# The GDP Expenditures Equation: What Is GDP and How Do We Measure It?

## Lesson Author

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## Standards and Benchmarks (see page 24)

## Lesson Description

In this lesson, students learn the definition of gross domestic product (GDP) and the composition of the expenditure categories of GDP. They participate in an active learning demonstration of the GDP expenditure equation [GDP = C + I + G + (X – M)] to understand the relationships among the variables and the effect of changes in aggregate spending on GDP. Special attention is given to the effect that imports have on GDP.

## Grade Level

High school or college

## Concepts

Business cycle

Exports

Gross domestic product (GDP)

Gross private investment

Government spending

Imports

Intermediate goods

Personal consumption expenditures

Recession

## Compelling Question

How do economists measure and assess the health of the economy?

## Objectives

Students will be able to

- define GDP,
- identify the GDP expenditure components,
- explain how spending in each of the expenditure components affects overall GDP, and
- explain how changes in the level of spending are related to the business cycle.

## Time Required

30 minutes

## Preparation

- Handout 1, printed on individual pages (not front and back); Handout 2 cut into strips
- Slides: https://www.stlouisfed.org/education/gdp-expenditures-equation

## Procedure

1. Begin the lesson by discussing the following:
   - Why do you think it's important for the economy to grow? (*A growing economy provides benefits for people such as more jobs and income.*)
   - How do economists measure the economy to determine if it's growing? (*Answers will vary. Suggest that economists can either measure all the spending on goods and services in the economy or all the income earned by people—but they are essentially the same because one person's spending is another person's income*.)

2. Display Slide 1. Explain to the students that economists use **gross domestic product**, or **GDP**, to measure the size of the economy. Tell the students that they will be participating in an activity that will help them better understand the relationship between spending and the size of the economy.

3. Display Slide 2. Define GDP as the total market value, expressed in dollars, of all final goods and services produced in an economy in a given year. Explain that there are three important phrases in the definition. Discuss the three phrases as follows:
   - Display Slide 3. "Total market value, expressed in dollars" means the following:
     - The value of goods and service is determined by the prices paid by the end users.
     - The total of these prices is the total value of GDP.
     - U.S. GDP is measured in U.S. dollars.

- Display Slide 4. "Final goods and services" means the following:
  - "Final" refers to goods and services sold to end users.
  - These goods and services have been purchased for *final use* and not for resale or further processing.
  - GDP does not include **intermediate goods**, which are man-made goods used to produce other goods or services, becoming part of those goods or services.
  - Excluding intermediate goods helps avoid double counting. The following is an example:
    - Tires sold to a company that produces automobiles are intermediate goods.
    - Because those tires will be installed on a new car, they are not counted in GDP, because the value of the tires will be reflected in the total price of the car when it's sold to the end user.
    - However, when new tires are purchased by an end user to replace the worn out tires on his or her car, they *are* final goods and are counted in GDP.
- Display Slide 5: "Produced in an economy" means the following:
  - A good or service must be produced within the borders of the United States to be counted in U.S. GDP.
  - Getting the count correct to include only U.S. goods and services requires a little accounting, which will be covered later.

4. Display Slide 6. Review the definition of GDP. Explain that GDP data are released quarterly (every three months).

5. Display Slide 7. When examining changes in the output of goods and services, economists use real GDP, which is GDP adjusted for inflation to hold prices constant over time, and by comparing changes in real GDP, economists can tell how the economy is changing.

6. Display Slide 8. Explain the following:
   - Changes in real GDP indicate changes in the **business cycle**.
   - The business cycle is the fluctuating levels of economic activity in an economy over a period of time measured from the beginning of one **recession** to the beginning of the next.
   - An economic **expansion** is a period when real GDP increases—a period of economic growth. That is, increases in real GDP from quarter to quarter (positive GDP growth) indicate that the economy is growing, or expanding.
   - An economic **contraction** is when real GDP decreases. It is a period of economic decline and might mean the economy is in recession.

- A recession is a period of declining real income and rising unemployment. It is a significant decline in general economic activity extending over a period of time.

7. Tell the students that you will need seven volunteers to participate in an activity where they will learn about an equation economists use to calculate GDP. (**NOTE:** For larger classes include the plus sign "+" cards to increase engagement to 11 students. In this case, hand a plus sign to a student volunteer at the same time you hand out each of these variables: I, G, and X.) You will select the volunteers as the lesson continues and give them part of the equation to hold (from Handout 1). When a student is called, he or she is to come forward to line up in the front of the classroom and face the other students. As each volunteer comes forward, the rest of the students are to cheer.

8. Hold up the "GDP" card. Select a student volunteer and lead the students in a cheer, "give me GDP!" Hand the "GDP" card to the student volunteer.

9. Display Slide 9. Explain that when statisticians use spending to measure GDP, it is called the expenditure method of calculating GDP. This method measures the total money spent in several major categories. The next three variables in the equation represent the three major domestic categories of spending.

10. Hold up the "C" card. Select a student volunteer and lead the students in a cheer, "Give me a C!" Hand the C card to the student volunteer.

11. Display Slide 10. Explain the following:
    - The "C" represents **personal consumption expenditures** or, simply, consumption spending, which is spending by households on new—not used—goods and services.
    - For example, goods include new cars and hamburgers and services include haircuts and visits to the dentist.
    - C includes only new goods, to avoid double counting. For example a car might be bought new and then resold three to five years later as a used car. It only counts once—when it is sold as a new car.
    - Personal consumption expenditures usually make up over two-thirds of GDP spending.

12. Hold up the "I" card. Select a student volunteer and lead the students in a cheer, "Give me an I!" Hand the I card to the student volunteer.

13. Display Slide 11. Explain the following:
    - I is for **gross private investment**, or simply business investment, which is spending by businesses on machinery, factories, equipment, tools, and construction of new buildings.

- In this case, investment does not refer to buying financial investments, such as stocks and bonds. Rather, in economics, investment often refers to businesses spending on physical capital, which includes factories, tools, and equipment.
- Investment also includes new housing and goods placed in inventory.

14. Hold up the "G" card. Select a student volunteer and lead the students in a cheer, "Give me a G!" Hand the G card to the student volunteer.

15. Display Slide 12. Explain the following:
    - G is for **government spending**, which is spending by *all levels* of government on goods and services, including, for example, spending on the military, schools, and highways.
    - G does not include government spending on transfer payments, such as Social Security payments. However, when people spend their Social Security income on goods and services, that spending is counted as part of consumption spending along with all other spending.

16. Hold up the "=" (equal sign) card. Select a student volunteer and lead the students in a cheer, "Give me an equal sign!" Direct him or her to stand between GDP and C.

17. Display Slide 13. Discuss and explain the following:
    - What does the equal sign communicate about an equation? (*The value on one side of the equal sign is the same as—that is, equal to—the value on the other side.*)
    - If C—personal consumption expenditures—were to increase, how would the rest of the equation be affected? (*If C were to increase, GDP would increase as well. That is, for the equation to remain equal, GDP would have to increase by an equal amount.*)
    - What does an increase in C mean for the economy? (*If consumption spending increases by a certain amount, GDP would increase by the same amount.*)
        - The economy is very complex. For this lesson, we will hold all other variables constant—known to economists as the ceteris paribus ("all else equal") condition. This will allow us to see how a change in any of the expenditure variables impacts GDP.

18. Check to make sure the students holding the cards reflect the equation as displayed on Slide 13. Then proceed with the activity.

19. Distribute one prompt from Handout 2 to each student who has not already volunteered to hold a card as part of the equation. Tell the students to read their prompt loudly and clearly when their number is called. Students holding the cards should raise or lower their cards to show the change in the equation indicated by the prompt. Call out each prompt number in turn and discuss as follows:

**Prompt 1: Consumers spend $521 billion on new automobiles and parts.**

- Which variables are affected? (*Personal consumption expenditures—C—increase by $521 billion, so GDP increases by $521 billion.*) (C card raised; GDP card raised)

**Prompt 2: Businesses spend $380 billion on new software.**

- Which variables are affected? (*Gross private investment—I—increases by $380 billion, so GDP increases by $380 billion.*) (I card raised; GDP card raised)

**Prompt 3: The U.S. Federal Government spends $650 billion on national defense.**

- Which variables are affected? (*Government purchases—G—increase by $650 billion, so GDP increases by $650 billion.*) (G card raised and GDP card raised)

20. Explain that GDP measures actual spending, but news often focuses on changes in the level of spending from one time period to another. For example, rather than reporting the spending on new cars, the news might report that spending on automobiles decreased by 5 percent compared with last month. Discuss the following:

    - How would a 5 percent decrease in personal consumption expenditures be reflected in the equation? (*Personal consumption expenditures—C—would decrease, and so would GDP.*) (C card lowered; GDP card lowered)
    - What does a decrease in GDP say about the economy? (*A decrease in GDP indicates economic contraction and perhaps a recession*).

21. Continue with Prompts 4-6 as before.

    **Prompt 4: Consumers boost spending in May as incomes rise and inflation stays low.**

    - Which variables are affected? (*Personal consumption expenditures—C—increase, so GDP increases by the same amount.*) (C card raised; GDP card raised)

    **Prompt 5: The local school district cuts spending to balance its budget.**

    - Which variables are affected? (*Government purchases—G—decrease, so GDP decreases by the same amount.*) (G card lowered; GDP card lowered)

    **Prompt 6: Businesses see a bright economic future and increase spending on new factories and equipment.**

    - Which variables are affected? (*Gross private investment—I—increases, so GDP increases by the same amount.*) (I card raised; GDP card raised)

22. Explain that the equation works well for a country that doesn't trade, but trade plays a significant role in the U.S. economy and is reflected in GDP by adding two variables to the equation.

23. Hold up the "X" card and lead the students in a cheer, "Give me an X!" Hand the "X" card to the student volunteer.

24. Display Slide 14. Explain and discuss the following:
    - X is for **exports**, which are resources, goods, or services that are produced domestically but sold abroad.
    - X includes both **final goods and services** and **intermediate goods**.
        - What are some examples of intermediate goods? (*Answer will vary but may include tires on a new car, thread in clothing, or flour in a loaf of bread.*)

25. Continue with Prompt 7 as before.

    **Prompt 7: Due to a strong European economy, German consumers and businesses increase their spending on U.S. goods and services.**
    - Which variables are affected? (*Exports—X—increase, so GDP increases by the same amount.*) (X card raised; GDP card raised)

26. Display Slide 15. Explain the following:
    - When the data are collected for C, I, and G, they are recorded as spending without consideration for where the goods or services were produced. That is, these data include spending on *both* **domestic** and foreign goods and services.
    - For example, the C component includes personal consumption expenditures on both cars produced domestically and cars produced by foreign producers.
    - Remember that GDP is intended to measure only the value of *domestic* production, that is, production that occurs within a particular country.
    - For this reason, the equation includes a variable for **imports**.

27. Hold up the "–M" (minus M) card and lead the students in a cheer, "Give me a M!" Hand the –M card to a student volunteer at the front of the room.

28. Display Slide 16. Explain the following:
    - M is for **imports**. Imports are resources, goods, or services that are produced abroad but sold domestically. M is an accounting variable subtracted with the intent of correcting for the value of spending already counted as C, I, or G but actually spent on imported goods.

- Again, this is to ensure that only the value of domestic production is included in GDP. Like the X variable, the M variable includes intermediate goods. The following is an example:
    - If smart phone parts are produced in the United States and shipped to a foreign country for assembly, the value of those parts are counted with exports.
    - If car parts are produced by a foreign country and imported to produce a car in the United States, the value of those parts are counted with imports.

29. Display Slide 17. Explain that for the GDP expenditure equation, economists group exports (X) and imports (M) together within parentheses, which indicates the balance of trade. That is, the value of imports is subtracted from the value of exports. A negative trade balance (or trade deficit) occurs when imports exceed exports (M > X). A positive trade balance (or trade surplus) occurs when exports exceed imports (X > M).

30. Display Slide 18. Review the components of GDP.

31. Continue with Prompts 8-11 as before.

**Prompt 8: Suzanne buys a new car for $30,000; the car was produced in the United States.**

- Which variables are affected? (*Personal consumption expenditures—C—increase by $30,000, so GDP increases by $30,000.*) (C card raised; GDP card raised)

**Prompt 9: Juan buys a new car for $30,000; the car was produced in Japan.**

- Which variables are affected? (*Personal consumption expenditures—C—increase by $30,000, but the value of the car, an import—M—is subtracted, so the net effect is that GDP is unchanged. That is, the increase in C is offset by a decrease in M of the same amount.*) (C card raised; M card lowered; GDP card not moved)

**Prompt 10: Jasmine buys a new car for $30,000; the car was assembled in the United States, but the manufacturer used $10,000 in imported parts in the production process.**

- Which variables are affected? (*Personal consumption expenditures—C—increase by $30,000, but the value of the imported parts—M—is subtracted, so the net effect is that GDP increases by $20,000.*) (C card raised; M card lowered; GDP card raised—but not as high as the C card)

**Prompt 11: ACME Inc. produces $30,000 of car parts and exports them to Germany.**

- Which variables are affected? (*Exports—X—increase by $30,000, so GDP increases by $30,000.*) (X card raised; GDP card raised)

32. Tell the students that they now have all the knowledge they need to use the GDP expenditures equation, and the next set of prompts will test that knowledge. Continue with Prompts 12-20 as before, with students raising or lowering the cards to reflect changes to the equation.

**Prompt 12: To improve infrastructure, the state of Missouri spends additional money on highways and bridges.**

- Which variables are affected? (*Government purchases—G—increase, so GDP increases by the same amount.*) (G card raised; GDP card raised)

**Prompt 13: Due to an optimistic economic outlook, businesses increase their investment spending on new technology.**

- Which variables are affected? (*Gross private investment—I—increases, so GDP increases by the same amount.*) (I card raised; GDP card raised)

**Prompt 14: To reduce unemployment during a recession, the government hires unemployed people to clean and care for city parks and monuments.**

- Which variables are affected? (*Government purchases—G—increase, so GDP increases by the same amount.*) (G card raised; GDP card raised)

**Prompt 15: People observe a higher rate of unemployment and decide to save more by cutting back their spending on goods and services.**

- Which variables are affected? (*Personal consumption expenditures—C—decrease, so GDP decreases by the same amount.*) (C card lowered; GDP card lowered)

**Prompt 16: A foreign government imposes trade barriers on U.S. goods and services by establishing quotas and adding tariffs. Consumers in that country respond by buying fewer U.S. goods and services.**

- Which variables are affected? (*Exports—X—decrease, so GDP decreases by the same amount.*) (X card lowered; GDP card lowered)

**Prompt 17: Automobile companies invest billions in self-driving car technology amid an uncertain future.**

- Which variables are affected? (*Gross private investment—I—increases, so GDP increases by the same amount.*) (I card raised; GDP card raised)

**Prompt 18: Spending on new housing decreases from a year ago.**

- Which variables are affected? (*Gross private investment—I—decreases, so GDP decreases by the same amount.*) (I card lowered; GDP card lowered)

**Prompt 19: A local government purchases $25,000 of new office furniture for its office; the office furniture was produced in the United States.**

- Which variables are affected? (*Government purchases—G—increase, so GDP increases by the same amount.*) (G card raised; GDP card raised)

**Prompt 20: ACME Inc. buys a new delivery truck for $40,000; it was produced in the United States, but the manufacturer used $20,000 in imported parts in the production process.**

- Which variables are affected? *(I—investment—increases by $40,000, M—imports—decreases by $20,000, and the net effect results in an increase in GDP of $20,000.*) (I card raised; M card lowered; GDP card raised—but not as high as the I card)

## Closure

33. Discuss the following to review the lesson:

- What does GDP measure? (*The total market value, expressed in dollars, of all final goods and services produced in an economy in a given year.*)
- What are the expenditure variables used to calculate GDP? (*C—personal consumption expenditures, I—gross private investment, G—government purchases, X—exports, and M— imports.*)
- What happens when spending in one of the spending categories changes? (*A change to any of the expenditures categories will shift GDP by the same amount.)*
- *What is an intermediate good? (A man-made good that is used to produce another good or service, becoming part of that good or service.*)
- What are final goods and services? (*Final goods and services are goods and services sold to end users. Final goods and services have been purchased for final use and not for resale or further processing.*)
- Which variables include intermediate goods in their measurement? (*Exports and imports*)
- How is the M variable different from the others? (*The M variable is intended to account for spending on imports already counted in one of the other spending categories. As such, it's important to emphasize that the imports variable is an accounting variable rather than an expenditure variable.*)
- Does buying an imported good or service subtract from GDP? Why? (*No, imported goods have no direct impact on GDP, because GDP is intended to measure domestic production.*)
- How do changes in real GDP relate to the business cycle? (*An increase in real GDP is economic expansion, whereas a decrease in real GDP is economic contraction. If the contraction is significant it might also be a recession.*)

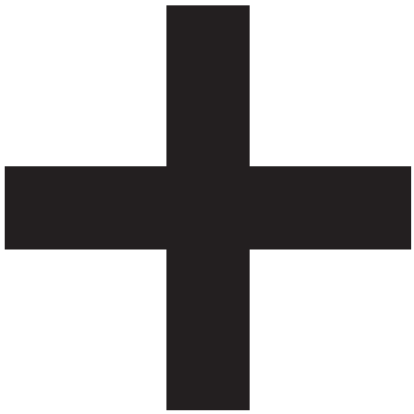
## Handout 1: GDP Expenditure Variables (page 1 of 11)

# GDP

## Handout 1: GDP Expenditure Variables (page 2 of 11)

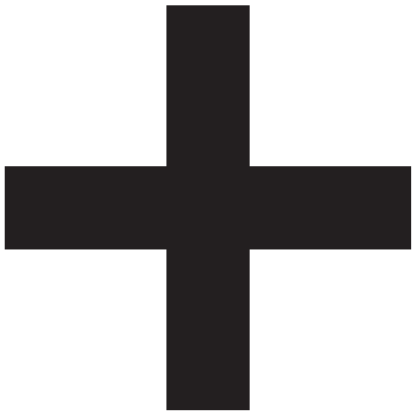
## Handout 1: GDP Expenditure Variables (page 3 of 11)

## Handout 1: GDP Expenditure Variables (page 4 of 11)



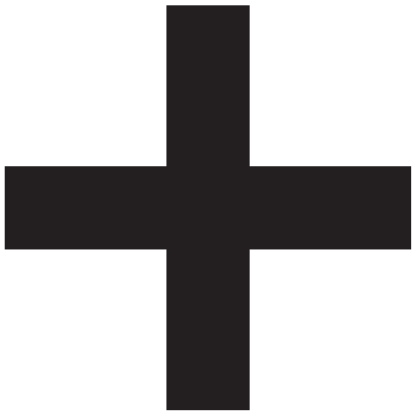
## Handout 1: GDP Expenditure Variables (page 5 of 11)

## Handout 1: GDP Expenditure Variables (page 6 of 11)



## Handout 1: GDP Expenditure Variables (page 7 of 11)

## Handout 1: GDP Expenditure Variables (page 8 of 11)



## Handout 1: GDP Expenditure Variables (page 9 of 11)

## Handout 1: GDP Expenditure Variables (page 10 of 11)

## Handout 1: GDP Expenditure Variables (page 11 of 11)

## Handout 2: GDP Expenditure Prompts (page 1 of 2)

**Prompt 1:** Consumers spend $521 billion on new automobiles and parts.

**Prompt 2:** Businesses spend $380 billion on new software.

**Prompt 3:** The U.S. federal government spends $650 billion on national defense.

**Prompt 4:** Consumers boost spending in May as incomes rise and inflation stays low.

**Prompt 5:** The local school district cuts spending to balance its budget.

**Prompt 6:** Businesses see a bright economic future and increase spending on new factories and equipment.

**Prompt 7:** Due to a strong European economy, German consumers and businesses increase their spending on U.S. goods and services.

**Prompt 8:** Suzanne buys a new car for $30,000; the car was produced in the United States.

**Prompt 9:** Juan buys a new car for $30,000; the car was produced in Japan.

**Prompt 10:** Jasmine buys a new car for $30,000; the car was assembled in the United States, but the manufacturer used $10,000 in imported parts in the production process.

**Handout 2: GDP Expenditure Prompts (page 2 of 2)**

**Prompt 11:** ACME Inc. produces $30,000 of car parts and exports them to Germany.

**Prompt 12:** To improve infrastructure, the state of Missouri spends additional money on highways and bridges.

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## Voluntary National Content Standards in Economics

### Standard 18: Economic Fluctuations

Fluctuations in a nation's overall levels of income, employment, and prices are determined by the interaction of spending and production decisions made by all households, firms, government agencies, and others in the economy. Recessions occur when overall levels of income and employment decline.

- **Benchmarks: Grade 8**

  1. GDP is a basic measure of a nation's economic output and income. It is the total market value, measured in dollars, of all final goods and services produced in the economy in one year.
  2. GDP can be computed by summing household consumption spending; investment expenditures; purchases by federal, state, and local governments; and net exports.
  3. Net exports equal the value of exports (goods and services sold to other countries) minus the value of imports (goods and services bought from other countries). Net exports can be either positive (trade surplus) or negative (trade deficit).
  7. A recession occurs when overall levels of income and employment decline.

- **Benchmark: Grade 12**

  4. Fluctuations of real GDP around its potential level occur when overall spending declines, as in a recession, or when overall spending increases rapidly, as in recovery from a recession or in an expansion.