BENEFIT–COST ANALYSIS, INDIVIDUAL DIFFERENCES, AND THIRD PARTIES☆

Lawrence H. Goulder

1. INTRODUCTION

Benefit–cost analysis took root in the U.S. at the federal level in the 1930s with the use of the method by the Army Corps of Engineers. It now is used widely by government agencies and research organizations. The practice has long been controversial, and it remains so. Some critics find the weaknesses of benefit–cost analysis to be so severe as to warrant abandoning its practice.

One of the most contentious issues relates to the way the estimated benefits[1] from a proposed policy depend on the characteristics of the individuals affected by the policy. As discussed below, in usual benefit–cost calculations, the benefits attributed to a given person are based on that person's willingness to pay (WTP) for the impact of the proposed policy change. Since WTP typically depends on individual characteristics, such as income and age, the value or benefit attributed to a given policy's impact generally differs depending on characteristics of the affected population. Thus, the identical physical impact – for example, a given reduction in

☆This paper was prepared for the conference, "What We Can Do To Improve The Use Of Benefit–Cost Analysis?" University of Washington, May 18–19, 2006.

Research in Law and Economics, Volume 23, 67–86

ISSN: 0193-5895/doi:10.1016/S0193-5895(07)23003-9

cancer risk – could imply different estimated benefits depending on whether the affected community tended to have high or low income, be young or old, or differed in other ways. This raises important ethical concerns.

Nowhere does this issue arise more starkly than when benefit–cost analysis is employed to assess the benefits from reduced risk of death. Many government projects and regulations affect individuals' risk of death from disease, environmental toxins, or accidents. The value (or benefit) attributed to a project-related reduction in the risk of death can be a large component of the overall benefit calculation. Indeed, in some cases this value (aggregated across all affected individuals) swamps all of the other estimated benefits from the regulation in question. For example, in its assessment of the prospective benefits from the 1990 Clean Air Act over the period 1990–2010, the U.S. Environmental Protection Agency (EPA) attributed over 90 percent of the gross benefits from the Act's air quality improvements to avoided premature mortality.[2]

Since nothing can be more important than life itself, it is not surprising that imputing values to statistical life-saving provokes strong feelings and spawns a range of criticisms. Some of the challenges to the application of benefit–cost analysis in the life-saving context reflect a misunderstanding as to what is meant by the value of a statistical life (VSL) – in particular, the failure to distinguish the value of an incremental change in the probability of death (which is what benefit–cost analysis in fact aims to determine) from the value of life itself.

But other challenges to benefit–cost analysis cannot be dismissed so easily. The problem, mentioned above, of individual differences has especially great force in the context of valuing changes to the probability of death. The key statistic in this context is the VSL, which is calculated based on each affected individual's WTP for the change in the statistical probability of death that applies to him or her. Since, as mentioned, WTP depends on individual characteristics, the VSL in benefit–cost calculations depends on these characteristics as well. In standard benefit–cost applications, the value attached to a rich person's statistical life will generally be higher than the value attached to the statistical life of a poorer individual. To some critics, this property of benefit–cost analysis makes it illegitimate as a policy evaluation tool.

The issue came to the fore recently in a challenge to the EPA's calculations of benefits from reduced mortality risk. Some studies had found that seniors in the U.K. and Canada tend to have a lower WTP for increments to safety than younger individuals do.[3] Prompted by these findings, the Clinton Administration employed an "age-adjustment factor"

in the calculation of the benefits from an EPA rule to reduce diesel exhaust from highway engines. A given improvement in safety counted less for seniors in the affected population than for other individuals. Under the George W. Bush Administration, the age-adjustment factor was also applied in the calculation of benefits from this administration's proposed Clear Skies Initiative (U.S. Environmental Protection Agency, 2003) and in several EPA rulemakings. In these latter applications, the age-adjustment factor was part of an "alternative" calculation used alongside a "base" estimate that applied the same value to all individuals for a given safety increment.

In the first years of the present decade, the EPA was widely criticized for its application of the age-adjustment factor, which critics derisively termed the "senior death discount." Under pressure, John Graham, head of the Office of Information and Regulatory Affairs within the Office of Management and Budget and one of the highest-ranked regulatory officials in the Bush Administration, declared in 2003 that the Administration would discontinue use of the age-adjustment factor. In a May 2003 memo,[4] Graham indicated that a reason for the change was new empirical work indicating that seniors may well value life-saving to the same degree as younger individuals.[5] This gave the Administration a reason to abandon the adjustment factor. It also enabled the Administration to avoid confronting the central issue – whether the VSL should differ when people exhibit differences in WTP.[6]

The EPA has also had to struggle with the question whether to adjust estimated benefits based on differences in WTP attributable to difference in income. This recently became a major focal point in recent discussions of regulating water quality (arsenic concentrations) under the Safe Drinking Water Act.[7]

How should benefit–cost analysis deal with the fact that WTP may differ across individuals because of differences in age or economic resources (as opposed to differences in physical impacts)? Does a theoretically consistent application of benefit–cost analysis require that the estimated benefits (or, in particular, the VSL) differ for individuals when WTP differs? Do the problems raised by differences in WTP repudiate the usefulness or normative standing of benefit–cost analysis?

This paper makes three related points connected with these issues. First, it argues that the most consistent application of benefit–cost analysis is one in which benefits are calculated based on the affected individuals' own, *unadjusted* WTP – even when this WTP differs dramatically across individuals. Second, it calls for interpreting "affected individuals" broadly,

so as to include interested third parties as well as the individuals that are directly affected by the given policy change. Third, it suggests that in some contexts – in particular, in international policy efforts where major policy impacts include reductions in the risk of death – accounting for the WTP of third parties can dramatically increase the estimated benefits from the policy at hand.

The paper indicates how benefit–cost analysis can be improved through the use of information typically left out of such analyses. Yet even if this improves the method, it will not and should not be expected to make the benefit–cost test a sufficient criterion for decision making. Other policy evaluation criteria such as distributional equity remain important.

2. SHOULD WTP BE ADJUSTED FOR INDIVIDUAL DIFFERENCES?

2.1. A Simple Approach to Estimating Benefits

The standard methodology for benefit–cost analysis defines benefits in terms of WTP, and costs in terms of required compensation or "willingness to accept." For simplicity, in what follows the single abbreviation "WTP" will stand for willingness to pay when it is positive, and will refer to required compensation (or willingness to accept) when it is negative.

Willingness to pay can be defined in terms pre- and post-reform utilities, as follows. Let p_i and Y_i, refer to the prices and income faced by individual i prior to the policy change in question, and let p_i' and Y_i' refer to the corresponding prices and income following the policy change. Similarly, let G and G' refer to the vector of public goods enjoyed before and after the policy change. The public goods vector can include shared produced goods and public services, as well as environmental quality. Individual i's willingness to pay (WTP_i) for a given change in the vector of public goods is implicitly defined by:

$$U_i(p_i', Y_i' - WTP_i, G') = U_i(p_i, Y_i, G) \tag{1}$$

where U_i is the utility function of individual i. The willingness to accept (WTA) is the negative of the WTP. Thus, an individual's WTP (willingness to accept) is the reduction (increase) in income that would cause that person's utility to remain unchanged after the change in public goods and

associated price changes.[8] In standard benefit–cost analysis, the net benefit from a policy is the sum of the (positive and negative) individual *WTPs*.[9]

2.2. Does the Sum of WTPs Have Normative Significance?

To what extent is there a normative basis for using the sum of the WTPs as a basis for decision making? Is this sum relevant to the decisions whether to adopt a policy option? The answer to these questions is directly relevant to the main question of this section – namely, the question whether individuals' WTP_i's should be adjusted in any way in performing a benefit–cost assessment.

Several answers to the "normative standing" question have been offered. One answer appeals to the connection between the sum of the WTP_i's and aggregate income or wealth. In the equation above, WTP_i is the money-equivalent to the change in income (or wealth)[10] to the individual in question. Thus, a policy that generates a positive sum of WTP_i's is one whose impact is equivalent to an increase in aggregate income (or wealth). Zerbe (1998) and others make what strikes me as a strong case that this increase has normative appeal, and that it therefore deserves weight in a policy evaluation. Abstracting from impacts on the distribution of well-being, on political feasibility, or on other (important) dimensions of social welfare, it seems a good idea to introduce policies that generate the equivalent of an increase in aggregate income or wealth, and to refrain from policies that yield the equivalent of a decrease in aggregate income or wealth.

Clearly the sum of the WTP_i's does not offer, by itself, any information about how benefits and costs are distributed. Although this is a limitation in the sum-of-WTP index, it is not necessarily a reason to abandon benefit–cost analysis. The issue at hand is whether the sum of the WTP_i's has normative force, not whether it is a stand-alone criterion for decision making.

A second argument invoked to support the use of the sum of the WTP_i's in decision making refers to the fact that benefit–cost analyses need not just happen once. This argument claims that although a single application of benefit–cost analysis might lead to support for a policy that produces losers as well as winners, the repeated application of benefit–cost analysis to a sequence of policy decisions is likely to benefit most individuals. That is, while a given person might lose from specific policies, the continued use of the benefit–cost criterion in a series of policy choices is likely to benefit that individual (relative to that individual's welfare in a world where benefit–cost

analysis is repudiated).[11] Opinions may differ as to the validity of this empirical claim. Note that the argument does not remove the need to include distributional equity as a criterion for evaluating individual policy options. However, it does suggest giving additional weight to the benefit–cost test and somewhat less weight to distributional equity in any specific policy evaluation.

A third argument supporting the use of the sum of the WTP_i's as a basis for decision making claims a close connection between this sum and the Kaldor–Hicks compensation principle. This principle argues that a given project should be introduced if and only if the winners could compensate the losers and still be better off. In other words, the project should allow for a potential Pareto improvement.

This argument claims a logical equivalence between achieving positive aggregate net benefits (a positive sum of the WTP_i's) and satisfying the Kaldor–Hicks compensation principle: if a policy involves positive net benefits, then the winners have the potential to compensate the losers and still have something left over. Correspondingly, if the sum of the WTP_i's is negative, there is no such potential. To the extent that offering the potential for a Pareto improvement is compelling, the use of benefit–cost analysis gains attractiveness because the sum of the WTPs reveals the presence or absence of this potential.[12]

Many authors have employed this argument to provide normative force to the use of benefit–cost analysis – more specifically, attention to the sum of the WTPs – in making policy decisions. However, Milgrom (1993) constructs a situation in which the logical equivalence between the positive sum of WTPs and passing the Kaldor–Hicks test fails. Milgrom's example involves a policy that affects two individuals, here denoted A and B. B is altruistic in that she gains utility from A's utility. The policy in question raises A's utility and reduces B's. It yields net benefits: the value of the gains to A exceed the value of the losses to B. However, A cannot compensate B (return B to her initial utility level) and still remain better off. In this example, with interdependent utility, there is an added "cost" from transferring the A's gains to B, since the utility loss to A (associated with A's giving up income to compensate B) hurts the altruistic B. Thus, the logical equivalence between a positive sum of the WTP_i's and the potential for compensation no longer holds. Zerbe, Bauman, and Finkle (2006) argue that the conditions for Milgrom's result are unlikely to occur in realistic settings involving a large number of interdependent individuals. Nevertheless, Milgrom's result seems to weaken severely the force of this particular argument for using the sum of WTP_i's.[13]

The first argument seems strongest. The normative basis for benefit–cost analysis seems to be the idea that producing an equivalent to an increase in income (or wealth) is desirable, other things equal. The second argument may help reduce concerns about distributional impacts, and thus can justify giving significant weight to a benefit–cost assessment. But it does not eliminate the importance of considering distributional equity. And the third argument rests on the claim that a positive sum of WTPs satisfies the Kaldor–Hicks criterion – a claim that turns out to be false.

2.3. Implications for the "Adjustment" Issue

The normative foundation for benefit–cost analysis has implications for the question whether it is appropriate to apply benefit–cost analysis when WTPs differ substantially because of differences in income or other individual differences. So long as distributional equity is given separate consideration, it seems appropriate to take account of the sum of the WTP_i's, since (as argued above) this confers information about whether the equivalent change in aggregate income is positive or negative, information that has some normative standing.

Some analysts supportive of benefit–cost analysis are nevertheless uncomfortable with its straightforward application in situations where the WTP of individuals differs dramatically because of individual differences in income, age, or other characteristics. A proposed alternative application is to scale the individual WTP_i's up or down to deal with differences in income. One possibility would be to multiply each individual's WTP by the ratio of the average income in the relevant community or region to the income of the individual in question. Since individual WTP_i's are likely to be directly related to income, this gives more weight to the well-being of lower-income individuals than would otherwise be the case.

Although such an adjustment may have appeal on fairness grounds, it comes at a price: once benefits and costs are calculated based on a transformed WTP, the sum of the WTP_i's no longer is a reliable indicator of the equivalent change in income attributable to the policy change. Suppose, for example, that most of the winners from a proposed policy had low incomes, and most of the losers had high incomes. Scaling up the WTP_i's of the low-income individuals and scaling down the (negative) WTP_i's of the high-income individuals might cause the policy to generate net benefits, even though the proposed policy's equivalent impact on aggregate income is negative.

Defenders of this sort of adjustment can argue that there remains normative force to the sum of *adjusted* WTP_i's. One could argue that decisions should in fact be influenced by whether a policy change would produce an equivalent increase in aggregate income in a world where incomes initially were equal. This argument is not entirely persuasive. It is problematic to introduce distributional considerations by way of adjustments to individual WTP, for two reasons. First, the particular adjustment assumes that WTP is strictly proportional to income, which need not be the case. Thus, it is not clear that the sum of adjusted WTP_i's indicates what the sum of WTPs would be if incomes were equal. Second, it seems more informative to consider distributional issues separately, rather than through the sum of WTP_i's. This allows one to consider distributional equity along many dimensions, not simply the income dimension. Finally, the adjustment considered here seems to focus on a particular distributional outcome – complete income equality – in choosing to scale all WTP_i's up or down based on their relation to average income. Why is this particular scaling preferable to others? It is not clear that this particular adjustment to the WTP_i's confers much information beyond the information that would be employed in an evaluation of distributional effects that is separate from the benefit–cost calculation. All in all, sticking with the actual (unadjusted) WTP_i's seems most compelling.

Yet, as suggested earlier, the use of WTP_i's can prompt great controversy when income differences are profound. In recent international discussions of climate-change policy, it produced hostile reactions. One of the most important sources of damage from climate change is premature mortality, reflecting the greater spread of tropical zones and tropical disease. In a study of predicted monetized[14] damages from climate change, Richard Tol (1995) attributed over half of the damages in tropical zones to premature mortality stemming from the broader spread of such diseases.

The estimated monetized damage depends on the value attributed to premature death or, equivalently, the value of the lost statistical lives. The countries in current or predicted tropical zones are relatively poor countries. If the VSL is calculated for these countries based on the actual WTP, the resulting value will be substantially lower than the estimated value for a lost statistical life for a resident of a relatively affluent country. In 2004, the per-capita income in Ethiopia (calculated based on purchasing power parity) was $750, as compared to $39,800 in the U.S. Per-capita income in Ethiopia is less than two percent of that in the U.S. If WTP for greater safety is proportional to income, a strict application of benefit–cost analysis would accord an avoided death in Ethiopia only one fiftieth the value of an avoided death in the U.S. David Pearce, an eminent environmental economist acclaimed for his pathbreaking work on sustainable development, happened to suggest in a meeting of the Intergovernmental Panel on Climate Change that such differences in the VSL ought to be maintained in the calculations of benefits (avoided damages) from climate policy. The suggestion created an uproar. Protesters occupied his office at University College London for several days. Many called for Pearce's expulsion from the IPCC.

3. IS THERE A WAY OUT?

In view of the controversial nature of benefit–cost analysis in these contexts, what is a reasonable methodological response? One possibility is to adjust the VSLs (or WTP_i's) in some way, but as discussed above the normative basis for doing so seems weak. Another possibility is to dispense with benefit–cost analysis in situations like the one just described, where income differences are great. But such an approach dispenses with the potential information that a benefit–cost analysis can provide.

I believe there is a third and better alternative. This alternative refrains from making any adjustments to any individual's WTP (or implied VSL). At the same time, it affects the sum of the WTP_i's by allowing for a wider range of preferences to be included in the benefit–cost calculation. It allows for a broader calculation of the sum of the WTPs by bringing in third-party effects. This broader calculation will often end up assigning higher value to protecting lives of low-income individuals than would apply in the simplest application of benefit–cost analysis. This might reduce some (but surely not all) of the dissatisfaction with the use of benefit–cost analysis in situations where individual incomes (or ages or other characteristics) differ. As discussed below, the broader approach is consistent with the essential purpose of benefit–cost analysis and preserves its normative basis.

4. INTERNATIONAL VENTURES AND THE DOMAIN OF WILLINGNESS TO PAY

I will discuss this alternative in the context of international climate change policy. Perhaps the most basic issue in discussions of climate change policy is how much, if at all, the nations of the world should reduce

emissions of greenhouse gases in order to slow or avoid climate change. Predicted impacts of climate change include increased frequency of extreme temperature events (such as heat waves), heightened storm intensity, altered precipitation patterns, sea level rise, and reversal of ocean currents. Scientists now are in strong agreement that much climate change is already occurring, and that human activities are contributing significantly to these changes. The changes could have significant impacts on marine and terrestrial life and on human welfare. The benefits from climate policy represent the value to humans of the avoided climate-change-related damages.

As mentioned, a principal benefit is the avoidance of premature mortality. Let X_i represent the reduction in mortality risk in region (or nation) i that is predicted from a given climate policy. A simple approach to evaluate the benefit from lower risk of death would be to add up the X_i's in every region of the world. As indicated earlier, in a simple application the value of each X_i would be based on the WTP_i's of the residents of the region involved. In this application, the WTP_i's will differ greatly – perhaps by two orders of magnitude – across regions. Although some of the differences would reflect differences in the X_i's, to a large extent the differences would stem from differences in income or wealth.

Yet a consistent application of benefit–cost analysis calls for something different from this simple approach. Here we have the international community acting out of a common concern. Importantly, the concern of many residents of the richer, more industrialized countries reflects not only a worry about damages within their own country but also a concern about impacts in other countries. For many residents of industrialized countries, part of the distress about the potential for climate change is the prospect of serious damages to ecosystem function, natural amenities, wildlife, and human welfare in other countries. Correspondingly, individuals in rich countries are willing to make sacrifices to avert or reduce climate change in part because this will avoid harm (such as premature death) to people living in other countries.

In short, there are important third-party effects. Avoiding premature deaths in poorer countries not only raises the well being of the directly affected parties but also of outside parties that recognize this impact.

To the extent that third parties gain utility from recognizing the direct benefits to others, an expanded measure of benefits is warranted.[15] Specifically, the calculation of benefits from avoided premature mortality should include both the WTP of the individuals likely to benefit directly but also the WTP of third parties who have empathy for the directly

affected individuals. This is fully consistent with – indeed required by – the fundamental virtue of a benefit–cost assessment: namely, the ability of this assessment to represent an equivalent change in aggregate income or wealth. To exclude the WTP of third parties would be to leave out important components of the overall equivalent income change. In such a case, the normative force of the benefit–cost calculation would be lost.

How much difference would it make to include third-party effects? The answer requires a serious empirical investigation, which is beyond the scope of this paper. The answer may also be very context-specific. Notwithstanding those qualifications, the following simple calculations suggest *it could make a huge difference*. Let N_{Poor} and N_{Rich} represent the population of poor and rich countries, respectively. Let V_{pp} (V_{rr}) represent the WTP by an individual of a poor (rich) country for a small safety improvement to himself. Suppose that WTP is proportional to income, so that $V_{rr} = V_{pp} * YRATIO$, where $YRATIO$ represents the ratio of rich to poor country per-capita income. Finally, let V_{rP} represent the WTP by a rich-country individual for the given safety improvement conferred on all citizens of poor countries. Note that V_{pp} and V_{rr} indicate the WTP for a safety improvement to one's self, while V_{rP} is the WTP for a safety improvement enjoyed by a very large number of individuals.

Now consider the benefit from an incremental reduction in risk to residents of the poor country. The *direct* effect – the benefit associated with the WTPs of the directly affected individuals – is

$$N_{Poor} * V_{pp} \tag{2}$$

The *third-party* effect – the benefit associated with the V_{rP}'s (that is, the rich-country individuals' WTP for reduced risk to poor-country residents) – is

$$\begin{aligned} & N_{Rich} * V_{rP} \\ &= N_{Rich} * (V_{rP}/V_{rr}) * V_{rr} \\ &= N_{Rich} * (V_{rP}/V_{rr}) * YRATIO * V_{pp} \end{aligned} \tag{3}$$

The ratio of the third-party effect to the direct effect is therefore

$$(N_{Rich}/N_{Poor}) * V_{rP}/V_{rr} * YRATIO \tag{4}$$

or, in the case where $N_{Rich} = N_{Poor}$, simply

$$V_{rP}/V_{rr} * \text{YRATIO} \tag{5}$$

A reasonable (and wide) range for V_{rP}/V_{rr} is from .01 to 1. (Recall that the numerator is a rich-country individual's WTP for a risk reduction

that is enjoyed by *all* residents of poor countries.) *YRATIO* might range from 10 to 100.

Table 1 calculates the ratio of third-party to direct effect under values for V_{rP}/V_{rr} and *YRATIO* within these ranges. Under these assumptions, accounting for third-party effects increases the estimated benefits from 10 percent to 10,000 percent (or a factor of 100). In this very crude example, allowing for third-party WTP makes anywhere from a significant difference to an overwhelmingly large difference.

This suggests, in particular, that allowing for third-party effects could increase by an order of magnitude the estimated benefits from reducing the mortality risk associated with climate change. Because the expanded approach will tend to attribute higher values to impacts that benefit low-income individuals, it might quell some of the criticisms toward benefit-cost analysis that stem from considerations of distributional equity. But the expanded approach clearly does not deal with all legitimate distributional equity concerns. Passing the benefit–cost test remains useful insofar as it informs policy makers about equivalent income changes. But passing this test remains only one of several important criteria for decision making. Other evaluation criteria remain informative and important.

Table 1. Impact of Third-Party Effect on Estimated Benefit.

Ratio of Rich Country Income to Poor Country Income	Valuation by Individual in Poor Country	Rich Person's Valuation of *Aggregate* Poor-Country Impact Relative to His *Individual* Impact	Direct Effect	Third-Party Effect	Ratio of Third-Party to Direct Effect
(*YRATIO*)	(V_{pp})	(V_{rP}/V_{rr})	($N_{POOR} * V_{pp}$)	[$N_{RICH}*(V_{rP}/V_{rr})$ $*YRATIO*V_{pp}$]	
10	1	0.01	100	10	0.1
10	1	0.1	100	100	1
10	1	1	100	1000	10
40	1	0.01	100	40	0.4
40	1	0.1	100	400	4
40	1	1	100	4000	40
100	1	0.01	100	100	1
100	1	0.1	100	1000	10
100	1	1	100	10000	100

Note: $N_{POOR}=100$, $N_{RICH}=100$.

5. PROBLEMS: WHERE CAN THE LINE BE DRAWN?

5.1. Practical Considerations

Although it is theoretically consistent to allow for third-party effects, doing so would introduce practical difficulties. Clearly third-party effects apply, to some degree, to the impacts of virtually every public policy. Yet incorporating such effects in every benefit–cost analysis would be burdensome and often infeasible. The potential absurdities of incorporating third-party effects universally were illustrated in a stimulating article by Paul Portney (1994), who served on a blue-ribbon panel formed by the National Oceanic and Atmospheric Administration to consider whether existence or "passive use" values associated with environmental improvements could be measured with any reliability.[16] In this article, Portney recognizes the significance of third-party effects:

> There is no reason why existence values should be unique to environmental policy, either. For instance, I might derive utility from knowing that factories are safer as a result of Occupational Safety and Health Administration regulations, that pharmaceuticals carry less risk because of the oversight of the Food and Drug Administration, and that swimming pool slides are safer because of the vigilance of the Consumer Product Safety Commission. All this may be so even though I do not work in a factory, take prescription drugs, or have a swimming pool. In other words, individuals may have existence values for many different "goods," and the inclusion of such values in a regulatory analysis could markedly alter the decision-making calculus. (p. 13)

Portney's comment leads one to worry about the practicalities of making it standard procedure to deal with existence values and other third-party effects in benefit-cost analyses. Nearly every policy will yield third party effects, but clearly it is not possible to address them in all cases. Portney acknowledges this problem in a subsequent paragraph:

> Imagine now the difficulty of doing applied benefit-cost analysis when virtually every citizen in the United States is potentially benefited or injured by virtually every possible program. In principle, at least, it will become extraordinarily difficult to draw bounds around those likely to gain and lose so as to facilitate valuation. (p. 14)

It is clearly not practical to consult Portney (or other third parties) every time a new Occupational Safety and Health Administration regulation is being evaluated.

Is introducing third-party effects a Pandora's box? Where to draw the line? It is not possible to locate precisely where one should draw the line determining when it is and when it is not practical to consider third-party effects. However,

I would suggest that in international policy settings, third-party effects may often be important enough to warrant consideration, despite the practical burdens. The threshold of importance may be achieved in such settings for two reasons. First, income disparities may be especially large in this context. As indicated in Table 1, when income differences are large, even a small relative concern for outsiders' welfare can have a significant impact on the overall measure of benefit.

Second, international efforts are often in response to problems in which there are transboundary impacts: the activities (such as pollution levels) in one country produce impacts in other countries. In the climate-change context, the activities of the industrialized countries can contribute to the health and mortality risks in less developed countries. To the extent that residents of the industrialized countries feel some responsibility for the impacts (positive or negative) in other countries, they may take some satisfaction in helping to avert negative impacts.

It should also be noted that third-party effects can help explain why some nations become involved in international efforts, despite the fact that the direct net benefits to that nation appear to be negative. Arguably, the involvement in the collective effort suggests some other benefit that the nation expects – which could be the benefit from recognizing that it is moving toward more responsible international behavior.[17]

This discussion of third-party impacts may seem to blur the distinction between benefit–cost analysis – which tends to focus on net benefits in the aggregate – and concerns about distributional equity. Clearly there is some overlap. To the extent that individuals in one country care about distributional equity, they may exhibit some WTP to help bring about such equity.[18] But even if this WTP has a basis in distributional equity concerns, it also has a valid place in a benefit–cost analysis, since the third-party's psychological benefit stemming from improved equity is part of the aggregate WTP, the indicator of the equivalent aggregate income change. At the same time, it should be recognized that attending to third-party effects will not encompass all valid distributional considerations. Indeed, philosophers raise important issues of distributional equity that have very little connection with individual WTP.

5.2. The Problem of Malevolent Third-Party Preferences

Another problem arises once one considers allowing for third-party preferences. Not all third parties will consider benefits to the directly affected party a good thing. That is, some third parties will have malevolent preferences. Their WTP for a benefit to a directly affected party will be negative or, correspondingly, they would attach a positive WTP to harm to the directly affected party. Does consistency require that malevolent preferences be counted? Should estimates for the value of safety improvements in the U.S. be reduced based on the preferences of those foreigners that detest Americans?

I believe the answer to these questions is no. This answer is based on the fact that benefit–cost analysis is not independent of cultural norms and legal rules. Society does and should decide on which emotions should count, and which should not. In this connection, Zerbe (1998) writes:

> Neither the law nor benefit-cost analysis stand wholly outside each other; they are intertwined. The values used in benefit-cost analysis are shaped by law just as those used in law are shaped by benefit-cost analysis.

The point can be illustrated in several ways. Zerbe offers an example where a group of thugs harms a young man.[19] Although it is possible that the collective WTPs of the perpetrators was more than enough to offset the negative WTP (i.e., the WTA) of the victim, society would not apply benefit–cost analysis to this episode or consider justifying the assault in benefit–cost terms. Because the actions of the thugs are criminal, their psychological benefits do not get included in a WTP calculation. Indeed, there is no WTP calculation.[20]

By analogy, certain emotions such as hate might well be considered inappropriate for consideration in a benefit–cost analysis. On these grounds, malevolent preferences might be ruled out.

The issue is difficult: the line between acceptable and unacceptable preferences and emotions is not always clear. Moreover, society may move the line through time. Yet even if the location of the line is neither clear nor stationary, the line may still exist and the case for ruling out some preferences may remain legitimate.

Surely a great deal of subjectivity is involved in determining what preferences should or should not count. Society's decisions to allow some preferences or emotions, and not others, derive from society's laws and norms. But this dependence does not make benefit–cost analysis illegitimate.

6. CONCLUSIONS

Standard applications of benefit–cost analyses calculate the benefits (and costs) based on the affected parties' WTP (or required compensation) for the

impact implied by a policy change. Since WTP may depend on individual characteristics such as age or income, the value or benefit attributed to a given policy impact (such as an improvement in safety) can differ depending on the age or income of the affected population. To many, this is inequitable and calls in question the legitimacy of benefit–cost analysis. Some suggest discarding benefit–cost analysis in such situations. Others recommend altering the methods so that the impact on each individual might be given equal value, or at least involve smaller differences in value.

This paper offers a different option. It endorses a broader domain for the benefit calculation: including the WTP by third parties for the policy outcome in question. When one takes these effects into account, the measure of benefits remains firmly rooted in the actual WTP of affected parties. As a result, the benefit–cost calculation retains what may be its most important normative basis: its ability to indicate the change in aggregate income (or wealth) that is equivalent to the policy's impact.

In some cases, attention to third-party effects will increase measured benefits significantly. The increase is likely to be more important the larger the disparities in income between directly affected parties and third parties. Income disparities can be quite large in some international policy settings, such as international climate change policy.

It is one thing to recommend including third-party effects as a theoretical matter; it is another to estimate these effects. In some cases, these effects might not be substantial enough to justify the effort of adding them to the valuations offered by directly affected parties. However, in international settings third-party effects may often be substantial enough to justify the effort and costs associated with estimating them.

Clearly it is not possible to locate precisely the line that divides the cases where attending to such effects is practical or impractical. But imprecision does not justify dismissing such effects. Uncertainty pervades many aspects of benefit–cost analysis, and there seems to be no more reason to insist on certainty about this dividing line than to demand certainty about future discount rates, preferences of future generations, or the biophysical impacts of a proposed policy.

Some types of third-party effects already have established a place in applications of benefit–cost analysis. One important third-party effect is existence value. In environmental policy analysis, it is now generally accepted that avoided loss of existence value has a valid place in the assessment of policy benefits, and benefit–cost analyses of environmental policies routinely include assessments of this type of value.[21] An intriguing question, beyond the scope of this paper, is why this particular third-party

effect has enjoyed wide application, while another type – third-party concerns for avoided premature death – has not.

NOTES

1. Throughout this paper, "benefit" refers to the value attached to a physical or psychological impact. Some authors use the term "monetized benefit" to express this concept.

2. See U.S. Environmental Protection Agency (1999). Similarly, in the EPA's retrospective evaluation of the Clean Air Act's benefits and costs over the period 1970–1990 (U.S. Environmental Protection Agency, 1997), in the central case 81 percent of the benefits were attributed to avoided premature death.

3. See Krupnick et al. (2002). This study found that the WTP to avoid an incremental reduction in mortality risk was 30 percent lower for individuals over 70 year old compared with the WTP of younger individuals.

4. John D. Graham, "Memorandum to the President's Management Council, Benefit-Cost Methods and Lifesaving Rules," Office of Information and Regulatory Affairs, Office of Management and Budget, Executive Office of the President, May 30, 2003.

5. The newer empirical work includes Itaoka, Krupnick, and Akai (2005), which found no evidence that WTP declines with age, and Alberini, Cropper, Krupnick, and Simon (2004), which found only weak evidence. In a very recent working paper, Viscusi and Aldy (2003) find no evidence that WTP to avoid mortality risk rises with age. Indeed, their results tend to indicate that the WTP peaks at age 46.

6. The May 2003 memo also endorsed the use of cost-effectiveness analysis alongside benefit–cost analysis in the evaluation of regulations with life-saving benefits. As indicated in the memo, in cost-effectiveness analysis there is no need to attach a value to the avoided premature mortality: instead, policies are compared in terms of the cost of achieving some predetermined target such as the prevention of a given number of premature deaths. However, the cost-effectiveness approach cannot reveal whether the stipulated target is too lax or stringent from the point of view of its benefits and costs.

7. The Clinton Administration had called for a reduction in maximum allowable arsenic concentrations from 50 to 10 μg/liter. Whether the tougher standard passed a benefit–cost test seemed sensitive to the locality involved, because of differences across communities in per-capita treatment costs and in WTP for improved water quality, where the latter reflected differences in income. Small towns faced especially high costs of improved treatment, because of the inability to exploit scale economies. Representatives of many small towns pressured the EPA not to apply the tougher standard to their localities. The EPA considered calculating WTP (benefits) for small towns based on the actual incomes in those localities, which were below the national average. This would have generated lower benefit estimates than estimates based on average income for the nation, and thus it would have helped justify a lower standard for the small towns. But the EPA ultimately decided to calculate benefits to these areas based on average national income rather than on the income in each affected community.

8. This discussion considers the benefit or cost relating to introducing a new policy. The status quo represents the reference point, and the WTP indicates the change in welfare from that reference level of welfare. The WTP here corresponds to what is termed the equivalent variation. One can also consider the benefit or cost from foregoing the new policy. Here, the change is from the new-policy situation to the initial situation – that is, the welfare under the new policy constitutes the reference level of welfare. In this case, the WTP is defined by:

$$U_i(p_i, Y_i - WTP_i, G) = U_i(p_i', Y_i', G')$$

and it corresponds to what is termed the compensating variation. For a further discussion of the equivalent variation and compensating variation concepts, see Zerbe (1998).

9. In principle, this sum would represent all gross benefits and gross costs of the policy. In practice, however, many gross costs are evaluated by other measures, such as increases in production costs, losses of profit, or reductions in wage income.

10. In the equation defining the willingness to pay, WTP_i is the income-equivalent to the change in utility. If one interprets Y and Y' as wealth rather than income in these equations, then WTP_i represents the wealth-equivalent to the utility change.

11. In a similar vein, Polinsky (1971) emphasizes that the effect of the application of benefit–cost analysis should be considered in terms of the probabilistic impact after a series of policy decisions.

12. The word "potential" carries a lot of weight here. In usual parlance, a potential Pareto improvement arises if the winners could compensate the losers through lump-sum transfers and remain at least as well off (with at least one winner strictly better off). There are many reasons why such transfers are not in fact feasible. To begin with, it often is difficult or impossible to identify all the winners and losers. Second, effecting the transfers may entail very high administrative costs. Indeed, the administrative costs of identifying for every individual the amount that individual stands to win or lose, and implementing the necessary transfers from winners to losers, could be extremely high. Finally, even if it was technically possible to determine the necessary transfers, such transfers may not be politically feasible. Politics might call for transfers that are not lump-sum, or perhaps reject some or all of the needed compensation. Thus, there is a huge divide between a potential and an actual Pareto improvement.

13. Until recently I embraced this argument, but Milgrom's example now leads me to abandon it!

14. That is, damages expressed in value terms.

15. Zerbe (2002) provides parallel arguments supporting the inclusion of third-party effects in benefit–cost assessments.

16. Existence values from an environmental improvement are the values people attach from the intellectual recognition of the improvement, apart from any utility gain connected with changes in the ability to use or directly experience the environmental change. A person who never plans to view (or eat) a bald eagle might gain existence value (utility) from knowing of its existence, and thus could suffer a welfare loss from if this eagle were to become extinct.

17. Of course, the willingness to partake in international efforts could be attributed to other factors. The participating nation might expect a future quid pro quo. Or the nation's citizens might value the respectability their nation enjoys from its participation – this satisfaction is different from the third-party impacts discussed above – the utility from producing beneficial impacts to people in other countries.

18. Zerbe (1998) considers closely the ways that a wide range of psychological attitudes – including concerns about distribution – can enter an individual's WTP.

19. This example is in Zerbe (1998). See also Zerbe (1991).

20. Kelman (1981) considers a similar issue, pointing out that it would be inappropriate to apply benefit–cost analysis to determine whether a rape is justifiable.

21. While analysts generally accept the legitimacy of existence value as a determinant of benefits or costs, and while many studies include assessments of this value, there remains considerable disagreement as to whether this value can be measured with any accuracy. The principal tool for measuring this value is contingent valuation, and this tool remains controversial. Hanemann (1994) and Diamond and Hausman (1994) offer positive and negative assessments of contingent valuation, respectively.

ACKNOWLEDGEMENT

I am grateful to Kenneth Arrow, Peter Hammond, Mark Jacobsen, Paul Portney, and Richard Zerbe for very helpful discussions.

REFERENCES

Alberini, A., Cropper, M., Krupnick, A., & Simon, N. (2004). Does the value of statistical life vary with age and health status? Evidence from the U.S. and Canada. *Journal of Environmental Economics and Management*, *48*, 769–792.

Diamond, P., & Hausman, J. (1994). Contingent valuation: Is some number better than no number? *Journal of Economic Perspectives*, *8*(4), 45–64.

Hanemann, W. M. (1994). Valuing the environment through contingent valuation. *Journal of Economic Perspectives*, *8*(4, fall), 19–43.

Itaoka, K., Krupnick, A., & Akai, M. (2005). Age, health, and the willingness to pay for mortality risk reductions: A contingent valuation survey in Japan. RFF Discussion Paper DP 05-34, August.

Kelman, S. (1981). Cost–benefit analysis: An ethical critique. *Regulation*, 33–40, January/February.

Krupnick, A., Alberini, A., Cropper, M., Simon, N., O'Brien, B., Goeree, R., & Heintzelman, M. (2002). Age, health and the willingness to pay for mortality risk reductions: A contingent valuation study of Ontario residents. *Journal of Risk and Uncertainty*, *24*, 161–186.

Milgrom, P. (1993). Is sympathy an economic value? Philosophy, economics, and the contingent valuation method. In: J. Hausman (Ed.), *Contingent valuation: A critical assesment*. Amsterdam: North Holland.

Polinsky, A. M. (1971). Probabilistic compensation criteria. *Quarterly Journal of Economics*, *86*(3), 407–425.

Portney, P. (1994). The contingent valuation debate: Why economists should care. *Journal of Economic Perspectives*, *8*(4), 3–17.

Tol, R. S. J. (1995). The damage costs of climate change: Toward more comprehensive calculations. *Environmental and Resource Economics*, *5*, 353–374.

U.S. Environmental Protection Agency. (1997). *The benefits and costs of the Clean Air Act 1970 to 1990*, Office of Air and Radiation, Report to Congress October 1997.

U.S. Environmental Protection Agency. (1999). *The benefits and costs of the Clean Air Act 1990 to 2010*, Office of Air and Radiation, Report to Congress November 1999.

U.S. Environmental Protection Agency. (2003). *The Clear Skies Act of 2003.* http://www.epa.gov/air/clearskies/fact2003.html

Viscusi, W. K., & Aldy, J. E. (2003). *The value of a statistical life: A critical review of market estimates throughout the world.* NBER Working Paper w9487, February 2003.

Zerbe, R. O., Jr. (1991). Comment: Does benefit cost analysis stand alone? Rights and standing. *Journal of Policy Analysis and Management*, *10*(1), 96–105.

Zerbe, R. O., Jr. (1998). Is cost–benefit analysis legal? Three rules. *Journal of Policy Analysis and Management*, *17*(3), 419–456.

Zerbe, R. O., Jr. (2002). Can law and economics stand the purchase of moral satisfaction? *Research in Law and Economics*, *20*.

Zerbe, R. O., Jr., Bauman, Y., & Finkle. A. (2006). An aggregate measure for benefit–cost analysis. *Ecological Economics*, forthcoming.