

## Chapter 5

# MACROECONOMIC MEASUREMENT: ENVIRONMENTAL AND SOCIAL DIMENSIONS

*Macroeconomics In Context (Goodwin, et al.)*

### Chapter Overview

This chapter provides an introduction to economic, social, and environmental accounting. It also offers a survey of several different measures of economic well-being and economic performance. You will learn about the economic functions of the environment, and how a measure of and a value for these environmental services could be incorporated into the national accounts. You will also learn about the exclusion of household production in the national accounts, and how this exclusion can be remedied.

### Objectives

After reading and reviewing this chapter, the student should be able to:

1. Explain why GDP should not be confused with national welfare.
2. Understand why GDP does not measure well-being.
3. Identify the dimensions of well-being as described by the Stiglitz-Sen-Fitoussi Commission.
4. Explain trends in subjective well-being data across countries and across time.
5. Describe alternative measures of economic well-being including the Genuine Progress Indicator, the Better Life Index, and the Human Development Index.
6. Explain and critique the historical exclusion of household production from the national accounts.
7. Understand the methods used to measure household production and impute a monetary value to it.
8. Identify and provide examples of the three economic functions of the environment.
8. Identify how, conceptually, the depreciation of natural capital can be included in measures of production and saving.
9. Understand the issues involved in assigning monetary values to environmental asset stocks, depreciation, and service flows.

### Key Terms

defensive expenditures

satellite accounts

subjective well-being

Better Life Index (BLI)

Human Development Index (HDI)

replacement-cost method

opportunity-cost method

green GDP

damage-cost approach

maintenance-cost approach

## Active Review

### *Fill in the Blank*

1. A measure of welfare based on survey questions asking people about their own degree of life satisfaction is called \_\_\_\_\_.
2. Additional or parallel accounting systems that provide measures of social and environmental factors in physical terms, without necessarily including monetary valuation, are called \_\_\_\_\_.
3. A town is spending money to raise their dikes and strengthen their levees in order to prevent the neighboring river from flooding the town. Such spending would be considered to be \_\_\_\_\_.
4. A measure of well-being expressed in monetary terms that has been transformed from the Index of Sustainable Economic Welfare (ISEW) is the \_\_\_\_\_.
5. The index of well-being developed by the UNDP in 1990 that combines measures of health, education, and income is called the \_\_\_\_\_.
6. Suppose a policy-maker estimates the value of household production by the expenditure it would take to pay someone else to do the same job. He or she would be using the \_\_\_\_\_ cost approach.
7. The three types of functions that the natural environment plays in economic life are \_\_\_\_\_ functions, \_\_\_\_\_ functions, and \_\_\_\_\_ functions.
8. The absorption and accumulation of mercury into the food chain would be an example of the \_\_\_\_\_ function of the environment.
9. The measure of national production that subtracts both the depreciation of manufactured capital and the depreciation of natural capital is called \_\_\_\_\_.
10. Suppose a policymaker estimates the value of a forested hillside in preventing floods by the expenditure that would be needed to repair flood damage in the neighboring town. He or she would be using the \_\_\_\_\_ cost approach.

### *True or False*

11. Satellite accounts are a helpful way of measuring the monetary value of changes in a country's environmental resources.
12. Average subjective well-being grows as rapidly as GDP per capita.

13. The Genuine Progress Indicator and the Gross Domestic Product both exhibit strong upward trends in the United States for the period 1950-2004.
14. The failure to subtract the lost household production as more women entered the paid labor force over the last century means that the GDP growth over this period of time is overstated.
15. The HDI has been modified in recent years to account for poverty and inequality.
16. Water filtration provided by wetlands is an example of a sink function of the environment.

*Short Answer*

17. Identify and describe five critiques of GDP presented in the chapter.
18. How is the market-based welfare component of GPI estimated?
19. Identify the categories that are added in, and those that are subtracted for, when calculating the GPI.
20. What might account for the deviations of the HDI rankings from the GDP? Why might a country like Sri Lanka have a lower level of GDP per capita than Namibia, and yet have a higher HDI ranking than Namibia?
21. Describe the three new indices developed by the UN to account for poverty, inequality, and gender inequality in 2010.
22. What are the three variables that are used to construct the Happy Planet Index?
23. What have been some justifications given for the historical exclusion of household production from the national accounts?

24. Is it easier or harder to incorporate household production into the national accounts, compared to incorporating environmental assets and services? Explain.
25. What measure has been developed in recent years that subtract for the depreciation of both manufactured capital and natural capital?
26. Why has it been difficult to produce a single estimate of an environmentally adjusted or “greened” GDP? What are the two approaches that can be used to put a value on environmental assets and services?

### **Problems**

1. Suppose Country A (the Ukraine) built a nuclear power plant that had a large accident and led to the release of radioactive iodine that damaged the population’s thyroids. It led to \$1 million in health costs. Country B (Poland) administered potassium iodide pills to the population, to protect the population’s thyroids in the case of an accident. The protection pills cost the country \$100,000. Country C (Germany) decided to ban the building of nuclear power plants. What is the value of the radioactivity-free air in Country C due to this ban of nuclear power plants:

a) measured in terms of the damage cost approach?

b) measured in terms of the maintenance cost approach?

2. According to the results of the 2021 U.S. time use survey, women spent an average of 2.7 hours per day on household activities such as housework, food preparation, yard work, or paying bills, while men spent 2.2 hours per day (when averaged over all responses). Suppose these findings reflect the hours spent in household production for a middle class professional couple, who can each make \$20 an hour in paid work. Suppose they can hire someone else to do these household activities for them for \$10 an hour. Estimate the daily value of these household production activities (assuming no one else in the household is contributing to household production) using:

a) the opportunity cost method

b) the replacement cost method

### 3. Counting the GPI

Suppose the economists in the country Greenland have been counting the GPI and currently have estimated Personal Consumption Expenditures to be \$1,000. They still need to account for the following entries. Finish the task for them, identifying whether the entries would be added or subtracted (or simply excluded) when measuring the GPI.

Personal Consumption Expenditures = \$1,000

		<b>Added (+)</b>	<b>Subtracted (-)</b>
National defense	\$100		
Spending on new bridges	\$25		
Net foreign borrowing	\$75		
Damage from crime	\$50		
Volunteer work in community centers	\$50		
Oil tanker accident	\$30		
Loss of wetlands	\$20		
Helping kids with homework	\$40		
Cooking of meals at home	\$30		
Cost of commuting	\$15		
Services of household washing machines	\$10		
You clean your own house	\$50		
Working overtime on Saturdays (in your paid job)	\$25		
Value of higher education	\$40		

Column Totals: \_\_\_\_\_

Total GPI: \_\_\_\_\_

## Self Test

1. According to the textbook, subjective well-being (SWB) tends to...
  - A. increase as GDP per capita decreases.
  - B. increases as GDP per capita increases, but at a diminishing rate.
  - C. does not show any relationship with regard to GDP per capita.
  - D. increase as GDP per capita increases, and does so at an accelerating rate.
  - E. is better understood when contrasted with GDP rather than with GDP per capita.
2. Jane buys a package of cigarettes. While her purchase would show up in the national accounts as an increase in GDP, it is actually an example of
  - A. a purchase of a well-being reducing product
  - B. a defensive expenditure
  - C. loss of leisure
  - D. loss of human and social capital formation
  - E. unequal distribution
3. Nancy has cut back her paid work hours to part-time and spends some of her extra time participating in her local community peace and justice group which engages in important community-building activities. While her decision to reduce her paid labor activities would show up as a decrease in GDP, it may actually increase well-being because it is an example of
  - A. a well-being reducing product
  - B. a defensive expenditure
  - C. loss of leisure
  - D. a gain in human and social capital formation
  - E. a well-being reducing production method
4. Which one of the following items is *not* subtracted when calculating the GPI?
  - A. cost of crime
  - B. lost leisure time
  - C. environmental costs
  - D. net foreign borrowing
  - E. government spending on highways and streets
5. Which one of the following items is added in when calculating the GPI?
  - A. net foreign borrowing
  - B. consumer durable assets
  - C. most government spending on goods and services
  - D. the services of consumer durables
  - E. paid domestic services

6. When tracking the trends in real GDP per capita and real GPI per capita from 1950 to 2004, what are the findings?
- A. Per capita GPI is lower than per capita GDP, and it has grown more slowly.
  - B. Per capita GPI is lower than per capita GDP, but it has grown more quickly.
  - C. Per capita GPI is higher than per capita GDP, and it has grown more quickly.
  - D. Per capita GPI is higher than per capita GDP, but it has grown more slowly.
  - E. Per capita GPI is about the same as per capita GDP, and they both have grown at about the same rate.
7. Which of the following is not accurate?
- A. The Better Life Index includes nearly a dozen dimensions of well-being.
  - B. The Better Life Index is more ambitious than the Genuine Progress Indicator.
  - C. The Better Life Index was launched by the Organization for Economic Cooperation and Development.
  - D. The Better Life Index combines life expectancy at birth, years of formal education, and real per-capita GDP as three key indicators.
  - E. All of these are accurate.
8. The HDI aggregates which three indicators in its index of well-being?
- A. GDP, adult literacy and education, life expectancy.
  - B. GDP, income inequality, and access to medical care.
  - C. GDP per capita, adult literacy and education, income inequality.
  - D. GDP per capita, adult literacy and education, life expectancy.
  - E. GDP per capita, access to medical care, life expectancy.
9. Which of the following best reflects the trends found in the HDI rankings?
- A. There is a strong correspondence between HDI and GDP per capita, as a high GDP per capita is always associated with a high HDI ranking, and vice versa
  - B. Although there is a rough correspondence between HDI and GDP per capita, some countries have low GDP per capita, yet high HDI rankings, and vice versa.
  - C. There is a weak correspondence between HDI and GDP per capita.
  - D. There is an inverse correspondence between HDI and GDP per capita, as countries with high GDP per capita have low HDI rankings, and vice versa.
  - E. There is no correspondence between HDI and GDP per capita.

10. Which of the following statements is FALSE?
- A. The Multidimensional Poverty Index uses a broader set of indicators to measure living standards than the Human Development Index.
  - B. The HDI captures aspects of poverty more accurately than the MPI.
  - C. The Inequality-Adjusted HDI makes an adjustment for inequality for each of the three components of the HDI index.
  - D. The Gender Inequality Index focuses on highlighting the differences in achievements of men and women.
  - E. All of the above statements are true.
  - F.
11. Which of the following would *not* be an example of household production that is currently excluded from in GDP?
- A. childcare
  - B. housecleaning
  - C. meal preparation
  - D. landscaping by a paid gardener
  - E. taking kids to afterschool activities
12. According to the most conservative estimates, what is the total value of household production in the U.S.?
- A. about 5 - 10% of GDP
  - B. about 15 - 20% of GDP
  - C. about 25 - 35% of GDP
  - D. about 40 – 50% of GDP
  - E. about 100% of GDP
13. Approximately what percent of all U.S. workers were full time homemakers in the U.S. in 2000?
- A. about 5%
  - B. about 16%
  - C. about 35%
  - D. about 40%
  - E. about 56%
14. Which of the following is used to measure (or estimate) the quantity of unpaid, non-market core sector production?
- A. Satellite accounts
  - B. Time use surveys
  - C. Value added
  - D. The precautionary principle
  - E. The maintenance cost method



15. Which of the following best characterizes the shares of time women vs. men spent on the household production activities of housework, food preparation, yard work, or paying bills, when averaged over all responses, according to 2021 BLS survey?
- A. Women and men spent an equal amount of time per day on household activities.
  - B. Women spent on average 2.4 hours per day, while men spent 1.6 hours per day.
  - C. Women spent on average 2.4 hours per day, while men spent 3.3 hours per day.
  - D. Women spent on average 1.5 hours per day, while men spent 0.5 hours per day.
  - E. Women did all the household activities, while men did none.
16. A lawyer decides to scale back her hours to part-time, in order to raise her small children and care for her elderly parents. She takes a cut in her annual salary of \$40,000, and lays off her nanny who she was paying \$25,000 per year. Her unpaid caring labor would be valued at \_\_\_\_\_, according to the \_\_\_\_\_ approach.
- A. \$25,000, opportunity cost
  - B. \$40,000, replacement
  - C. \$40,000, damage cost
  - D. \$25,000, maintenance cost
  - E. \$25,000, replacement cost
17. Hiking on a beautiful mountain to enjoy nature is an example of what kind of function provided by the environment?
- A. resource function
  - B. environmental service function
  - C. sink function
  - D. maintenance function
  - E. all of the above
18. Which of the following is not an economic function of the natural world?
- A. Environmental service functions
  - B. Capital functions
  - C. Sink functions
  - D. Resource functions
  - E. All of these are economic functions of the natural world.

19. Suppose Town A has a factory that spews out heavy pollution and causes \$2 million in health costs to the population. Town B also has such a factory, but requires it to invest \$50,000 in a new scrubber on its smokestack that cleans up most of its pollution. The value of the unpolluted air would be \$2 million according to the ...
- maintenance cost approach.
  - damage cost approach.
  - replacement cost approach.
  - opportunity cost approach.
  - spending approach.
20. Suppose Town A does not chop down the forest on the hillside above it. Town B does chop down its forested hillside, and a flood results in \$1 million worth of damage to the town. Town C also chops down its forested hillside, but spends \$500,000 in raising and strengthening its dikes and levees to guard itself from flood-damage. The value of the forest's services to Town A would be \_\_\_\_\_ approach according to the \_\_\_\_\_ approach.
- \$500,000, maintenance cost
  - \$500,000, damage cost
  - \$1 million, maintenance cost
  - \$1 million, replacement cost
  - \$1 million, opportunity cost

### Answers to Active Review Questions

- Subjective well-being
- Satellite accounts
- defensive expenditures
- Genuine Progress Indicator (GPI)
- Human Development Index (HDI)
- replacement
- resource, environmental service, sink
- sink
- Green GDP
- damage
- False. Satellite accounts only measure changes in the *quantities* of environmental resources, not changes in their monetary *values*.
- False
- False
- True
- True
- False. It is an environmental service function.
- The text identifies the exclusion of household production, volunteer work, and human & social capital formation as some of the key limitations of GDP. GDP also neglects issues of inequality, the value of leisure time, and interactions with the natural world. Various components of the GDP, such

as defensive expenditures and products that reduce well-being, show up as additions on GDP accounting. Also, consumption spending is counted as additions to GDP, even though some consumption may be financed by unsustainable levels of debt.

18. Starting with the category of Personal Consumption Expenditures (or Household Budget Expenditures), defensive and regrettable expenditures and long-term household investments are subtracted from HBE. Then, an adjustment is made for income inequality by subtracting the cost of inequality. Finally, the value of provision of public goods and services that households benefit from is added to estimate the total market-based welfare.
19. The GPI adds in services from human, social, manufactured, and natural capital such as unpaid housework and parenting, higher education, volunteer work, the services of consumer durables, and net capital investment. It also adds the value of public goods and services such as the services of highways and streets. It subtracts defensive and regrettable expenditures and the social and environmental costs of economic activities including the cost of crime, lost leisure time, underemployment, commuting, automobile accidents, household pollution abatement, water pollution, air pollution, noise pollution, loss of wetlands, loss of farmland, loss of primary forests, resource depletion, carbon dioxide emissions damage, cost of ozone depletion, net foreign borrowing, and the cost of consumer durables.
20. The deviations between the HDI and GDP rankings might be due to what is being produced in the country (e.g. spending on weapons that are used in wars rather than spending on health and education), and the unequal distribution of goods and services within a country. A country like Sri Lanka might have better social infrastructure and less of a gap between rich and poor than does Namibia.
21. In order to account for poverty, the UN developed the Multidimensional Poverty Index (MPI) based on the same three dimensions as the HDI – living standards, education, and health – but using a broader set of indicators to measure each dimension. Living standards is measured by six composite variables, including cooking fuel, sanitation, drinking water, electricity, housing, and assets. Health is measured by nutrition and child mortality levels, and education is measured by years of schooling and school attendance rate. The UN also developed the Inequality-Adjusted HDI (IHDI) to account for inequality by making an adjustment for inequality for each of the three dimensions of the HDI measure. The third index developed by the UN is the Gender Inequality Index (GII) that includes measures of reproductive health, women’s empowerment, and gender disparities in the labor market to expose the differences in achievements between men and women.
22. Average life expectancy, average subjective well-being, inequality of outcomes, and ecological footprint.
23. Some reasons have included: a. households are not producing economic goods; b. it’s too difficult to distinguish household production from consumption; c. GDP measures just market production; d; including household production would make too big of a change in the accounts.
24. It is easier, as one can follow the existing procedures already used to impute a value for government production. It does not require the development of new techniques.
25. The Green GDP.
26. Because there is more than one way to put a measure on the value of environmental services. The two approaches to measure environmental services are the damage cost approach and the maintenance cost approach.

### Answers to Problems

1. The value of the unpolluted air would be  
 a) \$1 million in terms of the damage cost approach  
 b) \$100,000 in terms of the maintenance cost approach

2. The couple spends a total of 4.9 hours per day on household activities. The value of these household activities using  
 a) the opportunity cost method would be \$98 per day  
 b) the replacement cost method would be \$49 per day

### 3. Counting the GPI

Personal Consumption Expenditures = \$1,000

		Added (+)	Subtracted (-)
National defense	\$100	Neither added nor subtracted. Excluded.	
Spending on new bridges	\$25	+25	
Net foreign borrowing	\$75		-75
Damage from crime	\$50		-50
Volunteer work in community centers	\$50	+50	
Oil tanker accident	\$30		-30
Loss of wetlands	\$20		-20
Helping kids with homework	\$40	+40	
Cooking of meals at home	\$30	+30	
Cost of commuting	\$15		-15
Services of household washing machines	\$10	+10	
You clean your own house	\$50	+50	
Working overtime on Saturdays (in your paid job)	\$25		-25 (loss of leisure)
Value of higher education	\$40	+40	

Column Totals:

+245

-215

**Total GPI = \$1000 + \$245 - \$215 = \$1030**

### Answers to Self-Test Questions

1. B
2. A
3. D
4. E
5. D
6. A
7. D
8. D
9. B
10. B
11. D
12. C
13. B
14. B
15. B
16. E
17. B
18. B
19. B
20. A