



Bonga University  
College of Business and Economics  
Department of Economics  
Macroeconomics-I (Econ2031) Reading material

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## CHAPTER ONE

### The State of Macroeconomics

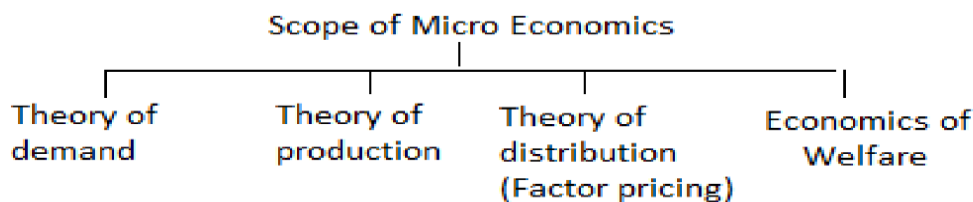
**Introduction:** The subject matter of economics has been divided into two parts- Micro economics and Macroeconomics. Ragner Frisch of Oslo University (Norway) was the first economist to use these terms in 1933 which now have been adopted by economists all over the world.

#### Micro Economics

The term ‘**micro**’ is derived from the Greek word ‘**mikros**’ which means ‘**small**’. Therefore micro economics studies the economic behavior of individual units of an economy and not an economy as a whole. It concerns itself with the detailed study of individual decision-makers like a household, a firm or individual consumers and producers.

How a consumer maximizes his satisfaction with his limited income or how a firm maximizes its profits or how the wage of a worker is determined are all instances of micro analytical approach. According to Prof. Boulding —*Micro economics is the study of particular firms, particular households, individual prices, particular households, individual prices, wage incomes, individual industries, and particular commodities.*

Micro economic analysis is also known as ‘**microscopic analyses**’. Since the subject matter of micro economics deals with the determination of factor prices and product prices micro economics is called as ‘**price theory**’.

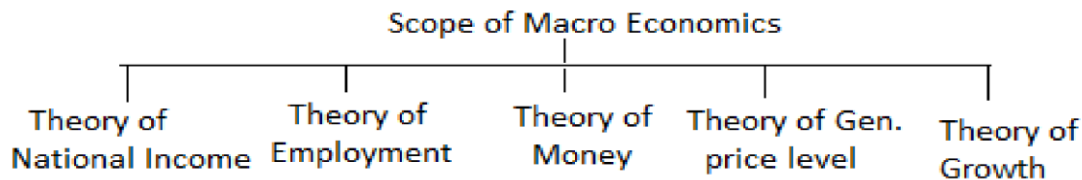


#### Macroeconomics

 The word ‘**macro**’ is derived from the Greek word ‘**makros**’ which means ‘**large**’. Therefore macroeconomics is the study of economy in its totality or as a whole.

✎ *It is concerned with the study of national income and not individual income, national saving and not individual saving, aggregate consumption expenditure and not individual consumption expenditure, total production and not production of individual firm, general price level and not individual price etc.*

✎ In short it deals with the economy as a whole. The problem of full employment, aggregate consumption, aggregate investment, total savings, general level of prices and variations in them are all the subject matters of macroeconomics.



**Example:** The decision of a firm to purchase a new office chair from company X is not a macroeconomic problem. The reaction of Ethiopian households to an increased rate of capital taxation is a macroeconomic problem.

### 1.1 What Macroeconomics is all about?

- ✓ The macro economy affects society's well-being e-g unemployment and social problems.
- ✓ The macro economy affects your well-being e-g unemployment and earnings growth, interest rates and mortgage payments etc.
- ✓ The macro economy affects politics & current events e-g inflation and unemployment in election years.

Therefore, macroeconomics is an important discipline to study such kind of problems and deliver the necessary remedies used for the sustainable wellbeing of the society in general.

**Why macroeconomics and not only microeconomics?** The whole is more complex than the sum of independent parts. It is not possible to describe an economy by forming models for all firms and persons and all their cross-effects.

🔔 Macroeconomics investigates aggregate behavior by imposing simplifying assumptions (“assume there are many identical firms that produce the same good”) but without abstracting from the essential features.

These assumptions are used in order to build macroeconomic models. Typically, such models have three aspects: *the ‘story’, the mathematical model, and a graphical representation*. Therefore, macroeconomics is a branch of economics that studies the economy as a whole including growth in income, change in general price level, the rate of unemployment, exchange

rate, balance of payment, business cycle etc. It is concerned with the behavior of the aggregate components of the economy.

✎ Macroeconomics deals both with long run economic growth and short run fluctuations that constitute the business cycle. It precisely defines the overall performance of the economy. Macroeconomics attempts not only to explain economic events but also to device policies to improve economic performances

## 1.2 Basic Concepts and Methods of Macroeconomics Analysis

Gross Domestic Product (GDP): is the total value of everything a country produces in a given time period. Everything that is produced and sold generates income. Therefore, output and income are usually considered equivalent and the two terms are often used interchangeably. Output can be measured as total income, or, it can be viewed from the production side and measured as the total value of final goods and services or the sum of all value added in the economy.

Macroeconomic output is usually measured by Gross Domestic Product (GDP) or one of the other national accounts. Economists interested in long-run increases in output study economic growth. Advances in technology, increases in machinery and other capital, and better education and human capital all lead to increased economic output overtime. However, output does not always increase consistently. **Unemployment:** The total population of an economy can be categorized in to working age and outside the working age population (which is country specific). Those in the working age also divided into two currently active and inactive.

✎ People in the working age category, who are either employed or actively seeking for job constitute the labor force. Thus, a person is said to be unemployed if he/she is in the active part of the society & actively seeking/searching for a job but doesn't have one during the census. The amount of unemployment in an economy is measured by the unemployment rate, the percentage of workers without jobs in the labor force. The rate of unemployment can be measures as:

$$\text{Unemployment Rate} = \frac{\text{Number of Unemployed}}{\text{Number of Labour Force}} \times 100\%.$$

## A. Inflation and Deflation

A general price increase across the entire economy is called inflation. When prices decrease, there is deflation. Economists measure these changes in prices with price indexes. Inflation can occur when an economy becomes overheated and grows too quickly. Similarly, a declining economy can lead to deflation.

 Central bankers, who control a country's money supply, try to avoid changes in price level by using monetary policy. Raising interest rates or reducing the supply of money in an economy will reduce inflation. Inflation can lead to increased uncertainty and other negative consequences. Deflation can lower economic output. Central bankers try to stabilize prices to protect economies from the negative consequences of price changes.

The percentage change consumer price index (CPI) is the most commonly used measure of inflation. Inflation is the average of increase in price of all goods and services in the CPI market basket. The greater the weight attached to an item in the CPI, the greater impact of a change in its price in the CPI.

$$\text{Rate of Inflation} = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100\% \quad (\text{The growth rate of CPI})$$

**Pure Inflation:** refers to a condition that occurs when the price of all goods and services rise by the same percentage over the year. If an economy is experiencing with pure inflation, there would be no change in relative prices of the goods and services. Thus, pure inflation does not motivate consumers to substitute one product with the other. Or it does not change the profitability of the sellers of one good rather than the other.

**Hyper Inflation:** indicates increasing of the inflation rate at an alarming rate. The classic example of hyperinflation was of course the rampant inflation in Weimar Germany between 1921 and 1923.

 When hyperinflation occurs, the value of money becomes worthless and people lose all confidence in money both as a store of value and also as a medium of exchange.

**Disinflation:** shows a sharp reduction in the annual rate of inflation. When disinflation occurs, the price level continues to rise but the rate of increases is sharply reducing.

### Effects of Inflation:

🔑 The most immediate effects of inflation are the decreased purchasing power of money.

🔑 Inflation can result a redistribution of income & wealth from creditors to debtors. As a result inflation can pay back loans in currency units that have less purchasing power than what they borrowed. It can also harm savers, who, in effect are creditors because purchasing power of currency units in saving decreases as a result of inflation.

🔑 Actions taken in anticipation of inflation can adversely affect the performance of the economy. When buyer and sellers try to anticipate, they base their economic decision in part on the gains and losses they expect to incur. This can affect the supply and demand for particular goods and services thereby deteriorates market price.

🔑 Anticipated inflation can distort consumer choice by causing buyers to purchase goods now that they might otherwise prefer to purchase in the future.

**B. Business Cycle:** The business, trade or economic cycle is when actual GDP tends to move up and down in a regular pattern causing booms and slumps (depressions), with recession and recovery as intermediate stages.

✎ The generally upward long-term path of GDP has been regularly interrupted by short-term declines. A significant decline in real GDP is called a **recession**. An especially lengthy and deep recession is called a **depression**.

✎ The highest point of the economy, before the recession begins, is called the **peak**; conversely, the lowest point of a recession, before a recovery begins, is called the **trough**. Thus, a recession lasts from peak to trough, and an economic upswing runs from trough to peak. The movement of the economy from peak to trough and trough to peak is called the **business cycle**.

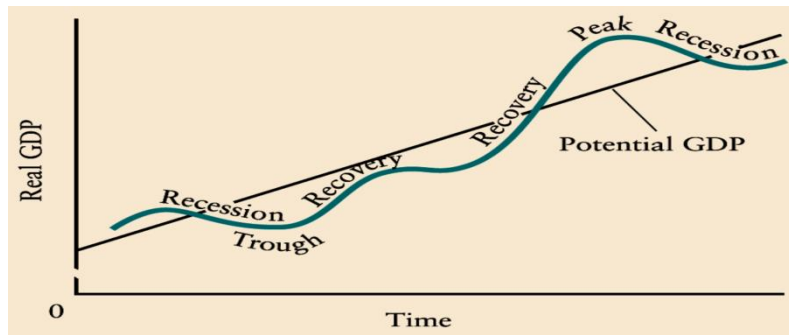


**Fig 1 the business cycle**

GDP doesn't grow at its trend level rather it fluctuates irregularly around the trend, showing business cycle pattern from through recovery to peak and then from peak recession to through. These movements are not regular in time or in size. It changes with change in different variables. The deviation of output from the trend is referred as the output gap.

### 1.3 Macroeconomic Goals and Instruments

The macroeconomic policy of any country and macroeconomics as a discipline by itself focuses in achieving the following most important objectives (the 'magical hexagons'). These are:

- i. **Economic growth.** This refers to the growth of output (GDP) in an economy. Economic growth ultimately determines the prevailing standard of living in a country. Economic growth is measured by the percentage change in real (inflation-adjusted) gross domestic product. Many macroeconomists argued that growth rate of more than 3% is considered good.
- ii. **Moderate or Low level of inflation):** Inflation is a sustained increase in the overall level of prices, and is measured by the consumer price index. If many people face a situation where the prices that they pay for food, shelter, and healthcare are rising much faster than the wages they receive for their labor; there will be widespread unhappiness as their standard of living declines. For that reason, low inflation is the major goal.
- iii. **External Stability (Equilibrium)-**This deals with the current account (avoiding deficits), the exchange rate (keeping it stable) and the net foreign debt or surplus.

- iv. **Reducing Unemployment (Full employment of resources):** Unemployment, as measured by the unemployment rate, is the percentage of people in the labor force who do not have a job. Lower goods and services produced. Unemployment, however, is more than a statistic—it represents people's livelihoods.



When people lack jobs, the economy is wasting a precious resource—labor, and the result is particularly the cyclical unemployment, which is the outcome of poverty. Hence, economic policy makers should give due attention or emphasize in poverty reduction and to address the cyclical unemployment, which could be permanent unless they are capable using different macroeconomics instruments. Generally, while measured unemployment is unlikely to ever be zero, a measured unemployment rate of 5% or less is considered good.

- v. **Just (equitable) Distribution of wealth and income:** This is aiming to close the gap between the rich and poor. A fair share of the national 'cake', more equitable than would be in the case of an entirely free market.
- vi. **Efficiency in resource allocation-** This answers the basic economic questions of how to produce and what to produce respectively. This is to apply the resources in the best way to achieve maximum production. This increases productivity.
- **Macroeconomics Instruments:** -Although an active government intervention is an area of controversy, government plays important roles in the economy in one way or the other. To achieve the above objectives, economic policy makers use mix of macroeconomics instruments.
  - **Frameworks:** In macroeconomics, we use the theories of aggregate demand (AD) and aggregate supply (AS) and also models and theories.
  - **Policy Instruments:** The most important instruments among others include monetary policy, fiscal policy, income policy, and labor policy, trade policy etc.

## 1.4 The State of Macroeconomics: Evolution and Recent Developments



Economic thinking has begun since the cradle/birth of mankind/human being. This is because archeological excavations evidenced that our ancestors (ancient mankind) were

having some economic thinking such as saving due to scarcity of resources and division of labour even when gathering and hunting were their means of survival/basic livelihood. Further studies made in ancient civilizations of Egypt, Babylon, Persia, Axum, China, India, Byzantine, Greek, and Rome confirms that trade and tax were the sources of their civilization.

- ✚ The above findings, therefore, attest that people make economic decision since birth at different age levels (child, youth, adult, and old) to death whether knowingly or unknowingly.
- ✚ Available document, however, suggest that formal study on economic issues was started around 2 century AD in ancient Greek philosophy/wisdom. This implies that economics is an old science like Art, literature, Astronomy, Mathematics, Physics, Medicine, and the like.
- ✚ Plato and Aristotle were the two prominent ancient Greek philosophers who produced enormous economic articles on economics that served as foundation/basis for further studies and advancement of economic ideas. However, the studies of scholars conducted on economic issues and theories developed up to the industrial revolution of the 18<sup>th</sup> century focus only on microeconomic issues.
- ✚ Macroeconomics as a branch of economics was emerged some 230 years back to the writing of Adam Smith “The wealth of Nation” in 1776. The evolution of macroeconomics from **1776 to date** is discussed briefly in the section that follows.
- ✚ As an arbitrary dichotomization, its historical evolution is divided into two broad categories, namely the orthodox and recent/contemporary macroeconomics schools.

#### 1.4.1 The Classical School of Thought (1776 - 1870)

In mid-18th century, the industrial revolution had just begun. England gained supremacy in industrial and commercial development, ahead of her 17th century competitors, Holland and France. Adam Smith (1723-1790) and his contemporaries, including Thomas Malthus (1766-1834), David Ricardo (1772-1823), Jean Baptiste Say (1767-1832) and John Stuart Mill (1806-1873), tried to put forward systematic reasoning of the substantial growth of manufacturing, trade, inventions, and the division of labor. Their main body of thought can be summarized as follows:

 **Minimal government involvement:** The first principle of the classical school is that the best government governs the least. The free competitive market would guide production, exchange, and distribution. The economy is self-adjusting (or self-correcting) and tending towards full employment without government intervention. Government activity should be confined to enforcing property rights, providing for the national defense, and providing public education and other infrastructures.

 **Self-interested economic behavior:** The classical economists assumed that self-interested behavior is basic to human nature. Merchants produce goods and services for making profits; workers offer their labor services to obtain wages, and consumers purchase products as a way to satisfy their wants.

 **Harmony of interests:** The classicists emphasize the natural harmony of interest in a market economy. By pursuing their own individual interests, people serve the best interests of society, such as wealth creation in the economy.

 **Importance of all economic resources and activities:** The classicists pointed out that all economic resources – land, labor, capital, and entrepreneurial ability – as well as all economic activities – agriculture, commerce, production, and international exchange – contribute to a nation’s wealth.

 **Economics laws:** The classical school made tremendous contributions to economics by developing a number of influential economic theories or “laws”. Examples include the law of comparative advantage, the law of diminishing returns, and the Malthusian theory of population, Say’s law, the Ricardian theory of rent, the quantity theory of money, and the labor theory of value. The classicists believed that the laws of economics are universal.

#### 1.4.2 The Keynesian Macroeconomics (1936-1975)

An American economist called Keynes challenged/criticized the classical wisdoms of macroeconomics based on the events or episodes during the great economic depression of the early 1930s (1929 to 1935).

✎ The Keynesian theory is a set of economic theories pioneered by John Maynard Keynes in his seminal work, *The General Theory of Employment, Interest, and Money* (1936)

✎ The crux of the Keynesian theory lies on the belief that the private sector does not always possess the self-correcting mechanism as put forward by the classical economists. It therefore justifies a degree of state intervention to influence the economy, most notably to manage the effects of the business cycle of growth and recession.

## Major Tenets of the Keynesian Theory

✎ **Rigid Prices:** Keynes presumes that prices are inflexible or rigid, which can prevent markets from achieving equilibrium. Markets, especially resource markets, do not automatically achieve equilibrium, meaning that full employment is not guaranteed.

✎ **Effective Demand (Aggregate Expenditure):** Keynes bases his economic theory on the notion of effective demand, the principle that consumption expenditures are based on the disposable income actually available to the household sector rather than income that would be available at full employment (long run potential output level).

✎ **Saving and Investment Determinants:** Keynes presumes that on top of the interest rate, household saving is determined by household income and business investment is based on the expected profitability of investment (i.e. marginal efficiency of capital).

✎ **Business Cycle:** The primary source of business-cycle instability is changes in aggregate demand (or aggregate expenditures).

✎ **Unemployment:** Persistent unemployment problems, especially those occurring during the Great Depression, were due to the lack of effective aggregate demand.

✎ Keynesian economics focuses on explaining why recessions and depressions occur and offering a policy prescription for minimizing their effects. The Keynesian view of recession is based on two key building blocks.

**First**, aggregate demand is not always automatically high enough to provide firms with an incentive to hire enough workers to reach full employment.

**Second**, the macro economy may adjust only slowly to shifts in aggregate demand because of sticky wages and prices, which are wages and prices that do not respond to decreases or increases in demand.

✚ The great depression was caused by excessive or overproduction of wheat and coffee. Due to excess production than demanded the price of wheat and coffee goes down, implying supply fails to create its demand as argued by the classical experts of the time.

### 1.4.3 The Neo-Classical School of Thought (1870-1936)

As the name “**Neoclassical**” implies, this perspective of how the macro economy works is a “new” view of the “old” classical model of the economy. The idea of this school of thought was not different from the classical.

✚ The **Neoclassical Perspective** on macroeconomics holds that, in the long run, the economy will fluctuate around its potential GDP and its natural rate of unemployment. There are two building blocks of neoclassical economics:

- a) The size of the economy is determined by potential GDP, and
- b) Wages and prices will adjust in flexible manner so that the economy will adjust back to its potential GDP level of output.

✚ The key policy implications this: Should the government focus more on long-term growth and on controlling inflation than on worrying about recession or cyclical unemployment? This focus on long-run growth rather than the short-run fluctuations in the business cycle means that neoclassical economics is more useful for long-run macroeconomic analysis and Keynesian economics is more useful for analyzing the macroeconomic short run.

## Recent Developments: The contemporary macroeconomics

### A. The New Classical School

The Post-World War II period saw the widespread implementation of Keynesian economic policy in the United States and Western European countries. Its dominance in the field by the 1970s was best reflected by the controversial statement attributed to ex-President Richard Nixon and economist Milton Friedman: "We are all Keynesians now".

Problems arose in the 1970s and the 1980s when stagflation occurred. This caused both high inflation and steep economic downturn that in turn caused unemployment. Keynesians were puzzled by the outbreak of stagflation because the original Phillips curve ruled it out.

The new classical school emerged in the 1970s as a response to the failure of Keynesian economics to explain stagflation.

 Their theory is that when the economy occasionally diverges from its full-employment output, internal mechanisms within the economy automatically move it back to that output. In their opinion, if a change in AD moves the equilibrium outside of  $AS_{LR}$ , there will be a change in AS that will bring it back.

After the 1970's and the apparent failure of Keynesian economics, the new classical school became the dominant school in Macroeconomics. This was captured by the fact that the new concepts and ideas which emerged from new classical economics such as expectations were accepted by the opposing new Keynesian school except for the fact that the latter still maintained the effectiveness of fiscal and monetary policy. Both the new classical and the new Keynesian schools now form the basis of mainstream macroeconomics.

 This school of thought brought two concepts:

- i. **Rational Expectations:** It states that businesses, consumers, and workers understand how government policies will affect the economy and *anticipate* the impacts in their own decision making. In other words, everyone knows what's going to happen and they plan for it.
- ii. **Adaptive Expectation:** This assumes that businesses, consumers, and workers form their expectation of a variable based on recently observed values of the variable like inflation

etc. It is the process of predicting /forecasting the future outcomes of a policy conducted by the government based on the previous experiences.

- ✚ For example, when the government begins some expansionary policies, workers will anticipate that a result will be higher inflation which would cause a decrease in their real wages. So, the workers quickly ask for more money for their nominal wage. If things work out well, there will be no temporary increases in profit, output, or unemployment.
- ✚ They also say that policies designed to push unemployment below its natural rate will quickly increase the rate of inflation, having no effect on unemployment.

B. **New Keynesian economics:** is a school of contemporary macroeconomics that strives to provide microeconomic foundations for Keynesian economics. It developed partly as a response to criticisms of Keynesian macroeconomics by adherents of New Classical macroeconomics.

**Two main assumptions define the New Keynesian approach to macroeconomics.**

- a). Like the New Classical approach, New Keynesian macroeconomic analysis usually assumes that households and firms have rational expectations. But the two schools differ in that New Keynesian analysis usually assumes a variety of market failures.
- b). New Keynesians assume that there is Imperfect competition in price and wage setting to help explain why prices and wages can become "sticky", which means they do not adjust instantaneously to changes in economic conditions.

Wage and price stickiness, and the other market failures present in New Keynesian models, imply that the economy may fail to attain full employment. Therefore, New Keynesians argue that macroeconomic stabilization by the government (using fiscal policy) or by the central bank (using monetary policy) can lead to a more efficient macroeconomic outcome than laissez faire policy would.



## Chapter Two

### 2. National income Accounting

National income accounting concepts have been designed to measure the overall production performance of the economy. By comparing the national income accounts over a period of time, we can plot the long- run course that the economy has been following; the growth or stagnation of the economy will show up in the national income accounts.

✎ It also provides a basis for the formulation & application of public policies designed to improve the performance of the economy.

✎ It is generally agreed that the best available indicator of an economy's health (well being) is its total annual output of goods & services, or the economy's aggregate output.

#### 2.1 The concepts of GDP and GNP

The basic social accounting measures of the total output of goods & services are Gross Domestic Product (GDP) and Gross National Product (GNP)

Definition: GDP is defined as the total market value of all final goods and services produced in the territories (within the boundary) of the economy in a given year.

GNP is defined as the total monetary value of final goods & services produced by citizens of the country in a given year. Thus, GDP and GNP are related as follows:

$$\text{GNP} = \text{GDP} + \text{Net Factor Income (NFI)}$$

But  $\text{NFI} = \text{Factor income generated from citizens living abroad} - \text{factor income flowing out by foreigners living in host country}$

GDP is more commonly taken as the basic measure of a nation's output as compared to GNP

This is because

1. GDP is easier to measure, since data on net foreign earnings are usually poor,
2. GDP is the better measure of the job – creating potential of the economy than is GNP and
3. it makes international comparisons easier, as most countries use GDP

GDP is a monetary measure that includes only the market value of final goods & services and ignores transactions involving intermediate goods (in order to avoid double counting). To avoid



### 1. Value added approach/product approach:

In this method, GDP can be obtained either by taking the market value of final goods & services or by taking the value added at each stage of production. Consider the hypothetical data below.

| Stages of Production        | Sales value of Product | Value Added |
|-----------------------------|------------------------|-------------|
| Firm A, sheep ranch         | \$ 60                  | \$ 60       |
| Firm B, wool processor      | \$ 100                 | \$ 40       |
| Firm C, suit manufacturer   | \$ 125                 | \$ 25       |
| Firm D, clothing wholesaler | \$ 175                 | \$ 50       |
| Firm E, Clothing retailer   | \$ 250                 | \$ 75       |
| Total sales value           | \$ 710                 |             |
| Value added ( total income) |                        | \$ 250      |

Thus, by calculating and summing the values added by all firms (sectors in the economy, we can determine the GDP, that is, market value of total output.

GDP can also be determined either by adding up all that is spent on this year's total output or by summing up all the incomes derived from the production of this year's output. That is, by summing up all the incomes derived from the production of this year's output

#### Exercise Question

*A farmer grows a bushel of wheat and sells it to a miller for \$1.00. The miller turns the wheat into flour and sells it to a baker for \$3.00. The baker uses the flour to make a loaf of bread and sells it to an engineer for \$6.00. The engineer eats the bread. Compute value added at each stage of production and GDP.*

## 2. Expenditure Approach

✎ All final goods produced in an economy are purchased either by the three domestic sectors: households, government and business enterprises or by foreign nations. Thus, to determine GDP through this approach one must add up all types of spending on finished goods and services by these sectors. That is;

GDP= personal consumption expenditure (C) by house holds  
 + Gross private domestic investment (I) by businesses  
 + Government purchases of goods & services (G) by government  
 + Net exports (export – Import)  $X_n$  by foreign sector

Thus,  $GDP = C + I + G + N_x$

❖ Personal consumption expenditure (C) entails expenditures by households on durable consumer goods, non – durable consumer good & consumer expenditures for services.

✎ It is also defined as the value of all goods and services bought by households. It includes:

- **Durable goods** which last a long time e-g cars, home appliances etc.
- **Non-durable goods** which last a short time e-g food, clothing etc.
- **Services** work done for consumers' e-g dry cleaning, air travel etc.

❖ Gross investment (I) Purchases of machinery & equipment, all constructions and changes in inventories includes replacement & added investment i.e. Replacement investment implies depreciation (capital used up), D, and added investment that are known as net investment ( $I_n$ ). Thus,  $I = D + I_n$ . the relationship between gross investment & depreciation provides a good indicator of whether our economy is expanding static or declining

- When gross investment ( I ) exceeds deprecation ( D ) i.e. positive net investment (  $I_n > 0$  ), the economy is expanding , static or declining
- A stationary or static economy reflects the situation in which I and D are equal ( or  $I_n = 0$  )
- The unhappy case of declining economy arises whenever I is less than D , i.e. When the economy uses up more capital in a year than it manages to produce.

✎ **Basically, there are three fundamental components of investment in our case. These are:**

 **Business Fixed Investment:** Spending on plant and equipment those firms will use to produce other goods & services

 **Residential Fixed Investment:** Spending on housing units by consumers and landlords

 **Inventory Investment:** The change in the value of all firms' inventories

 Gov't expenditures (G) include all government (federal, state and local) spending on the finished products of businesses & all direct purchase of resource by government.

 Net exports (Xn) is the amount by which foreign spending on domestic goods and services (Exports = X) exceeds domestic spending on foreign goods and services (Import = M) It can positive or negative.

## Investment and Capital

 **Capital** is one of the factors of production. At any given moment, the economy has a certain overall stock of capital. While **investment** is spending on new capital intended for future returns of either profits or consumption.

## Components of Expenditures

$$Y = C + I + G + NX$$

Y => Total Demand for domestic goods and services

C => Consumption Spending by Households

I => Investment spending = by businesses and households

G => Govt. purchases of goods and services

NX=> Net exports or net foreign demand

### Example

|                      |       |
|----------------------|-------|
| Personal Consumption | 3,657 |
|----------------------|-------|

|                           |       |
|---------------------------|-------|
| Depreciation              | 400   |
| Wages                     | 3,254 |
| Indirect Business Taxes   | 500   |
| Interest                  | 530   |
| Domestic Investment       | 741   |
| Government Expenditures   | 1,098 |
| Rental Income             | 17    |
| Corporate Profits         | 341   |
| Exports                   | 673   |
| Net Foreign Factor Income | 20    |
| Proprietor's Income       | 403   |
| Imports                   | 704   |

Let me demonstrate calculating the GDP using the Expenditures Approach with the above hypothetical data:

$$Y = C + I + G + NX$$

$$Y = 3,657 + 741 + 1,098 + (673 - 704)$$

$$Y = 3,657 + 741 + 1,098 - 31$$

$$Y = 5,465$$

### **3. Income Approach**

This year's GDP can also be determined (other than by adding up all that is spent to buy this year's total output) by summing up all the incomes derived from the production of this year's total output.

It measures GDP in terms of income earned. It is the sum of all incomes received from all factors of production. They contribute to the production process plus two additional non – factor payments. The main income categories are:

- a) Compensation of employees: This comprises wages & salaries paid by governments and businesses =  $W + S$
- b) Returns(r) consists of income payments received by households and business, which supply property resources.
- c) Interest (I) comprises items such as the net interest payments households receive on saving deposits, certificate of deposits ( CDs ) and corporate bonds.
- d) Proprietor's Income or Profit (I<sub>p</sub>) is net income of sole proprietorships and partnerships ( or income of un incorporated businesses)
- e) Corporate Profits ( II c) may be divided into three
  - They may be collected as corporate income taxes
  - They may be distributed as dividends ( to stockholders )
  - They may be retained as undistributed corporate profits
 (i.e. Corporate II = corporate income tax + dividend + undistributed corporate profits)  
 Note: Total Profits (II) = I<sub>p</sub> + II<sub>c</sub>  
 Adding employee compensation, rents interests I<sub>p</sub> & II<sub>c</sub>, and NFI we get a country's National Income (NI)
- f) Indirect Business Taxes (IBT) Which firms treat as costs of production & therefore add to the prices of the products they sell.  
 E.g. Sales tax, excise tax, business property tax, license fee
- g) Consumption of fixed capital (depreciation –D) the annual charge, which estimates the amount of capital equipment used up in each year's production, is called Depreciation.  
 Therefore,  $GDP = (W + S) + R + I + II + IBT + D$

## 2.3 Other Social Accounts ( GNP, NNP, NI and DI)

- 1)  $GNP = GDP + NFI$

2) **Net National product (NNP)** is GNP adjusted for depreciation changes. It is derived by subtracting the capital consumption allowance, which measures replacement investment, from GNP. That is  $NNP = GNP - D$

3) **National Income (NI)** Measures the income earned by resource suppliers for their contributions of land, labor, capital and entrepreneurial ability which go into the year's net prosecution

4) **Personal Income (PI)** is income received by households

$PI = NI$  (income earned)

- Social security contribution
- Corporate income taxes
- Undisturbed corporate profits
- + Transfer payments

5) **Disposable Income (DI)** the income individuals have to spend or save after payment of taxes. It is simply personal income less personal tax and non – tax payments (PT).  $DI = PI - PT$

Example: using the above hypothetical example again we can calculate GDP with income approach

|                         |       |
|-------------------------|-------|
| Personal Consumption    | 3,657 |
| Depreciation            | 400   |
| Wages                   | 3,254 |
| Indirect Business Taxes | 500   |
| Interest                | 530   |
| Domestic Investment     | 741   |
| Government Expenditures | 1,098 |
| Rental Income           | 17    |
| Corporate Profits       | 341   |
| Exports                 | 673   |

|                           |     |
|---------------------------|-----|
| Net Foreign Factor Income | 20  |
| Proprietor's Income       | 403 |
| Imports                   | 704 |

National Income = Compensation to Employees (Wages) + Rents + Interest + Proprietor's Income + Corporate Profits

National Income(Y) = GDP = 3,254 + 17 + 530 + 403 + 341 = 4,545

Y = National Income + Indirect Business Taxes + Depreciation + NFFI

Y = 4,545 + 500 + 400 + 20 = 5,465

This is the same value for the GDP received when calculating it using the Expenditures Approach.

## 2.4 Nominal versus Real GDP

**Nominal GDP:** Represents the market value of all final goods and services at current prices. But the value of different year's GDPs can be usefully compared only if the value of money (price) itself doesn't change. Inflation (or deflation complicates GDP because GDP is a price times quantity figure. The change in either the quantity of output or the level of prices will affect the size GDP since GDP equals the sum of  $P_i Q_i$ . But it is the quantity of goods & services produced & distributed to households which affect their standard of living not the price.

✍ If for instance, all prices doubled without any changes in quantities GDPs would double. Yet it would be misleading to say that the economy's ability to satisfy demands has doubled, because the quantity of every good produced remains the same.

✍ Thus, to compare GDPs of different periods (or to see differences in production activities or economic performance of a nation) Nominal GDP must be adjusted for price level changes. In other words, real GDP should be used.

✍ Real constant- Birr GDP measures each year's outputs in terms of the prices, which prevailed in a selected base year as opposed to nominal (current Birr) GDP, Which measures each year's output valued in terms of the prices prevailing in that year.

Example:- Using the following hypothetical data of a nation, we can determine nominal and real GDP as follows:

| Years  | 2001        |          | 2002        |          | 2003        |          |
|--------|-------------|----------|-------------|----------|-------------|----------|
|        | Prices (\$) | Quantity | Prices (\$) | Quantity | Prices (\$) | Quantity |
| Good A | 30          | 900      | 31          | 1000     | 36          | 1050     |
| Good B | 100         | 192      | 102         | 200      | 100         | 205      |

### Nominal GDP

Multiply Ps & Qs from same year:

2001: \$46, 200 =  $30 \times 900 + 100 \times 192$

2002: \$51, 400

2003: \$58, 300

### Real GDP

Multiply each year's Qs by 2001 Ps

2001: \$46, 200 (why?)

2002: \$50, 000 (check)

2003: \$52, 000 =  $30 \times 1050 + 100 \times 205$

## 2.5 The GDP Deflator and the Consumer Price Index

### A. The GDP Deflator

From nominal GDP and real GDP we can compute a third static: the GDP deflator. The GDP deflator, also called the implicit price deflator of GDP, is defined as the ratio of nominal GDP to real GDP (times 100).

$$\text{GDP deflator} = (\text{Nominal GDP} / \text{Real GDP}) \times 100$$

The definition of the GDP deflator allows us to separate nominal GDP into two parts: one part measures quantities (real GDP) and the other measures prices (the GDP Deflator) .

Thus, GDP deflator reflects what is happening to the overall level of prices in the economy

### B. The Consumer Price Index (CPI)

Price Index: Measures the combined price of a particular collection of Goods & services in a specific period relative to the combined price of an identical group of goods & services in a reference period.

The CPI is the most commonly used measure of the level of prices (or cost of living) Just as GDP turns the quantities of many goods and services into a single number measuring the value of production, the CPI turns the prices of many goods and services into a single index measuring the overall level prices.

The CPI differs from the GDP deflator in three main ways.

1. The GDP deflator measures the prices of a much wider (all) group of goods and services the CPI does. The CPI measures the prices of only the prices of goods and services bought by firms or the government will show up in the GDP deflator but not in the CPI.
2. The CPI measures the cost of a given basket of goods and services, which is the same from year to year. The basket of goods and services included in the GDP deflator, however, differs from year to year, depending on what is produced in the economy in each year. In other words, the CPI assigns fixed weights to the prices of different goods, whereas the GDP deflator assigns changing weighs.
3. The CPI directly includes prices of imports, whereas the GDP deflator includes only prices of products produced domestically. Neither of these two price indices is clearly superior to the other in measuring the cost of living. Moreover, the difference between them is usually not large in practice.

Thus, the CPI is also used to deflate nominal GDP so as to arrive at the real GDP.

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- The rate of change of GDP deflator is the inflation rate.

Example:- consider that a basket contains 20 breads and 10 eggs.

**For each year, compute**

- The cost of the basket
- The CPI (use 2000 as the base year)
- The inflation rate from the preceding year

|       | Prices(birr) |     |                                         |                              |                                             |
|-------|--------------|-----|-----------------------------------------|------------------------------|---------------------------------------------|
| Years | Bread        | Egg | Cost of basket(birr)                    | CPI                          | Inflation rate (%)                          |
| 2000  | 10           | 15  | $(20 \times 10) + (10 \times 15) = 350$ | $350/350 \times 100 = 100$   | -----                                       |
| 2001  | 11           | 15  | $(20 \times 11) + (10 \times 15) = 370$ | $370/350 \times 100 = 105.7$ | $(105.7 - 100)/100 \times 100 = 5.7\%$      |
| 2002  | 12           | 16  | $(12 \times 20) + (16 \times 10) = 400$ | $400/350 \times 100 = 114.3$ | $(114.3 - 105.7)/105.7 \times 100 = 8.13\%$ |
| 2003  | 13           | 15  | $(20 \times 13) + (15 \times 10) = 410$ | $410/350 \times 100 = 117.1$ | $(117.1 - 114.3)/114.3 \times 100 = 2.5\%$  |

- ✓ The CPI is a weighted average of prices. The weight on each price reflects that good's relative importance in the CPI's basket. Note that the weights remain fixed over time.

## 2.6 GDP and Welfare

GDP has some limitations in gauging the social wellbeing of the people in a nation.

This is mainly because:

- A) Non- market transactions (such as preparing meals, making household repairs and handling own financial affairs in homes) are not included non – monetary economies will be underestimated.
- B) It doesn't include the underground economy (Black Market) transactions that are never reported to tax and other government authorities because either the transaction involve illegal goods and services or the people want to evade taxes.
- C) It ignores the quality aspect of goods & services.
- D) It does not consider the cost of environmental damage, which could decrease the quality of lives, among others.
- E) The satisfaction that one gets from recreational activities and other uses of his/her leisure time

## 2.7 The Business Cycle

The business cycle shows how the economic activity, i.e., the GDP, changes over time. A cycle starts from a trough (minimum point) and ends at a trough. The economy is said to be in an expansion phase if it is moving from a trough to a peak along the business cycle. The economy is said to be in a recession if it is moving from a peak towards a trough. A depression is a severe recession.

According to the Keynesian school, there is always a trade-off between inflation and unemployment; if the economy is featuring a recession, for instance, inflation will decrease but unemployment will increase and vice-versa in expansion.

Although, the trade-off between inflation and unemployment can be observed along the business cycle, yet this is not always the case; an economy might feature high inflation and high unemployment at the same time. This phenomenon is known as stagflation.

### **The Full Employment Level of Output, $Y_p$ , and the Natural Rate of Unemployment (UN)**

 When all resources in the economy are fully utilized, the economy is said to be at the potential (full employment) level of output, denoted  $Y_p$ : This is the optimal level of output that we like to have. If this level is achieved, unemployment should be zero, but not completely true.

 The idea is that there exists a level of unemployment even if all resources are fully utilized. This unemployment rate that exists at the potential level of output is called 'the natural rate of unemployment' and denoted UN: UN exists because of frictional, structural, and seasonal unemployment.

### **Frictional, Structural, and Seasonal Unemployment**

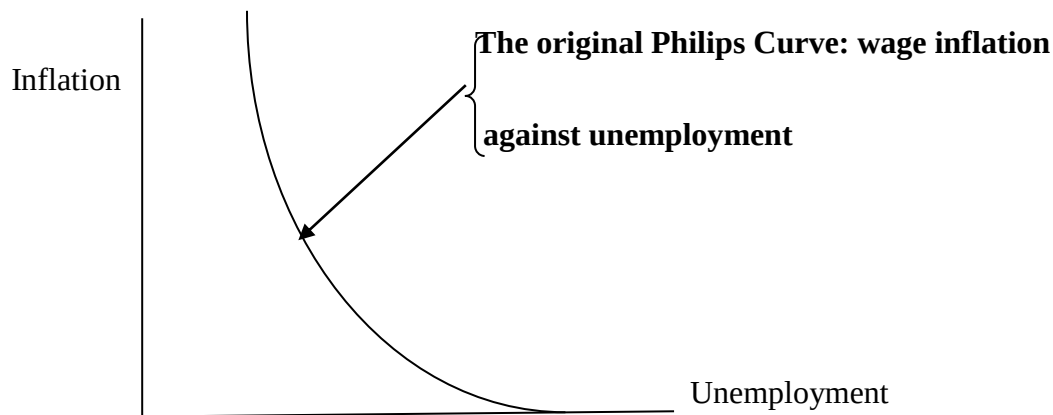
Frictional Unemployment is a type of unemployment that exists when individuals leave jobs for other jobs (between jobs). Structural Unemployment is another type of unemployment that exists due to a change in the structure of the economy. For instance, A computer specialist located in a small town, where people hardly use computers, is unemployed because the structure of the economy does not provide a suitable job in his field. A third type of unemployment occurs when the individual is specialized in a seasonal job.

Natural unemployment can be justified on the basis of any of the three previously mentioned types of unemployment.

**Cyclical Unemployment:** A fourth type of unemployment is resulting from fluctuations on the business cycle; it is called cyclical unemployment. For instance, lying of worker in a recession is classified under cyclical unemployment.

## 2.8 Unemployment and Inflation

New Zealand-born economist A.W Philips first put this theory forward in 1958 gathered the data of unemployment and changes in wage levels in the UK from 1861 to 1957. He observed that one stable curve represents the trade-off between inflation and unemployment and they are inversely/negatively related. In other words, if unemployment decreases, inflation will increase, and vice versa.



As the economy has just started growing, the aggregate demand (AD) will increase and therefore leading to an increase in employment. In the beginning, there will be little pressure for a raise in wages. However, as the economy grows faster and more people are employed, wages will start rising slowly.

This will increase the firm's cost of production and the high costs are usually passed on to the customers in the form of higher prices. **Therefore a decrease in unemployment has led to an increase in inflation and vice versa.**

## **Chapter Three**

### **Aggregate Demand in the Closed Economy**

#### **3.1 Foundations of Theory of Aggregate Demand**

Of all the economic fluctuations in world history, the one that stands out as particularly large, painful, and intellectually significant is the Great Depression of the 1930s. During this time, the United States and many other countries experienced massive unemployment and greatly reduced incomes. This devastating episode caused many economists to question the validity of classical economic theory. Classical theory seemed incapable of explaining the Depression. According to that theory, national income depends on factor supplies and the available technology, neither of which changed substantially from 1929 to 1933. After the onset of the Depression, many economists believed that a new model was needed to explain such a large and sudden economic downturn and to suggest government policies that might reduce the economic hardship so many people faced.

In 1936 the British economist John Maynard Keynes revolutionized economics with his book *The General Theory of Employment, Interest, and Money*. Keynes proposed a new way to analyze the economy, which he presented as an alternative to classical theory. His vision of how the economy works quickly became a center of controversy. Yet, as economists debated *The General Theory*, a new understanding of economic fluctuations gradually developed.

Keynes proposed that low aggregate demand is responsible for the low income and high unemployment that characterize economic downturns. He criticized classical theory for assuming that aggregate supply alone capital, labor, and technology determines national income. Unlike to this output also depends on the demand for goods and services. Demand, in turn, is influenced by monetary policy, fiscal policy, and various other factors. Because monetary and fiscal policy can influence the economy's output over the time horizon when prices are sticky, price stickiness provides a rationale for why these policies may be useful in stabilizing the economy in the short run.

**Aggregate demand (AD):** is the relationship between the quantity of output demanded and the aggregate price level. In other words, the aggregate demand curve tells us the quantity of goods and services people want to buy at any given level of prices.

The quantity Theory of Money is:

$$MV = PY$$

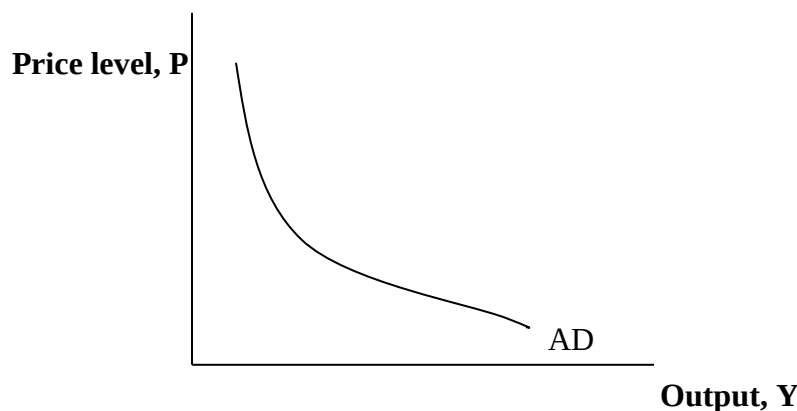
Where  $M$  is the money supply,  $V$  is the velocity of money,  $P$  is the price level, and  $Y$  is the amount of output. If the velocity of money is constant, then this equation states that the money supply determines the nominal value of output, which in turn is the product of the price level and the amount of output.

 Velocity of money is the Rate at which money circulates, changes hands, or turns over in an economy in a given period. Higher velocity means the same quantity of money is used for a greater number of transactions and is related to the demand for money. It is measured as the ratio of GDP to the given stock of money. It is also called velocity of circulation.

The quantity equation states that the supply of real money balances  $(M/P)^s$  equals the demand  $(M/P)^d$  and that the demand is proportional to output  $Y$ .

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

For any fixed money supply and velocity, the quantity equation yields a negative relationship between the price level  $P$  and output  $Y$ .



 The aggregate demand curve AD shows the relationship between the price level  $P$  and the quantity of goods and services demanded,  $Y$ . It is drawn for a given value of the money supply  $M$ . The aggregate demand curve slopes down ward: the higher the price level  $P$ , the lower the

level of real balances  $M/P$ , and therefore the lower the quantity of goods and services demanded  $Y$ .

### Three Basic Explanations for the Negative Slope of the AD Curve

#### 1. The Wealth Effect

An increase in the general price level reduces the purchasing power of the households and business sectors, i.e., they can buy less in real terms, and thus reduces the planned aggregate expenditures.

#### 2. The Substitution Effect

A rise in the domestic price level increases the price of domestic goods relative to foreign goods. This may cause some households and businesses to substitute foreign goods for domestic goods, which, in turn, reduces the aggregate planned expenditures.

#### 3. The Interest rate effect

An increase in the general price level,  $P$ ; will cause households and businesses to demand more money in order to undertake transactions (the demand on money balances,  $M^d$  increases), which, in turn, pushes the interest rate,  $i$ , to increase. As the interest rate increase, consumption and investment expenditures decrease and thus aggregate planned expenditure goes down.

$$P \uparrow \Rightarrow M^d \uparrow \Rightarrow i \uparrow \Rightarrow C \downarrow \text{ and } I \downarrow \Rightarrow AE \downarrow \Rightarrow AD \downarrow$$

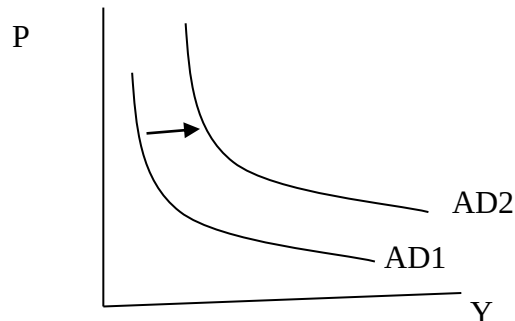
### Shift of the AD curve versus Movement along the AD curve

✍ The AD curve shows the relationship between price level and quantity of output demanded, **holding other factors unchanged. When price level changes**, the output level changes due to the wealth effect, interest-rate effect and exchange-rate effect. Such changes are shown by **movements along an AD curve**.

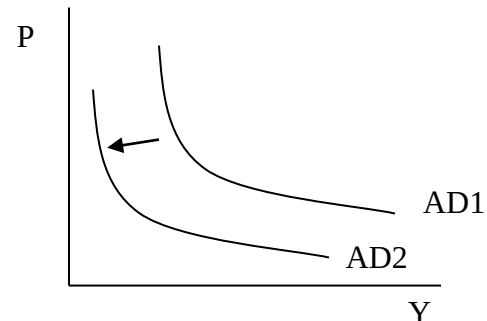
📖 However, when other factors (e.g. government policy) change, and the **price level remains unchanged**, the whole AD curve will shift to the right or left

**Shifts in the Aggregate Demand:** Changes in the money supply shift the aggregate demand curve. A decrease in the money supply  $M$  reduces the nominal value of output  $PY$ . For any given price level  $P$ , output  $Y$  is lower. Thus, a decrease in the money supply shifts the aggregate demand curve inward from  $AD_1$  to  $AD_2$  (b). An increase in the money supply  $M$

raises the nominal value of output  $PY$ . For any given price level  $P$ , output  $Y$  is higher. Thus, an increase in the money supply shifts the aggregate demand curve outward from  $AD1$  to  $AD2$  (a).



(a) Increase in  $M$



(b) Decrease in  $M$

### 3.2 The goods Market and the IS curve

The IS curve plots the relationship between the interest rate and the level of income that arises in the market for goods and services. In The General Theory, Keynes proposed that an economy's total income was, in the short run, determined largely by the desire to spend by households, firms, and the government. The more people want to spend, the more goods and services firms can sell. The more firms can sell, the more output they will choose to produce and the more workers they will choose to hire. Thus, the problem during recessions and depressions, according to Keynes, was inadequate spending.

**The Keynesian cross:** is a model designed by Keynes to explain the relationship between expenditure and output. Accordingly there are two types of expenditure:

✍ **Actual expenditure:** it is the amount households, firms, and the government spends on goods and services which is equal with the GDP.

✍ **Planned expenditure:** it is the amount households, firms, and the government would like to spend on goods and services.

In closed economy, since net exports are zero, we write planned expenditure  $E$  as the sum of consumption  $C$ , planned investment  $I$ , and government purchases  $G$ :

$$E = C + I + G$$

**Consumption function:** To this equation, we add the consumption function

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

This equation states that consumption depends on disposable income ( $Y - T$ ), which is total income  $Y$  minus taxes  $T$ .

**Investment function is exogenous:** To keep things simple, for now we take planned investment as exogenously fixed:

$$I = \bar{I}.$$

**Government Policy Variables are exogenous:** And assume that fiscal policy—the level of government purchases and taxes—is fixed:  $G = \bar{G}$ ,

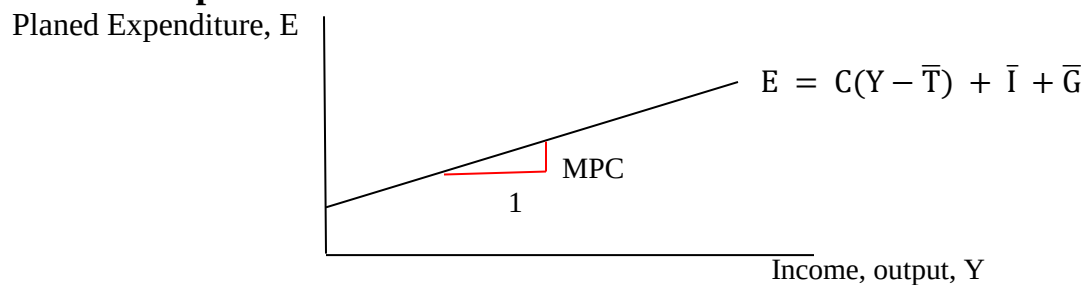
$$T = \bar{T}$$

Combining these five equations, we obtain

$$\text{Planned expenditure: } E = C(Y - \bar{T}) + \bar{I} + \bar{G}.$$

This equation shows that planned expenditure is a function of income  $Y$ , the level of planned investment  $\bar{I}$ , and the fiscal policy variables  $\bar{G}$  and  $\bar{T}$ .

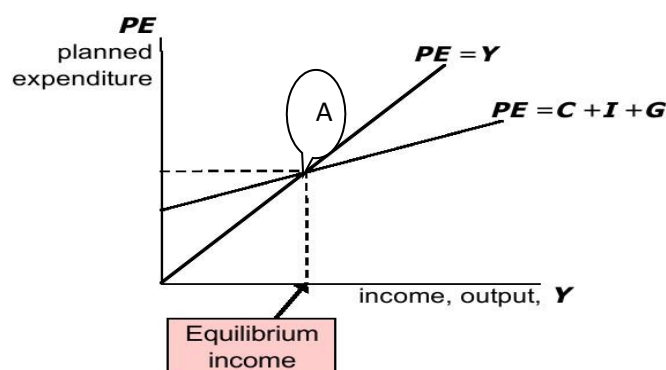
### Planned Expenditure as a function of Income



Planned expenditure depends on income because higher income leads to higher consumption, which is part of planned expenditure. The slope of this planned-expenditure function is the marginal propensity to consume, MPC.

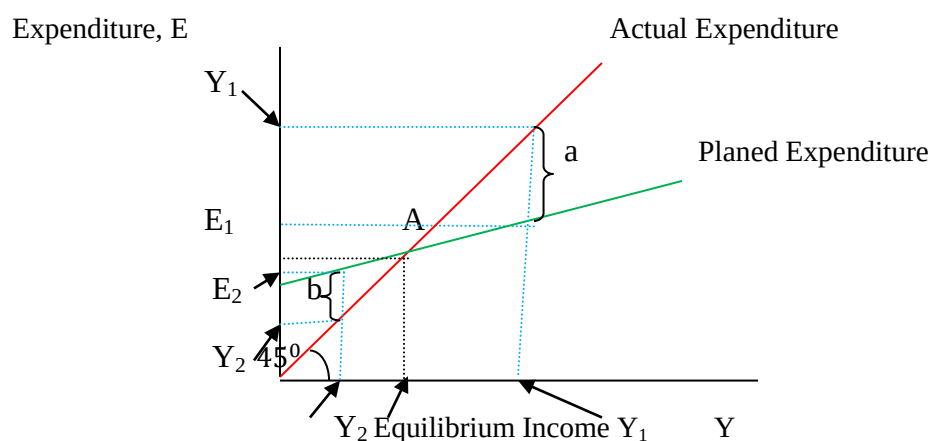
At equilibrium of the economy: Actual Expenditure = Planned Expenditure

## The equilibrium value of income



The equilibrium in the Keynesian cross is at point A, where income (actual expenditure) equals planned expenditure.

**The Adjustment to Equilibrium in the Keynesian Cross:** If firms were producing at level  $Y_1$ , then planned expenditure  $E_1$  would fall short of production and firms would accumulate inventories (a). This inventory accumulation would induce firms to reduce production. Similarly, if firms were producing at level  $Y_2$ , then planned expenditure,  $E_2$  would exceed production, and firms would run down their inventories (b). This fall in inventories would induce firms to raise production. In both cases, the firms' decisions drive the economy toward equilibrium.

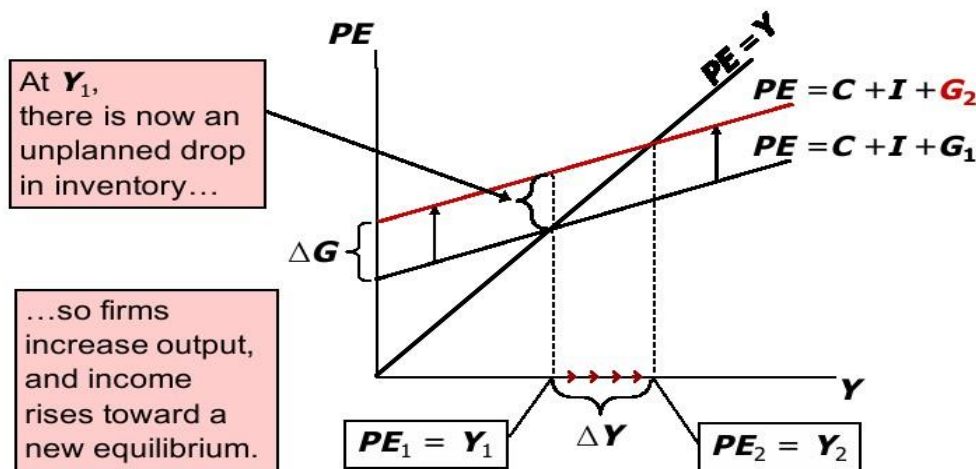


In summary, the Keynesian cross shows how income  $Y$  is determined for given levels of planned investment  $I$  and fiscal policy  $G$  and  $T$ . We can use this model to show how income changes when one of these exogenous variables changes.

## Fiscal Policy and the Multiplier

- a. **Government Purchases:** Because government purchases are one component of expenditure, higher government purchases result in higher planned expenditure for any given level of income. If government purchases rise by  $\Delta G$ , then the planned-expenditure schedule shifts upward by  $\Delta G$ . An increase in government purchases leads to an even greater increase in income. That is,  $\Delta Y$  is larger than  $\Delta G$ . The ratio  $\Delta Y / \Delta G$  is called the **government purchases multiplier**; it tells us how much income rises in response to a Birr 1 increase in government purchases. An implication of the Keynesian cross is that the government-purchases multiplier is larger than 1.

### An increase in government purchases



## CHAPTER 20 Aggregate Demand I



An increase in government purchases of  $\Delta G$  raises planned expenditure by that amount for any given level of income (1). The equilibrium moves from point A to point B, and income rises from  $Y_1$  to  $Y_2$ . Note that the increase in income  $\Delta Y$  (2) exceeds the increase in government purchases  $\Delta G$ . Thus, fiscal policy has a multiplied effect on income.

✎ How big is the multiplier? Show mathematically? (Answer:  $\frac{\Delta Y}{\Delta G} = \frac{1}{1-MPC}$ )

To answer this question, we trace through each step of the change in income. The process begins when expenditure rises by  $\Delta G$  which implies that income rises by  $\Delta G$  as well. This increase in

income in turn raises consumption by  $MPC \times \Delta G$  where MPC is the marginal propensity to consume. This increase in consumption raises expenditure and income once again. This second increase in income of  $MPC \times \Delta G$  again raises consumption, this time by  $MPC \times (MPC \times \Delta G)$  which again raises expenditure and income, and so on. This feedback from consumption to income to consumption continues indefinitely. The total effect on income is:-

**Initial Change in Government Purchases =  $\Delta G$ . First Change in Consumption =  $MPC \times \Delta G$**   
**Second Change in Consumption =  $MPC_2 \times \Delta G$ . Third Change in Consumption =  $MPC_3 \times \Delta G$**   
**...**  
 **$Y = (1 + MPC + MPC_2 + MPC_3 + \dots) \Delta G$ . The government-purchases multiplier is**

$$\frac{\Delta Y}{\Delta G} = 1 + MPC + MPC_2 + MPC_3 + \dots$$

This expression for the multiplier is an example of an infinite geometric series. A result from algebra allows us to write the multiplier as

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

Mathematical note: We prove this algebraic result as follows. Let

$Y = C + I + G$  equilibrium condition

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

$\Delta Y = \Delta C + \Delta G$  because I is exogenous

$\Delta Y = MPC \Delta Y + \Delta G$ , Since  $\Delta C = MPC \Delta Y$

Solve for  $\Delta Y$ :

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

$\frac{1}{1 - MPC}$  is the government purchase multiplier

**Example:**  $MPC = 0.8$

$$\Delta Y = \frac{1}{1 - MPC} \Delta G = \frac{1}{1 - 0.8} \Delta G = \frac{1}{0.2} \Delta G = 5 \Delta G$$

The increase in  $G$  causes income to increase by 5 times as much!

✍ Why the multiplier is greater than 1?

Initially, the increase in  $G$  causes an equal increase in  $Y$ . I. e  $\Delta Y = \Delta G$

But,  $\uparrow Y \Rightarrow \uparrow C$

Further  $\uparrow Y$

Further  $\uparrow C$

Further  $\uparrow Y$

So, the final impact on income is much bigger than the initial  $\Delta G$

- b. **Taxes:** An increase in taxes of  $\Delta T$  immediately reduces disposable income ( $Y - T$  by  $\Delta T$  and, therefore, decreases consumption by  $-MPC \times \Delta T$ . Hence the planned-expenditure schedule shifts inward by  $-MPC \times \Delta T$ .

## An increase in taxes

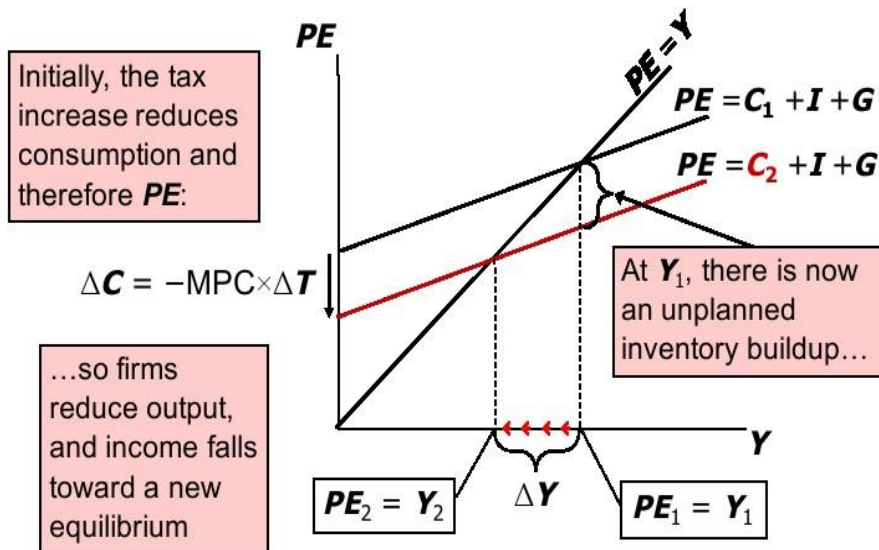


Fig 3.7 impact of increase in tax multiplier on planned expenditure

An increase in taxes of  $\Delta T$  reduces planned expenditure by  $-MPC \times \Delta T$  for any given level of income. The equilibrium moves from point  $Y_1$  to point  $Y_2$ , and income declines from  $Y_1$  to  $Y_2$ . Again, fiscal policy has a multiplied effect on income.

Just as an increase in government purchases has a multiplied effect on income, so does a decrease in taxes. The **tax multiplier** is therefore  $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1-MPC}$

### Deriving the tax Multiplier

$Y = C + I + G$  (Equilibrium condition)

$Y = c(Y - T) + I + G$   $C = \alpha + \beta Y_d$  Where  $Y_d = Y - T$  and

$T = tY$ , where  $t$  is tax rate

$Y = \alpha + \beta(Y - T) + I + G$

$Y - \beta Y = \alpha - \beta T + I + G$

$(1 - \beta)Y = \alpha - \beta T + I + G$  (now solve for  $Y$ )

$Y = \frac{1}{1 - \beta} (\alpha + I + G - \beta T)$

Thus the tax multiplier is:  $\frac{-b}{1-b}$ . Since  $b$  is less than one, it follows that the tax multiplier is smaller than the expenditure multiplier,  $(\frac{1}{1-b})$ . What does it mean?

Example: If  $T^{\uparrow} = 300 \rightarrow Y^d \downarrow = -300 \Rightarrow \Delta C = b(-\Delta T)$

$$\Delta C = (0.8)(-300) = -240$$

$$\Rightarrow \Delta Y = (\Delta C)(K) = (-240) \frac{1}{(1-mpc)} = (-240) \left( \frac{1}{1-.8} \right) = (-240)(5) = -1200 \quad \text{Where, } K \text{ is the expenditure multiplier}$$

Alternatively, the change in  $Y$  can be calculated using the formula for the tax multiplier above.

### Properties of Tax Multiplier

$\Rightarrow$  **Tax multiplier is negative:** A tax hike reduces consumer spending, which reduces income.

$\Rightarrow$  **Tax multiplier is greater than one (in absolute value):** A change in taxes has a multiplier effect on income.

$\Rightarrow$  **Tax multiplier is smaller 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  $G$ .

 **The Balanced Budget Multiplier:** If taxes increase by the same magnitude of the increase in government expenditures,  $G$ , what would be the effect on national income? Would equal leakages and injections cancel out each other in this case?

The change in national income will be the combined effect of the expenditures and tax multipliers:

$$\frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} = \left( \frac{1}{1-b} \right) + \left( \frac{-b}{1-b} \right) = \frac{1-b}{1-b} = 1$$

This implies that the balanced budget multiplier, in a closed economy is equal to 1. Thus a balanced budget policy increases national income by the same amount of  $G = T$ .

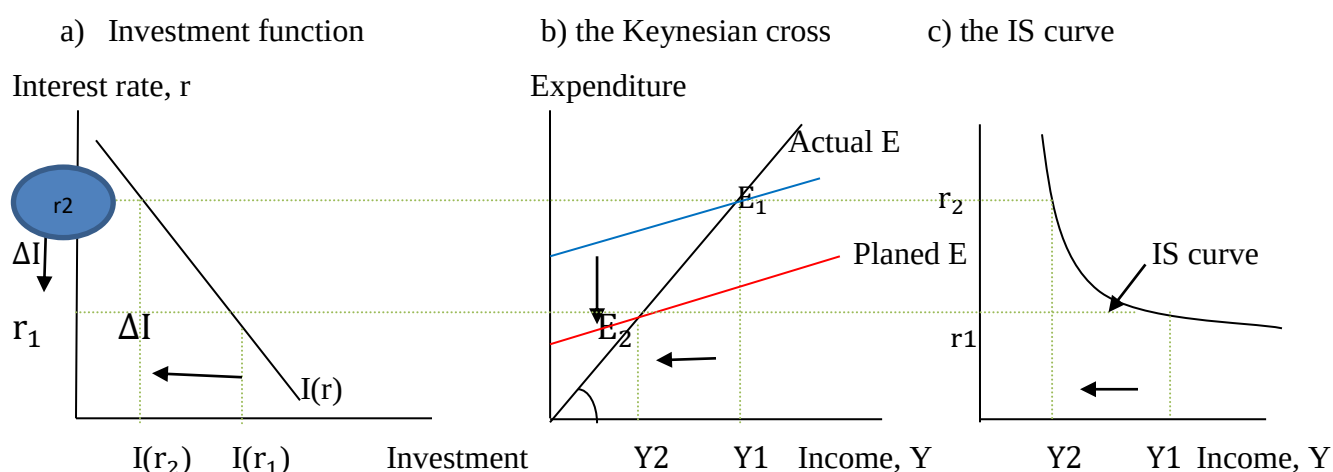
## The Interest Rate, Investment, and the IS Curve

The Keynesian cross is only a steppingstone on our path to the IS–LM model. The Keynesian cross is useful because it shows how the spending plans of households, firms, and government determine the economy's income. Yet it makes the simplifying assumption that the level of planned investment  $I$  is fixed. But an important macroeconomic relationship is that planned investment depends on the interest rate  $r$ .

$$I = I(r).$$

Since the interest rate is the cost of borrowing to finance investment projects, an increase in the interest rate reduces planned investment. As a result, the investment function slopes downward.

The IS curve combines the interaction between  $r$  and  $I$  expressed by the investment function and the interaction between  $I$  and  $Y$  demonstrated by the Keynesian cross. Because an increase in the interest rate causes planned investment to fall, which in turn causes income to fall, the IS curve slopes downward. **See fig 3.8 below**

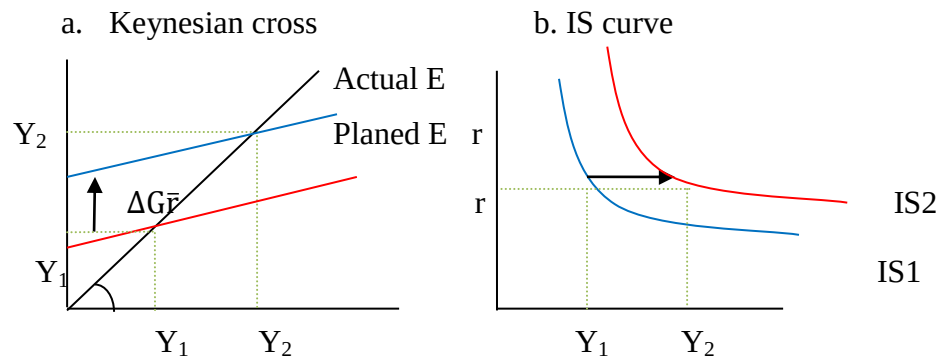


Panel (a) shows the investment function: an increase in the interest rate from  $r_1$  to  $r_2$  reduces planned investment from  $I(r_1)$  to  $I(r_2)$ . Panel (b) shows the Keynesian cross: a decrease in planned investment from  $I(r_1)$  to  $I(r_2)$  shifts the planned expenditure function downward and thereby reduces income from  $Y_1$  to  $Y_2$ . Panel (c) shows the IS curve summarizing this relationship between the interest rate and income: the higher the interest rate, the lower the level of income.

🔑 The IS curve shows us, for any given interest rate, the level of income that brings the goods market into equilibrium. The IS curve is drawn for a given fiscal policy; that is, when we construct the IS curve, we hold  $G$  and  $T$  fixed. When fiscal policy changes, the IS curve shifts.

🔑 In summary, the IS curve shows the combinations of the interest rate and the level of income that are consistent with equilibrium in the market for goods and services. The IS curve is drawn for a given fiscal policy.

**Effects of fiscal policy on IS curve:** Changes in fiscal policy that raise the demand for goods and services shift the IS curve to the right. Changes in fiscal policy that reduce the demand for goods and services shift the IS curve to the left.



The above **figure 3.9** above shows how an increase in government purchases by  $\Delta G$  shifts the IS curve. This figure is drawn for a given interest rate  $r$  and thus for a given level of planned investment. The Keynesian cross shows that this change in fiscal policy raises planned expenditure and thereby increases equilibrium income from  $Y_1$  to  $Y_2$ . Therefore, an increase in government purchases shifts the IS curve outward. We can use the Keynesian cross to see how other changes in fiscal policy shift the IS curve. Because a decrease in taxes also expands expenditure and income, it too shifts the IS curve outward. A decrease in government purchases or an increase in taxes reduces income; therefore, such a change in fiscal policy shifts the IS curve inward.

**An Increase in Government Purchases Shifts the IS Curve Outward** Panel (a) shows that an increase in government purchases raises planned expenditure. For any given interest rate, the upward shift in planned expenditure of  $\Delta G$  leads to an increase in income  $Y$  of  $\Delta G/(1 - MPC)$ . Therefore, in panel (b), the IS curve shifts to the right by this amount.

### Loanable-Fund Interpretation of IS curve

The demand for loanable funds...

◆ comes from investment:!

◆ Firms borrow to finance spending on plant & equipment, new office buildings, etc. Consumers borrow to buy new houses.

🔔 depends negatively on  $r$ , !

the “price” of loanable funds ! (cost of borrowing).

The supply of loanable funds comes from saving:

✂ Households use their saving to make bank deposits, purchase bonds and other assets. These funds become available to firms to borrow to finance investment spending.

✂ The government may also contribute to saving ! if it does not spend all the tax revenue it receives.

Recall that the national income accounts identity can be written as

$$Y - C - G = I$$

$$S = I.$$

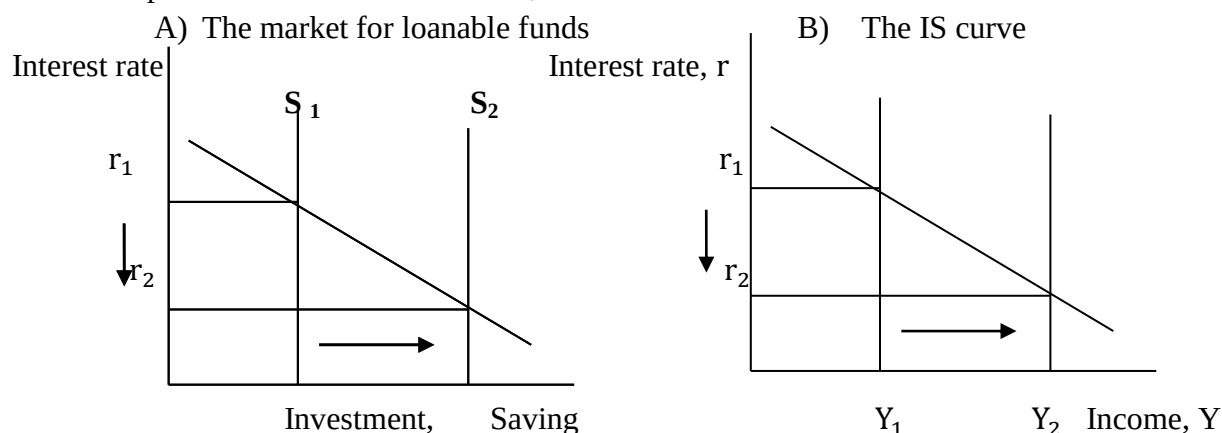
The left-hand side of this equation is national saving  $S$ , and the right-hand side is investment  $I$ .

$$Y - c(Y - T) - G = I(r).$$

The left-hand side of this equation shows that the supply of loanable funds depends on income and fiscal policy. The right-hand side shows that the demand for loanable funds depends on the interest rate. The interest rate adjusts to equilibrate the supply and demand for loans. To see how the market for loanable funds produces the IS curve, substitute the consumption function for  $C$  and the investment function for  $I$ :  $Y - c(Y - T) - G = I(r)$ .

As Figure below illustrates, we can interpret the IS curve as showing the interest rate that equilibrates the market for loanable funds for any given level of income. When income rises from  $Y_1$  to  $Y_2$ , national saving rises, this equals  $Y - C - G$ , increases. (Consumption rises by less than income, because the marginal propensity to consume is less than 1.) As panel (a) shows, the increased supply of loanable funds drives down the interest rate from  $r_1$  to  $r_2$ . The IS curve in panel (b) summarizes this relationship: higher income implies higher saving, which in turn implies a lower equilibrium interest rate. For this reason, the IS curve slopes downward.

This alternative interpretation of the IS curve also explains why a change in fiscal policy shifts the IS curve. An increase in government purchases or a decrease in taxes reduces national saving for any given level of income. The reduced supply of loanable funds raises the interest rate that equilibrates the market. Because the interest rate is now higher for any given level of income, the IS curve shifts upward in response to the expansionary change in fiscal policy. Finally, note that the IS curve does not determine either income  $Y$  or the interest rate  $r$ . Instead, the IS curve is a relationship between  $Y$  and  $r$  arising in the market for goods and services or, equivalently, the market for loanable funds. To determine the equilibrium of the economy, we need another relationship between these two variables, to which we now in turn.



1. An increase in income rises saving
2. Cause interest to drop

A Loanable-Funds Interpretation of the IS Curve Panel (a) shows that an increase in income from  $Y_1$  to  $Y_2$  raises saving and thus lowers the interest rate that equilibrates the supply and demand for loanable funds. The IS curve in panel (b) expresses this negative relationship between income and the interest rate.

☞ The national saving does not depend on the level of interest rate and therefore, it is vertical with zero slope

### 3.3 The Money Market and the LM Curve

The LM curve plots the relationship between the interest rate and the level of income that arises in the market for money balances. It is best expressed by the theory of the interest rate, called the **theory of liquidity preference**. Just as the Keynesian cross is a building block for the IS curve, the **theory of liquidity preference** is a building block for the LM curve. The theory of liquidity

preference posits that the interest rate adjusts to balance the supply and demand for the economy's most liquid asset—money. The theory of liquidity preference assumes there is a fixed supply of real money balances. That is,

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

This is because  $M$  is exogenous variable determined by the government and price is fixed in the short run. The theory of liquidity preference posits that the interest rate is one determinant of how much money people choose to hold. The reason is that the interest rate is the opportunity cost of holding money: it is what you forgo by holding some of your assets as money, which does not bear interest, instead of as interest-bearing bank deposits or bonds. When the interest rate rises, people want to hold less of their wealth in the form of money. We can write the demand for real money balances as

$$(M/P)^d = L(r),$$

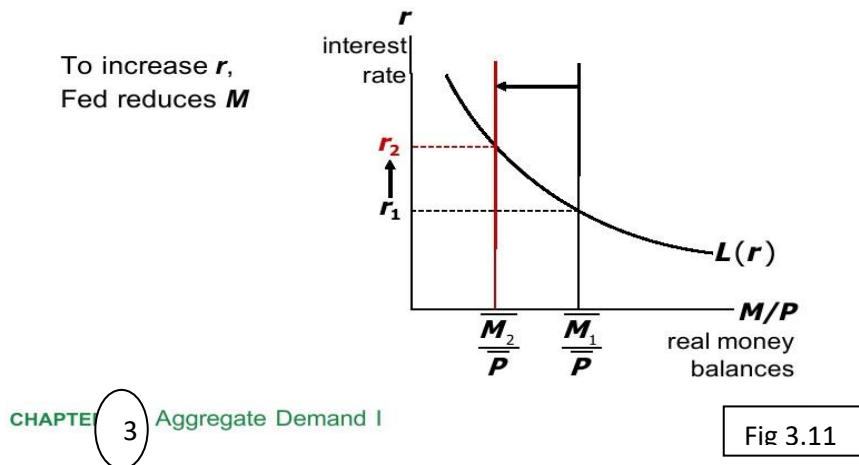
Where the function  $L(r)$  shows that the quantity of money demanded depends on the interest rate. Thus, the demand curve slopes downward because higher interest rates reduce the quantity of real money balances demanded.

According to the theory of liquidity preference, the supply and demand for real money balances determine what interest rate prevails in the economy. That is, the interest rate adjusts to equilibrate the money market.

**The Theory of Liquidity Preference:** The supply and demand for real money balances determine the interest rate. The supply curve for real money balances is vertical because the supply does not depend on the interest rate. The demand curve is downward sloping because a higher interest rate raises the cost of holding money and thus lowers the quantity demanded. At the equilibrium interest rate, the quantity of real money balances demanded equals the quantity supplied.

**A reduction in the Money Supply in the Theory of Liquidity Preference:** If the price level is fixed, a reduction in the money supply from  $M_1$  to  $M_2$  reduces the supply of real money balances. The equilibrium interest rate therefore rises from  $r_1$  to  $r_2$ .

## How the Fed raises the interest rate



CHAPTER 3 Aggregate Demand I

According to the theory of liquidity preference, a decrease in the money supply raises the interest rate, and an increase in the money supply lowers the interest rate.

## Income, Money Demand, and the LM Curve

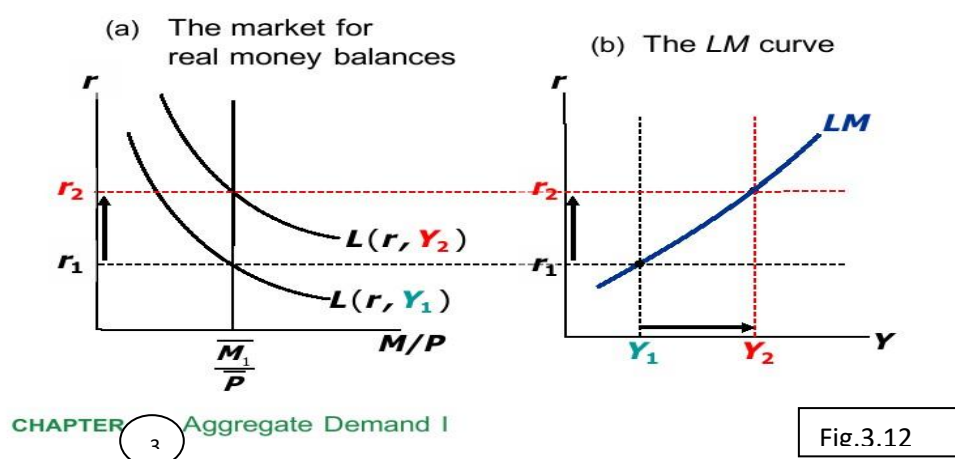
The level of income affects the demand for money. When income is high, expenditure is high, so people engage in more transactions that require the use of money. Thus, greater income implies greater money demand. We can express these ideas by writing the money demand function as

$$(M/P)^d = L(r, Y).$$

The quantity of real money balances demanded is negatively related to the interest rate and positively related to income. The LM curve plots this relationship between the level of income and the interest rate. The higher the level of income, the higher the demand for real money balances. And the higher the equilibrium interest rate. For this reason, the LM curve slopes upward.

**Deriving the LM Curve:** Panel (a) shows the market for real money balances: an increase in income from  $Y_1$  to  $Y_2$  raises the demand for money (1) and thus raises the interest rate from  $r_1$  to  $r_2$ . Panel (b) shows the LM curve summarizing this relationship between the interest rate and income: the higher the level of income, the higher the interest rate.

## Deriving the LM curve



In summary, the LM curve shows the combinations of the interest rate and the level of income that is consistent with equilibrium in the market for real money balances. The LM curve is drawn for a given supply of real money balances. Decreases in the supply of real money balances shift the LM curve upward. Increases in the supply of real money balances shift the LM curve downward.

If income increases, the demand for money increases at any given interest rate. Given that the supply of money is fixed, the interest rate must increase to lower the demand for money and maintain the equilibrium.

### Quantity-Equation Interpretation of the LM Curve

According to the liquidity-preference model, the demand for real money balances also depends on the interest rate: a higher interest rate raises the cost of holding money and reduces money demand. When people respond to a higher interest rate by holding less money, each dollar they do hold must be used more often to support a given volume of transactions—that is, the velocity of money must increase.

We can write this as:

$$MV(r) = PY.$$

The velocity function  $V(r)$  indicates that velocity is positively related to the interest rate. This form of the quantity equation yields an LM curve that slopes upward. Because an increase in the interest rate raises the velocity of money, it raises the level of income for any given money

supply and price level. The LM curve expresses this positive relationship between the interest rate and income.

Besides this for any given interest rate and price level, the money supply and the level of income must move together. Thus, increases in the money supply shift the LM curve to the right, and decreases in the money supply shift the LM curve to the left.

### How $\Delta M$ shifts the LM curve

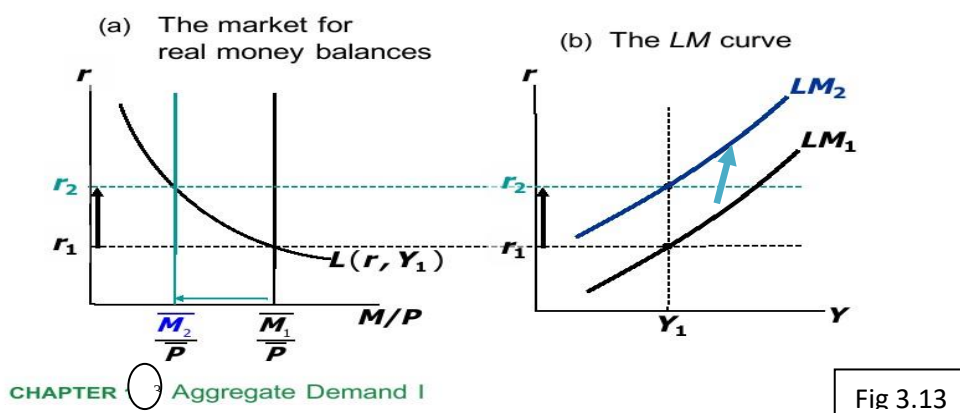


Fig 3.13

**A Reduction in the Money Supply Shifts the LM Curve Upward** Panel (a) shows that for any given level of income  $Y$ , a reduction in the money supply raises the interest rate that equilibrates the money market. Therefore, the LM curve in panel (b) shifts upward.

### 3.4 The Short-Run Equilibrium

We now have all the pieces of the IS–LM model. The two equations of this model are

$$Y = C(Y - T) + I(r) + G \quad (\text{IS equation in the goods Market})$$

$$\frac{M}{P} = L(r, Y) \quad (\text{LM equation in the Money Market})$$

The model takes fiscal policy,  $G$  and  $T$ , monetary policy  $M$ , and the price level  $P$  as exogenous. Given these exogenous variables, the IS curve provides the combinations of  $r$  and  $Y$  that satisfy the equation representing the goods market, and the LM curve provides the combinations of  $r$  and  $Y$  that satisfy the equation representing the money market. The equilibrium of the economy is the point at which the IS curve and the LM curve cross. This point gives the interest rate  $r$  and

the level of income  $Y$  that satisfy conditions for equilibrium in both the goods market and the money market. In other words, at this intersection, actual expenditure equals planned expenditure, and the demand for real money balances equals the supply.

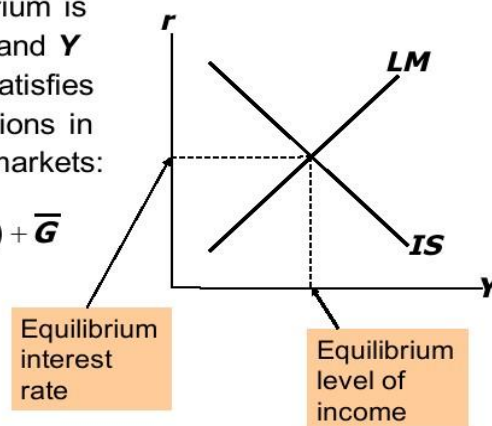
### Equilibrium in the IS–LM Model

#### 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:

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

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



CHAPTER 3 Aggregate Demand I

Fig. 3.14

The intersection of the IS and LM curves represents simultaneous equilibrium in the market for goods and services and in the market for real money balances for given values of government spending, taxes, the money supply, and the price level. Note: A change in either fiscal or monetary policy leads to changes in equilibrium output and equilibrium interest rate.

**Fiscal policy:** an increase in  $G$  or a reduction in  $T$  shifts the IS curve out, hence both equilibrium output and equilibrium interest rate increases.

**Monetary policy:** an increase in money supply shifts the LM curve out. Hence it will increase output but it will decrease equilibrium interest rate.

#### Interaction of Fiscal and Monetary policies:

✎ What would happen to equilibrium when there is an increase in tax?

- a. If the government keeps money supply constant?

LM curve stay the same IS curve shift down hence equilibrium  $r$  and  $Y$  decrease.

- b. If the government wants to keep interest rate constant?

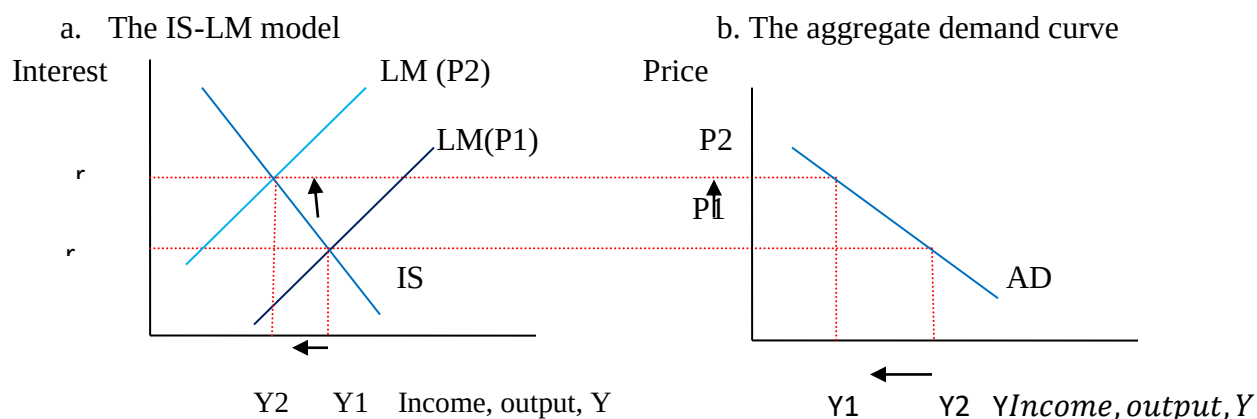
The government should decrease money supply. This shifts both the IS and LM curve inward. Hence it greatly reduces  $Y$  greatly as compared to A.

- c. If the government holds the income level constant?

Here the government should increase the money supply, the LM curve shifts out and the IS curve shifts down. This will lead to a reduction in the equilibrium interest rate

### 3.4 From IS-LM to Aggregate Demand

Note that in the IS-LM model price is considered as exogenous fixed variable. But an increase in price will reduce the real money balance  $M/P$  and hence the LM curve shifts up. This will internally reduce the equilibrium level of output.



In figure 3.15 above, panel (a) shows the IS–LM model: an increase in the price level from  $P1$  to  $P2$  lowers real money balances and thus shifts the LM curve upward. The shift in the LM curve lowers income from  $Y1$  to  $Y2$ . Panel (b) shows the aggregate demand curve summarizing this relationship between the price level and income: the higher the price level, the lower the level of income.

A change in income in the IS–LM model resulting from a change in the price level represents a movement along the aggregate demand curve. A change in income in the IS–LM model for a fixed price level represents a shift in the aggregate demand curve.

What causes the aggregate demand curve to shift?

☞ Inward: decrease in money supply or government purchase, an increase in tax

☞ Outward: an increase in money supply or government purchase, a decrease crease in tax

## **The IS-LM model - Fiscal policy**

### **Fiscal policy:**

Fiscal contraction (or fiscal consolidation): decrease in the budget deficit  $G - T$

⇒ Decrease in government spending

⇒ Increase in taxes

Fiscal expansion: increase in the budget deficit  $G - T$

⇒ Increase in government spending

⇒ Decrease in taxes

### ***What happens when taxes increase?***

Leftward shift of the IS curve. *Why?*

No shift of the LM curve. *Why?*

The increase in taxes shifts the IS curve. The LM curve does not shift, the economy moves along the LM curve.

### **When taxes increase:**

⇒ Consumption goes down, leading to a decrease in output/income.

⇒ The decrease in income reduces the demand for money. Given that the supply of money is fixed, the interest rate must decrease to push up the demand for money and maintain the equilibrium.

**NB:** the decrease in output is limited by the positive effect of a decrease in the interest rate on investment (even though we don't know if investment increases or decreases)

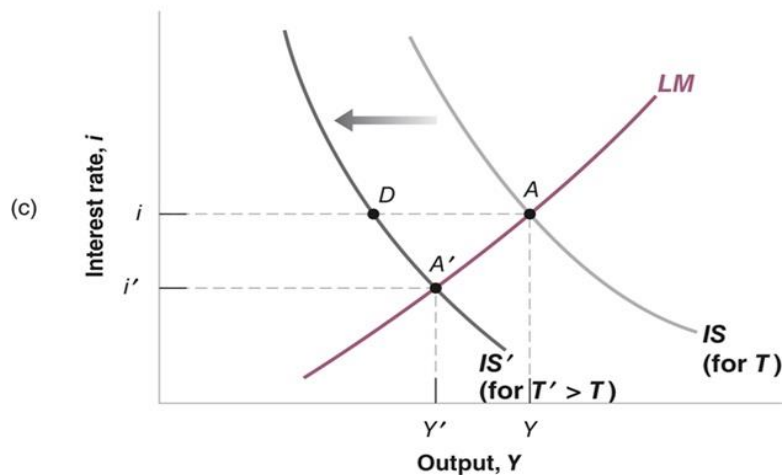


Figure 3.16 the effects of an increase in taxes

## The IS-LM model - Monetary policy

### Monetary policy:

**Monetary contraction** (or monetary tightening): decrease in the money supply

**Monetary expansion:** increase in the money supply

### What happens when the money supply increases?

⇒ No shift of the IS curve. *Why?*

⇒ Downward shift of the LM curve. *Why?*

The increase in money supply shifts the LM curve. The IS curve does not shift, the economy moves along the IS curve.

When money supply increases:

⇒ To maintain the equilibrium, the demand for money should go up. For that to happen, the interest rate must decrease.

⇒ The decrease in the interest rate favors investment, demand for goods and equilibrium output.

**NB:** the decrease in the interest rate is limited by the positive effect of an increase in output on investment, and therefore on output.

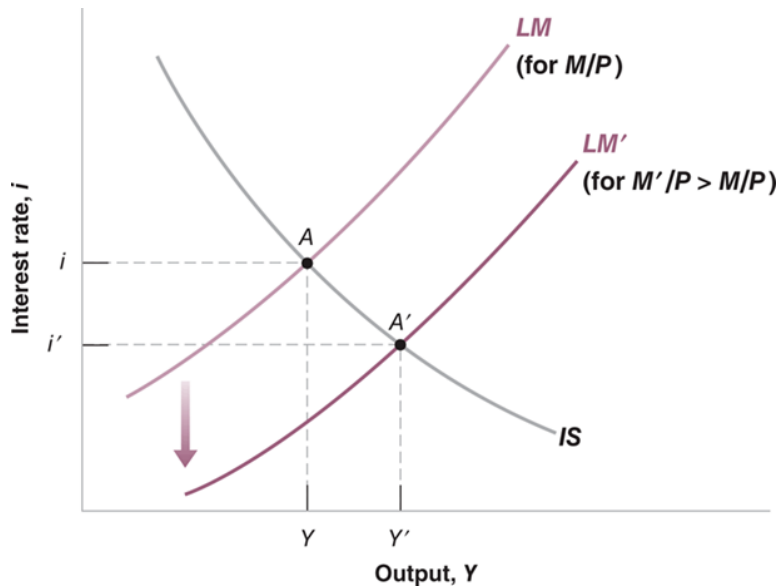


**Fig 3.17 the effects of an increase in money supply**

**Summary:** the following table briefly summarizes the effects of fiscal and monetary policy on the IS-LM curves

|                      | Shift of IS | Shift of LM | Movement in Output | Movement in Interest Rate |
|----------------------|-------------|-------------|--------------------|---------------------------|
| Increase in taxes    | left        | none        | down               | down                      |
| Decrease in taxes    | right       | none        | up                 | up                        |
| Increase in spending | right       | none        | up                 | up                        |
| Decrease in spending | left        | none        | down               | down                      |
| Increase in money    | none        | down        | up                 | down                      |
| Decrease in money    | none        | up          | down               | up                        |



## CHAPTER FOUR

### AGGREGATE DEMAND IN THE OPEN ECONOMY

#### 4.1 International flows of Capital Goods

An *open economy* is one that interacts freely with other economies around the world. An open economy interacts with other countries in two ways.

- It buys and sells goods and services in world product markets.
- It buys and sells capital assets in world financial markets.

*Exports* are goods and services that are produced domestically and sold abroad.

*Imports* are goods and services that are produced abroad and sold domestically.

*Net exports (NX)* are the value of a nation's exports minus the value of its imports. Net exports are also called the *trade balance*.

A *trade deficit* is a situation in which net exports (*NX*) are negative.

- Imports > Exports

A *trade surplus* is a situation in which net exports (*NX*) are positive.

- Exports > Imports

*Balanced trade* refers to when net exports are zero—exports and imports are exactly equal.

Factors That Affect Net Exports

- The tastes of consumers for domestic and foreign goods.
- The prices of goods at home and abroad.
- The exchange rates at which people can use domestic currency to buy foreign currencies.
- The incomes of consumers at home and abroad.
- The costs of transporting goods from country to country.
- The policies of the government toward international trade.

*Net capital outflow* refers to the purchase of foreign assets by domestic residents minus the purchase of domestic assets by foreigners.

Variables that Influence *Net Capital Outflow*

- The real interest rates being paid on foreign assets.
- The real interest rates being paid on domestic assets.

- The perceived economic and political risks of holding assets abroad.
- The government policies that affect foreign ownership of domestic assets.

Net exports ( $NX$ ) and net capital outflow ( $NCO$ ) are closely linked. For an economy as a whole,

$NX$  and  $NCO$  must balance each other so that:  $NCO = NX$

This holds true because every transaction that affects one side must also affect the other side by the same amount.

This table shows the three outcomes that an open economy can experience.

| Trade Surplus           | Balanced Trade          | Trade Deficit           |
|-------------------------|-------------------------|-------------------------|
| Exports > Imports       | Exports = Imports       | Exports < Imports       |
| Net Exports > 0         | Net Exports = 0         | Net Exports < 0         |
| $Y > C + I + G$         | $Y = C + I + G$         | $Y < C + I + G$         |
| Savings > Investment    | Saving = Investment     | Saving < Investment     |
| Net Capital Outflow > 0 | Net Capital Outflow = 0 | Net Capital Outflow < 0 |

## 4.2 Saving and Investment in the Small Open Economy

To build the model of the small open economy, we take three assumptions.

- ✓ The economy's output  $Y$  is fixed by the factors of production and the production function. We write this as

$$Y = \bar{Y} = F(\bar{K}, \bar{L}).$$

- ✓ Consumption  $C$  is positively related to disposable income  $Y - T$ . We write the consumption function as

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

- ✓ Investment  $I$  is negatively related to the real interest rate  $r$ . We write the investment function as

$$I = I(r).$$

A net export is a component of GDP:  $Y = C + I + G + NX$

National saving is the income of the nation that is left after paying for current consumption and government purchases:

$$Y - C - G = I + NX$$

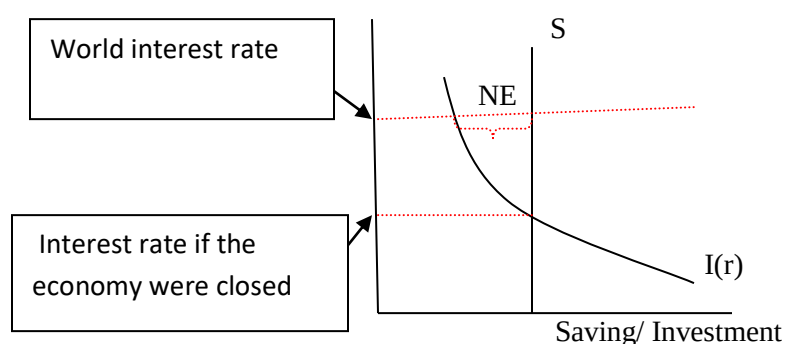
National saving ( $S$ ) equals  $Y - C - G$  so:  $S = I + NX$

The left-hand side of the identity is the difference between domestic saving and domestic investment,  $S - I$ , which we'll call net capital outflow. (It's sometimes called net foreign investment.) If net capital outflow is positive, our saving exceeds our investment, and we are lending the excess to foreigners. If the net capital outflow is negative, our investment exceeds

our saving, and we are financing this extra investment by borrowing from abroad. Thus, net capital outflow equals the amount that domestic residents are lending abroad minus the amount that foreigners are lending to us. It reflects the international flow of funds to finance capital accumulation.

In the closed economy, the real interest rate adjusts to equilibrate saving and investment—that is, the real interest rate is found where the saving and investment curves cross. In the small open economy, however, the real interest rate equals the world real interest rate. *The trade balance is determined by the difference between saving and investment at the world interest rate.*

Real interest rate  $r^*$



In a closed economy, the real interest rate adjusts to equilibrate saving and investment. In a small open economy, the interest rate is determined in world financial markets. The difference between saving and investment determines the trade balance. Here there is a trade surplus, because at the world interest rate, saving exceeds investment.

Or  $\text{Saving} = \text{domestic investment} + \text{Net Capital Outflow}$

$$S = I + \text{NCO}$$

If  $S - I$  and  $NX$  are positive, we have a **trade surplus**. In this case, we are net lenders in world financial markets, and we are exporting more goods than we are importing. If  $S - I$  and  $NX$  are negative, we have a **trade deficit**. In this case, we are net borrowers in world financial markets, and we are importing more goods than we are exporting. If  $S - I$  and  $NX$  are exactly zero, we are said to have **balanced trade** because the value of imports equals the value of exports.

*The national income accounts identity shows that the international flow of funds to finance capital accumulation and the international flow of goods and services are two sides of the same coin.*

### 4.3 Exchange rates

International transactions are influenced by international prices. The two most important international prices are the nominal exchange rate and the real exchange rate.

The *nominal exchange rate* is the rate at which a person can trade the currency of one country for the currency of another. The nominal exchange rate is expressed in two ways:

- In units of foreign currency per one domestic currency.
- And in units of domestic currency per one unit of the foreign currency.

Assume the exchange rate between the Japanese Yen and Ethiopia birr is 20 yen to one birr.

- One birr trades for 20 yen.
- One yen trades for  $1/20$  ( $= 0.05$ ) of a birr

*Appreciation* refers to an increase in the value of a currency as measured by the amount of foreign currency it can buy.

*Depreciation* refers to a decrease in the value of a currency as measured by the amount of foreign currency it can buy.

If a dollar buys more foreign currency, there is an appreciation of the dollar. If it buys less there is a depreciation of the dollar.

**The *real exchange rate*** is the rate at which a person can trade the goods and services of one country for the goods and services of another.

The real exchange rate compares the prices of domestic goods and foreign goods in the domestic economy.

- If a case of German beer is twice as expensive as American beer, the real exchange rate is  $1/2$  case of German beer per case of American beer.

The real exchange rate depends on the nominal exchange rate and the prices of goods in the two countries measured in local currencies.

The real exchange rate is a key determinant of how much a country exports and imports.

$$\text{Real exchange rate} = \frac{\text{Nominal exchange rate} \times \text{Domestic price}}{\text{Foreign price}}$$

### 4.4 The Mundell-Fleming model

**Mundell–Fleming model** is an open-economy version of the *IS–LM* model. Both models stress the interaction between the goods market and the money market. Both models assume that the price level is fixed and then show what causes short-run fluctuations in aggregate income (or, equivalently, shifts in the aggregate demand curve). The key difference is that the *IS–LM* model assumes a closed economy, whereas the Mundell–Fleming model assumes an open economy.

The Mundell–Fleming model makes one important and extreme assumption: it assumes that the economy being studied is **a small open economy with perfect capital mobility**. That is, the economy can borrow or lend as much as it wants in world financial markets and, as a result, the economy's interest rate is determined by the world interest rate.

$$r = r^*$$

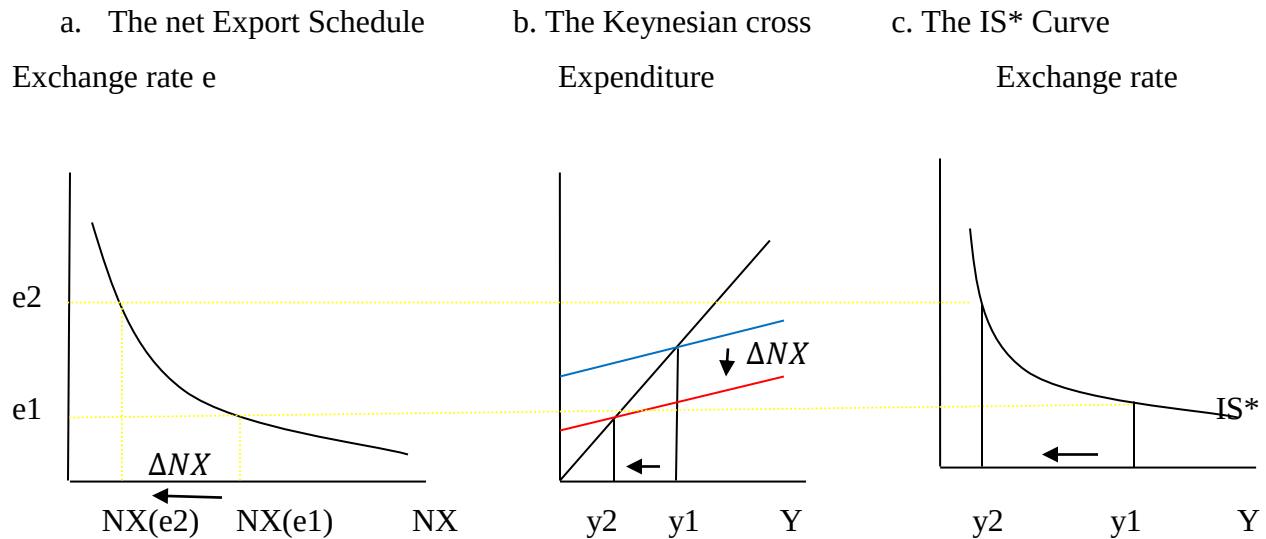
The  $r = r^*$  equation represents the assumption that the international flow of capital is rapid enough to keep the domestic interest rate equal to the world interest rate. In a small open economy, the domestic interest rate might rise by a little bit for a short time, but as soon as it did, foreigners would see the higher interest rate and start lending to this country (by, for instance, buying this country's bonds). The capital inflow would drive the domestic interest rate back toward  $r^*$ . Similarly, if any event were ever to start driving the domestic interest rate downward, capital would flow out of the country to earn a higher return abroad, and this capital outflow would drive the domestic interest rate back upward toward  $r^*$ .

#### a. The Goods Market and the *IS\** Curve

The Mundell–Fleming model describes the market for goods and services:

$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

This equation states that aggregate income  $Y$  is the sum of consumption  $C$ , investment  $I$ , government purchases  $G$ , and net exports  $NX$ . Consumption depends positively on disposable income  $Y - T$ . **Investment** depends negatively on the interest rate, which equals the world interest rate  $r^*$ . **Net exports** depend negatively on the exchange rate  $e$ . As before, we define the exchange rate  $e$  as the amount of foreign currency per unit of domestic currency—for example,  $e$  might be 20 **Yen** per **Birr**.



**The IS\* Curve** The  $IS^*$  curve is derived from the net-exports schedule and the Keynesian cross. Panel (a) shows the net-exports schedule: an increase in the exchange rate from  $e_1$  to  $e_2$  lowers net exports from  $NX(e_1)$  to  $NX(e_2)$ . Panel (b) shows the Keynesian cross: a decrease in net exports from  $NX(e_1)$  to  $NX(e_2)$  shifts the planned expenditure schedule downward and reduces income from  $Y_1$  to  $Y_2$ . Panel (c) shows the  $IS^*$  curve summarizing this relationship between the exchange rate and income: the higher the exchange rate, the lower the level of income.

Note the net export depends on the real exchange rate (the relative price of goods at home and abroad) rather than the nominal exchange rate (the relative price of domestic and foreign currencies). If  $e$  is the nominal exchange rate, then the real exchange rate  $e$  equals  $eP/P^*$ , where  $P$  is the domestic price level and  $P^*$  is the foreign price level. The Mundell–Fleming model, however, assumes that the price levels at home and abroad are fixed, so the real exchange rate is proportional to the nominal exchange rate.

### b. The Money Market and the $LM^*$ Curve

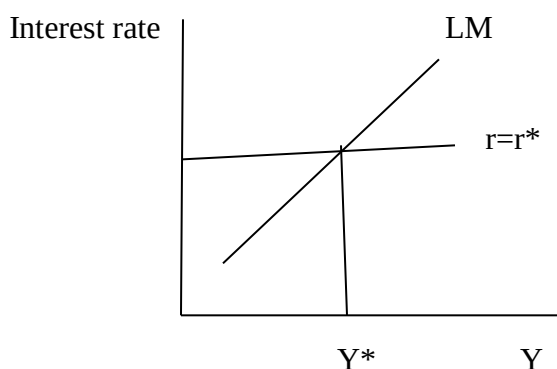
The Mundell–Fleming model represents the money market with an equation that should be familiar from the  $IS-LM$  model, with the additional assumption that the domestic interest rate equals the world interest rate:

$$M/P = L(r^*, Y).$$

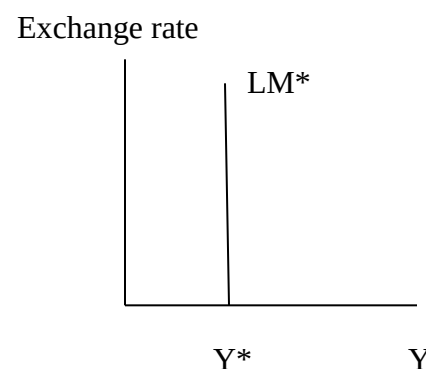
This equation states that the supply of real money balances,  $M/P$ , equals the demand,  $L(r, Y)$ . The demand for real balances depends negatively on the interest rate, which is now set equal to the world interest rate  $r^*$ , and positively on income  $Y$ . The money supply  $M$  is an exogenous variable

controlled by the central bank, and because the Mundell–Fleming model is designed to analyze short-run fluctuations, the price level  $P$  is also assumed to be exogenously fixed.

a. The LM curve



b. The LM\* Curve



**The LM\* Curve** Panel (a) shows the standard LM curve [which graphs the equation  $M/P = L(r, Y)$ ] together with a horizontal line representing the world interest rate  $r^*$ . The intersection of these two curves determines the level of income, regardless of the exchange rate. Therefore, as panel (b) shows, the LM\* curve is vertical.

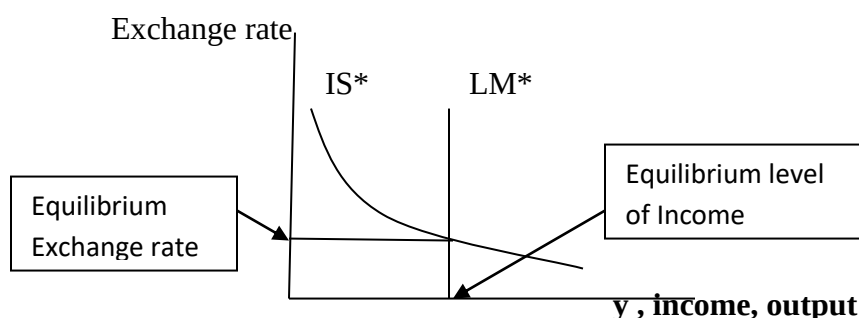
Generally, according to the Mundell–Fleming model, a small open economy with perfect capital mobility can be described by two equations:

$$Y = C(Y - T) + I(r^*) + G + NX(e) \quad IS^*$$

$$M/P = L(r^*, Y) \quad LM^*$$

The first equation describes equilibrium in the goods market, and the second equation describes equilibrium in the money market. The exogenous variables are fiscal policy  $G$  and  $T$ , monetary policy  $M$ , the price level  $P$  and the world interest rate  $r^*$ . The endogenous variables are income  $Y$  and the exchange rate  $e$ .

The Mundell–Fleming Model



**The Mundell–Fleming Model** This graph of the Mundell–Fleming model plots the goods market equilibrium condition  $IS^*$  and the money market equilibrium condition  $LM^*$ . Both curves are drawn holding the interest rate constant at the world interest rate. The intersection of these two

curves shows the level of income and the exchange rate that satisfy equilibrium both in the goods market and in the money market.

## 4.5 Fiscal and monetary policies in an open economy with perfect capital mobility

### a. Under Floating exchange rate

Under floating exchange rates, the exchange rate is allowed to fluctuate in response to changing economic conditions.

**Fiscal Policy:** an expansionary fiscal policy (an increase in government purchases or cut in taxes) increases planned expenditure, it shifts the  $IS^*$  curve to the right. As a result, the exchange rate appreciates, whereas the level of income remains the same.

In the closed-economy  $IS-LM$  model, a fiscal expansion raises income, whereas in a small open economy with a floating exchange rate, a fiscal expansion leaves income at the same level.

#### Why the difference?

When income rises in a closed economy, the interest rate rises, because higher income increases the demand for money. That is not possible in a small open economy: as soon as the interest rate tries to rise above the world interest rate  $r^*$ , capital flows in from abroad. This capital inflow increases the demand for the domestic currency in the market for foreign-currency exchange and, thus, bids up the value of the domestic currency. The appreciation of the exchange rate makes domestic goods expensive relative to foreign goods, and this reduces net exports. The fall in net exports offsets the effects of the expansionary fiscal policy on income.

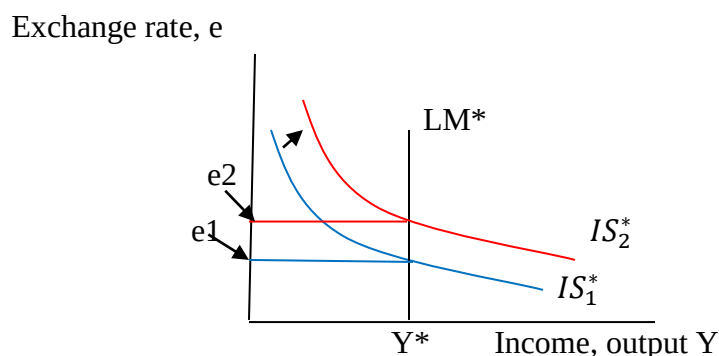
*Why is the fall in net exports so great that it renders fiscal policy powerless to influence income?*

In both closed and open economies, the quantity of real money balances supplied  $M/P$  is fixed, and the quantity demanded (determined by  $r$  and  $Y$ ) must equal this fixed supply.

In a closed economy, a fiscal expansion causes the equilibrium interest rate to rise. This increase in the interest rate (which reduces the quantity of money demanded) allows equilibrium income to rise (which increases the quantity of money demanded). By contrast, in a small open economy,  $r$  is fixed at  $r^*$ , so there is only one level of income that can satisfy this equation, and this level of income does not change when fiscal policy changes. Thus, when the government increases

spending or cuts taxes, the appreciation of the exchange rate and the fall in net exports must be large enough to offset fully the normal expansionary effect of the policy on income.

#### 4.5.1 Fiscal Expansion under Floating Exchange Rates



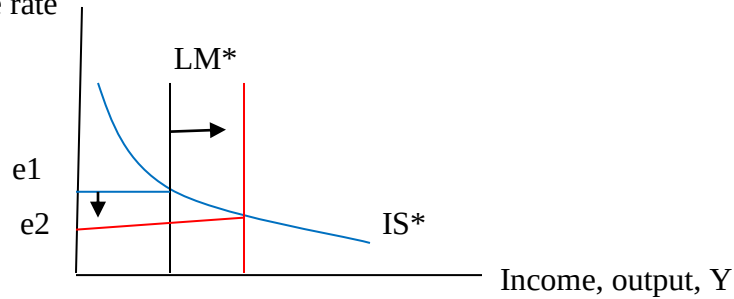
*An increase in government purchases or a decrease in taxes shifts the  $IS^*$  curve to the right. This raises the exchange rate but has no effect on income.*

**Monetary Policy:** Suppose now that the central bank increases the money supply. Because the price level is assumed to be fixed, the increase in the money supply means an increase in real balances. The increase in real balances shifts the  $LM^*$  curve to the right. Hence, an increase in the money supply raises income and lowers the exchange rate.

Although monetary policy influences income in an open economy, as it does in a closed economy, the monetary transmission mechanism is different. **In a closed economy an increase in the money supply increases spending because it lowers the interest rate and stimulates investment.** In a small open economy, the interest rate is fixed by the world interest rate. **As soon as an increase in the money supply puts downward pressure on the domestic interest rate, capital flows out of the economy as investors seek a higher return elsewhere.** This capital outflow prevents the domestic interest rate from falling. In addition, because the capital outflow increases the supply of the domestic currency in the market for foreign-currency exchange, the exchange rate depreciates. The fall in the exchange rate makes domestic goods inexpensive relative to foreign goods and, thereby, stimulates net exports. Hence, in a small open economy, monetary policy influences income by altering the exchange rate rather than the interest rate.

**A Monetary Expansion Under Floating Exchange Rates**

Exchange rate



An increase in the money supply shifts the  $LM^*$  curve to the right, lowering the exchange rate and raising income.

**Exercise:**

What is the impact of a restricted trade policy (tariff or an import quota) on national income and exchange rate under floating exchange rate?

It will decrease import and hence increases the *net export* = *export* – *import*. This shifts the  $IS^*$  curve outward. This will appreciate the exchange rate but has no effect on output.

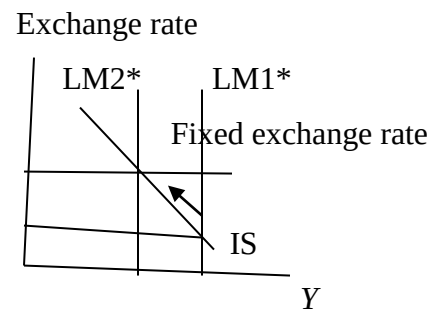
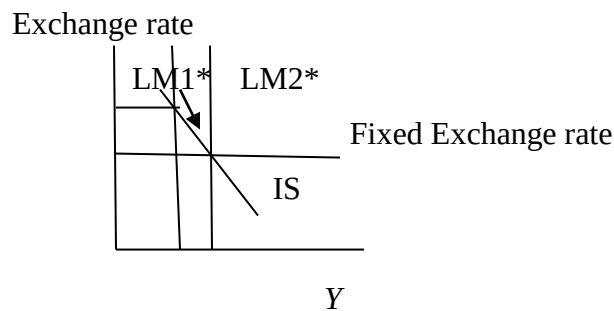
**4.5.2 Fixed exchange rates**

Under a system of fixed exchange rates, a central bank stands ready to buy or sell the domestic currency for foreign currencies at a predetermined price. A fixed exchange rate dedicates a country's monetary policy to the single goal of keeping the exchange rate at the announced level.

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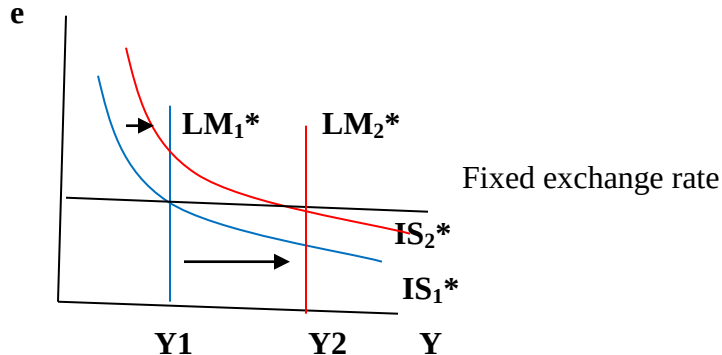
**How a Fixed-Exchange-Rate System Works:**

- a. The Equilibrium Exchange Rate Is Greater Than the Fixed Exchange Rate b. The Equilibrium Exchange Rate Is Less Than the Fixed Exchange Rate



In panel (a), the equilibrium exchange rate initially exceeds the fixed level. Arbitrageurs will buy foreign currency in foreign-exchange markets and sell it to the Fed for a profit. This process automatically increases the money supply, shifting the  $LM^*$  curve to the right and lowering the exchange rate. In panel (b), the equilibrium exchange rate is initially below the fixed level. Arbitrageurs will buy dollars in foreign-exchange markets and use them to buy foreign currency from the Fed. This process automatically reduces the money supply, shifting the  $LM^*$  curve to the left and raising the exchange rate.

### Fiscal Policy:

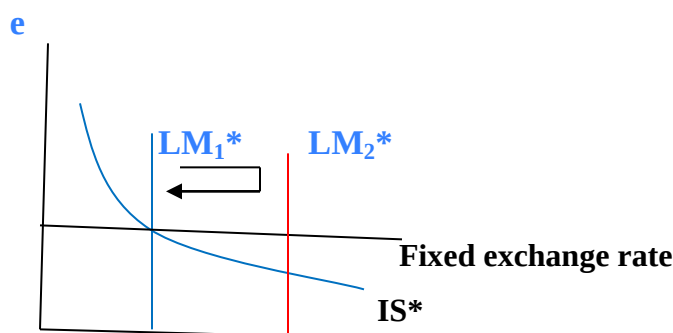


**A Fiscal Expansion under Fixed Exchange Rates:** A fiscal expansion shifts the  $IS^*$  curve to the right. To maintain the fixed exchange rate, the government must increase the money supply, thereby shifting the  $LM^*$  curve to the right. Hence, in contrast to the case of floating exchange rates, under fixed exchange rates a fiscal expansion raises income.

### Monetary Policy:

**A Monetary Expansion under Fixed Exchange Rates:** If the government tries to increase the money supply—for example, by buying bonds from the public—it will put downward pressure on the exchange rate. To maintain the fixed exchange rate, the money supply and the  $LM^*$  curve

must return to their initial positions. Hence, under fixed exchange rates, normal monetary policy is ineffectual.



**A Monetary Expansion Under Fixed Exchange Rates** If the Fed tries to increase the money supply—for example, by buying bonds from the public—it will put downward pressure on the exchange rate. To maintain the fixed exchange rate, the money supply and the  $LM^*$  curve must return to their initial positions. Hence, under fixed exchange rates, normal monetary policy is ineffectual.

A country with a fixed exchange rate can, however, conduct a type of monetary policy: it can decide to change the level at which the exchange rate is fixed. A reduction in the value of the currency is called devaluation, and an increase in its value is called a **revaluation**. In the Mundell–Fleming model, a devaluation shifts the  $LM^*$  curve to the right; it acts like an increase in the money supply under a floating exchange rate. Devaluation thus expands net exports and raises aggregate income. Conversely, a revaluation shifts the  $LM^*$  curve to the left, reduces net exports, and lowers aggregate income.

 What is the impact of a restricted trade policy (tariff or an import quota) on national income under fixed exchange rate regime?

The result of a trade restriction under a fixed exchange rate is very different from that under a floating exchange rate. In both cases, a trade restriction shifts the net-exports schedule to the right, but only under a fixed exchange rate does a trade restriction increase net exports  $NX$ . The reason is that a trade restriction under a fixed exchange rate induces monetary expansion rather than an appreciation of the exchange rate. The monetary expansion, in turn, raises aggregate income.

**The Mundell–Fleming Model: Summary of Policy Effects**

| Policy             | EXCHANGE-RATE REGIME |            |            |        |            |            |
|--------------------|----------------------|------------|------------|--------|------------|------------|
|                    | Floating, impact on  |            |            | Fixed  |            |            |
|                    | Income               | Ex.ge rate | Net export | Income | Ex.ge rate | Net export |
| Fiscal expansion   | 0                    | ↑          | ↓          | ↑      | 0          | ↑          |
| Monetary expansion | ↑                    | ↓          | ↑          | 0      | 0          | 0          |
| Import restriction | 0                    | ↑          | 0          | ↑      | 0          | 0          |

## 4.6 Limitations of the Mundell-Fleming model

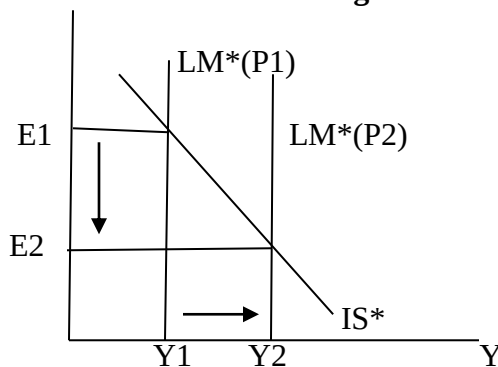
**Interest-Rate Differentials:** because of Country Risk and Exchange-Rate Expectations there is an interest rate differential across countries. The assumption of perfect capital mobility doesn't work always.

$r = r^* + \mathcal{V}$ . Rather than  $r = r^*$  where  $\mathcal{V}$  stands for risk premium in reality.

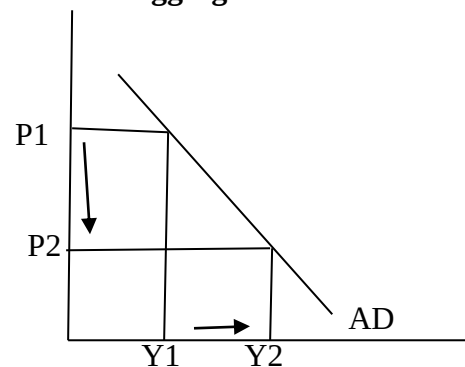
**An Increase in the Risk Premium** An increase in the risk premium associated with a country drives up its **interest** rate. Because the higher interest rate reduces investment, the  $IS^*$  curve shifts to the left. Because it also reduces money demand, the  $LM^*$  curve shifts to the right. Income rises, and the exchange rate depreciates.

### The Mundell–Fleming Model with a Changing Price Level

a. The Mundell–Fleming Model



b. The aggregate demand curve



**Mundell–Fleming as a Theory of Aggregate Demand** Panel (a) shows that when the price level falls, the  $LM^*$  curve shifts to the right. The equilibrium level of income rises. Panel (b) shows that this negative relationship between  $P$  and  $Y$  is summarized by the aggregate demand curve.

## Chapter Five

### Aggregate Supply

#### 5.1 Introduction

Most economists analyze short-run fluctuations in aggregate income and the price level using the model of aggregate demand and aggregate supply. The aggregate demand and aggregate supply curves together pin down the economy's price level and quantity of output.

**Aggregate supply (AS)** is the relationship between the quantity of goods and services supplied and the price level. Because the firms that supply goods and services have flexible prices in the long run but sticky prices in the short run, the aggregate supply relationship depends on the time horizon.

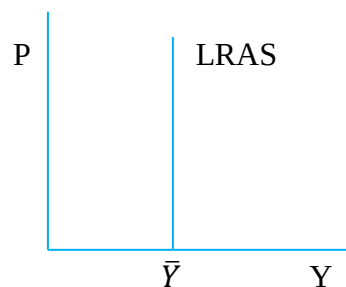
📖 We need to discuss two different aggregate supply curves: the long-run aggregate supply curve *LRAS* and the short-run aggregate supply curve *SRAS*. We also need to discuss how the economy makes the transition from the short run to the long run.

#### 5.2 The classical Approach to Aggregate Supply

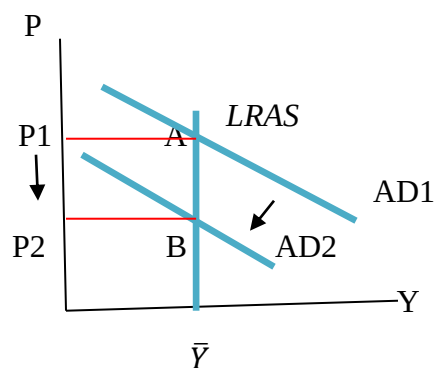
According to the classical's view, the amount of output produced depends on the fixed amounts of capital and labor and on the available technology.

$$Y = F(\bar{K}, \bar{L}) = \bar{Y} \text{ ----- (1)}$$

This happens in the long run. According to the classical model, output does not depend on the price level. To show that output is the same for all price levels, we draw a vertical aggregate supply curve. If the aggregate supply curve is vertical, then changes in aggregate demand affect prices but not output.



- ✚ If the aggregate supply curve is vertical, then changes in aggregate demand affect prices but not output. For example, if the money supply falls, the aggregate demand curve shifts downward.
- ✚ The vertical aggregate supply curve satisfies the classical dichotomy, because it implies that the level of output is independent of the money supply. This long run level of output,  $\bar{Y}$  is called the *full-employment* or *natural* level of output. It is the level of output at which the economy's resources are fully employed or, more realistically, at which unemployment is at its natural rate.



✚ A reduction in the money supply shifts the aggregate demand curve downward from AD1 to AD2.

The equilibrium for the economy moves from point A to point B. Since the aggregate supply curve is vertical in the long run, the reduction in aggregate demand affects the price level but not the level of output.

✚ What are the factors that affect (shift) long run aggregate supply curve (SRAS)? Some of them are as follows:

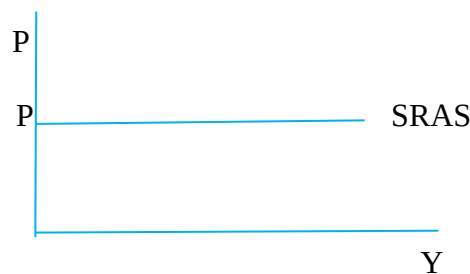
- i. **Labor:** Labor supply can be increased by growth in population and increases in immigrants.
- iii. **Capital:** Capital includes both physical and human capital. An increase in the economy's physical capital stock (e.g. factories, machinery and tools) raises productivity and an increase in human capital (e.g. skills and knowledge of the workers).

iv. **Natural Resources:** A discovery of new minerals and natural resources increases LRAS. On the contrary, a change in weather patterns e.g. more frequent drought or floods that makes farming more difficult and hence shifts LRAS curve to the left.

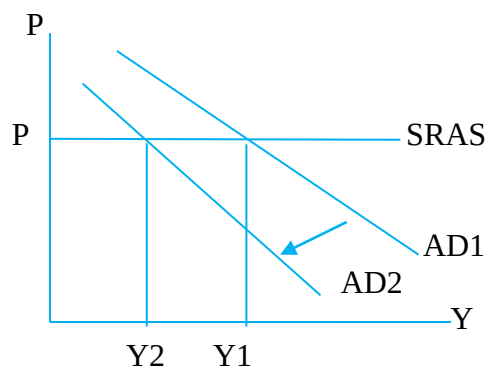
iv. Technological **Knowledge:** Technological change refers to an advance in knowledge which can improve the production efficiency of goods and services. For example, the invention of computer will shift the LRAS curve to the right.

✎ The classical model and the vertical aggregate supply curve apply only in the long run. In the short run, some prices are sticky and, therefore, do not adjust to changes in demand. Because of this price stickiness, the short-run aggregate supply curve is not vertical.

All prices are fixed in the short run. Therefore, the short-run aggregate supply curve, SRAS, is horizontal.



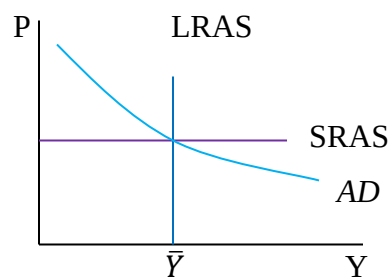
◆ A fall in aggregate demand reduces output in the short run because prices do not adjust instantly. After the sudden fall in aggregate demand, firms are stuck with prices that are too high. With demand low and prices high, firms sell less of their product, so they reduce production and lay off workers. The economy experiences a recession.



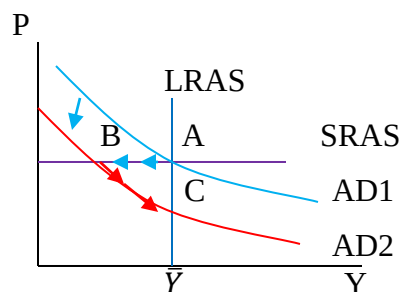
🔔 Over long periods of time, prices are flexible, the aggregate supply curve is vertical, and changes in aggregate demand affect the price level but not output.

🔔 Over short periods of time, prices are sticky, the aggregate supply curve is flat, and changes in aggregate demand do affect the economy's output of goods and services.

✎ The long-run equilibrium is the point at which aggregate demand crosses the long-run aggregate supply curve. Prices have adjusted to reach this equilibrium. Therefore, when the economy is in its long-run equilibrium, the short-run aggregate supply curve must cross this point as well.



Adjustment in the long run: the following graph shows how equilibrium is reached when demand is reduced through price adjustment.



The economy begins in long-run equilibrium at point A. A reduction in aggregate demand, perhaps caused by a decrease in the money supply, moves the economy from point A to point B, where output is below its natural level. As prices fall, the economy gradually recovers from the recession, moving from point B to point C.

**Exercise:** discuss about the effects of supply & demand shock and their stabilization mechanisms.

### 5.3 The Keynesian Approach to Aggregate Supply

According to the Keynesians, some market imperfection (that is, some type of friction) causes the output of the economy to deviate from the classical benchmark. As a result, the short-run aggregate supply curve is upward sloping, rather than horizontal, and shifts in the aggregate

demand curve cause the level of output to deviate temporarily from the natural rate. These temporary deviations represent the booms and busts of the business cycle. The Short run aggregate supply expressed in equation form as:

$$Y = \bar{Y} + a(P - P^e), a > 0 \text{ ----- (2)}$$

Where  $Y$  is output,  $\bar{Y}$  is the natural rate of output,  $P$  is the price level, and  $P^e$  is the expected price level. This equation states that output deviates from its natural rate when the price level deviates from the expected price level. The parameter  $a$  indicates how much output responds to unexpected changes in the price level;

### **Factors that shift the short run aggregate supply curve (SRAS)**

 Factors that shift the LRAS curve will also shift the SRAS curve. However, people's expectation of the price level will affect the position of the SRAS curve even though it has no effect on the LRAS curve.

 A higher expected price level decreases the quantity of goods and services supplied and shifts the SRAS curve to the left. Suppose workers and firms expect the future price will increase, the workers will negotiate a rise in wage to maintain their purchasing power and firms facing higher factor prices will raise the output prices accordingly.

 If all firms and workers in the economy are affected by higher expected prices, the costs of production will increase and the SRAS curve will shift to the left.

### **5.3.1 The sticky price model**

This model emphasizes that firms do not instantly adjust the prices they charge in response to changes in demand. Sometimes prices are set by long-term contracts between firms and customers. Even without formal agreements, firms may hold prices steady in order not to annoy their regular customers with frequent price changes. Some prices are sticky because of the way markets are structured: once a firm has printed and distributed its catalog or price list, it is costly to alter prices.

To see how sticky prices can help explain an upward-sloping aggregate supply curve, we first consider the pricing decisions of individual firms and then add together the decisions of many firms to explain the behavior of the economy as a whole. Notice that this model encourages us to

depart from the assumption of perfect competition. Perfectly competitive firms are price takers rather than price setters. If we want to consider how firms set prices, it is natural to assume that these firms have at least some monopoly control over the prices they charge.

Consider the pricing decision facing a typical firm. The firm's desired price  $p$  depends on two macroeconomic variables:

- The overall level of prices  $P$ . A higher price level implies that the firm's costs are higher. Hence, the higher the overall price level, the more the firm would like to charge for its product.
- The level of aggregate income  $Y$ . A higher level of income raises the demand for the firm's product. Because marginal cost increases at higher levels of production, the greater the demand, the higher the firm's desired price.

We write the firm's desired price as

$$p = P + a(Y - \bar{Y}) \text{ -----}(\$)$$

This equation says that the desired price  $p$  depends on the overall level of prices

$P$  and on the level of aggregate output relative to the natural rate  $Y - \bar{Y}$ . The parameter  $a$  (which is greater than zero) measures how much the firm's desired price responds to the level of aggregate output.

Now assume that there are two types of firms. Some have flexible prices: they always set their prices according to this equation. Others have sticky prices: they announce their prices in advance based on what they expect economic conditions to be. Firms with sticky prices set prices according to

$$p = P^e + a(Y^e - \bar{Y}^e),$$

where, as before, a superscript "e" represents the expected value of a variable. For simplicity, assume that these firms expect output to be at its natural rate, so that the last term,  $a(Y^e - \bar{Y}^e)$ , is zero. Then these firms set the price

$$P = P^e$$

That is, firms with sticky prices set their prices based on what they expect other firms to charge.

We can use the pricing rules of the two groups of firms to derive the aggregate supply equation.

To do this, we find the overall price level in the economy, which is the weighted average of the

prices set by the two groups. If  $s$  is the fraction of firms with sticky prices and  $1 - s$  the fraction with flexible prices, then the overall price level is

$$P = sP^e + (1 - s)[P + a(Y - \bar{Y})].$$

The first term is the price of the sticky-price firms weighted by their fraction in the economy, and the second term is the price of the flexible-price firms weighted by their fraction. Now subtract  $(1 - s)P$  from both sides of this equation to obtain

$$sP = sP^e + (1 - s)[a(Y - \bar{Y})].$$

Divide both sides by  $s$  to solve for the overall price level:

$$P = P^e + \left[ \frac{(1 - s)a}{s} \right] (Y - \bar{Y}).$$

The two terms in this equation are explained as follows:

- When firms expect a high price level, they expect high costs. Those firms that fix prices in advance set their prices high. These high prices cause the other firms to set high prices also. Hence, a high expected price level  $P^e$  leads to a high actual price level  $P$ .
- When output is high, the demand for goods is high. Those firms with flexible prices set their prices high, which leads to a high price level. The effect of output on the price level depends on the proportion of firms with flexible prices.

Hence, the overall price level depends on the expected price level and on the level of output.

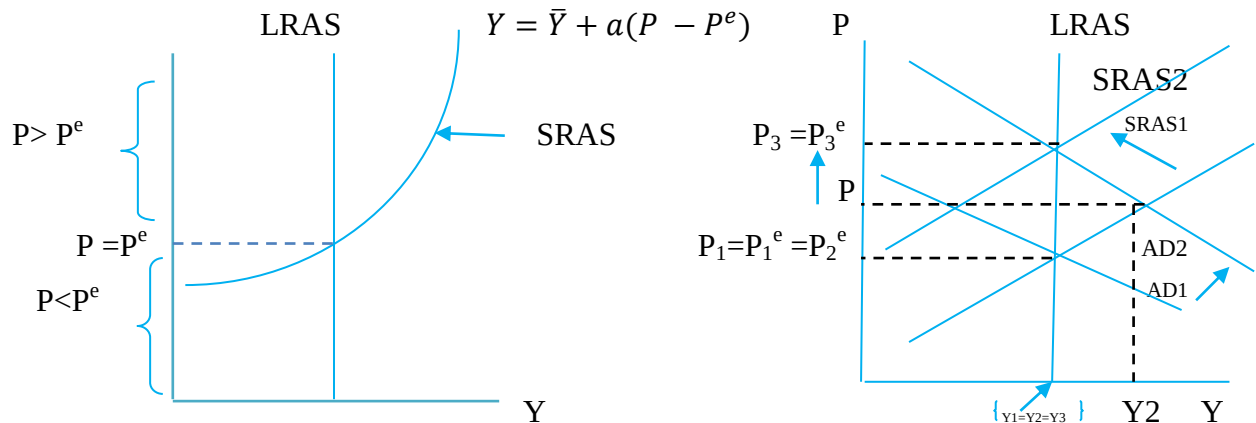
Algebraic rearrangement puts this aggregate pricing equation into a more familiar form:

$$Y = \bar{Y} + a(P - P^e),$$

where  $a = \frac{s}{[(1-s)a]}$  Like the other models, the sticky-price model says that the deviation of output from the natural rate is positively associated with the deviation of the price level from the expected price level.

Although the sticky-price model emphasizes the goods market, consider briefly what is happening in the labor market. If a firm's price is stuck in the short run, then a reduction in aggregate demand reduces the amount that the firm is able to sell. The firm responds to the drop in sales by reducing its production and its demand for labor.

Note the contrast to the sticky-wage model: the firm here does not move along a fixed labor demand curve. Instead, fluctuations in output are associated with shifts in the labor demand curve. Because of these shifts in labor demand, employment, production, and the real wage can all move in the same direction. Thus, the real wage can be procyclical.



The first graph shows that output deviates from the natural rate  $\bar{Y}$  if the price level  $P$  deviates from the expected price level. The second graph also shows here the economy begins in a long-run equilibrium, point A. When aggregate demand increases unexpectedly, the price level rises from  $P_1$  to  $P_2$ . Because the price level  $P_2$  is above the expected price level  $P_2^e$ , output rises temporarily above the natural rate, as the economy moves along the short-run aggregate supply curve from point A to point B. In the long run, the expected price level rises to  $P_3^e$ , causing the short-run aggregate supply curve to shift upward. The economy returns to a new long-run equilibrium, point C, where output is back at its natural rate.

### 5.3.2 The sticky wage model

✍ When the wage is fixed/stuck, a rise in the price level lowers the real wage ( $w/p$ ) making labor **cheaper**. The lower real wage induces firms to hire more labor. The additional labor hired produces more output.

To explain why the short-run aggregate supply curve is upward sloping, many economists stress the sluggish adjustment of nominal wages. In many industries, nominal wages are set by long-term contracts, so wages cannot adjust quickly when economic conditions change. Even in industries not covered by formal contracts, implicit agreements between workers and firms may limit wage changes. Wages may also depend on social norms and notions of fairness that evolve

slowly. For these reasons, many economists believe that nominal wages are sticky in the short run.

The **sticky-wage model** shows what a sticky nominal wage implies for aggregate supply. To preview the model, consider what happens to the amount of output produced when the price level rises:

1. When the nominal wage is stuck, a rise in the price level lowers the real wage, making labor cheaper.
2. The lower real wage induces firms to hire more labor.
3. The additional labor hired produces more output.

This positive relationship between the price level and the amount of output means that the aggregate supply curve slopes upward during the time when the nominal **wage cannot adjust**.

◆ To develop this story of aggregate supply more formally, assume that workers and firms bargain over and agree on the nominal wage before they know what the price level will be when their agreement takes effect. The bargaining parties—the workers and the firms—have in mind a target real wage. The target may be the real wage that equilibrates labor supply and demand. More likely, the target real wage is higher than the equilibrium real wage: union power and efficiency-wage considerations tend to keep real wages above the level that brings supply and demand into balance.

The workers and firms set the nominal wage  $W$  based on the target real wage  $\omega$  and on their expectation of the price level  $P^e$ . The nominal wage they set is

$$W = \omega \times P^e \quad \text{or}$$

$$\textbf{Nominal Wage} = \textbf{Target Real Wage} \times \textbf{Expected Price Level}.$$

After the nominal wage has been set and before labor has been hired, firms learn the actual price level  $P$ . The real wage turns out to be

$$\textbf{Real Wage} = \textbf{Target Real Wage} \times \frac{\textbf{Expected Price Level}}{\textbf{Actual Price Level}}$$

$$\text{Or} \quad \frac{W}{P} = \omega \times \frac{P^e}{P}$$

This equation shows that the real wage deviates from its target if the actual price level differs from the expected price level.

- ◆ When the actual price level is greater than expected, the real wage is less than its target; so firms hire more workers and output rises above its natural rate
- ◆ When the actual price level is less than expected, the real wage is greater than its target. So firms hire fewer workers and output falls below its natural rate
- ◆ When actual price is equal to the expected price level, real wage equals the target wage. Unemployment and output are at their natural rates

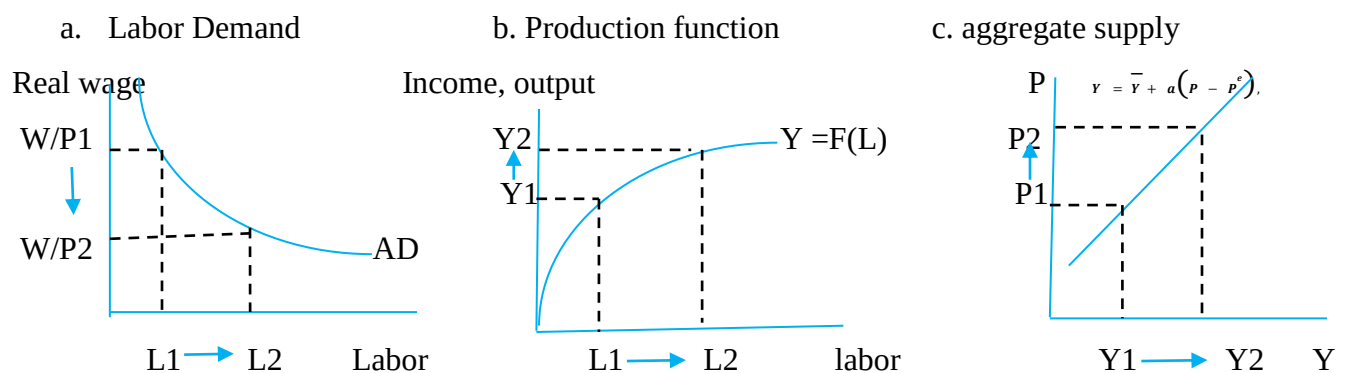
The final assumption of the sticky-wage model is that employment is determined by the **quantity of labor that firms demand**. In other words, the bargain between the workers and the firms does not determine the level of employment in advance; instead, the workers agree to provide as much labor as the firms wish to buy at the predetermined wage. We describe the firms' hiring decisions by the labor demand function

$$L = L^d(W/P),$$

which states that the lower the real wage, the more labor firms hire and Output is determined by the production function

$$Y = F(L),$$

which states that the more labor is hired, the more output is produced.



**The Sticky-Wage Model** Panel (a) shows the labor demand curve. Because the nominal wage  $W$  is stuck, an increase in the price level from  $P1$  to  $P2$  reduces the real wage from  $W/P1$  to  $W/P2$ . The lower real wage raises the quantity of labor demanded from  $L1$  to  $L2$ . Panel (b) shows the

production function. An increase in the quantity of labor from  $L_1$  to  $L_2$  raises output from  $Y_1$  to  $Y_2$ . Panel (c) shows the aggregate supply curve summarizing this relationship between the price level and output. An increase in the price level from  $P_1$  to  $P_2$  raises output from  $Y_1$  to  $Y_2$ .

Because the nominal wage is sticky, an unexpected change in the price level moves the real wage away from the target real wage, and this change in the real wage influences the amounts of labor hired and output produced. The aggregate supply curve can be written as

$$Y = \bar{Y} + \alpha (P - P^e).$$

Output deviates from its natural level when the price level deviates from the expected price level.

### 5.3.3 The worker Misperception model

The worker misperception (fooling) model, presented by Friedman in 1968 (in his article entitled “Role of Monetary Policy”, American Economic Review) is based on the assumption that wages can adjust freely and quickly to equilibrate the labour market.

Since workers temporarily equate a rise in nominal wage to a rise in real wage, i.e., they suffer from money illusion, unexpected movements in the price level influence labour supply. In this model, while the quantity of labour demanded by firms depends on the actual real wage, the quantity of labour supplied depends on the expected real wage, which is nominal wage ( $W$ ) deflated by the expected price level ( $P^e$ ), i.e.,

$$L_d = f\left(\frac{W}{P}\right) \text{-----} (5)$$

$$L_s = g\left(\frac{W}{P^e}\right) \text{-----} (6)$$

The reason for this is that while deciding on how much labour to supply, workers know their nominal wage but not the overall price level ( $P$ ). Expected real wage can be expressed as the product of actual real wage and a new variable  $P/P^e$ :

$$\frac{W}{P^e} = \frac{W}{P} \times \frac{P}{P^e} \quad \dots (7)$$

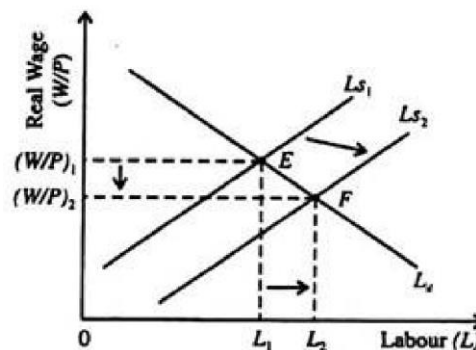
Here,  $P/P^e$  measures workers' misperception of the price level. If the value of this new variable exceeds 1, then  $P > P^e$ , i.e., actual price exceeds the expected price. If  $P < P^e$ , the converse is true.

Now, if we substitute equation (7) in equation (6) we get:

$$L_s = g\left[\frac{W}{P} \cdot \frac{P}{P^e}\right] \quad \dots (8)$$

This means that the quantity of labour supplied depends on the real wage and on worker misperception of the price level. According to this model, an unexpected rise in the price level makes workers feel that the real wage has gone up. But this is a false belief.

Living in a world of illusion they are induced to supply more labour at the initial real wage. This reduces the real wage from  $(W/P)_1$  to  $(W/P)_2$  in the figure below and raises the demand for labour from  $L_1$  to  $L_2$ . The end result is a rise in employment, output and income.



Even in this model, where workers believe (in the event of a rise in overall price level) that the real wage is higher than it actually is, deviations of actual prices from their expected levels induce the workers to increase their supply of labour. This, in its turn, alters the output levels of firms.

**So the equation of the short-run aggregate supply (SRAS) curve is the same as in the sticky-wage model:**

$$Y = \bar{Y} + \alpha(P - P^e)$$

or,  $Y_g = Y - \bar{Y} = a(P - P^e)$ .

The actual output deviates from its natural rate when the actual price level deviates from the expected price level. Here  $Y_g$  measures the output gap.

## Brief summary of stabilization mechanisms

### Changes in equilibrium levels of price and output

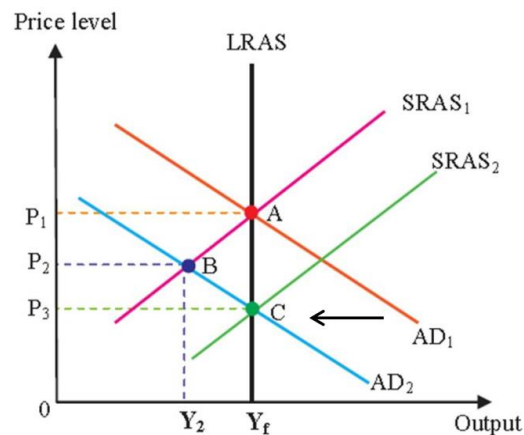
#### I. The effects of a change in aggregate demand

Suppose households and firms are pessimistic about the future economic conditions.

$C \& I \downarrow \rightarrow AD_1 \rightarrow AD_2$

In the short run, the equilibrium moves from A to B.

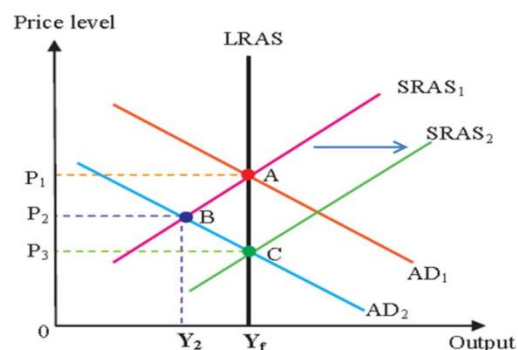
Q and price levels fall from  $P_1$  to  $P_2$ . This drop in output means that the economy is in a recession.



Under high unemployment, workers are willing to accept lower wages and firms are willing to accept lower prices.

After all adjustments, the SRAS curve shifts to the right, from  $SRAS_1$  to  $SRAS_2$ . Equilibrium moves from B to C, reaching the full-employment output level again at a lower price level  $P_3$ . This process is called **automatic adjustment mechanism**.

In the long run, the decrease in AD causes a drop in the equilibrium price level but leave the output



level unchanged. Thus, the long-run effect of a change in AD is a *nominal change (in the price level) but not a real change (output level remains constant)*.

## II. The effects of a change in short run aggregate supply curve



Suppose firms face a sudden increase in their costs of production (e.g. oil price increases substantially).

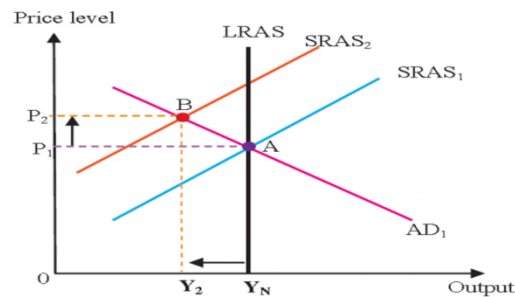


SRAS curve shifts to the left (SRAS<sub>1</sub> to SRAS<sub>2</sub>). Assume that it does not affect the LRAS.



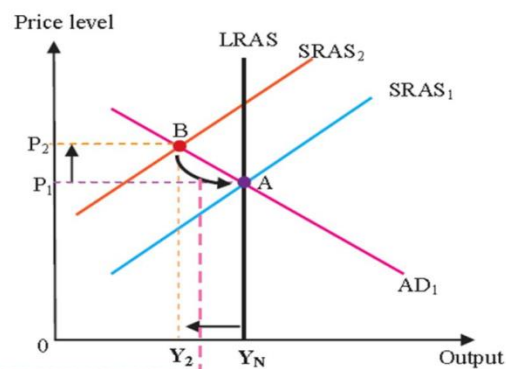
In the short run,  $Q \downarrow$ ,  $P \uparrow$ , this situation is called **stagflation**. The

equilibrium moves from A to B.



If the government does nothing price and wage expectations will adjust. With increased unemployment, workers are willing to accept lower wages. When nominal wages fall, producing goods and services becomes more profitable and firms are willing to supply more, causing the SRAS curve to shift back to the right.

Recession gradually ends and employment rebounds. The equilibrium moves back from B to A (SRAS<sub>2</sub> to SRAS<sub>1</sub>).



caused by automatic adjustment mechanism

Figure 8 The effects of a shift in SRAS curve

### 5.3.4 Imperfect information analysis

*Assumes each supplier produces a single good and consumes many goods* When the price level rises unexpectedly all suppliers in the economy observe increase in the price of the goods they produce. They all infer, rationally but mistakenly, that the relative prices of the goods they produce have risen. Thus they produce more. This model says that when ACTUAL prices exceed EXPECTED prices, suppliers raise their output.

Unlike the sticky-wage model, this model assumes that markets clear—that is, all wages and prices are free to adjust to balance supply and demand. In this model, the short-run and long-run aggregate supply curves differ because of temporary misperceptions about prices.

The imperfect-information model assumes that each supplier in the economy produces a single good and consumes many goods. Because the number of goods is so large, suppliers cannot observe all prices at all times. They monitor closely the prices of what they produce but less closely the prices of all the goods they consume. Because of imperfect information, they sometimes confuse changes in the overall level of prices with changes in relative prices. This confusion influences decisions about how much to supply, and it leads to a positive relationship between the price level and output in the short run.

Consider the decision facing a single supplier—a wheat farmer, for instance. Because the farmer earns income from selling wheat and uses this income to buy goods and services, the amount of wheat she chooses to produce depends on the price of wheat relative to the prices of other goods and services in the economy.

If the relative price of wheat is high, the farmer is motivated to work hard and produce more wheat, because the reward is great. If the relative price of wheat is low, she prefers to enjoy more leisure and produce less wheat.

Unfortunately, when the farmer makes her production decision, she does not know the relative price of wheat. As a wheat producer, she monitors the wheat market closely and always knows the nominal price of wheat. But she does not know the prices of all the other goods in the economy. She must, therefore, estimate the relative price of wheat using the nominal price of wheat and her expectation of the overall price level.

Consider how the farmer responds if all prices in the economy, including the price of wheat, increase. One possibility is that he expected this change in prices. When he observes an increase

in the price of wheat, his estimate of its relative price is unchanged. He does not work any harder.

The other possibility is that the farmer did not expect the price level to increase (or to increase by this much). When he observes the increase in the price of wheat, he is not sure whether other prices have risen (in which case wheat's relative price is unchanged) or whether only the price of wheat has risen (in which case its relative price is higher). The rational inference is that some of each has happened.

In other words, the farmer infers from the increase in the nominal price of wheat that its relative price has risen somewhat. He works harder and produces more.

Our wheat farmer is not unique. When the price level rises unexpectedly, all suppliers in the economy observe increases in the prices of the goods they produce. They all infer, rationally but mistakenly, that the relative prices of the goods they produce have risen. They work harder and produce more. To sum up, the imperfect-information model says that when actual prices exceed expected prices, suppliers raise their output. The model implies an aggregate supply curve that is now familiar:

$$Y = \bar{Y} + a(P - P^e) \text{ ----- (3)}$$

Output deviates from the natural rate when the price level deviates from the expected price level.