

chapter 11 (27)

Income and Expenditure

Chapter Objectives

Students will learn in this chapter:

- The nature of the multiplier and how initial changes in spending lead to further changes
- The meaning of the aggregate consumption function, which shows how current disposable income affects consumer spending.
- How expected future income and aggregate wealth affect consumer spending.
- The determinants of investment spending, and the distinction between planned investment spending and unplanned inventory investment.
- How the economy achieves an outcome known as income–expenditure equilibrium.
- Why investment spending is considered a leading indicator of the future state of the economy.

Chapter Outline

Opening Example: The housing boom in Ft. Myers Florida from 2003–2006, followed by the housing bust in 2008, is a small-scale example of an economy-wide boom and bust. These cycles are often driven by ups and downs in investment spending that multiplies to affect the whole economy.

I. The Multiplier: An Informal Introduction

A. Four simplifying assumptions:

- Producers are willing to supply additional output at a fixed price
- The interest rate is given
- There is no government spending or taxes
- Exports and imports are zero

B. An increase in spending creates a direct effect and generates multiple rounds of additional increases on spending.

1. *Definition:* The **marginal propensity to consume** (or *MPC*) is the increase in consumer spending when disposable income rises by \$1.
2. $MPC = \Delta \text{Consumer spending} / \Delta \text{Disposable income}$
3. *Definition:* The **marginal propensity to save** (or *MPS*) is the increase in consumer saving when disposable income rises by \$1.
4. $MPS = 1 - MPC$.

5. *Definition:* An **autonomous change in aggregate spending** is the initial rise or fall in aggregate spending at a given level of real GDP.
6. *Definition:* The **multiplier** is the ratio of the total change in real GDP caused by an autonomous change in aggregate spending to the size of that autonomous change.
7. The multiplier = $1/(1 - MPC)$.

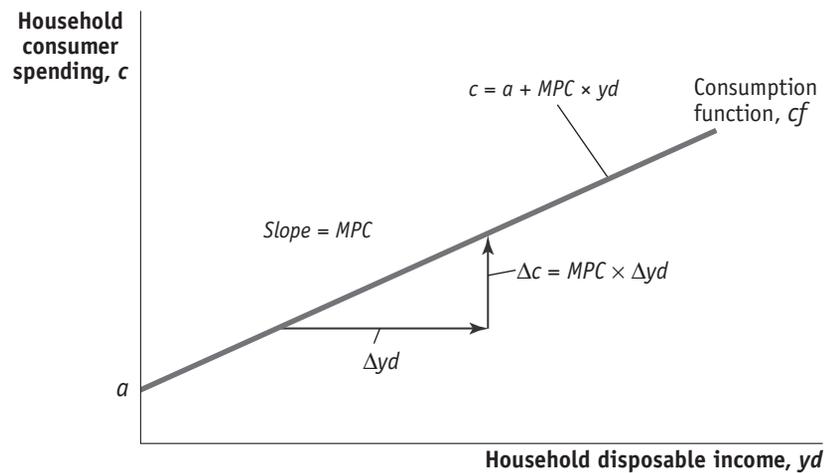
II. Consumer Spending

- A. *Definition:* The **consumption function** is an equation showing how an individual household's consumer spending varies with the household's current disposable income.
- B. The consumption function is expressed as:
 where c denotes individual household consumer spending, a is individual household autonomous consumer spending, MPC is the marginal propensity to consume, and yd is individual household current disposable income.

$$c = a + MPC \times yd$$

- C. Slope of individual consumption function:

$$\frac{\Delta c}{\Delta yd} = MPC$$



- D. *Definition:* The **aggregate consumption function** is the relationship for the economy as a whole between aggregate current disposable income and aggregate consumer spending.
- E. The aggregate consumption function is expressed as:
 where C is aggregate consumer spending, A is aggregate autonomous consumer spending, MPC is the marginal propensity to consume, and YD denotes aggregate current disposable income.

$$C = A + MPC \times YD$$

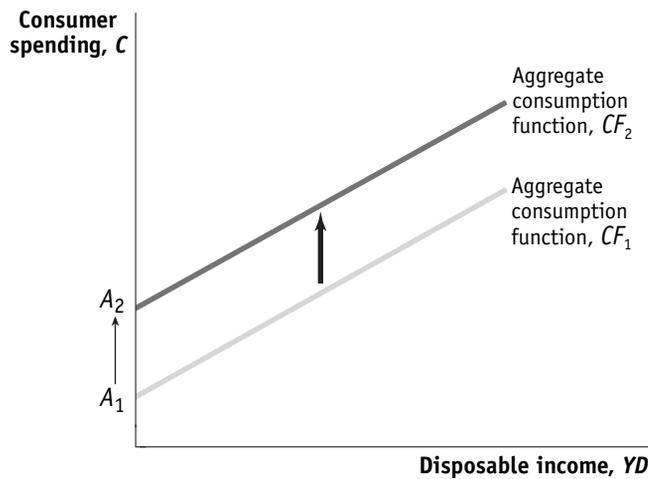
- F. Slope of aggregate consumption function:

$$\frac{\Delta C}{\Delta YD} = MPC$$

G. Shifts of the Aggregate Consumption Function

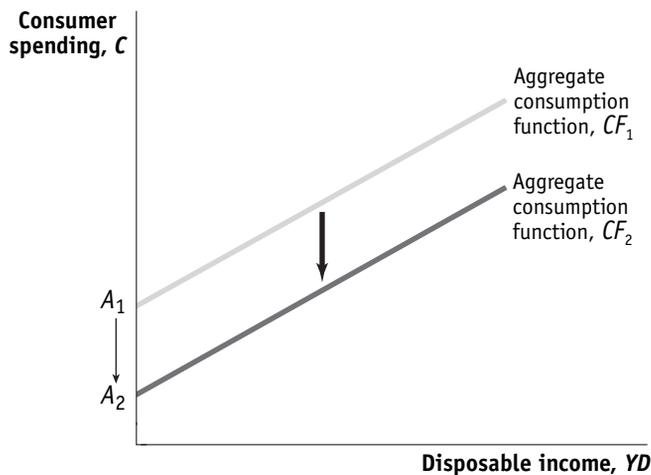
1. The aggregate consumption function shifts to the right when:
 - Future disposable income is expected to increase
 - Aggregate wealth increases
2. The aggregate consumption function shifts to the left when:
 - Future disposable income is expected to decrease
 - Aggregate wealth decreases
3. An upward shift of the aggregate consumption function increases the value of aggregate autonomous consumer spending, as shown in panel (a) in Figure 11-4 (Figure 27-4) in the text.

(a) An Upward Shift of the Aggregate Consumption Function



4. A downward shift of the aggregate consumption function decreases the value of aggregate autonomous consumer spending, as shown in panel (b) in Figure 11-4 (Figure 27-4) in the text.

(b) A Downward Shift of the Aggregate Consumption Function



III. Investment Spending

A. Definition: **Planned investment spending ($I_{planned}$)** is the investment spending that businesses intend to undertake during a given period.

B. Definition: According to the **accelerator principle**, a higher growth rate of GDP leads to higher planned investment spending, and a lower growth rate of real GDP leads to lower planned investment spending.

C. Inventories and Unplanned Investment Spending.

1. **Definition: Inventories** are stocks of goods held to satisfy future sales.
2. **Definition: Inventory investment** is the change in the value of total inventories held in the economy during a given period.
3. **Definition: Unplanned inventory investment ($I_{Unplanned}$)** occurs when actual sales are more or less than businesses expected, leading to unplanned changes in inventories.
4. **Definition: Actual investment spending** is the sum of planned investment spending and unplanned inventory investment.
5. Actual investment spending (I) is expressed as:

$$I = I_{Unplanned} + I_{Planned}$$

IV. The Income–Expenditure Model

A. Assumptions underlying the multiplier process include:

- The aggregate price level is fixed.
- The interest rate is fixed.
- Taxes, government transfers, and government purchases are all zero.
- There is no foreign trade.

B. Planned Aggregate Spending and Real GDP

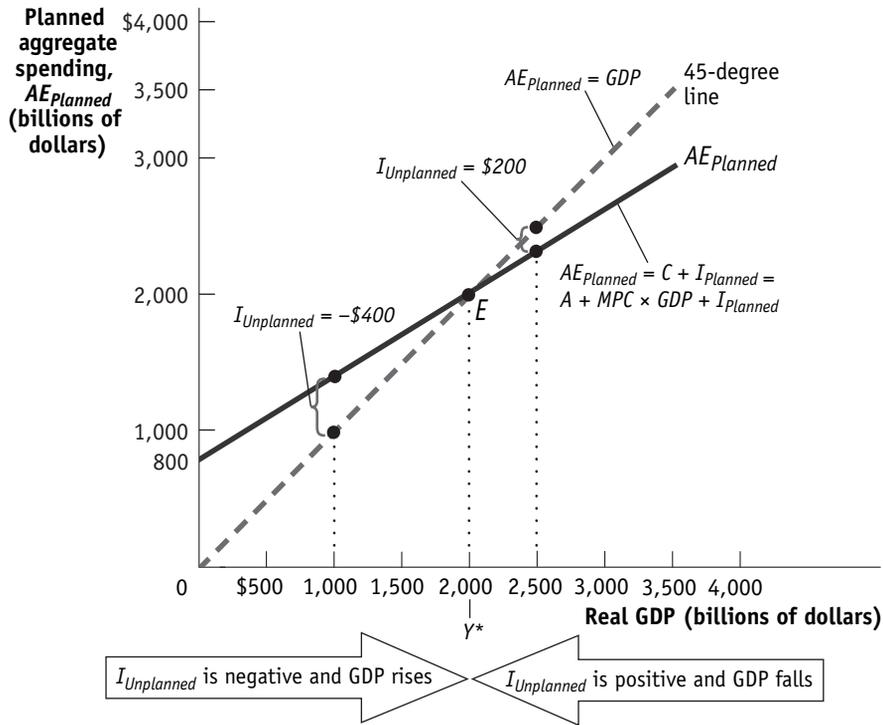
1. **Definition: Planned aggregate spending ($AE_{Planned}$)** is the total amount of planned spending in the economy.
2. Planned aggregate spending is equal to the sum of consumer spending and planned investment spending.

$$AE_{Planned} = C + I_{Planned}$$

3. The level of planned aggregate spending in a given year depends on the level of real GDP in that year.

C. Income–Expenditure Equilibrium

1. **Definition:** The economy is in **income–expenditure equilibrium** when aggregate output, measured by real GDP, is equal to planned aggregate spending.
2. **Definition: Income–expenditure equilibrium GDP** is the level of real GDP at which real GDP equals planned aggregate spending.
3. A 45-degree line represents a set of income–expenditure equilibrium points.
4. **Definition:** The **Keynesian cross** diagram identifies income–expenditure equilibrium as the point where the planned aggregate spending line crosses the 45-degree line. The income–expenditure equilibrium is illustrated in Figure 11-9 (Figure 27-9) in the text.

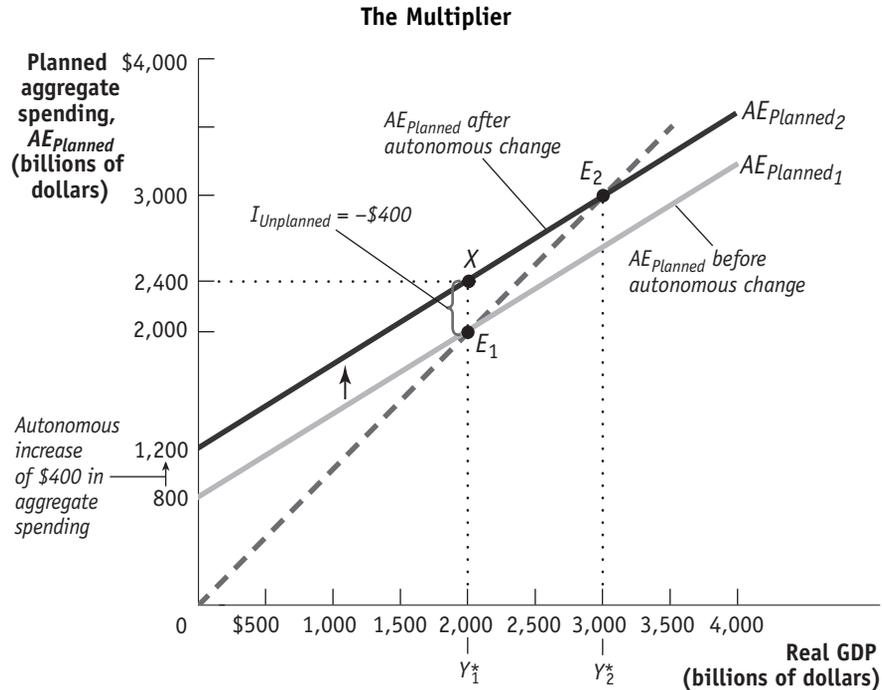


5. When the economy is in income–expenditure equilibrium, unplanned inventories are zero.
 6. At any level of real GDP that is less than the income–expenditure equilibrium level of GDP, unplanned inventory investment is negative and firms respond by increasing production.
 7. At any level of real GDP that is greater than the income–expenditure equilibrium level of GDP, unplanned inventory investment is positive and firms respond by decreasing production.
- D. The Multiplier Process and Inventory Adjustment
1. After an autonomous change in planned aggregate spending, the economy moves to a new income–expenditure equilibrium through the inventory adjustment process.
 2. Due to the multiplier effect, the change in income–expenditure equilibrium GDP (ΔY^*) is a multiple of the autonomous change in planned aggregate expenditure ($\Delta AE_{Planned}$).

$$\begin{aligned} \Delta Y^* &= \text{Multiplier} \times \Delta AE_{Planned} \\ &= \frac{1}{1 - MPC} \times \Delta AE_{Planned} \end{aligned}$$

where ΔY^* denotes change in income–expenditure equilibrium.

3. The magnitude of the shift of the AD curve, at any given aggregate price level, arising from an autonomous change in aggregate spending is equal to the multiplier times the change in planned aggregate spending.
4. The effect of an autonomous change in aggregate spending on income–expenditure equilibrium is illustrated in Figure 11-10 (Figure 27-10) in the text.



5. The effects of the Paradox of Thrift can be measured using the multiplier process.
6. The algebraic derivation of the multiplier is covered in the appendix to Chapter 11.

Teaching Tips

The Multiplier: An Informal Introduction

Creating Student Interest

Ask students to assume that they get a raise in their pay. Then ask, “What will you do with this extra money?” Students will obviously state that they will both save and spend this extra money. Explain that the extra money they are spending will foster additional production of goods and services, which in turn will generate additional income for the producers of these goods and services. Some of the additional income earned by the producers of these goods and services will also be spent, which will create additional spending rounds in the macroeconomy. This process is known as the multiplier effect.

Presenting the Material

A great way to explain the multiplier process is with a numerical example, such as the one outlined in the text. By carrying out the calculations of the additional consumer spending rounds arising from an initial increase in investment spending, students will have a better understanding of the multiplier process. Note that prices are being held constant during this analysis.

Consumer Spending

Creating Student Interest

Ask students to assume they have been given a raise of \$1 per day. What options do they have for this additional income? They can spend it or save it. Ask them how much they will spend and how much they will save. They are likely to say they will spend it all! Use their responses to compute the average *MPC* for the class. If the average *MPC* is 1, discuss why the class has such a high *MPC* and ask if everyone in the economy is likely to have an average *MPC* equal to 1 (while it is high for the whole economy, it is probably less than 1). Discuss the meaning of the *MPC* with the class.

Presenting the Material

It is important to stress the intuitive understanding of the consumption function, with its graphical and mathematical representations. Since students typically have less trouble understanding concepts than they do graphs, it is best to start with the intuitive explanation of the consumption function. Afterward, emphasize the mathematical and graphical presentations of this function.

Begin by asking students how much they would consume/spend if their income was \$0. At least some students will likely respond “\$0”. Point out that consuming \$0 would mean they don’t eat, and that couldn’t go on for very long (they would soon leave the model!). People must consume, even if their income is 0. Define “autonomous consumption” for the class and how it is possible to spend when your income is 0. Now ask the students, If your income goes up, how much additional will you spend/consume? Go back to the definition of *MPC* to explain. How fast consumption rises when income goes up is determined by the *MPC*. The added consumption when income increases is “induced consumption”—consumption created as a result of increased income. The autonomous and the induced consumption are the two parts of total consumption.

Now translate this intuitive explanation to the mathematical consumption function. The autonomous consumption is the level of consumption when income is zero—the *Y* intercept. How fast consumption rises as income rises is the slope of the consumption function (rise/run = change in *C*/change in *Y*_d). Total consumption is equal to the autonomous consumption plus the induced consumption: $C = a + (MPC \times Y)$.

Investment Spending

Creating Student Interest

A simple real-world example can be used to illustrate the inventory adjustment process. Ask students to think about the last car lots they either visited or drove by. Indicate to them that the unsold cars on a lot constitute inventory held by the owners of the car lots. If during some period, auto sales are much greater than anticipated and there is an unexpected reduction in the car lot owners’ inventories, they will contact the car manufactures for additional stock and this will prompt the auto manufacturer to increase its production. Conversely, if the car lot owners’ sales are much lower than anticipated during a given period, they will contact the automobile manufacturers and inform them of this situation. In response to this information, the automobile manufacturers will reduce their production.

Presenting the Material

Begin by reminding students that the level of investment spending is inversely related to the interest rate. Also discuss the effects that expected future real GDP and current production capacity have on investment spending. This will naturally lead into a discussion of the accelerator principle. It is also important to discuss the concepts of inventories

and unplanned investment spending. Specifically, distinguish between actual investment (I) and planned investment spending ($I_{Planned}$), as well as the concept of unplanned inventory investment ($I_{Unplanned}$). Mathematically, the relationship among these measures is expressed as:

$$I = I_{Unplanned} + I_{Planned}$$

The Income–Expenditure Model

Creating Student Interest

Ask students if they recall the events following 9/11. The political leaders at that time, including the president of the United States, the governor of New York, and the mayor of New York City, as well as financial leaders, all urged citizens to spend money in New York City, invest in the stock market, or otherwise support the economy. It was the intent of these leaders to encourage additional spending in an effort to avert a demand related recession.

Presenting the Material

It is extremely important that students have a firm understanding of the income–expenditure model presented in Figure 11-9 (Figure 27-9) in the text. While explaining the inventory adjustment process, try to incorporate the following mathematical equations:

$$\begin{aligned} GDP &= C + I \\ &= C + I_{Planned} + I_{Unplanned} \\ &= AE_{Planned} + I_{Unplanned} \end{aligned}$$

In addition, the data in Table 11-3 (Table 27-3) in the text and Table 11-4 (Table 27-4) in the text can be linked with the previous equations, as well as Figure 11-9 (Figure 27-9). The multiplier process and its impact on the aggregate expenditure and the aggregate demand curve can also be demonstrated graphically, as shown in Figure 11-10 (Figure 27-10), as well as mathematically as follows:

$$\begin{aligned} \Delta Y^* &= \text{Multiplier} \times \Delta AE_{Planned} \\ &= \frac{1}{1 - MPC} \times \Delta AE_{Planned} \end{aligned}$$

Common Student Pitfalls

- **Autonomous consumption.** Students can have difficulty understanding the notion of autonomous consumer spending. In particular, students often question how consumer spending can be positive even when income is zero. Emphasize to students that when disposable income is zero, consumers are financing their spending with their savings.
- **The link between investment and consumption.** Students may not immediately see the connection between an increase in investment spending (I) and the impact on consumer spending (C). This is likely due to the fact that students see C and I as separate entities. Explain that new investment (i.e., plant and equipment) is created by workers who are members of households. Some of the income earned by these workers is spent, which creates the subsequent rounds of consumer spending that follow the initial increase in investment spending.
- **Inventories.** Students may mistakenly think that at the income–expenditure equilibrium, inventories are equal to zero. Emphasize to students that at this equilibrium inventories are not typically zero. Rather, there are no unanticipated reductions or increases in inventories at the equilibrium level of output. In other words,

at the income–expenditure equilibrium, unplanned changes in inventories are equal to zero, while planned inventories are positive.

Case Studies in the Text

Economics in Action

The Multiplier and the Great Depression—This EIA discusses the role of the multiplier in the Great Depression.

Ask students the following questions:

1. What do economists believe drove the economy into Great Depression? (Answer: a fall in investment spending that multiplied into a larger fall in consumption spending)
2. What did the multiplier equal during the Great Depression and what happened to the multiplier over time? Why did it change? (Answer: 3; it has fallen; automatic stabilizers)

Famous First Forecasting Failures—This EIA explains the birth of modern econometrics and how an early failure of economists’ attempts to estimate the aggregate consumption function led to progress in understanding the economy.

Ask students the following questions:

1. Did an estimated simple linear consumption function fit the aggregate consumer spending data between 1929 and 1940? (Answer: Yes, the estimated linear aggregate consumption function did fit the actual aggregate spending data very well for the period 1929–1940.)
2. Why didn’t the simple, linear consumption function accurately estimate aggregate consumer spending following World War II? (Answer: Following World War II, households had much more optimistic expectations regarding future disposable income and also had increases in their aggregate wealth. This caused the aggregate consumption function to shift up relative to that for the pre-war era.)

Interest Rates and the U.S. Housing Boom—This EIA explains how low interest rates led to the housing boom and “bubble”.

Ask students the following questions:

1. Why did low interest rates lead to a housing boom (and bubble)? (Answer: low interest rates made buying housing cheaper. People bought more housing and that investment led—through the multiplier process—to an overall economic expansion)
2. When and why did the housing bubble burst? (Answer: 2007; people bought houses expecting unrealistic increases in future value)

Inventories and the End of a Recession—This EIA explains how increases in consumer spending are initially met through decreases in inventories.

Ask students the following questions:

1. When did consumer spending begin to increase after the 2001 recession and how did businesses respond? (Answer: late 2001; depleting inventories)
2. How did producers eventually respond to the increase in consumer spending? (Answer: increasing production in 2002)

Activities

Spending Round by Round (15 minutes)

Pair students and ask them to complete the following exercises.

1. Assume the MPC is 0.75. What is the value of the multiplier?
2. Assume investment spending increases by \$20 billion and the MPC is 0.75. Calculate the first through the fourth rounds of spending in the economy.
3. Assume investment spending increases by \$20 billion and the MPC is 0.75. Calculate the total change in GDP arising from this increase in investment spending.

Answers:

$$1. \text{ Multiplier} = \frac{1}{1 - MPC} = \frac{1}{1 - 0.75} = 4$$

2. Round 1: Increase in investment spending = \$20 billion
Round 2: Increase in consumer spending = $0.75 \times \$20$ billion = \$15 billion
Round 3: Increase in consumer spending = $(0.75)^2 \times \$20$ billion = \$11.25 billion
Round 4: Increase in consumer spending = $(0.75)^3 \times \$20$ billion = \$8.4375 billion
3. Total increase in GDP arising from \$20 billion increase in investment spending

$$= \$20 \text{ billion} \times \frac{1}{1 - MPC} = \$20 \text{ billion} \times \frac{1}{1 - 0.75} = \$80 \text{ billion}$$

Working with the Aggregate Consumption Function (20 minutes)

Ask students to work in pairs on the following exercises.

1. Assume there are four individuals in the macroeconomy. Using the data in the following table, compute the aggregate consumption function.

Current Disposable Income	Consumer Spending			
	Cara	Fred	Don	Robin
\$0	\$1,050	\$1,350	\$1,580	\$2,100
\$1,000	\$1,200	\$1,500	\$1,800	\$2,400

2. Explain what the values of the slope and vertical intercept of the aggregate consumption function mean from an economic perspective.
3. Plot the aggregate consumption function you computed in the previous question.

Answers:

1. To determine the value of aggregate autonomous consumer spending (A), sum the values of the four individuals' consumer spending when current disposable income is equal to zero as follows:

$$A = \$1,050 + \$1,350 + \$1,580 + \$2,100 = \$6,080$$

To determine the slope of the aggregate consumption function, first compute the value of aggregate spending when current disposable income is

\$1,000. Next, calculate the change in aggregate consumer spending when income changes from \$0 to \$1,000.

When current disposable income equals \$1,000, aggregate consumer spending is:

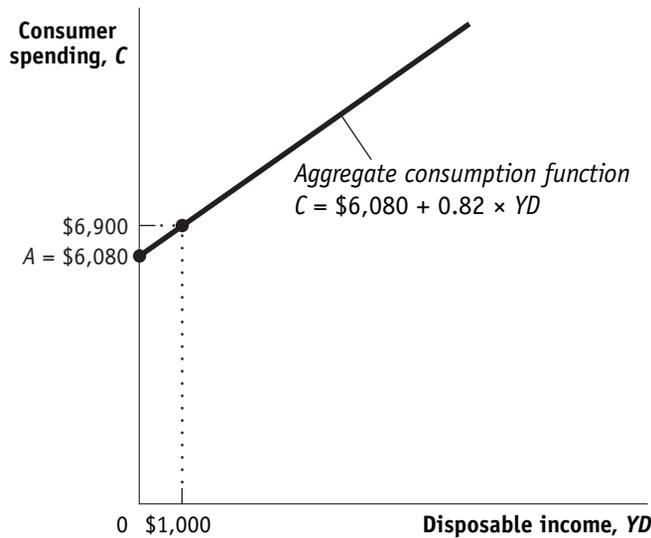
$$\begin{aligned} & \$1,200 + \$1,500 + \$1,800 + \$2,400 = \$6,900 \\ MPC &= \frac{\Delta C}{\Delta YD} = \frac{(\$6,900 - \$6,080)}{(\$1,000 - \$0)} = \frac{\$820}{\$1,000} = 0.82 \end{aligned}$$

Therefore, the aggregate consumption function is

$$\begin{aligned} C &= A + MPC \times YD \\ C &= 6,080 + 0.82 \times YD \end{aligned}$$

- The vertical intercept of the aggregate consumption function is \$6,080, which indicates that when aggregate disposable income is \$0, aggregate autonomous spending is \$6,080. The MPC is 0.82, which indicates that if aggregate disposable income increases by \$1, then aggregate consumer spending will increase by \$0.82.

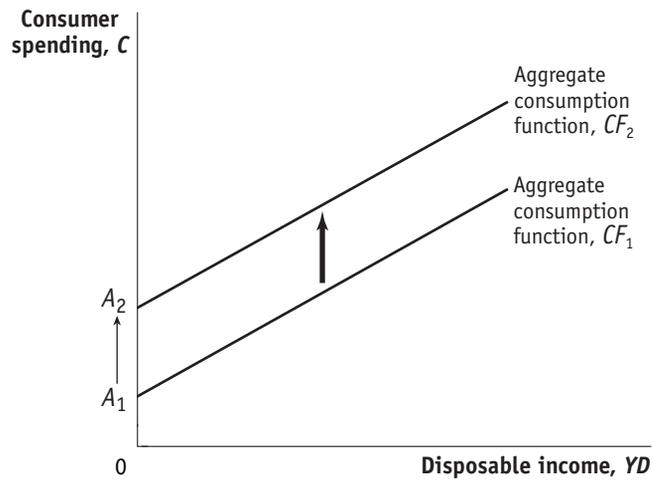
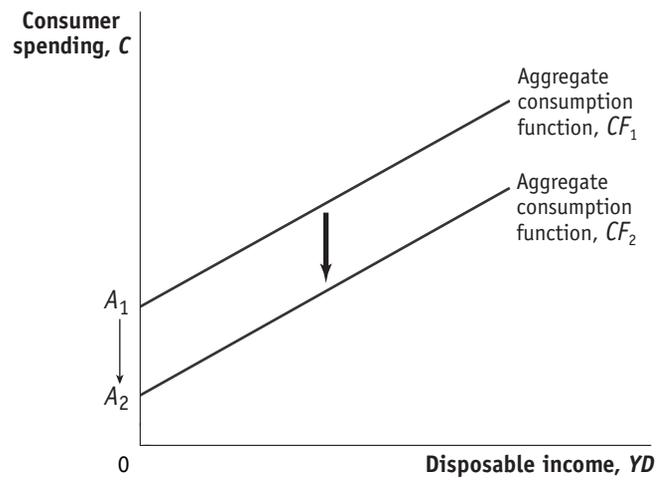
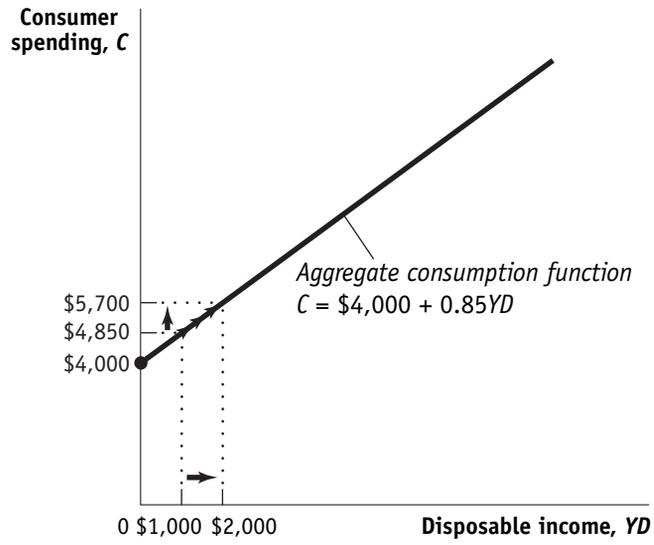
3.



Changing the Consumption Function (10 minutes)

Pair students and ask them to complete the following exercises.

- Draw a graph showing the effect on the aggregate consumption function of an increase in disposable income.
- Draw a graph showing the effect on the aggregate consumption function of the expectation that disposable income will decrease in the future.
- Draw a graph showing the effect on the aggregate consumption function of an increase in wealth.



Controlling Inventories (10 minutes)

Ask students to work in pairs on the following thought questions.

1. Why is it important for businesses to minimize any unplanned changes in their inventories?
2. Is it easier or harder for firms to minimize any planned changes in their inventories today than it was 50 years ago?

Answers:

1. Businesses don't want to have too much of an unplanned increase in inventories because there are holding costs associated with inventories. Also, in some instances, products held in inventory too long can perish or become obsolete, thereby greatly diminishing their value. Businesses also don't wish to have too much of an unplanned decrease in inventories, as they will run the risk of not having enough product to sell and thus incurring customer ill will.
2. Due to the use of bar codes on products and computerized inventory analysis, firms have the capability to more closely control their inventories today than was the case 50 years ago.

Macroeconomic Table for Two (20 minutes)

Ask students to work in pairs using the data in the following table to complete the following exercises.

GDP	YD	C	$I_{Planned}$	$AE_{Planned}$	$I_{Unplanned}$
(billions of dollars)					
\$ 0	\$ 0	\$ 200	\$ 100	\$ _____	\$ _____
400	400	500	100	_____	_____
800	800	800	100	_____	_____
1,200	1,200	1,100	100	_____	_____
1,600	1,600	1,400	100	_____	_____

1. Complete the columns for $AE_{Planned}$ and $I_{Unplanned}$ in the table.
2. What is the value of the MPC?
3. What is the equation for the planned aggregate expenditure function?
4. What is the value of income-expenditure equilibrium GDP, (Y^*)?
5. Graph the planned aggregate expenditure function and the 45-degree line. Indicate the value of income-expenditure equilibrium.

Answers:

1. In general, $AE_{Planned} = C + I_{Planned}$ and $I_{Unplanned} = GDP - AE_{Planned}$
 When GDP = \$0, $AE_{Planned} = \$300$ and $I_{Unplanned} = \$ -300$.
 When GDP = \$400, $AE_{Planned} = \$600$ and $I_{Unplanned} = \$ -200$.
 When GDP = \$800, $AE_{Planned} = \$900$ and $I_{Unplanned} = \$ -100$.
 When GDP = \$1,200, $AE_{Planned} = \$1,200$ and $I_{Unplanned} = \$0$.
 When GDP = \$1,600, $AE_{Planned} = \$1,500$ and $I_{Unplanned} = \$100$.

2.
$$MPC = \frac{\Delta C}{\Delta YD} = \frac{(\$500 - \$200)}{(\$400 - \$0)} = \frac{\$300}{\$400} = 0.75$$

3. In general, the equation for the planned aggregate expenditure function is:

$$AE_{Planned} = A + MPC \times GDP + I_{Planned}$$

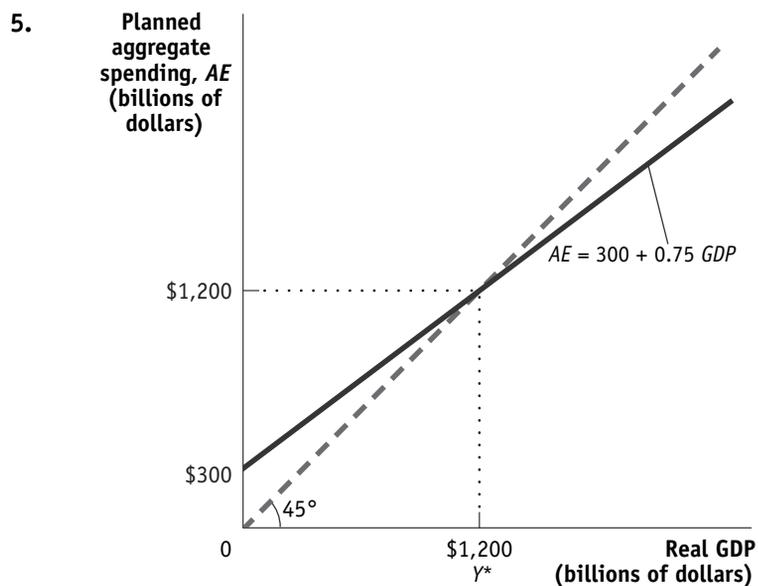
Therefore, in this problem, the planned aggregate expenditure function is:

$$AE_{Planned} = 200 + 0.75 \text{ GDP} + 100 = 300 + 0.75 \text{ GDP}$$

4. At Y^* , $GDP = C + I_{Planned} + I_{Unplanned}$

$$\text{or } GDP = AE_{Planned} + I_{Unplanned}$$

In this exercise, the value of income–expenditure equilibrium (Y^*) occurs when $GDP = \$1,200$ billion, since when $AE_{Planned} = \$1,200$ billion, $I_{Unplanned} = \$0$.



Web Resources

The following website provides information on consumer spending:

The Bureau of Labor Statistics Consumer Expenditure survey: <http://www.bls.gov/cex/>.