

# **The Revolution in Welfare Economics and its Implications for Environmental Valuation and Policy**

**John M. Gowdy**  
**Department of Economics**  
**Rensselaer Polytechnic Institute**  
**Troy, New York 12180**  
**USA**

## **Abstract.**

Neoclassical welfare economics is in disarray after more than three decades of a “quiet revolution” undermining the theory of consumer choice and the fundamental theorems of welfare economics. The welfare theorems lie behind widely used techniques to value the environment including cost benefit analysis (CBA) and widely used benchmarks to judge environmental policies, such as the idea of a Potential Pareto Improvement. Within environmental and ecological economics CBA continues to proliferate in spite of its well-known theoretical shortcomings. The first half of this paper examines the current state of welfare economics focusing on (1) the fundamental theoretical flaws in the calculation and use of potential Pareto improvements as a policy guide to making social welfare judgments, and (2) the rational actor model underlying CBA which has been shown to be an unsatisfactory model of human behavior. The paper then turns to a discussion of endogenous preferences as a guide to how actual human behavior can be used as the basis for policy analysis. I end with a discussion of the contrasts between neoliberal (Nozick) and progressive (Rawls) conceptions of social welfare in light of contemporary economic theories of human behavior.

## Introduction

In spite of mounting empirical evidence and a growing body of theory demonstrating the logical inconsistencies and empirical shortcomings of neoclassical welfare economics, this framework continues to dominate attempts by economists, including many ecological economists, to place values on environmental features. Judging from the contents of the leading environmental economics journals, day-to-day work by applied economists is curiously disconnected from current work in mainstream economic theory. A time lag between theoretical frontiers and everyday practice is normal in any science, but its consequences are severe in the case of environmental valuation. Current U.S. policies on climate change and biodiversity preservation, for example, rely heavily on welfare economic models whose legitimacy depends crucially on outdated theoretical formulations, and on assumptions known to be at odds with actual human behavior. Particularly troublesome is the widespread use of the concept of a Potential Pareto Improvement (PPI) as one of the major economic tools for evaluating alternative environmental policies. Research in environmental valuation and policy can be rejuvenated by abandoning neoclassical welfare theory and turning to models explicitly incorporating endogenous preferences, distributional effects, and responsibility toward future generations.

One of the great intellectual achievements of economics is the development and refinement of a comprehensive, logically and mathematically consistent system describing the workings of a stylized competitive economy. This system, neoclassical welfare economics, is enshrined in the Fundamental Theorems of Welfare Economics. These are:

*The First Fundamental Theorem of Welfare Economics:* Assume that all individuals and firms are selfish price takers. Then a competitive equilibrium is Pareto optimal.

*The Second Fundamental Theorem of Welfare Economics*: Assume that all individuals and producers are selfish price takers. Then almost any Pareto optimal equilibrium can be supported via the competitive mechanism, provided appropriate lump-sum taxes and transfers are imposed on individuals and firms.<sup>1</sup>

These two theorems<sup>2</sup> have been the backbone of neoclassical theory and policy in the decades since WWII. Lockwood (1987, 811) writes of the Second Theorem: “It is no exaggeration to say that the entire modern microeconomic theory of government policy intervention in the economy (including cost-benefit analysis) is predicated on this idea.” Likewise, Fisher (1983) writes: “The central theorems of welfare economics (i.e. the first and second fundamental theorems) may be the single most important set of ideas that economists have to convey to lay people...”

The second fundamental theorem, underlying cost-benefit analysis, asserts that any Pareto optimum judged to be superior to another can be supported by appropriate government action. Many textbooks assert that any Pareto efficient situation judged to be superior to another can be “achieved” via the market mechanism using appropriate taxes or subsidies. This assertion is too strong unless additional assumptions are made about the uniqueness and stability of global equilibrium (Bryant 1994).

The rationale for distinguishing between alternative states of the economy is the Kaldor-Hicks criterion.<sup>3</sup> If the magnitude of the gains from moving from one state of the economy to another is greater than the magnitude of the losses, then social welfare is increased by making the move even if no actual compensation is made. This is a Potential Pareto Improvement and as Stavins, Wagner, and Wagner assert (2002, 5): “This is the fundamental foundation—the

normative justification—for employing benefit-costs analysis, that is, for searching for policies that maximize the positive differences between benefits and costs.” Establishing environmental policies using a cost-benefit approach to identify Potential Pareto Improvements is central to virtually every leading environmental economics textbook. Notice how a PPI is different from the notion of Pareto efficiency which simply says that an efficient state is one in which any change will make at least one person worse off. If two points **A** and **B** are both on a utility possibilities frontier, both are Pareto efficient and it is impossible to judge between them using the strict Pareto criterion. A *Pareto improvement* occurs when at least one person is made better off without making anyone else worse off. A *Potential Pareto Improvement* involves a change that helps one person and harms another.

The notion of Pareto efficiency rests on the building blocks of neoclassical welfare theory, economic man and perfect competition. Both these concepts have been the subject of harsh criticism for over a century (Hobson 1900, Veblen 1898), but this has had little effect on the course of economic theory. During the past three decades or so, however, heterodox critics of neoclassical welfare economics have been joined by a chorus of mainstream economists. A blunt assessment is given by Stiglitz (1994, 27): “[T]he first fundamental theorem of welfare economics—asserting the efficiency of competitive economies—is fundamentally flawed. Quite contrary to that theorem, competitive economies are almost never efficient...”<sup>4</sup>

Two fundamental problems mar the welfare-based cost-benefit approach to environmental policy. The first is the insurmountable theoretical difficulties with determining potential Pareto improvements using the Kaldor-Hicks criterion. The second problem lies with the way costs and benefits are empirically calculated in most economic studies. Using the

assumptions of the rational actor model, applications of CBA filter data collected from actual respondents by forcing them to fit the restrictive assumptions of consumer choice theory.<sup>5</sup>

What follows is *not* a critique of all attempts to put numbers on the benefits and costs of moving from one state-of-nature to another. What I am criticizing is the narrow, unrealistic, and ideological framework of neoclassical welfare economics currently underlying most cost-benefit calculations. Judging from the literature, and from conversations with cost-benefit advocates, most economists do not appreciate the theoretical difficulties involved in estimating welfare changes. And certainly most non-economists are unaware of the leap-of-faith required in going from “estimating costs and benefits” to calculating a “Potential Pareto Improvement.”

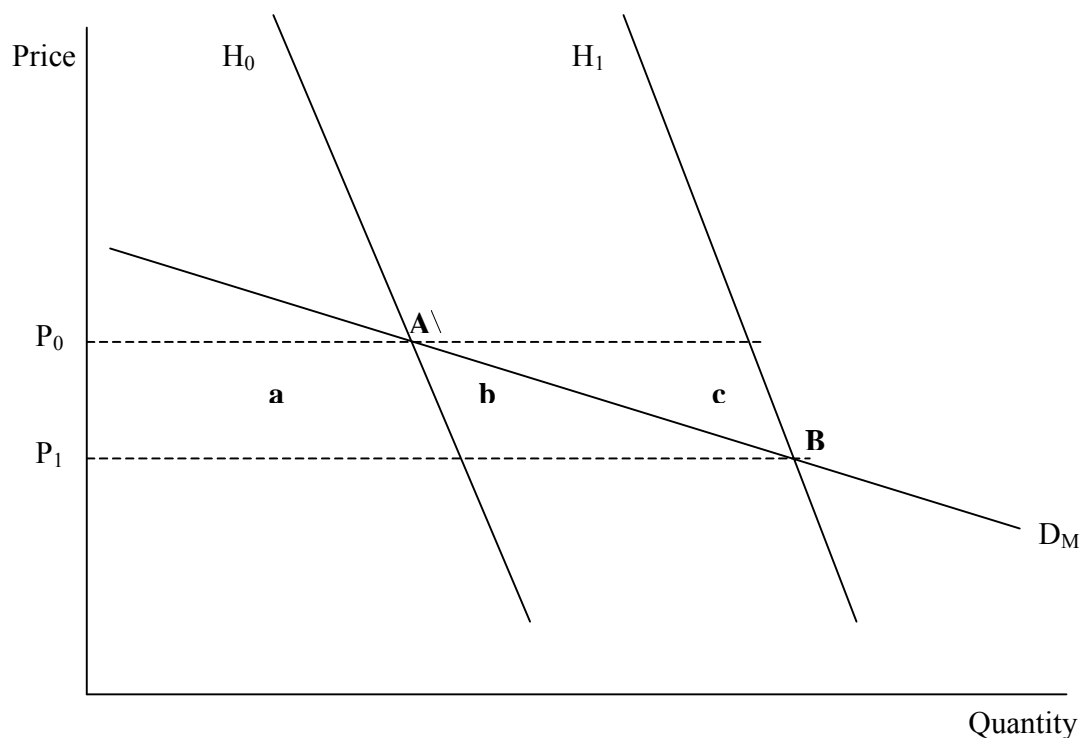
## **Welfare Theory and Environmental Valuation**

### *Measuring Changes in Social Welfare*

The difficulties with neoclassical welfare theory have been known for decades. Until recently, however, problems such as the Arrow impossibility theorem and the Scitovsky and Boadway paradoxes were considered to be theoretical anomalies having little relevance to practical applications of the PPI principle. Recently, however, work in behavioral economics and game theory has demonstrated that actual human behavior is better explained by the “paradoxes” than by the axiomatic model of welfare economics. There are sound behavioral explanations for the widely observed deviations from “rational” economic behavior.

Before we begin our discussion of welfare theory and the associated paradoxes we need some concepts and definitions. Figure 1 below shows three different measures of the welfare effects of a price change in a single good (adapted from Bateman and Turner, 1992, see also Bateman et al. 2000 and Hicks 1943-44). These are the Marshallian consumer surplus (CS), the

Hicksian *equivalent variation* (EV) and the Hicksian *compensating variation* (CV).



**Figure 1. Welfare Change Measures for a Price Constrained Good**

Assume that price is a continuous variable. The income compensated welfare gain, called compensating variation, resulting from a price reduction from  $P_0$  to  $P_1$  is given by the area **a**. This is the gain from moving along the Hicksian income compensated demand curve  $H_0$ . The income compensated welfare loss, called equivalent variation, resulting from a price increase from  $P_1$  to  $P_0$ , is given by the area **a + b + c**. This is the loss from moving along the (higher) Hicksian income compensated demand curve  $H_1$ . The income compensated demand curve  $H_1$  is higher than the income compensated demand curve  $H_0$  because real income is higher at the lower price,  $P_1$ . The Marshallian measure of consumer surplus uses nominal income (and the uncompensated

demand curve  $D_M$ ) and the measure for both losses and gains from the price change is the area  $a + b$ .

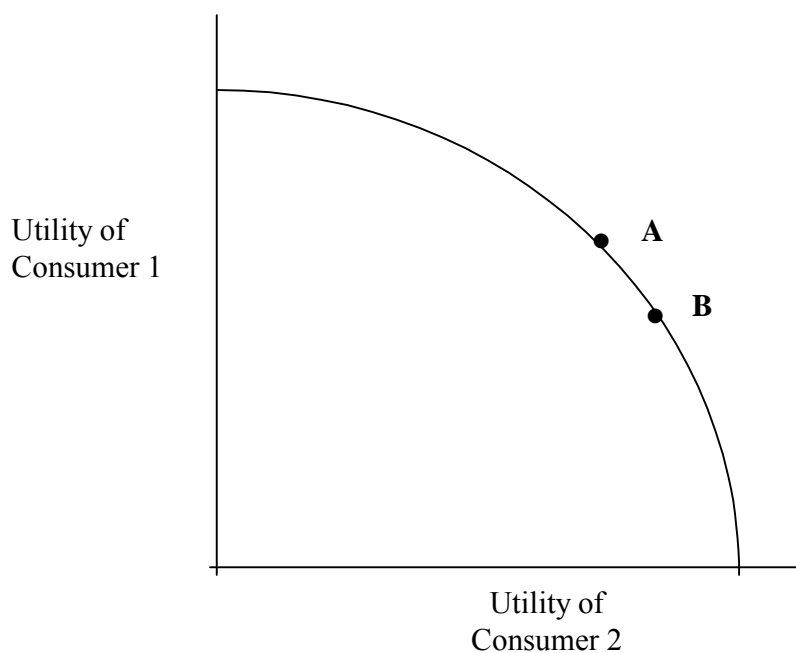
The Hicksian demand curves are adjusted for changes in income so that they show only the substitution effect of a price change. For a normal good Hicksian demand curves are steeper (less elastic, or less price responsive) because the income effect of a change in price is taken away. The difference in slopes between the Hicksian and Marshallian measures depends on the size of the income effect. For a normal good:

$$(1) [CV = a] < [CS = a + b] < [EV = a + b + c]$$

If the income effect is zero then  $CV = CS = EV$ . For a normal good, when you are better off (as in  $H_1$  in figure 1) you need more compensation for a worsening situation (a price increase of some amount  $x$ ) than you are willing to pay for an improvement (a price decrease of some amount  $x$ ) when you are worse off (as in  $H_0$  in figure 1).

Problems arise in comparing losers and gainers because to do this one must compare point **A** to point **B** in figure 1. Point **A** with a higher price and lower real income, is the starting point for evaluating gains, while point **B** with a lower price and thus a higher real income, is the starting point for evaluating losses. Consider a change along the utility possibilities frontier illustrated in figure 2 below. All the points on the frontier are Pareto optimal so that a movement from point **B** to point **A** must necessarily increase the utility of person 1 and decrease the utility of person 2. How do we know if total welfare in this two-person society goes up or down with a movement from **B** to **A**? The Kaldor-Hicks criterion seems straightforward. If person 1 values his gains from the move from **B** to **A** more than person 2 values her losses from the move, even if no actual compensation is made, then total welfare increases. So a movement from **B** to **A** is a

potential Pareto improvement.



**Figure 2. Two Points on A Utility Possibilities Frontier**

The justification for the Kaldor-Hicks approach contains several critical assumptions.

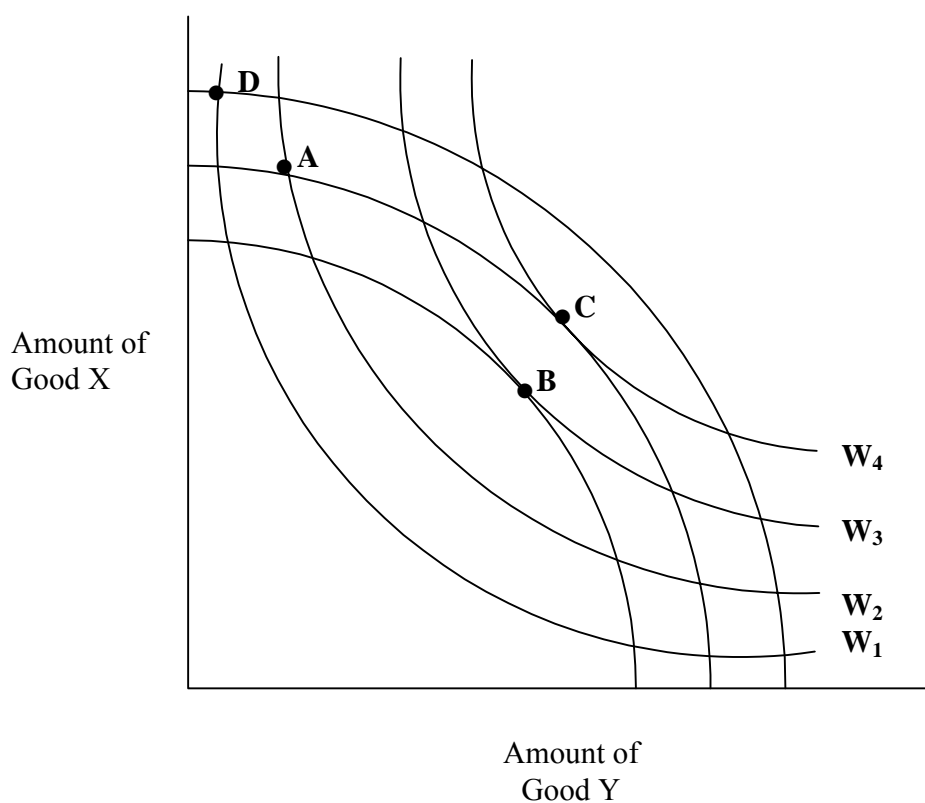
One is that policy should be determined by efficiency. Another is that improvements in efficiency (increases in total surplus) can be measured by looking at the welfare changes described above.

Finally, it is assumed that the issues of distribution and efficiency can and should be separated.<sup>6</sup>

Calcott (2001, 6-10) describes separability:

The core of the separability argument can be expressed with the metaphor of the pie. Increasing total surplus is described as 'making the pie bigger.' The division of the pie is viewed as a separate issue. A bigger pie makes a new division possible, in which everyone gets a bigger slice than they otherwise would have. If the division of the pie (redistribution of income) can be entrusted to someone who will make the correct decisions, then we do not need to know what these divisions are, in order to accept that a larger pie will be beneficial.

As shown in figure 3 below it is quite possible that an increase in “efficiency” can reduce social welfare if a society has a preference for equality. Suppose an increase in efficiency, indicated by an outward shift in the production possibilities frontier, moves the economy from **B** to **A**.



**Figure 3. Efficiency and Social Welfare**

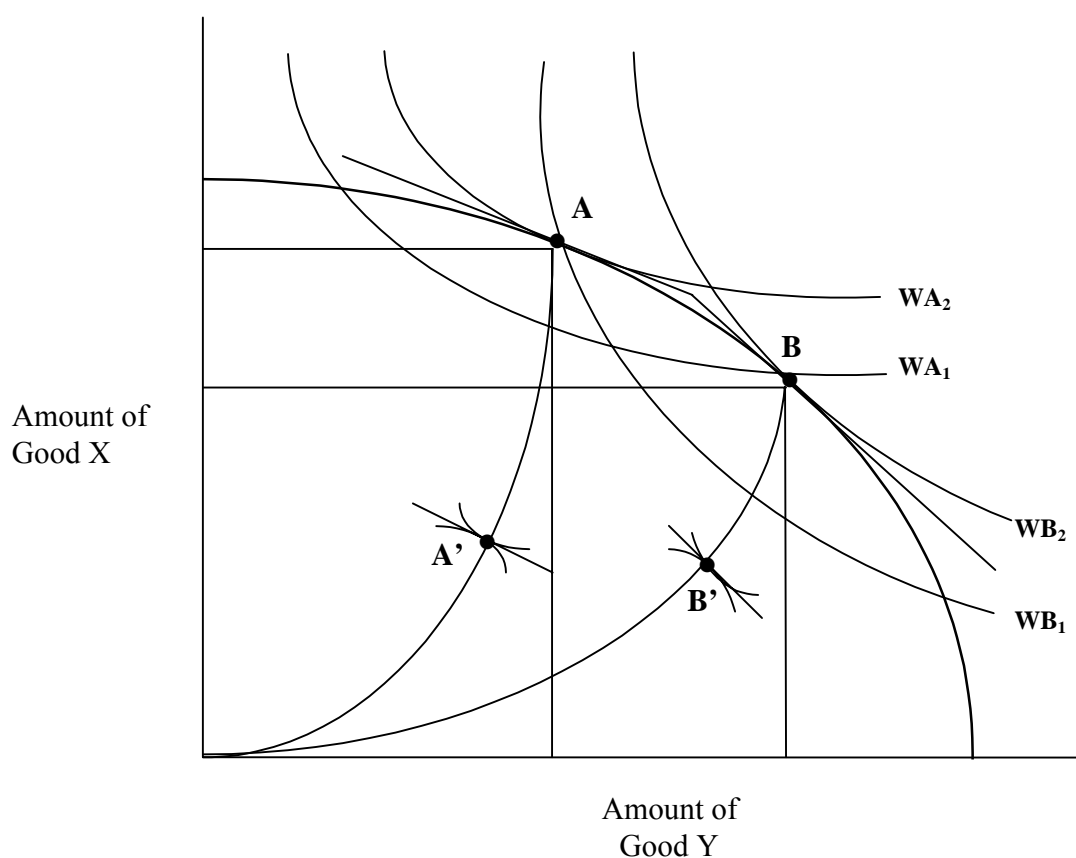
This move should be done under the Kaldor-Hicks PPI test since total output goes up, but society is worse off as indicated by the move from the social welfare function  $W_3$  to a lower social welfare function  $W_2$ . The separability argument is basically “that’s a political not an economic problem” since it is theoretically possible for political authorities to step in and redistribute the gains so that society could redistribute the efficiency gains and end up at point **C**

on the higher social welfare curve  $W_4$ . But in practice this almost never happens, and in fact the potential Pareto efficiency rule would dictate a move from point **A** not to point **C** but rather to point **D** on a higher PPF but an even lower social welfare curve  $W_1$ .<sup>7</sup>

Problems arise from several sources for the PPI concept and the separability assumption. First, theoretical difficulties exist in identifying PPIs. As illustrated in Figure 1, the real income base is different at points **A** and **B**, so these points represent two *partial equilibrium* situations, while *general equilibrium*, is required to make judgments about total welfare changes. Relative prices are likely to be different at points **A** and **B** so we cannot say we are working in a general equilibrium framework. Second, experimental results consistently and convincingly show that people place much higher values on losses than they do on equivalent gains. There is a psychological asymmetry involved in comparing losses and gains.

#### *Theoretical Difficulties with the Kaldor-Hicks Criterion*

Scitovsky (1941) demonstrated that if a movement from **B** to **A** can be shown to be Pareto improving according to the Kaldor-Hicks criterion, then it can also be shown that a movement from **A** back to **B** is also Pareto improving. This is called “cycling” and it relies on the condition that compensation is not actually paid. If compensation is paid, then applying the PPI criterion would “stick” the choice at either **A** or **B**, depending on which was the starting point as shown in figure 4.<sup>8</sup> If the initial Pareto equilibrium is at **B** with associated social welfare functions  $W_{B1}$  and  $W_{B2}$ , point **B** would be preferred to point **A** because it is on a higher social indifference curve. On the other hand if the starting point is **A** with its associated social indifference curves  $W_{A1}$  and  $W_{A2}$  then point **A** would be preferred to point **B**.



**Figure 4. A Production Possibilities Frontier with Two Social Welfare Optima**

A change in initial distribution of goods (income) means a change in the reference points that determine Pareto optimality. Each point **A** and **B** on the production possibilities frontier is associated with points **A'** and **B'** within the Edgeworth box for each amount of goods **X** and **Y**. The necessary condition for general Pareto optimality is that the slope of the production possibilities frontier, the rate of product transformation of **Y** into **X** ( $RPT_{Y \text{ for } X}$ ), is equal to the common marginal rates of substitution **Y** for **X** ( $MRS_{Y \text{ for } X}$ ) in consumption for each person. These slopes will be different at different points along the PPF, meaning that in competitive equilibrium, the price ratios for **X** and **Y** will be different at **A** and **B**. Related to this is the “Boadway Paradox.” Boadway (1974, 926) demonstrated that “when comparing alternative

projects or policies, the one with the largest net gain is not necessarily the ‘best’ one in the compensation sense.” The Boadway paradox also arises from the fact that estimates of income compensated variations (CVs) welfare gains, at constant prices, are partial equilibrium measures. These measures coincide with general equilibrium measures only if there is a single market-clearing price ratio at every point on the contract curve, a condition that holds only if preferences are identical and homothetic<sup>9</sup> (Jones 2002). When relative prices change with a redistribution of income, as they almost certainly do in a general equilibrium system, then CV estimates are misleading measures of potential welfare gains.

There are a number of other theoretical dilemmas with the PPI approach. Brekke (1997) shows that the choice of a numeraire matters when the marginal rates of substitution differ among consumers. And it is well-known that in the case of interpersonal utility functions, equating the marginal rates of substitution of consumers does not guarantee Pareto optimality (Henderson and Quandt 1980, 297).<sup>10</sup> More than fifty years ago Samuelson (1950) showed that it is not certain that group **A** is better off than group **B** even if group **A** has more of everything. Also well-known in welfare economics is the theory of the second best demonstrating that if several Pareto conditions are violated in real-world markets, then correcting only one of them moves the economy further away from Pareto efficiency.<sup>11</sup>

The upshot of these results for welfare economics is that the Kaldor-Hicks PPI rationale for comparing two states of the economy has some fundamental problems which preclude its practical application. Even *within* the narrow framework of neoclassical welfare theory it cannot even be proved that more is preferred to less—the very essence of modern economics (Bromley 1990). There is no theoretically justifiable way to make welfare judgments without invoking

interpersonal comparisons of utility and this is not permissible under the conditions for applying neoclassical welfare economics (Bromley 1990, Suzumura 1999).

### *Preference Filtering in Empirical Cost-Benefit Studies*

The second problem with estimating PPIs lies with the way neoclassical welfare economists actually calculate the value of losses and gains. At the core of neoclassical welfare theory is the “rational actor” model of human behavior. Individuals act to maximize utility according to consistent, constant, well-ordered preferences. In the rational actor model, preferences are exogenous, that is, they are not influenced by other individuals, economic policies or social institutions (Gintis 1998; Laitner, DeCanio and Peters 2001, 12). The argument for using individual preferences as the starting point is a powerful one. It is a good thing for individuals to have what they want, and each individual is the best judge of what he or she wants. According to Randall (1988, 217) economists are “doggedly nonjudgmental about people’s preferences.” But are they? In fact, by forcing individual preferences through the narrow funnel of rational choice theory, economists are denying individuals a whole range of choices falling under the rubric of *endogenous preferences*.<sup>12</sup>

For example, in surveys of consumer preferences for environmental services, information is collected that routinely violates the axioms of consumer choice theory. Lexicographic preferences<sup>13</sup> are widespread (Spash and Hanley 1995), people express ethical concerns based on group norms (Fehr and Gächter 2000), and considerable evidence exists that people value the medium and distant futures about the same (hyperbolic discounting) (Laibson 1997). But collected information about consumer attitudes is filtered by economists through the axioms of consumer choice to fit the stylized “facts” of neoclassical welfare economics (see figure 5).

<b>Expressed Preferences</b>	<b>The Filter of Welfare Economics</b>	<b>Distorted Preferences</b>
[lexicographic ordering, hyperbolic discounting, risk aversion, pure altruism]	≡ [transitivity, non-satiation, universal substitutability, radical individualism]	≡ [everything is tradable, everything has a price, straight-line discounting]

**Figure 5. Preferences and the Axioms of Consumer**

These filters take a variety of forms. For example, in surveys using the contingent valuation method (CVM), “protest bids” are very common. These may be in the form of “extreme” bids of zero or infinity. One reason for these bids are the existence of lexicographic preference, that is, people may place absolute values on environmental preservation and refuse to make trade-off between environmental features and money. Stevens et al. (1991) and Spash and Hanley (1995) found that approximately 25% of respondents in CVM surveys refused to consider the concept of trading income changes with changes in environmental quality.

In many CVM surveys these bids are excluded from the analysis thereby disenfranchising those respondents. A recent trend in CVM studies is to filter out lexicographic preferences by designing surveys to elicit market-compatible responses, such as the use of bid cards (Reaves, Kramer, and Holmes 1999). Bid cards restrict the choices in CVM surveys to a given set of offers, thus forcing choices to conform to the normative assumptions of the investigator. Environmental features are forced to be equivalent to market goods. Sagoff (1988, 94) calls this a *category mistake* because analysts ask questions as if they were about objective facts, when these questions are really about subjective interests and desires (see the discussion in Keat, 1997).

Another ubiquitous serious filtering of preferences is the use of Willingness to Pay (WTP) rather than Willingness to Accept (WTA) measures of environmental value. Basically WTP is a measure of how much a person would be willing to pay for something she does not

have, while WTA is a measure of how much a person would have to be compensated for the loss of something that is theirs. WTA measures are typically several times larger than WTP measures for a variety of reasons both theoretical and psychological. In the context of welfare economics, the WTA measure is the theoretically proper one to use in the case of environmental losses and damages. According to the authors of the influential NOAA panel report (Arrow et al. 1993) “The conceptually correct measure of lost passive-use value for environmental damage that has already occurred is the minimum amount of compensation that each affected individual would be willing to accept.” In spite of the fact that WTA measures are the conceptually correct ones to use, the NOAA panel recommends the WTP measure: “The willingness to pay format should be used instead of the compensation required because the former is the conservative choice” (Arrow et al. 1993, 32).<sup>14</sup> And also due to “The cause of concern that respondents would give unrealistically high answers to such questions” (Arrow et al. 1993, 4). What constitutes an “unreasonably high” answer is not discussed, nor is why a “conservative choice” is best even though it is theoretically inferior. Again, if economists really mean to take consumer sovereignty seriously, they should not filter consumer preferences by imposing their own criteria about what is a reasonable response and what is not. WTP measures are used as a matter of convenience because these measures rely on market or pseudo-market prices. In spite of strong criticism (Bromley 1998, Knetch 1994, Spash 2002) WTP measures are almost universally used in CVM valuation studies even though they are theoretically inferior because they fit neoclassical economists’ normative assumptions about human behavior.<sup>15</sup>

## **Endogenous Preferences and Real Human Choices**

If economists are serious about taking human preferences as the starting point for

economic policy, its models of human choice should describe behavior as it really exists and not as it “ought to be” to make it tractable in a welfare economics framework. Recent research shows convincingly that preferences are *endogenous*, that is, they depend on the individual’s personal history, interaction with others, and the social context of the individual choice. The relationship between consumption and well-being is strongly affected by cultural norms (Brekke and Howarth 2000). Some kinds of endogenous preferences particularly relevant to environmental valuation are these (Carpenter 2002, Gintis 1998):

*The endowment effect* - One of the major reasons for  $WTA > WTP$  is the endowment effect. It seems to be a psychological law that people prefer something they already have to something that do not have (Kahneman and Tversky 1979; Knetch 1989; Thaler 1980). The hypothesis that losses from a reference position are systematically valued more than equivalent gains has been verified in numerous experiments. Tests of the endowment effect have shown that it is not due to wealth effects, income disparities, strategic behavior or transactions costs (Knetch 1989).

Differences between WTA and WTP “persist over repeated binding iterations of market trials” (Knetch, Thaler and Kahneman 1988). A straightforward and compelling experiment showing the endowment effect was conducted using three groups of students at the University of Victoria (Knetch 1989). One group was given a coffee mug and were asked to complete a short questionnaire. After the questionnaire was completed the student were shown a 400 gram Swiss chocolate bar and an offer was made to exchange the mug for the candy. A second group was given the chocolate bar first and at the end of the questionnaire they were offered an exchange of the candy bar for a coffee mug. The students in a third group were merely given the choice of a mug or candy bar.

**Table 1. Proportion Favoring**

Group	Mug over Candy	Candy over Mug	Number of Participants
Give up mug to get candy	89%	11%	76
Give up candy to obtain mug	10%	90%	87
No initial entitlement	56%	44%	55

As shown in Table 1, there was an overwhelming response to keep whichever gift was given to them at the beginning of the experiment. About 90 percent of the participants in the first two groups kept what they originally possessed. This experiment, and dozens of others, show that preferences are dependent on the direction of the change, that is, whether people are paid to give up something they have or have to pay to get something they do not have. The psychological model makes good predictions of economic behavior, the rational actor model does not.

*Process regarding preferences* - People care about processes as well as outcomes. In environmental policy the process of arriving at a decision may be as important in public acceptance as the actual outcome itself. On the production side studies have shown that people care about how products are made as well as the characteristics of the final product itself (Barham 2002). This calls into question environmental rulings by the World Trade Organization, such as rulings against eco-labeling, based on outcome-only criteria (Gowdy and Walton 2003). Game theory experiments show the importance of process and fairness in economic decision-making (Bowles and Gintis 2000). In the ultimatum game, a “proposer” is given a sum of money and instructed to share it with a “respondent” who can either accept or reject the offer. Results of the game (mean offers and rejection rates) vary significantly according to the process through which money is obtained and offers are made. Offers are substantially lower if proposers win

their position by doing well on a quiz (Hoffman et al. 1994). Rejection rates are much lower if respondents are told that the offers were generated by a computer (Blount 1995). In the prisoner's dilemma game, defection rates are significantly higher if the game is referred to as the "Wall Street Game" rather than the "Community Game" (Ross and Ward 1996).

Results from these and numerous other studies in game theory, experimental economics, and behavioral economics show that models which do not take into account social processes such as community norms about fairness are poor predictors of economic behavior. Again, this is in contrast to the neoclassical welfare model in which "ends" are given. Bowles and Gintis (2000, 4) write: "The economic man known to students of Walrasian economics acts on the basis of preferences that are self-regarding—excluding such intrinsic values as altruism, fairness, and vengeance—and are defined over a restricted range of outcomes—excluding honesty as well as concerns about the *process* rather than simply the *outcome* of exchange *per se*."

*Time inconsistency and hyperbolic discounting* - Time consistency is critical to the standard economic assumption that benefits delivered in the future should be discounted at a fixed rate. Studies of actual human behavior indicate that people discount the near future at a higher rate than the distant future (Gintis 2000, Laibson 1997). People also have different discount rates for different kinds of outcomes. Anticipation has been found to be a positive thing in itself and may result in something in the future having a *higher* value (Loewenstein 1987). This finding is relevant to environmental preservation policies such as preserving national parks and other wildlife areas. Individuals may enjoy them more in the future (after retirement, for example) and the anticipation of this is important. Straight-line discounting is another filter that reduces the economic value of environment. The discounting issue has never been satisfactorily addressed in

cost-benefit analysis. Many have pointed out the ethical issues arising from the implicit assumption in CBA that social decisions should be analyzed from the point of view of one individual acting at a particular point in time (Heinzerling and Ackerman 2002)

*Biased cultural transmission* - According to standard theory, people choose among various options by carefully and consistently weighing them according to efficient welfare maximizing criteria. Results from a number of societies show that people are more likely to key in on respected members of a community and do what they do, whether it is “efficient” or not (Henrich 2001). Individual actors do not act as cost-benefit calculators who continuously adapt their behavior to changing environmental conditions. They may or may not respond “rationally” to incentives. A large body of empirical studies indicate that people acquire behavior patterns not by rationally choosing among alternatives but rather through social learning or cultural transmission (Henrich 2001, 2002). Innovation diffusion by copying through “conformist transmission” predicts S- shaped diffusion curves, while the rational actor model predicts a R-shaped curves. The S-shaped curve is one of the most robust findings in the innovation diffusion literature having been confirmed in over 3,000 studies (Henrich 2002). Once again, the rational actor model is shown to make poor predictions of economic behavior.

Real world examples of innovative changes in behavior cannot be explained by models of individual agents maximizing utility (Henrich 2003). Good predictions can be made, however, using models of biased cultural transmission. By *selectively* imitating respected individuals, people may insure that innovations become established in a community. Whether or not a particular innovation is adopted depends not so much on its “superiority” as determined by cost-benefit calculations, but rather on its conformance with established cultural patterns. This has

far-reaching implications for the design of environmental policies, and calls into question the almost universal belief among economists that incentive-based policies are to be preferred.

*Other regarding (social) preferences* - Results from game theory and behavioral economics show that people act to affect the well-being of others, positively or negatively, even at significant cost to themselves (Fehr and Gächter 2002). A sense of fairness, including pure altruism, is a critical factor in economic decisions. This is illustrated in various game theory experiments such as the public goods game in which participants are willing to impose, at great cost to themselves, punishments on non-contributors, even in the last round of the game (Bowles and Gintis 2000). In a study of 15 small scale societies using the ultimatum, dictator and public goods games, Henrich et al. (2001) found that behavioral variability across groups was much more pronounced than individual characteristics. "...[I]n addition to their own material payoffs, many experimental subjects appear to care about fairness and reciprocity, are willing to change the distribution of material outcomes at personal cost, and are willing to reward those who act in a cooperative manner while punishing those who do not even when these actions are costly to the individual." These studies confirm the importance of interpersonal, inter-generational and inter-species ethics. These kinds of behavior patterns have important consequences for judgements about environmental values and policy design.

## **Welfare Economics and Sustainability**

Have the theoretical breakthroughs described above had any significant influence on the theory and methods of environmental economics? Judging from articles published in the leading environmental economics journals and looking at the environmental policy prescriptions of leading economists, one would have to say "no." Criticisms of neoclassical economics are

frequently dismissed as attacks on a “straw man” that does not represent contemporary mainstream theory (Pezzy and Toman 2002, 18). Neoclassical economists rightly point out that mainstream theorists have extended the neoclassical paradigm far beyond the limits of traditional welfare analysis. But in empirical work environmental economists continue fall back on the standard welfare model. In fact, the PPI concept has been pushed even further by economists in the sustainable development literature.

Dasgupta (2002), for example, gives an excellent verbal account of the issues of sustainable development and the environment but then offers a theoretical analysis based on the Ramsey-Koopmans social welfare function,

$$(2) \quad W(t) = \int_t^{\infty} U[C(\tau)] \exp[-\delta(\tau-t)] d\tau, \quad \delta > 0,$$

assuming the existence of a social welfare function, a strictly concave and monotonically increasing utility function, “time consistency” (social welfare through time is a function only of capital assets,  $\mathbf{K}(t)$ ), and the existence of a “correct” and positive social discount rate  $\delta$ .

Consumption is aggregated into a single consumption good,  $C$ . Following the rationale of the Kaldor-Hicks criterion, Dasgupta argues that changes in a “wealth like index” is a measure of a society’s well-being, taking both the present and future of that society into account. In spite of the well-known and insurmountable difficulties with the PPI criterion, Dasgupta (2002, 7) writes: “This means that changes in wealth over time in a country can be used to identify whether or not the pattern of development is sustainable.” An increase in social welfare is equated to an increase in wealth.<sup>16</sup> An economy is sustainable if the index of wealth is non-declining over time.

The same argument is made in Nordhaus’ (1992, 2001) models of global climate purporting showing the excessive costs of climate change mitigation. Nordhaus also uses a

Ramsey model of the form:

$$(3) U[c(t)] = P(t) \{ [c(t)]^{1-\alpha} - 1 \} / (1-\alpha),$$

showing that total utility (social welfare) is equal to per capita consumption  $c(t)$  times population  $P(t)$ . In his DICE model future utility (consumption) is discounted at the real interest rate. The utility function is of the CES type forcing the elasticity of substitution to be the same between any pair of choices. Using this model, climate change policies are evaluated by comparing the before and after effects of the policies on discounted aggregate world economic output.<sup>17</sup> There may be good arguments for Nordhaus' conclusions that certain climate mitigation policies are too costly from society's point of view. But they are not to be found in his welfare model with its restrictive assumptions that ignore crucial insights from contemporary mainstream economics.

Stavins, Wagner and Wagner (2002) also define sustainability as dynamic efficiency expressed as:

$$(4) W(t) = \int_t^{\infty} U(c(\tau)) e^{-r(\tau-t)} d\tau$$

over all feasible alternative consumption paths  $c(\tau)$ , where  $U(c(\tau))$  is "the most general, idealized utility function comprising both direct consumption as well as the enjoyment of non-market goods and services and  $r$  is social rate of time preference." The condition for intergenerational equity is

$$(5) dW(t)/dt \geq 0$$

where  $W(t)$  is the maximized total welfare function from equation (4).

Stavins, Wagner and Wager are explicit in their use of the PPI to judge whether equations (4) and (5) move an economy toward sustainability. They write (2002, 5): [Instead of the strict Pareto criterion] "Economists resort instead to seeking 'potential' Pareto improvements in the

Kaldor-Hicks sense—the world is viewed as being made better off if the magnitude of the gains and the magnitude of losses are such that the gainers can fully compensate the losers for their losses and still be better off themselves. Note again that under the Kaldor-Hicks criterion, the change is considered to be an improvement whether or not the compensation actually takes place. Actual compensation of losers by winners is essentially left to the political process.” The leading environmental economists, at least in their policy prescriptions, seem unaware of the current literature in welfare economics. Since this is unlikely, a more plausible explanation of the continued advocacy of the PPI criterion by these economists is that they hold such strong ideological biases about the notions of efficiency, economic growth, and the superiority of market outcomes, they choose to ignore the theoretical difficulties discussed above.<sup>18</sup>

The debate over various neoclassical welfare models of sustainability has for the most part focused on the technical issues imbedded within the functional forms of the optimization models, especially the coefficient of the elasticity of substitution, and the “proper” social discount rate. When preferences expressed in survey results deviate from the axioms of consumer choice the usual response is to find ways to make the data fit the model.<sup>19</sup> Neoclassical environmental economists are “doggedly judgmental” about retaining the potential Pareto improvement criterion as the basis for environmental policy. The arguments made by neoclassical environmental economists at first blush seem convincing. But we are frequently led by a leap of faith from “common sense” to “welfare theory.” For example, in a recent paper Hanley and Shogren (2001) begin by asserting “...decisions researched over nature conservation using economic analysis are in some sense better than decisions reached without such an analysis.” What economist would argue with this? But later in the paper “economic analysis”

turns on the Potential Pareto Improvement criterion, “Can the gainers compensate the losers and still be better off?,” a question unanswerable except under very unrealistic assumptions.

Fortunately, economists have more to offer than this.

Traditional welfare economics has many strengths, especially if we reject its extreme manifestations in post WWII neoclassical welfare theory. It remains a powerful statement of the sanctity of the individual and the rejection of “perfectionist” theories of human nature that have caused such havoc in the modern world. But the sanctity of the individual is violated by forcing individual choice into the straightjacket of the axioms of consumer choice, denying interpersonal comparisons of utility, and ignoring what we have learned about how human beings make decisions. The expression of individual free will is shackled, not liberated, by the policy applications of neoclassical welfare economics.

### **Is There Life After Homo economicus?**

It is no exaggeration then, to say that the policy recommendations of contemporary environmental economists are driven by the Kaldor-Hicks criterion. A policy test whose logical inconsistency has been revealed by decades of theoretical and empirical work. The theoretical intractability of the Pareto theorems and the existence of various sorts of endogenous preferences raises some fundamental questions about the efficacy of the neoclassical welfare model:

*Is it possible to retain the axiomatic model of consumer choice taking endogenous preferences into account?*

The jury is still out on this question but the answer seems to be “no.” Heroic attempts have been made to reconcile endogenous preferences with standard welfare theory but they are quite restrictive and *ad hoc*. Munro and Sugden (2003), for example, present a simplified version

of the Kahneman-Tversky reference-dependent theory of consumer choice in which preferences are conditional on reference points. But these reference points can only be accommodated by imposing continuity and arbitrarily ruling out cycling in choice. Attempts to incorporate uncertainty in the axiomatic consumer choice model also require unrealistically restrictive assumptions. Donald Campbell, (1987, chapter 4) for example, deals with uncertainty by postulating a "contingent contract" market that would in effect provide insurance policies for commodities surrounded by uncertainty. Although this approach guarantees Pareto efficient equilibria, Campbell (1987, 65-66) concludes that this extension of the Arrow-Debreu model "would require an intolerably large number of markets in practice." (See the discussions in Albert and Hahnel (1990, chapter 1) and Hirshleifer and Riley (1979)). Coate (2000) develops a Pareto efficiency approach to evaluate policy changes that does not rely on either a welfare function or Hicks-Kaldor type compensation criteria. Coate's efficiency method compares the distributional consequences of pairs of feasible policies. Unfortunately, this approach retains most of the assumptions of standard cost-benefit analysis and adds some others (Coate 2000,451-454).

*Without Homo economicus is anything left of the notion of Pareto efficiency?*

As a general proposition almost everyone would agree with the statement "If an action can be taken that will make one person better off without making another person worse off, then this action should be taken." But moving from this simple idea to the Fundamental Theorems requires the rational economic actor and this model is fatally flawed if preferences are endogenous. If the utility of one person depends on the utility of another, equating marginal rates of substitution for two consumers does not guarantee Pareto efficiency (Binger and Hoffman 1998). If policy recommendations are restricted to the original strict Pareto condition that no one

is harmed by the change then there are very few policy situations which call for economic analysis. But broadening the scope of policy recommendations to *potential* Pareto improvements seems theoretically intractable.

Another problem with *Homo economicus* is that since preferences are culturally dependent, the model fails to make accurate predictions about economic behavior. Reviewing the results of game theory experiments from 15 small-scale societies Henrich et al. (2000, 73) conclude: “The canonical model [of entirely self-interested individuals] is not supported in any society studied.” In view of the operational and conceptual difficulties with *Homo economicus*, and the flaws in the First and Second Theorems of welfare economics, the concept of potential Pareto improvements appears to have no practical policy relevance.

*Without its welfare theoretic foundations, what is left of cost-benefit analysis and contingent valuation?*

Policies based on Potential Pareto Improvements must rely on monetary estimates of costs and benefits and must assume that changes in these estimates accurately reflect changes in social welfare. To the extent that monetary values are estimated using procedures that force preferences through the neoclassical funnel shown in Figure 5, they may offer a poor policy guide. Nevertheless, judging from the contents of the leading environmental economics journals, it is not an exaggeration to say that most environmental economists continue to use the Kaldor-Hicks criterion as *the* guide to environmental policy. But given the existence of endogenous preferences, and the other theoretical difficulties with PPI discussed above, in the neoclassical welfare framework it is impossible to say anything definite about the relative efficiency of different states of the economy. Furthermore, studies of *real* preferences call into question the

relationship between increased “efficiency” (as measured by increased economic surplus) and well-being (Frey and Stutzer 2000). These studies reinforce Bromley’s (1990, 2000) position that efficiency is only one of many possible policy goals.<sup>20</sup> A review of the welfare economics literature of the last few decades leaves one to wonder why environmental economics lags so far behind the rest of the field. As Bromley (2000, 3) puts it: “It seems odd that despite fundamental problems with various welfaristic truth rules—problems recognized by a number of the best welfare theorists...—many environmental economists persist in their efforts to hold environmental policy hostage to discredited ideas about how to judge which institutional structure is socially preferred.” Heinzerling and Ackerman (2002) summarize the current state of cost-benefit analysis and reject CBA even if used with other measures:

These features of cost benefit analysis [discounting and monetarization] make it a terrible way to make decisions about environmental protection, for both intrinsic and practical reasons. Nor is it useful to keep cost-benefit analysis around as a kind of tag-along, providing information that regulators may find “interesting” even if not decisive...Cost-benefit analysis cannot overcome its fatal flaw: it is completely reliant on the impossible attempt to price the priceless values of life, health, nature and the future. Better public policy decisions can be made without cost-benefit analysis, by combing the successes of traditional regulation with the best of the innovative and flexible approaches that have gained ground in recent years.

Another consideration is this, suppose we could establish, through some sort of discursive democratic process, some general consensus about the value of an environmental feature. We would still be in the realm of subjective “feelings” about the desired state of the world. Pearce (quoted in Adams 1993, 250) clearly states the nature of economic valuation: “What economic valuation does is to measure *human preferences* for or against changes in the state of environments. It does not ‘value the environment’. Indeed it is not clear what ‘valuing the environment’ would mean.” This is true, but in the most serious problems human societies now

face, including global climate change and biodiversity loss, the *value of the functions of the environment* is what we need to know, not just human feelings toward the environment. Human preferences for a certain level of environmental quality may be inconsistent with the long-run survival of our species. The history of human cultures after the adoption of agriculture some 10,000 years ago is one of unsustainability. One culture after another, from small scale societies such as Easter Island (Erickson and Gowdy 2000) to large civilizations such as the Sumerians, Incas, and Mayans (Ponting 1991) overshot their resources bases and collapsed. Perhaps if these societies had been democracies rather than theocracies they might have avoided their fate. But there is no guarantee that what people want as individuals is the same as what is needed to insure the long-term survival of the human species. Capturing human “preferences” means moving beyond the narrow framework of *Homo economicus*, and moving toward strong sustainability means going beyond average opinion as the sole guide for public policy.

### **Endogenous Preferences, Reasonable Valuation, and Environmental Policy**

How can we broaden public input to policy questions beyond CBA and other market-based criteria? As a starting point for policy guidance it is useful to return to the discussion of endogenous preferences. We can take these one by one and consider the policy implications of each.

#### *The Endowment effect -*

As discussed above, numerous studies have shown that people are reluctant to give up something that they feel is theirs by right. There is a status quo bias (Gintis 2000). This is related to the finding that people are risk averse and lends support to the notion of a safe minimum standard and the precautionary principle. The safe minimum standard (SMS) approach (Ciriacy-

Wantrup 1968; Bishop 1978) explicitly recognizes that irreversible environmental damage should be avoided unless the social costs of doing so are “unacceptably high.” The concept is necessarily vague because it does not rely on a single money metric as does CBA. It recognizes that losses should be valued higher than gains, that a great amount of uncertainty is involved in judging the effects of environmental losses, and that there are limits to substituting manufactured goods for environmental resources. The safe minimum standard approach has the potential to take into account “rights based” or deontological values. Such values are widely held as indicated by numerous valuation surveys (Lockwood 1998; Spash 1997; Stevens et al. 1991) and, again, if economists are serious about using preferences as a guide to policy these values should be taken into account in policy decisions. There is some sympathy for an SMS approach among neoclassical environmental economists because of the uncertainty issue (Farmer and Randall 1998; Randall 2002).

The endowment effect may be related to the wide-spread existence of lexicographic preferences in that for many people *any* loss of some particular thing may be unacceptable. A large percentage of respondents in CVM surveys exhibit “rights-based” preferences consistent with the endowment effect and lexicographic ordering. Spash (2000, 198) defined a modified lexicographic preference as a case where “individuals attain and maintain a minimum standard of living prior to being prepared to defend other humans, non humans or future generations.” In a CVM study of the value of wetlands as a bird habitat Spash (2000) found that a large portion of respondents held such modified rights-based preferences. 37% of the respondents in his survey agreed with the statement that “Such endangered species need protection because they have a right to life which cannot be traded against economic considerations.” An additional 20.9%

agreed with the statement that “Protection of such endangered species must be weighed against economic considerations, but in this case, the endangered species must come first.”

These results lend credence to the call for a rights-based approach to environmental policy. Do future generations have a right to clean air, clean water, and an interesting and varied environment? There is no reason to think that future generations would be any more willing than we are to have something taken away from them forever (especially things like a stable climate and biological species) as long as they are compensated by something “of equal value.” As Bromley (1998, 238) writes: “Regard for the future through social bequests shifts the analytical problem to a discussion about deciding what, rather than how much, to leave for those who will follow.” A rights-based approach to sustainability moves us away from the welfare notions of tradeoffs and fungibility toward the two interrelated concerns of uniqueness and irreversibility. The question of what to leave also moves us away from marginal analysis and worrying about relative amounts of resources, toward looking at discontinuous changes and total amounts of resources.

#### *Process-Regarding Preferences -*

The literature on endogenous preferences indicates that people care about means as well as ends. Human preferences include strong feelings about how goods are produced, about fairness in terms of economic rewards and distribution. The process of decision-making, how decisions are reached, may be as important as the decision itself in public acceptance of policy decisions. And the very process of decision-making shapes preferences. These ideas are extensively discussed in the valuation literature on discursive ethics (O’Hara 1996), deliberative democracy (Jacobs 1997), and stakeholder negotiation (O’Connor 2002). A growing trend is to combine

environmental valuation with these various forms of deliberative processes (Niemeyer and Spash 2001). Some advocate “deliberative monetary valuation” (DVM) which use “citizens juries” to come up with monetary valuations of environmental impacts. This approach has many of the drawbacks of CBA including assuming commensurability and setting aside lexicographic preferences. The DVM method does have the advantage of recognizing that preferences are constructed during the deliberation process.

An important contribution to process-oriented valuation is the use of scenarios to examine the potential impacts of policy proposals. Erickson, Gowdy and Limburg (2003) used an integrated assessment model of economic activity (a social accounting matrix or SAM), a Markov model of land use change, and an index of biological integrity to assess the potential impacts of economic development on biodiversity in the Wappinger Creek watershed, a tributary of the Hudson River. Citizen input was solicited at each stage of the project including the initial construction of the economic scenarios. The final model was used by focus groups to examine the socio-economic and environmental consequences of various economic and land use policy options.

#### *Time inconsistency and discounting -*

In the neoclassical welfare economics framework time consistency requires that the future be discounted at the same rate during all future time periods. The discount rate must be independent of the time period within which the costs and benefits occur. Once again, experimental results show that this assumption is generally at odds with actual human behavior. Gintis (2000, 313) writes:

People tend not [to] be time consistent. Rather, they appear to have higher discount rates over payoffs in the near future than in the distant future. It follows that people often favor

short-term gains that entail long-term losses...It follows that traditional benefit-cost analysis may underestimate the long-term benefits of environmental policies by discounting distant payoffs at too high a rate.

People also appear to have different discount rates for different kinds of outcomes (Lowenstein 1987). Survey evidence about real consumer preferences, as opposed to preferences as they are imagined by economists, indicates that people do not distinguish between the medium and distant futures (Cropper, Ayded, and Portney 1994; Kirby and Herrenstein 1995). If we respect preferences, straight-line discounting should not be used to place values on distant-future environmental damages such as those caused by climate instability or biodiversity loss. Using a constant discount rate in the case of long-term damages has two other major disadvantages. First, policies are very sensitive to the choice of the discount rate. At a discount rate of 1%, it is justified to spend 37 cents to avoid \$1 damage in 100 years. At a discount rate of 4% it is only justified to invest 1.8 cents to avoid \$1 damage. Second, large damages in the future have almost no discounted present value and thus no effect on policy recommendations. For example, at a 5% discount rate the life of one individual at the present is worth more than a billion people 500 years in the future (Heinzerling and Ackerman 2002).

Hyperbolic discounting has been widely discussed in the theoretical literature (Harris and Laibson 2001; Karp 2002; O'Donoghue and Rabin 1999; Weitzman 2001) but the idea has had little impact on the policy recommendations of most economists. Exceptions include Cropper and Laibson (2001) who recommend using hyperbolic discounting in the case of global warming and Chichilnsky (1996) who uses hyperbolic discounting in her model of sustainable development.

One of the positive features of welfare economics is that, in theory, it respects the sanctity of individual choice. If individuals choose to place the same value on something present 50 years

from now as they do on that same thing present 100 years from now, then we should respect that preference.

*Biased cultural transmission -*

Contrary to the neoclassical welfare model, people do not rationally choose among a set possibilities and select the most efficient one based on a careful weighing of costs and benefits. Support for environmental and social policies does not necessarily fall on the most “rational” choice. Models of human behavioral change have been proposed in a variety of disciplines, but most rely on the rational actor model of neoclassical economics. They share the idea that individuals decide on a course of action by rationally weighing the costs and benefits of alternatives. A new class of models is challenging this notion by arguing that behavioral changes are driven by “biased cultural transmission” (Henrich 2001). Real world examples of innovative changes in behavior cannot be explained by models of independent agents maximizing utility (Henrich 2003). Good predictions can be made, however, using models of biased cultural transmission. By *selectively* imitating respected individuals, people may insure that innovations become established in a community. Whether or not a particular innovation is adopted depends not so much on its “superiority” as determined by cost-benefit calculations, but rather on its conformance with established cultural patterns.

Recognizing the importance of cultural transmission can help formulate effective policy. The mission of The Nature Conservancy (TNC) is the preservation of biodiversity. Although TNC policy is certainly not based on academic models of human behavior, the success of TNC biodiversity preservation efforts illustrates the efficacy of the biased cultural transmission model. TNC efforts to establish biosphere reserves in the South Pacific have relied on the “biased

cultural transmission” of a conservation ethic. An illustrative example is TNC efforts to preserve biodiversity on the island of Pohnpei in Micronesia (Geatz 2000). The island's upland rainforest is being threatened by the cultivation of the sakau plant used to make a ceremonial drink. Islanders began to grow sakau in the upland areas after a particularly severe drought in 1983. Cultivation continued in the ecologically sensitive area after the drought subsided, and the island's fragile rainforest highlands were rapidly degraded. The Nature Conservancy decided to intervene in 1993 and after two years of intensive village-to-village education about the danger to the rainforest and the importance of protecting it, a rainforest protection program was implemented between traditional leaders and the government.

The Pohnpei case not only has practical lessons for biodiversity protection, it is also of great theoretical interest. Traditional economists would explain the movement of individual sakau cultivators into the upland areas as a “tragedy of the commons.” Individuals making rational decisions about the use of “open access” resources end up harming the common good. But the story is not as simple as that. Research in Pohnpei showed that sakau growing in the upland areas was actually *uneconomical*, greater returns could be obtained by putting the same effort into lowland cultivation. But upland growing spread because of misinformation and villages copying trusted community leaders. The TNC recognized this and turned public opinion by convincing tribal elders—using sophisticated scientific information including aerial photographs—that the upland forests were in danger. This model of biodiversity protection through providing scientific information to tribal elders who then convince the local population of the importance of preserving ecosystems, has been successfully implemented in Palau, Borneo, and the Andaman islands.

## **The Evolutionary Ethics of Economic Choices: Nozick or Rawls?**

In spite of valiant attempts to build a positive, value-free science, neoclassical welfare economics remains an ethical and ideological system. Many of the recommendations of welfare economics stem from not from sound economic analysis but rather an ideological commitment to free markets and an antipathy to government “interference” in the economy. Even if we grant all the restrictive assumptions of welfare economics, from *Homo economicus* to perfectly operating competitive markets, there is no way to “close” the neoclassical welfare system from within. The best we can get is a near infinite collection of Pareto optimal points as illustrated by the utility possibilities frontier of Figure 1 or the production possibilities frontier of Figures 2, 3 and 4. Given the Arrow impossibility theorem, there is no way to pick a particular Pareto optimal distribution without appealing to an ethical judgment.

Consider an unspecified Bergsonian social welfare function:

$$(6) \sum_{i=1}^3 k(I)U(I)$$

where social welfare is a weighted sum of all individual’s utilities. The weights are unspecified and depend on some generally agreed on public policy. To close the neoclassical welfare system, an ethical decision must be made about the weights,  $k(I)$ , that is, how to distribute utility (income) among individuals. Two very different “contractarian” approaches to social welfare policy are those of Robert Nozick and John Rawls (Albert and Hahnel 1990, chapter 2). Nozick’s position is consistent with the ideology and methodological individualism of neoclassical welfare economics.

Ethics has to do with perspective, and the ethical perspective of neoclassical welfare

economics is that of an isolated individual at a particular point in time. Underlying the neoclassical perspective is a view of evolutionary economic and social change based on social Darwinism. The influence of Herbert Spencer on economics was enormous even though he has been largely forgotten (Hodgson 1994). The best-known American social Darwinist was the economist William Graham Sumner whose survival-of-the-fittest justifications of free market outcomes are still influential.<sup>21</sup> The theory of marginal productivity, was explicitly developed in the 1880s, by Böhm-Bawerk in Austria and Wicksteed in England, as an answer to Marx's labor theory of value (Campus 1987). For J.B. Clark (1899) the marginal productivity theory of distribution became a natural law. He thought that his most important contribution to economics was to point out the ethical implications of the notion of assigning the specific contributions to economic output attributable to each productive factor. The existing distribution of economic output is necessarily just because, under perfect competition, each factor of production receives what it produces.<sup>22</sup>

Nozick (1974) uses this line of reasoning to argue that the ethical way to proceed is to assume the existing distribution is fair since it is based on a history of social and economic evolution and contributions to economic output. In Nozick's view "there are only individual people, different individual people, with their own individual lives," and "using one of these people for the benefit of others...does not sufficiently respect and take account of the fact that he is a separate person" (Quoted in Albert and Hahnel 1990). Nozick's theory of historical entitlements closes the neoclassical welfare system by taking the existing income distribution as the best. The institutions of competitive markets and private enterprise are themselves the arbitrators of the social welfare function. As Albert and Hahnel (1990 chapter 2) point out, "the

justification is not that these institutions maximize some notion of social welfare, but that individuals with independent conceptions of ‘the good’ would freely consent to these economic arrangements in a situation characterized by fairness.” Echoing William Graham Sumner, Nozick argues that any attempt to step in and redistribute income from one person to another would be unfair to the productive members of society. The Nozick position, taking the existing income distribution as ethically justifiable, is consistent with the strict Pareto criterion. It is consistent with the potential Pareto improvement criterion only if compensation is actually paid.

A different ethical perspective, more in tune with what we know about human nature and our place in the natural world, is given by John Rawls. In contrast to Nozick, Rawls uses a conception of the social contract that takes into account the role of luck and chance in human affairs. The social contract in a just society should begin with a thought experiment involving a “veil of ignorance” behind which no one knows what their own personal traits or initial position in the society would be. Only in this situation will people be able to judge what rules are just and fair. The veil of ignorance can be applied to personal traits, geography, or generations. Rawls calls this an eternal perspective.

The perspective of eternity is not a perspective from a certain place beyond the world, nor the point of view of a transcendent being; rather it is a certain form of thought and feeling that rational persons can adopt within the world. And having done so, they can, whatever their generation, bring together into one scheme all individual perspectives and arrive together at regulative principles that can be affirmed by everyone as he lives by them, each from his own standpoint. Purity of heart, if one could attain it, would be to see clearly and to act with grace and self-command from this point of view.

How would our view of the fairness of the current distribution of income among social classes or among countries if our position were to be randomly chosen? Or our view of global warming if we did not know if we would be placed on the planet now or five hundred years from now?

Which perspective, Nozick's or Rawls', is closer to "human nature" in view of the discussion of endogenous preferences above and what we know about evolutionary processes? Findings from psychology, biology, and anthropology, including the characteristics of endogenous preferences, new theories of group selection (Gowdy and Seidl 2003, Sober and Wilson 1998) and theories of evolutionary change (Eldredge 1997, Gould and Lewontin 1979) favor Rawls conception of reality. These new findings are relevant to Nozick's position against distributive justice, a position that rises or falls on the validity of his historical entitlement theory. Do historical economic outcomes depend on merit or chance? If the pattern of biological evolution is a guide, the existing economic configuration is a combination of merit, luck, and historical contingency (Gowdy 1992, 1994; van den Bergh and Gowdy 2000, 2003). As discussed above, contemporary economic theory, enriched by psychology, anthropology, and game theory, also comes down on the side of Rawls. Did the existing distribution of wealth come about by adhering to justice-based rules or by chance events, political power, and rules rigged to favor the rich?

Neoliberal policies are formulated and presented according to the PPI principle. In the neoclassical framework, any policy involves taking something from one group and giving it to another. Arrow (1974, 6) writes: "Any complaints about its [the market economy's] operation can be reduced to complaints about the distribution of income, which should then be rectified by lump sum transfers." Losers value their losses more than gainers value their gains. No wonder policies have face such difficulties. Once a subsidy has been put into place, for example to farmers, the recipients feel these subsidies are theirs by right. Once in place, subsidies are hard to dislodge. Current neo-liberal policies are, at bottom, a return to the social Darwinism of Spencer

and Sumner. But survival of the fittest is not the way the way biological evolution works and it is a poor guide to economic theory and policy.

## **Conclusion**

The welfare theoretic controversies discussed above may seem esoteric to most non-economists and even to many economists. But the power of the formalization of Adam Smith's invisible hand in neoclassical welfare theory has driven economic policy in the decades since World War Two. Incalculable damage has been done to the citizens of "developing" countries and "transitional" economies in the name of Pareto efficiency and economic rationalization. Many of the Earth's ecosystems have been decimated in the name of "optimal" economic growth and "free-market" environmentalism. Even in the world's wealthiest countries the quality of life, as measured by surveys of well-being, has deteriorated in the past quarter-century. To paraphrase Herman Daly, the invisible hand of the market has turned into the "invisible foot", kicking to pieces the public good wherever it is allowed to expand unchecked. Judging from the mainstream literature, however, however, the neoclassical welfare ideology supporting this system has had its heyday. The existing global industrial system did not "naturally" evolve. It was created by the deliberate policies of people in power, whose actions were (and are) driven by the ideas inherent in classical and neoclassical economics—the invisible hand, the marginal productivity theory of distribution, social Darwinism, and the fiction of economic man.

If we are to set ourselves on the road to sustainability, meaning social and environmental harmony and resilience, we must have economic theories based on a solid scientific and theoretical framework as a guide. Theories are important. I end with a well-worn but still timely quote of John Maynard Keynes (1936, 383):

The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back.

## References

- Adams, 1993. J. "The Emperor's Old Clothes." *Environmental Values* 2:247-60.
- Albert, M. and R. Hahnel. 1990. *A Quiet Revolution in Welfare Economics*, Princeton, NJ, Princeton University Press
- Arrow, K. 1974. "Political and Economic Evaluation of Social Effects and Externalities." In M. Intrilligator and D. Kendrick (editors), *Frontiers of Quantitative Economics*, North Holland, Amsterdam.
- Arrow, K., R. Solow, P. Portney, P. Leamer, R. Radner, and H. Schuman. 1993. *Report of the NOAA Panel on Contingent Valuation*. Washington, D.C. Resources for the Future.
- \*Barham, E. 2002. "Towards a Theory of Values-Based Labeling." *Agriculture and Human Values* 19: xxx-xx.
- Bateman, I., I. Langford, A. Munro, C. Starmer, and R. Sugden. 2000. "Estimating Four Hicksian Measures for a Public Good," *Land Economics* 76 (3): 355-373.
- Bateman, I. and K. Turner 1992. "Appendix 1: Welfare Measures for Priced and Unpriced Goods," in "Evaluation of the Environment: The Contingent Valuation Method." CSERG Working Paper 92-18.
- Bergh, J.C.V.M. van den and J. Gowdy. 2000. "Evolutionary Theories in Environmental and Resource Economics: Approaches and Applications," *Environmental and Resource Economics* 17(1):37-57.
- Bergh, J.C.V.M. van den and J. Gowdy. 2003. "The Microfoundations of Macroeconomics: An Evolutionary Perspective," *Cambridge Journal of Economics* 27:65-84.
- Binger, B. and E. Hoffman. 1998. *Microeconomics with Calculus*. Reading, MA, Addison-Wesley.
- Bishop, R. 1978. "Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard." *American Journal of Agricultural Economics* 60:10-18.
- \*Blackorby, C. and C. Donaldson. 1990. "The Case Against the use of the Sum of Compensating Variations in Cost-Benefit Analysis." *Canadian Journal of Economics* 23:471-494.
- Blaug, M. 1985. *Economic Theory in Retrospect*. Cambridge, Cambridge University Press.
- Blount, S. 1995. "When Social Outcomes Aren't Fair." *Organizational Behavior & Human Decision Processes* LXIII:131-144.

- Boadway, R. 1974. "The Welfare Foundations of Cost-Benefit Analysis." *Economic Journal* 47:926-939.
- \*Boadway, R. and M. Marchand. 1995. "The Use of Public Expenditures for Redistributive Purposes." *Oxford Economic Papers* 47:45-59.
- Bowles, S. and H. Gintis. 2000. "Walrasian Economics in Retrospect." *Quarterly Journal of Economics* 115:1411-1439.
- Brekke, K. 1997. "The Numeraire Matters in Cost-Benefit Analysis." *Journal of Public Economics* 64:117-123.
- Brekke, K. and R. Howarth. 2000. "The Social Contingency of Wants." *Land Economics* 76: 493-503.
- Bryant, W. 1994. "Misinterpretations of the Second Fundamental Theorem of Welfare Economics: Barriers to Better Economic Education." *Journal of Economic Education*, Winter:75-80.
- Bromley, D. 1990. "The Ideology of Efficiency: Searching for a Theory of Policy Analysis." *Journal of Environmental Economics and Management* 19:86-107.
- Bromley, D. 1998. "Searching for Sustainability: The Poverty of Spontaneous Order." *Ecological Economics* 24:231-240.
- Bromley, D. 2000. "The Two realms of Reason: Calculation and Sentiment." Presented at the 7<sup>th</sup> Ulvön Conference on Environmental Economics, Ulvön, Sweden, June 2000.
- Brown, T. and R. Gregory. 1999. "Why the WTA-WTP Disparity Matters." *Ecological Economics* 28:323-335.
- Calcott, P. 2001. "On Three Arguments for the Efficiency Criterion." Institute of Policy Studies, Victoria University of Wellington, Wellington New Zealand, Working Paper number 8.
- Campbell, D. 1987. *Resource Allocation Mechanisms*, Cambridge, Cambridge University Press
- Campus, A. 1987. "Marginalist Economics" In *The New Palgrave Dictionary of Economics*, vol. 3, 320-322, ed. J. Eatwell, M. Milgate and P. Newman. London: Macmillan.
- Carpenter, J. 2002. "Endogenous Social Preferences." Middlebury College Economics Discussion Paper 02-09, Middlebury, Vermont.
- Chichilnsky, G. 1996. "An Axiomatic Approach to Sustainable Development." *Social Choice and Welfare* 13:231-257.

\*Chipman, J. and J. Moore. 1978. "The New Welfare Economics 1939-1974." *International Economic Review* 19:547-584.

Ciriacy-Wantrup, S.V. 1968. *Resource Conservation: Economics and Policies*, 3<sup>rd</sup> edition, University of California, Division of Agricultural Science, Berkeley.

Clark, J.B. 1899. *The Distribution of Wealth*. New York, Macmillan.

Coate, S. 2000. "An Efficiency Approach to the Evaluation of Policy Changes." *Economic Journal* 110:437-455.

Corning, P. 2002. "Born Again Liberalism: The Coming Revolt of the Middle Class." Institute for the Study of Complex Systems, Palo Alto, CA.

Cropper, W. and D. Laibson. 1999. "The Implications of Hyperbolic Discounting for Project Evaluation." *Discounting and Intergenerational Equity*, P. Portney and J. Weyant, editors, Resources for the Future, Washington, D.C.

Cropper, W., S. Ayded, and P. Portney. 1994. "Preferences for Life-Saving Programs: How the Public Discounts Time and Age." *Journal of Risk and Uncertainty* 8:243-266.

Dasgupta, P. 2002. "Sustainable Economic Development in the World of Today's Poor." for the conference "Scarcity and Growth in the New Millennium", Resources for the Future, Washington D.C., November 18-19.

Dorfman, R. 1988. "Some Concepts from Welfare Economics" In R. Dorfman and N. Dorfman, editors, *Economics of the Environment*, New York, W.W. Norton.

Easterlin, R. 1995. "Will Raising the Incomes of All Raise the Happiness of All?" *Journal of Economic Behavior and Organization* 27:35-47.

Edgeworth, F.Y. 1881. *Mathematical Psychics: An Essay on the Application of Mathematics to the Moral Sciences*. London.

Eldredge, N. 1997. *Dominion*. Berkeley, University of California Press.

Erickson, J. and J. Gowdy. 2000. "Resource Use, Institutions, and Sustainability." *Land Economics* 76:345-354.

Erickson, J., J. Gowdy, and K. Limburg. 2003 "Integrating Ecology and Economics: An Integrated Assessment Model of the Hudson River Watershed." For *Economics and Ecological Risk Assessment: Applications to Watershed Management*, R. Bruins and M. Heberling, editors, CRC Press.

- Famer, M. And A. Randall. 1998. "The Rationality of a Safe Minimum Standard." *Land Economics* 74:287-302.
- Fehr, E. and S. Gächter. 2000. "Cooperation and Punishment in Public Goods Experiments." *American Economic Review* 90:980-994.
- Fehr, E. and S. Gächter. 2002. "Altruistic Punishment in Humans," *Nature* 415 (10 Jan):137-140.
- Feldman, A. 1987. "Welfare Economics." In *The New Palgrave Dictionary of Economics*, vol. 4, 889-894, ed. J. Eatwell, M. Milgate and P. Newman. London: Macmillan.
- Fisher, F. 1983. *Disequilibrium Foundations of Equilibrium Economics*. Cambridge, UK: Cambridge University Press.
- Frey, B. and A. Stutzer. 2000. "Happiness, Economy and Institutions." *The Economic Journal* 110:918-938.
- Geatz, R. 2000. "Roots of Tradition." *Nature Conservancy* Nov/Dec:21-28
- Gintis, H. 1998. "The Individual in Economic Theory: A Research Agenda." Department of Economics, University of Massachusetts, Amherst, MA.
- Gintis, H. 2000. "Beyond *Homo economicus*: Evidence from Experimental Economics." *Ecological Economics* 35:311-322.
- Gould, S.J. and Lewontin, R. 1979. "The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Paradigm." *Proceedings of the Royal Society of London B* 205:581-598.
- Gowdy, J. 1992. "Higher Selection Processes in Evolutionary Economic Change," *Journal of Evolutionary Economics* 2:1-16.
- Gowdy, J. 1994. *Coevolutionary Economics: Economy, Society and Environment*, Dordrecht, Kluwer.
- \*Gowdy, J. 1997. "The Value of Biodiversity: Markets, Society, and Ecosystems" *Land Economics* 73:25-41.
- \*Gowdy, J. 2003. "Altruism, Evolution, and Welfare Economics," *Journal of Economic Behavior and Organization*, forthcoming.
- Gowdy, J. and J. Erickson. 2003. "The Approach of Ecological Economics." *Cambridge Journal of Economics*, revision under review.

- Gowdy, J., R. Iorgulescu, and S. Onyeiwu. 2003. "Fairness and Retaliation in a Rural Nigerian Village," *Journal of Economic Behavior and Organization*, forthcoming.
- Gowdy, J. and I. Seidl. 2003. "Economic Man and Selfish Genes: The Implications of Group Selection for Economic Valuation and Policy." *Journal of Socio-Economics* (under Review)
- Gowdy, J. and M. Walton. 2003. "Consumer Sovereignty, Economic Efficiency and the Trade Liberalization Debate," *International Journal of Global Environmental Issues*, forthcoming.
- Hanley, N. and Shogren. 2001. "Awkward Choices: Economics and Nature Conservation." In *Economics, Ethics, and Environmental Policy*, ed. D. Bromley and J. Paavola, Oxford, UK: Blackwell.
- Hannemann, M. 1991. "Willingness to Pay and Willingness to Accept: How Much can they Differ?" *American Economic Review* 81:635-647.
- Harris, C. and D. Laibson. 2001. "Dynamic Choices of Hyperbolic Consumers." *Econometrica* 69:935-957.
- Heinzerling, L. and F. Ackerman. 2002. "Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection." Georgetown Environmental Law and Policy Institute, Georgetown University Law Center, Washington. D.C.
- Henderson, J. and J. Quandt. 1980. *Microeconomic Theory: A Mathematical Approach*, New York, McGraw Hill.
- Henrich, J. 2001. "Cultural Transmission and the Diffusion of Innovations: Adoption Dynamics Indicate that Biased Cultural Transmission is the Predominate Force in Behavioral Change." *American Anthropologist* 104:992-1013.
- Henrich, J. 2002. "Decision-making, Cultural Transmission and Adaptation." In J. Ensminger (ed) *Economic Anthropology: Theory at the Turn of the Century*, New York, Rowman and Littlefield.
- Henrich, J. 2003. "Cultural Group Selection, Coevolutionary Processes and Large Scale Cooperation." *Journal of Economic Behavior and Organization*, forthcoming.
- Henrich, J., R. Boyd, S. Bowles, C. Camerer, E. Fehr, H. Gintis, and R. McElreath. 2001. "In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies." *American Economic Review* 91:73-78.
- Hicks, J. 1939. "Foundations of Welfare Economics." *Economic Journal* 49:696-712.

- Hicks, J. 1943-44. "The Four Consumer Surpluses." *Review of Economic Studies* 9:31-116.
- Hirshleifer, J. and J. Riley 1979. The Analytics of Uncertainty and Information: An Expository Survey." *Journal of Economic Literature* 17:1375-1421.
- Hobson, J. 1900. *The Economics of Distribution*. New York: Macmillan.
- Hodgson, G. 1993. *Economics and Evolution: Bringing Life Back into Economics*. Ann Arbor, University of Michigan Press.
- Hoffman, E., K. McCabe, K. Shachat, V. Smith. 1994. "Preferences, Property Rights, and Anonymity in Bargaining Games." *Games and Economic Behavior* VII:346-380.
- Jacobs, M. 1997. "Environmental Valuation, Deliberative Democracy and Public Decision-Making Institutions." In *Valuing Nature: Economics, Ethics and the Environment*, J. Foster (editor), Routledge, London, pp. 232-246.
- Jehle, G. 1991. *Advanced Microeconomic Theory*. Englewood Cliffs, NJ, Prentice Hall.
- Johnston, R. and S. Swallow. 1999. "Focus Shift for Discrete-Choice Preference Estimation." *Land Economics* 75:295-310.
- Jones, C. 2002. "The 'Boadway Paradox' Revisited." School of Economics, The Australian national University, Canberra, Working Paper number 421.
- Kahneman, D. and A. Tversky. 1979. "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica* 47:263-291.
- Kaldor, N. 1939. "Welfare Propositions of Economics and Interpersonal Comparisons of Utility." *Economic Journal* 49: 549-552.
- Karp, L. 2002. "Global Warming and Hyperbolic Discounting." Department of Economics, University of California, Berkeley, CA.
- Keat, R. 1997. "Values and Preferences in Neo-Classical Environmental Economics." In *Valuing Nature: Economics, Ethics and the Environment*, John Foster, editor, London, Routledge, pp. 32-47.
- Keynes, J. M. 1936. *The General Theory of Employment, Interest, and Money*. Reprinted in *The Collected Writings of John Maynard Keynes*, vol. VII, Macmillan, London, 1973.
- Kirby, K. and R. Herrnstein. 1995. "Preference Reversals Due to Myopic Discounting and Delayed Reward." *Psychology Science* 6:83-89.

- Knetch, J. 1989. "The Endowment Effect and Evidence of Nonreversible Indifference Curves." *American Economic Review* 79: 1277-1284.
- Koning, N. and R. Jongeneel. 1997. "Neo-Paretian Welfare Economics: Misconceptions and Abuses." Wageningen Economic Papers, 05-97, Wageningen University, The Netherlands.
- Laibson, D. 1997. "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics* 112:443-477.
- Laitner, J., S. DeCanio, and I. Peters. 2001. "Incorporating Behavioral, Social, and Organizational Phenomena in the Assessment of Climate Change Mitigation Options." In *Society, Behavior, and Climate Change*, Jochem et al., editors, Dordrecht: Kluwer.
- Lane, R. 1993. "Does Money Buy Happiness?" *The Public Interest* 113:56-65.
- Lipsey, R. and K. Lancaster. 1956. "The General Theory of the Second Best." *Review of Economic Studies* 24:11-32.
- Lockwood, B. 1987. Pareto efficiency, in *The New Palgrave Dictionary of Economics*, vol. 3, London, Macmillan
- Lockwood, M. 1998. "Integrated Value Assessment Using Paired Comparisons." *Ecological Economics* 25:73-87.
- Lowenstein, G. 1987. "Anticipation and the Value of Delayed Consumption." *Economic Journal* 97:666-684.
- \*Morey, E. 1984. "Confuser Surplus." *American Economic Review* 74:163-173.
- Munro, A. and R. Sugden. 2003. "On the Theory of Reference-Dependent Preferences." *Journal of Economic Behavior and Organization* 50:407-428.
- Niemeyer, S.. And C. Spash. 2001. "Environmental Valuation Analysis, Public Deliberation, and Their Pragmatic Synthesis: A Critical Appraisal." *Environmental and Planning C: Government and Policy* 19:567-586.
- Nordhaus, W. 1992. "An Optimal Transition path for Controlling Greenhouse Gases," *Science* 258: 1315-1319
- Nordhaus, W. 2001. "Global Warming Economics." *Science*. 294: 1283-84
- Nozick, R. 1974. *Anarchy, State, and Utopia*. Basic Books, New York.
- \*O'Connor, M. 2000. "Pathways for Environmental Evaluation: A Walk in the (Hanging)

Gardens of Babylon." *Ecological Economics* 34:175-193.

O'Connor, M. 2002. "Social Costs and Sustainability." In *Economics, Ethics and Environmental Policy*, D. Bromley and J. Paavola, editors, Blackwell, Oxford, UK, pp. 181-202.

O'Donoghue, T. And M. Rabin. 1999. "Doing it Now or Later." *American Economic Review* 89:103-124.

O'Hara, S. 1996. "Discursive Ethics in Ecosystem Valuation and Policy." *Ecological Economics* 16:95-107.

Pezzy, J. and M. Toman. 2002. "The Economics of Sustainability: A Review of Journal Articles." Resources for the Future, Washington, D.C., Discussion paper 02-03.

Ponting, C. 1991. *A Green History of the World*. Penguin Books, London.

Posner, R. 1985. "Wealth Maximization Revisited." *Notre Dame Journal of Law, Ethics and Policy* 2:85-105.

Randall, A. 1988. "What Mainstream Economists have to say about the Value of Biodiversity." In *Biodiversity*, ed. E.O.Wilson, Washington, D.C. National Academy Press.

Randall, A. 2002. "Benefit-Cost Considerations Should be Decisive when there is Nothing More Important at Stake." In *Economics, Ethics, and Environmental Policy*, Daniel Bromley and Jouni Paavola, editors, Routledge, London, pp. 53-68.

Rawls, J. 1971. *A Theory of Justice*. Harvard University Press, Cambridge, MA.

Reaves, D., R. Kramer, T. Holmes. 1999. "Does Question Format Matter? Valuing an Endangered Species." *Environment and Resource Economics* 14:365-383.

Ross, L. and A. Ward. 1996. "Naïve Realism: Implications for Social Conflict and Misunderstanding." In E. S. Reed, E. Turiel, and T. Brown, editors, *Values and Knowledge*, Mahwah, NJ, Lawrence Erlbaum Associates.

Sagoff, M. 1988. *The Economy of the Earth*. Cambridge, UK, Cambridge University Press.

Samuelson, P. 1950. "Evaluation of Real National Income." *Oxford Economic Papers* 2:1-29.

Scitovsky, T. 1941. "A Note on Welfare Propositions in Economics." *Review of Economic Studies* 9:77-88.

Sober, E. and D. Wilson. 1997. *Unto Others: The Evolution and Psychology of Unselfish Behavior*, Cambridge, MA, Harvard University Press.

- \*Spash, C. 2002. "Empirical Signs of Ethical Concern in Economic Valuation of the Environment." In *Economics, Ethics, and Environmental Policy*, ed. D. Bromley and J. Paavola, Oxford, UK, Blackwell.
- Spash, C. 2000. "Ecosystems, Contingent Valuation and Ethics: The Case of Wetland Re-Creation." *Ecological Economics* 34:195-215.
- Spash, C. 1997. "Ethics and Environmental Attitudes with Implications for Economic Valuation." *Journal of Environmental Management* 50:403-416.
- Spash, C. and N. Hanley. 1995. "Preferences, Information, and Biodiversity Preservation." *Ecological Economics* 12:191-208.
- Stavins, R., A. Wagner and G. Wagner. 2002. "Interpreting Sustainability in Economic Terms: Dynamic Efficiency Plus Intergenerational Equity." Resources for the Future, Washington, D.C. Discussion paper 02-29, August 2002.
- Stevens, T., J. Echeverria, R. Glass, T. Hager, and T. Moore. 1991. "Measuring the Existence Value of Wildlife: What do CVM Estimates Show?" *Land Economics* 70:355-363.
- Stiglitz, J. 1994. *Whither Socialism?* Cambridge, MA: MIT Press.
- Sumner, W. 1918. "The Forgotten Man." In *The Forgotten Man and Other Essays*, A. Keller, editor, New Haven, Yale University Press.
- Suzumura, K. 1999. "Paretian Welfare Judgements and Bergsonian Social Choice." *Economic Journal* 109: 204-221.
- Thaler, R. 1980. "Toward a Positive Theory of Consumer Choice." *Journal of Economic Behavior and Organization* 1:39-60.
- Veblen, T. 1898. "Why is Economics not an Evolutionary Science?" *Quarterly Journal of Economics* 12:373-397.
- Weitzman, M. 2001. "Gamma Discounting." *American Economic Review* 91:260-271.
- Willig, R. 1976. "Consumer's Surplus without Apology." *American Economic Review* 66:589-597.

## Notes

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1. See Feldman (1987), Jehle (1991), and Bryant (1994). Feldman's definition of the Second Theorem states that almost any Pareto position can be "achieved" while Jehle uses the word "supported." As Bryant points out, "supported" is the proper word to use since the hypotheses of the standard welfare model are not sufficient to guarantee either the uniqueness or the global stability of equilibrium.

2. The Third Fundamental Theorem states that there is no Arrow social welfare function that satisfies the conditions of universality, Pareto consistency, independence, and non-dictatorship (Feldman 1987, 893). According to this theorem it is impossible to say anything about the absolute level of social welfare or to make judgments about distribution. This theorem is quite devastating to neoclassical welfare economics, but it will not be discussed here.

3. Kaldor's compensation principle says that a state **A** is preferred to state **B** if the gainers from a move from **B** to **A** can *hypothetically* compensate the losers so that everyone is better off after the move. Hick's compensation principle says that a state **A** is preferred to state **B** if it is *not hypothetically possible* for the losers to pay the gainers *not* to make the move from **B** to **A**.

4. Stiglitz' criticism of the first and second welfare theorems focuses on the assumptions of perfect information and a complete set of markets.

5. Preferences are assumed to be complete, reflexive, transitive, and continuous. Preferences also exhibit the behavioral properties of non-satiation and diminishing marginal rates of substitution.

6. Kaldor (1939, 550) makes the case for separability as follows: "There is no need for the economist to prove—as indeed he could never prove—that as a result of the adoption of a certain measure nobody in the community is going to suffer. In order to establish his case, it is quite sufficient for him to show that even if all those who suffer as a result are fully compensated for their loss, the rest of the community will still be better off than before. Whether the landlords, in the free-trade case, should in fact be given compensation or not, is a political question on which the economist, *qua* economist, could hardly pronounce an opinion."

7. The situation described by movements from **B** to **A** to **D** in figure 3, with increasing output, increasing inequality and decreasing social welfare, has actually happened in the U.S. in the past three decades. Despite a large increase in real GDP earning from wages were 7% lower on the average in 1998 compared to 1973. In 1999 the wealthiest 1% of the population (2.7 million households) received as much income as the entire bottom 38% (100 million households). (Corning 2002). The University of Rotterdam has surveyed "happiness" by country since the 1950s using a scale of 1-3, where 3 is "very happy". In spite of rising total income, the index of happiness for the U.S. decreased from 2.24 in 1990 to 2.20 in 1998. It seems that a rising tide raises a few ships but sinks many more.

8. An example of a variation of the Scitovsky paradox is given in the web site "Critiques of Law and Economics" at [http://www.wau.nl/wub/wep/nr9705/wep05\\_2.htm](http://www.wau.nl/wub/wep/nr9705/wep05_2.htm). Suppose 1000 workers

work in a factory on the opposite side of a railroad track from where they live. They must cross the railroad track on the way to and from their jobs. Crossing the tracks can be very dangerous depending on the speed of the trains. If the trains are permitted to run at 60 miles per hour, each worker has a 0.1% chance of getting killed in a given year. If the trains run are ordered to run at 30 miles per hour no one gets killed. If the trains run at 30mph instead of 60 mph the railroad loses \$200,000 per year. Suppose an accurate survey was conducted that found that if the trains ran at 30 mph they would have to be compensated \$1000 per year to make up for the increased risk to allow the trains to go 60 mph. If the trains ran at 60mph they would be willing to pay \$100 to have the trains run at 30mph.

Which of the following rules is superior under the net social welfare criterion?

State **A**: The railroad is permitted to run its trains at 60 mph.

State **B**: The railroad runs its trains at 30 mph.

The answer is “both”. A movement from **A** to **B**, AND a movement from **B** to **A** both involve a loss in social welfare. Suppose we move from **A** to **B**. The railroad loses \$200,000 a year and the worker gain \$100,000 (1000X\$100), for a net loss in welfare of -\$100,000. Suppose we move from **B** to **A**. The railroad gains \$200,000 and the workers lose \$1,000,000 (1000X\$1000) for a net loss in social welfare of -\$800,000.

In this example, the larger amount workers would have to be compensated for a loss in welfare, compared to how much they would have to be paid for a gain in welfare, is consistent with the endowment effect discussed later.

9. Utility functions are homothetic if, along a straight line drawn from the origin in a diagram of a consumer’s commodity space, the slopes of the indifference curves are the same. This means that the marginal rates of substitution depend only on the relative amounts of the commodities, not absolute amounts. This is equivalent to assuming a constant marginal utility of income which is another thorny valuation issue.

10. Assume a simple society with two goods  $q_1$  and  $q_2$  and two consumers with utility functions:

$$U_1 = U_1(q_{11}, q_{12}, q_{21}, q_{22})$$

$$U_2 = U_2(q_{11}, q_{12}, q_{21}, q_{22})$$

where  $q_{11}$  is the amount of  $q_1$  in consumer 1's commodity bundle,  $q_{12}$  is the amount of  $q_2$  in consumer 1's commodity bundle,  $q_{21}$  is the amount of  $q_1$  in consumer 2's commodity bundle, and  $q_{22}$  is the amount of commodity 2 in consumer 2's commodity bundle. Maximizing of consumer 1 subject to the condition that consumer 2's utility is constant yields the condition for Pareto optimality:

$$\frac{MU_1/Mq_{11} - MU_1/Mq_{21}}{MU_1/Mq_{12} - MU_1/Mq_{22}} = \frac{MU_2/Mq_{11} - MU_2/Mq_{21}}{MU_2/Mq_{12} - MU_2/Mq_{22}}$$

Since the partial derivatives of the utility functions are functions of all variables, the optimal level of one consumer depends on the optimal level of the other. The general solution is indeterminate.

11. As Lipsey and Lancaster (1956, 11) state the theory of the second best:

“The general theorem for the second best optimum states that if there is introduced into a general equilibrium system a constraint that prevents the attainment of one of the Paretian conditions, then other Paretian conditions, although still attainable, are, in general, no longer desirable.”

12. A lively debate, for the most part outside the scope of this paper, centers around the question of which sorts of endogenous preferences can be handled by standard welfare theory and which sorts cannot. A good introduction to the debate is given by Albert and Hahnel (1990, chapter 4). See also Bowles and Gintis (2000) who reject *Homo economicus* but argue that “...economics should become more psychological and more institutional, yet no less dedicated to the construction of mathematical general equilibrium models.”

13. Lexicographic ordering of preferences means that people are unwilling to make trades. Consider two commodity bundles **A** and **B** containing two goods *x* and *y*. The bundle with more *x* is preferred no matter how much *y* is in the bundle (the primary ordering). If both bundles contain the same amount of *x*, then the bundle with more *y* is preferred (the secondary ordering). If **A** = (*x*<sub>1</sub>, *y*<sub>1</sub>) and **B** = (*x*<sub>2</sub>, *y*<sub>2</sub>). Bundle **A** is preferred to bundle **B** if either *x*<sub>1</sub> > *x*<sub>2</sub> or if *x*<sub>1</sub> = *x*<sub>2</sub> and *y*<sub>1</sub> > *y*<sub>2</sub>.

14. Although it was certainly not the intent of the NOAA authors to shut off debate about the proper measure to use, this has been an unfortunate effect. The others of the report are so esteemed by the profession, two are Nobel laureates, that a reference to the NOAA recommendations is enough to justify using a WTP measure.

15. One theoretical justification for using a WTP measure is that the WTP and WTA measures should not differ substantially (Willig 1974). The Hicksian measure of welfare changes holds real income constant in the case of price increases or decreases so as to isolate the role of substitution. A well-known result of welfare theory is the Slutsky equation separating the effects of a price change into two effects, the change in relative prices and the change in real income. In elasticity form the Slutsky equation can be written (Binger and Hoffman 1998, 204-205):

$$\varepsilon_U = \varepsilon_C - \varepsilon_M (P_x X/M).$$

The income uncompensated price elasticity ( $\epsilon_U$ ) equals the compensated price elasticity ( $\epsilon_C$ ) minus the income elasticity ( $\epsilon_M$ ) times the budget share of the good. If the income elasticity of the good is small, or if the good represents a small portion of the consumer's budget, then both the WTA and WTP measures will be close to the non-income compensated (Marshallian) measure. This would mean that the WTP and WTA measures should be about the same, and also that market prices and quantities give a good approximation of welfare changes. According to Hanneman (1991) with a positive income elasticity WTA would be equal to WTP only if there is a perfect substitute for the good being evaluated. In this case, in the equation above, to quantity of X demanded would go to zero with any price increase so that  $\epsilon_C = \epsilon_U$ . But real measures of WTA are consistently several times larger than WTP (Brown and Gergory 1999).

16. Dasgupta (2002) gives a very interesting analysis of sustainability *within the framework* of the standard neoclassical welfare model. My objection is that this analysis is presented without acknowledging the theoretical difficulties with the basic assumptions of the model.

17. Numerous studies have shown that, for individuals above the poverty line, income is a rather poor predictor of well-being. Indicators such as community ties, a healthy family-life, and job satisfaction are much better predictors of happiness (Easterlin 1995; Lane 1993). This calls into question the leap of faith in moving from "maximizing utility" to "maximizing GDP" (see the steps in Dorfman 1988).

18. See the excellent discussion of this point in Koning and Jongeneel (1997), section 5, including statements by prominent economists to the effect that the status and far-reaching authority of economists to comment on public policy would be undermined by abandoning the Potential Pareto Improvement principle. Blaug (1985) writes: "If we refuse, even in principle, to distinguish allocative efficiency from distributive equity, we must perforce reject the whole welfare economics and with it any conventional presumption in favour of competitive markets, and indeed, in favour of the price mechanism as a method of allocating scarce resources. Arguments for co-ordinating economic activity by markets would then have to be expressed in terms of political philosophy—for example, that markets diffuse economic power—and economics would in consequence have to become a totally different subject."

19. Johnston and Swallow (1999, p.308) are quite explicit about this. Referring to evidence for "non-neoclassical" preferences they suggest: "Research may also identify means to minimize such behavior, and encourage respondents to apply neoclassical optimization to the full range of hypothetical survey scenarios."

20. In an analysis of "sustainability", Stavins, Wagner, and Wagner (2002, 6-7) write: "In theory, it may be argued that sustainability is ultimately the most desirable policy goal, but in practice it is more reasonable to aim for potential sustainability in the form of dynamic efficiency (of an all-encompassing societal welfare function). We recognize that this opens an avenue for criticism of economics as being exclusively focused on efficiency rather than equity, but the efficiency criterion and related analytical methods are—ultimately—where the greatest strengths of economics lie."

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21. In “The Forgotten Man” (Sumner 1918, 198) writes: “There is an almost invincible prejudice that a man who gives a dollar to a beggar is generous and kind-hearted, but that a man who refuses the beggar and puts the dollar in a savings bank is stingy and mean. The former is putting capital where it is sure to be wasted, and where it will be a kind of seed for a long succession of future dollars, which must be wasted to ward off a greater strain on the sympathies than would have been occasioned by a refusal in the first place. Inasmuch as the dollar might have been turned into capital and given to a laborer whole, while earning it would have reproduced it, it must be regarded as taken from the later.” If one accepts fully the marginal productivity argument, and the goal of efficiency in producing output as primary, it is unethical to divert money to the less well-off because the fact of their poverty proves their inefficiency.

22. Some economists push this further and argue that the rich are more deserving of economic surpluses than the poor. Sometimes this is based on marginal productivity arguments (Posner 1985). But Edgeworth (1881) and many that followed him, argued that the rich have a “greater capacity for joy” as a justification for inequality. This argument is implicit in cost-benefit studies that value human life based on expected lifetime incomes so that the lives of sub-Saharan Africans are worth about 1/100 of a North American or European life.