The Goods Market

Table 3-1   The Composition of U.S. GDP, 2006

		Billions of dollars		Percent of GDP	
	GDP (Y)	13,246		100.0	
1	Consumption (*C*)	9,269		70.0	
2	Investment (*I*)	2,163		16.3	
	Nonresidential		1,396		10.5
	Residential		767		5.8
3	Government spending (*G*)	2,528		19.0	
4	Net exports	-763		-5.8	
	Exports (X)		1,466		11.0
	Imports (IM)		-2,229		-16.8
5	Inventory investment	49		0	

Source: Survey of Current Business, April 2007, Table 1-1-5.

- **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**.

- **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.

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

$$Exports \ = \ imports \ \Leftrightarrow \ trade \ balance$$

$$Exports \ > \ imports \ \Leftrightarrow \ trade \ surplus$$

$$Exports \ < \ imports \ \Leftrightarrow \ trade \ deficit$$

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

The total demand for goods is written as:

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

The symbol "$\equiv$" means that this equation is an **identity**, or definition.

To determine Z, 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 any amount of the good at a given price, *P,* 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.

- Under the assumption that the economy is closed, *X = IM* = 0, then:

$$Z \equiv C + I + G$$

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.

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

$$C = c_0 + c_1 Y_D$$

Consumption (C)

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.

Disposable income is given by:

$$Y_D \equiv Y - T$$

Consumption (*C*)

Figure 3 - 1

Consumption and Disposable Income
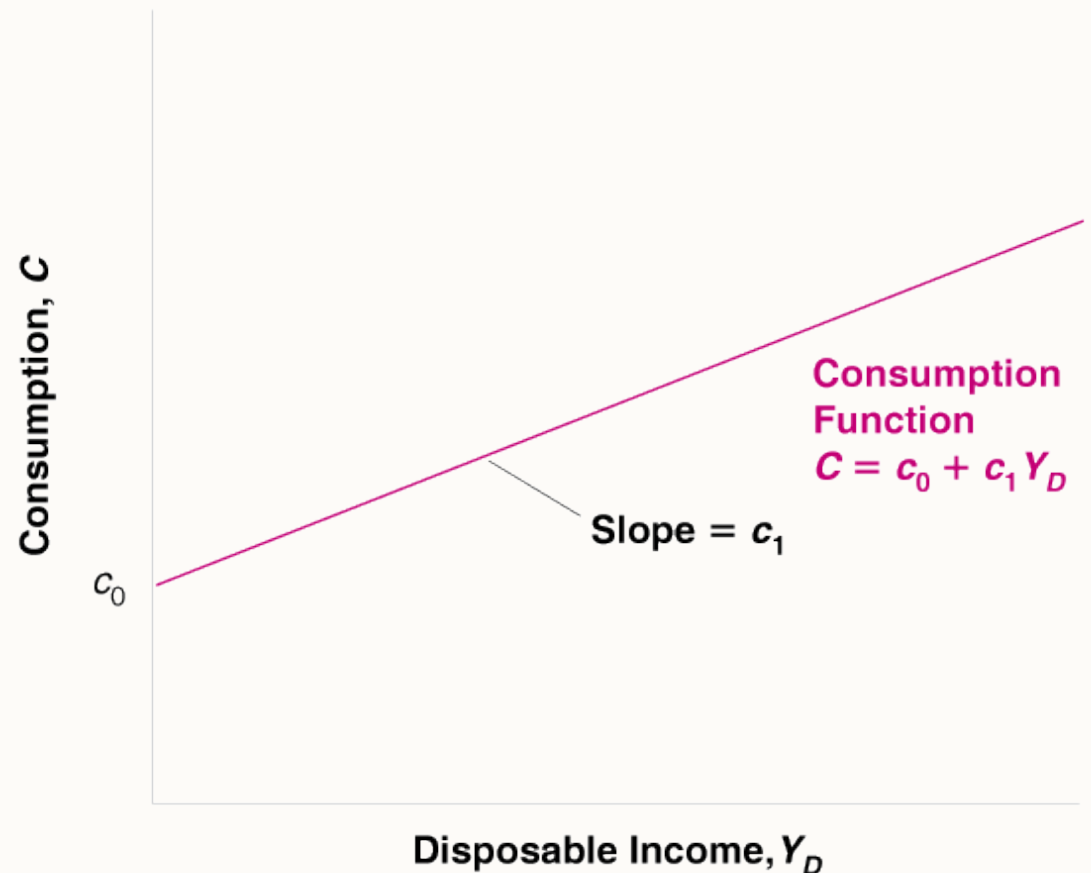
Consumption increases with disposable income but less than one for one.

$$C = C(Y_D)$$

$$Y_D \equiv Y - T$$

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

Consumption, *C*

c_0

Consumption Function
$C = c_0 + c_1 Y_D$

Slope = c_1

Disposable Income, Y_D

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:

$$I = \bar{I}$$

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.

Assuming that exports and imports are both zero, the demand for goods is the sum of consumption, investment, and government spending:

$$Z \equiv C + I + G$$

Then:

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

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

$$Y = Z$$

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

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

Macroeconomists always use these three tools:

1. Algebra to make sure that the logic is correct

2. Graphs to build the intuition

3. Words to explain the results

Using Algebra

Rewrite the equilibrium equation:

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

Move $c_1 Y$ to the left side and reorganize the right side:

$$(1 - c_1)Y = c_0 + \bar{I} + G - c_1 T$$

Divide both sides by $(1 - c_1)$:

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

Using Algebra

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

- Autonomous spending and the multiplier:
- The term $[c_0 + \bar{I} + \bar{G} - c_1 T]$ 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**.

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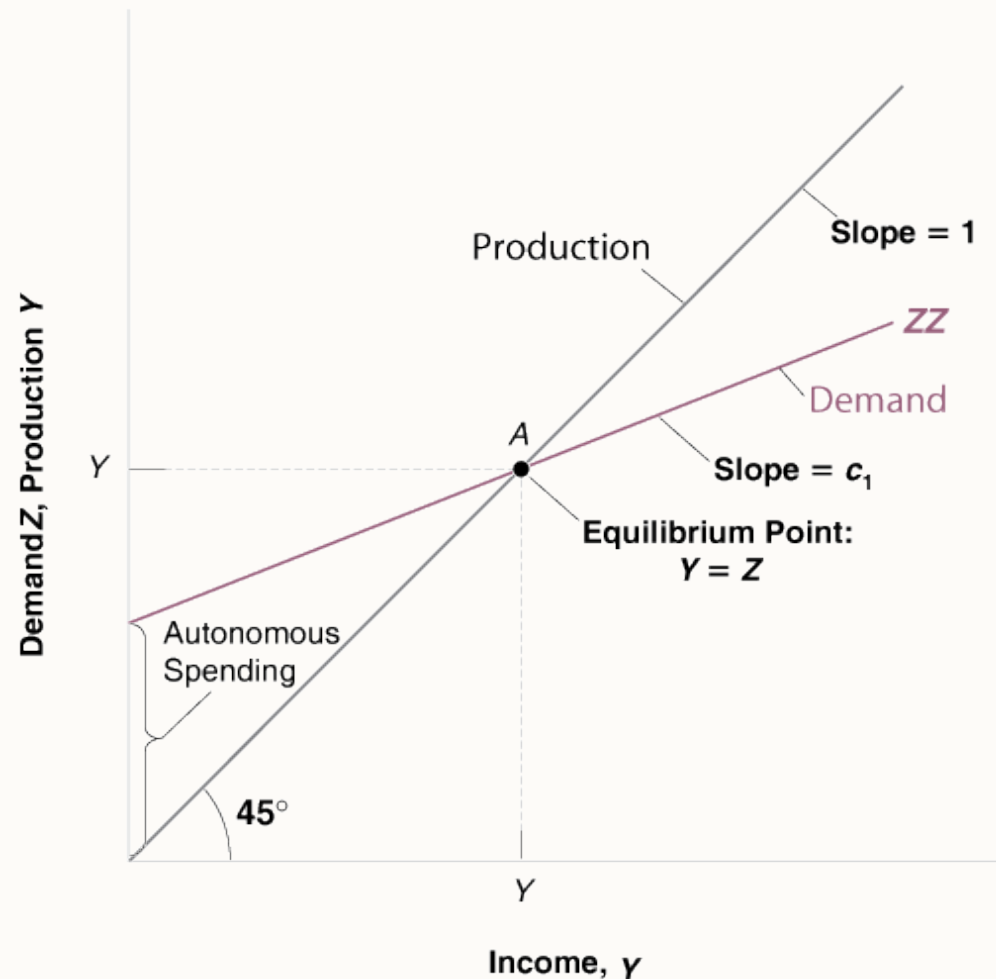
Using a Graph

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

■ **Figure 3 - 2**

Equilibrium in the Goods Market

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

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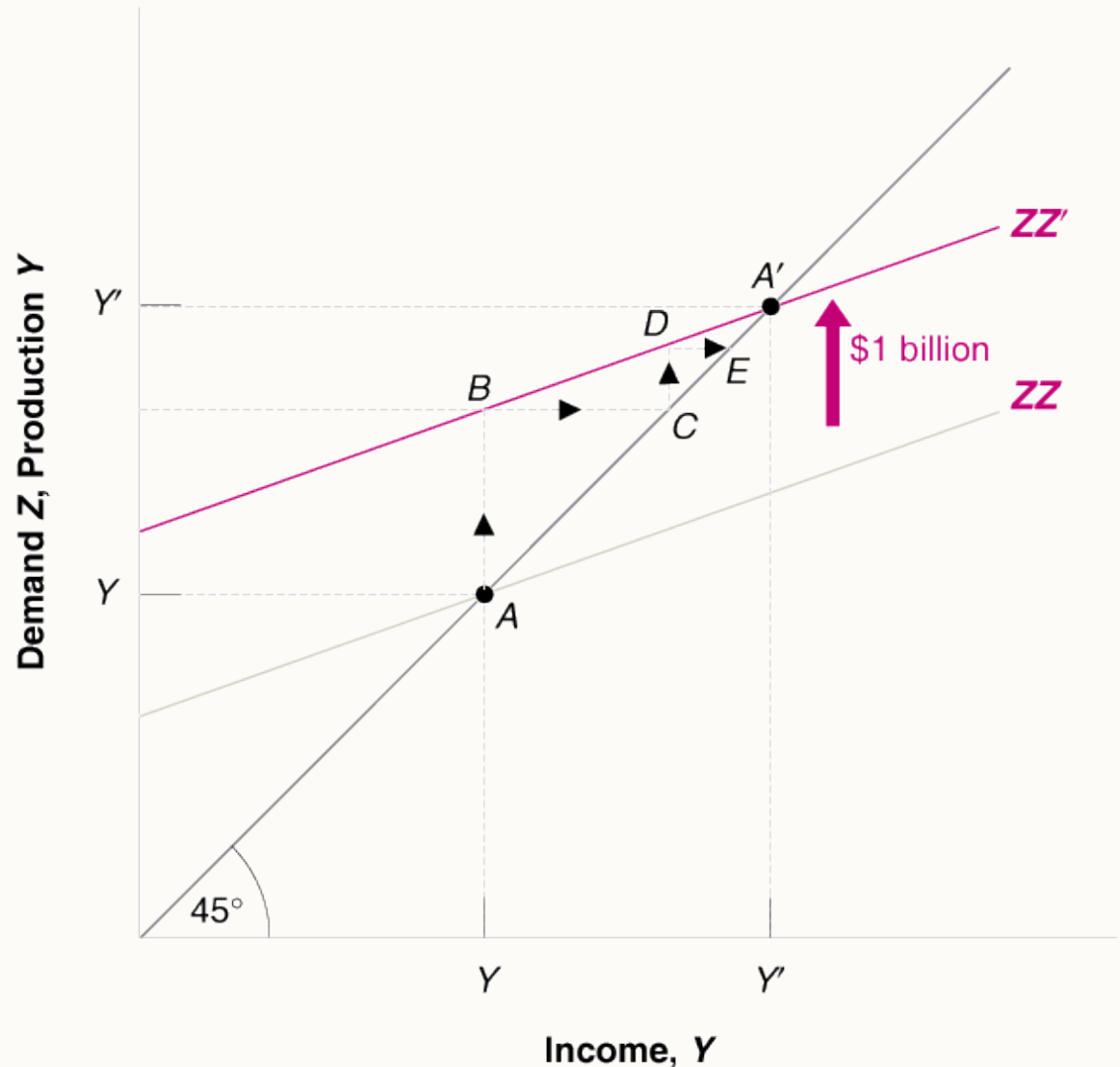- In Equilibrium, production equals demand.

Using a Graph

Figure 3 - 3

The Effects of an Increase in Autonomous Spending on Output

An increase in autonomous spending has a more than one-for-one effect on equilibrium output.
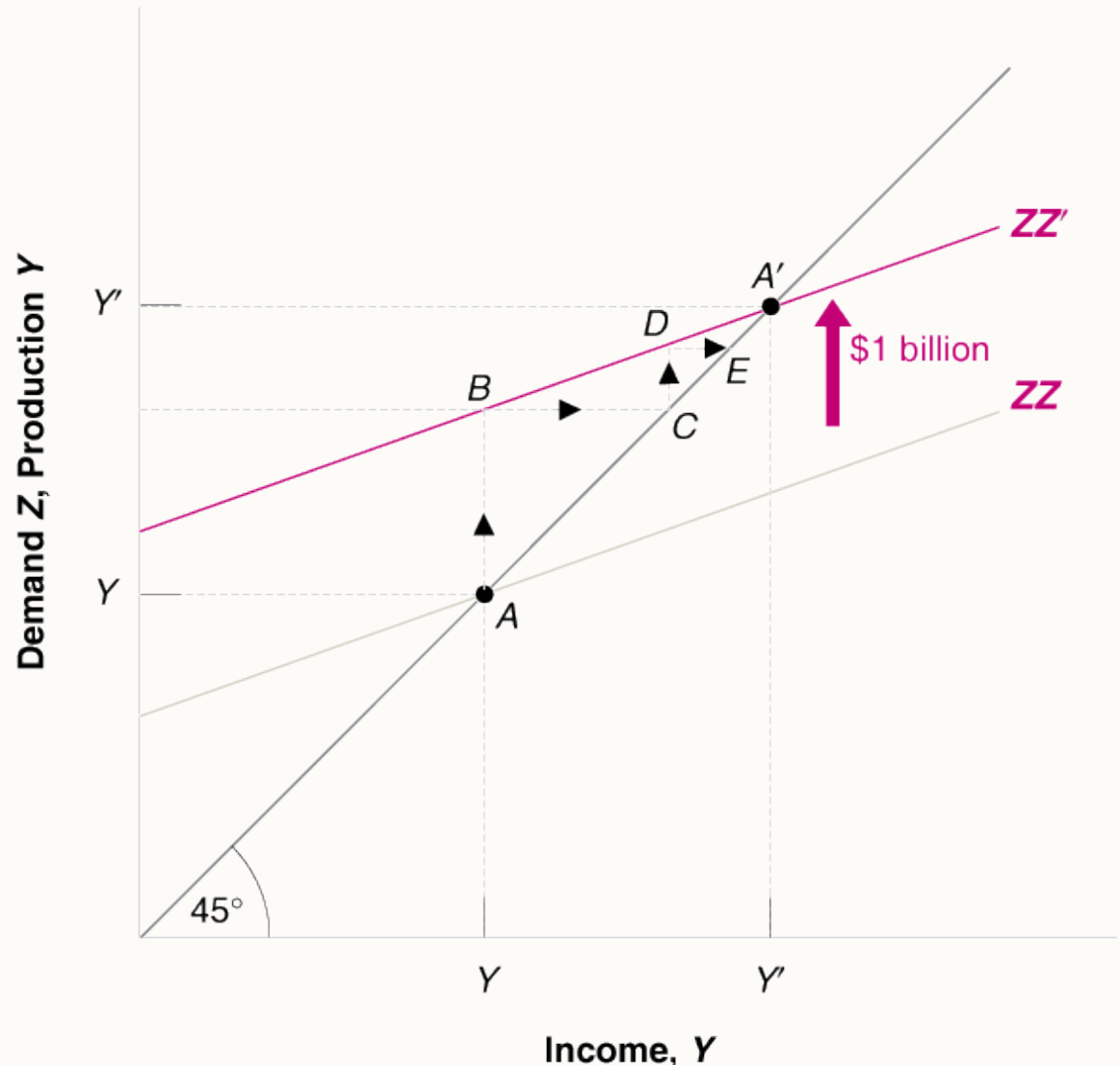
Using a Graph

- The first-round increase in demand, shown by the distance *AB* equals $1 billion.

- This first-round increase in demand leads to an equal increase in production, or $1 billion, which is also shown by the distance in *AB.*

- This first-round increase in production leads to an equal increase in income, shown by the distance in *BC,* also equal to $1 billion.

Using a Graph

- The second-round increase in demand, shown by the distance in *CD*, equals $1 billion times the propensity to consume.

- This second-round increase in demand leads to an equal increase in production, also shown by the distance *DC*, and thus an equal increase in income, shown by the distance *DE.*

- The third-round increase in demand equals $$c_1$ billion, times c_1, the marginal propensity to consume; it is equal to $$c_1 \times c_1 = c_1^2 billion.

Using a Graph

Following this logic, the total increase in production after, say, $n + 1$ rounds, equals $1 billion multiplied by the sum:

$$1 + c_1 + c_1^2 + \ldots + c_1^n$$

Such a sum is called a **geometric series**.

Using Words

To summarize:

- 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.

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.

FOCUS

- A **forecast error** is the difference between the actual value of GDP and the value that had been forecast by economists one quarter earlier.

- The **consumer confidence index** is computed from a monthly survey of about 5,000 households who are asked how confident they are about both current and future economic conditions.

FOCUS

Table 1	GDP, Consumption, and Forecast Errors, 1990-1991			
Quarter	(1) Change in Real GDP	(2) Forecast Error for GDP	(3) Forecast Error for c_0	(4) Index of Consumer Confidence
1990:2	19	-17	-23	105
1990:3	-29	-57	-1	90
1990:4	-63	-88	-37	61
1991:1	-31	-27	-30	65
1991:2	27	47	8	77

Saving is the sum of private plus public saving.

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

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

- **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.

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

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

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

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.

- Consumption and saving decisions are one and the same.

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

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

In equilibrium:

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

Rearranging terms, we get the same result as before:

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

FOCUS

The **paradox of saving** (or the paradox of thrift) is that as people attempt to save more, the result is both a decline in output and unchanged saving.

3-5 Is the Government Omnipotent? A Warning

- Changing government spending or taxes is not always easy.

- The responses of consumption, investment, imports, etc, are hard to assess with much certainty.

- Anticipations are likely to matter.

- Achieving a given level of output can come with unpleasant side effects.

- Budget deficits and public debt may have adverse implications in the long run.