NYU STERN

The Global Economy
Class Notes

Introduction to Macroeconomic Data

Revised: February 22, 2012

Gross Domestic Product (GDP) is our primary measure of macroeconomic performance: the total value of output produced in a particular economy over some period of time (typically a year or a quarter). Countries with high GDP per person are said to be rich, and those whose GDP has gone down are said to be in recessions. But what is GDP and how is it measured? We review its definition and construction below. Along the way, we also note connections among output, income, and expenditures, and explain how we separate changes in quantities from changes in prices.

The system that produces GDP and related numbers is known as the National Income and Product Accounts (NIPA). The national accounts are analogous to financial statements: they give us a picture of an economy, just as financial statements give us pictures of firms. Similar methods are used in most countries, so the numbers are (in principle) comparable.

Measuring GDP

GDP is the total value of goods and services produced in a given region, typically a country. In the US, for example, GDP was 11,004b US dollars in 2003: 11 trillion dollars. With a population of 291m (average for the year), that amounts to almost $38,000 per person. But where does this number come from? What does it mean?

The standard approach to measuring GDP is to add up the value produced by every firm or production unit in the economy. The question is how we separate value produced by one firm from value produced by another in an economy in which the value chain typically involves many firms. Walmart, for example, has enormous sales, but most of the value is already built into products by suppliers. As a concrete example, consider a fictional firm that assembles PCs from parts made elsewhere. Its only other expense is labor. Let's say that the firm's income statement looks something like this:

Sales revenue	40,000,000
Expenses	26,000,000
Wages	20,000,000
Cost of goods sold (parts)	6,000,000
Net Income	14,000,000

The question is how we measure this firm's contribution to output. The straightforward answer is 40m, the total value of its sales. But if we think about this a minute we realize that 6m of this was produced somewhere else, so it shouldn't be counted as part of the firm's output. A better answer is 34m, the value the firm has added to the parts. That, in fact, is the accepted answer: we base GDP on value-added, not sales. The value-added principle is applied throughout the NIPA: we compute value-added for every production unit in the economy and sum them to get GDP for the economy as a whole.

Another way to compute value-added is to sum payments to labor and capital. In this case we add 20m paid to workers (labor) to 14m net income paid to owners of the firm (capital). That gives us total payments of 34m, the same number we found above using a different method. Since this approach is based on the income received by labor and capital, we see that the value of production and income are the same. More on this in the next section.

Usually, when we compare the GDPs of two countries we presume that the country with the larger GDP produces more in some useful sense. But suppose they produce different goods. Suppose country A produces 10 billion apples and country B produces 10 billion bananas. Which produces more? We generally assume that if apples are worth more than bananas then country A produces more. The idea is that market prices tell us which are more valuable, apples or bananas. The same idea underlies our measurement of value-added. Suppose, to make this concrete, that the 40m sales of our fictitious company consists of 20,000 PCs at $2,000 each. Our presumption is that the market price of $2,000 reflects economic value and we use it as part of our calculation of GDP. In some cases this isn't so easy. In, say, North Korea, prices do not generally reflect market forces, so it's not easy to calculate economic values (although we know in this case that they're small). There are also some subtle issues in market economies about how to value non-market activities, like washing your own clothes, and "bads," like pollution. Typically neither is valued in the national accounts. We don't claim this is right, but it's what we do.

Example (salmon value chain). A fisherman catches a salmon and sells it to a smokehouse for $5. After smoking, the smokehouse sells it to Gourmet Garage for $10, which in turn sells it to a restaurant for $15. The same restaurant buys lettuce from a farmer at Union Square for $3. The restaurant puts the lettuce and salmon together on a plate and sells it to an NYU student for $25. How much does each production unit contribute to GDP? What is the overall contribution to GDP?

Answer. The contributions (value-added) are $5 each for the fisherman, smokehouse, and Gourmet Garage, $3 for the farmer, and $7 for the restaurant, for a total of $25.

Note that we could have computed GDP by counting only the value of the final good in the value chain. This is true in general: GDP can be computed as the total value

of final goods produced in the economy. Intermediate products (salmon, lettuce, PC parts) must then be ignored, as their value shows up at the end of the value chain.

We'll finish this section with two subtle issues. One is the treatment of government services. We generally treat government as a producer of value added and measure its output at cost. If we pay the mayor $100,000, that's counted as $100,000 of value added whether she does a good job or not. The other is that capital expenditures are not treated as intermediate inputs. Basically, we ignore them when we compute the value added of a firm. Why? Because the expense is balanced by an equal addition to the firm's value. With firms, financial statements do something similar: we spread the expense out over time in the form of depreciation. Here we measure output gross of depreciation so we ignore capital expenditures altogether as expense. It sounds a little strange, but that's what the national income and product accounts do.

Identities

Since every transaction has both a buyer and a seller, we can often approach any measurement problem from (at least) two directions. This gives rise to *identities*: relations that hold as a matter of accounting truth. They do not depend on any particular economic theory, and for that reason are extremely useful.

Income (Gross Domestic Product = Gross Domestic Income). We've seen the first identity already: output and income are equal. Let's go back to our PC assembler to see this in action, adding a few things to make it more realistic:

Sales revenue	40,000,000
Expenses	32,000,000
Wages	20,000,000
Cost of goods sold	6,000,000
Interest	2,000,000
Depreciation	4,000,000
Net income	8,000,000

In the previous section we computed GDP as value added of 34m. Here we compute GDI (I for Income) from payments to labor (20m) and capital (14m = 2m + 4m + 8m). The answer, of course, is the same.

Since we include depreciation in our measures of output and income, we refer to them as *gross* — gross of depreciation. In principle we could compute Net Domestic Product by subtracting depreciation, but most people stick with GDP because economic depreciation (as opposed to what shows up on financial statements and tax returns) is difficult to measure.

The national income and product accounts do this at the aggregate level: namely, measure output by adding up payments to inputs. By construction, then, output and income are the same.

Expenditures (Gross Domestic Product = Gross Domestic Expenditure). Our second identity comes from the perspective of expenditures on final goods — the last stage in the value chain. We distinguish both who buys them (consumers, firms, governments, or foreigners) and whether they are consumption or investment. The most common decomposition of this sort is: GDP equals consumer expenditures C by households plus business investment I plus government purchases of goods and services G plus net exports NX; in more compact notation,

$$Y \;=\; C + I + G + NX.$$

We refer to this as the expenditure identity. On the left, Y is the letter we use for GDP. (It's not clear where Y comes from, but that's what we do.) On the right are the expenditure components of GDP. The point is that they two are equal: everything that's produced is sold — to someone. (And if it's not sold, we call it an addition to inventories and include it in I.)

We refer to C as (personal or household) consumption. Investment (I) is primarily accumulation of physical capital by firms: purchases of new buildings and machines, plant and equipment in the language of national income accountants (two-thirds of the famous PPE and capex of financial accounting). In some sources, this activity is referred to as "gross fixed capital formation." Investment includes, as noted, additions to the stock of inventories, a category that is small on average but highly variable. Government purchases G consists of spending on goods and services (mainly wages) for both consumption and investment purposes. It does not include government outlays for social security, unemployment insurance, or interest on the debt. We think of these, instead, as transfers, since no goods or services are involved. [A fine point for aficionados: in come countries, I includes investment by government, which is therefore excluded from G. Either way works, as long and you're consistent about it.] Net exports (NX) is exports minus imports: the trade balance, in other words.

Flows of funds. The expenditure identity follows the goods, but you can also follow the "money" (the financial funds) that goes along with the goods. For households, you might think about how income compares to consumption. If it's higher, we call what's left saving, which is a source of funds that can be used by others. We might also think about how firms finance investment in new plant and equipment. They might, for example, raise funds in capital markets from households.

Let's be specific. We'll look at two similar relations, both based on the expenditure identity. One is

$$S \;=\; Y - C - G \;=\; I + NX,$$

where S is (gross domestic) saving. You might think about how to derive this from the expenditure identity. This is a consolidated measure of saving in which we subtract both household and government expenditures from income. It's also a gross measure since income (GDP) includes deprecation. Investment is also gross, so the two sides of the relation balance. The other relation separates household and government activities:

$$S_p + S_g \equiv (Y - T - C) + (T - G) = I + NX,$$

where T is taxes collected by the government net of transfer payments and interest, $S_p = Y - T - C$ is (gross) personal saving, and $S_g = T - G$ is government "saving" (the negative of the government deficit). Clearly S_p and S_g are two components of national saving S.

What do these relations tell us? Roughly speaking, the left side is a source of funds and the right a use of funds, and sources and uses balance. In the first version, saving is a source of funds that can be used can purchase corporate securities (which finance new investment by firms in plant and equipment) or foreign securities (which finance a trade deficit by the rest of the world if NX is positive). If net exports is negative, it's the reverse of course: we sell securities to the rest of the world, which is then a source of funds. In the second version, household saving can be also be used to purchase government securities (if government saving is negative).

Example (PC assembler, continued). Suppose 10m of the 40m sales are sold abroad. If this is the only firm in the economy, what are Y, NX, C, and S? Assume investment and the government deficit are zero.

Answer. GDP remains 34m: production hasn't changed. Net exports is exports (10m) minus imports (6m) or 4m. With no investment or government deficit, the 30m of local sales must be consumption. Saving is therefore 4m = 34m – 30m (income minus consumption). The flow identity then tells us that saving of 4m is used to purchase 4m in foreign securities. stated differently, the rest of the world (everyone but us) must have a trade deficit of 4m, which they finance by borrowing from us (the saving we mentioned).

Distinguishing prices from quantities

You'll see various versions of the terms *real* and *nominal* GDP. Nominal GDP measures output in dollars (or local currency units), real GDP measures the quantity of output once overall changes in prices have been (somehow) taken out. A *price index* or *deflator* is a measure of the overall level of prices — what we call the *price level*. If the price level rises over time, we say the economy experiences inflation; if the price level decreases, the economy experiences deflation.

The question for this section is how we separate changes in quantities (real GDP growth) from changes in prices (inflation). The former is good (we have more stuff), but the latter is bad (prices are going up), so it makes some difference to us which we have. Like sales, GDP and related objects are values: products of price and quantity. You might well ask: how much of a change in value is a change in quantity, and how much a change in price? With one product, the answer is easy. With more than one, you need to average the prices or quantities somehow, and (sad to say) there's no obvious best way to do this. There are instead many ways to do it, and they give us different answers. We'll charge ahead anyway, but it's something to keep in mind.

One difficulty in separating prices and quantities is that prices of specific products change in different ways, and it's not clear how to average them to get a measure of "overall" prices. Two sensible approaches, known as fixed-basket and fixed-weight, respectively, give different answers. In practice this isn't a huge problem (the answers usually aren't much different), but it adds another element of fuzziness to macroeconomic data. The issue is that the economy has many goods and services whose prices and quantities change by different amounts over time. If all prices rose by 10% between last year and this one, we would say inflation is 10% and divide this year's nominal output by 1.10 to get real output. But when prices of different products change by different amounts, things aren't that easy. The Consumer Price Index (CPI) is based on a fixed-basket approach: it measures the change in the price level as the change in the total cost of a given basket of products (two quarts of milk, one hamburger, five newspapers, etc). The difficulty here is that people change what they consume over time, partly in response to price changes, partly because tastes and products change. Should we use last year's typical basket or this year's? The GDP deflator is based on a fixed-weight approach, and is constructed in two steps. We first compute a measure of real GDP by evaluating (typically different) expenditure quantities at constant prices. The price deflator is then the ratio of nominal to real GDP. The difficulty is again that prices change over time: should we use last year's prices or this year's?

Fixed-basket approach. The CPI indicates the change in the total cost of a basket of goods and services that is representative of a typical household's spending habits at a given date. Such a basket might include, say, five gallons of gasoline, one haircut, two pounds of chicken, three bottles of soda, and so on. Government statistical agencies do this by sending people to stores to check the prices of all the products in the basket. The CPI is the cost of the whole basket, normalized to equal 100 at some date. It's the same idea, really, as the Dow Jones Industrial Average or the S&P 500. Producer price indexes apply a similar methodology to goods purchased by firms. An example shows how the fixed-basket approach works.

Example (fish and chips). Consider an economy with two goods, fish and chips. At date 1 we produce 10 fish and 10 chips. Fish sells for 25 cents and chips for 50 cents. At date 2 the prices of fish and chips have risen to 50 cents and 75 cents, respectively. The quantities have changed to 8 and 12. We summarize the data in this table:

Date	Price of Chips	Quantity of Chips	Price of Fish	Quantity of Fish
1	0.5	10	0.25	10
2	0.75	12	0.50	8

Note that the two prices have not gone up by the same amount: the price of fish doubled, while chip prices only went up by 50 percent. Another way to say the same thing is that the relative price of chips to fish has fallen from 2 (= .50/.25) to 1.5 (= .75/.50). What is the inflation rate?

Answer. We construct the CPI using date 1 quantities. The index is

Date	CPI
1	$7.50 = .50 \times 10 + .25 \times 10$
2	$12.50 = .75 \times 10 + .50 \times 10$

The inflation rate by this measure is 66.7% (1.667 = 12.50/7.50). Since nominal GDP growth is 73.3%, real GDP growth is 4%. In fact:

$$\gamma_Y \;=\; \frac{1+\gamma_{NY}}{1+\pi} - 1 \;=\; \frac{1+0.733}{1+0.666} - 1 \;=\; 0.04.$$

By convention, the CPI in the base year (year 1 in this case) is normalized to 100. Normalizing is straightforward: just divide all the values of the CPI by its value in the base year and multiply by 100. In our example, the index is 100 in year 1 and 166.7 in year 2.

Fixed weight approach. Price deflators are typically computed from the ratio of GDP (or other expenditure component) at current and base year prices, nominal and real GDP, respectively. Over several periods, this fixed-weight approach applies a constant set of prices to changing quantities. As before, this is easiest to see in an example.

Example (fish and chips, continued). GDP at current prices and date 1 prices is:

Date	Nominal GDP (current prices)	Real GDP (date 1 prices)
1	$\$7.50 (= .50 \times 10 + .25 \times 10)$	$\$7.50 (= .50 \times 10 + .25 \times 10)$
2	$\$13.00 (= .75 \times 12 + .50 \times 8)$	$\$8.00 (= .50 \times 12 + .25 \times 8)$

The GDP deflator (the ratio of nominal to real GDP) is 1.0 in year 1. This is trivial, as nominal and real GDP must coincide in the base year. In year 2, the deflator is 1.625 = 13/8, implying an inflation rate of 62.5%. Note the difference from the inflation rate computed with the CPI.

In short, different approaches lead to different measures of inflation. The conceptual difficulty with both methods is that it's not clear how to measure the price level when relative prices are changing. What can we do? We content ourselves with the knowledge that the differences are typically small, and remind ourselves that macroeconomic measurement (like financial accounting) is as much art as science.

Fine points

Some other issues you may run across, all of them important, but not so important you need to commit them to memory:

Causality. You might be tempted to interpret identities as saying that one side of an identity causes the other. Don't be. For example, you might hear someone say that low consumption is causing low output ("we need consumers to spend more"). However, the identity says only that if output goes down, then so must one or more of its components. No causality is implied. We could as easily say that consumption falls because output did. The point is not that there is no causal connection, but that no such connection is built into the identity.

Underground economy. Standard GDP figures do not include the value of goods and services produced by the so-called "underground" economy. This term generally refers to businesses that are not licensed to operate, such as sellers of counterfeit CDs in the streets of Bangkok, and businesses evading either income or social security taxes, such as Southern Spain's farms employing illegal immigrants as day laborers. Such activity is generally not reported, and therefore does not show up in official statistics. In advanced economies such as the US and Japan, the size of the underground economy is thought to be small. But in developing countries, such as Peru and Lebanon, it has been estimated to be as large as 50% of official estimates of GDP.

Capital gains. We've seen that GDP reflects income, but there are kinds of income that are not included in GDP. The prime example is capital gains: they are part of your income, but do not show up in GDP because they do not reflect (at least not directly) the production and sale of current output. And since they're not in GDP, they're not in saving either. One curious result: net worth can rise even when saving is zero. In the US, capital gains are a larger fraction of changes in net worth than saving. For similar reasons, GDP does not include interest on government debt. Why? Because it isn't a payment made for producing goods and services.

GDP v. GNP. While GDP measures output produced within the borders of a given country, Gross National Product measures output produced by inputs owned by the citizens of that country. For example, to compute Bangladesh's GNP, we need to add to GDP the income paid to Bangladeshi capital invested abroad and subtract income paid to capital installed in Bangladesh but owned by citizens of other countries. Similarly with labor: we need to add the wages earned abroad by Bangladeshi people and subtract the wages earned in Bangladesh by foreign nationals. Thus GNP is a measure of the income received by "locally-owned" labor and capital. In most countries, the differences between GDP and GNP are small. One exception is Ireland, where a large amount of foreign capital makes GNP significantly smaller than GDP (by about 20% last time we looked).

Net exports v. current account. You may hear people refer to the US "current account" deficit. What are they talking about? The current account (we'll label this *CA* later in the course) is net exports (the trade balance) plus net receipts of foreign capital and labor income plus miscellaneous transfers from abroad. In the US there's little difference, but see Ireland, above. We'll generally use the terms current account, net exports, and trade balance as synomyms. Current account sounds a little cooler, and can be used to make people believe you're an expert.

Chain weighting. The US — and many other countries, too — now uses a method that's somewhere between fixed-weight and fixed-basket methods: chain-weighting. It mitigates some of the problems of applying the same prices over long periods of time (when relative prices often change dramatically), but doesn't eliminate them. If we told you exactly what it is, your eyes would glaze over. But trust us, it's an improvement.

Prices and quality change. Many people feel that price indexes do not adequately account for increases in product quality. As a result, price increases are (slightly) overstated, and quantity increases are understated. Separating prices from quantities is particularly difficult with services, where the quantity produced is inherently difficult to measure. (It sounds like the start of a joke: How can you tell when a lawyer is more productive?) Our best guess is that this adds about 1% to the inflation rate: that is, inflation is probably about 1% lower than reported. Not a lot, but it adds up over time.

Expenditure deflating. In most countries, real GDP is computed by applying price deflators to final goods, typically the expenditure components. This isn't really real GDP, it's real GDE (gross national *expenditure*). The two are often similar, but need not be if production is largely exported. As an extreme example, Saudi Arabia produces oil for export. If we adjust GDP for changes in prices of Saudi purchases (food, shelter, imported cars and electronic equipment), then an increase in the price of oil can lead to an increase in real GDP, even if the quantity of oil produced hasn't changed. An alternative is to adjust production quantities directly for price changes, which some countries do.

PPP adjusted data. When we compare output across countries, people have noticed that if (say) the euro increases in value relative to the dollar, then it appears that Europeans have become richer than Americans. We say "appears" because we haven't taken into account that dollar prices of non-tradable goods such as hair-cuts and car-washes are typically higher in Europe when the euro is strong: in other words, this is a change in prices, not quantities. A similar issue arises when comparing GDPs of a rich country like Germany and a developing country like Botswana. If we use local prices and simply convert them to dollars or euros at the spot exchange rate, Botswana will look poorer that it actually is, because local prices of many basic goods are much lower in Botswana. The state-of-the-art way to address this issue is

to apply the same prices to output in both locations to produce "purchasing power parity" based output measures. The logic is the same as with the GDP deflator, but the comparison is across countries rather than across time.

Seasonal adjustment. Quarterly or monthly data often exhibits systematic variations by season. Quarterly GDP, for example, typically has a sharp increase in the fourth quarter (holidays). Most macroeconomic data has been smoothed to eliminate this seasonal variation. The same thing happens with business data: analysts often report changes relative to the same period the year before, which will take out any constant seasonal effect.

Executive summary

1. GDP measures the total value of production measured at market prices, the sum of value-added by every production unit in the economy.
2. Identities.
   - Output (GDP) = Income (payments to labor and capital, gross of depreciation).
   - Output (GDP) = Expenditures (purchases of goods): $Y = C + I + G + NX$
   - Flow of funds (how is investment financed?): $S = I + NX$
3. We use magic to separate changes in quantities from changes in prices:
   - Quantity indexes, like real GDP, measure the overall movement of quantities.
   - Price indexes measure the overall movement of prices.

Review questions

1. Company A sells 4 tires to Company X for 400. Company B sells a CD player to Company X for 300. Company X installs both in a car, which it sells for 5000. What is the total contribution to GDP of these transactions?

   Answer. The contribution to GDP is 5000, 400 from A, 300 from B, and the rest from X.

2. Place each transaction into the appropriate expenditure component of US GDP:
   (a) Boeing sells an airplane to the Air Force
   (b) Boeing sells an airplane to American Airlines
   (c) Boeing sells an airplane to Virgin Atlantic airline

(d) Boeing sells an airplane to Halle Berry

(e) Boeing builds an airplane but fails to sell it

Answer.

(a) G – It's a government purchase, as the Air Force is part of the Federal Government

(b) I – It's investment, as American Airlines will use the aircraft as capital good

(c) NX – It's export, since Virgin Atlantic is incorporated in the United Kingdom

(d) C – It's consumption (durable consumption), because Halle Berry will use the plane for her personal travel, and not as capital good

(e) I – It's investment, because the plane will increase Boeing's inventory of unsold products

3. The following data describe the NYU economy:

	Prices			Quantities		
Year	PCs	Pizza	Beer	PCs	Pizza	Beer
2000	100	10	5	25	100	250
2005	50	20	15	50	125	200
2010	25	30	30	100	150	150

(a) Compute real and nominal GDP and the GDP deflator using 2000 as the base year.

(b) Compute the CPI using 2000 quantities as your basket.

Answer. The numbers are

Year	Nominal GDP	Real GDP	Deflator	CPI	Base = 100
2000	4750	4750	100.00	4750	100.00
2005	8000	7250	110.34	7000	147.37
2010	11500	12250	93.88	11125	234.21

The point is that different methods give different answers. This is most striking if we compare the fourth and last columns. The last one is the CPI, indexed so that it's value is 100 in 2000. Note that the deflator has prices going down in 2010, the CPI has prices rising — a lot! The reason is that the CPI has a fixed basket, and doesn't account for the substitution effect: our tendency to buy more PCs as their price falls.

4. This problem was suggested by Frederic Bouchacourt, MBA 09. The issue is how we deal with investment and depreciation; we need to make sure they show up in output, expenditures, and income the same way so that we get the same GDP number all three ways. Imagine an economy with 3 companies, named D, E, and F, who operate over years 1 and 2 as follows:

   - D produces apples and sells them to F for 10 dollars in years 1 and 2. This 10 dollars is paid to workers.
   - E builds a machine to can apples and sells it for 10 dollars to F in year 1 and does nothing in year 2. It pays its workers 10 in year 1, nothing in year 2.
   - F buys apples from D for 10 dollars in years 1 and 2 and buys a machine to can apples from E for 10 dollars in year 1. F pays its workers 10 each year. With the help of this machine, F produces canned apples in years 1 and 2 that are sold to final consumers for 30 dollars in each year. The machine is amortized equally over the two years: 5 per year.

   In this economy:

   (a) What is GDP in years 1 and 2?

   (b) What are consumption and investment?

   (c) What are capital and labor income?

   (d) What is net domestic product in each year (GDP minus depreciation)?

   Answer.

   (a,b) We can find GDP two ways: as value-added (summed across producers) or as expenditures (summed across categories). If we compute value-added for each firm and sum, we have

	Year 1	Year 2
Firm D	10	10
Firm E	10	0
Firm F	20	20
GDP	40	30

   Note that investment does not count as part of the cost of materials: that's the way the national accounts work. It's similar to financial accounting: we don't consider new plant and equipment ("capex") an expense, although we may include depreciation of existing capital. The latter doesn't show up here, because we measure output gross of depreciation.

   If we look at the expenditure identity, we have consumption C of 30 each year (canned apples) and investment I of 10 in the first year only. Expenditures add to 40 the first year, 30 the second, so we get the same answer.

(c) Value-added is payments to capital and labor. Since we know value-added and payments to labor, payments to capital are the difference. Payments to labor are 30 in year 1, 20 in year 2. In year 1, capital receives $(10 - 10) + (10 - 10) + (20 - 10) = 10$, of which 5 is depreciation. In year 2, capital receives $(10 - 10) + 0 + (20 - 10) = 10$, of which 5 is depreciation.

(d) Net domestic product is GDP minus depreciation. Since depreciation is 5 each year, NDP is 35 (=40–5) the first year, 25 (=30–5) the second. Effectively, we've subtracted off the cost of the investment, but unlike other material costs, we do it over time rather than all at once. That's the logic of amortization: to spread the cost over time, since the benefits are presumably spread the same way. You can also calculate net domestic income just as we did gross domestic income, except that you subtract depreciation from capital income each period. That way, net domestic product equals net domestic income.

5. Find the appropriate data for the US income and expenditures from the BEA's online interactive tables, particularly Tables 1.10 and 1.1.5.

   (a) What are the expenditure components of GDP? How does the official version differ from ours? What is the share of consumption in Gross Domestic Product?

   (b) What are the components of Gross Domestic Income? How does the official version differ from ours? What is the share of labor compensation in Gross Domestic Income?

   (c) Are Gross Domestic Product and Gross Domestic Income the same? Why or why not?

If you're looking for more

Most macroeconomics textbooks cover similar material. If you're interested in how measurement issues affect international comparisons, here are two particularly interesting papers on the subject:

- Rob Feenstra, Hong Ma, Peter Neary, and Prasada Rao, "Who shrunk China?," describe the impact of various measurement issues on estimates of China's GDP.
- Chad Jones and Pete Klenow, "Beyond GDP," look at the relation between GDP per person and various other measures of individual welfare.