GDP and the Measurement of Progress

PRINCIPLES OF ECONOMICS (ECON 210)

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Introduction

• Economists would like to be able to compare economies.
  • 2 or more countries: which one’s citizens are better (best) off?
  • 1 country over time: are we doing better than last year? How much better than our parents?

• “Well-being” is a broad, inclusive concept. Really hard to measure, observe.
  • But we can measure tangible things that are inputs into well-being.
Introduction

• **Gross Domestic Product**: The market value of all final goods and services produced within a country in a year.

Is GDP valid for making the comparisons we want? Ask:

• What does GDP measure, i.e., well-being or social welfare?

• What does GDP not measure? Does this make it a useless or misleading measure of welfare?
“GDP is the market value . . .”

• Goods’ prices reflect how they are valued by the marginal consumer. Goods that consumers are willing to pay a lot for are counted as more valuable.

• This is not identical to gains from trade—the real extent to which people are made better off by consumption. GDP measures the consumption, itself, more so than the gains from trade.
Market value versus gains from trade
Intermediate goods in the production process are not counted in GDP because they merely add value to the final output.

- Since the cumulative value added is the value of the final good, it would be redundant to count the value added by the intermediate good separately.

Physical tools used to produce goods that do not become part of the final good are counted in GDP, though.

- The firm using the tools and machines is considered the final consumer of them.
“... goods and services ...”

- An increasing proportion of the value created by advanced economies comes from services.
- People provide many valuable services to one another that do not entail producing a tangible good.
- Examples: tennis lessons, manicures, stand-up comedy performances, retirement planning advice.
GDP does not count transfers of ownership of goods, such as existing homes and used cars, produced in earlier periods.

Nor do transfers of assets, such as stocks, whose value derives from future production.

The services provided by brokers, sales people, and buyers’ and sellers’ agents in the present still count as present GDP production.
This is the difference between GDP and GNP (Gross National Product). GDP is based on geographical boundaries; GNP is based on ownership.

Foreign workers and capital employed in production within the U.S. count toward GDP in the U.S., but toward the GNP of their native country.

The output of U.S.-owned capital and American workers employed in other countries counts in U.S. GNP and in the GDP of the foreign country.
“... in a year.”

- GDP is a “flow” measure, as opposed to a “stock” like national wealth.
- It is analogous to an individual’s annual income.
- The Bureau of Economic Analysis (BEA) performs the calculation for each quarter, as well as annually, in the U.S.
Are the following included in U.S. GDP? Briefly explain why or why not:

a. Used textbooks sold at your college bookstore?
ANS: No. Used items aren’t “produced” during that year so they are not included in GDP.

b. Used books sold at a garage sale?
ANS: Still no. Used items don’t count.
Are the following included in U.S. GDP? Briefly explain why or why not:

c. Cars made in the United States at a Toyota factory?
ANS: Yes. What matters is where it’s made, not whether an American company owns the factory.

d. Cars made in Germany at a General Motors factory?
ANS: No. What matters is where it’s made, not whether an American company owns the factory.
Cowen and Tabarrok Facts and Tools #6

Are the following included in U.S. GDP? Briefly explain why or why not:

e. The price paid by a German tourist when staying at a New York hotel?
ANS: Yes. It’s made in the USA! Technically, it counts as an “exported service.”

f. The price paid by an American tourist staying at a Berlin hotel?
ANS: No. GDP is about production inside the U.S. border. This service is produced in Germany.
GDP growth and growth rate

There are many reasons GDP changes over time. It can be expressed as absolute change:

$$\Delta GDP_t = GDP_t - GDP_{t-1},$$

where $\Delta$ signifies “change in” and the subscript $t$ indicates the time period.

$t$ is the present; $t - 1$ is the preceding period.

To facilitate comparisons across economies of different sizes, growth rates can be calculated relative to the starting point:

$$Growth\ Rate = \frac{\Delta GDP_t}{GDP_{t-1}} \times 100$$

in % terms. An increase from $10$ trillion to $11$ trillion would be both a $1$ trillion absolute increase and a $\left(\frac{1}{10} \times 100\right)\ 10\%$ rate of growth.

This would be very fast growth if it occurred in a single year.
Average growth

• Growth over time can be averaged by using compound growth. If GDP in the earlier year, \( t = 0 \), grows to \( GDP_T \) after \( T \) years, the average annual growth rate (\( g \)) solves:

\[
GDP_T = GDP_0 (1 + g)^T
\]

\[\Leftrightarrow g = \left( \frac{GDP_T}{GDP_0} \right)^{\frac{1}{T}} - 1\]

• The average % growth rate would be 100\( g \).
Average growth (continued)

• In the intervening years, the growth rate can fluctuate around $g$ because of business cycles.

• Individual years and quarters can have slower or faster than average growth.

• Growth can even be negative temporarily during recessions but still positive ($g > 0$) in the long run.
Superficial reasons GDP can grow

• Deflating nominal GDP and calculating GDP per capita distinguishes real (inflation-adjusted) growth in the standard of living from price level increases over time and population growth holding average income constant.

• Each year has its own population ($N_t$) and price level ($P_t$), as well as real GDP ($Y_t$). Nominal GDP is expressed:

$$GDP_t = P_t \times Y_t,$$

and on a per capita basis,

$$\overline{GDP}_t = \frac{GDP_t}{N_t} = \frac{P_t Y_t}{N_t}.$$
Nominal GDP growth

• Nominal growth can occur because of an increase in $P$ (inflation) or because of an increase in the ratio of $Y$ to $N$.
  • Note that if $Y$ and $N$ both grow at the same rate, the ratio does not change, and per capita GDP does not grow.
  • Nominal GDP can grow without increasing the real value of output (either aggregate or per capita).

• The ratio of price levels in different years offers a way of measuring growth in the presence of inflation in prices. The GDP deflator,
  \[ \frac{P_t}{P_{base}} = D_t, \]
  can be used to convert nominal GDP into real GDP and compare it to other years using a common price level. E.g.,
  \[ GDP_{base} \geq \leq \frac{1}{D_t} \times GDP_t. \]
Lately . . .
Growth rates lately . . .
GDP’s shortcomings

• What valuable goods does GDP miss? Any good for which the market value is difficult to observe.

• Examples:
  • The underground economy,
  • Non priced production,
  • “Free” goods.

• It also does not measure the distribution of income across households.

• Nor the value of product variety and quality improvements over time.
The underground economy

- Illegal goods that the parties do not want the government to know about.
- Informal transactions intended to avoid taxes
  - Even if the goods produced are legal.
- Comparisons across countries with different sized underground economies can be misleading.
Non priced production

• Many valuable goods are produced and not sold for money.

• Household production and “chores”.

  • Home maintenance, child care, and food preparation can be purchased in the formal economy but are frequently produced within the household instead.

  • The professionals demonstrate that the services are valuable but producing them within the household means not counting them toward GDP.

• Over time this has become less common, suggesting that GDP is capturing more services because they are increasingly performed by professionals.
“Free” goods

- Voluntarily provided goods/services. E.g.,
  - blog content, YouTube videos, volunteer work, for which the contributors are not paid. Then how much would consumers pay if they had to?

- Goods with non-existent markets, e.g.,
  - for clean air, biodiversity, traffic alleviation.
  - Property rights to these goods are poorly defined so monetary transactions involving them are hard to observe.

- Leisure.
  - Only consumption performed during leisure time counts toward GDP.
  - But the time itself is not—despite the opportunity cost of foregone wages individuals bear to enjoy leisure.
The distribution of income

• GDP per capita is a fine measure of the typical person’s standard of living, but there is variability (relatively rich and poor) around the average.

• Economies with the same GDP per capita can have different levels of inequality.

• Economists, at the intersection of labor and development economics, study the relationship between growth and inequality.
Variety

- Regardless of which “brand” consumers buy, options are valuable.
- Everyone can find something more “personalized” to their taste and closer to their ideal:
  - beer,
  - tv show,
  - clothing style.
- “More consumer surplus per unit”.

Can I have one of each?
Quality improvements

• The inflation-adjusted price of (desktop or laptop) computers is not that much different from 20 years ago.

• But are these vintages really comparable in terms of quality?

• No way!

• How do you value these vast improvements’ contributions when the price doesn’t go up?
  • It’s tough. But conceptually: how valuable would a modern desktop be in 1995?
  • If you owned one you could rent it for a fantastically high rate.

• These (taken for granted) improvements really understate how much our standard of living has improved.
Improving GDP, alternative measures

• Recently economist Diane Coyle has raised the public consciousness about GDP with her book, “GDP, A Brief but Affectionate History”. Discussion here, here, and her own summary here.

• One novel idea is to use data generated by satellites in orbit around the earth.
  • They observe the brightness of lights at night as a measure of economic activity.
  • This can be used to correct some measurement problems in official tallies of GDP.

• The Human Development or Better Life Indices can be used to weight non-income measures the GDP may miss.
  • Re-weighting can change the ranks across countries.
Conclusion

• The emphasis in this chapter is on how to measure economic progress and its pace of growth.

• The next chapter is about explaining the causes and consequences of growth. The reasons some countries’ economies have grown quite rich and others have not is one of the primary questions in macroeconomics.

• Now that the issues related to measuring this phenomenon have been discussed, we turn our attention to the reasons economies grow.