How to Measure a "Giant"?

A Short Guide to Gross Domestic Product Figures

By Steven F. Jackson

Instructors in political science, history, and area studies have long known that the rapid economic growth of Asian countries is one of the most important world trends to teach students. Political scientists and international relations experts regularly view a country's economic size as a reflection of its international power. The size of the economy helps set military budgets and acquisitions, foreign aid, and public diplomacy. These capabilities help a country influence other countries, or to resist counterinfluences against its interests. The growth of economic power is the subject of great concern in international relations; indeed, theories called "The Thucydides Trap" and the "Power Transition" both warn that conflict between the United States and China is likely because China is surpassing the US in its economic size, just as the rapid growth of Athenian power caused alarm in ancient Sparta. Economic size and growth are part and parcel of power, both international and domestic, and the statistic most often used to measure economic size is gross domestic product (GDP), the total of economic activity in a country. GDP divided by the population (per capita), in turn, is often used as a very rough metric of a nation's economic welfare.

But in teaching the matter, instructors are faced with at least two different ways of measuring and comparing countries' GDP: purchasing power parity (PPP) and market exchange rate (sometimes abbreviated MER). If instructors were to go to the World Bank's World Development Indicators database, they would be faced with dozens of options for measuring GDP, with no clear indication of which to choose in teaching about different countries. This guide is meant to briefly outline the differences between these measures, their development, the challenges in their accuracy, and the implications of using one measure over the other.

As an example of the challenge of choosing between these two measurements, consider these two statements from the CIA *World Factbook*, one of the most commonly used references for countries' basic data, which gives two seemingly contradictory measurements of the size of China's economy:

China had a GDP of US $23.21 trillion in 2017.

China had a GDP of US $12.01 trillion in 2017.

The first figure is almost twice that of the second figure, yet are for the same country, concept, and year. That is because the first figure uses PPP-based GDP, and the second uses MER-based GDP.

Gross Domestic Product

GDP is a measure of the value of all the goods and services that are made inside the territory of a country during a year. GDP is estimated by government agencies using surveys of firms, banks, employers, and other methods. In the USA, the Bureau of Labor Statistics does the surveying and the Department of Commerce calculates and publishes the figures. They also work backward to see if their previous estimates were accurate and publish corrections. It is an estimate, albeit the one that is most frequently used in describing the economic size of a country or region, and the economic welfare of its inhabitants. Leaders, governments, media, academics, and economists all pay enormous attention to this number. Its year-to-year increase is what all these people mean when they talk about "growth": either overall GDP growth or per capita GDP growth, either "real"—adjusted for inflation —or "current"—not adjusted for inflation. This economic growth has created two Asian giants, Japan and China, and is creating another, India. But how we assess how big those giants are is affected by which method we use to measure them.

The idea of using a single number to represent all national economic activity came about during the Great Depression, when both British and American policymakers wanted to know precisely how bad it was, and economists began to develop estimates of national income. What was to be included in this number was controversial then and controversial now. Simon Kuznets, working in America, thought the number should not include armaments, since these were "waste" in the perspective of 1937. Two years later, with a war on, they were very relevant, and by 1942, the first measure of gross national product—similar to but not identical to GDP—was born.[1] And so were also born endless debates about what should or should not be counted in GDP (for more on the history of the statistic, see Diane Coyle's highly readable treatment in *GDP: A Brief but Affectionate History*).

After the war, with Marshall Plan aid flowing to the ruined and exhausted economies of Europe, the need to have GDP figures for these countries became important, since American and European leaders wanted to know if the program was working: were the economies of these countries growing, as measured by their per capita GDP? To answer this question, the Organisation for European Economic Cooperation (OEEC) was created in 1948 to administer and track the aid and to measure the recipient economies. This became the Organisation for Economic Cooperation and Development (OECD) in 1961, which remains one of the most important sources for economic statistics such as GDP and, as we will see later, PPP. The OECD was famously involved in the economic growth of Western Europe and, less famously (but importantly for our purposes here), in the improvement and standardization of economic statistics for the member states of what became the "Rich Countries' Club." But statistics must change to continually capture the changing and evolving economy and the importance of sectors. In China, agriculture is 7.9 percent of the GDP. In India, it is 15.4 percent. In the USA, it is only 0.9 percent. At an even smaller level of detail, statisticians must deal with trends such as the rapidly growing importance of computers and cellphones, and the declining importance of shopping malls. Thus, economic statisticians must change the way in which they estimate GDP, and the OECD and its members' national statistical offices need to agree to use the same new approaches so these countries are all measuring the same way and with the same definitions.

Along Comes Purchasing Power Parity

All countries calculate their own economic size in their own currency units: dollars, rupees, yen, or yuan. But in order to compare countries and their relative economic size, we need a standard currency, and despite its challenges, the US dollar is used as a common standard of measure. Until 1971, currency exchange rates were fixed. Now, however, when dollars are exchanged for rupees or yen, they are exchanged at a rate that fluctuates from day to day and year to year. But it is fairly straightforward to find an average exchange rate for 2018 (US $1 equals ¥110.34), multiply Japan's economy's GDP in yen (¥548 trillion in 2018) times that number, and come up with a figure of US $4.86 trillion. That is what is meant by "exchange rate" or "market exchange rate" in GDP figures. That exchange rate reflects that nation's goods that are internationally traded such as automobiles, clothing, and cellphones, but there are large portions of a country's economy that are not traded internationally: public services, housing, haircuts, water supply. The exchange rate-based GDP calculation was the method used from the 1950s until the 1990s

and works fairly well to calculate the relative size of OECD countries' economies, both because these countries share similar characteristics—advanced industrial democracies, large service segments, high levels of trade—and fairly standardized statistical approaches and bureaus.

When comparing developing countries, however, things get trickier. Table 1 below shows GDP estimates by the CIA and the World Bank for four "giant" economies: China, India (developing economies), and Japan, with the USA for comparison (developed economies), both in absolute size and in per capita terms.

GDP Comparisons of China, India, USA and Japan, 2017 (trillion US$)

	CIA: GDP Exchange Rate	WB: GDP Exchange Rate	CIA: PPP	WB: PPP (current)	CIA: PPP per capita	WB: PPP per capita
China	$12.01	$12.14	$23.21	$23.26	$16,700	$16,782
India	$2.60	$2.65	$9.47	$9.60	$7,200	$7,169
USA	$19.49	$19.48	$19.49	$19.48	$59,800	$59,928
Japan	$4.87	$4.86	$5.44	$5.32	$42,900	$41,959

Table 1: Sources: *CIA World Factbook* 2020; *World Bank World Development Indicators* 2020.

Although there are small discrepancies between the CIA and World Bank within the categories due to methodological differences, the big difference is between the MER- and PPP-based measurements. The two agencies' figures each show the same pattern: GDP at exchange rate is much lower than at PPP for China and India, somewhat lower for Japan, and almost identical for the USA. If we were to add other countries to the list in Table 1, it would reveal much the same pattern: GDPs at exchange rate are much lower for developing countries than at PPP. But unfortunately, it is not a single, simple ratio for every country or every year.

The problem with using the exchange rate to estimate a nation's economic size is that prices tend to vary across countries even after we have converted them to a common currency. Anyone who has traveled overseas knows that prices for very similar goods at home can be very different abroad. A hamburger in Europe can be very expensive, but a haircut in India can be very cheap. Typically, the cost of living in developing countries is much cheaper than in developed countries, but that is not true across the board; imported goods are often extremely expensive in developing countries for various reasons. This is an issue that has long frustrated economists. What was needed was a measure that used tangible goods that everyone uses as the metric. This "basket" of standard goods measures value of a lifestyle: some housing, some food, electricity, clothing, and some services such as Internet connection. This is the idea behind PPP. The idea has been around for a long time, but the implementation can be difficult. The first figures for GDP based upon PPP conversions were published in 1954, which only compared advanced industrial democracies. The effort grew and resulted in the World Bank's International Comparison Project and the Penn World Table, which were among the first efforts to calculate PPPs for all countries. The World Bank handles the PPPs of the world outside of the OECD. Notable for historians is Angus Maddison's project to find historical GDP data going back 2,000 years (see bibliography). But like other economic statistics, there has been a constant effort to improve the estimates, so the standard basket of goods it uses has changed. Now the OECD's basket of goods is quite large: 3,000 consumer goods and services, 200 types of equipment goods, and fifteen construction projects, among others.

Including large developing nations' GDP such as China's and India's in these PPP calculations did not happen overnight, nor was it smooth. Those countries have very different economies than American or European economies, with larger agricultural sectors and smaller service sectors. Another part of the problem was that many developing countries were not doing the kind of large-scale price surveys that OECD countries conduct to create the benchmark parity numbers. World Bank surveys in 1985 covered sixty countries, including India but not China. In 1993, a total of 110 nations participated, and this time neither China nor India took part. Finally, in 2005, India, China, and 141 other countries took part. When countries do not participate or provide incomplete information, economists will often estimate the numbers with varying degrees of accuracy. But when the 1993 estimates of China's PPP (based upon relatively wealthy Shanghai) were announced by the World Bank, China quadrupled its GDP and was suddenly launched into the position of the third-largest of national economies. But in 2007, when China participated in the price survey and price estimates included rural areas as well as Shanghai, the World Bank recalculated China's GDP in PPP downward by 40 percent and India's downward by 36 percent. Clearly, the PPP needed some fine-tuning for the developing countries, and as these countries improved their statistical capabilities, PPP numbers improved.

The Politics of Numbers

PPP and other ways of estimating the comparative size of economies remain controversial, as economic statistics always are. For some countries, the size of GDP is linked to its sense of importance in the world. When China's GDP at exchange rate passed Japan's in 2010, Japanese commentators bemoaned

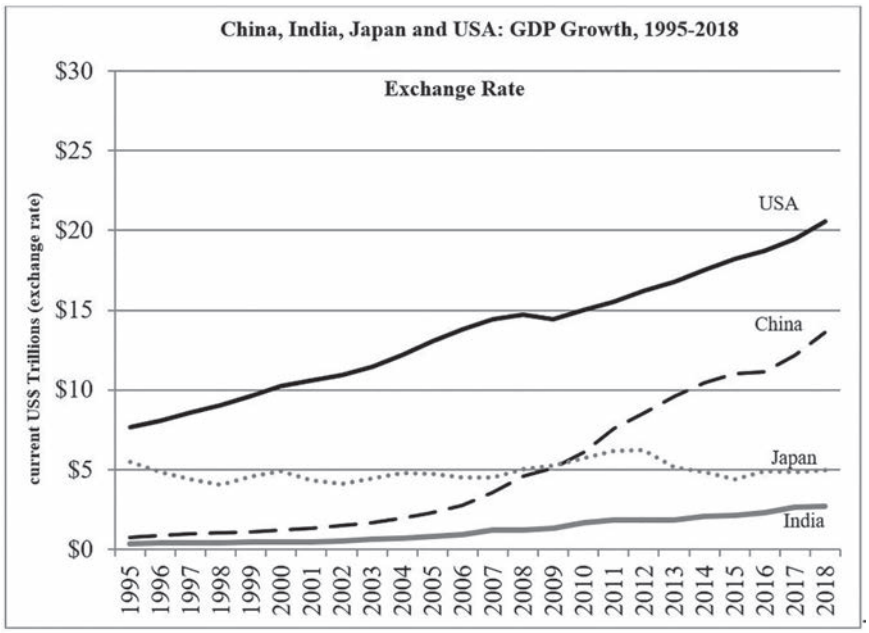

Figure 1: China, India, Japan and USA: GDP Growth 1995-2018 in Exchange Rate.
Source: *World Bank World Development Indicators*, 2020.

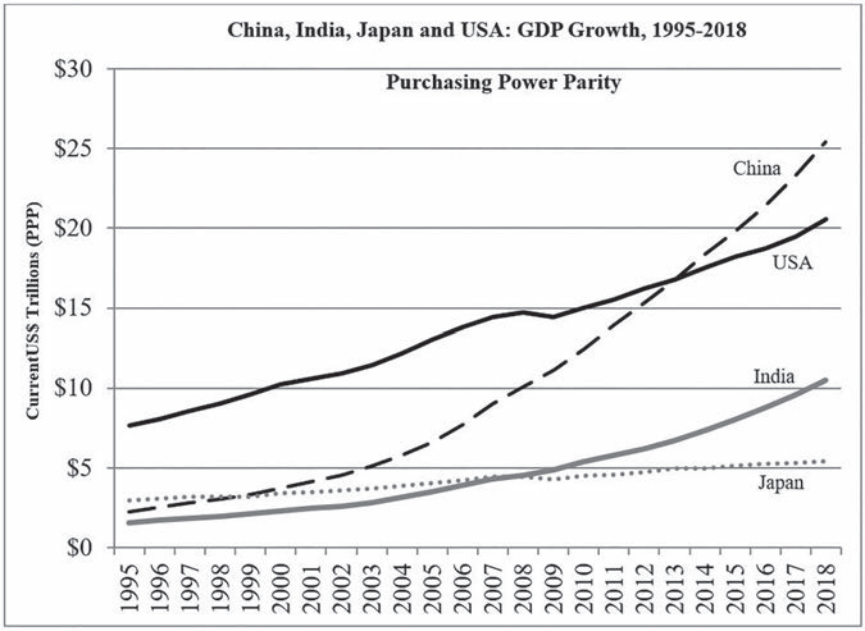

Figure 2: China, India, Japan and USA: GDP Growth 1995-2018 in Purchasing Power Parity.
Source: *World Bank World Development Indicators*, 2020.

that country's "GDP defeat." When Nigeria's GDP passed its regional rival South Africa's as "Africa's largest economy" in PPP in 2013, it boosted that country's collective ego, only to lose the title in 2016.

But developing countries sometimes dislike PPP-derived figures: they negatively affect the ability to get World Bank and other concessional loans and official development aid. These figures are always calculated in per capita terms, and as seen in Table 1, China may have the largest total economy in the world, but divided by 1.3 billion people makes Chinese only middle income. China apparently argued with the World Bank in 2000 that its per capita income was still low enough to qualify for loans. Ghana in 2010 went from a "low-income" country to a "low-middle income" country overnight simply because the numbers were recalculated.

Not only is development aid affected by changes in GDP estimates, in some cases they have direct bearing on foreign policy. If the USA is cutting its oil trade with Venezuela to push that country's government to "the edge," it is important to know exactly how close the Venezuelan economy is to the edge in the first place. Yet these questions are often where the statistical data are poorest—countries that are opaque or incomparable to others. The only GDP figure for North Korea can be found in the CIA World Factbook, which extrapolated it from the Maddison Project, and it has been the same number for years: US $40 billion. No other statistical agency even hazards a guess. Thus, a calculation of the success of economic sanctions on North Korea is often based on a very questionable guess at the state of the North Korean economy prior to the sanctions. The controversies of estimates were particularly acute for the CIA in the late 1980s: the question of how large the Soviet economy really was. This was particularly difficult to estimate because the Soviet leadership itself only had a hazy idea and counted its economy in another form—net material product—which is quite different from the prevailing GNP of the day. The late columnist William Safire was convinced that the CIA was entirely too generous in its estimates of Soviet GNP and went so far as to call the agency's estimates an "intelligence fiasco." [2]

Statistical fudging by government economists and statisticians in order to please higher-ups continues, and some economists believe that China's officially reported GDP (in yuan) is somewhat overstated in several ways. First, there is pressure for provincial leaders to report good news upward, and so the numbers are rounded up and then rounded again. Another characteristic of Chinese GDP numbers is that they are suspiciously smoother than most countries' which normally have much more periodic variation. China admitted that some of its provincial numbers were suspect in 2017, and the Chinese National Bureau of Statistics is taking the challenge seriously. India is also working with the World Bank to improve its central and state statistical capacity. But as long as political leaders want to shape the news, there will be pressure on statisticians to announce numbers that fit the script.

Which Number to Choose?

The effect of using exchange rate- or PPP-based measurements can be fairly dramatic when we compare the four giant economies of China, India, Japan, and the United States, as seen in Table 1. If we plot the number across time, the trends are enormously different. Consider the two figures on this page. The first shows these four countries' economic growth measured in GDP at exchange rate from 1995 to 2018.

Figure 1 might be reassuring to those American policymakers who fear that China is overtaking the USA. It shows the USA is still substantially ahead of China's economy, a difference of almost US $7 trillion. The "Lost Decade" of Japan and its problems after the 2011 Tōhoku earthquake/tsunami/nuclear disaster seem clear by the ups and downs of Japanese GDP, which ends in 2018 slightly below where it began in 1995. India, however, is the smallest of the four but appears to be growing, albeit not spectacularly. Contrast those narratives with Figure 2, which shows the same countries' GDP in PPP-based calculations:

The change that results from using the PPP-derived data is quite remarkable. China passed the USA in GDP in 2013; international relations scholars and American foreign policy experts view that chart with grave concern,

implying both that China has greater GDP and thus more potential power than the USA does, and that historically the period in which a rising power overtakes an established power is one likely to see a great power war. India, which had barely shown a rise in GDP in exchange rate, now has quadrupled its GDP and seems to be accelerating. Japan's rocky ups and downs in exchange rate terms now seem to show much smoother growth. Only the USA stays the same because US PPP rates are what the World Bank uses in its base calculations.

In teaching, learning, and writing about these "Giants of Asia," which number to use, exchange rate or PPP? That obviously depends on the kind of questions that are being asked. If you are interested in knowing about the standard of living and the economic welfare of the people, then PPP in per capita terms is the better number.

When asking questions about a country's ability to influence the world's economy, international economic institutions, and its major economic partners around the world, then we are often examining that country's foreign trade, foreign direct investment, and currency-based interactions with the rest of the world's economies. If China is threatening to cut off its trade with Australia or to give a foreign aid grant to Kenya, these are political actions that are affected by China's foreign exchange reserves, trade balances, balance of payments, and the like. Indian purchases of American military technology such as helicopters or air-warning systems require US dollars and are unaffected by the low cost of haircuts in Mumbai. For more current issues of international power and competition, there is an argument to be made that exchange rate calculations have more relevance. Hard cash is what buys petroleum, pays for Confucius Institutes, creates foreign loans and development aid, sends students to graduate schools overseas, and buys ads in foreign newspapers. Tourists spend US, Canadian, and Australian dollars, Euros, and yen. That hard cash is reflected in market exchange rate GDP.

Questions of broad international power are perhaps the most difficult, because a case can be made for either exchange rate or PPP. If a country develops and produces its own military technology, pays its soldiers in indigenous currency, and feeds them domestically produced food, then the PPP figures might better measure how much the domestic economy can be harnessed to military capabilities. International relations specialists who examine what is called "the power transition" study long spans of time during which a rapidly rising country overtakes an established country, provoking a rivalry that has often resulted in wars between great powers. For those purposes, PPP GDP figures are often used for comparing the underlying basis of national power across long periods of time.

Instructors seeking a simple answer to the PPP versus MER debate may find this to be a frustrating conclusion, because each has its utility as a measurement. Both in teaching and in evaluating student research, it is obviously necessary to compare apples to apples and oranges to oranges, and to be clear in our own minds what we are seeking to convey to students and expecting from students. The choice between the two rates can be a good critical thinking exercise for students and scholars alike. ■

NOTES

1. GDP is very similar to Gross National Product (GNP), except that GNP measures economic output of a nation's residents, not what happens in its territory. A British-owned firm in the USA counts toward British GNP, but the same firm counts toward US GDP. GNP was largely replaced in 1991 by Gross National Income (GNI) as a measure.
2. William Safire, "Essay: Intelligence Fiasco," *The New York Times*, April 27, 1990.

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