

# CM19: AGGREGATE ECONOMIC WELFARE (5/6/21)

*"There is no evidence that God ever intended the United States of America to have a higher per capita income than the rest of the world for eternity." Robert Solow*

## SOME OF, BUT NOT ALL THAT YOU SHOULD KNOW

1. What is AEA?
2. How is AEA related to GDP?
3. How is GDP defined?
4. Why do we engage in economic activity?
5. What is Aggregate Economic Welfare (AEW) meant to measure?
6. Why can't we use GDP to compare the standard of living in India and Belgium?
7. How is GDP per capita (GDPpc) calculated?
8. What is assumed about income distribution when calculating GDPpc?
9. In general do people prefer a more or less equal distribution of income?
10. Is "leisure" a good?
11. Why would GDPpc give a misleading impression of what happens to AEW if people decided to take more leisure?
12. Is AEW likely to be higher if an increase in GDPpc is achieved by increasing the level of pollution?
13. Does GDPpc take into account the depletion of natural resources?

14. Which country is likely to have the higher AEW one with a better infrastructure but relatively lower GDPpc, or one with a higher GDPpc but a much worse infrastructure?
15. Do more literate and better-educated people have a higher standard of living than people who are illiterate and very poorly educated?
16. Other things equal do increases in health and longevity increase AEW?
17. If you have to buy better locks because there is an increase in crime does this cause GDPpc to rise? Does the increased expenditure on locks cause AEW to increase?
18. Is AEW likely to be higher in countries that have high levels of corruption and bureaucracy?
19. Is AEW likely to be higher in a country, which respects the Rule of Law?
20. More than half the world's population is female. Does GDPpc reflect their economic welfare?
21. What happens to GDPpc when a man who has been staying at home to raise his two-year-old sends the kid to daycare and goes back to his old job?
22. Is the "underground economy" counted in GDPpc?
23. Is the "underground economy" more important in LDCs or in advanced industrialized economies?
24. If we corrected GDPpc (measured at PPPs) for the 12 "omissions" discussed in the lecture would the AEW of LDCs rise or fall relative to advanced industrialized countries?
25. What factors does the HDI take into account?
26. If you buy fertilizer to make a homemade bomb does GDPpc rise or fall?
27. Why is GDPpc at market prices likely to underestimate AEW?
28. What are the two problems that make attempts to replace GDPpc as a measure of AEW so difficult?

29. Does it make sense to use GDPpc to compare the AEW of the UK and Burundi?

## 1. GROSS DOMESTIC PRODUCT

1. We measure *Aggregate Economic Activity* (AEA) by calculating the annual output of *final* goods and services, what economists call Gross Domestic Product (GDP). GDP stands for:

**Gross** [*all* investment including the replacement of worn out or obsolescent machines and buildings – if we included only new investment then we would be calculating Net National Product]

**Domestic** [produced inside a country's borders as opposed to Gross National Product – GNP – which is the output of the county's citizens, wherever it is produced]

**Product** [the annualized current production/output of goods and services added together in terms of dollar values].

**GDP** is defined to be:

the **value** [which is simply price times quantity, which we write as  $P \times Q$ . Note that value is one of those sneaky words that economists use – we simply mean X dollars but in common usage value implies something that you desire, something that is intrinsically “valuable”]

at **market** prices [only output that passes through legal markets is included in GDP]

of all the **final** [this avoids “double counting” – the bread example discussed below. We are concerned with the *value added* by firms not the value of their gross output, where value added is the value of the firm's output less the cost of the inputs that it buys from other firms.]

**goods** (tangibles like coats and cars and bottles of Coca-Cola – note that when you buy an AK47 and ammunition and use it to kill preschoolers you are increasing GDP)

and **services** [intangibles like education, banking, retailing, car servicing, cinema visits, travel: services account for about 85% of private employment and 65% of GDP; service output is calculated from wages and benefits paid. Does this mean that a hedge fund manager adds a billion dollars of output to the economy each year and postal workers are more productive than UPS or FedEx employees?]

produced *within the borders* or boundaries of a country

in a given time period, a **year** [although we also calculate quarterly GDP, we multiply it by four to annualize it].

(Note that there are *seven* things that you need to get right if I ask you a question that involves the definition of GDP.)

## 2. GDP IS NOT A MEASURE OF AGGREGATE ECONOMIC WELFARE.

1. Why do we engage in *economic activity – the production, exchange, and consumption of goods and services*? We do so because we need to consume goods and services to stay alive and to achieve a certain standard of living. When we work, we receive incomes and benefits (such as employer contributions to our pension plans, paid vacations, subsidized health and dental care, sick leave, maternity leave) in exchange for our labor. Economists *assume that we always prefer more goods and services to less*, which seems to imply that we must become better off when GDP increases because GDP is our measure of the production of goods and services. But if you tell an economist that economists believe that we should maximize GDP, then the economist will immediately deny that this is so, arguing that when an economist says that consumers always prefer more goods and services that economists are defining goods and services in a sophisticated way so that they include such things as leisure and a better environment. (However, if you read economics textbooks – you are washed up on a desert island and the only books available are economics textbooks! – you will notice that economists have a tendency to illustrate their arguments with examples that involve only consumption of private goods such as jeans and hamburgers.)

2. By Aggregate Economic Welfare (AEW) I mean a *country's (really its population's) total wellbeing, or welfare, or standard of living, or how well off it is compared to other countries*. GDP, a measure of output or the production of goods and services in a year (Aggregate Economic Activity, AEA), is *not* a

measure of the satisfaction that we derive from consuming that output (AEW). How many miles you can run in an hour is a measure of how fit you are. Although by this measure you may be very fit, you may still be in the early stages of brain cancer. Fitness is not the same thing as health, and output is not the same as wellbeing.

3. The most obvious problem with using GDP as a measure of AEW is that it ignores *population size*: China in 2020 had an estimated population of about 1,439m<sup>1</sup> compared to the US population of about 332m (including those who are undocumented).

The Chinese GDP (IMF estimates for 2019 using exchange rates) of about \$14t (\$27.3t at PPPs) has to stretch over 1,400m people whereas the US has only 330m persons sharing its \$21t GDP (which is equal to its PPP GDP). China's GDP at PPPs is about 30% larger than that of the US.

4. When comparing the size of two economies we have a problem because they usually have different currencies. Although the UK was a member of the EU it was not part of the common currency area that used the ubiquitous Euro – the Brits kept the pound sterling. So, if we want to compare the size of the US and Chinese economies, we have to have a way to convert dollars into yuan.

The obvious way to do this is to use the exchange rate between the two currencies (averaged over a year). But an exchange rate is determined by the supply and demand for the currency. The demand and supply of the currency includes currency used for financial transactions (about \$6t on an average day). However, financial transactions are not part of output – only the commissions on the transactions. (I buy \$1m of Apple stock. The ownership of the stock has changed but nothing has been produced except the fees associated with the transaction.) The exchange rate only reflects transactions that pass through international markets – and so the money I pay my barber does not affect the exchange rate. In 2020 only about 26% of US economic activity involved international markets and so three quarters of US economic activity does not affect its exchange rate. (There are other problems that you can explore if you do ECON207.)

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<sup>1</sup> If you have been reading my emails you will know that the Chinese government recently delayed publishing the results of the 2020 decennial census. In 1946 the Soviet Union undertook a census after WW2 – the Great Patriotic War. Stalin did not like the results – they showed the enormous difference between the number of males and females of military age. The statisticians were shot and “revised” population figures were published.

Economists prefer to make exchange conversions using Purchasing Power Parities: PPPs. A PPP is calculated by deciding on a set of goods and services (of the same quality) that are available in both countries – say a man’s shirt, a woman’s dress and a pound of rice. If the three items cost \$50 in the US and Y350 in China then the implied PPP is \$1= Y7 and so the Chinese GDP in US dollars using a PPP conversion is obtained by dividing the Chinese GDP in yuan by 7. Of course, the trick is to come up with a commodity bundle that is available in both countries. (The World Bank, IMF, OECD all do their own PPP calculations. The World Bank figures are most commonly used.)

Here are some figures for 2019 (IMF data) before they were distorted by the pandemic.

	ER	PPP (\$t)
US	21.4	21.4
CHINA	14.1	27.3
JAPAN	5	5.5
GERMANY	4	4.7
UK	2.8	3.3
INDIA	2.9	10.5
RUSSIA	1.8	4.3

So, China is the largest economy in the world and US is the second largest. Given that China has been growing at about 6% in the last decade and the US at about 2% if these relative growth rates were to continue, *which I think is very unlikely*, the Chinese economy would increase in size by a factor of 8 in the next 36 years, during which time the US economy would double in size.<sup>2</sup> (Using exchange rate conversions, the US has been the largest economy in the world since 1874.)

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<sup>2</sup> I would expect the Chinese growth rate to fall as the easy ways of growing – urbanization, population growth, declining returns to infrastructure – are passed.

5. As a *very rough first approximation* to a measure of AEW we could use PPP GDP per capita (per head or per person) – GDPpc – that is, GDP divided by population (GDP/Pop). The 2019 US GDPpc was therefore about  $\$21.44\text{t}/330\text{m} = \$64,970$  per person per year. The 2019 Chinese GDPpc was about  $\$27.31\text{t}/1,393\text{m} = \$19,600$  per person per year; around 30% of the US figure.

The only numbers you need to memorize: US GDP \$21t, US population 330m, Chinese GDP \$27t, Chinese population 1.4b.

[https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_GDP\\_\(PPP\)](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP))

[https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_GDP\\_\(nominal\)](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal))

## 2. ERRORS OF OMISSION.

If we want to use GDPpc as a measure of AEW then we must take into account a whole set of factors that are omitted from GDP and hence are **not** part of GDPpc *but which contribute to AEW*.

1. *Income Distribution* (CM21): GDPpc assigns equal shares to every one – I get 1/330 millionth of total US income as does the highest paid CEO in the US. Clearly the distribution of income is not perfectly equally spread across the whole population. Consider the implications of using GDPpc to compare the AEW of Sweden relative to China. China has many billionaires – how many depends on whether you regard Hong Kong as “really” part of China – but about 100 million Chinese fall below the World Bank poverty line of \$1.90 per day.

<https://www.forbes.com/billionaires/#3c109a26251c>

<https://www.telesureenglish.net/news/China-Pledges-to-Lift-10-Million-Out-of-Poverty-in-2019-20181229-0007.html>

2. *Leisure*: Americans work longer hours per week and per year and have fewer vacations than do Europeans and so, perforce, we produce more goods and services but what if we “really” would like to have more leisure, as Americans tell survey takers?

Average hours worked per year (2017): Germany 1356, Denmark 1408, Norway 1419, Holland 1433, Sweden 1453, France 1514, UK 1514, Spain 1687, Italy 1723, US 1780 (about 25% more than the Norwegians). (The French 35-hour week is not a maximum number of allowable work hours but a threshold beyond

which you have to be paid overtime if a blue-collar worker and receive extra compensation if you are a “white collar” worker.)

<https://stats.oecd.org/Index.aspx?DataSetCode=ANHRS>

If leisure is a good, something that we desire and that increases our sense of wellbeing (which is what economists assume), then when we have more of it our AEW increases. My son used to work at Microsoft and when they were shipping a product, he would routinely work 60 or more hours a week. If, instead, he worked 40 hours per week then he would have 20 extra hours to spend with his wife, their two children, his mom and dad and his many friends. He now works for Oracle where he averages 40 hours per week. Although children can be a pain in the butt, they only hang around for 18 years (you hope!) and suddenly you have the house to yourself. The woman who works when her children are small may never hear their first words or see them take their first step.

But if we have more leisure then we do less work and produce less and get fewer “goodies” than before. *And if we work less then GDP will fall.* However, if we all trade-off leisure for consumption, then economists assume that as rational individuals (maximizers) we must value the increased leisure more highly than the lost goods and services; why would you swap your watch for mine if you didn’t like mine better? These sorts of trade-offs are the bread and butter of economic analysis, and are one of the “litmus tests” that separates economists from non-economists who tend to think in terms of either-or rather than more or less or how much of one commodity/activity can be swapped for some other commodity/activity. We accept lower incomes and benefits (we are willing forgo consuming some goods and services), because we value the leisure more. However, we can only have more leisure by working fewer hours (which is why we earn fewer goods and services). But if we work less then GDP will fall, and hence GDPpc will fall.

*If we use GDPpc as our measure of AEW then it will tell us that AEW falls when we work less, but that does not agree with the fact that we feel better off because the leisure is more valuable to us, and so, by our thinking, AEW has risen. Clearly GDPpc is not the same as AEW.*

3. *Environmental quality and natural resource depletion (CM14):* If the annual deterioration in the environment and natural resource depletion were taken into account then it is estimated that China's growth rate from 1990 to 2010 would be about 7% not 10% – three percentage points lower, but a 30% lower rate of



growth. Indeed, GDPpc would *rise* if we had to buy smog masks but our AEW would *fall*. Tobin and Nordhaus adjusted GDP for environmental pollution when calculating their Measure of Economic Welfare (MEW) in 1972. The most polluted cities in the world are in LDCs. (In 2014 half of the world's 20 most polluted cities were in India and none in China!)

Brazil's GDP does not take account of the destruction of its rain forests with their valuable animal and plant species.

<https://www.livescience.com/30353-most-polluted-places-earth.html>

<https://www.cbsnews.com/pictures/the-most-polluted-cities-in-the-world-ranked/9/>

<https://www.cheatsheet.com/culture/most-air-polluted-cities-in-the-world.html/>

[https://www.businessinsider.com/these-are-the-cities-with-the-worst-air-pollution-in-the-world-2015-9/ - 10-lucknow-india-96-gm3-of-pm-25-1](https://www.businessinsider.com/these-are-the-cities-with-the-worst-air-pollution-in-the-world-2015-9/-_10-lucknow-india-96-gm3-of-pm-25-1)

4. *State of Infrastructure* – roads, bridges, railways, airports, seaports (broadband). According to the US Institute of Civil Engineers' report card on the state of the US infrastructure none of these items rated more than a C grade: my impression is that US highways are in poor repair and are badly signed compared to those in the UK and Western European countries. (If we used Net Domestic Product per capita rather than GDPpc it would take into account some of that worn out infrastructure but the way that depreciation is calculated in the national accounts does not really come to grips with this problem.) GDPpc will increase if you buy a powerful car but will your welfare increase if you can only drive at 30 mph because of potholes?

These links contrast ways that engineers and economists estimate and think about infrastructure improvements.

<http://conversableeconomist.blogspot.com/2011/08/americas-infrastructure-problem.html>

<http://www.bloomberg.com/news/2012-02-14/spending-won-t-fix-what-ails-u-s-transport-commentary-by-edward-glaeser.html>

<http://www.quora.com/Airports/Why-do-American-airports-have-such-poor-amenities>

5. *Home Production*. "A woman's work is never done!" Cooking, cleaning, child care, elder care are not included in GDP because they are difficult to measure, and because the men (Simon Kuznets and Richard Stone, both Nobel laureates) who derived the original National Income Accounts were imbued with the social prejudices that prevailed at the time (the late 1930s and early 1940s) when they

developed the accounting conventions that we use to calculate GDP. And the accounts were mainly developed as a tool to organize war production during WW2. The omission of home production probably does not shift the size of GDP significantly except when there is a sudden influx of women into the labor force as in WW1 and WW2 and during the 1970s when women became “liberated”.

Conceptually there are significant problems in measuring the value of, say, childcare. What wage should we use, the pay of a worker in a daycare or some higher value to recognize that women devote more energy to looking after their own children and less to looking after other women’s children? (As has been shown by studies of women who are expected to help supervise part time at day care centers.) And how much of looking after a child is output or work and how much is consumption (some women actually enjoy playing with two-year old’s)?

<http://www.washingtonpost.com/blogs/worldviews/wp/2014/02/13/where-women-work-and-dont-a-map-of-female-labor-force-participation-around-the-world/>

[http://economix.blogs.nytimes.com/2009/05/04/including-home-production-gdp-might-not-look-so-bad/?\\_php=true&\\_type=blogs&\\_r=0](http://economix.blogs.nytimes.com/2009/05/04/including-home-production-gdp-might-not-look-so-bad/?_php=true&_type=blogs&_r=0)

<http://www.dol.gov/wb/stats/recentfacts.htm>

6. *The “Underground Economy”*. This includes both legal activities such as work for cash, which is not reported as income to the IRS, and illegal activities such as drugs and prostitution. The link suggests that the “underground” or “gray” or “shadow” economy may be very significant in non-industrialized countries and even in industrialized countries. Here are the results of a study of the value added by the underground economy in 84 countries.

The Underground or Shadow Economy as Percent of Official GDP, 1988–2000

Country Group	Percent of GDP
Developing	35–44
Transition	21–30
OECD	14–16

According to a survey conducted in 1998–99 in Africa, Nigeria and Egypt had the largest shadow economies, equivalent to 77 percent and 69 percent of GDP, respectively; South Africa, by contrast, had a shadow economy of only 11 percent of GDP. In Asia in the same period, Thailand ranked number one with a shadow economy of 70 percent of GDP; Hong Kong and Singapore had the smallest shadow economies, both at 14

percent of GDP. In Latin America in 1998-99, the biggest shadow economy was in Bolivia, at 67 percent of GDP, and the smallest was in Chile, at 19 percent.

Among the states of the former Soviet Union in 1998–99, Georgia's shadow economy was the largest, at 64 percent of GDP; Russia's was 44 percent of GDP; and Uzbekistan's was the smallest, at 9 percent. Among the transition countries of central and eastern Europe in the same period, Bulgaria's was the largest, at 34 percent of GDP, and Slovakia's the smallest, at 11 percent.

In the 21 OECD countries in 1999–2001, Greece and Italy had the largest shadow economies, at 30 percent and 27 percent of GDP, respectively. In the middle group were the Scandinavian countries, and at the lower end were the United States and Austria, at 10 percent of GDP, and Switzerland, at 9 percent.

Ironically US GDP would increase if hard drugs were made legal because that form of economic activity would then be included in the US GDP. In 2015 the EU started to include estimates of the drug and prostitution industries' outputs into their GDP calculations, because this increases measured GDP and lowers the ratio of National Debt to GDP without having to increase actual GDP.

<http://www.imf.org/External/Pubs/FT/issues/issues30/>

*7. Health and longevity:* AEW goes up if we are healthy and can enjoy a long life. Nordhaus (another Nobel winner) estimated that the increase in longevity in the US between 1945 and 2000 was equivalent to an increase in GDPpc of about 50%. John D. Rockefeller was one of America's richest men but the quality of his health and dental care was much inferior to mine or even to that of many poor Americans today. Many people living in LDCs, especially those situated in the tropics, suffer from diseases and parasites that reduce their ability to work and produce goods and services as well as being debilitating and directly welfare reducing.

Because medical knowledge is freely available, (although not medical resources – hospitals, clinics, doctors, nurses, medical equipment and drugs – think of the Ebola outbreak in West Africa) longevity has been increasing rapidly in LDCs. Paradoxically this may lead to the increase in the number of years that you live in poverty.

[http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_life\\_expectancy](http://en.wikipedia.org/wiki/List_of_countries_by_life_expectancy)

[http://www.who.int/neglected\\_diseases/diseases/en/](http://www.who.int/neglected_diseases/diseases/en/)

[Hans Rosling's *Gapminder* is a fun site but it may lead you to believe that LDCs are better places to live than they actually are.]

<http://www.gapminder.org/>

The US does poorly in terms of infant mortality rates (and child poverty) by the standards of other developed countries. Part of the difference is the result of the large differences by race and income level in the US.

<http://www.washingtonpost.com/blogs/wonkblog/wp/2014/09/29/our-infant-mortality-rate-is-a-national-embarrassment/>

8. *Literacy and years of schooling* – especially of girls. Illiteracy is a major barrier to our ability to take advantage of our true potential as human beings. We usually assume that better educated people have higher levels of wellbeing than those who are less well educated. (The number of years we spend in school may not be a good measure of how well educated we are. I doubt that most Americans who graduate from a four-year undergraduate program are better educated than I was when I graduated from the LSE after three years.) Many economists regard the deterioration of our high school education to be one of the major problems facing the US. Because high school is not free in China about three quarters of the Chinese population have not completed high school.

<http://www.uis.unesco.org/literacy/Pages/data-release-map-2013.aspx>

<http://www.voxeu.org/article/educational-attainment-world-1950-2010>

<http://huebler.blogspot.com/2013/12/mys.html>

<http://dayofthegirl.org/girls-denied-education-worldwide/>

9. *Levels of Violence*: There have been about 60,000 deaths in Mexico over the last 7 years because of drug wars. Think of the daily violence in the Yemen, Congo, Iraq, Syria, Afghanistan, Somalia, Sudan. In the 21<sup>st</sup> century millions of people have had to flee their homes and sometimes their countries because of civil wars and ethnic violence. 2014 saw the twentieth anniversary of the massacre by Hutus of 800,000 Tutsis in three months in Burundi (most murders were by machete). Most people are unaware of the fact that the Tutsis massacred about 300,000 Hutus in 1972.

If you have to install an alarm system because crime has risen GDPpc goes up but are you better off than if there was less crime? The US has the largest prison population in the world largely as a consequence of the so-called “War on Drugs”. The costs of building the prisons and “caring for” the prisoners all add to our GDP but do they add to our welfare?

<http://www.theguardian.com/news/datablog/2013/jun/11/global-peace-index-2013>

<http://www.bbc.co.uk/news/world-latin-america-10681249>

<http://www.worldlifeexpectancy.com/cause-of-death/violence/by-country/>

Steven Pinker has argued that the world, is getting more peaceful not more violent and that homicide rates in Mexico have been falling since the 1930s – we just pay more attention to them nowadays. (The second link is an attempt at a rebuttal to Pinker’s 2012 book.)

[http://www.slate.com/articles/news\\_and\\_politics/foreigners/2014/12/the\\_world\\_is\\_not\\_falling\\_apart\\_the\\_trend\\_lines\\_reveal\\_an\\_increasingly\\_peaceful.html](http://www.slate.com/articles/news_and_politics/foreigners/2014/12/the_world_is_not_falling_apart_the_trend_lines_reveal_an_increasingly_peaceful.html)

<http://dissentvoice.org/2012/12/steven-pinker-on-the-alleged-decline-of-violence/>

When you move to a “gated community” or pass through TSA security systems GDP increases but would you not be better off if you did not have to make these expenditures?

10. *Good governance*: Corruption and bureaucracy. China, Russia, India, and most LDCs have extremely corrupt political systems and have very inefficient government agencies. In India it may take one to two years to obtain the necessary permits to start a business, something that in the US may take less than a week. In the US we have powerful lobbyists who have an incestuous relationship to Congress.

[http://www.nytimes.com/2013/10/15/world/africa/african-governance-prize-again-withheld.html?\\_r=0](http://www.nytimes.com/2013/10/15/world/africa/african-governance-prize-again-withheld.html?_r=0)

Here is a ranking of countries by the quality of their governments. Note that they are predominantly advanced industrialized countries. We easily could argue about the methodology and come up with different rankings.

1. Switzerland 2. Sweden 3. Singapore 4. U.S. 5. Germany 6. Japan 7. Finland 8. Holland  
9. Denmark 10. Canada 11. Hong Kong 12. U.K 13. Taiwan 14. Norway 15. France 16. Australia

11. *Human Rights and the Rule of Law*: The Rule of Law is the idea that the law is impartial and that we are all equal in court. I felt that the Rule of Law was diminished during the previous administration. Many LDCs and countries in Eastern Europe have very restricted human rights and do not allow criticism of the government: Russia requires NGOs to register as foreign agents and has recently and recently Putin declared that Navalny's opposition party was an "extremist" organization, essentially terrorists. Environmental protests in China have often been put down violently and receive only negative news coverage. However, you should not assume that everyone is going to embrace western style governance – a recent poll in Pakistan showed massive support for Sharia Law, and a military dictatorship was the second highest ranked option. A majority of the 30% of Egyptians who voted in the recent presidential election endorsed the military overthrow of the elected president. China and Russia are countries that have almost no historical experience of non-authoritarian government and little appreciation for the Rule of Law. Russia and China and most countries in the world have governments that use the law to coerce their citizens. Nor should you confuse elections with democracy; countries can have elections (that may be rigged) but no concept of democracy, a system of government that took hundreds of years to develop to its present far from perfect state.

[http://en.wikipedia.org/wiki/Freedom\\_in\\_the\\_World](http://en.wikipedia.org/wiki/Freedom_in_the_World)

12. *Status of women*: In most countries in the world females – more than half the population – have few rights and even fewer opportunities to have fulfilling careers and lives. Women were not allowed to drive in Saudi Arabia until 2018. South Africa has the highest recorded numbers of rapes. India is only starting to come to grips with its gang rape problem. A teenaged girl, Malala Yousafzai, was shot in the head by the Taliban for daring to go to school in Pakistan. Boko Haram abducted over 200 schoolgirls in Nigeria in 2014.

<http://www.thedailybeast.com/articles/2011/09/18/best-and-worst-countries-for-women-from-iceland-to-the-u-s-to-pakistan-and-afghanistan.html>

<http://www.telegraph.co.uk/news/worldnews/middleeast/saudi-arabia/11218174/Saudi-Arabia-considers-lifting-ban-on-women-drivers.html>

<http://www.washingtonpost.com/news/morning-mix/wp/2014/04/30/hundreds-of-kidnapped-nigerian-school-girls-reportedly-sold-as-brides-to-militants-for-12-relatives-say>

## 2.2 GDPpc is at best a measure of material prosperity.

Omissions 2-7 tend to be correlated with GDPpc and so taking them into account may have little impact on the usefulness of GDPpc as a measure of AEW. Omissions 9-12 may be dismissed as social issues rather than economic ones. At best we should use *GDPpc to compare AEWs only if the countries are at similar levels of economic development*; US and Norway, not US and Burundi. Unfortunately, LDCs not only have very low GDPpcs even when using PPP currency conversions, but they also tend to score poorly on all of the omission items and so they are probably even worse off than GDPpc comparisons with industrialized countries would suggest. On the other hand, Omission 6 would suggest that LDCs are probably bigger than they appear because so much of their AEA is not captured by official statistics.

## 3. ERRORS OF COMMISSION.

1. GDP is the value of the final “goods” and “services” produced by the economy during a calendar year. Because economists do not make value judgments, they make no distinction between diamond-studded dog collars and food for children in poverty, between the purchase of luxury yachts and shelter for the homeless; and lawyers’ services are just lawyers’ services no matter whom the client is. The purchase of an automatic rifle and the ammunition needed to kill 20 five-year old’s increases GDP, as does the use of police, ambulances and hospitals that result from the massacre.

2. GDP is the value of final output measured at market prices. However, market prices are determined *at the margin* – by the value placed on the *last* unit of the commodity bought and sold. But economic theory argues that the value to you of consuming the last unit that you buy is less than the value that you obtain from consuming the next to last unit. That unit in turn gives you more value than the previous unit, and so on until we arrive back at the first unit that you buy which is the one with the highest value to you: the one for which you are willing to pay the most dollars, sacrifice the largest number of other goods and services (see CM5 which discusses the concept of consumer surplus in considerable detail). This idea, that additional units of a good or service give you less and less satisfaction (value), is what economists refer to as the diminishing marginal utility of consumption. If economists are correct, then GDPpc underestimates our AEW from consuming goods and services because it only takes into account the value of the marginal – last – units consumed.

In Figure 1 I have tried to illustrate this with a very simple diagram. On the horizontal axis I am measuring the output of a final good or service consumed during the year (Q).

On the vertical axis I am measuring the value to us of each unit consumed, with the first unit giving us more value (satisfaction or benefit) than the last one does. But the price of the commodity is determined (via supply and demand) by the last unit bought and sold. Therefore, this commodity adds to GDP  $P \times Q$ , the rectangle at the bottom of Figure 1. But the total value to us of consuming the commodity is the whole area under the red line, that is, the total value is  $A + B$ . And so, the estimate of the welfare that we derive from consuming our GDP is too small because it does not include the area of the triangle A.

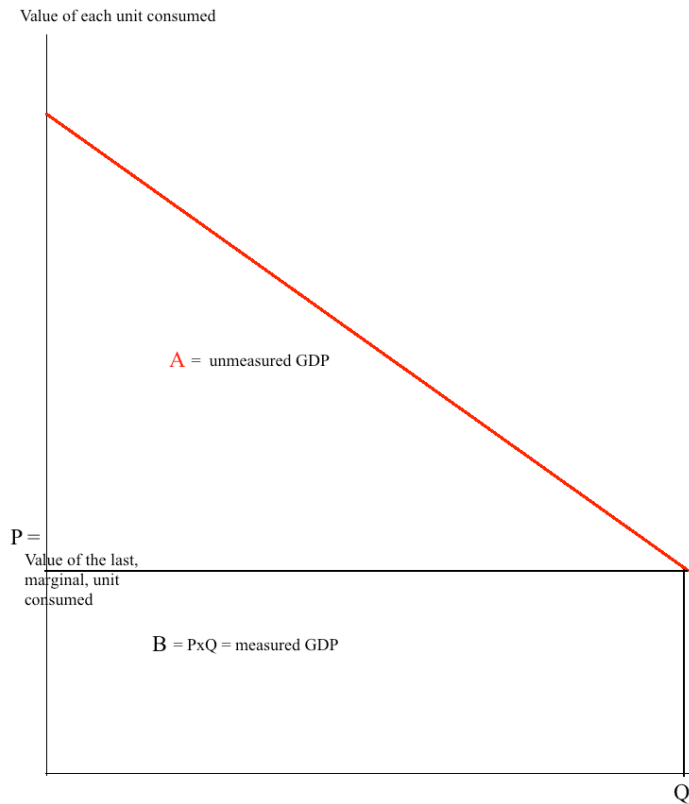


Figure 1



3. GDP includes the market value of all final goods and services produced, including investment in computer-operated lathes and bridge girders and the paper used in giving you a speeding ticket. In some ways – and we could obviously argue about this – it might be more appropriate to use consumption of private and public goods as our measure of welfare although that too would still be subject to the caveats discussed above.

#### 4. IS THERE A BETTER MEASURE OF AEW?

There have been many attempts to improve on GDPpc as a measure of AEW usually by taking into account one or more of the omissions 2-6. As early as 1972 Tobin and Nordhaus developed what they called a Measure of Economic Welfare by attempting to come to grips with 3. The best-known modification of GDPpc is the UN Human Development Index (HDI), which attempts to capture the extent to which a country allows its citizens to maximize their capabilities. (The concept of capabilities was introduced by Amartya Sen, a Nobel Prize winner. Sen was part of the team that developed the HDI.)

The HDI takes into account education (mean years of schooling – omission 8), health (life expectancy at birth – omission 7), in addition to income (GNIpc). The HDI was revised in 2011 (see the second Wiki link – there is also an income distribution adjusted version of the HDI). You are *not* expected to remember the details of how the HDI is constructed just its main components.

The biggest problem with the HDI as an *alternative* to GDPpc is that the two measures are highly positively correlated.

Norway had the highest HDI in 2018, while the US ranked 15<sup>th</sup> (tied with the UK. Note that there are relatively small differences in the numbers for countries ranked 1 to 24 by the HDI, 5.4%.

[https://en.wikipedia.org/wiki/Human\\_Development\\_Index](https://en.wikipedia.org/wiki/Human_Development_Index)

In recent years there has been interest in Western Europe and Canada in using a measure of Gross National Happiness (see CM20) to replace, or augment, GDP. Congress considered adding a more comprehensive measure of wellbeing in addition to GDP. However, all alternative measures of AEW involve two arbitrary decisions: *what to include* and *how much weight to give to the components*. With a little ingenuity I can come up with an index that makes any country in the world rank highest by *my* index: Zimbabwe would rank highest if I used the

number of pictures of the late Robert Mugabe with a weight of .999 and a weight of .0001 for everything else.

Although GDPpc is clearly a very imperfect measure of AEW there is no obviously better measure. The items that are most often used to correct GDPpc are often correlated with GDPpc and so add little to our understanding. And while GDP is a reasonable way to track the health of the economy from quarter to quarter, a change in a measure of AEW may only be of interest for periods as long as five to ten years. And while we have some idea about what to do when there are fluctuations in GDP, it is not so obvious what to do when there are changes in longevity as has been the case in the US in recent years.

When thinking in terms of GDPpc comparisons make sensible choices of countries to compare and take into account all the caveats mentioned above.  
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