

Lecture 26, 15 Nov 2007
Economics etc.

Conservation Biology
ECOL 406R/506R
University of Arizona
Fall 2007

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Upcoming Readings
today: **Ch 12, and web-links (Economics)**
Tues 20 Nov: professional panel (TNC, USFWS, NPS)
-bring a question, hand it in at beginning to me
Tues 27 Nov: Galapagos Debate Links

-Debate on 27 Nov
-Grading Criteria due 27 Nov
-Creativity on 29 Nov,

1

Conservation Biology Lab 406L/506L

Friday 30 Nov 1230 -> 1530, Wrap Up
Meet 1230h southwest corner of BSE

See lab website for more information



2

Debate 15 November 2007, **MOVED TO 27 NOV.**
RE: Galapagos Conservation

Three groups – one will debate, another will evaluate, third will observe, then we rotate.

406

Debate 1 (20 Sept.)
Group A debate
Group B evaluate
Group C observe
Debate 2 (23 Oct.)
Group A observe
Group B debate
Group C evaluate
Debate 3 (27 Nov.)
Group A evaluate
Group B observe
Group C debate

Debate 1 (20 Sept.)
506 A assist
506 B assist
506 C observe
Debate 2 (23 Oct.)
506 A observe
506 B assist
506 C assist
Debate 3 (27 Nov.)
506 A assist
506 B observe
506 C assist

3

Fall 2007 Conservation Biology course presents....

A Creativity Project Exhibit
a student project display integrating artistic innovations with a goal to foster the education and communication of conservation issues

- poetry
- short stories
- children's books
- music
- art
- sculpture
- and more...

Thursday, November 29, 2007
Forbes lobby
2-3 pm

Grading Criteria due 27 November

Out of 100 points.

15 points for your grading effort of other pieces.

Also, tell us soon what resources (table, vertical board, power supply?) you will need

4

Conservation, Economics, Sustainable Development

That which seems to be wealth may in verity be only the gilded index of far reaching ruin.

-John Ruskin, 1883

5

Traditional Neoclassical Economics :

(Miller 2003)

Economy= system of production, distribution, and consumption of goods and services (scarcity)

Driven by wants and needs of govt, society, individuals

- Decisions about
- A. what goods and services
 - B. how produce
 - C. how much
 - D. how distribute

Supply and Demand

are made by individuals, governments, businesses

Use resources:

- A. natural
- B. human
- C. financial
- D. manufactured

Infinite Substitution?

to make goods and services

6

"For poor women the only holiday is when you are asleep."

Women:

- Do 2/3 of the work
 - 10% of the income
 - own 0.01% of the property
 - 70% of the world's poor
 - 2/3 of the world's illiterate
- (page 87 Miller 2005)

Killing the Natives, Chapter 3

U.S.: 4% global population
25% fossil fuels
>25% cars
50% advertising spending

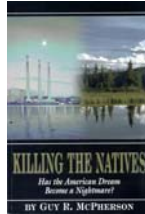
Goods vs. Bads

\$80 billion on shoes, jewelry, watches
\$65 billion on higher education

Americans since 1950 have consumed more than all in history preceding

indivs/house dropping in US

Jimmy Carter – malaise speech, reduce consumption...Reagan



Over the past 50 years, the federal government has provided more than \$500 billion in subsidies to the fossil fuel and nuclear industries, investing a fraction of that in energy efficiency and renewable sources of energy such as wind, solar and geothermal. As a result, coal, nuclear power, oil and gas provide more than 91 percent of our electricity needs in the U.S. This dependence on fossil fuels carries severe public health consequences, including asthma attacks, respiratory disease, heart attacks, and premature deaths. Moreover, fossil fuels, such as coal and oil, pollute the environment from the point of extraction to combustion in the form of global warming, acid rain, oil spills and runoff pollution. At the same time, nuclear power has left us with a nuclear waste problem for which no safe solution exists.

Science a la Joe Camel

By Laurie David, Washington Post
Sunday, November 20, 2005 8:01

At hundreds of screenings this year of "An Inconvenient Truth," the first thing many viewers said after the lights came up was that every student in every school in the United States needed to see this movie.

The producers of former vice president Al Gore's film about global warming, myself included, certainly agreed. So the company that made the documentary decided to offer 50,000 free DVDs to the National Science Teachers Association (NSTA) for educators to use in their classrooms. It seemed like a no-brainer.

The teachers had a different idea. Thanks for the DVDs, they said. In their e-mail rejection, they expressed concern that other "special interests" might ask to distribute materials, too; they said they didn't want to offer "political" endorsement of the film; and they said "Yes, if any, send it to NSTA or its members" as according to the NSTA Web site.

Gore, however, is not running for office, and the film's theatrical run is long since over. As for classroom benefits, the movie has been enthusiastically endorsed by leading climate scientists worldwide, and is required viewing for all students in Norway and Sweden.

But, maybe the NSTA just being very cautious, but there was one more curious argument in the e-mail. Accepting the DVDs, they wrote, would place "unnecessary risk upon the NSTA capital campaign, especially certain targeted supporters." One of those supporters, it turns out, is the Exxon Mobil Corp.

That's the same Exxon Mobil that for more than a decade has done everything possible to muddy public understanding of global warming and stifle any serious effort to solve it. It has run ads in leading newspapers including the one questioning the role of methane emissions in global warming, and financed the work of a small band of scientific skeptics who have tried to challenge the consensus that heat-trapping pollution is drastically altering our atmosphere. The company spends millions to support groups such as the Competitive Enterprise Institute that aggressively pressure lawmakers to oppose emissions limits.

It's bad enough when a company tries to sell junk science to a bunch of grown-ups. But, like a tobacco company using cartoons to peddle cigarettes, Exxon Mobil is going after our kids, too. And it has been doing so for longer than you may think. NSTA says it has received \$5 million from the company since 1998, mostly for the association's "Building a Presence for Science" program, an electronic networking website intended to "bring standards-based teaching and learning" into schools, according to the NSTA Web site. Exxon Mobil has a representative on the group's corporate advisory board. And in 2002, NSTA gave the company an award for its commitment to science education.

So much for special interests and explicit endorsements.

In the past year alone, according to its Web site, Exxon Mobil's foundation gave \$42 million to key organizations that influence the way children learn about science, from kindergarten until they graduate from high school.

And Exxon Mobil isn't the only one getting in on the action. Through textbooks, classroom posters and teacher seminars, the oil industry, the coal industry and other corporate interests are exploiting shorthands in education funding by using a small slice of their record profits to buy themselves a classroom soapbox.

NSTA's list of corporate donors also includes Shell Oil and the American Petroleum Institute (API), which funds NSTA's Web site on the science of energy. These students can find a section called "Shining on Oil" and read a page that touts the industry's environmental track record — citing improvements mostly attributable to laws that the companies fought tooth and nail, by the way — but makes only vague references to spills or pollution. NSTA has distributed a video produced by API called "You Can Be Cool Without Oil," a shameless pitch for oil dependence.

The educator organization also hosts an annual convention — which is described on Exxon Mobil's Web site as featuring "more than 450 companies and organizations displaying the most current textbooks, lab equipment, computer hardware and software, and teaching enhancements." The company "regularly displays" its "many... education materials" at the exhibition, John Borowski, a science teacher at North Salem High School in Salem, Ore., was dismayed by NSTA's partnerships with industrial polluters when he attended the association's annual convention this year and witnessed hundreds of teachers and school administrators work away with armloads of free corporate lesson plans.

Along with propaganda challenging global warming from Exxon Mobil, the curricular offerings included lessons on forestry provided by Weyerhaeuser and International Paper. Borowski says, and the benefits of genetic engineering courtesy of Isagenix gene therapies.

"The materials from the American Petroleum Institute and the other corporate interests are the worst form of a sin omission," Borowski says. "The oil and coal guys won't address global warming, and the tobacco industry papers over cigarettes."

An API memo leaked to the media as long ago as 1998 succinctly explains why the association is angling to infiltrate the classroom: "Informing teachers/students about uncertainties in climate science will begin to erect barriers against further efforts to impose Kyoto-like measures in the future."

So, how is any of this different from showing Gore's movie in the classroom? The answer is that neither Gore nor Participant Productions, which made the movie, stands to profit or risk from giving away DVDs, and we aren't talking millions of dollars in lost business from fossil-fuel-dependent polluters and a shift to cleaner, renewable energy.

It's hard to say whether NSTA is a bad guy here or just a sorry victim of tight education budgets. And we don't pretend that a two-hour movie is a substitute for a rigorous science curriculum. Students should respect, and parents should demand, the educators present on hand and unbiased tools at the state of knowledge about the challenges of the day.

As for Exxon Mobil — which just began a lousy advertising campaign that touts clean energy and low emissions — this story shows that stepping green stripes on a corporate logo doesn't change the beast within. The company is still playing the same cynical game it has for years.

While NSTA and Exxon Mobil ponder the moral lesson they're teaching with all this, there are 50,000 DVDs sitting in a Los Angeles warehouse, waiting to be distributed. In the meantime, Mom and Dad may want to keep a sharp eye on their kids' science homework.

Laurie David is producer of "An Inconvenient Truth," is a Natural Resources Defense Council trustee and founder of StopGlobalWarming.org.

Conservation, Economics, and Education



Figure 2.13 An Indonesian boy wading in a polluted river suffers external costs. External costs are costs not borne by the buyer or seller; they may include water pollution, aesthetic harm, human health problems, property damage, harm to aquatic life, aesthetic degradation, declining real estate values, and other problems. Brennan and Withgott 2005

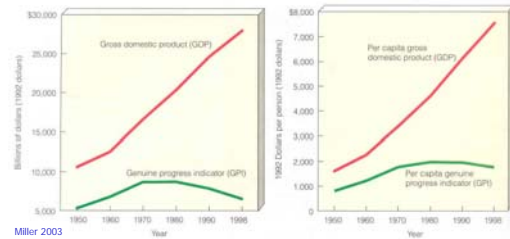


Figure 2-6 Comparison of the gross domestic product (GDP) and genuine progress indicator (GPI), left, and the per capita values for these indicators (right) in the United States between 1950 and 1998. (Data from Curt Cato, Mary Sue Goodman, and Mathis Wackernagel)

Genuine Progress Indicator
Index of Sustainable Economic Welfare

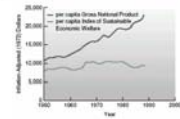
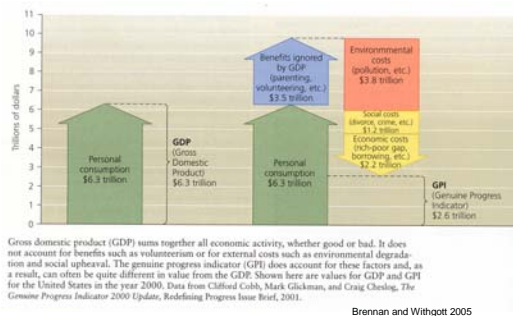


Figure 12.11 VanDyke, 2003
Figure 12.11 The U.S. Genuine Progress Indicator (GPI) and Index of Sustainable Economic Welfare (ISEW) since 1950. Although the GDP has increased, the ISEW has leveled off.



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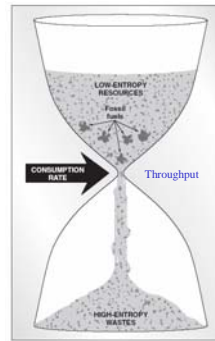


Figure 12.9
The "hourglass analogy" of economist Herbert A. Simon (1916-2001) illustrates the relationship between entropy and economics. The sand in the upper part of the hourglass represents useful low-entropy resources. As humans consume these resources, high-entropy wastes are produced. Regardless of the consumption rate, the sand in the upper half is destined to run out.

Index of Sustainable Economic Welfare
(p. 355 Van Dyke 2003)

- 1 Income Distribution
- 2 Net Capital Growth
- 3 Natural Resource Depletion/
Environmental Damage
- 4 Unpaid Household Labor

(social and environmental justice)

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Internal Market Costs
vs.

Externalities

-External to Market Forces

- Noise
- Pollution
- Acid rain
- Erosion
- Global Warming
- Eutrophication
- Disease
- Asthma
- Birth Defects
- Behavior and Intelligence

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Economic Growth vs. Development

-efficiency, sophistication, utility

-Producer Pays/Polluter Pays

-Dramatically less waste (packaging, scrubber sludge)

-Taxation/Subsidies

-Government strategies and regulation

-Stable, democratic government required?

Product itself

[Nonrival (air to breathe) or nonexclusive goods (UV protection from ozone)]

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The New York Times
15 Nov 2007

In Eco-Friendly Factory, Low-Guilt Potato Chips



CASA GRANDE, Ariz. — At Frito-Lay's factory here, more than 500,000 pounds of potatoes arrive every day from New Mexico to be washed, sliced, fried, seasoned and portioned into bags of Lay's and Ruffles chips. The process devours enormous amounts of energy, and creates vast amounts of wastewater, starch and potato peelings.

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Over the next several years, Frito-Lay plans to install high-tech filters that would recycle most of the water used to rinse and wash potatoes, as well as the corn used to make Doritos and other snacks, and then burn the leftover sludge to create methane gas to run the plant's boiler. The company will also build at least 50 acres of solar concentrators behind the plant to generate solar power. A biomass generator, which will probably burn agricultural waste, is also planned to provide additional renewable fuel. The retrofit of the Casa Grande factory, scheduled to be completed by 2010, would reduce electricity and water consumption by 90 percent and its natural gas use by 80 percent. Greenhouse gas emissions would be cut by 50 percent to 75 percent, the company said.

Since 1999, Frito-Lay companywide has reduced its water use by 38 percent, natural gas by 27 percent and electricity by 21 percent, cutting \$55 million a year in utility costs.

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Net Zero

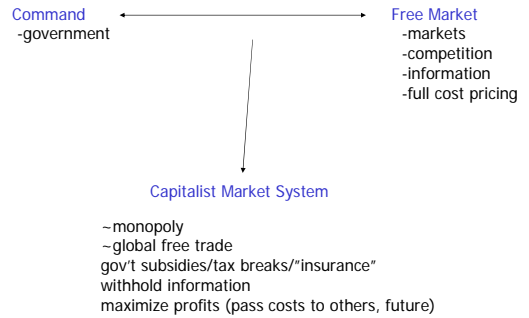
Frito-Lay officials maintain that trying **net zero** provides a hedge, particularly if the most pessimistic **predictions about climate change and the availability of water and petroleum hold true.**

“If the price of these resources continues to rise, we will be very happy we made these investments,” said Rich Beck, senior vice president for operations.

Possible?

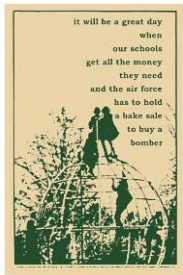
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Traditional Neoclassical Economics (Miller 2003):



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What do we spend our money on?



<http://www.nationalpriorities.org/Cost-of-War/Cost-of-War-3.html>

C: ~\$436 billion

B: >\$6.8 trillion

1:16 -> C:B

Wright and Nebel 2002

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EARTH WATCH
THE CLEAN AIR ACT BRINGS A WINDFALL

The Clean Air Act (1970, 1977, and 1990) has been the subject of open political warfare between those who think its cost has been too high for industry, taxpayers, labor, and consumers and those who think the health and environmental benefits were justified. Compliance has affected patterns of industrial production, employment, and capital investment. Although these repercussions must be viewed as uncertainties that have generated benefits and opportunities, the deleterious impacts in some industries was severe and included reductions in high-value coal mining and cutbacks in polluting industries such as steel. A need developed for a real cost-benefit analysis.

In 1990, Congress requested the EPA to assess the question: How do the overall health, welfare, ecological, and economic benefits of Clean Air Act programs compare with the costs of these programs? In response, the EPA performed the most exhaustive cost-benefit analysis of public policy ever attempted. Here is what the EPA reported in a 1996 study:

- The total direct cost of implementing the Clean Air Act for all federal, state, and local rules from 1970 to 1990 was \$436 billion (in 1990 dollars). This cost was borne by businesses, consumers, and government entities in the form of higher prices for many goods and services and for some utilities.
- The mean estimate of direct benefits from the Clean Air Act from 1970 to 1990 was \$6.8 trillion.
- Therefore, the net benefit of the Clean Air Act has been \$6.4 trillion!
- "The finding is overwhelming. The benefits far exceed the costs of the Clean Air Act in the first 20 years," said Richard Morgenstern, associate administrator for policy planning and evaluation at the EPA. Further, the report states that "all benefits may be significantly underestimated due to the exclusion of large numbers of benefits from the assessed benefit estimate."
- The benefits to society, directly and indirectly, have been widespread across the entire population. The clean air act has:
 - reduced air pollution (described in this chapter);
 - improved human health: Each year, 70,000 lives were saved, and there were 18,000 fewer heart attacks, 10,000 fewer strokes, 13,000 fewer cases of hypertension, and 15 million fewer cases of respiratory illness;
 - "avoided cost": Improved health has meant less debilitating disease, less hospitalization, less need for special care, and less need for medicines;
 - lowered levels of lead, which is particularly harmful to children. In 1980, 220,000 tons of lead were not buried in gasoline, because of Clean Air Act measures. Because exposure to lead impairs the cognitive development of children, the huge reductions in lead levels produced a benefit of estimated \$2 billion and the possibility of a more productive, less dependent life.
 - lowered cancer rates;
 - resulted in less acid deposition.
- The EPA study must also consider age as its one hope for a more optimistic future. Society knows what to do: take action despite disruptive efforts by special-interest and political partners, and request about \$15 in benefits for every \$1 invested in reduced air pollution.
- In 1999, the EPA published a second analysis of costs and benefits that looked at the impacts of the CAAA of 1990 and estimated expected costs and benefits to 2010. The findings are consistent with the EPA's previous analysis. According to the latest analysis, the new regulations will cost an estimated \$27 billion, but will generate health and ecological benefits of about \$19 billion. Estimates indicate that the regulations will prevent 23,000 American from an early death, more than 17 million asthma episodes, 67,000 incidences of acute or chronic bronchitis, and 22,000 respiratory-related hospital stays. Many of the benefits, such as those to crops and ecosystems, are difficult to put in dollar terms. Thus, the benefits exceed the costs by a margin of far more on a dollar basis than the \$6.4 trillion gain.

Source: Adapted from R. Christopher Dawson, an Introduction to Physical Geography, 4th ed. Copyright © 1997 by the author. Reprinted by permission of Pearson Education, Inc. Upper Saddle River, NJ, 1997.



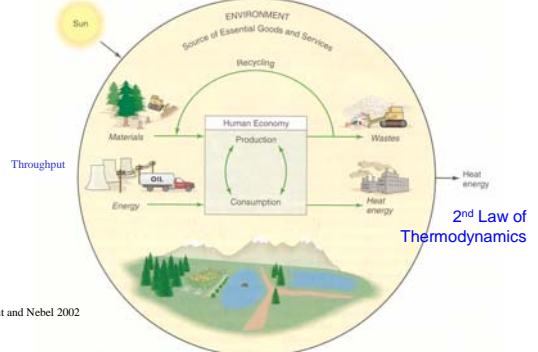
nomadic Maasai

Private Property?

TABLE 28.1 Water use by people in different sorts of communities in Arabia People in indigenous desert settlements use one-tenth the water of people in modern towns. The figures are for all domestic water use, including drinking, washing, bathing, and other water demands.

Type of community	Domestic water use per person (L/day)
Modern Arabian town without major industry ^a	240
Traditional agricultural village	120
Small desert settlement with supply by government water truck	80
Small desert settlement with traditional water supply	28

Source: After Goudie and Wilkinson 1977. (Hill et al. 2004)
^aNew York City has a similar usage rate.



Wright and Nebel 2002

FIGURE 23-3 Environmental economic view of economic activity. The natural environment encompasses the economy, which is constrained by the resources found within the environment.

Table 2.1 Ecosystem Services and Functions	
Ecosystem service*	Examples
Gas regulation	Carbon dioxide/oxygen balance, ozone for protection against ultraviolet light
Climate regulation	Greenhouse gas regulation, dimethyl sulfide production affecting cloud formation
Disturbance regulation	Soam protection, flood control, drought recovery, and other aspects controlled by vegetation structure
Water regulation	Provisioning of water for agricultural (such as irrigation) or industrial (such as milling) processes or transportation
Water supply	Provisioning of water by watersheds, reservoirs, and aquifers
Erosion control and sediment retention	Prevention of loss of soil by wind, runoff, or other removal processes; storage of silt in lakes and wetlands
Soil formation	Weathering of rock and the accumulation of organic material
Nutrient cycling	Nitrogen fixation, nitrogen, phosphorus, and other elemental or nutrient cycles
Waste treatment	Waste treatment, pollution control, detoxification
Pollination	Provisioning of pollinators for the reproduction of plant populations
Biological control	Keystone predator control of prey species; reduction of herbivory by top predators
Refugia	Nurseries, habitat for migratory species, regional habitats for locally harvested species, or overwintering grounds
Food production	Production of fish, game, crops, nuts, and fruits by hunting, gathering, subsistence farming, or fishing
Raw materials	The production of lumber, fuel, or fodder
Genetic resources	Medicine, products for materials science, genes for resistance to plant pathogens and crop pests, ornamental species (pets and horticultural varieties of plants)
Recreation	Ecotourism, sport fishing, and other outdoor recreational activities
Cultural	Aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems

*Ecosystem "goods" included in ecosystem services.
 Source: Adapted with permission from Robert Costanza et al., "The value of the world's ecosystem services and natural capital," *Nature*, May 1997.

Brennan and Withgott 2005

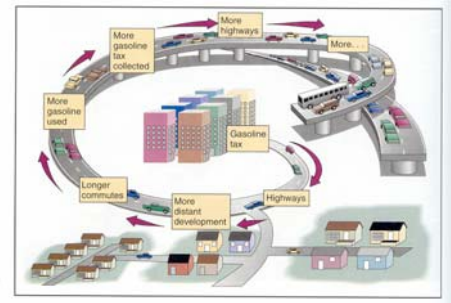
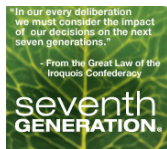


FIGURE 24-5 The development cycle spawned by the Highway Trust Fund.

Wright and Nebel 2002



Vs. Positive DISCOUNT RATE

Herman Daly

Former Environmental Economist with Worldbank
 Professor at U. Maryland



Utility vs. Throughput
 Utility not measurable; it is an experience

Circulatory system vs. digestive system
 (perpetual motion machine)

Wealth vs. Iith (accumulation of goods vs. bads)

Micro vs. Macro economics
 (MR=MC vs. endless)

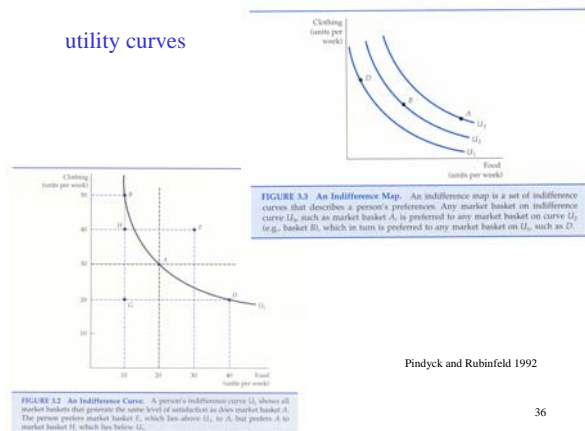
"SATISFICING"
 Development vs. Growth

If resources infinite then price = 0,
 but if pay for resources then can redistribute wealth

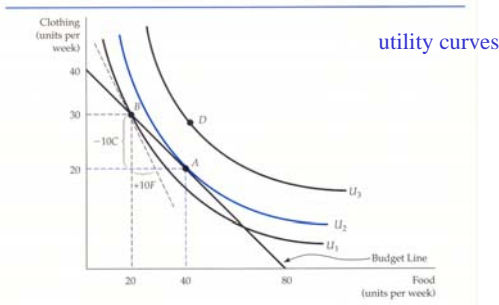
Center for the Advancement of the
 Steady State Economy

<http://www.steadystate.org/Index.html>

utility curves



Pindyck and Rubinfeld 1992



utility curves

FIGURE 3.11 Maximizing Consumer Satisfaction. When the budget line and the indifference map are combined, consumers maximize their satisfaction by choosing *A*. At this point the budget line and indifference curve U_3 are tangent, and no higher level of satisfaction can be attained. At *A*, the point of maximization, the marginal rate of substitution between the two goods equals the price ratio. At *B*, however, the marginal rate of substitution (1) is greater than the price ratio ($1/2$), and maximization does not occur. Pindyck and Rubinfeld 1992

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Warren Buffett: Tax Inherited Estates



By LAURIE KELLMAN - 14 Nov 2007

Billionaire Warren Buffett told the Senate Finance Committee on Wednesday that [Congress should keep the estate tax rather than repeal it and help a few rich Americans like him.](#)

"I think we need to ... take a little more out of the hides of guys like me," Buffett told the panel.

One of the world's richest men and biggest philanthropists, Buffett has been outspoken against efforts, mostly by Republicans, to repeal or reduce the federal tax on inheritances. Democrats argue that a repeal would amount to a huge windfall for the nation's wealthiest families.

Estates worth up to \$2 million this year and next will be exempt from the federal estate tax. Portions of estates above that threshold will be taxed at 45 percent. In 2009, the exemption level rises to \$3.5 million, and by 2010 the estate tax will be repealed — but only for a year. Unless Congress changes the law, it comes roaring back in 2011 with an exemption threshold of only \$1 million and a top tax rate of 55 percent.

Buffett said inheritance taxes preserve a measure of meritocracy, and with it opportunity, by recycling portions of great wealth through public coffers.

"The resources of society I don't think should pass along in terms of an aristocratic dynasty of wealth," Buffett told the panel. "I believe in keeping equality of opportunity as much as you can in this country."

...

Committee Chairman Max Baucus, D-Mont., citing information from the IRS, said that [of nearly 2.5 million deaths in 2004, about 19,300 estates paid the estate tax.](#)

Avoiding the Crisis Mentality

