NATIONAL INCOME ACCOUNTING

Topics

      A. Methods of measuring national output
      B. Limitations of measures of national output

Reading Assignment:

Principles of Economics: Chapter 19

      The major goals of macroeconomic policy can be met by developing policies that assure a vigorous and growing production of *real* goods and services that is not distorted or disrupted by severe inflation or unemployment. Before discussing possible solutions to excessive inflation or unemployment, we need to learn the methods that are used to measure national output.

      Gross Domestic Product (GDP) Defined: Gross Domestic Product **(never, ever forget this term**) in the U.S. (***And other countries***) is the ***market value*** of *all* goods and services produced ***in the U.S. in a given time period***, (usually one calendar year). This is one of the most frequently used terms in macroeconomics, and the one that is most frequently cited in newspapers, magazines, journals, and other media. Gross Domestic Product in the U.S. was 20,580 ***trillion*** dollars in ***nominal*** terms in 2018. GDP can be measured in ***four*** ways. It may drive you nutty keeping these variations in your mind. We must also note that these data are in continuous refinement and will probably change *slightly* over the next few years.

      Important: The following procedures measures the ***monetary*** value of GDP during a single year. It is not the **real** GDP that was used in our graph of AD and AS, which refers to the real economy, i.e., the actual physical amounts of goods and services produced as described in notes 1. We will show how changes in real GDP is calculated in notes 6.

1. Measuring Gross Domestic Product (GDP) from the output/production side?

      The most obvious method, and and probably the most definitive, is simply to sum the market value of all goods and services produced during the course of a year. We need to emphasize that it does not matter whether the production is carried out by companies chartered in the U.S. or by companies that are located in some other country.   For example, Nissan trucks produced in the U.S. are counted as GDP for the U.S., but General Motors products produced in Europe, or Canada, or Mexico are not.   Nor does it matter whether the production was carried out by an incorporated or unincorporated enterprise. Note the focus on ***final values***. The value of a newly produced car is measured by its selling price, or if not sold, by its ***additional value in inventory***. GDP includes the value of automobiles, sheets, food, dental care, haircuts, government work, construction, computers and any other ***domestically*** produced goods or services.

      In our circular flow of resources (The one shown here is slightly revised and expanded from our earlier version), **this approach to measuring** GDP is shown by the value of all output

produced by firms and government organizations (right side of graph). It does not, incidentally, include pension or health care payments (say through Medicare) since these do not originate in the creation of a good or service. These payments are called transfer payments, i.e., they are money taken from one segment of society and given to another. However, the services (say medical care) and consumption items that are produced and paid for through transfer payments are part of GDP. This may sound confusing so stop and contemplate the issue for a minute.

The U.S/ Department of Commerce combines data derived from a wide range of sources to make this calculation of GDP each year. This includes all output from *private firms* and *government agencies*; see the far right side of circular flow of resources.

2. How is GDP measured from the Expenditure Side?

The second way, of defining GDP is from the expenditure, or uses, side, i.e., the purposes for which GDP/total output is used, - the top part of the circular flow of resources. This concept of GDP will become critical when we discuss methods of dealing with inflation and unemployment

Revised Circular Flow of Resources

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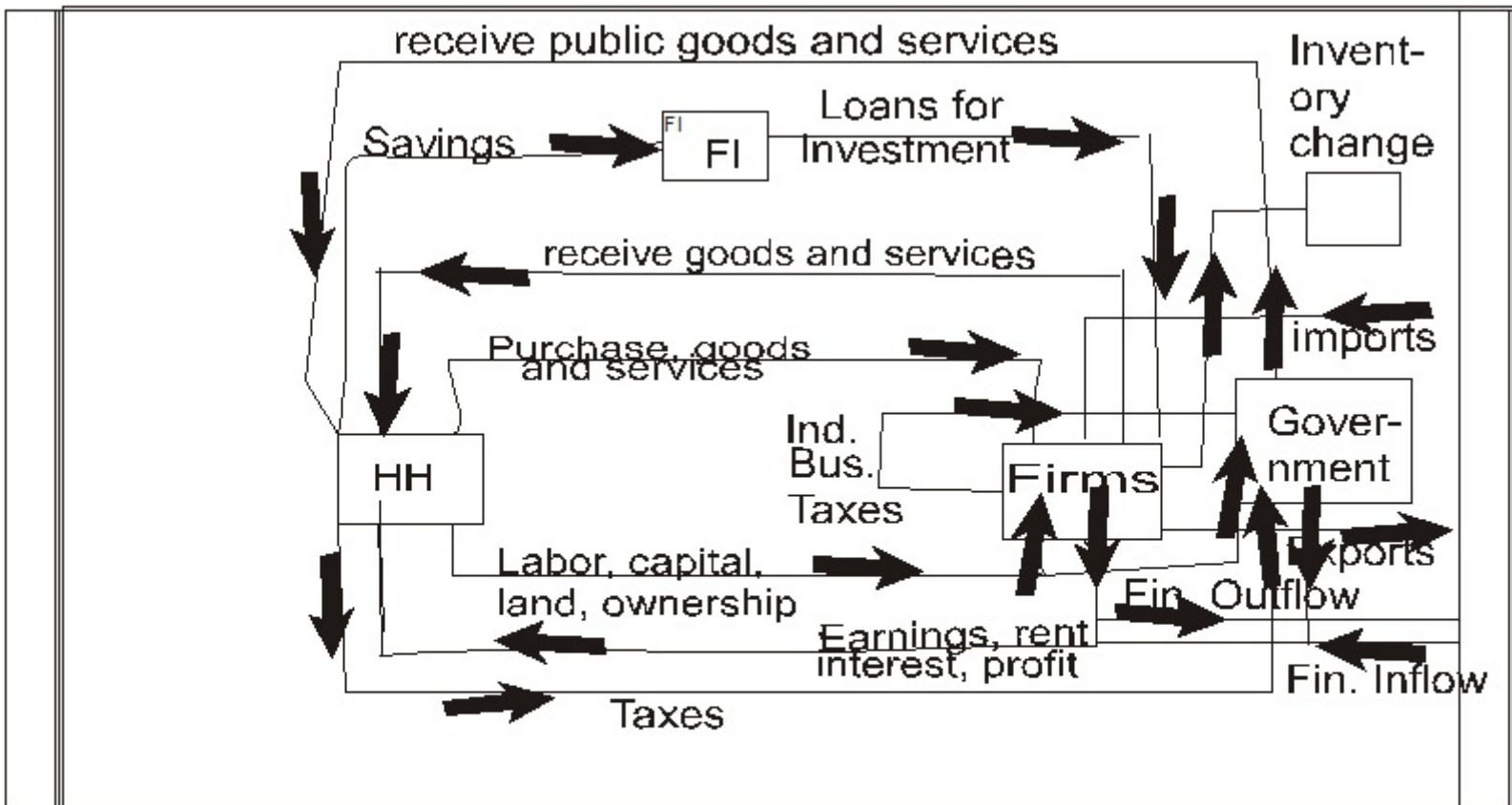
in the economy and is important for an understanding of Keynesian theory.

You should recall from our discussion of the circular flow of resources in the economy that the _top_ side of this circular flow consisted of *purchases*/*uses* that were made *possible largely by* the incomes earned and taxes paid from working for firms and government organizations (Hence the name, circular flow of resources).   Look at the top part of the circular flow of resources model. These lines represent consumption, C, investment, I, (derived from peoples' savings and the difference between government taxes and expenditures which may be and in fact usually are, negative), and government, G, (which includes all levels of government, federal, state, and local). We must also add the difference between between **imported** (Im) and **exported** (Ex) goods, usually identified as X, i.e. Ex - Im = X. *All* output can be categorized into one of these categories.

Why do we need an adjustment for imports and exports? Exported goods are goods we make, and are part of domestic production. Imported goods are used domestically for consumption, investment, or government spending, and are included in C, *I,* and G, but are produced in another country and are part of their GDP, *not* ours.   If we import more than we export, we are using more goods that we produce. But if we export more than we import, then we are producing more than we are using. We are currently using more goods produced by other countries than other countries are using goods produced by us (hence our large trade deficit). Like it or not, we are living beyond our means, and have been for many years. Note that in the revised circular flow of resources, I have altered the way I show imports and exports because both of these activities originate primarily from activities by firms (and not individuals), e.g., Amazon, Sears, Walmart, Kmart, etc., buying goods for resale in the U.S.

What about goods that we produce but that are not sold. Well, you should recall that is why I added a box for inventory change. One possible use of domestic production is to add to inventories. If inventories rise, this means that some produced goods were not sold, but added to the stock of goods available for sale. Nonetheless, they are part of the current years's GDP. On the other hand, if inventories fall, this means that some goods were used for C, I, or G that were produced in prior years and are not part of this year's production. This amount must then be deducted from total measures of C, I, and G.

Of course, all producers and retailers sell some goods each year out of their carryover inventory. But if inventories remain constant, then the amount of currently produced goods added to inventory must equal the amount of goods produced in prior years that is sold so it is only the *change* in inventories that must be measured.

The four categories, C + I + G + (Ex - Im) *plus* inventory change, exhaust all possibilities for using the goods and services that are produced. Note that consumer durables, e.g., washing machines, vacuum cleaners, automobiles are included in consumption (in our simplified circular flow of resources) even if financed by loans. I suppose they could be considered consumer investment since they will be used in multiple years and are often financed by loans. I could easily expand the circular flow of resources to include lines for consumer durables and loans for these durables, but it is not necessary. Each of these categories of how GDP is used are shown in our circular flow of resources chart.

Usually, GDP from the *expenditure* or uses, side is written:

$$GDP = C + I + G + X.$$

Whoops, where in inventory change in the above formula? In the national income accounts, **changes in inventory are considered part of investment**. Think of it this way. If you own a car dealership, and purchase 100 cars from a manufacturer but sell only 90, then, in effect, you have an additional investment of the value of 10 cars that is included in your inventory that must be accounted for in our measures of GDP.

Including inventory change as part of investment is unquestionably confusing the first time you hear it, but the more you think about it, the more sensible it becomes. Note that inventory change can be **intended** or **unintended**. This distinction is an important topic that we will discuss later.   In national income accounting, *both* intended and unintended inventory change is included in investment. Consider, if a dealer wished to increase inventory by five cars, this is intended investment; but if inventory actually increases by ten cars, then the second five cars added to inventory is unintended, but still represents increased investment since the cars had to be produced in the current year.

Note also that investment in measures of GDP is defined as *gross* investment which includes *all* additions to the capital stock *(investment) as well as* expenditures on *replacing* capital stock due to obsolescence, or wear and tear. After all, these replacement capital stock items were produced in the current year. Investment includes only physical products or intangible products (say research that will be used later. It does not include financial transactions (say the purchase of stocks or bonds), although this may be confusing at first.

Aside: When the U. S. Department of Commerce computes GDP , it includes some imputed values. One of the most important is an imputed rental value for owner occupied residences, i.e., if you own your residence, then an estimate of imputed rent is made and added into GDP. This is necessary in order to create a value comparable to rents charged for apartments. Rents are treated as a consumption expenditure just as vacations, clothing, etc. Another sometimes imputed value is for the consumption of goods by the person producing the goods, e.g., farm products (a rancher slaughters a beef for his or her own consumption).

3. **What is GDP measured from income side?**

Now turn to the bottom of the circular flow of resources chart. From there, we can develop the third measure of GDP, and the one that is usually the most difficult for students to grasp.

You recall from the circular flow of resources that the value of **all** output (GDP measured in dollar terms) *must be reflected* in some payment (or imputed return) to individuals or entities. Thus, labor (both management and employees) receives wages (W), Capital receives interest (Int), Land receives rent R and whatever is left over goes to entrepreneurship as profits (P). [1]

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[1]This is a simplification. Often capital is rented, e.g., a machine. Nonetheless these rents are counted as part of GDP. However, as long as all interest and rental income is accounted for, we will end up with a accurate measure of GDP.

Thus, in a very simple model, GDP = W + Int+ R + P. Note that we use " Int" to represent interest to avoid confusion with investment (I). The formula is necessarily true since anything that is left over (in this simple model) after paying W, Int, and R *must* accrue to profits.

Please note that the government also uses significant amounts of resources in carrying out its activities and remuneration for these resources (as wages, rents, and interest, presumably there is no profit) *must* be included in measures of GDP. In addition, most businesses pay indirect business taxes (IBT to the government), i.e.,excise taxes and sales taxes. These taxes are considered to be paid by purchasers, and collected by the firm for the government. In effect part of sales receipts are paid directly to the government. These taxes are clearly part of the final prices of goods and services and must be included in measuring GDP from the income side. Think of these taxes as consumers paying for public services.

Some of you, especially those studying accounting, will wonder why we implicitly include retained earnings (part of profits) *that are not distributed* to the owners of businesses *as payments to the owners of business since they are included i9n profits*. The easiest way to think of retained earnings is that they are imputed income to the owners on the one hand, and, at the same time, are investments by these owners in the business. Retained earnings basically force shareholders to save and invest (and incidently avoid income taxes).

The income that people receive is based not only on what they are paid domestically for their labor, land, and capital, but also what they receive from resources that they own in other countries, e.g., stocks, bonds, etc. Similarly, our firms, and government, make payments to people in other countries from revenues derived from domestic production. Since we are concerned only with income that arises from domestic production, income received from abroad should *not* be counted in GDP (but you better report it when you file your income tax return), and factor payments sent abroad should be considered part of our GDP since it derives from our production. The difference is termed net factor income (NFI). Note the additional two lines representing movements of factor income on the right side of the circular flow of resources which were not included in our initial circular flow of resources.

Most businesses also incur capital consumption expenses. This *reduces* profits but since it is part of current GDP, it must be added to the above equation.

If we adjust for NFI and CC (since it reduces profits), then GDP from the income side, is written:

GDP = W + Int + R + P +CC+NFI +IBT.

4. How is GDP measured by "value added?"

You will sometimes hear and read the term "value added." This leads to a *fourth* way of defining GDP, but one that *cannot* be shown on the circular flow of resources.
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Most final products that people buy are produced in stages by two or more firms, each one adding some measure of value to the good. Consider the stages and different companies involved in the production of automobiles in the following simple model (a very simplified approach, the actual number of stages in the real world are much greater and more complex).

- First, Steel, rubber, oil, plastic and other raw materials must be produced by companies specializing in producing or extracting these materials.

- Second, these raw materials are purchased by other companies that refine these raw materials into usable goods. Some of these companies will produce tires, some car seats, some various parts for the motor, etc.

- Third, these intermediate goods will be purchased by a car manufacturer which will further process them and assemble them into a car.

- Finally, the car will be shipped to a distributor for sale to a consumer.

Each of these stages *adds value* to the product.

- The first stage adds the *entire* value of the raw materials, say $5,000 which represents the entire value added of these firms. This is the price that is charged for goods sold to second stage firms. It includes *all* wages, interest, rent, profit, depreciation, capital consumption, and indirect business taxes paid by these first stage companies.

- To find the value added of second stage firms, we subtract the *difference* between the price the companies paid for the raw materials, $5,000 and the price that they charge the automobile manufacturers, say $11,000, for the parts they manufacture. Their value added is $6,000. It includes the rent, interest, wages, profit, capital consumption, and indirect business taxes paid by these firms (**not just profit**), and *not* the materials they purchased from the first stage firms.

- To find the value added of third stage manufacturers, you must find the difference between what is paid for the intermediate products, $11,000 and the wholesale value of the automobiles, say $15,000, so the value added is $4,000.

- The final stage, the distribution stage, calculates value added by retail distributors by calculating the difference between the wholesale price, $15,000 and the retail price of the automobile, say $20,000 so the value added is $5,000. Again, note that this includes *all* the expenses incurred by the distributor, which includes transportation cost, showroom costs, advertising, sales commissions as well as profit.

Two points must be emphasized.

- First, at each stage, the value added for that stage is equal to the payments that are made by the manufacturer to the factors of production, land, labor, and capital (i.e. rent, wages, interest,) as well as any indirect taxes that must be paid. as well as depreciation, and the residual, profit . Basically, value added equals the value of what companies produce (the sales price) *less* the cost of goods purchased, a concept that those of you that study accounting will find familiar and which should be intuitively obvious to the rest of you.. To repeat, value added includes the

wages, rents, interest, capital consumption, and indirect business taxes paid by the producer and the profit that is earned. For example, if the car distributor paid the salesperson $1,000 for selling the car, and incurred $3,000 in costs for labor, rent, interest, indirect business taxes, and depreciation, then the net profit would be $1,000 if the car sold for $20,000, but the value added for the manufacturer would be $4,000.

- Second, if you add the value added at each stage, it will necessarily *equal* the market value of the final product, in this case, i.e., $5,000, $6,000, $4,000, and $5,000 = $20,000.

GDP could, in theory, be calculated by adding together the ***value added*** of ***all*** producing units.

Optional: Although the United States does not calculate GDP using the value added approach, many large companies import materials to be used in producing a final product. Basically, the materials that are imported represent part of the GDP from other countries, and the additional value added by U.S. companies, i.e., value added, is part of U.S. GDP. The opposite occurs, of course, if we ship materials to other countries for further manufacturing. However, this is a little too involved for a survey course.

You may sometimes see proposals for a value added tax. One argument in favor of a value added tax is that citizens may not be aware of it when they pay the final retail price and therefore will not feel as much aggrieved as they would if faced with an increase in the income tax. Now you will know what is meant when, and if, a value added tax is finally proposed. I should note that there are variations to the above model of value added.

GDP is currently measured by each of the first three methods of estimation described above by the U.S. Department of Commerce. Extensive data on measures of gross domestic product and its components are readily available on the internet. Estimates are not made using the value added approach. When, and if, you take a course in national income accounting, you will learn additional subcategories of expenditures under the broad categories described, and a new concept, Gross National Income, which is close, but not quite the same as GDP will be taught. Enough of this.

5. What problems are involved in using GDP as a *rough* measure of "well-being" of a population?

Notice the emphasis on "rough."

Clearly, our standard of living is based largely on the amount and quality of ***real*** goods and services that we physically produce. The more real goods and services we produce, the more people can consume (or save/invest). In the next unit of this course, we will discuss methods of measuring changes in ***real GDP*** over time. However, GDP, whether measured in real ***or*** money terms (as described above), is, at best, a rough measure of the well-being that accrues to citizens as a result of the production of goods and services. There are numerous productive activities not included in GDP and some omissions that people might question.

A. Barter: Almost everyone, at some time or other, engages in bartering one service for

another, or one good for another. A common example is taking turns driving each other to work or other locations. Taxi or bus fare would be included in GDP, but these bartered services, although just as valuable, would not. As another example, many people barter services, e.g., an exchange of computer services for auto repair which represent important and valued services but would probably not be reported as income. The problem is primarily that it is next to impossible to measure all of the bartered goods and services.

B. Some Illegal activities. Rarely are illegal activities reported to IRS, e.g., smuggling, drug sales, illegal gambling, tradesmen receiving cash payments for services that are not reported (although they are legally required to pay taxes on this income, which sometimes puts them in a difficult situation e.g., waitresses who do not report tips). Whatever you may think, in some sense of the term, these are productive activities that add to peoples' well-being, at least some people think they do.

B. **Income received in kind.** As one example, some farmers and other individuals grow some of their own food, most of which is not reported to the government (although again, they are supposed to do so if consumption is above a certain dollar value).   One might consider barter as a type of income in kind.

C. **Homemaking services**. This is a major omission from GDP. Some people would regard some aspects of homemaking services, such as child care, as far more valuable than the work performed by many people for pay. Consider what the current cost of child care is. It is included in GDP if provided by a child care provider, and not if provided by a stay at home parent. Of course, a major problem in including homemaking services in our measure of GDP is that we really do not know how to value most of them (although you can find many estimates, usually in Masters theses, most of which are absurd).

D. Home Schooling. Children who are home schooled receive valuable service. Given that close to 2 million children are home schooled in the U.S., this could easily represent an omission of $50 to $75 billion and perhaps much more

E. Other work performed around the home. Examples are mowing lawns, painting one's house, other home maintenance, fixing computers, etc. If the work is done by hired workers, the amount paid is supposed to be reported to IRS so that social security and other taxes are paid. If reported, the value of these payments to hired workers will be included in measures of GDP, e.g., using a lawn service, hiring a plumber or a mechanic, hiring a painter, etc. But if you do it yourself, it will not.

F. Negative factors: Not all productive activity that enters in measures of GDP improves general well being. For example, much production introduces pollution and other toxic agents into the environment which cause cancer and other diseases, pollutes streams, etc. Also consider whether a 2 hour commute to work each morning and evening, during which the value of cars is depreciated, gasoline is consumed, repair services are required, all (except car depreciation) of which enter into GDP, is really beneficial to peoples' well being or are, in fact, a cost of production and should be deducted from GDP. Another thought: should we subtract the value of the harm done to the planet, say global warming, from the value ascribed to production (Should we consider this harm as an external costs).

G. Value of leisure time: During people's leisure time, they often engage in unpaid activities such as reading a book, fishing, attending plays, playing poker with friends, etc. They are carrying on activities which increase their well-being, instead of earning extra money by working. One way to look at this is that a leisure time activity is production and consumption carried on simultaneously. Although a nation's goods and service are produced to enhance consumption, either immediately or in the future, the value of these consumption activities performed during a person's leisure time are not included in GDP even though the amount of leisure hours available to many people has increased dramatically during the last 100 years. Of course, one reason why they are not considered is that no one has the slightest idea how to put a value on them. But when you think about it, people ***do*** value leisure, and increasingly give up time they could be working (and making money and adding to GDP) in order to have more leisure.

These, and other, problems have been controversial for as long as I can remember. Despite these problems (and others), measures of GDP are immensely useful. They are reasonably consistent over time, and provide an estimate of how the productive capacity of a country has changed and enabled citizens to achieve higher living standards. Unemployment and inflation levels are correlated with nominal GDP, and changes in unemployment and inflation levels can be reasonably predicted from changes in nominal GDP. As long as you are aware that measures of GDP have shortcomings and what these shortcomings are, then you can impute your own estimates of the size of these shortcomings and make a rough adjustment for what you believe the real value of GDP should be.

6. What is Net Domestic Product (NDP)?

There are other measures of economic activity although GDP will be the principle measure that we will use in this course, and, as noted, the concept that you are most likely to come across in your reading.

 In the real world, most businesses wear out machinery, and sometimes production methods and/or technology become obsolescent. When capital is used up or becomes outdated, businesses charge this off to depreciation, i.e., capital consumption. If we subtract **capital consumption** (usually shortened to CC**)** from GDP, the total we arrive at is termed Net Domestic Product (NDP). Politicians do not use this figure too often, probably because GDP is by definition larger and makes better press.

NDP = GDP - Capital Consumption

Example: If GDP = 100, and capital consumption is 10, then NDP = 90 (Isn't this simple, but it illustrates the point). ***NDP is a concept you must remember***.

7. What is National Income (NI)?

National Income is an estimate of the income payments that actually go to resources (land, labor, and capital). ***Note If we measure GDP from the income side*** (bottom of the circular flow of resources) and then subtract capital consumption leaving W+INT+R+P+NFI+IBT), the total should sum to NDP. In other words, when we subtract CC from GDP measured from the uses side, and then subtract CC from GDP measured from the income side (the top and bottom halves of our measure of GDP using the circular flow of resource), we should get the same answer. We don't

because of *errors in measurement*, which are called **the statistical discrepancy** by the U.S. Department of Commerce. National income (NI) is simply NDP measured from the uses side minus the statistical discrepancy. Don't worry, I will not ask questions about the calculation of national income on examinations.

NI = NDP (from the uses side of the circular flow of resources) minus the statistical discrepancy.

8. What is Personal Income (PI)?

Some individuals earn income but do not receive it, e.g., money paid for social security, or retained earnings in corporations. Other people receive money, e.g., social security benefits, welfare payments, that they do not earn in the current year. You subtract the former from national income and add the latter to arrive at personal income (PI). This is the amount that individuals actually receive as income during the year, much of which they pay income taxes on.

9. What is Disposable Personal Income (DPI)?

DPI is PI after mandatory taxes, e.g., income taxes, property taxes, are paid. What is left is DPI, the amount that individuals actually have available to spend, or to save.

We will not be using measures of NDP, NI,, or PI. However, the concept of disposable personal income (DPI) is quite important as it is a major determinate of how much people will spend. Influencing the level of DPI is crucial to macroeconomic policy. That is why I went through the tedious process of going from GDP to DPI. Please understand what is meant by disposable personal income.

10. What do Households do with their income (W, R, I, and P)?

Well, clearly, they can spend on consumption ©, or they can save (S) or they can pay taxes (T). Since this represents all the alternatives available to people as to how they utilize their income, GDP can be represented as follows,

$$GDP = C + S + T + X$$

Note that the term X (exports minus imports) must be included so that the total = GDP.

We should note that just as inventory change is considered a part of investment, it is also considered as part of savings by economists. That is, if a producer adds to his or her inventory, this is considered both as an investment by that producer and a form of savings, whether intended or unintended, and is included in the above equation just as it was in GDP.

11. This leads to the following important (but tough to understand) relationship.

If we subtract the equation showing the uses that people make of factor payments (question 10 above) from the equation showing how GDP is divided among uses/expenditures in the economy (question 2) we arrive at the following:

$$GDP = C + I + G + X$$

$$GDP = C + S + T + X$$

Remember, inventory change is included in the I and S terms

Which equals: $I - S + G - T = 0$

or

$$I - S = T - G$$

or

$$I = S - (G - T)$$

If the government has a balanced budget, I will always equal S. In a high employment economy, if the government runs a deficit, then investment will often decline. In other words, large government deficits will ***crowd out*** (the term used in the text) some investment and decrease growth which some economists feel is one consequence of the enormous deficits we have been running.

 However, there are exceptions to this rule, primarily if the deficit is run in order to increase employment, which in turn may increase savings. We will discuss this further later. The other exception is when other countries provide aid, either by a loan or a gift, which can increase investment,.

Economists frequently assert that that S ***always*** equals I. However, we need to consider the two aspects of S and I, *ex post* and *ex ante* o*r intended and unintended.*

Ex ante (intended) investment and *ex ante* savings refer to what people intend to do. There is absolutely ***no*** reason for the amounts that people ***intend*** to save and to invest to be equal, in fact, they often are not.

Now let us consider savings and investment *ex post*. *Ex post* means after the fact. Investment *ex post* includes inventory change that is ***both*** intended and unintended inventory change as we discussed in methods of measuring GDP. Savings *ex post also* includes both intended savings as well as unintended savings. Consider, if intended savings were greater than intended investment, then, assuming that we have a balanced federal budget, inventories would necessarily rise (since sales targets would not be met) increasing actual investment. But if intended savings were less than intended investment, then inventories would necessarily fall (and actual investment would be less than intended).   Either way, I and S ***ex post***, would be equal, although this process may be a little too complicated for a survey class. When economists say saving will equal investment, they are referring to savings and investment ***ex post***, not **ex ante**, a relationship that was never taught in my economics courses and that I had to figure out while teaching classes..

Think of it this way. Assume, for the moment, that we do not have a government sector (now we go to a truly simple model). Everything that is produced must either be purchased (for consumption or investment) or go into inventory change. Once you eliminate consumption, whatever is left must either have been either used for intended investment, or have been placed in unintended inventory change and since it was not consumed, must also be considered as saved.

This distinction between *ex ante* and *ex post* savings and investment has confused students (and some professional economists) for as long as I can remember. ***Remember*** that in national

income accounting, we measure S and I *ex post*. *Ex ante* S and I will become critically important when we discuss ways of stabilizing the economy.

It may be confusing that inventory change is considered both as saving and investment which means that you need to think about this for a while.

It may be useful to think of G-T as government savings which can be either positive or negative.

Review Questions

1.. Define the term, "value added," as it applies to a business.
2. Name and explain two important items that contribute to social welfare that are not included in measures of Gross Domestic Product.
3. GDP = C + I + G + X. What do each of these terms represent. Suppose C = 100, I =30, G = 30, and X = -10. What are the values of GDP, NDP, and NY.
4. What is meant by the term "unintended inventory buildup?"
5. What are the largest omissions from measures of GDP in terms of activities contributing to peoples' well being? Give two examples.
6.. If C = 100, G = 50, I = 50, and X = -20, what is total GDP? If depreciation equals 40, what is NDP.
7. Since we consume more foreign goods that we export, do we add or subtract this difference in measures of the GDP of the U.S.
8. Why is it necessary to adjust for difference between imports and exports (as symbolized by the X term) when measuring GDP using the formula GDP = C + I + G + X?
9 . what is *ex ante* investment?
 10. What is *ex post* investment?
11. What is ex ante savings?
12. What is ex post savings?