The Multiplier

An initial change in any of the components of aggregate demand (AD) will lead to further changes in the economy and an even larger final change in real gross domestic product (GDP). That is, any initial change in spending will be multiplied as it impacts the economy. The final impact of an initial change in spending can be calculated using the *spending multiplier*. The size of the final impact of an initial change in spending on real GDP is affected by the amount of additional spending that results when households receive additional income, called the *marginal propensity to consume*, or MPC. The MPC is the key to understanding the multiplier, so the first step in understanding the multiplier is to understand the MPC.

The MPC is the change in consumption divided by the change in disposable income (DI). It is a fraction of any change in DI that is spent on consumer goods (C): $MPC = \Delta C / \Delta DI$.

The *marginal propensity to save (MPS)* is the fraction saved of any change in disposable income. The MPS is equal to the change in saving divided by the change in DI: $MPS = \Delta S / \Delta DI$.

The MPC measures *changes* in consumption when income changes. The MPC is distinct from the *average propensity to consume (APC)*, which measures the average amount of the total income households spend or save.

The APC is the ratio of C to disposable income, or $APC = C / DI$.

The *average propensity to save (APS)* is the ratio of savings (S) to disposable income, or $APS = S / DI$.

1. Fill in the blanks in Table 3-2.1.

Table 3-2.1
Average Propensities to Consume and to Save

Disposable income	Consumption	Saving	APC	APS
$0	$2,000	-$2,000	—	—
$2,000	$3,600	-$1,600	1.8	-0.8
$4,000	$5,200	-$1,200		
$6,000	$6,800	-$800		
$8,000	$8,400	-$400		
$10,000	$10,000	$0		
$12,000	$11,600	$400		

2. Fill in the blanks in Table 3-2.2.

Table 3-2.2
Marginal Propensities to Consume and to Save

Disposable income	Consumption	Saving	MPC	MPS
$12,000	$12,100	–$100	—	—
$13,000	$13,000	$0	0.90	0.10
$14,000	$13,800	$200		
$15,000	$14,500	$500		
$16,000	$15,100	$900		
$17,000	$18,800	$1,400		

3. Explain why the sum of MPC and MPS must always equal 1.

The Multiplier

The following example illustrates how an initial change in a component of AD results in an even larger change in real GDP (i.e., the multiplier process).

The people in Econoland live on an isolated island. One year a stranger arrives and builds a factory to make seashell charms. The factory is considered an investment on Econoland. If the MPC on the island is 75 percent, or 0.75, it means that Econoland residents consume 75 percent of any change in income and save 25 percent of any change in income. The additional spending generates additional income and eventually a multiple increase in income. This is called the *multiplier effect*. When they hear about the multiplier effect, the islanders are thrilled about the new factory because they like the idea of additional income.

The residents of Econoland want to know what would eventually happen to the levels of GDP, consumption, and saving on the island as the new spending works its way through the economy. Luckily there is a retired economist on Econoland who offers a brief statement of the multiplier. "It's simple," he says, "One person's spending becomes another person's income." The economist gives a numerical example, as shown in Table 3-2.3. "This shows the process," he says. The rounds refer to the movement of spending from resident to resident. His example stops at four rounds and the rest of the rounds are added together to cover the total effect on all Econoland's citizens.

Table 3-2.3

Changes in Econoland's GDP, Consumption, and Saving

Round	Income (GDP)	Consumption spending	Saving
Round 1	$1,000	0.75 of $1,000 = $750.00	0.25 of $1,000 = $250.00
Round 2	One person's spending becoming another person's income: $750.00	0.75 of $750 = $562.50	0.25 of $750 = $187.50
Round 3	The next person's spending becoming another person's income: $562.50	0.75 of $562.50 = $421.88	0.25 of $562.50 = $140.62
Round 4	The next person's spending becoming another person's income: $421.88	0.75 of $421.88 = $316.41	0.25 of $421.88 = $105.47
Rounds continue	. . .	. . .	. . .
All rounds	Final outcome for income (GDP) 1 / (1 − 0.75) x $1,000 = 4 x $1,000 = $4,000	Final outcome for consumption spending 0.75 of $4,000 = $3,000	Final outcome for saving 0.25 of $4,000 = $1,000

The retired economist summarizes the multiplier effect for the crowd of Econolanders. "This shows us that the factory is an investment that has a multiplied effect on our GDP. In this case, the multiplier is 4." He adds, "It appears to be magic, but it is simply that *one person's spending becomes another person's income.*" The islanders nod with agreement but also look puzzled, so the old professor asks the citizens a series of questions. How would Econlanders answer these questions?

4. Would the multiplier be larger or smaller if you saved more of your additional income?

5. What do you think would happen if all Econolanders saved all of the change in their incomes?

6. What would happen if you spent *all* of the change in your income?

The professor then points out that a new road around the island or a new bridge built by the island government over the lagoon would also have a multiplied effect on GDP. He also tells them that if the government of Econoland lowers taxes, the citizens would have more income to spend, which would cause a multiplier effect. He notes that there is another side to this. If taxes are raised, there is a multiplier effect, which decreases income and GDP by a multiple amount.

Multiplier Formulas and Terms

$MPC = \Delta C / \Delta DI$

$MPS = \Delta S / \Delta DI$

Spending Multiplier $= 1 / (1 - MPC)$ or $1 / MPS$

How to use the spending multiplier:

Change in GDP = change in AD component x spending multiplier.

When to use the spending multiplier:

When there is a change in a component of AD.

When the government changes taxes, it will also affect AD. If taxes are decreased, consumers (or businesses) have more disposable income and will increase spending. When the government raises taxes, households (or businesses) have less disposable income and will decrease spending. The basic multiplier effect is the same, but with two differences. First, increasing taxes decreases spending, and decreasing taxes increases spending. The effect of taxes on spending is negative, so the tax multiplier has a negative sign. Second, taxes are not a component of AD. When taxes change, consumers (or businesses) will change their spending by only part of that amount, determined by the MPC. So, for every additional dollar in disposable income, spending will only increase by $MPC. Therefore, the numerator of the tax multiplier is MPC, rather than 1.

Student Alert: Make sure to use the tax multiplier when the change affecting AD is a change in taxes!

Tax Multiplier $= -MPC /(1 - MPC) = - MPC /MPS$

How to use the tax multiplier:

Change in GDP = change in taxes x tax multiplier.

When to use the tax multiplier:

When there is a change in lump-sum taxes.

Note: Remember that the tax multiplier has a negative sign.

Quick Quiz on Multipliers

7. What is the value of the tax multiplier if the MPC is 0.80? _____

8. What is the value of the spending multiplier if the MPC is 0.67? _____

9. What is the tax multiplier if the MPS is 0.25? _____

The Tools of Fiscal Policy

Changes in taxes and government spending designed to affect the level of aggregate demand in the economy are called *fiscal policy.*

Recall that *aggregate demand* is the total amount of spending on goods and services in the economy during a stated period of time and is made up of consumer spending (C), investment (I), government spending (G), and net exports (Xn). *Aggregate supply* is the total amount of goods and services available in the economy.

During a recession, the short-run equilibrium is below the full-employment level of output. Aggregate demand is too low to bring about full employment of resources. Government can increase aggregate demand by spending more and/or cutting taxes. Increasing aggregate demand to move the economy toward full employment is *expansionary fiscal policy.* Expansionary fiscal policy increases employment but also can raise the price level and result in budget deficits.

If the level of aggregate demand is too high, it creates inflationary pressures. Government can decrease aggregate demand by reducing spending and/or increasing taxes. Decreasing aggregate demand to decrease inflationary pressures is *contractionary fiscal policy.* Contractionary fiscal policy reduces inflationary pressures but can also decrease output and employment. Contractionary fiscal policy can result in budget surpluses (or smaller budget deficits).

Student Alert: **Remember that the multiplier is different for taxes and for spending!**

Decide whether each of the following fiscal policies of the federal government is expansionary or contractionary. Write *expansionary* or *contractionary*, and explain the reasons for your choice.

1. The government cuts business and personal income taxes and increases its own spending.

2. The government increases the personal income tax, Social Security tax, and corporate income tax. Government spending stays the same.

3. Government spending goes up while taxes remain the same.

4. The government reduces the wages of its employees while raising taxes on consumers and businesses. Other government spending remains the same.

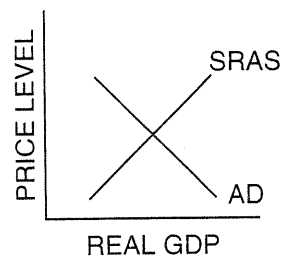## Summarizing Aggregate Demand and Aggregate Supply Shifts

For each of the graphs below, identify the starting equilibrium PL and Y. Then show the shift given for each graph and identify the new equilibrium PL and Y. Indicate the resulting change in price level, unemployment, and real GDP by circling the up arrow for an increase or the down arrow for a decrease.
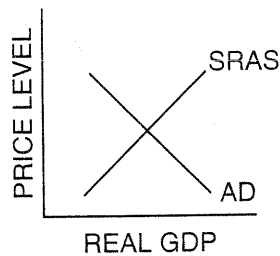
1. Increase in AD
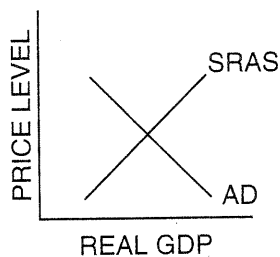
Real GDP: ↑ ↓
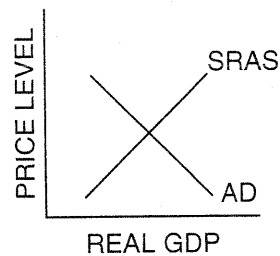
Price level: ↑ ↓

Unemployment: ↑ ↓

2. Increase in AS

Real GDP: ↑ ↓

Price level: ↑ ↓

Unemployment: ↑ ↓

3. Decrease in AD

Real GDP: ↑ ↓

Price level: ↑ ↓

Unemployment: ↑ ↓

4. Decrease in AS

Real GDP: ↑ ↓
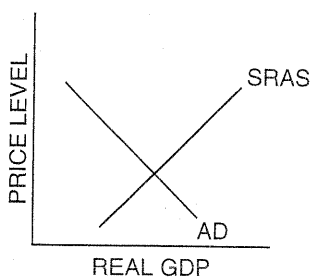
Price level: ↑ ↓

Unemployment: ↑ ↓

Changes in Short-Run Aggregate Supply and Aggregate Demand

The equilibrium price and quantity in the economy will change when either the short-run aggregate supply (SRAS) or the aggregate demand (AD) curve shifts. The AD curve shifts when any of the components of AD change—consumption (C), investment (I), government spending (G), exports (X), or imports (M). The aggregate supply (AS) curve shifts when there are changes in the price of inputs (e.g., nominal wages, oil prices) or changes in productivity.

## Changes in the Equilibrium Price Level and Output

For each situation described below, illustrate the change on the AD and AS graph and describe the effect on the equilibrium price level and real gross domestic product (GDP) by circling the correct symbol: ↑ for increase, ↓ for decrease, or — for unchanged
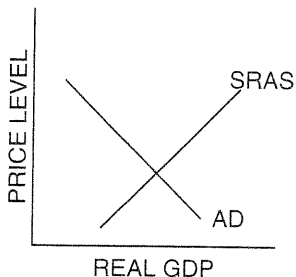
1. Business investment increases.

Price level: ↑   ↓   —

Real GDP: ↑   ↓   —

2. The government increases spending.
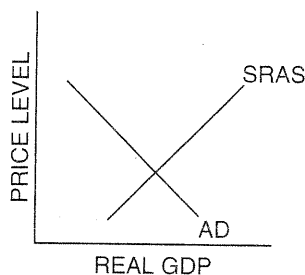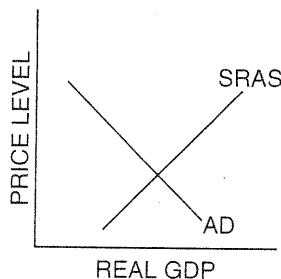

Price level: ↑   ↓   —

Real GDP: ↑   ↓   —

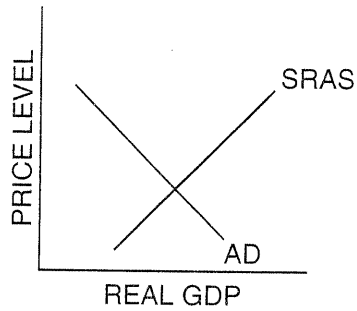**3. New oil discoveries cause large decreases in energy prices.**

Price level: ↑   ↓   —

Real GDP: ↑   ↓   —

4. Consumer spending increases.
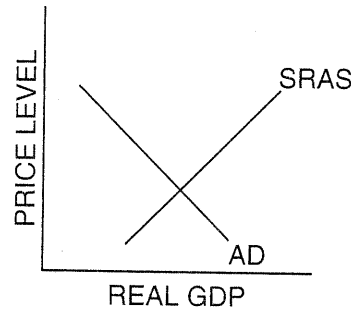

Price level: ↑   ↓   —

Real GDP: ↑   ↓   —

5. Production costs increase.
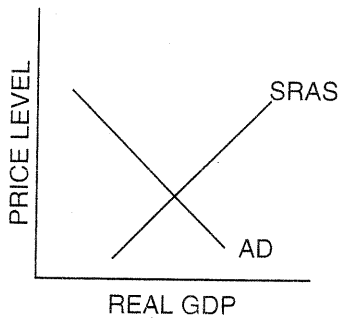

Price level: ↑ ↓ —

Real GDP: ↑ ↓ —

6. New technology and better education increase labor productivity.
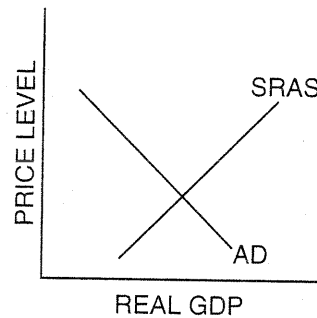

Price level: ↑ ↓ —

Real GDP: ↑ ↓ —

7. Consumers' confidence improves.

Price level: ↑ ↓ —

Real GDP: ↑ ↓ —

8. Net exports decrease.

Price level: ↑ ↓ —

Real GDP: ↑ ↓ —

Graphing Demand and Supply Shocks

Draw an AS/AD graph to illustrate the change given in each of the questions below. On your graph be sure to label the axes (PL and Y), the AS and AD curves, and the starting and ending equilibrium PL and Y (these should be placed on the axes).

9. Economic booms in both Japan and Europe result in massive increases in orders for exported goods from the United States.

10. The government reduces taxes and increases transfer payments.

11. Fine weather results in the highest corn and wheat yields in 40 years.

12. While the United States was in the midst of the Great Depression, a foreign power attacked, Congress declared war, and more than 1,000,000 soldiers were drafted in the first year while defense spending was increased several times over.
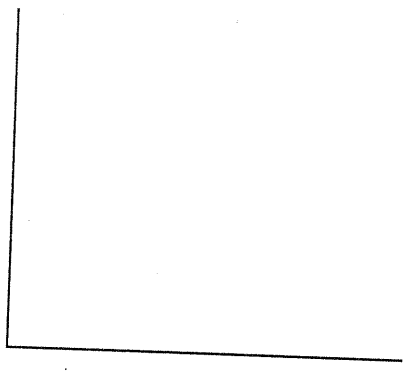
13. To balance the budget, the federal government cuts Social Security payments by 10 percent and federal aid to education by 20 percent.
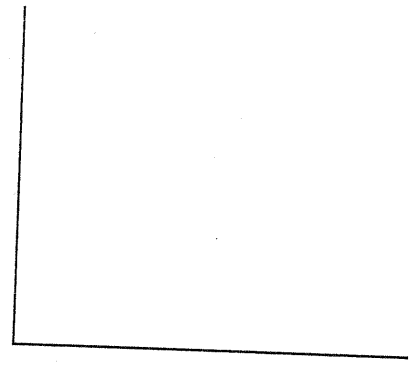
14. During a long, slow recovery from a recession, consumers postponed major purchases. Suddenly they begin to buy cars, refrigerators, televisions, and furnaces to replace their failing models.
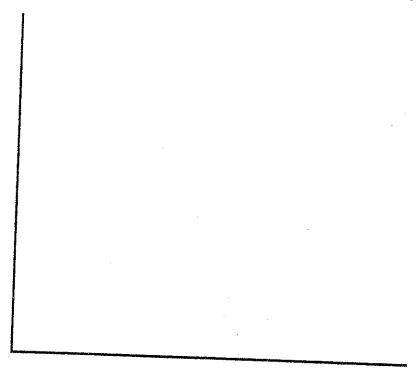
Effects of Fiscal Policy

Test your understanding of fiscal policy by completing Table 5-1.1. Your choices for each situation must be consistent—that is, you should choose either an expansionary or contractionary fiscal policy. (Fiscal policy cannot provide a solution to one of the situations.) Fill in the spaces as follows:

Column A: Objective for aggregate demand

Draw an up arrow to increase aggregate demand or a down arrow to decrease aggregate demand.

Column B: Action on taxes

Draw an up arrow to increase taxes or a down arrow to decrease taxes.

Column C: Action on government spending

Draw an up arrow to increase government spending or a down arrow to decrease government spending.

Column D: Effect on federal budget

Write *toward deficit* if your action will increase the deficit (or reduce the surplus) or *toward surplus* if your action will reduce the deficit (or increase the surplus).

Column E: Effect on national bebt

Draw an up arrow if your action will increase the national debt or a down arrow if your action will decrease the national debt.

Table 5-1.1
Effects of Fiscal Policy

	(A) Objective for aggregate demand	(B) Action on taxes	(C) Action on government spending	(D) Effect on federal budget	(E) Effect on national debt
1. National unemployment rate rises to 12 percent.					
2. Inflation is strong at a rate of 14 percent per year.					
3. Surverys show consumers are losing confidence in the economy, retail sales are weak, and business inventories are increasing rapidly.					
4. Business sales and investment are expanding rapidly, and economists think strong inflation lies ahead.					
5. Inflation persists while unemployment stays high.					

Discretionary Fiscal Policy and Automatic Stabilizers

One of the goals of economic policy is to stabilize the economy. This means promoting full employment and stable prices. To accomplish this, aggregate demand must be near the full-employment level of output. If aggregate demand is too low, there will be unemployment. If aggregate demand is too high, there will be inflation.

If aggregate demand is too low, government can use fiscal policy to stimulate the economy through increased spending or decreased taxes. These policies are examples of *expansionary fiscal policy*. If government wants to decrease aggregate demand, it can pursue a *contractionary fiscal policy* by decreasing taxes or increasing spending.

If government has to pass a law or take some other specific action to change taxes or spending, then the action is at the government's discretion and the policy is *discretionary policy*. If the effect happens automatically as the economic situation changes, then the policy is the result of an *automatic stabilizer*. An example of an automatic stabilizer is unemployment compensation. If the economy goes into a recession, some people are laid off and are eligible to receive unemployment compensation. The payment creates income and spending to keep aggregate demand from falling as much as it would have. Unemployment compensation stabilizes the economy automatically during a recession.

For each of the scenarios on the following page, indicate whether it represents an automatic (A) or discretionary (D) stabilizer, and whether it is an example of expansionary (E) or contractionary (C) fiscal policy.

Economic scenarios	Automatic (A) or Discretionary (D)	Expansionary (E) or Contractionary (C)
Example: Recession raises amount of unemployment compensation.	A	E
1. The government cuts personal income tax rates.	_____	_____
2. The government eliminates favorable tax treatment on long-term capital gains.	_____	_____
3. Incomes rise; as a result, people pay a larger fraction of their income in taxes.	_____	_____
4. As a result of a recession, more families qualify for food stamps and welfare benefits.	_____	_____

Economic scenarios	Automatic (A) or Discretionary (D)	Expansionary (E) or Contractionary (C)
5. The government eliminates the deductibility of interest expense for tax purposes.		
6. The government launches a major new space program to explore Mars.		
7. The government raises Social Security taxes.		
8. Corporate profits increase; as a result, government collects more corporate income taxes.		
9. The government raises corporate income tax rates.		
10. The government gives all its employees a large pay raise.		