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SNAPSHOT

Beyond GDP

What the Measure of Economic Performance Misses About Economic Performance

Diane Coyle

DIANE COYLE is a freelance economist and a former advisor to the UK Treasury. She is author, most recently, of [GDP: A Brief but Affectionate History \[1\]](#), from which this essay is excerpted. Copyright © 2014 by Diane Coyle. Published by Princeton University Press. Reprinted by permission.

The media and economic communities regularly use Gross Domestic Product (GDP), a tally of all goods and services produced within a country during a specific time period, as a measure of economic performance. But GDP is a relatively new way of assessing economies. In fact, the concept wasn't invented until the early twentieth century, when the Great Depression and then World War II pushed Washington to start counting government spending on services and war (before seen as a necessary evil that reduced national income) as a net positive for the economy.

The construction of GDP statistics was not straightforward, even in those early days when the economy was less complex than it is now. It took decades for more than a handful of countries to create national accounts and for economists and statisticians to create methods for comparing GDP over time and across nations. And the work continues to this day. One illustration is adjusting the dollar total for inflation to get "real" GDP. But constant improvements in the quality of products, and the introduction of new goods and services over time, have made it harder than ever to calculate price changes. For example, a 2013 laptop was a vastly different machine from a 2004 laptop, even if their price tags were roughly the same. A few decades ago, meanwhile, the price of computing was infinite, because computers did not exist. It is hard to capture this transformation in a single price index.

Further, despite years of progress, it is still difficult to make international comparisons, given the significant differences in economic structures around the world and in what consumers spend their incomes on. Although economists don't hesitate to make generalizations, our impressions of growth in different economies at different times depend on the statistical methods. For example, introducing those adjustments for improvements in the quality of computers in the 1990s made U.S. economic growth look much stronger relative to other countries.

There are other things that GDP misses entirely. It has nothing to say about the environmental damage that the production of goods and services causes. And, although GDP growth is taken as a proxy for progress, it was never intended to measure happiness or welfare. Finally, as nations struggle out of the global downturn of 2007-2008, some seriously question whether the model overestimates the contributions to the economy of financial services.

Given all these problems, some have suggested ditching GDP entirely in favor of new measures, such as a national happiness index. These don't get around the need to have a measure of economic activity. But it is true that the economy's character -- and what citizens value beyond GDP -- is changing, and that the way we measure the economy will have to keep up. In particular, economists will have to grapple with three issues. The first is economic complexity, driven by innovation, the constant introduction of new products and services, and the increasing globalization of production chains. The second is the increasing share in advanced economies of services and intangibles, including online activities with no price. The third is the

urgent question of sustainability -- whether the depletion of resources and assets now will undermine potential future GDP growth.

VARIETY IS THE SPICE

In 1998, the United States offered 185 television channels, 141 over-the-counter painkillers, and 87 brands of soft drink. In 1970, there were five TV channels, five painkillers, and 20 types of soft drink. Even more striking, whereas there were 400 types of computers and nearly five million websites in 1998, there were zero just decades earlier. All this is a great thing: variety through constant innovation could be considered one of the key indicators of economic development. It is surprisingly hard, though, to find economic statistics that take into account the number of different products available. (The Federal Reserve Bank of Dallas 1998 Annual Report, from which the figures here are taken, is one of the few sources available even now.) Official agencies simply don't ask. In surveys, they ask shoe manufacturers about volume -- number of pairs made -- and prices, but not the number of styles. They count high-tech walking boots, running shoes that will cushion my knees and ankles, vegan shoes, shoes shaped to exercise my thighs as I walk, gorgeous red high heel shoes, ugly but ultra-comfortable sandals, and sneakers that I designed myself online as just plain "shoes."

But why does this affect GDP? By failing to capture fully the increasing range of products in the economy, GDP under-reports innovation. It also fails to record consumer welfare. Take driverless cars, for example. A driverless car will increase GDP by the same amount as any other kind of car, or perhaps by a bit more. Statisticians can calculate a hedonic price index to account for the fact that the car's owner can sit back and relax when driving. But GDP will never capture what driverless cars contribute to safety -- a reduction in the number of accidents as driverless cars spread.

The measure also misses out on the value brought by customization (the shoes I build online): As the Dallas Fed's economists wrote in 1998, "We might not see faster growth rates or surges in productivity, but mass customization will pay off for America. Resources are wasted guessing what customers want. When more products are customized, we won't squander money on clothing that sits in the closet because it doesn't fit or compact discs with only one or two songs we really like. And goods won't languish on dealers' shelves. Achieving a higher standard of living with fewer demands on natural and labor resources will help ease price pressures and continue this decade's good news on inflation." The promises of "mass customization" they dangled before their readers' eyes in 1998 are coming to pass, including TV shows on demand and clothing made-to-measure at the midmarket, not just for the wealthy few.

Complexity goes beyond the number of products. Most goods are now made via global supply chains. The components are manufactured in a number of countries, shipped around the world to be assembled in one place, and then shipped to their destination markets. This is true of apparently simple goods, such as shirts, and of sophisticated ones, such as the iPhone. Price indexes, and thus GDP, do not capture the large price declines that come with outsourcing. In turn, import prices have been greatly overstated and import volumes understated. In addition, conventional trade statistics do not net out the value added by intermediate stages: the U.S. balance of payments figures just record the whole final value of the iPhone when it is imported from China. According to Yuqing Xing, a professor at the National Graduate Institute for Policy Studies in Tokyo, "The traditional method of recording trade has failed to reflect the actual value chain distribution and painted a distorted picture about the bilateral trade relations. The Sino-U.S. bilateral trade imbalance has been greatly inflated." Value-added trade statistics are newly available, and their study is likely to change what we think about the shape of the world economy.

COUNTER PRODUCTIVE

In 1987, the economist Robert Solow famously quipped that "you can see the computer age everywhere but in the productivity figures." Official estimates of productivity growth did rise from the mid-1990s to 2001, although productivity growth has since slowed. For its part, the United Kingdom has seen more or less zero GDP growth since 2008, but employment there has increased. By definition, that implies (at best) no increase in productivity.

This points to a second serious issue for GDP as a measure of the economy. Each year, the economy consists of more that is immaterial, which makes measuring productivity hard. It is relatively straightforward to keep tabs on economic output per worker when you can count the number of cars or refrigerators or nails or microwave meals being shipped from factories. But how do you measure the output of nurses, accountants, garden designers, musicians, software developers, health care assistants, and the

like? The only way is to count how many of them there are and how many customers they provide with a service. But that entirely overlooks the quality of the service they provide, which, in their industries, is more important than quantity.

Productivity, in turn, might not be as important a measure as it once seemed. As the tech guru Kevin Kelly has written, "Generally any task that can be measured by the metrics of productivity -- output per hour -- is a task we want automation to do. In short, productivity is for robots. Humans excel at wasting time, experimenting, playing, creating, and exploring." Kelly is comfortable with the idea of robots doing more work for us. Some are not. In response to *Race Against the Machine* by Erik Brynjolfsson, an MIT economics professor, and Andrew McAfee, principal research scientist at MIT's Center for Digital Business, Paul Krugman took to his New York Times column to write, "What's striking about their examples is that many of the jobs being displaced are high-skill and high-wage; the downside of technology isn't limited to menial workers. Still, can innovation and progress really hurt large numbers of workers, maybe even workers in general? I often encounter assertions that this can't happen. But the truth is that it can, and serious economists have been aware of this possibility for almost two centuries." Krugman is right. During the Industrial Revolution, new looms and mills disadvantaged skilled craft workers.

When it comes to automation and job displacement, we tend to dislike productivity increases. Yet the bots of today will eventually have the same effects on the economy as steam-powered mills in the nineteenth century. Robots are a new kind of capital equipment, and their value will initially go to the owners of that capital. Over time, however, each working person will benefit from more capital with which to do his or her job, just as a weaver could produce more with a mechanical loom than with a handloom in his cottage. And that will translate directly into higher labor productivity and -- if workers acquire the necessary skills and society can manage income inequality -- higher wages for all. For now, increased income inequality has accompanied productivity increases linked to digital technologies, indicating that the gains have not been widely shared, but there is no reason to think that they necessarily couldn't.

A related issue is how to count the value of an intangible product or service, the purely digital items such as search engines, apps, crowd-sourced encyclopedias, and so on. These often have a price of zero and, with no market price, are not captured in GDP statistics. As Brynjolfsson and Adam Saunders, of the Wharton School, University of Pennsylvania, put it in a recent paper echoing Solow, "We see the influence of the information age everywhere, except in the GDP statistics." So, for example, the record industry's sales of music have declined in dollar terms, but there are almost certainly more people, rather than fewer, listening to music. The gap between what a consumer pays and the value he or she receives from the purchase is called "consumer surplus," and the growing prevalence of goods and services with no price seems to be increasing consumer surplus.

All that leads to the sense that the gap between what GDP measures and aggregate economic welfare is growing uncomfortably large. Brynjolfsson and JooHee Oh, a postdoctoral associate at MIT, estimate that there has been an unreported gain to consumers of about \$300 billion a year for a decade from access to free online services, such as Facebook, Wikipedia, Craigslist, and Google. Hal Varian, the chief economist at Google, reckons that Google's free search service is worth \$150 billion a year to users; of course he would say that, but his calculations seem reasonable. The economist Michael Mandel has argued that data, or information, should be added as a third category to goods and services. He estimates that the third category would add 0.6 percentage points to the United States' real GDP growth in 2012 -- a substantial difference.

Statisticians need to start thinking about how to measure better the production and consumption of information, digital products, that deliver value to consumers. Because GDP counts only monetary transactions, the new free business models are not well measured. There have always been free but valuable activities, from using public libraries to taking walks in the countryside; the difference now is the scale and just how intertwined nonmonetary activities are with traditional business as counted in GDP.

SAVE SOME FOR LATER

GDP measures the increase in output of goods and services over time without fully accounting for whether growth now comes at the expense of growth in the future.

GDP statistics do include a measure of the depreciation of physical assets ("capital consumption"). The physical stock of capital (machines, transportation equipment, buildings) must grow by more than what is needed to make up for depreciation, for a growing economy. Producers also need to make additional

investments to keep pace with growth in the population if consumption per person is to remain stable, which is what matters more than the total size of GDP. In addition, if innovation -- technical progress -- is taken into account, it is surely important to include some indicator of the research effort required to innovate.

The latest international national accounting standard, SNA2008, has tried to address the problem. The United States is the first country seriously to put into practice its suggested improvements, which include counting spending on research and development -- and an estimate of the investment in "artistic originals" such as Hollywood movies and music -- as investment rather than a business cost. The United States' GDP saw a one-time jump of more than two percent in 2007 thanks to the new methodology. An even bigger increase of 3.4 percent was announced in mid-2013 partly due to this change.

Questions about the treatment of investment in assets are just one dimension of sustainability. More often, the term "sustainability" refers to the extent to which GDP growth from year to year depletes natural resources or harms the environment in other ways. It should be said that official statisticians have been paying more attention to environmental measures, ranging from CO emissions and water quality to the volume of mineral resources extracted. And in 2012, the UN Statistical Commission adopted a new international statistical standard, the System of Environmental Economic Accounting, or SEEA, which links environmental statistics to economic statistics.

Still, although national statistical offices in many countries have become much more diligent in collecting environmental statistics, and people who are interested or concerned can look them up, most people are not sufficiently interested. If policymakers are to take seriously the environmental impact of growth -- and the extent to which current growth comes at the expense of future growth -- natural depreciation needs to be included in GDP alongside the depreciation of machines and roads.

As if depreciation of natural assets weren't complicated enough, there is yet another kind of asset to consider: human capital, or how able people are to make use of the other assets they have at their disposal. Human capital depends on education and practical training and ability to create and innovate. Related to human capital is social capital, a hard-to-define concept that tries to capture how well people are able to organize collectively through political and other institutions. It is hard to measure, but it clearly affects economic growth. To give just one example out of many, former colonies that inherited the English legal framework have grown faster and have higher incomes per capita now than those that inherited the French legal framework. Legal traditions would appear to be one factor contributing to social capital.

Investment in human and social capital is not really measured in conventional statistics, although spending on some inputs, such as education expenditure, is. This is understandable, given that the concepts are hard to pin down in the first place, but they do matter. A country should not regret forgoing some increase in GDP this year for the sake of investments that will contribute to its population's ability to work, build, and invent later. The World Bank has started work on measuring "comprehensive wealth," which includes natural assets, human capital, and physical infrastructure. An alternative approach is the Harvard economist Martin Weitzman's Net National Product (NNP), derived from standard GDP and related statistics, which measures a country's maximum sustainable level of consumption. But even this measure does not include investment in or depletion of environmental stocks: for example, the United Kingdom national accounts include mineral oil exploration as part of gross investment but not depletion of oil and gas stocks by extraction. As a result, the United Kingdom's NNP is overstated. But the system could be amended to fix this problem.

BETTER MEASURE?

"GDP" has become such a familiar term that nobody gives it much thought. It is, however, a flawed statistic -- especially when it comes to measuring innovation, quality, intangibles, and sustainability. Has GDP, therefore, reached its limits? The definitions involved in the national accounts are already convoluted and complicated, and take up vast amounts of national statisticians' time to grapple with -- except, of course, in countries such as Greece that used to make up figures or those African countries that have never collected necessary raw statistics. Huge multi-decade GDP databases might lead us to think that GDP is a natural object that we can measure with increasing accuracy. But the accuracy is spurious. The object being measured is only an idea, not something with an independent existence waiting to be examined.

The U.S. Commerce Department once called GDP one of the greatest inventions of the twentieth century, and so it was. And it still does a better job at measuring economies than any currently available alternative.

Rather than continue down the path of making the definitions and refinements ever more complicated, statisticians and economists should think more deeply about what is meant by "the economy" in the twenty-first century. There is a tremendous opportunity to use digital technology -- and specifically big data -- to rethink what information is collected and what we do with it. With so much activity now online, it must be possible to get a better picture of those consumer gains not captured by today's economic statistics. Perhaps we can also find illuminating ways to visualize what's happening in the economy.

In addition, the nations need to modernize how they collect statistics. National accounts and other official economic data come from a range of sources, but surveys of individuals and businesses form their backbone. It is almost impossible for the conventional survey methods, which involves sending forms to certain businesses or setting researchers to collect information on prices from different outlets, to keep up to date when the very structure of the economy changes. To give one obvious example, survey forms don't really account for online shopping -- and online prices are likely to be lower.

So it is also time to use new technologies to collect economic data. That could be particularly important in developing countries, where the prevalence of mobile phones offers an unprecedented opportunity to measure their economies. Just as user-generated content has become an important resource in disaster response, business, and the news media, user-collected statistics could prove a more timely and accurate data source than factory surveys. There seem to be very few trials, however -- just a handful collecting health data. National statisticians in the developed economies, for now, have had little incentive to experiment with online or mobile collection of raw data.

At present, we are in a statistical fog, without the information needed about either the negative aspects of growth when it is unsustainable and when it depletes the natural and other assets available for the future, or the positive aspects, when it delivers innovations and creativity. GDP, for all its flaws, is still a bright light shining through the mist.



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