Economics II

Lecture 14

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ECONOMICS &
MANAGEMENT
UNIVERSIDADE DE LISBOA

Lecture 14

Outline:

8. Aggregate Demand and Income in the Short Run

8.1. The Simple Keynesian Model without Government

Readings:

Frank e Bernanke (2011), chapter 11

Amaral et al. (2007), chapter 5

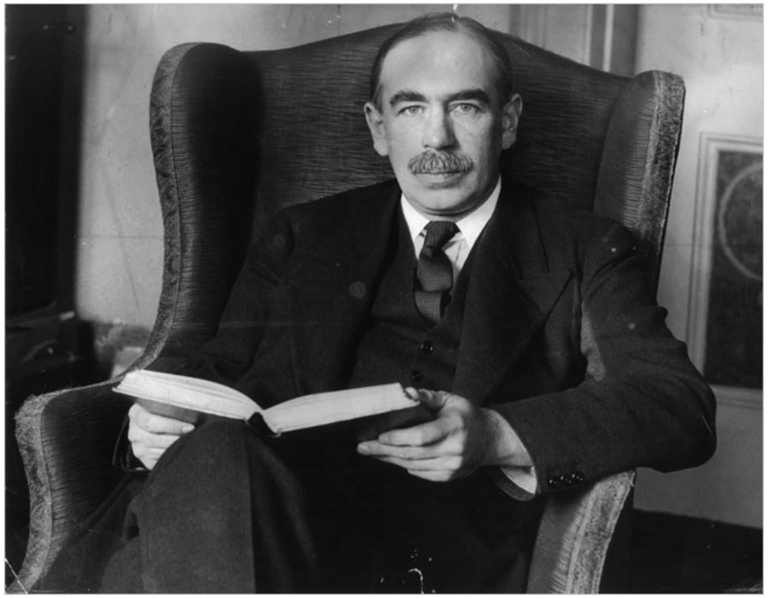
Objectives of this lecture:

At the end of this lecture students will be able to:

- Understand the macroeconomic model concept.
- Use the simple Keynesian multiplier.
- Understand the concept of multiplier effect of an exogenous variable on the equilibrium value of an endogenous variable.
- Compute multipliers.

8. Aggregate Demand and Output in the Short Run

8.1. The Simple Keynesian Model without Government



John Maynard Keynes:

- 1883 – 1946.
- In 1936 he published *The General Theory of Employment, Interest and Money*.
- Probably, the most influential economist of the 20th century.
- Surely, the greatest macroeconomist of 20th century.
- He is considered to be the "father" of Macroeconomics.

The model that we are going to use is referred to as "Keynesian" due of the nature of its assumptions:

- the importance of aggregate demand as a driver of production activity;
- the existence of excess production capacity;
- the adjustment of economic imbalances through quantities rather than via the price mechanism, ...
- i.e. there is nominal rigidity.

As with other models, its performance depends on how its assumptions are suitable for specific economies.

Let us start by putting together the pieces we already know in a simpler jigsaw puzzle.

In the simple Keynesian model we consider the following assumptions:

- there is no Government;
- there is no rest-of-the-world sector:
  - the economy is closed;
- the price level does not change with the other variables:
  - the price index is exogenous;
- there is an excess (surplus) of production capacity;
- investment intentions do not depend on the interest rate:
  - information about the interest rate is irrelevant.

The model equations:

(1) $$D = C + I$$

- It represents the purchasing (expenditure) intentions of final goods and services at constant base-year prices.
- This is a definition equation.
- Public consumption (G) is not there due to the fact that there is no Government.
- The trade (goods and services) balance ($NX = Ex - Im$) is not there due to the fact that this is a closed economy.

(2) $$C = \bar{C} + c.Y_d$$

- It represents the expenditure intentions in private consumption at constant base-year prices.
- It is a behavioural equation.

(3) $$Y_d = Y$$

- It represents households' disposable income at constant base-year prices.
- This is a definition equation.
- Income taxes (T) and transfers (TR) are not there due to the fact that there is no Government.

(4) $$I = \bar{I}$$

- It represents expenditure intentions in investment at constant base-year prices.
- It is a behavioural equation.
- They do not depend on the real interest rate ($b = 0$), therefore they are explained by factors exogenous to the model.

(5) $$D = Y$$

- It represents the (*ex-ante*) equality between purchasing (expenditure) and the supply (output) intentions of final goods and services at constant base-year prices.
- It is an equilibrium equation.

The model, in its structural form, is given by

- the system of equations and…
- … the corresponding economic constraints (variables' domains);

$$
\begin{cases}
D = C + I \\
C = \bar{C} + c.Y_d \\
Y_d = Y \\
I = \bar{I} \\
Y = D
\end{cases}
$$

Types of elements in the model:

- Endogenous variables:
  - Their values are unknown (*ex ante*).
  - They depend on the factors included in the model.
  - Examples: Y, C.
- Exogenous variables:
  - Their values are known from the start.
  - They are not explained by the model.
  - Example: $\bar{I}$.
- Parameters:
  - Their values are supposedly invariant (corresponding to stable behaviours of economic agents).
  - Examples: c, $\bar{C}$.

An equilibrium for this model is:

- a solution for the values taken by endogenous variables…
- … that meets economic constraints (e.g. $Y > 0$).
- A state from which agents are not interested in departing (i.e. it is a fixed point).

In order to find the equilibrium value for output in the simple model…

- … we solve the system for Y!
  - By substitution,
  - by Cramer's rule, …

Solving by substitution:

(1)+... $D = C + I \Leftrightarrow$

(2)+... $\Leftrightarrow D = \left(\bar{C} + c.Y_d\right) + I \Leftrightarrow$

(3)+... $\Leftrightarrow D = \left(\bar{C} + c.Y\right) + I \Leftrightarrow$

(4)+... $\Leftrightarrow D = \left(\bar{C} + c.Y\right) + \bar{I} \Leftrightarrow$

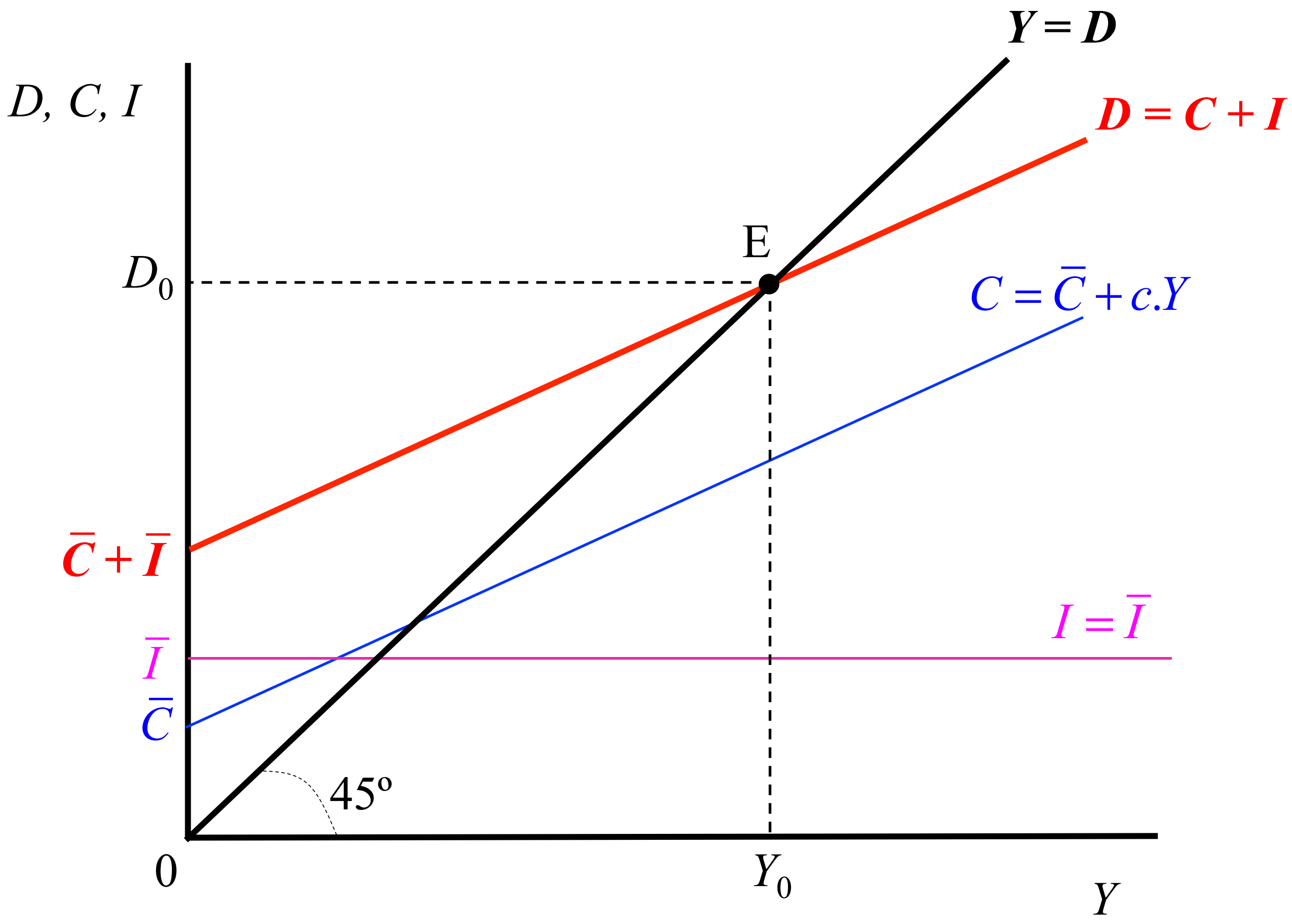
(5)+... $\Leftrightarrow Y = \left(\bar{C} + c.Y\right) + \bar{I} \Leftrightarrow$

$$\Leftrightarrow (1 - c).Y = \bar{C} + \bar{I} \Leftrightarrow$$

$$\Leftrightarrow \boxed{Y = \frac{\bar{C} + \bar{I}}{1 - c}}$$

Reduced form for equilibrium output.

Graphical representation for the equilibrium in this economy:



A short numerical example:

$$C = 15 + 0.8Y_d$$

$$I = 25 \text{ m.u.}$$

$$Y = \frac{15+25}{1-0.8} = 200 \text{ m.u.}$$

Question: What would happen to equilibrium GDP if the investment was 10 m.u. higher?

- Wrong answer: it would also be 10 m.u. higher.
- Right answer: it would be 50 m.u. higher!
- So much? Why?

Mathematically:

$$Y = \frac{15 + (25 + 10)}{1 - 0.8} = 250 \text{ m.u.}$$

Economically:

- More investment means higher aggregate demand and therefore higher production of capital goods - direct effect.
- Higher production of capital goods means more income generated in these industries.
- The increase in income induces a rise in consumption – indirect effect.
- In this example:
  - investment goes up by 10 m. u.;
  - consumption goes up by 0.8 x 50 = 40 m. u.;
  - output goes up by 10 + 40 = 50 u.m.

Investment increased by 10 m.u., ...

- ... but the equilibrium value of output increased by 50 m.u.

There is a <u>multiplier</u> effect.

- In this example, the multiplier effect of autonomous investment on equilibrium output is equal to 50/10 = 5.

In general, we obtain:

- considering that reduced-form equilibrium output is given by

$$Y = \frac{1}{1-c}.\bar{C} + \frac{1}{1-c}.\bar{I}$$

- the effect of a small change in autonomous investment on equilibrium output is given by

$$\frac{\partial Y}{\partial \bar{I}} = \frac{1}{1-c} > 1$$

because $0 < c < 1$.

Thus, the <u>multiplier</u> of autonomous investment is no more than…

- the partial derivative of Y (equilibrium output) with respect to $\bar{I}$ (autonomous investment).
- Since the model is linear in $\bar{I}$, then we do not need the changes to be small (infinitesimal), i.e.

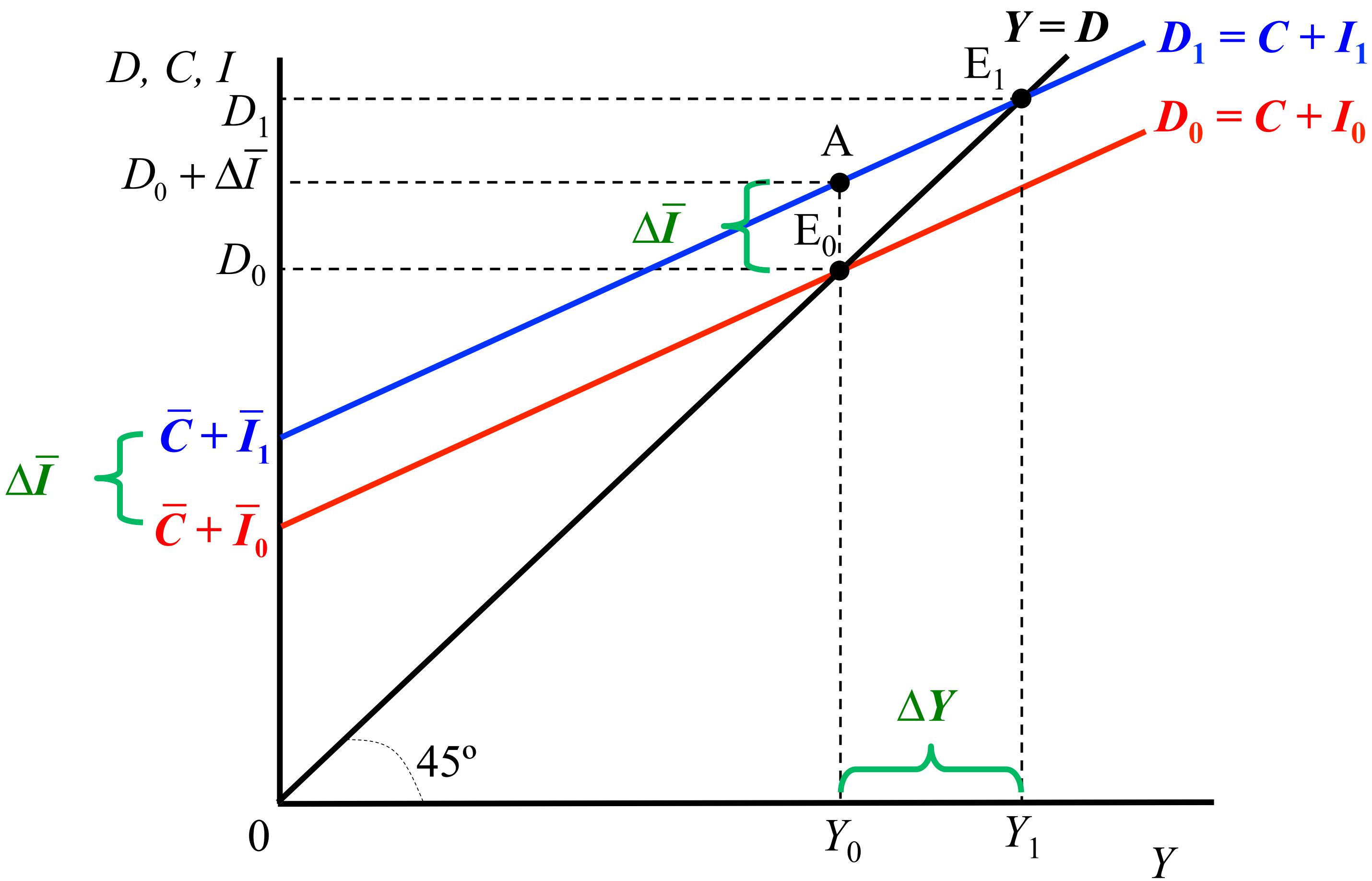
$$\frac{\partial Y}{\partial \bar{I}} = \lim_{\Delta \bar{I} \to 0} \left. \frac{\Delta Y}{\Delta \bar{I}} \right|_{\Delta \bar{C}=0} = \left. \frac{\Delta Y}{\Delta \bar{I}} \right|_{\Delta \bar{C}=0}$$

There is also an autonomous-consumption <u>multiplier</u> given by

$$\frac{\partial Y}{\partial \bar{\bar{C}}} = \frac{1}{1-c} > 1$$

- I.e. a 1 m.u. increase in autonomous consumption has the same effect on (short-run) equilibrium output than an identical increase in autonomous investment.

Graphical representation of the multiplier effect of autonomous investment:



Economics II – These overheads are not part of the course's readings.