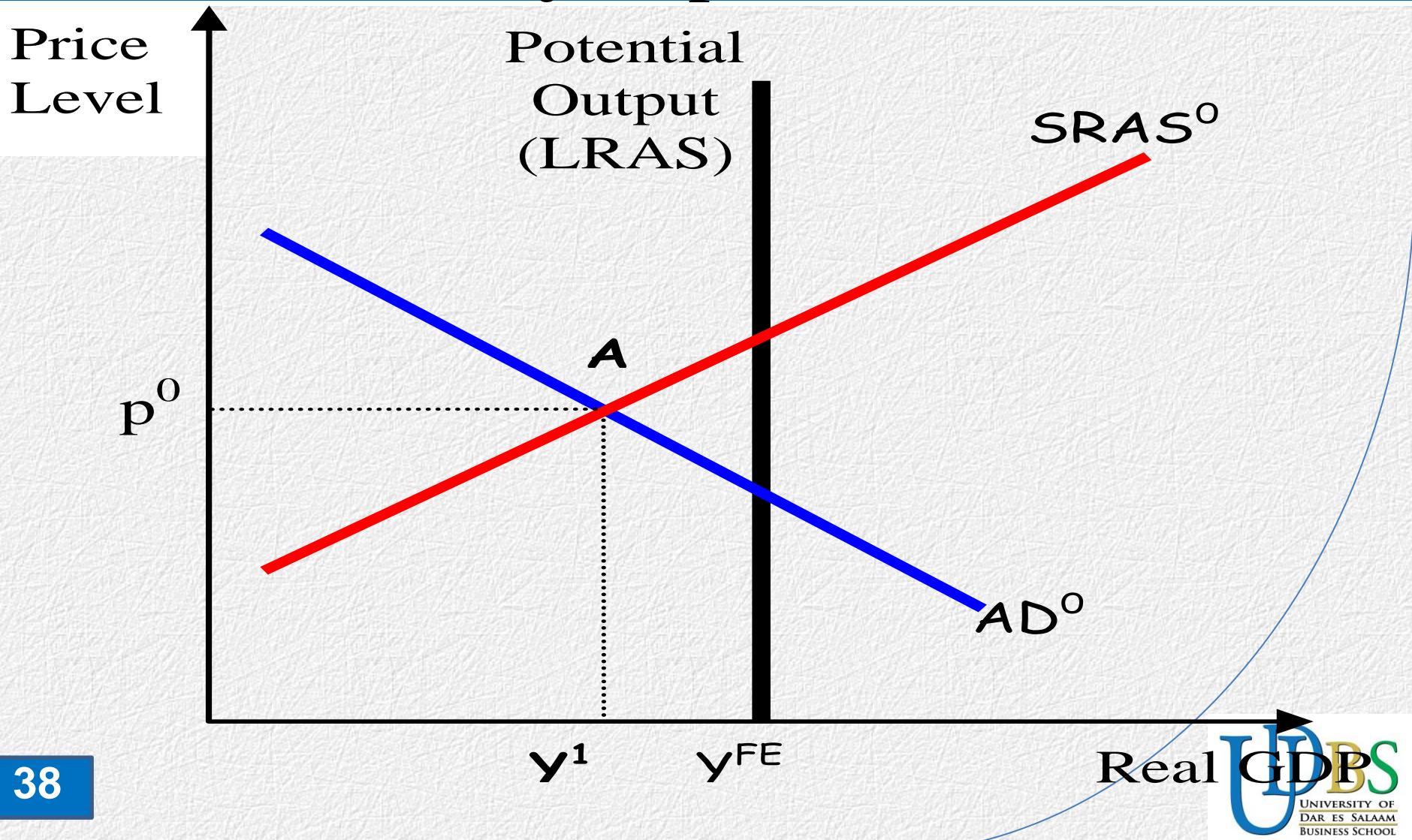
# Fiscal Policy and the AD Curve

- How government responds to **contractionary gap** using fiscal policy.
- **Contractionary gap** – output is below full employment.
- Wages and other resource prices are **slow** to respond, thus SRAS may not shift to close the gap.
- To speed up closing, government increases G or decreases T, to shift AD curve to the right.
- This changes both output and price level.

# Fiscal Policy and the AD Curve

- With changes in price level, the **multiplier will be smaller**.
- **Steep SRAS:** less impact on output and more impact on price level.
- **Gentle SRAS:** more impact on output and less impact on price level.
- The economy is initially in contractionary gap at A.
- Contractionary gap:  $Y^{FE} - Y^1$

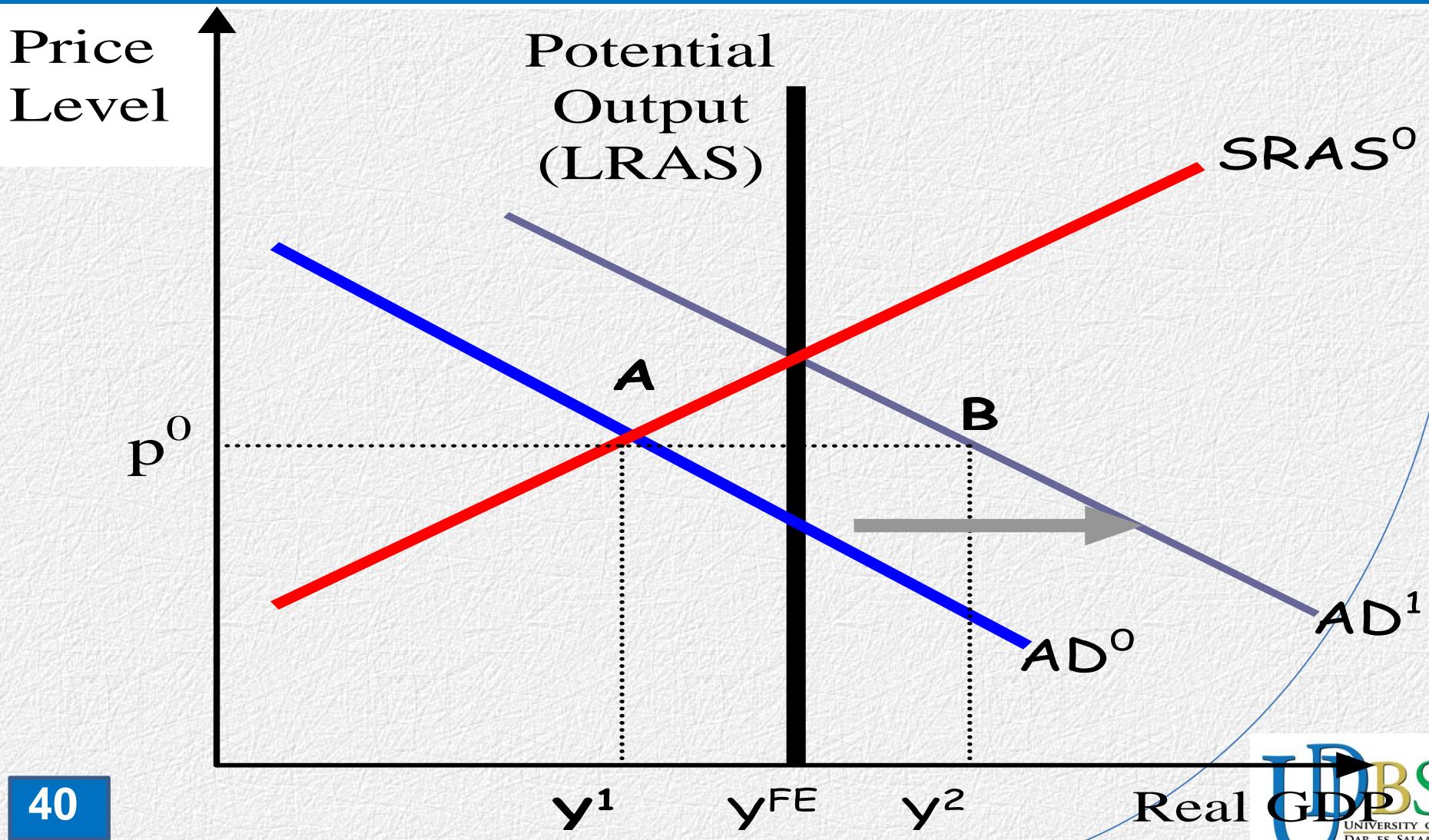
# Fiscal Policy and the AD Curve



# Fiscal Policy and the AD Curve

- Expansionary fiscal policy shifts AD curve to AD<sup>1</sup>.
- Output increases from Y<sup>1</sup> to Y<sup>2</sup>.
- At that level, **demand exceeds supply**, and price has to rise.

# Fiscal Policy and the AD Curve



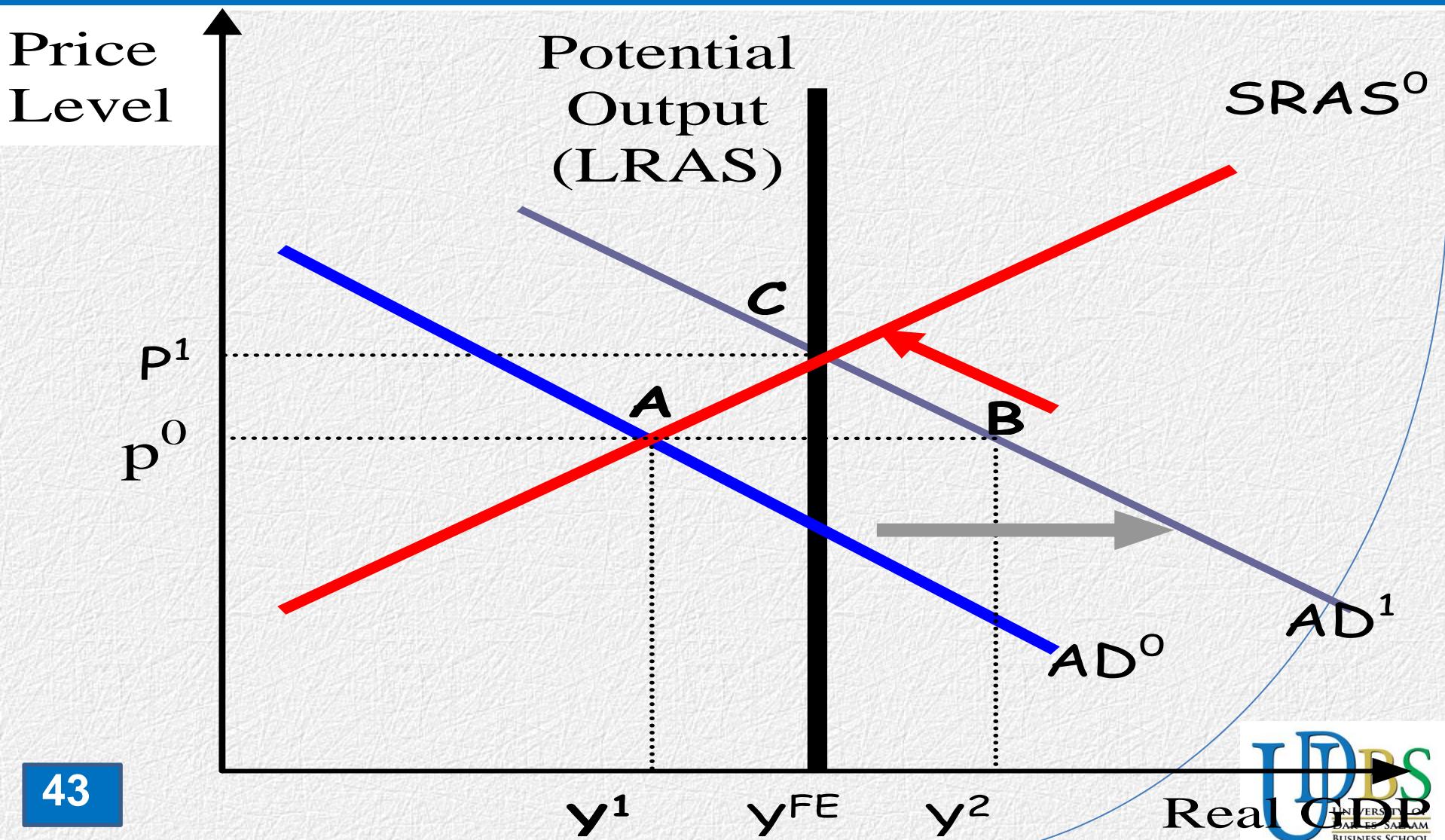
# Feedback Effects of Fiscal Policy on Aggregate Supply

- Ultimate increase in real GDP is less than  $Y^2 - Y_1$ .
- Because of the increase in price level.
- **Recall:** A point B, demand exceeds supply.
- It creates upward pressure on prices bse SRAS is positively sloped.
- In the LR, with higher prices, labourers will demand higher wages, and more production which increases demand for inputs will exert more pressure on input prices to rise.

# Feedback Effects of Fiscal Policy on Aggregate Supply

- As a whole, costs of production will increase, and that will shrink production capabilities, and supply will shrink back from  $Y^2$  to  $Y^{FE}$ .
- The final result will be at point C, where output is at full employment  $Y^{FE}$ , and prices rise to  $P^1$ .

# Feedback Effects of Fiscal Policy on Aggregate Supply



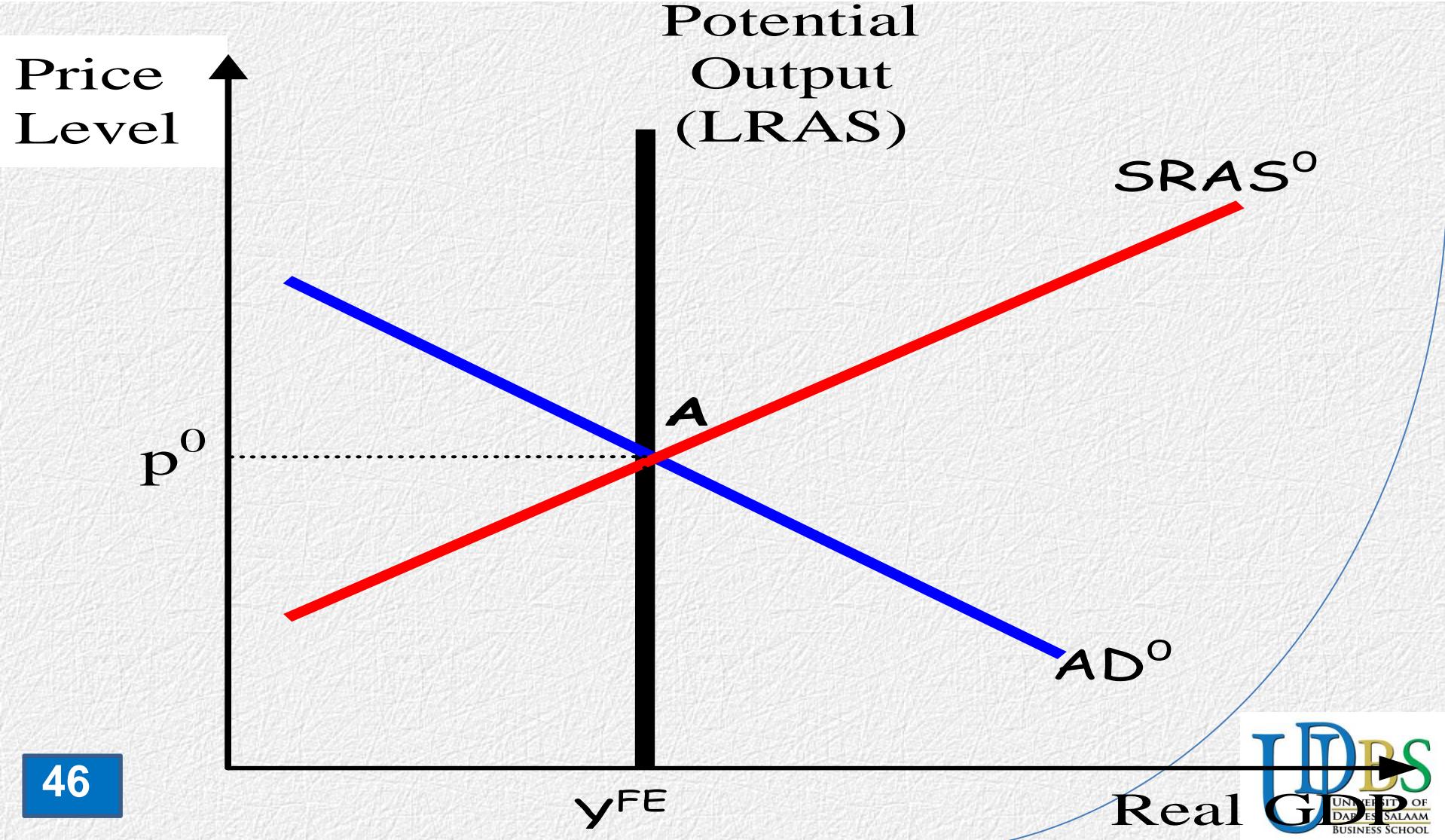
# Fiscal Policy and Natural Rate of Unemployment

- **Natural Rate of Unemployment** occurs when economy produces at **potential level of output**.
- If incorrectly estimated, economy will be pushed to the level that is unsustainable.
- E.g. if the government thinks it is 4% but in fact actually is 5%.
- Fiscal policy would be implemented to increase employment and reduce unemployment to 4%.
- When it reaches 5%, the economy is already at full employment.

# Fiscal Policy and Natural Rate of Unemployment

- Attempt to reduce it to 4% will create an **expansionary gap**.
- In LR, nominal wages will rise, SRAS will shift up and unemployment will return to its natural rate of 5%.
- We illustrate this below.
- Initially natural rate of employment is at A where economy produces at full employment output.

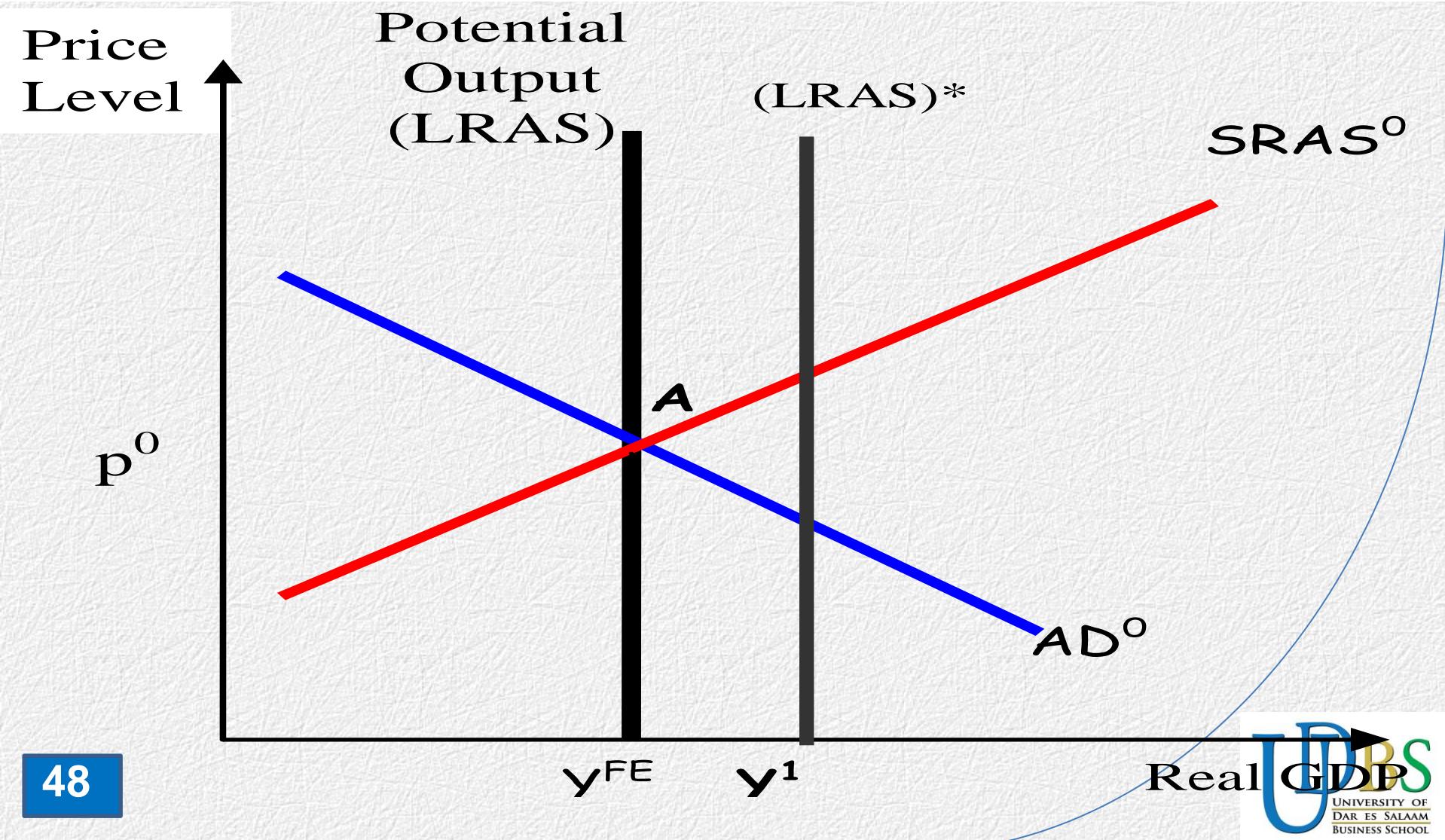
# Fiscal Policy and Natural Rate of Unemployment



# Fiscal Policy and Natural Rate of Unemployment

- If the government **underestimates** the natural rate of employment at 4% instead of 5%.
- i.e. it believes the potential level of output is at  $Y^1$  instead of  $Y^{FE}$  (LRAS\*).

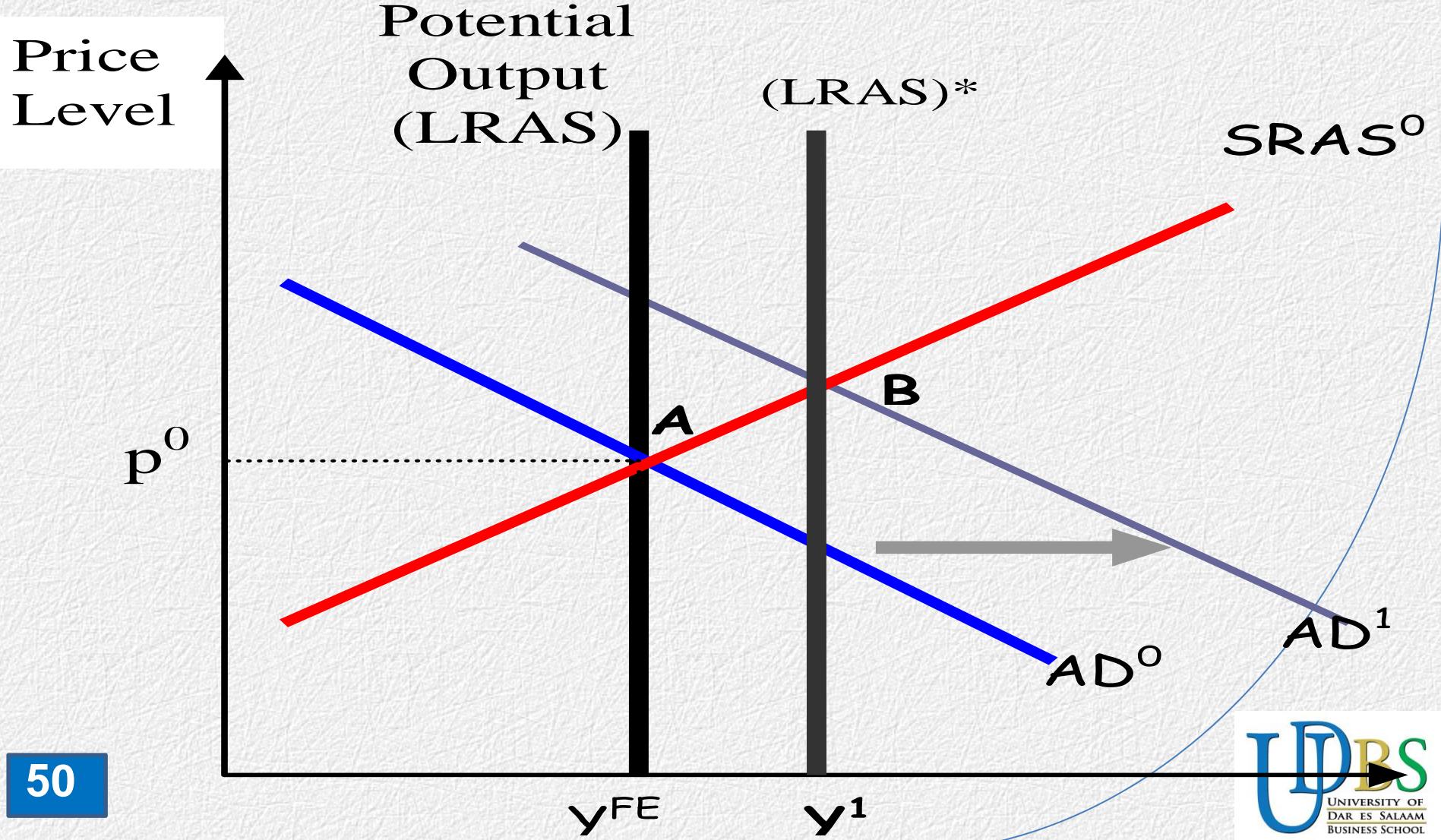
# Fiscal Policy and Natural Rate of Unemployment



# Fiscal Policy and Natural Rate of Unemployment

- The government thus increases spending to close the gap.
- AD increases from  $AD^0$  to  $AD^1$ , moving along the SRAS from point A to B.
- At point B, however, we are actually at expansionary gap and the price level rises.

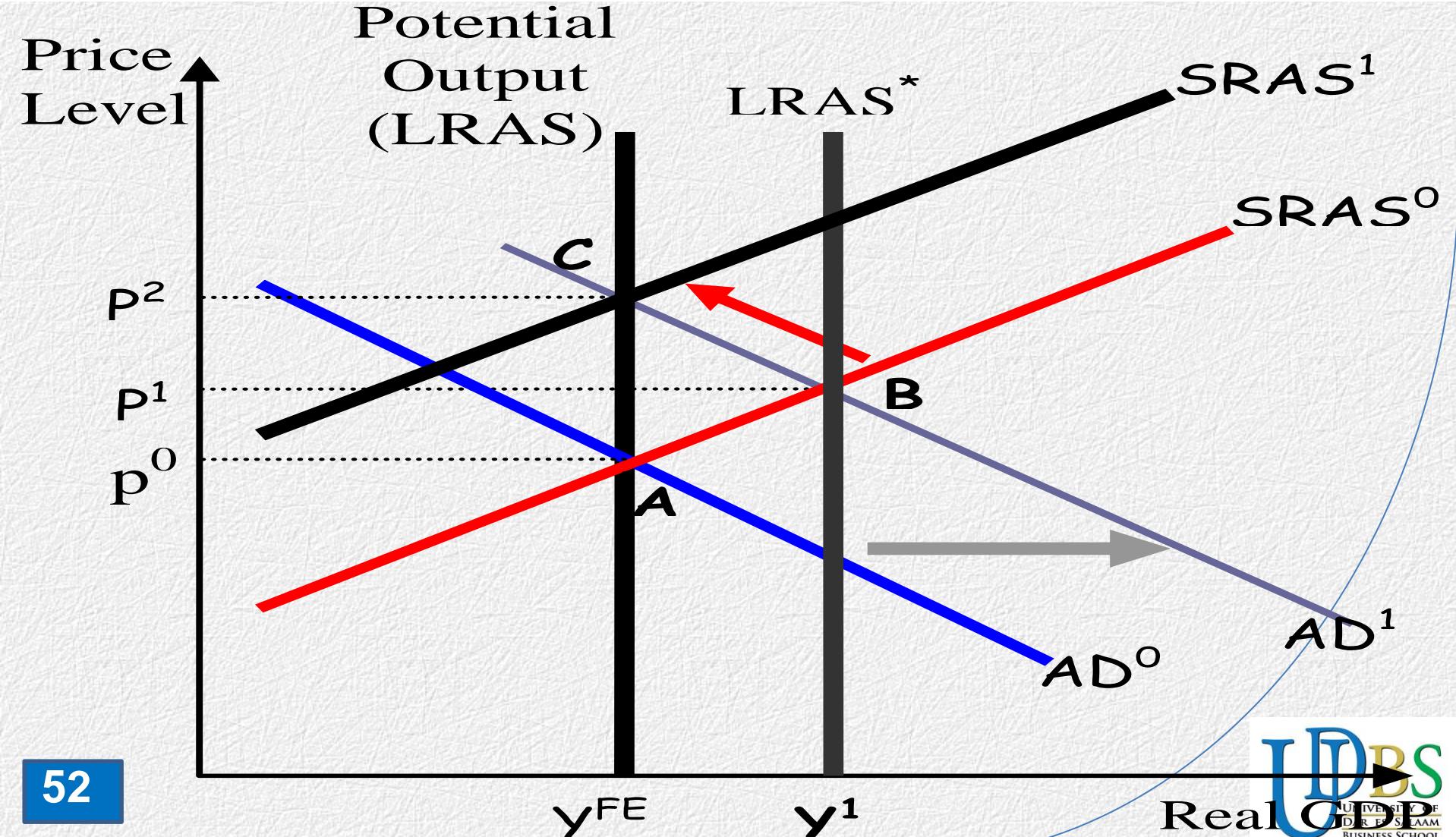
# Fiscal Policy and Natural Rate of Unemployment



# Fiscal Policy and Natural Rate of Unemployment

- In LR, in response, workers negotiate higher nominal wages, and SRAS shifts up to SRAS<sup>1</sup>.
- We are back to potential output level at point C.
- However, the underestimation of natural rate of unemployment leads to **higher inflation** in the LR.

# Fiscal Policy and Natural Rate of Unemployment



# Taxation and Government

- Government needs **money** to provide goods and services, e.g. defence, social services, infrastructure, security, law enforcement, public goods, etc.
- It raises money via **grants, aids, borrowing, fees and taxes**.
- **User Fees:** a price paid by users of governments goods and services, e.g. court fines.
- **Taxes:** paid by everyone or only the users of a good/service.

# Taxation and Government

- Taxation is **primary vehicle** of government finance.
- Are imposed on transactions, institutions, property, meals, etc.
- But finally paid by **individuals or households**.
- **Tax Base:** measure or value upon which tax is imposed.
- Includes income, consumption or wealth.
- **Tax Rate Structure:** percentage of a tax base paid in taxes, e.g. 30% of income, 18% of selling prices, etc.

# Taxation and Government

- **Types of Taxes:** personal income taxes, corporate income taxes, excise taxes, customs taxes, VAT, property taxes, social security taxes, sales taxes, etc.
- Most taxes are levied on **measurable economic flows**, e.g. profits, net income, etc.

# Principles of Taxation

- **1) Efficiency:** tax system should not be distortionary, but used to enhance economic efficiency.
- **2) Administrative Simplicity:** low cost of administration and compliance.
- **3) Flexibility:** allow easy adaptation to changed circumstances (**automatic stabilizers**).
- **4) Policy Responsibility:** transparent tax system.

# Principles of Taxation

- **5) Fairness:** impose higher taxes on those who can better bear the burden.

# Tax Classification according to Burden

- **A) Proportional Tax:** tax whose burden is **same** proportion of income for all households.
- Tax amount as percentage of income (tax burden) is constant.
- E.g. corporate tax (30% flat income tax rates) for all corporate.
- Marginal tax rate equals to average tax rate.
- Distributes income and consumption very well based on **ability to pay**.

# Tax Classification according to Burden

- **B) Progressive Tax:** tax whose burden (tax as % of income) increases as income increases.
- Has distributional effect on income and consumption.
- Marginal tax rate is higher than average tax rate.
- Aims to reduce tax burden on people with low ability-to-pay, e.g. personal income tax brackets.

# Tax Classification according to Burden

- Applied also in form of **tax exemptions** (selective taxation) to create progressive distribution effects, e.g. import duties exemption on agricultural inputs.

# Individual Income Tax Rate (From 1<sup>st</sup> Jul 2010) from TRA

| No | MONTHLY TAXABLE INCOME (TSHS) | TAX RATE  |
|----|-------------------------------|---|
| 1  | $I \leq 135,000$              | NIL   |
| 2  | $135,000 < I \leq 360,000$    | 14% of the amount in excess of 135,000/=                        |
| 3  | $360,000 < I \leq 540,000$    | 31,500/= plus 20% of the amount in excess of 360,000/=          |
| 4  | $540,000 < I \leq 720,000$    | 67,500/= plus 25% of the amount in excess of 540,000/=          |
| 5  | $I > 720,000$                 | Tshs 112,500 plus 30% of the amount in excess of Tshs 720,000/= |

# Computation of Tax Burden Based on TRA Tax Brackets

| SALARY        | TAX AMOUNT  | BURDEN |
|---------------|-------------|--------|
| Shs 100,000   | Shs 0       | 0.0 %  |
| Shs 300,000   | Shs 23,100  | 7.7 %  |
| Shs 400,000   | Shs 39,500  | 9.9 %  |
| Shs 600,000   | Shs 82,500  | 13.8 % |
| Shs 1,000,000 | Shs 196,500 | 19.7 % |

# Tax Classification according to Burden

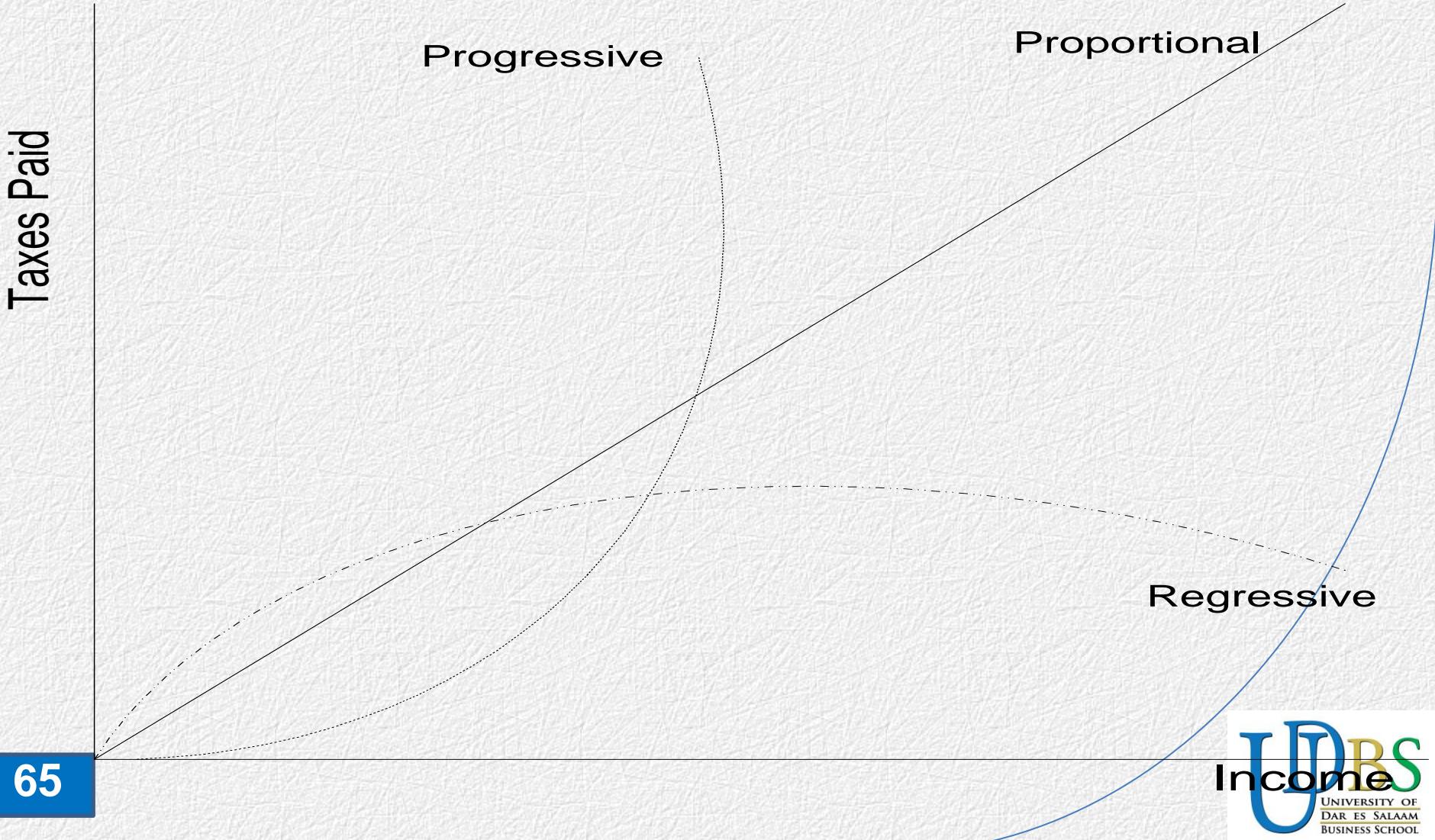
- **C) Regressive Tax:** tax whose burden (tax as % of income) **falls** as income increases.
- E.g. excise taxes on specific commodities, retail sales tax, VAT, poll tax, sin taxes.
- Marginal tax rate is less than average tax rate.
- Imposes a greater burden on poor due to inverse relationship btn tax rate and ability to pay.
- How?
- Fixed taxes are applied in which every person has to pay same amount of taxes.

# Proportional, Progressive, and Regressive Taxes

The Burden of a Hypothetical 5% Sales Tax Imposed on  
Three Households with Different Incomes

| HOUSEHOLD | INCOME    | SAVING RATE % | SAVING   | CONS.    | 5% TAX ON CONS. | TAX AS A % OF INCOME |
|-----------|-----------|---------------|----------|----------|-----------------|----------------------|
| A         | \$ 10,000 | 20            | \$ 2,000 | \$ 8,000 | \$ 400          | 4.0                  |
| B         | 20,000    | 40            | 8,000    | 12,000   | 600             | 3.0                  |
| C         | 50,000    | 50            | 25,000   | 25,000   | 1,250           | 2.5                  |

# Tax Classification according to Burden



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**Lecture 5:**  
**General Equilibrium and**  
**AD-AS Model**

# Nature of the Aggregate Demand (AD) Curve

- **Recall:**  $AE = AD = C + I + G + X - M$
- Change in **price level** affects **real money balances** and therefore **level of spending**.
- **AD Curve:** illustrates relationship btn **aggregate demand** for goods and services and the **aggregate price level**, ceteris paribus.
- **Downward Sloping:** Why downward sloping?
- **1) Wealth Effect:** decrease in price level makes consumers feel wealthier ( $M/P$ ) thus encouraged to spend more and thus more demand for goods/services.

# Nature of the Aggregate Demand (AD) Curve

- **2) Interest Rate Effect:** a lower price level, holding nominal money supply ( $M$ ) constant, leads to large quantity of real money balances ( $M/P$ ), causing interest rate to fall that stimulates investment spending.

$$P \downarrow \Rightarrow M / P \uparrow \Rightarrow i \downarrow \Rightarrow I \uparrow \Rightarrow Y^{ad} \uparrow$$

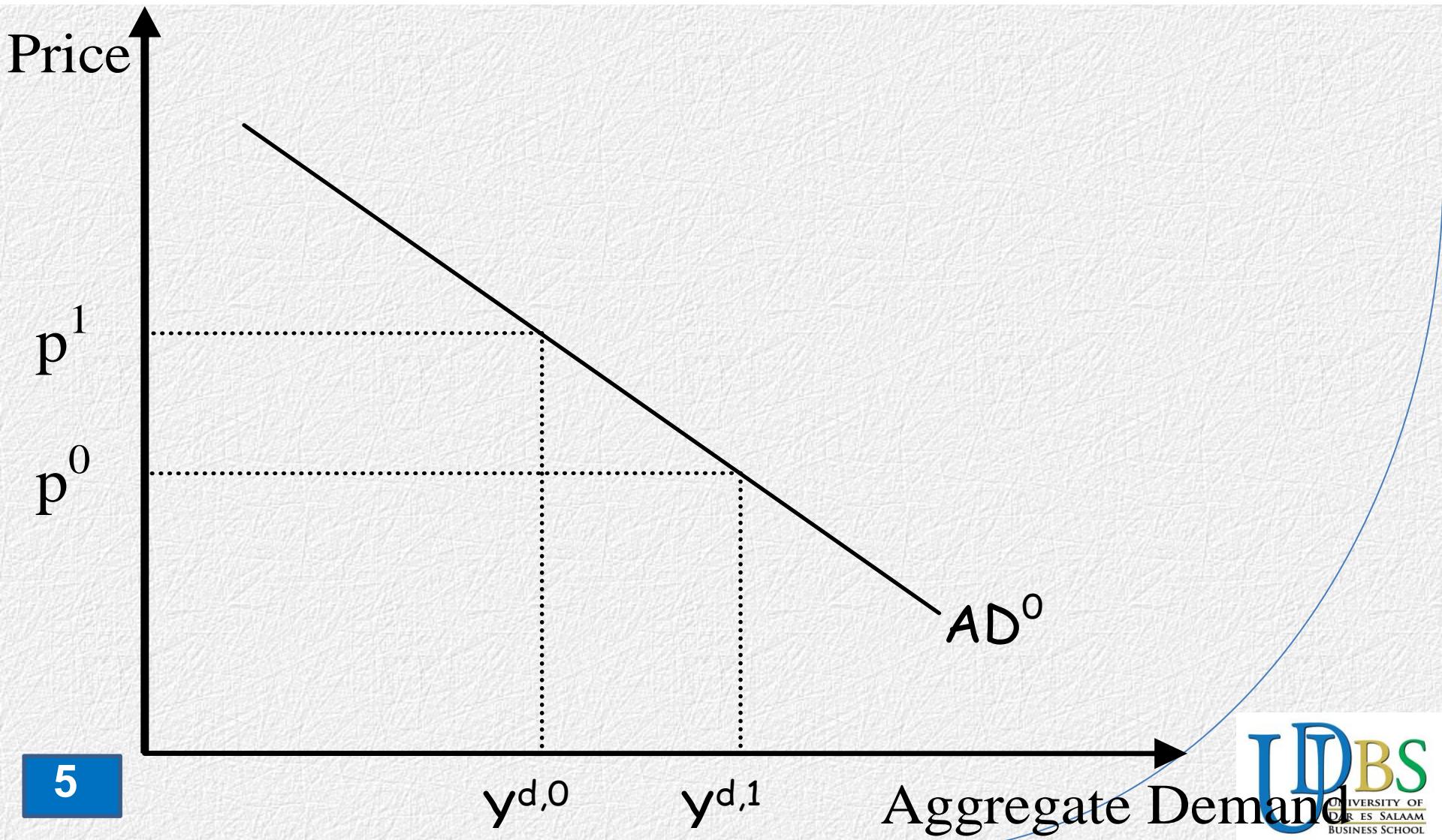
- **3) Exchange Rate Effect:** a lower price level, holding nominal money supply ( $M$ ) constant, leads to large quantity of real money balances ( $M/P$ ), causing interest rate to fall.

# Nature of the Aggregate Demand (AD) Curve

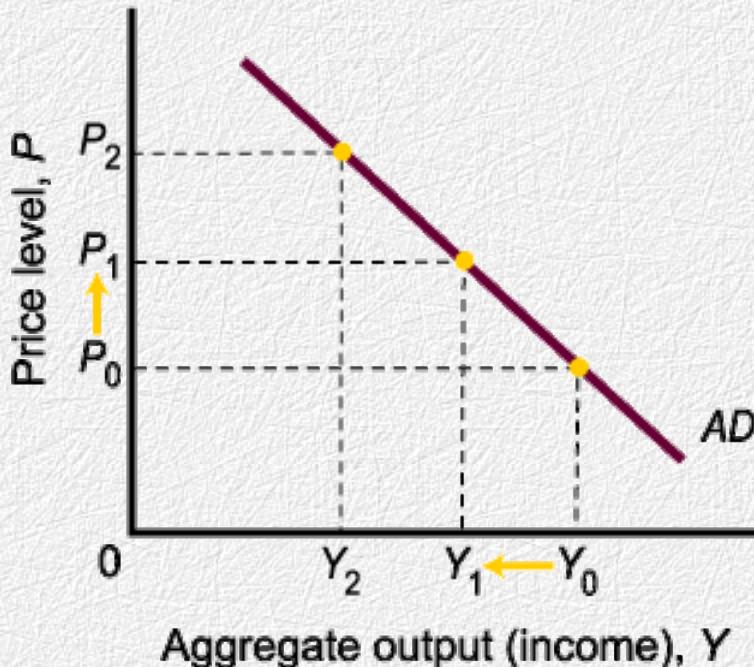
- Fall in interest rate encourages more investment in foreign countries and less at home.
- This leads to shilling depreciation, that makes exports cheaper (thus more exports) and imports dearer (thus less imports).
- Thus, net exports will rise and AD will increase.

$$P \downarrow \Rightarrow M/P \uparrow \Rightarrow i \downarrow \Rightarrow e \downarrow \Rightarrow NX \uparrow \Rightarrow Y^{ad} \uparrow$$

# Nature of the Aggregate Demand (AD) Curve



# The Aggregate Demand Curve

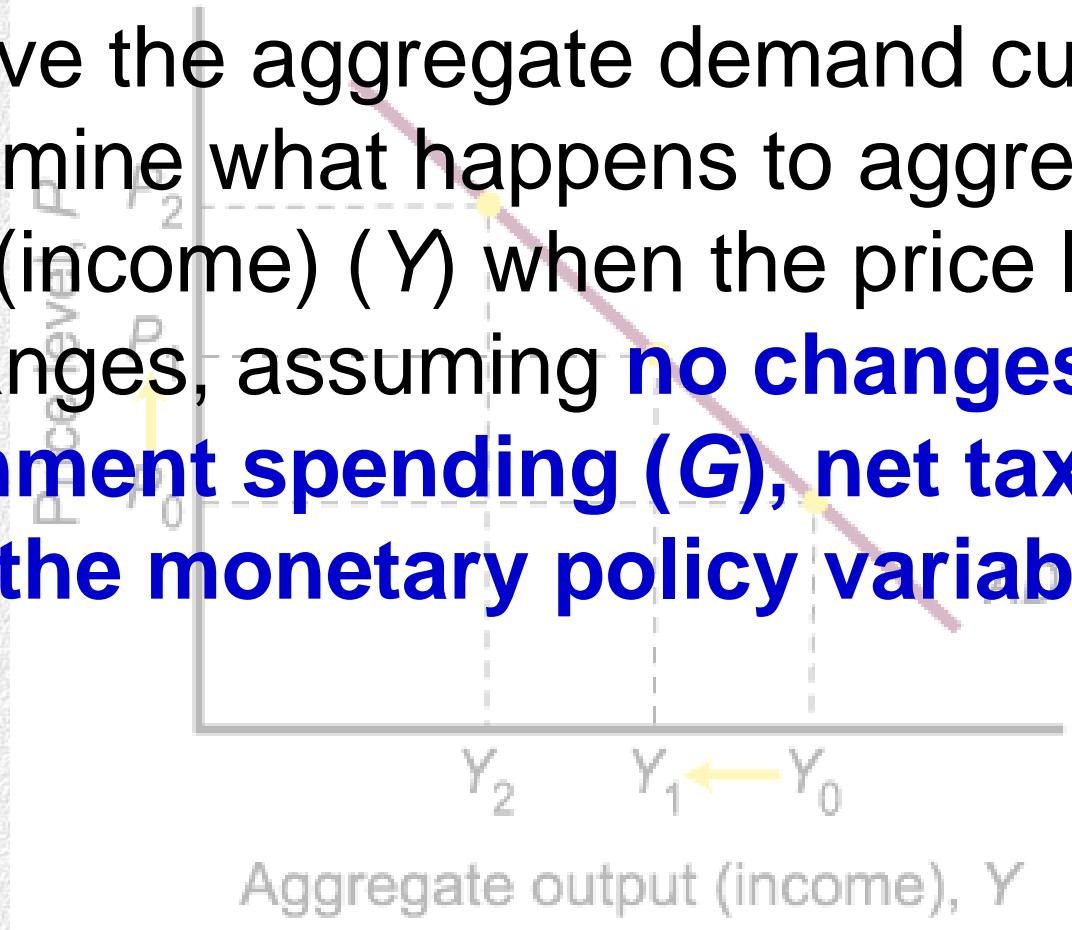


- **Aggregate demand** is the total demand for goods and services in the economy.

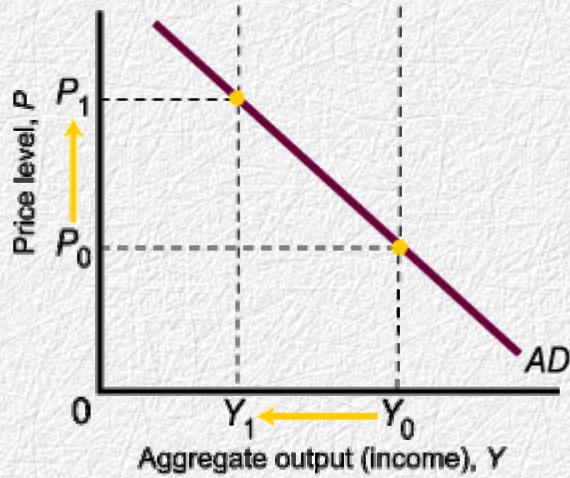
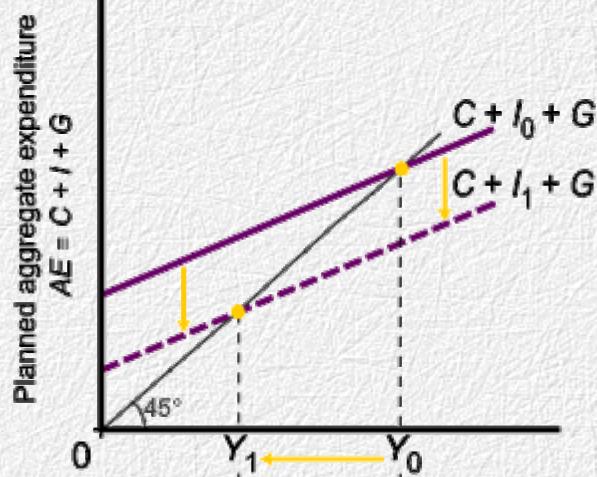
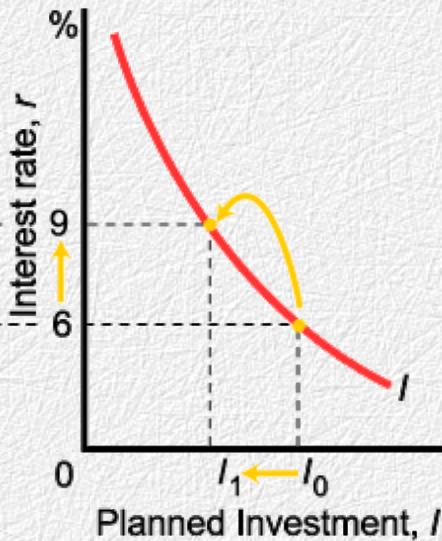
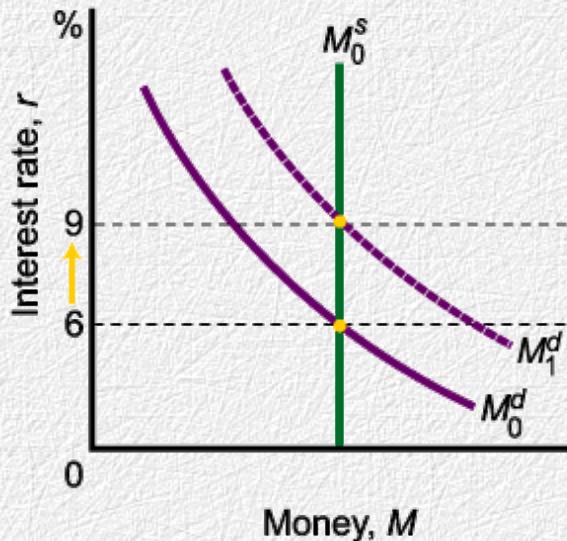
- The **aggregate demand (AD) curve** is a curve that shows the negative relationship between aggregate output (income) and the price level.

# Deriving the Aggregate Demand Curve

- To derive the aggregate demand curve, we examine what happens to aggregate output (income) ( $Y$ ) when the price level ( $P$ ) changes, assuming **no changes in government spending ( $G$ ), net taxes ( $T$ ), or the monetary policy variable ( $M^s$ )**.



# Deriving the Aggregate Demand Curve



$\uparrow P \rightarrow M^d \uparrow \rightarrow r \uparrow \rightarrow I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$

- Each pair of  $P$  and  $Y$  on the AD curve corresponds to a point at which both the **goods market** and the **money market** are in **equilibrium**.

# Shifts in the Aggregate Demand

- Causes are **policy** and **non-policy** forces.
- 1) Fiscal Policy:** government influence via taxes, transfer payments and government purchases.
  - Increase in  $G$  leads to increase in  $AD$  directly.
  - Decrease in  $T$  and increase in  $TP$  increases  $Y_D$  and thus consumption.
- 2) Monetary Policy:** increase in money supply leads to fall in interest rate which increases investment, consumption and net exports, and thus  $AD$ .

# Shifts in the Aggregate Demand

- **3) Wealth:** more wealth makes consumers richer and thus spends more at same income level.
- **4) Expectations:** optimism about future incomes, profits and inflation affects current expenditure decisions.
- **5) Foreign Income Level:** higher incomes in foreign countries lead to higher demand for our goods, exports and AD increase.

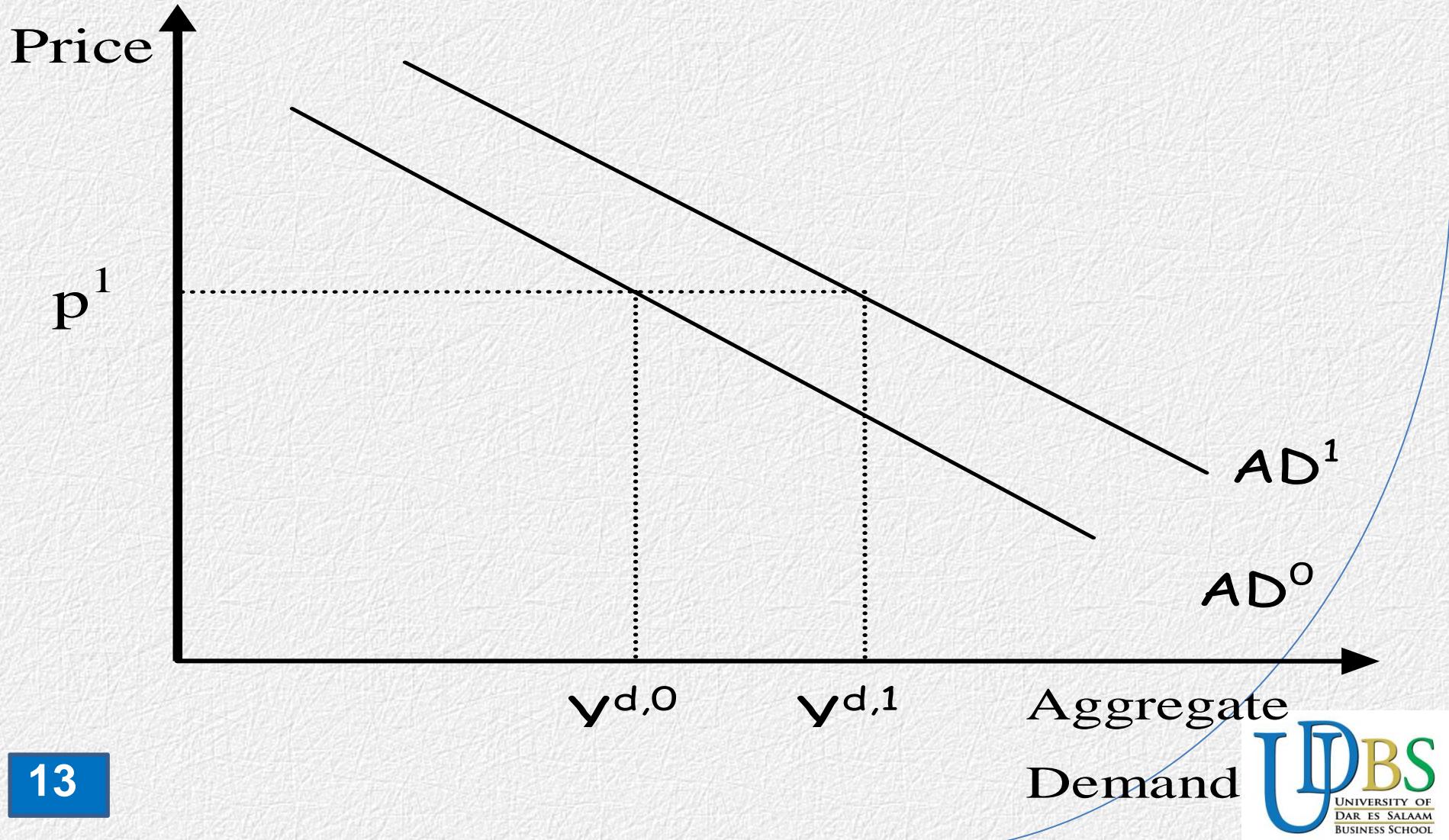
# Shifts in the Aggregate Demand

- **6) Exchange Rate:** depreciation of domestic currency makes exports cheaper (exports increase) and imports dearer (decrease), thus NX and AD **increases** with depreciation, and decreases with appreciation.
- Thus, more AD lead to higher real GDP, higher economic growth and employment, and higher price level in the future.
- **Expansionary:** AD shifts **upwards to the right.**

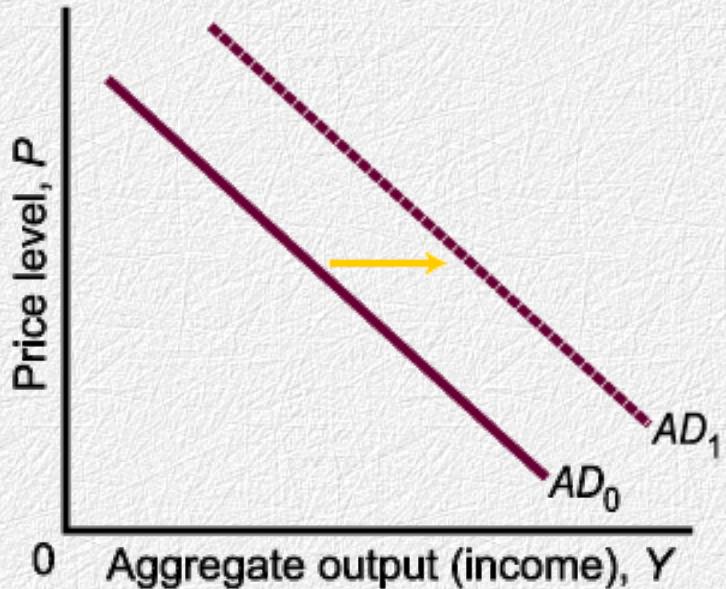
# Shifts in the Aggregate Demand

- **Contractionary:** AD shifts **downwards to the left**.
- Increase in  $C$ ,  $I$ ,  $G$ , or  $NX$  increases AD in the goods market and shifts the  $AD$  curve to the right.
- Increase in ***nominal money supply*** will shift the  $AD$  curve to the right because of the lower interest rate.
- Decline in ***money demand*** will shift the  $AD$  curve to the right because of it also lowers interest rate.

# Shifts in the Aggregate Demand

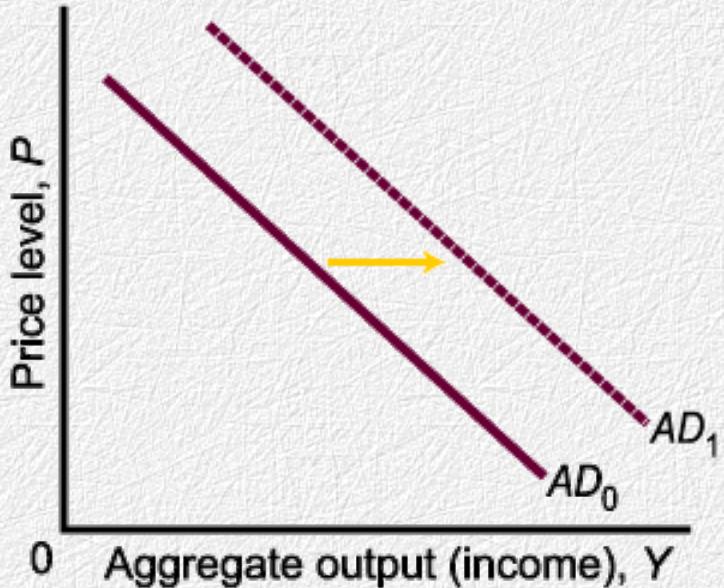


# Shifts of the Aggregate Demand Curve



- An increase in the quantity of **money supplied** at a given price level shifts the aggregate demand curve to the right.

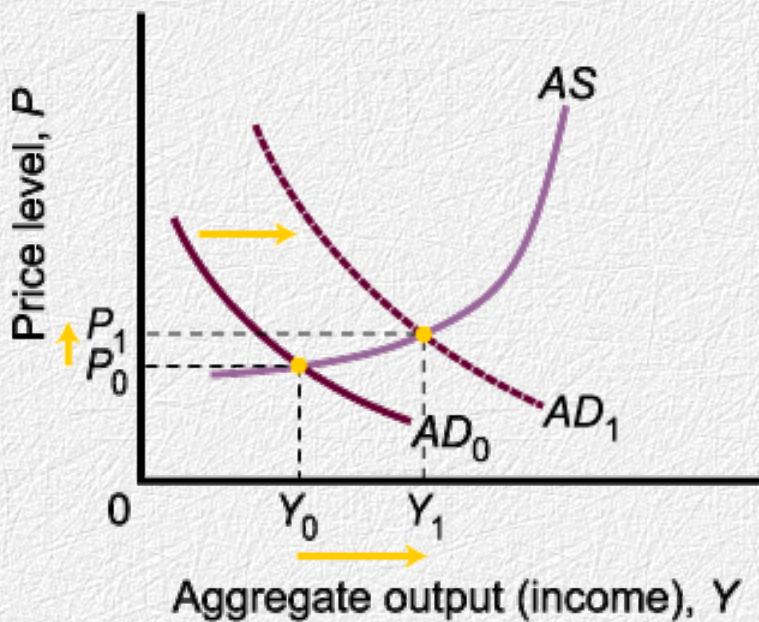
# Shifts of the Aggregate Demand Curve



- An increase in **government purchases** or a decrease in net taxes shifts the aggregate demand curve to the right.

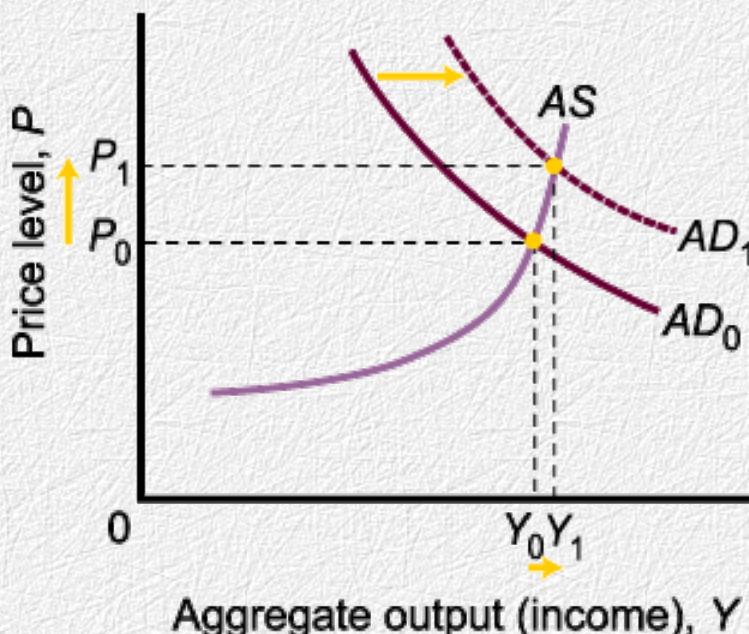
# ***AD, AS, and Monetary and Fiscal Policy***

- *AD* can shift to the right for a number of reasons, including an increase in the **money supply**, a **tax cut**, or an increase in **government spending**.



- **Expansionary policy** works well when the economy is on the flat portion of the AS curve, causing little change in  $P$  relative to the output increase.

# ***AD, AS, and Monetary and Fiscal Policy***

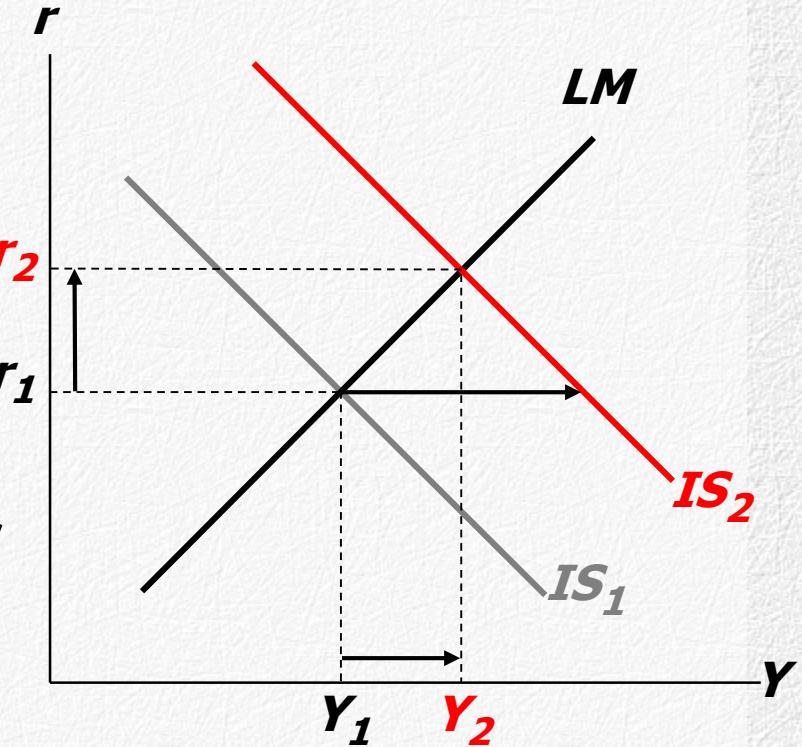
- On the **steep portion** of the AS curve, expansionary policy does not work well. The multiplier is **close to zero**.
    - When the economy is operating **near full capacity**, an increase in  $AD$  will result in an increase in the price level with **little increase in output**.
- 

# Recall: IS Curve

IS is shifted right by:

**Fiscal policy:** raise G or cut T;

**Shocks:** exogenous rise in  $r^1$  C or I (rise in Consumer or Business confidence).



Shift in IS leads to: a rise in  $Y$ , which raises money demand and bids up  $r$  (**move along LM**).

# Recall: LM Curve

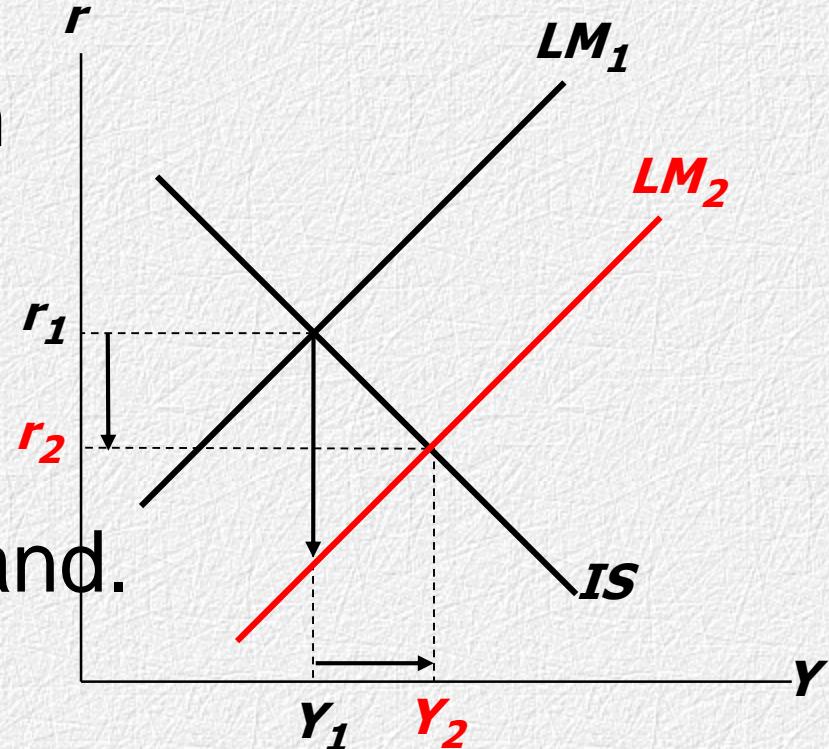
Shifted Right by:

Monetary policy: rise in

M;

Shocks: fall in

Exogenous money demand.



Shift in LM leads to fall in  $r$ , raises  $I$ ,  
hence raises  $E$  and  $Y$  (**movement along  
IS curve**).

# IS-LM and Aggregate Demand

- So far, we've been using the *IS-LM* model to analyze the **short run**, when the price level is **assumed fixed**.
- However, a change in  $P$  would shift the *LM* curve and therefore affect  $Y$ .
- The **aggregate demand curve** captures this relationship between  $P$  and  $Y$

# Deriving the *AD* curve

Intuition for **slope**  
of *AD* curve:

$$\uparrow P \Rightarrow \downarrow (M/P)$$

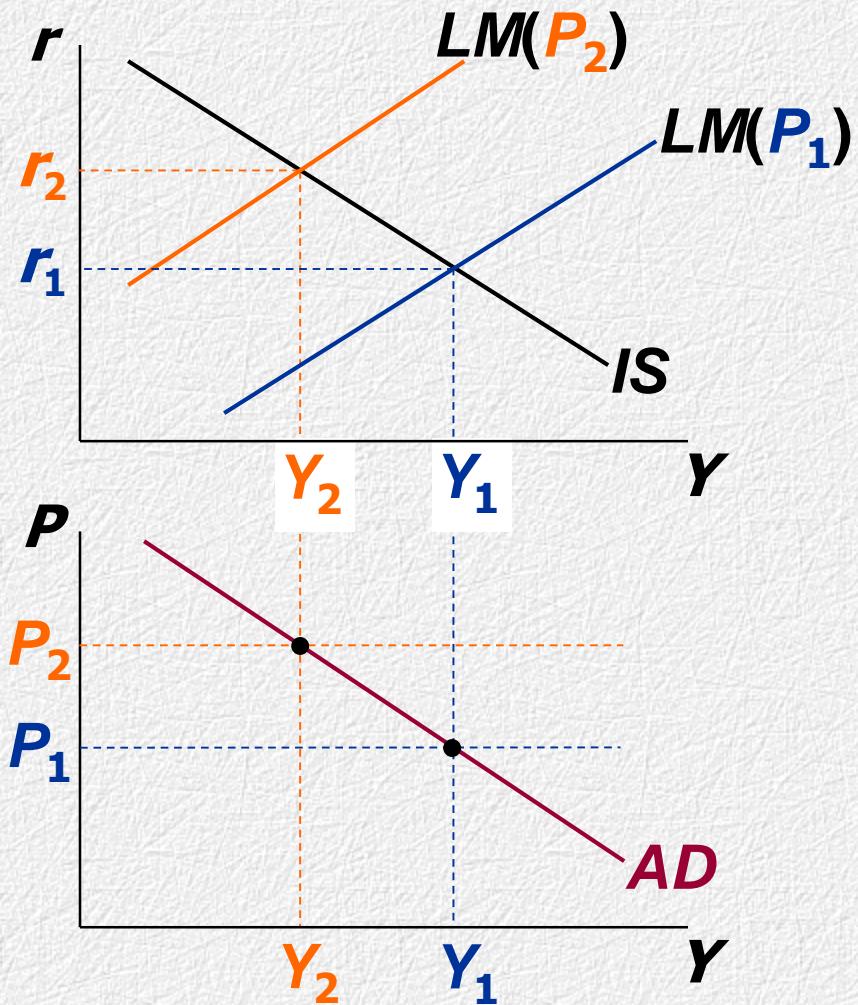
$\Rightarrow LM$  shifts

left

$$\Rightarrow \uparrow r$$

$$\Rightarrow \downarrow I$$

$$\Rightarrow \downarrow Y$$



# Monetary policy and the *AD* curve

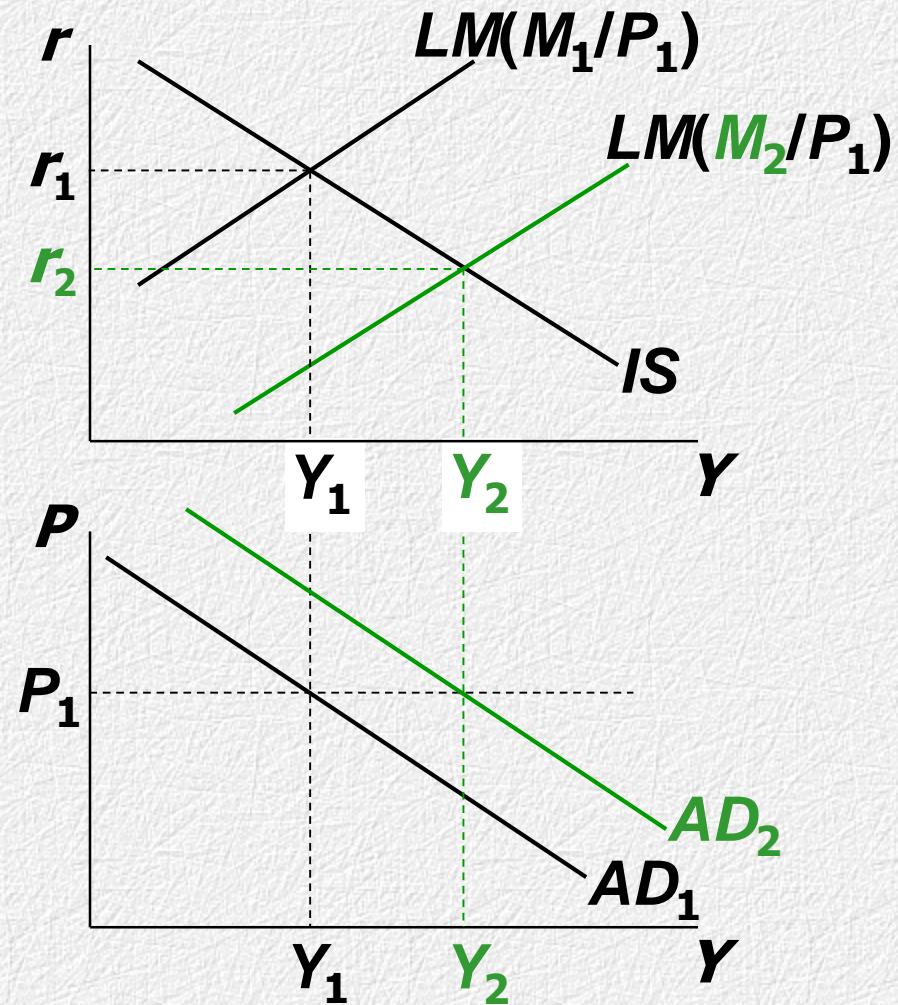
The BOT can increase  
**aggregate demand**:

↑  **$M$**  →  $LM$  shifts right

→ ↓  **$r$**

→ ↑  **$I$**

→ ↑  **$Y$**  at each  
value of  **$P$**



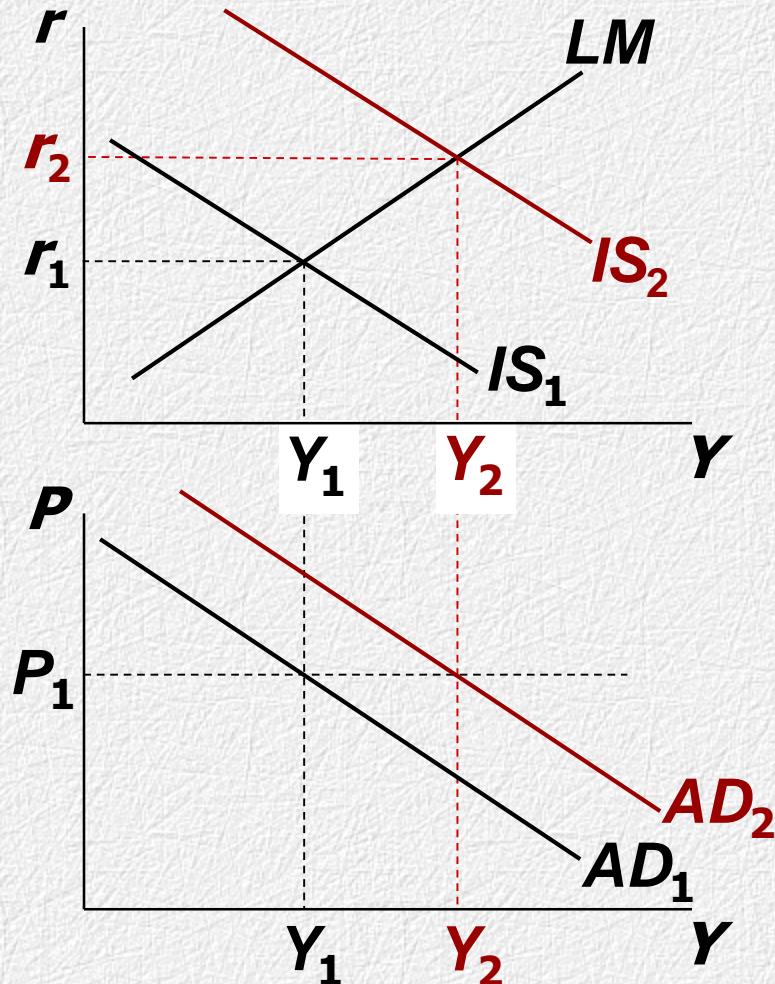
# Fiscal policy and the *AD* curve

**Expansionary fiscal policy** ( $\uparrow \mathbf{G}$  and/or  $\downarrow \mathbf{T}$ ) increases agg. demand:

$\downarrow \mathbf{T} \Rightarrow \uparrow \mathbf{C}$

$\Rightarrow$  IS shifts right

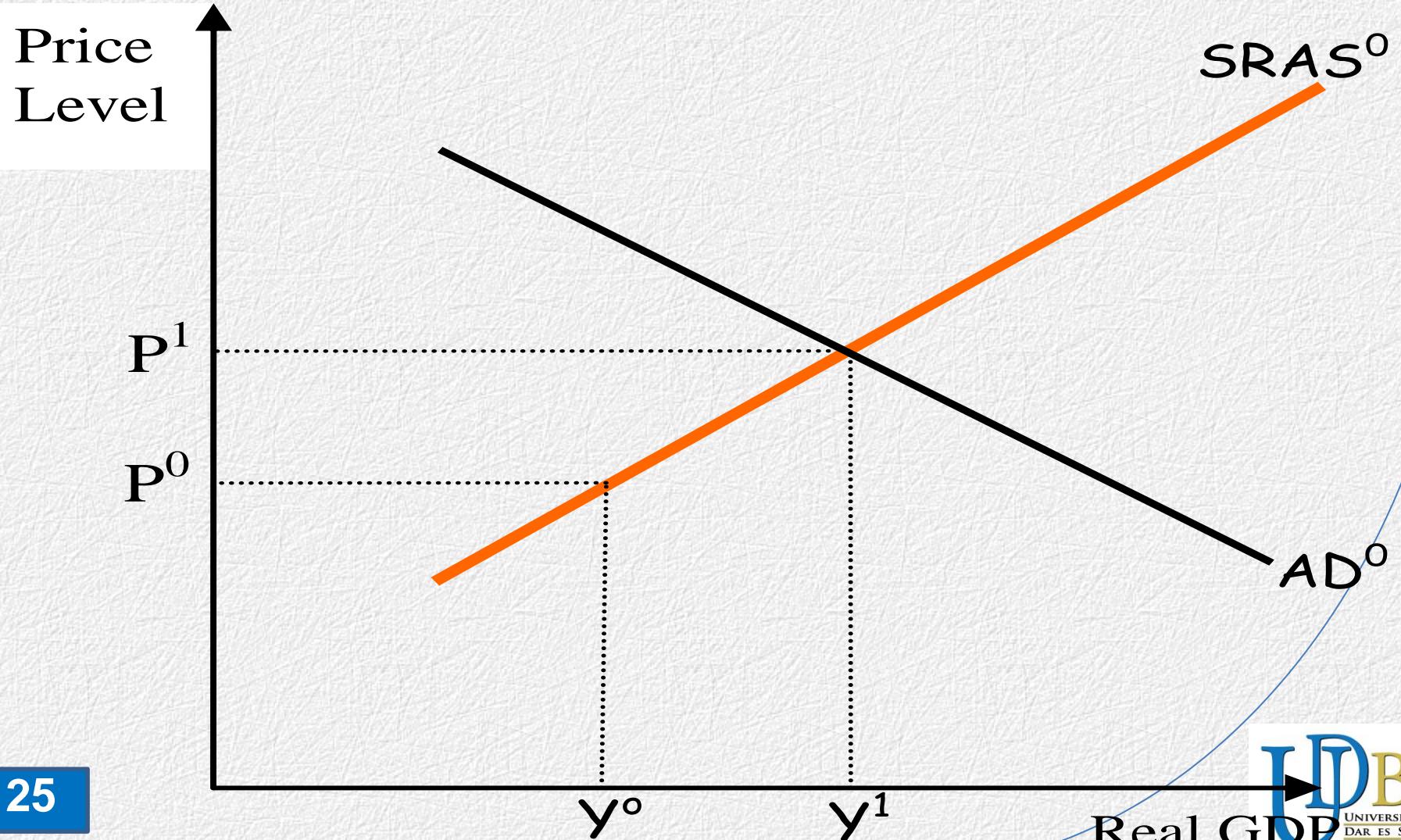
$\Rightarrow \uparrow \mathbf{Y}$  at each value of  $\mathbf{P}$



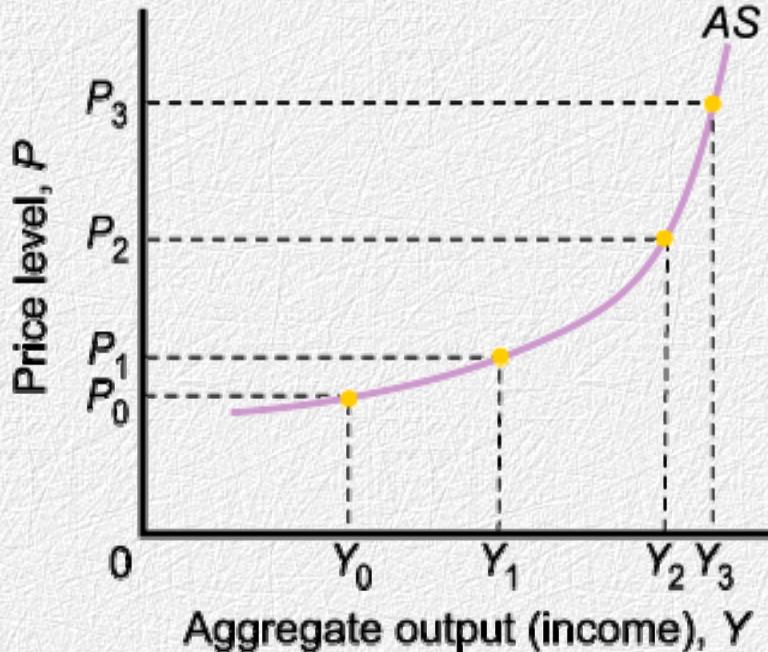
# Aggregate Supply

- **AS Curve:** shows total quantity of goods and services produced and sold at different **aggregate price levels**, ceteris paribus.
- In **SR**, an increase in overall price level raises quantity of goods/services produced.
- SRAS curve is **positively sloped**.

# Aggregate Supply

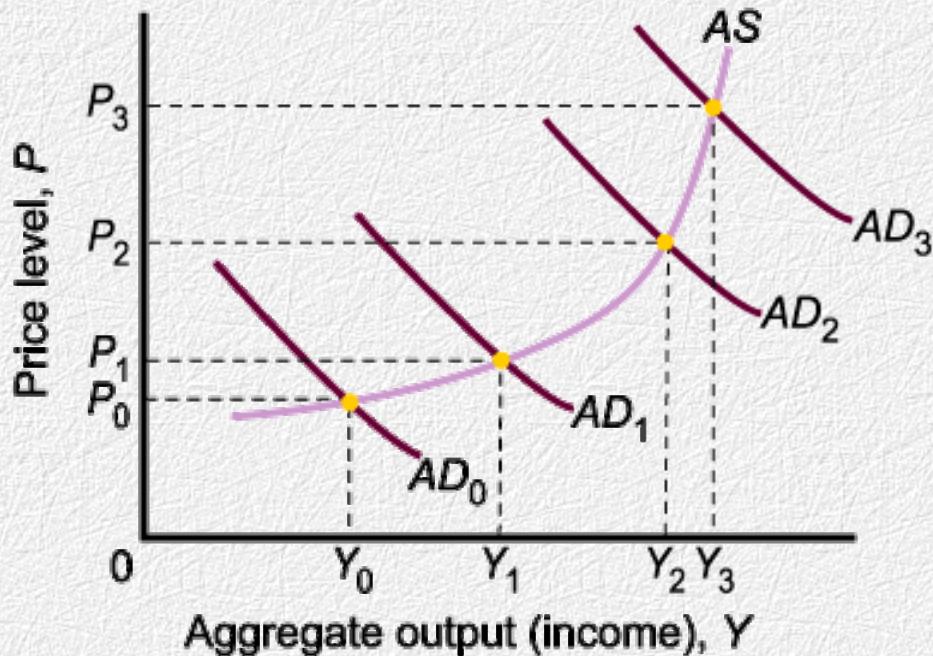


# Aggregate Supply in the Short Run



- In SR, the SRAS curve (the price/output response curve) has a **positive slope**.
- At low levels of aggregate output, the curve is **fairly flat**. As the economy approaches capacity, the curve becomes **nearly vertical**. At capacity, the curve is vertical.

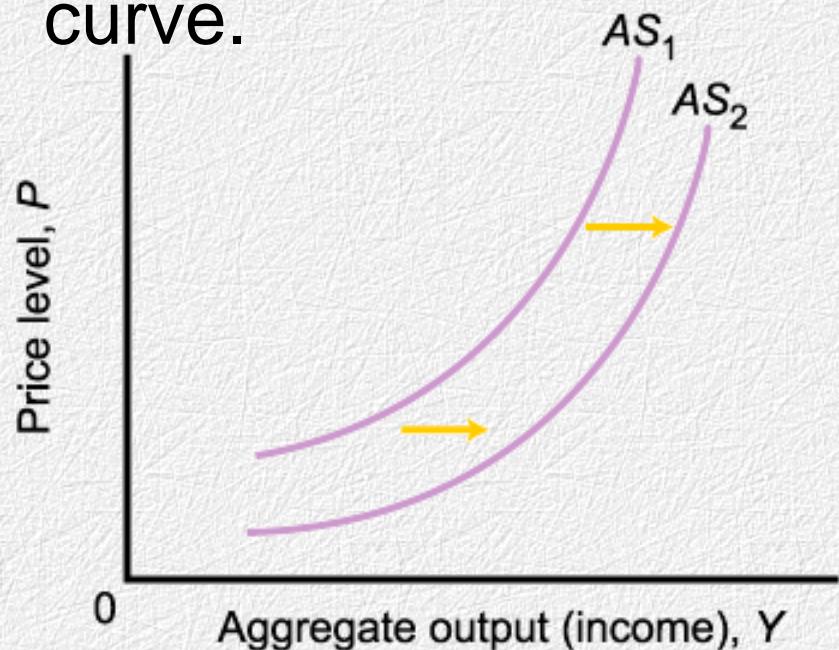
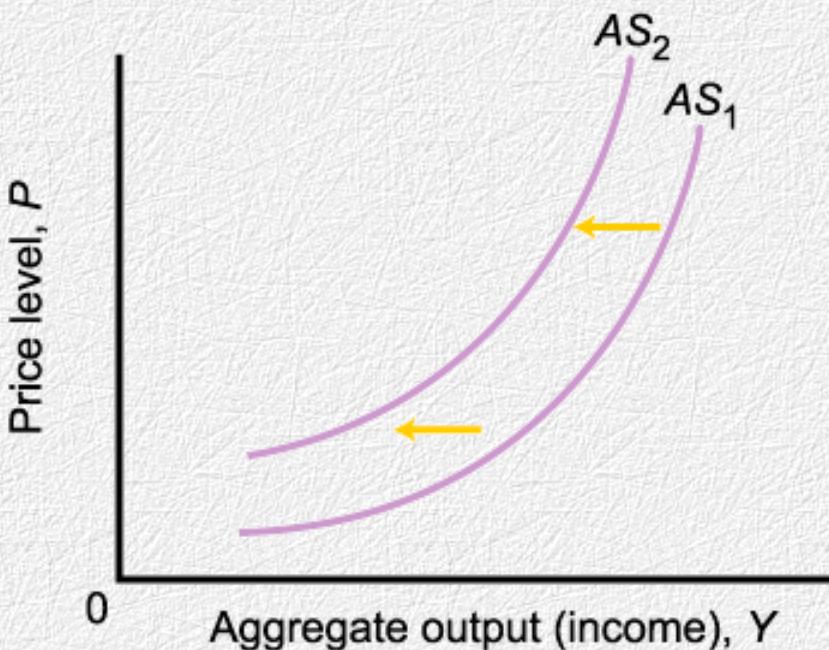
# Output Levels and Price Responses



- An increase in AD when the economy is operating at low levels of output is likely to result in an increase in output with little or no increase in the overall price level.
- As the economy approaches maximum capacity, firms respond to further increases in demand only by raising prices.

# Shifts of the Short-Run Aggregate Supply Curve

- A **leftward shift** of the AS curve could be caused by cost shocks.
- A decrease in costs, economic growth, or public policy, can cause a rightward shift of the AS curve.

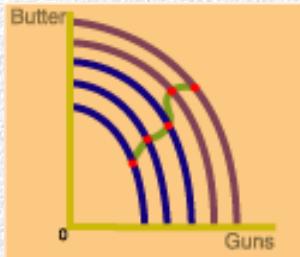
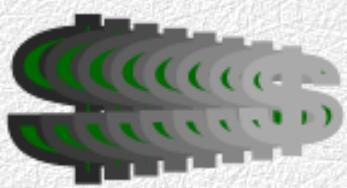


# Shifts of the Short-Run Aggregate Supply Curve

## Factors That Shift the Aggregate Supply Curve

### Shifts to the Right

Increases in Aggregate Supply



#### Lower costs

- lower input prices
- lower wage rates

#### Economic growth

- more capital
- more labor
- technological change

#### Public policy

- supply-side policies
- tax cuts
- deregulation

#### Good weather

### Shifts to the Left

Decreases in Aggregate Supply

#### Higher costs

- higher input prices
- higher wage rates

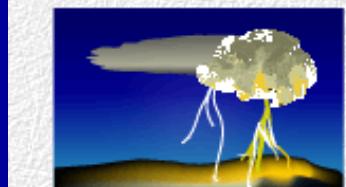
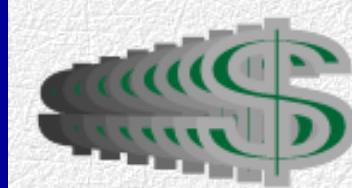
#### Stagnation

- Capital deterioration

#### Public policy

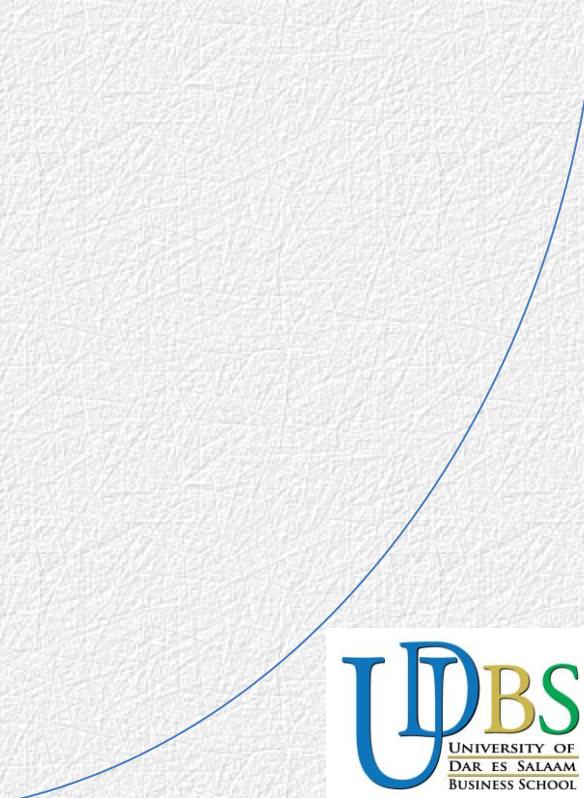
- waste and inefficiency
- over-regulation

#### Bad weather, natural disasters, destruction from wars

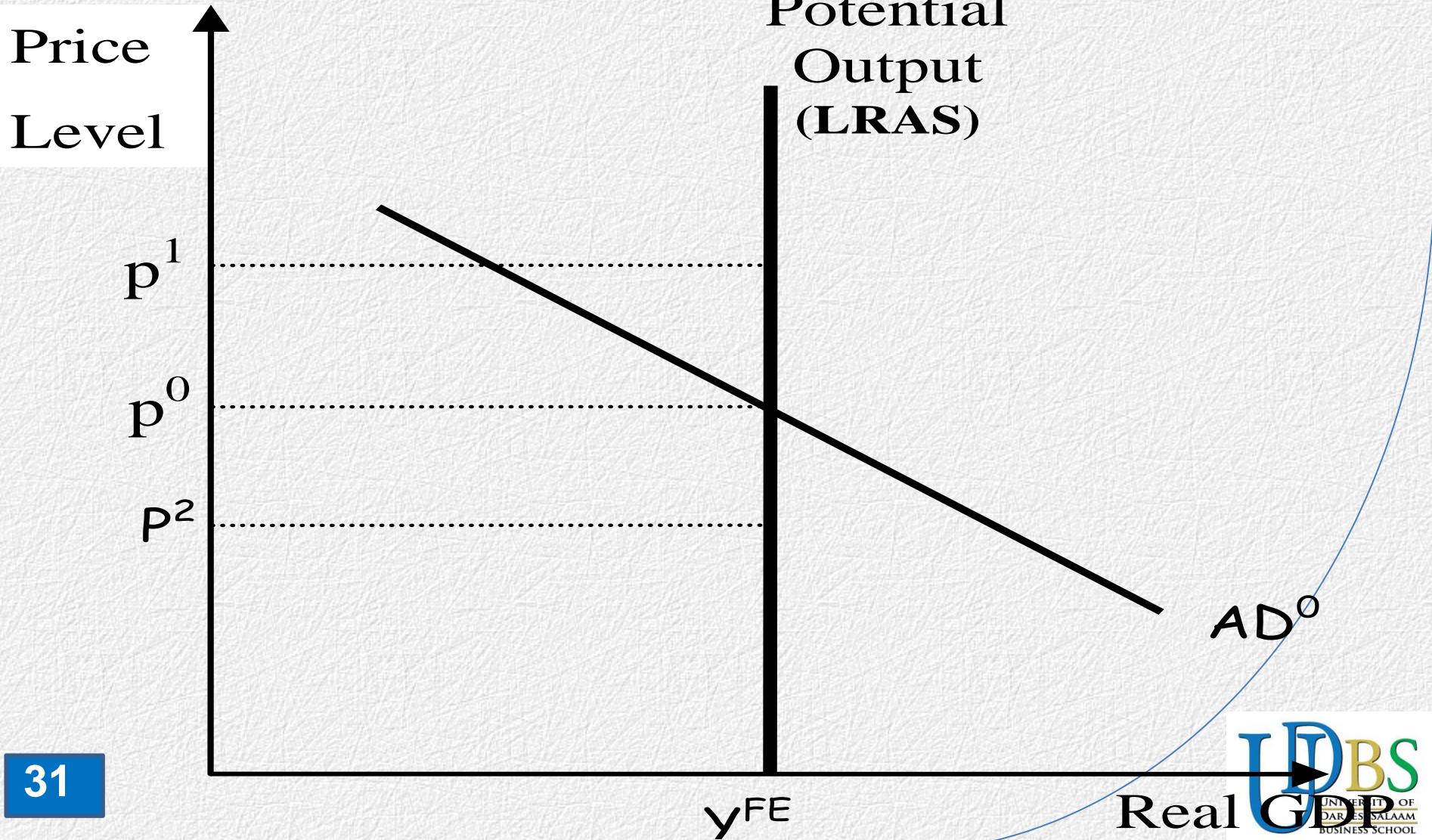


# Aggregate Supply

- In **LR**, economy produces at **potential output** (when all available resources are fully deployed).
- **LRAS** curve is **vertical**.



# Aggregate Supply



# Nature of SRAS Curve

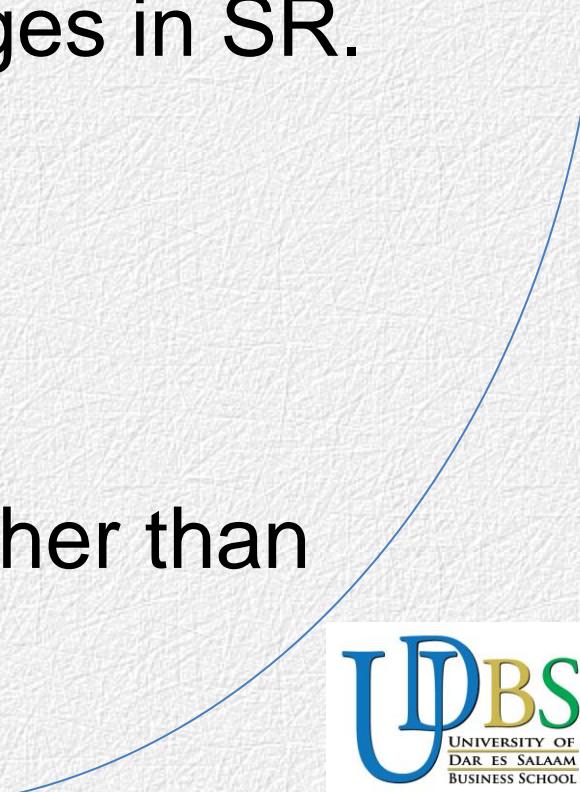
- The SRAS is **positively sloped**. Why?
- **Labour** is a primary resource to production, thus **labour market** provides foundation of analysis.
- Supply of labour depends on **wage rate** and **size/ability** of **workforce**, and preference of **work vis-a-vis leisure**.
- **Nominal Wage**: wage in current shillings quoted in employment contracts.

# Nature of SRAS Curve

- **Real Wage:** wage measured as purchasing power of a wage shilling (nominal wage divided by price level).
- In **SR**, some resource prices, such as wages are **fixed** by contracts.
- **A) Misperceptions Theory:** developed by **Robert Lucas, Jr.**
- Holds: “***Output increases when price level is higher than expected.***”

# Nature of SRAS Curve

- Business managers and workers have **imperfect information** about changes in price level.
- They don't adjust prices and wages in SR.
- $Y = Y^* + a(P - P^e)$
- $Y^*$  = full-employment output.
- $P$  = actual price level
- $P^e$  = expected price level
- **Implication:** if actual price is higher than expected ( $P > P^e$ ), then  $Y > Y^*$ .



# Nature of SRAS Curve

- Firms experience higher profits which stimulate more employment of factors of production including labour.
- Workers will supply more labour when labour contracts fix wage rate above equilibrium level (**efficiency wage theory**) causes workers compete and are more productive.
- Again, since price level has gone up, real wages fall, workers will have to work more to keep with pace of inflation.

# Nature of SRAS Curve

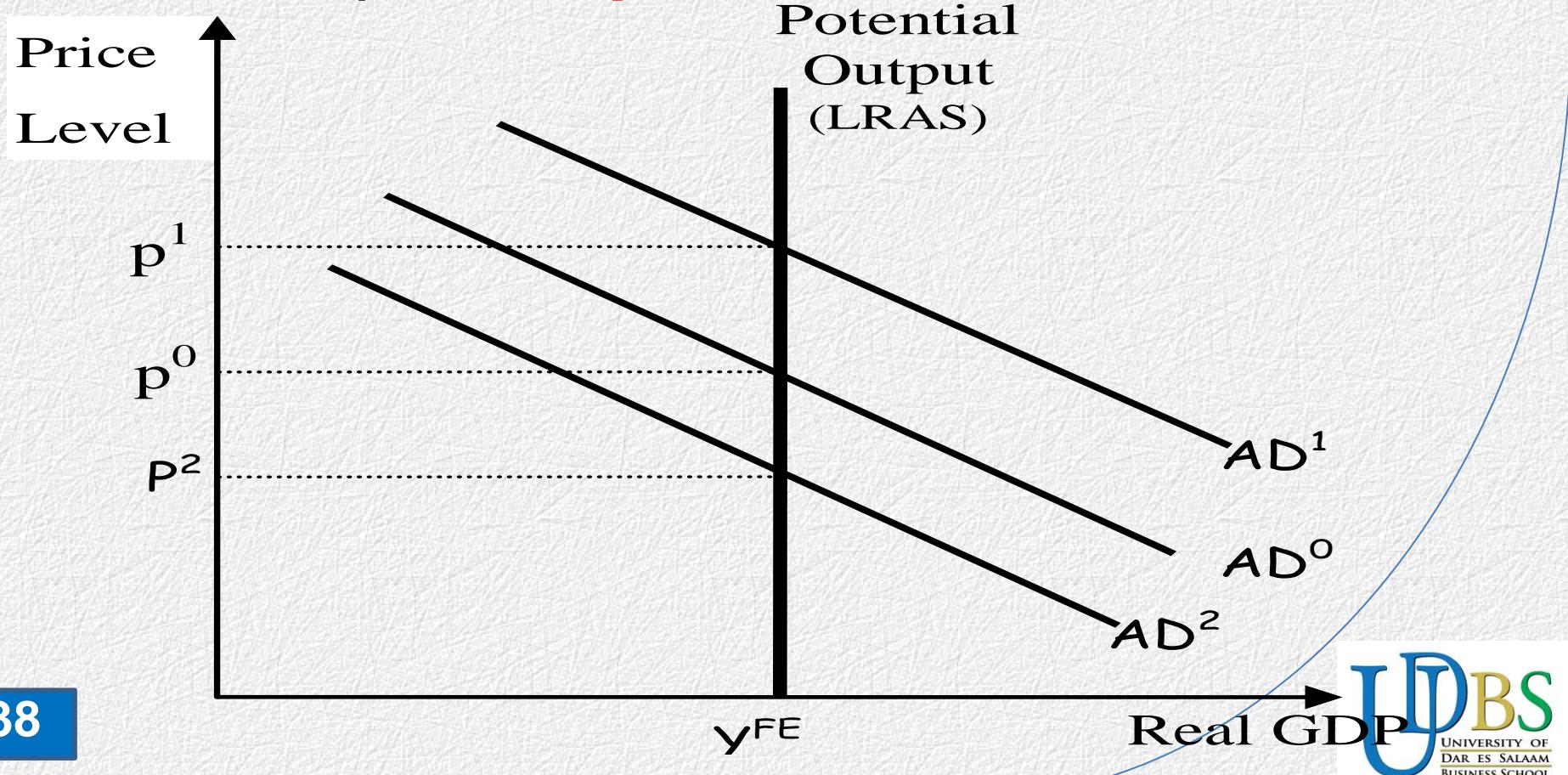
- **B) New Keynesian View:** based on **sticky price argument**.
- Some prices, especially wages are **sticky (fixed by contract)** and have **natural rigidity** to decrease.
- As prices increases, while wages are fixed, **revenues increase faster than costs**, firms make more profits, and thus expand output.

# Long Run Aggregate Supply (LRAS)

- **LRAS Curve:** a **vertical line** drawn at economy's potential output ( $Y^{FE}$ ).
- At that level, actual price = expected price, no surprises.
- $Y^*$  depends on **supply of resources**, **technology** and **efficiency of production**.
- The shift of LRAS reflects changes in **factors of production** and **productivity**.
- The increase in AD at LRAS does not affect the level of production, instead its effect is **visible in prices**.

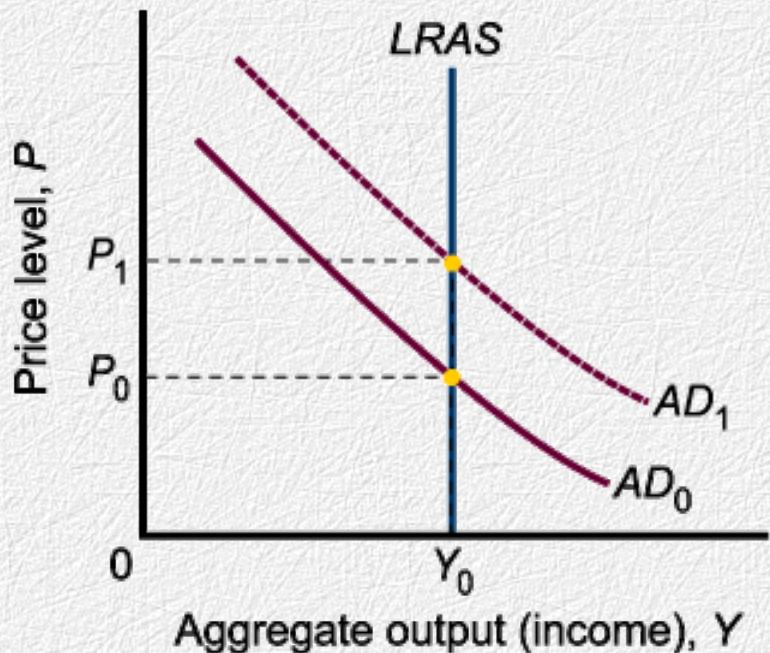
# Long Run Aggregate Supply (LRAS)

- Higher AD pushes **prices up**.
- Lower AD pushes **prices down**.



# Long-Run Aggregate Supply and Policy Effects

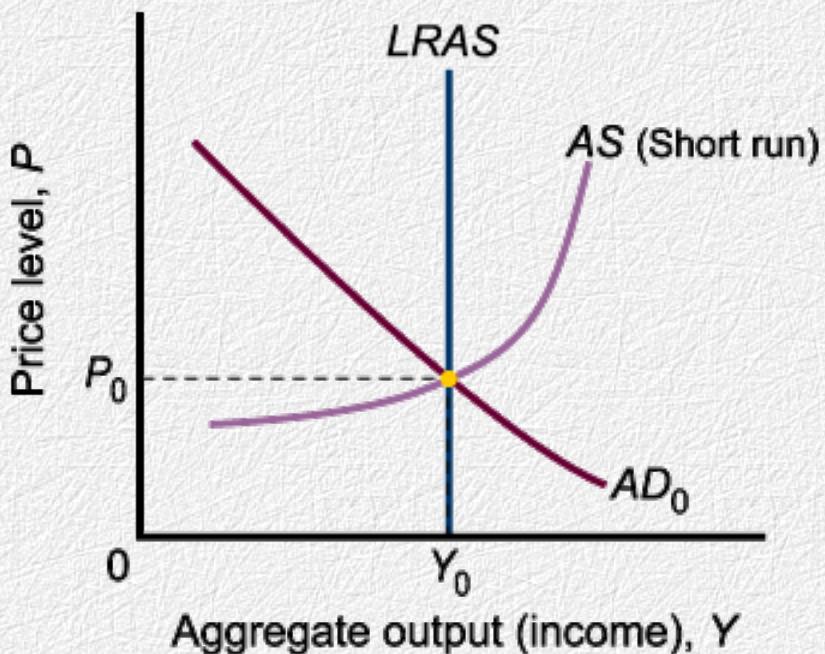
- If the AS curve is vertical in the long run, neither monetary policy nor fiscal policy has any effect on **aggregate output**.



- In the long run, the multiplier effect of a change in government spending or taxes on aggregate output is zero.

# The Long-Run Aggregate Supply Curve

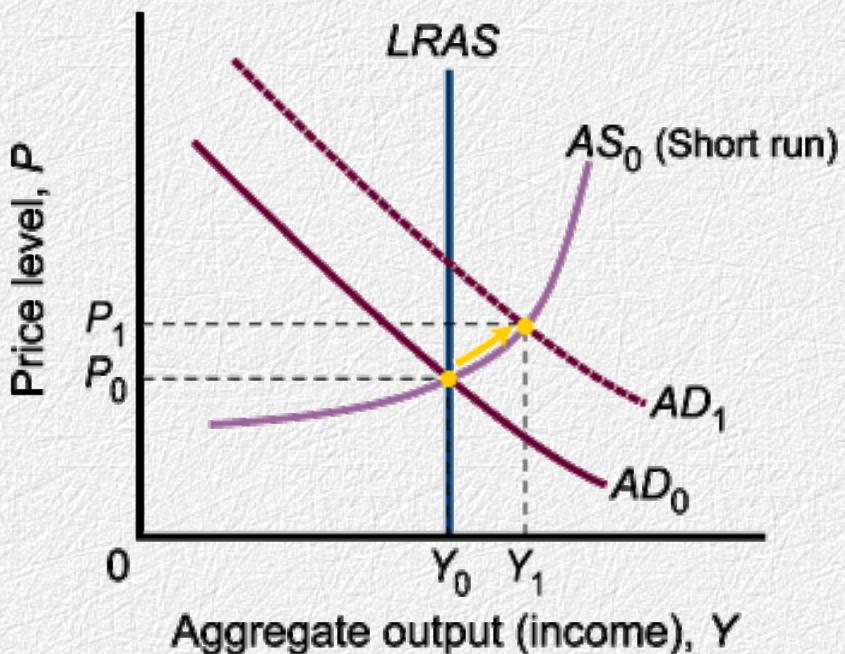
- **Costs lag behind price-level** changes in the short run, resulting in an upward-sloping AS curve, but ultimately move with the overall price level.



- If costs and the price level move in **tandem** in the long run, the AS curve is vertical.

# The Long-Run Aggregate Supply Curve

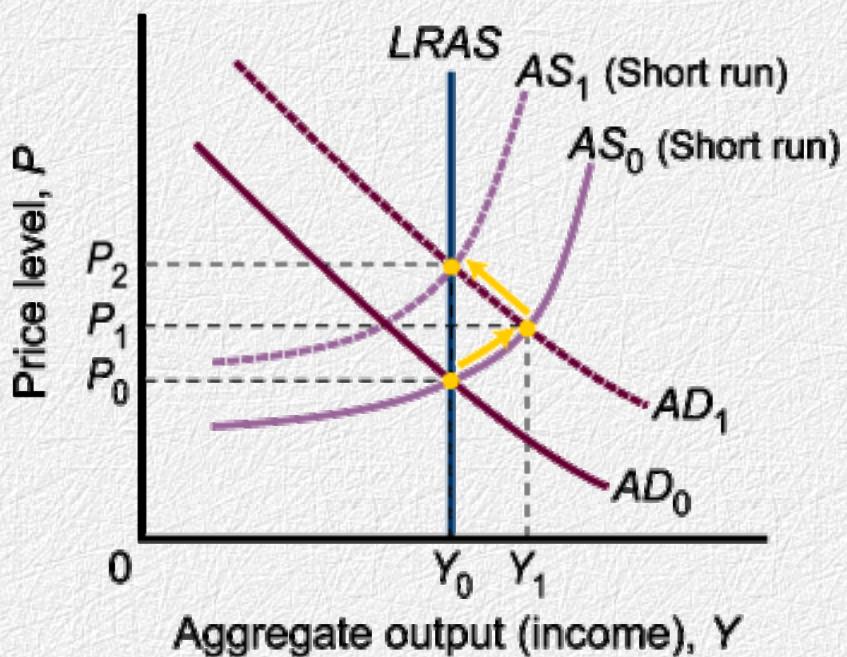
- $Y_0$  represents the level of output that can be **sustained** in the long run without inflation. It is also called **potential output**.



- Output can be pushed above potential GDP by **higher aggregate demand**. The aggregate price level also rises.

# The Long-Run Aggregate Supply Curve

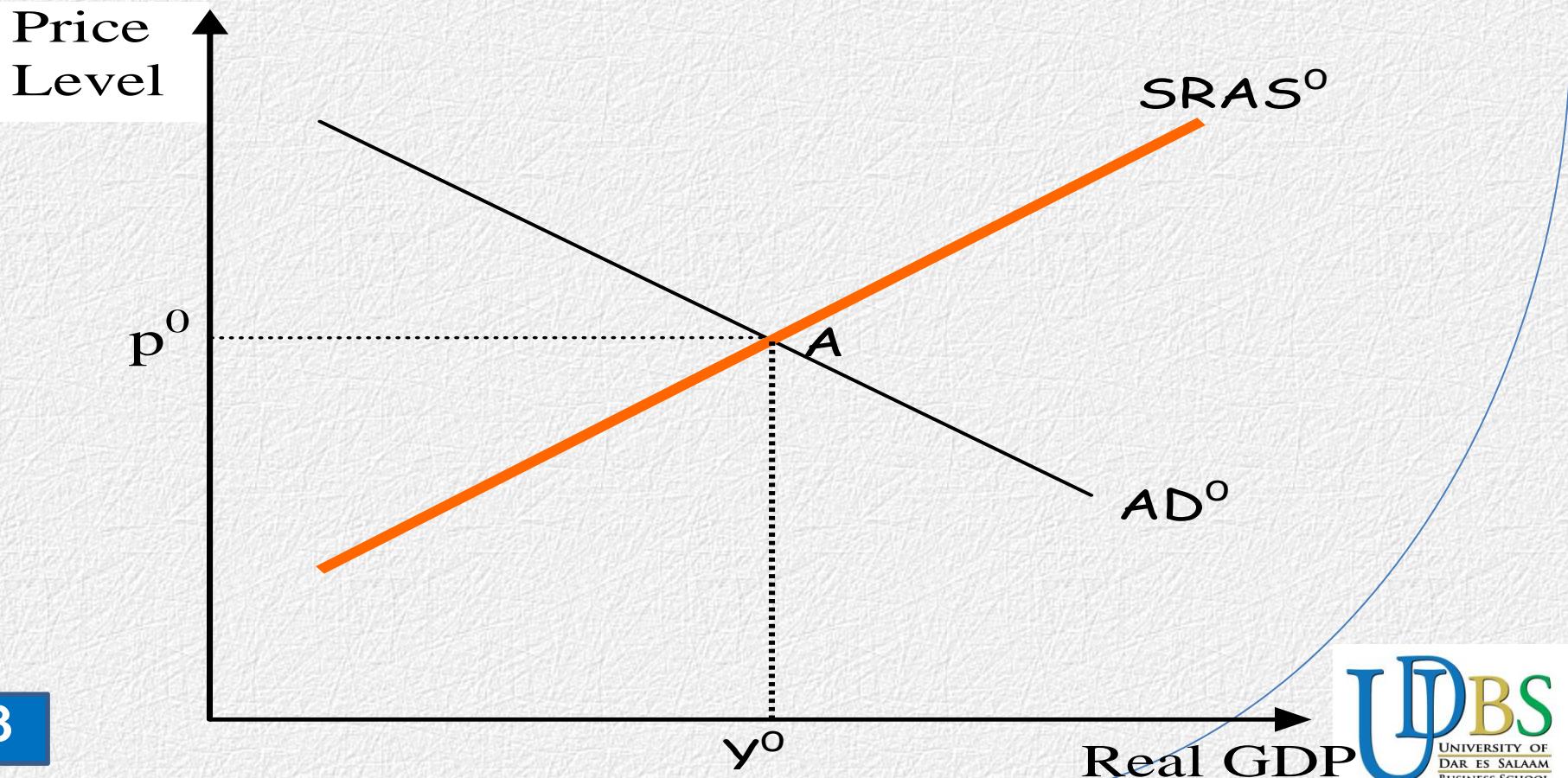
- When output is pushed above potential, there is **upward pressure on costs**. Rising costs push the **SRAS curve to the left**.



- If costs ultimately increase by the same percentage as the price level, the quantity supplied will end up back at  $Y_0$ .

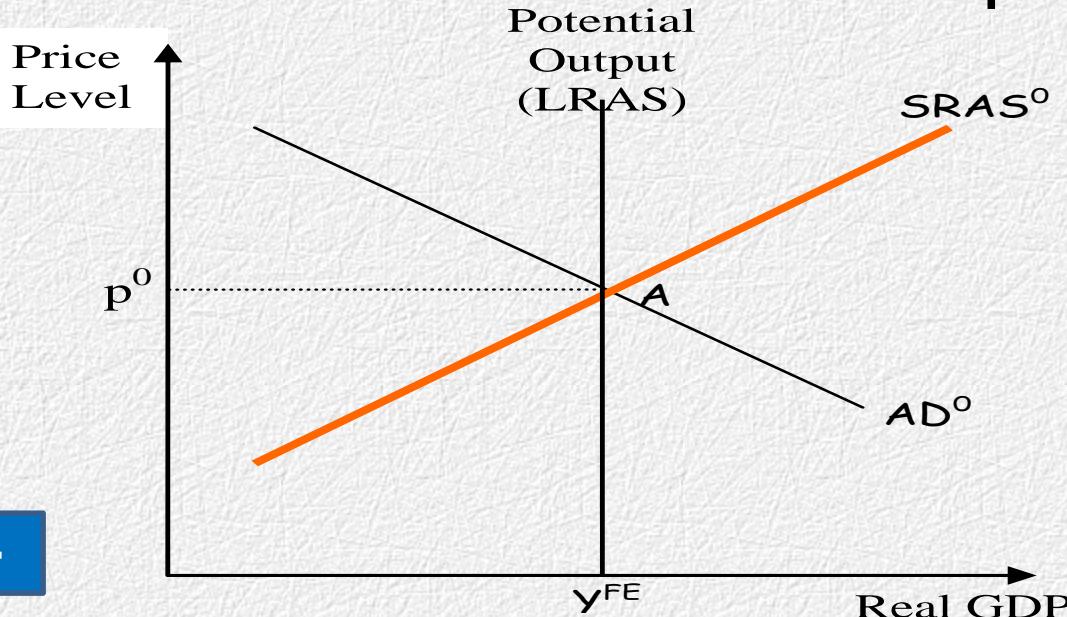
# Equilibrium in the AD-AS Framework

- **SR equilibrium** occurs at intersection of AD and SRAS curve.



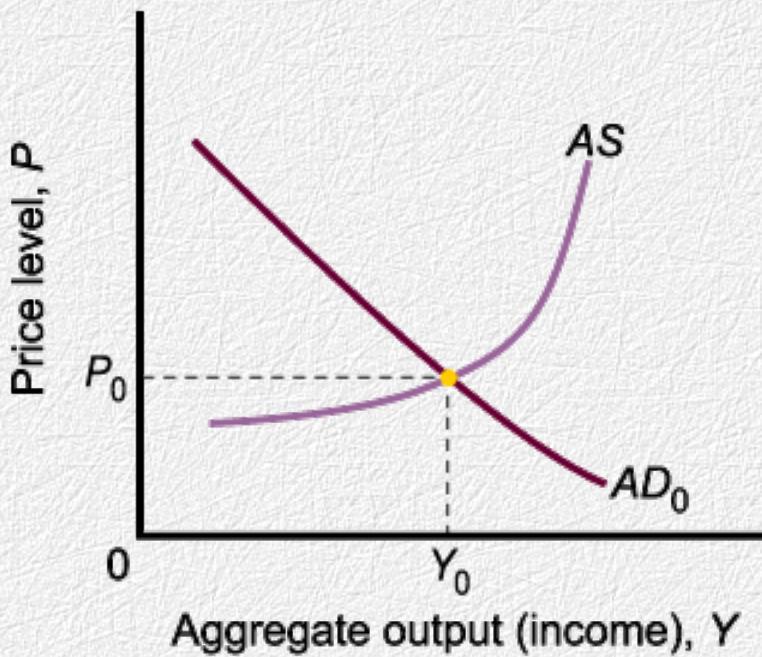
# Equilibrium in the AD-AS Framework

- **LR equilibrium** occurs when AD intersects the LRAS curve.
- Economy is viewed to be in equilibrium generally when the three curves AD, SRAS, and LRAS intersect at the same point.



# The Equilibrium Price Level

- The **equilibrium price level** is the point at which the aggregate demand and aggregate supply curves intersect.

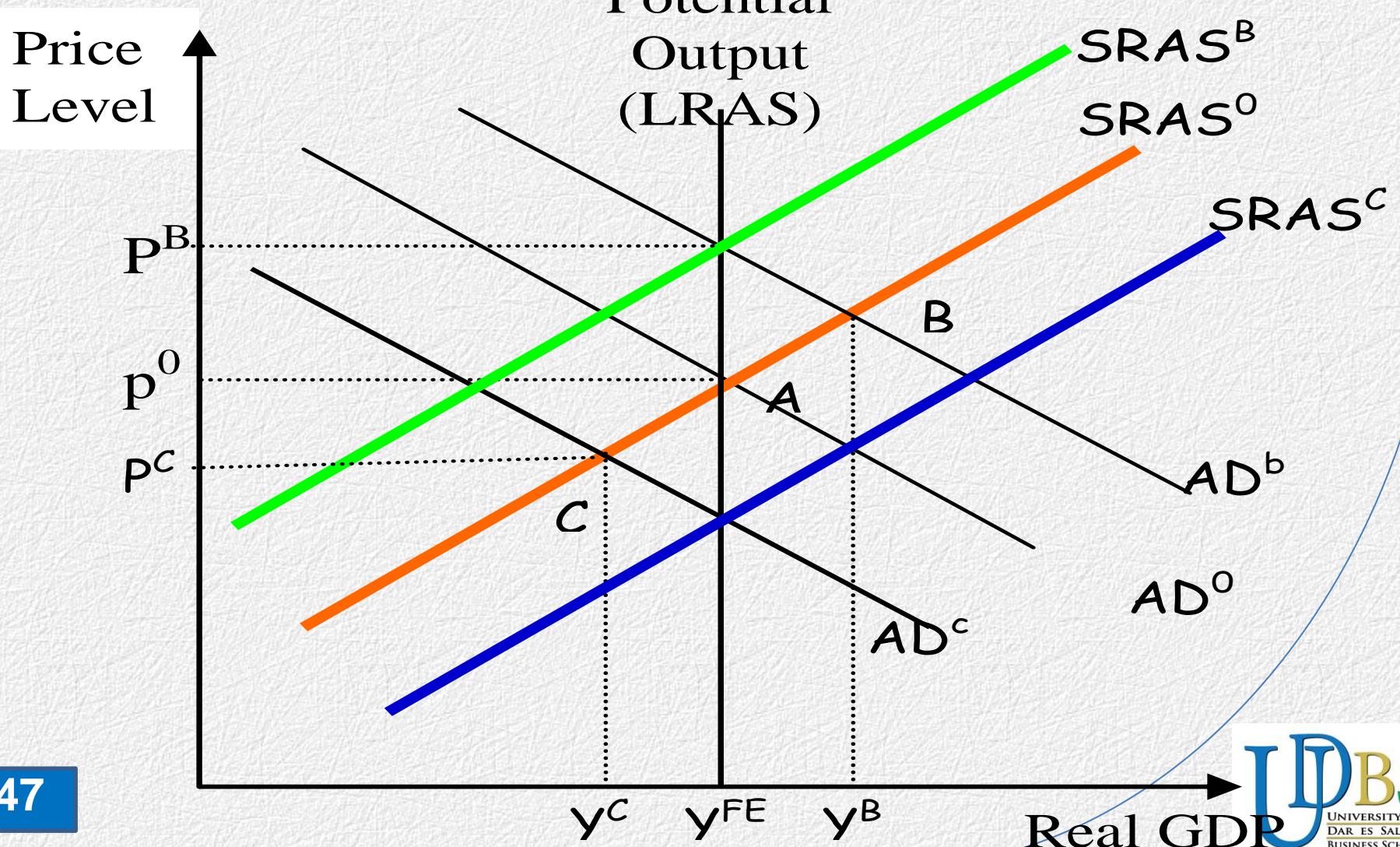


- $P_0$  and  $Y_0$  correspond to equilibrium in the **goods market and the money market** and a set of price/output decisions on the part of all the firms in the economy.

# Equilibrium in the AD-AS Framework

- If **SR equilibrium** is at level of output beyond  $Y^{FE}$  ( $Y^B$ , point B), resources are **overstretched**.
- **Wages** and **prices will rise**, and SRAS curve will shift to the left until it intersects with AD at LRAS.
- If the SR equilibrium is at level of output below  $Y^{FE}$  ( $Y^C$  at point C), resources are **underutilized**, and there is **excess labour**.
- **Wages and prices fall**, shifting SRAS curve to the right until it intersects with AD at point along LRAS.

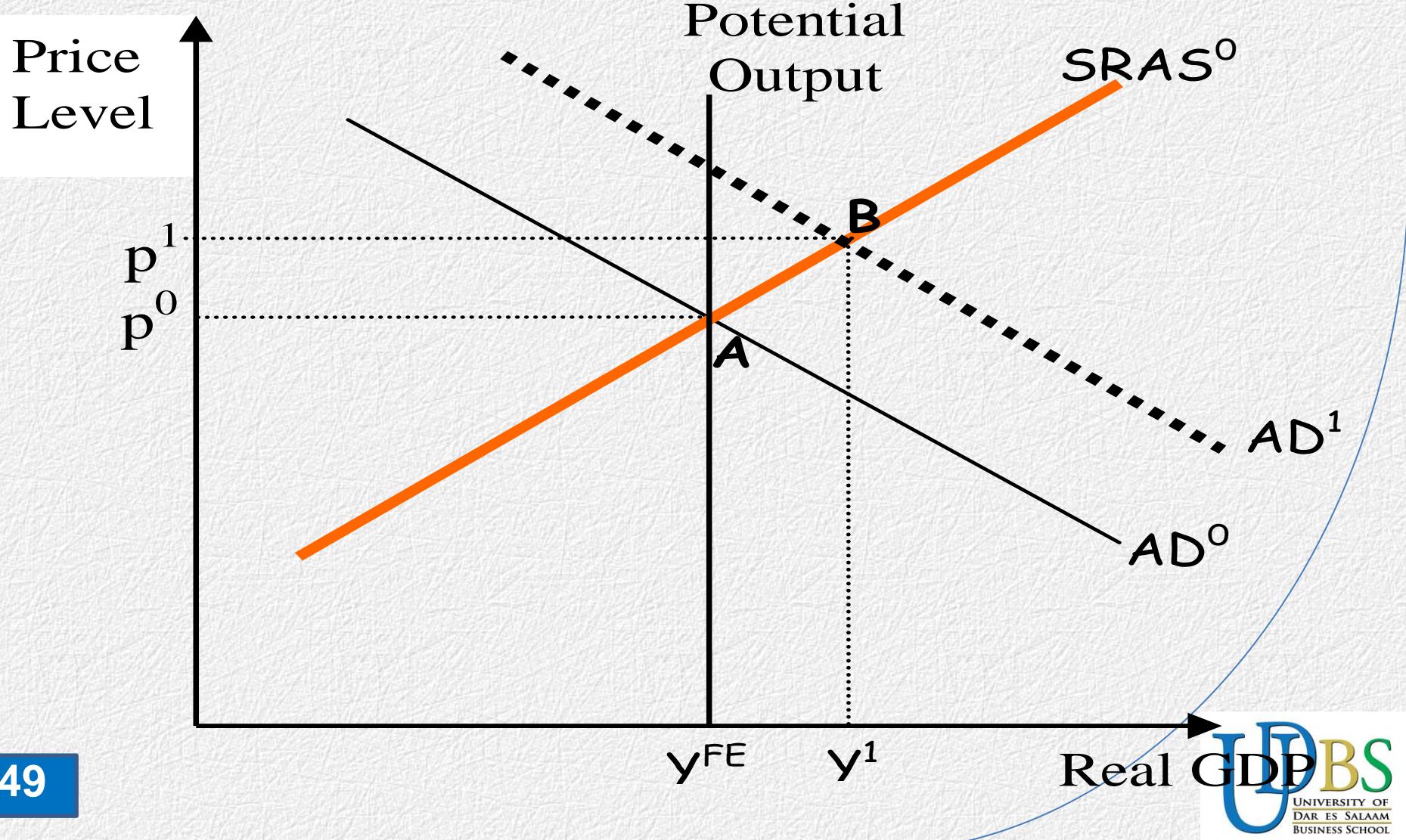
# Equilibrium in the AD-AS Framework



# Short-Run Adjustments

- AD can turn out to be different from expected.
- A **higher than expected AD**, lead to **actual price level to exceed expected price level**.
- In **SR**, upward pressures on prices lead to increase in level of **aggregate supply to  $Y^1$  at B**, and equilibrium is restored.
- **NB:** This is movement **along same SRAS** curve  $SRAS^0$ .
- In **SR**, price increases to  $P^1$  and output to  $Y^1$ .
- In **LR**, wages and other inputs prices will change to restore equilibrium (**we'll discuss**)

# Short-Run Adjustments



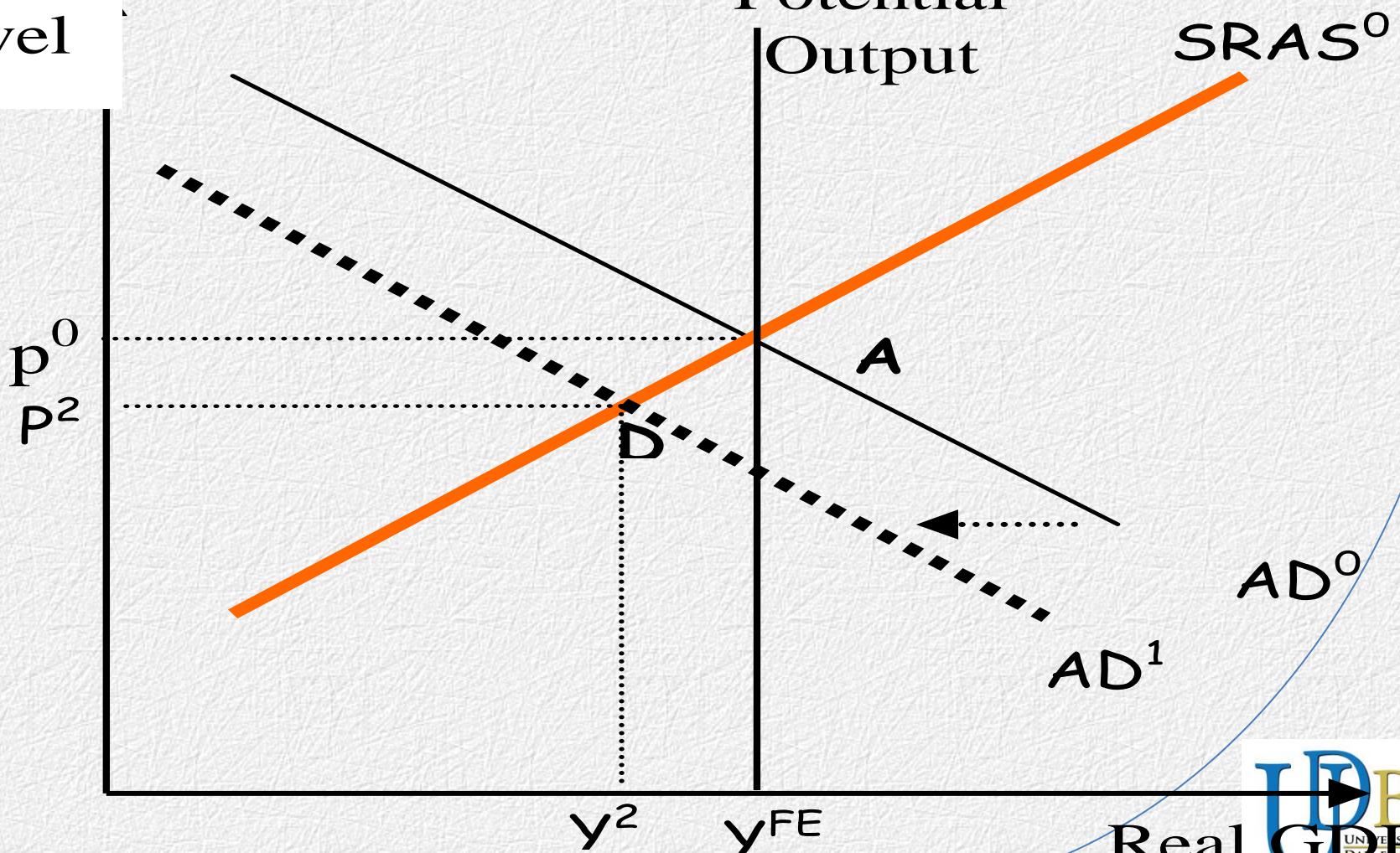
# Short-Run Adjustments

- When AD is lower than expected, actual price level falls to  $P^2$  and is below expected price level.
- Firms decrease output to  $Y_2$  and equilibrium moves to D in SR.
- From A to D, it is movement along same SRAS<sup>0</sup> curve.

# Short-Run Adjustments

Price  
Level

Potential  
Output

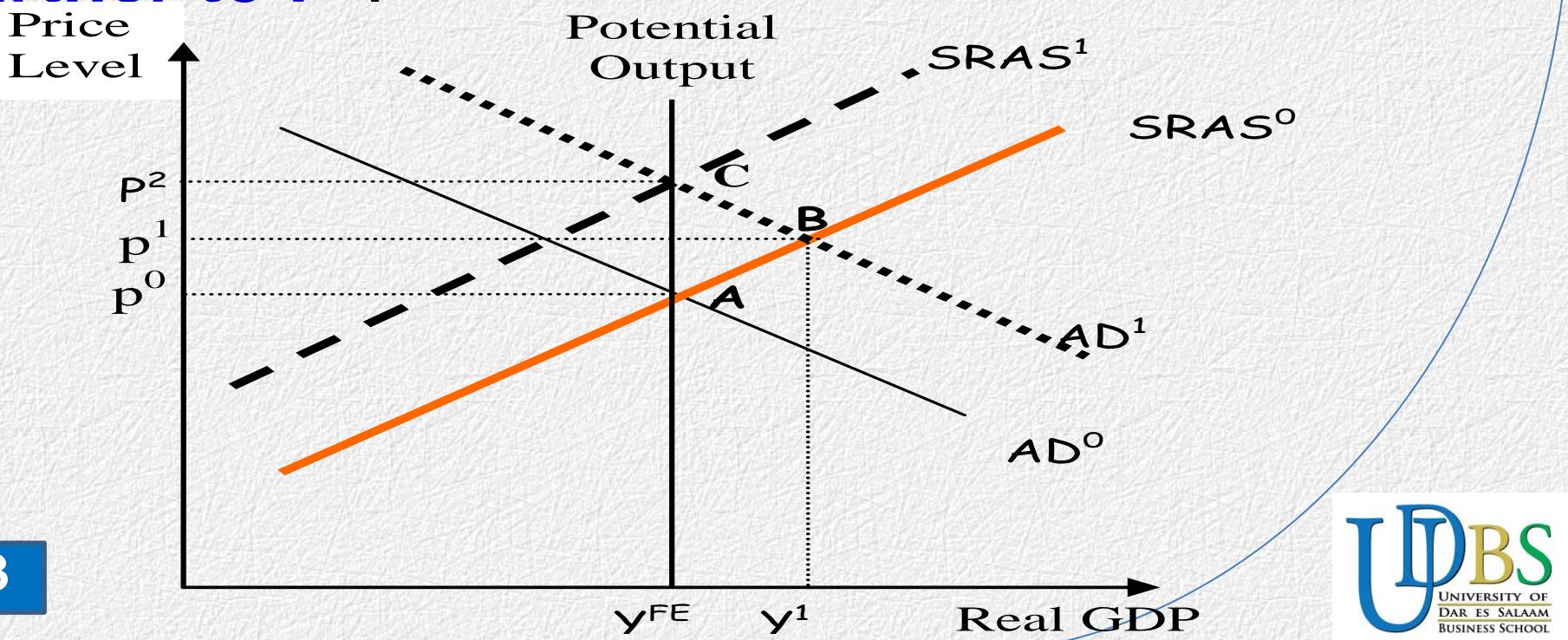


# Short-Run to Long-Run Adjustment

- When demand level is **higher than expected** at **AD<sup>1</sup>**.
- Creates **upward pressure on prices, actual price is higher than expected price.**
- In **SR**, firms respond by **producing more** and level of output exceeds potential output (**expansionary gap, Y<sup>1</sup> – Y<sup>FE</sup>**)
- **LR**: workers ask for **higher nominal wages in next period**, this **increases cost of production** and **SRAS curve shifts up to SRAS<sup>1</sup>**.

# Short-Run to Long-Run Adjustment

- Expansionary gap causes **SRAS** to shift to the **left** and **price level to increase**.
- Output returns to  **$Y^{FE}$**  but price level rises **further to  $P^2$** .

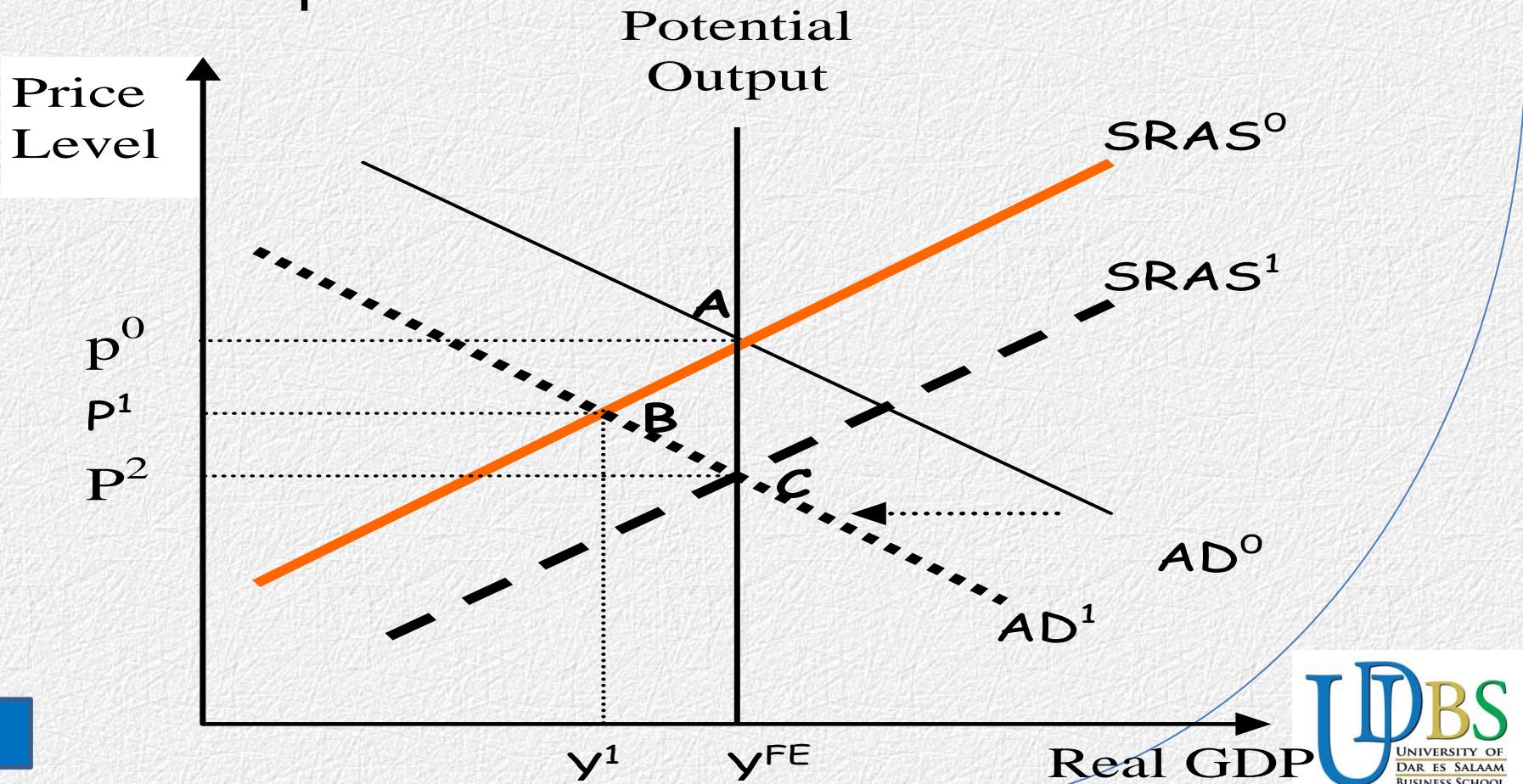


# Short-Run to Long-Run Adjustment

- When demand curve is **lower than expected at AD<sup>1</sup>**.
- **Prices go down**, and **actual price level is below the expected price level**.
- **SR**: firms **reduce production** and level of output will fall below potential output (**contractionary gap**,  $Y^{FE} - Y^2$ )
- **LR**: **higher unemployment** results to workers willing to work at **lower nominal wages**, SRAS shifts down to **SRAS<sup>1</sup>**.

# Short-Run to Long-Run Adjustment

- LR equilibrium is re-established at  $Y^*$  but at even lower prices  $P^2$ .



**DEPARTMENT OF FINANCE**  
**University Of Dar Es Salaam**  
**Business School**

**FN 101: Principles of Macroeconomics**

Genuine Martin  
B.Com, M.A. (Economics)

**Lecture 6:**  
**Central Banking and**  
**Monetary Policy**

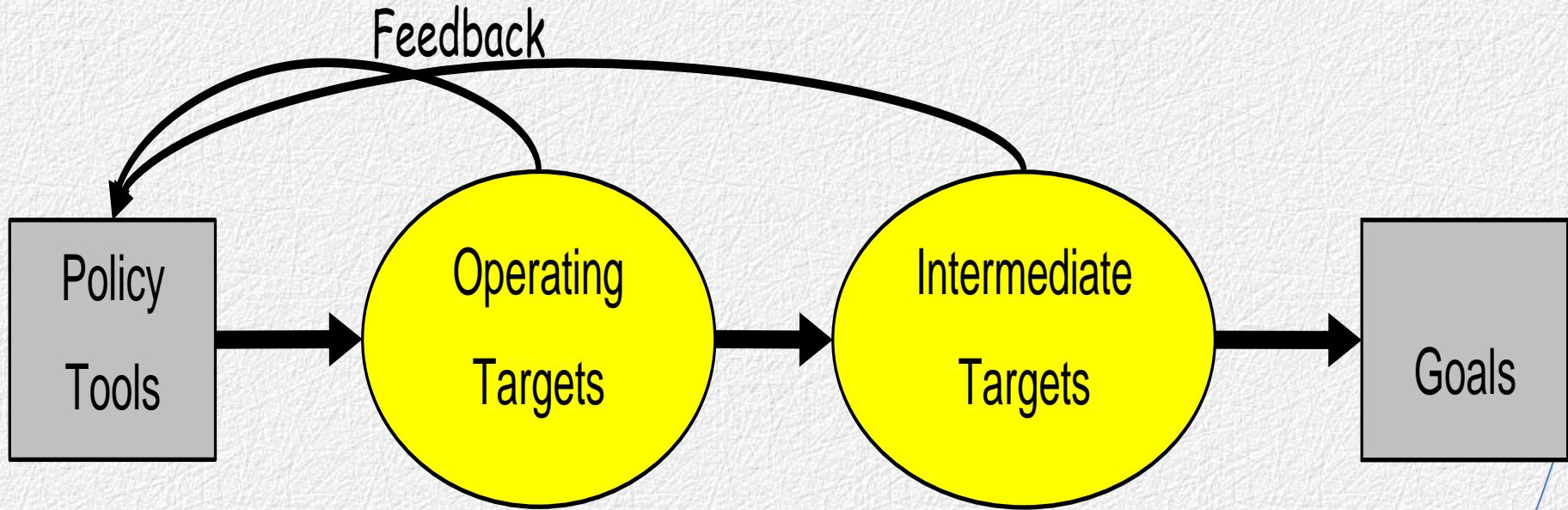
# Monetary Policy

- Relationship btn money supply with interest rate, output, prices, exchange rate, employment, etc.
- How to use money supply to affect this relationship.
- **Monetary Policy:** process used by central bank to control and manage **money supply** to promote economic growth and stability.
- **Expansionary:** **increases** money supply.
- **Contractionary:** **decreases** money supply.

# Monetary Policy

- **Goals:** price stability, high employment, economic growth & financial markets stability.
- **Problems of achieving goals:**
- **1) Goals conflict:** stable low prices at expense of high unemployment.
- 2) Will tools **achieve** the goals directly?
- Need careful selection of targets to use.
- **3) Timing difficulties:** lags for monetary policy to take effect.
- Investment projects are long time and need huge financial outlays.

# Monetary Policy



- Open Market Operations
- Discount Policy
- Reserve Requirements

- Reserves
- Inter-bank money market rates
- REPO Rates

- Monetary Aggregates
- Interest Rates

- Output
- Inflation
- Unemployment Rate

# Monetary Policy

- **Monetary policy targets:** operating and intermediate targets.
- **Operating Targets:** variables central bank **controls directly**.
- Reserves and interbank money market rates.
- Operating targets must have close relationship with intermediate targets.
- **Intermediate Targets:** financial variables central bank uses to achieve goals.
- **Qualities of Good Intermediate Targets:**

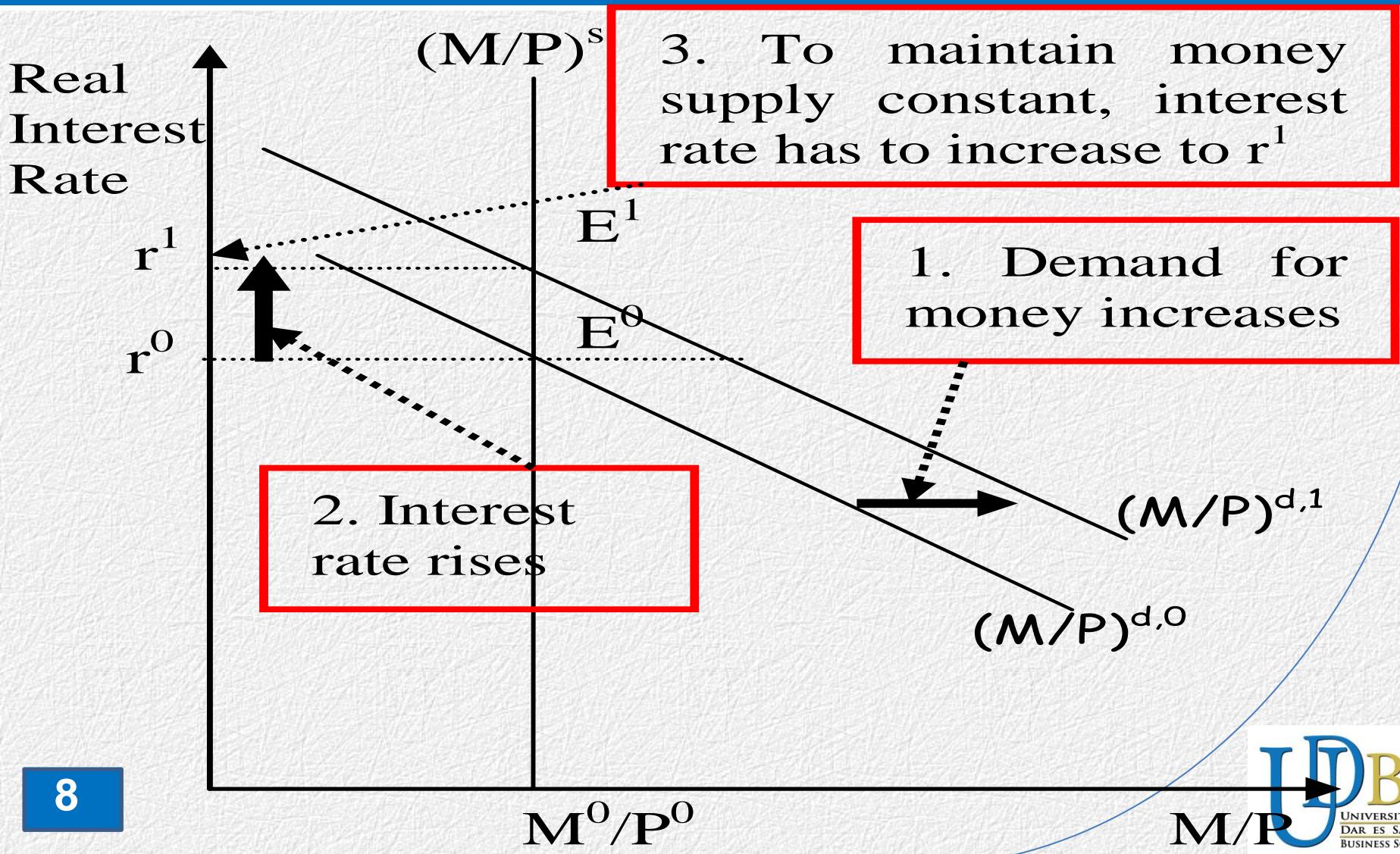
# Monetary Policy

- 1) **Measurable** in short time frame to avoid information lags.
- 2) **Controllable**.
- 3) Have **predictable** impact on policy goals.
- They are monetary aggregates and interest rate.
- Central bank uses one of them, **BUT NOT BOTH.**

# Money Supply Targeting

- The central bank can't set both  $r^0$  and  $M^0$  targets.
- Suppose demand for money increases from  $(M/P)^{d,0}$  to  $(M/P)^{d,1}$ .
- With constant  $M^0$ , interest rate is forced up to  $r^1$ .
- If  $M^s$  remains at  $M^0$ , has to let interest rate move to  $r^1$ .

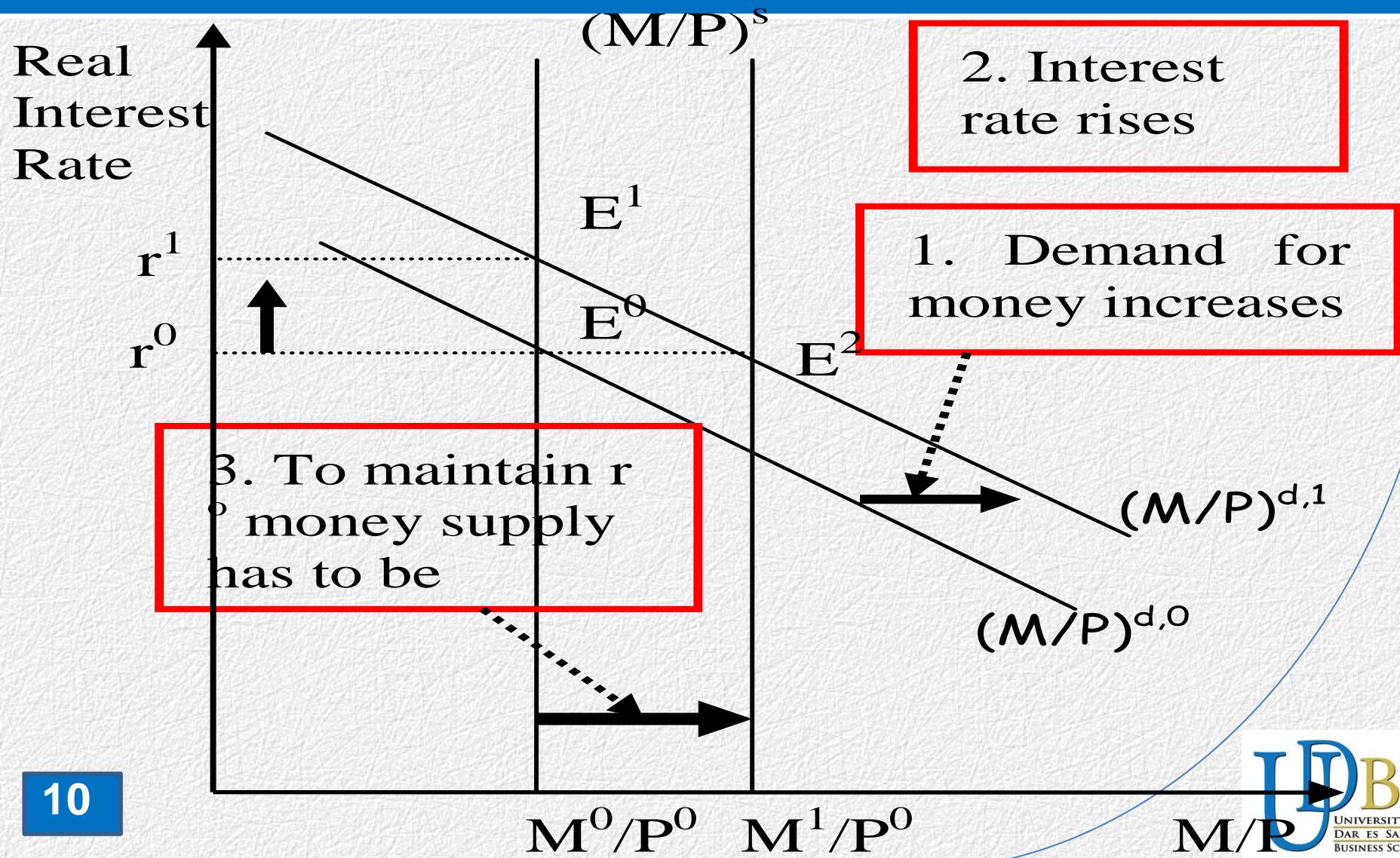
# Money Supply Targeting



# Interest Rate Targeting

- If central bank chooses to maintain  $r$  at  $r^0$ , has to increase money supply to  $M^1$ .
- **NB:** 1) To maintain same money supply, need to give up control over interest rate.
- 2) To maintain same interest rate, need to give up control over money supply, and allow it to increase.

# Interest Rate Targeting



# Monetary Policy Tools

- Three **primary tools**: OMO, discount rate and reserve requirement ratio.
- **Other tools**: FEMO, direct credit controls, selective monetary controls, moral suasion, and gentlemen's agreements.
- **A) Open Market Operations (OMO)**
- Buying and selling of **government securities** (T-Bills, T-Bonds).

# Monetary Policy Tools

- **Purchase** of Treasury papers from banks and public expand reserves and MB thus **increasing** money supply and lowering short-term interest rates.
- **Sale** of Treasury papers to banks and public contract reserves and MB thus **decreasing** money supply and raising short-term interest rates.
- **Advantages of OMO:**
  - 1) Central bank has complete control.
  - 2) Flexible and precise.

# Monetary Policy Tools

- 3) Easily reversible.
- 4) No administrative delays.
- **B) Discount Lending**
- **Discount Window:** facility at which banks borrow reserves from central bank.
- **Types:** primary credit, secondary credit, and seasonal credit.
- **Primary Credit:** plays most important role in monetary policy.
- Healthy banks are allowed to borrow at very short maturities (**standing lending facility**)

# Monetary Policy Tools

- **Secondary Credit:** given to banks with financial troubles and severe liquidity problems.
- Interest rate is higher (**penalty**).
- **Seasonal Credit:** given to meet needs of limited number of small banks (hospitality and agriculture sectors) with seasonal pattern of deposits.
- Apart from monetary policy, discounting prevents financial panics and bank failures (**lender of last resort**).

# Monetary Policy Tools

- **Advantage:** performs role of lender of last resort.
- **Disadvantage:** not completely controlled by central bank.
- Central bank influencing volume of lending by setting discount rate and terms.
- Increase in discount rate reduces volume of discount loans that exerts pressure on other interest rates.
- **NB:** banks are discouraged to utilize this facility.

# Monetary Policy Tools

- **C) Reserve Requirements**
- Banks hold a specified percent of liabilities (sight deposits, SD, TD, FCD, short and medium term borrowing) with central bank (**minimum reserves**).
- **Required reserve ratio** affects the multiplier (**negative** relationship).
- **Rise** in reserve requirements **reduces** amount of deposit creation, leading to fall in multiplier and contraction of money supply.

# Monetary Policy Tools

- It also increases demand for reserves and raise fed funds rate.
- Once a powerful tool but its use is limited.
- Its use can cause immediate liquidity problems for banks and its variation would create more uncertainty for banks and make liquidity management difficult.
- Debate continues.
- **Liquidity Argument:** creates pool of funds to assist illiquid, but solvent banks during financial panic.

# Monetary Policy Tools

- Also increases central bank control over monetary policy.
- **D) Foreign Exchange Market Operations (FEMO).**
- Central banks sell/purchase FX to maintain a fixed exchange rate (**fixed exchange rate regimes**) or smoothen undesirable fluctuations in exchange rates (**flexible exchange rate regimes**).
- Reduces disruptions to monetary policy emanating from FX markets.

# Monetary Policy Tools

- **Purchases** of FX results to increase in FX reserves and **increase** in local currency supply; decrease domestic interest rates and produce currency depreciation.
- **Sale** of FX results to decrease in FX reserves and **decrease** in local currency supply; decrease domestic interest rates and produce currency appreciation.
- **E) Direct Credit Controls**

# Monetary Policy Tools

- Central bank sets upper limit for credit by banks to nonbanks (**absolute amount or growth rate**).
- Sharpest weapon but effective if extensive controls are introduced (**frequent evasions**).
- Against **market oriented economy**.
- **F) Selective Monetary Controls**
- Use of certain bills and differentiated discount rates to affect certain sectors.
- Endangers independence of central bank.
- Against market oriented economy.

# Monetary Policy Tools

- **G) Moral Suasion**
- Attempt by central bank to **influence behaviour** of government, banks & nonbanks via reports, studies, speeches & meetings.
- Effective if central bank is independent.
- **H) Gentlemen's Agreements**
- **Voluntary** agreements btwn central bank and government, banks, and public relating to certain economic behaviour, e.g. restrained wage policy with labour unions.

# Monetary Policy Transmission Mechanism

- Mechanism through which monetary policy affects the economy.
- Guides policymakers to make accurate **timing** and **effect** of policies in economy.
- There are numerous channels how it works.
- **A) Traditional Interest-Rate Channel**
- Expansionary policy leads to fall in real interest rate ( $r$ ), lowers cost of capital, causing rise in investment and consumption on credit (housing and durables) leading to increase in aggregate demand and output ( $Y$ ).

# Monetary Policy Transmission Mechanism

- Fall in nominal interest rate (with **sticky prices** in SR) lead to fall in real interest rate.

*Expansionary monetary policy*  $\Rightarrow r \downarrow \Rightarrow I \uparrow \& C \uparrow \Rightarrow Y \uparrow$

- **B) Other Asset Prices Channel**
- Other assets prices (bonds prices, exchange rates and stock prices) and real wealth transmit monetary effects onto the economy.
- **1) Exchange Rate Effect on NX:** growing internationalization and flexible exchange rates.

# Monetary Policy Transmission Mechanism

- Increases in money supply lead to fall in real interest rate, domestic financial assets are less attractive relative to foreign currency assets.
- More demand for FX assets and less demand for local currency assets lead to **depreciation** of a shilling.
- This makes domestic goods cheaper (**more exports**) and foreign goods dearer (**less imports**) thus **raising net exports** (NX) and output (Y).

# Monetary Policy Transmission Mechanism

*Expansionary monetary policy  $\Rightarrow r \downarrow \Rightarrow e \downarrow \Rightarrow NX \uparrow \Rightarrow Y \uparrow$*

- 2) **Tobin's q Theory**: by **James Tobin**
- Monetary policy affects **valuation** of equities (**stock prices**) relative to **replacement** cost of capital [**q**].
- If **q** is high, market price of firms is high relative to replacement cost of capital, i.e. new plant and equipment is cheap relative to market value of firms.

# Monetary Policy Transmission Mechanism

- Companies can issue stocks at higher price than cost of facilities and equipments, and use money from stocks issue to expand investments which are cheaper.
- How does monetary policy affect  $q$  then?
- Higher money supply in hands of public, the public uses extra money to spend, part of which they **purchase stocks** which increases its demand, and raise their prices.
- Higher stock price leads to **higher  $q$**  and thus higher investment and higher output.

# Monetary Policy Transmission Mechanism

*Expansionary monetary policy  $\Rightarrow P_s \uparrow \Rightarrow q \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$*

- **3) Wealth Effects:** by **Franco Modigliani**
- **Life Cycle Hypothesis:** determinant of consumption is lifetime resources (wealth incl. financial wealth) to smoothen consumption.
- More money supply raises stock prices (discussed above) thus increasing financial wealth thereby raising consumption and level of output.

*Expansionary monetary policy  $\Rightarrow P_s \uparrow \Rightarrow \text{Wealth} \uparrow \Rightarrow C \uparrow \Rightarrow Y \uparrow$*

# Monetary Policy Transmission Mechanism

- **C) Credit View:** based on **asymmetric information** problems in financial markets.
- **Two Channels:** bank lending and firms' and households' balance sheets.
- **1) Bank Lending Channel:** banks best solve asymmetric information by assessing and selecting borrowers and channel funds to most productive end.

# Monetary Policy Transmission Mechanism

- Expansionary policy increases bank reserves and deposits that increase quantity of available loans that cause investment and consumer spending on credit to increase and finally the output level.

*Expansionary monetary policy  $\Rightarrow$  bank deposits  $\uparrow \Rightarrow$  bank loans  $\uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$*

- **2) Bank Sheet Channel:**
- Lower **net worth** of firms lead to severe **adverse selection** (have **less collateral**) and **moral hazard** (owners with fewer stakes in firm engage in **risky projects**).

# Monetary Policy Transmission Mechanism

- These affect lending seriously.
- Expansionary monetary policy causes a rise in stock prices that raises the net worth of firms (reduces adverse selection and moral hazard) and increases lending.
- With more lending, investment spending increases leading to higher output.

*Money Supply  $\uparrow \Rightarrow P_s \uparrow \Rightarrow \text{net worth} \uparrow \Rightarrow \text{adverse selection} \downarrow, \text{moral hazard} \downarrow \Rightarrow L \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$*

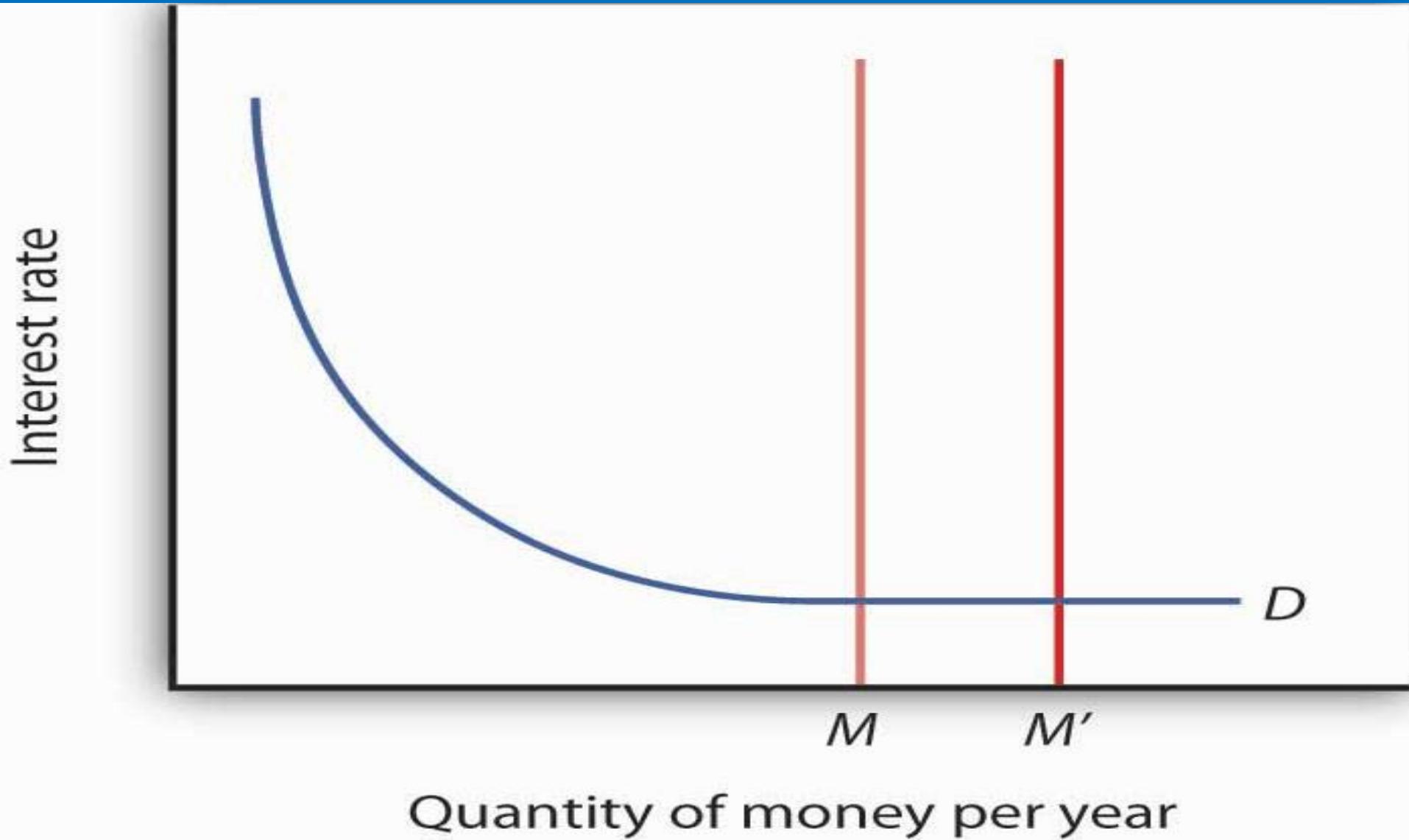
# Monetary Policy Constraints

- Mechanics of monetary policy are simple, but the practice is very challenging.
- Constraints to alter money supply, interest rate or AD exist.
- **1) Reluctant Lenders:** increase in reserves from central bank may not find their way to borrowers if banks keep **excess reserves**.
- **2) Liquidity Trap:** when interest rates are too low, opportunity of holding money is too cheap and people prefer to hold currency.

# Monetary Policy Constraints

- Expansion of money supply cannot drive interest rate lower.
- This happens on horizontal portion of  $M^d$  curve, when people are willing to **hold unlimited amount** of money.

# Monetary Policy Constraints



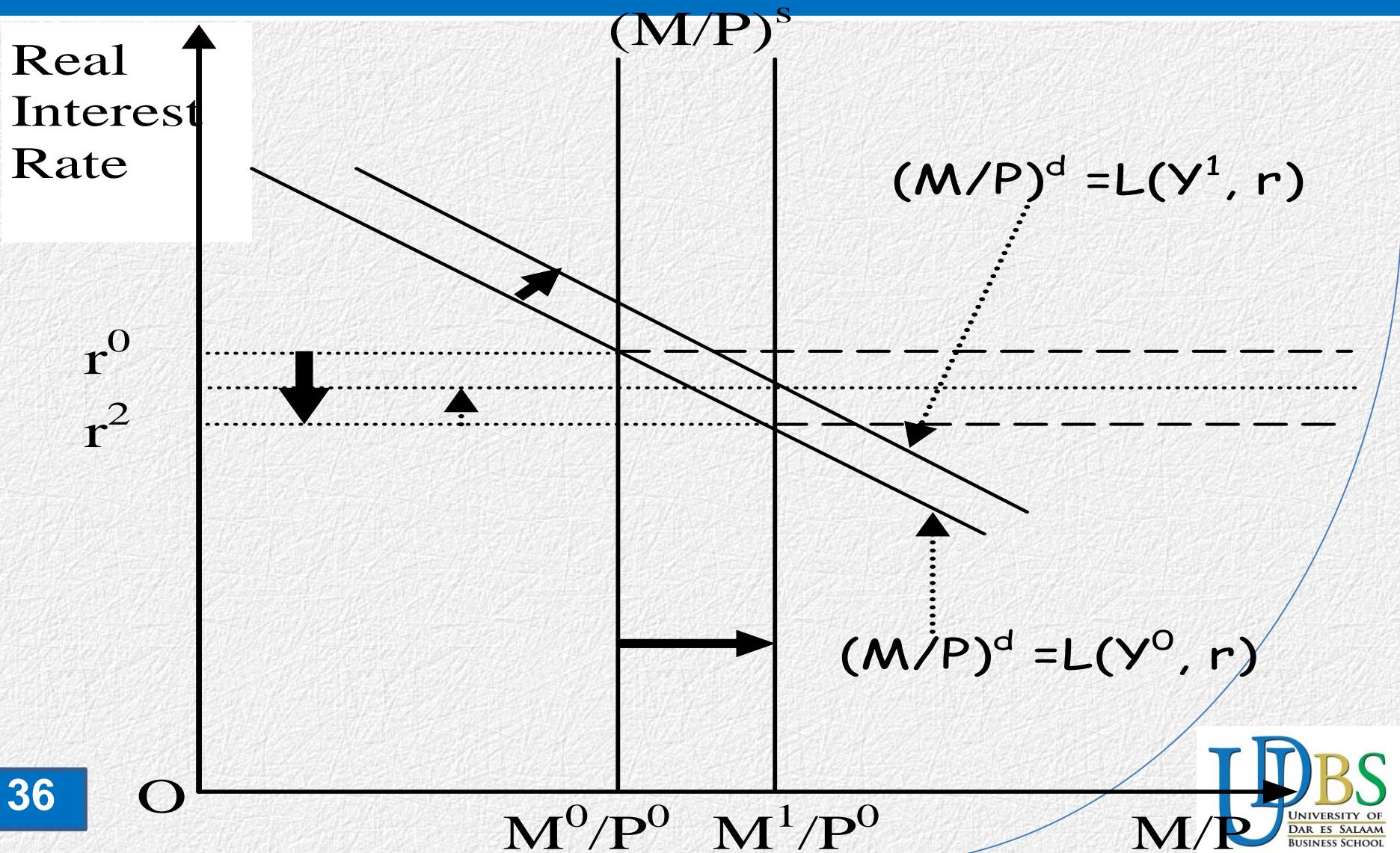
# Monetary Policy Constraints

- **3) Low Expectations:** decline in interest rate due to monetary expansion may not guarantee expansion of investments if investors have little expectations of future profit.

# Monetary Policy and the LM Curve in SR

- Change in M/P through change in M or P causes LM curve to shift.
- Case of expansionary monetary policy by central bank.
- Central bank increases nominal money supply from  $M^0$  to  $M^1$ .

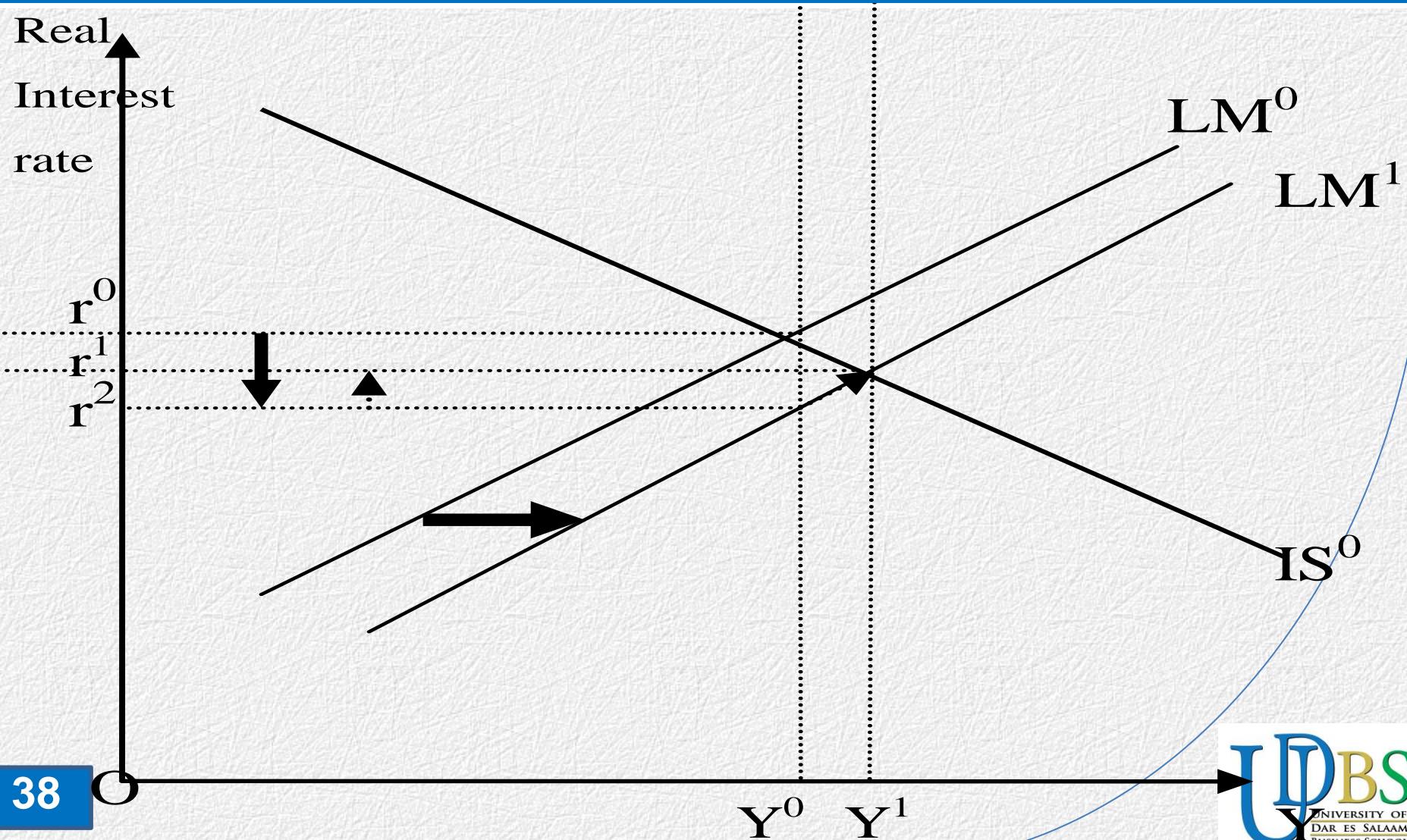
# Monetary Policy and the LM Curve in SR



# Monetary Policy and the LM Curve in SR

- With sticky prices, real money supply increases.
- LM curve shifts to the right from  $LM^0$  to  $LM^1$ .

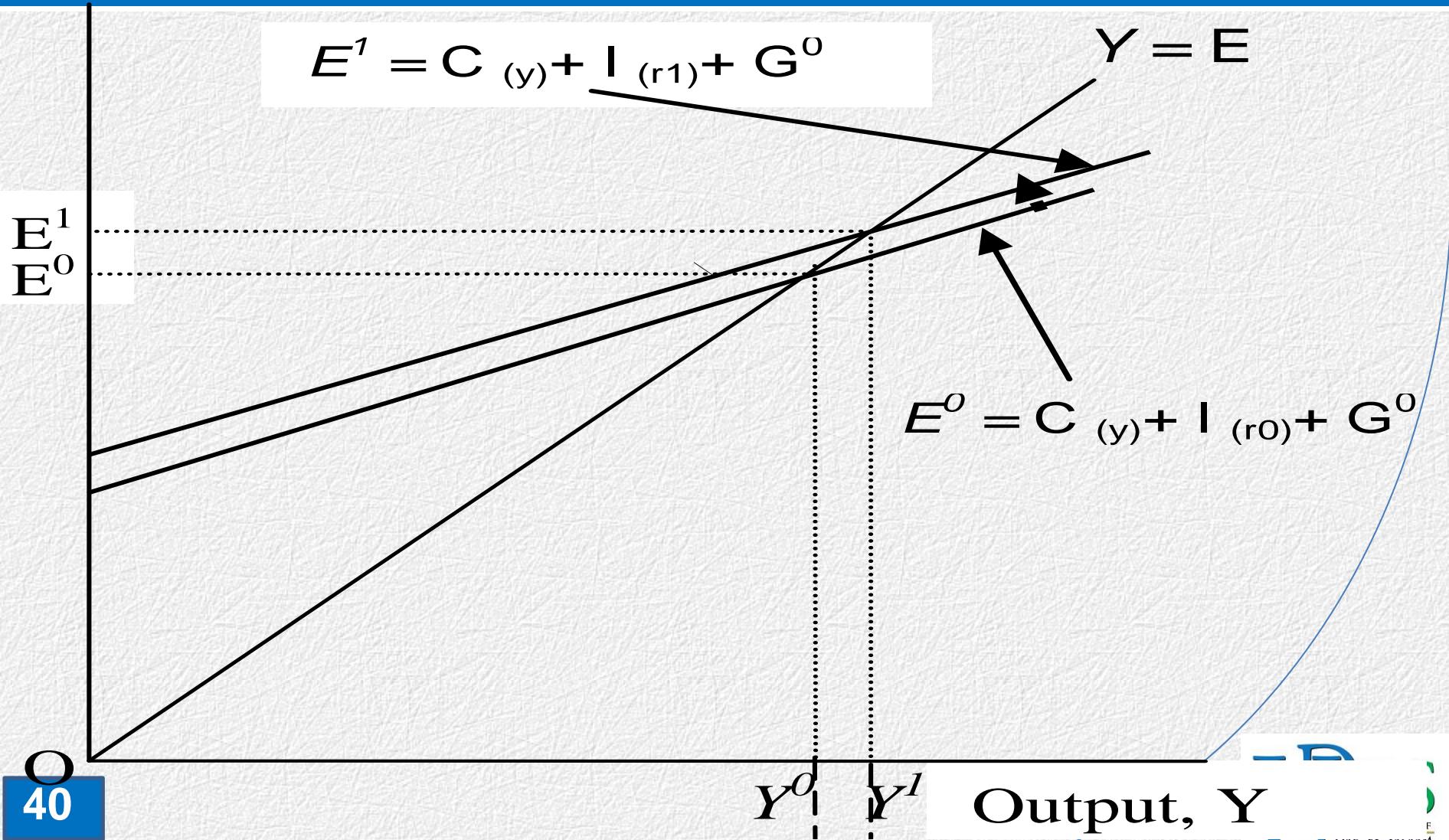
# Monetary Policy and the LM Curve in SR



# Monetary Policy and the LM Curve in SR

- This causes interest rate to fall from  $r^0$  to  $r^2$ .
- Decrease in interest rate causes investment and aggregate expenditure to increase, expenditure curve shifts from  $E^0$  to  $E^1$ .

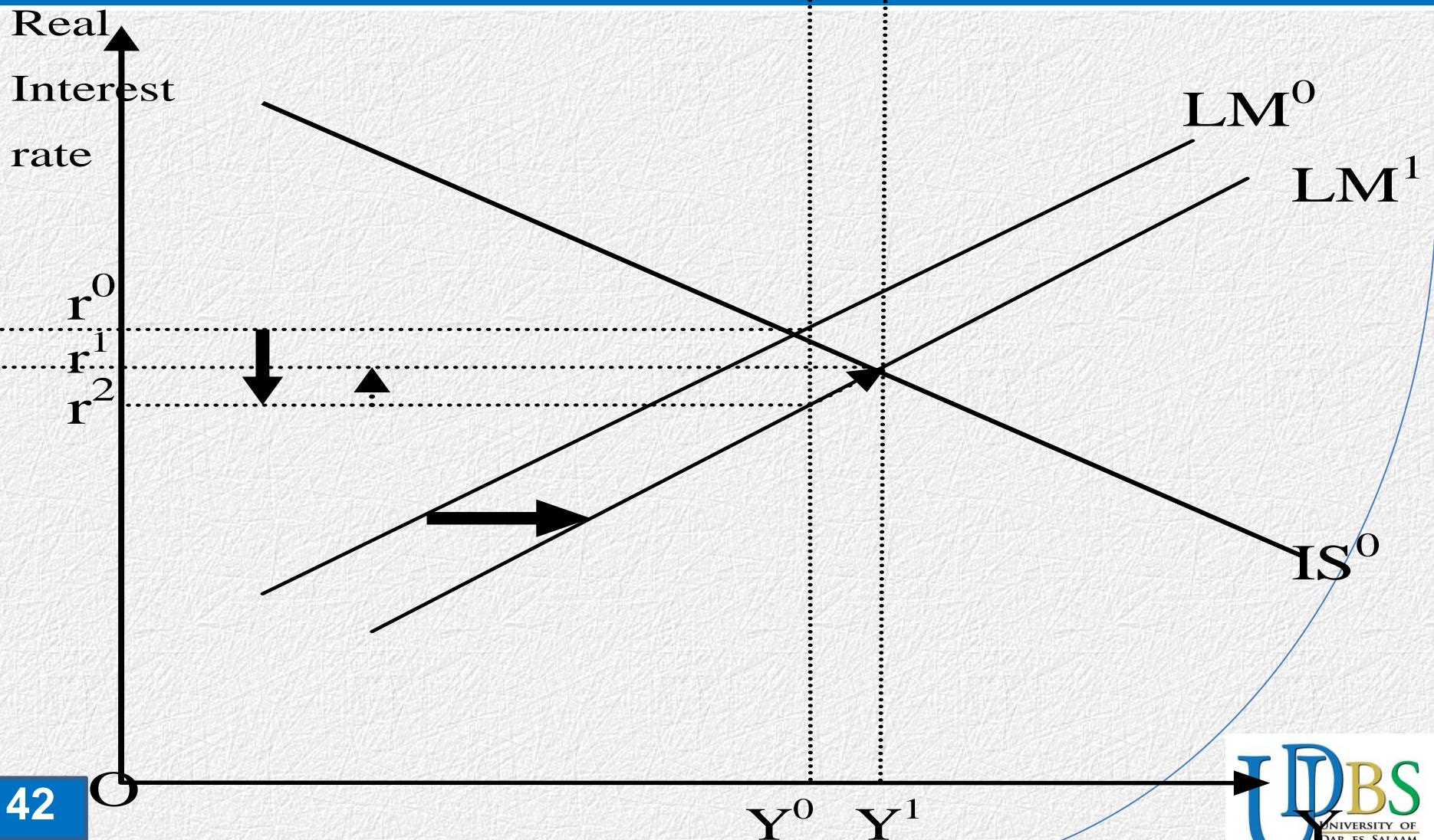
# Monetary Policy and the LM Curve in SR



# Monetary Policy and the LM Curve in SR

- Income increases from  $Y^0$  to  $Y^1$ .
- This increases money demand leading to shift of the  $M^d$  curve from  $M^d(Y_0)$  to  $M^d(Y_1)$  that causes interest rate to rise to  $r^1$ .
- Iterations continue until new equilibrium is established at  $r^1$  and  $Y^1$ .

# Monetary Policy and the LM Curve in SR



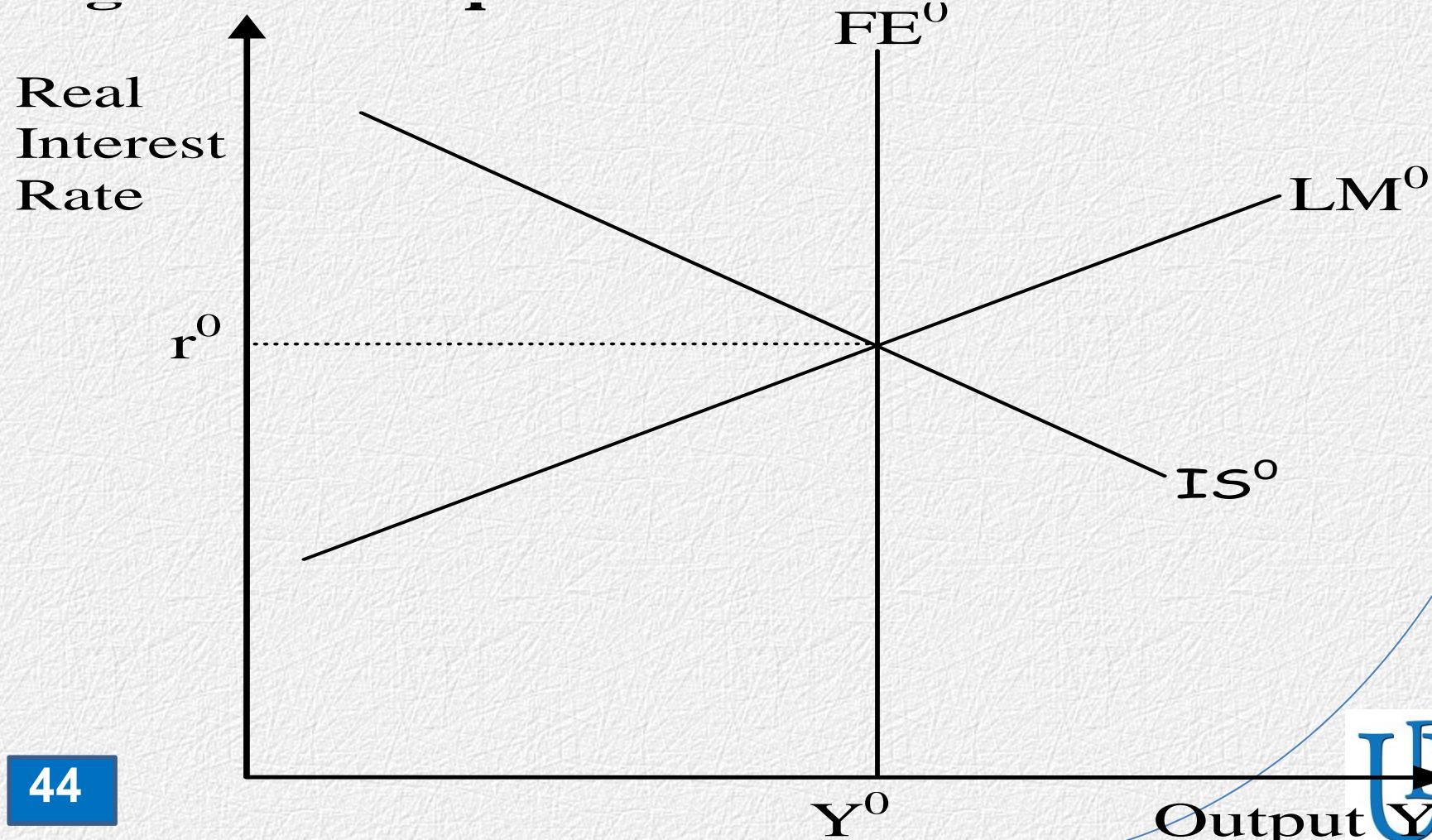
# Monetary Policy and the LM Curve in SR

- The schematics of the process is summarized as:

$$M^s \uparrow \Rightarrow M^s / P \uparrow \Rightarrow r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \Rightarrow M^d \uparrow \Rightarrow r \uparrow$$

# Monetary Policy and Long Run Equilibrium

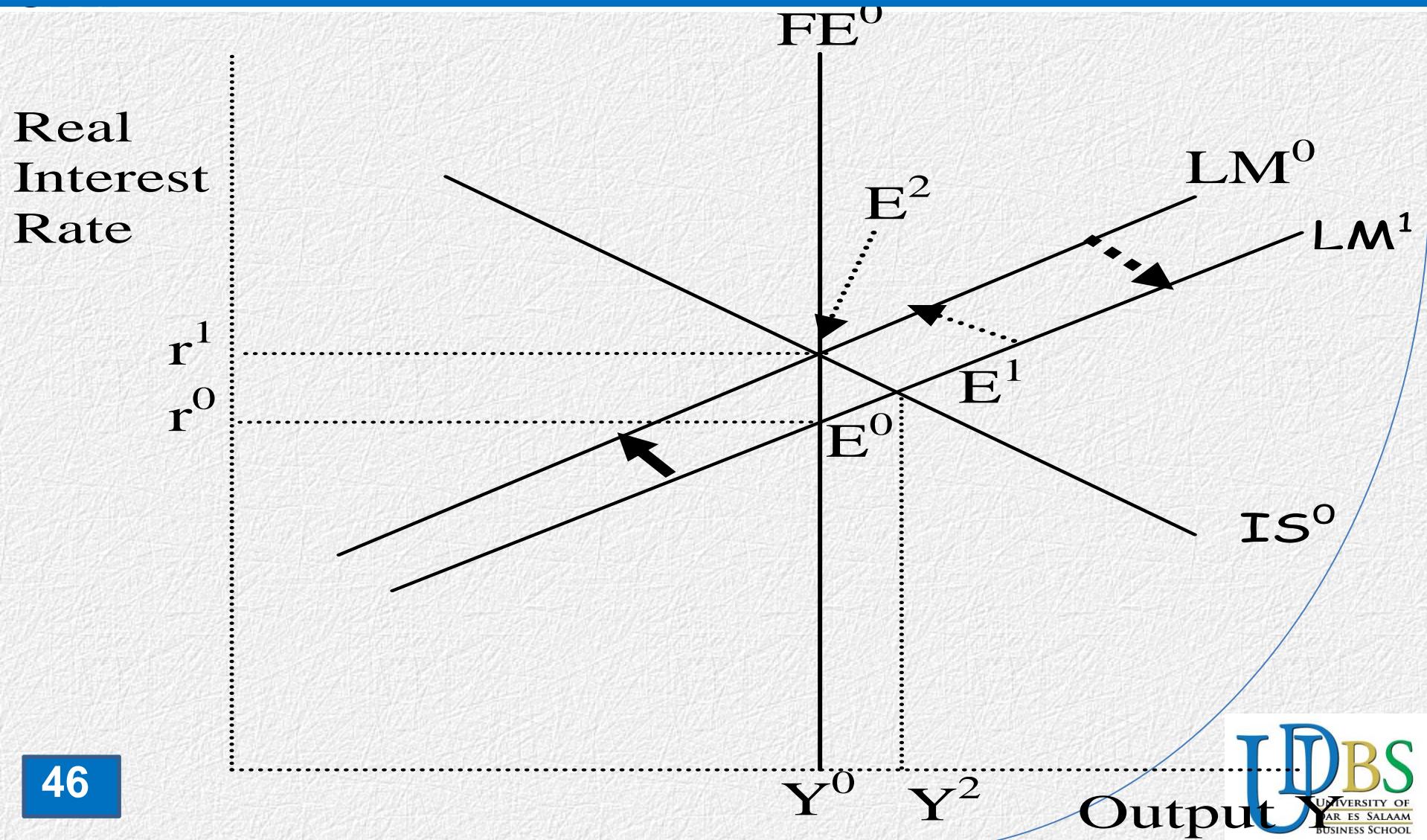
- **LR:** IS, FE, and LM curve intersect.



# Monetary Policy and Long Run Equilibrium

- In LR **price adjusts** to restore equilibrium.
- Consider expansionary monetary policy that shifts LM curve from  $LM^0$  to  $LM^1$ .
- Moves equilibrium from  $E^0$  to  $E^1$ .
- At  $E^1$ ,  $Y^2$  is higher than full employment output  $Y^0$ .
- **Excess demand** forces **push up prices**.
- Higher prices lower **real money balances** ( $M/P$ ).
- This shifts LM curve back from  $LM^1$  to  $LM^0$  until equilibrium is restored.

# Monetary Policy and Long Run Equilibrium



# Monetary Policy and Long Run Equilibrium

- This phenomenon is called **neutrality of money**.
- i.e. A one-time change in nominal money supply affects only **nominal variables** (nominal interest rate, price level and nominal output).
- Change in price level leads to change in real money balances.
- **NB:** If IS shifts to the right.
- Price level will rise.
- Real money balances will decline; LM will shift to the left until same real output is restored.

# Monetary Policy and Long Run Equilibrium

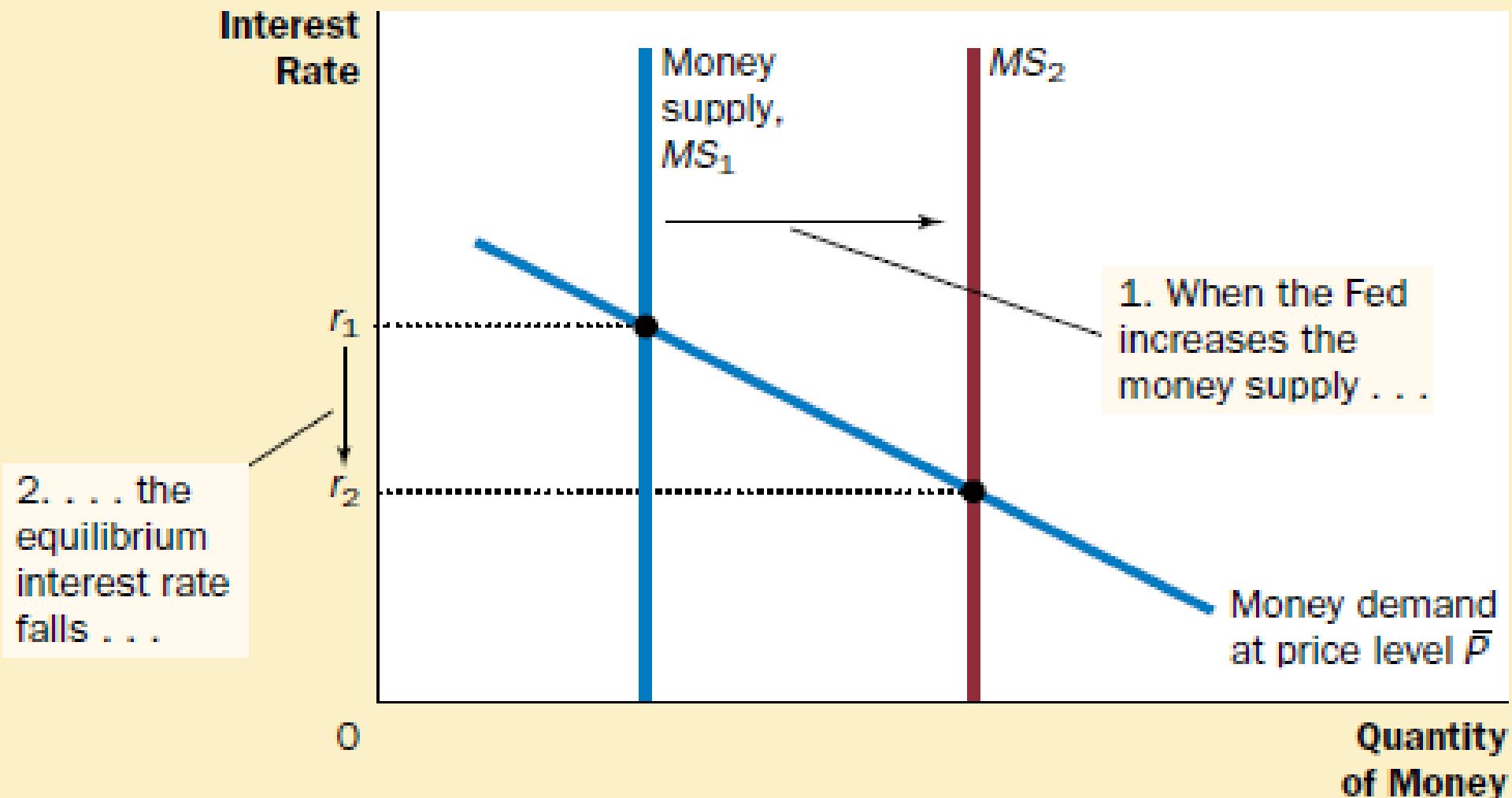
- If FE shifts to the right, price level will fall, real balances will increase causing LM curve to shift to the right until equilibrium is restored.

# Monetary Policy and Aggregate Demand

- If central bank increases money supply, interest rates fall from  $r^1$  to  $r^2$ .

# Monetary Policy and Aggregate Demand

(a) The Money Market

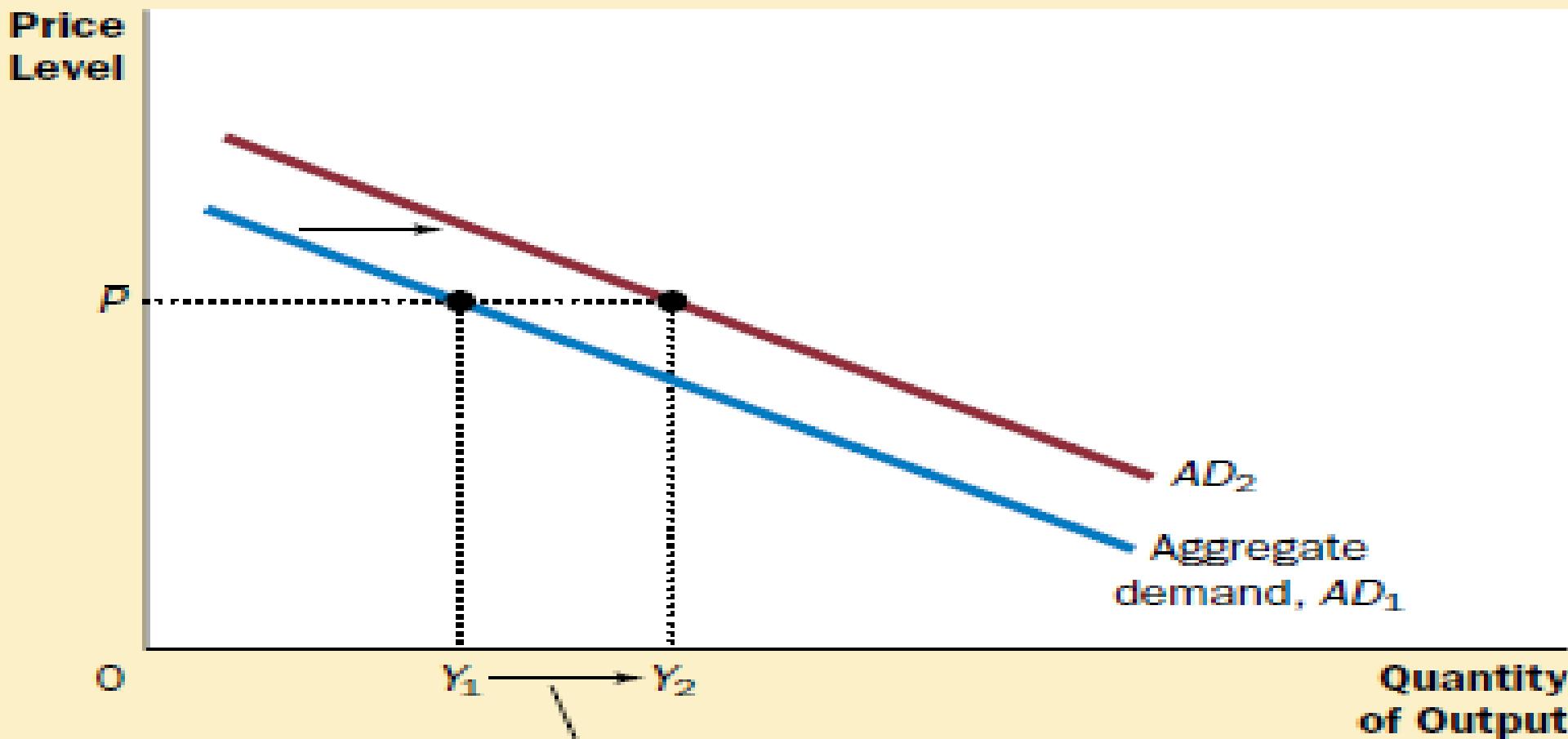


# Monetary Policy and Aggregate Demand

- Lower interest rates stimulate investments which increase aggregate spending at same level of prices.
- In SR, aggregate demand shifts from  $AD^1$  to  $AD^2$  and output increases from  $Y^1$  to  $Y^2$ .

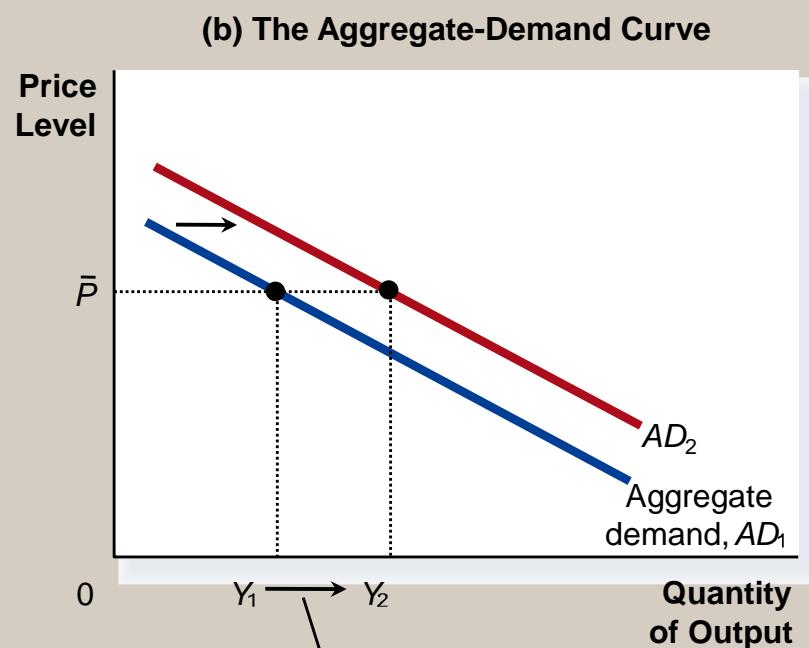
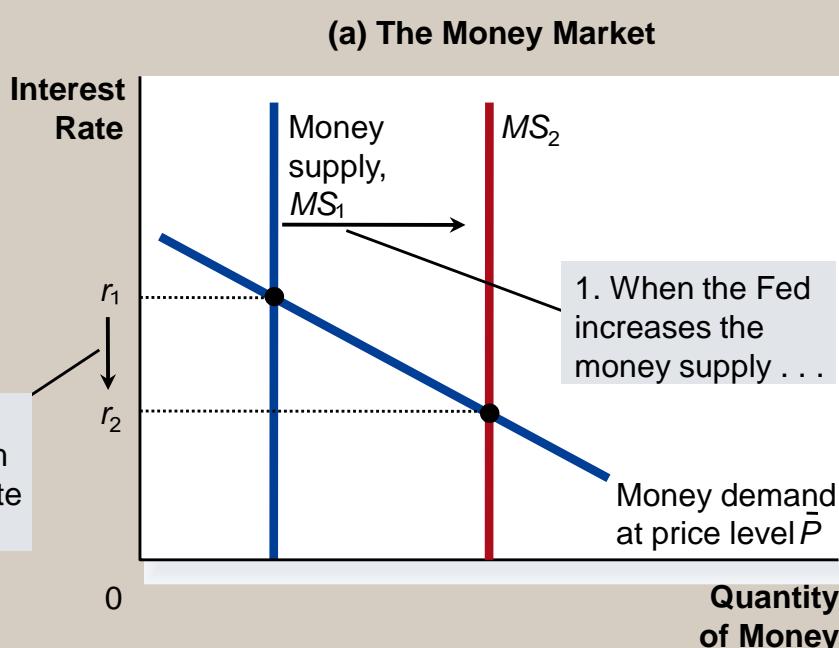
# Monetary Policy and Aggregate Demand

(b) The Aggregate-Demand Curve



3. . . which increases the quantity of goods and services demanded at a given price level.

# A Monetary Injection



# Effectiveness of Monetary Policy

- Effectiveness of monetary policy on AD depends on the extent to which interest rate responds to change in money supply (**slope of  $M^d$  curve and LM curve**), and in turn how C, I and NX respond to changes in interest rate (**slope of  $I(r)$  function and IS curve**).
- Consider equilibrium in goods market:  $Y = AE = C + I + G$
- Where:  $C = C_0 + \alpha_1 Y$ ,  $I = I_0 + \alpha_2 Y - \alpha_3 i$ ,  $G = G$
- $\alpha_3$  = responsiveness of investment to changes in interest rate.

# Effectiveness of Monetary Policy

- **IS:**  $Y = C_0 + \alpha_1 Y + I_0 + \alpha_2 Y - \alpha_3 Y + G$

- Make  $i$  the subject:

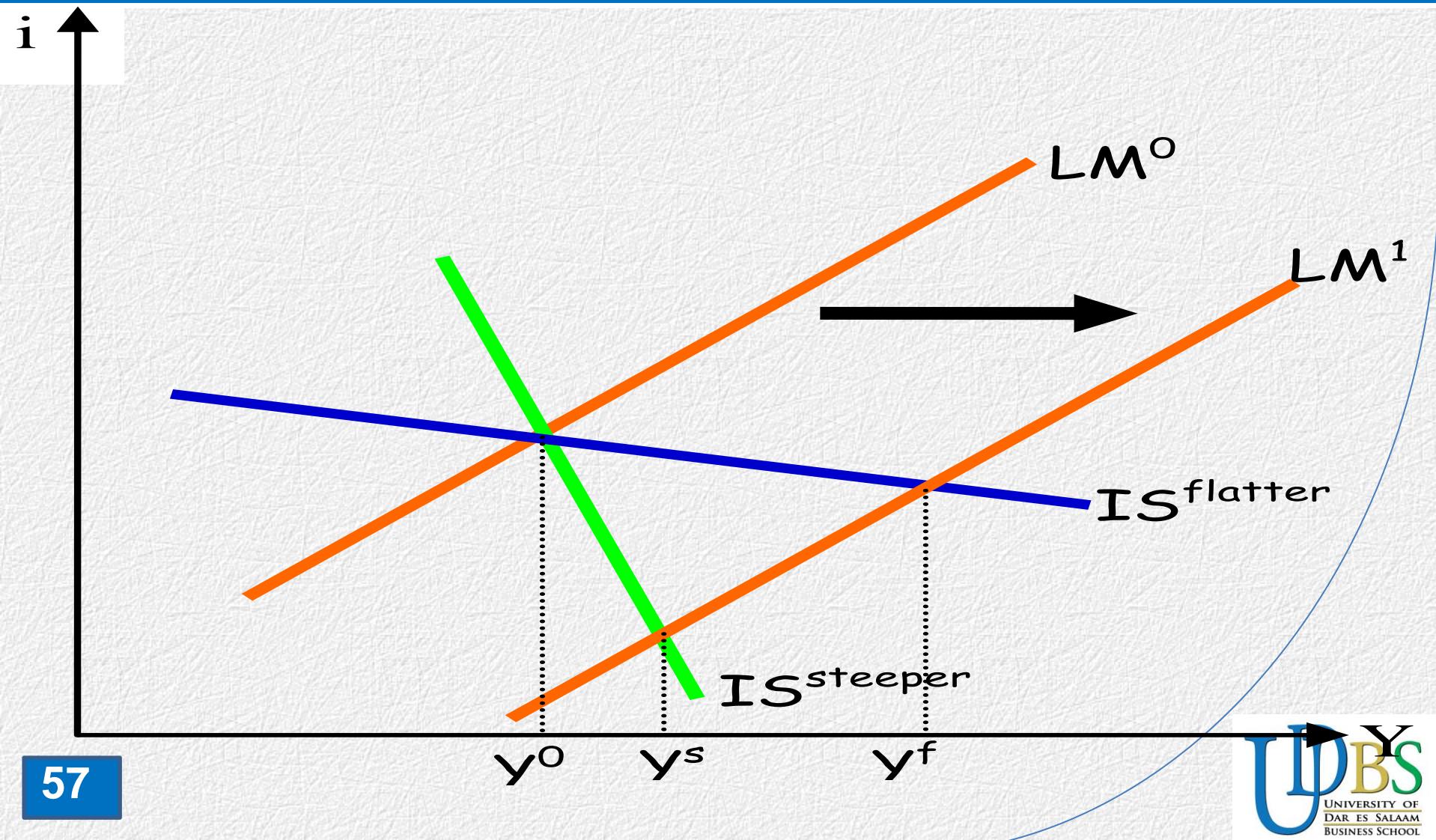
$$i = \left( \frac{C_0 + I_0 + G}{\alpha_3} \right) + \frac{\alpha_1 + \alpha_2 - 1}{\alpha_3} Y$$

- The **larger the  $\alpha_3$**  (investment is more responsive to interest rate) and **smaller the  $\alpha_1$  &  $\alpha_2$**  (changes in  $C$  and  $I$  produce larger effect on  $Y$ , express  $Y$  in terms of  $C$  and  $I$  to see this), the **smaller the slope of IS.**

# Effectiveness of Monetary Policy

- Thus, monetary policy expansion that decreases interest rate will have **larger impact on investment and consumption**, and yet **larger impact on Y**.
- Thus: **Monetary policy is more effective when the slope of IS curve is gentle.**
- In the graph below, monetary expansion (shift of LM curve from  $LM^0$  to  $LM^1$ ) moves Y from  $Y^0$  to  $Y^s$  when IS curve is **steep** and further to  $Y^f$  when IS curve is **gentle**.

# Effectiveness of Monetary Policy



# Effectiveness of Monetary Policy

- What about the nature of the LM curve?
- **Money Demand Equation:**  $M^d/P = \alpha_4 Y - \alpha_5 i$
- Equilibrium in money markets:  $M^d/P = M^s/P$
- $M^s/P = \alpha_4 Y - \alpha_5 i$
- Make  $i$  the subject:

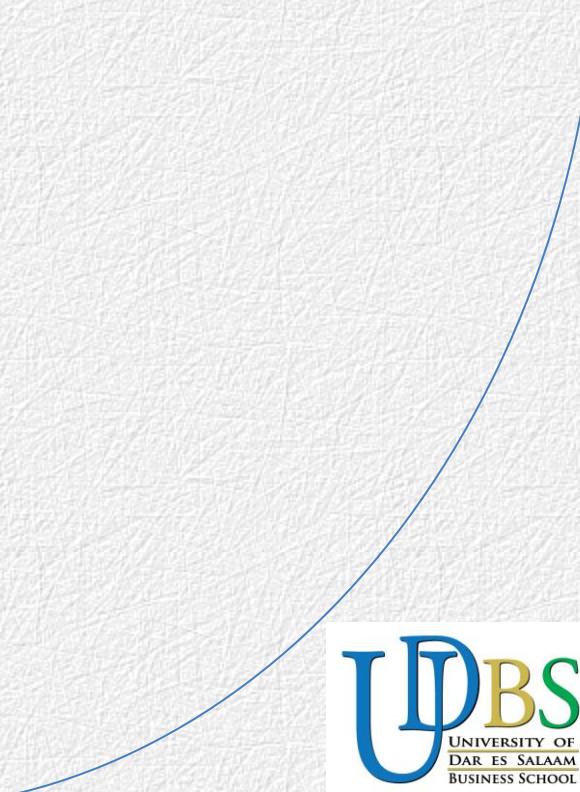
$$i = \frac{-M / P}{\alpha_5} + \left( \frac{\alpha_4}{\alpha_5} \right) Y$$

# Effectiveness of Monetary Policy

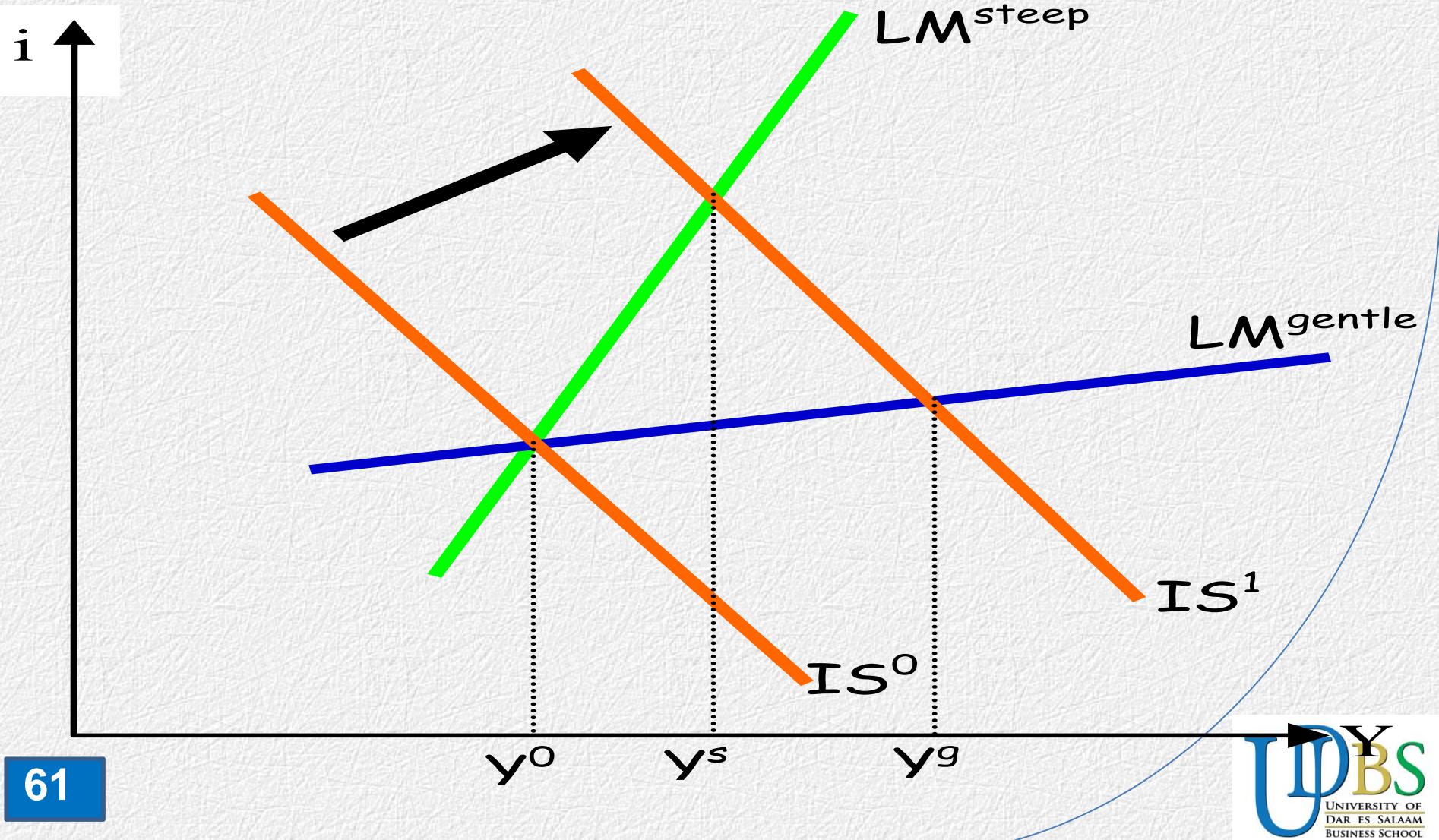
- The **larger the  $\alpha_5$**  (money demand is more responsive to interest rate changes,  $M^d$  is **gently sloped**,  $M^d$  will have less impact on interest rate),
- And **smaller the  $\alpha_4$**  (money demand is **less responsive** to interest rate changes, increase in income will have **less impact on  $M^d$** , thus **less leakage** in form of investment),
- The **LM will be gently sloped.**

# Effectiveness of Monetary Policy

- The **gentler the LM curve**, the **more effective** the fiscal policy.
- See the graph below.



# Effectiveness of Monetary Policy



# Effectiveness of Monetary Policy

- Fiscal expansion moves the IS curve from  $IS^0$  to  $IS^1$ , moving  $Y$  from  **$Y^0$  to  $Y^s$**  when the LM curve is **steep** and further to  **$Y^g$**  when the IS curve is **gentle**.
- **Combining** the goods and money markets indicates the **relative effectiveness** of monetary vis-a-vis fiscal policy and suggests policy action will have more impact on output.
- Solve for the AD equation by equating interest from money markets to interest in goods market.

# Effectiveness of Monetary Policy

$$\frac{C_0 + I_0 + G}{\alpha_3} + \frac{\alpha_1 + \alpha_2 - 1}{\alpha_3} Y = \frac{-M/P}{\alpha_5} + \left( \frac{\alpha_4}{\alpha_5} \right) Y$$

- Make  $Y$  the subject in terms of  $G$  and  $M$ .

$$Y = \frac{\alpha_5(C_0 + I_0)}{\alpha_3\alpha_4 + \alpha_5 - \alpha_1\alpha_5 - \alpha_2\alpha_5} + \left( \frac{\alpha_5}{\alpha_3\alpha_4 + \alpha_5 - \alpha_1\alpha_5 - \alpha_2\alpha_5} \right) G + \left( \frac{\alpha_3}{\alpha_3\alpha_4 + \alpha_5 - \alpha_1\alpha_5 - \alpha_2\alpha_5} \right) \frac{M}{P}$$

- Let  $\Phi = \alpha_3\alpha_4 + \alpha_5 - \alpha_1\alpha_5 - \alpha_2\alpha_5$

$$Y = \frac{\alpha_5(C_0 + I_0)}{\Phi} + \left( \frac{\alpha_5}{\Phi} \right) G + \left( \frac{\alpha_3}{\Phi} \right) \frac{M}{P}$$

- From the equation above:
- $\Delta Y / \Delta G = \alpha_5 / \Phi$

# Effectiveness of Monetary Policy

- Thus: The **larger the  $\alpha_5$** , the **gentler the slope of LM curve**, and the **more effective is the fiscal policy**.
- $\Delta Y / \Delta(M/P) = \alpha_3 / \Phi$
- Thus: The **larger the  $\alpha_3$** , the **gentler the slope of IS curve**, and the more **effective is the monetary policy**.

$$\frac{\Delta Y / \Delta G}{\Delta Y / \Delta(M/P)} = \frac{\alpha_5}{\alpha_3}$$

# Effectiveness of Monetary Policy

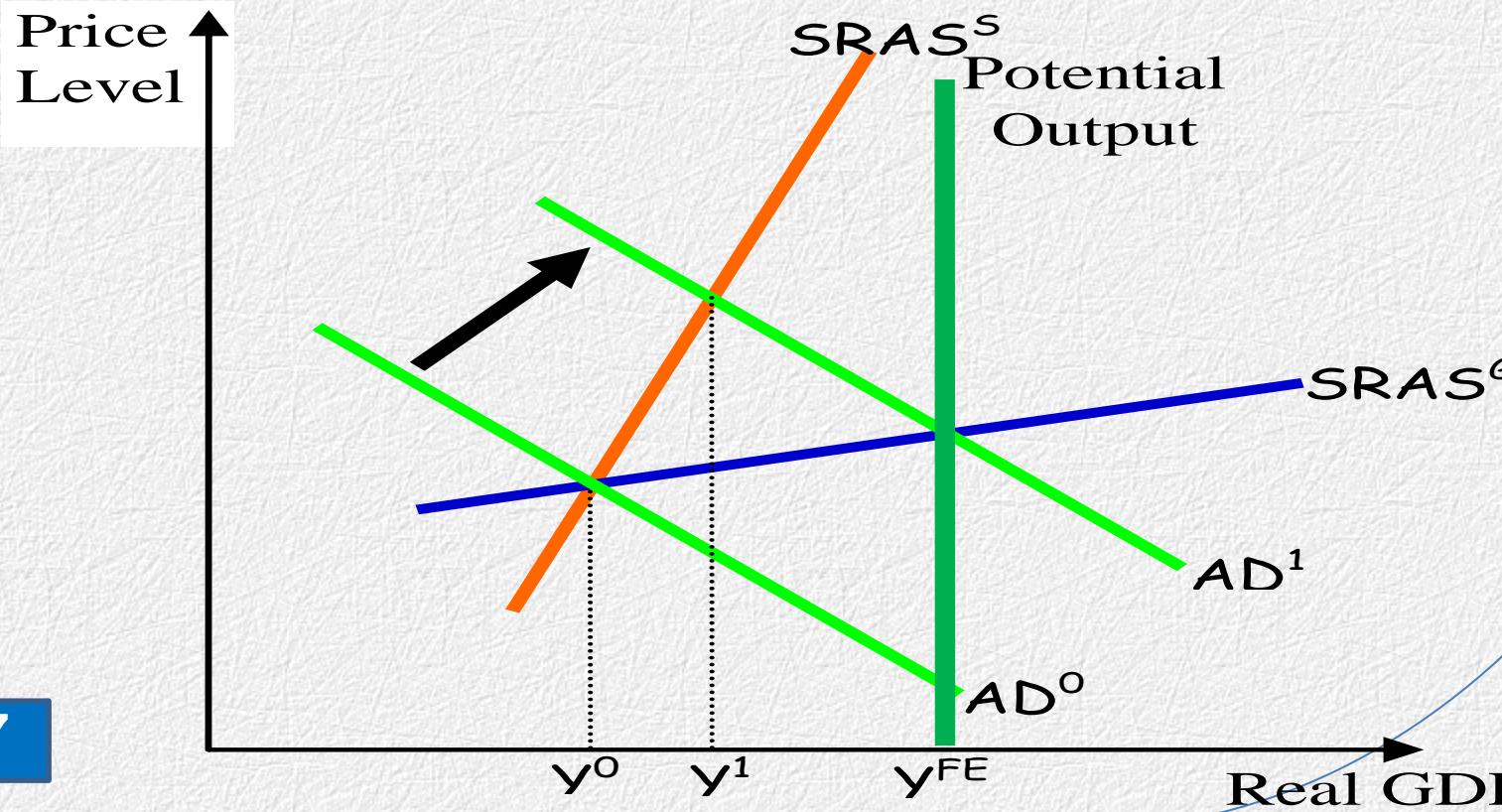
- When  $\alpha_5$  is larger than  $\alpha_4$ , LM curve is much **gentler** than the IS curve, and **fiscal policy is more effective**.
- When  $\alpha_3$  is larger than  $\alpha_3$ , IS curve is much **gentler** than the LM curve, and **monetary policy is more effective**.

# Slope of SRAS and Monetary Policy Effectiveness

- **Slope of SRAS** completes effectiveness of monetary policy.
- Gives indication of how aggregate output responds to price change in SR.
- A **flatter SRAS** will make **monetary policy more effective**.
- The shift of the AD curve from  $AD^0$  to  $AD^1$  produces **more effect** on output when the SRAS curve is **gentle** ( $SRAS^G$ ) compared to when it's **steep** ( $SRAS^S$ ).

# Slope of SRAS and Monetary Policy Effectiveness

- With a gently sloped SRAS, the increase in AD managed to attain the potential output level at  $Y^{FE}$  compared to when the SRAS is steep.



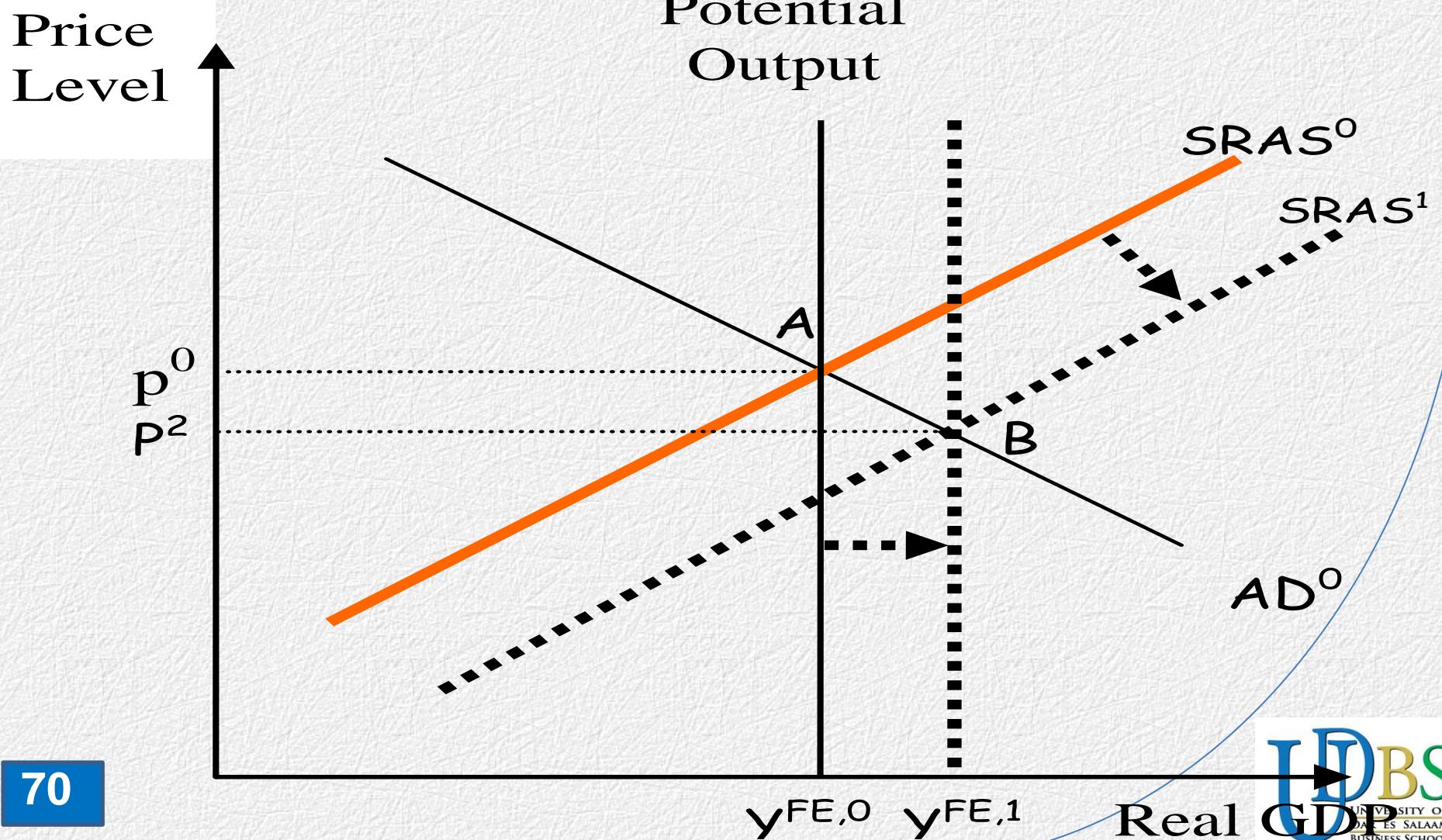
# Supply Shocks and Aggregate Supply

- **Supply Shocks:** unexpected events that affect aggregate supply.
- **Beneficial Shocks:** unexpected events that increase aggregate supply leading to higher output and lower prices.
  - E.g. abundant harvests, discovery of natural resources, technological breakthroughs, etc.
- **Adverse Supply Shocks:** unexpected events that reduce aggregate supply leading to lower output and higher prices (**stagflation**).
- Shocks can be temporary or permanent.

# Supply Shocks and Aggregate Supply

- **Temporary Shock:** only SRAS will shift.
- **Permanent Shock:** both SRAS and LRAS will shift.
- If beneficial supply shock is permanent (improvement in technology), both SRAS and LRAS will shift out to the right.

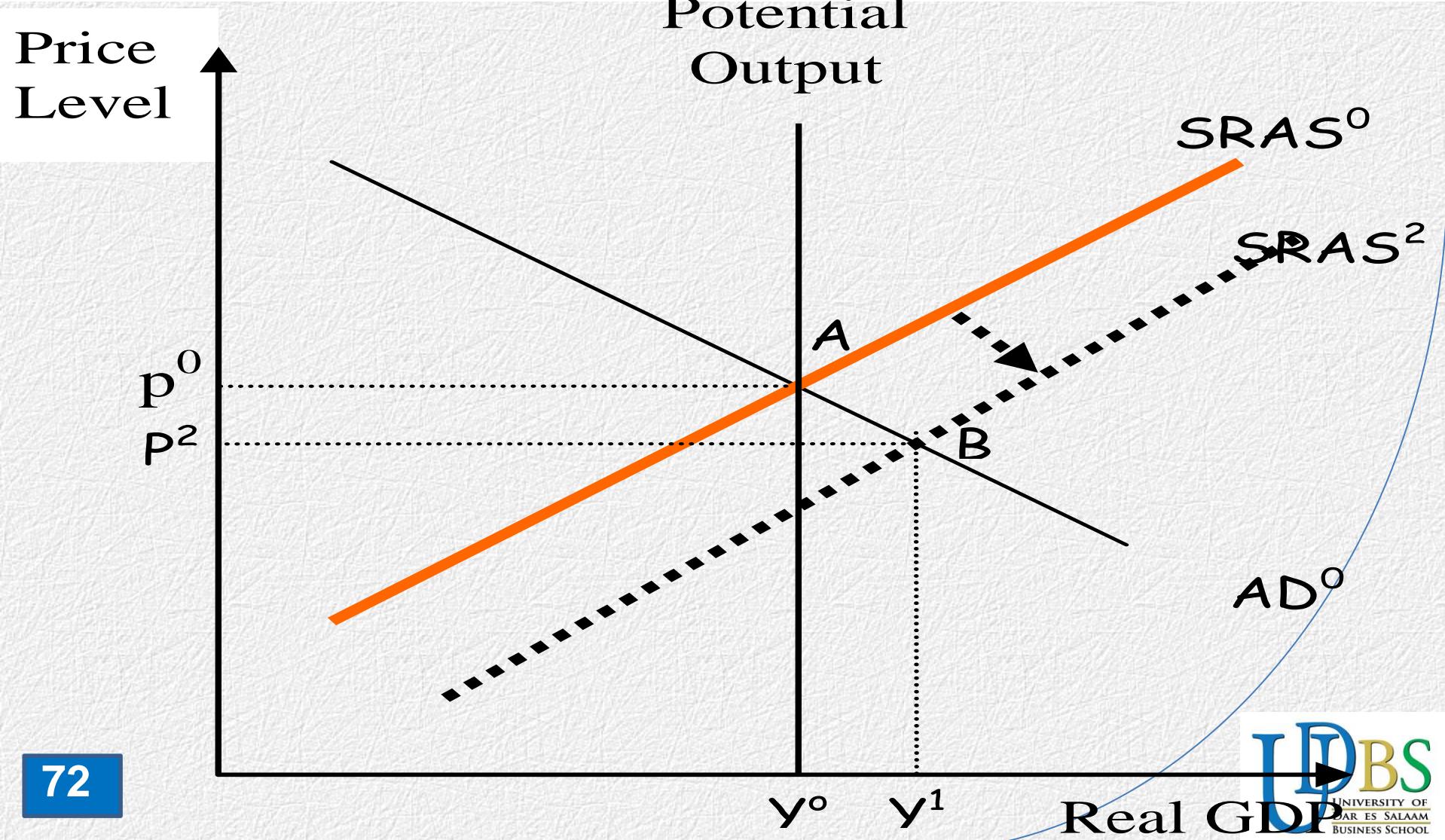
# Supply Shocks and Aggregate Supply



# Supply Shocks and Aggregate Supply

- If beneficial shock is temporary (good harvest), only the SRAS will shift to the right to point B.
- In **LR**, SRAS will move back to point A.

# Supply Shocks and Aggregate Supply



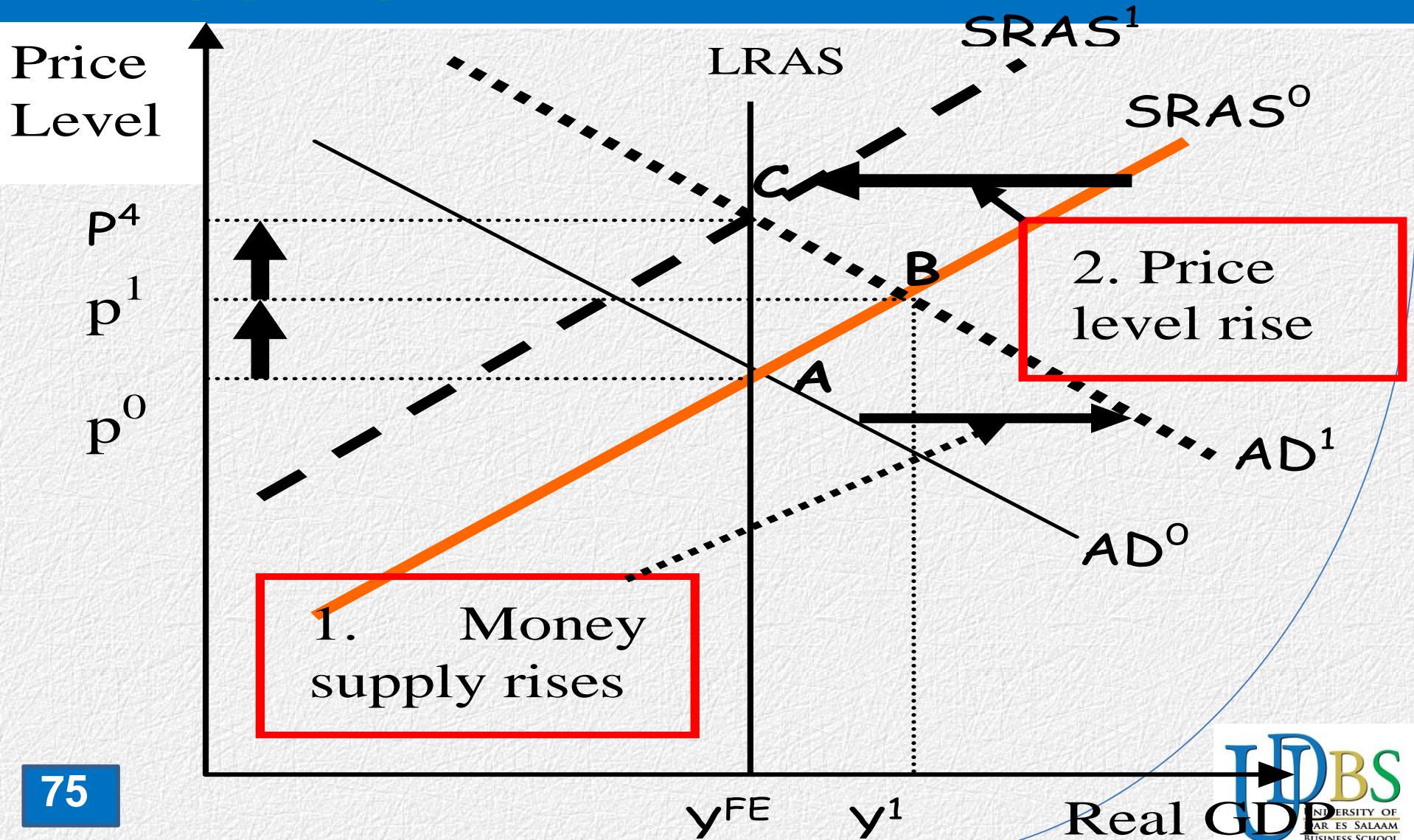
# Supply Shocks and Aggregate Supply

- Unexpected **increase in nominal supply** shifts the AD curve from A to B,  $AD^0$  to  $AD^1$ .
- In **SR**, actual output exceeds full-employment output creating upward pressure on prices from  $P^0$  to  $P^1$ .
- In LR, higher prices will push up **costs of production** (labourer demand higher wages) and SRAS is pushed leftward to intersect  $AD^1$  at C.

# Supply Shocks and Aggregate Supply

- Thus, a one-time increase in money supply causes prices to increase further to  $P^4$ , with no change in  $Y$ .

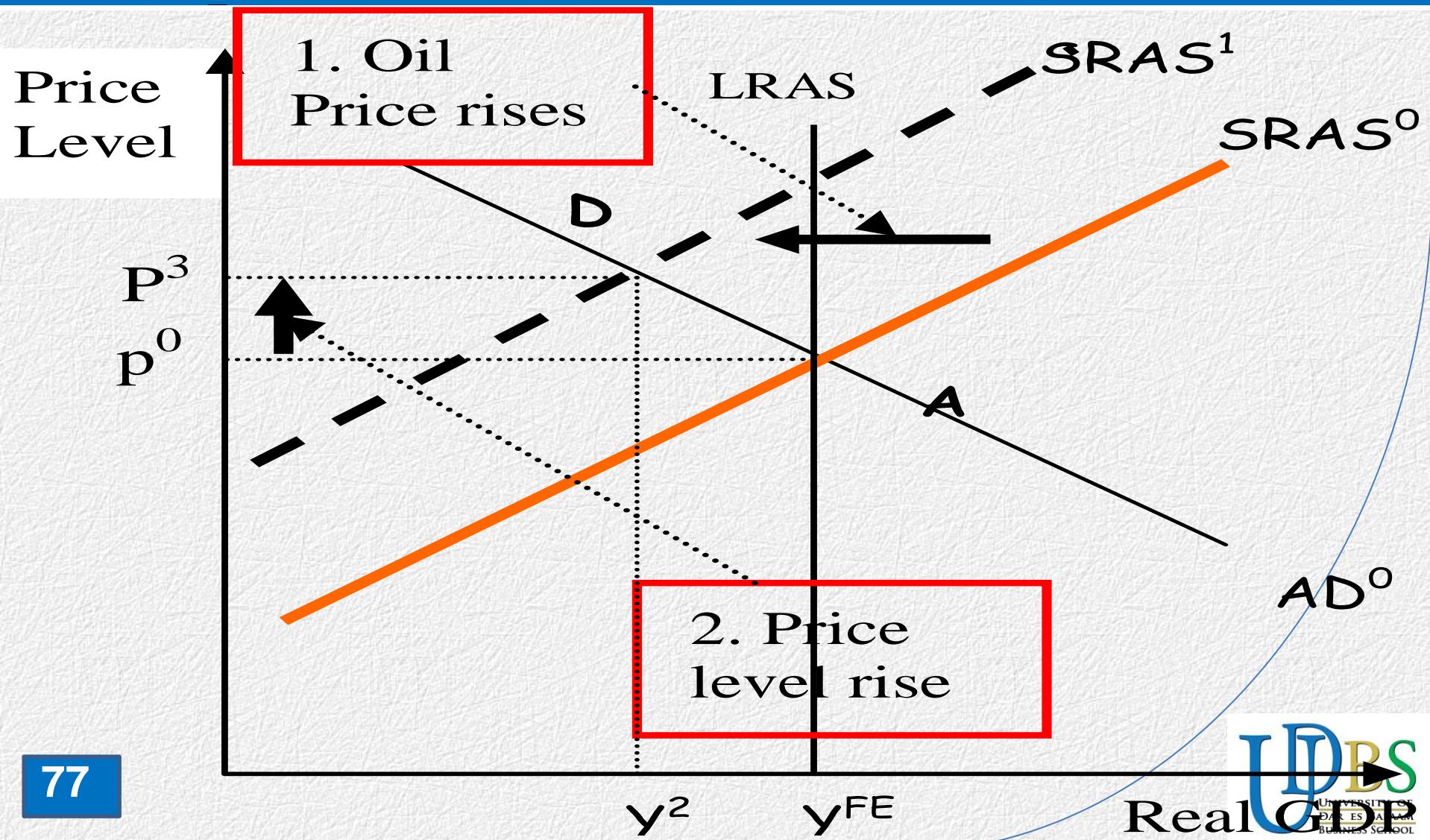
# Supply Shocks and Aggregate Supply



# Supply Shocks and Aggregate Supply

- Let's examine **stagflation** of the 1970s oil price shock.
- Increase in price of oil shifts the SRAS curve leftward.
- Price level rises from  $P^0$  to  $P^3$  causing inflation in SR.

# Supply Shocks and Aggregate Supply



**DEPARTMENT OF FINANCE**  
**University Of Dar Es Salaam**  
**Business School**

**FN 101: Principles of Macroeconomics**

Genuine Martin  
B.Com, M.A. (Economics)

**Lecture 8:**  
**Inflation and**  
**Unemployment**

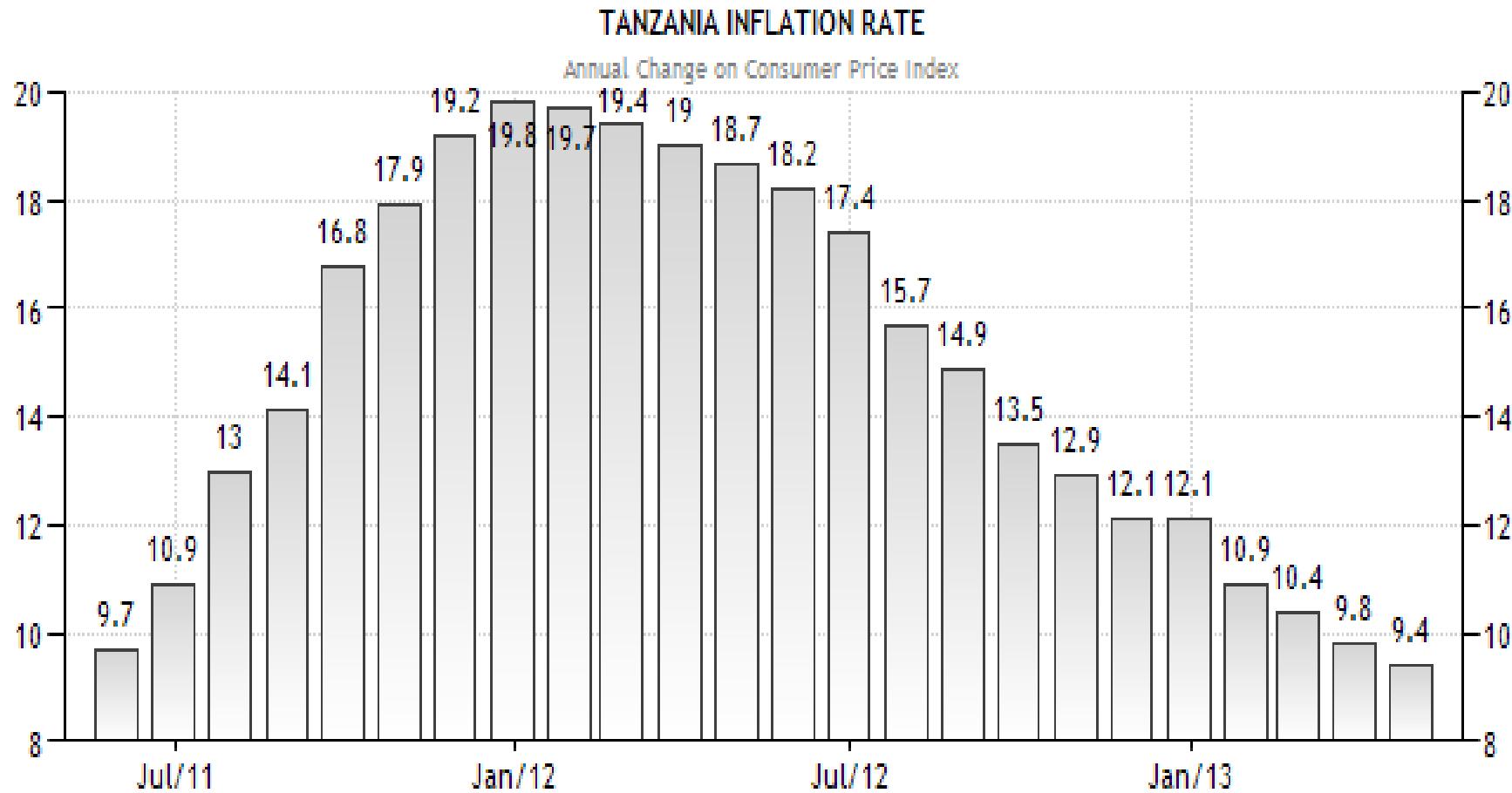
# Meaning of Inflation

- **Inflation** is a rise in **general** level of prices.
- Arises whenever growth rate of **nominal AD** exceeds growth rate of **nominal AS**.
- **Sustained inflation** is a **sustained** rise in **general** level of prices.
- Sustained is different from **one-time** shock.
- **SR** money supply or aggregate supply cannot themselves produce inflation.
- Calculated as percentage rise in price indexes.
- Commonly used indices are **CPI**, **PPI** and **GDP Deflator**.

# Meaning of Inflation

- Inflation is a key **macroeconomic variable**.
- Reflects **cost of living, standard of living, consumer and investor confidence**, and level of **economic activities**.

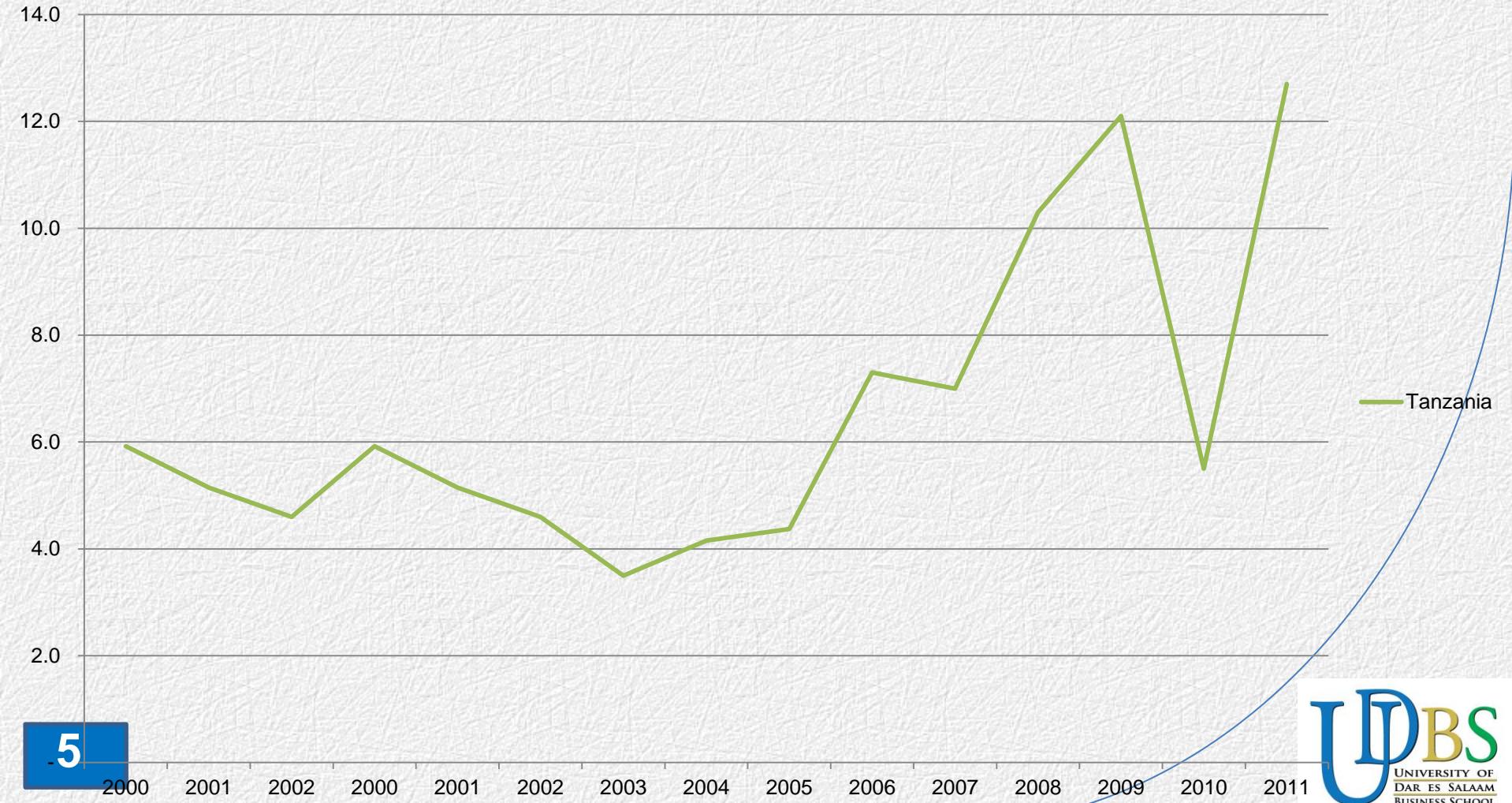
# Meaning of Inflation



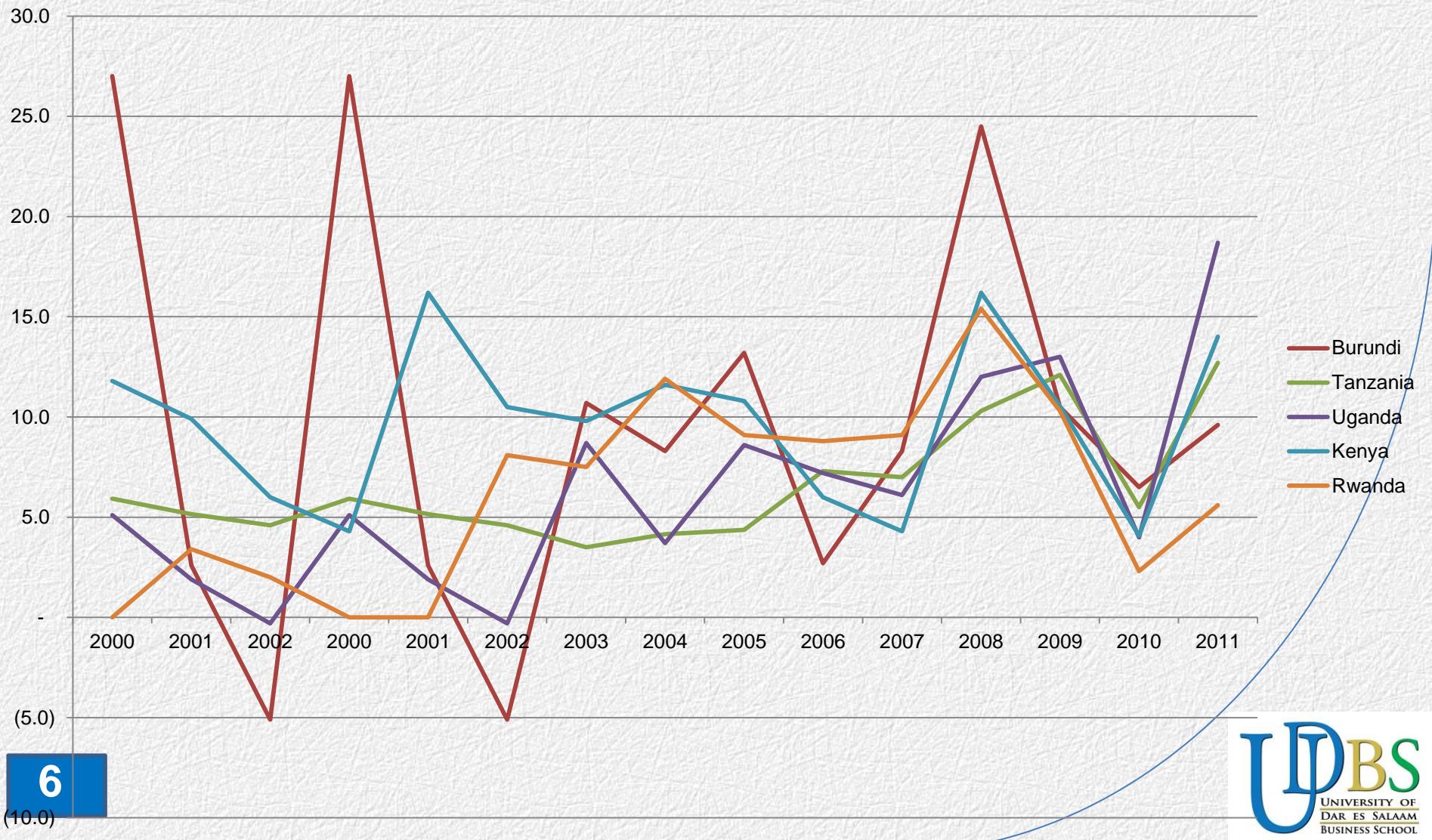
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# Meaning of Inflation

Tanzania



# Meaning of Inflation



# Causes of Inflation

- Three major explanations are put forward.
- Cost-Push, Demand-Pull and Monetary explanations.
- **1) Cost-Push (Supply-Side) Inflation:** results from workers' pressure for **higher wages**, and other increases in **costs of production**, pushing prices up.
- Also **supply shocks**, e.g. weather, floods, drought, strikes, oil shortage, over regulation, etc.

# Causes of Inflation

- **Wage Costs:** increase in wages, pushes up costs of production.
- In response firms increase prices of their products and **sell less**, or **fail to compete** and cut down production.
- **Import Prices:** rise in price of oil, industrial equipments and raw materials escalate **cost of production** and exert same impact as wage costs.
- **Mark-Up Pricing and Profits:** many firms fix prices on unit costs plus profit mark up.

# Causes of Inflation

- Makes inflation more responsive to **supply** than to demand influences.
- In SR, **SRAS shifts leftward**, causing **output to fall** and **price to rise**.
- Policy makers may accommodate decline in output with expansionary **fiscal** or **monetary** policy.
- This increases inflation even further.
- In **LR**, cost-push inflation will disappear.
- However, with expansionary monetary policy,  
in **LR inflation is sustained**.

# Causes of Inflation

Price  
Level

$P^0$   
 $P^1$   
 $P^2$

$SRAS^0$

$y^{FE}$

2. Money Supply Increases

$SRAS^2$

$SRAS^1$

LRAS

C

B

A

$AD^1$

$AD^2$

1. Wages demands shifts SRAS

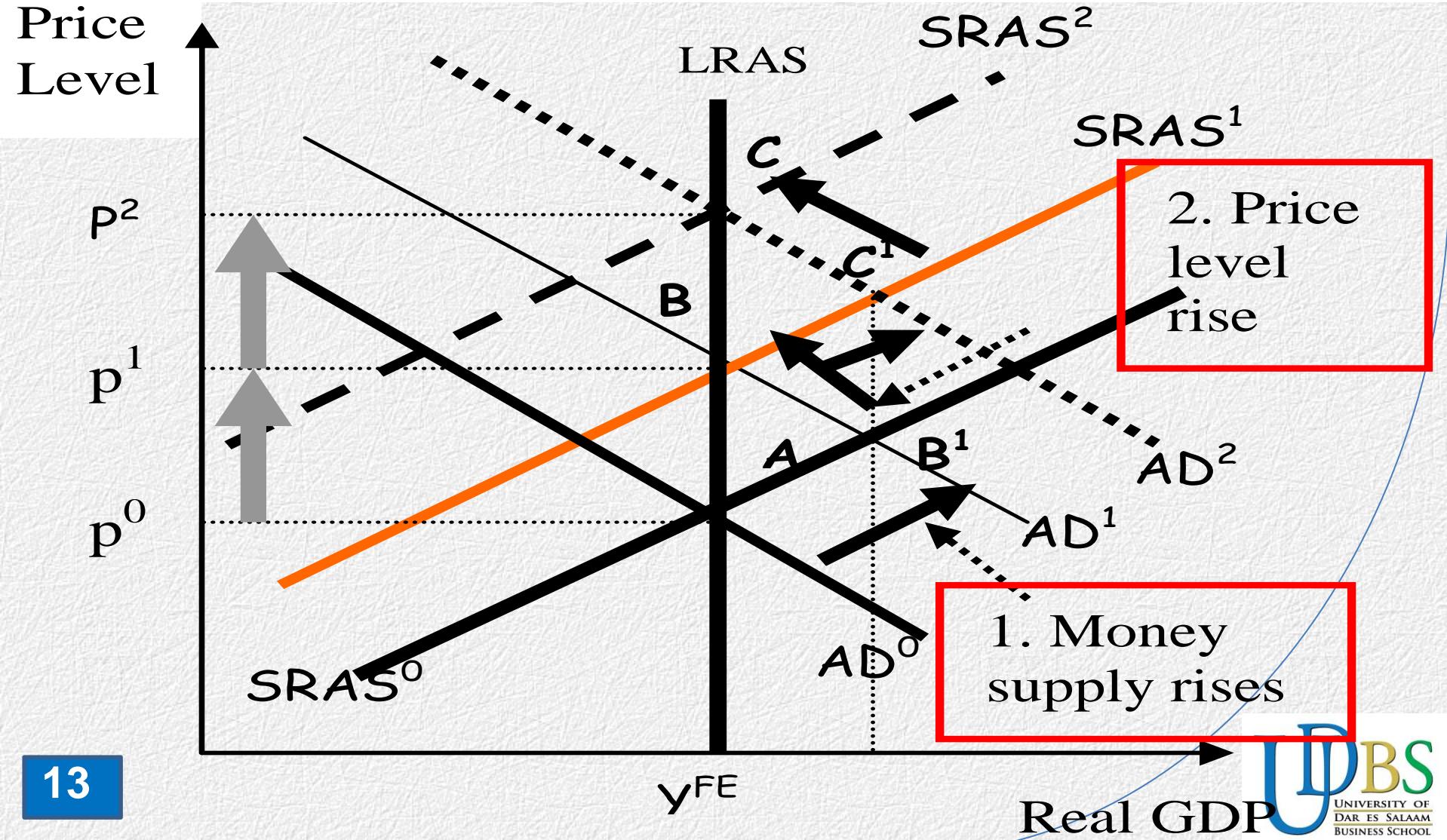
# Causes of Inflation

- **2) Demand-Pull Inflation:** AD exceeds value of output.
- All **demand determinants** contribute to demand-pull inflation.
- Results from attempt to use expansionary **macroeconomic policy** to increase output beyond full employment level.
- Lowers unemployment below the **natural rate**.
- As illustration shows, when expansionary monetary policy shifts AD curve rightward, output is temporarily above full-employment level.

# Causes of Inflation

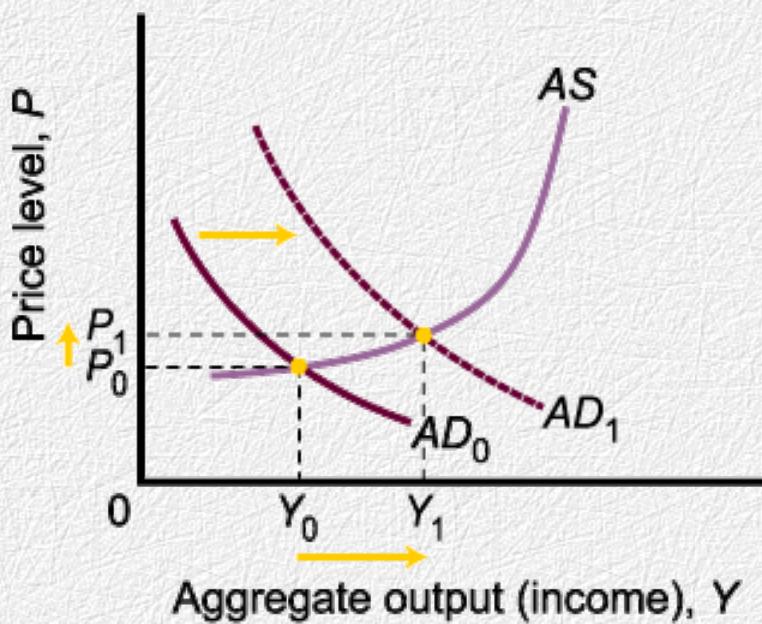
- Higher expected price level shifts SRAS up, in LR, only price level rises.
- The longer policy makers attempt to increase output beyond FE, the greater the **cumulative inflation**.

# Causes of Inflation

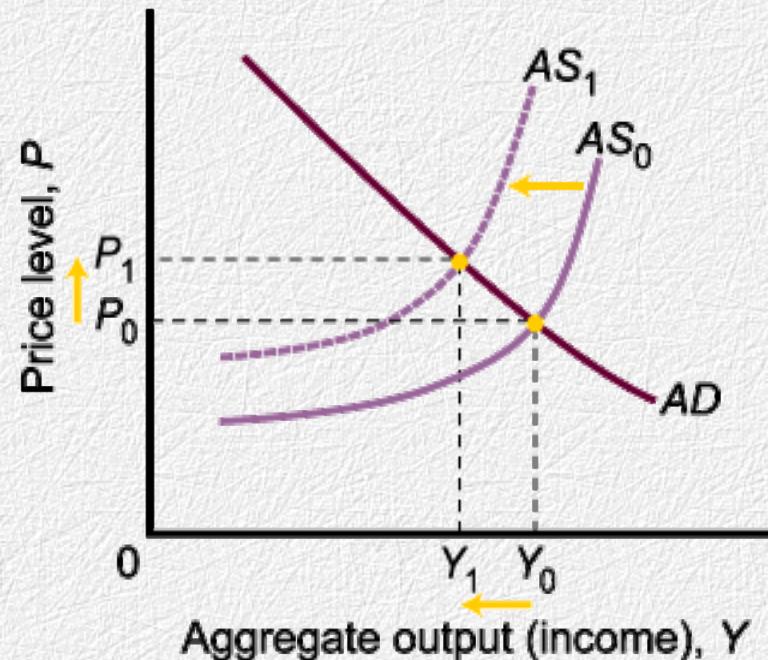


# Causes of Inflation

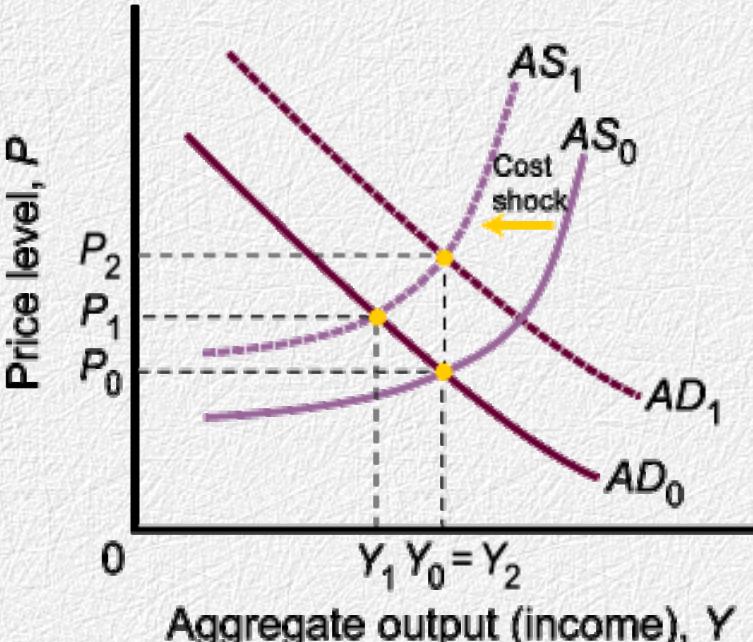
- **Demand-pull inflation** is inflation initiated by an increase in aggregate demand.



- **Cost-push, or supply-side, inflation** is inflation caused by an increase in costs.



# Cost-Push, or Supply-Side Inflation

- Cost-push inflation is one possible cause of **stagflation**—a situation in which output is falling at the same time that prices are rising.
    - **Cost shocks** are bad news for policy makers. The only way to counter the output loss is by having the price level increase even more than it would without the policy action.
- 

# Causes of Inflation

- 3) Monetary Inflation: “*Inflation is always and anywhere a monetary phenomenon in the sense that it can only be produced by a more rapid increase in the quantity of money than in output*” – Friedman, 1970.
- Based on equation of exchange:  $M \times V \equiv P \times T$
- Assuming V and T are constant, there is direct relationship btn money supply (M) and general price level (P).

# Causes of Inflation

- More money increases purchasing power (**wealth**) leading to more **consumption** and **demand**, and finally on **prices**.
- Money works as **demand-pull inflation**.
- Empirical evidence is rich.

# The Quantity Theory of Money

$$M \times \bar{V} = P \times Y$$

- The **quantity equation in growth rates:**

$$\frac{\Delta M}{M} + \frac{\Delta V}{V} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y}$$



The quantity theory of money assumes

$V$  is constant, so  $\frac{\Delta V}{V} = 0$ .

# The Quantity Theory of Money

Let  $\pi$  (Greek letter “pi”) denote the inflation rate:

$$\pi = \frac{\Delta P}{P}$$

The result from the preceding slide was:

$$\frac{\Delta M}{M} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y}$$

Solve this result for  $\pi$  to get

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

# The Quantity Theory of Money

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

- Normal economic growth requires a certain amount of money supply growth to facilitate the growth in **transactions**.
- Money growth in excess of this amount leads to inflation.

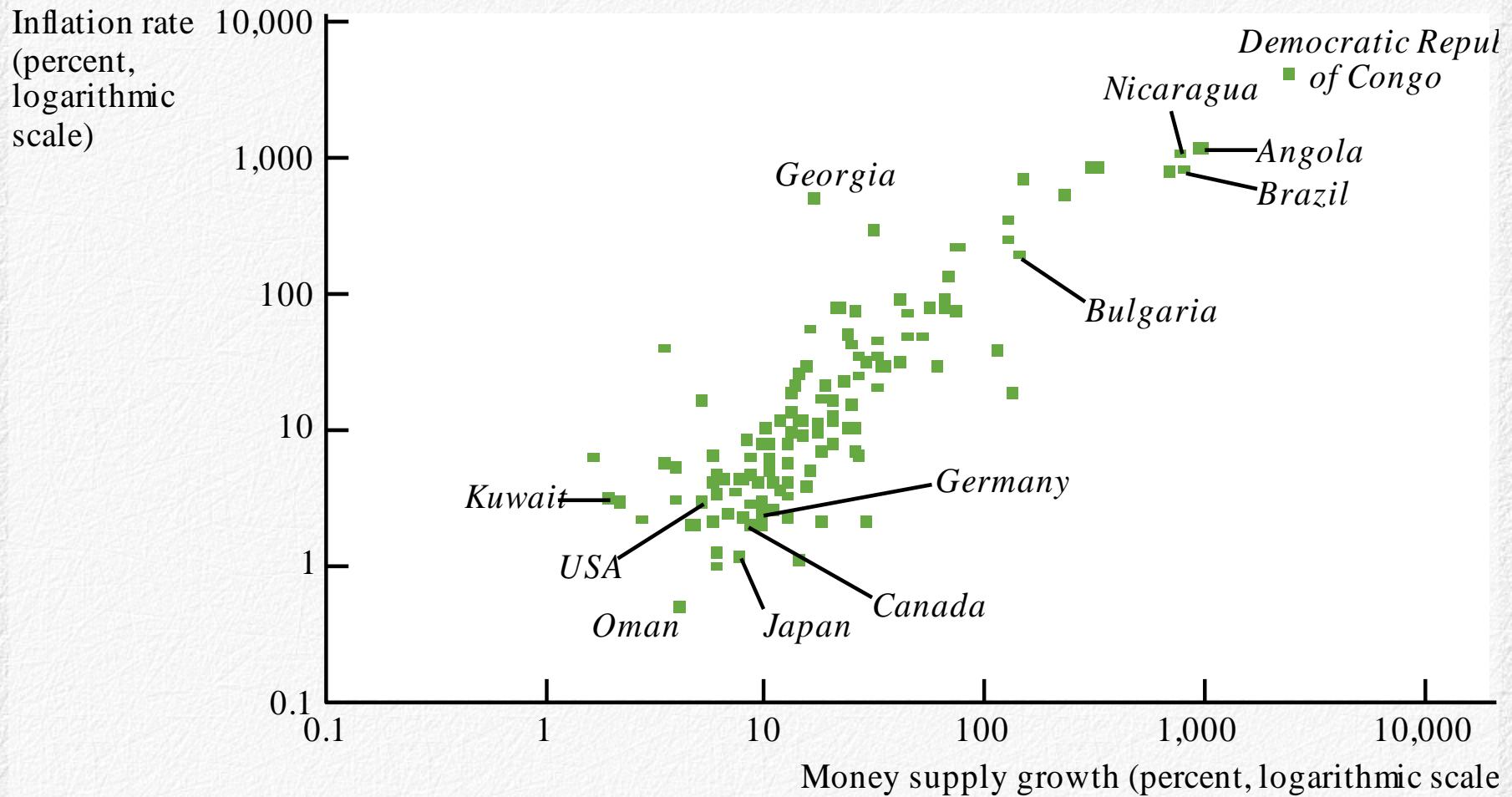
# The Quantity Theory of Money

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

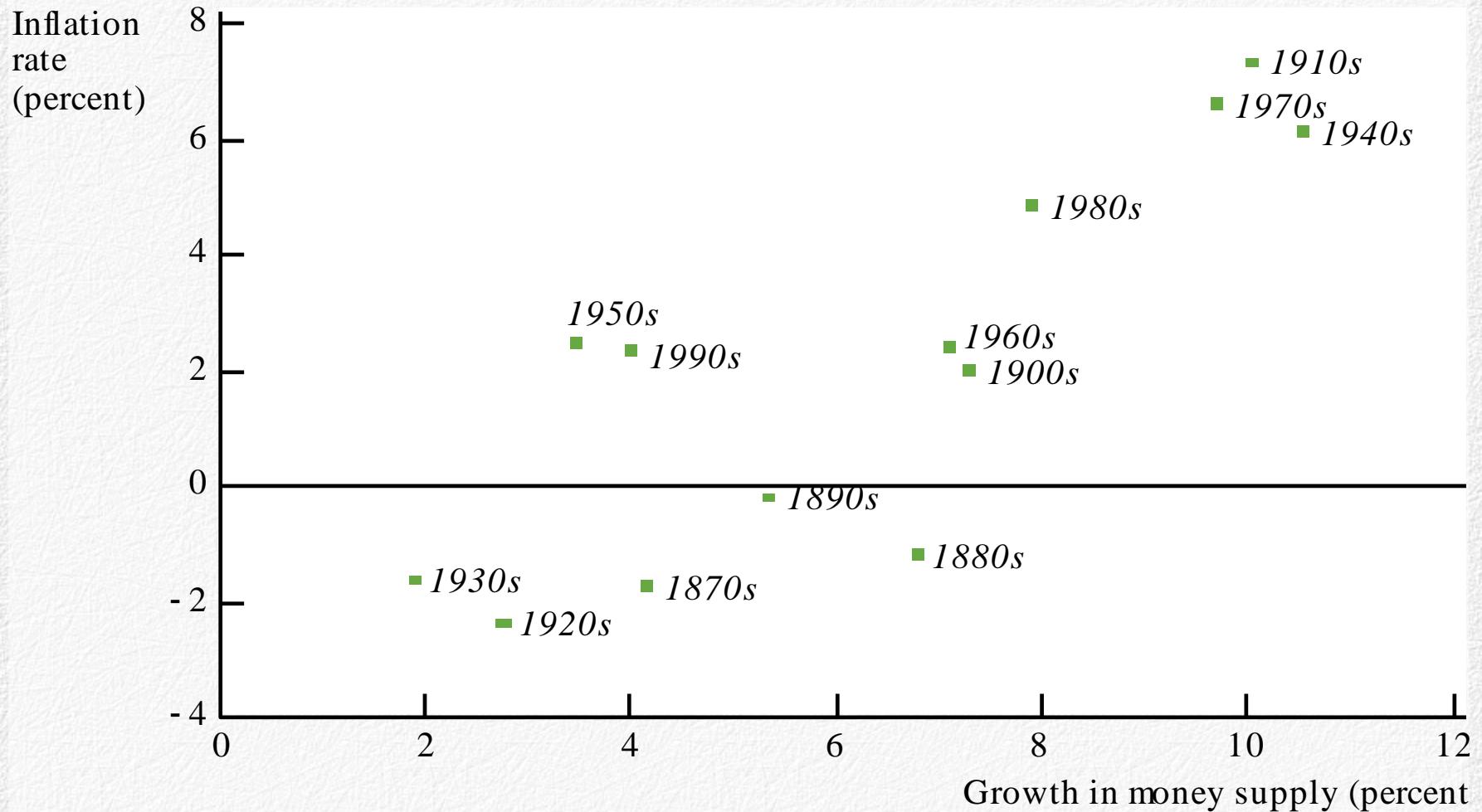
$\Delta Y/Y$  depends on growth in the factors of production and on technological progress

*Hence, the Quantity Theory of Money predicts a one-for-one relation between changes in the money growth rate and changes in the inflation rate.*

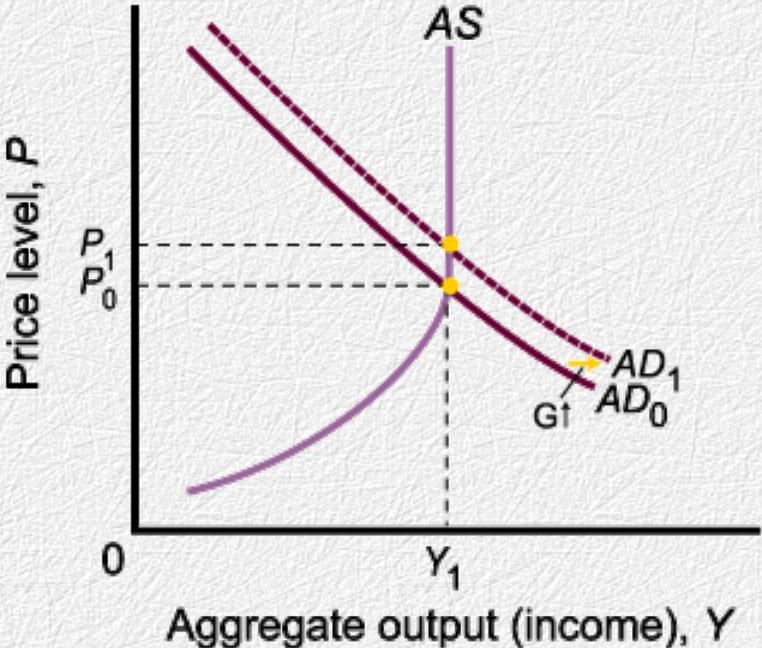
# International Data on Inflation and Money Growth



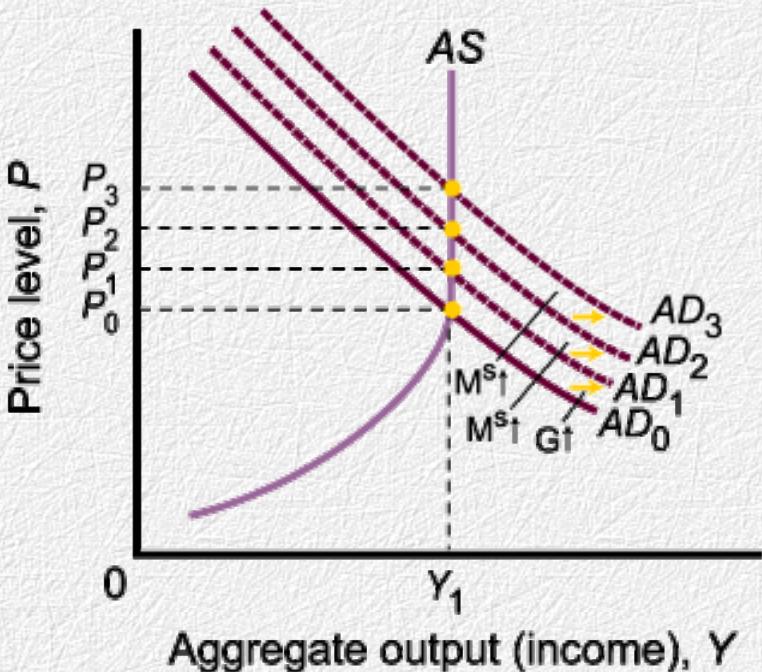
# U.S. Data on Inflation and Money Growth



# Money and Inflation

- **Hyperinflation** is a period of very rapid increases in the price level.
    - An increase in  $G$  with the money supply constant shifts the  $AD$  curve from  $AD_0$  to  $AD_1$ . This leads to an increase in the interest rate and **crowding out** of planned investment.
- 

# Money and Inflation



- If the BOT tries to prevent crowding out by keeping the interest rate unchanged, it will increase the money supply and the  $AD$  curve will shift farther and farther to the right. The result is a **sustained inflation**, perhaps **hyperinflation**.

# Causes of Inflation

- Read a Paper below, its very useful to show what drives inflation in Tanzania:
- **Laryea S.A. And Sumaila, U.R. (2001),**  
*“Determinants of Inflation in Tanzania”*,  
Development Studies and Human Rights, WP  
2001:12.
- **In Summary, the Paper found out:**
- In SR, **output** and **monetary factors** are the main determinants.
- In LR, in addition to **output** and **money**,  
**parallel exchange** rate plays a key role.

# Causes of Inflation

- **Imports** drive **exchange rate** and thus **inflation**.
- Evidence shows that inflation is engineered more by monetary than real factors both in SR and LR.
- Inflation is largely a **monetary phenomenon**.
- To control inflation, contractionary monetary and fiscal policies are very instrumental.
- Also the government can reduce inflation by increasing **output (food)** accounts for about **65%** of weight used in CPI).

# Central Bank Credibility and Price Controls

- Central bank core objective is **price stability**.
- Need **credibility** and **independence** to execute measures.
- A **tough central banker** increases public willingness to believe anti-inflationary statements.
- Adoption of **rules** vis-a-vis **discretionary** strategy.
- Another government tool is **price controls** (**price ceilings**) to bar rise in prices.

# Central Bank Credibility and Price Controls

- However, **shortages** and **long lines**, as well as **black markets** develop.
- Inflation stays underground but will burst when controls are lifted.

# Measuring Inflation

- **CPI** is most widely used measure of inflation.
- Measures cost of buying **standard basket** of goods at different times.
- It is a **welfare indicator**, shows effect of prices on purchasing power.
- Quantities in the basket are held **constant**.
- The basket comprises of products (prices & quantity) consumed by a **typical urban dweller**.
- Each price of a commodity is **weighted** based on **importance** of that good/item in the basket.

# Measuring Inflation

- Inflation rate is then the percentage change in the level of CPI across time.

$$CPI_t = \frac{\sum_{i=1}^N P_{i,t} Q_{i,b}}{\sum_{i=1}^N P_{i,b} Q_{i,b}} \times 100$$

- Where: i = a good produced in economy, b = base date, t = specific point in time.
- Assume economy has one million households, and each consumes equal proportion of GDP.
- 2008 is the base year (same quantity).

# Measuring Inflation

- Table illustrates computation of inflation rates.

| Good<br>(Service) | Year | A  | B  | C  | D  | TOTAL<br>(PxQ) | CPI   | Inflati<br>on<br>Rate |
|-------------------|------|----|----|----|----|----------------|-------|-----------------------|
| Q (units)         | 2008 | 12 | 38 | 59 | 41 |                |       |                       |
| P ('000 Tshs)     | 2008 | 17 | 40 | 11 | 25 | 3,398,000      | 100.0 |                       |
|                   | 2009 | 21 | 39 | 13 | 30 | 3,731,000      | 109.8 | 9.8%                  |
|                   | 2010 | 19 | 38 | 12 | 25 | 3,405,000      | 100.2 | -8.7%                 |

# CPI base in 2007 (Weights)

| S/N | Major Group                                | Weight (%) |
|-----|--|------------|
| 1   | Food and Non Alcoholic Beverages           | 47.8       |
| 2   | Alcoholic, Tobacco and Narcotics           | 3.3        |
| 3   | Clothing and Footwear                      | 6.7        |
|     | Housing, Water, Electricity, Gas and Other |            |
| 4   | Fuel                                       | 9.2        |
|     | Furnishing, Housing Equipment and Routine  |            |
| 5   | Maintenance of the House                   | 6.7        |
| 6   | Health                                     | 0.9        |
| 7   | Transport                                  | 9.5        |
| 8   | Communication                              | 2.1        |
| 9   | Recreation and Culture                     | 1.3        |
| 10  | Education                                  | 1.7        |

# CPI base in 2007 (Weights)

| S/N | Major Group                      | Weight (%)   |
|-----|----------------------------------|--------------|
| 11  | Restaurants and hotels           | 6.4          |
| 12  | Miscellaneous goods and services | 4.5          |
|     | <b>TOTAL</b>                     | <b>100.0</b> |

# CPI base in Oct-2010

| Month     | Oct-10 | Nov-10 | Dec-10 | Jan-11 | Feb-11 | Mar-11 | Apr-11 |
|-----------|--------|--------|--------|--------|--------|--------|--------|
| CPI       | 99.90  | 100.20 | 101.70 | 104.10 | 106.41 | 107.93 | 109.09 |
| Inflation | 4.2    | 5.5    | 5.6    | 6.4    | 7.5    | 8.0    | 8.6    |
| Month     | May-11 | Jun-11 | Jul-11 | Aug-11 | Sep-11 | Oct-11 | Nov-11 |
| CPI       | 109.88 | 110.79 | 112.51 | 114.08 | 116.80 | 117.80 | 119.41 |
| Inflation | 9.7    | 10.9   | 13.0   | 14.1   | 16.8   | 17.9   | 19.2   |
| Month     | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 |
| CPI       | 121.79 | 124.64 | 127.05 | 128.39 | 129.45 | 129.92 | 130.06 |
| Inflation | 19.8   | 19.7   | 19.4   | 19.0   | 18.7   | 18.2   | 17.4   |
| Month     | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 | Dec-12 | Jan-13 |
| CPI       | 130.19 | 131.09 | 132.58 | 132.98 | 133.87 | 136.48 | 138.26 |
| Inflation | 15.7   | 14.9   | 13.5   | 12.9   | 12.1   | 12.1   | 10.9   |

# CPI base in Oct-2010

| Month     | Feb-13 | Mar-13 | Apr-13 |
|-----------|--------|--------|--------|
| CPI       | 140.23 | 140.93 | 141.59 |
| Inflation | 10.4   | 9.8    | 9.4    |

# Measuring Inflation

- However, CPI may fail to indicate **true cost of living** due to:
- **1) Errors in data collection and estimation:** wrong sample of goods, sampling techniques, collection of prices, computation, etc.
- **2) Quality Bias:** some price increase may result from **quality** and **variety** rather than inflation.
- CPI **overstates** true extent of inflation.
- **3) Substitution Bias:** same kind and amount of goods are held in typical basket.

# Measuring Inflation

- Since prices increase differently, typical family responds by **switching to cheaper products**.
- CPI **overstates** true extent of inflation.
- **4) New Goods Bias:** new goods provide **variety** and **choice**, including **less costly** alternatives.
- This cost saving is not reflected in CPI.
- **GDP Deflator:** another widely used index.
- Price of **all goods and services** produced in a country.

# Measuring Inflation

- **Variable weight (chain)** to reflect changes in expenditure shares.
- **Producer Price Index (PPI):** level of prices at wholesale or producer stage.
- Based on foods, manufactured and mining products.
- **Fixed weights** are used to calculate PPI.
- Widely used by **businesses**.

# GDP Deflator versus CPI

- CPI uses **fixed basket (base year)** i.e. **Laspeyres index**, while GDP deflator uses **changing quantities (current year)** i.e. **Paasche index**.
- CPI focuses on goods and services bought by a **typical consumer**, while GDP deflator focuses on goods produced in **whole economy**.
- CPI includes all goods consumed irrespective of where produced, while GDP deflator include goods produced only **within economy**.

# GDP Deflator versus CPI

- CPI biases **overstate** true extent of inflation, while GDP deflator is a **more comprehensive price index** of all goods and services.

# Types of Inflation

- Based on different levels of **severity**.
- **1) Low Inflation:** prices rise **slowly** and **predictably**.
- **Single-digit** annual inflation rates.
- With stable prices, people trust money, and are willing to write long-term contracts.
- **2) Galloping Inflation:** inflation in **double** or **triple** digits, i.e. 20%, 100% or 200% a year.
- Once entrenched, serious economic distortions arise.

# Types of Inflation

- Contracts are **indexed** to price index or foreign currency.
- Money loses value **very quickly**, financial markets wither away, and people **hoard goods**, buy houses, and never lend money at low nominal interest rates.
- **3) Hyperinflation:** economies can survive under galloping inflation, but hyperinflation is a **deadly cancer**.
- Prices rise a million or even a billion percent per year.

# Types of Inflation

- Real money stock ( $M/P$ ) falls drastically, and relative prices (prices versus wages) are highly unstable.

# Effects of Inflation

- Depend whether it is **anticipated** or not.
- If **anticipated** and at **low rates**: little effect on economic efficiency and distribution of income and wealth.
- People simply **adapt behaviours**.
- In reality, inflation is usually **unanticipated**.
- Since prices and wages (**relative prices**) don't move together, two definite effects are **redistribution of income**, and **distortion of relative prices**.

# Costs of Expected Inflation

- **1) Shoe-Leather Costs:** rises in prices erodes value of cash, forcing people to make **frequent withdrawals** from banks.
- **2) Tax Bracket Creep:** if tax brackets are not indexed for inflation, with rising inflation, individuals might have higher **nominal incomes** leading to higher tax payments while **real incomes** are unchanged or falling.
- **3) Menu Costs:** with inflation, firms keep changing prices, incurring costs of printing **new catalogues**, and **price lists**.

# Costs of Expected Inflation

- **4) Effect on Fixed Income Earners:** if inflation is higher than increases in nominal wages, **purchasing power falls**.
- More serious for retirees surviving on fixed nominal interest income.

# Costs of Unexpected Inflation

- Unexpected inflation is more serious.
- **1) Redistribution of Wealth:** if wages and prices of financial assets are fixed in nominal terms, unexpected inflation redistributes wealth.
- E.g. borrowers gain at expense of lenders.
- **2) Noise in Price System:** inflation distorts prices and **price signals**.
- Much harder to distinguish between relative prices and overall price.
- Prices should be determined by demand and supply.

# Costs of Unexpected Inflation

- Inflation exerts pressure on prices apart from demand and supply.
- **3) Inflation can Increase Efficiency:** relative prices determine **resource allocation**.
- Economic agents shift to **less costly products**, e.g. in 1970s when oil prices rose drastically, firms switched to nuclear sources.
- **Lowest cost** means of production **increases efficiency**.
- However, if inflation is high and unpredictable, efficiency benefits are lost.

# Costs of Unexpected Inflation

- **4) Interference with Long-Run Planning:** with unpredictable trends of prices, it is difficult to make long-run decisions (retirement, investment and business strategy).
- **5) Hyperinflation:** extreme case of uncertain inflation bse of **continuous** and **sustained** increase in aggregate demand.
- Rate of inflation is hundreds or thousands or more percentage points per year for significant period of time.

# Costs of Unexpected Inflation

- Occurs when central bank **continually prints excessive money** (often for government spending).
- It completely distorts use of money forcing people to hold wealth in **real assets**.

# Meaning of Unemployment

- **Labour Force:** all persons over age 16 working for a pay or actively seeking paid employment.
- **Unemployment Rate:** proportion of labour force (employed and unemployed) that are unemployed but are actively looking for a job or waiting to return to work.
- Unemployed must report **specific efforts** to find a job.

# Meaning of Unemployment

- **Employed:** people performing any paid work, as well as **absentees** due to illness, strikes, and vacations.
- **Out of Labour Force:** adults at home, retirees, ill to work, children, or simply those who gave up looking for work.

# Measuring Unemployment

- **Unemployment Rate:** number of unemployed divided by total labour force.

$$\text{Unemployment Rate} = \frac{\text{Unemployed}}{\text{Labour Force}} = \frac{\text{Unemployed}}{\text{Employed} + \text{Unemployed}}$$

- The **potential output** of any economy depends on size of civilian **adult population** and the proportion of adults in labour force (**labour force participation rate**).
- Participation rates vary across **age groups** and **gender**.

# Measuring Unemployment

$$\text{Participation Rate} = \frac{\text{Labour Force}}{\text{Civilian Adult Population}}$$

# Defining and Measuring Unemployment

$$\text{labor force} = \text{employed} + \text{unemployed}$$

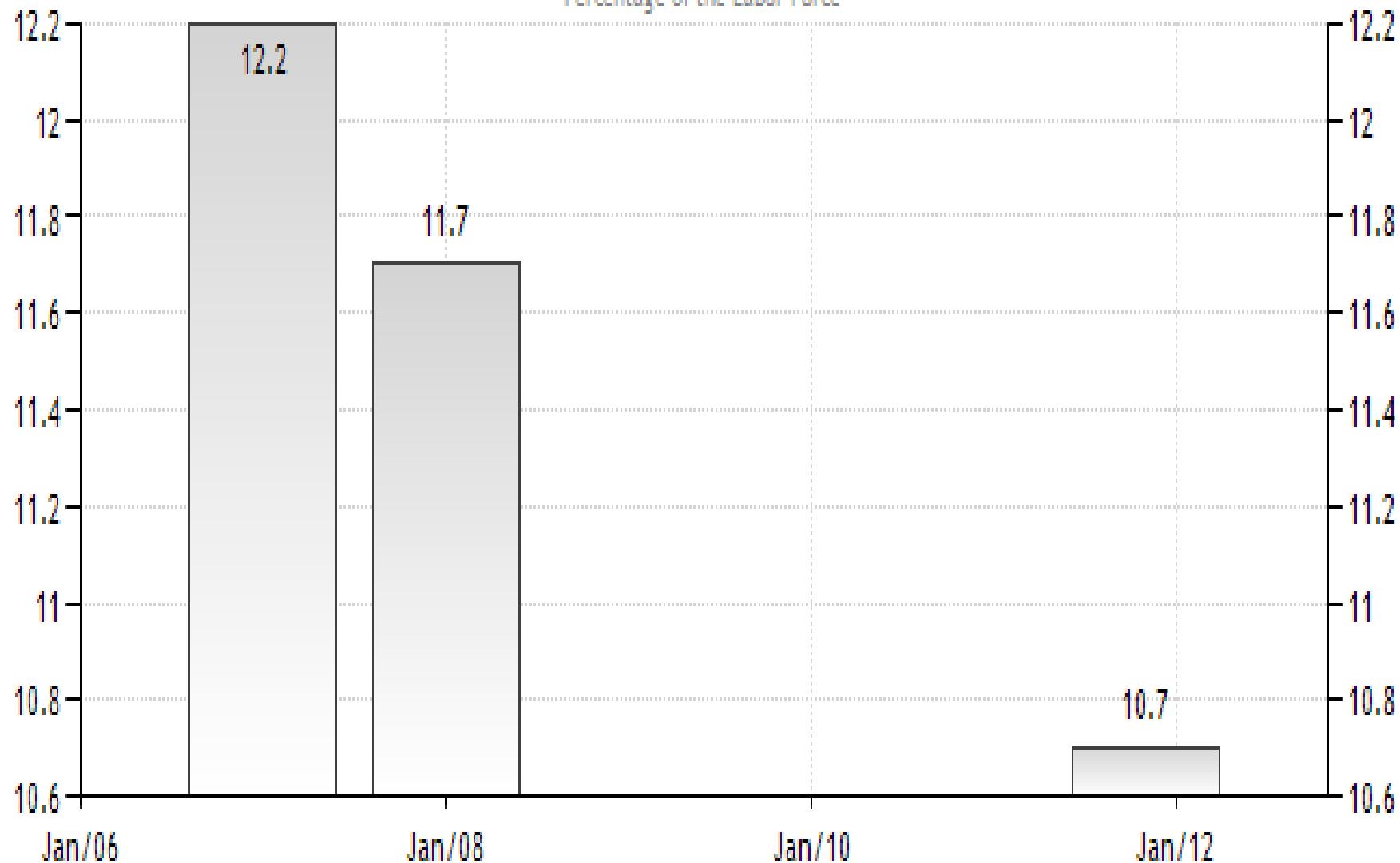
$$\text{population} = \text{labor force} + \text{not in labor force}$$

$$\text{unemployment rate} = \frac{\text{unemployed}}{\text{employed} + \text{unemployed}}$$

$$\text{labor force participation rate} = \frac{\text{labor force}}{\text{population}}$$

## TANZANIA UNEMPLOYMENT RATE

Percentage of the Labor Force



SOURCE: [WWW.TRADINGECONOMICS.COM](http://WWW.TRADINGECONOMICS.COM) | NATIONAL BUREAU OF STATISTICS

# Unemployment Rate in TZ (NBS)

- 2006 ILS shows:
- **Unemployed:** 2,194,392 (**11.7%**).
- **Labour Force:** 18,821,525.
- For 2011 ILS:
- **Unemployed:** 2,368,672 (**10.7%**).
- **Labour Force:** 22,152,320.

# Discouraged-Worker Effects

- The *discouraged-worker effect* **lowers** the unemployment rate.
- Discouraged workers are people who want to work but cannot find jobs, grow discouraged, and stop looking for work, thus **dropping out of the ranks of the unemployed and the labor force**.

# Types of Unemployment

- Three kinds are identified.
- Helps diagnose health of labour markets.
- **Full** employment same as **zero** unemployment?
- **Frictional** and **structural** unemployment occur even though labour market is in balance.
- **1) Frictional (Voluntary) Unemployment:** arises out of incessant movement of people btn regions & jobs, thru life cycle stages, searching for better jobs.
- Evident even when economy is at full employment.

# Frictional Unemployment

- Brief periods of unemployment when people **move between** jobs, or into labour market.
- **Causes:**
- 1. Time to **match** job seekers and required skills.
- 2. **Imperfect information** between employers and job seekers.
- Is it bad?

61 Not really!

# Frictional Unemployment

- It is **short lived** and results to a **better match-up** of skills to jobs.
- How is it **different from other forms?**
- 1. Adequate demand exists in job market.
- 2. Frictionally unemployed have required skills.

# Types of Unemployment

- **2) Structural Unemployment:** mismatch b/w supply and demand for labour, across occupations, regions & sectors.
- Arises when certain **sectors** grow and others decline due to changes in structure of economy.

# Structural Unemployment

- Results from **mismatch** of **skills** (location) of job seekers and **requirements** (location) of available jobs due to **changing structure** of an economy.
- **Example:**
- 1. Changing pattern of **consumers demand**.
- 2. New-labour saving **technology** (ATMs).
- 3. Intersectoral shifts (agriculture-manufacturing-services).

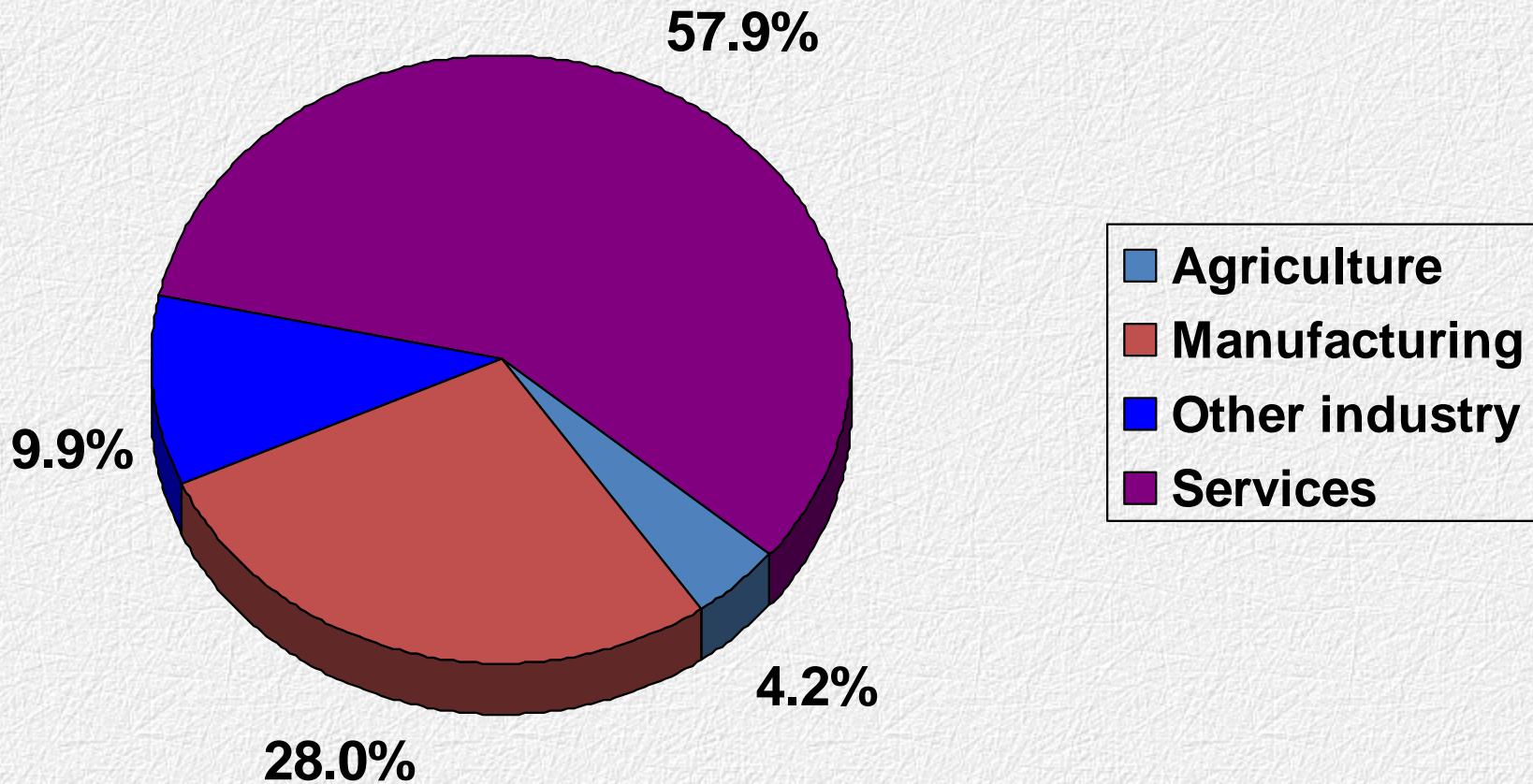
# Structural Unemployment

- Unemployment period lengthens when skills required lack.
- **Is this form of unemployment serious???**
- Costs are greater – hard to **re-train** or **re-skill** people to new job types.

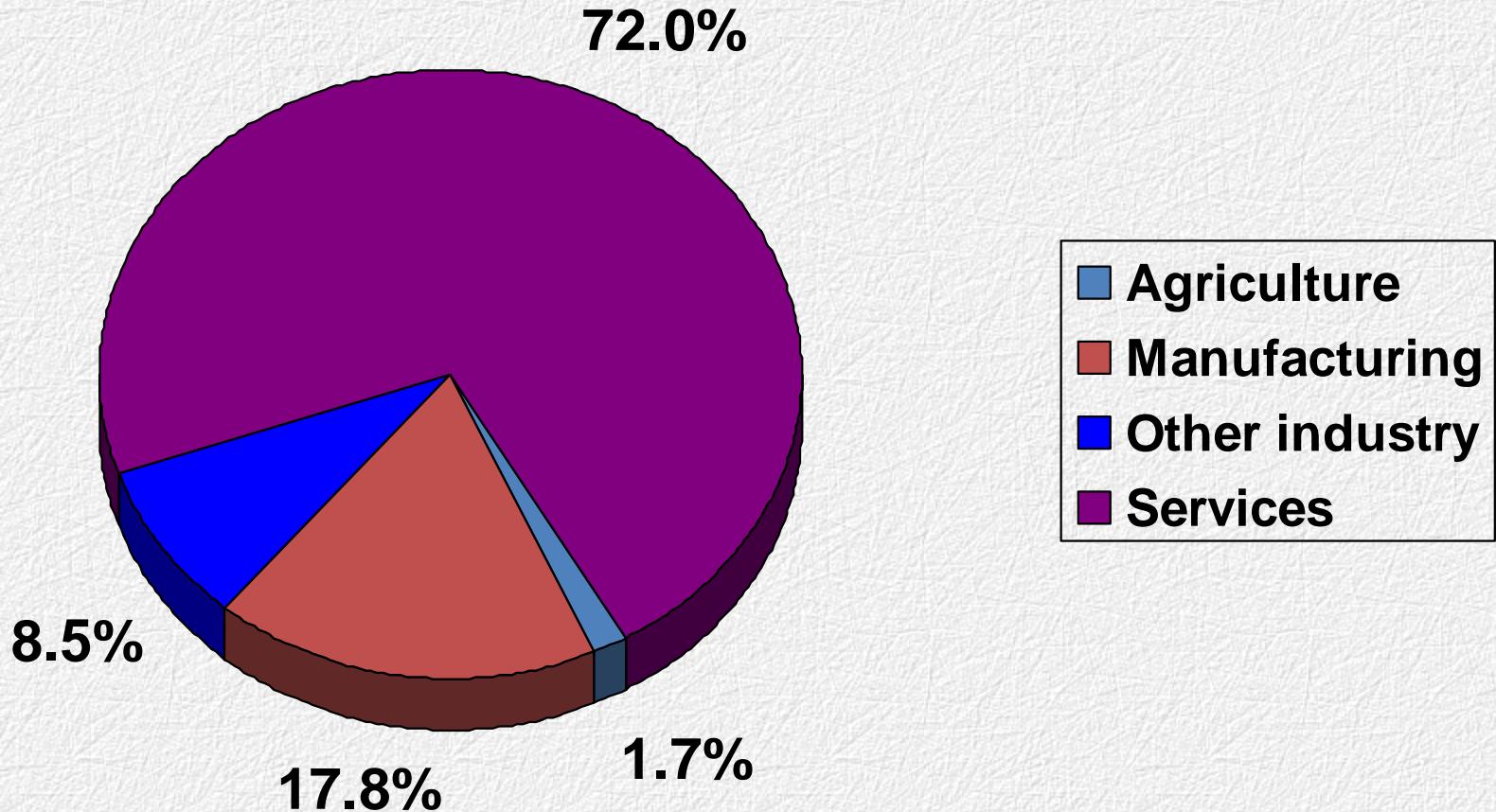
# **Sectoral Shifts**

- **Sectoral shifts** - changes in the composition of demand among industries or regions. **Examples:**
- Technological change increases demand for computer repair persons, decreases demand for typewriter repair persons.
- A new international trade agreement causes greater demand for workers in the export sectors and less demand for workers in import-competing sectors.
- It takes time for workers to change sectors, so sectoral shifts cause **structural** unemployment.

# Industry Shares in U.S. GDP, 1960



# Industry Shares in U.S. GDP, 1997



# Examples of Sectoral Shifts

- **Late 1800s:** decline of agriculture, increase in manufacturing.
- **Late 1900s:** relative decline of manufacturing, increase in service sector
- 1970s energy crisis caused a shift in demand away from huge gas guzzlers toward smaller cars.
- In our dynamic economy, smaller (though still significant) sectoral shifts occur frequently, contributing to **frictional unemployment**.

# Types of Unemployment

- **3) Cyclical Unemployment:** overall demand for labour is low due to decline in **total spending** and output (**Okun's Law**).
- Occurs during **recession** when **demand < supply**.

# Real GDP and Unemployment Rates, 1929-1933

## Real GDP and Unemployment Rates, 1929–1933

### THE EARLY PART OF THE GREAT DEPRESSION, 1929–1933

| PERCENTAGE<br>CHANGE<br>IN REAL<br>GDP | UNEMPLOYMENT<br>RATE | NUMBER OF<br>UNEMPLOYED<br>(MILLIONS) |
|--|----------------------|---------------------------------------|
| 1929                                   | 3.2                  | 1.5                                   |
| 1930                                   | 8.9                  | 4.3                                   |
| 1931                                   | 16.3                 | 8.0                                   |
| 1932                                   | 24.1                 | 12.1                                  |
| 1933                                   | 25.2                 | 12.8                                  |

Note: Percentage fall in real GDP between 1929 and 1933 was 26.6 percent.

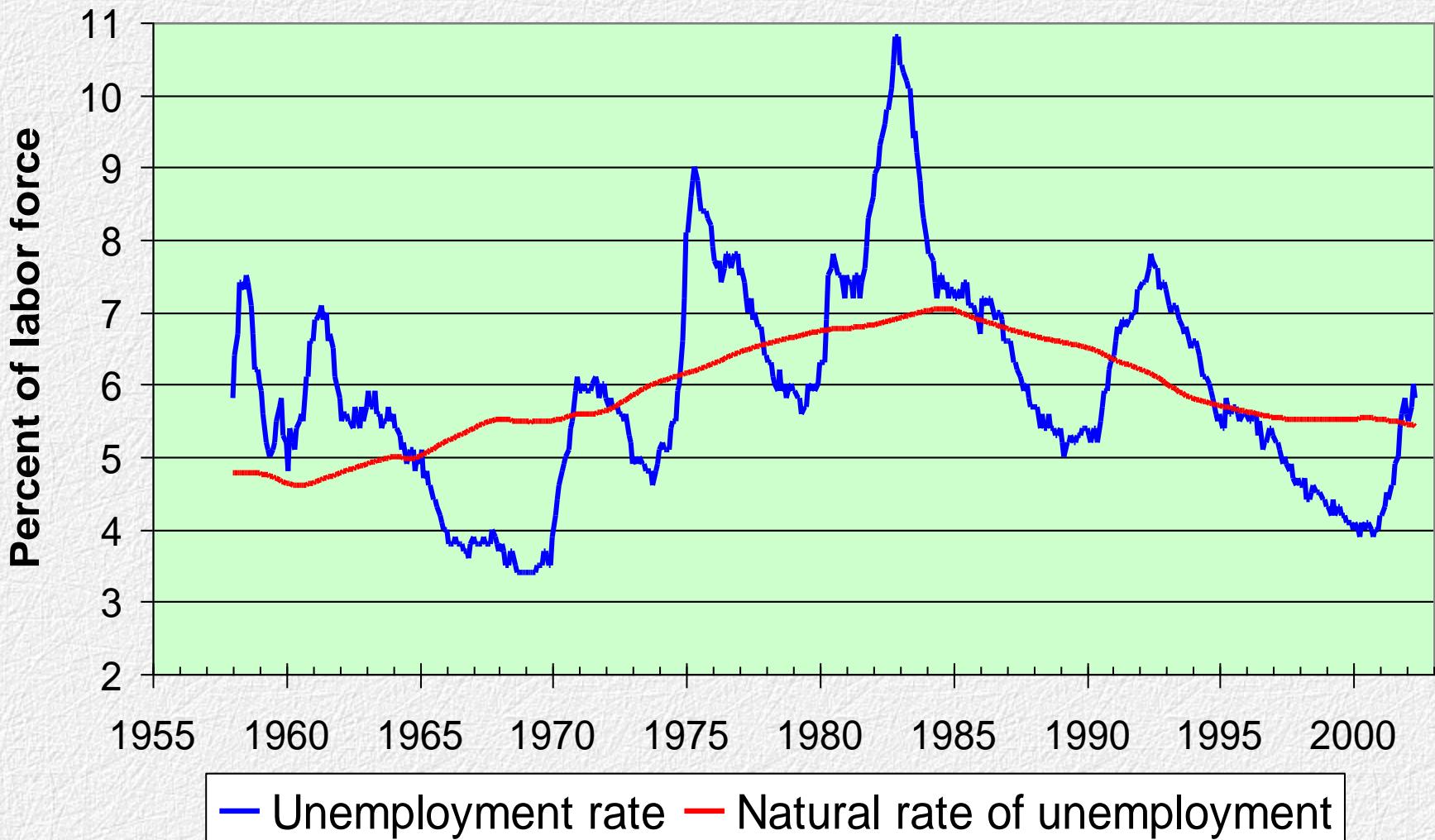
# Full Employment Goal

- Change in **structural forces** lead to change in level of **natural unemployment**.
- **Full employment** is goal of most governments.
- It means avoiding as much **cyclical** and **structural** unemployment as possible, while keeping **frictional unemployment** reasonably low.
- Acts should specify what the **rate of natural employment** should be.
- In 1960s, the **Council of Economic Advisors** placed full employment at **4%** below which prices begin to rise.

# Natural Rate of Unemployment

- **Natural rate of unemployment** - average rate of unemployment around which the economy fluctuates.
- In a recession, the actual unemployment rate rises above the natural rate.
- In a boom, the actual unemployment rate falls below the natural rate.
- Natural rate is a normal unemployment rate when the economy is not in recession or boom.
- Caused by frictional and structural forces.

# U.S. Unemployment, 1958-2002



# Model of Natural Rate

Notation:

$L$  = # of workers in labor force

$E$  = # of employed workers

$U$  = # of unemployed

$U/L$  = unemployment rate

# Assumptions:

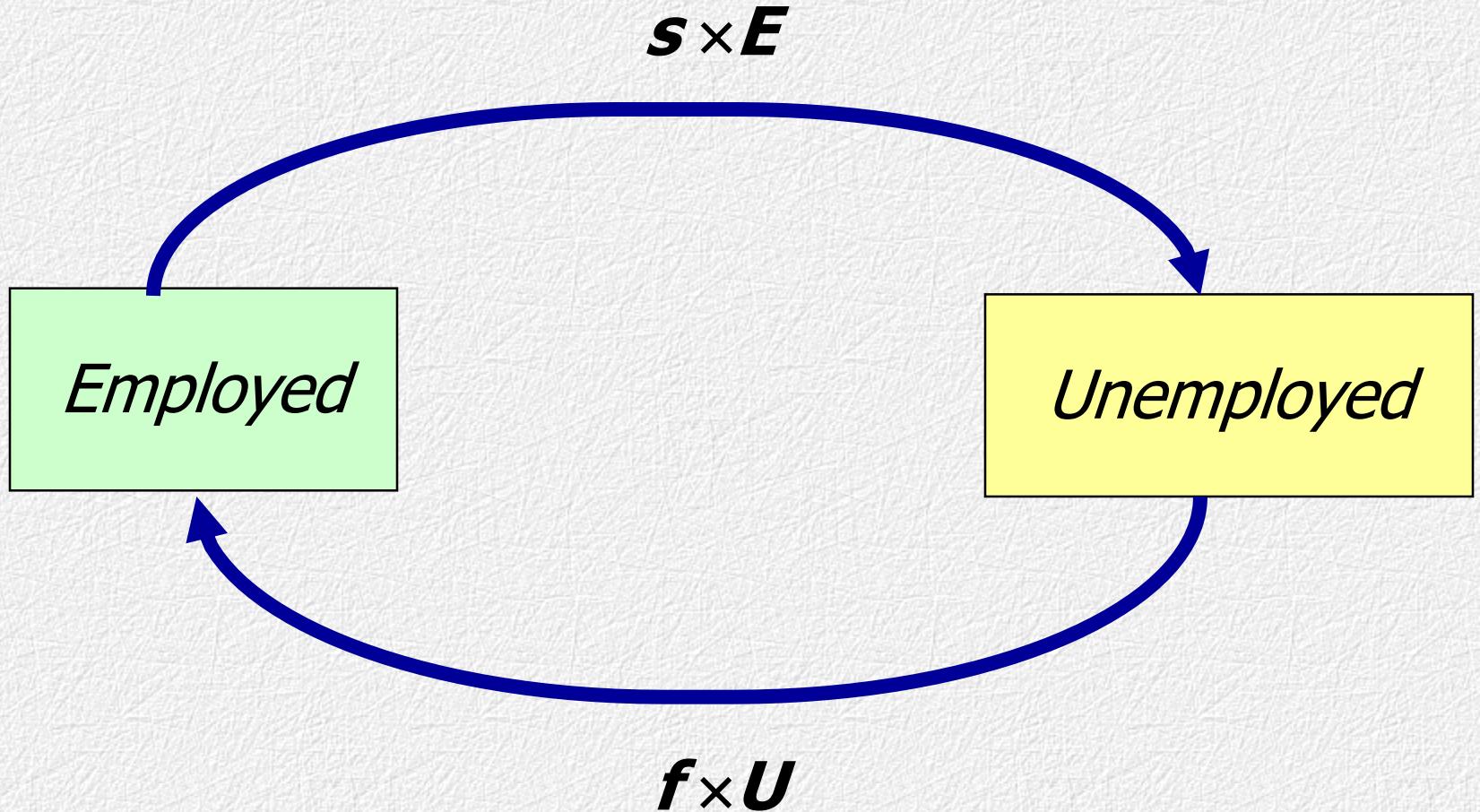
1.  $L$  is exogenously fixed.
2. During any given month,  
 $s$  = fraction of employed workers  
that become separated from their jobs,  
 $f$  = fraction of unemployed workers  
that find jobs.

$s$  = rate of job separations

$f$  = rate of job finding

(both **exogenous**)

# Transitions between Employment and Unemployment



# Steady State Condition

- **Steady State (Long-Run) Equilibrium –** where unemployment rate is constant.
- Workers separated from jobs equal unemployed people joining the labour market.

$$S \times E = f \times U$$

# of employed  
people who lose or  
leave their jobs



# of unemployed  
people who find jobs



# Steady State Condition

$$\mathbf{f} \times \mathbf{U} = \mathbf{s} \times \mathbf{E}$$

$$= \mathbf{s} \times (\mathbf{L} - \mathbf{U})$$

$$= \mathbf{s} \times \mathbf{L} - \mathbf{s} \times \mathbf{U}$$

Solve for  $\mathbf{U}/\mathbf{L}$ :

$$(\mathbf{f} + \mathbf{s}) \times \mathbf{U} = \mathbf{s} \times \mathbf{L}$$

So,

$$\boxed{\frac{\mathbf{U}}{\mathbf{L}} = \frac{\mathbf{s}}{\mathbf{s} + \mathbf{f}}}$$

# Example:

- Each month, 1% of employed workers lose their jobs ( $s = 0.01$ )
- Each month, 19% of unemployed workers find jobs ( $f = 0.19$ )
- Find the natural rate of unemployment:

$$\frac{U}{L} = \frac{s}{s + f} = \frac{0.01}{0.01 + 0.19} = 0.05, \text{ or } 5\%$$

# Policy Implication

- A policy that aims to reduce the natural rate of unemployment will succeed only if it **lowers s** or **increases f**.

# Why is there Unemployment?

- If job finding were instantaneous ( $f = 1$ ), then all spells of unemployment would be brief, and the natural rate would be near zero.
- There are two reasons why  $f < 1$ :
  1. Job Search
  2. Wage Rigidity

# Job Search & Frictional Unemployment

- **Frictional Unemployment** - caused by the time it takes workers to search for a job.
- Occurs even when wages are flexible and there are enough jobs to go around
- **Occurs because:**
  - Workers have different abilities and preferences
  - Jobs have different skill requirements
  - Geographic mobility of workers not instantaneous
  - Flow of information about vacancies and job candidates is imperfect

# Public Policy and Job Search

Govt programs affecting unemployment:

- ***Govt Employment Agencies:*** disseminate info about job openings to better match workers & jobs.
- ***Public Job Training Programs:*** help workers displaced from declining industries get skills needed for jobs in growing industries.

# Why is there Unemployment?

The natural rate of unemployment:  $\frac{U}{L} = \frac{s}{s + f}$

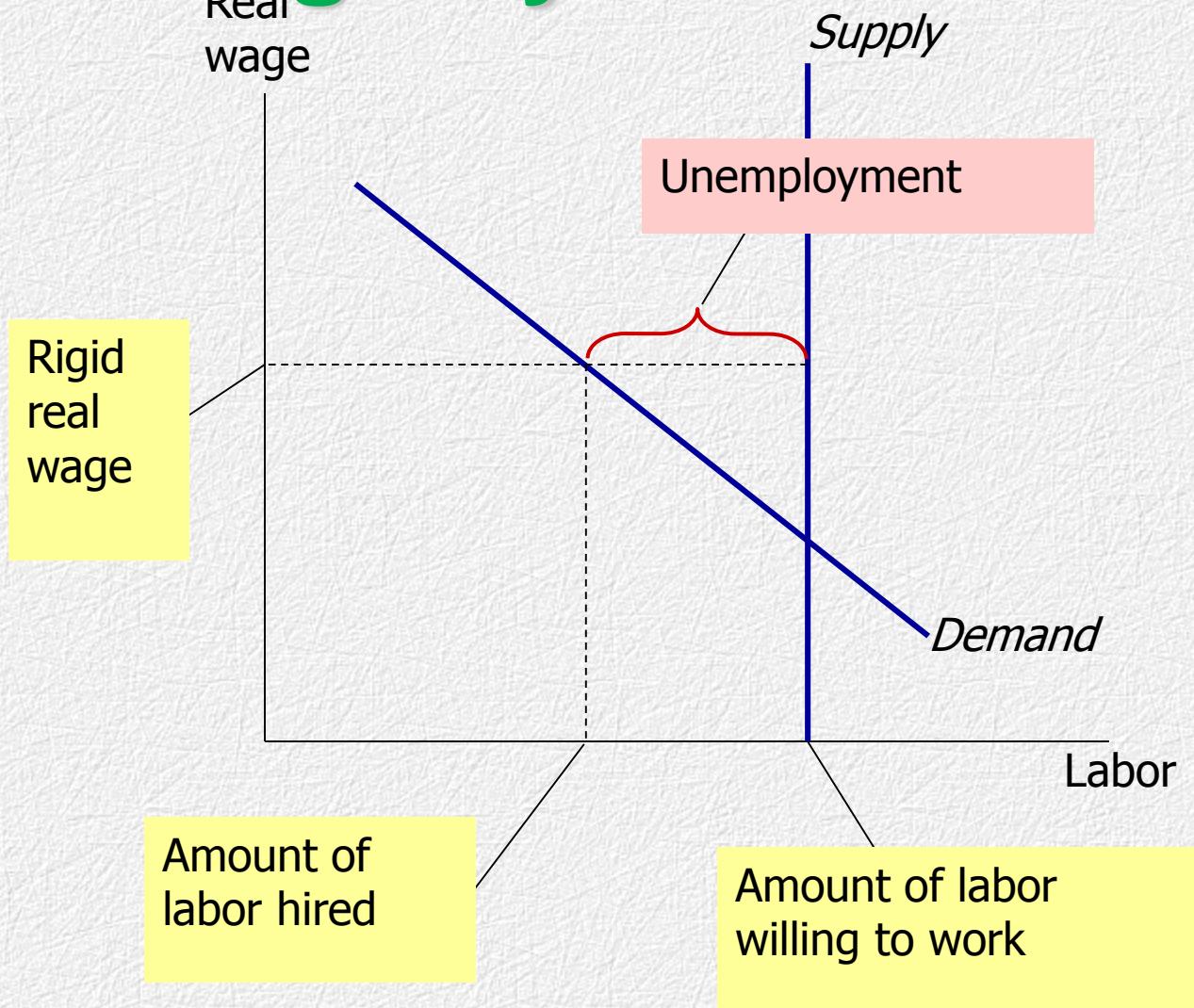
- There are two reasons why  $f < 1$ :

*DONE ✓ 1. Job Search*

*Next ➔ 2. Wage Rigidity*

# Unemployment from Real Wage Rigidity

If the real wage is stuck above the eq'm level, then there aren't enough jobs to go around.



# Unemployment from Real Wage Rigidity

If the real wage is stuck above the eq'm level, then there aren't enough jobs to go around.

Then, firms must ration the scarce jobs among workers.

**Structural Unemployment:** the unemployment resulting from real wage rigidity and job rationing.

# Reasons for Wage Rigidity

1. Minimum wage laws
2. Labor unions
3. **Efficiency wages** (employers offer high wage as incentive for worker productivity and loyalty)

# The Minimum Wage

- The minimum wage is well below the eq'm wage for most workers, so it cannot explain the majority of natural rate unemployment.
- However, the minimum wage may exceed the eq'm wage of unskilled workers, especially **teenagers**.
- If so, then we would expect that increases in the minimum wage would increase unemployment among these groups.

# The Minimum Wage in the Real World:

- In Sept 1996, the minimum wage was raised from \$4.25 to \$4.75. Here's what happened:

| Unemployment rates, Before & After |                        |                        |
|------------------------------------|------------------------|------------------------|
|                                    | 3 <sup>rd</sup> Q 1996 | 1 <sup>st</sup> Q 1997 |
| Teenagers                          | 16.6%                  | 17.0%                  |
| Single mothers                     | 8.5%                   | 9.1%                   |
| All workers                        | 5.3%                   | 5.3%                   |

- Other studies: A 10% increase in the minimum wage increases teenage unemployment by 1-3%.

# Labor Unions

- Unions exercise monopoly power to secure **higher wages** for their members.
- When the union wage exceeds the eq'm wage, unemployment results.
- Employed union workers are **insiders** whose interest is to keep wages high.
- Unemployed non-union workers are **outsiders** and would prefer wages to be lower (so that labor demand would be high enough for them to get jobs).

# Efficiency Wage Theory

- Theories in which **high wages increase worker productivity**:
  - Attract higher quality job applicants
  - Increase worker effort and reduce “shirking”
  - Reduce turnover, which is costly
  - Improve health of workers (*in developing countries*)
- The increased productivity justifies the cost of paying above-equilibrium wages.
- The result: **unemployment**

# Impact of Unemployment

- Economic and social problem.
- **Economic Problem:** waste of valuable resources that would engage in production (**idle resources**).
- Output falls short of potential GDP during major periods of unemployment.
- Human and psychological toll during long periods of persistent involuntary unemployment.

# Impact of Unemployment

- Leads to declining standards of living, psychological pain of being fired, deteriorating health conditions and increased criminal activities.

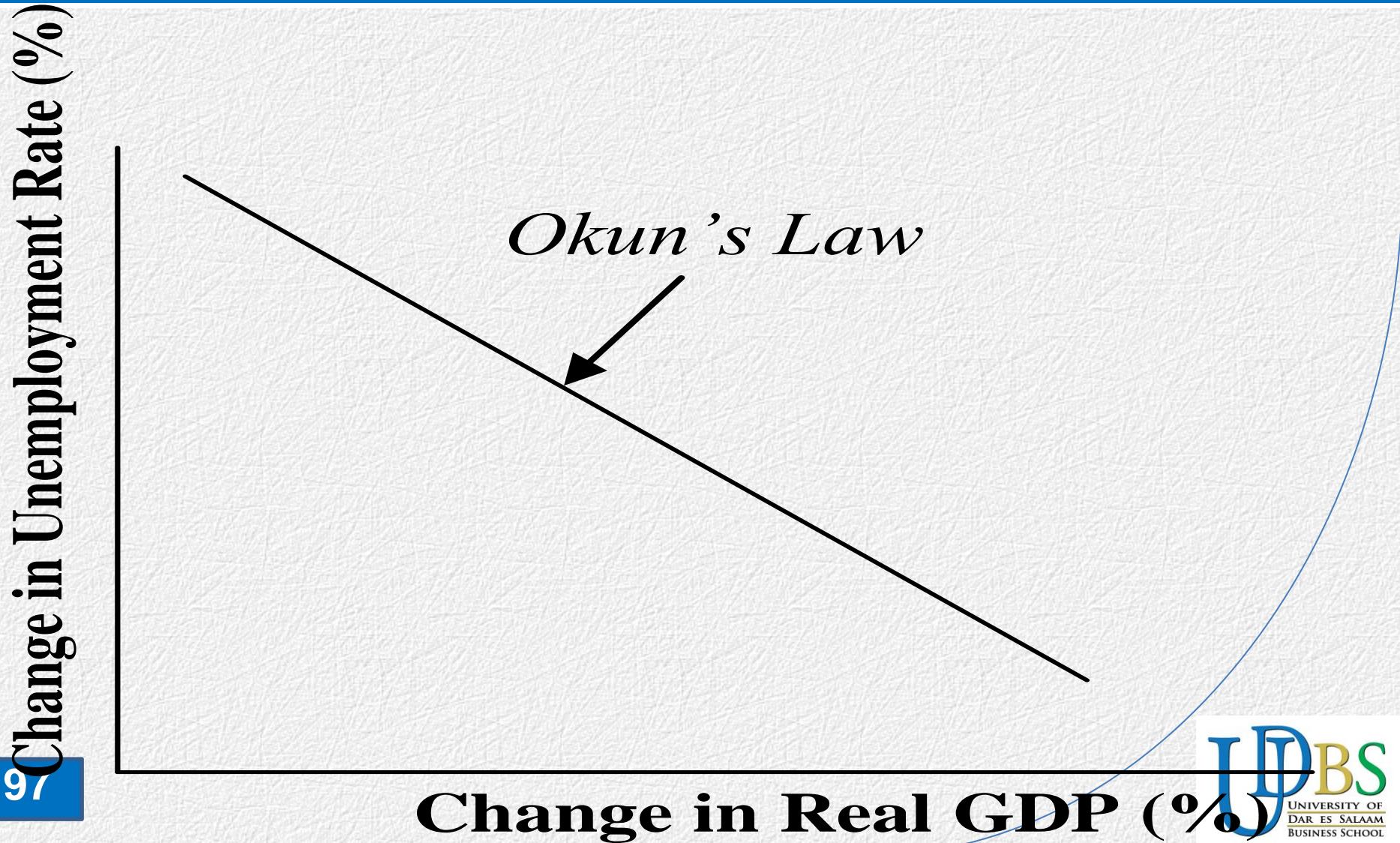
# Okun's Law

- **Recession** leads to rise in **unemployment rate**.
- As output falls, firms hire fewer labourers, thus new workers are not hired and current workers are laid off.
- Co-movement and numerical relationship of output and unemployment was first identified by **Arthur Okun**.

# Okun's Law

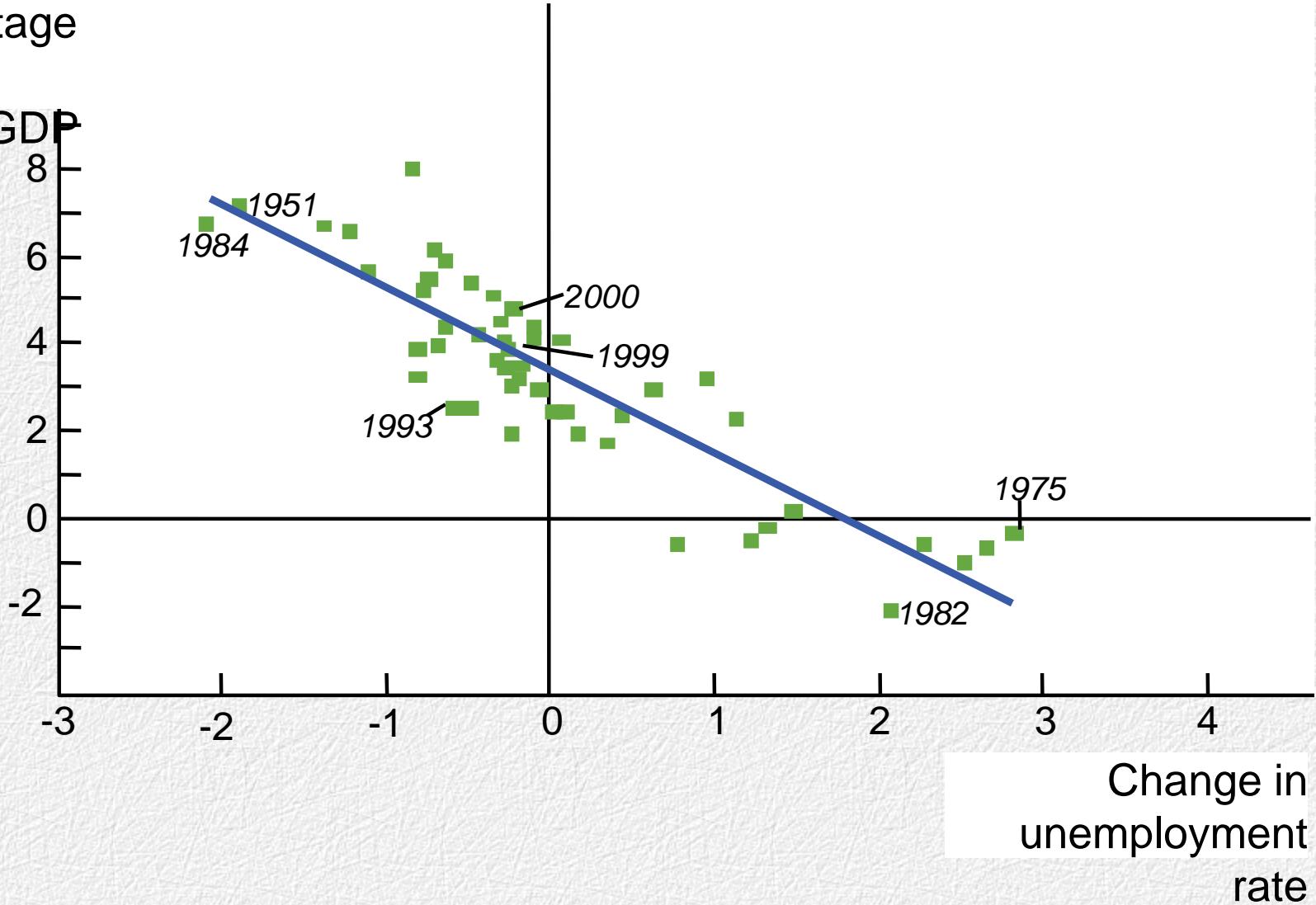
- **Okun's Law:** “*for every 2 percent that GDP falls relative to potential GDP, the unemployment rate rises about 1 percent point*”.

# Okun's Law



# Okun's Law

Percentage  
change  
in real GDP



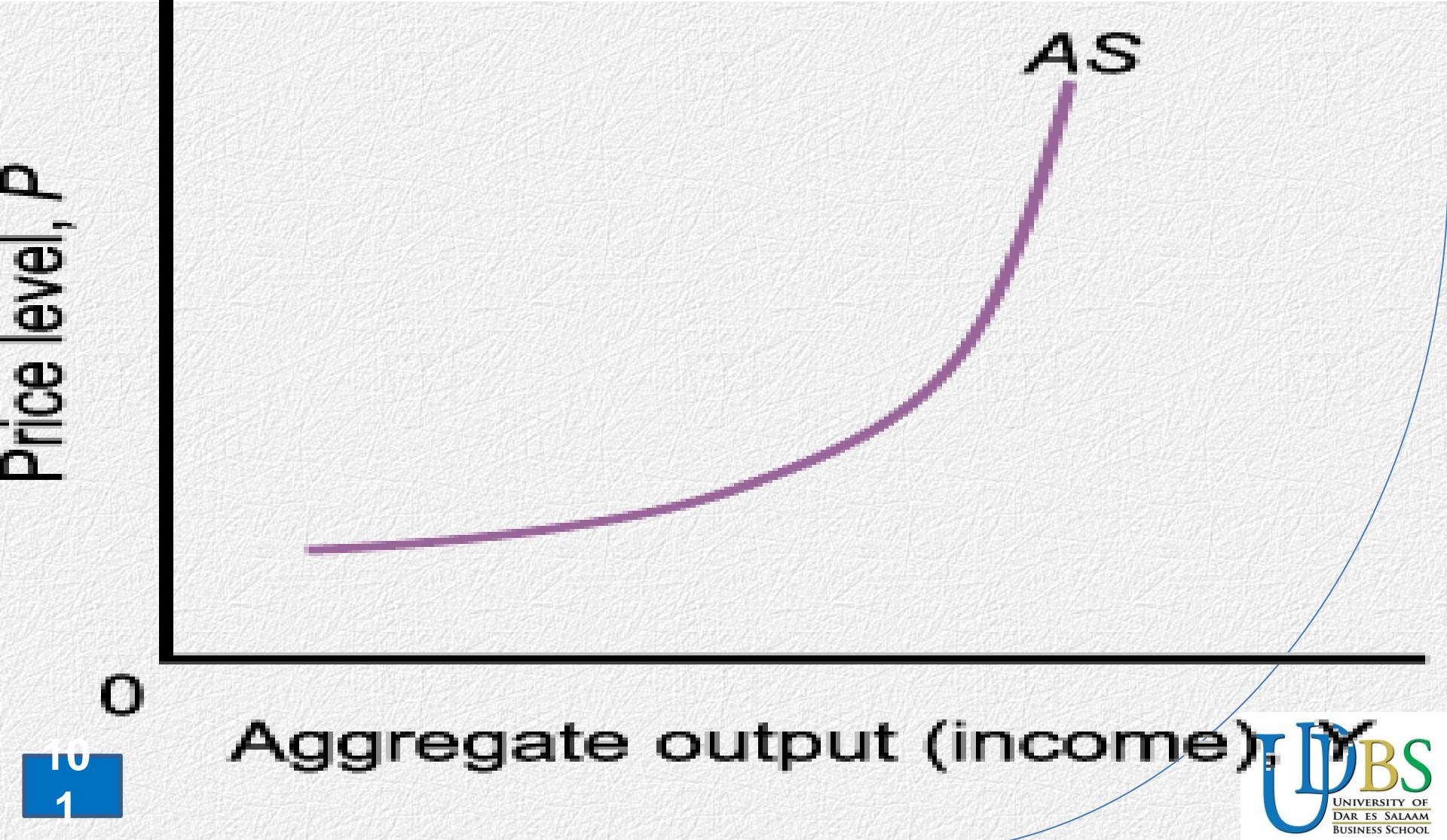
# Phillips Curve

- AW Phillips (1958) based on 100 years of evidence and data, traced out **inverse relationship** btn **unemployment rate** and rate of change of money wages (**inflation**).
- Opportunity cost of reducing unemployment is higher inflation.
- Opportunity cost of reducing inflation is higher unemployment.
- Phillips curve was based on an era where **inflation was low** and primary disturbances were **demand shocks**.

# Phillips Curve

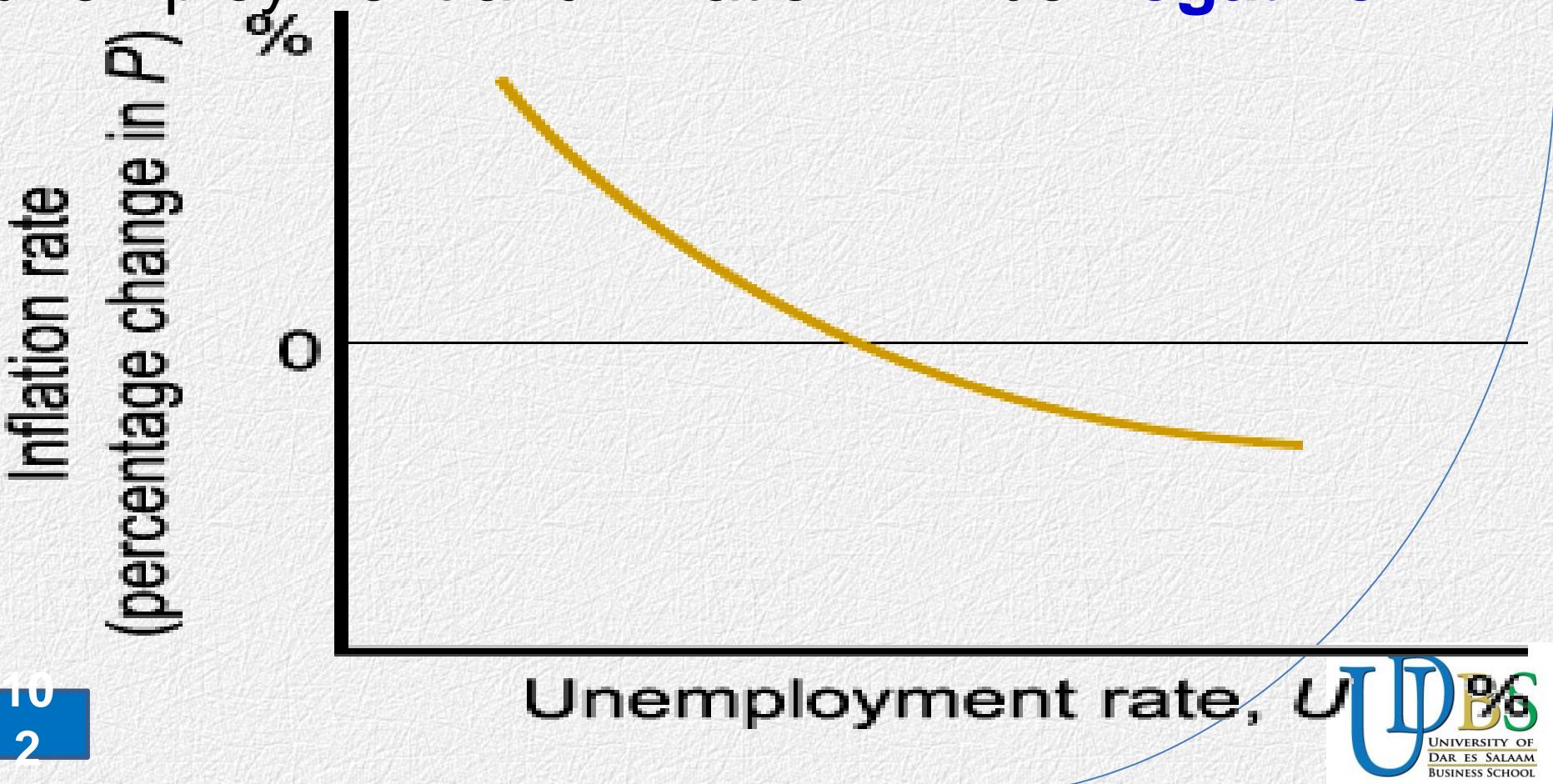
- Recall: unemployment rate (U) and aggregate output (income) are negatively related (**Okun's Law**).
- Y and price level (P) are positively related (**SRAS Curve**).

# Phillips Curve

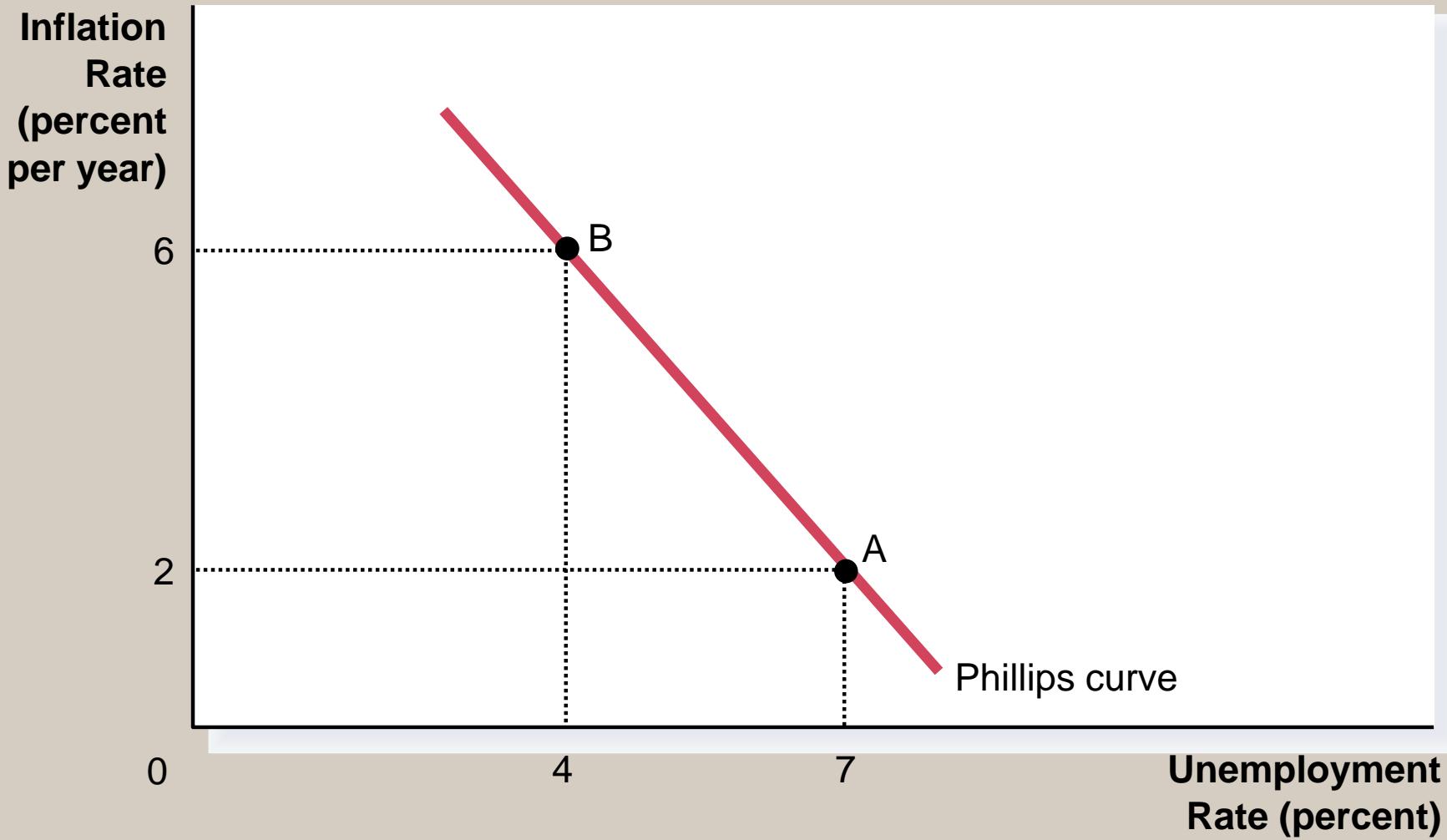


# Phillips Curve

- Therefore, logically relationship between unemployment and inflation will be **negative**.



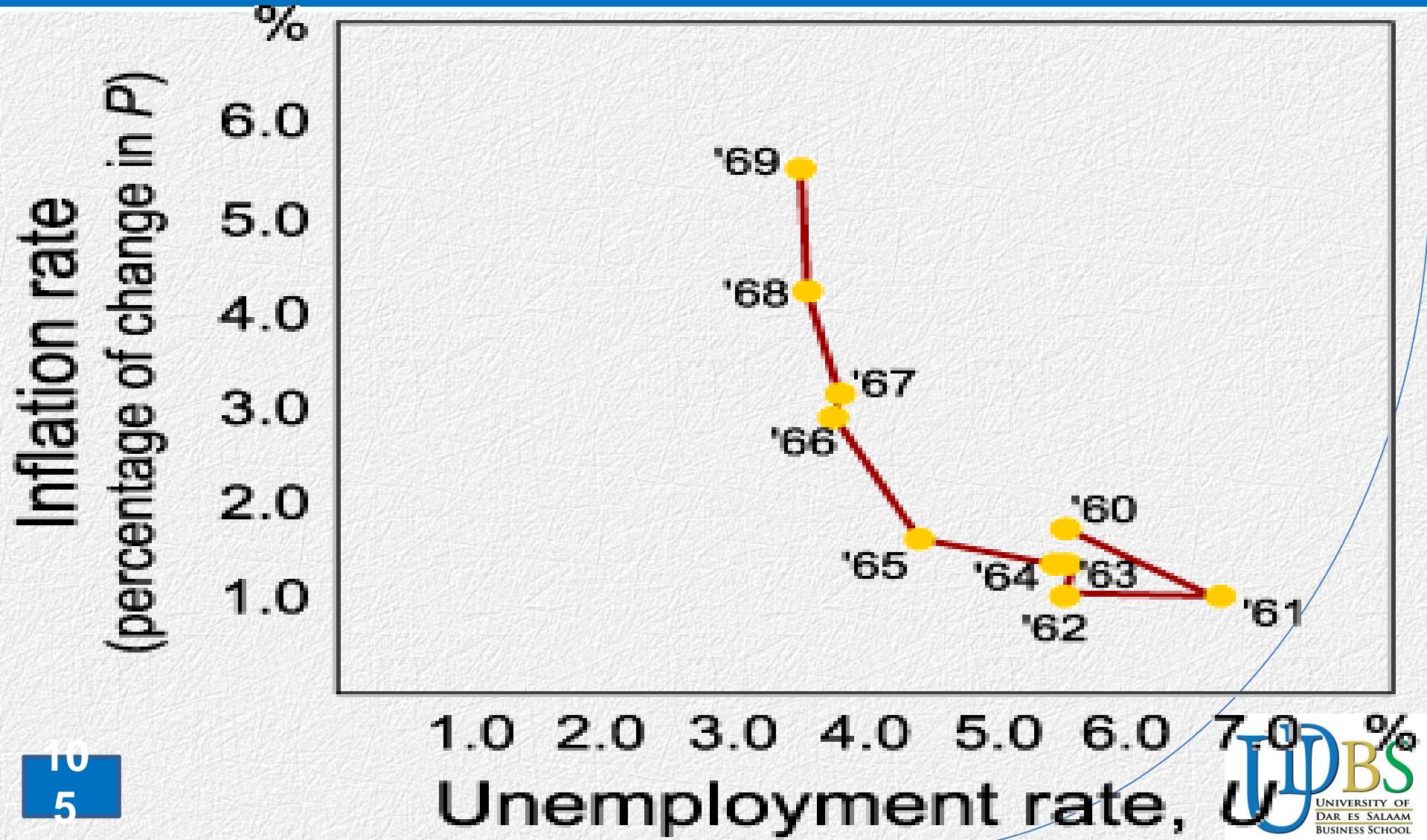
# Figure 1 The Phillips Curve



# Phillips Curve

- As unemployment declines in response moving closer and closer to capacity output, overall price level rises.
- $Y \uparrow \rightarrow U \downarrow \rightarrow P \uparrow$
- Phillips curve shows a **trade-off** b/w inflation and unemployment.
- To lower inflation rate, we must accept higher unemployment rate.
- In 1960s and early 1970s, inflation responded in fairly predictable way to changes in unemployment rate.

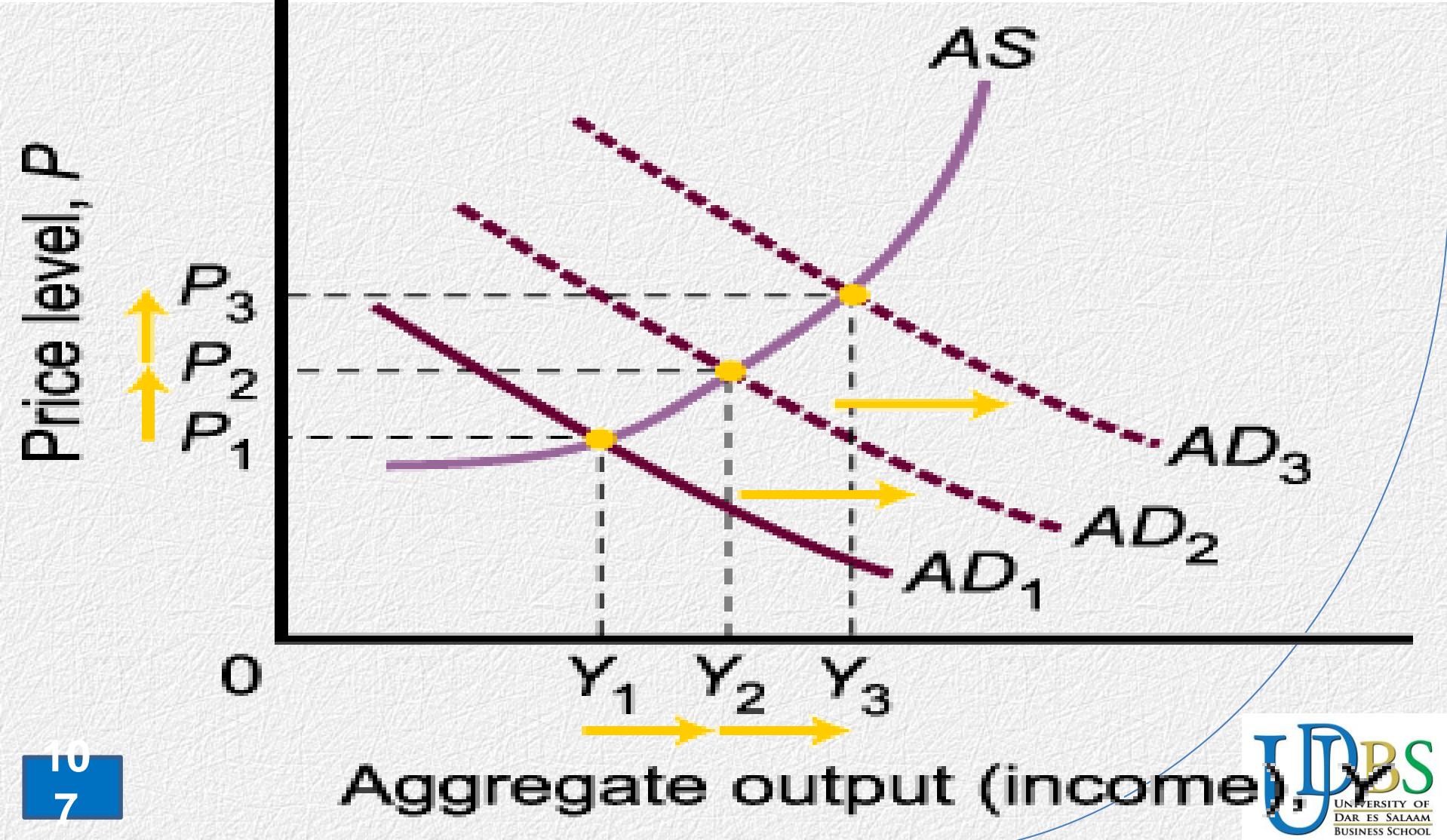
# Phillips Curve



# Phillips Curve

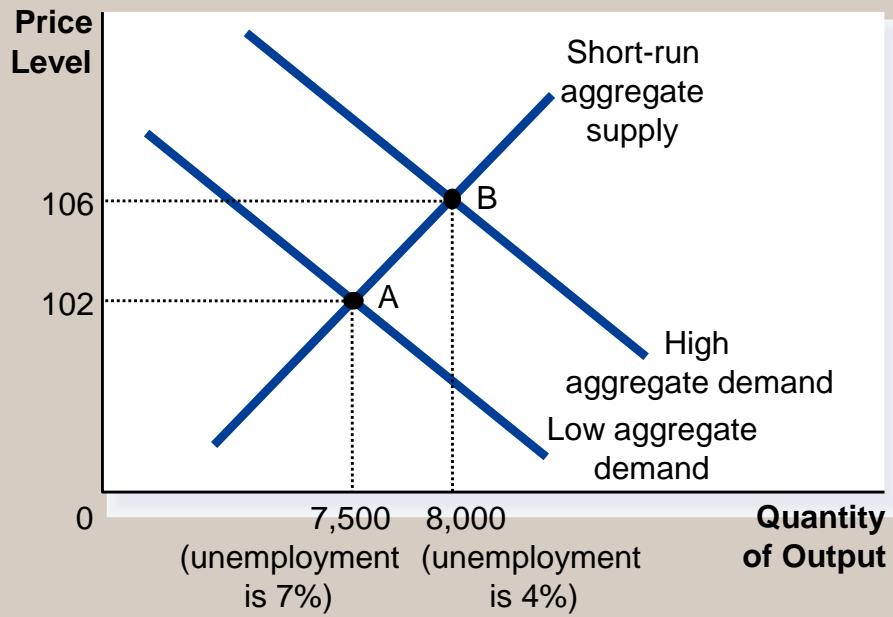
- Was a period characterized by low inflation rates and dominance of demand-related shocks in the economy
- When AD shifts with no shifts in AS, there is **positive relationship** btwn price level and level of GDP, and since GDP and unemployment are negatively related, relationship btwn price level and unemployment is obviously negative.

# Phillips Curve

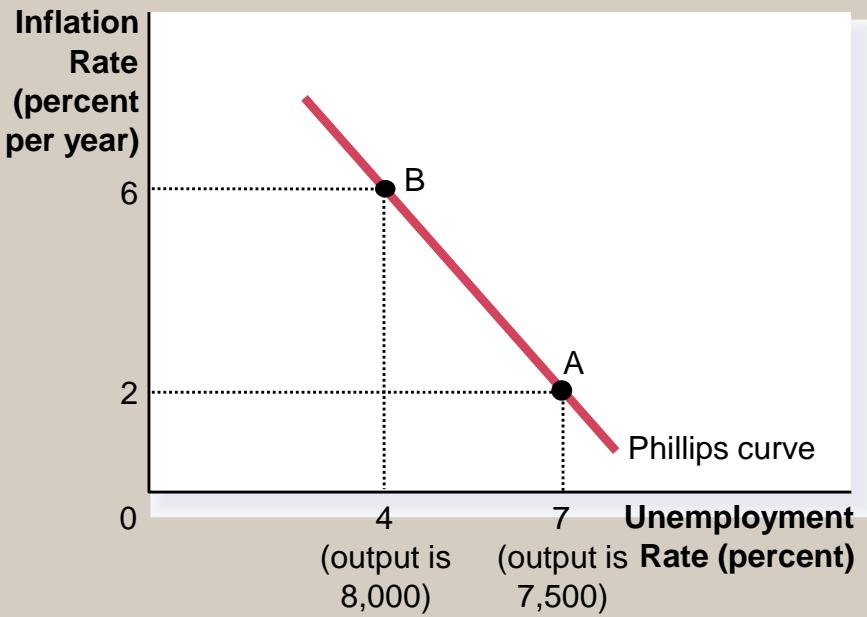


# How the Phillips Curve is Related to Aggregate Demand and Aggregate Supply

(a) The Model of Aggregate Demand and Aggregate Supply



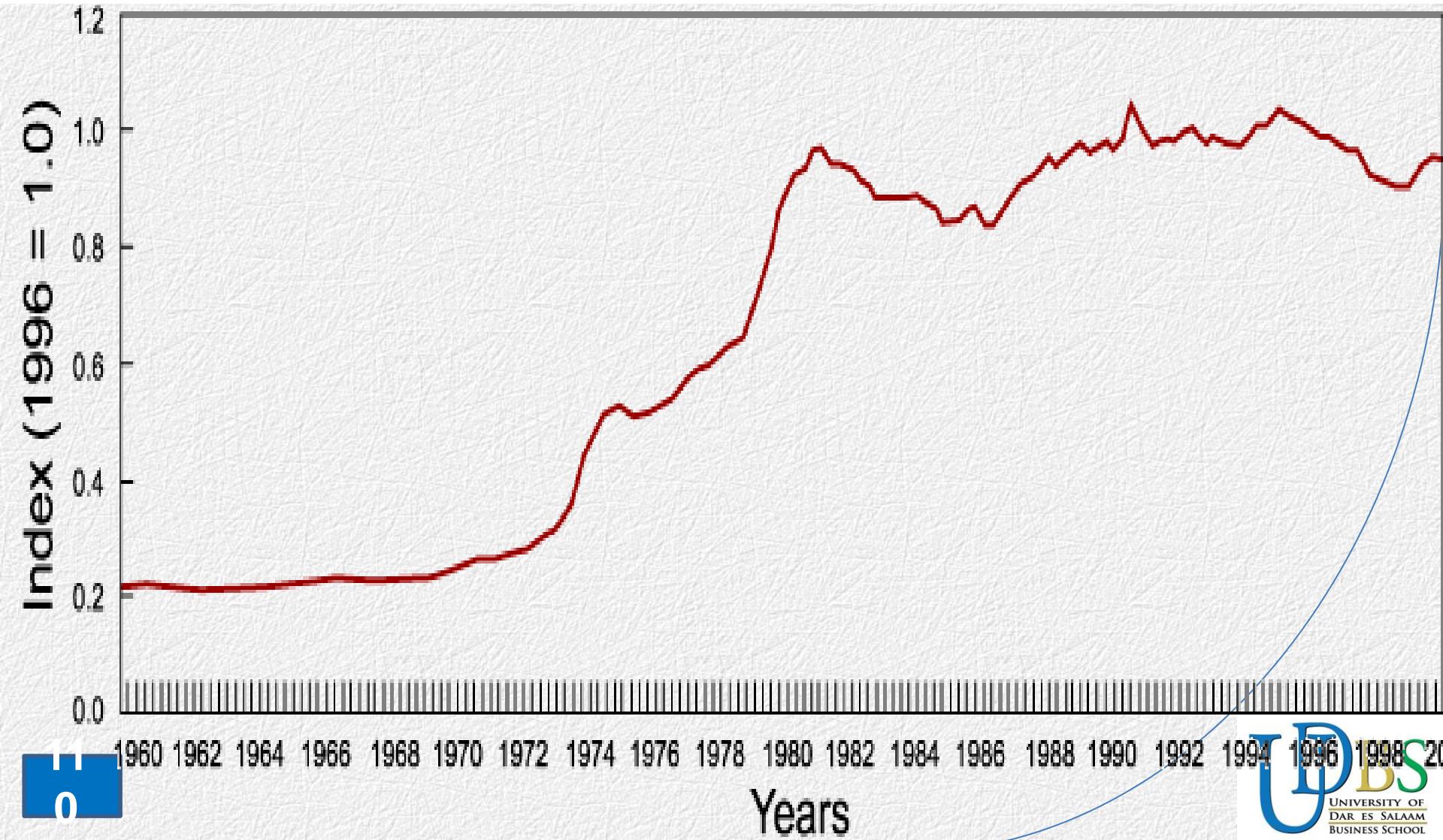
(b) The Phillips Curve



# Phillips Curve

- 1970s was a turning point.
- Phillips relationship was proved wrong for two reasons.
- First, biggest disturbances were **adverse supply shocks** (oil embargoes, and crop failures).
- Price of imports changed very little in 1960s and early 1970s.
- Increased substantially in 1974 and again 1979-1980.

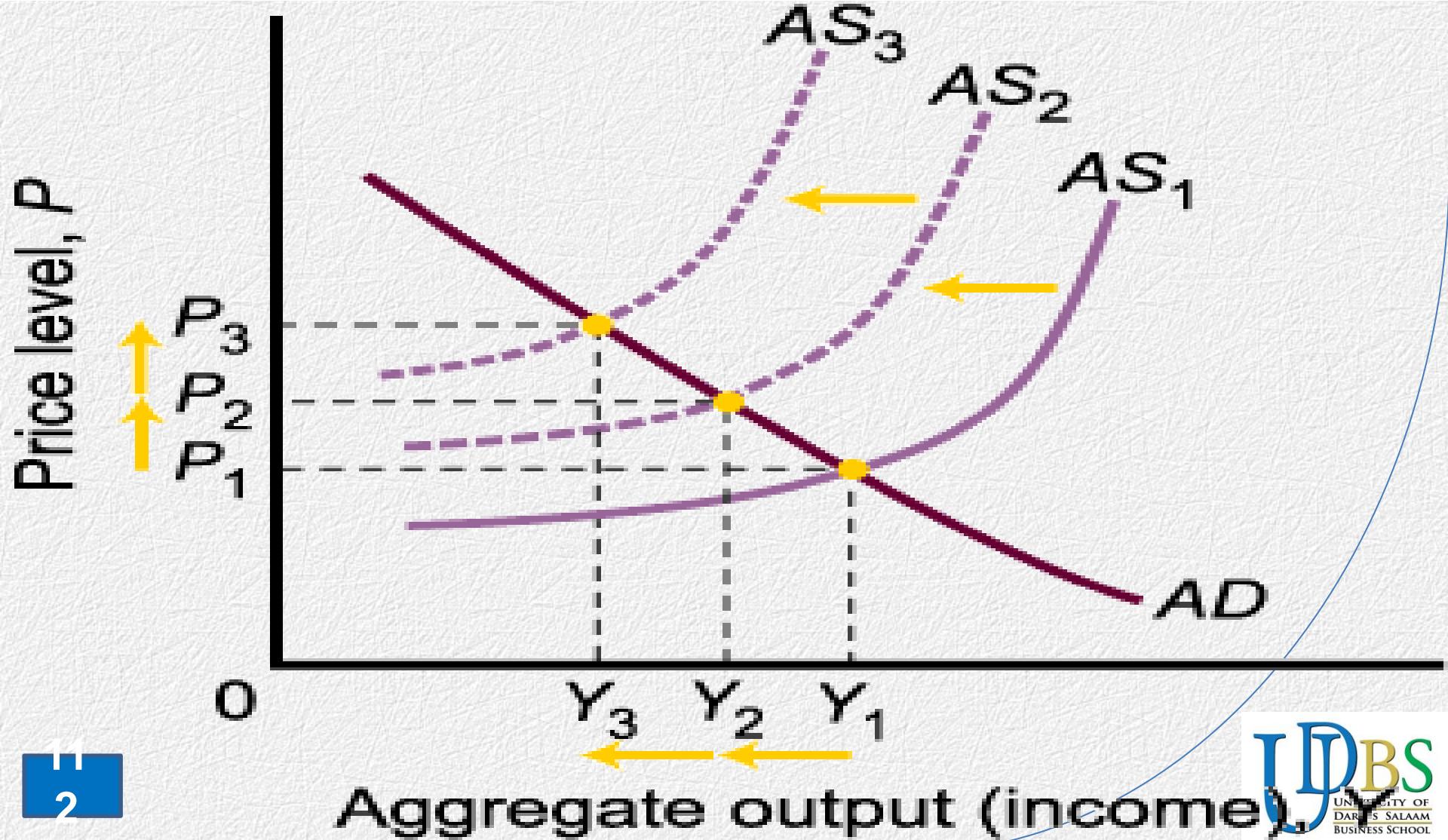
# Phillips Curve



# Phillips Curve

- Since 1981, it has changed very little.
- SRAS shifted upwards to the left bse of **higher input prices**, leading to both higher inflation and higher unemployment (**positive relationship**).
- When AS shifts with no shifts in AD, there is **negative relationship** between **prices** and **income**, and thus **positive relationship** between **prices** and **unemployment**.

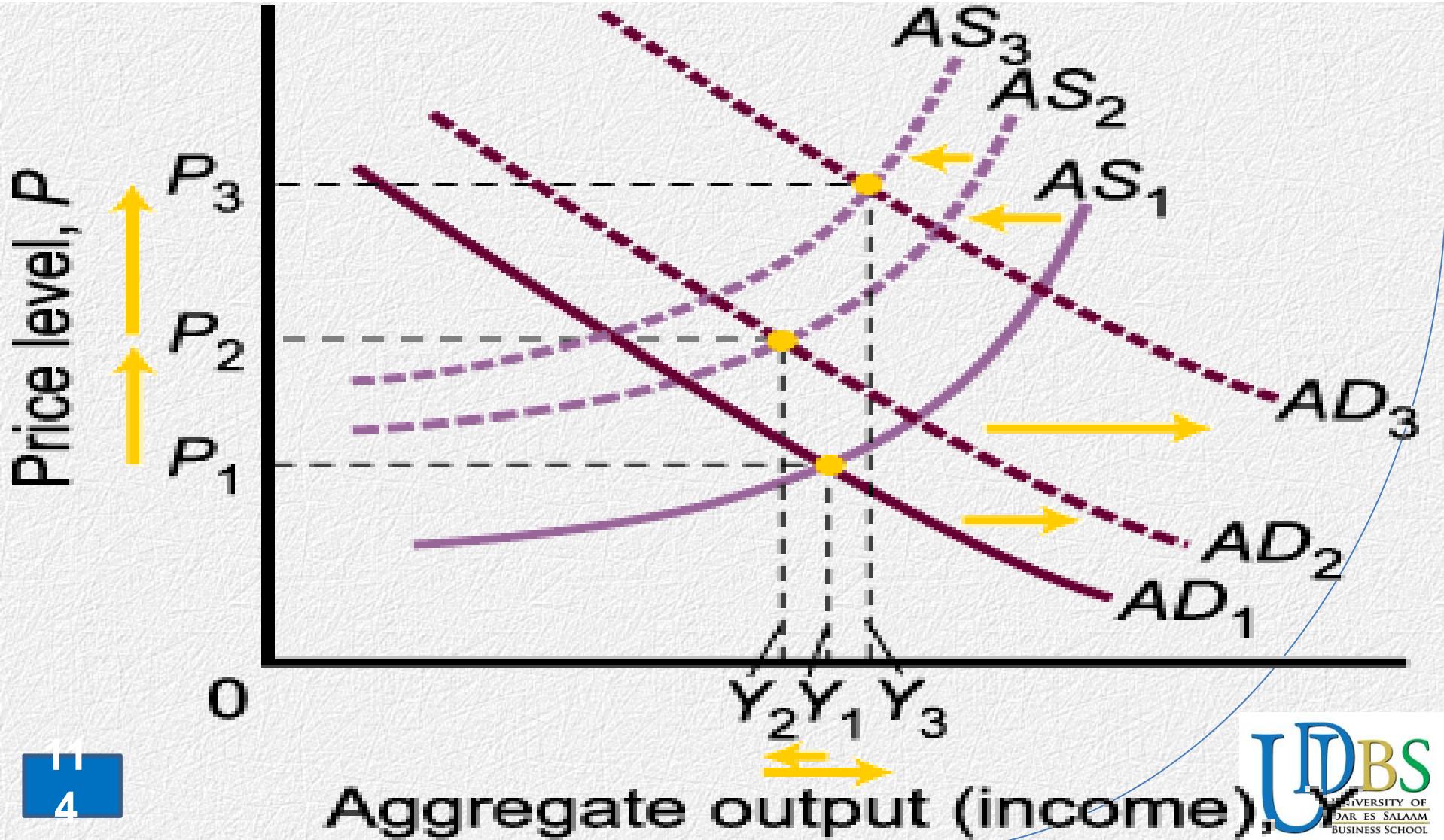
# Phillips Curve



# Phillips Curve

- If both AD and AS are shifting, there is **no systematic relationship** between prices and income, and thus between unemployment rate and inflation rate.

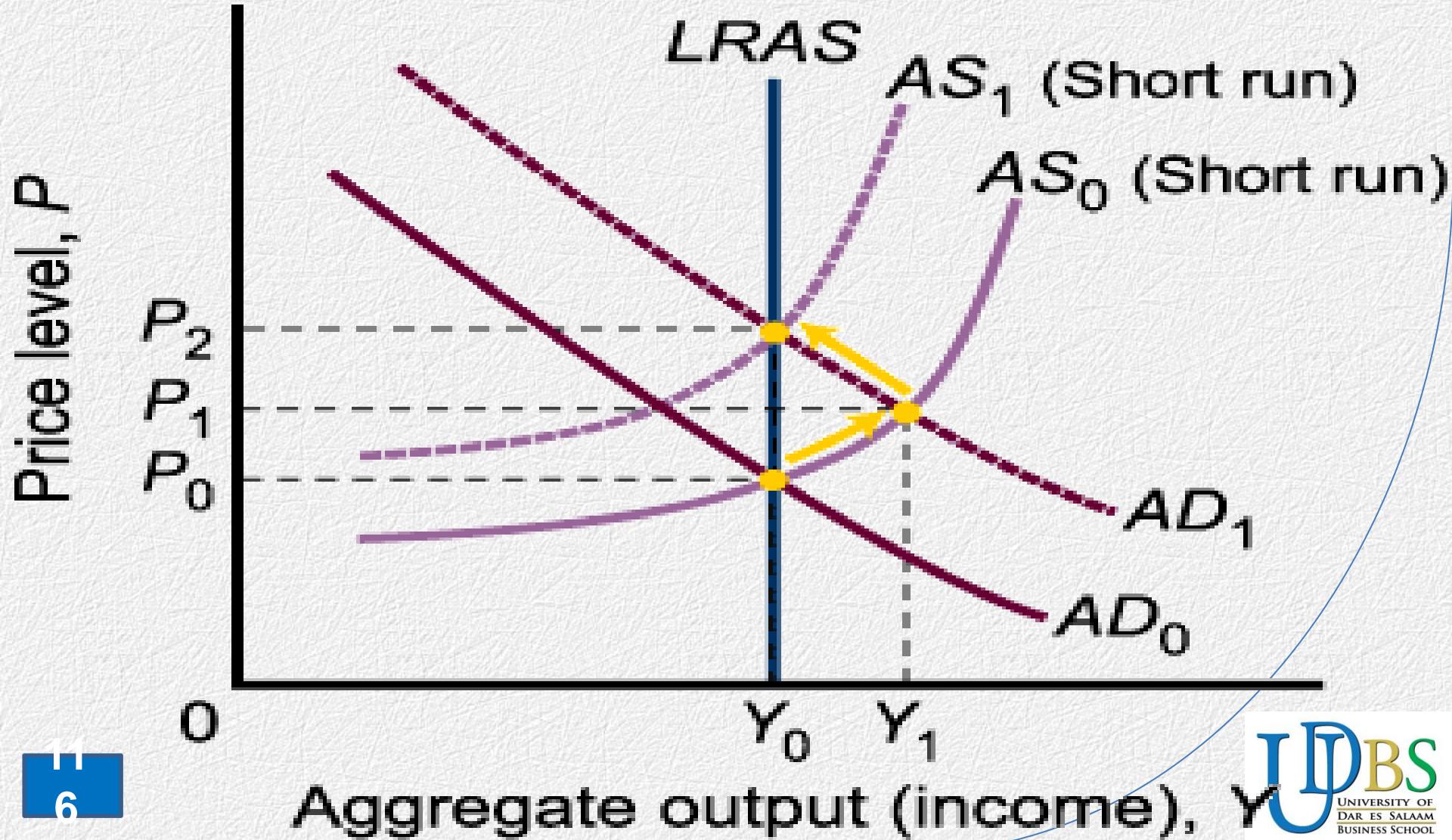
# Phillips Curve



# Phillips Curve

- Second, when SR equilibrium output exceeds potential output, **expansionary gap** opens.
- The gap is closed by upward movement of SRAS curve, resulting to greater inflation and higher unemployment.
- When output is pushed above potential GDP ( $Y^0$ ), there is upward pressure on **costs**.
- Rising costs push SRAS to the left.
- Quantity supplied ends back at  $Y^0$ .

# Phillips Curve

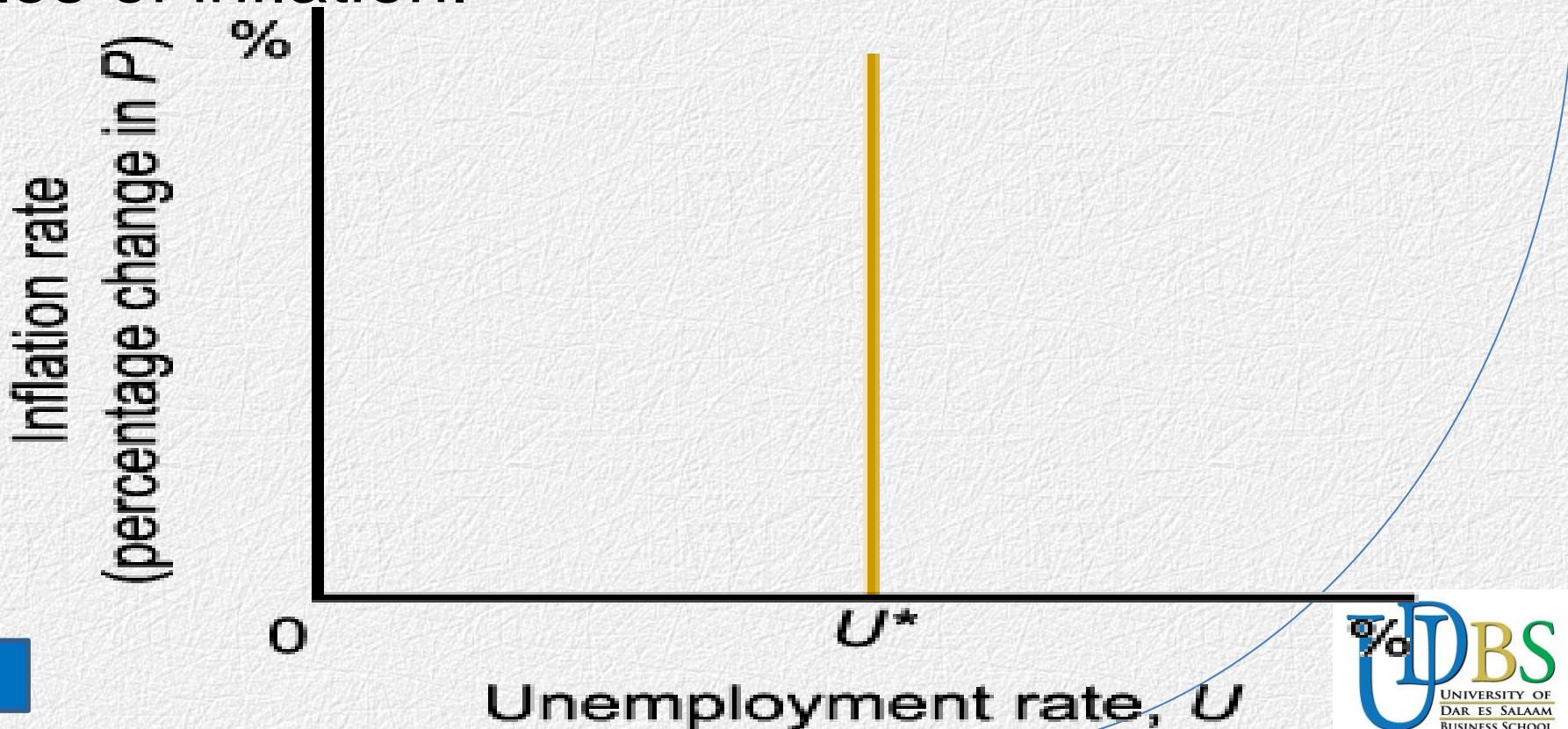


# Phillips Curve

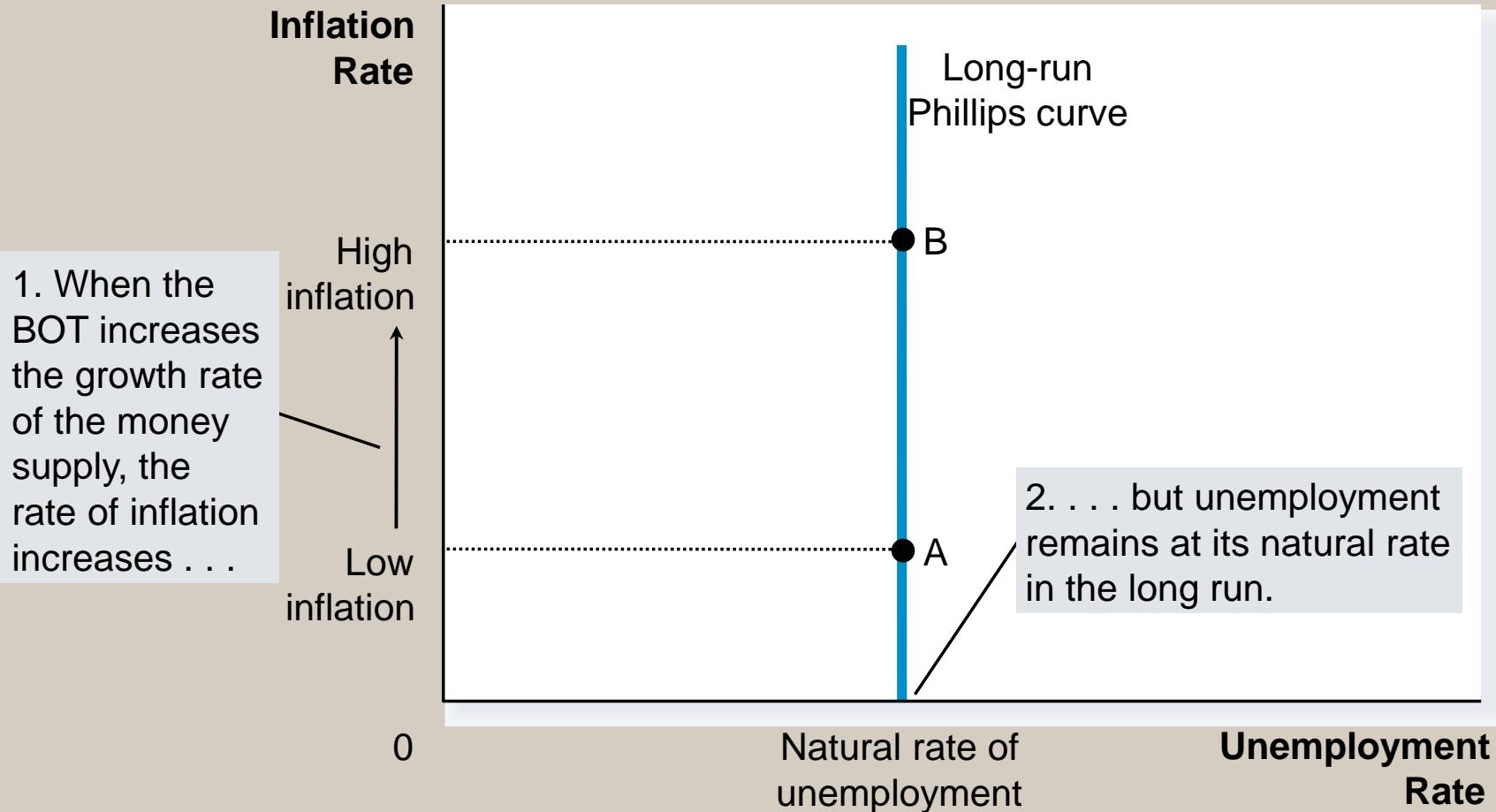
- If LRAS is vertical, so is Phillips curve.
- In **LR**, Phillips curve corresponds to the **natural rate of unemployment**.
- **Natural rate of unemployment ( $U^*$ )** is consistent with **fixed LR output at potential GDP**.
- When employers and workers have time and ability to **adjust fully** to any unexpected change in AD, **LR Phillips curve** is a **vertical line** drawn at economy's **natural rate of unemployment**.

# Phillips Curve

- Policy makers can't choose b/w unemployment and inflation, they can only choose alternative rates of inflation.



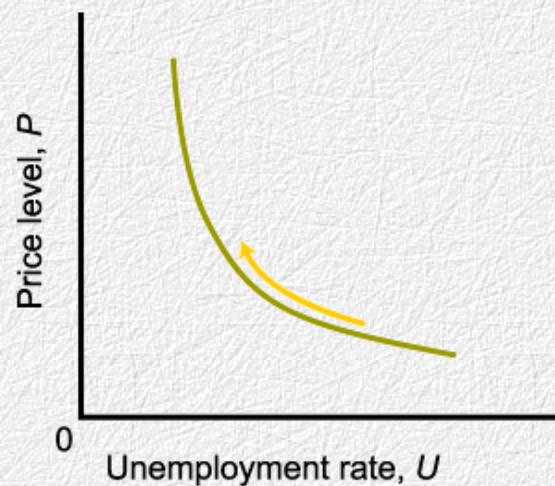
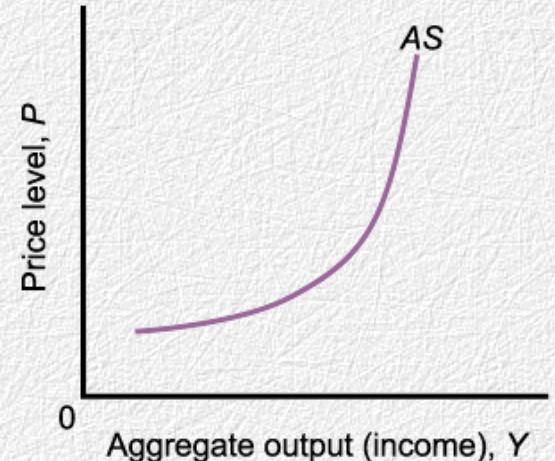
# The Long-Run Phillips Curve



# Short-Run Relationship Between the Unemployment Rate and Inflation

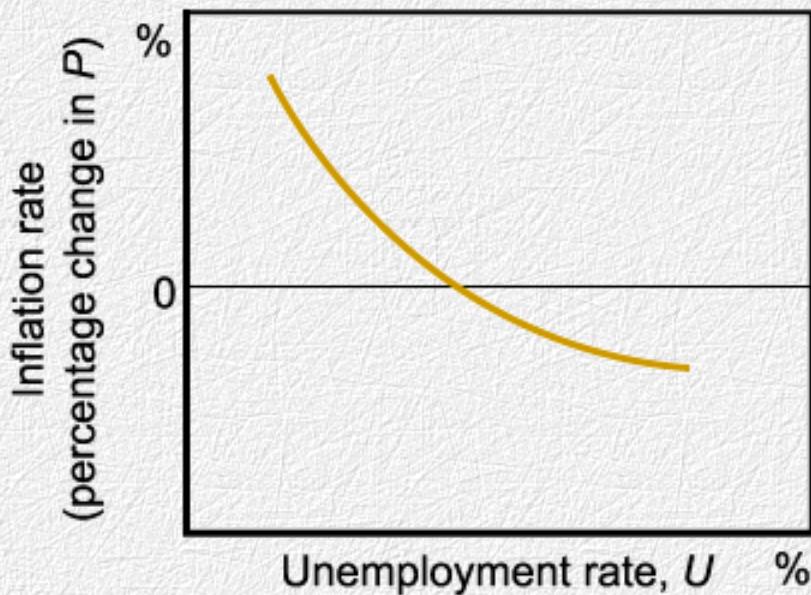
- The unemployment rate ( $U$ ) and aggregate output (income) ( $Y$ ) are negatively related.
- The relationship between  $Y$  and the price level ( $P$ ) is positive, as depicted by the  $AS$  curve.
- The relationship between  $U$  and  $P$  is negative. As  $U$  declines in response to the economy moving closer and closer to capacity output, the overall price level rises more and more.

$$P \uparrow \rightarrow Y \uparrow \rightarrow U \downarrow$$



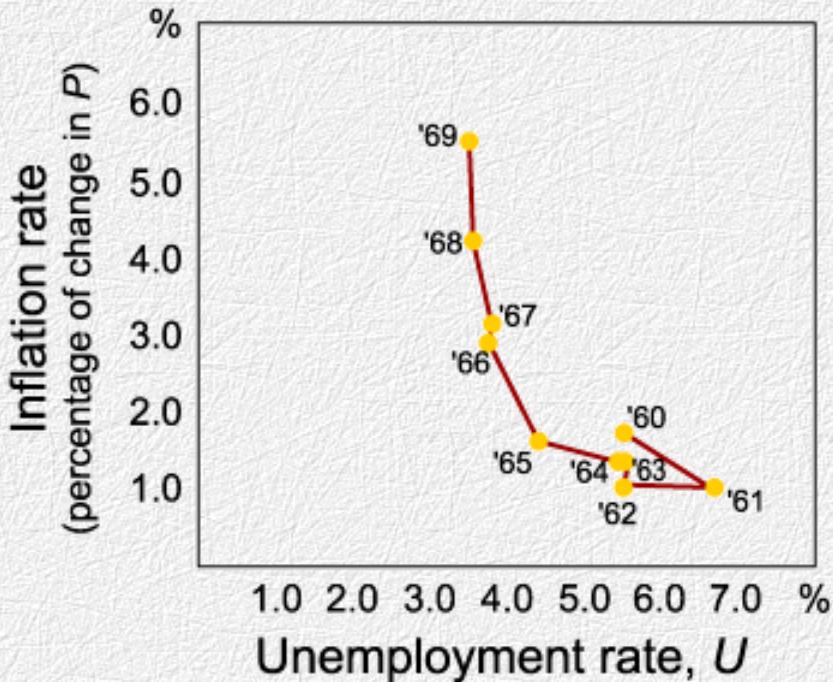
# The Phillips Curve

- The Phillips curve shows the relationship between the inflation rate and the unemployment rate.



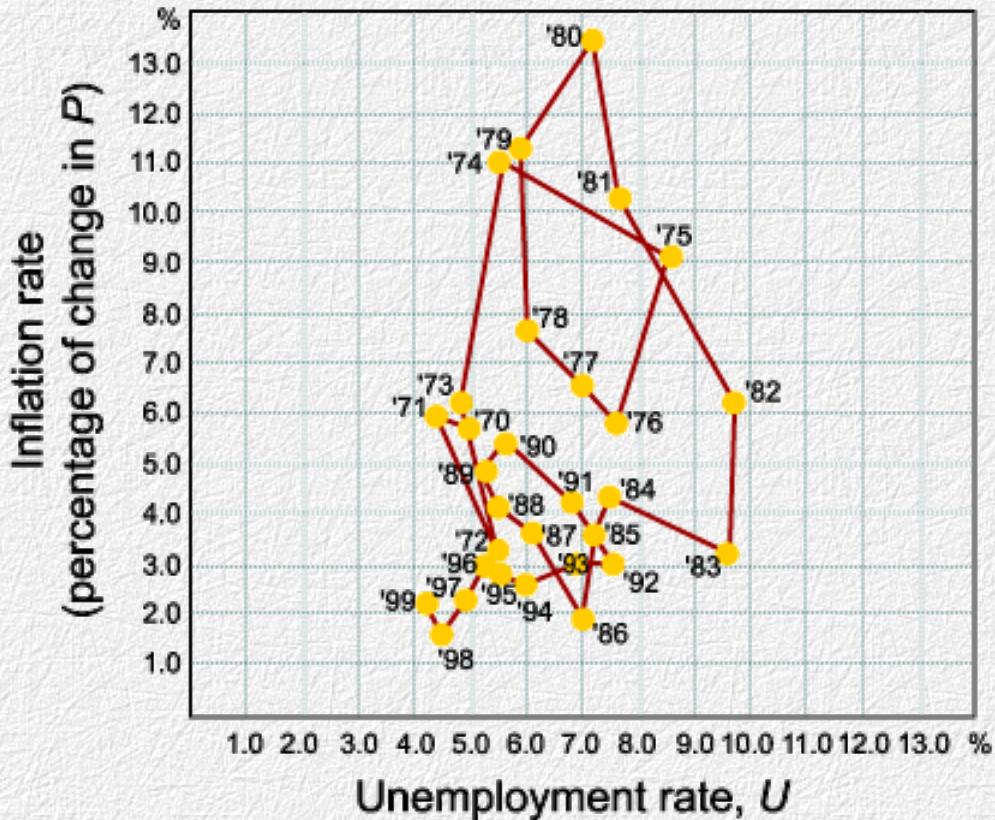
- This macroeconomic relationship has been widely studied.
- It shows that there is a **trade-off** between inflation and unemployment. To lower the inflation rate, we must accept a higher unemployment rate.

# The Phillips Curve: A Historical Perspective



- In the 1960s and early 1970s, inflation appeared to respond in a fairly predictable way to changes in the unemployment rate.

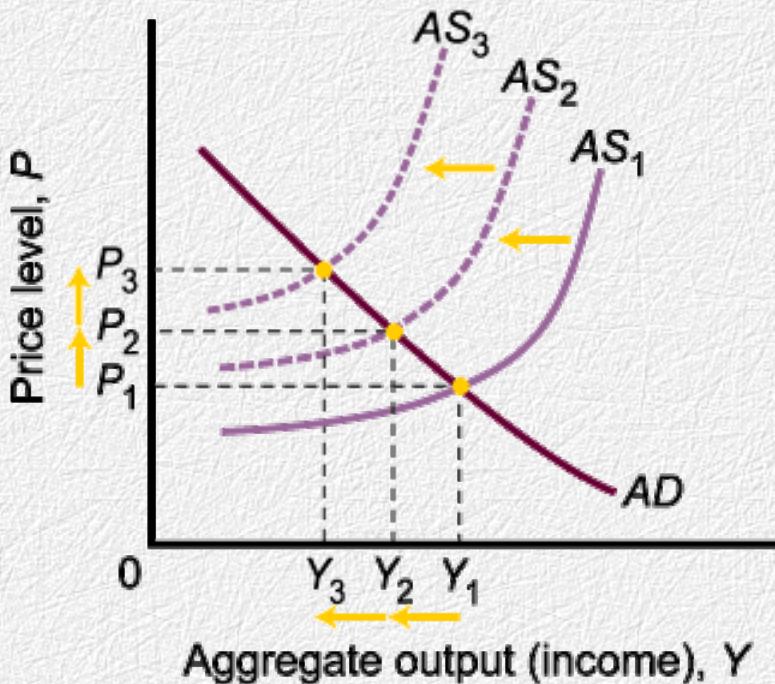
# The Phillips Curve: A Historical Perspective

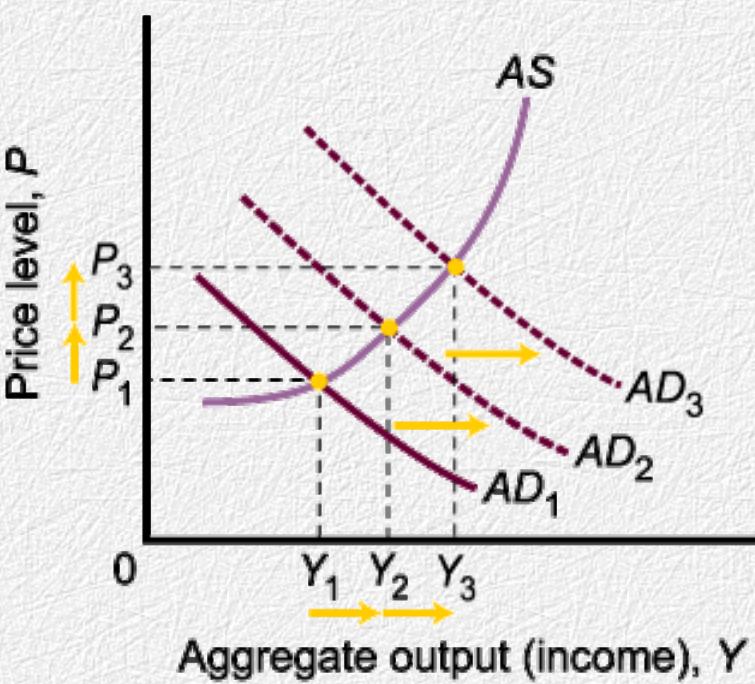


- But in the 1970s and 1980s, the Phillips Curve broke down.
- The points on this figure show no particular relationship between inflation and unemployment.

# Aggregate Supply and Aggregate Demand Analysis and the Phillips Curve

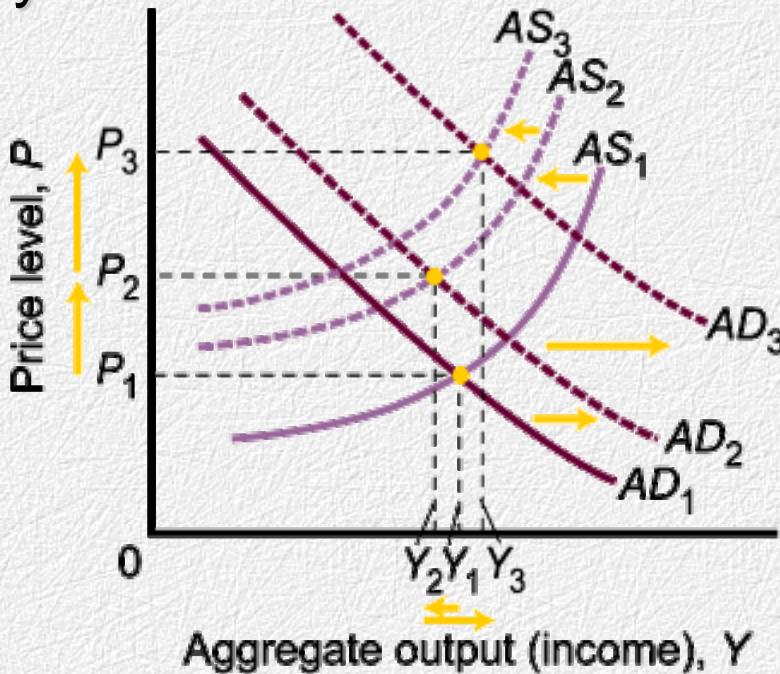
- When AS shifts with no shifts in AD, there is a **negative relationship** between  $P$  and  $Y$ .
- When AD shifts with no shifts in AS, there is a **positive relationship** between  $P$  and  $Y$ .



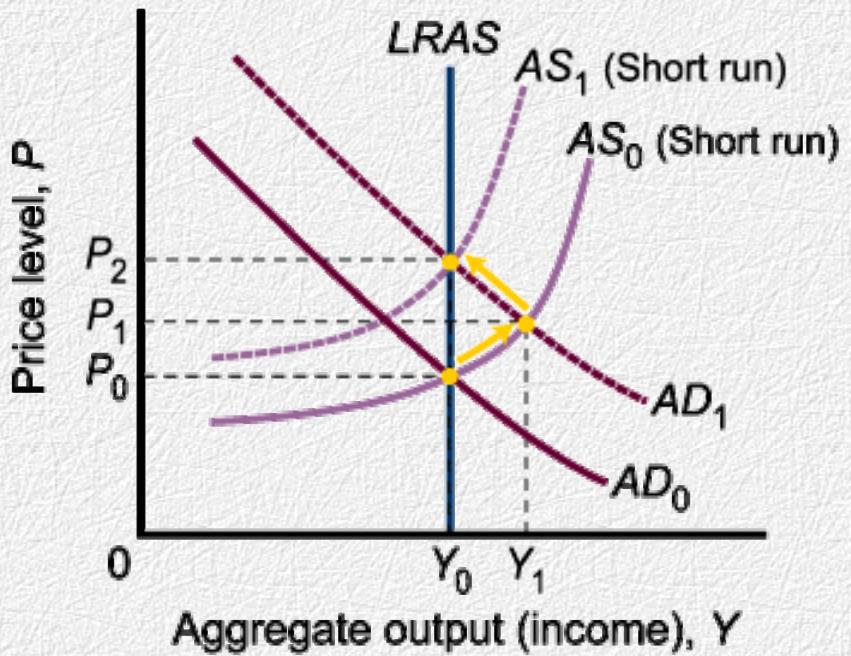



# Aggregate Supply and Aggregate Demand Analysis and the Phillips Curve

- If both AD and AS are shifting, there is **no systematic** relationship between  $P$  and  $Y$  and thus no systematic relationship between the unemployment rate and the inflation rate.

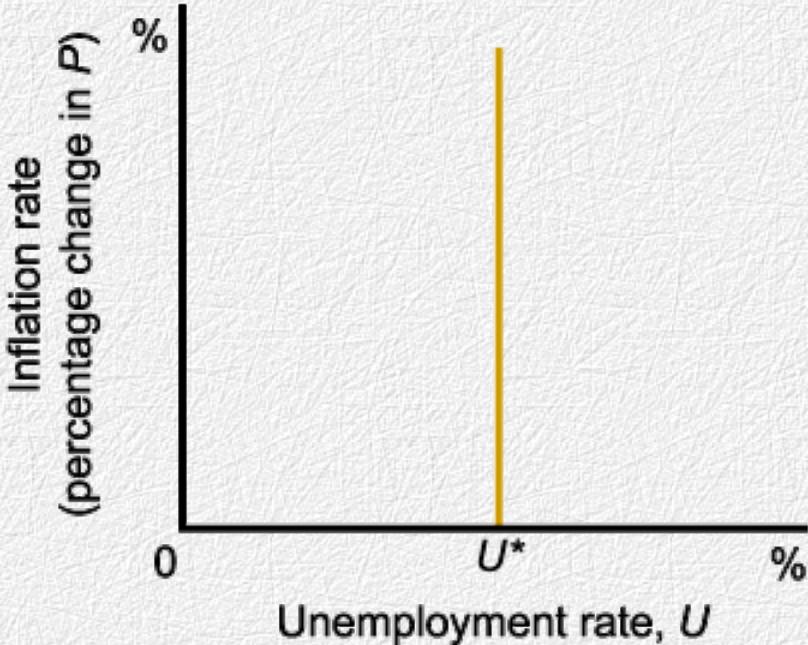


# The Long-Run AS curve, Potential GDP, and the Natural Rate of Unemployment



- When output is pushed above potential GDP ( $Y_0$ ), there is upward pressure on costs. Rising costs push the short-run AS curve to the left. The quantity supplied will end up back at  $Y_0$ .
- If the AS curve is **vertical** in the long run, so is the Phillips Curve.

# The Long-Run AS curve, Potential GDP, and the Natural Rate of Unemployment



- In the long run, the Phillips Curve corresponds to the **natural rate of unemployment**.
- The natural rate of unemployment ( $U^*$ ) is the unemployment rate that is consistent with the notion of a **fixed long-run output** at potential *GDP*.

# Job Challenges of 21<sup>st</sup> Century

- Rapid pace of **structural changes** and **business cycles** remain a major challenge to policy makers.
- Most jobs created in the next decades will be **service jobs**.
- These jobs will require increasing levels of **education** and **skill**.
- Workers without the right skills will be out of step in fast-changing markets.

# Job Challenges of 21<sup>st</sup> Century

- As **skills gap widens**, structural unemployment will increase.
- **Skills gap** – gap between skills required for emerging jobs and skills of workers.
- President Barack Obama, Address to Joint Session of Congress, February 24, 2009:

# Job Challenges of 21<sup>st</sup> Century

- "*In a global economy where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity, it is a pre-requisite. That is why it will be the goal of this Administration to ensure that every child has access to a complete and competitive education – from the day they are born to the day they begin a career.*"

**DEPARTMENT OF FINANCE**  
**University Of Dar Es Salaam**  
**Business School**

**FN 101: Principles of Macroeconomics**

Genuine Martin  
B.Com, M.A. (Economics)

**Lecture 3:**  
**Equilibrium in Goods**  
**Markets**

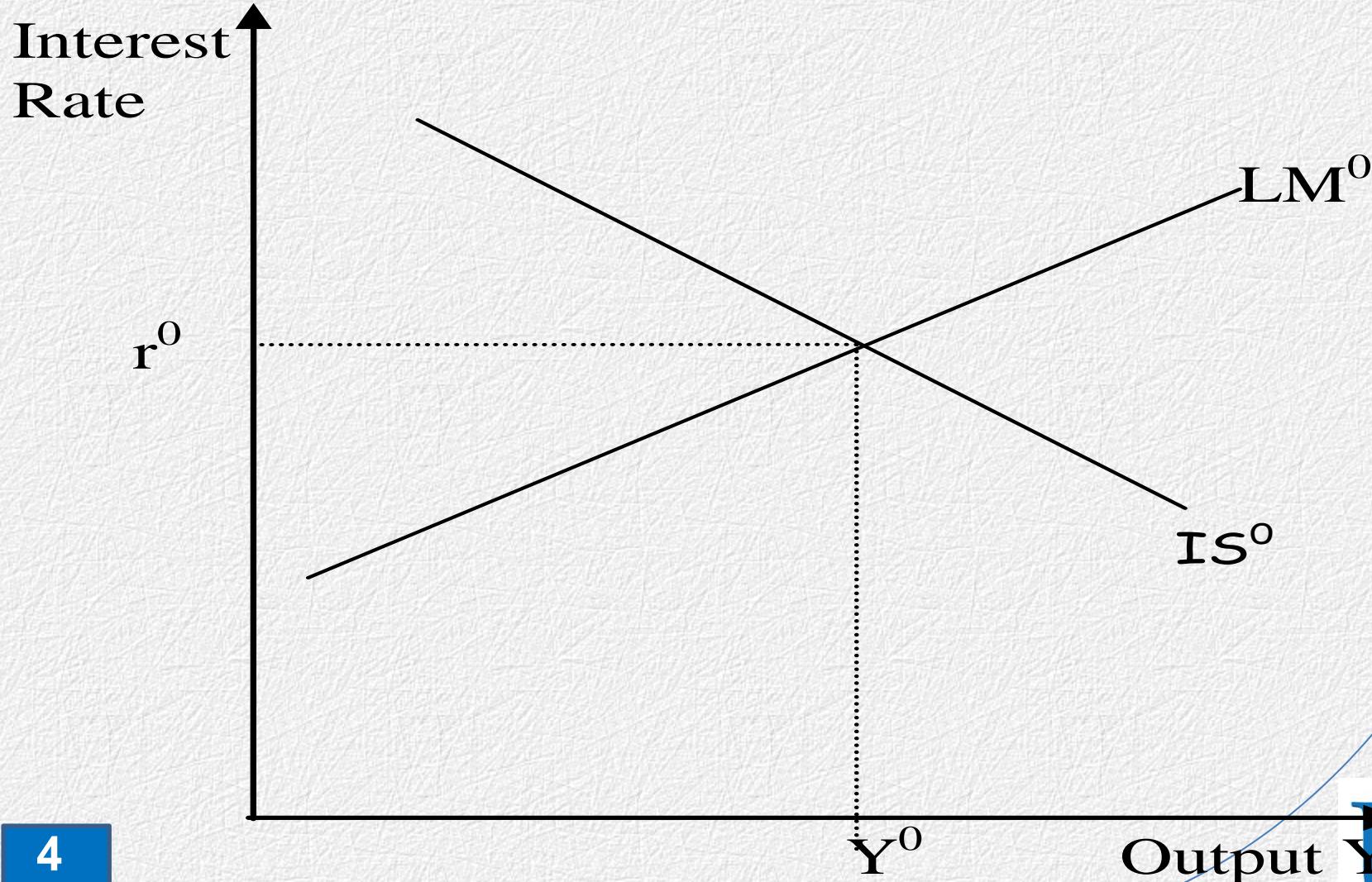
# Introduction

- **General equilibrium** – outcome in which all markets in economy are in equilibrium at the same time.
- **Simple Classification:** goods and money markets.
- **Goods Markets:** trade in goods and services produced in the economy.
- **Money Market** – trade in financial assets used as medium of exchange.
- **IS-LM-FE** is framework of analysis.  
2 Focus more on IS-LM.

# Introduction

- **IS** – goods market equilibrium.
- **LM** - money market equilibrium.
- **FE** – economy operates at full employment.
- **Periods:** short run (SR) and long run (LR).
- **SR:** both financial system and goods market are in equilibrium.
- IS and LM curves intersect.

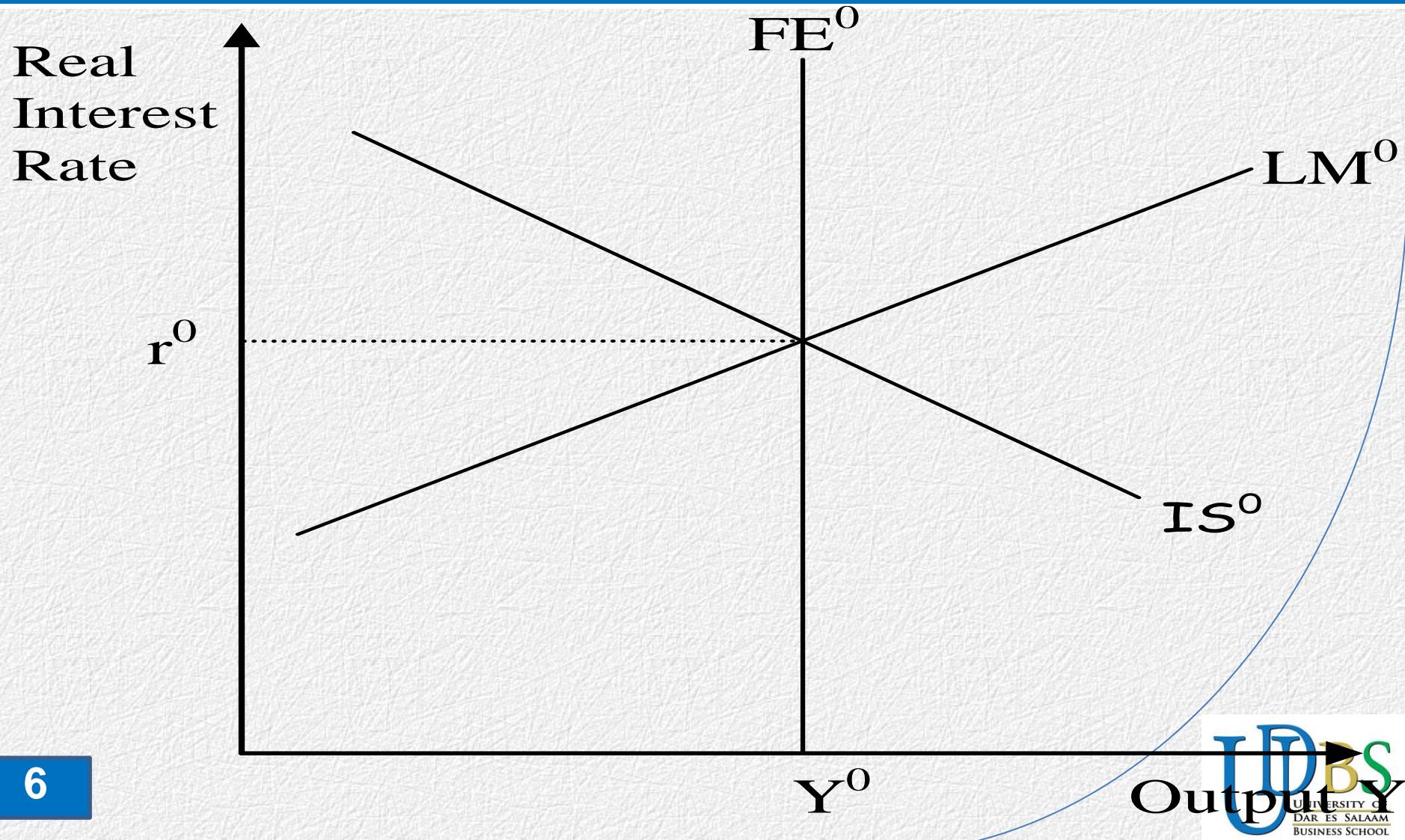
# Introduction



# Introduction

- **LR:** IS, LM and FE curves intersect.
- Economy produces at full employment level.
- **Full Employment:** all production resources are fully utilized.
- **Interest rate** equates saving and investment, & households and businesses are satisfied with allocation between money and non-money assets.

# Introduction



# Aggregate Expenditure / Aggregate Demand

- **Aggregate Expenditure:** total quantity of output demanded at alternative price levels in a given time period, ceteris paribus.
- **Four Components:** C, I, G, and NX ( $X - M$ ).
- $AE = AD = C + I + G + NX$
- **Goods Market Equilibrium:** current output supplied = aggregate demand ( $Y = E$ ).
- $Y = AE = C + I + G + NX$  (Open Economy)
- $Y = C + I + G$  (Closed Economy)

# Consumption

- Largest component of aggregate demand (about 2/3).
- **Consumption:** spending by households (consumers) on final goods and services.
- **Consumption determinants:** price level, interest rates, wealth, etc.
- Most decisive influence: level of disposable income.

# Consumption

- **Disposable Income:** amount of income consumers take home after deducting taxes, depreciation, RE, and adding transfers.
- For simplicity:  $Y_d = Y - T$
- **Recall:** All disposable income is either spent or save,  $Y_d = C + S$ .
- **Average Propensity to Consume (APC):** proportion of total disposable income spent on consumer goods and services.

# Consumption

$$APC = \frac{\text{total consumption}}{\text{total disposable income}} = \frac{C}{Y_D}$$

- **Average Propensity to Save (APS):**

proportion of total disposable income saved.

$$APS = \frac{\text{total savings}}{\text{total disposable income}} = \frac{S}{Y_D}$$

- How choice btn consumption and saving is affected by changes in income?

- **Marginal Propensity to Consume (MPC):**

change in consumer expenditure in response to change in disposable income.

# Consumption

- $0 < MPC < 1.$

$$MPC = \frac{\text{change in consumption}}{\text{change in disposable income}} = \frac{\Delta C}{\Delta Y_D}$$

- **Marginal Propensity to Save (MPS):** change in consumer saving in response to change in disposable income.

$$MPS = \frac{\text{change in savings}}{\text{change in disposable income}} = \frac{\Delta S}{\Delta Y_D}$$

- Since all disposable income is either saved or consumed,  $Y_d = C + S.$
- $11$   $MPS + MPC = 1$ , and  $MPS = 1 - MPC.$

# Determinants of Consumption

- **Income** is a decisive influence on consumption spending.
- $C = a + bY_d$
- Changes in income lead to movement **along** same consumption curve.
- Other factors determine consumption as well.
- These lead to upward or downward **shift** of consumption function.
- **1) Expectation:** about future income, prices, and interest rates affect current consumption.
- Anticipate pay raise?

# Determinants of Consumption

- Start more spending now.
- Anticipate rise in interest rate
- People borrow money and spend now.
- Expect fall in price level?
- Delay current purchases.
- That is why firms conduct **consumer confidence surveys**.
- **2) Net Wealth:** value of household assets minus liabilities.
  - Assets: house, cars, bank accounts, etc.
  - Liabilities: mortgages, car loans, credit cards,

# Determinants of Consumption

- Decrease in net wealth makes consumers poorer.
- Makes consumers spend less and save more.
- Increases in wealth increases desire to spend.
- **3) Credit:** availability of credit increases spending on cars, furniture, consumables, & other durables.
- **4) Interest Rates:** a rise in interest rates rewards savers, and punishes borrowers.

# Determinants of Consumption

- Increase in interest rates increases saving and decreases consumption of ‘big ticket’ items (cars, houses).
- **4) Taxes:** if income taxes go up, disposable income will decline ( $Y_d = Y - T$ ), consumers won’t be able to buy much.
- **5) Price Level:** a change in price level affects real value of wealth ( $M/P$ , how much money can buy), i.e. purchasing power.

# Determinants of Consumption

- Increase in price level reduces purchasing power of wealth and money, causing households to consume less and save more.
- **Consumption Types (Keynes).**
- **1) Autonomous Spending:** spending not influenced by current income.
- **2) Income-Dependent Spending:** spending determined by current income.
- Summarized in the equation called **consumption function.**

# Determinants of Consumption

- Total consumption = Autonomous consumption + Income-dependent consumption.
- $C = a + bY_D$
- C = current consumption, a = autonomous consumption, b = marginal propensity to consume, and  $Y_D$  = disposable income.
- Predicts how changes in disposable income affect consumer spending.
- Upward **shifts** of consumption function imply a rightward shift of aggregate demand curve.

# Determinants of Consumption

- Downward **shifts** of consumption function imply a leftward shift of aggregate demand curve.
- **Thus:** anything that changes value of autonomous consumption will shift the consumption function and aggregate demand curve.
- These range from expectations, wealth, credit, taxes, interest rates, etc.

# Investment

- **Investment Spending:** consists of purchase of new plant and equipment, acquisition of inventories, and residential construction.
- Injection to circular flow of income.
- **Market interest rate** is opportunity cost of investing.
- Firms invest if return they get exceeds return they would get if investing in interest-bearing bank account.
- **Determinants of Investment:**

# Investment

- **1) Expectations:** expectations of favourable future increase investors' confidence and current investment.
- Favourable tax or budget policy, new inventions or unanticipated sales increase expectations.
- Recessions, rail strike, wars, or oil shortage shake expectations.
- **2) Interest Rates:** high interest rates raise cost of borrowing and make plant and equipment purchases more expensive.

# Investment

- **3) Technology and Innovation:** technological advances and cost reductions have stimulated investment in laptop computers, cellular phones, video conferencing, fibre-optic networks, etc.
- **4) Cash Flow:** low cash flow generation from projects complicate future repayment of loans (payback period).
- Cash generating ability of projects encourage investment.

# Investment

- Keynes suggested demand for investment is not very sensitive to level of income.
- Thus, investment is treated as **autonomous spending**.
- Consumption represents a large proportion of total spending than investment.
- But, investment is quite volatile relative to consumption.
- It accounts for majority of **variation** in real GDP.

# Investment

- Economic forecasters pay special attention to surveys of business confidence and investment plans.
- **Nominal and Real Interest Rates**
- Interest rate is cost of funds.
- **Nominal Interest Rate (i):** total or stated interest rate.
- Has two components.
- **1) Real Interest Rate (r):** compensates for the use of money (price of money).

# Investment

- Interest rate existing on **default-free security** if no inflation is expected.
- **2) Expected Inflation ( $P^e$ ):** compensates for the expected increase/change in purchasing power.
- $i = r + P^e$ .
- Represents the **Fisher equation/hypothesis**.
- Nominal interest rates rises/falls point for point with expected inflation.
- Assuming real interest rate is known/constant.

# Investment

- The equation can be used to estimate/forecast nominal interest rate.
- Nominal interest rate and expected inflation are observable, unlike real interest rate.
- Therefore, expected real interest rate is predicted as  $r = i - P^e$ .
- And investment function, is  $I = I(r)$ .

# Government Spending and Taxes

- Government expenditure accounts for substantial part of GDP (about 16%) with big ticket items like defence, infrastructure, health, and education.
- Government gets revenue from **taxes**.
- Taxes are **positive** function of **income**.

$$T = f(Y) = T_0 + \alpha Y$$

- Taxes are offset by **transfer payments**.
- Net Taxes (NT) = T – TP.
- G is not directly related to income.

# Investment

- Spending is done based on policy priorities and can be financed by fees and borrowing.
- G is **autonomous**.
- Taxes can also be assumed to be autonomous in some cases.
- $Y = b(Y - T^*) + I(r) + G^*$ .

# Net Exports

- **Net exports** = Exports – Imports
- Net exports are not very sensitive to income changes (**autonomous**).
- However, in some cases, imports are a **positive** function of **income**.

$$M = f(Y) = M_0 + mY$$

- As income rises, spending on goods rises, including imports.
- Exports are a function of other countries' incomes, thus autonomous to our economy.

# Net Exports

- Net exports overall tend to fall as income rises.
- $NX = X - M = X - M_0 - mY$ .
- **Non-income determinants of exports:** domestic price level, foreign price level, domestic and overseas interest rates, foreign income levels, and exchange rate.

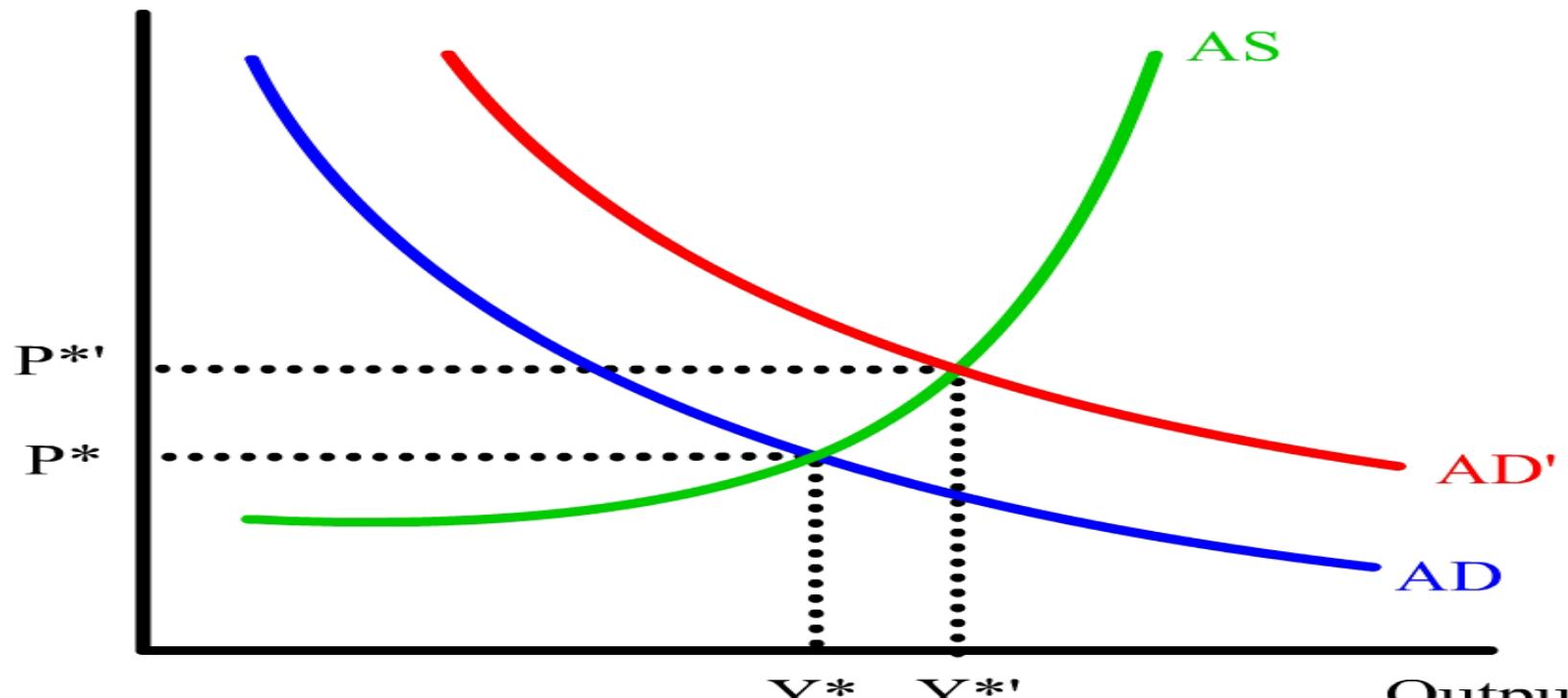
# Determinants of Aggregate Expenditure

- We discussed various determinants of each component of aggregate expenditure.
- We summarize here key forces that affect overall level of aggregate spending.
- **1) Fiscal Policy:** Change in government spending affects aggregate demand directly.
- Recall:  $AD = C + I + G + X - M$ .
- $G \uparrow \Rightarrow AD \uparrow$
- Change in Taxation affects aggregate demand through a change in disposable income that affects total consumption.

# Determinants of Aggregate Expenditure

- $T \downarrow \Rightarrow Y_D \uparrow \Rightarrow C \uparrow \Rightarrow AD \uparrow$
- **Expansionary** fiscal policy ( $G \uparrow$  or  $T \downarrow$ ) increases AD and shifts AD to the right.

Price Level



# Determinants of Aggregate Expenditure

- **Contractionary fiscal policy** ( $G \downarrow$  or  $T \uparrow$ ) decreases AD and shifts AD to the left.
- **2) Monetary Policy:** expansionary monetary policy increases expenditure on consumption, investment and net exports.
- $(M/P)^S \uparrow \Rightarrow r \downarrow \Rightarrow C \uparrow \& I(r) \uparrow \Rightarrow NX \uparrow \Rightarrow AD \uparrow$
- Lower interest rate causes outflow of capital, currency **depreciation**, increase exports (cheaper) and decrease imports (dearer) thus NX increases.
- **32** This shifts AD to the right.

# Determinants of Aggregate Expenditure

- **Contractionary** monetary policy decreases expenditure on consumption, investment and net exports.
- $(M/P)^S \downarrow \Rightarrow r \uparrow \Rightarrow C \downarrow \& I(r) \downarrow \Rightarrow NX \downarrow \Rightarrow AD \downarrow$
- Higher interest rate causes inflow of capital, currency appreciation, decrease exports (dearer) and increase imports (cheaper) thus NX decreases.
- This shifts AD to the left.
- **3) Wealth:** increase in wealth raises total consumption and shifts AD curve to the right.

# Determinants of Aggregate Expenditure

- **4) Expectations:** good expectations about the future will encourage households to consume more, and investors to invest more.
- Aggregate demand shifts to the right.
- **5) Foreign Income Levels:** increase in foreign income raises demand by foreigners for our goods / services.
- Increases net exports and shifts aggregate demand to the right.

# Determinants of Aggregate Expenditure

- **6) Exchange Rate:** a depreciation of currency makes exports cheaper, and imports more expensive.
- Exports will increase, and imports decrease.
- Combined effect increases net export expenditure and shifts the aggregate demand to the right.

# The Multiplier Process

- **Multiplier:** shows how aggregate expenditure and income changes when autonomous (exogenous) component of spending changes.
- It is a multiplication process.
- E.g. government increases spending by Tshs 10 bn.
- This spending becomes income to someone else.
- E.g. salaries to households paid by government.

# The Multiplier Process

- People spend some and save the rest (MPC, MPS).
- Let MPC = 0.80.
- 80% of initial increase in income (Tshs 8 bn) is spent, and Tshs 2 bn is saved.
- The Tshs 8 bn spending becomes income to other households.
- These households spend  $80\% \times \text{Tshs } 8 \text{ bn}$  (Tshs 6.4 bn) and save Tshs 1.6 bn.

# The Multiplier Process

- The Tshs 6.4 bn spending generates income to others, of which 80% x Tshs 6.4 is spent (Tshs 5.12) and the rest saved.
- The process continues until change in income fades away.
- $\Delta Y = \Delta G + MPC^1 \times \Delta G + MPC^2 \times \Delta G + MPC^3 \times \Delta G + \dots$
- $\Delta Y = \Delta G(1 + MPC^1 + MPC^2 + MPC^3 + \dots)$
- $\Delta Y = \Delta G(1 + MPC^1 + MPC^2 + MPC^3 + \dots)$
- Geometric Progression with  $G_1 = \Delta G$ , and  $r = MPC$ ,  $n = \infty$ .

# The Multiplier Process

$$\sum_{k=0}^{n-1} (\Delta G x r^k) = \Delta G \left( \frac{1 - r^n}{1 - r} \right)$$

$$\Delta Y = \Delta G \left( \frac{1 - MPC^\infty}{1 - MPC} \right)$$

- But  $0 < MPC < 1$ .

$$\Delta Y = \Delta G \left( \frac{1 - 0}{1 - MPC} \right) = \Delta G \left( \frac{1}{1 - MPC} \right)$$

$$\frac{\Delta Y}{\Delta G} = \left( \frac{1}{1 - MPC} \right)$$

- Formula gives ultimate increase in equilibrium real GDP from initial increase in spending.

# The Multiplier Process

$$C = a + bY_d = a + b(Y - NT)$$

- Goods Market equilibrium:

$$Income = Expenditure = C + I + G + (X - M)$$

- But  $C = a + bY_d = a + b(Y - NT)$ .

$$Y = a + bY - bNT + I + G + (X - M)$$

- Bringing Common Terms with Y to the left.

$$Y = \frac{1}{1-b}(a - bNT + I + G + X - M)$$

- Simple Expenditure Multiplier is:

$$\text{Multiplier} = \frac{1}{1-b} = \frac{1}{1-MPC} = \frac{1}{MPS}$$

# The Multiplier Process

- $\Delta \text{ income} = \text{multiplier} \times \Delta \text{ autonomous expenditure.}$
- The larger the value of MPC, the larger the value of the multiplier.
- Because larger fraction of income is spent leading to larger successive spendings.
- When MPC = 0.8
$$\Delta Y = \frac{1}{1-MPC} X \Delta G = \frac{1}{1-0.8} X 10 = \text{Tshs } 50 \text{ billion}$$
- However, in real world multipliers are not that big. Why?
- Because of leakages.

# The Multiplier Process

- For example, imports are a positive function of disposable income.
- $M = mY_d = m(Y - NT)$  and *Income = Expenditure* identity
- Where  $m$  = Marginal Propensity to Import.

$$Y = a + bY - bNT + I + G + X - m(Y - NT)$$

$$Y = \frac{1}{1-b+m} (a - bNT + I + G + X - mNT)$$

$$\text{Multiplier} = \frac{1}{1-b+m}$$

# The Multiplier Process

- If proportional income tax is introduced:
- $C = a + bY_d = a + b(Y - T)$  where  $T = t \cdot Y$  and  $t$  = proportion of income that is taxed.
- $C = a + b(Y - tY) = a + b(1 - t)Y$
- At equilibrium,  $Y = AE$

$$Y = a + b(1 - t)Y + I + G + (X - M)$$

$$Y = \frac{1}{1 - b(1 - t)} (a + I + G + X - M)$$

$$\text{Multiplier} = \frac{1}{1 - b(1 - t)} = \frac{1}{1 - b + bt}$$

# The Multiplier Process

- Introducing both the proportional income tax and the variable net exports:
- Note that,  $M = mY$

$$Y = a + b(1-t)Y + I + G + X - mY$$

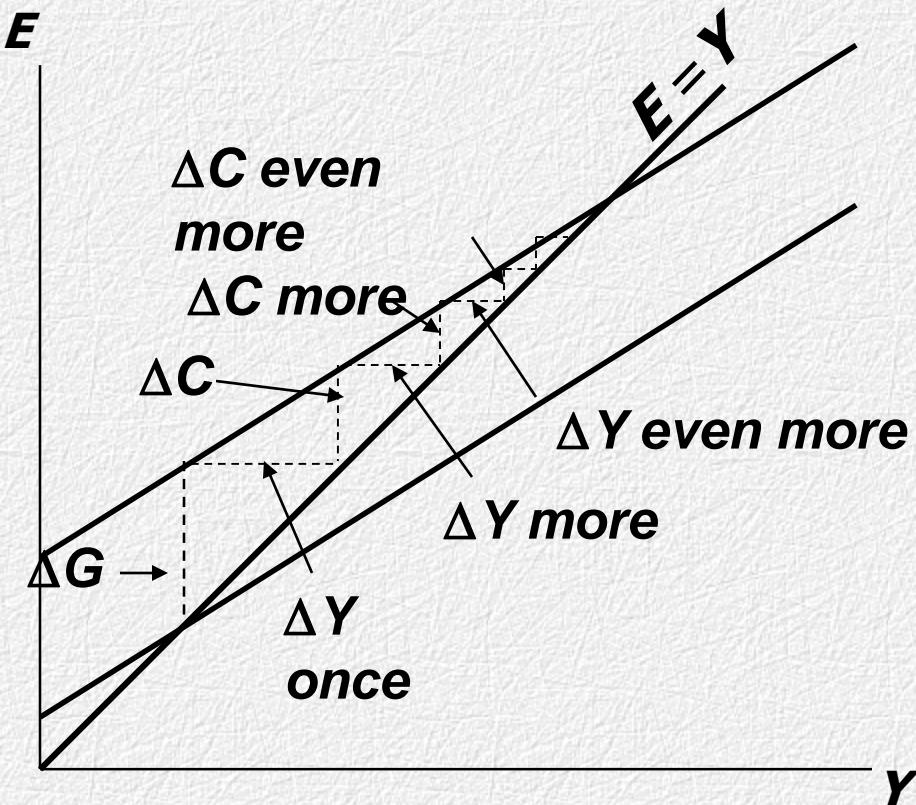
$$Y = \frac{1}{1-b+bt+m} (a + I + G + X)$$

$$\text{Multiplier} = \frac{1}{1-b+bt+m}$$

# Why the Multiplier is Greater than 1?

- **Def:** Government purchases multiplier:  $\frac{\Delta Y}{\Delta G}$
- Initially, the increase in  $G$  causes an equal increase in  $Y$ :  $\Delta Y = \Delta G$ .
- But  $\uparrow Y \Rightarrow \uparrow C$
- $\Rightarrow$  further  $\uparrow Y$
- $\Rightarrow$  further  $\uparrow C$
- $\Rightarrow$  further  $\uparrow Y$
- So the government purchases multiplier will be greater than one.

# An Increase in Government Purchases



# Sum Up Changes in Expenditure

$$\begin{aligned}\Delta Y &= \Delta G + (\text{MPC} \bullet \Delta G) + \text{MPC}(\text{MPC} \bullet \Delta G) \\ &\quad + \text{MPC}(\text{MPC}(\text{MPC} \bullet \Delta G)) + \dots \\ &= \Delta G + (\text{MPC}^1 \Delta G) + (\text{MPC}^2 \Delta G) + (\text{MPC}^3 \Delta G) \dots\end{aligned}$$

This is a standard geometric series from algebra:

$$= \frac{1}{1 - \text{MPC}} \Delta G$$

So the multiplier is:

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{MPC}} > 1 \text{ for } 0 < \text{MPC} < 1$$

# Solving for $\Delta Y$

$$Y = C + I + G \quad \text{equilibrium condition}$$

$$\Delta Y = \Delta C + \Delta I + \Delta G \quad \text{in changes}$$

$$= \Delta C + \Delta G \quad \text{because } I \text{ exogenous}$$

$$= MPC \times \Delta Y + \Delta G \quad \text{because } \Delta C = MPC \Delta Y$$

Collect terms with  $\Delta Y$  on the left side of the equals sign:

$$(1 - MPC) \times \Delta Y = \Delta G$$

Finally, solve for  $\Delta Y$ :

$$\Delta Y = \left( \frac{1}{1 - MPC} \right) \times \Delta G$$

# Algebra Example

Suppose consumption function:  $C = a + b(Y - T)$

where  $a$  and  $b$  are some numbers ( $MPC = b$ )

and other variables exogenous:

$$I = \bar{I}, T = \bar{T}, G = \bar{G}$$

Use Goods market equilibrium condition:

$$Y = C + I + G$$

# Algebra Example

$$Y = C + I + G$$

$$Y = a + b(Y - \bar{T}) + \bar{I} + \bar{G}$$

Solve for  $Y$ :  $Y - bY = a - b\bar{T} + \bar{I} + \bar{G}$

$$(1 - b)Y = a - b\bar{T} + \bar{I} + \bar{G}$$

$$Y = \frac{1}{1 - b} \bar{G} + \frac{1}{1 - b} \bar{I} + \frac{a}{1 - b} - \frac{b}{1 - b} \bar{T}$$

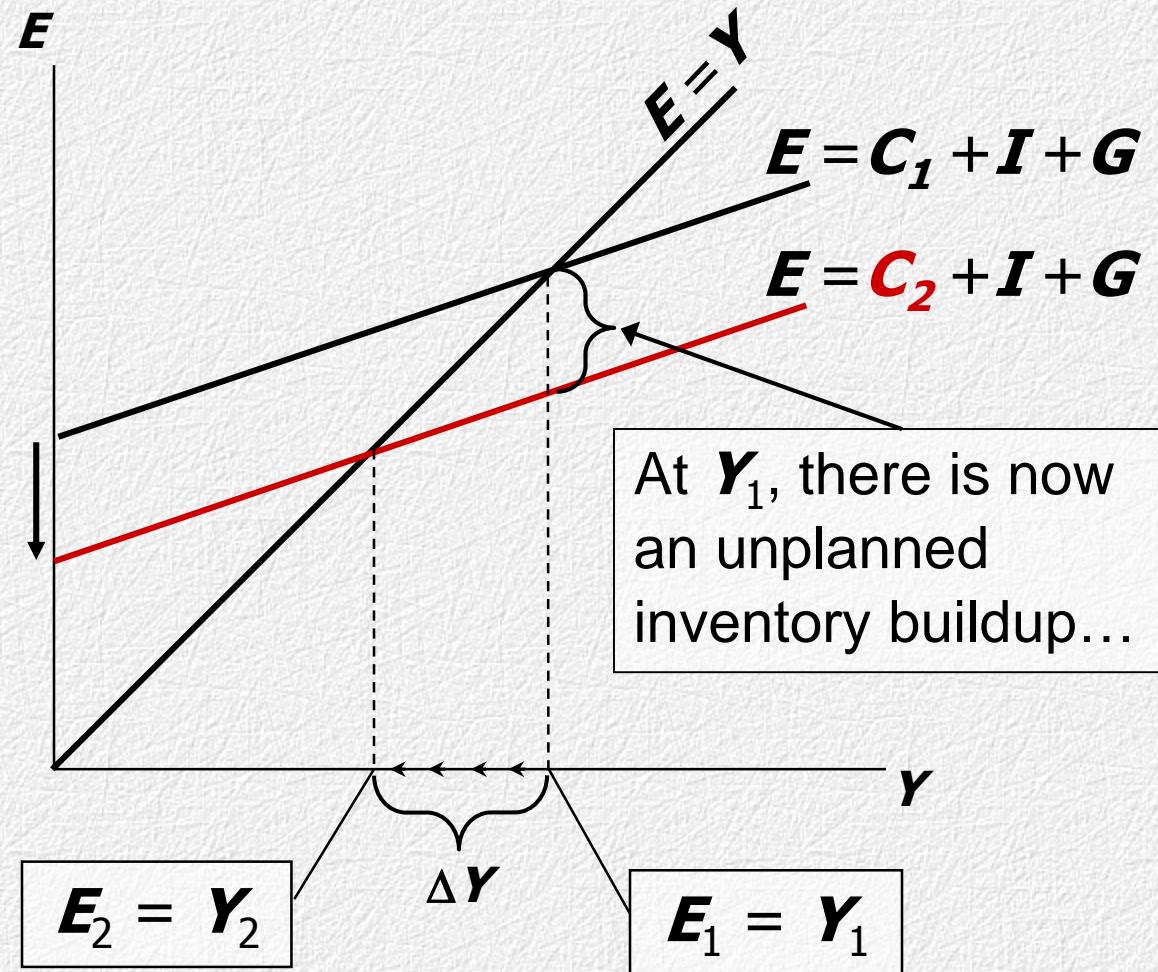
So if  $b = MPC = 0.75$ , multiplier =  $1/(1 - 0.75) = 4$ .

# An Increase in Taxes

Initially, the tax increase reduces consumption, and therefore  $E$ :

$$\Delta C = -MPC \Delta T$$

...so firms reduce output, and income falls toward a new equilibrium



# Tax Multiplier

**Tax Multiplier:** how much does output fall for a unit rise in taxes:  $\Delta \mathbf{Y} / \Delta \mathbf{T}$

Can read the tax multiplier from the algebraic solution above:

$$\mathbf{Y} = \frac{1}{1-\mathbf{b}} \bar{\mathbf{G}} + \frac{1}{1-\mathbf{b}} \bar{\mathbf{I}} + \frac{\mathbf{a}}{1-\mathbf{b}} - \frac{\mathbf{b}}{1-\mathbf{b}} \bar{\mathbf{T}}$$

So:  $\Delta \mathbf{Y} = \left( \frac{-\mathbf{b}}{1-\mathbf{b}} \right) \cdot (\Delta \mathbf{T})$  where  $\mathbf{b}$  is the MPC.

If  $\mathbf{b}=0.75$ , tax multiplier =  $-0.75/(1 - 0.75) = -3$ .

# Solving for $\Delta Y$

$$\Delta Y = \Delta C + \Delta I + \Delta G$$

eq'm condition in changes

$$= \Delta C$$

$I$  and  $G$  exogenous

$$= MPC \times (\Delta Y - \Delta T)$$

Solving for  $\Delta Y$ :  $(1 - MPC) \times \Delta Y = -MPC \times \Delta T$

Final result:

$$\Delta Y = \left( \frac{-MPC}{1 - MPC} \right) \times \Delta T$$

# The Tax Multiplier

**Question:** How is this different from the government spending multiplier?

- 1) Negative:** An increase in taxes reduces consumer spending, which reduces equilibrium income.
- 2) Smaller (absolute value) than the govt spending multiplier:** Consumers **save** the fraction ( $1-MPC$ ) of a tax cut, so the initial boost in spending from a tax cut is smaller than from an equal increase in **G**.

# Full Employment Output

- **Full-Employment Output:** production level achieved by use of all available factors of production.
- On IS-LM-FE framework, its constant at  $Y^*$  and represented by the vertical line called **FE line**.
- A change in  $Y^*$  results from change in current productivity of capital or labour.
- Also note that, **during SR**: prices are fixed, output is determined by aggregate demand, and unemployment is negatively related to output.

# Full Employment Output

- **During LR:** prices are flexible, output is determined by factors of production and technology, and unemployment equals to its natural rate.

# Goods Market and the IS Curve

- **Planned and Actual Investment Equality.**
- Is it possible that  $Y \neq$  Aggregate Expenditure???
- When some production of output is not sold??
- So that  $Y >$  Aggregate Expenditure??
- The answer is **NO**.
- Unsold output is counted as inventory and added to investment (expenditure side).
- Explored on the difference btn planned and actual investment.

# Goods Market and the IS Curve

- **Planned Investment ( $I_P$ ):** investments firms plan to undertake in a year.
- **Actual Investment ( $I_A$ ):** amount of investment actually undertaken during the year.
- $I_A = I_P + \text{Unplanned Changes in Inventories.}$
- If  $Y > \text{Planned Expenditure}$ , firms have produced 'too much', and inventories will rise.
- In next period, firms cut back on production, and  $Y = \text{Aggregate Expenditure}$ .
- When there are no unplanned changes in inventories,  $I_P = I_A$ , and GDP is at equilibrium.

# Goods Market and the IS Curve

- Note:  $AE = C + I_P + G + (X - M)$  OR
- $AE = C + I + G + (X - M)$
- Whenever  $I$  is used, it means planned investment  $I_P$ .

# Equilibrium Aggregate Output (Income)

aggregate output /  $Y$

planned aggregate expenditure /  $AE$  /  $C + I$

equilibrium:  $Y = AE$ , or  $Y = C + I$

## Disequilibria:

$$Y > C + I$$

aggregate output > planned aggregate expenditure

Inventory investment is greater than planned.

Actual investment is greater than planned investment.

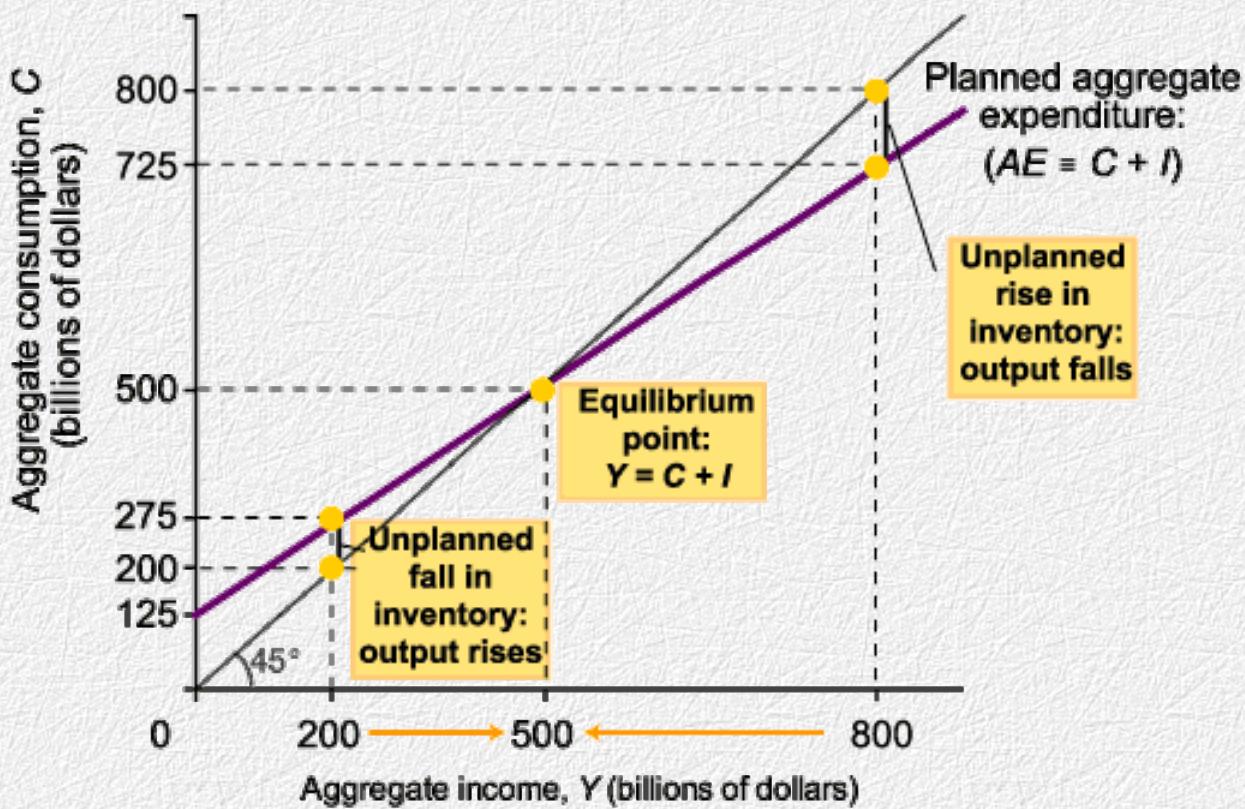
$$C + I > Y$$

planned aggregate expenditure > aggregate output

Inventory investment is smaller than planned.

There is unplanned inventory disinvestment.

# Inventory Adjustment



# Deriving the Planned Aggregate Expenditure Schedule.

$$C = 100 + .75Y \quad I = 25$$

Deriving the Planned Aggregate Expenditure Schedule and Finding Equilibrium (All Figures in Billions of Dollars) The Figures in Column 2 are Based on the Equation  $C = 100 + .75Y$ .

| (1)                               | (2)                       | (3)                | (4)   | (5)   | (6)                        |
|-----------------------------------|---------------------------|--------------------|---|---|----------------------------|
| AGGREGATE OUTPUT (INCOME) ( $Y$ ) | AGGREGATE CONSUMPTION (C) | PLANNED INVESTMENT | PLANNED AGGREGATE EXPENDITURE ( $AE$ )<br>$C + I$ | UNPLANNED INVENTORY CHANGE<br>$Y - (C + I)$ | EQUILIBRIUM? ( $Y = AE?$ ) |
| 100                               | 175                       | 25                 | 200   | - 100                                       | No                         |
| 200                               | 250                       | 25                 | 275   | - 75  | No                         |
| 400                               | 400                       | 25                 | 425   | - 25  | No                         |
| 500                               | 475                       | 25                 | 500   | 0   | Yes                        |
| 600                               | 550                       | 25                 | 575   | + 25  | No                         |
| 800                               | 700                       | 25                 | 725   | + 75  | No                         |
| 1,000                             | 850                       | 25                 | 875   | + 125                                       | No                         |

# Finding Equilibrium Output Algebraically

$$(1) \quad Y = C + I$$

$$(2) \quad C = 100 + .75Y$$

$$(3) \quad I = 25$$

By substituting (2) and (3) into (1) we get:

$$Y = 100 + .75Y + 25$$

$$Y = 100 + .75Y + 25$$

There is only one value of Y for which this statement is true. We can find it by rearranging terms:

$$Y - .75Y = 100 + 25$$

$$Y - .75Y = 125$$

$$.25Y = 125$$

$$Y = \frac{125}{.25} = 500$$

# The Keynesian Cross

- A simple closed economy model in which income is determined by expenditure.  
*(due to J.M. Keynes)*
- Notation:
  - $I$  = *planned* investment
  - $E = C + I + G$  = planned expenditure
  - $Y$  = real GDP = actual expenditure
- Difference between actual & planned expenditure: unplanned inventory investment

# Elements of the Keynesian Cross

consumption function:

$$C = C(Y - T)$$

govt policy variables:

$$G = \bar{G}, \quad T = \bar{T}$$

for now,  
investment is exogenous:

$$I = \bar{I}$$

planned expenditure:

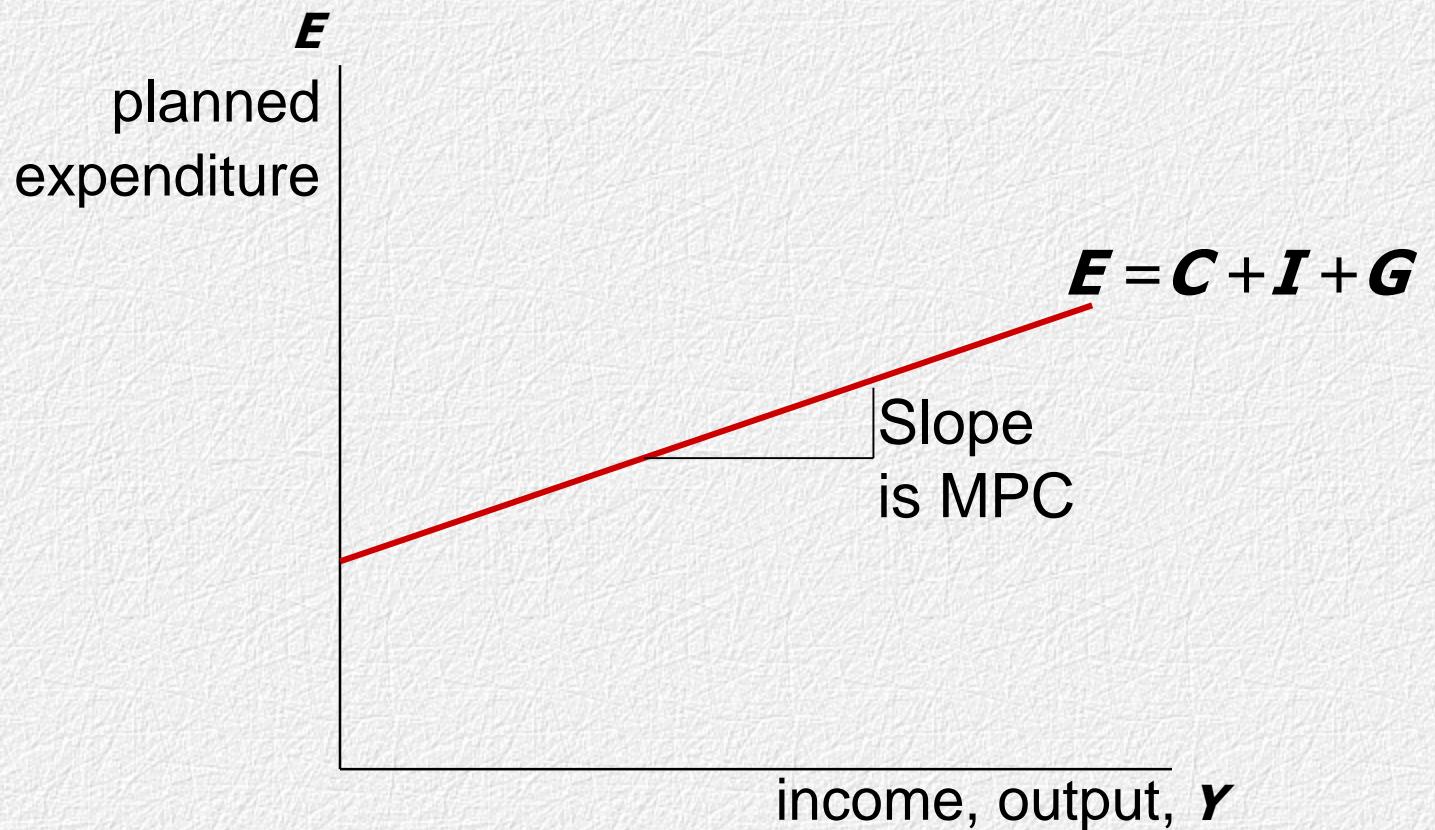
$$E = C(Y - \bar{T}) + \bar{I} + \bar{G}$$

Equilibrium condition:

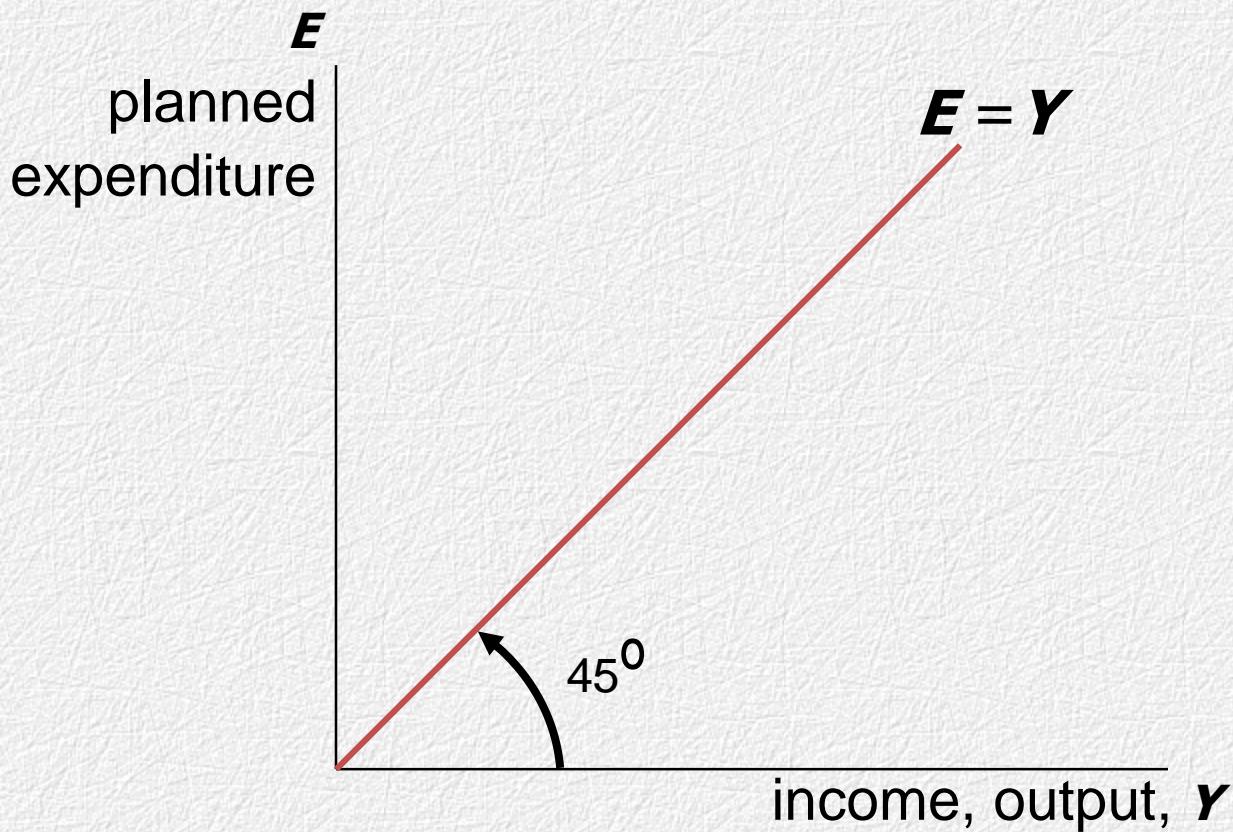
Actual expenditure = Planned expenditure

$$Y = E$$

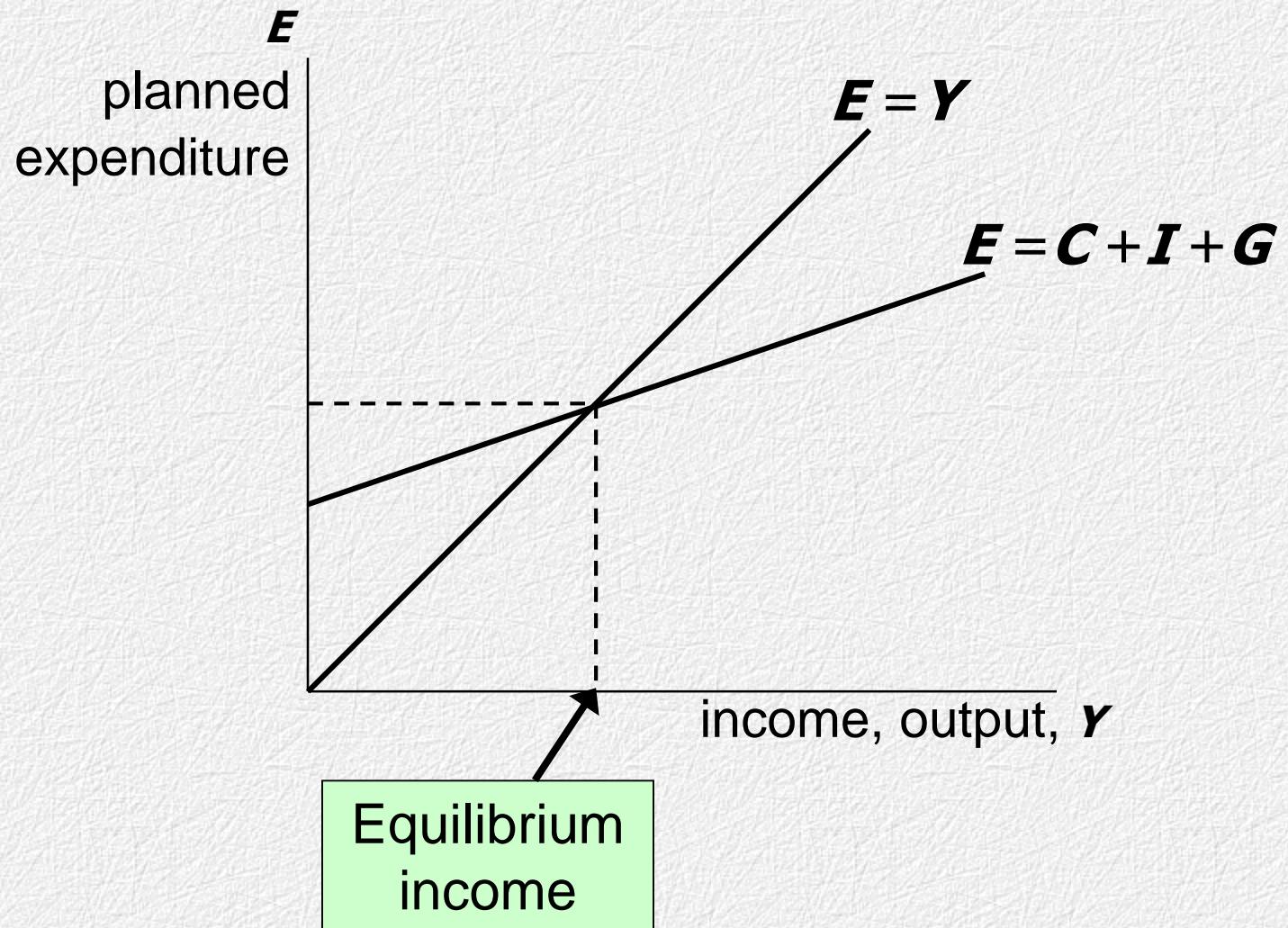
# Graphing Planned Expenditure



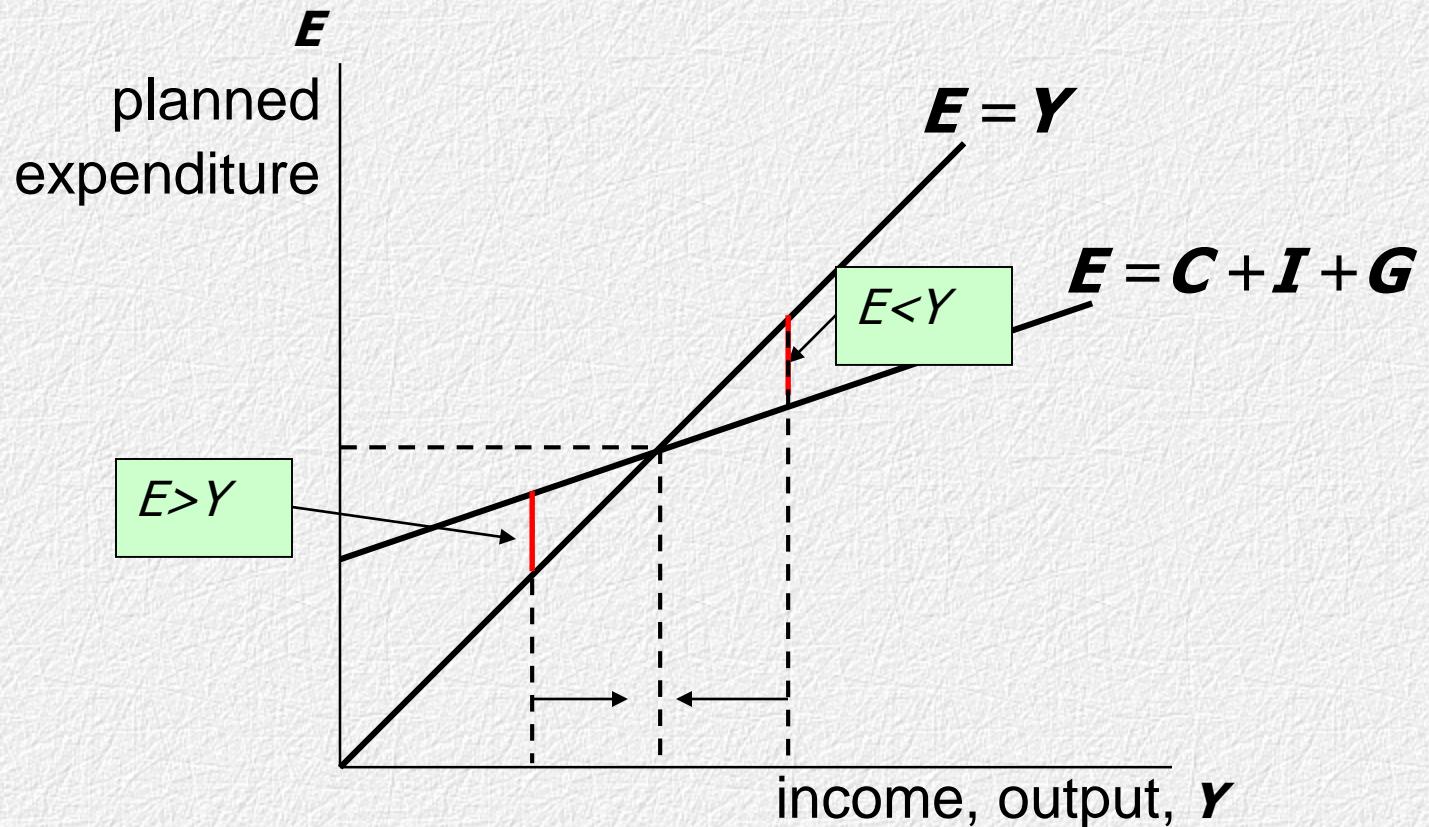
# Graphing the Equilibrium Condition



# The Equilibrium Value of Income



# The Equilibrium Value of Income



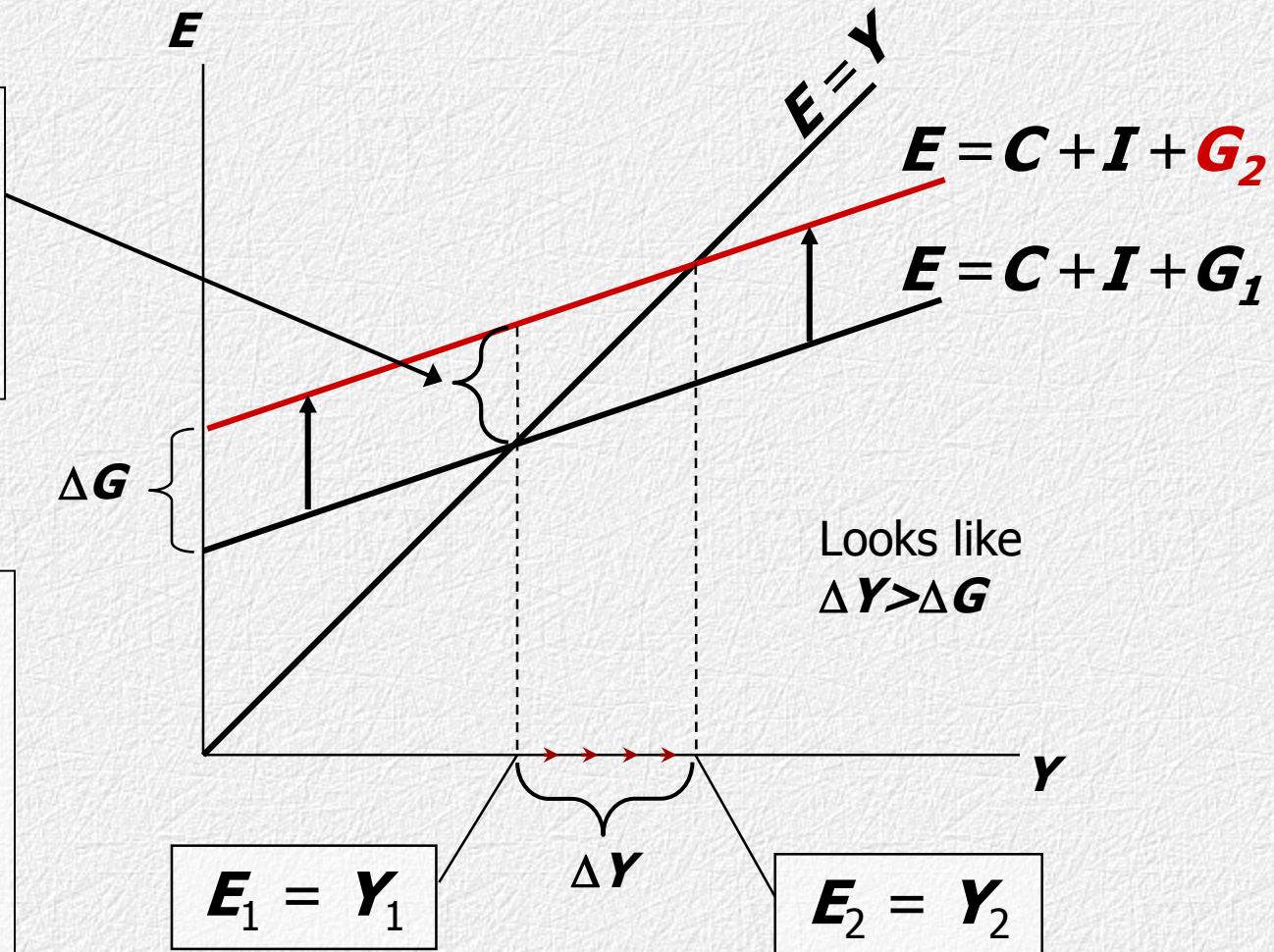
$E > Y$ : depleting inventories: must produce more.

$E < Y$ : accumulating inventories: must produce less.

# An Increase in Government Purchases

At  $Y_1$ ,  
there is now an  
unplanned drop  
in inventory...

...so firms  
increase output,  
and income  
rises toward a  
new equilibrium



# A Question to Consider:

- Using the Keynesian Cross, what would be the effect of an increase in investment on the equilibrium level of income/output.

# Building the *IS* curve

**IS Curve:** a graph of all combinations of  $r$  and  $Y$  that result in goods market equilibrium,

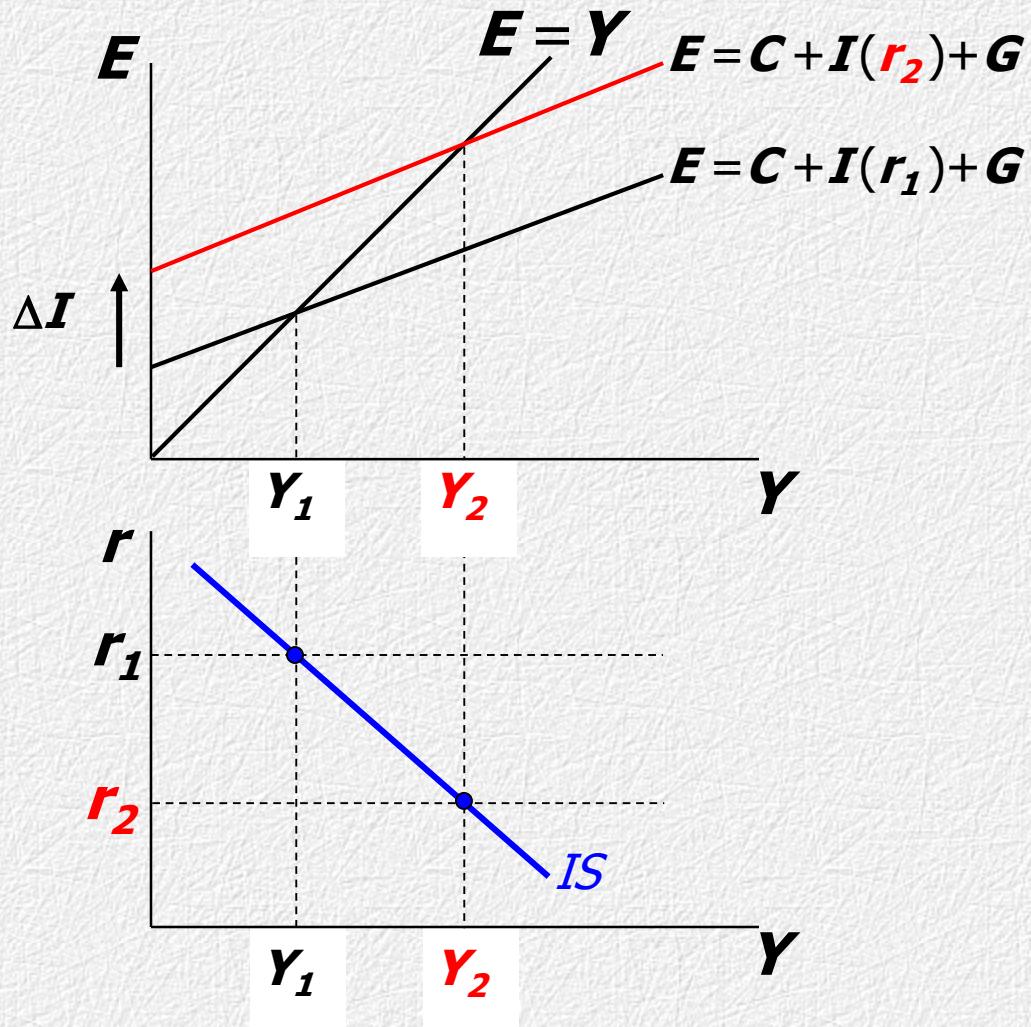
Actual expenditure (output) = planned expenditure

The equation for the *IS* curve is:

$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$

# Deriving the *IS* curve

$\downarrow r \Rightarrow \uparrow I$   
 $\Rightarrow \uparrow E$   
 $\Rightarrow \uparrow Y$



# Understanding the *IS* Curve's Slope

- The *IS* curve is **negatively sloped**.
- Intuition:  
A fall in the interest rate motivates firms to increase investment spending, which drives up total planned spending ( $E$ ).  
To restore equilibrium in the goods market, output (a.k.a. actual expenditure,  $Y$ ) must increase.

# Fiscal Policy and the *IS* curve

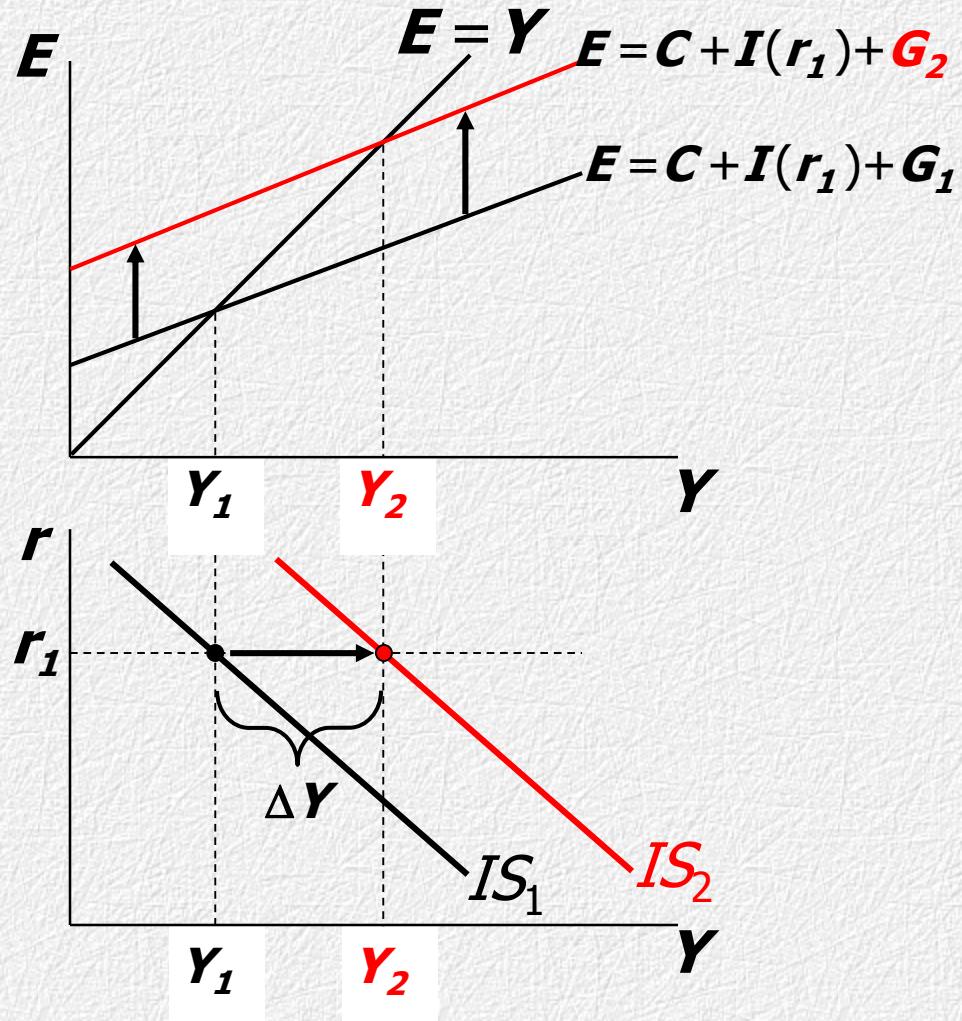
- We can use the *IS-LM* model to see how fiscal policy (**G** and **T**) can affect aggregate demand and output.
- Let's start by using the Keynesian Cross to see how fiscal policy shifts the *IS* curve...

# Shifting the *IS* curve: $\Delta G$

At any value of  $r$ ,  
 $\uparrow G \Rightarrow \uparrow E \Rightarrow \uparrow Y$   
...so the IS curve  
shifts to the right.

The horizontal  
distance of the  
IS shift equals

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



# Algebra Example for IS Curve

Suppose the expenditure side of the economy is characterized by:

$$C = 95 + 0.75(Y-T)$$

$$I = 100 - 100r$$

$$G = 20, T=20$$

Use the goods market equilibrium condition:

$$Y = C + I + G$$

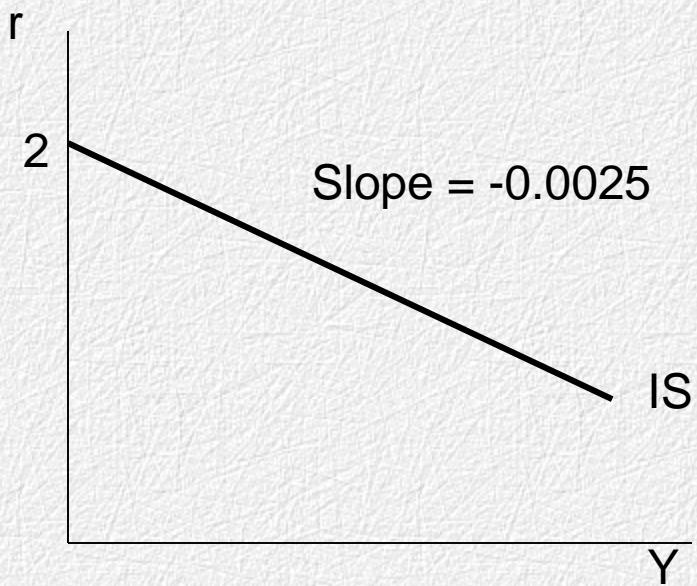
$$Y = 215 + 0.75(Y-20) - 100r$$

$$0.25Y = 200 - 100r$$

IS:  $Y = 800 - 400r$  or write as

IS:  $r = 2 - 0.0025Y$

# Graph the IS curve



$$\text{IS: } r = 2 - 0.0025Y$$

# Slope of IS Curve

Suppose that investment expenditure is  
“**more responsive**” to the interest rate:

$$I = 100 - 100r \quad \text{200r}$$

Use the goods market equilibrium condition:

$$Y = C + I + G$$

$$Y = 215 + 0.75(Y-20) - 200r$$

$$0.25Y = 200 - 200r$$

IS:  $Y = 800 - 800r$  or write as

IS:  $r = 1 - 0.00125Y$  (slope is lower)

So this makes the IS curve **flatter**: A fall in  $r$  raises  $I$  more, which raises  $Y$  more.

# Goods Market Equilibrium and the IS Curve

- A closed economy at equilibrium:
- $Y^0 = b(Y^0 - T^0) + I(r^0) + G^0$
- Where superscript 0 shows that starting position.
- If income increases to  $Y^1$ , disposable income increases to  $Y^1 - T^0$ .
- Consumption increases to  $b(Y^1 - T^0)$ .
- Increase in consumption is lower than increase in income because  $b < 1$ .
- Recall:  $Y_D = MPC + MPS$ .
- That is, some of income is saved.

# Goods Market Equilibrium and the IS Curve

- Thus at  $r^0$  interest rate, aggregate expenditure will be less than income, and disequilibrium would result.
  - A decrease in interest rate is needed to increase investment, aggregate spending and restore equilibrium.
  - Interest rate ( $r$ ) is a very key adjusting variable here.
  - In money markets, increase in aggregate income, increases savings as well.
- Recall:  $Y_D = MPS + MPC$ .

# Goods Market Equilibrium and the IS Curve

- With constant MPC, the only factor to bring equilibrium is interest rate.
- The increase in income that results to less than proportional increase in aggregate spending as we saw above,
- Income Increase > Aggregate Expenditure Increase
- Income Increase results to increase in savings (MPC is constant).
- Increase in savings brings down interest rate (increases liquidity in financial system).

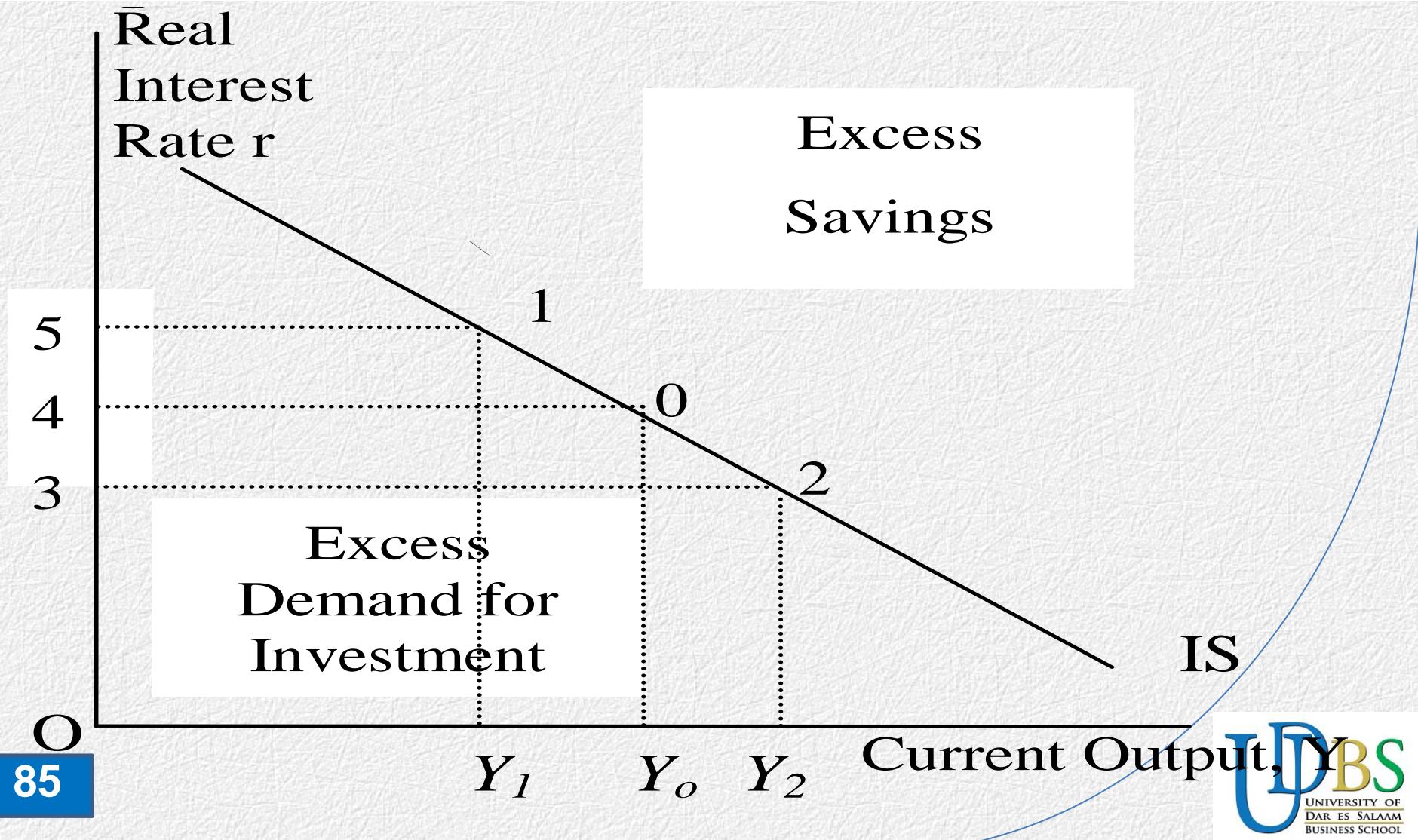
# Goods Market Equilibrium and the IS Curve

- Lower interest rates encourage investment, which increases aggregate spending and equilibrates income and expenditure.
- To explain this phenomenal event, two explanations will be offered.
- Equilibrium in investable funds market (**S=I Equality**).
- Equilibrium in goods market (**Keynesian Cross**).

# Goods Market Equilibrium and the IS Curve

- **IS Curve:** summarizes equilibrium in goods market by showing combination of current output and real interest rate for which quantities of goods demanded and supplied are equal.
- Its slopes **downward to the right** because at higher levels of current output, current savings rise, and real interest rates fall to restore equilibrium in the goods market.
- Points above IS curve represent **excess supply** of goods, and points below represent **excess demand** for goods.

# Goods Market Equilibrium and the IS Curve



# Equalization of Savings and Investment

- **Good Market Equilibrium:**
- Current Output ( $Y$ ) = Aggregate Expenditure ( $E$ ).
- Recall:  $E = C + I + G$  (closed economy).
- At equilibrium:  $Y = C + I + G$ .
- National consumption depends on consumption:  $C = f(Y)$
- Functional Form:  $C = a + bY_d$
- Where:  $a$  = autonomous consumption,  $b$  = MPC, and  $Y_d$  = disposable income, and  
 $Y_d = Y - T$ .

# Equalization of Savings and Investment

- Government expenditure ( $G$ ) and lump sum tax ( $T$ ) are exogenous (policy) variables.
- $G = G^0$  and  $T = T^0$
- National Investment depends on interest rate  $I = I(r)$ .
- Thus we have:  $Y = a + b(Y - T) + I(r) + G^0$
- We can re-write as:  $Y - C = I(r) + G^0$
- Subtract Lump Sum Tax:  $Y - T^0 - C = I(r) + G^0 - T$
- Rearranging:  $(Y - T^0 - C) + (T^0 - G^0) = I(r)$ .
- **Private Saving:**  $Y - T^0 - C$
- **Public/Government Saving:**  $T^0 - G^0$

# Equalization of Savings and Investment

- **Total National Saving:**  $(Y - T^0 - C) + (T^0 - G^0)$
- Goods Market Equilibrium: **National Saving = National Investment.**
- $S = I(r)$
- From:  $S = (Y - T^0 - C) + (T^0 - G^0)$
- National Saving Depends on  $Y$ ,  $T^0$ ,  $C$  and  $G^0$ .
- However,  $T^0$ , and  $G^0$  are exogenous, and  $C$  depends on  $Y$ .
- Thus, national saving is determined by  $Y$ .
- $S = S(Y)$ .

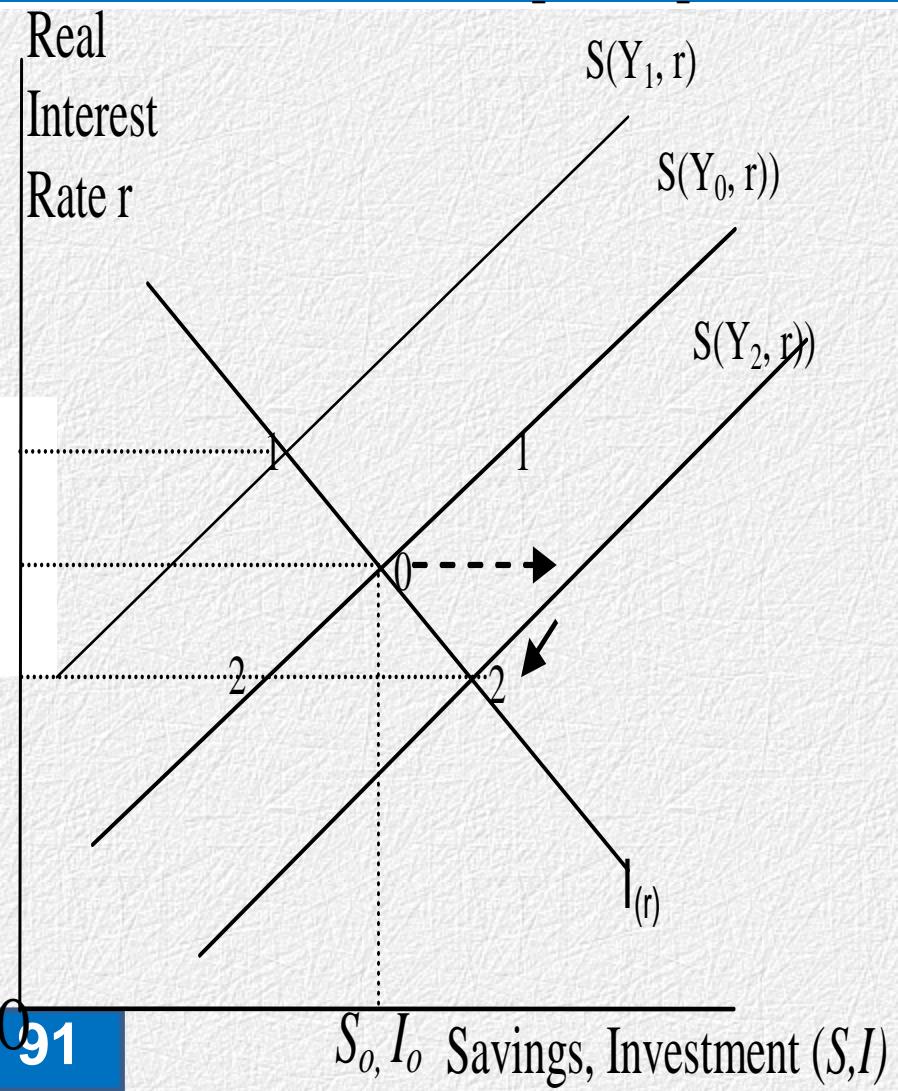
# Equalization of Savings and Investment

- National Investment is determined by interest rate,  $I = I(r)$ .
- In reality, interest rate also determines amount of savings.
- $S = S(Y, r)$
- Combination of income and interest rate that ensures savings = investment is the IS Curve.
- $S(Y, r) = I(r)$
- Savings increases with interest rate while investment decreases with interest rate.
- Change in income shifts the savings curve.

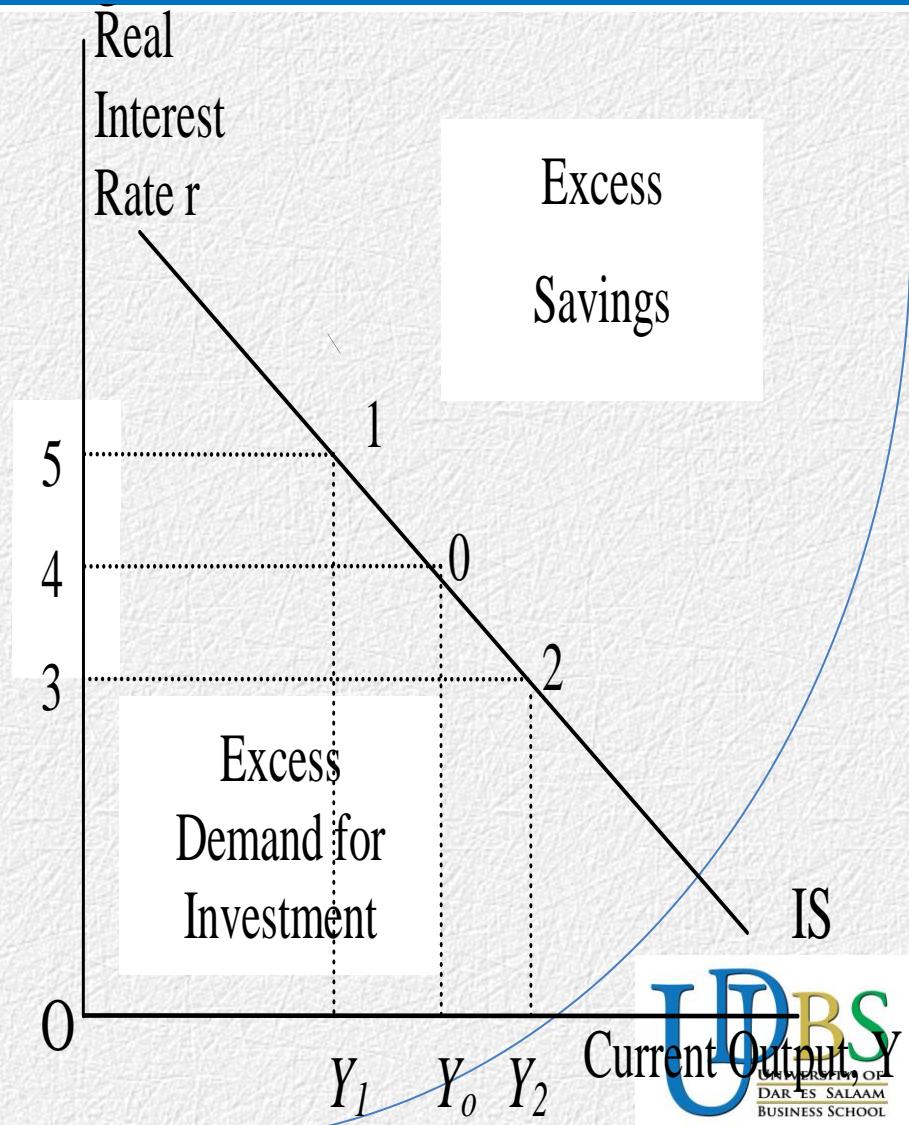
# Equalization of Savings and Investment

- That creates inequality between saving and investment.
- This forces interest rate to adjust.
- Increase in income causes savings to increase.
- If interest rate is unchanged, there is excess savings.
- This forces interest rate down.
- Hence negative relationship between interest rate and income.

# Equalization of Savings and Investment



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# Goods Market Equilibrium: IS Curve in Keynesian Cross

- **IS Curve:** summarizes equilibrium in goods market by ensuring when interest rate changes, total planned expenditure changes also to ensure equilibrium of current output and spending.
- **Goods Mkt Equil.:**  $Y = AE = C(y) + I(r) + G^0$
- **Slope of Expenditure Line:**  $MPC < 1$ .
- In Y-E plane,  $E = Y$  is a  $45^\circ$  line with slope of 1.

# Goods Market Equilibrium: IS Curve in Keynesian Cross

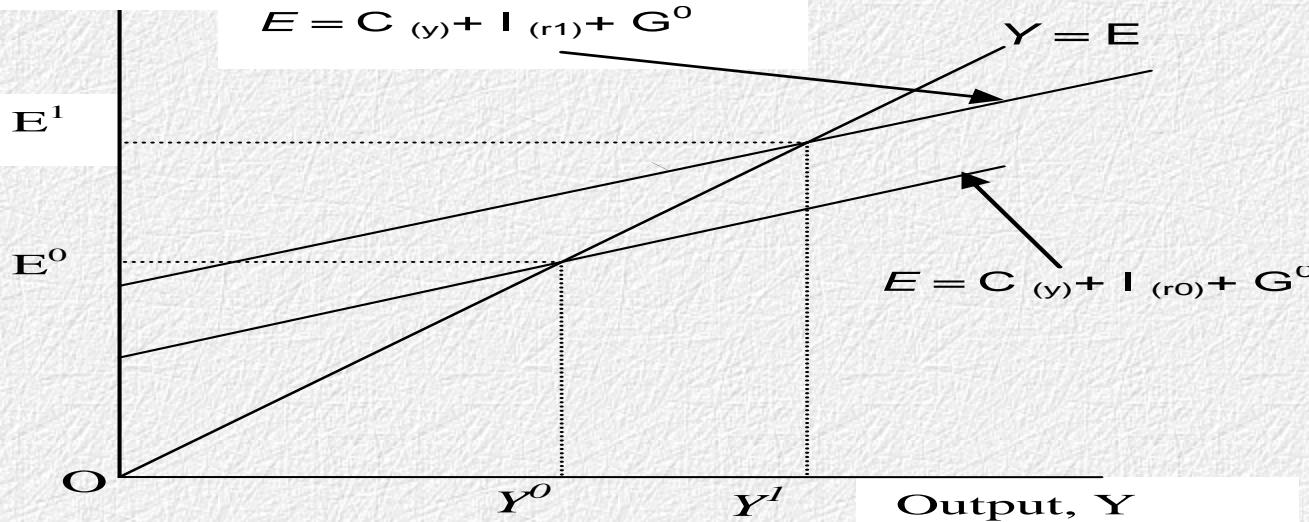
- Goods market is in equilibrium when AE line cuts the  $45^0$  line.
- Vertical Axis: **AE**, Horizontal Axis: **Aggregate Output**.
- At  $r^0$  interest rate, E curve,  $E = C(y) + I(r^0) + G^0$
- **Decrease** in interest rate from  $r^0$  to  $r^1$  leads to **increase** in investment and AE and **upward** shift of the AE curve as shown.
- With increase in AE (DD side), output required to maintain equilibrium in goods markets increases as well.

# Goods Market Equilibrium: IS Curve in Keynesian Cross

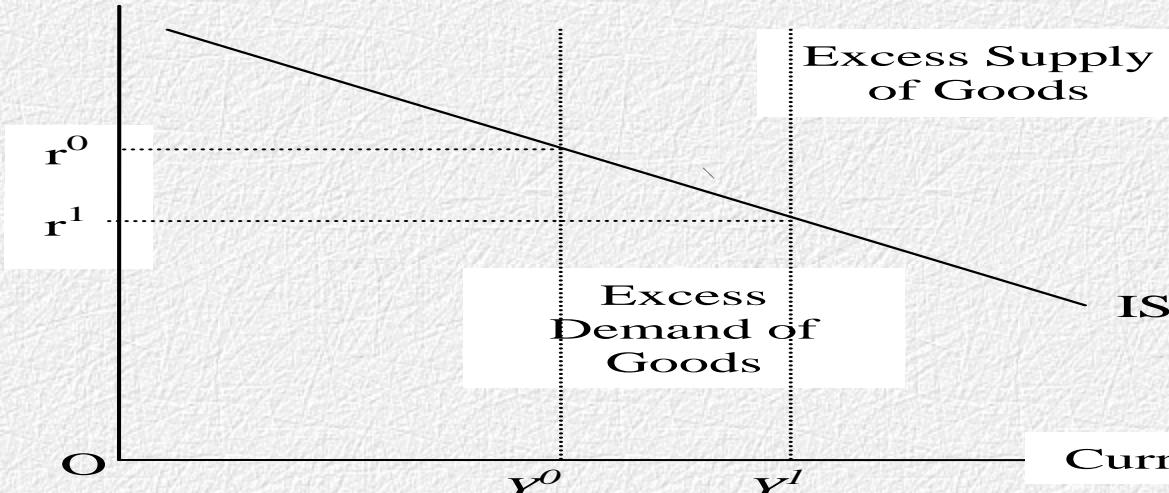
- Thus **decrease** in interest rate leads to **more** output.
- Interest rate and aggregate income are **inversely** related.
- Because an increase in interest rate decreases investment and total planned expenditure thus a need for current output to decrease to ensure equilibrium in the goods market.

# Goods Market Equilibrium: IS Curve in Keynesian Cross

Expenditure



Real Interest Rate



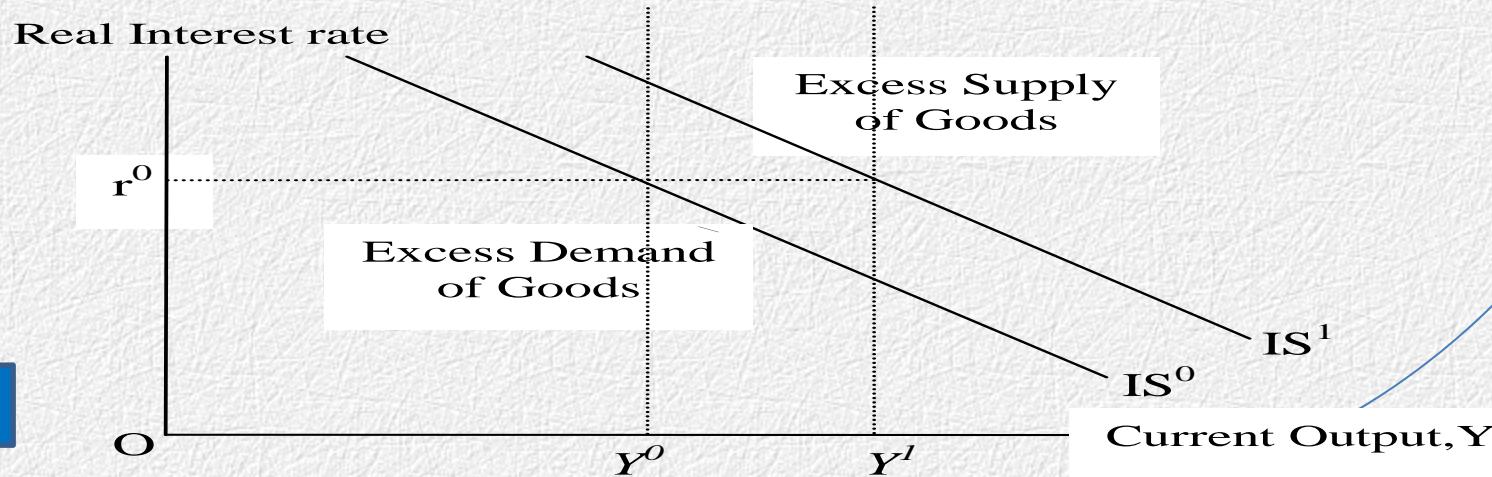
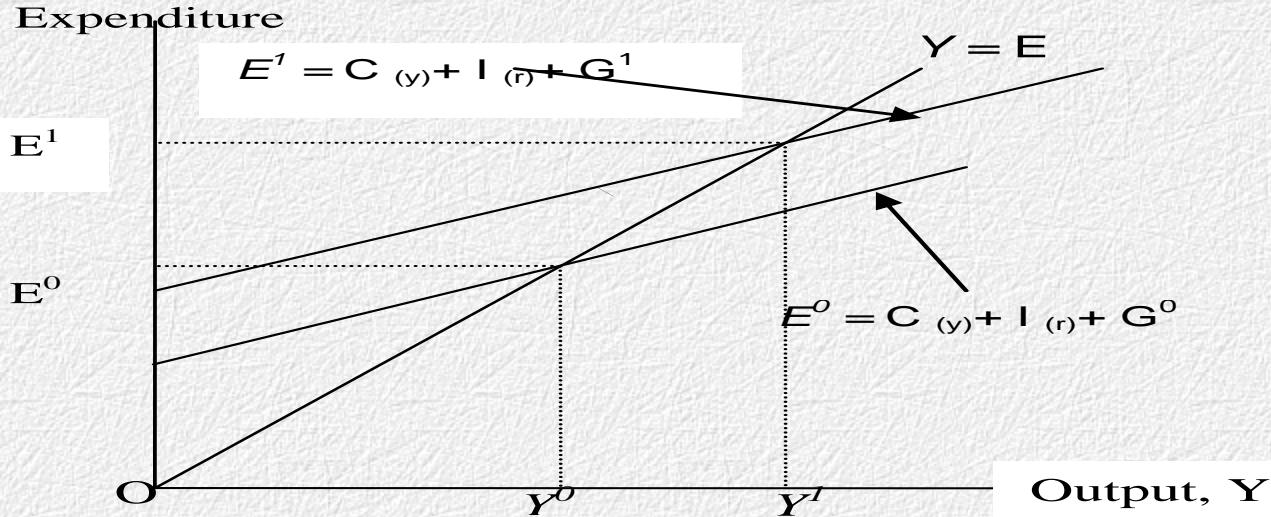
# Shifts in the IS Curve

- **Shift** is caused by change in AE caused by factors other than change in interest rate.
- Include: autonomous consumption, government expenditure, foreign demand for our goods, households' willingness to save, expected future profitability.
- AE is higher or lower for a given level of interest rate.
- Suppose government spending increases from  $G^0$  to  $G^1$

# Shifts in the IS Curve

- At same level of interest rate, aggregate spending increases from  $E^0$  to  $E^1$
- Output required to maintain equilibrium in goods market is also higher.
- Thus equilibrium output increases from  $Y^0$  to  $Y^1$  at same level of interest rate  $r^0$ .
- That entails a shift of the IS curve to establish new equilibrium given by  $IS^1$ .

# Shifts in the IS Curve



# Summary of IS Curve

- IS curve shows how aggregate demand for output responds to changes in interest rate, and summarizes equilibrium in the goods market.
- Represents combination of **current output** and **real interest rate** for which quantities of goods demanded and supplied are equal.
- **Slopes downward to the right**, at higher levels of output, current savings rises and real interest rate falls, which restores equilibrium in the goods markets.

# Summary of IS Curve

- Points **above** IS curve represent **excess supply** of goods and points **below** represent **excess demand** for goods.

