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Why the WTA–WTP disparity matters

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Abstract

The disparity between willingness to pay (WTP) and willingness to accept compensation (WTA) has been demonstrated repeatedly. Because using WTP estimates of value where a WTA estimate is appropriate tends to undervalue environmental assets, this issue is important to environmental managers. We summarize reasons for the disparity and then discuss some of the implications for management of environmental assets. We end by suggesting some approaches for dealing with the lack of credible methods for estimating WTA values of environmental goods.

Keywords: Economic value; Willingness to pay; Willingness to accept compensation; Resource allocation; Damage assessment

1. Introduction

Interesting anomalies act as a magnet on our curiosity, encouraging us to try to make sense of something that is surprising. One of the more popular anomalies, at least among resource economists and behavioral psychologists, is the observed disparity between two familiar and supposedly equivalent measures of economic value. One is willingness to pay (WTP), which reflects the maximum monetary amount that an individual would pay to obtain a good. The other is willingness to accept compensation (WTA), which reflects the minimum monetary amount required to relinquish the good. WTP therefore provides a purchase price, relevant for valuing the proposed gain of a good, whereas WTA provides a selling price, relevant for valuing a proposed relinquishment.

WTP measures are widely used to provide information to policy makers regarding the economic value of nonmarket, or non-pecuniary,

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environmental assets, for example as inputs to cost–benefit analyses (e.g. to determine the merit of a proposed habitat improvement program) or as part of resource damage studies (e.g. to establish levels of compensation for coastal fishers after an oil spill). The first case considers an environmental improvement or gain, for which a WTP measure is conceptually appropriate. The case of resource damages, however, considers a loss, for which a WTA measure should instead be used (Bromley, 1995). Yet WTA measures of economic value for environmental losses are seldom employed.

Why is the wrong measure of value so freely used? A principal reason is that it is permitted under conventional economic theory, which informs us that, in most circumstances, the two measures will yield roughly equal estimates of value (Willig, 1976). This is acknowledged to not be true when the value of the exchange in question is a significant proportion of income or when the associated transaction costs are large. Except for these income or transaction cost effects, however, the economic community has agreed for over 50 years that "we shall normally expect the results to be so close together that it would not matter which [measure] we choose" (Henderson, 1941) because "…for many goods, services, and amenities that command a modest fraction of the consumer's budget, the differences between…[WTA and WTP] measures are trivial" (Randall, 1987).

This general assumption of equivalence in gain (WTP) and loss (WTA) measures of value is contrary to a large body of empirical evidence demonstrating that WTA measures of value are typically two or more times parallel estimates of WTP. These results come from experiments and contingent valuation surveys as well as real-world environmental policy applications (Knetsch, 1995). This constitutes one-half of the anomaly referred to earlier, in that empirical results fail to agree with the predictions of established and very-much-alive theory. The other half of the anomaly—more relevant from the standpoint of environmental managers—is that because the lower WTP values are commonly used in allocating environmental resources among competing uses, in establishing monetary awards for environmental damages, in determining preferred levels of mitigation activities, and in justifying expenditures to protect rare habitats or endangered species, decisions based on the attendant economic studies may well be wrong. Further, the bias in these decisions is both widely recognized and consistent—it diminishes the non-market environmental costs of resource use or damage due to the error in selection of an evaluation approach.

In this paper we briefly review evidence for the disparity and the variety of explanations given for its occurrence. Our focus, however, is on the implications of the disparity for environmental decisionmakers, with an emphasis on reasons why more attention should be paid to this anomaly by those concerned with protection of the natural environment.

2. Evidence of the disparity

Evidence of the disparity between WTA and WTP measures of value comes from a variety of sources: experimental studies using consumer goods, hypothetical and cash evaluations involving environmental goods, and real-exchange policies that include gain–loss dimensions. The evidence from these sources is overwhelming: losses matter more to people than do commensurate gains, and reductions in losses are worth more than foregone gains.

A classic series of real-money experiments was conducted by Knetsch and Sinden (1984) using a lottery for a merchandise voucher, redeemable for either goods or cash. In one of their conditions, tickets were first passed out to all lottery participants. Then one-half of the players (randomly selected) was asked to pay $2 to keep their ticket, whereas the other half was asked if they would accept $2 to give it up (i.e. to forego their entitlement). Given a random distribution of preferences, the percentage of people paying $2 should be the same as the percentage refusing $2. However, the results from the two groups were very different: 50% (19/38) of those in the WTP side paid the $2 to play, whereas 76% (29/38) of those offered compensation refused the $2 offer. Subse-

Table 1
Chronological list of studies comparing WTA and WTP[a]

Authors	Good	Procedure[b]	Real money?	Mean or median values		
				WTA ($)	WTP ($)	Ratio
Environmental goods[c]						
Hammack and Brown (1974)	Waterfowl hunting	Mail CV	No	1044	247	4.2
Banford et al. (1979)	Fishing pier	Interview CV	No	120	43	2.8
Bishop and Heberlein (1979)	Goose hunting permit	Mail CV	No	101	21	4.8
Brookshire et al. (1980)	Elk hunting quality	Interview CV	No	69	13	5.4
Rowe et al. (1980)	Air visibility	Interview CV	No	24	5	5.2
Brookshire and Coursey (1987)	Park tree density	Interview CV	No	855	14	61.0
Brookshire and Coursey (1987)	Park tree density	Smith auction[d]	Yes	18	7	2.4
Bishop et al. (1988)	Deer hunting permit	Mail/phone bids	Yes	153	31	4.9
Boyce and McCollum (1993)	Bison hunting permit	Market price exch.	Yes	12 233	215	56.9
MacDonald and Bowker (1994)	Industrial plant odor	Interview CV	No	735	105	7.0
Non-environmental goods						
Knetsch and Sinden (1984)	Lottery ticket	Dichotomous choice	Yes	5.18	1.28	4.1
Coursey et al. (1987)	Drink bitter liquid	Vickrey auction[d]	Yes	4.7	2.9	1.6
Harlow (1988)	Lottery ticket	Vickrey auction	Yes	2.14	1.39	1.5
Harless (1989)	Lottery ticket	Vickrey auction	Yes	na	na	2.7
Hof et al. (1989)	Cattle grazing permit	Mail CV	No	~7.00	~1.50	4.7
Kahneman et al. (1990)	Mug	BDM auction	Yes	5.78	2.21	2.6
Boyce et al. (1992)	House plant	BDM auction[d]	Yes	8.00	4.81	1.7
Kachelmeier and Shehata (1992)	Lottery ticket	BDM auction	Yes	11	6	1.8
Adamowicz et al. (1993)	Movie ticket	Classroom CV	No	9.30	4.76	2.0
Shogren et al. (1994)	Risk of sickness	Vickrey auction[d]	Yes	3.5	0.9	3.9
Franciosi et al. (1994)	Mug	BDM auction	Yes	5.36	2.19	2.4
Eisenberger and Weber (1995)	Lottery ticket	BDM auction	Yes	6.11	4.23	1.4
Morrison (1997)	Mug	BDM auction	Yes	2.20[e]	0.99[e]	2.2

[a] Some studies used more than one procedure, more than one good, or several versions or levels of the same good. We did not attempt to list them all here. In most cases, results were similar to those reported here.
[b] CV refers to contingent valuation. BDM refers to the random price auction of Becker et al. (1964).
[c] Additional early, unpublished, contingent valuation studies of environmental goods include the Eby (1975) study of fishing in a park, that of Meyer (1975) of saltwater recreation, and that of Sinclair (1976) of a favorite fishing site. These studies also found substantial WTA/WTP ratios. See Gordon and Knetsch (1979).
[d] Several iterations were used, with the last or binding iteration reported here.
[e] Pounds Sterling rather than US dollars.

quent experiments—using lottery tickets or familiar and inexpensive goods such as mugs, candy bars, and pens—have replicated and extended these results under a variety of between- and within-subject conditions, with results consistently demonstrating a substantial and persistent disparity (Table 1).

Results from studies by environmental economists typically show even higher ratios for the disparity in valuation measures. An early example is the response of duck hunters (Hammack and Brown, 1974) who indicated that, on average, they would pay $247 above actual costs to hunt waterfowl for a year but demanded a minimum of $1044 to give up that opportunity to hunt. Such large differences in WTA and WTP responses are

echoed in numerous other studies of environmental assets, most of which have reported WTA/WTP ratios ranging from 2:1 to 5:1, with some considerably higher (Table 1). It must be noted, though, that contingent valuation estimates may accentuate the ratio because of the tendency for contingent valuation to asymmetrically overestimate WTA (e.g. Boyce et al., 1989).

Perhaps the most striking evidence for the WTP–WTA disparity comes from observations of people's behavior in making everyday choices. These settings include the reluctance of car owners to give up their existing automotive insurance options when a more attractive choice is readily available (Johnson et al., 1993), the far greater amount people demand to accept a decrement of safety compared to the amount they would pay for a safer product (Viscusi et al., 1987), and the asymmetric behavior regarding the acquisition and retention of national art treasures (Frey and Pommerehne, 1987). In each of these cases, the possible acquisition of a gain and the potential loss of something currently held are valued very differently.

3. Explanations for the disparity

The reasons advanced for the WTP–WTA disparity include both economic and psychological explanations. Economic reasons include income effects, transaction costs, implied value, and the profit motive. Psychological reasons include a variety of explanations and a diversity of terms, which we summarize here under four headings: the endowment effect, legitimacy, ambiguity, and responsibility. Understanding these reasons can assist in predicting the magnitude of the gain–loss disparity and help sensitize policy makers to situations where large differences in WTP and WTA measures of value are likely to occur.

3.1. Income effects and substitutes

The most obvious explanation for a WTA–WTP disparity, at least to an economist, is the income, or wealth, effect. It is observed when payment to obtain a good is constrained by income, but compensation demanded to give up the good is not. When the good is sufficiently desirable—technically, when the income elasticity of demand is large enough—that income significantly constrains ability to pay, WTA may exceed WTP. The magnitude of an income effect depends on the availability and price of substitutes, because an owner's WTA will not exceed the price at which a perfect substitute can be purchased. Thus, to the extent that perfect substitutes are lacking, the opportunities for a disparity are enhanced (see Bockstael and McConnell, 1980; Hanemann, 1991). It is important to note, however, that a lack of substitutes would tend to increase both WTA *and* WTP. Thus, as Hanemann shows, a lack of substitutes is not, in and of itself, a cause of the disparity. The income effect is unlikely to play a large role in the WTA–WTP disparity observed for relatively inexpensive market goods with ample substitutes, except for individuals with little disposable income, such as some student participants in WTA–WTP experiments. However, the income effect is a likely contributor to the disparity observed for more unique and valuable goods such as environmental conditions.

3.2. Transaction costs

Transaction costs are those that make a purchase or sale possible, such as locating the good or traveling to where it will be exchanged. To the extent that transaction costs affect buyers and sellers differently, a WTA–WTP disparity may result. Most experiments showing a disparity, however, have been designed so as to minimize or eliminate any effect of transaction costs on the magnitude of the observed disparity.

3.3. Implied value

Attempting to purchase or sell something sends a signal: an item offered for sale may be viewed as unwanted, thereby depressing its value, whereas an item that someone is attempting to buy may be viewed as desirable, thereby enhancing its value. This will not apply when the setting is one already established for trade, such as a retail store. When

the proposed trade is unanticipated, however, as is the case for many environmental survey settings, the consequence of an implied value signal can be the creation, or augmentation, of a WTA–WTP disparity.

3.4. Profit motive

The search for profit is a central aspect of many real-world transactions. Because many of the goods for which evaluations are required do not have well-defined prices, but instead are characterized by a range of possible values, it is likely that buyers will look to the lower end of this range and that sellers will look to the higher end. This behavior is both rational and predictable; it is the essence of getting a 'good deal,' so long as expectations do not exceed what the market will bear. This behavior will result in a difference in WTP and WTA evaluations of the worth of a good. The disparity will be larger to the extent that both external data (about what others may be willing to sell a good for or to pay for it) and internal data (about one's own values) show a larger possible range. Market experience should tend to lower a disparity induced solely by the profit motive.

3.5. Endowment effect

Thaler (1980) proposed the endowment effect to describe the notion that desirable things are considered more valuable when they are part of a person's endowment than when they are not, all else equal. This explanation of the WTP–WTA disparity is based on the asymmetric valuation of gains and losses suggested by Prospect Theory (Kahneman and Tversky, 1979), and the claim that selling a good creates a loss, whereas buying the same good generates a gain. Although Prospect Theory originally was proposed for risky prospects with associated probabilities, Thaler (1980) and Knetsch and Sinden (1984) adopted this feature to help explain individuals' buying and selling behavior of familiar consumer goods, as well as more complex social policy options.

The endowment effect is conceptually the same as loss aversion, as noted by Tversky and Kahneman (1991), and captures the intrinsic human traits that pain matters more than pleasure and that organisms habituate to steady states. These conditions result in a general reluctance to sell, so that a good which is owned is considered to be worth more simply because it is in hand. The endowment effect is likely to create an especially strong aversion to losses in cases where the proposed sale is involuntary, as in many of the usual contingent valuation settings.

3.6. Legitimacy

Some proposed exchanges involve ethical dimensions that are sufficiently out of the realm of ordinary transactions that individuals may be unwilling to undertake them. Such concerns about legitimacy arise frequently in the context of valuations of human or species health and safety, for example as a result of the strong social norm against giving up safety in return for money. Even under conditions in which one would not be willing to pay much to purchase additional safety, the notion of selling one's safety, the safety of another species, or the safety of future generations is generally unacceptable. As a result, large disparities have been found in comparisons of WTP and WTA health and safety valuations (e.g. Viscusi et al., 1987).

3.7. Ambiguity

Nearly all purchases or sales involve some ambiguity concerning such key factors as the market price of a good or its substitutes, the characteristics of the good, and how much enjoyment it will bring once purchased or how much it will be missed once sold. Under conditions of high ambiguity, risk averse buyers will tend to underestimate a good's value to them and risk averse sellers will overestimate its value, leading, all else equal, to a disparity. This behavior is more likely for unfamiliar goods, such as those often used in contingent valuation surveys, than for familiar goods such as the mugs or candy bars often used in experiments. The tendency for ambiguity to cause a WTA–WTP disparity is related to the concept of decision and transaction costs, because

buyers and sellers must decide whether the cost of acquiring additional information is worth the effort.

Regret (Loomes and Sugden, 1982), another explanation for the WTP–WTA disparity, relies on ambiguity about the outcome of the choice. In the presence of ambiguity about a good, its price, and one's future feelings about the transaction, buying and selling involves a potential harm in the form of a net loss. Thus, options to buy or sell involve a potential for regret. Anticipating the regret I may feel if I later learn that I paid a higher price than I had to, I state a lower price; or anticipating the regret I will feel if I later conclude that I miss the good more than I thought I would, I raise my offer. To lower the potential for regret, a premium is required. This premium lowers WTP and raises WTA, compared with the absence of anticipating regret.

3.8. Responsibility

A sense of moral responsibility—for example, to other people, for things placed in one's care, or to the environment—can also lead to a WTA–WTP disparity (Gregory, 1986). When responsibility is felt and a potentially damaging or harmful outcome is possible, inaction is commonly favored over action, because people feel less bad if the harm just happens than if they acted in a way that caused it (Ritov and Baron, 1992). The premium required to offset this potential therefore contributes to the disparity by lowering WTP and raising WTA.

Evidence that moral responsibility may *enhance* a WTA–WTP disparity was presented by Boyce et al. (1992) in a real-money experiment involving a house plant. The experiment placed some participants in the position of potentially allowing the destruction of a plant via their decision to either sell it or not purchase it. The authors argued that the differential assignment of property rights under WTA and WTP measures of value altered the aversiveness of the loss because it shifted "the allocation of moral responsibility for preserving the commodity" (p. 1366). Irwin (1994) supported this finding in a contingent valuation study comparing WTA and WTP for both market and environmental goods. In addition to the standard WTA–WTP disparity, she found that WTA of the environmental goods exceeded WTA of the market goods, although, as it happened in this particular case, WTP did not differ between the two sets of goods. The larger disparity for the environmental goods led Irwin to conclude that selling, but not buying, emphasizes the moral aspects of goods, "presumably because selling implies responsibility" (p. 453).

Whether this set of reasons is comprehensive and how these different influences on the disparity might be combined in given situations are questions whose answers remain cloudy. Table 2 indicates our hypotheses about the most likely causes of the disparity for inexpensive market goods (those goods commonly used in most real-money experiments testing for the disparity) and for environmental goods. Common to both lists are the endowment effect, ambiguity and responsibility. The profit motive is likely to affect transactions involving market goods but not environmental goods. The income effect, transaction costs, implied value and legitimacy are likely to affect transactions involving environmental goods but not inexpensive market goods.

Although we cannot necessarily explain the disparity to our satisfaction, we can recognize its presence and be aware that poor comprehension

Table 2
Likely applications of the plausible reasons for a WTA–WTP disparity

Plausible reasons	Type of good	
	Inexpensive market goods	Environmental goods
Income effect		X
Transaction costs		X
Implied value		X
Profit motive	X	
Endowment effect	X	X
Legitimacy		X
Ambiguity	X	X
Responsibility	X	X

of why the disparity occurs is not an excuse for neglect. Attempts to explain away the disparity as the result of inadequate market experience (Brookshire and Coursey, 1987; Coursey et al., 1987; Shogren et al., 1994) have tended to only reduce, not remove, the disparity (Table 1) and have used repetitions of auction procedures that may introduce unexpected behaviors. Understand it or not, the disparity is real and here to stay as a phenomenon of human decision processes. Further, influences such as legitimacy and responsibility may contribute toward the disparity for environmental goods but play an insignificant role with market goods. Because tough environmental management and evaluation decisions are also here to stay, and are becoming more complex and often more controversial over time, implications of the disparity for environmental management deserve consideration.

4. Implications of the disparity for environmental management

The implications of the WTA–WTP disparity have a profound, albeit poorly appreciated, effect on the management of natural resources and on many aspects of environmental decisionmaking. Often, the implications of the disparity are viewed as an issue associated with the implementation of economic survey techniques, in particular contingent valuation methods. However, as the real-money experiments listed in Table 1 show, the disparity is not limited to contingent valuation estimates of value. The roots of the issue are substantially more broad, and for environmental goods appear to be based largely in individuals' differing perceptions of gains and losses, on their response to ambiguity, and on ethical concerns.

Overall, the reluctance of analysts to employ WTA measures of an environmental loss means that activities with negative environmental impacts will be unduly encouraged, because the real value of the associated losses will be underestimated. This reluctance has some obvious implications for benefit–cost analysis and damage assessment. In addition, we note six evaluation settings in which the asymmetric valuation of gains and losses, or more specifically the WTA–WTP disparity, may play a role (see also Knetsch, 1990).

4.1. Restoration and improvement activities

Restoration activities are initiated to restore the quality of an environmental asset to its prior condition; environmental improvements are designed to enhance the current level of a resource. Restoration activities thereby address perceived losses, whereas improvements attempt to achieve gains. In some cases, such as following an accident (e.g. a chemical spill), this distinction is clear and unambiguous and the choice of a WTP measure to value the loss will lead to an underestimate of damages. In many other cases, however, the selection of a context or frame for a proposed environmental action is indeterminate. Whether a WTP or WTA valuation frame is selected may therefore set the tone for an acceptable or unacceptable proposal.

Consider a typical environmental clean-up proposal, in this case involving clean-up of a previously pristine river that has been polluted by a chemical plant built in 1970. The initiative can be viewed either as a gain from the current status, in which case it would be creating benefits, or as the restoration of its former, pre-1970 condition. If placed on the ballot as a referendum question, both theory and empirical studies suggest that a proposal to achieve an environmental gain (i.e. a cleaner river than now) is likely to be valued significantly lower than a proposal to reduce the environmental loss though restoration of the river's former pristine state (Gregory et al., 1993). Although little guidance is provided regarding selection of the preferred reference point (today's more polluted level vs. a former cleaner level), the gain/loss framing of the evaluation question should be a matter of conscious choice and not simply assumed to be irrelevant or insignificant.

4.2. Mitigation and compensation remedies

Conventional logic recommends compensation payments over mitigation measures as a preferred remedy for harms; mitigation payments restrict

the mechanism for reducing injury, whereas compensation payments do not. Because losses are valued more highly than gains, however, mitigation options may instead be preferred. The reason is that mitigation actions are designed to directly reduce losses; for example, a reduction in salmon fry will be offset by creation of new spawning areas, or a loss of forest cover will be offset by new investment in a planting program. Monetary compensation awards, however, will be discounted because they fall in the domain of gains. Some evidence suggests that compensation may be discounted even further if it accrues to individuals, whereas the value of mitigation is enhanced to the extent it accrues to the community as a whole (Easterling and Kunreuther, 1995).

4.3. Sustainability policies

Policies designed to achieve sustainability objectives face several hurdles relating to gain–loss distinctions. One implication follows from the earlier mitigation discussion, in that attempts to achieve 'soft' sustainability by substituting one form of natural capital for another may be met with less enthusiasm than anticipated. A further consequence of the disparity is that policies framed as achieving a reduction in losses will be viewed as more valuable than policies framed as achieving a gain. This influence is heightened in the case of sustainability policies, such as initiatives designed to limit greenhouse-gas emissions or to enhance biodiversity protection, characterized by the presence of ambiguity and scientific controversy concerning the results. As ambiguity increases, so too will the risk premium demanded by 'purchasers' of new emission or habitat-protection plans (whose WTP will go down) as well as by 'sellers' of current jobs or development rights (whose WTA will go up).

These distinctions are strengthened by the addition of time, because some of the benefits of sustainability policies occur only after many years or even generations. Questions asked to evaluate the future benefits of policies can therefore be phrased in terms of choices between gains (e.g. more healthy people, higher species numbers) or as a reduction in losses (e.g. expenditures to reduce premature deaths due to cancers or losses of habitat quality). A gains question would be along the lines of "What is the most money you would pay now to receive X at future time Y?" and a losses question would follow the form of "What is the least money you would require to give up receiving X at future time Y?" Under most circumstances, framing the issue in terms of losses should yield a substantially higher value for the designated sustainability initiative.

4.4. Pollution control

Economic strategies recommended to enhance environmental quality often take the form of pollution charges or effluent fees. Despite their logic as tools in the arsenal of the economist, public acceptance of such schemes often has been disappointing. One reason for this, related to the WTP–WTA disparity, may be that effluent fees allow pollution to continue, and that pollution is viewed by society as a loss, whereas payments made by those discharging the wastes are viewed by society as a gain. Because the losses are perceived to outweigh the gains, such a scheme is likely to be opposed—quite apart from the fact that those suffering damages as a result of the pollution appear to be ignored if they are not directly receiving the payments.

4.5. Negotiations and dispute resolution

Environmental disputes are increasingly addressed through negotiated settlements, in which the principal stakeholders attempt to work together to achieve a recommended solution. The initial framing of the problem, in terms of whether the dispute concerns a potential benefit or a loss, is critical. Consider a proposal to prevent a decline in visibility by controlling pollution from a site adjacent to a park. This framing of the question assumes a present-day reference and emphasizes avoidance of a future loss, as compared to alternative depictions of the problem focusing on the gains to be enjoyed in the future if the proposal is accepted. In general, negotiating contexts that align with people's views of the problem are far more likely to produce agreement.

A negotiating environment in which gains to one side are perceived as losses to another side is unlikely to produce acceptable solutions, because the anticipated losses will tend to outweigh the potential gains. Solutions that address the losses perceived by all parties are far more likely to garner support. Proposed solutions that appear to impose a loss on one party so that another can gain are also unlikely to meet basic criteria of fairness (Kahneman et al., 1986).

4.6. Assignment of rights

Although the value of a loss is appropriately measured by WTA, what is in fact experienced as a loss may not be treated as a loss within our legal system (Knetsch, 1983; Posner, 1986). This distinction between *de facto* and *de jure* loss occurs often with environmental goods. Consider two examples. First, if a neighbor lets his tree obstruct your view of the mountains, you have suffered a loss, which could be measured in economic terms as WTA. If covenants do not protect your view, however, then for all practical purposes it is the amount you are willing to pay to your neighbor to get him to cut his tree that is relevant. Second, if managers of public multiple-use forest land decide to allow a timber harvest, hikers of the area will suffer a loss, measurable as WTA. If the laws governing how the land is managed preclude rights to existing uses, however, then the relevant measure of the recreation value is what users would pay to prevent the harvest. To reiterate, the welfare loss to the person losing the view or to the hikers losing a hiking area is measured by WTA, but the assignment of rights may not recognize that WTA when resource allocation decisions are made.

In some public resource contexts the law clearly assigns rights, allowing an unambiguous selection of WTP or WTA as the valuation perspective to be used in evaluating changes in resource conditions. For example, in damages to public trust resources, such as damages caused by chemical spills, the losses are recognized as such—thereby equating *de facto* losses with *de jure* losses—and WTA is accepted as the appropriate perspective for valuation (see Jones and Pease, 1997). Similarly, if water rights allocate flows by prior appropriation and farmers hold all the more senior rights, the loss incurred during dry times by junior right-holding anglers when the seniors reduce the river's flow is, for all practical purposes, valued in WTP terms. In many other cases, however, the assignment of rights is unclear. For example, consider the loss that would be experienced by residents of a town if a new factory begins operations that lowers ambient air quality. If the law is unclear about assignment of rights, policy makers, in deciding whether or not to issue an emissions permit to the factory, can—and typically do—resort to the more easily measured WTP measure. We question this practice, which we believe persists because managers often do not fully appreciate the importance of the WTA–WTP distinction, and we urge that the law be clarified to remove ambiguities about the proper valuation perspective.

5. Alternative valuation strategies

Obtaining high-quality information on the anticipated benefits and damages of a proposed project or policy initiative is of central concern to environmental managers. We have argued that a WTA measure of resource losses is conceptually correct and often legally appropriate. Yet the translation of desire into practice is not straightforward. In particular, the literature on environmental policy emphasizes the many difficulties associated with attempts to derive defensible WTA-based measures of value of environmental goods and services (Turner et al., 1993), and use of contingent valuation to estimate WTA has been explicitly discouraged by the National Oceanic and Atmospheric Administration panel (NOAA, 1993).

What can be done to encourage use of the conceptually correct WTA measure for estimating the economic value of resource losses and environmental damages? The community of resource economists has been hesitant to take the initiative, and for predictable reasons. Many economists defer to established theory, and others tend to believe that citizen's lack of familiarity with a

selling context for environmental valuation will make WTA measures difficult to implement. In addition, economists engaged in WTP-based contingent valuation studies have emerged as major players in the newly created business of estimating economic losses and damages—the proposed social gain in environmental protection, through adoption of a WTA measure, might therefore be experienced as a personal loss by them.

Psychologists have been active in testing and criticizing current evaluation approaches (Fischhoff and Furby, 1988; Ajzen et al., 1996), but generally they have been hesitant to go further and suggest specific valuation techniques. Decision scientists have proposed alternative valuation approaches (Gregory et al., 1993; McDaniels, 1996), but the focus of these efforts has been to develop multidimensional or nonmonetary measures of environmental values rather than specifically to incorporate WTA measures of losses. Policy analysts have suggested many helpful procedures for ensuring rigorous analysis and for involving community spokespersons, but their usual directive is to employ a WTP measure to value either gains or losses: "The willingness to pay approach still holds: the true costs of unfavorable impacts are the total amount that people would be willing to pay to avoid them" (Stokey and Zeckhauser, 1978).

Ecologists, meanwhile, have largely ignored the topic, proposing measures of species importance or habitat quality as parallel but complementary policy evaluation tools. We find this lack of attention to economic measures surprising, if only because of the direct linkages from economic valuation efforts to ecological impact assessment. To the extent that economic measures could provide a more accurate reflection of the environmental losses entailed by a proposed plan or the loss of habitat associated with a past accident, then the goals of the ecologist or biologist presumably would be advanced.

In the absence of an accurate WTA measure, one possible valuation strategy is to stick with a WTP-based measure of loss but to recognize explicitly that it yields an underestimate of resource values. Thus, the evaluation of a resource damage could proceed using a WTP measure but, at the conclusion of the study, results would be multiplied by some factor to account for the disparity. Unfortunately, this approach is suspect because it sends perverse signals: it permits the use of an acknowledged incorrect approach, and it limits learning over time by avoiding the use of WTA measures altogether. In addition, this approach assumes that we can accurately estimate WTP for environmental goods and that we know enough to select the appropriate factor.

A second, quite different approach emerges from a nascent valuation literature coming from the legal community, which argues that the presumed task—finding a dollar value for environmental harms—is impossible. Scholars such as Sunstein (1994) and Radin (1993) offer rich insights into the process by which comparable values are established and the difficulties associated with developing commensurable measures of value for multi-dimensional environmental assets. They emphasize the need to help people learn about their values for complex environmental assets, and warn against attempts to simplify values to a single dimension.

This concept has a conceptual basis in the emerging theory of constructed preferences (Payne et al., 1992) and the rationale provided by multiattribute utility theory (Keeney and Raiffa, 1976) for making trades across dimensions of a choice. To the extent that the valuation process involves weighing the relative merits of a diverse set of attributes (e.g. the health, visibility, recreational, and environmental attributes of air quality), it is less concerned with revealing the innate environmental values of individuals and more concerned with helping to construct an understanding of value from its building blocks or components. Multiattribute procedures set out a rigorous foundation for setting priorities and making trades across the different environmental, economic, and social impacts of a proposed policy (Gregory and Slovic, 1997). The approach does away with the need for valuing everything in dollars; instead, the components of a choice are valued in terms that participants define in the context of each selected value dimension.

Another proposal, which comes from economists joined with legal scholars, is the cre-

ation of damage schedules that provide a scaling of the importance of various environmental harms (Rutherford et al., 1998). Damage schedules yield a number designed to get on with the job, rather than a theoretically correct monetary value of resource damages. The schedule reflects public judgments of relative values, of which people are more certain, rather than absolute monetary values, of which people are far less certain. These scale values can form the basis for the setting of environmental damage awards in much the same way that schedules now are used to settle worker's compensation claims and establish workplace safety regulations.

Other alternative strategies come from practitioners in the field, who worry less about the conceptual basis for valuation and more about the practical demands of their job. In such settings, the focus is on finding workable solutions rather than on testing theories. One commonsense approach, similar in its foundations to the insights of multiattribute analyses, is to work out reasonable trades across habitats or species, thereby avoiding altogether the estimation of monetary values. For example, the Wyoming Game and Fish Department recognized the need in the state for additional wild turkeys of a particular subspecies and knew they had antelope to spare; meanwhile, Oklahoma had enough turkeys but was low on antelope. So a trade was worked out that sent 100 wild Oklahoma turkeys to Wyoming in exchange for 75 antelope (National Public Radio, 1996). Other trades have involved grouse, trout, alligators, bighorn sheep, and river otters. In each case, the key to success is to work out directly a mutually-agreeable exchange rate (e.g. four turkeys = three antelope) and thereby avoid the intermediate step of translating the value of turkeys, antelope, or other environmental assets into dollars.

Such trading is similar to the direct resource compensation approach (Mazzotta et al., 1994; Unsworth and Bishop, 1994) now used for settling some environmental damage claims (Jones and Pease, 1997). With this approach, restoration efforts are chosen to provide an equivalent flow of goods and services. In essence, the new replacement set of goods and services is traded for the old, damaged set. The judgment of equivalency is based on the kind and value of goods and services provided, which may be formed without explicitly estimating their monetary values. The damage claim is then set equal to the least cost of providing the replacement good and services, as long as that cost is not considered exorbitant.

6. Conclusion

The difference in how individuals respond to gains and to losses is real, persistent, and convincing. Although a complete understanding of the reasons behind the observed disparity in specific situations remains elusive, enough is known to appreciate that the choice between a WTP and a WTA framing of valuation questions will matter. Further, the bias associated with using WTP measures to value losses is widely recognized. Nevertheless, the practice persists.

It is hoped that, over time, the importance of how valuation questions are framed will stimulate a wider dialogue and help to fuel a search for alternative valuation approaches. In the meantime, it is useful to remember that continuing our reliance on WTP estimates of environmental damages results in a loss—one that could and should be restored, at a high value to the environment and to society.

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