

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	1.80	-0.80
\$4,000	\$5,200	-\$1,200	1.30	-0.30
\$6,000	\$6,800	-\$800	1.13	-0.13
\$8,000	\$8,400	-\$400	1.05	-0.05
\$10,000	\$10,000	\$0	1.00	0
\$12,000	\$11,600	\$400	0.97	0.03

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	0.80	0.20
\$15,000	\$14,500	\$500	0.70	0.30
\$16,000	\$15,100	\$900	0.60	0.40
\$17,000	\$18,800	\$1,400	0.50	0.50

3. Explain why the sum of MPC and MPS must always equal 1.
The only choice people have is to consume or to save. Thus, an additional dollar in income must result in a change in consumption and/or a change in savings. The sum of the change must be 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) $1 / (1 - 0.75) \times \$1,000 = 4 \times \$1,000$ = \$4,000	Final outcome for consumption spending $0.75 \text{ of } \$4,000 = \$3,000$	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 Econolanders answer these questions?

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

Smaller

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

There would not be any change in output from consumption.

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

There would be an infinite change in output from consumption.

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

$$MPC = \Delta C / \Delta DI$$

$$MPS = \Delta S / \Delta DI$$

$$\text{Spending Multiplier} = 1 / (1 - MPC) \text{ or } 1 / MPS$$

How to use the spending multiplier:

$$\text{Change in GDP} = \text{change in AD component} \times \text{spending multiplier.}$$

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!

$$\text{Tax Multiplier} = -MPC / (1 - MPC) = -MPC / MPS$$

How to use the tax multiplier:

$$\text{Change in GDP} = \text{change in taxes} \times \text{tax multiplier.}$$

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? -4

8. What is the value of the spending multiplier if the MPC is 0.67? 3

9. What is the tax multiplier if the MPS is 0.25? -3