

Measuring GDP and Economic Growth: An Economic Barometer

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Abstract

This essay based on Michael Parkin, Macroeconomics, 8th edition. Gross domestic product (GDP) is a monetary measure of the market value of all the final goods and services produced in a period of time, often annually. GDP (nominal) per capita does not, however, reflect differences in the cost of living and the inflation rates of the countries; therefore, using a basis of GDP per capita at purchasing power parity (PPP) is arguably more useful when comparing differences in living standards between nations.

Keywords: GDP; Economic Growth; Economic Welfare Comparisons; NDP; Capital and Investment; Goods and Services.

1. Introduction

Will our economy keep Expanding through 2007 and 2008? If so will the expansion be rapid or are we going to slip into recession again many US corporations wanted to know the answer of these questions at the beginning of 2006. Google wanted to know whether to expand its server network and introduce new services or delay for a while. Amazon.com wanted to know whether to increase its warehousing facilities. To access the state of the economy and to make big decisions about business expansion, firms such as Google and Amazon use forecasts of GDP. What exactly is GDP and what does it tell us about the state of the economy? To reveal the rate of growth or shrinkage of GDP we must remove the effects of inflation and access how real GDP is changing. How do we remove the inflation component of GDP to reveal real GDP? Some countries are rich while others are poor. How do we compare economic well-being in one country with that in another? How can we make international comparison of GDP?

2. Gross Domestic Product

What exactly is GDP, how is it calculated, what does it mean, and why do we care about it? You are going to discover the answers to these questions in the article. First what is GDP?

GDP or Gross Domestic Product is the market value of all the final goods and services produced within a country in a given time period this definition has four parts.

2.1. Market Value

To measure total production, we must add together the production of apples and orange computers and popcorn. Just counting the items doesn't get us very far. For example, which is the greater total production: 100 apples and 50 oranges or 50 apples and 100 oranges?

GDP answers this question by valuing items at their market values- the prices at which each item is traded in markets. If the price of an apple is 10 cents, the market value of 50 apples is \$5. If the price of an orange is 20 cents the market value of 100 oranges is \$20. By using market prices to value of production we can add the apples and oranges together. The market value of 50 apples and 100 oranges is \$5 plus \$20 or \$25. ^[1]

2.2. Final Goods and Services

To calculate GDP, we value the final goods and services produced. A final good (or service) is an item that is bought by its final user during a specified time period in contrasts with an intermediate good or service which is an item that is produced by one firm, bought by another firm, and used as a component of a final good or service.

For example, a Ford SUV is a final good, but a Firestone tire on the SUV is an intermediate good. A Dell computer is a final good, but an Intel Pentium chip inside it is an intermediate good.

If we were to add the value of intermediate goods and services produced to the value of final goods and services, we would count the same thing many times—a problem called double counting. The value of an SUV already includes the value of the tires and the value of a Dell PC already includes the value of the Pentium chip inside it.

Some goods can be an intermediate good in some situations and a final good in other situations, for example, the ice cream that you buy on a hot summer day is a final good, but the ice cream that a restaurant buys and uses to make sundaes is an intermediate good. The sundae is the final good. So whether a good is an intermediate good or a final good depends on what it is used for, not what it is.

Some items that people buy are neither final goods nor intermediate goods. Examples of such items include financial assets—stocks and bonds—and second-hand goods—used cars or existing homes. These items are not part of GDP. But a used car and an existing home were part of GDP in the year in which they were produced.

2.3. Produced Within a Country

Only goods and services that are produced within a country count as part of that country's GDP. Nike Corporation, a U. S. firm, produces sneakers in Vietnam, and the market value of those shoes is part of Vietnam's GDP, not part of U.S. GDP. Toyota, a Japanese firm, produces automobiles in Georgetown, Kentucky, and the value of this production is part of U. S. GDP, not part of Japan's GDP.

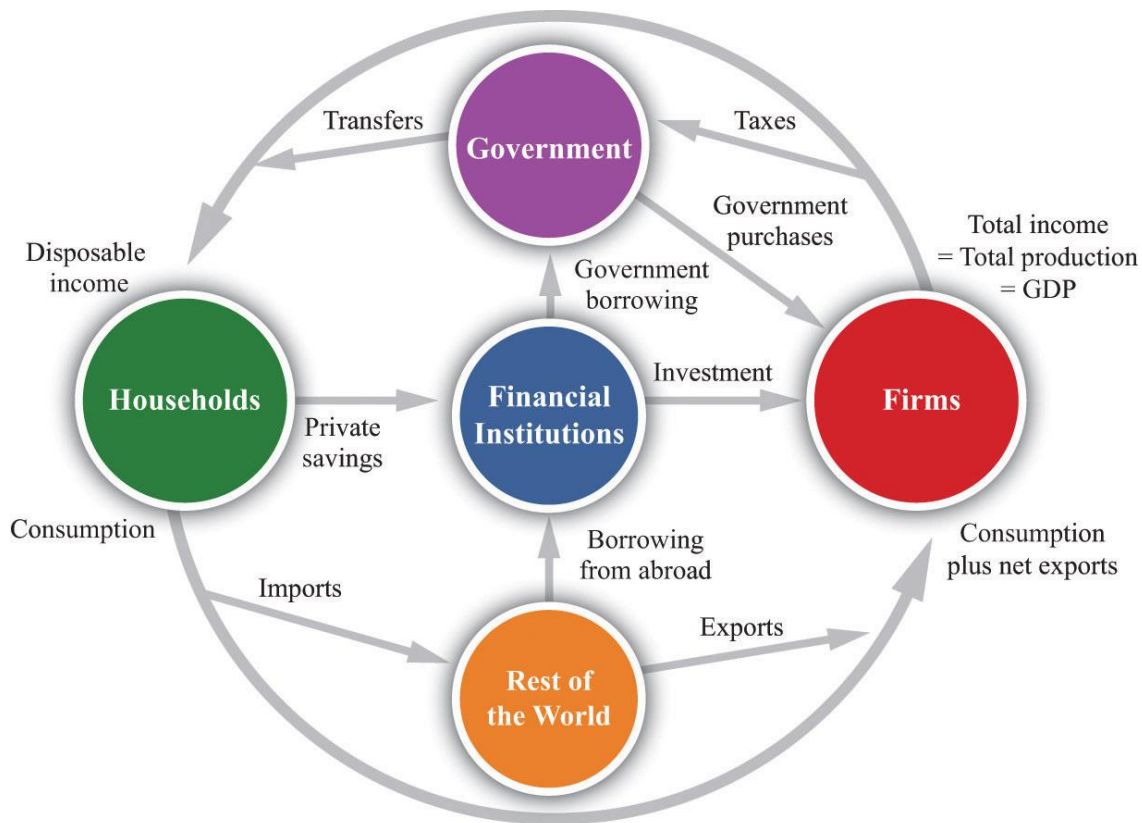
2.4. In a Given Time Period

GDP measures the value of production in a given time period—normally either a quarter of a year—called the quarterly GDP data—or a year—called the annual GDP data.

GDP measures not only the value of total production but also total income and total expenditure. The equality between the value of total production and total income is important because it shows the direct link between productivity and living standards. Our standard of living rises when our incomes rise and we can afford to buy more goods and services.

But we must produce more goods and services if we are to be able to buy more goods and services. Rising incomes and a rising value of production go together. They are two aspects of the same phenomenon: increasing productivity. To see why, we study the circular flow of expenditure and income.

3. GDP and the Circular Flow of Expenditure and Income ^[2]



3.1. Households & Firms

Households sell and firms buy the services of labor, capital, and land in factor markets. For these factor services, firms pay income to households: wages for labor services, interest for the use of capital, and rent for the use of land. A fourth factor of production, entrepreneurship, receives profit.

Firms retained earnings-profits that are not distributed to households-are part of the household sector's income. One can think of retained earnings as being income that households save and lend back to firms.

The complete circular flow has five sectors: a household sector, a firm sector, a government sector, a foreign sector, and a financial sector. Different chapters of the book emphasize different pieces of the circular flow, and Figure-1 shows us how everything fits together. In the following subsections, we look at the flows into and from each sector in turn. In each case, the balance of the flows into and from each sector underlies a useful economic relationship.

The Firm Sector includes the component of the circular flow associated with the flows into and from the firm sector of an economy. We know that the total flow of dollars from the firm sector measures the total value of

production in an economy. The total flow of dollars into the firm sector equals total expenditures on GDP. We therefore know that

$\text{production} = \text{consumption} + \text{investment} + \text{government purchases} + \text{net exports}.$

This equation is called the national income identity and is the most fundamental relationship in the national accounts.

By consumption we mean total consumption expenditures by households on final goods and services. Investment refers to the purchase of goods and services that, in one way or another, help to produce more output in the future. Government purchases include all purchases of goods and services by the government. Net exports, which equal exports minus imports, measure the expenditure flows associated with the rest of the world.

The household sector summarizes the behavior of private individuals in their roles as consumers/savers and suppliers of labor. The balance of flows into and from this sector is the basis of the household budget constraint. Households receive income from firms, in the form of wages and in the form of dividends resulting from their ownership of firms. The income that households have available to them after all taxes have been paid to the government and all transfers received is called disposable income. Households spend some of their disposable income and save the rest. In other words,

$\text{disposable income} = \text{consumption} + \text{household savings}.$

This is the household budget constraint. In Figure-1, this equation corresponds to the fact that the flows into and from the household sector must balance.

The Circular Flow of Expenditure & Income Figure

3.2. Governments

The government sector summarizes the actions of all levels of government in an economy. Governments tax their citizens, pay transfers to them, and purchase goods from the firm sector of the economy. Governments also borrow from or lend to the financial sector. The amount that the government collects in taxes need not equal the amount that it pays out for government purchases and transfers. If the government spends more than it gathers in taxes, then it must borrow from the financial markets to make up the shortfall.

The circular flow figure shows two flows into the government sector and two flows out. Since the flows into and from the government sector must balance, we know that

$\text{government purchases} + \text{transfers} = \text{tax revenues} + \text{government borrowing}.$

Government borrowing is sometimes referred to as the government budget deficit. This equation is the government budget constraint.

Some of the flows in the circular flow can go in either direction. When the government is running a deficit, there is a flow of dollars to the government sector from the financial markets. Alternatively, the government may run a surplus, meaning that its revenues from taxation are greater than its spending on purchases and transfers. In this case, the government is saving rather than borrowing, and there is a flow of dollars to the financial markets from the government sector.

3.3. Rest of the World

Firms sell goods and services to the rest of the world-exports-and buy goods and services from the rest of the world-imports. The value of exports minus the value of imports is called net exports. If net exports are positive, the net flow of goods and services is from U.S. firms to the rest of the world. If net exports are negative, the net flow of goods and services is from the rest of the world to US. firms.

4. Financial Flows

The circular flow model also enables us to see the connection between the expenditure and income flows and flows through the financial markets that finance deficits and pay for investment. These flows are shown in green in Fig-1. Household saving (S) is the amount that households have left after they have paid their taxes and bought their consumer goods and services. Government borrowing finances a government budget deficit. (Government lending arises when the government has a budget surplus.) A nation borrows from the rest of the world to pay for negative net exports (and lends to the rest of the world when net exports are positive) 'These financial ' flows are the sources of the funds that firms use to pay for their Investment in new capital. Let's look a bit more closely at how investment is financed.

5. How Investment is Financed

Investment adds to the stock of capital and is one of the determinants of the rate at which production grows. Investment is financed from three sources:

1. Private saving
2. Government budget surplus
3. Borrowing from the rest of the world.

The national savings of the economy is the savings carried out by the private and government sectors taken together. When the government is running a deficit, some of the savings of households and firms must be

used to fund that deficit, so there is less left over to finance investment. National savings is then equal to private savings minus the government deficit—that is, private savings minus government borrowing:

national savings = private savings – government borrowing.

If the government is running a surplus, then

national savings = private savings + government surplus.

National savings is therefore the amount that an economy as a whole save. It is equal to what is left over after we subtract consumption and government spending from GDP. To see this, notice that

private savings – government borrowing = income – taxes + transfers – consumption – (government purchases + transfers – taxes) = income – consumption – government purchases.

This is the domestic money that is available for investment.

If we are borrowing from other countries, there is another source of funds for investment. The flows into and from the financial sector must balance, so, investment = national savings + borrowing from other countries.

Conversely, if we are lending to other countries, then our national savings is divided between investment and lending to other countries: national savings = investment + lending to other countries.

5. Gross and Net Domestic Product ^[4]

What does the “gross” in GDP mean? Gross means before the depreciation of capital. The opposite of gross is net, which means after the depreciation of capital. To Understand the depreciation of capital and how it affects aggregate expenditure and income, we need to distinguish between flows and stocks.

5.1. Flows and Stocks in Macroeconomics

A flow is a quantity per unit of time. The water that is running from an open faucet into a bathtub is a flow. So are the number of CDs that you buy during a month and the amount of income that you earn during a month. GDP is a flow---the value of the goods and services produced in a country during a given time period. Saving and investment are also flows.

A stock is a quantity that exists at a point in time. The water in a bathtub is a stock. So are the number of CDs that you own and the amount of money in your savings account today. The two key stocks in macroeconomics are wealth and capital. And the flows of saving and investment change these stocks.

5.2. Wealth and Saving

Wealth is the value of all the things that people own. What people own, a stock, is related to what they earn, a flow. People earn an income, which is the amount they receive during a given time period from supplying

the services of factors of production. Income that is left after paying taxes is either spent on consumption goods and services or saved. Consumption expenditure is the amount spent on consumption goods and services. Saving is the amount of income remaining after paying net taxes and making consumption expenditures. So saving adds to wealth.

For example, suppose that at the end of the school year, you have \$250 in a savings account and some textbooks that are worth \$300. That's all you own. Your wealth is \$550. Suppose that you take a summer job and earn an income after taxes of \$5,000. You are extremely careful and spend only \$1,000 through the summer on consumption goods and services. At the end of the summer, when school starts again, you have \$4,250 in your savings account. Your wealth is now \$4,550. Your wealth has increased by \$4,000, which equals your saving of \$4,000. Your saving of \$4,000 equals your income of \$5,000 minus your consumption expenditure of \$1,000.

National wealth and national saving work just like this personal example. The wealth of a nation at the start of a year equals its wealth at the start of the previous year plus its saving during the year. So a nation's saving equals its income minus its consumption expenditure of \$1,000.

5.3. Capital and Investment

Capital is the plant, equipment, buildings, and inventories of raw materials and semi-finished goods that are used to produce other goods and services. The amount of capital in the economy exerts a big influence on GDP. Two flows change the stock of capital: investment and depreciation.

Investment, the purchase of new capital, increases the Stock of capital. (Investment includes additions to inventories.) Depreciation is the decrease in the stock of capital that results from wear and tear and obsolescence. Another name for depreciation is capital consumption. The total amount spent on purchases of new capital and on replacing depreciated capital is called gross investment. The amount by which the stock of capital increases is called net investment. Net investment equals gross investment minus depreciation.

6. Real GDP and the Price Level ^[5]

GDP measures total expenditure on final goods and services in a given period. In 2006, GDP was \$13,008 billion. A year before, in 2005, GDP was \$12,199 billion. Because GDP in 2006 was greater than that in 2005, we know that one or two things must have happened during 2006;

We produced more goods and services in 2006 than we produced in 2005.

We paid higher prices for our goods and services in 2006 than we paid in 2005.

Producing more goods and services contributes to an improvement in our standard of living. Paying higher prices means that our cost of living has increased but our standard of living has not. So it matters a great deal why GDP has increased.

We are now going to learn how economists at the bureau of economic analysis split GDP into two parts. One part tells us the change in production, and the other part tells us the changes in prices. The method that is used has changed in recent years, and we will learn both the old and the new methods.

We measure the change in production by using a number that we call Real GDP. Real GDP is the value of final goods and services produced in a given year when valued at constant prices. By comparing the value of the goods and services produced at constant prices, we can measure the change in the quantity of production.

6.1. Calculating Real GDP

Table-1 shows the quantities produced and the prices in 2005 for an economy that produces only two goods: balls and bats. The first step toward calculating real GDP is to calculate nominal GDP, which is the value of the final goods and services produced in a given year valued at the prices that prevailed in that same year. Nominal GDP is just a more precise name for GDP that we use when we want to be emphatic that we are not talking about real GDP.

Item	Quantity	Price
Balls	100	\$1.00
Bats	20	\$5.00

Table-1: GDP Data for 2005

To calculate nominal GDP in 2005, sum the expenditures on balls and bats in 2005 as follows:

Expenditure on balls= 100 balls \times \$1 = \$100

Expenditure on bats= 20 bats \times \$5 = \$100

Nominal GDP in 2005= \$100 + \$100 = \$200

Table-2 shows the quantities produced and the prices in 2006. The quantity of balls produced increased to 160, and the quantity of bats produced increased to 22. The price of a ball fell to 50\$, and the price of a bat increased to 22.50\$. To calculate nominal GDP in 2006, we sum the expenditures on balls and bats in 2006 as follows:

Expenditure on balls= 160 balls \times \$0.50= \$80

Expenditure on bats= 22 bats \times \$22.50= \$495

Nominal GDP in 2006= \$80 + \$495= \$575

Item	Quantity	Price
Balls	160	\$0.50
Bats	22	\$22.50

Table-2: GDP Data for 2006

To calculate real GDP, we choose one year, called the base year, against which to compare the other years. In the United States today, the base year is 2000. The choice of the base year is not important. It is just a common reference point. We'll use 2005 as the base year. By definition, in the base year, real GDP equals nominal GDP. So Real GDP in 2005 is \$200.

6.3. Base-Year Prices Value of Real GDP

The base-year prices method of calculating real GDP, which is the old method, values the quantities produced in a year at the prices of the base year. Table-3 shows the prices for 2005 and the quantities in 2006. The value of the 2006 quantities at the 2005 prices is calculated as follows:

Expenditure on balls= 160 balls \times \$1.00 = \$160

Expenditure on bats= 22 bats \times \$5.00 = \$110

Value of the 2006 quantities at 2005 prices= \$270

If we use the old base-year prices method, \$270 would be recorded as real GDP in 2006.

Item	Quantity	Price
Balls	160	\$1.00
Bats	22	\$5.00

Table-3: 2006 Quantities and 2005 Prices

6.4. Chain-Weighted Output Index Calculation

The chain-weighted output index method, which is the new method of calculating real GDP, uses the prices of two adjacent years to calculate the real GDP growth rate. So to find the real GDP growth rate in 2006, we compare the quantities produced in 2005 and 2006 by using both the 2005 prices and the 2006 prices. We then average the two sets of numbers in a way that we'll now describe.

To compare the quantities produced in 2005 and 2006 at 2006 prices, we need to calculate the value of 2005 quantities at 2006 prices. The value of the 2005 quantities at the 2006 prices is calculated as follows:

Expenditure on balls= 100 balls \times \$0.50 =\$50

Expenditure on bats= 20 bats \times \$22.50 =\$450

Value of the 2005 quantities at 2006 prices= \$500

We now have two comparisons between 2005 and 2006. At the 2005 prices, the value of production increased from \$200 in 2005 to \$270 in 2006. The increased in value is \$70, and the percentage increase is $(\$70 \div \$200) \times 100$, which is 35 percent.

Item	Quantity	Price
Balls	100	\$0.50
Bats	20	\$22.50

Table-4: 2005 Quantities and 2006 Prices

At the 2006 prices, the value of production increased from \$500 in 2005 to \$575 in 2006. The increase in value is \$75, and the percentage increase is $(\$75 \div \$500) \times 100$, which is 15 percent.

The new method of calculating real GDP uses average of these two percentage increases. The average of 35 percent and 15 percent is $(35+15) \div 2$, which equals 25 percent. Real GDP in 2006 is 25 percent greater than it was in 2005. Real GDP in 2005 is \$200, so real GDP in 2006 is \$250.

6.5. Chain Linking

The calculation we've just described is repeated each year. Each year is compared with its preceding year. So in 2007, the calculations are repeated but using the prices and quantities of 2006 and 2007. Real GDP in 2007 equals real GDP in 2006 increased by the calculated percentage change in real GDP for 2007. For

example, suppose that real GDP for 2007 is calculated to be 20% in 2006 is \$250. So real GDP in 2007 is 20% greater than this value and is \$300. In every year, real GDP is valued in base-year dollars.

By applying the calculated percentage change in real GDP in each year to the real GDP of the preceding year, real GDP in each year is linked back to the dollars of the base year like the links in a chain.

7. Calculating the Price Level ^[6]

Real GDP reveals the change in the quantity of goods and services produced. We're now going to see how we can find the change in prices that increases our cost of living.

The average level of prices is called the price level. One measure of the price level is the GDP deflator, which is an average of current year, prices expressed as a percentage of the base-year prices. To calculate the GDP deflator, we use the formula:

$$\text{GDP deflator} = (\text{Nominal GDP} \div \text{Real GDP}) \times 100$$

GDP deflator measures the price level. If nominal GDP rises but real GDP remains unchanged, the price level must have risen. The larger the nominal GDP for a given real GDP, the higher is the price level and the larger is the GDP deflator.

Table-5 shows how the GDP deflator is calculated. In 2005, the base year, real GDP equals nominal GDP, so the GDP deflator is 100. In 2006, it is 230, which equals nominal GDP of \$575 divided by real GDP of \$250 and then multiply by 100.

Year	Nominal GDP	Real GDP	GDP Deflator
2005	\$200	\$200	100
2006	\$575	\$250	230

Table-5: Calculating the GDP Deflator

8. The Uses & Limitations of Real GDP ^[7]

We use estimates of real GDP for three main purposes.

Although real GDP is used for these three purposes, it is not a perfect measure for any of them. But neither is it a seriously misleading measure. We will describe the uses and evaluate the limitations of real GDP in each of the three cases.

9. Economic Welfare Comparisons Overtime

Economic welfare is a comprehensive measure of the general state of economic wellbeing. Economic welfare improves when the production of all goods and services grows. The goods and services that make up real GDP growth are only a part of all the items that influence economic welfare.

Today, because of real GDP growth, real GDP per person in the United States is twice what it was in 1971. But are we as well off? Does this growth of real GDP provide a full and accurate measure of the change in economic welfare?

It does not. The reason is that economic welfare depends on many other factors that are either not measured accurately by real GDP or not measured at all by real GDP. Some of these factors are:

1. Over adjustment for inflation
2. Household production
3. Underground economic activity
4. Health and life expectancy
5. Leisure time
6. Environment quality

9.1. Over Adjustment for Inflation

The price indexes that are used to measure inflation give an upward-biased estimate of true inflation. When car prices rise because cars have improved, the GDP deflator counts the price increases as inflation. So what is really an increase in production is counted as an increase in price rather than an increase in real GDP. It is deflated away by the wrongly measured higher price level. The magnitude of this bias is probably less than 1% point a year, but its exact magnitude is not known.

9.2. Household Production

An enormous amount of production takes place every day in our homes. Preparing meals, cleaning the kitchen, changing a light bulb, cutting the grass, washing the car, and helping a high school student with homework are all examples of productive activities that do not involve market transactions and are not counted as part of GDP.

If these activities grew at the same rate as real GDP, not measuring them would not be a problem. But it is likely that market production, which is part of GDP, is increasingly replacing household production, which it

is not part of GDP. Two trends point in this direction. One is number of people who have jobs which has increased from 54 % in 1970 to 62% in 2006. The other is the trend in the purchase of traditionally home produced goods and services in the market. For example, more and more families now eat in fast food restaurants one of the fastest growing industries in the United States and use Day Care Services. This trend means that an increasing proportion of food preparation and child care that were part of household production are now measured as part of GDP. So real GDP grows more rapidly than does Real GDP plus Home Production.

9.3. Underground Economic Activity

The underground economy is the part of the economy that is purposely hidden from the view of the government to avoid taxes and regulations or because the goods and services being produced are illegal. Because underground economic activity is unreported, it is omitted from GDP.

The underground economy is easy to describe, even if it is hard to measure. It includes the production and distribution of illegal drugs, production that uses illegal labor that is paid less than the minimum wage, and jobs done for cash to avoid paying income taxes. This last category might be quite large and includes tips earned by cab drivers, hairdressers, and hotel and restaurant workers.

Estimates of the scale of the underground economy in the United States range between 9 and 30% of GDP. The underground economy is much larger in some countries, particularly in some Eastern European countries that are making a transition from centrally planned economies to market economies.

Provided that the underground economy is a reasonably stable proportion of the total economy, the growth rate of real GDP still gives a useful estimate of changes in economic welfare. But sometimes production shifts from the underground economy to the rest of the economy, and sometimes it shifts the other way. The underground economy expands relative to the rest of the economy if taxes become especially high or if regulations become especially restrictive. And the underground economy shrinks relative to the rest of the economy if the burdens of taxes and regulations are eased. During the 1980s, when tax rates were cut, there was an increase in the reporting of previously hidden income and tax revenues increased. So some part of the expansion of real GDP during the 1980s represented a shift from the underground economy rather than an increase in production.

9.4. Health and Life Expectancy

Good health and a long life that hops of everyone do not show up in real GDP, at least not directly. A higher real GDP dose enable us to spend more on medical research, healthcare, a good diet, and exercise equipment.

And as real GDP has increased, our life expectancy has lengthened from 70 years at the end of the world war two to approaching 80 years today. Infant deaths and death in childbirth, two fearful scourges of the 19th Century, have been greatly reduced.

But we face new health and life expectancy problems every year. AIDS and drug abuse are taking young lives at a rate that cause serious concern. When we take this negative influences into account, we see that real GDP growth overstates the improvements in economic welfare.

9.5. Leisure Time

Leisure time is an economic good that adds to our economic welfare. Other things being equal, the more leisure we have, the better off we are. Our working time is valued as part of GDP, but our leisure time is not. Yet from the point of view of economic welfare, that leisure time must be at least as well valuable to us as the wage that we earn on the last hour worked. If it were not, we would work instead of taking the leisure. Over the years, leisure time has steadily increased. The workweek has become shorter, more people take early retirement, and the number of vacation days has increased. These improvements in economic wellbeing are not reflected in real GDP.

9.6. Environment Quality

Economic activity directly influences the quality of the environment. The burning of hydrocarbon fuels is the most visible activity that damages our environment. But it is not the only example. The depletion of non-renewable natural resources, the mass clearing of forests, the pollution of lakes and rivers and other major environmental consequences of Industrial production.

Resources that are used to protect the environment are valued as part of GDP. For example, the value of catalytic converters that help to protect the atmosphere from automobile emission is part of GDP. But if we did not use such pieces of equipment and instead polluted the atmosphere. We would not count the deteriorating air that we were breathing as a negative part of GDP.

An Industrial society possibly produces more atmospheric pollution than an agricultural society dose. But pollution does not always increase as we become wealthier. Wealthy people value a clean environment and are willing to pay for one. Compare the pollution that was discovered in East Germany in the late 1980s with pollution in the United States. East Germany, a poor country, polluted its rivers, lakes, and atmosphere in a way that is unimaginable in the united states or in wealthy west Germany.

10. Economic Welfare Comparisons Across Countries

All the problems we've just reviewed affect the economic welfare of every country to make international comparisons of economic welfare, factors in addition to real GDP must be used. But real GDP comparisons are major components of international welfare comparisons, and two special problems arise in making these comparisons. First the real GDP of one country must be converted into the same currency units as the real GDP of the other country. Second, the same prices must be used to value the goods and services in the countries being compared. Let's look at these two problems by using a striking example: a comparison of the United States and China.

China and the United States compared in 2006, GDP per person in the United States was almost \$44,000. The official Chinese statistics published in the International Monetary Fund's (IMF) World Economic Outlook (WEO) says that GDP per person in China in 2006 was 15,500 yuan. (The yuan is the currency of China). On the average, during 2006, \$1 U.S. was worth 9.9 yuan. If we use this exchange rate to convert 15,500 yuan into U.S. dollars, we get a value of \$1,566. This comparison of China looks extremely poor, in 2006, GDP per person in the United States was 28 times that in China.

GDP in the United States is measured by using prices that prevail in the United States. China's GDP is measured by using prices that prevail in China. But the relative prices in the two countries are very different. Some goods that are expensive in the United States cost very little in China, so these items get a smaller weight in China's real GDP than they get in U.S. real GDP. If, instead of using China's prices, all the goods and services produced in China are valued at the prices prevailing in the United States, then a more valid comparison can be made of GDP in the two countries. Such a comparison uses prices called purchasing power parity prices, or PPP prices.

Alan Heston, Robert Summers, and Bettina Aten, economists in the Center for International Comparisons at the University of Pennsylvania, have used PPP prices to construct real GDP data for more than 100 countries. And the IMF now uses a method similar to that of Heston, Summers, and Aten to calculate PPP estimates of GDP in all countries. The PPP comparisons tell a remarkable story about China.

According to the PPP comparisons, GDP per person in the United States in 2006 was 5 times that of China, not the 28 times shown the PPP view of China's real GDP and compares it with the market exchange rate view.

11. Conclusion

If policymakers plan to raise interest rates to slow an expansion that they believe is too strong they look at the latest estimates of real GDP. But suppose that, for the reasons that we've just discussed, real GDP is mismeasured. Does this mismeasurement hamper our ability to identify the phases of the business cycle? It does not. The reason is that although the omissions from real GDP do change over time, they probably do not change in a systematic way with the business cycle. So inaccurate measurement of real GDP does not necessarily cause a wrong assessment of the phase of the business cycle.

The fluctuations in economic activity story about the phase of the business cycle that the economy is in a business cycle expansion; when real GDP shrinks (for two quarters), the economy is in a recession. Also, as real GDP fluctuates, so do production and jobs.

But real GDP fluctuations probably exaggerate or overstate the fluctuations in total production and economic welfare. The reason is that when business activity slows in a receding, household production increases and so does leisure time. When business activity speeds up in an expansion, household production and leisure time increase in a recession and decrease in an expansion, real GDP fluctuations and decrease in an expansion, real GDP fluctuations tend to overstate the fluctuations in both total production and economic welfare, but the directions of change of real GDP, total production and economic welfare are probably the same.

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