

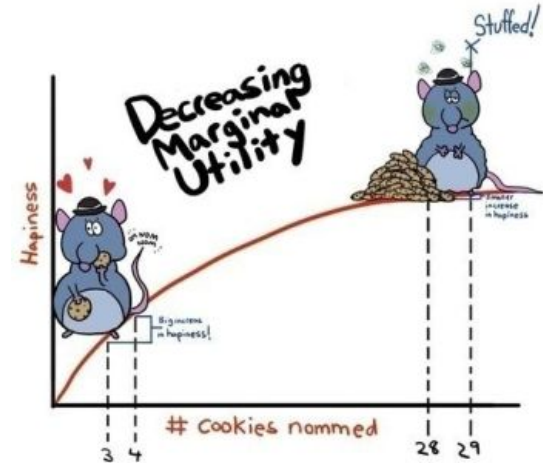
ECONOMICS Lecture 7

Utility and Preference

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Topics

- Utility and Utilitarianism
- Law of Diminishing Marginal Utility
- Social Welfare Function and Equity
- Consumer Choice and Preference
- The Decision-Making Principles



This lecture reviews the evolution of some ingrained concepts and ideas in analyzing individual behavior and social welfare—Utilitarianism, which is one of the most powerful and persuasive approaches to normative ethics in the history of philosophy.

Individual as a Decision Unit

- Economics is the study of choice under scarcity.
- People makes choices, individually and collectively.
- Theories or models are pictures that simplify reality. Irrelevant details are stripped away to concentrate on essentials that can explain most of the fact.
- Theoretically, economists model individuals or society as the economic agent aiming to maximize utility.
- The logic of utility analysis is the central topic in this lecture. What is utility? Who coined the term? How was it developed? What are its relevance today and applications?

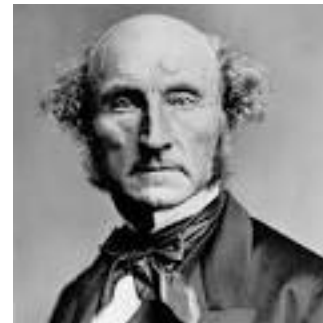
Utilitarianism: Pioneers

Utilitarianism is a theory in normative ethics holding that the proper course of action is the one that maximizes utility, usually defined as **maximizing happiness and reducing suffering**. Classic utilitarianism's two most influential contributors:



Jeremy Bentham

(1748-1832)



John Stuart Mill

(1806-1873)

Utility and Utilitarianism

The term utility was introduced by the British philosopher Jeremy Bentham (1748-1832). He declared :

“Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do... By the principle of utility is meant that principle which approves or disapproves of every action whatsoever according to the tendency it appears to have to augment or diminish the happiness of the party whose interest is in question: or, what is the same thing in other words to promote or to oppose that happiness.”

Utilitarianism and Utility

- Bentham's work, *An Introduction to the Principles of Morals and Legislation*, opens with a statement of the principle of utility.
- In Chapter IV, Bentham introduces a method of calculating the value of pleasures and pains, which has come to be known as the hedonic calculus.
- Bentham says that **the value of a pleasure or pain**, considered by itself, can be measured according to its intensity, duration, certainty (uncertainty) and propinquity (remoteness).
- Bentham believed that the pursuit of pleasure and the avoidance of pain were the **twin aims of all human action**.

Bentham on Utility and Policy

- Bentham's philosophy, Utilitarianism, held that self-interest—understood as pleasure or happiness—should be “maximized” and pain “minimized” (Bentham, incidentally, coined both terms). And, as with individual self-interest, so too with the public interest.
- According to Bentham, the aim of legislation and public policy was to promote “**the greatest happiness of the greatest number.**”
- James Mill (1773-1836, the father of John Stuart Mill) agreed, after a fashion. Formerly a dour Scots Presbyterian and still something of a Platonist, he took a dim view of unalloyed hedonism. Like Plato, he **ranked the pleasures in a hierarchy**, with the sensual pleasures subordinated to the intellectual ones.

Utilitarianism and Utility

John Stuart Mill (1806-1873) was an English philosopher, political economist. He has been called "the most influential English-speaking philosopher of the nineteenth century". He rejects a purely quantitative measurement of utility and says,

It is quite compatible with the principle of utility to recognise the fact, that some kinds of pleasure are more desirable and more valuable than others. It would be absurd that while, in estimating all other things, quality is considered as well as quantity, the estimation of pleasures should be supposed to depend on quantity alone.

Measuring Utility in Practice

- Scientific methods require scientists to build a theory from real life phenomena, observations, or facts.
- Scientists can transform observations into data via various measurement techniques.
- Measure, in nature, is to compare to rank different properties or features: big or small; high or low; more or less; heavy or light....
- Provided that options may go countless, we have to resort to numbers. Therefore, it seems straightforward to apply cardinal measure to utility analysis.

Utility: Cardinal Measure

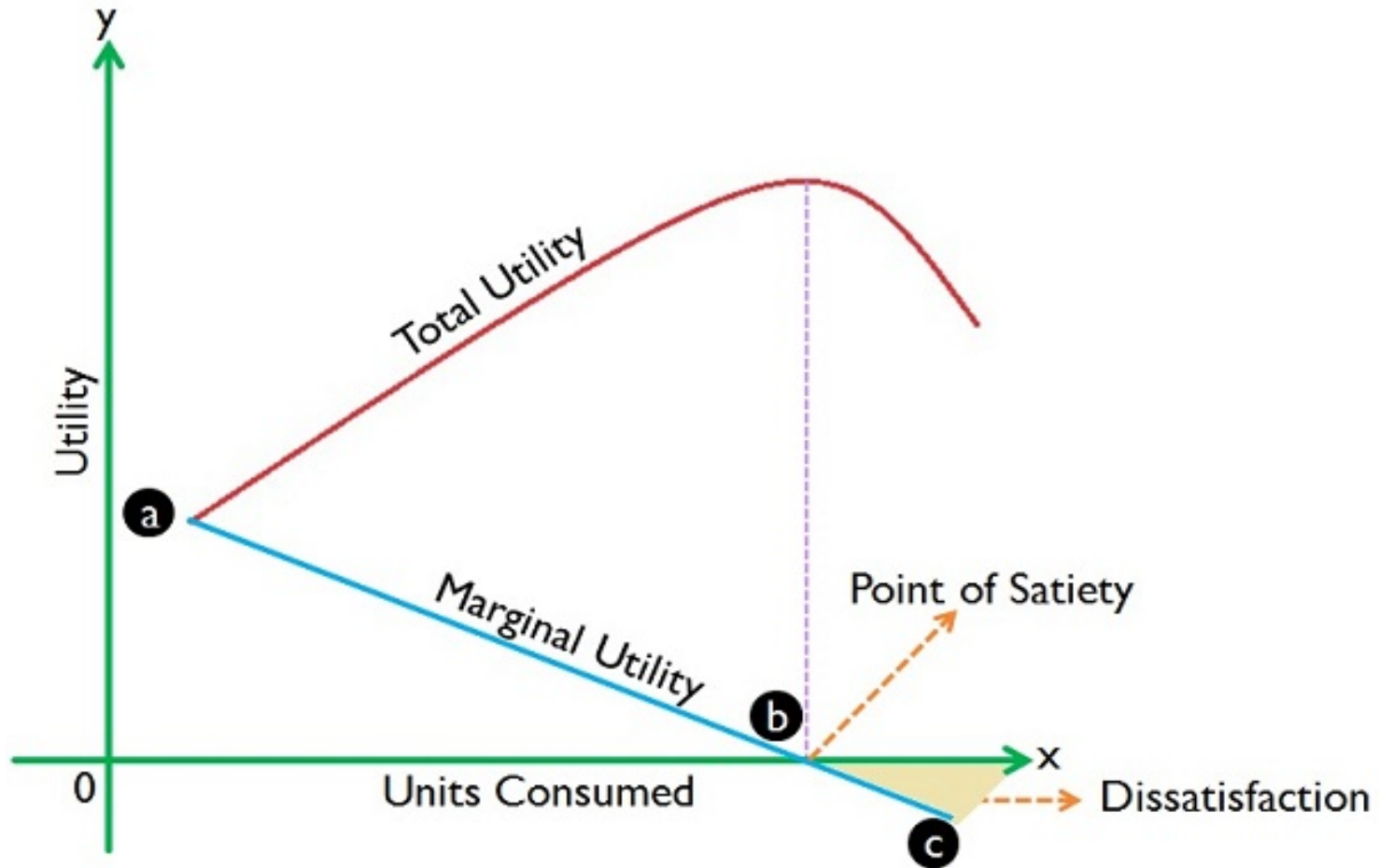
Bentham and economists alike thought that utility, like length or weight, could be measured quantitatively.

Example:

At lunch, little Tommy is super hungry, but only could eat hot dogs because it is “FREE” and convenient. How much utility is derived from hot dog consumption? What is your optimal consumption decision?

Quantity Consumed	Total Utility	Marginal Utility
1	10	10
2	18	8
3	23	5
4	25	2
5	22	-3
6	15	-7

Utility Functions: MU and TU



Diminishing Marginal Utility

- *The principle of diminishing marginal utility* states that as more and more of a good is consumed, consuming additional amounts will yield smaller and smaller additions to utility, ceteris paribus.
- Example: When you are thirsty, you get great utility from a glass of water. Once your thirst is quenched, the second and third glasses are less and less appealing. Feeling waterlogged, you will eventually refuse water altogether.
- Notice that, as long as marginal utility is greater than zero, the corresponding total utility is still rising, but at a decreasing rate. Draw the graphs for total utility and marginal utility as consumption quantity increases.

The Utility of Money and Income

- In 2010 Daniel Kahneman and Angus Deaton, both of Princeton University, found that happiness, as measured by people's own perception of their emotional well-being, levelled off when annual incomes reached around \$75,000 (or \$90,000 today).
- In a Gallup poll last year, residents in the top 10% of countries by GDP per person scored their life situation as seven out of ten on average, compared with just four for those in the bottom 10%. But what difference do individual earnings make?
- More recently, Matthew Killingsworth of the UC Berkeley finds that happiness continues to increase even as income ascends to plutocratic proportions, with two caveats. First, the more happiness you want, the more expensive it gets. And second, money is not nearly as important as other factors.

Money Buys Happiness, but ...

The grinny coefficient

United States, survey of 33,391 employed adults



Source: "Experienced well-being rises with income, even above \$75,000 per year", by Matthew A. Killingsworth, PNAS 2021

**"Not at all" to "extremely"
†"Very good" to "very bad"

Money might not guarantee happiness, but income tends to correlate with contentment. Previous research showed life satisfaction levelling off at high incomes. Now it seems to keep climbing. The catch is that **the next dollar a person makes will cheer them slightly less than the last one did.**

Money, Happiness, and Policy

- Mr. Killingsworth finds that only a small percentage of the overall variation in happiness is explained by differences in income; health, religion, employment and family all matter.
- The research offers two lessons for politicians who want to improve people's moods. First, helping the poorest is a bargain. In happiness terms, a dollar goes further for someone earning \$20,000 a year than for someone on \$40,000.
- Second, economic growth, much maligned as a yardstick of progress, is important as long as it doesn't come at the expense of other measures of well-being.
- Happiness relies on many factors, but a more prosperous future is probably a more contented one too.

Marginal Revolution

- Working in complete independence of one another—William Stanley Jevons (1835-1882) in Manchester, England; Leon Walras (1834-1910) in Lausanne, Switzerland; and Carl Menger (1840-1921) in Vienna—each scholar developed the theory of marginal utility to understand and explain consumer behavior.
- The theory held that the utility (value) of each additional unit of a commodity—the marginal utility—is less and less to the consumer. “Value,” said Jevons, “depends entirely upon utility.”
- This statement marked a significant departure from the classical theory of value, which stated that value derived from the labor used to produce a product or from the cost of production more generally. Thus (marginal revolution) began the neoclassical school, which is still the paradigm in economic analysis today.

Diamond-Water Paradox Revisit

- Adam Smith struggled with what came to be called the paradox of “value in use” versus “value in exchange.”
- The marginalist explanation: The total utility or satisfaction of water exceeds that of diamonds. We would all rather do without diamonds than without water. But almost all of us would prefer to win a prize of a diamond rather than an additional bucket of water.
- To make this last choice, we ask ourselves not whether diamonds or water give more satisfaction in total, but whether one more diamond gives greater additional satisfaction than one more bucket of water; our answer will depend on how much of each we already have.
- Though the first units of water consumed every day are of enormous value to us, the last units are not. The utility of additional (or marginal) units continues to decrease as we consume more and more.

Cardinal Utility – What and How?

- An important property of cardinal measure is that we can make linear or nonlinear transformation between two scales.
- For example, temperature can be measured in many ways, but a thermometer can be scaled to show degrees in Fahrenheit and Celsius scales. $F = (9/5)*C + 32$
- More examples: Kilogram * 2.2 = Pounds; Feet * 12 = Inch
- How can we transform utility scales across standards?
- How about aggregating utilities from consuming different goods? Say bread and butter (complements), or, coffee and tea (substitutes). Can we simply add up two independent utilities?

Cardinal Utility – Whose and When?

- Unlike some other properties of goods we are trying to describe (e.g. length, weight, temperature), we don't know exactly the measurement unit of utility.
- First, how to compare utility across individuals, say kids and adults? Second, how to take into account of cultural and religious variations, say Hindu and Muslim? Last but not least, is it the same in different weather conditions?
- **Utility is subjective and fickle, varying by person over time across space.**
- Can we apply a standardized utility function to model a representative agent in the society?

Individual and Social Welfare

- Suppose all individual utility functions are expressed and centralized by a super computer. How to estimate a society's aggregate utility for the purpose of making public choice?
- **Social Welfare Function:** describes the well-being of society as a whole in terms of the utilities of individual members. A social welfare function is useful when evaluating policies that affect some members of society differently than others.
- One such function, the **utilitarian**, weights everyone's utility equally and consequently maximizes the total utility of all members of society.
- Each social welfare function can be associated with a particular view about equity.

Four Views of Social Equity

1. Egalitarian—all members of society receive equal amounts of goods
2. Rawlsian—maximize the utility of the least-well-off person
3. Utilitarian—maximize the total utility of all members of society
4. Market-oriented—the market outcome is the most equitable

The four views of equity move roughly from most to least egalitarian. While the egalitarian view explicitly requires equal allocations, the Rawlsian puts a heavy weight on equality (otherwise, some people would be much worse off than others). The utilitarian is likely to require some difference between the best- and worst-off members of society. Finally, the market-oriented view may lead to substantial inequality in the allocations of goods and services.

Social Utility? Impossibility Theorem

- To consistently aggregate preferences and derive a social welfare function, majority voting must satisfy three conditions: *Dominance, Transitivity, Independence of irrelevant alternatives*
- Thus, majority voting can consistently aggregate individual preferences if and only if preferences are restricted to take a certain form. In fact, there is no good way to consistently aggregate these preferences. More on this in public goods.
- **Arrow's Impossibility Theorem:** There is no social decision (voting) rule that converts individual preferences into a consistent aggregate decision without either (a) restricting preferences or (b) imposing a dictatorship.

What Exactly is Utility?

- If we cannot find a utility function to model a wide range of consumption decision, then the theory is quite ad hoc.
- Since ranking is easier than calculating in comparison, what modern economists call utility reflects nothing more than the rank ordering of preference.
- Therefore, utility can also be measured by ordinal ranks.
- Utility is the variable whose relative magnitude indicates the direction of preference. In finding his or her preferred position, the individual is said to maximize utility.
- Now it's time to introduce three axioms of preference for comparing multiple goods and services in consumption.

Utility and Preferences

Individual utility is derived from consumption. Utility function reveals consumers' preferences. A consumption basket (or bundle) is a list with specific quantities of one or more goods.

Market Basket	Units of Food	Units of Clothing
<i>A</i>	20	30
<i>B</i>	10	50
<i>C</i>	40	20
<i>D</i>	30	40
<i>E</i>	10	20
<i>F</i>	10	40

The Laws of Preference

The Axiom of Comparison: A person can compare any two baskets A and B of commodities. Such a comparison must lead to one of the three following results: he or she

- (i) prefers basket A over B;
- (ii) prefers basket B over A;
- (iii) is indifferent between A and B.

$$(i) A \succ B \qquad (ii) A \prec B \qquad (iii) A \sim B$$

The Laws of Preference

The Axiom of Transitivity: Consider any three baskets of goods A, B, and C.

- If a consumer prefers A to B, and also prefers B to C, he or she must prefer A to C.
- Similarly, a person who is indifferent between A and B, and is also indifferent between B and C, must be indifferent between A and C.

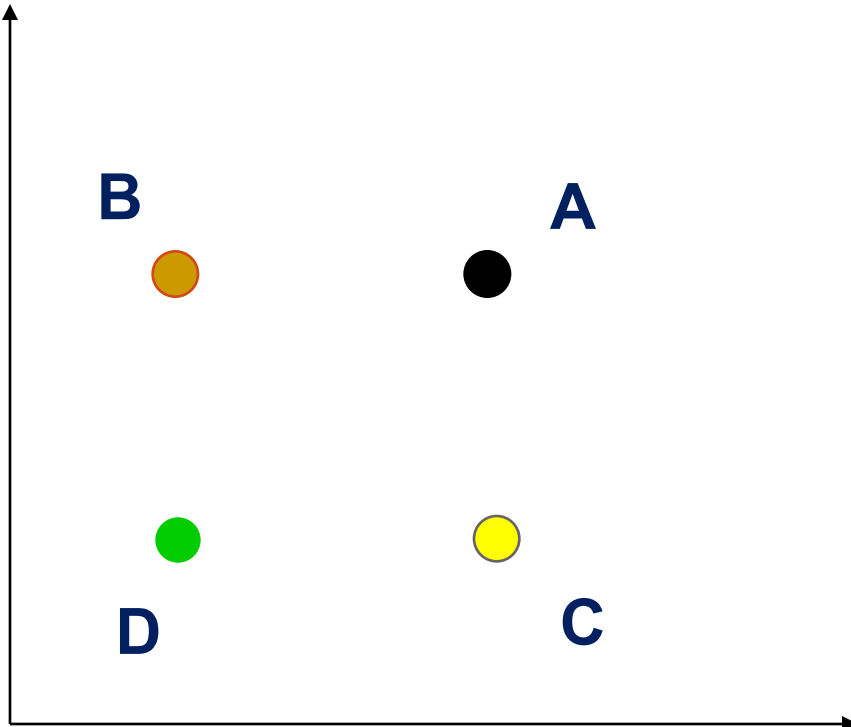
The Laws of Preference

The Axiom of Insatiateness: Goods are assumed to be desirable—i.e., to be good. Consequently, consumers always prefer more of any good to less.

- In addition, consumers are never satisfied or satiated; more is always better, even if just a little better.
- To explain the theory of consumer behavior, we will ask whether consumers prefer one market basket to another.

Ranking Preferences

Orange



Apple

$A \succ B$

$A \succ C$

$A \succ D$

$B \succ D$

$C \succ D$

$B ? C$

Optimal Decision Principles

1. Rationality=Economic Man=Self-Interest
(maximum benefit and minimum cost)
2. Opportunity Cost: $\text{Min} \{ \text{O.C.}(i) = \max[\text{value}(j)] \}$
3. Exchange Condition: $UV \geq EV = P$
4. Benefit-Cost Comparison: $\text{Max} \{ \text{TB} - \text{TC} = \text{NB} \}$
5. Marginal Equalization: $\text{MB} \geq \text{MC}$
6. Optimality Condition: 1) $\text{MB} = \text{MC}$; 2) $\text{Max} \{ \text{NB} \}$

Optimal Consumption Principles

At lunch, little Tommy is super hungry. He likes hot dogs because it is cheap and fast. What is the optimal consumption quantity?

Q	P \$	Total Utility	Marginal Utility	Marginal Cost	Total Cost	Net Benefit	Opportunity Cost
1	1	10	10				
2	1	18	8				
3	1	23	5				
4	1	25	2				
5	1	22	-3				
6	1	15	-7				

References

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