THE ROLE OF THE ECONOMIST IN ENVIRONMENTAL ISSUES

Uses and Abuses Of Benefit Cost Analysis

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The greatest contribution that the discipline of economics has made toward the study of the environment has been the development of the benefit cost analysis. Benefit cost analysis is used in both economic fields focusing on the environment: natural resource economics and environmental economics. Why is benefit cost analysis important? It is primarily because resources held in common induce poor human behavior. The costs associated with the use of shared resources aren't measured in the market and a tool is necessary to determine their value.

Upon first introduction, benefit cost analysis would appear benign; however, it is surprisingly and interestingly controversial. Before examining the controversy, an elementary overview of the role of an environmental economist is useful.

Environmental economists study how societies and individuals use and allocate valuable resources that the earth has provided. They examine activity that affects the environment. The discipline of economics has two fields dedicated to the study of the environment. Environmental economics applies the principles of both macro and micro economic fields to study optimal uses of common resources. Environmental economics studies the impact of economic activity on safety,

health and the environment. Economists also study natural resource use. Natural resource economics determines optimal use of renewable and non-renewable resources in the process of production. The environment is a special good in economics that is called a common resource. Economists classify goods according to two basic qualities: excludability and rivalry.

Excludability simply means can you prevent consumers from benefiting from the good. There are a number of goods where this is difficult, if not impossible. One such example is national defense. It is hard to prevent the benefits of that service from reaching everyone within the nation. Non-excludable goods make private market provision impracticable. If someone is to receive the benefit of the good regardless of whether they pay or not, why would that consumer pay for the good? Typically we turn to the government for provision of goods that exhibit the non-excludable property, because government has the ability to force payment whether a consumer "uses" the good or not (welfare, Medicaid, or national defense).

The other classification is rivalry. Rivalry refers to the fact that if some goods are used, there is less of the good available for others. The environment exhibits characteristics of non-excludability; however, the environment is a rival good. If fish are taken from the ocean, for example, there are less fish available for others. Goods that are non-excludable, but rival, are known as a common resource. If a common resource is not regulated, consumers can benefit without paying for the good and their consumption leaves less for others.

The heart of the economic approach to studying the environment is the recognition of the special properties of common resources and publicly provided goods. Public provision means a decision must be made on how much to spend on public projects and which public projects to undertake. The fact that the environment is a common resource means that there will certainly be a tendency for the public to 'overuse'

the resource, to get all that they can for their own personal gain. Some type of limitations must be imposed on use.

When firms consider the provision of a new product in the market, they undertake some form of profit and loss analysis. The firm estimates sales and revenue. They estimate the costs of production. Together this information leads them to a decision on whether this new venture is an opportunity that deserves the use of their resources. Is this the opportunity from which the firm stands to gain the most in the form of profits?

When an individual or household is presented with various options to enhance its satisfaction, each option with a unique price tag, the individual or household can evaluate the alternatives and make a decision. Is the expenditure justified in terms of the amount of satisfaction this decision brings versus other available options?

This process becomes considerably more complex when a public entity is trying to maximize the well being of an entire community. Only a systematic study of all prevailing costs and benefits would allow a public entity to evaluate the decision with the same amount of care that individuals, households and firms take when assessing opportunities. After all, what is to stop the head of a public entity from only pushing forward politically expedient projects regardless of the value to the community?

In order to estimate the costs and benefits of public projects and economic activity economists developed a tool called benefit cost analysis. Environmental benefit cost analysis has been used since the early 20th century to determine which environmental projects and regulations should be undertaken by the government. It is a simple enough approach to understand: benefits of a proposed action are estimated and compared with the total costs incurred by society. If the benefits are greater, the project is considered feasible. Historically benefit cost analysis has been used to assess feasibility for everything from municipal parks to federal automotive emission

guidelines. However the simplicity of the broad concept belies the controversy involved in its application.

The book released earlier this year, *Priceless—On Knowing the Price of Everything and the Value of Nothing*, provides some provocative thoughts into some controversial uses of the benefit cost analysis. The book's authors, Frank Ackerman and Lisa Heinzerling point out, among other things, that benefit cost analysis is too simple—a method that is easy to manipulate to one's own political ideology.

To illustrate just how easily cost benefit analysis can be manipulated in the determination of public policy, Ackerman and Heinzerling use the Bush administration's attempt to allow timber interests into publicly held forests. In 2000 the U.S. Forest Service proposed taking the remaining roadless areas of the national forests and setting them aside—off limits to timber interests. This proposal was met with overwhelming support from the public, most of whom would never likely see a single tree. The support is evidence of a great nonuse value for these forests.

In its attempt to justify opening the 60 million acres of virgin forest—one of the most significant preservation acts in the history of the United States—Bush's Office of Management and Budget (OMB) provided benefit cost analysis. The annual costs of preserving the forest were estimated at $184 million—primarily the opportunity cost of lost revenue to the country from the logging industry. Benefits of preserving the land, on the other hand would amount to only $219,000—the savings of not buildings roads. The slight amount of net benefits placed the forest preservation initiative on the OMB's hit lists of policies to be reconsidered. No estimation of the nonuse value of the forest was offered.

The authors also provide the example of environment economist Robert Stavins formerly associated with the Environmental Protection Agency (EPA). In 1984, while working for Environment Defense Fund, Stavins conducted a benefit cost analysis that contributed to the defeat of a proposed hydroelectric development on the Tuolumne River in Califor-

nia. Based on a high nonuse value, the Stavins' analysis determined that such a development was not feasible. However by 2002, Stavins had a change of heart. Serving as a consultant for Pacific Gas & Electric, Stavins argued that "the cost-benefit analysis wildly exaggerates the benefits of protecting fish."

So what is the correct method for determining the nonuse value of an environmental commodity? Economists often use the direct method—simply asking people what they believe an environmental commodity is worth. Environmental economists survey, among other things, what the average American would be willing to pay on an annual basis for the protection of species in danger of extinction. While this is a generally accepted method in the determination of benefits, Ackerman and Heinzerling claim that this method does not provide any type of reliable result.

To illustrate the discrepancy between use and nonuse value, Ackerman and Heinzerling use the humpback whales as an example. They state that the use value can be determined by those willing to pay to "whale watch," an industry that accounts for revenues of $160 million. However, when the public was surveyed to determine how much they would be willing to pay to prevent the extinction of the humpback whale, the average response per household was $173 per year, or $18 billion. Thus, the use value represents just a small fraction of what society believes the true value of humpback whales.

Additional inquiries might ask: would the value change if, for example, a company offered to pay the U.S. Government $20 billion for the right to hunt the world's remaining whales? Given the fact that this exceeds both the use and nonuse value combined; would this indicate that such a proposition should be considered feasible based on a benefit cost analysis?

The authors save most of their righteous indignation for environmental economists' attempt to value a human life. A value for human life is often necessary when government economists and environmental scientists are assessing health and safety impacts of public projects. The provision of

additional traffic lights may use the value of human life multiplied by a probable reduction in traffic deaths to perform benefit cost analysis. A regulation enforcing further reduction of airborne particulate matter might use a value for human life to estimate the benefits of decreased respiratory related deaths.

Industrial wage studies are commonly used to assist in the determination of the value of a life. Economists analyze two jobs—similar in all respects except risk of death. Riskier jobs generally command higher wages. By choosing a riskier job for greater pay, workers provide an indication as to what value they place on life. This provides what is known as the value of a statistical life.

Ackerman and Heinzerling analyze the EPA's most recent determination of $6.1 million as the value of a statistical life. This value was determined based on the research of W. Kip Viscusi, an economist whose wage studies determined the value of a statistical life at approximately $5 million in 1990 dollars. The EPA reexamined Viscusi's work, and adjusting for inflation, concluded that a statistical life was worth $6.1 million.

Ackerman and Heinzerling have no problem with the value itself and concede that this method is preferable to contingent valuation surveys. Unlike industrial wage studies, contingent valuation surveys provide hypothetical opinions of risk and do not reflect actual decisions made in the market place. According to the authors, Bush's OMB has attempted to use such studies to lower the value of a statistical life from the generally accepted $6.1 million to $3.7 million, presumably in an attempt to help the industrial community.

The primary problem the authors have (other than religious and moral problems of putting a price tag on a human life) is that it tends to obscure rational policy making into playing human lives against a bottom line. In the book the authors use Ford Motor Company's decision to continue production of the defective Ford Pinto as an example.

The Pinto was Ford's answer the invasion of small cars

from the Japanese market. As the author's state, "The Ford Pinto, one of the best-selling cars of the 1970s, had a defective gas tank with an unfortunate tendency to burst into flames in rear-end collisions, even at moderate speeds."

In the mid-1970s, despite tests, which indicated fuel tank problems, Ford lobbied against proposed federal regulations regarding fuel tank safety. Using the National Highway and Traffic Safety Administration's figure of $200,000 per statistical life and estimating fatalities at 180 per year, Ford presented a benefit cost analysis indicating that this $36 million benefit was not enough to justify industry costs of $137 million (or $11 per vehicle) to meet proposed standards.

Ultimately, Ford lost a series of lawsuits associated with fiery rear end collisions, recalled all Pinto models from 1971 to 1976 and discontinued the Pinto in 1980. The lesson learned, according to the authors, was that Ford executives "might have reflected that society's implicit value of a statistical life was quite a bit higher than they had been led to believe."

Ackerman and Heinzerling clearly identify some misuses of benefit/cost analysis as well as instances of probable manipulation; often, economists as well join the criticisms. Do the methods described by Viscusi fit the uses to which we put them? Consider their criticisms.

First, the methods yield only group averages. For example, if firemen accept the risks to life in return for increased salary, who is to say that the typical fireman has the same feeling about risks as the rest of the population? Who is to say firemen are equally risk averse as you and I.

Second, the method assumes that the only reward to risk is money. More likely pride and a feeling of honor accompany roles that seek to protect the community. An extreme example may help to prove this rule. No one forgets what it meant to be a New York fireman in the months after 9/11.

Finally, these values of life are statistical average values of life extrapolated from thousands of observations on responses to relatively small changes in risk. People undoubtedly will

react more strongly to large changes in risk. For example, if someone offered your estate $6.1 million on the condition that you accept your own demise on the spot, who wouldn't say to the offer: "B*lls*it!" Technically this implies nonlinearity in our risk response. So, economists would join in the warning to beware of simplistic applications of benefit/cost analysis.

While Ackerman and Heinzerling highlight abuses of the benefit cost analysis, there are times when neglecting benefit cost analysis would provide results meaningless in the determination of environmental policy. The history of dichlorodiphenyltrichloroethane (DDT) use in the U.S. provides a good example of how public perception influences policy decisions beyond the realm of environment economists.

DDT has saved more lives, arguably, than any pesticide in human history. DDT was developed 1939 by the U.S. Army at the end of World War II to kill malaria and typhus carrying mosquitoes in the Pacific. In 1945 it became available for civilian use, and since then has been used around the world to kill insects.

Farmers absolutely loved DDT, because they soon discovered it killed hundreds of different types of pests. Its use in malaria infested countries (as well as the southern U.S.) literally saved millions of lives. In Venezuela, for example, recorded cases of malaria went from 8 million in 1943, to 800 in 1958. The World Health Organization estimates that during these years the pesticide saved from 50 to 100 million lives worldwide.

One of the few to question the use of DDT at the time of is entry into U.S. agriculture was Rachel Carson. In 1945 she proposed an article on DDT and its effects to Readers Digest. Her idea for the article was rejected.

Thirteen years later Carson received a letter from a friend who complained that DDT (the world's miracle chemical compound) had an additional effect. Not only did it kill virtually every conceivable type of insect, it also killed birds.

By this time a best selling author (her book *The Sea*

Around Us stayed on the New York Times best seller list for almost two years), she was again unable to get a magazine to agree to publish any type of article regarding negative affects of DDT. Undaunted, Carson began four years of research and completed her book, *The Silent Spring*, in 1962. The book describes how the pesticide accumulated in the fatty tissue of animals, including humans, caused cancer and genetic damage, killed fish, and caused the thinning of shells in birds' eggs.

Understandably the publication created howls of criticism from the chemical industry. "If man were to faithfully follow the teaching of Miss Carson," an executive of American Cyanamid Company stated at the time, "we would return to the Dark Ages, and the insects and diseases and vermin would once again inherit the earth."

A more unexpected criticism came from the scientific community. While infinitely well researched, one of the main criticisms of the book was its failure to provide an analysis of the benefits of DDT.

Although, apparently, no benefit cost analysis was performed, it is very likely that the cost of banning DDT would have outweighed the benefits. Based on 1970 EPA estimates, switching from DDT to alternative pesticides would cost consumers in excess of $4 million for cotton products alone. And critics of Carson have maintained that no conclusive link between DDT and cancer was ever found. It was ultimately determined that small doses of the pesticide were not particularly harmful to wildlife. Presently, proponents of DDT are promoting its reinstitution to help combat the spread of the West Nile Virus.

But Carson's book had a dramatic affect on public policy. Upon its publication, President Kennedy ordered the President's Science Advisory Committee to examine Carson's findings. Some claim the book was responsible for the creation of the EPA, whose first act was to ban the pesticide from widespread use. Benefit cost analysis may not have provided useful information because of the public perception of the dangers of DDT.

What role should the benefit cost analysis take in helping to determine environmental policy? A world with no pollution, no health hazards and no risks is a wish that simply will not be granted. When individuals take risks with their own health or safety, they weigh the benefits against the perceived risks and costs and make a decision. No individual opts for a life devoid of risk; we drive in our cars (some without the latest safety features), consume alcohol, and eat unhealthy foods regularly. Private firms assess costs versus benefits of new endeavors as well. Trading off among various opportunities to get the most out of what the world has to offer becomes a daily task performed routinely.

But for shared goods, common resources like the environment, the trade-offs involved in its degradation need to be systematically assessed and accounted for. The benefits of a project that will cause pollution need to be detailed as well as the costs that the degradation may impose upon all of society. These benefits and costs need to be measured in like units in order to be compared and, as unpalatable as it may be, that like unit will be monetary value. In addition, risks and benefits will not necessarily be equally distributed among all the members of a community and may even cross over into future generations. The measurement of costs and benefits will be imprecise and in units (dollars) not typically associated with the goods (human lives).

However, abandoning benefit cost analysis does not ensure a better result. Continued improvement of the measurements is certainly possible. Decisions about the use and degradation of our common resources should not be made solely by assessing the benefits and costs if improperly measured, however decisions without some data of this type are uniformed.

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