

Measuring Economic Performance and Sustainability

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Goals of this presentation

1. To critique GDP as an indicator of macro-economic performance
2. To describe a comprehensive wealth accounting framework as an alternative indicator of economic performance
3. To link comprehensive wealth to sustainability

PP

Gross National Happiness
is more important than Gross
National Product. ”

By: HM. Jigme Singye Wangchuk.

Time to leave GDP behind

Gross domestic product is a misleading measure of national success. Countries should act now to embrace new metrics, urge **Robert Costanza** and colleagues

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Some alternatives to GDP

Index of Sustainable Economic Welfare (ISEW)

- Herman Daly & John B. Cobb, 1989

Genuine Progress Indicator (GPI)

- Center for Sustainable Economy and Institute for Policy Studies

System of Environmental-Economic Accounting

- European Commission, Food and Agriculture Organization, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank, 2012

Sustainability and the measurement of wealth

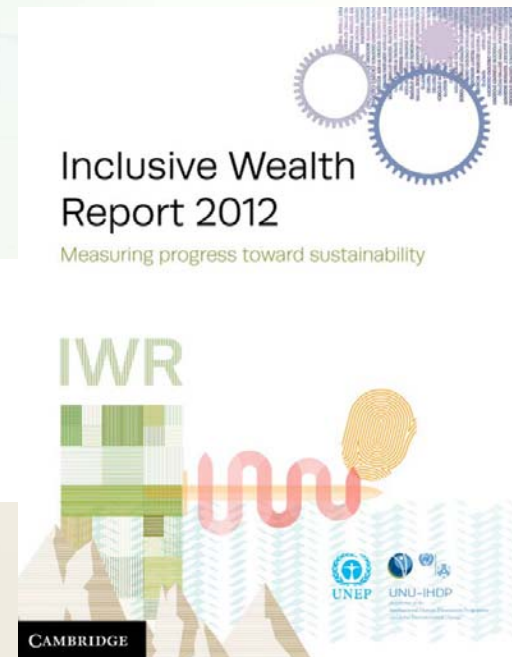
- Arrow, K.J., P. Dasgupta, L.H. Goulder, K.J. Mumford, and K. Oleson. *Environment and Development Economics* 17(3). 2012

Recent focus on wealth

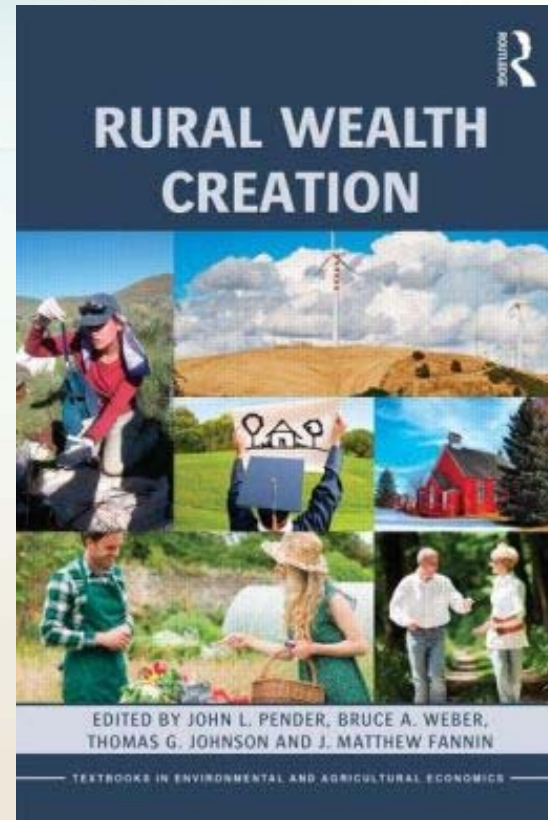


Wealth Accounting and Valuation of Ecosystem Services (WAVES)

VALUING THE ENVIRONMENT. MAKING BETTER DECISIONS.

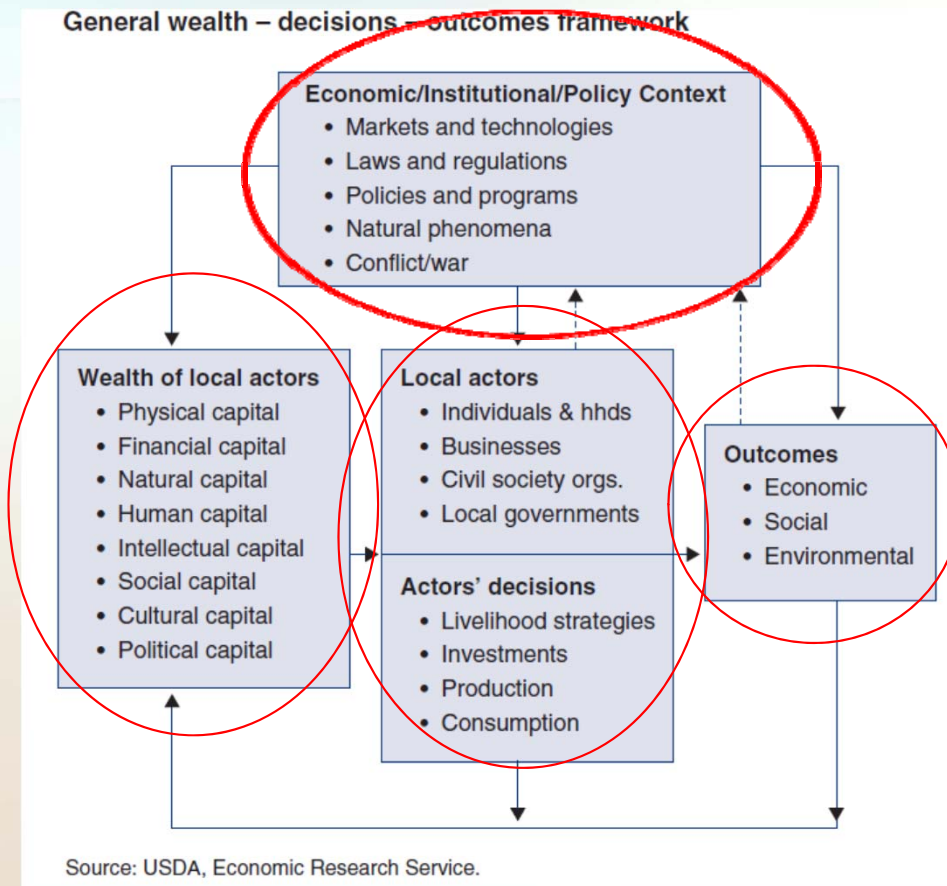


Especially Rural Wealth



What is Wealth Creation?

- Multiple forms of wealth
- Investment decisions by individuals and governments
- Policy strategies
- Comprehensive indicators of outcomes



Characteristics of Comprehensive Wealth

Flows versus stocks (wellbeing versus wealth)

Individual wellbeing is fundamentally a flow measure

GDP is our most common measure of income flow

But wellbeing is dependent on the wealth

Wealth is a stock—the net accumulation of assets and liabilities

Characteristics of Comprehensive Wealth

Comprehensive wealth and multiple forms of capital

1. Financial capital

Cash, deposits, stocks, bonds, futures contracts
Claims on assets held by others

2. Built capital

Buildings, machines, roads, bridges, parks, dams, transmission lines,

Characteristics of Comprehensive Wealth

Comprehensive wealth and multiple forms of capital

3. Natural capital

Air, water, soil, forests, animals, minerals, etc.

4. Human capital

Education, health, skills, experience, etc.

5. Social capital

Social organization, networks, trust, markets, etc.

Characteristics of Comprehensive Wealth

Comprehensive wealth and multiple forms of capital

6. Intellectual capital

Knowledge, books, patents, music, etc.

7. Political capital

Political networks, and trust and access in these networks, etc.

Characteristics of Comprehensive Wealth

Asset value and property rights

Wealth rises when:

- Asset values rise
- Property rights are strengthened

Property rights define shared interests in, and ability to expropriate value from, assets including non-market goods and services

Property rights are strengthened through legal, regulatory or policy change

Characteristics of Comprehensive Wealth

Place-based versus people-based wealth

People-based wealth:

- cumulative value of peoples' multiple capitals less liabilities

Place-based wealth:

- combined private, public and communal assets of a region regardless of ownership

The bridge between place and people wealth is spatial distribution of asset ownership, liabilities and incidence of external benefits and costs

Characteristics of Comprehensive Wealth

Role of the public sector in wealth creation

Taxation and spending

- Local taxes are appropriations of local wealth
- National and state taxes are expropriations of local wealth
- Redistributes income

Infrastructure

- Produces place-based assets through investments in infrastructure

Regulation

- Strengthens property rights
- Redistributes property rights

Comprehensive Wealth and Sustainability

- Economist, Irving Fisher linked the flow of benefits from comprehensive wealth to sustainability
- Fisherian Income: “the maximum amount of resources that could be consumed in the current period while still allowing for at least as much consumption in each successive period.”

Comparing Paretian and Fisherian Income

- Hicksian income is consumption plus net change in capital stocks valued at Pareto efficient prices.

$$Y(t) = C(t) + \dot{K}(t)$$

Where

$Y(t)$ is Hicksian income at time t

$C(t)$ is the rate of consumption at time t

$\dot{K}(t)$ is the rate of change in appropriated capital stocks at time t

Hicksian Income

- Hicksian income (production-based income) measures the net-production by society if assets are left intact
- But in Hicksian income, “...the only dynamic element is capital formation...” (Nordhaus 1995, p. 7)

Fisherian Income

- Nordhaus shows that maximum sustainable (Fisherian) income is the, “...stationary equivalent of future consumption.” (Nordhaus 1995, p. 7)

$$\rho(t) = C(t) + \dot{K}(t) + R(t)$$

Where

$\rho(t)$ is Fisherian income at time t

$C(t)$ is the rate of consumption at time t

$\dot{K}(t)$ is the rate of change in capital stocks at time t

$R(t)$ is the present value of future benefits of investments in unconventional capital at time t

Hicksian versus Fisherian Income

- Fisherian income includes the following elements that are ignored by Hicksian income
 - Appropriated stocks of natural resources (minerals and renewable resources)
 - Unappropriated items such as the environment, knowledge and technological change
- If Fisherian capital is rising, Fisherian income is rising and is thus sustainable
- Nordhaus refers to Fisherian income as sustainable income or wealth based income.

Measuring Comprehensive Wealth

- In The Changing Wealth of Nations (2011), the World Bank points out that “...comprehensive wealth is the present value of future consumption.”

$$K(t) = \int C(t)e^{-r} dt$$

- But K includes built capital, natural capital, human capital and intangible capital (social, cultural, etc.)
- They estimate intangible capital by:
 1. Assuming a discount rate, r
 2. Calculating the value of capital required to produce the Net Income in each country
 3. Subtracting aggregate tangible capital leaving an estimate of intangible capital

Weaknesses of the World Bank Approach

- National Income is based on Hicksian income
 - A static concept
 - Ignore non-market activity
 - Treats investments in knowledge and other intangibles as consumption
 - Ignore investment in unpriced natural resources and intangible capital
- Rate of return should be a function of wealth and consumption rather than wealth a function of consumption and assumed rate of return

A Proposed Wealth-based Model of Sustainability

- We start with Fisherian income

$$\rho(t) = C(t) + \dot{K}(t) + R(t)$$

- Production function for Fisherian income: a function of the flow of labor, and the stocks of produced and intangible capital, and extraction of non-renewable resources

$$Y(t) = f[L(t), K(t), S(t), E(t)]$$

- Production is divided between consumption and investment (in all types of assets)

$$Y(t) = C(t) + I(t)$$

Basic Model Description

- Stocks of natural capital decline with extraction or destruction, E

$$S(t) = S(0) - \int_0^t E(t)dt$$

$$\dot{S}(t) = -E(t)$$

- Produced capital increases with investment and declines with depreciation and destruction

$$\dot{K}(t) = I(t) - D(t)$$

Basic Model

- Primary state variable is Fisherian Income, $\rho(t)$

$$\rho(t) = C(t) + \dot{K}(t) + R(t)$$

$$Y(t) = f[L(t), K(t), S(t), E(t)]$$

$$Y(t) = C(t) + I(t)$$

$$S(t) = S(0) - \int_0^T E(t)dt$$

$$\dot{S}(t) = -E(t)$$

$$\dot{K}(t) = I(t) - D(t)$$

$\rho(t)$ = Fisherian income

$Y(t)$ = NI

$L(t)$ = labor

$K(t)$ = renewable
comprehensive capital

$R(t)$ = non-renewable
commodities

$S(t)$ = Stocks of non-
renewable capital

$I(t)$ = Investment

$D(t)$ = Depreciation

$E(t)$ = Resource extraction
& destruction

Basic Stock Effect Model

- Our objective is

Maximize $\rho(t) = C(t) + \dot{K} \rho(t) + R(t)$

Subject to:

$$Y(t) = f[L(t), K(t), S(t), E(t)]$$

$$\dot{S}(t) = -E(t)$$

$$\dot{K}(t) = I(t) - D(t)$$

$$S(t) > 0$$

A Multi-Capital Wealth Accounting System

Characteristics of an ideal wealth accounting system

1. Records the level and changes in all types of capital
2. Reflects the interaction between types of capital
3. Records the changing ownership as well as location of capital
4. Records both privately and publicly owned capital

An Example Wealth-Based Analysis

Wealth Effects of the Non-Renewable Energy Development

Generates flows of income, savings and investments to residents and non-residents

Generates local tax revenues to fund public services and investments in stocks of infrastructure

Reduces the stocks of non-renewable resources

May increase or decrease the value of social, political, natural, human, intellectual, financial and other capitals

Policy Implications

- A superior basis for assessing economic performance
 - Considers benefits and costs of non-market effects
 - Considers the returns to investment in the environment, education, health, intellectual property and social capital
- Clarifies the concept of sustainability
 - Sustainability is growth in comprehensive wealth
- Recognizes the complementarity among types of capital
 - Environment and health, natural capital and intellectual capital, for example

Policy Implications

- Importance of policies to encourage
 - Education and good health
 - Research
 - Saving
 - Investment
- Development strategies based on local assets
 - Place-based wealth
- Attention to the distribution of income and wealth
 - Across groups and places
- Attention to the returns to investment in public assets
 - Relationship between public investment and private wealth creation



Thank You