

Lesson 3 - National Income Accounting

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Section 1 - National Income Accounting

History of National Income and Product Accounts (NIPA)

In this lesson, we want to explore how output and income are measured in the United States. Most developed countries will also track these items using very similar, if not identical, methods. The tracking system we use is known as the **National Income and Product Accounts (NIPA)**. The origin of this system began with the estimation of national income during the early 1930s, when the lack of comprehensive economic data frustrated the efforts of President Roosevelt to design policies to combat the Great Depression. In response to this need, the Department of Commerce commissioned Simon Kuznets of the National Bureau of Economic Research (NBER) to develop estimates of national income. He then coordinated the work of researchers at the NBER in New York and with staff at the Department of Commerce. The estimates were initially presented in a report to the Senate in 1934, *National Income, 1929-32*.

The entry of the United States into World War II led to increased demand for data that could be used for wartime planning. Early in 1942, annual estimates of gross national product (GNP) were introduced to complement the estimates of national income. In addition, estimates were developed to detail how income was generated, received, and spent by various sectors of the economy.

The U.S. national income and product statistics were first presented as part of a complete and consistent accounting system in 1947. Over the years, the statistics have been revised to include a large amount of primary data that have become the official measures of U.S. economic performance. The NIPA are measured and maintained by the Bureau of Economic Analysis (BEA) at the Department of Commerce.

[Note: You can view recent measures in these accounts by clicking on the following link to the interactive data tables found at: <http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1>. Then click on the tab labeled "Section 1-Domestic Product and Income". Then click on the link titled, "Table 1.1.6. Real Gross Domestic Product, Chained Dollars (A) (Q)".]

Measures of the Economy

Gross Domestic Product (GDP) is the international standard for measuring the economic output and growth of countries. It is the market value of all final goods and services produced within a country, usually measured in the span of a year, stated in terms of that year's prices. We will discuss this more in depth later on in this section.

Related to GDP is **Gross National Product (GNP)**, which is a measure of the final output of the citizens and businesses of a country, regardless of where in the world the output is produced. Technically, $GDP = (GNP + \text{net foreign factor income})$, where net foreign factor income is the income from foreign sources located domestically minus the income of domestic sources located internationally. For the United States, the difference between GDP and GNP is relatively small. In other countries however, the differences can be quite large. Other important measures relating to the national income accounts are:

Net Domestic Product (NDP) = GDP - Capital Consumption Allowance. (You should think of capital consumption allowance as depreciation on business equipment and facilities.)

National Income (NI) = NDP - Statistical Discrepancy + Net Foreign Factor

Personal Income (PI) = NI - (Corporate Taxes + Undistributed corporate profits + Social Security Contributions) + Transfer Payments

(Note: Undistributed corporate profits are the same as retained earnings)

Disposable Income (DI) = PI - Personal Taxes

The purpose reviewing the GDP data and the NIPA numbers is for you to understand that there are various measures of income at the national level. GDP is the broadest measure used, and is used most often to compare income levels in different countries, but clearly, disposable income may be more important to you, since it relates more directly to how much money people have to spend.

Definition of Gross Domestic Product (GDP)

As discussed previously, National Income Accounting is the methodology used in measuring the total output and income of the economy. To begin to measure the output of the U.S. economy we must understand the definition of what we call the Gross Domestic Product. The **Gross Domestic Product (GDP)** is the *value of all the final goods and services produced in the domestic economy in a given year.*

GDP is Measured in Dollars

Certain words in this definition were italicized to give emphasis to key components of how the GDP is measured. Since the GDP measures the value of the goods and services produced it is important to note that the GDP is measured in dollars, NOT in units of output. Measuring the GDP in dollars allows us to aggregate or add up the output across very diverse types of goods and services. If the GDP were measured in units of output, for example, how do you add up 10 automobiles and two bushels of wheat? What does the sum of those two outputs equal? Can you imagine trying to do that with hundreds of thousands of goods and services and keeping it all in units of output? Fortunately, the GDP is measured in dollars, so if the 10 automobiles are valued at \$25,000 each and the two bushels of wheat are valued at \$10.00 dollars each, then the GDP is equal to \$250,020. Measuring the GDP in dollars allows us to easily aggregate the value of a very disparate output.

GDP Includes Only Final Goods and Services Produced in a Time Period

The GDP includes the value of the final goods and services produced in a given year so as not to double or triple count the value of intermediate goods that are used in the production of a final product. If we produce an automobile in a given year, we only count the value of the automobile as a final product. We do not count the value of the glass in the windshield and the value of the rubber in the tires (both of which may have also been produced in that same year) and then count the value of the automobile also. If we did, the value of the windshield and the tires would be counted twice. Therefore, the GDP counts only the value of the final goods and services produced in a given year.

Notice in the definition of the GDP that the words in a given year were also italicized. This is to give emphasis to the notion that the GDP in any given year does NOT include the value of everything that is bought and sold in that year. It only includes the final goods and services that were produced in that year. Many items are bought and sold as used items each year, but they were included in the GDP of the year in which they were produced and NOT in subsequent years when they are bought and sold as used items. It will be useful here to mention what happens to the value of an item that is produced in a given year, but does not sell in the year in which it is produced. At the end of the year it is included in inventories for that year and is thereby included in that year's GDP as will be seen when we discuss how to calculate GDP using the Expenditures Approach.

GDP is Limited to the Geographic Borders of the United States

The fact that the GDP measures the value of the output in the domestic economy means that it includes the value of all of the final goods and services produced within the borders of the domestic economy, no matter who owns the factors of production. In other words, if a foreign company is producing a good within the borders of the United States, it is counted as part of the US GDP.

Important Side Note: In 1991, the United States switched from using the GNP as the primary measure of output in our economy to using the GDP. As mentioned earlier, the GDP includes all of the final goods and services produced within the borders of the United States in a given year, no matter the national origin of the company producing those goods and services. A Toyota produced in the United States is, therefore, counted as part of the US GDP. The GNP, on the other hand, includes the value of the final goods and services produced by the national economy in a given year. A Toyota produced in the United States would be counted as part of the Japanese GNP because it was produced by the Japanese national economy. In a similar fashion, a Buick produced in China would be counted as part of the Chinese GDP, but would be counted as part of the US GNP.

Theoretical Measures of GDP

One theoretical measurement of GDP is found by multiplying the amounts of final goods and services by their respective prices. Thus GDP is measured as follows:

$$\text{GDP} = P_1 Q_1 + P_2 Q_2 + P_3 Q_3 + \dots + P_n Q_n$$

where $P_1 Q_1$ is the price of the first good times the quantity of the first good, plus the price of the second good times the quantity of the second good, etc., until one gets to the quantity of the n th good times its price. Algebraically, this can also be stated as

$$\text{GDP} = \sum_{i=1}^n P_i Q_i$$

or the sum of all prices times the quantity of their respective goods, starting at the first good and going until the n th good. In a small society, with a limited number of goods, measuring GDP in this manner may be practical, but in most economically developed countries, with many products, services and prices, this approach is very difficult to put into practice. Nevertheless, this measure gives you a picture of the breadth of the GDP measure.

You should also note that this measure only uses final goods to count for GDP. Suppose you are a wheat farmer, and you sell your wheat to a flour miller, who grinds the wheat into flour for consumers to use in baking. In this case, the flour is the final good, while the wheat is called an intermediate good. If the value of the wheat (the intermediate good) and the value of the flour (the final good) were both added into the GDP number, GDP would be over-stated because the wheat's value would be double-counted. The inclusion of only final goods prevents double counting and gives a much more accurate picture of the level of output in a country.

Intermediate goods can be accounted for in the calculations either by: a) only counting the value of final good/services; or b) counting the value added by each firm toward a final product. For example, suppose the miller sells all of his flour to consumers for \$1,000. Since the flour is the final good, GDP would increase by \$1,000. However suppose the farmer sold the wheat to the miller for \$400, who then turned it into flour, which eventually sold for \$1,000. If we added the intermediate values together—the \$400 produced by the farmer, and the \$600 produced by the miller, then we can also arrive at the \$1,000 GDP. Again, the intermediate approach to GDP is only practical in a very small, closed economy. In a major industrial economy, there are just too many intermediate products and prices to make such a measure practical.

Since both the sum of the prices times quantities, and the value of the intermediate goods approaches are not very practical, we need to now discuss the main methods used to estimate GDP. These are known as the **expenditure approach** and the **income approach**.

Section 2 - The Expenditure Approach

The expenditures approach to the GDP recognizes that there are four possible uses for the output of an economy in any given year. The output can be purchased by private households, by businesses, by the government, or by the foreign sector. We use the national income accounting identity to calculate GDP. The Bureau of Economic Analysis (BEA) uses the expenditures approach to calculate GDP.

The National Income Accounting Identity

Below is the national income accounting identity or the formula for gross domestic product (GDP).

$$Y = C + I + G + NX$$

Y = National Income or Gross Domestic Product (GDP)

C = Personal Consumption Expenditures

I = Gross Private Domestic Investment

G = Government Purchases

NX = Net Exports (Exports – Imports)

Expenditures by the public are called **Personal Consumption Expenditures (C)**. It is the total payment made by households on consumption goods and services. These expenditures represent purchases of goods/services produced by businesses in the U.S. Purchases of pizzas, Chevrolets, and textbooks are examples of Consumption expenditures. Based upon the data from the BEA website shown above, in 2010, personal consumption expenditures amounted to about 70.3 percent of total GDP.

Expenditures by businesses are called **Gross Private Domestic Investment (I or I_g)**. Firms do not always sell all of their output to households. These expenditures are purchases by business firms from other U.S. business firms and include equipment, factories, inventories, supplies, and/or raw materials. Investment expenditures made up about 13.4 percent of total GDP in 2010

Expenditures by all levels of government are called **Government Purchases (G)**. Government purchases (G) is officially known as "Government consumption expenditures and gross investment." This category consists of government purchases of goods and services at the federal, state, and local levels. Examples include the purchase of new tanks, interstate freeway systems, parks, and libraries. It excludes the direct counting of transfer payments such as Social Security, Medicare, Medicaid, etc. Expenditures by all levels of government were approximately 19.4 percent of 2010 U.S. GDP.

Expenditures for U.S.-made products by foreign citizens, companies, or countries (i.e., **Exports (X)**) minus expenditures for foreign-made products by U.S. citizens, companies, or governments (i.e., **Imports (M)**). These expenditures are commonly referred to as **Net Exports (NX or X_N)**. You should note that goods exported to other countries add to the value of U.S. GDP, while imports reduce the value of U.S. GDP. If imports are greater than exports, NX will be negative. In 2010, because our imports were in fact greater than our exports, U.S. GDP was reduced by about 3.2 percent.

GDP Example

This table shows various items that may or may not be used to calculate GDP. Use these items to calculate GDP.

GDP Example	
Personal Consumption	3,657
Depreciation	400
Wages	3,254
Indirect Business Taxes	500
Interest	530
Private Domestic Investment	741
Government Expenditures	1,098
Rental Income	17
Corporate Profits	341
Exports	673
Net Foreign Factor Income	20
Proprietor's Income	403
Imports	704

Calculating GDP Using Expenditure Approach

Using the above table, we will walk through how to calculate GDP. First, we know that C is personal consumption which equals 3,657. We also know that I is private domestic investment which equals 741. Then G is government expenditures which equals 1,098. Net Exports (NX) is exports minus imports. In this example, exports equals 673 minus 704 which is the value of imports. Therefore, net exports equals -31.

When we add these together GDP or national income equals 5,465. $(3,657 + 741 + 1,098 + (673 - 704)) = 5,465$

Section 3: The Income Approach

The Income Approach to calculating the GDP recognizes that the total expenditures on the economy's output in any given year must equal the total income generated by the production of that same output. Adding up what is spent on purchasing the output of the economy in a given year (the expenditures approach) has to equal the sum of all of the incomes that are generated in producing that output in a given year (the income approach). If you think about the total income earned in a given year by the factors of production, you must go back to the payments made to those factors we discussed previously. Remember that labor is paid a wage, land is paid rent, capital is paid interest, and the entrepreneur is paid a profit. The formula below shows how GDP can be calculated using the income approach:

GDP = Wages + Rents + Interest + Profits

Thus the income approach to GDP can be found by adding together wages, rents, interest, and profits in the form of proprietors' income, dividends, depreciation, indirect business taxes, and U.S.-earned net income of foreigners. This method of calculating GDP is also very common to most countries and helps us to further understand that GDP not only is a measure of output, but also a measure of income.

Section 4: Measuring Changes in GDP Over Time

The GDP is often used to measure the growth in an economy over time. If the GDP is rising, we assume the economy is growing; if the GDP is falling, the economy is shrinking and presumably is in the midst of an economic down-

turn. Since the GDP measures the value of the final goods and services produced in the domestic economy in a given year, however, the GDP can rise from one year to the next for one of three reasons: either because the economy has produced more from one year to the next, because the value of the product has gone up from year to year, or both. Since the value is measured in dollar prices, the GDP would go up from one year to the next, even if you produced exactly the same amount of output in both years but the prices of the products were to rise. It is therefore important to distinguish between what is called the **Nominal GDP** and what is called the **Real GDP**.

Nominal GDP

The **Nominal GDP** measures the value of the output of final goods and services using current dollar prices. It is the value of a given year's output using the dollar prices that prevailed in that given year (referred to as current dollar prices).

Real GDP

The **real GDP** measures the value of the output of final goods and services using constant dollar prices. It is the value of a given year's output using the dollar prices that prevailed in a previous year, called the base year (referred to as constant dollar prices).

Nominal GDP vs. Real GDP

As an example to illustrate the dramatic difference between the nominal and real GDP's in two different years, consider the fact that the Nominal GDP in the United States in 1960 was 513 billion dollars. In 1990, the US Nominal GDP was 5.757 trillion dollars. Do you think that the US economy really expanded by over 10 times in 30 years? Surely there was growth in the United States between 1960 and 1990, but we did not produce over 10 times as much output in 1990 as in 1960. Part of that seeming growth can be accounted for because prices went up during that 30 year period, so it would be interesting to know what the GDP in 1990 would be calculated to be if the prices in 1990 had been the same as they were in 1960. This would give us a measure called the Real GDP. The Real GDP in 1990 (using 1960 prices as the base year) was approximately 804 Billion Dollars. So we can see, in real terms, the economy did not even double between these two years, whereas in nominal terms it appeared to go up by over ten times! This should illustrate the importance of looking at the real GDP when calculating growth in an economy, so as not to be misled into thinking an economy is growing when it is actually just experiencing large increases in prices.

Price Indices and GDP Growth

Inflation is an upward movement in the average level of prices and deflation is a downward movement in the average level of prices. The price level is measured by a price index—the average level of prices in one period relative to their average level in an earlier period. The two most common price indices are called the Consumer Price Index (CPI) and the GDP Deflator. We will discuss the CPI in a future lesson.

To measure percentage changes in GDP we use a growth formula:

$$\text{Percentage change in GDP} = \frac{(\text{Current GDP} - \text{Previous GDP})}{\text{Previous GDP}} * 100$$

GDP Price Index

The **GDP Deflator** is an index that shows the prices based on the goods and services that are calculated in GDP (see the formula below to calculate the GDP Deflator). The GDP Deflator includes all of the items (C,I,G, and NX) included in the GDP. When comparing the value of the GDP from year to year, we use the GDP Deflator to make a valid comparison, i.e. one that takes into account the changes in prices that have occurred in the economy between the two years.

In order to calculate real GDP, we use the GDP Deflator. For example, let's assume we have a very simple economy

that only produces three products: pineapples, snorkels, and beach umbrellas. The prices and outputs of these items in the current and base years are as follows:

Calculating GDP Example

Use the table below to calculate nominal and real GDP and the GDP deflator in this fictional economy.

ITEM	Output	Current Period		Base Period	
		Price	Expenditures	Price	Expenditures
Pineapples	4,240	\$1.30	\$5,512	\$1.00	\$4,240
Snorkels	5,000	\$10.00	\$50,000	\$8.00	\$40,000
Umbrellas	1,060	\$100.00	\$106,000	\$100.00	\$106,000

Calculating nominal and real GDP and the GDP deflator

Using the table above, we will now calculate nominal and real GDP and the GDP deflator.

The Nominal GDP will be the value of the current year's output using the current year's prices:

$$\text{Nominal GDP in the Current Period} = (4,240 \times \$1.30) + (5,000 \times \$10.00) + (1,060 \times \$100.00) = \$161,512$$

The Real GDP will be the value of the current year's output using the base year's prices:

$$\text{Real GDP in the Current Period} = (4,240 \times \$1.00) + (5,000 \times \$8.00) + (1,060 \times \$100.00) = \$150,240$$

The GDP Deflator is equal to the Nominal GDP divided by the Real GDP and multiplied times 100. The formula to calculate the GDP Deflator is below as is the calculation of the GDP deflator for this example.

$$\text{GDP Deflator} = (\text{Nominal GDP} / \text{Real GDP}) \times 100$$

$$(\$161,512 / \$150,240) \times 100 = 107.5$$

This deflator tells us that there has been 7.5% inflation over the period from the base year to the current year. Note that if the prices had been the same in the base year and in the current year, the Nominal and the Real GDP would have been the same in the current year and the deflator would have equaled 100. A deflator of 100 indicates NO inflation between the two periods. A deflator greater than 100 indicates inflation and a deflator less than 100 indicates deflation (a decline in the average price level from one year to the next).

Section 5: Is GDP a Good Measure?

Is the GDP a Good Measure of Economic Output and Welfare?

Several examples of items not included in the official GDP statistics have caused some to suggest that the GDP is a poor measure of the economy's total output. In other words, some final goods and services produced in the economy are not counted as part of the GDP. The suggestion, therefore, is that the official GDP reported in any given year seriously under-represents the total value of all final goods and services produced in the economy in that year. While both the expenditures and income approaches to GDP are generally solid and reliable measures, GDP is not a "perfect" measure. There are a number of caveats you should understand as you evaluate GDP. Consider the following examples:

Underground Economy—most goods and services that are illegal or produced "under the table" are not counted in the GDP. This could be anything from illegal drugs to you building a deck on your neighbor's house and him rebuild-

ing your engine in exchange.

Household Production and Services—GDP does not reflect production that is not for sale, such as the work done by housewives or househusbands. If a mom drives her kids to school, cooks their food, and cleans the house, none of this production is included in GDP. If however, the mom paid a chauffeur, hired a professional chef, and paid for a cleaning service, all of those expenditures would be included in GDP. Most household production is not counted as part of the GDP, even though a final good or service is produced.

Quality—GDP does not measure changes in the quality of output. For example, a car produced in 1920 will get you from Point A to Point B, as will a car produced in 2011. However, the overall quality of the product, or the experience of the ride is not the same, and such quality differences cannot be reflected in the GDP measurements.

Purpose of Production—GDP does not reflect the purpose of production. Two countries can have the same GDP level, however one country's output may be largely based upon military hardware, while the other country's GDP is based upon the production of consumer goods.

Intangibles—GDP does not reflect the value of intangible objects, such as leisure, the welfare of society or its happiness, optimism, or changes in environmental quality. Quality of life issues are inherently difficult to measure and often reflect personal values and opinions. GDP does not attempt to account for such differences. For example, you could have two countries with exactly the same GDP and population, which might lead you to believe that both countries are equally well off. In Country A, however, the workers may labor for 70 hours per week, while in Country B they may labor for only 40 hours per week. Or Country A may be a dirty and polluted place to live, while Country B may be a pristine, pleasant place to live. As long as we value things like leisure time and clean living conditions, the GDP alone will not tell us how well off a population is.

Distribution—GDP does not reflect the distribution of goods and services. Suppose two countries have the same level of GDP, and in the first country, GDP is pretty evenly split among the population. However, in the second country, if say, 80 percent of the output is controlled by the ruling family, and the remaining 20 percent is available for the people, you would not know these distribution differences simply by looking at the GDP numbers.

Transfer Payments—GDP does not include financial transactions or transfer payments. If you purchased some IBM stock through a broker for \$10,000, that transaction represents a simple transfer of ownership of a financial asset from one person to another, and does not represent any new production in the economy.

Summary

Key Terms

- Consumption (C)
- Disposable Income (DI)
- Distribution
- Expenditure Approach
- Exports (X)
- GDP Deflator
- GDP Deflator Formula
- GDP Price Index
- Government Purchases (G)
- Gross Domestic Product (GDP)
- Gross National Product (GNP)
- Gross Private Domestic Investment (I or Ig)
- Household Production and Services
- Imports (M)
- Income Approach
- Intangibles
- Investment (I)

National Income (NI)
National Income and Product Accounts (NIPA)
Net Domestic Product (NDP)
Net Exports (NX or Xn)
Nominal GDP
Personal Consumption Expenditures (C)
Personal Income (PI)
Purpose of Production
Quality
Real GDP
Transfer Payments
Underground Economy

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