EE441 Economics of Public Expenditure

2. Tools for Positive and Normative Analysis

Euamporn Phijaisanit
Faculty of Economics
Thammasat University
1/2017

Outline of Topic 2

1. Tools of Positive Analysis
- The Role of Theory
- Causation versus Correlation
- Experimental Studies
  - Conducing an Experimental Study
  - Pitfalls of Experimental Studies
- Observational Studies
  - Conducting an Observational Study
  - Pitfalls of Observational Studies
- Quasi-Experimental Studies
  - Conducting a Quasi-Experimental Study
  - Pitfalls of Quasi-Experimental Studies
- Conclusions

Outline of Topic 2

2. Tools of Normative Analysis
- Welfare Economics
  - Pure Economy Exchange
  - Production Economy
- The First Fundamental Theorem of Welfare Economics
- Fairness and the Second Fundamental Theorem of Welfare Economics
- Market Failure
  - Market Power
  - Nonexistence of Markets
  - Overview
- Buying into Welfare Economics

TOOLS OF POSITIVE ANALYSIS

Public Finance and Positive Analysis

- Economists debate whether environmental regulations improve health outcomes, whether government-provided health insurance decreases mortality, whether school vouchers improve test scores, whether tax reductions for corporations generate more investment, etc.
- One goal of Public Finance is to estimate how government policy affects individuals' behavior.

The Role of Theory

- Economic models
  - Provide frameworks for thinking about the factors that might influence behavior.
  - Generate hypotheses whose validity can be assessed through empirical work.
  - Virtue of simplicity: reduces a problem to its essentials.
    - Example: Substitution versus income effect on working hours of individuals.
    - Example: A government policy of mandating seat belts in automobiles and the number of reckless driving and fatalities.
      - Theory alone cannot determine the impact. Empirical work is required.

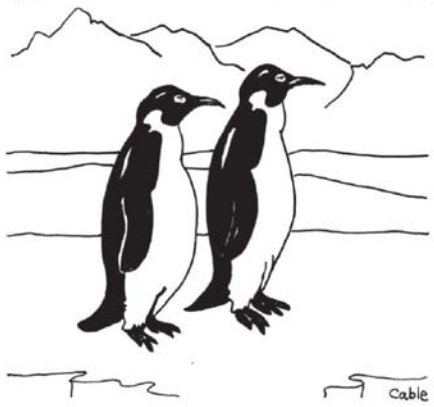
The Role of Theory

- Economic models
  - Provide frameworks for thinking about the factors that might influence behavior.
  - Generate hypotheses whose validity can be assessed through empirical work.
  - Virtue of simplicity: reduces a problem to its essentials.
- *Empirical analysis*: Analysis based on observation and experience.
  - Used to test hypotheses (educated guesses).

Causation vs. Correlation

- Conditions required for government action X to cause societal effect Y rather than just correlate (move together) with effect Y.
  - X must precede Y
  - X and Y must be correlated
  - Other explanations for any observed correlation must be eliminated
- The importance of the *distinction* for policy.
  - Example: There is a positive correlation between being married and wages…
    - Does that mean government should enact a policy encouraging marriage as a way of increasing wages?

Correlation does not prove causation



"Do you think all these film crews brought on global warming or did global warming bring on all these film crews?"
Carole Cable, The Wall Street Journal.

Empirical Work:
Experimental Studies

- Experimental (or randomized) study: subjects are randomly assigned to either a treatment group or control group.
  - Treatment Group: Group of people who are subject to the intervention being studied.
  - Control Group: Comparison group of people who are not subject to the intervention being studied.

Empirical Work:
Experimental Studies

- Randomization improves the chances that the control and treatment groups have similar characteristics
  - Focus can, then, be on possible causation between treatment and outcome.
- Randomization has a large potential to eliminate biased estimates.
  - *Biased estimate*: mixes the true causal impact with the impact of outside factors.

Pitfalls of Experimental Studies

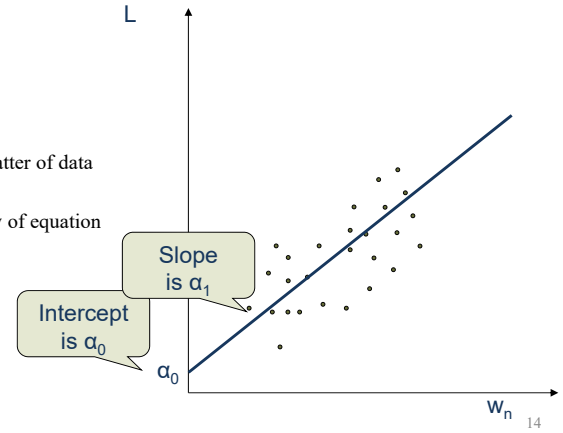
- Ethical issues
- Technical problems
- Response bias
- Impact of limited duration of experiment
- Generalization of results to other populations, settings, and related treatments
- "Black box" (unknown) aspect of experiments

Empirical Work:
Observational Studies

- Observational study – empirical study relying on observed data not obtained from experimental study
- Sources of observational data
  - Surveys
  - Administrative records
  - Governmental data
- *Econometrics*: statistical techniques to establish and estimate causal relationships in absence of randomization.

Conducting Observational Studies
Estimating Relationships

- $L = \alpha_0 + \alpha_1 w_n + \alpha_2 X_1 + \ldots + \alpha_n X_n + \varepsilon$
  - Dependent variable
  - Independent variables
  - Parameters
  - Stochastic error term
- Regression analysis
  - Regression line:
    - Best fit through scatter of data
  - Standard error
    - Indicates reliability of equation



Empirical Work:
Types of Observational Study Data

- Cross-sectional data: contains information on individual entities at a given point in time.
- Time-series data: contains information on a single entity at different points in time.
- Panel (longitudinal) data: combines features of both.
  - Contains information on individual entities at different points in time.

Pitfalls of Observational Studies

- Data collected in non-experimental setting
  - Difficult to ensure that the control group forms a valid "counterfactual"
    - *Counterfactual*: the outcome for people in the treatment group had they not been treated.
- Specification issues – Not all variables that should be included are available in dataset and/or cannot be measured.

Empirical Work
Quasi-Experimental Studies

- Quasi-experimental study (natural experiment) – observational study relying on circumstances outside researcher's control to mimic random assignment
- Successful Quasi-Experiments hinge on ensuring the treatment group assignment is random.
  - Difference-in-Difference Quasi-Experiments.
  - Instrumental Variables Quasi-Experiments
  - Regression-Discontinuity Quasi-Experiments

Quasi-Experimental Studies
Difference-in-Difference Quasi-Experiments

- An analysis that compares changes over time in an outcome treatment group to changes over the same period in the outcome of the control group.
- Example: The impact of beer taxes on teen traffic fatalities

Quasi-Experimental Studies
Instrumental Variables

- Analysis that relies on finding some variable that affects entry into the treatment group, but in itself is not related with the outcome variable.
- Example: Hoxby (2000) takes advantage of using enrollment year-to-year as an instrumental variable to determine the effect of class size on test scores. (Enrollment does not directly influence test scores).

Quasi-Experimental Studies
Regression-Discontinuity Quasi-Experiments

- An analysis that relies on a strict cut-off criterion for eligibility of the intervention under study in order to approximate an experimental design.
- Example: Decision on whether to make summer school mandatory for poorly performing students.
  - Jacob and Lefgren (2004) took advantage of Chicago Public Schools' policy in 1996. This policy tied summer school attendance to performance on standardized tests. J&L looked at students who were just a bit above and a bit below the cut-off scores because they are probably very similar.

Pitfalls of Quasi-Experimental Studies

- Assignment to control and treatment groups may not be random
- Not applicable to all research questions
- Generalization of results to other settings and treatments might not be possible.

Class Exercise

- In the Netherlands, taxes paid by individuals partly depend on their partner's income levels. Due to the progressive nature of the tax system, ceteris paribus, the higher the partner's income level, the higher the tax rates. In 2001, the Dutch government decreased the income tax on all individuals. However, due to the complex detail of the tax reform, the effective tax rates decreased most for individuals with high income partners. How might a researcher take advantage of this situation to study the effects of tax rates on labor supply? Be sure to describe the treatment group and the control group.

TOOLS FOR NORMATIVE ANALYSIS

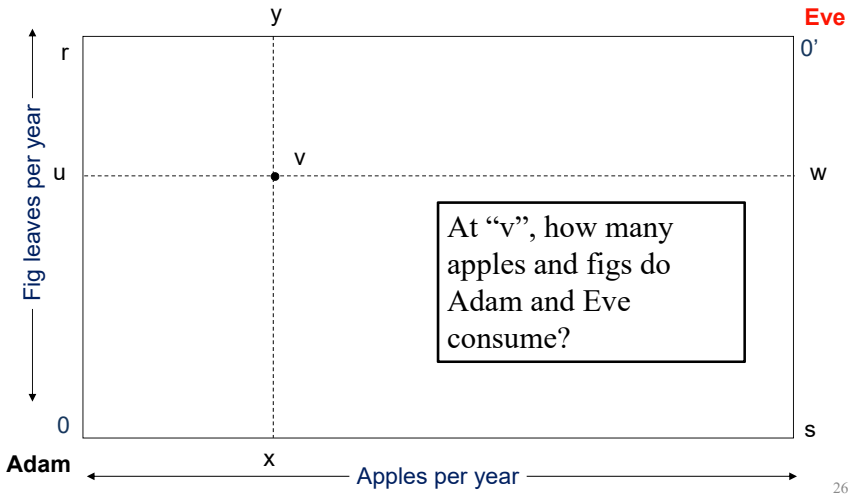
Welfare Economics

Concerned with the social desirability of alternative economic states.

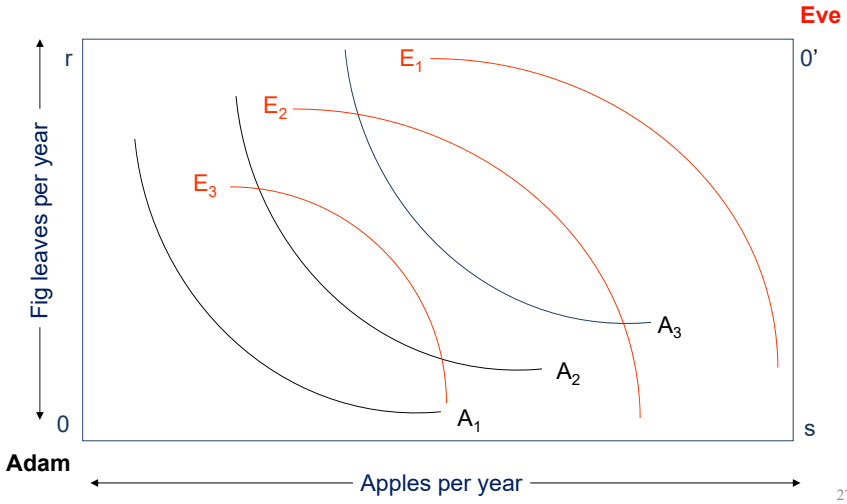
Consumption Economy

- **Edgeworth Box -** an analytical device used to model welfare economic theory
  - Depicts distribution of goods in a 2-good/2-person economy
- **Pareto Efficiency** – an allocation of resources such that no person can be made better off without making another person worse off
- **Pareto Improvement** – a reallocation of resources that makes at least one person better off without making anyone else worse off

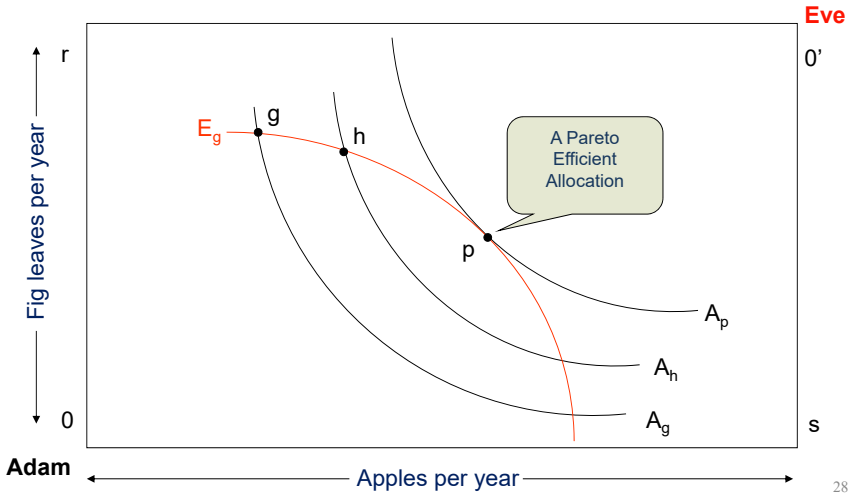
Edgeworth Box
2 person / 2 good economy



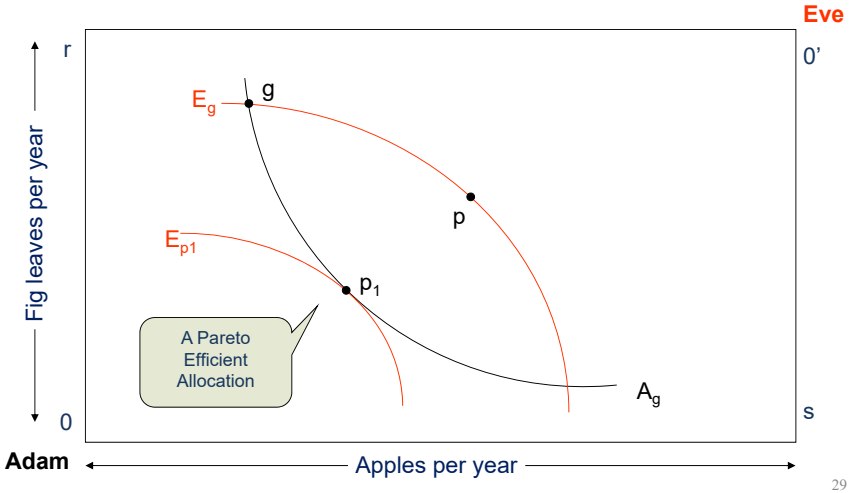
Indifference curves in Edgeworth Box



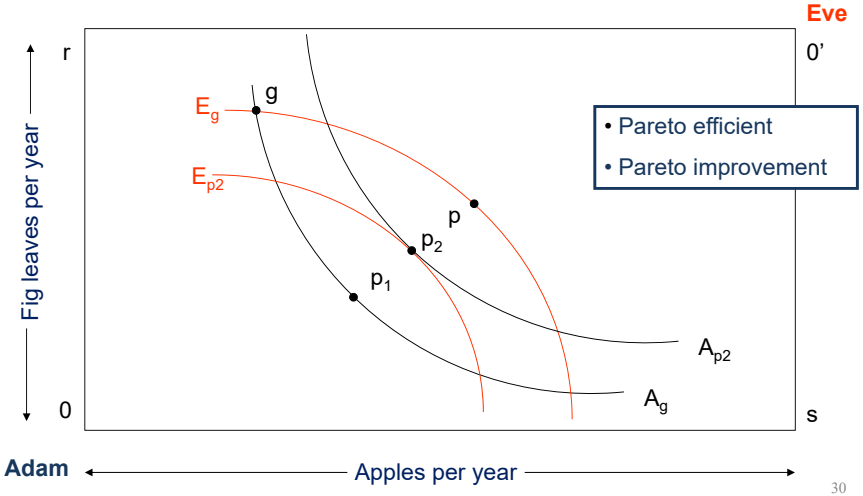
Beginning at Point g, how to make Adam better off without Eve becoming worse off



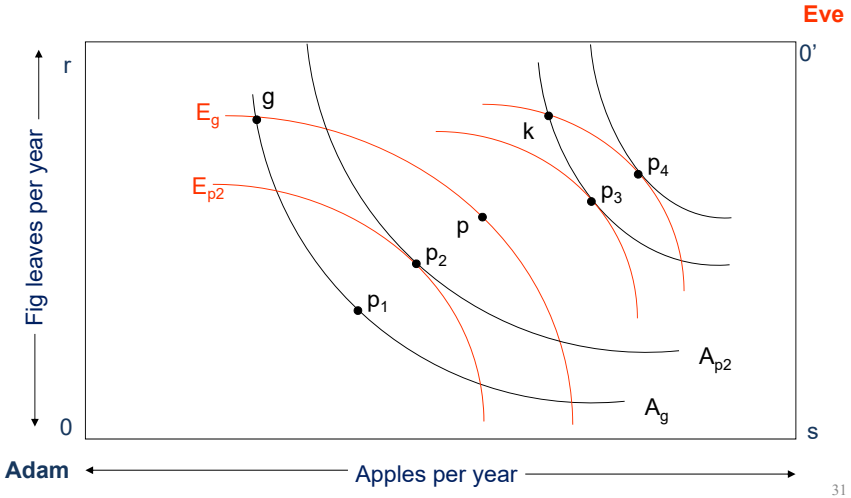
Beginning at Point g, how to make Eve better off without Adam becoming worse off



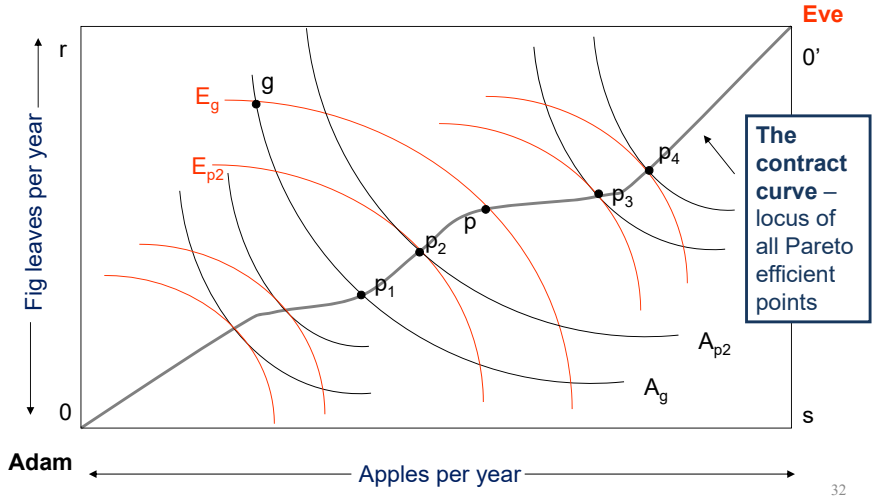
Beginning at Point g how to make both Adam and Eve better off



Starting from a different initial point: Point k



The Contract Curve



Pareto Efficiency in Consumption

$$MRS_{af}^{Adam} = MRS_{af}^{Eve}$$

Where MRS:

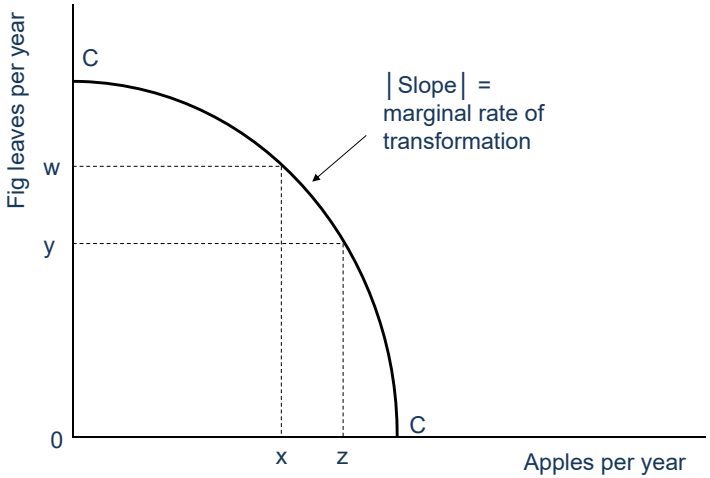
-is the rate at which an individual is willing to trade one good for another

-is the absolute value of the slope of an indifference curve

Production Economy

- Analysis when supplies of 2 goods (apples and figs) are variable rather than fixed
- Production Possibilities Curve
  - Graph to model production economy
  - Maximum quantity of one output that can be produced given the amount of the other output

Production Possibilities Curve



Marginal Rate of Transformation

- MRT_{af} = Marginal rate of transformation of apples for fig leaves
- MRT_{af} = rate at which the economy can transform one good into another
- MRT_{af} = Absolute value of slope of Production Possibilities Frontier
- $MRT_{af} = MC_a/MC_f$

Pareto Efficiency Conditions with Variable Production

- $MRT_{af} = MRS^{Adam}_{af} = MRS^{Eve}_{af}$
- $MC_a/MC_f = MRS^{Adam}_{af} = MRS^{Eve}_{af}$

The First Fundamental Theorem of Welfare Economics

- Given:
  - All producers and consumers are perfect competitors
  - A market exists for every commodity
- Then a Pareto Efficient allocation of resources emerges
  - A competitive economy allocates resources efficiently out any need for centralized direction

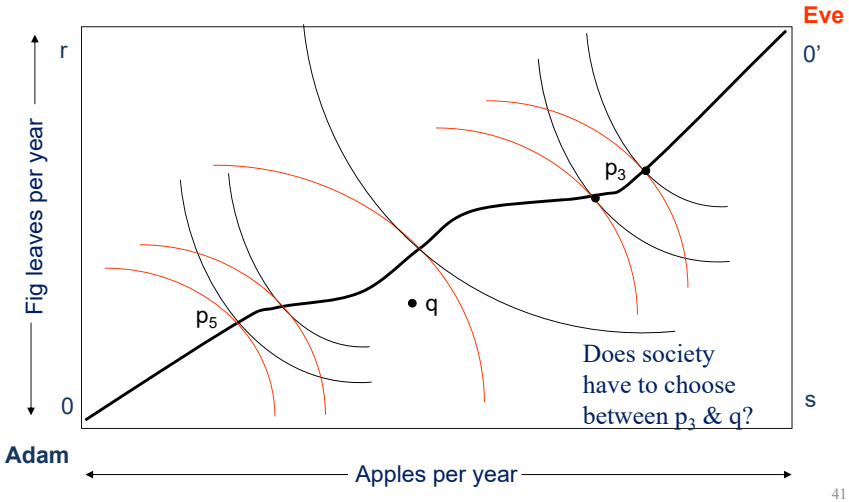
The First Fundamental Theorem of Welfare Economics

- $MRS^{Adam}_{af} = P_a/P_f$ ➡ Consumption Side
- $MRS^{Eve}_{af} = P_a/P_f$
- **$MRS^{Adam}_{af} = MRS^{Eve}_{af}$**
- $MC_a/MC_f = P_a/P_f$ ➡ Production Side
- $MRT_{af} = P_a/P_f$
- **$P_a/P_f = MC_a/MC_f$**

Fairness and Second Fundamental Theory of Welfare Economics

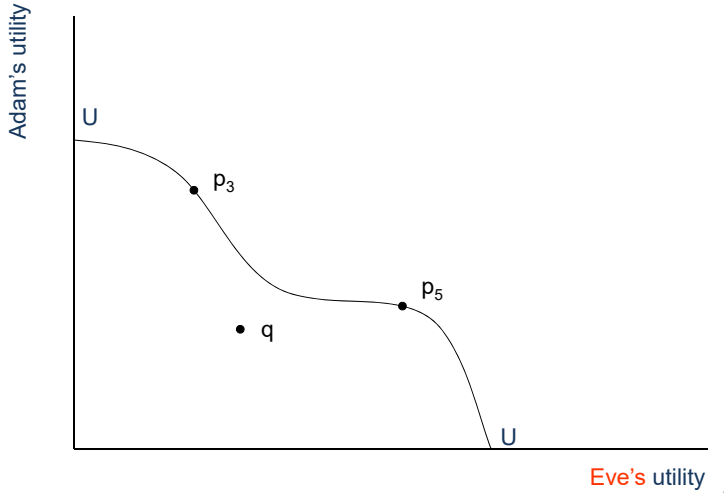
- Addresses equity concerns in allocations of goods
- Second Fundamental Theory of Welfare Economics states that society can attain any Pareto efficient allocation of resources – one that is more equitable – by redistributing the initial allocation of resources and then letting people freely trade
- Interference with market prices, which impairs efficiency, is unnecessary

Efficiency versus Equity



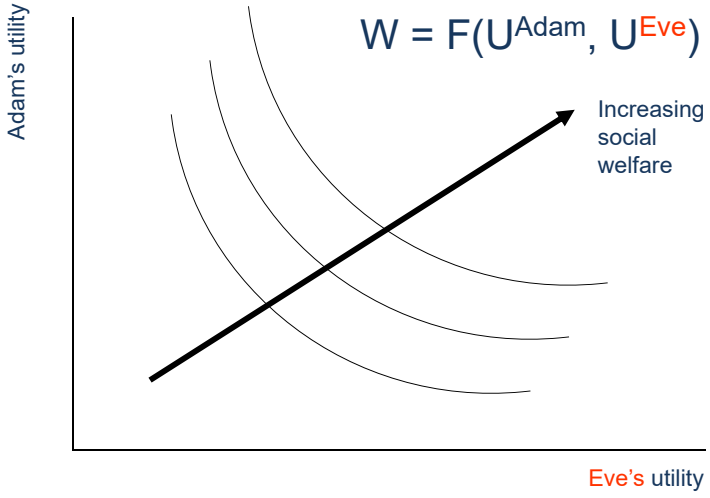
Utility Possibilities Curve

Maximum amount of one person's utility given each level of another person's utility

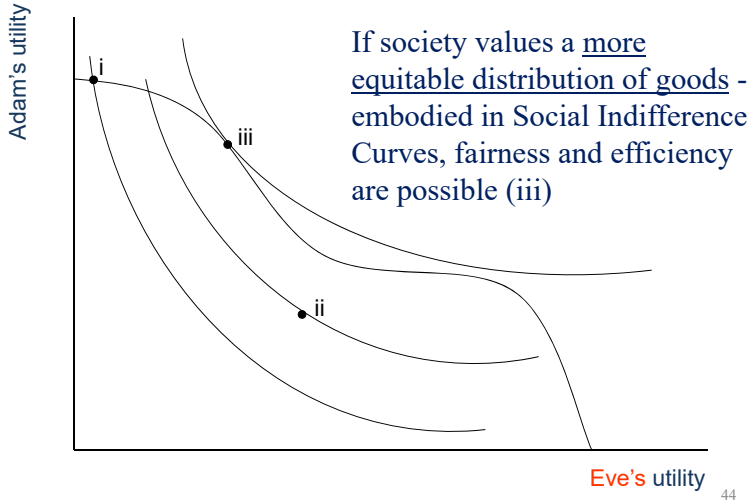


Social Indifference Curve

Society's willingness to trade off one person's utility for another's



Maximizing Social Welfare



If society values a more equitable distribution of goods - embodied in Social Indifference Curves, fairness and efficiency are possible (iii)

Market Failures: Causes of Inefficiency

- Market Power
  - Monopoly
- Nonexistence of Markets
  - Asymmetric information
  - Externality
  - Public good

Buying into Welfare Economics: The Controversies

- Underlying outlook is individualistic
  - Merit goods: commodities that output to be provided even if people do not demand it.
- Results orientation rather than the process used to arrive at the results
- However, coherent framework for analyzing policy
  - Will it have desirable distributional consequences?
  - Will it enhance efficiency?
  - Can it be done at a reasonable cost?

Summary

- Economic theory provides a framework for analyzing the causal relationship between government policy and individuals' behavior.
- Empirical work tests hypothesis arising from economic theory to determine if it is consistent with real-world phenomena.
- Various methods for conducting empirical work exist.

Summary

- Welfare economics is the study of the desirability of different economic states
  - Based on individualist social philosophy
- Pareto efficiency occurs when no person can be made better off without making another person worse off
  - $MRS^{i}_{xy} = MRT_{xy}$ i=persons i….n
- First Fundamental Theory of Welfare Economics: Competitive markets result in Pareto efficiency
- Second Fundamental Theory of Welfare Economics: Society can attain any Pareto Efficient outcome with reassignment of initial endowments and free trade

Class Exercise

1. In Sweden, health insurance firms are banned fro using health-related information, such as age, sex, or occupation, to determine health insurance rates. This ban is aimed at increasing the insurance premiums for healthy young Swedish people while decreasing insurance premiums for the ill and elderly. Is such a policy efficient?

Class Exercise

2. Suppose that there are only two people in society, Mark and Judy, who must split a fixed amount of income of $300. Mark's utility function is UM and his income is IM. Judy's utility function is UJ and her income is Ij. Suppose that:

UM = 100 x IM^(1/2) and

UL = 200 x IJ^(1/2)

Let the social welfare function be:

W = UM + UI

What distribution of the total income between Mark and Judy maximizes social welfare?