THE CONCEPT OF VALUE IN ECONOMICS

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Introduction: Nature as assets

1. Source of material inputs: Wood products, minerals, water, fish, etc.
2. Provides life-support service to humans and animals: Breathable atmosphere, livable climate
3. Provides a variety of amenity services: Scenic views, outdoor recreation, non-use value,others.
4. The environment disperses, transforms and stores the waste products of economic activity

The challenge is to place a monetary value on these services.

Type of value - Motives for Value

In any nonmarket valuation exercise it is desirable to start out by identifying the different groups of people who might be affected in some way, and noting how and why they are affected.
Example: Who might be affected when a beach is closed due to pollution?

1. People who visit the beach for recreation
2. Local businesses who cater to these people
3. City, county, state governments (parking revenues, sale tax revenues, hotel tax revenues, income tax revenues)
4. The general public (if the event is serious enough to arouse general concern, e.g. injured wildlife at the beach)

Type of value - Motives for Value

In US Law, what is the economic value associated with the loss of a trip to the beach?

1. Loss of "use and enjoyment" for beach visitors
2. loss of income or tax revenue for others

The Context of Valuation

- In the developed countries, the protection of the environment has emerged as one of the principal focuses of domestic policy (and, increasingly, international policy) over the past 30 years, and is likely to remain so for the future.
- Economic valuation of the environment- nonmarket valuation- plays an essential role in the design and analysis of environmental policy.
- The goal of nonmarket valuation is to ascertain what value if any - particular people place on an item in monetary terms.

The Context of Valuation

- In the context of environmental policy, nonmarket valuation occurs at the end of a series of linkages: From policy to action (e.g., Reduction of emissions) to "physical" impacts on the functioning of the ecosystem, to "physical" impacts on wildlife and/or human, to human reactions to these impacts.
- If the analysis in the preceding links is incorrect or unreliable, the nonmarket valuation following those links can hardly be reliable or informative: the valuation exercise must be compatible and consistent with the (non-economic) analysis that precedes it, and is immensely vulnerable to any flaws in that analysis.

The production of benefits from improved ambient water quality

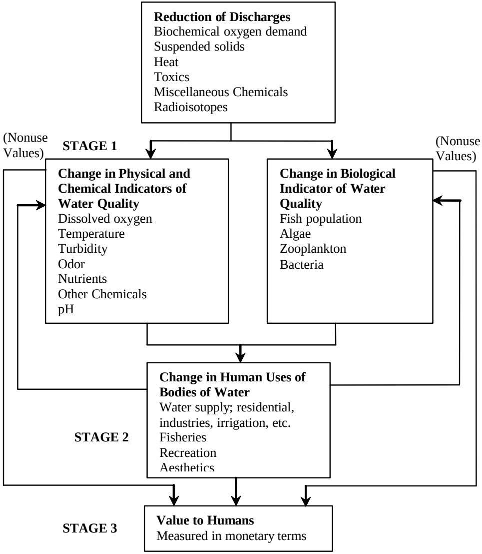

Figure 2-1. The production of benefits from improved ambient water quality

The production of benefits from improved ambient air quality

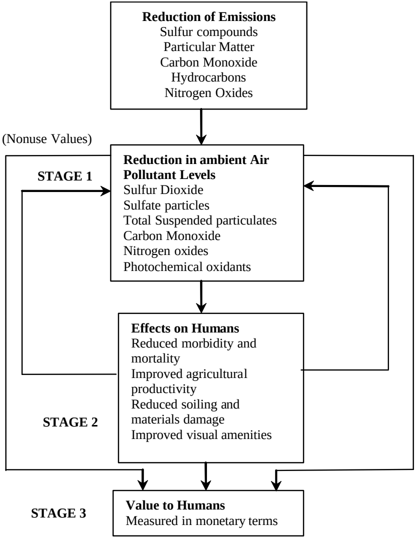

Figure 2-2. The production of benefits from improved ambient air quality

The two facets of economics

1. Explaining/predicting people's behavior
2. Measuring people's preferences

Preference measurement and behavior prediction should be put on equal footing in terms of their relevance for economics

Why do economists study people's choices?

- **To understand people's behavior**, whether past behavior (e.g., why did shippers switch from railroad to trucking after 1950?) or future behavior (e.g. will peak pricing would reduce rush-hour road congestion?).
- **To understand people's preferences** and to assess changes in their **welfare** (e.g., will peak pricing make rush-hour commuters better off?).
- The two objectives of modeling behavior and measuring preferences often go hand-in-hand. **Effective policy analysis usually involves both predicting behavior and assessing welfare impacts**.

Why do economists study people's choices?

- Nevertheless, they have generally received unequal emphasis among economists.
- Following positivism in late C19, there was a move to narrow the role of preferences in economics, ending by 1938 with the minimalist position that the only thing economists should care about is that preferences are consistent, ordinal, and quasi-concave.
- Since 1960s there has been a renewal of interest in preferences.

What is the ethical basis of value?

Distinguish two alternative approaches

- **Deontological view**: nature has value in its own right.
- **Anthropocentric view**: nature has value only to the extent that (some) people value it.

It is the latter view that justifies the use of economics when discussing the value of the environment. Economics is inherently anthropocentric in its focus: it deals with how and why people behave.

Possible objections to basing economic value on individuals' preferences:

- Individuals may have poor information and understanding
- Individuals are constrained by their income
- Individuals may not have well defined preferences; multiple preferences, contex-dependent preferences.

Controversy over the ethical appropriateness of benefit cost analysis

- How to aggregate individual values?
    - Pareto criterion
    - Potential compensation test
    - Social welfare function

Meaning of Economic Value

- The **formal definition** of ‘economic value’ has a somewhat long and tortuous history; it was not well settled until the 1970s
- The practical issue of measurement played key role: it was not until the 1970s that a practical method for valuing market commodities was worked out
- The extension to non-market valuation was by then almost immediate

Main question:

Does price measure economic value?

Does price measure economic value?

- This is what most people think: if an item has a price of \$7, then that is its economic value.
- This means that only marketed commodities can have economic value. There can be no such thing as non-market valuation.
- Since Dupuit(1844) and Marshall (1879) we have known that the answer is NO. But it took until 1970s for this to become well accepted in economics.

Why valuation matters: the distinction between demand and supply

- Demand has to do with what something is worth to people.
- Supply has to do with what is costs them to obtain it.
  - These are two entirely different issues.
  - Valuation deals with the former.
  - Economists often feel more comfortable dealing with the latter.

Modern Definition of Economic Value

- For non-marginal changes, economic value is defined in terms of consumer's surplus and producer's surplus.
- Dupuit (1844), Marshall (1890), Hotelling (1938)
- Recognizing this has key implications
  - Emphasizes need to know the demand and supply curves
  - Sees these as behavioral relations
  - Restore a subjective, contingent element to valuation
  - Makes Heterogeneity among consumers relevant
  - Raises problem of aggregation over individuals

The Diamond-Water Paradox

- Smith: "Nothing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a great quantity of other goods may frequently be had in exchange for it"
- Plato: "Only what is rare is valuable, and water, which is the best of all thing...is also the cheapest"
- From Plato to Oscar Wilde, writers have emphasized that market prices do not reflect the true value of items.
- Prices reflect the fluctuation circumstance of daily life, whether the vagaries of supply (sudden scarcity, monopoly, etc.) or demand (temporary needs, changes in taste, fads and fashions); true value is something more durable and stable.

What is true value?

- Plato: True Value is intrinsic to ideal Form underlying the item.
- Aristotle: True value os intrinsic to the natural end the item serves; e.g. a shoe is for wearing.
- St. Thomas Aquinas: The true value of an item is determined by its "inner goodness", an intrinsic quality stemming from relation to divine purpose.

What is true value?

- Later Scholastics: Intrinsic Value stem from inherent usefulness and ability to please man according to rational criteria
- Italian Humanists (Davanzati, 1588) stress subjective human preference rather than objective human need as the basis for true value "men seek happiness by satisfying their wants and desires, and they value items as these contribute to this end"
- Locke, Hume, Smith associate the true value of an item with its long run cost of production (its "natural price")
- Smith, Ricardo: labor cost as the stable standard value.

Distinguish two concepts of value:

- Value as an indication of relative ranking
  - e.g. a human life is more important (valuable) than the life of a horse; a horse is more valuable than a diamong ring.
- Value as a measure of trade off (value in exchange)
  - The value of X in terns of Y is how much Y you would be willing to exchange for X.

Modern Definition of Economic Value

- Dupuit (1844) The totla value an object of commodity is "the maximum sacrifice expressed in money which each consumer would be willing to make in order to acquire an object" provides "the measure of the object's utility."
- Marshall (1879) The "economic measure" of a satisfaction is "that which a person would be just willing to pay for any satisfaction rather than go without it."

Dupuit (1)

- "Utility and its measurement lie at the foundations of political economy"
- The context for Dupuit's paper was the evaluation of public works.
- J-B Say (1819) held that, with a private good, current price is "the only fair criterion of the value of an object."
- Dupuit countered that the utility of an item cannot be measured by its cost. With wine priced at 15 sous per bottle, for example, most of those who consume it do so because they value it at more than this price: "all those who attach to wine a value greater than 15 sous will buy it, and will derive a kind of profit"

Dupuit (2)

- For a public works project, Say said utility is measured by the reduction in cost occasioned by the project.
- Dupuit agreed in part, but argued that this overlooked the increase in traffic. Besides the cost saving for existing traffic, the traffic increment should also be valued, but at a varying rate.
- With declining marginal utility, the first increment in traffic would be worth something less than the old price (which is why it had not materialized at that price), the next increment would be worth something less than the first increment, and so on up to the final increment, which would be worth exactly the amount of the new price.

Dupuit (3)

- Diminishing marginal utility is an old idea.
- Cournot had introduced the concept of a downward-sloping demand curve as a behavioral relationship.
- But, Dupuit was the first to identify the downward-sloping demand curve as the representation of a declining marginal utility schedule, and as an expression of the consumer's marginal willingness to pay (the monetary value of his marginal utility).
- This was based on intuition, not mathematical reasoning.

MARSHALL (1)

- 30 years after Dupuit, Marshall independently formulated a similar argument, based on a mathematical analysis, but also involving a similar intuition about the role of diminishing marginal utility.
- Marshall defined the "economic measure" of a satisfaction as "that which a person would be just willing to pay for any satisfaction rather than go without it."
- As with Dupuit, the key to differentiating this from expenditure is the consumer's demand function, viewed as a behavioral relationship
- Concept of "consumer's rent" (1879) or "consumer's surplus" (1898)

MARSHALL (2)

- The empirical fact that a demand function generally slopes down proves that marginal willingness to pay varies with consumption.
- If a man would be induced to buy one pound of tea at a price of 20 shillings, but would buy two pounds at a price of 14 shillings, this demonstrates that (i) the first pound of tea is worth at least 20 shillings to him, and (ii) the second pound is worth less than 20 shillings but at least 14 shillings.
- When the price is 14 shillings, for an expenditure of 28 shillings he obtains something that is worth to him at least 34 shillings (i.e. 20 + 14); thus, he gains a surplus satisfaction of at least 6 shillings, which Marshall called "consumers' rent" in 1879 and "consumer's surplus" in 1898

MARSHALL (3)

- Marshall was careful to frame this as an argument from revealed preference, emphasizing that the inference about the consumer's willingness to pay for tea is a logical implication of his observed behavior in buying "of his own free choice" the second pound of tea at one price but not the other.
- How does one calculate this economic measure of satisfaction? Marshall made the same argument as Dupuit that it could be measured as an area under the demand function, namely the shaded area measures the consumer's surplus (the "Marshallian triangle").

MARSHALL (4)

- Whereas Dupuit merely asserted that the demand function, viewed with price as a function of quantity, is a marginal willingness to pay function, Marshall formally derived this as a mathematical implication of utility maximization. He postulated an additive cardinal utility function defined over N commodities: $u(X) = \sum u_i(x_i)$ and then derived a first-order condition for utility maximization for the i-th commodity

$$\frac{\partial u(x)/\partial x_i}{\partial u(x)/\partial y} = p_i$$

MARSHALL (5)

- Marshall recognized the key qualification that this marginal utility of money must be constant in order for the area under the demand function to measure total willingness to pay. However, he considered this a reasonable first approximation for any commodity that accounted for a small share of the consumer's budget.
- He also emphasized the proviso of ceteris paribus, including constant tastes, constant income, and constant prices for all other goods, and he readily conceded that, when consumer's surplus was calculated from an aggregate demand function, the resulting aggregation of values neglects the fact that "a pound's worth of satisfaction to an ordinary poor man is a much greater thing than a pound's worth of satisfaction to an ordinary rich man."

MARSHALL (6)

- This formulation of the economic concept of value is now accepted as definitive.
- Economic value is defined in terms of a tradeoff. When an economist states thar, for some person, X has a value of 50 in terms of Y, this menas no more and no less than that person would be willing to exchange X for 50 units of Y.
- What is being measured is Subjective "value in use." The measure of value is what the item is worth to the person, not what it costs.
- This is inherently subjective and contingent- it reflects people's particular circumstances and thier foibles.

MARSHALL (7)

- How much a person is willing to pay to obtain a satisfaction rather than go without is a concrete and well-defined notion. But, whether is something that can be accurately be measured from individual's demand function, as Marshall asserted, remained in doubt becuase this relied on the assumption of constant marginal utility of money.
- Marshall came to agree that this assumption was indefensible; his concept of economic value was a theoretical but not practical value because it could not be reliably measured in practice. In his later years, Marshall confessed that the concept of consumer's surplus was a major disappointment in his life because it was incapable of being quantified in a meaningful way.

MARSHALL (8)

- After Marshall, economists' interest in consumer's surplus waned with the rising tide of positivism. There was a general feeling that psychological concepts of wants and their satisfaction were too imprecise and too subjective to be useful for scientific measurement in economics, leading to the rejection of both cardinally measurable utility and interpersonal comparisons of utility.

MARSHALL (9)

- Consumer's surplus seemed embarrassingly outmoded because it could not be reconciled with ordinal utility theory.
- Also was unnecessary since, as a by-product of the marginal revolution and the development of first-order conditions for utility maximization, the view developed that market price offered a satisfactory measure of welfare – it was both practical and objective.
- Given some quantity change for a marketed commodity, Δx_i, the economic value of this change should be measured as: $\Delta W = p_i \Delta x_i$,. If there is no market price, then one should find a surrogate for p_i.

Steps in the rehabilitation of consumer's surplus

- Hicks and Allen (1934) paved the way for the eventual rehabilitation of Marshallian consumer's surplus by showing that the constancy of marginal utility of money translated was into a specific property of an indifference map (vertically parallel indifference curves.)
- Hicks (1939) shows that Marshall's analysis, including consumer's surplus, can be expressed precisely in terms of ordinal utility using indifference map analysis.
- Henderson (1941) pointed out that what Hicks had identified on the indifference map was not Marshall's consumer's surplus but something else. Marshall's consumer's surplus corresponded to what Henderson called the compensating surplus, whereas Hicks's definition corresponded to what Henderson called compensating variation.

Steps in the rehabilitation of consumer's surplus

- Henderson also noted that there was another way to formulate these concepts via lengths on a indifference map based on the compensation that the consumer would be *willing to accept* to forego the item, instead of what he would be *willing to pay* to obtained the item. (4 concepts compensating/equivalent variation/surplus).
- Hicks (1942) generalized immediately these results to changes in multiple prices.
- Henderson and Hicks agreed that two of the four measure were economically relevant-compensating and equivalent variation.
- Unfortunately, this analysis still was not operational because it relied on indifference map that could not be observed, so Hicks' findings are of not practical value.

Why the continuing hostility to consumer's surplus after Hicks (1946)?

- Samuelson's (1947) influential opposition: consumer's surplus is superfluous of historical and doctrinal interest – modern theory of index numbers answers all these questions.
- The multiplicity of alternative CS measures makes the concept both cumbersome (which to use?) and suspect.

Duality theory – how to obtain the indifference map

- If you start with a known direct utility function, then you do have access to the indifference map and can calculate the Hicksian measures.
- But, originally there were very few known and useful utility functions – Cobb-Douglas, Linear Expenditure system (1952), CES (1962).
- Roy's identity was rediscovered in late 1960s as tool to generate demand systems from a postulated indirect utility function – led to flexible function forms (translog, etc)

Hurwicz and Uzawa (1971) Integrability Theorem

- It was known that maximization of a quasiconcave utility function leads to 4 key properties, including symmetry and negative-semidefiniteness of Slutsky matrix.
- HU proved the converse: if the demand function satisfies symmetry and negative semi-definiteness, there exists an underlying quasiconcave utility function.
- They used a constructive proof which showed operationally how to recover the indirect utility function. That also sufficed for welfare analysis.

- Hurwicz-Uzawa analysis first exploited by Willig (1973, 1976)
- Also exploited by Hanemann (1980) and Hausman (1981)
- Vartia (1983) proposed the use of numerical techniques to solve Hurwicz-Uzawa's system of partial differential equations.
- All of the foregoing applies to market valuation: valuing the welfare effects of a price change in a marketed commodity.

Recalling previous definition of economic value

- The economic value of an item is not how much you do pay for an item. It is how much money you would be willing to exchange the item for.
- There are two ways to frame the exchange:
  1. The most you would be willing to pay for the item if you had to, and if you could get it by paying.
  2. The minimum compensation you would be willing to accept to give the item up.
- Economic value is not limited to market items: as a thought experiment, it can applied to anything that you care for.

Why nonmarket valuation?

- If we can't measure the value of environmental harm in monetary terms, much of conventional economic theory of the environment (Pigouvian taxes, Coasian liability rules) can't be applied.
- Benefit-cost analysis of projects & programs.
- Natural resource damage assessment.

Non-market valuation

- Non-market valuation measures in monetary terms the value people place on an item they may care for. Monetary value is thus defined in terms of a trade-off that the person would make, whether framed in terms of WTP or WTA.
- Obtain a monetary measure of the change in the person's welfare by using the change in the person's monetary income that she would consider equivalent to the item in question in terms the overall impact on her satisfaction.
- Interest in nonmarket valuation emerged in 1960s as part of a general trend to broaden the scope of application of economics to public spending decisions and government investment (cost-benefit analysis), including education and health (the rise of the human capital approach), and following a long-standing interest in the US in the evaluation of federal water projects.

Using trade-offs to measure economic value

How does one measure value?

- Ask people directly (stated preference)
  - If you could bring about Y, but you would have to pay X to accomplish this, would you be willing to do this? (Create a trade-off)
- Revealed preference. Infer value from the choices people make: their behavior reveals their underlying preference. Applies for non-market goods that are complements to purchase of market goods (Infer a trade-off)

Use and non-use value
Use Value

1. Direct: Source of material inputs (wood products, mineral, water, fish, etc). Variety of amenity services (Scenic views, outdoor recreation).
2. Indirect: Provides life-support services to humans and animals (breathable atmosphere, livable climate, biodiversity, dispersion, transformation and storage of waste products of economic activity)

Use and non-use value

Nonuse Value

- The notion underlying nonuse value is that some people would be willing to pay to preserve a wilderness area even if they knew that neither they nor their children would ever visit it because they obtain satisfaction from mere knowledge that it exists (Krutilla, 1967).
- Non-use value is the value people place on an item for motives unconnected with their own potential use of it.
- Non-use value cannot be measured by revealed preference approaches.

Non use value

1. Option
2. Bequest
3. Existence

Benefit Class	Benefit Category	Benefit Subcategory (examples)
Use	In-stream	Recreational (water skiing, fishing, swimming, boating)
		Commercial (Fishing, navigation)
	Withdrawal	Municipal (drinking water, waste disposal)
		Agriculture (irrigation)
		Industrial/ Commercial (process treatment, waste disposal)
	Aesthetic	Enhanced near-water recreation (hiking, picnicking, photography)
		Enhanced routine viewing (commuting, office/home views)
	Ecosystem	Enhanced recreation support (Duck hunting)
		Enhanced General ecosystem support (food chain)
Existence	Vicarious Consumption	Significant others (relatives, close friends)
		Diffuse others (General Public)
	Stewardship	Inherent (preserving remote wetlands)
		Bequest (family, future generations)

Figure 3-1 A typology of possible benefits from an improvement in freshwater quality.