

A Theoretical Approach to Deliberative Valuation: Aggregation by Mutual Consent

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ABSTRACT. *In deliberative valuation, a small group of selected persons explores the values that should guide collective decisions through a process of reasoned discourse. Proponents argue that deliberative techniques enhance the effectiveness and perceived legitimacy of policy making by facilitating public participation. This paper outlines an approach to deliberative valuation that is grounded in democratic theory, social psychology, and cooperative game theory, emphasizing applications to the monetary valuation of environmental services. The analysis suggests that deliberative groups that employ consent-based choice rules may aggregate individual values in a manner that systematically departs from the additive aggregation procedures of standard cost-benefit analysis. (JEL Q20)*

I. INTRODUCTION

In his seminal book *The Economy of the Earth*, Mark Sagoff (1988) critically examines the role of cost-benefit analysis in the evaluation of environmental policies. In a chapter entitled “Fragile Prices and Shadow Values,” Sagoff focuses specifically on the contingent valuation method, arguing that the use of this tool is akin to a jury trial in which the judge asks each juror to provide his or her opinion regarding the defendant’s innocence or guilt without hearing the evidence that pertains to the case.

According to Sagoff, conventional methods for measuring and aggregating people’s preferences in cost-benefit analysis are flawed in two key respects. First, techniques such as contingent valuation commonly require individuals to assign a monetary value to environmental goods and services that are distant from their daily lives and experiences. Forming meaningful

judgments regarding matters of collective action, however, requires immersion in an information-rich and normatively charged arena in which people can both understand the complex issues at stake and carefully consider their preferences and values through reasoned deliberation with others in their community. Through such deliberation, new information may be revealed that was not shared beforehand by everyone in the group. As a result, a more informed decision can be achieved.

Second, while having individuals place values on collective environmental goods and services may be methodologically feasible, the approach does not necessarily result in a socially legitimate judgment. Instead, in democratic societies, many social decisions are assigned to groups rather than individuals. In the United States, for example, the outcome of a criminal trial is deemed to be morally and politically legitimate because jurors reach a consensus decision through deliberation. The jury process stands in marked contrast to conventional cost-benefit analysis, in which preferences are aggregated by simply adding up “dollar votes.” Such aggregation procedures sidestep the process of reaching

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agreement concerning the values and norms that should shape public policy. According to Sagoff, this leads to a “category mistake” in which normative judgments that must be understood in terms of moral principles are shoe-horned into a framework that reduces all values to consumer preferences.

In recent years, Sagoff (1998) has contributed to a small but growing literature on the use of deliberative valuation in environmental policy analysis. Building on Habermas’ (1984) concept of communicative action and Dryzek’s (1990, 2000) theory of discursive democracy, authors such as Brown, Peterson, and Tonn (1995), O’Hara (1996), and Jacobs (1997) argue that reliance on deliberative techniques—in particular, the use of citizen groups convened to assess the costs and benefits of proposed policies—can improve the effectiveness of public participation in the policy process, thereby enhancing the perceived quality and legitimacy of policy decisions.

A growing empirical literature confirms Sagoff’s hypothesis that the values people hold towards matters of public policy are sensitive to changes in issue-framing and the information that is brought to their attention in the process of value elicitation (Slovic 1995; Vatn 2004). Similarly, results from the contingent valuation literature point to the sensitivity of respondents’ value estimates to survey question context and perceived social importance (Schkade and Payne 1994; Schuman 1996). Taken together, this body of evidence casts doubt on the view that policy analysts can reliably gauge social values by simply surveying individual’s *ex ante* preferences regarding environmental services that they have little direct experience with and towards which their attitudes are relatively unstable and unformed.

Thus far, relatively few studies have used deliberative methods to gauge people’s willingness to pay for improved environmental quality. One notable exception is the work of Gregory and Wellman (2001), who analyzed stakeholder values regarding the costs and benefits of wetlands restoration in the Tillamook Bay estuary in

coastal Oregon. A second study by James and Blamey (2004) explored the use of deliberative valuation in the assessment of national park management in Australia. Although these studies differ significantly in terms of both substantive focus and analytical methods, each suggests that deliberative valuation holds significant promise as a practical methodology.

The goal of this paper is to explore the conceptual underpinnings of deliberative valuation as a tool in policy analysis. In this context, Sagoff (1998) places particular emphasis on the use of mock citizen juries—small groups of people chosen to represent the broader community in which decisions are reached by mutual agreement. Precisely analogous issues, however, are raised by the use of multicriteria decision analysis in the context of groups charged with the task of evaluating proposed policy options on behalf of society as a whole (Proctor and Dreschler *in press*). For reasons that are described below, we limit attention to deliberative processes that are designed to achieve a consensus regarding the values that should guide social decisions. In the consensus approach, individuals may differ concerning their underlying beliefs and values. Each participant, however, is motivated to achieve a mutual agreement that is acceptable to all parties (Raiffa 2002, ch. 22).

Specifically, the paper examines two key questions concerning the links between deliberative valuation and more traditional approaches to social choice and applied welfare economics. The first question concerns the sense in which it is reasonable to expect a small deliberative group to reach a mutual agreement that aggregates the values or preferences of each individual participant. Since the early work of Arrow (1951), social choice theorists have expressed doubt concerning the prospects for constructing a group preference ordering that is consistent with seemingly plausible assumptions concerning rational decision-making. In an important contribution to this literature, Riker (1982) has argued that democratic procedures generally do not and cannot give rise to a well-defined

conception of the public interest, useful though they may be in limiting the discretionary powers of elected officials. Below, however, we find that a specific, analytically tractable aggregation rule flows from the premise that group values should be negotiated by a process involving the mutual consent of participants holding equal bargaining power. In this sense, our analysis suggests that an operational conception of the public interest may be derived from the democratic principle that social legitimacy rests on the (hypothetical or actual) consent of the governed.

The second question concerns the issue of whether conventional cost-benefit analysis and consent-based deliberative valuation would (under ideal circumstances) yield equivalent results regarding society's willingness to pay for environmental services. This question is linked to Kenyon, Hanley, and Nevin's (2001) view that deliberative valuation procedures should complement rather than supplant the use of contingent valuation in environmental policy analysis. While Kenyon, Hanley, and Nevin agree with Sagoff that public deliberation is often necessary for people to form meaningful value judgments, they argue that focusing on individual willingness to pay with additive aggregation is essential to the pursuit of economic efficiency. This approach is well illustrated by Davis and Whittington's (1998) study of water supply and sanitation systems in Lugazi, Uganda, in which respondents discussed and debated infrastructure improvements in community meetings before completing a contingent valuation survey.

The present analysis, in contrast, shows that a consent-based deliberative group would integrate a concern for economic efficiency with a complementary and sometimes offsetting emphasis on achieving a fair distribution of net benefits between members of society (Wilson and Howarth 2002). Under such circumstances, group willingness to pay for a project that enhances environmental quality will systematically differ from the sum of individual net benefits unless the project is financed using a payment scheme in which each

person's contribution is strictly proportional to her individual willingness to pay. Although possible in theory, such a payment scheme is typically unrealistic given the constraints imposed on real-world institutions—in particular, the taxation mechanisms through which governments commonly raise revenue. As a result, we expect the outcomes generated by consent-based deliberative valuation to depart significantly from those that would be derived from conventional cost-benefit analysis. While this finding does not in itself invalidate cost-benefit analysis, it suggests that additive aggregation would provide a biased measure of prevailing social values if decisionmakers were committed to the normative principles that support consent-based deliberation.

Successive sections of this paper will explore the links between deliberative valuation and the literatures on democratic theory, social psychology, and the theory of cooperative games. We shall interpret group deliberation as a process of social bargaining in which each individual's conception of the social good feeds into the construction of a mutually acceptable group value function. We shall then examine the connections between this value function and measures of willingness pay for environmental services at the level of both individuals and groups. Before turning in that direction, however, it is important to briefly review the historical origins of cost-benefit analysis and the sense in which reliance on cost-benefit analysis might promote policy outcomes that are meaningfully "democratic."

II. COST-BENEFIT ANALYSIS

As described by Nelson (1987), cost-benefit analysis was developed as an offshoot of the Progressive model of government that dominated U.S. politics in the early twentieth century. The Progressives of the time, led by figures such as Theodore Roosevelt, Woodrow Wilson, and Gifford Pinchot, found themselves responding to the perceived failures of U.S. political institutions in the late nineteenth

century. During that earlier period, both Congress and the Executive Branch had been effectively “captured” by special interest groups. The result was a rise in monopoly power and the despoliation of forests, rangelands, and mineral resources in the western United States.

In contrast with the perceived corruption of both government and the private sector, the Progressives favored a model of scientific governance in which technical experts would make policy decisions in a manner that best served the public interest (Norgaard 1994). This led to the formation of administrative agencies such as the U.S. Forest Service and the Bureau of Land Management, which were charged with managing federally owned natural resources in a manner that delivered sustained benefits over intergenerational time scales. Under the Flood Control Act of 1936, the Progressive model was expanded to prescribe the use of cost-benefit analysis to evaluate the desirability of proposed water projects. Well aware of the potential influence of special interests on public works programs, Congress mandated the use of cost-benefit analysis as a check on the potential failures of the political process (Porter 1995, ch. 7).

Its role in water resources management led to the institutionalization of cost-benefit analysis within the federal government and to the development of a substantial academic literature on the technique’s theoretical foundations and practical application (Eckstein 1958; Hufschmidt 2000). Although the major environmental statutes of the 1970s sharply limited the role of economic considerations in setting environmental standards, the influence of cost-benefit analysis expanded substantially following Executive Order 12291, signed by President Ronald Reagan on February 17, 1981. This presidential order charged the Office of Management and Budget with reviewing the costs and benefits of all proposed regulations (Smith 1984). Although it was modified by President Bill Clinton in 1993, the main features of this policy remain in effect (Environmental Protection Agency 2000).

The normative justification for cost-benefit analysis is a point of long-standing controversy (Gowdy 2004). As noted above, the pursuit of the public interest was a core commitment of Progressive politics. In a market-oriented society, it seems plausible to define the “public interest” in terms of monetary values—for example, people’s net willingness to pay to support a stipulated policy option. This intuition is formalized through the concept of a Pareto improvement: If the net benefits of a proposed policy exceeded the costs, and if those harmed by the policy were fully compensated for their losses, then the policy would enhance “social welfare” by advancing the interests of at least some stakeholders while leaving none worse off.

As Kneese and Schulze (1985) note, proponents of cost-benefit analysis sometimes argue that their approach is justified through appeals to utilitarian moral reasoning, offering a pragmatic means of implementing Pinchot’s (1947) maxim that resource management should maximize “the greatest good of the greatest number in the long run.” Strictly speaking, however, this argument would hold true only if the marginal utility of income was identical for each member of society. In the absence of an optimal income distribution, a policy might yield positive net benefits and yet reduce social welfare if its costs fell disproportionately on individuals with a comparatively high marginal utility of income. This observation, which extends readily to any social welfare function that depends positively on the preferences of each person, implies that distributional considerations must play a central role in the evaluation of proposed policies (Persky 2001). Ultimately, most observers believe that distributional conflicts must be resolved through the political process.

III. DEMOCRATIC THEORY AND SOCIAL CHOICE

Cost-benefit analysis is grounded on a consequentialist conception of social choice. It evaluates policy options based on their outcomes, and would in principle

support an authoritarian state that steadfastly advanced the interests of citizens. From this it follows that decisions based solely on cost-benefit analysis can be undemocratic unless one views the aggregation of “dollar votes” as an adequate standard of “democracy.” As Dahl (1989) points out, technocratic approaches to decision-making such as cost-benefit analysis can lead to socially inequitable solutions by conferring power on expert elites who can, like legislatures and administrative agencies, be captured by special interest groups. In addition, framing choices in terms of monetary costs and benefits may privilege certain types of values (O’Neill 1993, ch. 4) and the interests of particular stakeholders—that is, those with the greatest ability to pay (Guha and Martinez-Alier 1997).

In light of these considerations, authors such as Sagoff (1988), Vatn and Bromley (1994), and Norton (2005) question the widespread use of cost-benefit analysis, instead favoring procedural approaches to policy analysis that are grounded in democratic principles. In contrast with the consequentialist notion that social institutions should be structured to maximize an a priori conception of social welfare, political theorists in the tradition of John Locke (1690) understand democracy in terms of governance by, for, and with the consent of the governed (Rawls 1971; Buchanan, 1977; Binmore 1998). Taken at face value and pushed to its logical conclusion, this language implies that:

1. People hold a right (actual or hypothetical) to block actions or decisions that would adversely affect their interests;
2. By mutual agreement, people can (in fact or in principle) choose policy outcomes that promote their values or preferences.

Note the parallel here to the notion of consumer sovereignty in economics (Norton, Costanza, and Bishop 1998). In this present conception, however, democratic valuation processes are seen as legitimate because they involve the free choice of rational social actors. Accordingly, the process of democratic deliberation does not reduce to simple vote counting or the

aggregation of isolated individual preferences. Indeed, the majority rule criterion that is commonly employed in legislative bodies can be undemocratic when a dominant majority imposes its values on an unwilling minority (Moscovici 1985). While majority-rule procedures may be defensible in certain contexts because they reduce the transaction costs of decision-making (Buchanan 1977), they fall short as a general description of the democratic ideal.

As liberal theorists such as Rawls (1971) and Habermas (1992) emphasize, the normative foundation of democracy is based on the underlying goal of promoting the freedom or autonomy of each member of society. Since freedom is a relative concept reflecting the respective power of social actors to defend and pursue their own interests, democratic societies require meaningful equality in terms of fundamental social, political, and economic rights. In the absence of such equality, disadvantaged individuals would have reason to reject the prevailing social contract since they would not rationally consent to an institutional framework that treated them unfairly. These two theorists offer somewhat different conceptions of distributive justice. Rawls, for example, focuses on access to primary goods—the basic entitlements that shape people’s opportunity to define and pursue their own conception of the good life. Habermas, in contrast, emphasizes issues of power relations in social and political affairs.

A distinct, and in our view complementary theoretical framework, is offered by John Dryzek (1990, 2000). According to Dryzek, democracy involves more than simply reaching agreement on the basic institutions (rights, entitlements, and governance structures) that should guide resource allocation in society. Instead, it is concerned with the exchange between competing discourses, the “shared means of making sense of the world embedded in language” that are “grounded in assumptions, judgments, contentions, dispositions, and capabilities” (2000, 18). As Dryzek puts it, “A discourse will generally revolve around a central storyline, containing opinions

about both facts and values" (2000, 18). This way of thinking is closely linked to Norton's (2005) view that separating issues of fact and value is often inappropriate in the field of environmental policy, contrasting strongly with the Progressive vision that decision-making could be reduced to the application of technical expertise.

For Dryzek, democracy revolves around reasoned deliberation, both in government and (especially) in civil society. Through the process of reasoned deliberation, individuals:

1. Refine their personal beliefs and value judgments through information exchange, rational reflection, and social learning;
2. Strive towards "workable agreements" (2000, 170) that reconcile their differing conceptions of the social good to arrive at a course of action that is acceptable to all parties.

Dryzek's approach to democratic theory is relevant to the present discussion in at least two respects. First, it interprets values and preferences as socially constructed (or uncovered) through the process of deliberation. This contrasts with the standard approach of applied economics, in which people are assumed to hold preferences that are fixed and independent of social interactions. Second, Dryzek's framework implies that individual values or preferences are aggregated by mutual agreement. This latter point is related to Rousseau's (1762) notion of the "general will" but stops short of the claim that individuals' distinct values and beliefs can be merged into a single, all-encompassing identity. Instead, individuals jointly consent to the legitimacy of group norms that strike a balance between their competing aims, priorities, and moral judgments. This holds true even in cases where each individual's personal values depart to some degree from accepted group norms.

IV. THE SOCIAL PSYCHOLOGY OF SMALL GROUPS

As a complement to the philosophical arguments outlined above, the social psy-

chology of small group decision-making provides a useful empirical basis for understanding the process of social exchange in deliberative valuation (Burnstein and Vinokur 1977; Stasser, Taylor, and Hanna 1989). Building on a long tradition of research on the dynamics of social influence (Asch 1956; Burnstein and Vinokur 1977; Moscovici 1985), psychologists have identified consistent patterns that tend to emerge during group discourse (Stasser and Stewart 1992; Schittekatte and Van Hiel 1996). Empirical evidence from this literature suggests that the issues that group members mention during discussion are influenced by the information that members share in common (Stasser and Titus 1985), by members' pre-discussion preferences (Moscovici 1985), and by differentials in social status that are brought into the group from outside (Shaw 1981). How well group discourse serves as medium for exchanging information and transforming individual values depends on how successful the group is in overcoming these challenges.

Understanding the social psychology of small groups helps us to better know when and why the values expressed by groups may systematically depart from the straightforward aggregation of the values expressed by each individual member. For example, the actual content of discussion can in part determine a group's final decision; highly charged issues tend to promote polarization while less charged issues can lead to compromise (Turner 1991). In other words, the topic of discussion—the "central storyline" noted above by Dryzek (2000)—can influence the deliberative group process in fundamental ways. Burnstein and Vinokur's (1977) "persuasive arguments" theory of group polarization represents one way of viewing how individuals share information. This theory holds that when a group discusses an issue, its members will actively sample from a culturally shared domain of arguments. Thus, the balance of arguments in this domain supporting one position over another will tend to be favored by group members before discussion and will also tend to receive

the preponderance of support during discussion. As a result, without procedural rules that mitigate this tendency, group discourse may serve to enhance pre-discussion biases rather than ameliorate them.

In contrast with valuation methods that embrace rigid methodological individualism, group deliberation can potentially tap into the diverse store of knowledge and experience held by different group members. Because of differences in training, background, and life experiences, group members frequently will have different information about a given choice alternative under consideration (Shaw 1981). Yet often pre-existing status hierarchies can impede effective information exchange if disadvantaged individuals (e.g., members of minority groups and those with comparatively low incomes or educational attainment) yield decision-making authority to the socially advantaged (Shaw 1981; Turner 1991). A key procedural challenge facing deliberative valuation is thus to overcome social status inequalities, so that group members can effectively pool their unique, unshared information. Groups that meet this challenge have been shown to make more informed choices than would be the case if decision-making were left to a single individual.

Suboptimal decisions can also result when decision-making groups limit their discussion to shared rather than unshared information (Stasser and Titus 1985; Stasser, Taylor, and Hanna 1989; Stasser and Stewart 1992; Stasser, Stewart, and Wittenbaum 1995). Viewed in the context of generating group consent around the social value of complex environmental services like "carbon sequestration by a forest ecosystem" this observed tendency poses a significant challenge to the assumption that a group value should necessarily be represented by the arithmetic sum of individual assessments made in isolation. Many people simply may not have well-formed preferences for such things. Experiments on group dynamics suggest that when unique or important information (e.g., expert opinion) is brought forward in cooperative discussion through a facili-

tated group process, the end result may be a significant shift toward that unique information point, which can in turn enhance the quality of decisions.

Taken together, these findings suggest that key structural conditions or procedural rules will often be necessary to mitigate the tendency of social groups to truncate the free exchange needed to achieve the discursive ideal of bringing citizens to a mutually acceptable, workable agreement (Raiffa 2002). One important conclusion is that any small group of randomly selected citizens should be adequately facilitated by a neutral moderator (Gregory 2000). A professional facilitator can provide a formal structure for debate that explicitly establishes normative discursive rules that encourage individual participants to drop attachment to social status roles, share information, and engage in collective thinking. Members should be encouraged to talk among themselves about the steps necessary to reach agreement and how discussion might best be structured to accomplish this task. Properly facilitated, individuals who are brought together in groups need not stop at stating their own individual preferences, but will go on to articulate and recast their individual values in light of emergent group judgments.

V. DELIBERATIVE GROUPS AND DECISION-MAKING BY AGREEMENT

Although the use of formal deliberative methods is relatively new to the field of environmental valuation, participatory techniques have played a role in areas such as multi-criteria decision analysis and risk assessment. As detailed by Gregory (2000), a well-designed deliberative group procedure can increase the likelihood that policy decisions will "meet with broad-based approval and be viewed by taxpayers and elected officials as a sensible way to spend scarce funds" (p. 36). To accomplish this objective, Gregory advises that citizen participation should be involved in: (a) "framing decisions," (b) "defining key objectives," (c) "establishing alternatives,"

(d) “identifying consequences,” and (e) “clarifying tradeoffs.”

In a related vein, authors such as Brown, Peterson, and Tonn (1995) and James and Blamey (2004) reason that citizen juries—deliberative groups of roughly fifteen individuals carefully chosen to represent the community from which they are drawn—could be employed to gauge the public’s willingness to provide financial resources to support the implementation of proposed environmental policies. Brown, Peterson, and Tonn strongly emphasize the importance of using random sampling techniques in citizen jury selection. In the typical case, a citizen jury is convened for a period of several days, during which participants hear expert testimony and deliberate over the facts and values that should guide collective decisions. This approach is firmly rooted in the principles of discursive democracy and social psychology described in the preceding sections. According to the literature surveyed by James and Blamey, citizen juries may be charged with carrying out a variety of tasks, including the generation of narrative evaluations of proposed policy alternatives.

For the purposes of the present analysis, we shall consider a hypothetical deliberative group in which n individuals are convened by a professional facilitator to rank a set of proposed policy options that are elements of a given set X . To achieve the full benefits of small-group deliberation, it is natural to assume that $n = 15$. We shall suppose further that the group is instructed to choose a “best” outcome ($x^* \in X$) that all members can support as a matter of mutual agreement. In this setting, individual participants are effectively encouraged to drop their attachment to social status roles held outside of the group and engage in free and unfettered collective thinking. Members are also encouraged to talk among themselves about what unique information they each possess to arrive at a collective judgment and how their discussion might best be structured to accomplish this task. In the absence of agreement, current (or status quo) policies would remain in force, described

formally as the outcome $x^0 \in X$. Of course, this setup is based on a relatively restrictive framework that rules out the possibility of ranking alternatives through (for example) a majority voting procedure. As noted above, however, decision-making by mutual consent offers a normative model of liberal democracy that is emphasized by theorists such as Rawls (1971), Buchanan (1977), and Binmore (1998). Future research might profitably explore the implications of alternative institutional frameworks.

During the process of small group deliberation, suppose that each participant $i = 1, 2, \dots, n$ arrives at a value function $v_i(x)$ that summarizes her preferences, beliefs, and moral judgments concerning the choice that is under consideration. If $v_i(x) > v_i(\hat{x})$, then this individual would rationally choose outcome x over the alternative \hat{x} , if the choice were hers and hers alone. In technical terms, we may interpret $v_i(x)$ as a standard utility function, though we shall emphatically not assume that this function is necessarily limited to the measurement of a person’s individual well-being or consumer preferences. In effect, a person’s value function represents her conception of how decisions should be made in the context of public policy. For the reasons described in detail by Sagoff (1994), there might well be cases in which $v_i(x) > v_i(\hat{x})$ even though individual i strictly prefers \hat{x} over x from a personal perspective. In this event, the person’s value function would reflect a willingness to sacrifice her personal interests in support of a social or moral good.

Against this backdrop, we can now pose and examine the following central question: In an idealized deliberative group in which decisions were taken by mutual consent, how would the resulting collective choice be related to the underlying values held by each individual? In answering this question, it is useful to apply a core result from the theory of cooperative games (Binmore 1998). In a cooperative game, each participant is assumed to be individually rational, seeking to maximize her individual value function through a process

of structured negotiation with other group members. If (a) the negotiating process were set up to give each individual equal bargaining power, and (b) the outcome x^0 would arise in the absence of agreement, then the outcome chosen by the group would maximize the group value function:

$$V(x) = \prod_{i=1}^n (v_i(x) - v_i(x^0)), \quad [1]$$

which is defined as the product of $v_i(x) - v_i(x^0)$ for $i = 1, 2, \dots, n$ —that is, the increase in the value function for each participant i . This result, which was initially described by John Nash (1950), is known as the “Nash bargaining solution” in the game theoretic literature (see also Rubenstein 1982; Krishna and Serrano 1996; and Mariotti 1999). This literature shows that multiplicative aggregation arises as a direct consequence of the structure of the underlying choice problem.¹

The Nash solution has several interesting features that are relevant to the analysis of deliberative valuation mechanisms. First, the framework implies that, given the chance, each participant would freely choose the negotiated outcome x^* over the status quo outcome x^0 based on her individual values. Although there is no presumption that x^* is optimal from individual i 's perspective in the sense that it maximizes $v_i(x)$ on the set of feasible alternatives (X), the mechanism under discussion limits attention to Pareto-improving outcomes in line with the concept of “Pareto safety.” Second, the outcome of group deliberation is defined in terms of the distribution of changes in each member's value function relative to the status quo, $v_i(x^*) - v_i(x^0)$. Accordingly, issues of distributional equity play a key role in consent-based valuation (Wilson and Howarth 2002).

Finally, it is important to stress that although the Nash solution may be derived

from a set of underlying social choice axioms (see Binmore 1998), it is best understood as a means of describing the outcome of a structured process of fair negotiation. At base, the legitimacy of this approach rests on the view that social decisions should be made through the mutual consent of the affected parties or (in this instance) their representatives in a specially convened deliberative process. Of course, the outcome of group deliberation might be viewed as unfair if the status quo itself unduly privileged one or more participants. To ensure fairness, it is therefore necessary to assume that deliberation takes place against the backdrop of institutions that people initially accept as fair and legitimate.

VI. GROUP VALUATION AND WILLINGNESS TO PAY

On its face, the framework described above may seem removed from cost-benefit analysis as typically practiced in applied economics. In equation [1], the payoffs to each party are denominated in terms of her personal value function, which gauges the extent to which a given outcome is consistent with her considered values concerning the nature of the good society. This contrasts with the sole emphasis on monetary measures that is central to conventional cost-benefit analysis. Moreover, the Nash solution maximizes the product of the net payoff accruing to each person, not the arithmetic sum as in standard cost-benefit analysis. This aggregation rule emerges as a logical consequence of a commitment to the view that social decisions should be reached by mutual consent under conditions in which people hold equivalent negotiating power.

Frequently, however, social decisions involve explicit tradeoffs between environmental values and the benefits derived from conventional market goods. As an archetypal example, consider how much the citizens of a given community would willingly pay through increased taxes to implement a conservation project such as the protection of a unique forest ecosystem. The existence of such tradeoffs provides a logical bridge between group-based

¹ In the case of unequal bargaining power, equation [1] would be replaced by the more general value function $V(x) = \prod_{i=1}^n (v_i(x) - v_i(x^0))^{\lambda_i}$. Here, λ_i is a positive parameter that represents the bargaining power of individual i .

decision processes and monetary valuation. A key question is how a deliberative group's willingness to pay for environmental quality is related to the underlying values of each individual participant.

In answering this question, consider first individual i 's willingness to pay to finance a project that would provide communally shared environmental benefits. Willingness to pay might be based on the individual's personal preferences, moral values, or simply her considered judgment about what would be best for the community as a whole. For the sake of analysis, we shall assume that the project in question would:

1. Raise the level of environmental quality from the status quo level q^0 to the enhanced level $q^0 + \Delta q$;
2. Require individual i to make an incremental tax payment p_i , thereby reducing her effective income from the status quo level y_i^0 to the new level $y_i^0 p_i$.

We shall assume further that the individual's value function $v_i(q, y_i)$ is a strictly increasing function of environmental quality (q) and personal income (y_i), and that the project under consideration is marginal in the sense that its implementation would leave the derivatives of $v_i(q, y_i)$ with respect to each of these variables ($\partial v_i / \partial q$ and $\partial v_i / \partial y_i$) unchanged. Under these circumstances, implementing the project would yield the following net change in individual i 's value function:

$$v_i(q^0 + \Delta q, y_i^0 - p_i) - v_i(q^0, y_i^0) = \frac{\partial v_i}{\partial q} \Delta q - \frac{\partial v_i}{\partial y_i} p_i = \frac{\partial v_i}{\partial y_i} (w_i - p_i). \quad [2]$$

In this formulation, the term:

$$w_i \equiv \frac{\partial v_i / \partial q}{\partial v_i / \partial y_i} \Delta q \quad [3]$$

represents the monetary value that individual i attaches to improved environmental quality—that is, her maximum willingness to pay for project implementation. This interpretation follows from the observation that $(\partial v_i / \partial q) / (\partial v_i / \partial y_i)$ constitutes the shadow price of environmental quality, or the

marginal rate of substitution between environmental quality and income. To gauge the monetary value of the project's benefits, this shadow price is multiplied by the increase in environmental quality.

By substituting equation [2] into equation [1], it is possible to rewrite the group value function in the form:

$$\begin{aligned} V &= \prod_{i=1}^n (v_i(q^0 + \Delta q, y_i^0 - p_i) - v_i(q^0, y_i^0)) \\ &= \prod_{i=1}^n \left(\frac{\partial v_i}{\partial y_i} (w_i - p_i) \right) \\ &= \alpha \equiv \prod_{i=1}^n (w_i - p_i) \end{aligned} \quad [4]$$

that is defined in terms of the net monetary value that each individual attaches to the project under discussion—that is, her willingness to pay for the project's environmental benefits minus the tax payment she is required to remit. In this expression, the coefficient $\alpha \prod_{i=1}^n (\partial v_i / \partial y_i)$ takes on a fixed, positive value that depends on the marginal value of income to each individual.²

To characterize the deliberative group's willingness to pay for the hypothetical conservation project, it is necessary to describe how the tax burden required to finance the project would be divided between group members. Given the structure of the prevailing tax system, suppose that each individual i would pay a fixed fraction s_i of the total payment made by the group (W) if the project moved forward. Accordingly, each individual's payment would be $p_i = s_i W$ where the share coefficients s_i are fixed, positive parameters that sum up to unity so that $\sum_{i=1}^n s_i = 1$. This assumption provides a realistic if somewhat stylized summary of actual tax systems, in

² Given unequal bargaining power, equation [4] would take the form $V = \alpha \prod_{i=1}^n (w_i - p_i)^{\lambda_i}$, with $\alpha \equiv \prod_{i=1}^n (\partial v_i / \partial y_i)^{\lambda_i}$. Here λ_i is a positive parameter as in footnote 1. Interestingly, this specification leaves Propositions 1 and 2 unchanged. Nonetheless, this formulation suggests that empirical tests could be devised to test for the presence of differential power in real-world deliberative processes.

which each individual's share coefficient reflects her taxable income or holdings of taxable assets such as real property.

Given this formulation, the group value function may be restated as

$$V = \alpha \prod_{i=1}^n (w_i - s_i W). \quad [5]$$

Based on this expression, the deliberative groups' maximum willingness to pay for increased environmental quality may be defined as the level of W for which the group would be indifferent between implementing the proposed project and maintaining the status quo. In analytical terms, this outcome occurs where the group value function described in equation [5] assumes a value of zero. As shown in the Appendix, this definition is sufficient to establish the following proposition:

PROPOSITION 1. *Group willingness to pay for enhanced environmental quality is less than or equal to the sum of individual willingness to pay. The two are equal if and only if the ratio w_i/s_i is identical for each individual $i = 1, 2, \dots, n$.*

Except in one special case, this proposition stipulates that the standard aggregation procedures of cost-benefit analysis, in which net social benefits are calculated as the sum of individual willingness to pay, would overstate a deliberative group's willingness to pay for a project that improved environmental quality. The exception occurs in the case in which the ratio w_i/s_i is identical for each person. Recall that w_i measures individual i 's willingness to pay for enhanced environmental quality, while s_i measures her share of the incremental tax payments required to finance the project. Accordingly, this case defines a Lindahl (1958) equilibrium in which the prevailing tax system is structured to ensure strict proportionality between each individual's willingness to pay and her financial contribution to the project.

This condition will seldom be satisfied in real-world choice contexts. On the one hand, it is reasonable to suppose that, all else equal, an individual's willingness to

pay for improved environmental quality will increase along with her income. Given an income elasticity of unity and a public finance system in which a person's tax payments were strictly proportional to her income, the condition would be satisfied if people were identical in all other respects. On the other hand, the fact that willingness to pay and tax liability are each increasing functions of income does not in itself imply that these two factors vary in strict proportion. In the evaluation of a particular project to conserve environmental quality, an exact correspondence between these variables would be an unlikely coincidence.

Moreover, people facing similar tax burdens often differ importantly in terms of their underlying values. This observed heterogeneity effectively rules out the possibility that w_i/s_i would be the same for each person. To see this, consider a community in which people had similar incomes but were sharply divided over the relative importance of environmental conservation and economic development. In democratic societies, constitutional provisions generally preclude the imposition of differential taxes that are based solely on differences in people's preferences. In this case, individuals would face similar tax rates despite large differences in willingness to pay. Hence, the sum of individual willingness to pay for environmental benefits would overstate a deliberative group's willingness to pay for a conservation project through increased taxation.

VII. WILLINGNESS TO ACCEPT COMPENSATION

Although the results thus far have been couched in terms of group willingness to pay for an improvement in environmental quality, our analysis extends directly to a characterization of group willingness to accept compensation for the imposition of an environmental harm. Consider, for example, a consent-based deliberative group that was charged with evaluating a proposed project in which a hazardous industrial facility would reduce the prevailing

level of environmental quality by an amount $\Delta q < 0$. In exchange for the approval of this project, the facility's owners would pay the community a sum of money that would be used to cut people's taxes. The question concerns the minimum level of compensation the group would willingly accept if each participant received a fixed share s_i of the tax reductions accruing to the group as a whole.

In terms of the notation and derivations presented above, individual willingness to pay (w_i), group willingness to pay (W), and individual tax payments ($p_i = s_i W$) would all be negative for a project that led to a reduction in environmental quality. Accordingly, we could interpret $-w_i$ as individual i 's willingness to accept compensation for this project—that is, the level of tax reduction that would leave her indifferent between favoring the project and maintaining the status quo. Similarly, group willingness to accept compensation could be defined as the aggregate payment level $-W$ for which the group value function in equation [5] attains a value of zero. Since Proposition 1 stipulates that $W \leq \sum_{i=1}^n w_i$ with $W = \sum_{i=1}^n w_i$ if and only if w_i/s_i is identical for each individual, it follows that $-W \geq -\sum_{i=1}^n w_i$ subject to this same condition. Restating this expression in words yields the following proposition:

PROPOSITION 2. *Group willingness to accept compensation for diminished environmental quality is greater than or equal to the sum of individual willingness to accept compensation. The two are equal if and only if the ratio w_i/s_i is identical for each individual $i = 1, 2, \dots, n$.*

For the reasons discussed in the preceding section, it is unlikely that w_i and s_i would be strictly proportional in the context of real-world applications. In the present circumstances, this case would arise only if the compensation provided to the community as a whole was divided between individuals in strict proportion to their individual willingness to accept compensation. Clearly an across-the-board reduction in existing tax rates would seldom achieve this targeted result. As a rule, then,

we should expect the linear aggregation methods employed in cost-benefit analysis to understate the amount of compensation a consent-based deliberative group would demand for a project that damaged the natural environment.

VIII. SUMMARY AND CONCLUSIONS

This paper has explored the theory of consent-based deliberative valuation in the context of environmental policy analysis. In contrast with conventional non-market valuation techniques such as contingent valuation, deliberative group methods are based on the assumption that the values people hold regarding matters of collective choice are (or should be) constructed through the process of reasoned discourse with other members of society. Proponents of this approach argue that deliberative valuation provides a means of linking formal scientific knowledge with the informed judgments of citizens who are selected to represent the broader community. In this perspective, deliberative techniques can enhance the effectiveness and perceived legitimacy of policy decisions.

The paper has argued that the use of consent-based deliberative groups, in which small groups of citizens are convened to make recommendations regarding particular questions of public policy or resource management, is consistent with two strands of political theory. First, liberal democrats such as Rawls (1971), Buchanan (1977), and Binmore (1998) argue that democracy should be understood in terms of the actual or hypothetical consent of the governed. Second, discursive democrats such as Dryzek (1990, 2000) view democracy as a type of deliberative process in which citizens reach a "workable agreement" concerning the shared values and norms that should guide collective decisions. In each of these traditions, mutual agreement lies at the heart of the democratic ideal, though majority-rule voting procedures might be pragmatically justified in some contexts as a way to reduce the transaction costs of decision-making (Buchanan 1977).

The paper has also argued that a deliberative group that has reached a decision by mutual agreement can effectively be modeled using the techniques of cooperative game theory. In this setting, a group of people participating in a fair negotiating process would reach an agreement that maximized what we have termed a “group value function” that is defined in terms of the underlying values of each participant. When individual values are specified in terms of environmental quality and personal income, and when a given project would be marginal in the sense that it would leave the incremental value of these variables unchanged, then the group value function is defined in terms of the product of each individual’s net willingness to pay for the project in question. This aggregation rule, which may be deduced from the structure of the underlying choice problem using the framework pioneered by John Nash (1950), contrasts with the typical approach of cost-benefit analysis, in which net social benefits are calculated as the arithmetic sum of each individual’s net willingness to pay.

Using this theoretical model, the paper has established that the additive aggregation procedures employed in cost-benefit analysis will typically:

1. Overstate a consent-based deliberative group’s willingness to pay increased taxes for improved environmental quality;
2. Understate the amount of compensation a deliberative group would demand in the form of reduced taxes to willingly accept a project that damaged the environment.

These biases would prevail unless the net benefits of a particular project were perfectly aligned with the structure of the prevailing tax system—a situation that is unlikely to arise in practice. As a result, using conventional cost-benefit analysis to cept the normative principles that support consent-based deliberative democracy.

Given the consent-based choice rule considered in this paper, group willingness to pay and willingness to accept compensation are shaped by a particular conception of social fairness: A deliberative group

would reject a proposal that imposed net costs on some individuals so that other members of society might reap net gains. Accordingly, attention is limited to the set of Pareto superior outcomes that can be implemented in the face of institutional constraints on the distribution of net benefits. This finding accords with Binmore’s (1998) conception of rational social choice and contrasts with the familiar argument that a project would enhance “social welfare” if the sum of its monetary benefits is greater than zero.

As is the case for any theoretical study, the results of this analysis must be interpreted with care. A critic, for example, might argue that the consent-based decision rule that drives the paper’s specific analytical findings is wholly unrealistic or that it confers undue priority to the importance of the status quo. As we have stated, however, the approach outlined in this paper could and should be extended by explicitly considering alternative procedural frameworks such as the use of majority-rule voting procedures.

On the other hand, there may be instances in which the criterion of consensus is judged to be morally and/or politically appropriate as a means of assigning values. Consider, for example, a case in which the members of a community held a well-defined right to protect themselves against certain forms of environmental harms. Such rights are recognized under U.S. common law and are sometimes used as a basis for legal actions. Suppose further that the case involved a project that would impose a major health risk on a small segment of the community while providing diffuse benefits to the majority of residents. Then the legitimacy of allowing a majority vote to overturn the right to self-protection is by no means clear-cut. Presumably, deliberative groups should be organized in ways that addressed such concerns.

In closing, many questions remain concerning the theory and practice of deliberative valuation. Nonetheless, it is fair to mising approach to environmental assessment that responds to some key concerns about conventional cost-benefit analysis. Deliberative methods are grounded in a

well-defined conception of democratic governance that emphasizes both the autonomy of each member of society and the importance of designing institutions to achieve shared benefits. Inasmuch, the approach joins together concepts from economics, politics, social psychology, and ethics to achieve an interesting and synthetic approach to social choice.

APPENDIX

PROOF OF PROPOSITION 1

As noted in the text, group willingness to pay for improved environmental quality is defined as the value of W for which $V = \alpha \prod_{i=1}^n (w_i - s_i W) = 0$. Since $\alpha > 0$, this requires that $w_i - s_i W = 0$ for at least one individual. There are two cases to consider. In the first case, w_i/s_i is identical for each person. This implies that $w_i - s_i W = 0$ for all i so that $\sum_{i=1}^n w_i = \sum_{i=1}^n s_i W$. Since $\sum_{i=1}^n s_i = 1$, it follows that $\sum_{i=1}^n w_i = W$. Hence, group willingness to pay is equated with the sum of each individual's willingness to pay in this case.

In the second case, $w_i/s_i \neq w_j/s_j$ for some i and j for which $w_j - s_j W = 0$. Since a deliberative group would reject a proposed payment level for which $w_j - s_j W < 0$ for any i , it follows that $w_i - s_i W > 0$ for at least one i . Without contradiction, we may find a set of constants $\beta_i \geq 0$ such that $\sum_{i=1}^n \beta_i > 0$ and $w_i - (s_i + \beta_i)W = 0$ for all i . Summing the expression over individuals and noting that $\sum_{i=1}^n s_i = 1$, it follows that $\sum_{i=1}^n w_i = (1 + \sum_{i=1}^n \beta_i)W$. Since $\sum_{i=1}^n \beta_i > 0$, we may conclude that $\sum_{i=1}^n w_i > W$. Hence group willingness to pay is strictly less than the sum of individual willingness to pay.

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