

# Lecture Notes: Chapter 9: The Income-Expenditure Framework: Consumption and the Multiplier

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## Sticky Prices

### Business Cycles

To understand business cycles, we need a model that does not guarantee always-full employment, and in which real GDP does not always equal potential output. Business cycles, after all, are not fluctuations in potential output but fluctuations of actual production around potential output. Thus the full-employment model is of no help because its assumption that *prices are flexible* guarantees full employment. The flexible-price assumption allowed us to start our analysis by noting the labor market would clear with the supply of workers equal to the demand for labor, that as a result firms would fully employ the labor force, and thus real GDP and household income would be equal to potential output.

From this point forward, however, we need to break this flexible-price assumption in order to build a more useful model of the business cycle. From this point forward prices will be "sticky": they will not move freely and instantaneously in response to changes in demand and supply. Instead, prices will remain fixed at predetermined levels as businesses expand or contract production in response to changes in demand and costs. As you will see, such "sticky prices" make a big difference in economic analysis; they will drive a wedge between real GDP and potential output, and between the supply of workers and the demand for labor. We will then be able to use this sticky-price model to account for business-cycle fluctuations.

“Why are prices sticky?” you might ask. Why don't they adjust quickly and smoothly to maintain full employment? Why do businesses respond to fluctuations in demand first by hiring or firing workers and accelerating or shutting down their production lines? Why don't they respond first by raising or lowering their prices.

Economists have identified any number of reasons that prices could be "sticky," but they are uncertain which are most important. Some likely explanations are that:

- Managers and workers find that changing prices or renegotiating wages is costly, hence best delayed as long as possible.
- Managers and workers lack information and so confuse changes in total economy-wide spending with changes in demand for their specific products.
- The level of prices is as much a sociological as well as an economic variable--determined as much by what values people think is "fair" as by the balance of supply and demand. Workers take a cut in their wages as an indication that their employer does not value them—hence managers avoid wage cuts because they fear the consequences for worker morale.
- Managers and workers suffer from simple "money illusion"; they overlook the effect of price-level changes when assessing the impact of changes in wages or prices on their real incomes or sales.

## **Income and Expenditure**

If prices are sticky, higher aggregate demand boosts production, which boosts incomes. Higher incomes give a further boost to consumption, which in turn boosts aggregate demand some more. Thus any shift in a component of aggregate demand upward or downward leads to an *amplified* shift in total production because of the induced shift in consumption. The early twentieth century British economist John Maynard Keynes was one of the first to stress the importance of this *multiplier* process.

## **Building Up Aggregate Demand**

As long as prices are sticky, the level of real GDP is determined by the level of aggregate demand:

$$Y = E$$

and not by the level of potential output:

$$Y = Y^*$$

### *The Consumption Function*

$$C = C_0 + C_y(1 - t)Y$$

If changes in incomes are considered permanent, the MPC will be high: a \$1 increase in incomes will lead to an increase in consumption of as much as 80 cents. But if changes in income are considered transitory, the MPC will be low: a \$1 increase in incomes will lead to an increase in consumption of only 30 cents or so. Transitory increases in income have only a small effect on consumption because people seek to smooth out their consumption spending over time.

The level of investment spending,  $I$ , is determined by the real interest rate and assessments of profitability made by business investment committees:

$$I = I_0 - I_r \times r$$

In our model we represent these determinants by making investment spending  $I$  a function of the real interest rate  $r$  and of the parameters  $I_0$  and  $I_r$ , the baseline level of investment spending and the interest sensitivity of investment.

The level of government purchases  $G$  is set by politics. Net exports are equal to gross exports (a function of the real exchange rate  $\varepsilon$  and the level of foreign real GDP  $Y^f$ ) minus imports. Imports are a function of national income  $Y$ :

$$NX = GX - IM = (X_f Y^f + X_\varepsilon \varepsilon) - IM_y Y$$

Let's take the equation for aggregate demand:

$$E = C + I + G + NX$$

and replace the two components of aggregate demand that depend directly on national income  $Y$  by their determinants:

$$E = (C_0 + C_y(1-t)Y) + I + G + (GX - IM_y Y)$$

We can now classify the components of aggregate demand into two groups. The first group is so-called *autonomous spending*, which we will call "A." Autonomous spending is made up of those components of aggregate demand that do *not* depend directly on national income  $Y$ . The second group includes all the other components of aggregate demand. It is equal to the *marginal propensity to expend* [or MPE for short] on domestic goods times the level of national income  $Y$ . Thus with these new definitions of:

$$A = C_0 + I + G + GX$$

and:

$$MPE = C_y(1-t) - IM_y$$

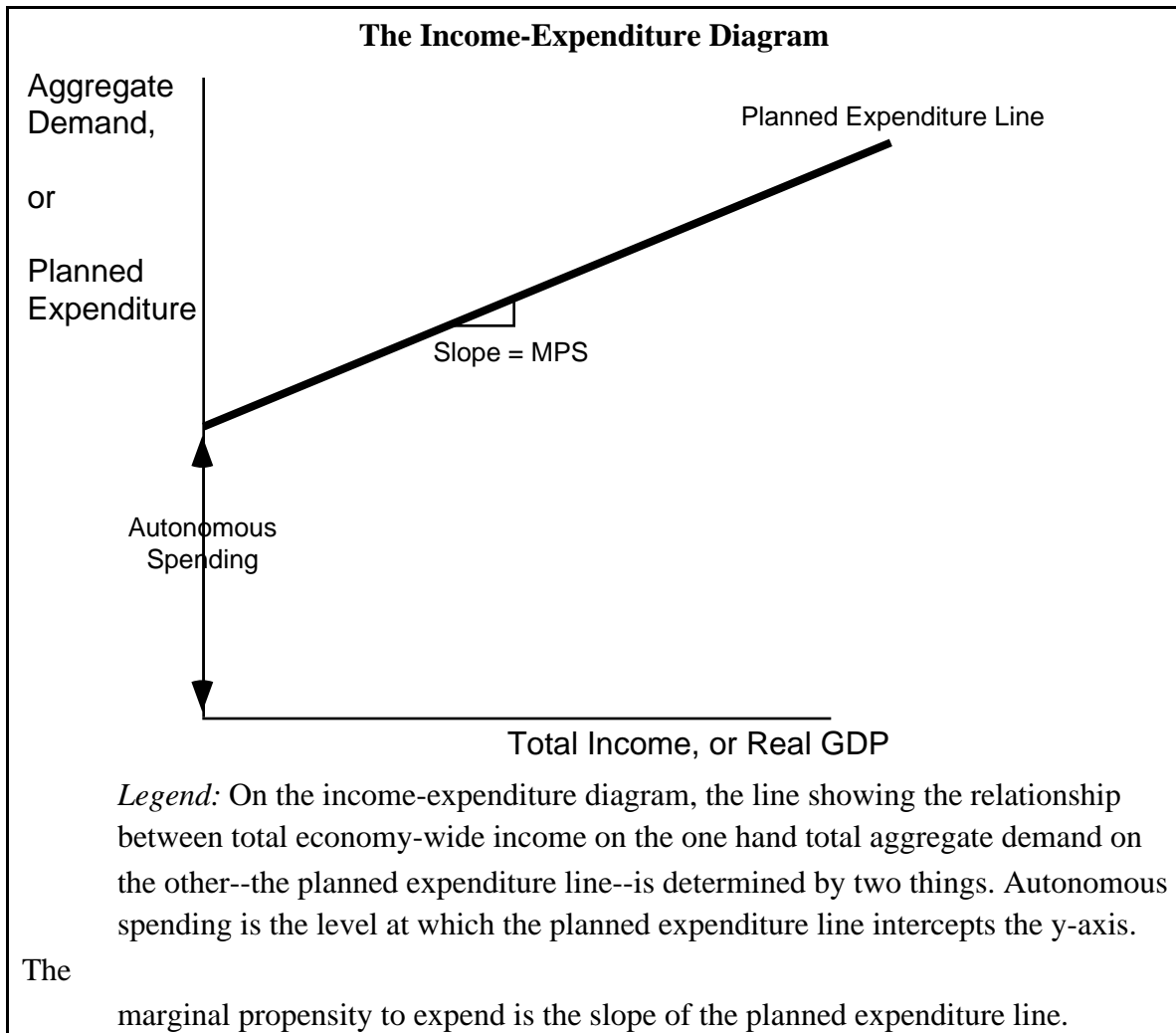
we can rearrange our equation for aggregate demand to fit these new definitions:

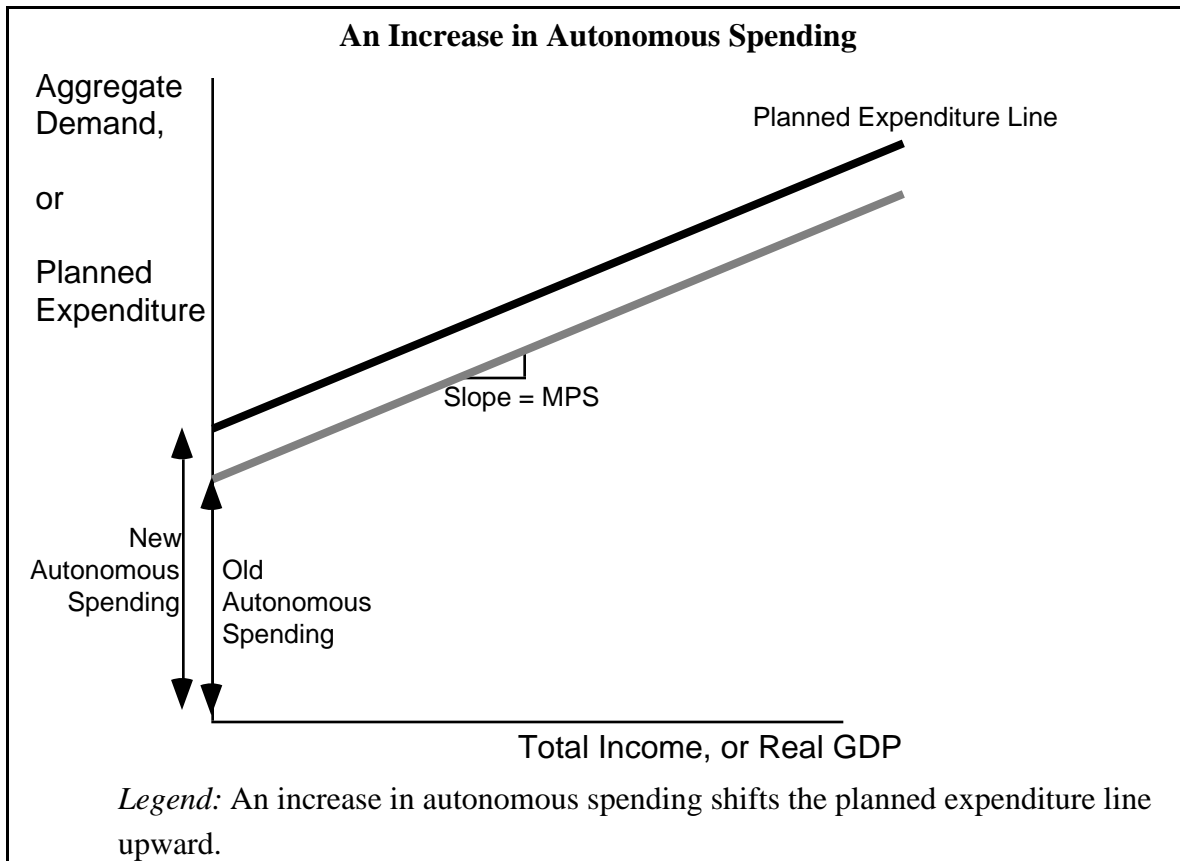
$$E = (C_0 + I + G + GX) + (C_y(1-t) - IM_y) \times Y$$

and rewrite aggregate demand in the more compact form:

$$E = A + MPE \times Y$$

The intercept of the planned expenditure or aggregate demand line is the level of autonomous spending  $A$ ; the slope of the planned expenditure or aggregate demand line is the marginal propensity to expend  $MPE$ .





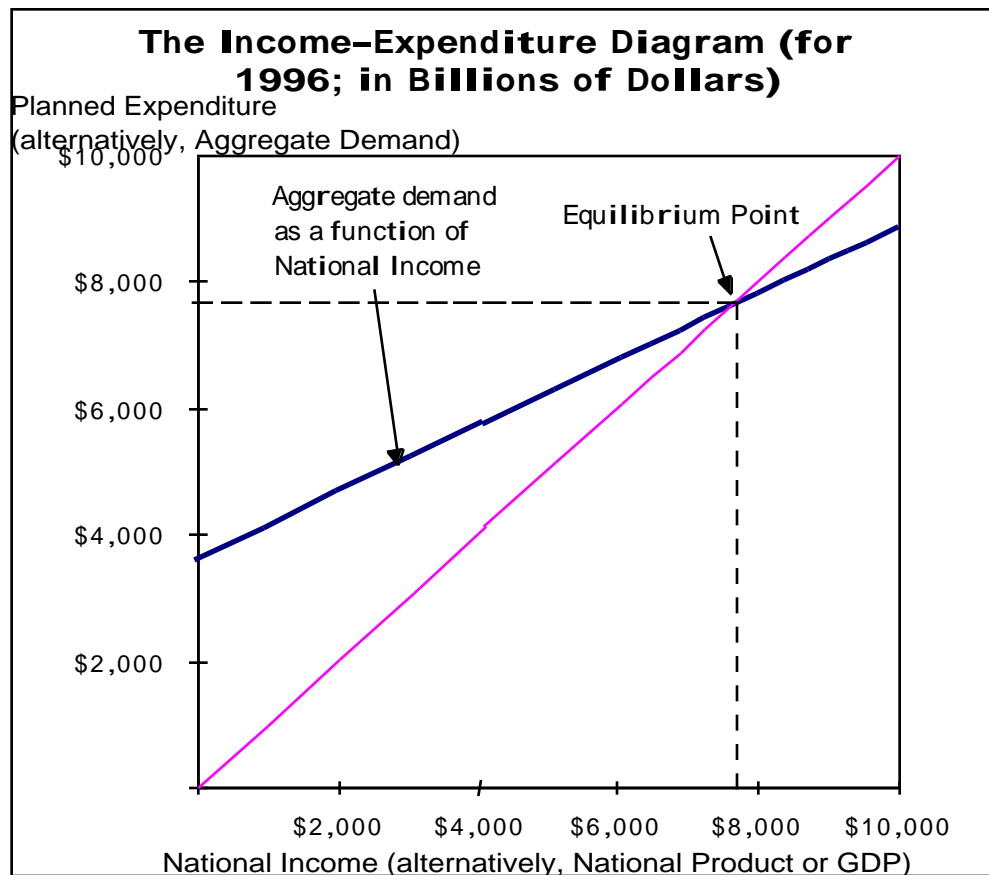
A change in the value of any determinant of any component of autonomous spending--the baseline levels of consumption  $C_0$ , of investment  $I_0$ , or government purchases  $G$ ; the real interest rate  $r$ ; and foreign-determined variables like foreign interest rates  $r^f$ , foreign levels of real income  $Y^f$ , or speculators' view of exchange rate fundamentals  $\epsilon_0$ —will shift the planned expenditure line up or down. The higher is autonomous spending, the further from the x-axis the planned expenditure line will be.

Changes in the marginal propensity to consume  $C_y$ , in the tax rate  $t$ , or in the propensity to spend on imports  $IM_y$  will change the MPE and the slope of the planned expenditure line. The higher the MPE, the steeper is the slope of the planned expenditure line (see Figure 9.11). Box 9.2 provides an example of how to calculate the MPE.

## Sticky-Price Equilibrium

The economy will be in equilibrium when planned expenditure equals real GDP--which is, according to the circular flow principle, the same as national income. Under these conditions there will be no short-run forces pushing for an immediate expansion or contraction of national income, real GDP, and aggregate demand.

### Equilibrium on the Income-Expenditure Diagram



*Legend:* On the income-expenditure diagram, the equilibrium point of the economy is that point where aggregate demand (as a function of total product) is equal to total product.

In algebra, the equilibrium values of aggregate demand  $E$  and real GDP or national income  $Y$  must satisfy both:

$$E = A + MPE \times Y$$

and:

$$E = Y$$

Substituting  $Y$  in for  $E$  in the first of these equations and regrouping, the solution is:

$$Y = E = \frac{A}{1 - MPE}$$

If the numerical values of the parameters of the planned expenditure function:

$$E = A + MPE \times Y$$

are (in billions)  $A = \$5600$  and  $MPE = 0.3$ , then planned expenditure as a function of real GDP is:

$$E = 5600 + 0.3 \times Y$$

The equilibrium level of real GDP and aggregate demand is then (in billions):

$$Y = \$8000$$

If the economy is not on the 45-degree line, then aggregate demand  $E$  does not equal real GDP  $Y$ . If  $Y$  is greater than  $E$ , there is excess supply of goods. If  $E$  is greater than  $Y$ , there is excess demand for goods. In neither case is the economy in equilibrium.

In the first case in which production exceeds demand, inventories are rising rapidly and firms unwilling to accumulate unsold and unsellable inventories are about to cut production and fire workers (see Figure 9.13). In the second case in which demand exceeds production, inventories are falling rapidly. Businesses are selling more than they are making. Some businesses will respond to the fall in inventories by boosting prices, trying to earn more profit per good sold. But the bulk of businesses will respond to the fall in inventories by expanding production to match demand. They are about to hire more workers. Real GDP and national income are about to expand.

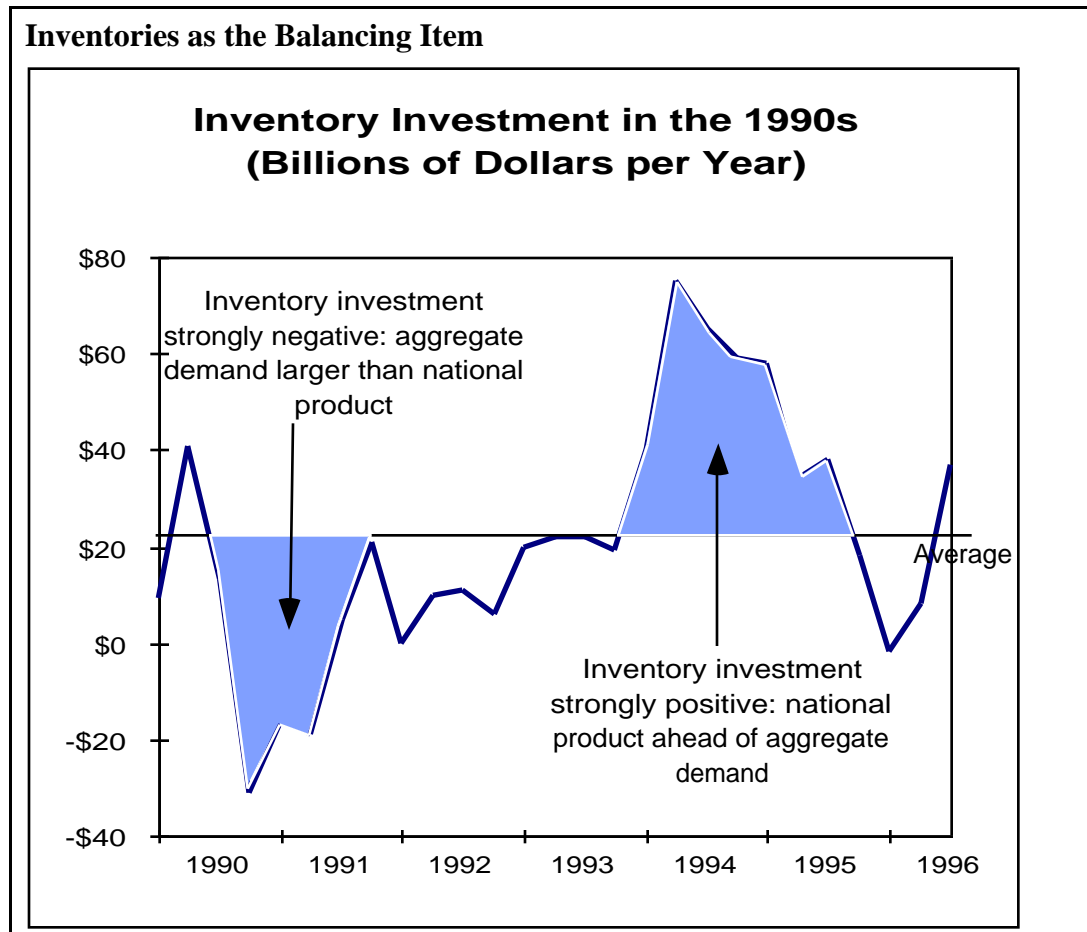
Now suppose that businesses see their inventories falling, and respond by boosting their production to equal last month's planned expenditure. Will such an increase bring the economy into goods-market equilibrium, with planned expenditure equal to total income and real GDP? The answer is that it will not. To boost production, firms must hire workers, paying more in wages, and causing household incomes to rise. When income rises, total spending rises as well. Thus the increase in production and income generates a further expansion in aggregate demand.

**Details: How Fast Does the Economy Move to Equilibrium?**

At any one particular moment the economy does not have to be in short-run equilibrium. Aggregate demand can exceed real GDP and national income and inventories can fall for periods as long as a year. There *are* strong forces pushing the economy toward short-run equilibrium. Businesses do not like to lose money by producing things that they cannot sell, or by not having things on hand that they could sell. But it takes at least months, usually quarters, and possibly more time for businesses to expand or cut back production

For example, between the summer of 1990 and the summer of 1991 inventories fell for five straight quarters. Real GDP was less than aggregate demand as businesses decided that their high levels of inventories were too large given the economic uncertainties created by the Iraqi invasion of Kuwait and the subsequent recession.

Between the winter of 1994 and the summer of 1995, for six quarters, inventories rose. For a year and a half GDP was greater than aggregate demand.



## The Multiplier

### Determining the Size of the Multiplier

Suppose something happens to change the level of planned expenditure at every possible level of total income. Anything that affects the level of autonomous spending will do. What would happen to the equilibrium level of total income and real GDP?

An upward shift in the planned expenditure line would increase the equilibrium level of total income. At the prevailing level of national income, planned expenditure would be larger than real GDP. Businesses would find themselves selling more than they were making, and their inventories would fall. In response, businesses would boost production to try to keep inventories from being exhausted and production would expand. How much production would expand depends on the magnitude of the change in autonomous spending and the value of the multiplier.

To calculate the multiplier, recall the simplified equation for planned expenditure:

$$E = A + MPE \times Y$$

And the equilibrium condition:

$$Y = E$$

Substitute the second into the first, and solve for Y:

$$Y = \frac{A}{1 - MPE}$$

Thus if autonomous spending changes by an amount  $\Delta A$ , equilibrium real GDP changes by:

$$\Delta Y = \frac{1}{1 - MPE} \times \Delta A$$

And if we want to express the denominator of this fraction in terms of the basic parameters of the model, it is:

$$\Delta Y = \frac{1}{1 - (C_y(1 - t) - IM_y)} \times \Delta A$$

This factor  $1/(1 - MPE) = 1/(1 - (C_y(1 - t) - IM_y))$  is the *multiplier*: it multiplies the upward shift in the planned expenditure line as a result of the increase in autonomous spending into a change in the equilibrium level of real GDP, total income, and aggregate demand.

Why the factor  $1/(1 - MPE)$ ? Think of it this way. The MPE--the marginal propensity to expend--is the slope of the planned expenditure line. A \$1 increase in national income raises the equilibrium level of planned expenditure by \$1, because expenditure has to go \$1 higher to balance income and production. As Figure 9.18 shows, it also raises the level of planned expenditure by \$MPE. Thus a \$1 increase in the level of total income closes \$(1 - MPE) of the gap between planned expenditure and total income. To close a full

initial gap of  $\Delta A$  between planned expenditure and national income, the equilibrium level of national income must increase by  $\Delta A/(1-MPE)$ .

Because autonomous spending is influenced by a great many factors:

$$A = C_0 + (I_0 - I_r \times r) + G + (X_f \times Y^f + \varepsilon_r \times \varepsilon_0 - \varepsilon_r \times r + \varepsilon_r \times r^f)$$

almost every change in economic policy or the economic environment will set the multiplier process in motion.