LECTURE 2: THE GOODS MARKET*

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The determination of output is the fundamental issue of macroeconomics. This lecture introduces the topic through the Keynesian cross model, which provides basic intuition about the building and solving of models, the determination of output, and the role of fiscal policy. Output is always determined by equilibrium in the goods market, i.e., the condition that supply (production of goods) equals demand. But in the short run, we assume that production adjusts automatically to output without changes in price. Therefore, output is effectively determined by demand in the short run. Moreover, we assume that investment is exogenous (and hence independent of the interest rate), so there is no need to consider simultaneous equilibrium in the goods and financial markets.

1 THE COMPOSITION OF GDP

The aggregate output (GDP), i.e. the purchases of domestic goods and services, is typically decomposed by macroeconomists into the following flow components. You can find a more detailed decomposition from the national income and product accounts (NIPA).

- **Consumption**, denoted C (Table 1.1.5, line 2). These are the goods and services purchased by domestic consumers.
- **Investment**, or **fixed investment**, denoted I (Table 1.1.5, line 7).[1] Investment is the sum of **nonresidential investment**, the purchase by domestic firms of new plants or new machines, and **residential investment**, the purchase by domestic consumers of new houses or apartments.
- **Government spending**, denoted G (Table 1.1.5, line 22). This represents the purchases of goods and services by domestic governments. Note that G does not include **government transfers** nor interest payments on the government debt.
- **Net exports**, or **trade balance**, denoted $X - IM$ (Table 1.1.5, line 15). This is the difference between exports, X, the purchases of domestic goods and services by foreigners, and imports, IM, the purchases of foreign goods and services by domestic consumers, firms, and governments.

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These are notes that I used by myself to lecture from and for educational purposes only. The material presented here is largely based upon the undergraduate textbook by Blanchard and Johnson (2012), *Macroeconomics*, 6th Edition, Prentice Hall. Please do NOT circulate.

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[1] Economists use "financial investment" to refer to the purchase of financial assets.

- **Inventory investment**. This is the difference between goods produced and goods sold, or the net change of inventory, in a given year. They need not be equal.

2 THE DEMAND FOR GOODS

We denote the total (domestic and foreign) demand for domestic goods, Z, as

$$Z \equiv C + I + G + X - IM \tag{2.1}$$

Note that inventory investment is not part of demand.

Assumptions. Before discussing about the determinants of Z, we make the following assumptions for simplification.

- Assume that all firms produce the same good. This assumption allows us to focus on only the goods market.
- Assume that firms are willing to supply any amount of the good at a given price level. This assumption isolates the role demand plays in the determination of output.[2]
- Assume that the economy is **closed**. As a result, $X = IM = 0$ and therefore

$$Z \equiv C + I + G \tag{2.2}$$

Consumption (C). The main determinant of consumption decisions is **disposable income**, the income that remains after consumers have received transfers from the government and paid their taxes. When the disposable income goes up (down), consumption goes up (down). Mathematically, this behavioral relation can be described as

$$C = \underset{(+)}{C}(Y_D) = c_0 + c_1 Y_D \tag{2.3}$$

where Y_D is the disposable income and $C(\cdot)$ is called **consumption function**. Here we assume that the function takes a linear form which can be characterized by two **parameters**, c_0 and c_1:

- The parameter $c_1 \in (0, 1)$ is called the **marginal propensity to consumer**. It gives the effect an additional dollar of disposable income has on consumption.[3]

[2] This assumption is valid only in the short run.

[3] To estimate behavioral relations and their parameters like (2.3), economists use **econometrics**, the set of statistical methods applied to economics.

- The parameter $c_0 \in (0, \infty)$ is what people would consume if their disposable income in the current year were zero, i.e. $C = c_0$. In this case, people finance their consumption by selling part of their assets or by borrowing. See Figure 1 below.

- We define the disposable income as

$$Y_D \equiv Y - T \tag{2.4}$$

where Y is income (which always equals production since we can consider GDP either from the production side or the income side) and T is taxes paid minus government transfer (**net taxes**) received by consumers. Plugging Y_D into the consumption function yields

$$C = c_0 + c_1(Y - T) \tag{2.5}$$

Thus, higher income increases consumption and higher net taxes decrease consumption, both less than one for one.

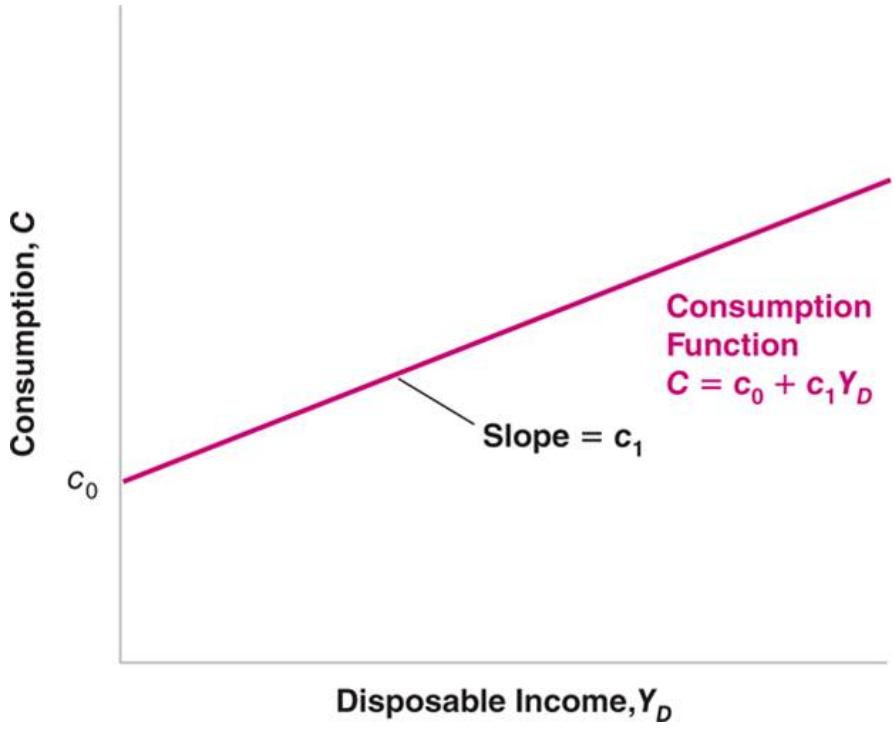

Figure 1. Consumption and disposable income

Investment (I). There are two types of variables in a model:

- **Endogenous variable**: variables that are explained within the model.

- **Exogenous variable**: variables that are taken as given. Here we treat investment as an exogenous variable. In particular, we write

$$I = \bar{I} \tag{2.6}$$

Government spending (G). Together with net taxes T, G describes **fiscal policy**—the choice of taxes and spending by the government. We take G and T as exogenous for two reasons:

- Governments do not behave with the same regularity as consumers or firms, so it is difficult to give simple behavioral rules as consumers do.
- One of the tasks of macroeconomists is to think about the implications of alternative spending and tax decisions.

3 THE DETERMINATION OF EQUILIBRIUM OUTPUT

Now we can rewrite the total demand for domestic goods as

$$Z = c_0 + c_1(Y - T) + \bar{I} + G \tag{3.1}$$

In what follows, we focus on the **equilibrium** in the goods market. For simplicity, we assume that firms do not hold inventories. In this case, inventory investment is identically zero and equilibrium in the goods market requires that production (supply for goods) Y be equal to demand for goods Z, i.e.

$$Y = Z = c_0 + c_1(Y - T) + \bar{I} + G \tag{3.2}$$

which is called an **equilibrium condition**.[4] In words, in equilibrium, production is equal to demand; demand in turn depends on income, which is itself equal to production.

Using algebra. Solving for the equilibrium output, the level of output such that production equals demand, yields

$$Y = \frac{1}{1 - c_1}[c_0 + \bar{I} + G - c_1 T] \tag{3.3}$$

Here are a couple of remarks on the above solution:

- The term $[c_0 + \bar{I} + G - c_1 T]$, called autonomous spending, is the part of the demand for goods that does not depend on output. Suppose the government is running a

[4] Models include three types of equations: identities, behavioral equations, and equilibrium conditions.

balanced budget, i.e. $T = G$. Since $0 < c_1 < 1$, $G - c_1 T = (1 - c_1)G > 0$ and so the autonomous spending is always positive unless the government is running a very large budget surplus.

- Since $c_1 \in (0,1)$, we know $\frac{1}{1-c_1} > 1$, which multiplies autonomous spending, and hence it is called a **multiplier**. The closer c_1 is to 1, the larger the multiplier. Any change in autonomous spending will change output by more than one for one.

Using graph. We may rewrite the total demand as

$$Z = (c_0 + \bar{I} + G - c_1 T) + c_1 Y \tag{3.4}$$

Then the equilibrium can be characterized graphically as in Figure 2 below. We may also consider the multiplier effects of an increase in autonomous spending on equilibrium output, as illustrated in Figure 3 below.

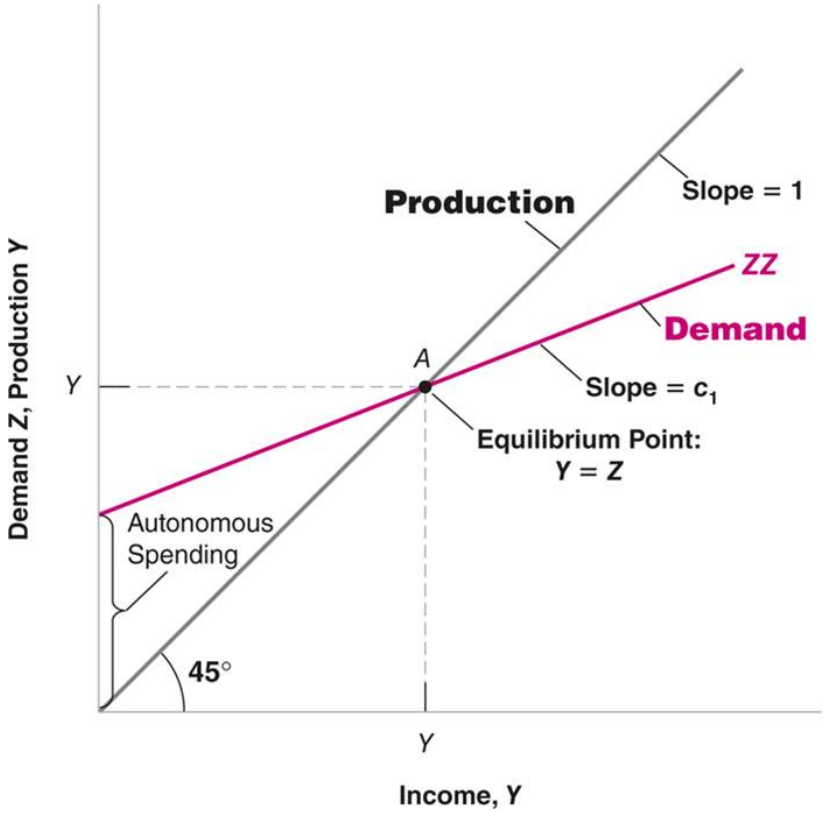

Figure 2. Equilibrium in the goods market

Using words. Production depends on demand, which depends on income, which is itself equal to production. An increase in demand leads to an increase in production and a corresponding increase in income. This increase in income leads to a further increase in demand, which leads to a further increase in production, and so on. The end result is an increase

in output that is larger than the initial shift in demand, by a factor equal to the multiplier, whose size is directly related to the value of marginal propensity to consume.

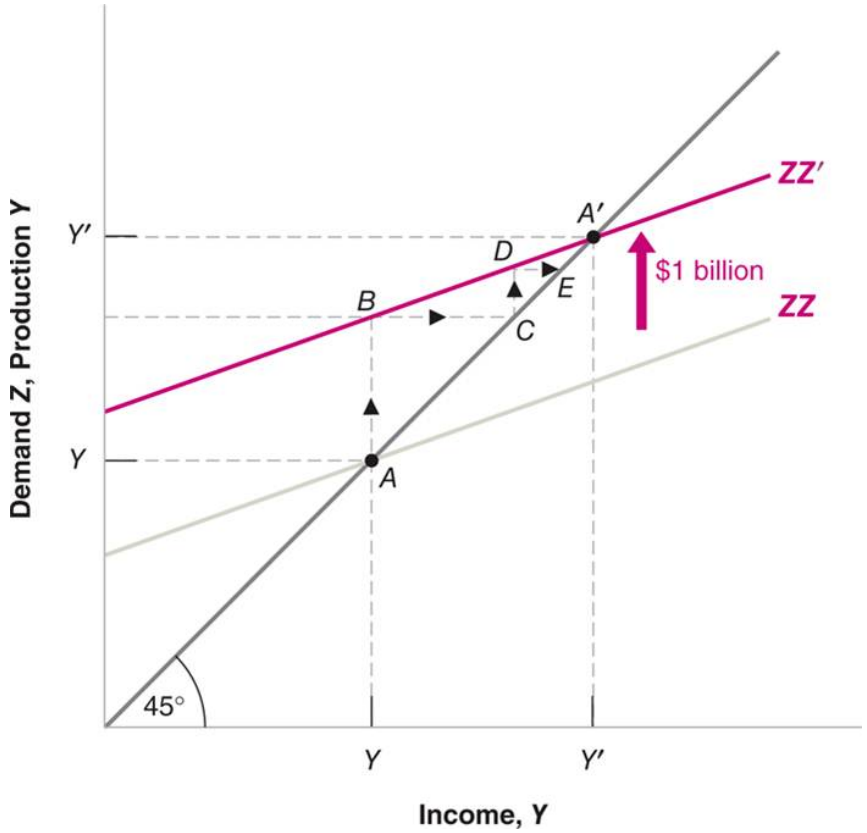

Figure 3. Effects of an increase in autonomous spending on output

4 INVESTMENT EQUALS SAVING

An alternative but equivalent way of thinking about equilibrium focuses on investment and saving, which is first proposed by John Maynard Keynes in his 1936 book, *The General Theory of Employment, Interest, and Money*.

Saving. Saving is the sum of private saving and public saving:

- **Private saving**, S, is the saving by consumers, i.e.

$$S \equiv Y_D - C \equiv Y - T - C \tag{4.1}$$

- **Public saving** is equal to net taxes minus government spending, i.e. $T - G$. If $T > G$, the government is running a budget surplus and so the public saving is positive. If $T < G$, the government is running a budget deficit and so the public saving is negative.

- Rearranging the equilibrium condition for the goods market gives

$$S = Y - T - C = I + G - T$$

or equivalently

$$I = S + (T - G) \tag{4.2}$$

which simply says that equilibrium in the goods market requires that investment equal saving. This way of looking at equilibrium explains why the goods market equilibrium condition is called the **IS relation**.

- Note that private saving can be written as

$$S = Y - T - C = -c_0 + (1 - c_1)(Y - T) \tag{4.3}$$

where $(1 - c_1) \in (0, 1)$ is called the **marginal propensity to save**. Thus, private saving increases with disposable income but by less than one dollar for each additional dollar of disposable income. Replacing private saving in (4.2) with the expression above gives

$$Y = \frac{1}{1 - c_1}[c_0 + \bar{I} + G - c_1 T] \tag{4.4}$$

which is exactly the same as (3.3).

5 IS THE GOVERNMENT OMNIPOTENT?

(3.3) seems to suggest that the government, by choosing the level of G or T, can choose the level of output it wants. However, this proposition is wrong because we have left many aspects of reality out of the model:

- Changing government spending or taxes is not easy.
- All the exogenous variables in the model are likely to be associated with complex, dynamic effects, making it hard for government to assess the effects of their policies.
- Expectations are likely to matter.
- Achieving a given level of output can come with unpleasant side effects.
- Cutting taxes or increasing government spending can lead to large budget deficits and an accumulation of public debt, which have adverse effects in the long run.