

MPRA

Munich Personal RePEc Archive

A foundation for benefit-cost analysis

Zerbe, Richard

University of Washington

April 2023

Online at <https://mpra.ub.uni-muenchen.de/121294/>
MPRA Paper No. 121294, posted 30 Jun 2024 09:55 UTC

A Foundation for Benefit-Cost Analysis¹

DRAFT

Richard O. Zerbe

University of Washington
richardozerbe@gmail.com
April 2023

Abstract

This paper considers the evolution of cost-benefit analysis, CBA, and proposes a foundation for its current use and continued development, to be called benefit-cost analysis, BCA. In the trajectory from CBA to BCA elements of a new foundation include first a recognition that there is a Pareto justification for its use, not just a potential Pareto or KH justification.² The Pareto justification applies to the whole use of BCA, rather than, as with KH, to individual projects. Second, the BCA recognizes, to a greater extent than CBA, its reliance on law to determine rights and reference points from which BCA determines gains or losses. Thus, in considering the role of law, the gain-loss disparity is recognized by BCA as is the role of law in determining rights. Third, BCA recognizes behavioral economics essentially unknown to CBA. Fourth, the proposed foundation for BCA recognizes that illegal goods or actions are not to be given standing so that the value of stolen goods to the criminal is zero, except in cases in which the very illegality of the law itself is at issue. Fifth, BCA recognizes from a theoretical viewpoint that moral and ethical sentiments should, aside from data limitations, be treated as other goods for which there is a willingness to pay or to accept. This applies to both utility weights relying on declining marginal utility with income and to equity weights relying on WTP or WTA

¹ I thank, James Hammitt, Thomas Kneiser, Szabolcs Szekeres and David Burgess for useful comments, and Richard Hamilton who pointed out many instances in which paying compensation was efficient, and Massimo Florio for encouragement.

² I recognize that there can be no perfect justification without cavil of this or any other justification. See the literature connecting with the work of John Rawls.

measures. Six, BCA recognizes that actual compensation can improve welfare. Seventh, I suggest that a discount rate that combines the use of both the social rate of time preference and the opportunity cost of capital constitutes an appropriate discounting procedure. Eighth, the suggested foundation for BCA will reduce many existing criticisms of CBA.

1.0 Introduction

This paper considers the evolution of cost-benefit analysis, CBA, and proposes a foundation for its current use and continued development, to be called benefit-cost analysis, BCA.³ It makes no difference whether we use the terms CBA or BCA but what is important is to recognize the changes and growth that have occurred since the economists substantially addressed CBA in the 1930s. In the trajectory from CBA to BCA the elements of a new foundation include first a recognition that there is a Pareto justification for its use, not just a potential Pareto or KH justification (Zerbe, 2020). The Pareto justification applies to the whole use of BCA, rather than, like KH, to individual projects. Second, BCA recognizes, to a greater extent than CBA, its reliance on law to determine rights and reference points from which BCA determines gains or losses. Third, BCA recognizes behavioral economics essentially unknown to CBA. Fourth, the proposed foundation for BCA recognizes that illegal goods or actions are not to be given standing so that the value of stolen goods to the criminal is zero, except in cases in which the very illegality of the law itself is at issue. Fifth, BCA recognizes that moral and ethical sentiments should be treated just as other goods for which there is a willingness to pay or to accept. Six, BCA recognizes that actual compensation can improve welfare. Seventh, I suggest that a discount rate that combines the use of both the social rate of time preference and the opportunity cost of capital, constitutes an appropriate discounting procedure. Eighth, the suggested foundation for BCA will reduce many existing criticisms of CBA.

2.0 Early History of CBA⁴

Although cost benefit analysis, CBA, as a tool of engineers was used in the United States in the early 1900s, an economic foundation for its use was first created by Kaldor (1939) and by Hicks (1939) in the late 1930s and early 1940s. J.R. Hicks, an early winner of the Nobel Prize in economics, went on to note in a 1939 paper, titled *The Foundations of Cost Benefit Analysis*, “[T]he subject of this paper, is a matter of very fundamental importance, both for economic theory and for the proper attitude of economists towards economic policy.” This seems as true now as it was then as new challenges have arisen.

The use of CBA provides information and suggests solutions for collective action problems that can be addressed by government projects or by benign neglect. Porter (1995) explains that such problems in government decision making arose in the late 1890s and early 1900s, with resultant legislative conflict and legislative logrolling leading to the passage of large and economically and publicly objectional pork belly projects. To address these objections, the U. S. Army Corps of Engineers introduced CBA in the United States as early as 1902, taking their cue from their French equivalent, the *Corps des Ponts de Chaussées*, so that after this date water projects needed to be certified as beneficial by the Board of Engineers for Rivers and Harbors, a part of the Corps. The Corps rejected more than half of proposed projects mainly on economic grounds. Later the Corps mandated this CBA certification requirement to provide compliance with the Flood Control Act of 1936. The Corps work was quite successful and was seen as such so that the Corps gained considerable recognition and prestige.

After 1940, however, the Corps was challenged by powerful electric and railroad utilities, shipping interests and rival federal agencies, especially by the Bureau of Reclamation and the Dept. of Agriculture. The response was a requirement of increasing quantification of projects so that by the 1950s there was a reasonable set of accepted rationalized principles. Economists succeeded in promoting the use of discount rates higher than the rates on treasury bonds, largely based on the costs of capital and accepted the valuation of intangibles such as landscapes and

⁴ Earlier CBA was rooted in the debates on the measurement of public utility between the engineers of the *Corps des Ponts et Chaussées* in the nineteenth century and, in particular, within the work of Jules Dupuit.

views. The increased prestige of CBA led to its use by other government agencies. Its use spread further with President Reagan's Executive Order declaring that Regulatory Impact Analysis (RIA) must be used for major initiatives, followed by Clinton's Executive Order in 1994. Its use has continued under successive presidents, including the current President, Biden.

The Economists

Before the late 1930s, it was generally assumed by economists and engineers that each individual had an equal capacity for enjoyment and that gains and losses among different individuals could be directly compared (Mishan, 1981, pp. 120–121; Hammond, 1985, p. 406). Lionel Robbins (1932, 1938) challenged this view by pointing out that interpersonal comparisons of utility were unscientific and that the equal capacity assumption was not, and could not be, supported by either evidence or theory.

Nicholas Kaldor (1939) introduced, and Sir John Hicks supported (1939a) and elaborated (1939b), a different justification for CBA known as the Kaldor-Hicks's (KH) test or the Potential Pareto test (PPT). The Kaldor test is passed if those who gain from a project could hypothetically and costlessly compensate (by lump sum transfers) those who lose, while the winners still remain better off than initially. This is the compensating variation, CV, or Kaldor test. The Hicks or EV test is passed if those who lose are unable to pay potential winners (by lump sum transfers) to not undertake the project, while themselves remain better off. The idea was that if the tests are passed there are sufficient gains to hypothetically compensate losers and thus to hypothetically satisfy the Pareto standard, and that whether or compensation was actually provided was a matter for politicians.⁵ The KH standard has then existed for 85 years without great change and its relative, the consumer welfare standard in antitrust, has lasted about 50 years. The Kaldor test relies on the compensating variation, CV in which gains are measured by willingness to pay,

⁵ Simply put the Pareto test is said to be met when a policy produces no losers. More formally, in its strong form, Pareto efficiency says that state A is preferred to state B when state A is ranked higher than state B for one person and all other persons rank A at least as high as B. The weak form occurs when the utility of all is higher in state A so that A is preferred to B.

WTP, and losses by the willingness to accept (WTA). A positive value for this is a necessary but not sufficient condition for a welfare improvement.⁶

4.0. The Development of BCA

It is perhaps useful to date the major changes in CBA from the publication of the 1979 work of Kahneman and Tversky (1979) and the subsequent creation of the Society for Benefit-Cost Analysis which occurred at a 2007 meeting arranged by the Evans School at the University of Washington, we proposed to form a Society for Benefit Cost Analysis (BCA) with a concomitant Journal, the Journal of Benefit-Cost Analysis. In using the BCA terminology rather than CBA, we thought to distinguish BCA from its CBA roots in engineering and to provide a more economic flavoring to the name and to practice. Although the terms CBA and BCA are often used interchangeably, I suggest BCA can be usefully seen as a further development or evolution of CBA. Table 1 shows differences then and now.

Table One: Differences in CBA and BCA

CBA	BCA
The kh criteria	Drops kh
No well-defined reference point	Has well defined reference points
The treatment of moral sentiments	Treats morals as other goods.
Issues of standing	Uses law and norms to determine standing.
Issues with compensation	Recognizes that compensation can satisfy a BCA test.
Little acknowledgement of the role of law	Recognizes a strong reliance on law in setting reference points and in determining standing.
Little or no recognition of behavioral Economics	Recognizes the importance of behavioral economics.
Widely criticized	Obviates most criticism.

⁶A positive value of the aggregated CV is necessary for the Kaldor strong test to be passed and a sufficient condition for a rejection of a negative CV, except in the unlikely case of non-intersecting community indifference curves, in which cases both the EV and CV give sufficient welfare measures (Bruce and Boadway, 1984 p. 267, and Chapter 9 in general.)

No resolution of discount Rate Issues	No resolution of discount rate issue.
The possibility of scitovsky reversals exists	No such possibility exists with BCA as it drops the compensation test which is a creature of the compensation test. It should be acknowledged, however, that even under the compensation test, reversal probability is quite low.

CBA as defined here suffers from several foundational deficits. First, potential compensation is a weak justification for acceptance of a project or for acceptance of CBA itself as it considers neither whether compensation will or should be carried out, nor indeed if it could even be carried out in the real world. That is, the potential compensation test justification does not require that compensation could even hypothetically be carried if the administrative costs for actual compensation are considered, nor can it be a legitimate excuse, as it often has been, for not considering ethical or moral goods on the grounds that such considerations are solely a matter for administrators. For, CBA itself provides the means of doing this by treating ethical or moral goods as economic goods for which there is a willingness to pay (WTP) or willingness to accept, WTA, perhaps contrary to Kaldor’s admonition.⁷ Second, the potential compensation test is the source of the Scitovsky reversal paradox according to which there is ambiguity about whether or not a project should be undertaken.⁸ Third the compensation test has been substantially criticized

⁷ James Hammitt interestingly asks if moral sentiments can have force even if there is no or negative willingness to pay. The answer is yes in a sense as one can imagine, say, an indignant response to being asked the WTP to have the right to a jury trial, or to avoid being lied to, but this moral force has economic value which can be measured by a more sophisticated questions such as ‘what effort what you make to ensure the right to a jury trial’

⁸ A widespread criticism of CBA and of KH relies on the existence of the Scitovsky reversal paradox). Tibor Scitovsky (1941) showed that the use of KH could lead to policy reversals in an endless cycle. That is, having used KH to justify moving from a state of the world A to a state B, KH could potentially be used again to justify a movement from the new state B back to A.⁸ Scitovsky suggested that projects should be required to pass both the Kaldor and the Hicks tests. This would eliminate reversals as projects that passed the test would be both necessary and sufficient.

(Alder and Posner, (2006, 2007)). Fourth, as CBA does not treat moral and ethical sentiments as it does other goods it is internally inconsistent and ambiguity remains about their treatment. Fifth, CBA fails to sufficiently recognize the role of law in its use. Six, there is a lack of reasonable agreement about what discount rate to use. Seven, there is a failure to recognize that the Consent Justification (Edgeworth, 1881) provides a better foundation for the use of BCA than does the hypothetical compensation of KH does. If distributional consequences are not to be considered under KH then we are missing the valuation of important goods so that project recommendations may be incorrect. Under KH there is no consideration of actual compensation of losers, which can be an efficiency question as there are many situations in which compensation is efficient and can be shown to be such using BCA. One such case is that of tuberculosis in cattle, where efficiency enhancing compensation occurred in both Britain and the United States.⁹ Cattle with tuberculosis were destroyed by governments and farmers were compensated. This was efficient as it reduced the spread of tuberculosis in cattle. Without compensation ranchers and farmers were much less likely to report instances of tuberculosis, which enhanced its spread.

In practice, the standard for acceptance of a project is simply a positive net present value standard (NPV), which is related to but not the same as either of the KH tests as very often both gains and losses are measured by WTP amounts, or their approximation as consumer and producer surpluses, not quite corresponding to either the CV or EV. The failure to use the correct WTA measure to value losses is well established (Brown and Gregory, 1999, Knetsch, 2020).

The CV and EV tests are incomplete in the sense that that CV is a necessary condition for a positive welfare change but is not a sufficient test and the EV is a sufficient test but not a necessary one (Bruce and Boadway, 1984). That is, using the CV test a project may pass the test but not improve welfare, and using only the EV test one may miss a welfare increasing project.¹⁰ Yet, it is difficult enough in practice to provide or find the data to use the usual measure, the CV, which is the reason why WTP amounts are often, or even usually, used for losses, contrary to theory and evidence (Boadway and Bruce, Chap. 9, 1984). Although the compensation test

⁹ See USDA Animal and Plant Health Inspection Service (2002, 2023)

¹⁰ Boadway and Bruce (1984 p. 263) note that neither the CV nor the EV test provides a complete social ordering and are subject to reversal and intransitivity paradoxes

raises the specter of the Scitovsky reversal paradox,¹¹ it has been shown that the probability of this paradox arising is quite small (Just, Schmitd, Zerbe, 2013). In practice, losses are often calculated using the WTP test instead of the WTA test and this difference between the WTP and WTA can be large and important. In practice a reasonable procedure is just to WTPs for both gains and losses except where the gain-loss discrepancy is likely to be large or large enough to affect the project denial or acceptance.

A confusion arises with Kaldor's justification for CBA and the consideration of moral or political sentiments. Kaldor's (1939, at 550) assumption that whether actual compensation should take place "is a political question on which the economist, qua economist, could hardly pronounce an opinion" seems incorrect as a literal statement, as distributional goods can be measured and valued through the WTP and WTA just as with other goods. Unfortunately, the influence of the compensation test in ignoring the costs of compensation has led some analysts to ignore distributional goods in a CBA context and a number of economists to argue that to count non-paternalistic moral sentiments in CBA or elsewhere is to double count. This argument has been shown to be wrong in both theory and practice once the administrative costs of compensation are included (Zerbe, et al, 2006). The fact is the KH test is unnecessary as it does no work for us. The justification for using BCA does not then lie in the use of KH but in the consent justification which relies directly on the Pareto justification rather than on only the potential Pareto justification. This is because, for a sufficiently large portfolio of projects which is not very large, everyone tends to gain, as the many projects that pass the CBA test will tend to distribute net gains across a population, (Zerbe, 2020).¹².

4.1 BCA Defined

BCA is defined here to contain the following foundational assumptions and aspirations, which helps to codify the evolution of CBA into BCA.

¹¹ Tibor Scitovsky (1941) thus suggested using both tests together. The Scitovsky test is passed if both the CV and EV tests are passed.

¹² Hammitt (personal communication) suggests the possibility that If BCA used individual-specific WTP it would be more biased toward the rich than with the common practice of using common values for everyone in the population.

- (1) The use of NPV using the CV is a reasonable summary measure for evaluating a project.
- (2) The recognition of a Consent Justification (Edgeworth, 1881, Zerbe 2020) for the use of BCA.
- (3) When projects have small income and substitution effects, the differences between WTP and WTA are smaller and are reasonably ignored. Otherwise the gain-loss discrepancy needs to be taken into account.
- (4) BCA considers all goods for which there is a WTP as economic goods. This includes the realization of ethical or moral sentiments as goods for which there is a WTP or WTA. This is part of the issue of standing in BCA (Whittington and McCrae, 1986, 1990; Zerbe 1991, 2002).
- (5) BCA recognizes both social preferences (SRTP) and the opportunity cost of capital (SOCC) in discounting.
- (6) For benefit estimation, the most rational approach would be to follow Viscusi and Gayer (2016) who suggest that “we adopt the default position of respecting consumer sovereignty under the presumption that fully informed people are better able to make decisions that bear on their own well-being than are others. The basis for this revealed-preference approach, which is supported by much empirical evidence, is that in most contexts consumers are better equipped than analysts or policymakers to make market decisions that affect themselves”
- (7) The recognition of the use of law in defining ownership, rights and standing to be counted, and thus connects BCA with law and the treatment of values arising from illegal behavior and illegal goods.
- (8) BCA uses WTP as gains from a legal reference point and uses WTA as losses from the legal reference point, recognizing that losses count more than equivalent gains. In doing this BCA recognizes the reference point, as developed by Kahneman and Tversky and the compensating and equivalent variations developed by Hicks. Short cuts in determining losses such as using the WTP should in practice be indicated.
- (9) BCA notes the recognition of a broader range of goods, such as existence values and equity preferences, as goods for which there exists a willingness to pay, WTP.
- (10) The discount rate recognizes both capital opportunity costs and time preferences.

4.2 Net Present Value (NPV)

The use of NPV along with the compensating variation, CV, provides a necessary condition for a welfare gain, and is consistent with actual practice, eliminates Scitovsky reversals, (Boadway and Bruce, 1984, Chaps 3 & 4 & 9), and is consistent with a Consent Justification developed by Edgeworth (1981) for the use of BCA (Zerbe, 2020) . In practice, however, both gains and losses are often measured by the WTP, on the grounds that that income and substitution effects are small so there is little difference between the WTP and WTA. But substitution and income effects are often for losses avoided not small, as for example in health care (Shogren et al, 1994). The practice of using the WTP is, however, unfortunately often used whether or not justified by practical concerns.

4.3 Moral Sentiments, Standing and the Law

Consideration of moral sentiments has become popular in the benefit cost literature, even influencing discount rate discussions, with economists, philosophers, and lawyers contributing. Prominent discussions concern the welfare of future generations, income and wealth inequity, actual vs. potential compensation and health and the environment as special cases.¹³

The treatment of moral sentiments in CBA has had an ambiguous role since Kaldor's assertion that judgements about distributional effects should be left to the politician. Hicks (1939a, p. 712) notes, "if measures making for efficiency are to have a fair chance, it is extremely desirable that they should be freed from distributive complication as much as possible." Otherwise its conclusions "would depend on the scale of social values held by a particular investigator. Such conclusions can possess no validity...." The assertion is certainly true by definition in regard to policy action but incorrect with respect to the BCA analyst's treatment of moral sentiments. It is hubris for analysts to think they should decide what is moral or immoral on the basis of their own mores, morals or subjective judgements

¹³ Many of the criticisms suggest that the income distribution is unjust so that decisions using the WTP or WTA can also be unjust. The distribution of income and wealth may be unjust but it does not follow that using BCA results in projects that are in the main more favorable to the rich. No empirical evidence has been produced, as far as I am aware, that BCA projects taken as a whole are mostly beneficial to the richer. I hypothesize that the opposite is the case.

BCA provides a straightforward approach for evaluating moral sentiments. Moral sentiments should be valued as with any other good by determining the WTP or WTA for their realization. In fact ignoring such sentiments is contrary to BCA itself as Hicks (1939, p. 512) recognized. The treatment of moral and ethical values is on a firm footing when they are recognized and treated as other goods. In addition, the realization of the economic value of moral sentiments obviates many criticisms of BCA as shown below and makes the determination of standing simpler.

An objection to inclusion of moral sentiments has arisen to the effect that if we include their values, we will also need to treat immoral sentiments so both should be avoided. This is perfectly backward. BCA would recognize them both moral and immoral sentiments. For, one man's morality is another's immorality. Critics of including moral sentiments raise utility monster cases.¹⁴ These are cases in which utility from bad actions is multiplied until harm exceeds any gains. For example, say, Donald and his friends like to beat up Joe. The disutility to Joe will we presume be greater than the utility from the beaters. Now let's increase the number of beaters until the summed utility of the beaters exceeds that of the loss to Joe. So it might seem that the existence of bad utility should lead to ignoring moral sentiments all together. This is, however, not the case. The illegality of beating suggests that the WTP sentiments arising from beatings should not be counted as the countervailing sentiments in favor of no beating allowed would outweigh those of the beaters.

4.4 Distributional Considerations

That moral sentiment whose consideration is the most prominent is the BCA treatment of distributional matters. There are four possibilities:

1. Ignore distributional effects
2. Consider them separately from non-distributional goods
3. Develop a set of weights to account for distributional goods.

¹⁴. These have led economists to ignore bad utility without a rationale. BCA provides a rationale consistent with CBA, namely that illegality suggests opposite sentiments overpowering bad utility.

4. Treat them as other goods for which there is a WTP.
5. Separate utility weighting from equity rating.

Ackland and Greenberg suggest separating utility rating from equity rating and incorporating utility rating into BCA and thus into NPV, but not including equity rating. Utility rating would account for declining marginal utilities of income. Equity rating would in their view involve a judgement about the morality of equity. The incorporation of utility rating into BCA seems wholly consistent with the foundations of BCA in so far as reasonably reliable estimates of declining marginal utility can be made. Ackland and Greenberg (2023) suggest that equity effects should not be included in BCA as to do so would rely on judgements not properly a part of BCA. Yet equity rating is also consistent with BCA to the extent that WTP or WTA estimates to achieve a moral position can be made. Thus, to treat moral sentiments, including distributional effects, as other goods is theoretically correct and consistent with BCA but in many or even most cases impractical due to data limitations or costs. Such estimates could be achieved through survey data. The usual expression of these is in existence values. Even twenty years ago according to Dana (2004, p. 369), more than 2000 contingent valuation (CV) studies have been completed, a significant number of which have been directed toward determining existence values. Existence values are defined by the federal appellate court in the Ohio decision as “the dollar amount an individual is willing to pay although he or she does not plan to use the resource, either at present or in the future.” (State of Ohio v. United States Department of Interior, 880 F.2d 432 (D.C. Cir. 1989). This case defines contingent valuation as including assessment of option and existence values (and cites 51 Fed.Reg. at 27,692, 27,721 for the definition of existence value) The basis for existence value is a concern for others, including future users, or for the intrinsic value of the thing or the being itself, or for the type of thing or being. Clearly existence values have at least in part a moral component. The Ohio court, at 464, went on: “Option and existence values may represent ‘passive’ use values but they nonetheless reflect utility derived by humans from a resource and thus, prima facie, ought to be included in a damage assessment.” For example, the federal wetlands program and the federal endangered species program are justified only by including existence values (Farber, 1992, p. 64, Dana, 2004, p. 353 In so far as this is possible equity ratings could also be included in BCA. Otherwise they should be treated separately but not ignored as to ignore them is to fail to provide useful information to the decision maker.

The counter argument to using either utility or equity weights is that distributional changes are best made through the tax system. Such an approach has been suggested, for example by Steve Shavell in an AER article. I have long been in agreement with Acland and Greenberg that the tax system and BCA inhabit different worlds and provide no reason why BCA should avoid distributional considerations.

Current interest appears to be in developing weights for distributional effects. Such weights are normally an inverse function of income or wealth such that $W = Y^\alpha$, where Y is income or wealth, and α is a variable. For example, for average income α might equal 1, and for lower incomes might be > 1 , or for above average incomes would be negative. A straightforward example is that $W = Y^{-1}$ in which the weight is just the inverse of income

4.5 Law, Rights and Standing

BCA (and CBA) are rooted in law in terms of ownership and rights, and in general establish a reference point representing the psychological status quo from which one should measure gains and losses (Kahneman and Tversky (1979)). The psychological reference point is determined by felt and perceived ownership, which in turn is largely formed by law. For both empirical and theoretical reasons, gains and losses are to be measured from the reference point with losses generally being greater than equivalent gains. Where law is legitimate as in a democratic system it generally determines where rights and hence reference points lie.

These and similar questions are ones of the concept of **standing** in BCA.¹⁵ Consider the situation in which the criminal thief values the goods more than its owner. BCA would hold that the value to the thief of the stolen goods would not count, as the thief's gain of the goods is illegal. That is, the thief has no standing to claim the goods. The fact of illegality is a legal statement resting on a social norm that is reasonably said to embody the social judgement that the WTP to avoid

¹⁵ Other questions include should costs to fetuses be counted? Should the educational benefits provided to the children of illegal immigrants be counted. Should the gains of the criminal from theft be counted. What if the goods are more valuable to the criminal thief than to the owner? (Whittington and McCrae, Zerbe 1991, 2008).

theft is greater than the WTP to allow it. Under BCA illegality embodies the sentiments (WTP) of the larger population that beating should be illegal. Only where the question is whether or not an action should be legal or illegal should the sentiments of criminals be counted. Now there may of course be unclear law or bad law or the issue is changing the law. Here the analyst would address the value of the law itself. If for example, we seek to decriminalize some drug, users of the drug, who may previously not have had standing, must now be given it.

Consider, the following problem. The Dominican Republic has a set of wealthy gated communities on the one hand and a large number of very poor people elsewhere.¹⁶ The gated communities have well-functioning services such as piped water supply, piped sewage disposal, reliable grid supplied electricity, police forces providing complete security, paved roads and well-tended landscaping, excellent schools, etc. The corresponding services in the rest of the country are very inadequate. The inhabitants of the gated communities are unwilling to pay for services to the rest of the population. Despite the poor getting some income from working in the gated communities the WTPs for those services summed over the non-rich are below the costs of providing even minimally acceptable services. In the absence of donations from outside the country it would be very difficult for the poor to advance without some redistribution of income. How would the BCA analyst proceed? Consider four paths: First, the analyst is stymied. Two, one can attribute a right to adequate services by the poor. In this case, the measure of value for the poor would be the WTA, which would be very much larger than their WTP. Third, one could consider excess deaths by the poor and, given a right to life, the value of life savings would be a WTA estimate. Finally, one could consider that the BCA client is not the DR but the United Nations who wish a WTA estimate on the grounds of their concept of rights. The resolution of such options is a matter of determining standing.

Behavioral Economics

Although it has important antecedents such as Adam Smith, behavioral economics is generally understood to have originated in the heuristics and biases research of Daniel Kahneman and Amos Tversky and Richard Thaler that started in the 1980s. The applications to BCA have been numerous (Robinson and Hammitt, 2015). This can only be regarded as a positive contribution to BCA and a feature separating BCA from CBA.

¹⁶ This problem was suggested to be by Richard Hamilton

5.0 The Discount Rate

Issues concerning discount rates span the history of cost benefit analysis and have long bedeviled the economics profession. It is perhaps unfortunate that politicians tend to change the rate with each change in Federal administration, but they are partially led to this by the failure of the profession to provide adequate guidance. The profession needs to determine both the rate to be used and/or the procedure to be used in attaining it. William Nordhaus (2019) observed that the debate on discounting is “just as unsettled as it was when first raised three decades ago.” The treatment of discounting in Circular A-4, 2003 remains unsatisfactory, though, given the lack of consensus in the profession, this is both understandable and unsurprising.¹⁷

Circular A-94 with the 7% discount rate (supposedly representing the rate of return to capital in the private sector, interpreted as the appropriate social opportunity cost rate (SOCR) prevailed from 1992 until just recently, surviving Clinton, Bush, Obama and Trump administrations. Prior to that, from 1972 to 1994, the recommended SOCR was 10% and was lowered just before Clinton took office, ostensibly because of evidence that 10% overstated the marginal rate of return to capital, but perhaps also because of a political adjustment? What is unsettling was the simultaneous endorsement of a 3% SRTP rate for evaluating investments in water resource management, for cost-effective analysis and for investments with benefits in the distant future, (with ambivalence about applying any shadow price of capital to displaced investment-so that essentially, as David Burgess (2024) notes in a private communication “one might use any value you think you might be able to justify.” That is, there are no established rules for justification and a large range of rates can be cited in the literature.

5.1. The Role of the Discount Rate

There is no chance of even a partial agreement until the job the discount rate is supposed to perform is agreed upon so that superfluous attachments to the rate can be ignored. Historically there has been agreement that its role included coverage of the opportunity costs of projects and beyond that to satisfy social time preferences. If this role is accepted it obviates many suggestions about what the discount rate should be. These include unacceptable suggestions that the incorporation of some analyst’s or agent’s preferences should be the discount rate, the use of

¹⁷ Even though the circular cites an older article by Jonathan Lesser and me (1994), they do not cite more recent articles by e.g. Burgess and Zerbe (2011)

the Ramsey growth model to determine the rate, and that moral sentiments should be reflected in the rate..¹⁸ Sumaila and Walters (2005), for example, incorporate future generations into the discount rates by means of an "Intergenerational Discount Factor" (Saez and Requena, 2007).

The first suggestion is at best unscientific and at worst hubris, arguably a characteristic of the discount rate used in the Stern report (2006). The incorporation of moral argument into discount rate determination seems to be based on the incorrect assumption that discounting morally favors present over future generations. Even if true, there is no basis for this to be reflected by the discount rate; moral sentiments have values in themselves and should be considered as other goods rather than as part of the discount rate discussion. Not all moral sentiments have equal value and to use discount rates inappropriately lumps these different values into a single category. Finally, the Ramsey growth model should be dropped as a basis for the discount rate as it assumes (the discount rate) that which it is used to determine or to predict. Szabolcs (2004) shows the Ramsey formula can be derived from optimizes a growth rate, whose derivation assumes a given discount rate. The formula cannot therefore be used to determine some different rate; it is a circular derivation of a discount rate.

5.2 Special Goods

There are also incorrect pleas to treat special cases of goods, such as health and the environment which would be discounted at lower rates than others. These pleas in general are ungrounded. Rather these pleas at best should, be treated as a suggestion that that these projects have been undervalued but should not result in a different discount rate. In so far as there is a rationale for these pleas, they seem to be based on the fact that such goods are consumer good and therefore should therefore be discounted by the time preference rate. The health literature before 1993 paid little or no attention to the broader economic discounting literature (Krahn and Pafini, 1993) and thus failed to consider the opportunity costs of capital, which is still rarely considered today.. A similar argument can be made with respect to claims for low discount rates for environmental projects.¹⁹ No goods are special except to the extent they are valued correctly which obviates the use of a special discount rate. For a correct approach to discount rate valuation see below in section 5.4

¹⁸See Gunawaardena (2024) and citations therein for example.

¹⁹ Ula Chrobak 2022 and (<https://www.sfu.ca/~heaps/483/discounting.htm><https://see>

5.3 The Two Primary Discount Rate Approaches

The two main discount rate approaches are the social rate of time preference (SRTP) and the social opportunity of capital (SOCR). The former is the estimated individuals time preference representing the marginal rate of substitution for goods received in different time periods, and is thus the rate to be used after the opportunity cost of capital is accounted for in paying down capital costs from benefits.^{20 21}

5.4 The Two Rate Approach

An approach developed by Szekeres (2024) recognizes both the costs of capital and the time preferences of those affected and is called two rate discounting. Examples show how this would work. Consider two projects for which we assume, SRTP =2%, and the SOCR =7%.

Example One: The project is without costs such as one produced by volunteers who are happiest when volunteering, or alternatively by a project whose costs are sunk costs or costs that have already been amortized by earlier benefits.²² The choice then is between two alternative streams of benefits that could be provided after capital costs have been covered. Is the preferred option the one with the highest NPV discounted at the SRTP or the NPV discounted at the SOCR? If we regard benefits as consumption benefits then they should be discounted at the SRTP. The implication is that to use the SRTP alone is to ignore costs. Thus, regardless of which discount rate is used, a project that does not cover costs is not worthwhile.²³

²⁰ I do not consider the long and convoluted history of discount rate determination and the smorgasbord of views and approaches. Marglin (1963) seems, however, to have had it about right.

²¹ Although it is proper and useful to show distribution effects of projects, it is confusing and conflating to do this by adjustments to the discount rate.

²² Even with no costs, consideration of project deferment is required to determine the NPV, as the net benefits of proceeding with a project now must be set against the value of waiting.

²³To the extent benefits over and above direct costs can also be used in paying down government debt, the SOCR is the correct rate. This argument depends, however, on the extent to which paying down debt is a viable option; in essence it creates a special category of benefits.

Example Two: This is the same as example one except there are costs as well as benefits and the example is used to illustrate the various NPV procedures produced by different discount rates.. Following Szekeres (2024), benefits are used to pay costs down as long as it pays to do so, that is as long as the $SOCR > SRTP$, so that the value of paying down capital costs is of greater value than the current consumption of benefits, and for the same reason to do this as quickly as possible.

The results are given in Table 1 where four NPV's are shown. The first two NPV calculations use two rate discounting, one with amortized costs the other with an efficient paydown. The first uses costs amortized at 7% over the life of the project, The resulting NPV is the two rate amortization or NPV_{TRA} . The second pays down costs as quickly as possible and is the efficient two rate test, the NPV_{ERF} . The third, NPV_{SOCR} , uses the SOCR and the fourth, NPV_{SRTP} , uses the SRTP.

Table 2
Solutions Compared

Year	0	1	2	3	4	5	6
Benefits	0	50	50	50	50	50	50
Costs	100						
Amortized Costs		21	21	21	21	21	21
Benefits-Costs		29	29	29	29	29	29
PV		28.43	27.87	27.33	26.79	26.27	25.75
NPV_{TRA}	162.44						
NPV_{TRE}	171.97						
NPV SOCR	138.33						
NPV SRTP	180.07						

In Table 1, project benefits are 50 per period and capital costs in period zero are 100. The costs are amortized over the life of the project and are subtracted from benefits with the resulting cash flows are discounted at 2% to give an NPV of 162. The project NPV is, however, better characterized by paying down costs as quickly as possible as this is the efficient thing to do to

avoid the 7% interest charge. The result is shown by the NPV_{TRE} . When this is done the NPV is higher at 172. In this example, costs are able to be paid down from benefits received. Otherwise the NPV would be negative. Thus, the hurdle rate for the project is the SOCR. Simply put, a desirable project must meet its opportunity costs. A way to envision the comparison of the SRTP and SOCR approaches is to envision a project that always yields a positive NPV when discounted at the SOCR; such a project is paying down government debt.

Not surprisingly the two factor NPVs are between the higher NPV determined by the SRTP and the SOCR. As the life of a project, **after costs are paid down**, becomes longer, the closer will be the NPV_{TRE} to the NPV_{SRTP} . For shorter term projects the percentage difference between the NPV_{SRTP} and the NPV_{TRE} can be large. As benefits increase relative to costs, holding the number of periods constant, the differences between the NPV for SRTP and ETF decreases. Yet, as long as benefits cover capital costs fully, the NPV_{SRTP} and the NPV_{ETF} will both be positive. The important point remains, if costs are not covered, the SRTP can yield a false positive NPV but neither the two rate test nor the SOCR will yield this error.

A One Shot Project

Consider a project that costs 100 now in period zero and yields benefits until year 30 when they yield 200. When the project is discounted at 2%, the NPV will be about 104 with a NPV of 4 so that it looks good. But it is not. Costs are grown with interest at 7% in the 30 year period to be about 761 in year 30 and the benefits in year 30 cannot pay off the costs. It is not, as Ben Groom has reported as saying of a 7% discount rate “basically means that “after about 25 years nothing counts”²⁴. Costs count a lot. The low rate procedure has sought justification in paying down costs through taxes, but this justification has been discredited (Burgess,

4.6 The Problem of Climate Change and Discounting the Long Future

The problem of climate change is given as a reason to use low discount rates for future harms. Consider a climate change project using two rate discounting. Consider, for example, that losses from climate change occur both now and later and that the costs of an investment made now to reduce future damages can be amortized against the reduction of harms now and in the future. Damages avoided in every period are benefits from which we can subtract amortized cost from

²⁴ See Ula Chrobak, 2022

the benefits following the two rate approach. In the following example the project life is 100 years, the initial cost is 100, initial benefits are two and consist of reductions in the harm of climate change whose values grow at 10% per year. For the first 14 years amortized costs exceed benefits, but beginning in year 15 benefits exceed costs. For two rate discounting we discount benefits net of costs at 2% per year. The NPV is 807.32. With SOCR discounting the NPV is also positive.

Table 2 Climate Change with Two Rate Discounting

Benefits	$2(1.1)^t$
100 Cost amortized at 7%	7 per year
Discount Rate	SRTP 2%
Present Value of Benefits Using Two Rate Discounting	807.32

Of course this example is purely illustrative but indicates that future harms can be adequately treated by two rate discounting. It seems then that by eliminating moral sentiments from discount rate determination and by accounting for opportunity costs, the adoption of the two rate discounting procedure to find the NPV_{TRE} or the SOCR will give a correct basis to rank projects and to eliminate those that do not cover their costs. In this example, costs are able to be paid down from benefits received. Otherwise the NPV would be negative. Thus, the hurdle rate for the project is the SOCR. Simply put, a desirable project must meet its opportunity costs.

Not surprisingly the two factor NPVs are between the higher NPV determined by the SRTP and the SOCR. As the life of a project, **after costs are paid down**, becomes longer, the closer will be the NPV_{TRE} to the NPV_{SRTP} . For shorter term projects the percentage difference between the NPV_{SRTP} and the NPV_{TRE} will be large, especially for a marginal project. As benefits increase relative to costs, holding the number of periods constant, the differences between the NPV for SRTP and ETF decreases. Yet, as long as benefits cover capital costs fully, the NPV_{SRTP} and the NPV_{TRE} will both be positive. The important point remains, if costs are not covered, the SRTP can yield a false positive NPV but the NPV_{TRE} will not.

6.0. Criticisms of CBA and BCA Answers

Criticisms of CBA are extensive in the legal and philosophy literature and elsewhere.²⁵ These are largely eliminated by the use of BCA, which should help to make BCA more acceptable and understandable. These criticisms²⁶ mainly concern moral and ethical limitations, such as the claim that CBA is missing values such as integrity, that it is rendered useless by the Scitovsky paradox (e.g. Markovitz and Coleman) and that it deprives citizens of the opportunity to participate in the democratic process (Ackerman and Heinzerling 2002, 2004)). Many criticisms are either mistaken such as the claim that inclusion of the value of altruism involves double counting (Zerbe et al 2006) or the claim that Scitovsky reversals vitiate the use of BCA (Just, Schmitz, Zerbe (2013), or they arise from misunderstandings of BCA (Zerbe 2007). These criticisms have bite to the extent that CBA neglects equity or other moral considerations, but this neglect is not a feature of BCA which is defined here explicitly to include such values. The most relevant criticism is that the BCA result depends on the pattern of wealth.²⁷ A panoply of criticisms levied at CBA is shown in Table Three below along with a BCA response:

Table 3:
BCA Answers to Criticisms of CBA

	Criticism	Basis for Criticism	BCA Response
1.	The Invariance Claim	The CBA result is invariant to the inclusion of non-paternalistic moral sentiments.	The claim is false . Inclusion can affect the rank of projects and change the sign. (Zerbe et. al., 2006.
2.	The Double Counting Claim	Including moral sentiments can result in double counting benefits.	Claim is untrue and arises from a misreading of results Zerbe et al 2006.
3.	BCA results will reflect the existing pattern of wealth.	Thus the results will be unfair..	This is true; results are likely to be unfair if the pattern of wealth is unfair.

²⁵ See for example, Frank Ackerman and Lisa Heinzerling (2002), and Ackerman and Heinzerling (2004), Heinzerling (2002), Henry Richardson (2000) Mark Sagoff (1988), Martha Nussbaum (2000), Ronald Dworkin (1980), Jules Coleman, (1988), Richard Markowitz (1993), Stephen Kelman (1981)

²⁶ An extensive discussion if presented in Zerbe (2007)

²⁷ There is, however, no empirical evidence that in actual use BCA benefits mostly the wealthier and from my experience it has the reverse effect.

			There is, however, no agreement on a fair distribution. Solutions are to incorporate equity considerations in BCA or to change the pattern of wealth, not to throw out useful BCA.
4.	There are missing and immoral values in CBA	No weight is given to concerns about the income distribution or other moral sentiments.	This is true. Who is to say what is immoral?
5.	Private Values are Used when community values are appropriate	The choices made as a public citizen may differ those made as a private person.	This criticism is met by noting that in BCA the context of project is given.
6.	CBA ignores inter-generational equity	Moral values are neglected.	Untrue. The WTP on behalf of future generations is to be captured by BCA.
7.	The use of discount rates is immoral	Its use is unfair to future generations.	The use of discount rates will increase the wealth of future generations.
8.	The inclusion of moral values also requires the acceptance of immoral values including “bad” utility.	This then may lead to immoral outcomes.	This is true but irrelevant as BCA does not count values of illegal goods such as the value of stolen goods to the thief. The illegality points to countervailing sentiments.
9.	There is no scientific method for aggregating preferences	Since one cannot aggregate preferences, one cannot say if total happiness has increased.	This is of course true.
10.	CBA and BCA favor the status quo.	Thus it is biased against change.	Thus proper procedure recognizes the existing pattern of rights and the greater weight of losses compared to equivalent gains so that the bias is justified.
11.	BCA forfeits discussion	In doing this it may miss values.	Properly, BCA is to be used to foster discussion and to provide information to that end.

12.	Scitovsky Reversals	Such reversals vitiate the use of BCA.	Hardly! They are improbable and are eliminated by using both the CV or EV or by using just NPV rather than KH..
-----	---------------------	--	---

Thus the argument of Table One is that BCA ameliorates or obviates many of the criticisms based on CBA.

7.0 Conclusions

BCA needs a firmer foundation to lend it greater consistency, to reduce criticisms of it and to make it more scientifically appealing. There is a trajectory from CBA to BCA which can provide at least a path which I have attempted here. In this trajectory, BCA builds onto CBA a recognition that there is a Pareto justification for its use, not just a potential Pareto justification. BCA recognizes to a greater extent than CBA, its reliance on law to determine rights and thus to determine reference points for BCA. In considering the role of law, the gain-loss disparity is recognized by BCA to a greater extent than by has been done by CBA. The value to criminals or wrongdoers of illegal acts are not to recognized under BCA as such value has no standing, except in cases in which illegality itself is the question to be answered. BCA recognizes cases in which actual compensation improves welfare, and recognizes that moral and ethical sentiments should be treated as other goods for which there is a willingness to pay or to accept. Utility weighting of effects is consistent with BCA but also equity effects to the extent both can be measured by WTP and WTA measures. The acceptance of behavioral economics as part of BCA gives more accurate results as reflecting reality than without it. A resolution of the long standing discount rate controversies will go a long way to providing respectability to BCA and CBA, and will help to prevent undertaking poor and wasteful projects. Finally, this suggested foundation for BCA will materially reduce existing criticisms of CBA.

References

- Ackerman, Frank & Lesa Heinzerling, 2002, "Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection," 150 U. Pa. L. Rev. 1553
- Acland, D. J., & Greenberg, D. H. (2023). Distributional weighting and welfare/equity tradeoffs: a new approach. *Journal of Benefit-Cost Analysis*, 14(1), 68-92.
- 2004, On Knowing the Price of Everything and the Value of Nothing
- Adler, Matthew and Eric Posner, *New Foundations for Cost Benefit Analysis*, Harvard University Press, 2006
- 2009, "New foundations of cost-benefit analysis: A reply to Professors Sinden, Kysar, and Driesen, *Regulation & Governance* 3, 72-83 doi:10.1111/j.1748-5991.2009.01045.x
- Baumol, William, 1968, "The Social Discount Rate", *The American Economic Review*, 58 (4), 788-802
- Boadway, Robin and Neil Bruce, *Welfare Economics*, Basil Blackwell Inc., Oxford (1984)
- Burgess, David and Richard Zerbe.. (2011) , "Calculating the Social Opportunity Cost Discount Rate", *J. Benefit-Cost Analysis*, vol. 2 issue 3, article 8.
- (2011), "The Appropriate Discount Rate to Use", *Journal of Benefit Cost Analysis*, vol. 2, issue 2.
- Ula Chrobak, Ula, (2022) "The Obscure Calculation Transforming Climate Policy"
<https://knowablemagazine.org/content/article/society/2022/the-obscure-calculation-transforming-climate-policy>
- Edgeworth, Francis Ysidro, 1881, *Mathematical psychics: An essay on the application of mathematics to the moral sciences*. No. 10. C. CITY: Kegan Paul & Company,
- Gunawardena, U. A. D. "An Inquiry into Ethical Foundations of Cost Benefit Analysis" U. A. D. Prasanthi Gunawardena, 2024
- Graham, John and Paul Noe, "A Paradigm Shift in the Cost-Benefit State", *The Regulatory Review*, 2016, <https://www.theregreview.org/2016/04/26/graham-noe-shift-in-the-cost-benefit-state>
- Harrod, R. F. 1938, "Scope and Method of Economics", 48 *Econ. J.* (1938)
- Heinzerling, Lisa, 2002, "Markets for Arsenic", 90 *Geo L.J.* 2311 (2002)
- 1981, "Regulatory Costs of Mythic Proportions" 107 *Yale L. J.* (1981)

- Dehnhardt, Alexandra, Torsten Grothmann, Josephin Wagner, “Cost-benefit analysis: What limits its use in policy making and how to make it more usable? A case study on climate change adaptation in Germany”, *Environmental Science & Policy*, 137, 2022, pp. 53-60
- Hicks, (Sir) J. R. 1939, “The Foundations of Welfare Economics” *Econ. J.*, 696, 1939a
- Value and capital: An inquiry into some fundamental principles of economic theory*, Oxford: Clarendon Press, 1939b
- Just, Richard, Andrew Schmitz, Richard Zerbe, (April 2012), “Scitovsky Reversals and Practical Benefit Cost Analysis”, *Journal of Benefit-Cost Analysis*, vol.3 (3).
- Just, Richard, Andrew Schmitz, Zerbe, Richard O. (2013),” “Scitovsky Reversals with Normal Goods”, *Journal of Benefit-Cost Analysis*, pp.411-413
- Kahneman, Daniel and Tversky, Prospect Theory: “An Analysis of Decision under Risk,” 47 (2), 1979, <https://www.jstor.org/stable>
- Kaldor, Nicholas, Welfare Propositions of Economics and Interpersonal Comparisons of Utility, *49 Econ. J.* (1939)
- Knetsch, Jack. (2020). Behavioural Economics, Benefit-Cost Analysis, and the WTP versus WTA Choice. *International Review of Environmental and Resource Economics*. 14. 153-196. 10.1561/101.00000119.
- Krahn, M., & Gafni, A. (1993). Discounting in the economic evaluation of health care interventions. *Medical Care*, 31, 403–418
- Marglin, Stephen A. (1963) “The Opportunity Costs of Public Investment.” *The Quarterly Journal of Economics*, Vol. 77, No. 2 pp. 274-289 <https://www.jstor.org/stable/1884403>
- Nash, C and David Pearce, Charles Stanley, 1975, “An Evaluation of cost-benefit analysis criteria, *Scottish Journal of Political Economy*, 22 (2), 121-34, 1975
- Nordhaus, William. (2019) “Climate Change: The Ultimate Challenge for Economics,” *American Economic Review* 2019, 109(6).
- Nussbaum, Martha, 2000, “The Costs of Tragedy: Some Moral Limits of Cost Benefit Analysis”, *20 J. Legal Stud.* 1005.
- Posner, Eric and Jonathan Adler, “Regulation & Governance” (2009) 3, 72–83
doi:10.1111/j.1748-5991.2009.01045.x
- Porter, Theodore M., 1995, *Trust in Number: The Pursuit of Objectivity in Science and Public Life.*

- Richardson, Henry, S. 2000, “The Stupidity of the Cost Benefit Standard, 29 J. Legal Studies, 971 (984-85).
- Robinson R. Cost-benefit analysis. *BMJ*. 1993 Oct 9;307(6909):924-6. doi: 10.1136/bmj.307.6909.924. PMID: 8241859; PMCID: PMC1679054.
- Robinson LA, Hammitt JK. Behavioral Economics and the Conduct of Benefit-Cost Analysis: Towards Principles and Standards. *Journal of Benefit-Cost Analysis*. 2011;2(2):1-51. doi:10.2202/2152-2812.1059
- Jason F. Shogren, Seung Y. Shin, Dermot J. Hayes and James B. Kliebenstein, 1994, “Resolving Differences in Willingness to Pay and Willingness to Accept”, *The American Economic Review*, Vol. 84, No. 1 (Mar., 1994), pp. 255-270
- Sinden, Amy, Kysar DA, Driesen DM (2009) Cost–Benefit Analysis: New Foundations on Shifting Sand. *Regulation & Governance* 3, 48–71.
- Schmitz, Andrew , Richard O. Zerbe, 2008, “Scitovsky Reversals and Efficiency Criteria in Policy Analysis” *Journal of Agricultural and Food Industrial Organization* 6(2), article 3, 2008 available at: <http://www.degruyter.com/view/j/jafio.2008.6.2/issue-files/jafio.2008.6.issue-2.xml>
- Scitovsky, Tibor, 1941, “A Note on Welfare Propositions in Economics”, *Review of Economic Studies*, 9(1), pp77-88,
- Stern, N. (2006). *Stern Review: The Economics of Climate Change*, Volume 30. London: Her Majesty’s Treasury
- Szekeres, Szabolcs (2023) “The simple answer to the Social Discount Rate question” MPRA Paper No. 117843. <https://mpra.ub.uni-muenchen.de/117843/> (Request an updated version by email: szsz@iid.hu)
- Talbott, William J., 2021, *Learning from Our Mistakes: Epistemology for the Real World*, Oxford University Press, 2021
- Trumbull, William M. (1990), “Who Has Standing in Cost Benefit Analysis?” *Journal of Policy Analysis and Management*, 9 (2), pp. 201–218.
- Whittington, Dale and Duncan MacRae, Jr. (1986), “The Issue of Standing in Benefit Cost Analysis,” *Journal of Policy Analysis and Management* 5 (4), pp. 665–682.

- Whittington, Dale and Duncan MacRae, Jr. (1990), "Judgments About Who Has Standing in Cost-Benefit Analysis: A Comment," *Journal of Policy Analysis and Management* 9 (2).
- Zerbe, Richard O, 2020, "The Consent Justification for Benefit Cost Analysis", *J. of Benefit-Cost Analysis* vol. 11 (2) pp. 319-340: DOI: <https://doi.org/10.1017/bca.2020.9>
- Is Benefit-Cost Analysis Legal: Three Rules, 1998, *Journal of Policy Analysis and Management*, Vol. 17, No. 3, 419–456.
- "Ethical Benefit Cost Analysis as Art and Science: Ten Rules for Benefit-Cost Analysis," *University of Pennsylvania Journal of Law and Social Change* 12(1), 73-106, 2009.
- (2014) "Welfare Economics Applied to Law with Costly Markets" in. *Efficiency in Law and Economics*, (editor, R. Zerbe, Series Editors: Richard Posner and Francesco Parisi), Edward Elgar Publishing, Inc., Northampton, MA:
- (2013,), "Ethical benefit–cost analysis as art and science—ten rules for benefit–cost analysis" in Zerbe, Richard O. & Scott Farrow, (eds) *Principles for Benefit Cost Analysis*, Northampton, MA, Edward Elgar
- (2001). *ECONOMIC EFFICIENCY IN LAW AND ECONOMICS*. Northampton, MA: Edward Elgar Publishing, Inc.
- 2006) "Justice and the Evolution of the Common Law," *The Journal of Law, Economics & Policy* 3(1) pp. 81-122.
- (Winter 1991). "Comment: Does Benefit Cost Analysis Stand Alone? Rights and Standing," *Journal of Policy Analysis and Management*, 10(1), 96-105
- (2009). "Ethical Benefit Cost Analysis as Art and Science: Ten Rules for Benefit-Cost Analysis," *University of Pennsylvania Journal of Law and Social Change* 12(1), 73-106.
- (Fall 2007). "The Legal Foundation of Cost-Benefit Analysis," *Charleston Law Review*, 2(1), 93-184.
- (2002). "Can Law and Economics Stand the Purchase of Moral Satisfaction?" *Research in Law and Economics*, 20, 135-172.
- (1998). "Is Benefit Cost Analysis Legal? Three Rules," *Journal of Policy Analysis and Management*, 17(3), 419-456.
- (Winter 1991). "Comment: Does Benefit Cost Analysis Stand Alone? Rights and Standing," *Journal of Policy Analysis and Management*, 10(1), 96-105

- Zerbe, Richard O. Yoram Bauman, Aaron Finkle, “An Aggregate Measure for Benefit Cost Analysis, 58 *Ecological Economics*, 449 (2006).
- Zerbe, Richard O. and Linda Graham (1999). “The Role of Rights in Benefit Cost Methodology: The Example of Salmon and Hydroelectric Dams,” *University of Washington Law Review*, 74(3), 763-797.
- Zuber, Stéphane & Marc Fleurbaey The Institute for Futures Studies. Discounting and Intergenerational Ethics, Working Paper 2019:6 115 2