

Chapter 6

Macroeconomic Measurement: Environmental and Social Dimensions

Macroeconomics In Context (Goodwin, et al.)

Chapter Overview

This chapter provides an introduction to social and environmental accounting and alternative measures of economic performance. You will be introduced to an image of economic activity as embedded in social and physical contexts. 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. Finally, the chapter introduces you to two alternative measures of economic well-being.

Chapter Objectives

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

1. Identify and provide examples of the three economic functions of the environment.
2. Identify how, conceptually, the depreciation of natural capital can be included in measures of production and saving.
3. Understand the issues involved in assigning monetary values to environmental asset stocks, depreciation, and service flows.
4. Explain and critique the justifications usually given for the historical exclusion of household production from the national accounts.
5. Understand the methods used to measure household production and impute a monetary value to it.
6. Understand why GDP does not measure well-being, and describe two examples of alternative measures of economic well-being.

Key Terms

resource functions
environmental service functions
sink functions
environmentally adjusted net domestic product (eaNDP)
genuine saving
defensive expenditures
damage cost approach

maintenance cost approach
satellite accounts
third person criterion
counter cyclical movement
replacement cost method
opportunity cost method
Genuine Progress Indicator (GPI)
Human Development Index (HDI)

Active Review

Fill in the Blank

1. The three types of functions that the natural environment plays in economic life are _____ functions, _____ functions, and _____ functions.
2. The absorption and accumulation of mercury into the food chain would be an example of the _____ function of the environment.
3. The measure of the value of natural assets is a _____ variable, whereas the measure of changes in the level of these natural assets over the course of a year is a _____ variable.
4. The measure of national production that subtracts both the depreciation of manufactured capital and the depreciation of natural capital is called _____.
5. 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 _____.
6. Suppose a policy-maker 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.
7. Distinguishing forms of household production from consumption (leisure) activities has been helped by the use of the _____, which examines whether a person could pay someone else to do the activity in his or her place.
8. 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.
9. A measure of well-being expressed in monetary terms that has been developed by the U.S. nonprofit group Redefining Progress is the _____.
10. The index of well-being developed by the UNDP in 1990 that combines measures of health, education, and income is called the _____.

True or False

11. Water filtration provided by wetlands is an example of a sink function of the environment.

12. A society with a “high time discount rate” tends to put a high value on the future and the well-being of future generations.
13. Satellite accounts are a helpful way of measuring the value of changes in a country’s environmental resources.
14. Playing a game of tennis with your child to help your child improve his/her tennis skills would be considered a form of household production if, by the third person criterion, you could just as easily hire a tennis coach to perform this same service.
15. 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.
16. The first estimates of the value of household services in the U.S. were produced more than 80 years ago.

Short Answer

17. What two measures have been developed in recent years that subtract for the depreciation of both manufactured capital and natural capital?
18. 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?
19. What have been some justifications given for the historical exclusion of household production from the national accounts?
20. What most likely is the cyclical movement of household production with the business cycle – is it pro-cyclical or counter-cyclical? Explain.
21. Is it easier or harder to incorporate household production into the national accounts, compared to incorporating environmental assets and services? Explain.

22. In an updated GDP that includes household production, how would the purchase of a car or appliance for household use be treated?

23. How does the GPI adjust for increasing U.S. income inequality?

24. Identify the categories that are added in, and those that are subtracted for, when calculating the GPI.

25. 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?

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 \$1million 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 2005 U.S. time use survey, women spent an average of 2.3 hours per day on household activities such as housework, food preparation, yard work, or paying bills, while men spent 1.4 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

		Added (+)	Subtracted (-)
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. 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. all of the above
- e. none of the above

2. Genuine Saving is

- a. is a measure of saving that subtracts for both the depreciation of manufactured capital and natural capital
- b. is a measure of saving that subtracts for the depreciation of natural, manufactured, social, human, and financial capital.
- c. was proposed by the United Nations to account for the saving in a country adjusted for depreciation
- d. is the true saving in a nation, as opposed to the fake saving that showed up in the false accounting schemes of many firms in the late 1990s and early 2000s.
- e. none of the above

3. 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

- a. maintenance cost approach
- b. damage cost approach
- c. replacement cost approach
- d. opportunity cost approach
- e. spending approach

4. 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 _____, according to the _____ approach.

- a. \$500,000, maintenance cost
- b. \$500,000, damage cost
- c. \$1 million, maintenance cost
- d. \$1 million, replacement cost
- e. \$1 million, opportunity cost

5. Which of the following major industrialized countries have not yet ratified the Kyoto Protocol, as of 2008?

- a. Russia
- b. The U.S.
- c. Australia
- d. Canada
- e. All of the above

6. 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

7. 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

8. 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%

9. Suppose the economy goes into a recession and GDP declines by 1% over the year. If unpaid household production had been included in the national accounts, what might we find?

- a. That GDP declines by a smaller amount, than it does when measured in the traditional way.
- b. That GDP declines by a larger amount, than it does when measured in the traditional way.
- c. That GDP declines by an equal amount, equal to what it does when measured in the traditional way.
- d. There is no change in the measure of GDP when unpaid household production is included.
- e. None of the above.

10. 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

11. 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 2005 BLS survey?

- a. Women and men spent an equal amount of time per day on household activities.
- b. Women spent on average 2.3 hours per day, while men spent 1.4 hours per day.
- c. Women spent on average 4.2 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.

12. 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

13. 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

14. 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

15. 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

16. 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

17. When tracking the trends in real GDP per capita and real GPI per capita from 1950 to 2002, 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.

18. The HDI aggregates which three indicators in its index of well-being?
- GDP, adult literacy and education, life expectancy.
 - GDP, income inequality, and access to medical care.
 - GDP per capita, adult literacy and education, income inequality.
 - GDP per capita, adult literacy and education, life expectancy.
 - GDP per capita, access to medical care, life expectancy.
19. Which of the following best reflects the trends found in the HDI rankings?
- 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
 - 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.
 - There is a weak correspondence between HDI and GDP per capita.
 - 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.
 - There is no correspondence between HDI and GDP per capita.
20. Comparisons between GDP and HDI reveal that
- GDP is a good measure of well-being
 - GDP has significant shortfalls as a measure of well-being
 - The HDI has significant shortfalls as a measure of well-being
 - The GDP is a better measure of well-being than is the HDI
 - Neither the GDP nor the HDI can serve as measures of well-being

Answers to Active Review Questions

- resource, environmental service, sink
- sink
- stock, flow
- environmentally adjusted net domestic product (eaNDP)
- defensive expenditures
- damage
- third person criterion
- replacement
- Genuine Progress Indicator (GPI)
- Human Development Index (HDI)
- False. It is an environmental service function.
- False. It would put a high value on the present, and relatively little value on the future.
- False. Satellite accounts only measure changes in the *quantities* of environmental resources, not changes in their monetary *values*.

14. True.
15. True.
16. True
17. The environmentally adjusted Net Domestic Product (eaNDP) and the measure of Genuine Saving.
18. 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.
19. 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.
20. It is most likely counter-cyclical: when the GDP goes up, people spend more hours in the paid labor force and purchase domestic services on the market, and when the GDP goes down, people spend fewer hours in paid labor and probably resort to more unpaid, do-it-yourself household production.
21. 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.
22. A car or appliance would be treated as a household investment rather than a consumer durable, and could be included in the category of investment.
23. Starting with the category of Personal Consumption Expenditures, the GPI adjusts for increasing income inequality by dividing by a factor that reflects the growth in the Gini ratio since 1968.
24. The GPI adds in: unpaid housework and parenting, , higher education, volunteer work, the services of consumer durables, the services of highways and streets, and net capital investment. It subtracts: 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.
25. 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.

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 3.7 hours per day on household activities. The value of these household activities using
 - a) the opportunity cost method would be \$74 per day
 - b) the replacement cost method would be \$37 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: \$1,030 (\$1,000 + 245 – 215 = \$1,030)

Answers to Self Test Questions

1. B
2. A
3. B
4. A
5. B
6. D
7. C
8. B
9. A
10. B

11. B
12. E
13. A
14. D
15. E
16. D
17. A
18. D
19. B
20. B