

Lecture 16

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Economics II



LISBOA
SCHOOL OF
ECONOMICS &
MANAGEMENT

Lecture 15

Summary :

8.3. Keynesian model in open economy

Bibliography:

Frank e Bernanke (2011), chapter. 11

Amaral et al. (2007), cap. 5

Lecture goals:

At the end of this lecture, students should be able to:

- Understand and use the Keynesian model in an open economy.
- Understand the influence of the degree of openness of the economy in the effectiveness of fiscal policy.
- Understand the impact of changes in the external variables on the equilibrium of the national economy.

Exercises for practical class:

Continued from previous practice session.

8.3. The Keynesian model in open economy

Let us remember
the model with
state (lecture 15):

$$\left\{ \begin{array}{l} D = C + I + G \\ C = \bar{C} + c.Y_d \\ Y_d = Y - T + TR \\ I^{\text{Priv}} = \overline{I^{\text{Priv}}} \\ Y = D \\ I = I^{\text{Priv}} + I^{\text{Publ}} \\ G = \bar{G} \\ TR = \overline{TR} \\ I^{\text{Publ}} = \overline{I^{\text{Publ}}} \\ T = \bar{T} + t.Y \end{array} \right.$$

Modeling the external sector:

- **Simplified hypothesis:**
 - The exterior price level (P^*) is exogenous..
 - Remember that we had already admitted that the domestic price level was also exogenous.
 - The exchange rate index is exogenous (fixed exchange rate regime or a monetary union).
 - Therefore, the competitiveness index (real exchange rate) is also exogenous.
 - The OUTPUT on the Rest of the World (External Sector), Y^* does not change (significantly) with the domestic variables, so it is also exogenous..

Changes to the equations of the model:

$$(1) \quad D = C + I + G + Ex - Im$$

- Non-resident agents also have purchasing intentions (expense) on goods and services produced by residents at constant base year prices - the exports of our economy.
- Residents agents have purchasing intentions (expense) on goods and services produced by non-residents at constant base year prices - imports of our economy.

(11)

$$Ex = \overline{Ex}$$



- Is the spending intentions of non-residents in domestic goods and services at constant base year prices.
- It is a behavioral equation.
- Do not depend on other variables in the model, so they are explained by exogenous factors to the model.
 - For simplicity, we assume here that $f = 0$ and $a_1 = 0$.
 - Alternatively, we can see this exogenous variable as the sum of the 3 studied exogenous components.

(12)

$$I_m = \overline{I_m} + m.Y$$



- Is the residents' spending intentions in foreign final goods and services, at constant base year prices.
- It is a behavioral equation.
- These intentions positively depend on the product.
 - For simplicity, we assume here that $a_2 = 0$.
 - Alternatively, the autonomous part (as in the exports) may include the part that would vary with competitiveness ...
 - ... also exogenous to the assumed hypothesis.

In this case, the model in its structural formula is given by:

$$\left\{ \begin{array}{l} D = C + I + G + Ex - Im \\ C = \bar{C} + c.Y_d \\ Y_d = Y - T + TR \\ I^{\text{Priv}} = \bar{I}^{\text{Priv}} \\ Y = D \\ I = I^{\text{Priv}} + I^{\text{Publ}} \\ G = \bar{G} \\ TR = \bar{TR} \\ I^{\text{Publ}} = \bar{I}^{\text{Publ}} \\ T = \bar{T} + t.Y \\ Ex = \bar{Ex} \\ Im = \bar{Im} + m.Y \end{array} \right.$$

Solving by substitution:

$$(1)+\dots D = C + I + G + Ex - Im \Leftrightarrow$$

$$(2)+\dots \Leftrightarrow D = (\bar{C} + c.Y_d) + I + G + Ex - Im \Leftrightarrow$$

$$(3)+\dots \Leftrightarrow D = [\bar{C} + c.(Y - T + TR)] + I + G + Ex - Im \Leftrightarrow$$

$$(6)+\dots \Leftrightarrow D = [\bar{C} + c.(Y - T + TR)] + (I^{\text{Priv}} + I^{\text{Publ}}) + G + Ex - Im \Leftrightarrow$$

$$(4)+\dots \Leftrightarrow D = [\bar{C} + c.(Y - T + TR)] + (\bar{I}^{\text{Priv}} + I^{\text{Publ}}) + G + Ex - Im \Leftrightarrow$$

$$(7)+\dots \Leftrightarrow D = [\bar{C} + c.(Y - T + TR)] + (\bar{I}^{\text{Priv}} + I^{\text{Publ}}) + \bar{G} + Ex - Im \Leftrightarrow$$

$$(8)+\dots \Leftrightarrow D = \left[\bar{C} + c.(Y - T + \overline{TR}) \right] + \left(\overline{I}^{\text{Priv}} + I^{\text{Publ}} \right) + \bar{G} + Ex - Im \Leftrightarrow$$

$$(9)+\dots \Leftrightarrow D = \left[\bar{C} + c.(Y - T + \overline{TR}) \right] + \left(\overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} \right) + \bar{G} + Ex - Im \Leftrightarrow$$

$$(10)+\dots \Leftrightarrow D = \left\{ \bar{C} + c. \left[Y - (\bar{T} + t.Y) + \overline{TR} \right] \right\} + \left(\overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} \right) + \bar{G} + \\ + Ex - Im \Leftrightarrow$$

$$(11)+\dots \Leftrightarrow D = \left\{ \bar{C} + c. \left[Y - (\bar{T} + t.Y) + \overline{TR} \right] \right\} + \left(\overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} \right) + \bar{G} + \\ + \overline{Ex} - Im \Leftrightarrow$$

$$(12)+\dots \Leftrightarrow D = \left\{ \bar{C} + c. \left[Y - (\bar{T} + t.Y) + \overline{TR} \right] \right\} + \left(\overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} \right) + \bar{G} + \\ + \overline{Ex} - \left(\overline{Im} + m.Y \right) \Leftrightarrow$$

$$(5)+\dots \Leftrightarrow Y = \left\{ \bar{C} + c \cdot \left[Y - (\bar{T} + t \cdot Y) + \overline{TR} \right] \right\} + \left(\overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} \right) + \bar{G} + \\ + \overline{Ex} - \left(\overline{Im} + m \cdot Y \right) \Leftrightarrow$$

$$\Leftrightarrow Y - c \cdot Y + c \cdot t \cdot Y + m \cdot Y = \bar{C} + \overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} + \bar{G} + \overline{Ex} - \overline{Im} + c \cdot (\overline{TR} - \bar{T}) \Leftrightarrow$$

$$\Leftrightarrow \left[1 - c \cdot (1 - t) + m \right] \cdot Y = \bar{C} + \overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} + \bar{G} + \overline{Ex} - \overline{Im} + c \cdot (\overline{TR} - \bar{T}) \Leftrightarrow$$

$$\Leftrightarrow Y = \frac{\bar{C} + \overline{I}^{\text{Priv}} + \overline{I}^{\text{Publ}} + \bar{G} + \overline{Ex} - \overline{Im} + c \cdot (\overline{TR} - \bar{T})}{1 - c \cdot (1 - t) + m}$$



**Reduced form to
equilibrium product.**

The effect of a small change in public consumption on the equilibrium of the product is given by:

$$\frac{\partial Y}{\partial \bar{G}} = \frac{1}{1 - c \cdot (1 - t) + m} > 0$$

because $0 < c \cdot (1 - t) < 1$.

- The higher the value of the marginal propensity to import, the lower the multiplier effect of public consumption on the product of equilibrium.
- Is no guarantee that the multiplier is greater than 1
- because it is unknown whether $1 - c \cdot (1 - t) + m < 1$.

Note that, by keeping the values of the common parameters are:

$$\left. \frac{\partial Y}{\partial \bar{G}} \right|_{\substack{\text{Economia} \\ \text{Aberta} \\ \text{com Estado}}} = \frac{1}{1 - c \cdot (1 - t) + m} < \left. \frac{\partial Y}{\partial \bar{G}} \right|_{\substack{\text{Economia} \\ \text{Fechada} \\ \text{com Estado}}} = \frac{1}{1 - c \cdot (1 - t)}$$

Open Economy with Government

Closed Economy with Government

- The opening of the economy reduces the effectiveness of fiscal policy.
- It is noted that the same goes for the other instruments of fiscal policy.

What would happen to GDP of equilibrium if the exports (autonomous) would increase by one m.u.?

$$\frac{\partial Y}{\partial Ex} = \frac{1}{1 - c(1 - t) + m} > 0$$

- The GDP increases, but not necessarily in the same amount that the exports (autonomous) increased.

Why is the multiplier effect of exports (autonomous) on equilibrium output may be less than 1?

- The multiplier of exports (autonomous) will be less than 1 if the marginal propensity to import is high enough.
- When the exports (autonomous) increase:
 - The domestic demand increases (D) and, ...
 - ... In order to attain the equilibrium, ...
 - ... The output (Y) must increase
 - Consequently, the disposable income of the households increases (Y_d)...
 - ... The private consumption increases, ...
 - ... But also increasing imports (I_m)!
- Part of the initial stimulus is lost out of the economy.

Some more interesting properties:

1. The multiplier of public consumption is equal to the public investment multiplier, the private investment multiplier, the autonomous consumption or the autonomous exports multiplier:

$$\frac{\partial Y}{\partial \bar{G}} = \frac{\partial Y}{\partial I^{\text{Publ}}} = \frac{\partial Y}{\partial I^{\text{Priv}}} = \frac{\partial Y}{\partial \bar{C}} = \frac{\partial Y}{\partial Ex} = \frac{1}{1 - c \cdot (1 - t) + m}$$

2. These multipliers increase if:

- The marginal propensity to consume increases;
- The marginal tax rate decreases;
- The marginal propensity to import decreases.

3. The multiplier of autonomous imports equals the symmetrical multiplier of autonomous exports:

$$\frac{\partial Y}{\partial Im} = -\frac{1}{1 - c \cdot (1 - t) + m} = -\frac{\partial Y}{\partial Ex} < 0$$

- This is due to the fact that imports be "negative net export."