CHOICES
The magazine of food, farm, and resource issues
3rd Quarter 2005 • 20(3)
A publication of the American Agricultural Economics Association

Economic Values without Prices: The Importance of Nonmarket Values and Valuation for Informing Public Policy Debates

By John Loomis

In the U.S., continued improvements in human health and well-being increasingly depend on improving the quality of our environment. The quality of the air we breathe, the water we drink, and the water quality of rivers and lakes we recreate in, affect our mental and physical well-being, in many ways. Yet, these valuable services of clean and natural environments are not directly priced in markets. As such, they tend to be overlooked by some policy makers who mistakenly believe that the only values that count are market revenues or local jobs. However, people do receive economic benefits from clean and natural environments because these environments provide utility. With our rising incomes and increasingly scarce natural environments, environmental quality is becoming increasingly valuable to us.

But, how do we quantify the economic values that clean and natural environments provide to people if there are no explicit market prices? To answer that question, economists have devised techniques of using *implicit or simulated* markets to estimate the monetary values of environmental quality. Most of these techniques are based on the fact that people do or will make *trade-offs* or *sacrifices* of other market goods or income in order to consume higher levels of environmental quality. The fact that people will pay more for houses, accept lower paying jobs, or travel further to visit areas of higher environmental quality should convey to policy makers that environmental quality has an economic value, dollar per dollar as valuable as many market goods.

> Nonmarket valuation is used to infer values for items that are not subject to markets like environmental services or health. Generally people are not charged for swimming in a public river or cleaner air. When a project is proposed that affects such activities, nonmarket valuation is employed to estimate project benefits.

Economic valuation of environmental quality has the potential to bring a more balanced perspective to the allocation and management of natural resources. Environmental valuation allows benefits received by society to be compared to the monetary costs and to the opportunity costs of other foregone investments. The inclusion of monetary estimates of the economic value of environmental quality allows for more formal consideration of these values in the decision making. Essentially, economic valuation of environmental quality allows those benefits to be treated equally, dollar per dollar, with market goods and costs, so as to ensure that society receives the maximum benefit from all its scarce resources whether marketed or not.

Articles in this Theme:

Estimating monetary benefits for environmental quality avoids several problems that often plague policy debates. First, valuation avoids the frequent false characterization of some polices as being a choice between "the economy versus the environment." Economic valuation of environmental quality demonstrates that the environment is a source of utility to people. Although environmental quality has some subtle differences from commodities because environmental quality is a public good rather than a private good, this should not obscure the fact that the environment is a source of economic benefit to people. Rather, the subtle distinction that the environment is a public good usually means that society cannot count on markets to provide economically efficient levels of the public good. For example, once the air is kept clean for one person it is available to everyone else in that town at no additional cost (i.e., air quality is nonrival). This feature makes it inefficient to charge additional people for consuming the cleaner air or to try to exclude nonpayers (which is often not technically possible for most public goods).

Second, environmental valuation often demonstrates that most public policies need not be "all or nothing." That is, the first few acres of wetlands protected probably have higher values for the ecosystem services provided than an additional acre of corn or soybeans in the Midwest. Finally, economic valuation of benefits and costs provides input to decisions makers on the question of "how clean is clean enough, how safe is safe enough?" Although economics should not be the final word on these important decisions, neither should the technical pursuit of purity overwhelm common sense. Beyond some threshold level of cleanliness or safety, additional cleanup or precautions cost society more than the value of the gain in safety. Diminishing marginal returns apply to safety or cleanliness too just as much as to fertilizer application.

However, without a common monetary metric to compare cost and benefits, it is difficult to know when we have reached that point of diminishing returns. Hence, the usefulness of valuation techniques is their ability to inform policy makers and stakeholders about how the benefits and costs change with different levels of food safety or water quality. With this information on economic efficiency, in conjunction with concerns about equity and distributional issues (e.g., environmental justice), policy makers can make more informed trade-offs.

But just how valuable is the economic valuation work of economists? Posed a different way, "Are the benefits of these studies, in terms of more efficient use of natural resources, worth the costs of these studies?" This is a tough question, one asked in many fields including weather forecasting and flood prediction. Given that policy decisions are (and should be) affected by many concerns besides economic efficiency (e.g., distributional equity, sustainability), it is rare to be able to point to any one information source in the policy process and say it was the definitive factor. Nonetheless, it would appear foolish to make million-dollar, and sometimes billion-dollar, decisions without carefully considering the full range of benefits and costs of the available alternatives.

Concepts of Nonmarket Valuation

The same concept of value used to value market goods is used to value nonmarket resources: willingness to pay. Price in the market is just willingness to pay for one more unit of the good. Without markets we do not have prices, but trade-offs that people make often demonstrate a willingness to pay. Nonmarket valuation is much like detective work in attempting to infer the monetary willingness to pay for environmental quality from bundled transactions such as home purchases, jobs accepted, or distances traveled for recreation. It is well accepted in real estate transactions that location matters. Part of that location is proximity to desirable environmental amenities (e.g., parks, good air quality) and distance from undesirable features (e.g., confined animal feeding operations). Because environmental amenities are scarce, buyers compete for houses with closer proximity to environmental amenities or higher levels of environmental quality, bidding up prices of these houses. Statistical analysis allows economists to disentangle the portion of the house price differential due to the location being nearby environmental amenities. This allows calculation of how much people have paid for the higher levels of environmental quality.

Recreational fishing and boating also provides a benefit to its participants. It is a benefit they would, if they had to, pay more for than the current nominal fishing license fee or boat launch fee. The fact that they do not have to pay "what the market will bear" results in the visitor retaining a "consumer surplus" as extra income in their wallet or purse. Much like irrigation water from publicly provided projects that is not sold at its market clearing price, neither is recreation, yet both have economic value greater than their administered prices.

In the case of recreation, economists rely on visitors' travel behavior to trace out a demand curve for recreation at a particular site. From the demand curve, we can estimate the additional amount a visitor would pay, if they had to, for continued access to the recreation resource. This actual behavior-based approach is referred to as the Travel Cost Method (TCM); discussed more in detail in Shaw's article in this issue. Because different visitors live at different distances from the site, the analyst can observe how the number of trips taken varies with variations in travel costs to the site. Essentially we observe spatially varying prices. Thus, the demand curve can be estimated by multiple regression using this cross-section data on travel costs (as proxies for price) and number of trips taken each season. By observing how recreation visitation changes with increased river flows, higher reservoir levels, and improved water quality, economists can statistically estimate the demand shifts for improved water resource conditions. From these demand shifts, the additional dollar amount a visitor would pay for the improved water resource condition can be calculated.

Recreation, however, is only half the story. Many individuals who may never fish or boat still receive some benefits from just knowing that free flowing rivers exist (Sanders, Walsh, & Loomis, 1990) or endangered species exist (Loomis & White, 1996). In these cases, all households would be asked to pay for protection of resources. Today, this is done in the form of a hypothetical referendum, where households are asked if they would vote in favor of a particular resource management action, if it costs their household $X. The analyst varies the monetary magnitude of $X across the households (some get a high amount, some get a low amount), so that a demand-like relationship can be traced out. From this demand curve, willingness to pay is calculated. This technique is commonly referred to as the Contingent Valuation Method (CVM). This survey-based approach can be used to value either recreation or existence values (often referred to as passive use values). Tom Stevens talks in more detail about these stated preference methods in the following article in this issue.

Agency and Court Acceptance of Nonmarket Valuation

Many federal and state agencies use nonmarket valuation to provide information on the economic benefits and costs when making natural resource allocation decisions. Beginning in 1979, Federal agencies such as the U.S. Army Corps of Engineers and Bureau of Reclamation were required to use the travel cost method and contingent valuation methods to value recreation benefits at projects with high visitation levels (U.S. Water Resources Council, 1979). During the 1980s, the U.S. Army Corps of Engineers published manuals on how to perform the contingent valuation method (Moser & Dunning, 1986). Today, the U.S. Bureau of Reclamation maintains a staff of several economists who are trained in and publish in the area of nonmarket valuation. Federal agencies such as the Environmental Protection Agency (EPA), which are required to conduct benefit-cost analyses of environmental regulations, frequently perform or rely upon existing TCM and CVM studies to provide estimates of nonmarket benefits. The National Park Service utilizes nonmarket values in its evaluation about whether to remove dams on the Elwha River that are blocking salmon migration in Olympic National Park (National Park Service, 1995) and in natural resource damage assessment.

When Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the U.S. Department of the Interior adopted CVM as a valuation method for valuing the loss in recreation and existence values from toxic waste sites and hazardous materials spills (U.S. Department of the Interior, 1986). Although industry challenged the use of CVM, the Court of Appeals upheld CVM, and ordered the Department of the Interior to broaden its use to measure existence values (what the court called passive use values) even when there was direct, on-site recreation use of the resource (State of Ohio vs. U.S. Dept. of the Interior, 1989). Consistent with economic theory, the court saw recreation use and existence values as additive.

The Exxon Valdez oil spill put CVM in the spotlight. When Congress passed the Oil Pollution Act of 1990, the responsible agency, the National Oceanic and Atmospheric Administration (NOAA), recommended CVM be used to measure both the recreation and passive use values lost due to oil spills. Given the controversy surrounding this, NOAA appointed a *blue ribbon* panel chaired by two Nobel Laureates to assess the reliability of the CVM for measuring passive use values. In its report in 1993, the Panel concluded that carefully designed and implemented CVM studies could provide estimates of passive use/existence values that would serve as a useful starting point for administrative and judicial decisions (Arrow et al., 1993).

Nonmarket valuation is not limited to federal agencies. Numerous state agencies use TCM and CVM for valuation of recreational fisheries and hunting. The states of Arizona, California, Idaho, Maine, Michigan, Montana, New Mexico, Texas, and Wisconsin (just to name a few) have all sponsored nonmarket valuation surveys resulting in TCM- and CVM-derived values for hunting and fishing in their respective states. The State of California used CVM and measurement of existence values for protecting Mono Lake as a bird habitat, but also for assessing the damages of oil spills.

Conclusion

What can nonmarket valuation contribute to better policy making? In some cases it can change the character of the debate from being "the economy versus the environment" to one of recognizing people care about the environment in the same way they care about market goods. In other situations, nonmarket valuation can bring balance to questions of "how safe is safe enough?" given scarce resources in society. What is the value of valuation? The value lies in providing a more complete accounting of the benefits and costs to all of the people. For *without* economic valuation, the predictions of the public choice economists are frequently realized: (a) those who would bear concentrated costs can block resource reallocations that benefit society as a whole, and (b) those few that stand to gain concentrated benefits can spread even larger costs out over millions of taxpayers. Valuation studies have the potential to provide an effective way to diminish the often bemoaned role of *special interests* in the current policy process. Although policy makers and society will often have other objectives in addition to economic efficiency, more informed trade-offs can be made between objectives if the benefits and costs of each alternative are known. Although it is true that *benefits and costs are not all that matter*, it is rare that *benefits and costs do not matter at all* to public decision makers and society.

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The Road Less Traveled: Revealed Preference and Using the Travel Cost Model to Value Environmental Changes

By W. Douglass Shaw

> *"So you see, this guy wouldn't bother driving all the way to that forest land and back if the value of his hiking experience there wasn't as least as big as his cost of doing that."*

In the early 1990s, a lot of environmental or resource economists found themselves saying something like the above to state and federal government officials, politicians, lawyers, physical scientists, and other noneconomists. They were, of course, trying to communicate the essential idea behind the values obtained with the travel cost model without exactly technically explaining what consumers' surplus is (hoping against hope that their audience would not be put straight to sleep!). The latter and complete explanation of and wrangling over consumers' surplus measures, which are essentially estimated maximum willingness to pay (WTP) or minimum willingness to accept compensation (WTA), often had to be done in the context of the politics surrounding controversial issues, and accompanied the boom period for large natural resource damage assessment (NRDA) cases in America, such as the Exxon Valdez oil spill. These types of applications are discussed a bit in the last portion of this paper, after the reader has had a chance to learn what travel cost modeling is all about.

The travel cost model (TCM), or recreation demand modeling approach, is a revealed preference method that fundamentally depends on observing actual behavior (trips taken over some period) rather than on answers to hypothetical questions. Let's say you just like to take a Sunday drive to look at the country, smell some fresh air, or whatever. Maybe this countryside view is of agricultural land and maybe there is a picnic area out there and you stop and enjoy the view and all the amenities while eating your lunch. Is that scenic drive and picnic worth something? Most certainly it is, or we assume you would not do it. Economists assume that a rational person evaluates the costs of the drive in gasoline and motor vehicle costs, along with the opportunity cost of time, as one could always be doing something else with that precious time. The essence of revealed preference is in making the choice to take the drive and get the benefits from the picnic, or not. It is one approach to valuing nonmarket goods.

In contrast, the stated preference valuation approach [e.g., contingent valuation method (CVM) questions] just asks how much people are willing to pay to restore resources to a healthier condition. This stated preference approach is easy for a noneconomist to understand, but revealed preference concepts are much less, so the TCM is indeed the less traveled road in nonmarket valuation. As I will demonstrate below, despite the simplicity of the CVM, many economists believe the TCM has some obvious advantages over often controversial stated preference approaches; perhaps we can most easily glean the truth in what we see people actually doing, not from listening to what they say they will do. In other words, the recall a person has for the trips she takes is perhaps not laden with as many difficulties that may underlie the answer to a valuation question.

> In a revealed preference valuation exercise, one examines the valuation of a resource by studying observed travel behavior and expenses or other forms of expenditures incurred in visiting and using the resource.

The idea for the TCM is not new. Its origin is in a letter from the economist Harold Hotelling, to the director of the National Park Service, in the late 1940s. Using the TCM, one can examine what people do and infer the value for a resource from observing their trips to and from recreation destinations. At first, economists wanting to implement Hotelling's idea simply collected information from automobile license tags, especially when the tag numbers and letters could be used to identify the state and county from which the driver came. With this information only, one could infer that at least one trip was taken from the country of origin, or *zone*, and the approximate distance the driver traveled could be estimated. Using an estimate of the per-mile cost of driving the automobile, the economists could then assign a cost to each trip coming from any particular county. This cost is assumed to be the price of that trip. This basic idea was used by many early travel cost modelers who applied data and actually estimated the value of recreation destinations.

Putting it simply, values from the TCM are extracted as areas under recreation demand functions, where the quantities demanded are trips taken to the recreation destination, be it a lake, river, or some public land, and the prices are basically measured using the travel costs incurred on the trip. With costs serving as trip prices on the vertical axis (see Figure 1) and trips on the horizontal axis, we see the trip demand curve. With enough data to provide variation in trip and cost combinations, economists can estimate the shape of the demand curve for something like the countryside area depicted above.

The TCM has come a long way since it was originally proposed by Hotelling. Early regional and aggregated travel cost models (those that used all of the reported trips from a county or origin zone) in vogue in the 1970s have almost completely been abandoned in favor of the individual-specific brand of models. Using more complete data collected

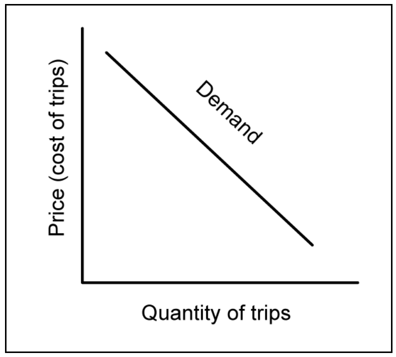

Figure 1. The trip demand function.

using mail or other kinds of survey questionnaires, economists model an individual's demand for one or perhaps many recreation destinations. Data on the time spent while traveling and at the recreation destination led to incorporation of time into recreation demand models by several scholars in the late 1970s. The exact role that time plays in travel cost models is still debated by recreation researchers today, but most agree it has an important one.

At about the same time as the work on time was underway (the late 1970s and early 1980s), two econometric models emerged that more carefully considered the nature of the recreation quantities, the trips, than the use of more basic econometric models would allow. To better handle substitution to other destinations, as well as properties of trips, some economists thought to use discrete choice modeling frameworks within a random utility model of recreation, similar to the way that many transportation economists were already using these models to estimate urban commuting trips. Their innovations led to many advanced statistical approaches. It is fair to say that TCM modelers can compete with almost any applied economist in the complexity of the micro-econometric modeling undertaken.

The travel cost approach certainly is not free from criticisms and I am quite supportive of well-done contingent valuation. To provide a balanced view in the context of valuation, first, it is probably much more difficult for the lay person to understand exactly where the benefits for the recreational resource come from in the application of the TCM, as opposed to the contingent valuation approach. A second point pertains to the recovery of the WTA, as well as the WTP using travel cost models. This can be done in theory, but differences can only be ascertained when the modeler incorporates income effects, which is very rarely done. I'll return to this below. In addition, it is only very recently that any economist has had the notion that revealed preference models can be used to uncover values that are not associated with actual use of the resource (e.g., nonuse or passive use/preservation values). Remember, there is nothing in economic theory that rules out the possibility that we might value the rural countryside even when we stop going to look at it. Though a recent paper suggests new thinking (see Herriges, Kling, & Phaneuf, 2004), all existing empirical estimates of nonuse values have relied on stated preferences for data, not revealed preference data collected in application of the travel cost model. Finally, the exact construction and definition of the ever-important travel cost variable itself is the subject of ongoing debate, particularly as it relates to the appropriate inclusion of time costs.

Some may say that many recreation demand modelers got obsessed with the little details of the travel cost models, econometric and otherwise (e.g., how components of the travel cost variable should be specified; what components can be ignored, if any; what the variance of the count data model is, etc.), in the past ten years or so. So, it is perhaps important to remember that the big attraction to using the travel cost model for environmental economics exists because of the very nice link between recreation and the environment. The hypothesis, which has typically not been rejected in empirical work, is that people who engage in all types of outdoor recreation activities care about environmental conditions. How do we use the TCM to value environmental changes on forests and other public lands? For example, how can the TCM be used to value a loss in agricultural and rural lands? The answer begins in the early 1980s, when a few economists thought to incorporate the use of recreation destination characteristics themselves, allowing estimation of demand and values for changes in those characteristics. We can consider open or green space acreage near the picnic area on our Sunday drive as such a characteristic.

The advantage of the characteristics approach over previous methods is that smaller and more well-defined changes could be examined than in models with no site characteristics. For example, rather than evaluating the addition of an entire new rural area, one could use characteristics in the modeling to evaluate the addition of a few acres of rural land or, conversely, the loss of such acreage. Other important resource characteristics might be acres of habitat for certain species of trees or a particular animal; any feature of public land that can readily be measured and quantified can be incorporated into a travel cost analysis.

Simplifying a bit here, one might think of the value for the environmental change as the area between two recreation demand functions, where a higher function is positioned (the demand is shifted out in Figure 1) because of an improvement in environmental amenities or characteristics at one destination. The TCM was used in the early 1980s to evaluate the change in characteristics at Colorado and Australian ski areas and the characteristics idea quickly caught on, and was applied to evaluate other environmental changes, in other contexts. For example, in my PhD dissertation I considered changes in catch rates for fish that might be affected by acid rain in New York's Adirondack mountains. Using Edward Morey's recreation share equation framework, I obtained consumers' surplus estimates calculated for those changes. Next, aside from making sure that data on these characteristics are collected, how does one really do this evaluation?

How to Evaluate Environmental Impacts or Changes

Return to the Sunday drive example presented above. If the *countryside* is at risk of being overrun with condominiums or other houses or buildings, maybe some will make this drive and picnic less, or not at all. How can we use revealed preference to evaluate the loss; should this happen?

As the above indicates, today's most popular specific travel cost methods are the random utility and count data approaches. Most modern TCMs can be used to evaluate the impact of changes in environmental quality on public and rural lands. [Note that the single-site Count Data TCM does not allow revealed preference estimation of the value for environmental changes unless there is a time series of observations because there is no variation in the environmental characteristic at one recreation destination, at one point in time.]

One can usually incorporate recreation destination characteristics that reflect environmental quality by using a model that allows estimation of multiple destination demands (or allows for the probability of taking a trip to more than one recreation destination, and therefore, of course, substitution between such destinations). For forested sites, the amount of total forested acreage, or the amount of acreage in specific species of trees, or in healthy or mature (e.g., *old growth*) acreage, might be used. For other types of land that involve species of wild animals (e.g., targeted species for hunters), the populations of these animals, or acreage of species habitat, might be used.

> Early applications of the travel cost model were to large-scale water projects proposed in the early 1960s, as the U.S. Bureau of Reclamation recognized that there could be recreational benefits accompanying their projects. Conversely, several prominent resource economists in the same era used the method to halt a dam being built on the Snake River, which would have eliminated white water recreation in Hell's Canyon.

The travel cost model is first estimated or calibrated using existing levels of characteristics (i.e., the acreage amounts that exist at each destination). Elasticity estimates can be calculated for any model, though in some cases these are a bit complicated to calculate. After econometric estimation of parameters, formulas for most measures of consumers' surplus can be derived, programmed, and calculated. Using these formulas, one might, for example, estimate the maximum willingness to pay for, or minimum willingness to accept, a change in the characteristics. There is no difference between these when income effects are not present in the model, as in the case of underlying utility functions that are linear in income. However, I can think of many situations where we might suppose that income effects are important, as in evaluating whether low income groups would have the same values for resource changes as high income individuals; think of the urban poor trying to get to a picnic in the rural countryside, versus the wealthy individual who owns a second home in that countryside area.

Suppose the demand for rural areas is shown to be positively related to the amount of bird habitat available on them. The WTP or WTA can in theory be estimated for, say, a one-acre or any acreage increase in the size of this habitat at one or more such parks. Using computer code, one can adjust the original levels of characteristics and use the formula to determine the monetary equivalent of the change in utility that corresponds to this change. In this way, respondents are not asked, at least in strict revealed preference modeling, to state their values for the environmental change.

The volume of travel cost literature is now fairly substantial, although these papers are not as numerous as the ones that apply the contingent valuation approach. Early applications of the TCM (those in the 1970s) most likely do not value environmental changes, but many recent ones do. I suspect, though I have not accurately counted, that most values in the TCM literature are for changes that pertain to aquatic resources: changes in catch rates for species in rivers, or more likely, for lakes that might be the result of environmental improvement or damage, or changes in water quality. That is probably because of the fact that readily available data accompanied the evaluation of controversial water projects in past years. Still, the TCM has been applied to obtain estimates for the value of the more unusual activities of rock climbing, mountaineering, and mountain biking.

Again, perhaps of more interest to readers here, are possible changes affecting public or rural lands, as it is well known such lands are shrinking. Estimates of recreation-related value for changes on forested lands are already in the literature, including recent efforts by some economists to value protection against the risks associated with forest fires, but other estimates need to be obtained for activities such as bird-watching, taking a simple walk. or having a picnic.

The Challenges and the Road Ahead

While stated preference approaches came under vicious attack in the 1990s, raising the cost of doing such studies and perhaps ultimately causing many trustees to shy away from rigorously pursuing NRD cases today by using state-of-the-art valuation approaches, the travel cost method was less objected to by these same parties and their economists. In fact, a recent winner of the coveted Nobel Prize in Economics, and an economist who more or less worked for Exxon in the Exxon Valdez case, coauthored and published a paper in 1995 (see Hausman, Leonard, & McFadden) that uses the travel cost approach to evaluate oil spill impacts. (This TCM study is less known about than the fact that CVM studies played a big part in the Valdez case. The technical approach was essentially the same as that used earlier by other authors. Interestingly, this other paper was published in 1994, in the *Canadian Journal of Agricultural Economics* – see Yen & Adamowicz). Another interesting development in the recent literature is the blend of stated preference and revealed preference within the overall TCM framework, allowing formal tests of validity for the stated preference data. Intuitively, think of it this way. Suppose we ask an individual to provide her stated intentions regarding trips in light of a fixed resource or environmental change. Then, suppose we also develop the TCM in such a way that this change can be incorporated. We can use the revealed preference framework to provide checks on the validity of the stated, intended trips.

As I suggested above, there are many issues in travel cost modeling that remain rather thorny ones. With certainty, there will be many more PhD dissertations that push econometric frontiers, seeking the most elegant way of using various types of data. And, applications of the TCM to activities and geographical areas (particularly in other countries, where there are few or no applications), for which there are no estimates, will broaden what we know about these activities in other countries.

The road ahead is really many roads (see the Introductory and other chapters in Hanley, Shaw, & Wright, 2003). I think one very attractive avenue of research involves integrating recreation demand models into larger or more general equilibrium models. For example, one of my former colleagues integrated demands for lakes into his computable general equilibrium model and was able to link changes in water quantities with changes in the demands for local goods and services. This has also been done by economists at New Mexico State and elsewhere, in efforts to assess climate change impacts. There is no reason why this cannot be done with other large scale environmental changes that impact rural and public lands.

Another future interesting avenue involves risky changes. Most everything discussed above assumes that changes are going to happen, or not, with certainty. Alas, much of the world isn't operating in this simple manner. There is often a good deal of uncertainty attached to any event being contemplated, or to any policy-relevant change. Uncertainty can be incorporated into recreation demand models to handle things like uncertain concentrations of toxic chemicals, or the health risks that stem from these chemicals. Perhaps taking a hint from a PhD dissertation at the University of Maryland many years ago by Doug Larson, economists have begun to look at people who do risky sports, specifically with the risks they take in mind. Others have also recently examined the risks associated with eating contaminated fish and the role that fish consumption advisories play. Still others have incorporated risks into hunting via the lottery that big game permits often involve and I am sure that others will join in and do some work along these lines.

Last, big and high profile NRDA cases do not seem that commonplace in the United States today, with the exception of a few cases, such as the State of New York's suit against various polluters of the Hudson River. Today the CVM appears to be an approach abandoned by federal agencies that are supposedly trustees of public resources, in lieu of such approaches as habitat equivalency and restoration cost analysis. But the TCM played an integral role in settlement of damages resulting from mining wastes in the Clark Fork Basin of Montana (the nation's largest Superfund site), and as shown above, in the Exxon Valdez case. Perhaps federal agencies will have cause to use the TCM again in future cases.

Much less contentious arenas than NRDA exist where the calculation of the loss or gain of benefits from use or preservation of public and rural lands is nevertheless still very important, and here again the TCM can be applied to obtain values. Obvious situations involve many resources: the growing use of rural land for housing developments; generally shrinking agricultural and undeveloped lands and diminished animal habitat; siting nuclear and other unwanted industry and household wastes, and other conflicts between urban and nonurban or undeveloped lands. In the case of all lands under federal jurisdiction, proposed projects require a formal assessment of the change in economic benefits that would accompany project implementation. These assessments stem from presidential executive orders or federal regulatory statutes.

In other, less formal situations, the public may simply wish to be informed of the magnitude of their dollar loss or gain. Many environmental economists believe that, failing such calculations, the winners will be those real estate and business developers with the usual claim "look how many jobs we will create." Of course our calculations might also demonstrate that such development is warranted.

The calculation of losses or gains with changes in environmental conditions on public lands will no doubt be increasingly important as growing populations put pressure on such lands. The once vast and open spaces of the West and elsewhere are smaller, and increasingly, people in large urban centers rely on only a small amount of public land to recreate and enjoy rural amenities. One stone still largely unturned in use of the TCM relates to handling congestion effects in revealed preference models, and congestion will likely become even more important at recreational resources in close proximity to heavily populated areas (i.e., does one even want to go to California's Yosemite Valley on a crowded Saturday in the summer?). Work on recreation demand modeling will continue in hopes of answering such questions, often through generations of economists that can be traced back to some of the pioneers.

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cultural Economics, Texas A&M University, College Station, TX. The author acknowledges two anonymous reviewers' helpful comments in shaping this manuscript, as well as many, many years of discussion and collaboration on recreation demand modeling with influential colleagues and friends including Bob Berrens, Joe Cooper, John Duffield, Mark Eiswerth, Peter Feather, Therese Grijalva, Michael Hanemann, Nick Hanley, Paul Jakus, Doug Larson, John Loomis, Frank Lupi, Edward Morey, Dan Phaneuf, Kerry Smith, Rich Woodward, and Steve Yen. I apologize if I left anyone out that should be on that list.

CHOICES
The magazine of food, farm, and resource issues
3rd Quarter 2005 • 20(3)
A publication of the American Agricultural Economics Association

Can Stated Preference Valuations Help Improve Environmental Decision Making?

By Thomas H. Stevens

Decisions about preservation, protection, or development of environmental "commodities" like ground water, atmospheric visibility, open space, wildlife, wetlands, and forests are often made without good information about the value of preservation relative to the cost. Clearly, the economic cost of preservation is often substantial. The cost of preserving wildlife habitat, for example, often totals thousands of dollars per acre. Difficult choices must be made because protection of habitat for one species may mean less money available to restore habitat for another.

In order to make good choices, better information about the relative value of competing uses is necessary. But, much of the economic value derived from preservation of natural environments falls outside the normal workings of the market. In fact, research suggests that most of the value of preservation is often existence (or passive use) value that can only be measured using contingent valuation, CV, or related stated preference methods (see Loomis, 1996a).

Stated preferences are also important in making decisions that do not involve existence values. Consider the problem of food safety. The potential benefit of irradiated meat and poultry, for example, is likely to be significant because this process reduces the probability of illness caused by salmonella and other pathogens. However, since irradiated meat is not generally available in the market, stated preference techniques offer an effective way to gauge consumer acceptance and willingness to pay for irradiation.

Regardless of application, all stated preference techniques employ a survey instrument in which a hypothetical market for the item being valued is created. This market describes the item, reasons why payment is needed, and a payment vehicle. In the traditional contingent valuation approach, survey respondents are typically asked about the amount they are willing and able to pay for the commodity being valued. Other types of stated preference analysis like conjoint and contingent choice also employ a hypothetical market, but respondents are asked to rank, rate, or choose among "commodity packages" that typically contain several attributes, including price (Louviere, Henscher, & Swait, 2000).

> In a stated preference valuation exercise one asks people, within the context of a hypothetical market, how much they are both willing and able to pay for commodities like clean water that are not valued in the marketplace.

Applications

One measure of the importance of stated preferences, SP, in decision-making is the extent to which this method has successfully been used for that purpose. A review of the literature indicates that SP has been used for more than 40 years and during this time well over 2,000 SP studies have been conducted (Carson, 2000). This method has been applied to a wide range of real world problems including water quality, wilderness and wildlife preservation, air quality, health care, and food safety. And, as noted by Carson, most modern SP studies are undertaken for the purpose of policy evaluation. Many federal and state agencies, foreign governments, and international organizations like the World Bank are now using SP. For example, an online nonmarket valuations database, EVRI, has been constructed by Environment Canada in cooperation with the US EPA and others to assist policy makers. As of March 2005, this database contained 757 stated preference studies, of which 290 focus on economic values associated with environmental commodities (www.evri.ca/english/tour.htm).

Perhaps the most widely known application of SP was the Natural Resource Damage Assessment of the infamous 1988 Exxon Valdez oil spill. Since that time, the demand for SP as a tool for assessing natural resource damages has increased dramatically. Within this context, it is important to note that the courts have upheld the use of contingent valuation in damage assessment and that both the "superfund" and the Oil Pollution Act of 1990 allow for recovery of lost passive use (existence) values.

SP is also playing an important role in policy making with respect to pre-market goods, food safety, certification, and labeling (Cameron & James, 1987). Fox, Shogren, Hayes, & Kliebenstein (1998) examined consumer willingness to pay for irradiated pork, and Shogren, Fox, Hayes, and Roosen (1999) found that about 30% of SP survey respondents would pay a 10% premium for chicken breasts irradiated to reduce the risk of food-borne pathogens. It is interesting that male participants were willing to pay less for irradiated chicken than women and that households with children under 18 years old were less likely to buy irradiated chicken.

In a more recent SP study, Fox, Hayes, & Shogren (2002) examined how consumers responded to alternative descriptions of irradiated pork. Favorable descriptions of irradiation increased willingness to pay and unfavorable descriptions decreased willingness to pay. But, when given both favorable and unfavorable information, consumers gave the unfavorable description more weight and willingness to pay decreased. This pattern is consistent with the concept of loss aversion and alarmist reactions, and seems very relevant in light of recent controversy about food safety.

Contingent valuation studies have also influenced decisions about the reintroduction of Gray Wolves to Yellowstone National Park and salmon restoration in New England. The net economic value of Gray Wolf reintroduction to Yellowstone National Park was estimated to total between 6.6 and 9.9 million dollars per year. This value, which consists entirely of existence value, represented between 22 and 29% of the estimated total economic impact associated with wolf reintroduction (USFWS).

The stated preference method was first used in 1963 to value hunting in Maine. Since then, stated preference valuation has become very popular, in part because it is the only method that can measure so-called passive use or existence values like the value of simply knowing that a particular natural resource exists. However, it is the most controversial of all nonmarket valuation techniques.

Atlantic salmon were virtually extinct in southern New England by the early 1800s. The Anadromous Fish Conservation Act (PL89-304) provided federal funds for salmon restoration, and the first Atlantic salmon to return to this region was spotted in 1974. Since then annual returns have ranged between 100 and about 500 per year and critics of the restoration program have noted that the cost of returning salmon is about $3,000 per pound. However, it turns out that Atlantic salmon produce substantial existence value. SP studies suggest that this value is about 16 million per year for residents of Massachusetts and as much as 81 million dollars per year for New England as a whole. The latter value is about twice that of annualized restoration program costs.

The Elwha River Restoration Project (ERRP) in Olympic National Park is another example where existence values played an important role in decision-making about wildlife. This study included estimates of nonmarket benefits associated with dam removal and salmon restoration. An SP survey asked each respondent if they would vote in favor of an increase in federal taxes over a ten-year period to remove two dams and restore both the river and fish populations. Results for the US totaled about 6.3 billion dollars per year; an amount that substantially exceeds market benefits, as well as program costs (Loomis, 1996b).

Other applications of SP focus on environmental quality. For example, Krupnick and Portney (1991) used willingness to pay data to evaluate the health benefits of reducing volatile organic compound emissions. Since considerable debate surrounds the problem of atmospheric pollution and visibility in wilderness areas and national parks, several SP studies of the value of visibility have been conducted (Smith & Osborne, 1996). One of the most recent (Halstead, Stevens, Harper, & Hill, 2004) examined the relationship between electricity deregulation and willingness to pay for atmospheric visibility in the Great Gulf Wilderness in New Hampshire's White Mountains. Visibility in this area is now about one-third of natural conditions, and visibility may get worse with electricity deregulation if consumers switch to lower cost coal fired generation. The SP question in this study presented each respondent with two pictures. One picture represented the status quo visibility, while the other represented reduced visibility with an option to pay a higher electricity bill to avoid this loss in visibility.

The stated preference methodology has also made important contributions to public policy about groundwater contamination. A Meta analysis of SP studies of the value of ground water protection suggests

that SP value estimates are appropriate measures of economic welfare for use by the US EPA in the design of policy (Boyle, Poe, & Bergstrom, 1994).

From a much broader perspective, SP has been frequently used to value entire ecosystems and wilderness areas. One recent example is a study of National Parks in Portugal (Nunes, 2002). Photo simulation was used to show alternative development/preservation scenarios and a total of 28 survey versions were used to test for effects of information, payment vehicle (a national tax or voluntary contribution), and level of park protection. SP has also been successfully applied to the problems of rain forest preservation, biodiversity, ecosystem management of forestland and wilderness, and open space preservation.

In addition, many applications of the SP method have assisted policy makers faced with local as opposed to regional or global concerns. Examples include analysis of black fly control in Maine, control of noxious weeds in national forests, reduction of fire hazard to old growth timber, urban quarry reclamation, beach quality, kayaking and whitewater rafting, rock climbing, and aircraft noise control.

Assessment

SP has become widely used in policy analysis, in part because it is the only technique that can measure existence value and nonmarket values associated with new policy initiatives. Many of the potential problems initially associated with SP have been overcome. However, this technique is still somewhat controversial; we cannot always be certain of the accuracy of SP value estimates since SP surveys are hypothetical in both the payment for and provision of the good in question. The presence of this so-called hypothetical bias is well documented in both laboratory and field settings. Meta analysis conducted by List and Gallet (2001) and by Murphy, Stevens, Allen, and Weatherhead (2005) suggests that mean hypothetical values are about 2.5 to 3 times greater than actual cash payments. Unfortunately, although this bias is well known, its underlying causes are not well understood. Possible reasons for hypothetical bias include lack of consequence associated with an individual's response, desire to increase the likelihood that the good is provided at little or no personal cost, and respondent uncertainty or ambivalence. Of particular concern is that hypothetical bias is associated with private as well as public goods, and this suggests that the underlying causes of hypothetical bias may be quite complex.

Although the exact nature and cause of this bias remains unknown, several promising techniques have recently been developed to adjust for it. Of these, uncertainty adjustment appears to offer considerable promise. This approach assumes that those who are uncertain about their "yes" response in a hypothetical setting are likely to respond "no" when confronted with a real payment situation. Although validity tests indicate this assumption is often reasonable, determining the exact level of certainty to use seems to vary with the nature of the public good. An alternative approach pioneered by Cummings and Taylor uses "cheap talk" to reduce hypothetical bias. This approach entails reading a script that explicitly highlights the hypothetical bias problem before participants make any decisions. Although cheap talk may sometimes eliminate hypothetical bias, recent research suggests that it may only do so for respondents facing relatively high payments (Murphy, Stevens, & Weatherhead, 2005). Consequently, research associated with the problem of hypothetical bias continues and policy makers are advised to exercise caution in application of SP results when many respondents are uncertain.

Another unresolved issue from the perspective of policy analysis involves the interpretation of SP responses. Several studies have suggested that some respondents fail to make meaningful tradeoffs. These individuals may, for example, refuse to make tradeoffs between money and wildlife on the basis of ethical or moral grounds. Yet, these same individuals often appear to place a very high value on wildlife preservation. Others may base payment decisions on the notion of paying their *fair share* instead of what the commodity is really worth to them. Another potential problem is that some respondents may be paying for something other than what is being valued. When asked to pay for atmospheric visibility, some individuals appear to be paying for environmental quality in general. And, some may simply be paying for a *good cause* when the cause itself does not really matter to them.

Another concern is that since the various stated preference methods differ in several respects, value estimates may vary depending on which technique is used (Stevens, Bellner, Dennis, Kittredge, & Willis, 2000). For example, the hypothetical market in conjoint analysis focuses on the various attributes and characteristics of each commodity, substitutes are made explicit and in comparison with the traditional CV approach, respondents can express ambivalence or indifference directly. Moreover, from a psychological perspective, the process of making choices in a conjoint format may be quite different from that associated with making decisions about willingness to pay in a traditional CV setting. As a result, several studies suggest that there may be substantial differences in value estimates depending on the type of stated preference methodology that is used (Stevens et al., 2000).

Yet, despite these problems, CV is the only method that can measure both existence values and the impacts of policy that has not yet left a significant trace in the marketplace. CV has been subjected to intense scrutiny by industry, academics, government agencies, and the courts. The accumulated evidence clearly suggests that CV is a very useful methodology for decision-makers. This is especially true in making assessments between potential policy alternatives before any policy commitment has been made. For information to be of use in real world policy making, decision makers need to know the likely economic effects of a policy change before they occur. That is, the policy change comes first and changes in economic behavior follow. In such situations, it is difficult to use valuation methods based on observations of actual behavior such as travel costs or avoidance cost, because the policy is intended to change behavior. In evaluating these new policies, or in cases where existence values are likely to be significant, stated preference methods are of particular importance to decision makers.[1]

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CHOICES
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3rd Quarter 2005 • 20(3)
A publication of the American Agricultural Economics Association

Benefit Transfer – The Quick, the Dirty, and the Ugly?

By Richard Ready and Ståle Navrud

"But if you miss, you had better miss very well."

Tuco: "The Good, The Bad, and the Ugly" (1966)

Consider the problem faced by the U.S. Federal Government. According to Executive Order 12866, executive agencies must evaluate the benefits and costs from every economically-significant regulatory action. In fiscal year 2003/2004, seven regulatory impact analyses were completed for regulations proposed just by the Environmental Protection Agency (EPA). In just one of those analyses, for new regulations on nonroad diesel engines, the EPA assembled estimates of the benefits associated with decreases in the numbers of premature deaths, nonfatal heart attacks, chronic bronchitis, asthma attacks, hospital visits, and lost work days, in addition to estimates of benefits associated with reductions in agricultural crop damage and improvements in visibility.

Similarly, the Forest Service needs estimates of ecosystem values for use in forest planning; the USDA needs estimates of environmental benefits from the Conservation Reserve Program; and the Army Corps of Engineers needs estimates of recreation values for designing management plans for its reservoirs. These agencies need information on benefits and costs of hundreds of environmental goods and services in thousands of different locations. There has been remarkable progress in developing methods for estimating these unpriced values; these methods are discussed in the two companion articles to this one.

However, it is simply not practical to conduct an original stated or revealed preference research study for each environmental good in each location every time a new policy analysis is conducted. Nor is it really necessary. If someone has already conducted a study that valued a day spent fishing on a small lake in Tennessee, the Army Corps may be able to use that number to value a day spent fishing on a small lake in Kentucky. If someone has already estimated the value of a reduction in cancer risk from decreased exposure to dioxin, the EPA may be able to use that number to value a reduction in cancer risk from decreased exposure to benzene. These are examples of *benefit transfer.*

The term benefit transfer refers to the case where information on the value of environmental goods and services generated in one context is used to value similar goods and services in a different context

The Quick, the Dirty

The terminology used in benefit transfer studies traces back to its early use in recreation applications. In the Army Corps reservoir example given above, the Tennessee lake where a primary study was conducted is called the *study site*, while the Kentucky reservoir, where the information is used for policy evaluation, is called the *policy site*. The study site/policy site terminology is now used even when the good is not provided at a distinct site.

Benefit transfer is widely used by government agencies because it is quicker and cheaper than conducting original studies every time a benefit estimate is needed. In some cases, benefit transfer is relatively straightforward and even familiar. When the Federal Highway Administration evaluates the time-savings benefits from new highway construction, it does not conduct original research on the value of travel time for every new highway. Rather, it uses per-hour values based on previous studies. Guidelines issued in 1997 suggest a value of $11.90 per hour for intercity personal travel, for example. When the EPA values a decrease in mortality risk from an improvement in air or water quality, it does not conduct original research for each mortality risk. Rather, it uses estimates of the value of a statistical life (VSL) based on previous studies.

In the nonroad diesel rule analysis, a VSL of $5.5 million was used.

These are both examples of a benefit transfer technique called *unit value transfer.* This approach is best suited for situations where the projected impacts of a policy can be measured in fairly homogeneous, divisible units (hours of travel time saved, premature fatalities avoided). A constant benefit value is used per unit of the unpriced good, based on one or more previous valuation studies for that good. Ideally, a unit value is used that was estimated at a study site similar to the policy site. An estimate from a study site located close to the policy site is also generally preferred, to minimize differences between the population of users at the study site and at the policy site. For example, the US Forest Service uses region-specific unit day recreation values as part of their mandated periodic Renewable Resource Planning Act (RPA) Assessment.

The use of unit values may be justified for valuing health impacts, transportation improvements, and some types of outdoor recreation. These are goods that we tend to think of as being more or less homogeneous across users and across policy contexts. Where benefit transfer becomes more difficult is where the context of the good at the policy site differs from that at the study site, either with regard to the attributes of the good being valued or the population enjoying the benefits. An acre of wildlife habitat in Utah is very different from an acre of wildlife habitat in Pennsylvania, and the values generated will likely differ as well.

Value function transfer has the potential to improve the performance of benefit transfer in situations where the good or the user population differs between the study site and the policy site in measurable ways. In this approach, a value function is first estimated at a study site or group of sites. A value function predicts the value of a good as a function of its measurable characteristics (quantity and quality), those of its users (income, etc.), and the context within which the good will be provided (availability of substitutes, etc.). In principle, the value of the good at any policy site can be determined by plugging in the relevant measures for that site. Some have argued that the form of the value function should be motivated by economic theory (Smith, Van Houtven, and Pattanayak, 2002), but more typically it is chosen in an ad hoc manner in an attempt to maximize goodness of fit.

One example of a simple value function is the Army Corps of Engineers' point system for determining user day values for recreation at Corps facilities. Points on a scale from 0 to 100 are awarded for the quality of the site, the number and types of activities enjoyed at the site, and the availability of substitutes for the site. In 2002, user day values ranged from $2.90 for general recreation with low point values to $34.41 for specialized recreation with high point values. Value functions will more often include objective measures of the quality (e.g., catch rate, reservoir size) and measures describing the population of users (e.g., income, travel distance to the site).

Value function transfer will work well only if a) there is sufficient variation at the study site in the attributes of the good, b) there is sufficient variation at the study site in the attributes of the user population, c) the attributes of the good and the population at the policy site fall within the range of the original data at the study site, and d) preferences for the good are similar at the study site and the policy site. One challenge to conducting value function transfer is that original valuation studies are often conducted in a limited geographic area, and important attributes of the good or the population may not vary within an individual study. However, by combining results from several original valuation studies, a value function can be estimated based on a richer set of goods and user populations. In a *meta-analysis*, value estimates are combined from several different studies. A value function is estimated with these value estimates as the dependent variable and with characteristics of the good, the population of users, and study methodology as the independent variables. For goods where a large number of source studies are available, meta-analysis has the potential to provide value functions that can be applied in a wider range of situations.

While benefit transfer typically tries to tailor value estimates to the policy site's good and population, in some situations it may not be desirable to adjust values to individual contexts. Even though there is some limited empirical evidence that willingness to pay to reduce mortality risk decreases somewhat with age, the EPA chooses to apply a constant VSL regardless of the population at risk. There are important ethical considerations when values are adjusted for age, income, or ethnicity, particularly if those values are used to set policy or to direct resources.

Benefit transfer is clearly feasible only if a study already exists that valued a good similar to the good in question. The analyst must assess the quality of the existing study or studies, and decide whether the good valued at the study site(s) is similar enough to the good at the policy site. The Office of Management and Budget, in its guidance to executive agencies on conducting regulatory analyses (OMB, 2003) provides a common-sense set of criteria that must be satisfied when choosing a source study.

The task of finding a suitable source study has been simplified for analysts with the recent creation of databases of previous valuation studies. One of the most comprehensive is the Environmental Valuation Reference Inventory (www.evri.ca) maintained by Environment Canada with support from the United States, Great Britain, and France. Even with such databases, a common problem is lack of documentation in the source studies. Often, this is due to the difference between the information that journal reviewers are looking for and the information that policy analysts need to conduct benefit transfer. For example, a researcher publishing a hedonic pricing analysis will always present the estimated house price function, but might not always report the average house price in the dataset. That kind of information is critical, however, when using that study in a meta-analysis or a benefit transfer.

...and the Ugly?

The conventional wisdom is that benefit transfer is inherently inferior to conducting original studies, but that it is a necessary evil given time and budget constraints. The concern is over *transfer error*, defined as the difference between the transferred value estimate and the true (unknown) value estimate at the policy site. Several studies have assessed the validity of benefit transfer by comparing value estimates between two sites, asking the question, if one of these sites had been used as a study site in a benefit transfer for the other site, how large would the transfer error have been? These studies typically test the validity of benefit transfer in three ways. First, the values estimated for the imagined study site and the imagined policy site are compared, to see if they differ statistically. Second, value functions are estimated at each site, and the validity of a pooled model is tested. Third, projected transfer error is calculated as the absolute value of the percent difference between the value transferred from the imagined study site and the value estimated at the imagined policy site.

The first two validity tests are often rejected. That is, it is common to find statistically significant differences between the unit values estimated at two sites and between value functions. While negative results for these tests are informative, they are not necessarily fatal to benefit transfer. With enough data, statistically significant differences can be found even where the values themselves are quite similar. From a policy perspective, the size of the potential transfer error is much more important than statistical convergence.

Regarding the size of the potential transfer error, these studies often find average transfer errors of 40 or 50%, but with a wide range that can span from zero percent to several hundred percent for individual transfer exercises. While generalizations are difficult, there is some evidence that transfer errors tend to be smaller when the two goods are located in the same geographic region (Rosenberger and Phipps, 2001). This may be because the goods themselves are more similar, or it may be because the user populations are more similar. Interestingly, the evidence that value function transfer outperforms unit value transfer is mixed at best. Some studies find an improvement in performance, others do not.

It is important to realize that transfer errors calculated in these validity studies are artificially inflated because the criterion (the value at the policy site) is not perfectly known. Calculated transfer error is the sum of actual transfer error and error in the criterion. Suppose a good has the same value, \$100, at two different sites, and that each of the values are estimated at with a standard deviation due to sampling error of \$20. A validity test of benefit transfer between these two sites will show an average transfer error of 24%. Compared to this "best case" expected transfer error, an observed transfer error of 40% is not that bad.

...Compared to What?

So does benefit transfer work or not? That question raises two more questions. First, how large of a transfer error is acceptable? Second, compared to what?

The answer to the first question depends both on the reason for doing the policy analysis and on the degree to which the value estimate is decisive. Some valuation situations require high precision and reliability. A good example is resource damage assessment, where a responsible party has to write a check based on the value estimate. In contrast, a higher level of uncertainty in the value estimates is probably acceptable when conducting a regulatory impact analysis for a regulation that is mandated by law. Further, the larger the value, both in absolute terms and as a proportion of the total benefit from the policy, the more important it is to get the right number. Finally, value estimates must be more reliable if their uncertainty could potentially tip the balance in favor of or against a proposed action.

With regards to the second question, the uncertainty introduced by benefit transfer may not be large relative to other sources of uncertainty in the value estimates. Estimated values of the same good measured using stated and revealed preference techniques can vary by an order of magnitude. Even within a given technique, research design decisions such as question format or the functional form used for data analysis can have dramatic impacts on value estimates. Indeed, meta-analyses often show that research design features are more important in explaining variation in values than attributes of the goods or the population of users.

The conventional wisdom that an original study is always preferred to a benefit transfer needs to be reexamined. While the potential exists for very large transfer errors, original studies have their own potential for problems. A thoughtful, carefully executed benefit transfer from a high quality, large-sample study conducted at a similar site, or a set of studies conducted at multiple sites, is probably preferable to a small-sample, rushed original study conducted at the policy site.

Nor should the choice between benefit transfer and conducting an original study be necessarily viewed as an either/or choice. Where information on the value of similar goods is available, but there is concern that the value at the policy site may be unique, a Bayesian perspective can be adopted. Value estimates or functions from existing studies can be used to form a prior distribution on the value of the good at the policy site. Valuation research conducted at the policy site provides new information on the value of the good. An updated distribution of the value of the good at the policy site contains information from both previous studies conducted at other sites and from the new research conducted at the policy site. A Bayesian perspective also suggests that the decision whether to conduct original research at the policy site, and if so how much, should be made based on the expected value of the information to be gained and the cost of conducting new research.

Does benefit transfer work? Should we be doing it? The answers to these questions are similar to the answers for nonmarket valuation more generally. Benefit transfer, if done carefully using appropriate sources for the transferred values, can work quite well. However, it can perform very poorly. The same can be said for nonmarket valuation in general. A more constructive discussion is over how to improve benefit transfer protocols and minimize the potential for large transfer error.

And the decision whether we should be doing it has already been made. Federal agencies routinely use benefit transfer to conduct regulatory and program analyses because they have to. If the values of most environmental goods and services are going to be included in these analyses, then they will have to come from benefit transfer. There is not enough time or resources to conduct original studies for each policy analysis. The choice is not between benefit transfer and conducting original studies. The choice, in many cases, is between conducting a benefit transfer and not including any estimate of the benefits from environmental goods and services.

How can benefit transfer be improved? First, the single most important action to improve benefit transfer is to increase the stock of high-quality original valuation studies. With the exception of some types of outdoor recreation and some types of health impacts, the set of available studies for most environmental goods is thin. Second, these studies have to be made available to analysts. Databases like EVRI can serve an important role. Third, the authors of new original studies need to report more details about the methods, data and the good valued. Academic journals tend to discourage publication of study details that are not central to the methodological or theoretical contribution of the research. There have been calls for a new publication outlet, perhaps an online journal, to serve as a repository for this kind of detail. Fourth, the analyst conducting benefit transfer has an obligation to document and justify the assumptions and protocols used. Just as original nonmarket valuation studies must be accompanied by enough documentation to allow judgment of their validity, so too must benefit transfer exercises be transparent and fully documented.

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For More Information

The literature on benefit transfer begins in earnest with a collection of papers organized by David Brookshire and published in the March 1992 issue of *Water Resources Research*. Desvousges, Johnson, and

Banzhaf (1998) provide an in-depth exploration of benefit transfer protocols, with particular attention to a case study estimating externalities from electricity generation. Rosenberger and Loomis (2003) provide more of a how-to treatment of benefit transfer. Navrud and Ready (Forthcoming) assemble several studies demonstrating current state of the art in benefit transfer.

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