Wealth Accounting for Biodiversity and Ecosystem Services

Kirk Hamilton

Grantham Research Institute

London School of Economics and Political Science

Outline

- National accounting
- Conceptual framework for sustainability
- The wealth of nations in 2005
- Saving for the future
- Accounting for biodiversity

National accounting and its limitations

Gross Domestic Product (GDP)

- GDP is a key aggregate in the System of National Accounts (SNA). It measures total production in an economy
- Growth in GDP is the 'headline' indicator of economic progress
- GDP growth has great political salience: declines in GDP are associated with unemployed people and idle factories

Limitations of GDP

- It doesn't measure wellbeing
- It measures goods but not bads (e.g. pollution)
- It doesn't reflect the harm inflicted by bads
- It doesn't reflect depletion of natural resources
- It doesn't measure whether an economy is sustainable
- It ignores the role that ecosystem services play in the economy

Beyond GDP – some examples

- Canadian Index of Wellbeing
- Genuine Progress Indicator
- Sustainable National Income
- Ecological Footprint
- 'Green GDP', etc.

- But – The goal should be to influence the Ministry of Finance and Planning. This means staying close to SNA definitions and boundaries. The UN SEEA is a good example

Concepts: An Economic Approach to Sustainable Development

Sustainability and human well-being

- Economics views environment and natural resource issues through the lens of benefits to humans, rather than environment having any intrinsic value
- From an economic viewpoint, therefore, a development path is sustainable if human well-being does not decline at any point along the path
  - Of course, part of this well-being is provided by the environment

Basic concepts (1)

- A basic measure is ‘saving’ – how much of production is saved for the future, rather than being consumed now
- ‘Genuine saving’ is a comprehensive measure of saving, which includes depletion of environmental resources
- Hamilton and Clemens (1999): negative genuine saving implies that development is not sustainable

Basic concepts (11)

- Other key papers are Dasgupta and Maler (2000) and Asheim and Weitzman (2001)
- Hamilton and Withagen (2007) show that there is a general rule for sustainability: ensure that genuine saving is positive and not growing faster than the rate of interest

Testing genuine saving

- Ferreira and Vincent (2005) show that genuine saving is correlated with future well-being in developing countries
- Ferreira, Hamilton and Vincent (2008) show that genuine saving is the only measure of saving that is correlated with future well-being

The Wealth of Nations in 2005

Income and wealth in Brazil, 2005 $bn

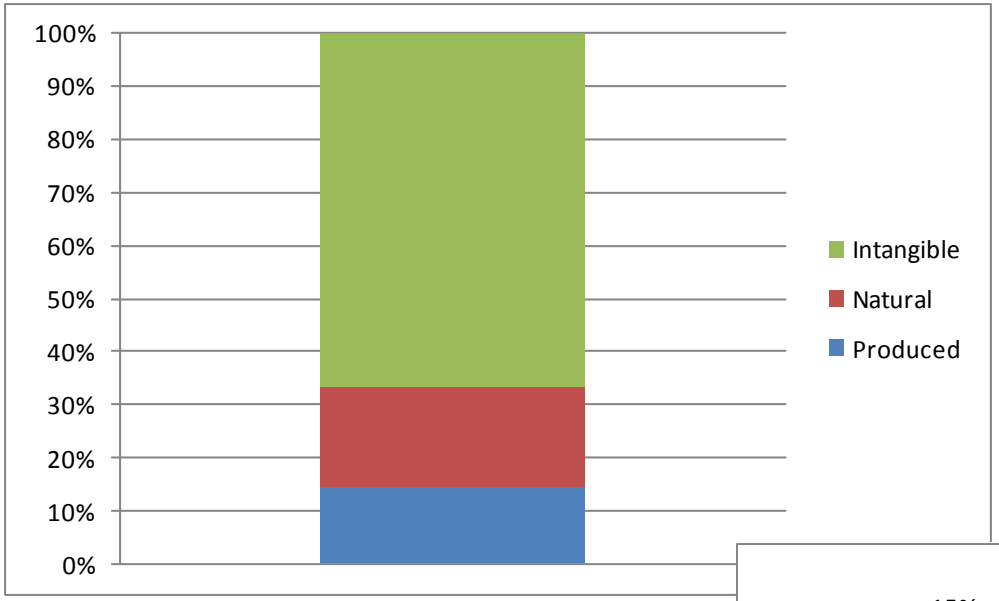
Produced capital	1,828
Natural capital	2,417
Net financial assets	-280
Net worth	3,965
Adjusted National Income	636
Implicit rate of return on wealth	16.0%

Brazil's intangible wealth, 2005 $bn

Intangible capital	8,806
Comprehensive wealth	12,772
Implicit rate of return on comprehensive wealth	5.0%

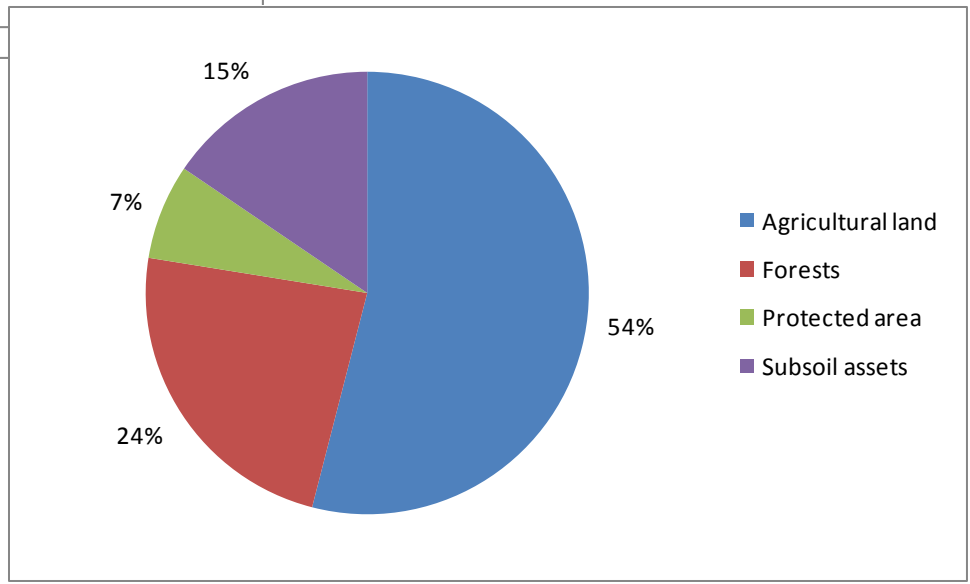
Where is the wealth of Brazil?

Shares of total wealth, 2005



Total wealth / capita: $79,000

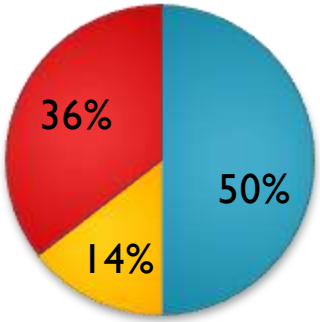
Shares of natural wealth, 2005



Composition of total wealth

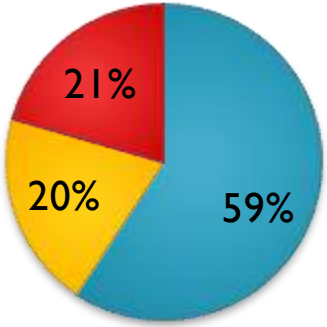
Shares of comprehensive wealth, by income class, 2005

Low Income Countries



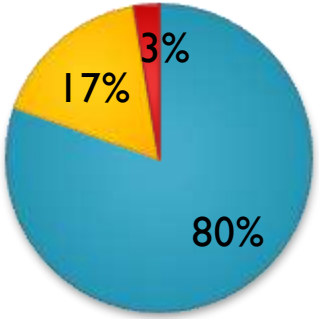
- Natural capital is most important in low income countries—more than twice as large as produced capital

Middle Income Countries



- In middle income countries natural capital and produced capital are roughly equal

High Income Countries

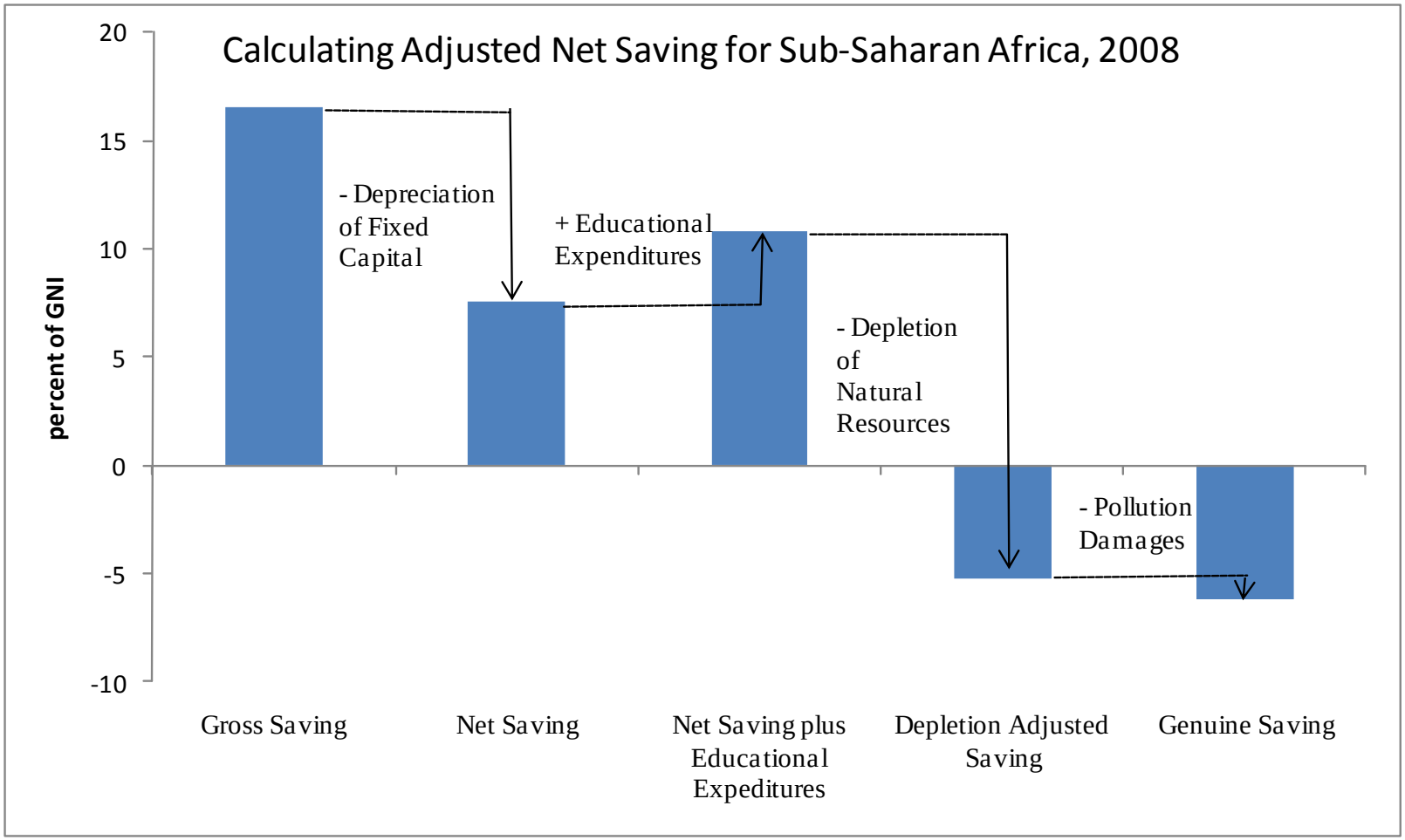


- Intangible wealth dominates in all countries, especially in high income countries

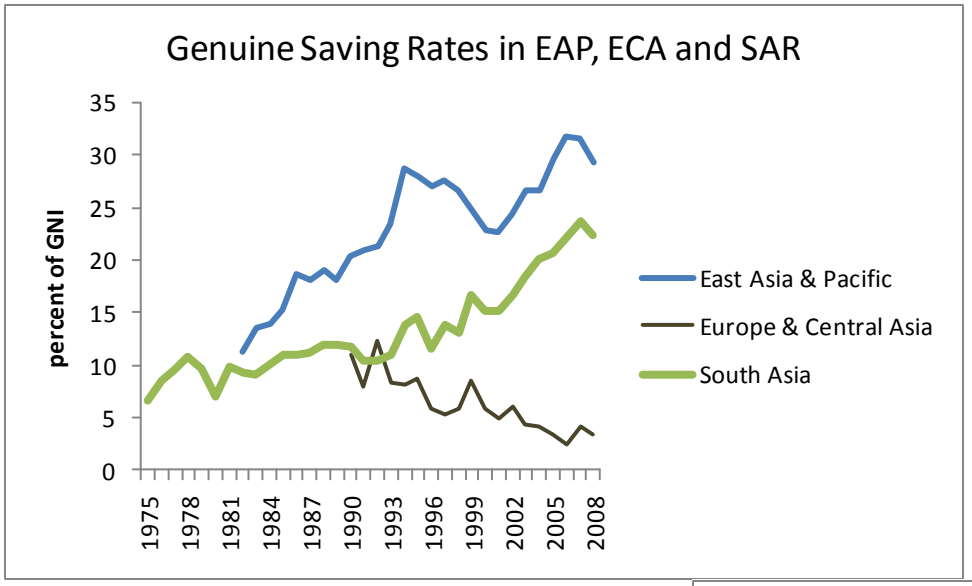
Intangible Capital Produced Capital Natural Capital

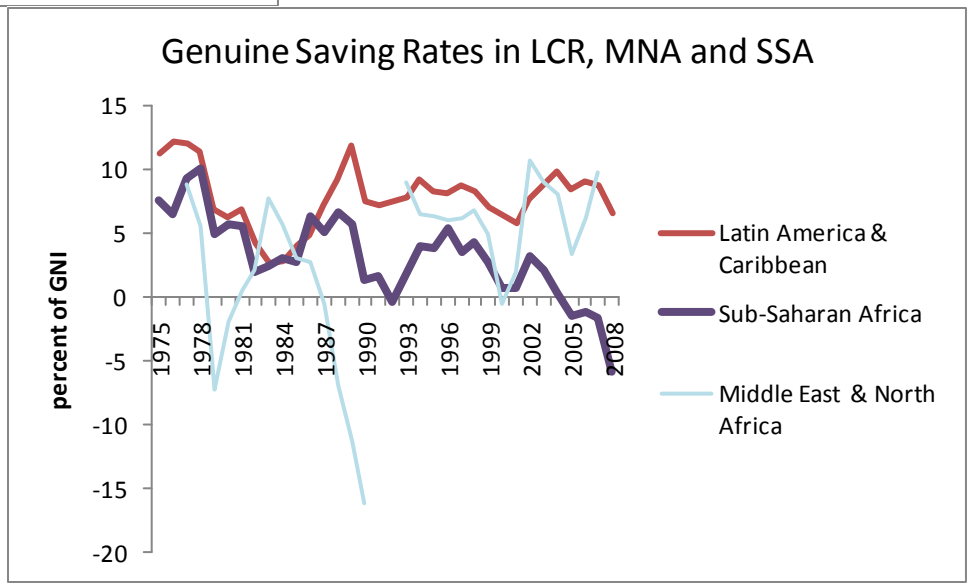
Saving for the future

Extending our measures of wealth creation



Long-run trends in genuine saving





Limitations of the approach

- Difficulty in valuing some natural assets, e.g. biodiversity
- Limited substitution possibilities in some cases
- Completeness of the accounting
- Accounting for ecosystem services

Biodiversity and national accounting

Natural assets

- The SNA defines economic assets as assets that:
  - Are owned
  - Are capable of yielding a flow of benefits to their owner
- Most natural resources fit this definition
- But, assets such as protected areas and the biodiversity they harbor, are typically not measured in the national balance sheet

What is biodiversity?

- Biodiversity is a property of a natural area. It is one property among many, including soil, hydrology, geology, topography, climate, and location
- It is typically measured as relative species abundance or joint species dissimilarity

The economic value of biodiversity

- Use values measured in the SNA include:
  - Hunting, fishing, photography, ecotourism
  - Bioprospecting revenues, knowledge, and insurance (e.g. crop diversity)
  - The value of ecosystem services, which are underpinned by biodiversity
- However, values in the SNA are often not explicitly broken out
- Non-use values include existence and option values, and lie outside the SNA

Practical problems in valuing biodiversity

- Natural areas provide a bundle of benefits which are linked to biodiversity in complex ways
  - Solution: Statistical techniques such as estimating production functions
- For existence values, respondents to questionnaires have difficulty in valuing quantities. And extinction of one species may raise the value of other species

Practical problems in accounting

- Statistical techniques may be required to arrive at prices for individual properties of natural areas (including biodiversity)
- Ecosystem services, which are underpinned by biodiversity, are typically provided as externalities – e.g. the nursery function of mangroves provided to inshore fisheries
  - This could lead to double-counting

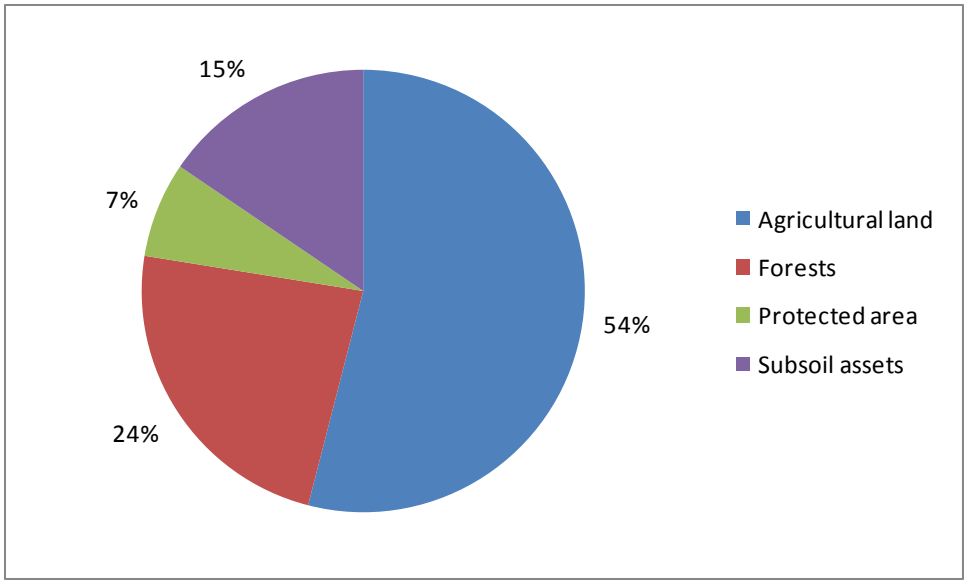
Conclusions on accounting for biodiversity and ecosystem services

- This analysis suggests that it is possible to bring the economic value of natural areas into balance sheet accounts
- This will permit tracking of economic losses when natural areas are damaged or lost – this would show up as dissaving and loss of sustainability in extended national accounts

An example – valuing protected areas in wealth accounts

The World Bank's Wealth of Nations data value protected areas at opportunity cost – how much agricultural production is given up when an area is given protected status? This should be a lower bound on the value of protected areas

Brazil 2005: shares of total natural wealth



Who is incurring the cost of protecting nature?

Annual opportunity cost (PA rent) of protecting natural areas across income classes, 2005

	Low income	Middle income	OECD
# of countries in class	41	65	29
# of countries in class with PA rents > 1% of GDP	24	34	4
% of countries in class with PA rents > 1% of GDP	59%	52%	14%
Which countries had PA rents > 5% of GDP?	Benin (6%) Kenya (7%) Lao PDR (7%) Tajikistan (8%) Nepal (9%) Ethiopia (10%) Uganda (11%)	Dominica (6%) Thailand (7%) Cameroon (8%) Honduras (9%) Belize (11%) Bhutan (12%) Ecuador (23%)	

“How we measure development will drive how we do development”

Aiming for sustainability

- Integrate the value of natural resources and natural areas into national accounting systems
- Strengthen natural resource management and protect the sources of ecosystem services
- Invest resource rents in other assets
- Invest in people
- Build institutions

Thank you!

http://data.worldbank.org