

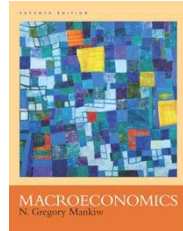
# Intermediate Macroeconomics

ECON 302

Professor Yamin Ahmad

## Lecture 4:

- Introduction to the Goods Market
- Review of the Aggregate Expenditures model and the Keynesian Cross



# Components of Aggregate Demand

- Aggregate Expenditures/Keynesian Model:
  - The Consumption Function
  - The Keynesian Cross
  - Autonomous Expenditures
  - Multipliers
- Equilibrium in the Goods Market/Loanable Funds Market
- The IS Relation

Note: These lecture notes are incomplete without having attended lectures

2

# The Composition of GDP

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

## Recall that:

- **Consumption (C)** refers to the goods and services purchased by consumers.
- **Investment (I)**, sometimes called **fixed investment**, is the purchase of capital goods. It is the sum of **nonresidential investment** and **residential investment**.

Note: These lecture notes are incomplete without having attended lectures

3

# The Composition of GDP

- **Government Spending (G)** refers to the purchases of goods and services by the federal, state, and local governments. It does not include **government transfers**, nor interest payments on the government debt.
- **Imports (IM)** are the purchases of foreign goods and services by consumers, business firms, and the U.S. government.
- **Exports (X)** are the purchases of U.S. goods and services by foreigners.

Note: These lecture notes are incomplete without having attended lectures

4

## The Composition of GDP

- **Net exports ( $X - IM$ )** is the difference between exports and imports, also called the **trade balance**.

$$\text{Exports} = \text{imports} \Leftrightarrow \text{trade balance}$$

$$\text{Exports} > \text{imports} \Leftrightarrow \text{trade surplus}$$

$$\text{Exports} < \text{imports} \Leftrightarrow \text{trade deficit}$$

- **Inventory investment** is the difference between production and sales.

## The Demand for Goods

- The total demand for goods is written as:

$$AE \equiv C + I + G + X - IM$$

- The symbol “ $\equiv$ ” means that this equation is an **identity**, or definition.
- Under the assumption that the economy is closed,  $X = IM = 0$ , then:

$$AE \equiv C + I + G$$

## The Demand for Goods

To determine  $AE$ , some simplifications must be made:

- Assume that all firms produce the same good, which can then be used by consumers for consumption, by firms for investment, or by the government.
- Assume that firms are willing to supply and demand in that market
- Assume that the economy is *closed*, that it does not trade with the rest of the world, then both exports and imports are zero.

## Consumption (C)

- **Disposable income, ( $Y_D$ )**, is the income that remains once consumers have paid taxes and received transfers from the government.

$$C = C(Y_D)$$

(+)

- The function  $C(Y_D)$  is called the **consumption function**. It is a **behavioral equation**, that is, it captures the behavior of consumers.
- Disposable income is defined as:  $Y_D \equiv Y - T$

## Consumption (C)

- A more specific form of the consumption function is this **linear relation**:

$$C = c_0 + c_1 Y_D$$

This function has two **parameters**,  $c_0$  and  $c_1$ :

- $c_1$  is called the **(marginal) propensity to consume**, or the effect of an additional dollar of disposable income on consumption.
- $c_0$  is the intercept of the consumption function, and is known as **autonomous consumption**, i.e. the amount of consumption expenditures households wish to purchase, independent of income.

Note: These lecture notes are incomplete without having attended lectures

9

## Consumption (C)

Figure 1

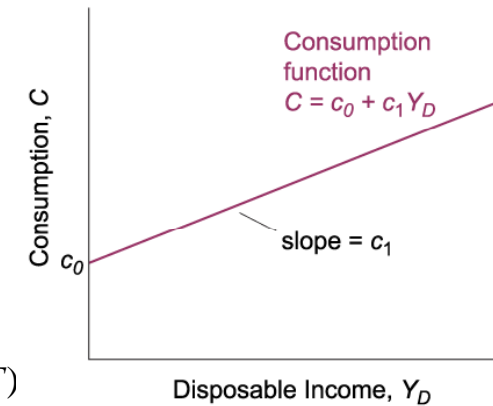
### Consumption and Disposable Income

Consumption increases with disposable income, but less than one for one.

$$C = C(Y_D)$$

$$Y_D \equiv Y - T$$

$$C = c_0 + c_1(Y - T)$$



Note: These lecture notes are incomplete without having attended lectures

10

## Investment (I)

- Variables that depend on other variables within the model are called **endogenous**. Variables that are not explain within the model are called **exogenous**. Investment here is taken as given, or treated as an exogenous variable:

$$I = \bar{I}$$

Note: These lecture notes are incomplete without having attended lectures

11

## Government Spending (G)

Government spending,  $G$ , together with taxes,  $T$ , describes **fiscal policy** — the choice of taxes and spending by the government.

We shall assume that  $G$  and  $T$  are also exogenous for two reasons:

- Governments do not behave with the same regularity as consumers or firms.
- Macroeconomists must think about the implications of alternative spending and tax decisions of the government.

Note: These lecture notes are incomplete without having attended lectures

12



## The Determination of Equilibrium Output

**Equilibrium in the goods market** requires that production,  $Y$ , be equal to the demand for goods,  $AE$ :

$$Y = AE$$

Then:

$$Y = c_0 + c_1(Y - T) + \bar{I} + \bar{G}$$

The **equilibrium condition** is that, production,  $Y$ , be equal to demand. Demand,  $AE$ , in turn depends on income,  $Y$ , which itself is equal to production.



## Using Algebra

The equilibrium equation can be manipulated to derive some important terms:

➤ **Autonomous spending** and the **multiplier**:

- The term  $[c_0 + \bar{I} + \bar{G} - c_1T]$  is that part of the demand for goods that does not depend on output, it is called **autonomous spending**. If the government ran a balanced budget, then  $T=G$ .
- Because the propensity to consume ( $c_1$ ) is between zero and one,  $\frac{1}{1-c_1}$  is a number greater than one. For this reason, this number is called the **multiplier**.

$$Y = \frac{1}{1 - c_1} [c_0 + \bar{I} + \bar{G} - c_1T]$$



## The Keynesian Cross

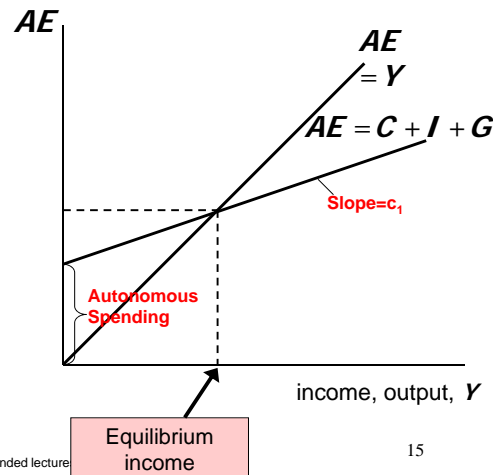
$$AE = (c_0 + \bar{I} + \bar{G} - c_1\bar{T}) + c_1Y$$

Figure 2

### Equilibrium in the Goods Market

Equilibrium output is determined by the condition that production be equal to demand.

- First, plot demand as a function of income.
- Second, plot production as a function of income.
- In Equilibrium, production equals demand.



## Practice Example 1:

Suppose that:

- $C=475 + 0.75(Y-T)$
- $T = 100$
- $I = 150$
- $G = 250$

1. Calculate the equation for the AE (Aggregate Expenditure) curve
2. What is real GDP in equilibrium?



## The Multiplier

Definition: The **multiplier** is the amount by which a change in autonomous expenditure is magnified or multiplied to determine the change in equilibrium expenditure and real GDP.



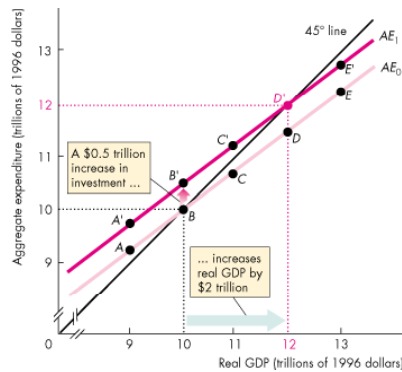
## The Basic Idea of the Multiplier

- An increase in investment (or any other component of autonomous expenditure) increases aggregate expenditure and real GDP and the increase in real GDP leads to an increase in induced expenditure.
- The increase in induced expenditure leads to a further increase in aggregate expenditure and real GDP.
- So real GDP increases by more than the initial increase in autonomous expenditure.



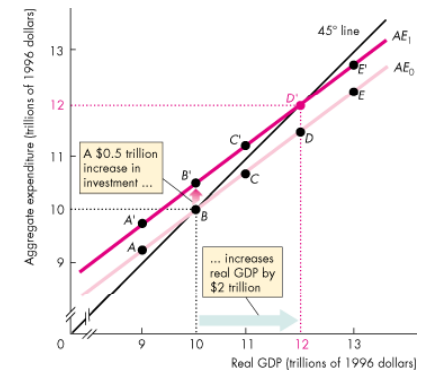
## The Multiplier Effect

- Figure 3 illustrates the multiplier.
- The Multiplier Effect:
  - The amplified change in real GDP that follows an increase in autonomous expenditure is the **multiplier effect**.



## The Multiplier Effect

- When autonomous expenditure increases, inventories make an unplanned decrease, so firms increase production and real GDP increases to a new equilibrium.





## The Multiplier

- Why Is the Multiplier Greater than 1?
  - The multiplier is greater than 1 because an increase in autonomous expenditure induces further increases in expenditure.
- The Size of the Multiplier
  - The size of the multiplier is the change in equilibrium expenditure divided by the change in autonomous expenditure.



## The Multiplier

- Ignoring induced imports and income taxes, the marginal propensity to consume determines the magnitude of the multiplier.
- The multiplier equals  $1/(1 - MPC)$  or, alternatively,  $1/MPS$ .



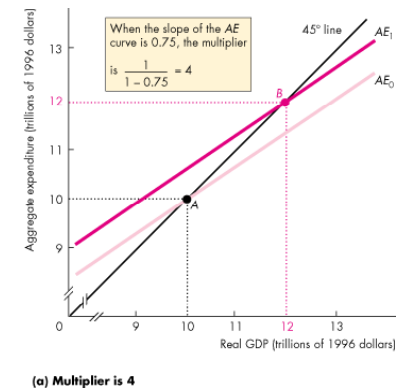
## Imports and Income Taxes

- Income taxes and induced imports both reduce the size of the multiplier.
- Including income taxes and induced imports, the multiplier equals  $1/(1 - \text{slope of the } AE \text{ curve})$ .



## The Multiplier

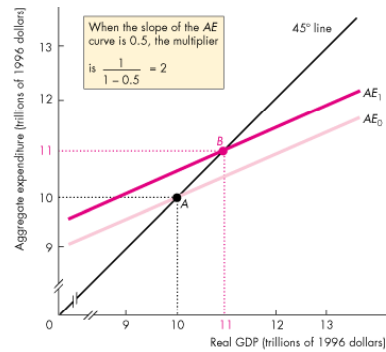
- Figure 4 shows the relation between the multiplier and the slope of the *AE* curve.
- In part (a) with no imports (or imports are autonomous) and no income taxes, the slope of the *AE* curve is 0.75 and the multiplier is 4.





## The Multiplier

- In part (b), when you include *either* income taxes or induced imports, the slope of the AE curve is 0.5 and the multiplier is 2.



(b) Multiplier is 2

Note: These lecture notes are incomplete without having attended lectures

25



## Summary of Impact on Multiplier Magnitude

- The multiplier is larger:
  - The greater the marginal propensity to consume ( $c_1$ )
  - The smaller the marginal tax rate ( $t_1$ )
  - The smaller the marginal propensity to import ( $m_1$ )
- Note: Autonomous/Lump sum taxes, i.e.  $T=t_0$  and autonomous imports  $m_0$  do not affect the value of the multiplier

Note: These lecture notes are incomplete without having attended lectures

26



## Using Words

### Summary (cont.):

- An increase in demand leads to an increase in production and a corresponding increase in income. The end result is an increase in output that is larger than the initial shift in demand, by a factor equal to the multiplier.

To estimate the value of the multiplier, and more generally, to estimate behavioral equations and their parameters, economists use **econometrics**—a set of statistical methods used in economics.

Note: These lecture notes are incomplete without having attended lectures

27



## Practice Example 2:

Consider once again the scenario in example 1.

- $C = 475 + 0.75(Y - T)$
- $T = 100$
- $I = 150$
- $G = 250$

Suppose that firms increase investment by 100. What happens to real GDP in equilibrium? How much does it change by?

Note: These lecture notes are incomplete without having attended lectures

28



## How Long Does It Take for Output to Adjust?

Describing formally the adjustment of output over time is what economists call the **dynamics** of adjustment.

- Suppose that firms make decisions about their production levels at the beginning of each quarter.
- Now suppose consumers decide to spend more, that they increase  $c_0$ .
- Having observed an increase in demand, firms are likely to set a higher level of production in the following quarter.
- In response to an increase in consumer spending, output does not jump to the new equilibrium, but rather increases over time.

Note: These lecture notes are incomplete without having attended lectures

29



## An Alternative Characterization of the Goods Market Equilibrium

- Investment, Savings and the Market for Loanable Funds

Note: These lecture notes are incomplete without having attended lectures

30



## Market For Loanable Funds

**Saving** is the sum of private plus public saving.

- **Private saving** ( $S$ ), is saving by consumers.

$$S \equiv Y_D - C \quad S \equiv Y - T - C$$

- **Public saving** equals taxes minus government spending.
  - If  $T > G$ , the government is running a **budget surplus** — public saving is positive.
  - If  $T < G$ , the government is running a **budget deficit** — public saving is negative.

$$Y = C + I + G \quad Y - T - C = I + G - T$$

$$S = I + G - T \quad I = S + (T - G)$$

Note: These lecture notes are incomplete without having attended lectures

31



Investment Equals Saving: An Alternative Way of Thinking about Goods-Market Equilibrium

$$I = S + (T - G)$$

The equation above states that equilibrium in the goods market requires that investment equals saving—the sum of private plus public saving.

This equilibrium condition for the goods market is called the **IS relation**. What firms want to invest must be equal to what people and the government want to save.

Note: These lecture notes are incomplete without having attended lectures

32

## Investment Equals Saving: An Alternative Way of Thinking about Goods-Market Equilibrium

- Consumption and saving decisions are one and the same.

$$S = Y - T - C$$

$$S = Y - T - c_0 - c_1(T - T)$$

$$S = -c_0 + (1 - c_1)(Y - T)$$

- The term  $(1 - c_1)$  is called the **marginal propensity to save**.

In equilibrium:

$$I = -c_0 + (1 - c_1)(Y - T) + (T - G)$$

Rearranging terms, we get the same result as before:

$$Y = \frac{1}{1 - c_1} [c_0 + \bar{I} + \bar{G} - c_1 T]$$

Note: These lecture notes are incomplete without having attended lectures

33

## Summary

- The Consumption Function depicts the relationship between (household) consumption expenditures and its direct relationship to disposable income.
- The marginal propensity to consume represents the fraction of every dollar increase in disposable income that is consumed. The level of autonomous consumption represents the amount of consumption expenditures households would purchase, independent of disposable income.

Note: These lecture notes are incomplete without having attended lectures

34

## Summary

- The Aggregate Expenditures/Keynesian model focuses on the demand side of the economy. Prices are held fixed (short run) and supply adjusts to meet demand. Hence, changes in demand lead to fluctuations in the business cycle.
- Goods Market Equilibrium is given by setting supply equal to demand. In the workhorse Keynesian (Aggregate Expenditures) model, it is where aggregate planned expenditure (AE curve) equals actual production (45° line)
- A change in autonomous expenditures (the intercept of the AE line) leads to a more than one for one change in equilibrium GDP. This concept is the Multiplier.

Note: These lecture notes are incomplete without having attended lectures

35

## Summary

- The size of the multiplier in a closed economy depends on the marginal propensity to consume (mpc) and the marginal tax rate ( $t_1$ ). In an open economy, it also depends on the marginal propensity to import,  $m_1$ . The multiplier is higher:
  - The higher the mpc
  - The lower the marginal tax rate,  $t_1$
  - (And in an open economy, the lower the marginal propensity to import,  $m_1$ .)
- The IS equation is an alternative way to think about goods market equilibrium and represents equilibrium in the loanable funds market

Note: These lecture notes are incomplete without having attended lectures

36