

I. HISTORY OF BENEFIT-COST ANALYSIS

Benefit-cost analysis attempts to solve collective action problems, which arise when individuals or groups pursuing narrow self-interest without coordination arrive at outcomes inferior to those that could be achieved by coordination. CBA was developed as a coordinating decision rule that could solve collective action problems and lead to outcomes that were both fair and efficient. (Porter)

The Army Corps of Engineers and CBA in Practice

The motivating force behind CBA in the United States was a desire to allay conflict and reach agreement. Its development and increasing quantification was not the product of technical elites but of disagreement, suspicion, and conflict, particularly bureaucratic conflict.¹ Benefit-cost methods were introduced in the U.S. by the U.S. Army Corp of Engineers.² Before the creation of the Corps, evaluations of public investments were almost completely ad hoc.³ The prestige of the Corps, along with its increasing quantification of project costs and benefits, was used by Congress to simplify their decision-making and avoid the wildly uneconomic projects produced by logrolling.⁴ After 1902, water projects needed to be certified as beneficial by a Board of Engineers for Rivers and Harbors that was established within the Corps. The Corps was far from a rubber stamp: they rejected more than half of the proposed projects, usually on the basis that their economics were unfeasible. By the 1920s the Corps required its recommended projects to promise benefits in excess of costs. Through the 1930s the numbers put forward by the Corps were generally accepted without question.⁵ The Corps was recognized as a relatively neutral and respected arbiter in Congressional fights over water projects.⁶ The creation of the Corps, then, represented not only the creation of an agency to build projects, but an agency to increase Congressional and public efficiency.

¹ PORTER, *supra* note 3.

² *Id.*, p. 149. According to Hammond, the use of formal benefit-cost ratios goes back at least as far as the Rivers and Harbor Act of 1902, and were explicitly mandated in the amendment to the Act in 1920. Richard J. Hammond, *Convention and Limitation in Benefit-Cost Analysis*, 6 NAT. RESOURCES J. 195-222 (1966).

³ PORTER, *supra* note 3, at 150.

⁴ *Id.* at 148 (The Corps was fashioned after the famous Corps des Ponts de Chausse'es)

⁵ *Id.* [Porter, Trust]

⁶ *Id.* at 153.

The Flood Control Act of 1936 mandated what was already Corps practice: the requirement that benefits of a project exceed its costs. More importantly, the Act allowed Congressional authorization only for projects that had been approved by the Corps. The Corps economic analyses limited debate in Congress over water projects, and the number of really disgraceful projects became rarer.⁷ Political influence and special interest legislation were not, of course, eliminated—the Corps tended to transgress its standards when political forces were overwhelming—but they were curtailed.

After 1940, Corps decisions became the subject of bitter controversy as the Corp was challenged by powerful electric and railroad utilities, by shipping interests, and by rival Federal agencies, especially the Bureau of Reclamation and the Department of Agriculture.⁸ Rival techniques or standards for CBA became the norm until an attempt was made to resolve differences by relying on first principles of economics. The closest result to reaching agreement was the “Green Book.” Although agreement was significantly incomplete, the grounds for decision making were pretty well established as rooted in economic theory. CBA was thereby transformed by conflict into a set of rationalized economic principles.

The redefinition of CBA according to economic standards began “in earnest” in the mid-1950’s.⁹ Porter notes that economists agreed with budget officials that the standards for passing a benefit-cost test had not been set strict enough. They recommended using uniform, higher discount rates than the rate on government bonds.¹⁰ Economists, however, were open to placing monetary values on what had been regarded previously as intangibles, such as the value of landscapes, so that the scope of values potentially subject to CBA expanded. The result of the new economic respectability of CBA was its spread to all kinds of government expenditures and to regulatory activity.

The use of CBA at the federal level significantly increased with the issuance of an Executive Order in 1981 by President Reagan declaring that Regulatory Impact Analyses

⁷ *Id.* at 155-57.

⁸ *Id.* at 161-75.

⁹ *Id.* at 188.

¹⁰ This recommendation appears suspect today. See generally RICHARD O. ZERBE, JR. & DWIGHT DIVELY, *BENEFIT-COST ANALYSIS IN THEORY AND PRACTICE* (1994)..

be conducted for major initiatives.¹¹ An additional Executive Order was issued by President Clinton in 1994, confirming the government's commitment to CBA and highlighting the bipartisan support for CBA in federal regulatory decision-making. While comprehensive legislation requiring the broad use of formal CBA has yet to be approved by Congress, the presence of CBA is nonetheless apparent within various levels of governmental decision-making. Moreover, public pressure for increased governmental efficiency increases the need for CBA in practice.¹²

The Pareto Criterion and CBA in Theory

As benefit-cost analysis became more the province of economists than engineers, its foundations became rooted in the Kaldor-Hicks criterion. Although this criterion has the virtue of attempting to be definite, it is not wholly successful. Moreover, it retains logical flaws. These defects are rooted in its history.

Although many economists are themselves unclear about the core assumptions of CBA, we can derive what can reasonably be called the main view of it by considering its origins. The first form of CBA, developed by Nicholas Kaldor, built on the foundation provided by Vilfredo Pareto. Pareto (1896) introduced a welfare criterion, the Pareto optimum, which became a foundational concept in welfare theory.¹³ A Pareto optimum is a state of affairs such that no one can be made better off without making someone else worse off.¹⁴ A change in the economy is said to represent a Pareto improvement over what came before it, or to be Pareto superior to what came before it, if at least one person is made better off as a result of the change and no person is made worse off.¹⁵ The Pareto

¹¹ ANTHONY BOARDMAN, ET AL. *COST BENEFIT ANALYSIS: CONCEPTS AND PRACTICE*, 5 (2001).

¹² *Id.* at 5-6.

¹³ Vilfredo Pareto, *COURS D'ECONOMIE POLITIQUE*, vol. II (1896).

¹⁴ In its strong form, Pareto efficiency states 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. If the utility (well-being) of each individual is higher in state A, then state A is preferred according to the weak form of Pareto efficiency. See ROBIN W. BOADWAY & N. BRUCE, *WELFARE ECONOMICS* (1984).

¹⁵ The attraction of the Pareto notion of efficiency is that it seems to eliminate interpersonal comparisons of welfare. Some economists feel that "the inescapable conclusion" is that if one precludes interpersonal comparisons of welfare the only logically consistent foundation analysis is the Pareto principle. Its obvious limitation is that it is not very policy relevant; few policies have no losers. This limitation resulted in a search for a more applicable measure of welfare that continues to this day and of which this article is a part.

criterion is not useful for most practical purposes for exactly the same reason that a criterion of unanimity is not useful in most voting situations.¹⁶ The practical substitute for the Pareto criterion is the potential Pareto criterion, also known also as the Kaldor-Hicks criterion.

The Development of the Kaldor-Hicks Criterion

The Kaldor-Hicks (KH), or potential Pareto criterion, is the standard for CBA. It arose during the late 1930s out of discussions among prominent British economists about repealing the Corn Laws.¹⁷ Before that time it was generally assumed that each individual had an "equal capacity for enjoyment," and that gains and losses among different individuals could be directly compared.¹⁸ By 1939, however, leading British economists, including the future Nobel Prize winner Sir John Hicks, were raising questions about such policy prescriptions because they involved interpersonal comparisons of utility.¹⁹ Nicholas Kaldor provided a solution: he acknowledged the inability of economists to establish a scientific basis for making interpersonal utility comparisons but suggested that

¹⁶ See Duncan Black, *On Arrow's Impossibility Theorem*, 12 J.L. & ECON. 227 (1970). (who shows that such a rule did not work very well for the Polish legislature).

¹⁷ These include: Robbins, Hicks, Kaldor, and Harrod, all writing in THE ECONOMIC JOURNAL. See generally Lionel Robbins, *Interpersonal Comparisons of Utility: A Comment*, 48 ECON. J. 635 (1938); John R. Hicks, *The Foundations of Welfare Economics*, 49 ECON. J. 696 (1939); Nicholas Kaldor, *Welfare Propositions in Economics and Interpersonal Comparisons of Utility*, 49 ECON. J. 549 (1939); Roy F. Harrod, *Scope and Method of Economics*, 48 ECON. J. 383 (1938).

¹⁸ See Ezra J. Mishan, INTRODUCTION TO NORMATIVE ECONOMICS 120–21 (1981); Peter Hammond, *Welfare Economics*, in ISSUES IN CONTEMPORARY MICROECONOMICS AND WELFARE 406 (George Feiwel ed., 1985). For example, Harrod argued that the net social benefit from a policy could be established on the assumption that the individuals affected were equal in their capacity to enjoy income. That is, an improvement can be assumed by looking at changes in income as long as, in modern terminology, the marginal utility of income with respect to income changes are the same for all individuals. See Harrod, *supra* note 34, at 387. Harrod used this reasoning to justify the 1846 repeal of the English Corn Laws, a classic test case for British economists. In response, Lionel Robbins pointed out that interpersonal comparisons of utility couldn't rest on a scientific foundation since utility cannot be measured, and that the justification for such comparisons is more ethical than scientific.¹⁸ Harrod complained that in the absence of comparability of utility of different individuals, "the economist as an advisor is completely stultified." See Harrod, *supra* note 34, at 396–97.

¹⁹ See Hicks, *supra* note 34, at 670. This debate about whether or not prescriptions of economics were scientific is paralleled by the 1980s debate, mostly in the legal literature, about the normative foundations of wealth maximization. For example, see 8 HOFSTRA L. REV., volumes 3 and 4 (1980). The 1980s debate was haunted, and confounded, by the issues that we consider in this article.

this difficulty could be made irrelevant.²⁰ His argument was that policies that led to an increase in aggregate real income were always desirable because the *potential* existed to make everyone better off:

[T]he economist's case for the policy is quite unaffected by the question of the comparability of individual satisfaction, since in all such cases it is possible to make everybody better off than before, or at any rate to make some people better off without making anybody worse off.²¹

According to Kaldor, a project is desirable if the money measure of gains exceeds the money measure of losses. With regard to the *potential* compensation that could turn losers into winners in such situations, Kaldor goes on to note that whether *actual* compensation should take place "is a political question on which the economist, qua economist, could hardly pronounce an opinion."²² Hicks, perhaps the most prominent economist of the time, accepted the Kaldor approach, which eventually became known as the Kaldor-Hicks (KH) criterion.²³ The KH criterion is the usual CBA criterion.²⁴

²⁰ See Kaldor, *supra* note 34, at 549–550; Robbins, *supra* note 34, at 640.

²¹ See Kaldor, *supra* note 34, at 549–550.

²² See Kaldor, *supra* note 34, at 550. It was thought that politicians or non-economists should make judgments and decisions about income distribution effects.

²³ See Hicks, *supra* note 34, at 671. A few years after the creation of KH, Scitovsky (1941) introduced a parallel, but slightly different, criterion that states that a project is desirable if the losers are unable in the original state of the world to bribe the potential winners not to undertake the project. Both of these criteria are referred to as potential compensation tests. Shortly after this Sir John Hicks showed that the Kaldor and Scitovsky criteria are related to measures of willingness to pay for a good and willingness to accept payment for a good.

²⁴ As envisioned by Kaldor, non-pecuniary effects were to be included in benefit-cost analysis. Kaldor, *supra* note 34 at ____?

"An increase in the money value of the national income (given prices) is not, however, necessarily a sufficient indication of this condition [the potential compensation test or Kaldor criterion] being fulfilled: for individuals might, as a result of a certain political action, sustain losses of a non-pecuniary kind, e.g., if workers derive satisfaction from their particular kind of work, and are obliged to change their employment, something more than their previous level of money income will be necessary to secure their previous level of enjoyment; and the same applies in cases where individuals feel that the carrying out of the policy involves an interference with their individual freedom. Only if the increase in total income is sufficient to compensate for such losses and still leave something over to the rest of the community, can the project be said to be 'justified' without resort to interpersonal comparisons."

Clearly it is sentiments that are to be valued and not just objects.

KH attempts to avoid interpersonal utility comparisons by separating equity from efficiency. Kaldor proposed that decision makers address sentiments regarding equity outside the purview of CBA.²⁵ The change in aggregate gains was to be the measure of efficiency, so that there was a separation of effects into those of efficiency and distribution.²⁶ Kaldor endorsed the procedure adopted by Pigou, which Kaldor describes as “dividing welfare effects into two parts: the first relating to production, and the second to distribution.”²⁷ (Of course, the KH approach produces outcomes that are equivalent to those produced by the assumption that the marginal utility of income is the same across all individuals, i.e., that each dollar of benefit or cost is treated the same regardless of who received it.²⁸) Hicks agreed with this separation and noted that “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.”²⁹ To Hicks it would be “‘rather a dreadful thing’ to have to accept the view that welfare analysis was unscientific. If it were, its conclusions would “... depend on the scale of social values held by a particular investigator. Such conclusions can possess no validity...; one’s welfare economics will inevitably be different according as one is a liberal, or a socialist, a nationalist or an internationalist, a christian [sic] or a pagan.”³⁰

²⁵ It cannot be said that this second assumption of equal marginal utility of income avoids interpersonal comparisons; indeed it embraces them in a very particular way: all people are treated equally in terms of the value they place on changes in income.

²⁶ Kaldor, *supra* note 34, at 551.

²⁷ The eagerness of economists to separate considerations of efficiency from those of distribution arose from a desire to put economics on a firm base as a policy instrument. Kaldor suggests, “the economist should not be concerned with prescriptions at all . . . For, it is quite impossible to decide on economic grounds what particular pattern of income-distribution maximizes social welfare.” Kaldor, *supra* note 34, at 551; see also A.C. Pigou, *THE ECONOMICS OF WELFARE* (4th ed. 1932).

²⁸ See John Chipman & James C. Moore, *The New Welfare Economics 1939–1974*, *INTERNATIONAL ECONOMIC REVIEW* 19(3), at 578 (1978); Kaldor, *supra* note 34, at 551. Certainly Mishan was aware that questions of distribution belonged to welfare economics and recognized that the separation was useful, since there was less agreement about the income distribution issues. See Ezra J. Mishan, *The Principle of Compensation Reconsidered*, 60 *J. POLITICAL ECON.* 312 (1952).

²⁹ Hicks, *supra* note 34, at 712.

³⁰ Hicks, *supra* note 34, at 696.

This separation of efficiency and equity has remained the common, though not universal, basis of normative analysis to this day.³¹ The more modern justifications for the separation are that changes in the income distribution are usually better effected through macroeconomic policy rather than through individual projects.³² This defense, however, leaves unaddressed matters of equities for identifiable peoples or groups, or sentiments attached to particular projects that cannot be handled by macro policy; equity and justice are particular as well as general.³³

Measurement of Benefits and Costs

³¹ Posner's term wealth maximization appears identical to KH except that he would allow altruistic concerns where there is a WTP for them. A strong theory of wealth maximization is said to have three crucial features. First, wealth maximization is an aggregate concept. *Id.* at 251. That is, it is more concerned with societal well-being than with individual welfare. For example, a wealth maximizer is not concerned with the distribution of wealth among citizens, and any coerced payment to affect distribution is presumed unproductive. See, e.g., Richard A. Posner, *Wealth Maximization Revisited*, 2 NOTRE DAME J.L. ETHICS & PUB. POL'Y 85, 103 (1985) ("To the wealth maximizer, altruism is neither good nor bad; but given that it exists, there is a legitimate if limited role for public wealth redistribution."). Second, to the extent that altruism exists within society, public efforts to reduce poverty may be justified because poverty reduction will benefit both non-donors and donors. *Id.* Finally, questions of need and desires are irrelevant. *Posner, supra note 6, at 61* ("The individual who would like very much to have some good but is unwilling or unable to pay anything for it – perhaps because he is destitute – does not value the good in the sense in which we are using the term 'value.'"). Note that this is not the same as including altruism in a benefit-cost analysis as its inclusion may change the sign of a benefit-cost analysis yet the altruistic component might not benefit both parties as when the transfer from altruists is greater than they would prefer.

³² See generally Mitchell A. Polinsky, AN INTRODUCTION TO LAW AND ECONOMICS 5 (2d ed. 1989).

³³ We note some rather random examples from reputable sources. Boardman, Greenberg, Vining, and Weimer note that, "Strict use of the Kaldor-Hicks test means that information on how benefits and costs are distributed among groups is ignored in decision making." See David L. Weimer & A.R. Vining, POLICY ANALYSIS: CONCEPTS AND PRACTICE 412 (2d ed. 1992). Friedman also notes, "Some analysts would like to ignore equity altogether and use the compensation test as the decisive analytic test... [A] second rationale for relying on the compensation test is the belief that concern for equity is simply unfounded." See Lee Friedman, MICROECONOMIC POLICY ANALYSIS 170 (1984). Additionally, Posner notes that wealth maximization is simply the Kaldor-Hicks tests and that wealth maximization ignores distributional effects. See Richard A. Posner, ECONOMIC ANALYSIS OF LAW 13 (3d ed. 1986); Richard A. Posner, *The Justice of Economics*, 15 J. PUB. FIN. & PUB. CHOICE 23, 132–33 (1987). McCloskey incorrectly contends that the consumer surplus measure of social happiness is the same as the national income measure. See Donald McCloskey, THE APPLIED THEORY OF PRICE 229 (1982). Of course, the national income measure contains no measure of income distribution.

In 1943 Hicks defined the compensating and equivalent variations (CV and EV) and from these the concepts of the willingness to pay (WTP) and willingness to accept (WTA).³⁴

In the context of a simple world of market goods and narrowly self-interested individuals, Hicks described the relationship between the CV and the WTP or WTA test, which became the standard for CBA. The move from A to B passes the KH test if and only if the sum of individual's willingness to pay for the change exceeds the sum of the willingness to accept payment for the change.³⁵ The WTP reflects the amount that someone who does not have a good would be willing to pay to buy it; it is the maximum amount of money one would give up to buy some good or service, or would pay to avoid harm. The WTA reflects the amount that someone who has the good would accept to sell it; it is the minimum amount of money one would accept to forgo some good, or to bear some harm. The benefits from a project may be either gains (WTP) or losses restored (WTA). The costs of a project may be either losses (WTA) or gains forgone (WTP). Both the benefits and the costs are the sum of the appropriate WTP and WTA measures. Thus, the relation of benefits and costs to the WTP and the WTA is:

Benefits: The sum of the WTPs for changes that are seen as gains and of the WTAs for changes that are seen as restoration of losses.

³⁴ This CV is not to be confused with Contingent Valuation. To understand the concepts of compensating and equivalent variations, consider a individual who will be affected by a move from state A to state B. Her compensating variation (CV) for the move from A to B is the income adjustment necessary *in state B* in order to make her indifferent between A and the income-adjusted B. (If she prefers B to A, her CV is positive and reflects the maximum amount she would be willing to pay to move from A to B; if she prefers A to B, her CV is negative and its absolute value reflects the minimum amount she would be willing to accept to move from A to B.) Her equivalent variation (EV) for the move from A to B is the income adjustment necessary *in state A* in order to make her indifferent between B and the income-adjusted A. (If she prefers B to A, her EV is positive and reflects the minimum amount she would be willing to accept to move from B to A; if she prefers A to B, her EV is negative and its absolute value reflects the maximum amount she would be willing to pay to move from B to A.)

It follows from these definitions that the compensating variation for a move from A to B gives the same value, but with the opposite sign, for the equivalent variation for a move from B to A.

It is also true that either of these variations are exact utility indicators in the sense that for *a single individual* they rank preferences correctly: an individual's CV or EV for the move from A to B is positive if and only if the individual prefers B to A.

³⁵ The equivalent variation uses the WTA for gains and the WTP for losses and is a test proposed by Scitovsky test. *[Should we add details here about Scitovsky like in the last paper?]*

³⁶ See ZERBE & DIVELY, *supra* note 27.

Costs: The sum of the WTAs for changes that are seen as losses and of the WTPs for changes that are seen as forgone gains.

The justification for adopting these methods of measurement is that they correspond with the psychological sense of gains and losses.³⁷ [*Here, and to some extent throughout this section, I find myself wondering if we're talking about KH, or KHM, or both... According to the outline, this should be a discussion of the development of KH, but the outline can be changed if necessary...*] The measurements are summarized in table 1 below.³⁸

Table 1. The Measurement of Benefits and Costs in Terms of Gains and Losses*

	The Compensating Variation (KH Measure)
Benefits	<p>GAIN: WTP—the sum of CVs for a positive change—is finite.</p> <p>LOSS RESTORED: WTA—the sum of CVs for a loss restored—could be infinite.</p>
Costs	<p>LOSS: WTA—the sum of CVs for a negative change—could be infinite.</p> <p>GAIN FORGONE: the sum of CVs is finite.</p>

The KH test is said to be satisfied when the gains are sufficient to hypothetically compensate the losses. (There are circumstances, discussed later, in which gains exceed losses but such compensation is not possible, even hypothetically.) The economic worth of a good to an individual is determined by his or her desire for it, whether a gain or a loss is involved, the income and wealth of the person, and the uniqueness of the good. These features are all captured by the WTP and WTA measures. The above discussion and set of characteristics outlined above define what can reasonably be called the mainstream view of economic efficiency and of BCA, a view based on KH. A full

³⁷ See Daniel Kahneman & Jack Knetsch, *Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias*, 5 J. ECON. PERSPECTIVES 193–206 (1991).

³⁸ The difference between benefits and costs is simply their sign: positive for benefits and negative for costs. Thus, without loss of accuracy, costs can be counted as negative benefits and benefits can be counted as negative costs.

description of the assumptions of the mainstream view of CBA is reasonably characterized by: (1) the use of the willingness to pay (WTP) for gains and for losses;³⁹ (2) a reliance on potential compensation tests so that a project is KH efficient only when it passes a potential compensation test; (3) an emphasis on efficiency that is separated from equity; (4) an assumption that a dollar is to be treated the same regardless who receives it, so that a dollar is assumed to have the same value to each person (equal and constant marginal utility of income); (5) a recognition and inclusion of non-pecuniary effects; (6) the omission of values represented by moral sentiments; (7) a reliance on externalities and market failure to determine where BCA might be useful in making corrections; (8) an assumption that transactions costs are zero;⁴⁰ (9) the treatment of BCA as a mechanism to provide the answer rather than an approach providing information as part of an ongoing discussion; and (10) the inclusion of wealth maximization as congruent with mainstream BCA.

The history discussed above resulted in what can reasonably be called the mainstream view of economic efficiency and of CBA, a view based on KH. The mainstream view of BCA is well shown in practice by the BCA's of the federal developmental agencies, and well illustrated in theory by the critical analyses of Lothrop, Ackerman and Heinzerling and others.⁴¹

³⁹ Although it is recognized that the willingness to accept is the correct measure for losses, traditional opinion has held that there is little difference between the two measures so that WTP may be used in practice.

⁴⁰ For an explanation of why this leads to difficulties See RONALD H. COASE, *THE FIRM, THE MARKET, AND THE LAW* 5 (1988). Coase's view is that the major failing of welfare economics lies in its assumption of zero transactions costs. By transactions costs I mean the costs necessary to transfer, establish and maintain property rights (See Douglas Allen, *What are Transaction Costs?*, in *RESEARCH IN LAW & ECONOMICS* 14, at 4 (Zerbe & Goldberg eds., 1991).)

⁴¹ Robert C. Lothrop, *The Misplaced Role of Cost-Benefit Analysis in Columbia Basin Fishery*, 16 *ENVTL. LAW.* 517 (1986). Lothrop assumes BCA is unrelated to law and to legal rights, that the willingness to pay is the correct measure for both gains and losses and that moral and ethical values are excluded. He apparently arrives at this view in part from looking at actual BCA studies. Because even mainstream BCA is incompletely defined, my characterization of it is necessarily inadequate as it makes definite what is in fact vague. However, it is a useful starting point from which to consider other possibilities. Also, this characterization of the mainstream view is convenient as it is fairly close to the view critics of BCA hold, although the critics' view is narrower than actual practice suggests.