WELL-BEING ANALYSIS VS. COST-BENEFIT ANALYSIS

JOHN BRONSTEEN†
CHRISTOPHER BUCCAFUSCO††
JONATHAN S. MASUR†††

ABSTRACT

Cost-benefit analysis (CBA) is the primary tool used by policymakers to inform administrative decisionmaking. Yet its methodology of converting preferences (often hypothetical ones) into dollar figures, then using those dollar figures as proxies for quality of life, creates significant systemic errors. These problems have been lamented by many scholars, and recent calls have gone out from world leaders and prominent economists to find an alternative analytical device that would measure quality of life more directly. This Article proposes well-being analysis (WBA) as that alternative. Relying on data from studies in the field of hedonic psychology that track people's actual experience of life—data that have consistently been found reliable and valid—WBA is able to provide the same policy guidance as CBA without CBA's distortionary reliance upon predictions and dollar figures. We show how WBA can be implemented, and we catalog its advantages over CBA. In light of this comparison, we conclude that WBA should assume CBA's role as the decisionmaking tool of choice for administrative regulation.

---

† Associate Professor, Loyola University Chicago School of Law.

†† Assistant Professor, Chicago-Kent College of Law.

††† Deputy Dean, Professor of Law and Herbert and Marjorie Fried Teaching Scholar, University of Chicago Law School. We thank Matthew Adler, Frederic Bloom, David Driesen, Aziz Huq, Lee Fennell, Alison LaCroix, Richard McAdams, Jennifer Nou, Eric Posner, Lisa Robinson, Dave Schwartz, Lior Strahilevitz, and David Weisbach for helpful comments. We also thank the participants in the 2013 *Duke Law Journal* Administrative Law Symposium, as well as the excellent editors of the *Duke Law Journal*. Carl Newman provided excellent research assistance. Jonathan Masur thanks the David and Celia Hilliard Fund for research support.

TABLE OF CONTENTS

INTRODUCTION

Virtually every law makes people's lives better in some ways but worse in others. For example, a clean-air law could make people healthier, but it could also force them to pay more money for the products they buy.[1] Every proposed law thus raises the question: Would its benefits outweigh its costs?[2]

To answer that question, there needs to be a way of comparing seemingly incommensurable things like health and buying power. The most common method is to ask how much money people are willing to pay for benefits like improved health (or how much money they are willing to accept for negatives like increased risks to their health). Suppose, for example, it could be determined that people are willing to pay $100 more per year in return for the health benefits of cleaner air. Those benefits could then be compared, by this first approach, to increased consumer costs.

This approach is called cost-benefit analysis (CBA), and it has long been the dominant method of systematic analysis for evaluating government policy.[3] Every economically significant regulation from

---

1. The reason is that businesses may have to spend more money to produce their products in a way that avoids polluting. If so, then someone must bear that cost and have less buying power as a result. It might be consumers (via higher prices), employees (via lower wages or job cuts), or business owners (via lower profits); but it must be someone.

Economic analysis of the effect of price increases on welfare can be complicated, because the effect may depend upon how consumers are likely to react to an increase in a specific context. Whether income effects or substitution effects predominate will vary. For simplicity, we refer here to reductions in buying power as an example of a potential cost or negative consequence of regulation, without specifying the complications from possible substitution effects.

2. This question is typically the first step in analyzing a law, but other steps may follow. We use the terms "costs" and "benefits" to refer to a law's effects on people's quality of life, and such effects may not be the only consideration in evaluating a law. For example, there may be moral reasons to support a law even if it would decrease human welfare. Thus, this Article concerns one step in the decisionmaking process, the step of assessing a law's effects on the quality of human life. It is an important step, but not necessarily the only one.

3. Cost-effectiveness analysis (CEA) is an alternative that has been used as well, albeit far less frequently than CBA, by government agencies in the United States. We discuss CEA in some detail later in this Article in the context of assessing quality-adjusted life years (QALYs), which are CEA's primary measure of outcomes. *See infra* Part IV.B.2. Other methods of systematic evaluation, such as multi-attribute analysis, exist as well, though they are even less commonly used by U.S. government regulators than is CEA.

executive-branch agencies must, by law, be evaluated via CBA[4] (or in some cases via cost-effectiveness analysis).[5] This has been the case since 1981, when President Reagan mandated it by executive order.[6] That order has been reaffirmed by every president since, including Presidents Clinton[7] and Obama.[8]

Despite CBA's prominence, however, it has been criticized harshly from the moment it was first required by executive order[9] to the present day,[10] and countless times in between.[11] More often than not, the criticisms are scathing.[12] Indeed, even CBA's most prominent defenders have written entire books and major articles prompted by their own acknowledgments of CBA's flaws.[13]

---

4. Exec. Order No. 13,563, 3 C.F.R. 215 (2012).

5. *Id.*; Exec. Order No. 12,866, 3 C.F.R. 638 (1994), *reprinted as amended in* 5 U.S.C. § 601 note at 745 (2006); *Economic Analysis of Federal Regulations Under Executive Order 12866*, OFFICE OF MGMT. & BUDGET, (Jan. 11, 1996), http://www.whitehouse.gov/omb/inforeg_riaguide. Regarding CEA, see *supra* note 3 and our discussion of QALYs *infra* Part IV.B.2.

6. Exec. Order No. 12,291, 3 C.F.R. 127 (1982), *reprinted in* 5 U.S.C. § 601 note at 431 (1982), *revoked by* Exec. Order No. 12,866, 3 C.F.R. 638.

7. Exec. Order No. 12,866, 3 C.F.R. 638.

8. Exec. Order No. 13,563, 3 C.F.R. 215.

9. *See, e.g.*, Steven Kelman, *Cost-Benefit Analysis: An Ethical Critique*, REGULATION, Jan./Feb. 1981, at 33, 33 ("In areas of environmental, safety, and health regulation, there may be many instances where a certain decision might be right even though its benefits do not outweigh its costs.").

10. *See, e.g.*, Alexander Volokh, *Rationality or Rationalism?: The Positive and Normative Flaws of Cost-Benefit Analysis*, 48 HOUS. L. REV. 79, 82 (2011).

11. *See, e.g.*, David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond Administrative Cost-Benefit Analysis*, 24 ECOLOGY L.Q. 545 (1997); Robert H. Frank, *Why Is Cost-Benefit Analysis So Controversial?*, 29 J. LEGAL STUD. 913 (2000) (evaluating the various objections to cost-benefit analysis); Daniel Kahneman & Jack Knetsch, *Valuing Public Goods: The Purchase of Moral Satisfaction*, 22 J. ENVTL. ECON. & MGMT. 57 (1992); Duncan Kennedy, *Cost-Benefit Analysis of Entitlement Problems: A Critique*, 33 STAN. L. REV. 387 (1981); Thomas O. McGarity, *A Cost-Benefit State*, 50 ADMIN. L. REV. 7 (1998) [hereinafter McGarity, *A Cost-Benefit State*]; Thomas O. McGarity, *Media-Quality, Technology, and Cost-Benefit Balancing Strategies for Health and Environmental Regulation*, 46 LAW & CONTEMP. PROBS. 159, 179–91 (1983); Richard L. Revesz, *Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L. REV. 941 (1999); Amy Sinden, *Cass Sunstein's Cost-Benefit Lite: Economics for Liberals*, 29 COLUM. J. ENVTL. L. 191 (2004).

12. *See, e.g.*, FRANK ACKERMAN & LISA HEINZERLING, PRICELESS 234 (2004) ("Cost-benefit analysis of health and environmental policies trivializes the very values that gave rise to those policies in the first place."); Kennedy, *supra* note 11, at 388 ("[T]he program of generating a complete system of private law rules by application of the criterion of efficiency is incoherent.").

13. *See, e.g.*, MATTHEW D. ADLER & ERIC A. POSNER, NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS (2006); ECONOMIC ANALYSES AT EPA: ASSESSING REGULATORY IMPACT (Richard D. Morgenstern ed., 1997); REFORMING REGULATORY IMPACT ANALYSIS (Winston

Along these lines, an important if subsidiary contribution of this Article is to combine our own new criticisms of CBA with those of others to make the case that CBA suffers from limitations inherent to its methodology.[14] The only method ever used to compare laws' pluses and minuses—the method that has been mandated for the past three decades—is flawed.

Yet it survives. A primary reason for its survival is evident and voiced often: no comparably rigorous, quantitative, and workable alternative exists for commensurating a law's positive and negative consequences.[15] Since virtually any law will both help people and hurt them, an important element of deciding whether to enact it will typically be to weigh the good against the bad.[16] Asking how much people are willing to pay for the good—and thereby converting all consequences into dollar figures—is viewed by many as the best option for rigorously attempting to commensurate the effects.[17]

In this Article, we propose an alternative method for comparing the positive and negative consequences of a law. This method, which we label "well-being analysis" (WBA), would analyze directly the effect of costs and benefits on people's quality of life. For example, clean-air laws would be assessed by comparing how much more people would enjoy their lives if they became healthier with how much less they would enjoy their lives if their buying power were

---

Harrington, Lisa Heinzerling & Richard D. Morgenstern eds., 2009); RICHARD L. REVESZ & MICHAEL A. LIVERMORE, RETAKING RATIONALITY: HOW COST-BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH (2008); Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165 (1999); Robert H. Frank & Cass R. Sunstein, *Cost-Benefit Analysis and Relative Position*, 68 U. CHI. L. REV. 323 (2001); Robert W. Hahn & Cass R. Sunstein, *A New Executive Order for Improving Federal Regulation? Deeper and Wider Cost-Benefit Analysis*, 150 U. PA. L. REV. 1489 (2002); Cass R. Sunstein, *Cognition and Cost-Benefit Analysis*, 29 J. LEGAL STUD. 1059 (2000).

14. *See infra* Parts III and V. Those Parts also advance our primary objective, which is to show the superiority of the alternative we propose. In contrasting the two methods, we consider not only CBA as it is now practiced but also the proposed improvements to it that have been advanced by CBA's defenders.

15. ADLER & POSNER, *supra* note 13; REVESZ & LIVERMORE, *supra* note 13. One of us has argued to this effect before. *See* Jonathan S. Masur & Eric A. Posner, *Against Feasibility Analysis*, 77 U. CHI. L. REV. 657, 710 (2010).

16. *See supra* note 2 and accompanying text.

17. In ultimate policymaking decisions, CBA is very often combined with non-monetized qualitative considerations—as authorized by the executive orders themselves. But it is the monetization that primarily differentiates CBA from mere intuitionistic decision analysis, because the monetization constitutes an attempt to directly and fully commensurate negative and positive consequences. This is the foundation of CBA's appeal, and it is the thing to which we offer an alternative here.

reduced.[18] This is the most natural and direct way to put seemingly incommensurable things on the same scale. And it yields the specific answer that is needed: whether a law will make people's actual experience of life better or worse on the whole.

Until now, this sort of direct assessment has been assumed to be impossible. But it has been made feasible by the emergence of a new field within social science known as hedonic psychology. Hedonics is the study of how people experience their lives, and in particular the measurement of how much any factor improves or worsens that experience. Originally, some critics questioned whether hedonic studies could credibly measure the quality of people's experiences.[19] But over the past fifteen years, these critics have been quieted by the success of such studies in producing replicable results that pass social science's rigorous tests of validity.[20]

Accordingly, there have been widespread calls for the findings of hedonic psychology to be used to inform government policy. The United Nations General Assembly recently passed a resolution urging countries "to pursue the elaboration of additional measures that better capture the importance of the pursuit of happiness and well-being . . . with a view to guiding their public policies."[21] This view has also been endorsed by Great Britain's Prime Minister David Cameron,[22] France's then-President Nicolas Sarkozy,[23] three widely divergent winners of the Nobel Prize in Economics,[24] and a recent

18. Again, we refer to "buying power" because it is a simple way to signify the economic cost. We mean the term to include, not to ignore, the potential complications introduced by considerations such as the extent to which consumers are able to substitute other goods for those whose prices will increase. *See supra* note 1.

19. Daniel Kahneman, Peter Wakker & Rakesh Sarin, *Back to Bentham? Explorations of Experienced Utility*, 112 Q.J. ECON. 375, 379 (1997) ("The view that hedonic states cannot be measured because they are private events is widely held . . . .").

20. *See infra* Part II.B.

21. G.A. Res. 65/309, at 1, U.N. Doc. A/RES/65/309 (July 19, 2011). The resolution contrasted such new measures with "the gross domestic product indicator," which "was not designed to and does not adequately reflect the happiness and well-being of people in a country." *Id.*

22. Roger Cohen, Op-Ed., *The Happynomics of Life*, N.Y. TIMES, Mar. 13, 2011, at 12.

23. Henry Samuel, *Nicolas Sarkozy Wants To Measure Economic Success in 'Happiness*,' TELEGRAPH (Sept. 14, 2009, 6:24 PM BST), http://www.telegraph.co.uk/news/worldnews/europe/france/6189530/Nicolas-Sarkozy-wants-to-measure-economic-success-in-happiness.html.

24. They are Joseph Stiglitz, Amartya Sen, and Daniel Kahneman. *See* JOSEPH E. STIGLITZ, AMARTYA SEN & JEAN-PAUL FITOUSSI, REPORT BY THE COMMISSION ON THE MEASUREMENT OF ECONOMIC PERFORMANCE AND SOCIAL PROGRESS 16 (2009), *available at* http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf; Daniel Kahneman & Robert

president of Harvard University.[25] The U.S. government, as well as several states and localities, has begun exploring the possibility of using hedonic data to formulate policy.[26]

To make this a reality, however, a methodology must be created for using the data from hedonic psychology to evaluate prospective laws.[27] We create such a methodology in this Article, and we show how it can be used to analyze the same regulations currently assessed by CBA.[28] We then explain how many of the flaws of CBA, some of which have long been recognized and others of which we expose here, would be corrected by WBA.[29]

Policymaking and social science are not like mathematics, and thus any of their tools will have imperfections. WBA is no exception, as we acknowledge in the ensuing Parts. However, WBA cures many of the largest problems of CBA. It is capable of immediate

---

Sugden, *Experienced Utility as a Standard of Policy Evaluation*, 32 ENVTL. & RESOURCE ECON. 161, 178 n.11 (2005).

25. DEREK BOK, THE POLITICS OF HAPPINESS: WHAT GOVERNMENT CAN LEARN FROM THE NEW RESEARCH ON WELL-BEING 45 (2010). In legal scholarship, Adam Kolber has done pioneering work in elucidating the value that experiential measures can bring to the law. *See, e.g.*, Adam Kolber, *The Experiential Future of the Law*, 60 EMORY L.J. 585, 588 (2011) ("My central claim is that as new technologies emerge to better reveal people's experiences, the law ought to do more to take these experiences into account."). Kolber has focused more on neuroscientific measures than on those of hedonic psychology, and more on the civil- and criminal-justice systems than on administrative rulemaking, but he places the same emphasis on experiential measurement that we endorse here and throughout our work.

26. OFFICE OF MGMT & BUDGET, OFFICE OF INFO. & REGULATORY AFFAIRS, REPORT TO CONGRESS ON THE BENEFITS AND COSTS OF FEDERAL REGULATIONS AND UNFUNDED MANDATES ON STATE, LOCAL, AND TRIBAL ENTITIES 46 (2011), *available at* http://www.whitehouse.gov/sites/default/files/omb/inforeg/2011_cb/2011_cba_report.pdf ("OMB continues to investigate the relevant [hedonic] literature and to explore, in a preliminary way, its possible implications for improving regulatory policy in ways that promote the goals of economic growth, innovation, competitiveness, and job creation."); Wendy Koch, *If Money Doesn't Buy Happiness*, USA TODAY, Aug. 1, 2012, *available at* http://usatoday30.usatoday.com/NEWS/usaedition/2012-08-02-Gross-national-happiness_CV_U.htm (listing several cities and states that have begun to consider using hedonic data in governmental decisionmaking).

27. *See* John Bronsteen, Christopher Buccafusco & Jonathan S. Masur, *Welfare as Happiness*, 98 GEO. L.J. 1583, 1628–41 (2010); Anthony Vitarelli, Note, *Happiness Metrics in Federal Rulemaking*, 27 YALE J. ON REG. 115, 133 (2010) ("Despite the proliferation of these metrics, a core challenge remains—creating a useful translation between the happiness measures and traditional measures of economic cost."). Vitarelli suggests that hedonic metrics be used to supplement cost-benefit analysis. *Id.* at 127. Although we take a somewhat more optimistic view of the hedonic measures and a somewhat more pessimistic view of CBA than he does, this Article answers his call for a way to use the hedonic metrics to evaluate regulations.

28. *See infra* Part II.

29. *See infra* Parts III–V.

implementation, and even in its infancy, it may be able to produce analyses more accurate than the ones CBA now produces after three decades of refinement.[30] We demonstrate this point directly by using WBA to reengineer an actual CBA that was used to assess a clean-water regulation.[31]

In Part I, we provide an overview of CBA and its methodology. In Part II, we explain how WBA would work in practice and the data upon which it would rely. In doing so, we contrast an actual CBA with a prototype of a WBA for the same regulation. The following Parts address the major problems with CBA that undermine its reliability and validity, and they suggest how WBA solves these problems. Part III addresses the shortcomings of CBA's use of stated and revealed preferences as proxies for well-being, Part IV focuses on limitations in the way that CBA defines the value of life, and Part V addresses issues associated with discounting the value of future money. At each step, we explain the ways in which WBA would overcome many of CBA's shortcomings and potentially provide a more accurate accounting of a prospective policy's effects on the quality of life.

I. HOW COST-BENEFIT ANALYSIS WORKS, AND ITS CORE LIMITATION

How do elected officials and regulators decide which policies to enact? They are surely influenced by political considerations,[32] and they may also have ideological commitments. But at least in some cases, they simply want to make good policy. And even when politics or ideology constrains a choice, a range of acceptable options typically remains.[33] Accordingly, regulators and elected officials and their staffs devote substantial time to identifying which policies are worth undertaking.[34]

30. This is due to the advantages of WBA, discussed throughout this Article, that stem from its use of a better proxy for welfare than CBA uses. Of course, the accuracy of any given CBA or WBA will depend in part upon the quality of the methods used, which may vary according to the available data and other considerations.

31. *See infra* Part II.C.

32. Examples of such considerations would be pleasing their constituents and campaign donors, even in cases in which doing so is at odds with the public good.

33. At a minimum, it is useful to know what the best policy would be before deciding how to weigh that consideration against others.

34. *See, e.g.*, Mark Seidenfeld, *A Civic Republican Justification for the Bureaucratic State*, 105 HARV. L. REV. 1511, 1514 (1992) (describing the civic republican model as one in which

Before they even begin, they must define what makes a policy worthwhile. A metaphysically correct definition of worth, if such a thing exists, may be beyond humanity's current grasp. However, there is widespread agreement that improving the quality of human life is at least an important component. Because virtually everyone deems it desirable to make people's lives better, at least when all else is equal, that has become the primary focus of policy analysis.[35] What it means to make someone's life better is, in turn, a potentially difficult question.

In a previous article, we argued that a person's quality of life—or, as it is more commonly labeled in economics, "welfare" or "well-being"—is simply the sum of the positive and negative feelings she experiences throughout her lifetime.[36] This view differs from those held by some economists (who view welfare as preference satisfaction—that is, getting what one wants) and some philosophers (who view welfare as the attainment of certain objective qualities or capabilities).[37] Importantly, however, the different conceptions of welfare overlap in practice far more than they diverge.[38] The question, then, is not what it means to make life better, but rather how to decide which policy would do so.

A. CBA and Welfare

Understanding whether a regulation does, in fact, improve quality of life is often difficult. At least theoretically, a new policy may improve the lives of a group of people without negatively

---

"government's primary responsibility is to enable the citizenry to deliberate about altering preferences and to reach consensus on the common good").

35. Adler & Posner, *supra* note 13, at 177.

36. Bronsteen, Buccafusco & Masur, *supra* note 27, at 1590–95. We use the terms "welfare" and "well-being" interchangeably throughout this Article.

37. *Id.* at 1601–27.

38. *Id.* at 1588, 1610, 1617. For instance, there is evidence that when selecting among different plans, people generally choose the option that they believe will make them happiest. Daniel J. Benjamin et al., *What Do You Think Would Make You Happier? What Do You Think You Would Choose?*, 102 AM. ECON. REV. 2083, 2107 (2012). This in turn implies that preferentist and hedonic views of welfare are closely related. In limited circumstances, one's conception of welfare could affect whether one views cost-benefit analysis or well-being analysis as a better proxy for it. For example, a person might want outcome *A*, but only because she mistakenly believes that it will bring her more pleasure than outcome *B*. An economist who takes the view that she would be better off getting what she wants, even when her preference is based on a mistake, may be more likely than others to deem CBA a closer proxy for welfare than WBA. We think that most people reject this view. Bronsteen, Buccafusco & Masur, *supra* note 27, at 1617–18.

impacting anyone.[39] In almost every case, however, the benefits of a regulation to one group of people will come at the expense of costs borne by either the same or another group of people.[40] Policymakers thus need a tool that can tell them whether a proposed law or regulation would improve the overall quality of human life. That is, would the policy help those who benefit more than it would hurt those who are harmed?[41]

Suppose a regulation would reduce the amount of chemical pollution emitted into the waterways and thereby reduce the number of people who die of cancer from the chemical. In so doing, however, it would increase the cost of manufacturing some good, forcing the millions of consumers who purchase it to pay more per person for the good. Whether the benefit of reducing cancer rates is greater than the cost of increasing the prices that consumers must pay depends, in part, on the respective effects of health and consumer purchases on human welfare.

CBA provides a method for comparing such seemingly incommensurable values. Its solution is to convert all costs and benefits into a uniform metric, monetary value, by figuring out how much money people would be willing to pay for the positives that regulations can give them. Via this method, an agency can monetize the value of health and compare it to the monetary value of consuming goods.

Imagine that the clean-water regulation would save ten lives[42] per year, but that it would also drive up manufacturing costs substantially.

---

39. We know of no such Pareto-optimal regulations.

40. Most theories of CBA do not equate this kind of Kaldor-Hicks efficiency with ultimate "rightness" because factors other than wealth maximization could affect such rightness. *See* Adler & Posner, *supra* note 13, at 195 ("[W]e conceive of CBA as a *decision procedure*, not as a criterion of moral rightness or goodness."). Still, learning whether a regulation would increase or decrease quality of life in the aggregate is widely viewed as an important part of assessing its desirability.

41. Again, increasing overall well-being need not be the only goal of policymaking. It may be weighed against considerations such as the distribution of well-being, as well as values independent of human well-being. ADLER & POSNER, *supra* note 13, at 52–61; Bronsteen Buccafusco & Masur, *supra* note 27, at 1589–90. Because overall well-being is one important consideration, however, both CBA and WBA are designed exclusively to measure it.

42. Those who perform CBA often object to characterizing a regulation as "saving lives" for two reasons. First, a life cannot be saved, but merely prolonged; and second, a regulation simply reduces the risk to a population of people rather than prolonging the lives of specific, pre-identified individuals. We do not view either of these points as a reason to avoid the term "saving lives."

Each of the 1 million consumers who purchase the affected good would have to pay $50 more per year to acquire that product. CBA asks whether it is worth spending $50 million ($50/person × 1 million people) to save 10 lives. To answer this question, CBA must place a price on the lives being saved.

To find out the cost people would be willing to pay for any type of regulatory benefit, such as avoiding the loss of life from cancer, CBA has two methods available. The first is "revealed preferences"[43] and the second is "stated preferences," the latter of which is most commonly determined by contingent valuation surveys that ask people how much they would be willing to pay for a benefit.[44] Revealed preferences are available when people have been faced with an opportunity to choose between some regulatory benefit and some amount of money in their actual lives, such that CBA can simply observe which option they chose. Their decision is said to reveal whether they prefer, for example, having more money or reducing their risk of death. Identifying that preference enables regulators to place a value on something like increased water quality, because it shows how much money people are willing to spend in order to minimize or eliminate a risk to their life. When they are available, revealed preferences are typically preferred to stated preferences, although this is not an absolute: a high-quality stated-

---

The first point is one that we take very seriously and discuss later in this Article as an advantage of WBA, because WBA counts heavily the likely number of years by which lives are prolonged on average by given regulations, whereas the most common form of CBA does not. *See infra* Part IV.B.1. Moreover, everyone understands that people do not live forever, yet "saving lives" is a widely used term. When a firefighter pulls someone out of a burning building, it is typical and in no way misleading to say that he saved the person's life rather than that he merely prolonged it.

As for the second point, we believe that if a regulation will eliminate a death risk of 1-in-10,000 to a population of 1,000,000 people, then it is best to characterize that as an estimated prospective benefit of saving 100 lives. To a significant degree, CBA effectively does this, regardless of the terminology it chooses. It is true that people are willing to pay more money to save identified individuals than they are to reduce statistical risks (whose reduction ends up saving as-yet-unspecified individuals), and the animating principles of CBA dictate that this matters. But as we explain later in this Article, we consider that a flaw in CBA rather than a problem with the term "saving lives."

43. *See infra* Part III.A.

44. *See infra* Part III.B. Another stated-preference method is choice experiments. They have been used far less frequently than contingent valuation surveys, but this may be starting to change. In any event, choice experiments are vulnerable to many of the same problems we discuss with contingent valuation surveys, and certainly to the same overarching disadvantages of CBA vis-à-vis WBA. To wit, they rely on predictions of welfare rather than in-the-moment measures of welfare.

preference study may be chosen over a lower-quality revealed preference study.

When analyzing actual regulations with trade-offs like those of the clean-water regulation mentioned above, economists performing CBA would typically use the revealed preference method.[45] They would look for a real-life situation in which people have chosen between having more money and avoiding a low-probability risk of death. Such a situation is said to arise when people choose their jobs, because one thing that differentiates jobs is the degree of mortality risk that they entail. Being a firefighter, for example, is more dangerous than being an accountant. CBA's idea is as follows. First, it uses statistical analysis to try to identify two jobs that are the same in every way except two: Job *A* is riskier than Job *B*, and to compensate for that risk, Job *A* pays more than Job *B*. People who choose Job *A* rather than Job *B* are said to have willingly accepted a somewhat higher risk of death (one that is low probability in absolute terms, but still higher than the risk in other jobs) in return for the benefit of higher wages. The amount of extra money that they make is the revealed market value of risk avoidance. If a job with a 1-in-10,000 annual risk of death pays $600 more annually than an otherwise comparable job with no risk (the hypothetical no-risk job is used here for simplicity of explication), then the value of avoiding such a risk is pegged at $600. Accordingly, society would collectively be willing to spend $6 million ($600 multiplied by 10,000) for each life saved.[46] Indeed, this is close to the actual number that economists employing CBA have produced.[47] A regulation that will save 10 lives is thus deemed to increase overall well-being if and only if it costs consumers a collective total of $60 million or less.

---

45. *See, e.g.*, Douglas A. Kysar, *Climate Change, Cultural Transformation, and Comprehensive Rationality*, 31 B.C. ENVTL. AFF. L. REV. 555, 586 (2004) ("[W]hatever preferences individuals seem to reveal through their market behavior are taken to be the best measure of true 'wants' or 'desires' and, therefore, also are taken exclusively to provide the valuation inputs that in critical part determine the policy outputs of CBA.").

46. Avoiding the *risk* is worth $600, but the regulators know that a certain number of people are likely to *actually* die without the regulation. Therefore, they need to know how much society is willing to pay to save those lives. If avoiding a 1-in-10,000 risk is worth $600, then avoiding an actual death (that is, a 1-in-1 "risk") is worth $6 million ($600 × 10,000).

47. *E.g.*, W. Kip Viscusi, *How To Value A Life*, 32 J. ECON. & FIN. 311, 312–14 (2008); *see also, e.g.*, U.S. ENVTL. PROT. AGENCY, EPA 815-R-00-026, ARSENIC IN DRINKING WATER RULE: ECONOMIC ANALYSIS 5-28 (2000) (estimating the value of a statistical life at $6.1 million).

If no revealed preference were available, then CBA would call for the use of a contingent valuation study. This would entail giving people surveys that ask how much money they would be willing to spend in return for avoiding a 1-in-10,000 risk of death. These surveys have also been used, for example, to learn people's willingness to pay for things like preserving the lives of endangered species.[48]

B. The Core Advantage of WBA over CBA

CBA is based on this idea: how much money a person is willing to pay for a thing shows how much the thing increases her welfare. But that is not true. When someone buys a thing in the hope of improving her welfare, she has made a prediction—a guess—about how the thing will affect her. That prediction may well be wrong, and indeed it usually is. Daniel Gilbert and Timothy Wilson's pioneering work has demonstrated that people are not good at predicting how their choices will affect how they feel in the future.[49]

By contrast, people are good at reporting how they feel right now. In-the-moment self-reports pass the same tests of reliability and validity that are failed by affective predictions.[50] This should not be surprising; guessing how you will feel in the future is of course more error-prone than saying how you feel now. And the reasons for this are apparent: "[The mind's] simulations are deficient because they are based on a small number of memories, they omit large numbers of features, they do not sustain themselves over time, and they lack context. *Compared to sensory perceptions, mental simulations are mere cardboard cut-outs of reality.*"[51]

Thus, a decision tool will be better at approximating welfare if it is based on self-assessments of how people feel in the moment than if it is based on predictions of how people will feel in the future. This is the central insight behind well-being analysis and its primary advantage over cost-benefit analysis.[52]

---

48. *E.g.*, John B. Loomis & Douglas S. White, *Economic Benefits of Rare and Endangered Species: Summary and Meta-Analysis*, 18 ECOLOGICAL ECON. 197, 203 (1996).

49. *See, e.g.*, Daniel T. Gilbert & Timothy D. Wilson, *Prospection: Experiencing the Future*, 317 SCI. 1351, 1354 (2007); Timothy D. Wilson & Daniel T. Gilbert, *Affective Forecasting: Knowing What To Want*, 14 CURRENT DIRECTIONS PSYCHOL. SCI. 131, 131 (2005).

50. *See infra* Part II.B.

51. Gilbert & Wilson, *supra* note 49, at 1354 (emphasis added).

52. Even if feeling good is not identical to welfare, few would deny that it is at minimum a major part of welfare. Indeed, when CBA's proponents delineate which preferences count

II. WELL-BEING ANALYSIS

Defenders of CBA have long argued that, despite its flaws, cost-benefit analysis is the best available means for determining the welfare effects of a project or regulation.[53] That may no longer be the case. We propose here an alternative method for analyzing regulatory policy: well-being analysis (WBA). WBA shares the basic framework of CBA, that of comparing costs and benefits, but it differs in the data and analytical tools it employs to make such comparisons.

Instead of monetizing the effects of regulation, WBA "hedonizes" them. That is, it measures how much a regulation raises or lowers people's enjoyment of life. For example, if a regulation would result in improved health but higher prices of products, then WBA would compare how much more people enjoy their lives when they are made healthier with how much less they enjoy their lives when their buying power decreases.

Like CBA, WBA is a tool for analyzing the welfare effects of policies—not a panacea meant to be the last word on what should be done. Policy analysis often proceeds by analyzing welfare effects and then weighing those effects against whatever other considerations are deemed relevant by regulators, legislators, and the citizenry they serve,[54] including fairness, justice, and human dignity.[55] Our contribution is to try to improve upon the first step of the process, the step in which welfare effects are measured. This would influence policy, but it in no way implies that we think the first step is the only step. Like proponents of CBA, we acknowledge the role that other considerations may play.[56]

---

toward welfare, the result ends up looking remarkably like those preferences that result in feeling good. *See* Bronsteen, Buccafusco & Masur, *supra* note 27, at 1622–27.

Moreover, even informed and accurate preferences are likely to be further removed from welfare than is happiness because many of those preferences are not self-interested. When someone expresses a preference by her willingness to pay for something, that preference is not necessarily aimed at increasing her own welfare (and thus should be excluded by CBA, which is a tool for welfare assessment).

53. *See, e.g.*, ADLER & POSNER, *supra* note 13.

54. *See* Adler & Posner, *supra* note 13, at 245 ("CBA does not capture, and is not meant to capture, nonwelfarist considerations.").

55. *See* Exec. Order No. 13,563, 3 C.F.R. 215 (2012).

56. *See* ADLER & POSNER, *supra* note 13, at 53 (noting the possible roles of "moral rights, the fair distribution of welfare, and even moral considerations wholly detached from welfare, such as intrinsic environmental values" that could be considered alongside the value of aggregate welfare when making public policy).

Subsequent Parts of this Article argue that WBA solves many of the conceptual and methodological problems facing CBA. This Part introduces WBA and explains the sources, validity, and reliability of its data.

A. WBA: The Basic Framework

WBA directly analyzes the effects of regulations on people's quality of life. To do that, it relies on hedonic-psychology data that measure how different factors affect people's enjoyment of their lives. In theory, such measures could perhaps be purely neurological—taken by a machine that reports how good someone feels at all times. But unless and until that sort of technology is created, psychologists must rely instead on individuals' personal assessments of how their lives are going for them at a particular moment in time. Fortunately, these self-assessments can be taken in ways that yield highly reliable results, as we explain in detail in the following Section.

Individuals' self-assessments indicate their level of subjective well-being (SWB), or "happiness." Recently, psychologists and economists have developed increasingly sophisticated surveying and statistical methods that enable the collection and analysis of well-being data on a large scale.[57] WBA uses these data to evaluate the welfare consequences of regulations by comparing the well-being gains and losses of affected parties. This Section explains the conceptual framework behind WBA, whereas the following Section discusses the data upon which WBA relies. The final Section of Part II explains how the data would be used in the actual performance of WBA.

WBA relies on the same basic cost-benefit-weighing principle that undergirds CBA: all else equal, regulations whose benefits exceed their costs are valuable because they enhance overall welfare. The main difference between the two techniques involves the way in which costs and benefits are calculated and compared. Regulations involve both market and nonmarket costs and benefits. For CBA, market effects are relatively easy to handle, because computing their monetary value is straightforward. Nonmarket effects, however, are more difficult for CBA. As we will describe in greater detail, CBA must apply a variety of problematic tools to monetize the value of

57. Daniel Kahneman, Ed Diener & Norbert Schwarz, *Preface* to WELL-BEING: THE FOUNDATIONS OF HEDONIC PSYCHOLOGY, at ix, xii (Daniel Kahneman, Ed Diener & Norbert Schwarz eds., 1999).

health, lives, and the environment. WBA avoids many of these difficulties by looking directly to a regulation's effects on people's experiences and lives. In WBA, all effects of a regulation are hedonized, which is to say that they are converted into units directly measuring their impact on the subjective well-being of the affected parties. The positive and negative hedonic impacts can then be compared with one another. They are the relevant costs and benefits.

Instead of converting regulatory effects into monetary values, WBA converts them into well-being units (WBUs). WBUs are intended to be subjective, hedonic, cardinal, and interpersonally comparable units that indicate the degree of a person's happiness for a given period of time. They are, in some respects, similar to the quality-adjusted life years (QALYs) that are increasingly popular in health economics.[58]

WBA maps a person's SWB onto a scale that would ideally run from -10 to 10, in which 10 indicates perfect happiness (subjectively defined), -10 indicates perfect misery, and 0 indicates neutrality or the absence of experience. This type of scale would allow individuals to register experiences that are worse than nonexperience (undergoing a root canal, for instance) and would simplify the comparison between experience and nonexperience. Most of the well-being data that have been collected to date have employed a scale from 0 to 10.[59] Accordingly, in the WBA that we conduct below, we utilize a scale running from 0 to 10. As the science of WBA evolves, we would envision transitioning to the preferred -10 to 10 scale.[60]

Each decile of the scale is equivalent and indicates a 10 percent change in the person's SWB.[61] Moreover, we treat the scale as identical across individuals, although, of course, the kinds of things that affect different individuals' SWB may not be.[62] One WBU is equivalent to 1.0 on the scale for a period of one year. Thus, if a person lives to the age of 100 and has an SWB of 7.0 for each year,

58. In Part IV we describe the differences between QALYs and WBUs and the advantages of the latter.

59. *See* Richard R. Layard, G. Mayraz & S. Nickell, *The Marginal Utility of Income*, 92 J. PUB. ECON. 1846, 1848 tbl.1 (2008) (collecting examples of well-being studies). Scales from 0 to 7 are also common.

60. Converting from one scale to another is also possible by using studies that pose the same questions to the same (or comparable) individuals on different scales.

61. This requires that the scale be *intra*personally cardinal.

62. This requires that the scale be *inter*personally cardinal. We discuss the issues raised by this cardinality requirement in greater detail in Part II.B.4.

that person has experienced 700 WBUs (7.0 WBU/year × 100 years). If an event such as illness causes a person's SWB to drop from 7.0 to 5.5 for a period of ten years, that person loses 15 WBUs (1.5 WBU/year × 10 years) over her lifetime.

This type of scale has significant benefits for any type of decision analysis, particularly regulatory analysis, because it enables the direct comparison of the hedonic impact of proposed policy changes. Imagine, for example, that the Occupational Safety and Health Administration (OSHA) is contemplating a simple regulation of workplace safety that will prevent 100 workers from each losing an arm while on the job. Implementing such a measure, however, will increase the costs of production and force factories to fire 300 workers in the affected industry.

CBA would attempt to calculate the value of the regulation by monetizing the costs and benefits it generates. With respect to the costs, CBA would in theory be able to estimate the lost wages of the 300 unemployed people.[63] The benefits, however, are trickier. Establishing a market price for the value of an arm is a fraught enterprise.[64] Given these shortcomings, the value CBA applies to the loss of an arm will be beset by a number of systematic errors associated with wealth effects, labor-market effects, and people's poor ability to predict how events like losing an arm will affect them. Accordingly, CBA may substantially and systematically misstate the benefits of the regulation.

WBA would approach the measure in the same general fashion but with different analytical data. Like CBA, WBA would attempt to quantify the cost of unemployment. But instead of looking solely to the workers' lost wages, it would calculate the hedonic cost of being unemployed.[65] Some data suggest that unemployment has a significant effect on well-being.[66] Thus, the welfare costs of unemployment may be much greater than CBA predicts. On the other side of the ledger,

63. In practice, however, CBA typically ignores the costs associated with unemployment. *See infra* Part II.C.

64. We discuss the many possible shortcomings of CBA's attempts to do so in Part III.

65. CBA could, in theory, use contingent valuation studies to estimate in monetary terms these hedonic consequences, but this does not currently happen as a matter of standard practice. In addition, such studies would suffer from the same kinds of problems, notably affective forecasting errors, that affect contingent valuation generally.

66. *See* Richard E. Lucas, Andrew E. Clark, Yannis Georgellis & Ed Diener, *Unemployment Alters the Set Point for Life Satisfaction*, 15 PSYCHOL. SCI. 8, 12 (2004); *infra* Part II.C.

WBA is well positioned to hedonize the benefits of the regulation. Studies of people who have lost limbs provide fairly accurate information on the hedonic loss associated with losing an arm (and thus the benefits of avoiding these losses).[67] Again, the results are likely to be different from those determined by CBA. Studies show that individuals who lose limbs often adapt substantially to their new condition, recovering most of their lost happiness within a few years.[68] This result is contrary to the predictions of healthy people, who typically assume that such disabilities will be devastating and discount the possibility that they will adapt to the loss.[69] Accordingly, the welfare benefits of the regulation may be overstated by CBA if contingent valuation or revealed preference surveys rely on mispredictions about hedonic adaptation.[70]

Although this example suggests that the hypothetical OSHA regulation may be less valuable than CBA implies, in many other circumstances WBA will point in the direction of more stringent regulation than CBA would suggest. For many regulations, the chief benefits will involve extending human lives, and the major costs will come in the form of higher consumer prices. In the context of WBA, loss of life constitutes an enormous hedonic cost, whereas many studies indicate that money has a relatively small effect on well-being.[71] When money is traded off against life, therefore, WBA is likely to favor health and safety regulations more than does CBA.

B. The Data of WBA

Social scientists have been attracted to the idea of measuring human welfare directly for a long time, but they have had difficulty

---

67. For an excellent summary of the initial research on hedonic adaptation, see Shane Frederick & George Loewenstein, *Hedonic Adaptation*, *in* WELL-BEING: THE FOUNDATIONS OF HEDONIC PSYCHOLOGY, *supra* note 57, at 302, 311–18.

68. *Id.* at 312.

69. Peter A. Ubel, George Loewenstein & Christopher Jepson, *Disability and Sunshine: Can Hedonic Predictions Be Improved by Drawing Attention to Focusing Illusions or Emotional Adaptation?*, 11 J. EXPERIMENTAL PSYCHOL.: APPLIED 111, 111 (2005) ("One of the most commonly replicated 'happiness gaps' is that observed between the self-rated quality of life of people with health conditions and healthy people's estimates of what their quality of life would be if they had those conditions . . . ." (citation omitted)); Peter A. Ubel et al., *Do Nonpatients Underestimate the Quality of Life Associated with Chronic Health Conditions Because of a Focusing Illusion?*, 21 MED. DECISION MAKING 190, 197 (2001).

70. *See infra* Part III.

71. Daniel Kahneman & Angus Deaton, *High Income Improves Evaluation of Life but Not Emotional Well-Being*, 107 PROC. NAT'L ACAD. SCI. 16,489, 16,492 (2010).

securing valid and reliable data.[72] WBA is now feasible because of the availability of relevant data about the effects of different circumstances on individual well-being. Over the last decade or so, new social science techniques have emerged that enable researchers to study subjective well-being from a variety of different perspectives with a number of different tools.[73] These techniques allow for a more or less direct measurement of people's happiness levels, overcoming the problem that had initially driven economists to seek monetary proxies for welfare.[74] Importantly, they enable the measurement of what Daniel Kahneman has termed "experienced utility" (how good people feel), in contrast to the "decision utility" that is typically studied in CBA.[75] Decision utility measures only whether people get what they want, on the assumption that getting it will make them better off. But because that assumption has been shown to be deeply imperfect,[76] Kahneman and others have turned toward measuring directly the quality of people's experience of life. This Section will briefly discuss a few of the most promising techniques for collecting such experiential data and their relative strengths and weaknesses.

1. *Life Satisfaction Surveys*. The oldest method of measuring SWB is the life satisfaction survey. These types of surveys ask individuals to respond to a question such as, "All things considered, how satisfied with your life are you these days?"[77] Respondents answer on a scale that ranges from "not very happy" to "very happy." Life satisfaction surveys have been included in the U.S. General Social Survey since the 1970s; as a result, we now have substantial quantities of longitudinal data on thousands of individuals.[78] The principal value in such surveys is the ability to correlate SWB data with a variety of other facts about people's lives. Using multivariate regression analyses that control for different circumstances,

72. *E.g.*, David Colander, *Retrospectives: Edgeworth's Hedonimeter and the Quest To Measure Utility*, J. ECON. PERSP., Spring 2007, at 215, 215–16.

73. For a review of well-being measures, see ED DIENER, RICHARD LUCAS, ULRICH SCHIMMACK & JOHN HELLIWELL, WELL-BEING FOR PUBLIC POLICY 46–66 (2009).

74. *See id.* at 10–11.

75. Kahneman et al., *supra* note 19, at 375.

76. *See infra* Part III.A.3.

77. *See* William Pavot & Ed Diener, *Review of the Satisfaction with Life Scale*, 5 PSYCHOL. ASSESSMENT 164, 164 (1993) (discussing the strength of the Satisfaction with Life Scale and referring to the fact that it is a "judgmental process, in which individuals assess the quality of their lives on the basis of a unique set of criteria").

78. DIENER ET AL., *supra* note 73 *Well-Being for Public Policy* at 191.

researchers are able to estimate the strength of the correlations between SWB and factors such as income, divorce, unemployment, disability, and the death of family members.[79] For example, on average, the death of a father will yield the loss of 0.25 life satisfaction points on a scale of 1 to 7 for a period of time, whereas the loss of a spouse will typically yield the loss of 0.89 points.[80]

Life satisfaction surveys are relatively inexpensive to administer and can be easily included in a variety of larger survey instruments. Accordingly, they are most valuable as sources of large-scale data about many subjects and of longitudinal data about changes in SWB over time. The latter use is especially valuable in assessing the causal effects of life events (such as marriage, disability, or unemployment) on SWB, because the same individual can be surveyed both before and after the event. This eliminates the need for between-subjects comparisons.[81] Life satisfaction surveys are less helpful, however, for assessing particularly granular changes in circumstances. More importantly, they rely on global judgments about how people's lives are going, rather than on those individuals' moment-by-moment hedonic experiences. Because hedonic experiences are often poorly remembered, such judgments can be biased because of a person's momentary mood[82] or the order in which questions are posed, among other errors.[83]

2. *Experience Sampling Methods*. Researchers sought to overcome the limitations of life satisfaction surveys by developing

79. *See, e.g.*, Andrew E. Clark, Ed Diener, Yannis Georgellis & Richard E. Lucas, *Lags and Leads in Life Satisfaction: A Test of the Baseline Hypothesis*, 118 ECON. J. F222, F231 (2008); Richard E. Lucas, Yannis Georgellis, Andrew E. Clark & Ed Diener, *Reexamining Adaptation and the Set Point Model of Happiness: Reactions to Changes in Marital Status*, 84 J. PERSONALITY & SOC. PSYCHOL. 527, 528 (2003); Richard E. Lucas, *Time Does Not Heal All Wounds: A Longitudinal Study of Reaction and Adaptation to Divorce*, 16 PSYCHOL. SCI. 945, 947–48 (2005).

80. Andrew J. Oswald & Nattavudh Powdthavee, *Death, Happiness, and the Calculation of Compensatory Damages*, 37 J. LEGAL STUD. S217, S232 (2008).

81. *See* Lucas et al., *supra* note 79, at 546. Between-subjects comparisons can be a problem if the two groups (for example, married people and single people) differ about more than just the comparison issue. Married people are not simply happier because they are married; the people who get married are more likely to have been happy people in the first place than the people who are single. *Id.*

82. *See* Alan B. Krueger, Daniel Kahneman, David Schkade, Norbert Schwarz & Arthur A. Stone, *National Time Accounting: The Currency of Life*, *in* MEASURING THE SUBJECTIVE WELL-BEING OF NATIONS: NATIONAL ACCOUNTS OF TIME USE AND WELL-BEING 9, 29 (Alan B. Krueger ed., 2009).

83. *See id.* at 40.

techniques that enabled them to more directly measure people's emotions while they were being experienced. The gold standard of such measures is the experience sampling method (ESM), which uses handheld computers and iPhones to survey people about their experiences.[84] Subjects are beeped randomly throughout the day and asked to record what they are doing and how they feel about it. The data that emerge from these studies provide a much more detailed picture of how people spend their time and how their experiences affect them.[85]

Despite their considerable value, ESM studies can be expensive to run.[86] This is why researchers have sought other methods that produce most of the advantages of ESM but at a lower price. One such technique is the day reconstruction method (DRM) pioneered by Daniel Kahneman and his colleagues. The DRM uses daily diary entries about each day's experiences to reconstruct an account of subjects' emotional lives. DRM studies correlate strongly with ESM studies and can be run at lower cost.[87] Similarly, the Princeton Affect and Time Survey (PATS) asks subjects to report and evaluate their experiences from the previous day.[88] It can be distributed via telephone and incorporated into other survey devices, enabling it to reach a larger population.[89]

3. *The Quality of Well-Being Data*. The ability to generate data is not the same as the ability to actually measure the thing that one seeks to measure. Nor is it the ability to measure it well. Data are only useful if they are reliable and valid. Much of the remainder of this Article analyzes the reliability and validity of the valuation measures used by CBA. As a means of comparison, we now discuss the quality of the data upon which WBA will rely.

Reliability is an indication of the consistency of a measurement instrument.[90] For example, a scale that reported very similar numbers

84. *Id.* at 30.

85. *Id.*

86. *See, e.g.*, *id.* ("So far, however, real-time data collection has proved prohibitively expensive and burdensome to administer to large, representative samples.").

87. *See* Daniel Kahneman, Alan B. Krueger, David A. Schkade, Norbert Schwarz & Arthur A. Stone, *A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method*, 306 SCI. 1776, 1776 (2004).

88. Krueger et al., *supra* note 83, at 34–36.

89. *Id.* at 36.

90. DIENER ET AL., *supra* note 73, at 68.

every time the same weight was placed on it would be judged highly reliable. In the context of well-being measures, reliability can be assessed by examining correlations between tests and retests of the same question at separate times, as well as correlations between different questions that ask about similar concepts.[91] Meta-analyses of different well-being tools have found high levels of reliability for both life satisfaction and experience sampling methods.[92] This is especially true of more advanced multi-item measures.[93]

Just because a measure reliably provides consistent data does not mean that it is measuring what you want it to measure.[94] The ability to *actually measure* the thing sought to be measured is called validity.[95] Although a full review of the validity of well-being measures is unnecessary here,[96] it is worth noting a number of findings that support the conclusion that a person's well-being can be validly measured by the tools discussed in the previous Subsection. First, despite the rather different techniques used to collect data, the various measures of well-being tend to correlate with one another.[97] One's overall life satisfaction is correlated both with the amount of positive and negative affect that one feels[98] and with one's satisfaction with the domains of one's life.[99] Not only are subjective reports of well-being correlated with one another, they are also correlated with external measures, such as third-party informant reports,[100] facial

91. *Id.* at 71.

92. *Id.* at 72–73. Test-retest reliability results typically range from $r = 0.55$ to $r = 0.70$. *Id.* at 72. These are fairly high numbers, especially given the difficulty of using test-retest calculations on a measure of well-being that is likely to change significantly over time.

93. *Id.* at 74.

94. For example, a bathroom scale may provide highly reliable data—the same readout every time—but those data are probably not a very good measure of your well-being.

95. *See* Samuel Messick, *Validity of Psychological Assessment: Validation of Inferences from Persons' Responses and Performances as Scientific Inquiry into Score Meaning*, 50 AM. PSYCHOLOGIST 741, 741 (1995) ("Validity is an overall evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions on the basis of test scores or other modes of assessment." (citation omitted)).

96. For such a review, see DIENER ET AL., *supra* note 73, at 74–93.

97. *Id.* at 70.

98. Michael Eid & Ed Diener, *Global Judgments of Subjective Well-Being: Situational Variability and Long-Term Stability*, 65 SOC. INDICATORS RES. 245, 245–46 (2004).

99. Ulrich Schimmack, *The Structure of Subjective Well-Being*, *in* THE SCIENCE OF SUBJECTIVE WELL-BEING 97, 97 (Michael Eid & Randy J. Larsen eds., 2007).

100. *See* Heidi Lepper, *Use of Other-Reports To Validate Subjective Well-Being Measures*, 44 SOC. INDICATORS RES. 367, 367 (1998) ("Objective reports allow researchers to evaluate whether the level of SWB reported by the individual is an enduring state and/or observable to

expressions,[101] and neurological data.[102] Well-being measures also tend to be fairly stable over time and exhibit high test-retest reliability.[103] But despite their overall stability,[104] they are also sensitive to changes in life circumstances: people who experience apparently negative events do indeed report lower levels of well-being—at least for a time, before they adapt.[105] Moreover, well-being scales can detect the relative magnitude of life events. For example, people who are more seriously injured predictably report lower happiness ratings than do people who are less seriously injured.[106] This suggests both that people are capable of consistently reporting how experiences make them feel and that their emotional responses generally exhibit credible and predictable patterns following specific events.

Just as CBA alternately relies upon revealed preference and contingent valuation studies, WBA would draw upon each of the data sources mentioned in the preceding Section. In some cases, longitudinal studies of overall well-being may provide the best data available for tracking people after events with potentially long-term effects.[107] These studies have been used, for example, by researchers to understand the hedonic impact of no-fault divorce laws on women

---

others."); Ed Sandvik, Ed Diener & Larry Seidlitz, *Subjective Well-Being: The Convergence and Stability of Self-Report and Non-Self-Report Measures*, 61 J. PERSONALITY 317, 322 (1993) ("The reports of informants are likely to summarize emotional information expressed by subjects over time . . . .").

101. Tiffany A. Ito & John T. Cacioppo, *The Psychophysiology of Utility Appraisals*, *in* WELL-BEING: THE FOUNDATIONS OF HEDONIC PSYCHOLOGY, *supra* note 57, at 470, 479.

102. Timothy G. Dinan, *Glucocorticoids and the Genesis of Depressive Illness: A Psychobiological Model*, 164 BRIT. J. PSYCHIATRY 365 (1994); Ito & Cacioppo, *supra* note 101.

103. *See* Ed Diener & Richard E. Lucas, *Personality and Subjective Well-Being*, *in* WELL-BEING, *supra* note 57, at 213, 213–14 ("[I]n spite of . . . transitory influences, SWB is moderately stable across situations and across the life span . . . ." (citations omitted)).

104. *See* Sandvik et al., *supra* note 100, at 338–39 ("The present study clearly indicates that there are long-term consistencies in average mood . . . .").

105. *See* Lucas et al., *supra* note 66, at 11.

106. *See* Andrew J. Oswald & Nattavudh Powdthavee, *Does Happiness Adapt? A Longitudinal Study of Disability with Implications for Economists and Judges*, 92 J. PUB. ECON. 1061, 1066 (2008). This sensitivity to degree is in contrast to findings that people's responses to contingent valuation surveys used in CBA display considerable scope neglect, that is, they are willing to pay the same amount of money to save 2000, 20,000, or 200,000 endangered birds. William H. Desvousges, F. Reed Johnson, Richard W. Dunford, Sara P. Hudson & K. Nicole Wilson, *Measuring Natural Resources with Contingent Valuation: Tests of Validity and Reliability*, *in* CONTINGENT VALUATION: A CRITICAL ASSESSMENT 91, 113 (Jerry A. Hausman ed., 1993).

107. This would be the case if no comparable ESM or DRM studies had yet been done for the relevant conditions.

in different states.[108] In other circumstances, the availability of ESM studies will enable more fine-grained analyses of regulations' effects on people's lives.

4. *Criticisms of Well-Being Data.* Economists and other defenders of CBA have raised a number of objections to well-being data, and before we proceed further it is worth addressing those objections. The first, and most important, is that well-being data lack interpersonal cardinality because different individuals may interpret the scales differently.[109] For example, a 5.0 on one person's scale may not be the same as a 5.0 on another person's scale. If people interpret the hedonic scales differently, it becomes impossible to know whether one person's reported change from an SWB of 5.0 to 6.0 was equivalent to another person's reported change from 5.0 to 6.0.

Although some limited evidence for concern about cardinality exists in certain contexts, methodological solutions to this problem are almost certainly available. First, differential use of the scale will only be a problem when that differential use is related to the populations being compared. For instance, imagine an agency using WBA to evaluate a project that will reduce traffic and commuting times on a highway. To determine the hedonic cost of commuting in traffic, the agency would compare the well-being of people while they are commuting with the well-being of people who are not commuting. Unless people who commute in traffic systematically use the hedonic scale differently from people who do not, different uses of the scale will simply show up as random noise. Variations among individuals in how they rate their own happiness—what they mean when they rate themselves a 5 or a 6, for instance—are likely to be random, not biased.[110] This randomness should wash out across large numbers of

108. *See generally* Betsey Stevenson & Justin Wolfers, *Bargaining in the Shadow of the Law: Divorce Laws and Family Distress*, 121 Q.J. ECON. 267 (2006).

109. *See* Matthew Adler & Eric A. Posner, *Happiness Research and Cost-Benefit Analysis*, 37 J. LEGAL STUD. S253, S280–81 ("The question is whether the numerical scales used in SWB surveys correspond to a true, interpersonally comparable scale of happiness."). In fact, concerns about the interpersonal cardinality of utility pushed economists toward monetization in the first place. *See* William Nordhaus, *Measuring Real Income with Leisure and Household Production*, *in* MEASURING THE SUBJECTIVE WELL-BEING OF NATIONS: NATIONAL ACCOUNTS OF TIME USE AND WELL-BEING, *supra* note 83, at 125, 136.

110. There is some reason to believe that citizens of different nations with vastly different cultures will treat happiness surveys systematically differently. *See* Ed Diener & Eunkook M. Suh, *Measuring Subjective Well-Being To Compare Quality of Life of Cultures*, *in* CULTURE AND SUBJECTIVE WELL-BEING 1, 3 (Ed Diener & Eunkook M. Suh eds., 2000) ("If societies have different sets of values, people in them are likely to consider different criteria relevant

people.[111] In many of the situations most relevant to WBA, this is virtually certain to be the case.[112]

Cost-benefit analysis is equally subject to concerns about cardinality. Because of the diminishing marginal value of money, two individuals with differing levels of personal wealth can obtain vastly different amounts of welfare from the same gain (or loss) of income.[113]

---

when judging the success of their society."). Empirical studies have found, however, that similarly situated individuals in different countries have similar levels of life satisfaction. Betsey Stevenson & Justin Wolfers, *Economic Growth and Happiness: Reassessing the Easterlin Paradox*, BROOKINGS PAPERS ECON. ACTIVITY, Spring 2008, at 1, 67, 69. This suggests that subjective well-being measures may even be comparable across countries. If that is the case, they will very likely be comparable across regions or communities within a given country.

111. *See* Rafael Di Tella & Robert MacCulloch, *Some Uses of Happiness Data in Economics*, J. ECON. PERSP., Winter 2006, at 25, 29–32 (discussing the possibility of reducing systemic differential reporting biases by comparing across larger groups). In addition, the U-Index proposed by Krueger et al. is designed to mitigate differences in scale usage. *See* Krueger et al., *supra* note 83, at 18–20.

112. For example, whereas different uses of the scale might be an issue when comparing surveys conducted in different countries with different languages, it is far less likely to be an issue when making local or national regulatory policy. There is no evidence that different populations within the United States use the scale differently. After all, why would individuals who drive to work in traffic use a hedonic scale differently than the individuals who might be asked to pay for public-transit projects? Among other things, in many cases these will be the same populations of people.

Some might contend that circumstances such as disability and unemployment create the potential for some degree of scale re-norming. That is, they might argue that ideal happiness could mean something different to a person after becoming seriously disabled or unemployed, and that the person might report a higher score for the same level of positive feeling than she would have reported before she was injured or unemployed. There is no reason to believe this is true, but even if it were, techniques like the U-index developed by Alan Krueger, Daniel Kahneman, and colleagues avoid the issue of different scale usage by comparing responses only within subjects. *See* Krueger et al., *supra* note 83, at 20. The hedonic data are interpreted with respect to individuals and converted into externally comparable numbers. Although this approach does not encompass all relevant data, it nonetheless constitutes an interpersonally cardinal scale.

In addition, if scale re-norming were taking place, we would expect to see evidence of adaptation to all debilitating health conditions. All affected individuals would be altering the way that they report their happiness to take into account their changed circumstances. Yet this is not what hedonic psychologists have found. Instead, humans appear to exhibit almost complete adaptation to some conditions, partial adaptation to others, and zero adaptation to others still, including health problems like chronic pain and ringing in the ears. *See* John Bronsteen, Christopher Buccafusco & Jonathan S. Masur, *Hedonic Adaptation and the Settlement of Civil Lawsuits*, 108 COLUM. L. REV. 1516, 1541 (2008). This is a strong indication that scale renorming is not taking place.

113. *See, e.g.*, Ed Diener & Carol Diener, *The Wealth of Nations Revisited: Income and Quality of Life*, 36 SOC. INDICATORS RES. 275, 279–81 (1995) ("[F]or lower levels of income, there is a rapid rise in meeting physical needs as income increases, but for much of the income distribution there is a ceiling effect . . . ."); Robert H. Frank, *The Frame of Reference as a Public*

Adjusting CBA in accordance with variations in marginal values of money is quite technically complex, and the proper solution is frequently unclear or highly context dependent.[114] And the problems for CBA do not end there. Even two equivalently wealthy individuals may have vastly divergent welfare functions—additional wealth might benefit one far more than the other. Individuals' welfare functions are unobservable;[115] economists know (or assume) that marginal values of money are positive and diminish with increasing wealth, but they can be sure of little else.[116] Economists typically respond to this problem by simply ignoring it[117] or by assuming that its effects dissipate across large populations[118]—in precisely the same way that it will for WBA. It is thus hard to imagine that interpersonal comparisons will present greater difficulty for WBA than they do for classical CBA.

A second possible obstacle for WBA lies in the ambiguities involved in aggregating interpersonal welfare states. For instance, if Person *A*'s welfare decreases from 6.0 to 5.0 and the welfare of Persons *B* through *Z* increases from 6.0 to 6.1, it is difficult to know whether this net gain of 1.5 WBUs[119] actually indicates that overall welfare has increased, decreased, or remained constant.[120]

This objection has two components. The first is simply a repetition of the interpersonal comparison problem discussed above: it is impossible to know whether a hedonic improvement for Person *B* from 6.0 to 6.1 is of equivalent magnitude to a hedonic regression for Person *A* from 6.0 to 5.9. We have already addressed this question. The second component is the argument that, when a project leaves

---

Good, 107 ECON. J. 1832, 1834–35 (1997) (discussing variation in the significance of income's role in satisfaction across income levels).

114. *See* JAMES C. MCDAVID & LAURA R. L. HAWTHORN, PROGRAM EVALUATION & PERFORMANCE MEASUREMENT: AN INTRODUCTION TO PRACTICE 265–66 (2006); *see also* ADLER & POSNER, *supra* note 13, at 142–46; Adler & Posner, *supra* note 13, at 177–81 (illustrating the difficulty of forward-looking CBA under income effects).

115. *See* PER-OLOV JOHANSSON, AN INTRODUCTION TO MODERN WELFARE ECONOMICS 40 (1991); ROBERT L. NADEAU, THE WEALTH OF NATURE 115–16 (2003).

116. Uncertainty concerning individual welfare functions is especially problematic when attempting to make interpersonal comparisons of utility, which are likely possible in only limited circumstances. *See, e.g.*, John C. Harsanyi, *Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility*, 63 J. POL. ECON. 309, 315–19 (1955).

117. *See, e.g.*, Adler & Posner, *supra* note 13, at 193.

118. *See, e.g.*, *id.* at 181–87; Di Tella & MacCulloch, *supra* note 111, at 29.

119. Twenty-five people have each gained 0.1, for a total gain of 2.5, and 1 person has lost 1.0, for a net of 1.5.

120. *See* Adler & Posner, *supra* note 109, at S281.

some people better off and others worse off, a weak welfarist[121] cannot conclude that it is worth pursuing merely because overall welfare has increased. This claim is certainly correct, but it is again identical to the problems faced by CBA or any other wealth-based decision procedure. The simple fact that a project will result in Person *A* receiving $100 and Person *B* losing $50 is not sufficient reason to undertake the project in light of distributional issues and other considerations beyond aggregate welfare.[122] This is merely another way of stating that there is no independent moral or normative significance to Kaldor-Hicks efficiency.[123] The fact that Kaldor-Hicks efficiency is not morally decisive is by now a well-accepted conclusion among even CBA's most sophisticated defenders.[124]

The final important objection to WBA focuses on hedonic compensations for prior events—when someone is compensated during Period 2 for a decrease in welfare that occurred during Period 1. Imagine that an individual has been injured in a car accident, causing her average moment-by-moment well-being to fall from 6.0 to 5.0 for a period of one year (after which time it returns to 6.0).[125] Imagine that there were two potential methods of compensating her for her injury: Plan *A* would raise her well-being from 6.0 to 7.0 for one year, and Plan *B* would raise her well-being from 6.0 to 6.5 for two years. A critic might argue that it is unclear whether either of

121. As we discussed in Bronsteen, Buccafusco & Masur, *supra* note 27, we are weak welfarists in the following sense: we contend that increasing aggregate welfare is desirable all else being equal, but we make no claims regarding the relative value of welfare vis-á-vis other possible values such as the distribution of welfare or welfare-unrelated moral concerns.

122. This is true if Person *A* and Person *B* have different welfare functions, such that the project might diminish overall welfare—again, the problem we address in Part IV.B.2—but it is also true even if they have identical welfare functions and aggregate welfare will increase.

123. A Kaldor-Hicks efficient outcome is one in which the parties that benefit from a project "could fully compensate those who stand to lose from it and still be better off." Amy Sinden, *In Defense of Absolutes: Combating the Politics of Power in Environmental Law*, 90 IOWA L. REV. 1405, 1415 (2005). Or, put another way, a project is Kaldor-Hicks efficient if it would be possible to make a transfer of wealth that would leave all parties better off than before the project was implemented. ANTHONY E. BOARDMAN, DAVID H. GREENBERG, AIDAN R. VINING & DAVID L. WEIMER, COST-BENEFIT ANALYSIS: CONCEPTS AND PRACTICE 32 (1996).

124. *See* ADLER & POSNER, *supra* note 13, at 22 ("Because Kaldor-Hicks is, taken as a moral principle, unsound, CBA cannot be justified by reference to Kaldor-Hicks."); Adler & Posner, *supra* note 13, at 195. *But see* Richard A. Posner, *The Ethical and Political Basis of the Efficiency Norm in Common Law Adjudication*, 8 HOFSTRA L. REV. 487, 491–97 (1980) (attempting to justify Kaldor-Hicks efficiency as a moral criterion); Richard A. Posner, *Utilitarianism, Economics, and Legal Theory*, 8 J. LEGAL STUD. 103, 103 (1979) (same).

125. As with the preceding Subsections, we draw this hypothetical (and this objection) from Adler & Posner, *supra* note 109, at S281.

these plans would compensate her appropriately. Depending on the relationship between her survey responses and her actual well-being, and on how she values the well-being of each of her various temporal selves, either Plan *A* or Plan *B* might over- or undercompensate her.

Upon examination it becomes evident that this objection again reduces to a combination of two arguments, one of which we have already addressed. The issue of whether a decline from 6.0 to 5.0 is of equivalent magnitude to an improvement from 6.0 to 7.0 (or twice that of an improvement from 6.0 to 6.5) is merely an intrapersonal variant on the quandary regarding interpersonal comparisons and the shape of hedonic curves.[126] We have already dealt with this question and shown that it is, if anything, more easily handled than the parallel problems surrounding CBA. On the other hand, the intertemporal problem—whether a gain in Period 2 effectively counterbalances a loss in Period 1—is simply an intrapersonal variant of a broader question of interpersonal aggregation. That is, if a project increases overall welfare, is that a sufficient condition for it to be worth pursuing, even if it decreases the welfare for some individuals? This is a difficult moral question, and one that we do not attempt to answer here. There may be many instances in which a project is welfare increasing but, for distributional reasons, should not be undertaken. Well-being analysis is not meant as an answer to distributional concerns, though of course it could be used to provide information relevant to those concerns.

To facilitate the comparison with cost-benefit analysis, we will proceed here as if the primary governmental objective were to increase aggregate well-being.[127] This parallels the principal goal underlying cost-benefit analysis. Accordingly, in the Sections that follow we describe a regulation or project as "well-being justified" or "welfare justified" if it would increase the overall aggregate welfare of the population.

5. *Deliberate Manipulation of Well-Being Data*. Technical and theoretical problems with well-being data aside, it is also possible that individuals or groups would seek to manipulate well-being data in order to accomplish various policy objectives. After all, it is nearly

126. *See supra* Part II.B.4.

127. This is by no means the only conceivable welfarist governmental objective, as we explained in detail in prior work. *See* Bronsteen, Buccafusco & Masur, *supra* note 27, at 1632–34.

costless for an individual to answer untruthfully in response to a well-being survey. An individual who hoped to affect future policy decisions could shade her response in order to make similar policy choices appear more or less beneficial. For instance, suppose that social conservatives in Washington State, where same-sex marriage became legal in December 2012,[128] wished to prevent it from being legalized in other states as well. They might begin registering extremely low levels of subjective well-being in the wake of the legalization in order to make it appear to policymakers as if the law has harmed overall well-being in the state.

This is a serious concern, but there are a number of potential policy correctives. First, policymakers would ideally be collecting well-being data on an ongoing (longitudinal) basis in order to facilitate analysis of policy changes. This means that an individual in Washington would be completing the same well-being survey after the legalization of same-sex marriage that she was completing before same-sex marriage was ever placed on the agenda. This would reduce the salience of any given policy issue to survey respondents.

In addition, respondents would not know what policy issue their responses would be used to analyze. Policymakers might use a given set of responses to gauge the effects of same-sex marriage, or they might use them to estimate the effects of a park being built across the street or the installation of a new light-rail line. An individual who reported artificially low (or high) well-being in an effort to hamper (or promote) one type of project or regulation might well end up influencing another instead.

Finally, policymakers could employ the same types of algorithms that online reputation regimes (such as Zagat or eBay) use to detect deliberately malicious feedback.[129] These algorithms typically screen for outliers—reports that are highly inconsistent with the vast majority of other feedback on the same firm or individual.[130] Here, policymakers could conceivably use algorithms that screen out data that are inconsistent with an individual's other self-reports with no

128. *See* Laura L. Myers, *Same-Sex Couples Wed in Washington State for First Time*, REUTERS, Dec. 9, 2012, *available at* http://www.reuters.com/article/2012/12/09/us-usa-gaymarriage-idUSBRE8B801S20121209. We thank Lior Strahilevitz for raising this point and suggesting this issue.

129. *See* Lior Jacob Strahilevitz, *"How's My Driving?" for Everyone (and Everything?)*, 81 N.Y.U. L. REV. 1699, 1732–37 (2006) (suggesting that similar algorithms could screen malicious feedback in "How's My Driving" programs).

130. *Id.* at 1733.

discernible basis for the inconsistency. In some cases this might mean throwing out useful information, but such screening algorithms have nevertheless proven to be accuracy enhancing in other contexts.[131] More generally, online reputation regimes have remained fairly reliable despite the strong incentives of particular individuals and firms to spread misinformation.[132] It is unlikely that well-being surveys will fare worse.

Moreover, CBA is hardly immune from this type of problem. An individual who responds to a contingent valuation survey has no incentive to provide an accurate response.[133] Thus, for instance, the same social conservative might offer an artificially high answer when asked how much she would be willing to pay to keep same-sex marriage illegal. Similarly, an environmentally conscious individual might provide an artificially high answer when asked how much she would pay for cleaner skies. Sophisticated social scientists have attempted to devise correctives to this issue, but it is impossible to eliminate the problem entirely.[134]

These types of problems are, if anything, more significant for contingent valuation surveys than they are for well-being surveys. The reason is that a contingent valuation survey necessarily highlights and makes salient the policy choice in question—the individual is asked how much she would pay for some policy outcome—which makes it easier for an individual to provide a deliberately misleading answer. The question at issue is not obscured, as it is within well-being surveys. We will discuss contingent valuation surveys in much greater depth in Part III. For the moment it suffices to note that the types of highly charged political issues that might cause individuals to manipulate well-being surveys would also cause them to manipulate contingent valuation surveys, possibly to greater effect.

---

131. *Id.*

132. *See id.* at 1734 n.145 ("Collusive ratings are a problem for online feedback systems generally, though eBay has been able to keep this problem at tolerable (albeit nonzero) levels to date.").

133. *See* Richard T. Carson & W. Michael Hanemann, *Contingent Valuation*, *in* 2 HANDBOOK OF ENVIRONMENTAL ECONOMICS 821, 883 (Karl-Gran Maler & Jeffrey R. Vincent eds., 2005) ("[P]eople only try to tell the truth when it is in their economic interest to do so."). Well-conducted contingent valuation studies attempt to control for these issues, but doing so is difficult. *See* John C. Whitehead & Glenn C. Blomquist, *Benefit-Cost Analysis*, *in* HANDBOOK ON CONTINGENT VALUATION 92, 103–04 (Anna Alberini & James R. Kahn eds., 2006).

134. *See* Carson & Hanemann, *supra* note 133, at 883 (explaining that respondents' incentives to prevaricate "make[] the design of CV [contingent valuation] survey questions and their analysis much more challenging").

C. Well-Being Analysis: An Example

How feasible is well-being analysis, and how would it differ from cost-benefit analysis? To answer those questions, in this Section we take an actual cost-benefit analysis conducted as part of an EPA regulation and recalculate the costs and benefits of the regulation using WBA.

This exercise actually stacks the deck overwhelmingly in favor of CBA and against WBA. The actual CBA used here was the product of decades of opportunities to refine CBA, and countless millions of dollars spent on studying these phenomena and performing these analyses.[135] By contrast, this Section constitutes the first WBA that has ever been conducted. There has never been any systematic collection of well-being data related to any government project, much less the regulation we analyze here.

For that reason, our analysis falls far short of the level of accuracy that could be achieved were WBA to be adopted in practice. Nonetheless, and strikingly, the WBA sketch we provide yields results that are likely to be no less reliable than those of the cost-benefit analysis that the Environmental Protection Agency (EPA) itself conducted. This demonstrates the inherent advantages of WBA, the ease with which it could immediately be implemented, and the potential for truly impressive results if it were conducted with the resources currently available to CBA.

1. *EPA Regulation of Pulp and Paper Production: A Cost-Benefit Analysis*.[136] The regulation we examine was promulgated by the EPA under the Clean Water Act[137] in 1998 to curb toxic effluents from pulp and paper mills.[138] Prior to 1998, pulp, paper, and paperboard mills

135. *See generally* Don Bradford Hardin, Jr., Comment, *Why Cost-Benefit Analysis? A Question (and Some Answers) About the Legal Academy*, 59 ALA. L. REV. 1135 (2008) (providing a general history of cost-benefit analysis).

136. Although our examples in the Introduction and Parts I and II have focused on clean-air and clean-water regulations for the sake of clarity and consistency, everything we say in this Article applies more generally to all regulations. We broaden our pool of examples in Parts III, IV, and V.

137. Clean Water Act, 33 U.S.C. §§ 1251–1387 (2006 & Supp. V 2012).

138. National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category, 63 Fed. Reg. 18,504 (Apr. 15, 1998) (codified at 40 C.F.R. pts. 63, 261 & 430). The regulation, 40 C.F.R. pt. 430, was upheld by the D.C. Circuit. Nat'l Wildlife Fed'n v. EPA, 286 F.3d 554, 557 (D.C. Cir. 2002). One of us has written about this regulation before. Masur & Posner, *supra* note 15, at 680–87;

used a number of chlorine-based chemicals in the normal manufacturing process. Dioxin and furan, two carcinogens, are among the byproducts that result from producing paper and paperboard with these chlorine-based chemicals.[139] Pulp and paper mills then released those chemicals into the waterways in quantities great enough to sicken and kill fish and cause a number of diseases, including cancer, in humans who ate the fish.[140]

The EPA considered three regulatory options. "Option A" required the mills to substitute chlorine dioxide for elemental chlorine in the production process, which reduces but does not eliminate the discharge of dioxin and furan.[141] "Option B" was a stricter rule, combining the Option A limits and a requirement that the mills eliminate lignin (a material in wood pulp), along with several other restrictions on the manufacturing process.[142] Option B would have resulted in even lower emissions of dioxin and furan than Option A. Finally, "Option TCF" ("totally chlorine free"), required that pulp and paper mills eliminate all chlorine from the production process, thereby also eliminating the discharge of furan and dioxin.[143]

The EPA estimated that this regulation would produce several different types of benefits. First, there would be fewer cancer deaths among recreational and subsistence anglers who consume fish that have swum near pulp and paper mills.[144] The EPA refused to specify a

---

Jonathan S. Masur & Eric A. Posner, *Regulation, Unemployment, and Cost-Benefit Analysis*, 98 VA. L. REV. 579, 594–95 (2012). The EPA simultaneously regulated airborne emissions from pulp and paper mills under the Clean Air Act, 42 U.S.C. §§ 7401–7671q (2006 & Supp. IV 2011)), but for ease of explication we limit our examination here to the Clean Water Act portion of the regulation.

139. National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category, 63 Fed. Reg. at 18,541–43.

140. *Id.* at 18,565, 18,587.

141. *Id.* at 18,542–43.

142. *Id.* at 18,541–42.

143. *Id.* at 18,542.

144. U.S. ENVTL. PROT. AGENCY, EPA CONTRACT NO. 68-C3-0302, ECONOMIC ANALYSIS FOR THE NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORY: PULP AND PAPER PRODUCTION; EFFLUENT LIMITATIONS GUIDELINES, PRETREATMENT STANDARDS, AND NEW SOURCE PERFORMANCE STANDARDS: PULP, PAPER, AND PAPERBOARD CATEGORY—PHASE 1, at 8-12 tbl.8-6 (1997), *available at* http://water.epa.gov/scitech/wastetech/guide/pulppaper/upload/1997_11_13_guide_pulppaper_jd_pulp.pdf (calculating the annual monetized benefits from a reduction in cancer cases). The EPA also stated that the regulations would reduce the risk of noncancer illnesses but did not report monetary estimates because of inadequate data. *Id.* at 8-14. In addition, the EPA

single monetary value of life, instead announcing that each life saved was worth between $2.5 and $9 million.[145] However, it is worth noting that these figures refer only to the value of the lives lost. The EPA did not possess and did not employ data on the cost of being stricken with cancer, above and apart from eventual mortality.[146] Second, reducing the quantity of dioxin released into fisheries would reduce the number of "fish consumption advisories," during which fishing must cease, and thus increase the number of days that fishing could take place.[147] Third and finally, pulp and paper mills produce sludge, which must be disposed of. Reducing the amount of dioxin and furan in the sludge would allow the mills to dispose of the sludge via cheaper means.[148]

At the same time, the regulation also imposed significant costs. Mills were forced to switch from chlorine-based chemicals to more expensive alternatives and to treat their effluents before they were released into the waterways.[149] Table 1 lists the annual costs and benefits, as calculated by the EPA, of all three options the agency considered in its regulation of pulp and paper.

---

estimated that the regulation would reduce deaths among Native Americans who are subsistence anglers. *Id.* at 8-15 tbl.8-8. It declined, however, to include this benefit within the analysis because of uncertainty in the data. *Id.* at 4-15 Although this decision is probably indefensible, we adhere to it here in the interest of parallelism between our WBA and the EPA's CBA.

145. *Id.* at 8-12 tbl.8-6.

146. We will attempt to approximate this cost—more accurately described as a benefit, actually, because these are cancer cases avoided—in the WBA we perform below. *See infra* Part II.C.2.

147. U.S. ENVTL. PROT. AGENCY, *supra* note 144, at 8-23. The EPA also surmised that more anglers would elect to fish if toxic effluents were reduced, and it estimated the benefit of this increased fishing at $4.7 to $15.5 million per year. Again, however, because of uncertainties in the data, the EPA did not end up including these figures in its benefit estimate. *Id.* at 8-23, 8-24, 8-26 tbl.8-12. As with the benefits described above, we adhere to the EPA's decision without endorsing it.

148. *Id.* at 8-24.

149. *See generally id.* at 5-1 to 5-29 (discussing costs of implementing the rule).

Table 1: Annual Costs and Benefits, EPA Pulp and Paper Regulation (in millions of 1995 dollars)[150]

	Option A	Option B	Option TCF
Total compliance costs	-262	-324	-1081
Benefits of cheaper sludge disposal	8–16	8–16	8–16
Benefits of eliminating fishing advisories	2.1–19.4	2.1–19.4	2.1–19.4
Monetized benefits of lives saved	1.8–21.7	1.9–22.5	2.0–25.2
Net benefits as calculated by the EPA	-250.9 – -205.7	-312.0 – -266.1	-1,084.4 – -1,035.9
Median net benefits	-228.3	-289	-542.5

As Table 1 makes clear, none of the options is cost-benefit justified according to standard CBA methodologies. The EPA selected Option A, which appears to do the *least harm*, yet even under that option the costs exceed the benefits by more than $228 million per year.[151]

In addition, and importantly for our analysis, the EPA calculated that the regulation would lead to the loss of significant numbers of jobs. The increased regulatory costs would increase pulp and paper prices, reducing consumer demand for pulp and paper products.[152]

150. This Table was assembled using data found in *id.* at 5-25 tbl.5-16, 5-28 tbl.5-18, 8-12 tbl.8-6, 8-23, 8-25, 8-45, 8-23, 8-26 tbl.8-12.

151. The EPA calculated that Option A coupled with regulation under the Clean Air Act would result in net positive benefits, and so the agency's eventual outcome is cost-benefit justified. *Id.* at 8-27 tbl.8-13. Of course, this begs the question of why the EPA did not simply regulate only under the Clean Air Act if it produced substantial net benefits whereas regulation under the Clean Water Act produced substantial net costs.

152. *See id.* at 6-18 ("Although the mills stay open with a price increase, consumers pay the price increase.").

This reduction in demand would force mills to lay off workers.[153] As pulp and paper production declined, suppliers and affiliated industries would also suffer and be forced to lay off workers. However, the EPA did not include these lost jobs in its cost-benefit analysis. We suspect that this stemmed from a belief, which continues to hold sway throughout the regulatory state, that workers will soon find alternative employment and the net costs of unemployment will be zero.[154] This assumption is almost certainly false, and one of us has separately criticized the EPA and other regulatory agencies for refusing to include the costs of unemployment in their cost-benefit analyses.[155]

We calculate, in Table 2, a revised cost-benefit analysis that includes unemployment costs. (The welfare costs of unemployment will also figure prominently in the WBA that follows.) For ease of explication, we list the compliance costs from Table 1 separately but combine the median figures for the three types of benefits (cheaper sludge disposal, elimination of fishing advisories, and lives saved) into one row, which we label "Median total benefits." It is worth noting that the EPA did not estimate the total unemployment that would result under Option TCF, though it did estimate the number of jobs that would be eliminated under that Option due to pulp and paper mill closures alone.[156] Based upon those numbers, which we provide below, the job loss from Option TCF would have likely been quite substantial.

153. *See id.* at 6-19 tbl.6-6 (summarizing impact on employment).

154. *See* Masur & Posner, *supra* note 138, at 582.

155. *Id.* at 580–81.

156. U.S. ENVTL. PROT. AGENCY, *supra* note 144, at 6-44 tlb. 6-19.

Table 2: Annual Costs and Benefits, EPA Pulp and Paper Regulation, Including Unemployment Costs (in millions of 1995 dollars)[157]

	Option A	Option B	Option TCF
Compliance costs	-262	-324	-1081
Median total benefits	34.5	34.9	36.3
Median net benefits excluding unemployment costs	-228.3	-289	-542.5
Jobs lost from plant closures	400	900	7100
Total jobs lost	3094	5711	N/A
Estimated annual unemployment costs[158]	-10.2	-18.8	N/A
Median net benefits including unemployment costs	-238.5	-307.8	N/A

What should be immediately evident from Table 2 is that regulatory-compliance costs—principally the costs of shifting to nonchlorinated chemicals—dominate even this revised cost-benefit analysis. Even for Option A, the least costly regulatory option, these compliance costs are nearly ten times greater than the total estimated benefits and more than twenty times greater than the costs related to unemployment. It is not atypical for compliance costs to dominate the

157. This Table was assembled using data found in *id.* at 5-25 tbl.5-16, 5-28 tbl.5-18, 6-15 tbl.6-4, 6-34 tbl.6-14, 6-44 tbl.6-19.

158. This figure is based upon an estimated yearly cost of $3300 per unemployed worker. *See* Masur & Posner, *supra* note 138, at 618 ("A conservative estimate is that an average worker who loses his job in a mass layoff will suffer earnings losses of more than $100,000 over the rest of his life . . . .").

cost side of the ledger in cost-benefit analysis. Industrial costs can be very steep and easily monetized, and so they can dwarf other inputs to the CBA. In addition, a glance back at Table 1 reveals that the monetized benefits of reducing deaths from cancer are quite modest when compared with the other benefits that the regulation will provide. The monetized benefits from cheaper sludge removal and fewer fishing advisories, in combination, exceed the benefits from reducing the number of deaths from cancer. These are both remarkable findings, and they shed light on the (possibly distorting) effects of monetizing costs and benefits. What remains to be seen is whether they are indicative of the true welfare effects of the regulation. That is a question we address in the following Subsection.

2. *The EPA's Cost-Benefit Analysis as a Well-Being Analysis.* In this Subsection we reengineer the EPA's cost-benefit analysis as a well-being analysis. To do so, we convert the costs and benefits of the regulation into well-being units. Wherever possible, we make this conversion directly. That is, we translate the benefits of reduced cancer deaths directly to WBUs, rather than adopting the EPA's pricing of those lives and then converting the dollars into WBUs.[159] All calculations are based on a well-being scale that runs from 0.0 to 10.0. What follows is a summary of the conversion of each of the costs and benefits involved.

a. Compliance Costs, Sludge Disposal, and Fewer Fishing Advisories. Compliance costs and the benefits of cheaper sludge disposal are both entirely monetary. Ideally we would measure the welfare value of fewer fishing advisories by estimating the hedonic value of fishing and multiplying it by the additional hours that anglers will be able to spend engaged in that activity. However, to our knowledge hedonic data on fishing does not yet exist. Accordingly, we use the EPA's monetary estimate of this benefit. We sum these three quantities to determine the aggregate monetary cost of the regulation.

The next question is how to translate that monetary cost into WBUs. These expenditures will have an effect on well-being only to the extent that they are paid for and felt by individuals. Some of the

159. We do not apply a discount rate in this WBA because it is uncertain whether discounting would be appropriate in WBA. *See infra* Part V. As we explain in Part V, this is a potential strength of WBA, rather than a weakness. If further research reveals that discounting is appropriate, it would be straightforward to discount costs and benefits accordingly.

benefits will accrue to the anglers who are able to fish with fewer interruptions. Compliance costs and sludge-related benefits will be borne by some combination of consumers of pulp and paper and shareholders in pulp and paper companies. (The exact division depends on the extent to which pulp and paper firms are able to pass their costs along to consumers.)

It is impossible to know precisely how many households will share these costs, though nearly every household consumes paper to some degree. For purposes of this analysis we assume that the monetary costs and benefits will be equally borne by one million Americans.[160] Each individual will bear several hundred dollars in net monetary costs, depending upon the regulatory option. We also assume that each individual earns the median household income, which in 1998 was $38,885.[161]

What effect will these monetary costs have on welfare? Studies have found that life satisfaction increases logarithmically with income. We use the results of one of the largest and most recent of these studies, which found that an approximately threefold increase in income was associated with a 0.11 increase in WBUs.[162] (Similarly, a two-thirds decrease was associated with a 0.11 decrease in WBUs.)[163] That is, an individual whose income increased from $100,000 per year to $272,000 per year would gain 0.11 WBUs per year. If that same individual's income decreased from $100,000 to $36,700, she would lose 0.11 WBUs. The total gain or loss is given by the following formula:

---

160. Because the *total* dollar cost is a constant number, our analysis is largely unaffected by whether that total cost is spread across virtually everyone who consumes paper products (say, 200 million Americans) or a much smaller subset (say, 1 million). The only difference is that if the total is borne by a smaller subset rather than spread across everyone, then each person affected must pay a higher amount. That results in a larger effect of cost on well-being, given that money affects welfare in a logarithmic rather than linear fashion. *See infra* note 162 and accompanying text. We anticipate that our analysis may be criticized for placing too little weight on the value of money, so we choose the smaller number of 1 million (as opposed to, say, 200 million or everyone) purely to make the most conservative possible assumption. That is, we accentuate the welfare effects of lost income, and those effects are still small. Our calculation on this point should thus be considered an upper bound on the welfare effect of monetary costs for a regulation of this type.

161. U.S. CENSUS BUREAU, MONEY INCOME IN THE UNITED STATES, at v (1998), *available at* http://www2.census.gov/prod2/popscan/p60-206.pdf.

162. Nattavudh Powdthavee & Bernard van den Berg, *Putting Different Price Tags on the Same Health Condition: Re-evaluating the Well-Being Valuation Approach*, 30 J. HEALTH ECON. 1032, 1038 tbl.3 (2011).

163. *Id.*

(1) Welfare loss due to income decline
= 0.11 WBUs × (ln (new income) – ln (old income))

We apply this formula to the income loss caused by the net costs of EPA's regulation in Table 3, below.

b. Cancer Cases Avoided. The EPA provided a range of estimates for the number of cases of cancer that will be avoided under each regulatory option. In the interest of simplicity, we base our calculations on the median number. There are limited available data on the welfare loss that an individual experiences when she is sick with cancer, but one study calculated the welfare loss from "stomach/liver/kidneys or digestive problems," which we believe is the closest analog.[164] That welfare loss is 0.238 WBUs per year while the person is sick.[165] We assume that the typical individual who dies from cancer caused by dioxin and furan effluents is sick with cancer for two years and then dies thirty years before she normally would.[166] This is obviously a rough assumption, but it is no rougher than the EPA's assumption that all lives are equivalently valuable and have a median value of $5.75 million.[167] The average American has a life satisfaction of 7.4 (again, on a scale of 0.0 to 10.0).[168] When an

164. *Id.*

165. *Id.*

166. To arrive at this number, we begin by noting that the average American lifespan is 78 years. U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES 77 (2012). If anglers were evenly distributed across age categories, then the average angler would be 39 years old, meaning that saving such a person from death would save them nearly 40 years of life. In recognition that our well-being numbers may be criticized for valuing life much more heavily than does CBA, we "round down" to make a very conservative estimate of 30 years.

167. *See infra* Parts III.A.1, IV.B.

168. *See* Ed Diener & Carol Diener, *Most People Are Happy*, 7 PSYCHOL. SCI. 181, 182 tbl.1 (1996). Studies have shown that older individuals are typically happier than younger and middle-aged people. Yang Yang, *Social Inequalities in Happiness in the United States, 1972 to 2004: An Age-Period Cohort Analysis*, 73 AM. SOC. REV. 204, 213 (2008). Individuals who do not become sick and die from cancer as a result of this regulation will be adding years to the end of their lives, when they are happiest. Accordingly, by using the average American life satisfaction figure we will tend to underestimate slightly the benefits of avoiding cancer.

One potential problem from using these data is that individuals might not assign a value of 0 to death or nonexistence when using a hedonic scale that runs from 0 to 10. Some individuals might use 0, the bottom end of the scale, to indicate states that are worse than nonexistence, such as intense pain. If that is the case, then death or nonexistence might register as some small, non-zero number. Our concerns may be entirely unwarranted, and even if they were to prove accurate they would have little impact on the WBA we perform. Nonetheless, it is for this reason that we generally advocate using a scale that runs from -10 to 10. *See supra* Part II.A.

individual dies, she loses all of the welfare that she might otherwise have experienced throughout the remaining years of her life.[169] Thus, we calculate the welfare benefit from avoiding one fatal case of cancer by the following equation:

(2) Welfare benefit from avoided fatal cancer
$= 2 \times (0.238 \text{ WBUs}) + 30 \times (7.4 \text{ WBUs}) = 222.48 \text{ WBUs}$

c. Unemployment. Unemployment is one condition about which there exists substantial hedonic data. Studies indicate that unemployment has a significant impact on well-being.[170] Unemployed individuals suffer a loss of 0.83 WBUs per year during the time that they remain unemployed.[171] Even after finding new employment, these same individuals lose an average of 0.34 WBUs per year during the next seven years after they begin working again.[172]

For purposes of this WBA, we assume that the average person who becomes unemployed as a result of this regulation is out of work for six months. This corresponds roughly to the median duration of unemployment in the years 2011 and 2012.[173] Each unemployed individual thus loses $0.83 \times 0.5 = 0.415$ WBUs during the period of unemployment. In addition, she loses 0.34 WBUs per year for the

169. We do not include any benefits to the family or friends of individuals who do not develop cancer because CBA typically does not include these third-party benefits. *See* Sean Williams, *Statistical Children*, 30 YALE J. ON REG., 101, 103 (2013).

170. Richard E. Lucas, *Adaptation and the Set-Point Model of Subjective Well-Being: Does Happiness Change After Major Life Events?*, 16 CURRENT DIRECTIONS PSYCHOL. SCI. 75, 77 (2007); Lucas et al., *supra* note 66, at 11.

171. *See* Lucas et al., *supra* note 66, at 11.

172. *See* Lucas, *supra* note 170, at 77; Lucas et al., *supra* note 66, at 11. Lucas and his coauthors do not have data past the 7-year mark (nor does anyone else), and we are reluctant to speculate as to what future studies might reveal. Four German scholars have also recently conducted an excellent study of the effect of current (but not past) unemployment on moment-by-moment happiness. Andreas Knabe, Steffen Rätzel, Ronni Schöb & Joachim Weimann, *Dissatisfied with Life, but Having a Good Day: Time-Use and Well-Being of the Unemployed* 2 (CESifo Working Paper No. 2604, 2009), *available at* http://ideas.repec.org/p/ces/ceswps/_2604.html. This is precisely the sort of data that we hope policymakers will collect in the service of analyzing regulations via WBA. We do not incorporate this study in our analysis because all of our other data comes from life satisfaction studies, and it would complicate the analysis substantially if we were to attempt to combine these different types of data.

173. *See* BUREAU OF LABOR STAT., U.S. DEP'T OF LABOR, HOUSEHOLD DATA: ANNUAL AVERAGES, at tbl.30 (2012), *available at* http://www.bls.gov/cps/cpsa2012.pdf (showing that the median duration of unemployment for full-time workers was 24.1 weeks in 2011 and 21.8 weeks in 2012).

seven years following reemployment, for a total of $0.34 \times 7.0 = 2.38$ WBUs.

The EPA's CBA presents only yearly costs and benefits, not total costs and benefits. The agency annualized all costs over a 30-year period.[174] However, the agency calculated total (as opposed to yearly) unemployment. Accordingly, we divide the hedonic costs of being unemployed by 30 to obtain the yearly costs, similarly annualized over a 30-year period. The hedonic effect of the unemployment caused by the EPA's pulp and paper regulation is given by the following equation:

(3) Welfare cost of unemployment per job lost
$= (-0.83 \times 0.5 - 0.34 \times 7.0)/30 = -0.093$ WBUs

We are now prepared to aggregate the welfare effects of the various costs and benefits. Table 3 presents the WBA of the EPA's regulation.

174. U.S. ENVTL. PROT. AGENCY, *supra* note 144, at 4-23.

Table 3: Well-Being Analysis of EPA's Pulp and Paper Regulation[175]

	Option A	Option B	Option TCF
Net monetary costs (millions of 1995 $)	-239.25	-301.25	-1058.25
Welfare effects of net monetary costs (WBUs)	-0.00068	-0.00086	-0.00304
Median cases of cancer avoided	1.57	1.62	1.79
Welfare effects of avoided cancer cases (WBUs)	349.29	360.42	398.24
Total jobs lost	3094	5711	N/A
Welfare effects of unemployment (WBUs)	-287.74	-531.12	N/A
Total welfare effect (WBUs)	61.55	-170.70	N/A

This WBA diverges from the EPA's CBA in two particularly notable respects. First, Option A now appears welfare justified: it will increase overall well-being in the net. Option B is still not welfare justified, but it appears less egregiously harmful than it did through the lens of cost-benefit analysis. The EPA may well have been correct to choose Option A (rather than not regulating at all), contrary to what CBA would indicate. Second, and perhaps more importantly, the monetary costs of the regulation, which dominated the CBA, are nearly irrelevant here. Instead, the benefits of saving lives and the costs of unemployment produce the dominant welfare effects. This

175. This Table was assembled using data found at National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category, 63 Fed. Reg. 18,504, 18,588, 18,591 (Apr. 15, 1998) (codified at 40 C.F.R. pts. 63, 261 & 430); and U.S. ENVTL. PROT. AGENCY, *supra* note 144, at 6-34 tbl.6-14, 8-45.

may appear surprising to scholars steeped in cost-benefit analysis, but it is entirely consistent with reams of evidence demonstrating that changes in wealth and income have extremely small impacts on individual well-being.[176]

This is not to say that policymakers should begin ignoring the effects of their regulations on wealth. As we explain in Part III.D, regulations that increase welfare at the expense of vast amounts of wealth might eventually become self-defeating and eliminate future opportunities for welfare gains. This is why we would not rule out preserving CBA as a complement to WBA. But the WBA we perform here makes clear the distortions introduced by CBA's focus on wealth and monetization. Regulations that do not appear cost-benefit justified might in fact be found to greatly enhance welfare once that welfare is measured more directly.

Of course, we present here only a back-of-the-envelope sketch of a WBA. Our conclusion that the EPA's pulp and paper regulation was welfare-enhancing is necessarily tentative and dependent upon our assumptions, which may be incorrect. But this exercise should demonstrate the feasibility of WBA as a workable decision tool. It is possible to conduct a full-scale WBA of a major regulation using only the scattered data currently available. With sustained effort and attention on the part of the regulatory state, WBA could revolutionize the accuracy with which prospective laws are evaluated.

III. WILLINGNESS TO PAY AND WELL-BEING

To translate costs and benefits into dollars, cost-benefit analysis relies upon measures of how much individuals are willing to pay to acquire benefits or avoid harms.[177] These so-called "willingness to

176. For a review of the extensive literature, see Ed Diener & Robert Biswas-Diener, *Will Money Increase Subjective Well-being? A Literature Review and Guide to Needed Research*, 57 SOC. INDICATORS RES. 119, 120–51 (2002). These findings are also congruent with the emphasis that advocates of feasibility analysis have long placed on job loss, as opposed to other types of monetary costs. *See, e.g.*, David Driesen, *Distributing the Costs of Environmental, Health, and Safety Protection: The Feasibility Principle, Cost-Benefit Analysis, and Regulatory Reform*, 32 B.C. ENVTL. AFF. L. REV. 1, 36–37 (2005).

177. Amartya Sen, *The Discipline of Cost-Benefit Analysis*, 29 J. LEGAL STUD. 931, 945 (2000) ("In mainstream cost-benefit analysis, the primary work of valuation is done by the use of willingness to pay."). Some cost-benefit studies instead examine subjects' willingness to accept money in exchange for sacrificing a benefit or bearing a cost. These willingness-to-accept (WTA) measures often yield different results than do WTP measures, but the methodologies used to determine them are effectively identical, and the problems that affect WTP similarly plague WTA. *See generally* John K. Horowitz & Kenneth E. McConnell, *A Review of*

pay" (WTP) measures are determined in two types of ways. In some cases, economists attempt to measure individual valuations through studies of revealed preferences—studies that demonstrate how much individuals are implicitly willing to pay to gain some benefit or willing to accept to bear some harm.[178] For instance, some studies center on the wage premium for workers who take dangerous jobs: they examine how much more a firm must pay a worker to accept a job that carries some type of risk, thus revealing the price a worker would put on avoiding that risk.[179] Sometimes, however, cost-benefit analysis must place prices on costs or benefits that are not traded in a robust marketplace, such as clean air.[180] In these cases, in which revealed preferences are unavailable, economists rely upon surveys that ask respondents hypothetically how much they would be willing to pay to procure a particular benefit or eliminate a particular harm. These surveys are known as stated-preference (in contrast to *revealed* preference) or contingent valuation studies.[181]

Both revealed preference studies and contingent valuation studies are fraught with difficulties and error. These difficulties have led to challenging theoretical and methodological disputes among CBA's proponents, and they are widely cited as undermining the validity and reliability of cost-benefit analysis. Nevertheless, cost-benefit analysis continues to rely upon them because it is believed that there is no viable alternative. Yet well-being analysis, if

---

WTA/WTP Studies, 44 J. ENVTL. ECON. & MGMT. 426 (2002). Accordingly, we use WTP here as shorthand to mean WTP or WTA.

178. Richard H. Pildes & Cass R. Sunstein, *Reinventing the Regulatory State*, 62 U. CHI. L. REV. 1, 76 (1995) ("[P]eople reveal the values they attach to various goods through their actual behavior in market or market-like settings. If we attend to the choices people actually make, we will be able to infer from them the valuations assigned to various goods.").

179. *See, e.g.*, W. KIP VISCUSI, RATIONAL RISK POLICY 46–47 (1998) ("[R]isky jobs must be attractive in some other way, such as higher pay, for workers to be willing to bear the risk.").

180. Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553, 1557 (2002) ("Since there are no natural prices for a healthy environment, cost-benefit analysis requires the creation of artificial ones."); Miriam Montesinos, Comment, *It May Be Silly, but It's an Answer: The Need To Accept Contingent Valuation Methodology in Natural Resource Damage Assessments*, 26 ECOLOGY L.Q. 48, 49–50 (1999) ("The problem with placing values on natural resources is that natural resources are not market commodities and therefore do not have market prices.").

181. *See, e.g.*, Daniel Kahneman, Ilana Ritov, Karen E. Jacowitz & Paul Grant, *Stated Willingness To Pay for Public Goods: A Psychological Perspective*, 4 PSYCHOL. SCI. 310, 310 (1993) ("Hundreds of contingent valuations have been carried out in the last two decades . . . ."); Pildes & Sunstein, *supra* note 178, at 80 ("Rather than looking at actual choices, these methods ask people hypothetical questions about how much they would be willing to pay to avoid certain harms or conditions.").

conducted properly, could in fact ameliorate or even eliminate many of the difficulties endemic to willingness-to-pay measures. The Sections that follow describe some of the most important sources of error involved in the measurement of willingness to pay and explain how well-being analysis could constitute an improvement or supplement to the status quo.

A. Revealed Preferences

CBA's preferred method for quantifying costs and benefits is to examine what actual consumers of a good (such as workplace safety or clean air) were willing to pay to acquire that good.[182] These revealed preference studies are particularly common in the context of workplace hazards: there are many studies of the wage premiums paid to workers who take dangerous jobs.[183] Indeed, CBA prices lives primarily by using wage premiums—the amount by which the wages of dangerous jobs exceed those of jobs that are safe but otherwise comparable.[184] If, for example, a job with an annual death risk of 2 in 10,000 paid $100 more per year than a comparable job with an annual risk of death of 1 in 10,000, that would imply that workers had priced their lives at $1 million (10,000 x $100). According to this approach, high wage premiums reveal that people value their lives a lot, because they need to be paid a lot in order to incur the risk of death. Low wage premiums mean the opposite.

The value of a life is central to CBA in part because so many regulations involve trading off some good (such as consumer costs) against a risk of death from injury or disease.[185] Accordingly, accurate calculations of the value of life are absolutely essential to CBA.[186] In

182. *See, e.g.*, Edna T. Loehman, Sehoon Park & David Boldt, *Willingness To Pay for Gains and Losses in Visibility and Health*, 70 LAND ECON. 476, 479–85 (1994) (examining how much people would pay for improved air quality).

183. *See* Viscusi, *supra* note 47, at 312–13 (noting that the literature on wage-risk trade-offs has become the basis for government policy).

184. *See, e.g.*, *id.* ("Estimates from the U.S. labor market indicate that a worker currently would require an annual wage premium of $700 to face a fatality risk of 1/10,000 . . . ."); *see also, e.g.*, U.S. ENVTL. PROT. AGENCY, *supra* note 47, at 5-28 (illustrating how the value of a statistical life increases as the cancer latency period decreases).

185. *See* Revesz, *supra* note 11, at 943 ("The primary benefit of many important environmental statutes, as determined by the dollar value assigned by cost-benefit analysis, is the human lives that are saved.").

186. *Id.* at 943–44 ("Thus, in determining whether a particular regulation can be justified on cost-benefit grounds, the central questions revolve around the value assigned to the lives that would be saved by the program.").

addition, revealed preference studies can be used to price other goods, such as clean air or a new road or park, by looking at those goods' effect on housing prices.

Yet these revealed preference studies have many potential sources of error. The error sources fall loosely into three categories: informational and computational problems, wealth effects, and affective forecasting difficulties. The first two could conceivably be overcome at significant effort and expense; the third is likely insuperable. WBA, by contrast, offers a solution to many of the most difficult of these problems.

1. *Informational and Computational Problems*. Economists favor revealed preference studies because they focus on individuals' actual economic decisions.[187] However, that means that these studies must rely on individuals to make accurate and informed decisions regarding their own welfare. Errors in individual decisionmaking will lead to errors in the measurement of costs and benefits. The problems with this approach are particularly manifest in the context of wage-premium studies, and they are manifold.

First, wage-premium studies assume that people are able to assimilate a 1-in-10,000 risk of death so as to decide whether they prefer avoiding that risk or earning extra money. But empirical evidence contradicts that assumption.[188] In study after study,[189] "survey respondents display[] an utter inability to modulate their willingness to pay for increases in safety according to how much those safety

187. *See* Frank B. Cross, *Natural Resource Damage Valuations*, 42 VAND. L. REV. 269, 315 (1989) ("Contingent valuation is controversial, however, because it is entirely hypothetical and because it assumes that people respond to the survey as they would to a marketplace transaction. . . . Economists are much more comfortable measuring revealed preferences in genuine market sales.").

188. *See* Jonathan S. Masur, *Probability Thresholds*, 92 IOWA L. REV. 1293, 1331–37 (2007) ("Study after study has demonstrated that individuals experience great difficulty, purely as a matter of estimation and intuition, when dealing with high-magnitude, low-probability threats.").

189. Young Sook Eom, *Pesticide Residue Risk and Food Safety Valuation: A Random Utility Approach*, 76 AM. J. AGRIC. ECON. 760, 769 (1994); M.W. Jones-Lee, M. Hammerton & P.R. Philips, *The Value of Safety: Results of a National Sample Survey*, 95 ECON. J. 49, 65–66 (1985); Michael W. Jones-Lee, Graham Loomes & P.R. Philips, *Valuing the Prevention of Non-Fatal Road Injuries: Contingent Valuation vs. Standard Gambles*, 47 OXFORD ECON. PAPERS 676, 688 (1995); C.T. Jordan Lin & J. Walter Milon, *Contingent Valuation of Health Risk Reductions for Shellfish Products*, *in* VALUING FOOD SAFETY AND NUTRITION 83, 96–97 (J.A. Caswell ed., 1995); V. Kerry Smith & William H. Desvousges, *An Empirical Analysis of the Economic Value of Risk Changes*, 95 J. POL. ECON. 89, 100 tbl.2 (1987).

increases actually would diminish the probability of harm."[190] People's minds are not designed to differentiate between exceedingly small risks and infinitesimally small risks, and when asked to do so rationally, they frequently fail.[191] As a result, small differences in pay between certain risky jobs and certain safe jobs cannot be attributed to a rational demand by workers to be compensated appropriately for the risk.

Second, most wage-premium studies are based on the assumption that workers know the actual mortality risk (1 in 10,000, for example) of their job.[192] There is no reason to believe that this is so, and if it is not, then the studies' validity breaks down; one cannot rationally demand a specific amount of extra money in return for a specific amount of risk if one does not know what the amount of risk is.

Third, even if people could assimilate these low-probability numbers and knew the actual mortality risk of their jobs, they might act on such knowledge in ways other than demanding slightly more money for those jobs. For example, they might choose to incur the cost of being more careful on the job rather than incur the cost of taking a safer job that they enjoy less. Such a choice would fulfill CBA's dubious assumption of economic rationality while still rendering grossly inaccurate the life-value numbers arising from CBA.

Fourth, it may be that 1-in-10,000 risks of death are simply too fine-grained for regression analysis to detect. There are countless differences between one job and another. Even a careful CBA study that identifies a few dozen of those differences has necessarily left out scores of smaller ones. The small risk to life, if it is traded off at all by workers, could be traded off against these smaller differences rather than the larger ones that are visible to econometricians. Indeed, CBA's wage premiums seem to fluctuate for reasons independent of risk to life. For example, when unions in the trucking industry lost

190. Masur, *supra* note 188, at 1335.

191. Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61, 73–74 (2002) ("For most of us, most of the time, the relevant differences—between, say, 1/100,000 and 1/1,000,000—are not pertinent to our decisions, and by experience we are not well equipped to take those differences into account.").

192. *See* Maureen Cropper, James K. Hammitt & Lisa A. Robinson, *Valuing Mortality Risk Reductions: Progress and Challenges*, 3 ANN. REV. RESOURCE ECON. 313, 317 (2011) ("[E]stimates of VSL based on hedonic wage equations assume that the measure of job risk used by the researcher matches workers' risk perceptions.").

some of their capacity to influence management, drivers' wages failed to keep pace with those of comparable jobs in other industries.[193] Developments like that one, which had nothing to do with workers' tolerance for risk, resulted in CBA's use of lower wage-premium numbers (and thus lower values for life).[194] In theory, one might say that a perfect CBA would isolate the value of risk by accounting for union power and everything else like it that can affect wages. But this has been difficult in practice, and it might be impossible even in theory. No two jobs are truly equivalent in every relevant feature except their risk to life. And even if there were two such jobs, they could not remain equivalent over time, because their wages would be affected in different ways by economic developments independent of risk.

In light of these problems, it should not be surprising that wage-premium studies have produced widely variant values of life. Studies using similar methodologies have set the value of a statistical life as low as $100,000 and as high as $76,000,000.[195] Such large variation in the results of the studies casts doubt on their reliability and validity and suggests that random noise or unmeasured variables, rather than rational risk trade-offs, account for the numbers.

WBA, by contrast, sidesteps nearly all of these problems. WBA does not require that individuals understand the risk of death in the

193. ACKERMAN & HEINZERLING, *supra* note 12, at 87 ("Average real wages for truck drivers declined 30 percent between 1977 and 1995, due to the combination of deregulation and the declining power of the Teamsters union . . . ."); MICHAEL H. BELZER, SWEATSHOPS ON WHEELS: WINNERS AND LOSERS IN TRUCKING DEREGULATION 21–22 (2000) ("While unions . . . represented about 60% of all truck drivers twenty years ago, today they represent less than 25% of all drivers.").

194. *See, e.g.*, Janusz R. Mrozek & Laura O. Taylor, *What Determines the Value of Life? A Meta-Analysis*, 21 J. POL'Y ANALYSIS & MGMT. 253, 266–70 (2002) ("Restricting the sample of workers to 100 percent unionized workers resulted in larger VSL estimates . . . ."). Some studies attempt to control for unionization. *See, e.g.*, W. Kip Viscusi, *The Value of Life: Estimates with Risks by Occupation and Industry*, 42 J. ECON. INQUIRY 29, 36 (2004).

195. Mrozek & Taylor, *supra* note 194, at 254; *see also* U.S. ENVTL. PROT. AGENCY, VALUING MORTALITY RISK REDUCTIONS FOR ENVIRONMENTAL POLICY: A WHITE PAPER 85 tbl.4 (2010), *available at* http://yosemite.epa.gov/ee/epa/eerm.nsf/vwan/ee-0563-1.pdf/$file/ee-0563-1.pdf (compiling data from many hedonic wage studies into a table). Another indication of the spread of possible results from such studies is a compilation of 37 hedonic wage studies that EPA recently assembled. As calculated by the authors, the standard deviation of the values of life among those 37 studies was $14.1 million, or approximately *twice* the value that EPA currently places on a statistical life. *See id.*; *see also* W. Kip Viscusi & Joseph E. Aldy, *The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World*, 27 J. RISK & UNCERTAINTY 5, 19 tbl.2 (2003) (summarizing a series of hedonic wage studies performed over the last three decades that identify VSLs ranging from $0.5 million to $20.8 million).

workplace, nor must they be able to accurately grasp what it means to face a 1-in-100,000 risk. Under WBA, an individual is only required to report her current state of well-being accurately, a far simpler cognitive task. There is no need to assume that individuals make perfectly rational choices under conditions of perfect information. The value of an individual life can be measured simply by aggregating the positive and negative moments in that life, as reported by the individual.

WBA also eliminates some of the need to perform complicated regression analysis in order to compare similarly situated jobs or marketplace goods. Here, WBA's advantage lies in the ability to take advantage of longitudinal studies. Suppose that an agency is attempting to value the cost of a case of emphysema (in terms of pain, suffering, and diminution in the quality of life) to analyze a regulation that would protect workers from contracting emphysema in the workplace. CBA would examine the wages paid to workers in industries in which emphysema is a workplace hazard, and then using regression analysis, it would attempt to isolate the wage premium that is attributable directly to the risk of emphysema. This is an extremely difficult endeavor, as we explained. WBA, on the other hand, would simply look at the well-being of a given individual *before* and *after* she contracted emphysema. The post-emphysema loss in well-being represents the hedonic cost of the disease, a cost which the agency can then weigh against other hedonic costs and benefits. Economists have already made use of large sets of social-survey data to conduct exactly these types of studies.[196]

We hasten to add that this approach will not eliminate the need for regression analysis entirely. Other circumstances in the individual's life may have changed during the same time period. For instance, her disease may have forced her to take a different job, reducing her wages. WBA will have to account for these changes as well, using regression analysis, but the problem will be much simpler. Because the study will involve the same individuals at multiple different times, it will not be necessary to control for nearly so many variables. That CBA cannot similarly utilize longitudinal studies, and must instead rely on how much money a (potentially uninformed) individual would pay or accept at a given instant, is just one of its methodological shortcomings.

196. *See generally* Oswald & Powdthavee, *supra* note 106 (using a longitudinal study to determine the hedonic cost of disability).

2. *Wealth Effects*. It has long been understood that the value an individual places on a risk or a benefit will necessarily be affected by that individual's wealth.[197] A millionaire might think nothing of paying $10,000 to breathe slightly cleaner air, but someone who must support a family on $25,000 per year will be much more hesitant to make the same trade-off. Similarly, wealthy people rarely take high-risk jobs because the wage premium is worth less to them and is insufficient to compensate them for the risk. The reason is not that the benefit or risk involved is greater for the wealthier person (though there may be slight differences). Rather, wealth effects are driven by the fact that the *money* is worth less to the wealthy person.[198] Because cost-benefit analysis involves translating harms and benefits into dollars, these "wealth effects" will affect cost-benefit calculations.

Wealth effects play a large and undeniable role in wage-premium studies, yet CBA cannot fully account for these effects. The fact that rich and poor people (who presumably care equally, or at least comparably, about staying alive) would be willing to pay vastly different amounts to avoid a 1-in-10,000 risk of death illustrates the inadequacy of this metric for valuing lives. WBA circumvents these issues entirely by valuing lives based on individuals' own assessments of their well-being.

Yet the problem of wealth effects for revealed preference studies and CBA is even more general. To demonstrate this, let us abstract away from wage studies to more general methods for utilizing revealed preferences. In theory, an agency employing CBA could use

---

197. *See* Viscusi & Aldy, *supra* note 195, at 36–43 (finding an income elasticity between 0.5 and 0.6, such that a 10 percent rise in income would increase WTP by 5 to 6 percent); *see also* Thomas Kniesner, W. Kip Viscusi & James P. Ziliak, *Policy Relevant Heterogeneity in the Value of Statistical Life: New Evidence from Panel Data Quantile Regressions*, 40 J. RISK & UNCERTAINTY 14, 28 (2010) (finding an income elasticity approaching or exceeding 1.0, such that a 10 percent rise in income would increase WTP by more than 10 percent); W. Kip Viscusi, *The Heterogeneity of the Value of Statistical Life: Introduction and Overview*, 40 J. RISK & UNCERTAINTY 1, 7–11 (2010) (summarizing more recent research finding that WTP values are more sensitive to income than previously thought).

198. The reason is the declining marginal value of money. *See, e.g.*, Adam J. Kolber, *The Comparative Nature of Punishment*, 89 B.U. L. REV. 1565, 1599 n.88 (2009) ("Even rights denominated in dollars cannot meaningfully be compared to each other without considering how people value those dollars. Due to the declining marginal value of money, most people value the liberty to spend $100,000 less than 100 times the amount that they value the liberty to spend $1000."); Andrew P. Morriss & Roger E. Meiners, *Borders and the Environment*, 39 ENVTL. L. 141, 155 n.64 (2009) ("Of course, richer people lose more money when they miss a day of work due to illness than do poor people, but the declining marginal value of money means that what they lose may not be as valuable as the smaller in magnitude losses incurred by the poorer people.").

housing prices or other data that reflect the benefits and costs of living under various conditions in order to put a value on those conditions.[199] Imagine, for instance, that an agency is attempting to put a dollar figure on the cost of having a nearby factory that emits noxious fumes. The agency could compare housing prices in locations with clean air and locations with noxious fumes and use multivariate regression to isolate the effect of the noxious fumes on those prices. This represents a particularly advanced method for revealing preferences in that the method can encompass circumstances in which individuals are not directly exchanging money for a good.

Now imagine a government project—a waste storage facility, for instance—that will create noxious fumes, resulting in a uniform decrease in well-being of everyone within range of those fumes, but will have overall positive effects more generally. This project can be located in a rich area with 500 very wealthy people or a poor area with 1000 people. Imagine that the agency is able to determine that the 500 wealthy people would be willing to pay $50,000 each to avoid having the waste storage facility placed in their neighborhood, whereas the poorer people would be willing to pay $10,000 each.

If the agency that is deciding where to site the project can tax and transfer as part of the project, the solution—purely from the perspective of welfare economics—is clear. The government should locate the project in the poor area and make a compensating transfer from the wealthy to the poor. The wealthy people would prefer to pay, say, $25,000 per person to avoid having the project located in their neighborhood, and that would be enough money to compensate the poorer people such that they would prefer to accept the money and the facility over receiving neither. If such a transfer were also to make the poorer people happier on balance, then both CBA and WBA would recommend that the agency pursue that course.

Suppose, however, that the agency cannot implement the transfer and this first-best solution is unavailable. If the agency is using CBA based upon actual willingness-to-pay statistics from the two areas, it could find that the 500 wealthy people are willing to pay more to avoid the noxious fumes ($500 \times \$50{,}000 = \$25$ million) than the 1000 poor people ($1000 \times \$10{,}000 = \$10$ million), purely because of wealth effects. It thus might end up locating the project in the poor area rather than the wealthy area. But doing so will actually lead to a

199. *See* Anup Malani, *Valuing Laws as Local Amenities*, 121 HARV. L. REV. 1273, 1276–80 (2008) (describing such a methodology and using it to value certain legal changes).

greater reduction in welfare than locating the project in the wealthy area, simply because there are more people who will be affected by the project in the poorer neighborhood.

By contrast, a decisionmaker employing WBA would pick up on the actual welfare effects of these two options and realize that the welfare loss will be greater if the project is located in the poor area than if it is located in the wealthy area, because it will affect twice the number of people in the poor area. It will site the project in the wealthier area. An agency using WBA will thus arrive at the second-best solution; an agency employing CBA will select only the third-best option.[200]

This phenomenon is much more general. Any time a government agency must decide between two projects—or two locations for the same project—one of which will affect wealthy people and the other of which will affect poor people, it risks being led astray by wealth effects if it looks at the actual populations of people who will be affected. It may be led to believe that the "wealthy" project will have a greater effect on welfare than the "poor" project, simply because of the impact of wealth on willingness to pay. When the agency cannot tax and transfer—and nearly all agencies lack that authority—it will err and select the wrong project. WBA, on the other hand, would not be confused by wealth effects. WBA does not require that costs and benefits be translated into dollars, and so the wealth of the affected population cannot confound the analysis.

CBA could conceivably address the wealth/welfare disconnect by applying distributional weights to costs and benefits. For instance, CBA might value a dollar of costs or benefits more if it is experienced by a poor person and less if it is experienced by a rich individual. The greater an individual's wealth, the less a dollar of cost or benefit experienced by that person would affect the CBA.[201] The main problem with this approach is that it is difficult or impossible to

200. In addition, if the agency chose the second-best solution and located the project in the wealthy area, residents of that neighborhood could conceivably bargain with residents of the poorer neighborhood to have the project moved in exchange for a side payment. This bargain is of course unlikely; transaction costs or legal barriers might prevent it. But it is at least possible. No such Coasean bargain is possible if the project is located in the poor neighborhood because the poorer people do not have the funds to pay off the wealthier people.

201. *See* Matthew D. Adler, Equity by the Numbers: Measuring Poverty, Inequality, and Injustice (2013) (unpublished manuscript) (on file with the *Duke Law Journal*) (proposing a means of attempting to assign equity weights to costs and benefits experienced by populations at different levels of wealth).

determine what those distributive weights should be; an individual's marginal utility of money is essentially unknowable.[202] This may be part of the reason that CBA has never adopted distributional weights of this type.

3. *Affective Forecasting Errors*. Some of the problems with CBA that we outline in the preceding Sections—informational and computational difficulties, and wealth effects—could conceivably be cured via enormous expenditures on data collection and the use of extremely delicate and sophisticated statistical methods.[203] No practitioner of CBA has come close to implementing these types of solutions, though they remain theoretically possible.

However, revealed preference studies suffer from an additional incurable flaw, one that WBA does not share. The flaw is that they rely upon affective forecasting: the prediction of how an individual will feel about an event or a condition before it happens. This is an activity with which individuals often struggle greatly. Imagine a government project that improves air quality in a particular location. Suppose that an agency wishes to place a monetary value on this cleaner air using housing prices in a revealed preferences study. The theory behind using housing prices to measure the value of this project is that individuals will pay more to live in the locality once its air quality has been improved. In theory, then, home prices in the affected area will depend upon how much both current homeowners[204] and prospective purchasers value the improved air quality.[205] Inevitably, these valuations require comparisons between what it is like to live in areas with better and worse air qualities. Thus, the current homeowner must remember what the air was like before the improvement and estimate her welfare loss from returning to such a

202. *See* Marjorie E. Kornhauser, *Equality, Liberty, and a Fair Income Tax*, 23 FORDHAM URB. L.J. 607, 617 (1996) (explaining that there is no way to determine an individual's marginal utility of money).

203. As we have discussed, some of these problems also implicate WBA, though not to the same degree.

204. *See* Jennifer Gerarda Brown, *The Role of Hope in Negotiation*, 44 UCLA L. REV. 1661, 1666 (1997) (analyzing a hypothetical "suggest[ing] . . . that a [homeowner]'s hopes or aspirations influence negotiation analysis and behavior").

205. *See* Paul Boudreaux, *An Individual Preference Approach to Suburban Racial Desegregation*, 27 FORDHAM URB. L.J. 533, 547 (1999) ("Housing prices are affected by buyers' desires for certain amenities, such as air conditioning, a large kitchen or a driveway. Housing prices will vary when certain features rise or fall in desirability. Housing prices are also affected by whether the location of housing is near desirable or undesirable metropolitan features." (footnote omitted)).

state, and the prospective homeowner must estimate how valuable the improved air will be to her in the future.

Study after psychological study has shown that both of these exercises are fraught with error. Humans are notoriously bad at affective forecasting.[206] And they have surprising difficulty even *remembering* how they felt about an event or condition long after it has passed.[207] Although people usually do a good job of anticipating the valence of life events—that is, whether they will be good or bad—they tend to make systematic errors about both the magnitude and duration of their affective responses to those events.[208] If individuals make significant errors when valuing some amenity, then CBA will similarly make significant errors when it adopts and incorporates those valuations.

WBA, by contrast, will only require asking people about their *current* well-being. The governmental agency can then compare the current well-being of a population that is receiving the benefits of a similar regulation with the well-being of that population (or a similar reference population) before the regulation was implemented to determine its impact. These findings can then be applied to similar situations in other locations. No prospective or retrospective judgments are necessary.

Revealed preference studies in conjunction with wages and workplace conditions have precisely the same problem. Imagine a job that comes with some undesirable working condition, such as an increased risk of contracting emphysema due to airborne chemicals in the workplace. A typical wage study would compare the salary accompanying this job to the salary accompanying a comparable job that lacked the risk of emphysema.[209]

---

206. *See* Wilson & Gilbert, *supra* note 49, at 131 ("Research on affective forecasting has shown that people routinely mispredict how much pleasure or displeasure future events will bring and, as a result, sometimes work to bring about events that do not maximize their happiness." (emphasis omitted)); *see also* David A. Schkade & Daniel Kahneman, *Does Living in California Make People Happy? A Focusing Illusion in Judgments of Life Satisfaction*, 9 PSYCHOL. SCI. 340, 344–45 (1998) (discussing affective forecasting errors).

207. *See* Dylan M. Smith, Ryan L. Sherriff, Laura Damschroder, George Loewenstein, & Peter A. Ubel, *Misremembering Colostomies? Former Patients Give Lower Utility Ratings Than Do Current Patients*, 25 HEALTH PSYCHOL. 688, 691 (2006) (describing difficulties with remembering affective states).

208. For Wilson and Gilbert's description of this phenomenon, see *supra* note 49 and accompanying text.

209. *See, e.g.*, Matthew D. Adler, *Fear Assessment: Cost-Benefit Analysis and the Pricing of Fear and Anxiety*, 79 CHI.-KENT L. REV. 977, 1024 (2004) ("WTP/WTA for the risk of death can

This approach, like the housing study described above, relies on the predictions of employees regarding conditions with which they have no experience. The hypothetical employee, asked to choose between the safer and riskier workplaces, would have to anticipate what it would be like for her to contract emphysema and then put a price on the risk of that occurring. This is a significant cognitive hurdle. This employee presumably does not already have emphysema, and she may not even know anyone who has ever contracted emphysema. How, then, could she possibly forecast what it will be like? The result is that agencies often exclude such risks from cost-benefit analyses, treating them as if they did not exist.[210] Studies used to determine the value of a statistical life fare little better; how can an individual reliably estimate the value of her own life or what it would be like to lose it?[211]

WBA simply avoids all of these difficulties. Under WBA, researchers would ask people with and without emphysema to report on their current levels of well-being.[212] No prospective forecasts or retrospective judgments are necessary; the individual need only report her current feelings. Researchers would then compare the well-being of people with emphysema to people without it. The differential is the hedonic cost of emphysema, which could then be plugged directly into a well-being analysis. Because they eliminate any possibility of affective forecasting (or memory) errors, these contemporaneous self-assessments are likely to be far more accurate than the guesses about the future and past that revealed preference studies demand. At a practical level, well-being analysis thus offers significant advantages over revealed preference studies.

---

be inferred from the wage differential between more and less dangerous occupations."); Cass R. Sunstein, *The Arithmetic of Arsenic*, 90 GEO. L.J. 2255, 2268–75 (2002) (explaining how the EPA developed its arsenic regulations under the Clinton administration). *But cf.* OFFICE OF INFO. & REGULATORY AFF., *supra* note 26 at 18 n.20 (noting that OSHA developed its rule on occupational exposure to hexavalent chromium using a $7 million value of life).

210. *See* Occupational Exposure to Hexavalent Chromium, 71 Fed. Reg. 10,100, 10,307 (Feb. 28, 2006) (codified at 29 C.F.R. pts. 1910, 1915, 1917, 1918 & 1926 (2012)) (ignoring these risks); Masur & Posner, *supra* note 15, at 671 (describing a regulation in which the agency ignores certain health costs for lack of data).

211. We explain other problems with value-of-life calculations in Part IV.

212. *See, e.g.*, Powdthavee & van den Berg, *supra* note 162, at 1034 (providing self-assessment data related to a variety of ailments). The preferred method for collecting this data is to ask the same people for assessments of their own well-being before and after those people contract emphysema. Large-scale data collection efforts like the British Household Panel Survey make this approach feasible, and Powdthavee and van den Berg rely on those types of sources. *See id.*

B. Contingent Valuations

Revealed preference studies are widely considered the best methodology for pricing costs and benefits.[213] However, economists cannot rely entirely on revealed preference studies because not all costs and benefits involve goods that are traded in markets. Absent a market that can be used to set the price for a good, cost-benefit analysis must turn to contingent valuation studies: survey-based hypothetical questions regarding hypothetical payments for hypothetical projects.[214] For example, imagine that the government is considering mandating the installation of improved automobile exhaust systems. The primary effect of these systems would be to reduce the amount of smog emitted by cars, leading to less smog (and clearer skies) across the country.

The economic costs of the exhaust systems might be easy to measure, but how can an agency determine the value of cleaner skies? Individuals do not have opportunities to buy and sell units of clean sky for amounts of money. Indeed, government regulation exists in part because these sorts of transactions are sufficiently difficult that they do not occur.[215] An agency might attempt to use a sophisticated housing-price study, as described in the previous Section, but those types of studies are extremely difficult to implement and have never found widespread use in CBA.[216] With no markets to scrutinize, and with no opportunity to determine WTP by examining revealed preferences, agencies are forced instead to employ contingent valuation surveys. These surveys simply ask people how much they would be willing to pay to receive a benefit (such as cleaner skies) or to avoid a harm, with little additional guidance.

---

213. *See supra* note 187.

214. Lisa Heinzerling, *Markets for Arsenic*, 90 GEO. L.J. 2311, 2315 (2002) ("The valuation is 'contingent' because the valuation produced is contingent upon the hypothetical market that was contrived. A famous example is the large-scale survey taken in the wake of the Exxon Valdez oil spill, which sought to elicit the monetary value citizens around the country placed on avoiding another comparable spill.").

215. *See, e.g.*, Matthew D. Adler & Eric A. Posner, *Implementing Cost-Benefit Analysis When Preferences Are Distorted*, 29 J. LEGAL STUD. 1105, 1117 (2000) ("Textbook CBA, as generally understood, directs agencies to translate people's moral attitudes about the environment into CVs for the existence of environmental goods that they do not directly enjoy, usually called 'existence value' or 'nonuse value.'").

216. *See* Malani, *supra* note 199, at 1275 (discussing housing prices as a means of measuring "the welfare effect of a law," but noting that "[t]his is, of course, not the standard practice"); *supra* Part III.A.2.

To their credit, contingent valuation surveys avoid many of the informational and computational problems that plague revealed preference studies. Respondents need not know the risk presented because it is stated in the contingent valuation survey. There is no obvious possibility that they will respond to the risk other than by demanding more money, because the surveys do not allow for such actions.[217] And by asking directly how much a respondent would pay to avoid a risk or obtain a benefit, contingent valuation surveys eliminate the need for difficult regression analysis.

Yet despite these advantages, contingent valuation surveys are nonetheless riddled with serious, perhaps decisive, flaws.[218] The Subsections that follow describe in detail those problems, and the corresponding advantages of WBA's methodologies.

1. *Hypothetical Questions*. Not surprisingly, the problems with contingent valuation surveys center on the fact that they necessarily involve hypothetical questions. Subjects are asked to speculate about how much they would be willing to pay without having actually to pay anything, which renders their speculation less trustworthy.[219] Subjects are rarely subject to any true budget constraint: they can state freely that they would be willing to pay $1 million for cleaner skies without worrying about the other projects that would go unfunded as a result of such expenditures.[220] And if a researcher wishes to impose a budget constraint, it is difficult to choose one that is not arbitrary. Subjects are frequently asked about topics they may know little or nothing about—for instance, how much they would pay to avoid persistent construction noise that they have never before experienced.[221] This implicates all of the insurmountable problems related to affective

---

217. *See supra* Part III.A.1.

218. *See* John M. Heyde, Comment, *Is Contingent Valuation Worth the Trouble?*, 62 U. CHI. L. REV. 331, 343 (1995) (summarizing criticisms of contingent valuation); *see also* Ackerman & Heinzerling, *supra* note 180, at 1558 (same).

219. *See* Cross, *supra* note 187, at 317 ("Because people have little experience placing monetary value on unpriced natural resources, survey results may be hypothetical and inaccurate.").

220. *See, e.g.*, John E. Calfee & Clifford Winston, *The Consumer Welfare Effects of Liability for Pain and Suffering: An Exploratory Analysis*, 193 BROOKINGS PAPERS ON ECON. ACTIVITY: MICROECONOMICS, no. 1, at 142, 143 n.17 (stating that contingent valuation surveys rarely involve budget constraints); Cross, *supra* note 187, at 317.

221. *See* Cross, *supra* note 187, at 316; McGarity, *A Cost-Benefit State*, *supra* note 11, at 66 ("Another frequent criticism of contingent valuation techniques is that they allow value to be measured by the uninformed opinions of uneducated individuals who have had no experience in valuing the things that are the subject matter of the surveys.").

forecasting that we described in the preceding Section.[222] When real money and real experiences are not at stake, individual statements about willingness to pay are simply unreliable. Economists have long understood this point.[223] But CBA cannot avoid such hypothetical surveys because market transactions do not exist for all potential costs and benefits.

These weaknesses in contingent valuation surveys have predictably resulted in prices that are all over the map. To take just one example: contingent valuation surveys have set the value of a statistical life anywhere from $40,000 to $13 million.[224]

Other tests of the validity of contingent valuation surveys have produced results that similarly fail to inspire confidence. For instance, willingness to pay should be proportional to the size of the benefit conferred or the risk reduced. That is, if people are willing to pay $1000 to eliminate a 1-in-1000 mortality risk, they should be willing to pay $5,000 to eliminate a 5-in-1000 risk.[225] Yet numerous studies have shown that this is not the case; individual willingness to pay does not scale proportionately with the size of the risk reduction.[226] For instance, in one study respondents were only willing to pay 1.6 times as much to reduce a 5-in-1000 risk as they were to reduce a 1-in-1000 risk.[227] Many contingent valuation studies do not even include this type of validity test. In one recent meta-analysis of 40 contingent valuation studies, only 50 percent of them incorporated a test for validity.[228] Of those that did include such a test, only 15 percent of the studies "passed" the test, in the sense that WTP was "nearly

222. *See supra* Part III.A.1.

223. *See* Peter A. Diamond & Jerry A. Hausman, *Contingent Valuation: Is Some Number Better Than No Number?*, J. ECON. PERSP., Fall 1994, at 45, 49 (discussing the recurrent problems with contingent valuation surveys and providing an overview of alternative explanations for the responses given in willingness-to-pay questions).

224. U.S. ENVTL. PROT. AGENCY, *supra* note 195, at 82–83. The EPA also compiled 40 contingent valuation surveys of the value of life. The standard deviation of the value of life among those 40 surveys was over $3 million, as calculated by the authors. *See id.*

225. *See* Cropper et al., *supra* note 192, at 327.

226. *See id.* (surveying the literature).

227. Anna Alberini, Maureen Cropper, Alan Krupnick & Nathalie B. Simon, *Does the Value of a Statistical Life Vary with Age and Health Status? Evidence from the US and Canada*, 48 J. ENVTL. ECON. & MGMT. 769, 782 tbl.6 (2004).

228. Cropper et al., *supra* note 192, at 327–28 (citing U.S. ENVTL. PROT. AGENCY, *supra* note 195).

proportional to the risk reduction."[229] It is hard to put much faith in policy made on the basis of studies such as these.

One of the principal strengths of WBA is that it need not rely upon such hypothetical inquiries. Instead, WBA compares individuals' contemporaneous levels of happiness before and after an actual project is completed and then uses that information to make projections regarding future projects. The surveyed individuals need not speculate as to how much money they would pay, and they are not subject to all of the biases and distortions that asking hypothetical questions regarding money might generate. Rather, they are simply asked to state their current level of well-being—a question that has been demonstrated to produce reliable and valid answers.[230] For instance, to estimate the value of clean skies, an agency would collect data on well-being in a location with clean skies and a location with smog-filled skies—or, better yet, in the same location before and after it initiates some project that will lead to cleaner skies. By comparing well-being figures with and without clean skies, economists could measure the welfare benefits of reducing smog. These benefits could then be compared with the economic costs.

Of course, in some cases it may be difficult to isolate the hedonic effects of clean skies amidst all of the other confounding variables. For instance, the same jurisdiction that has cleaner skies might also have lower unemployment rates, which could itself generate greater well-being. Agencies will need to employ sophisticated multivariate regression analysis, as we describe above in Part II.[231] Yet even when regression analysis is necessary, at most it will present practical hurdles that can be surmounted with adequate data and analysis.

However, complicated regression analysis will not always be necessary. Agencies will often be able to employ intrapersonal data—essentially, longitudinal studies—to circumvent many of the problems with multivariate regression we described in the previous Section. For instance, suppose that an agency wished to evaluate the benefits of a project that would reduce commute times by upgrading public-transit systems. Rather than relying on erratic contingent valuation surveys—or trying to isolate how much people are willing to pay for

229. *Id.* at 328.

230. DIENER ET AL., *supra* note 73, at 71–73.

231. *See supra* Part II; *see also* Oswald & Powdthavee, *supra* note 80, at S232 (providing an example of sophisticated multivariate regression being used to isolate the effect of one factor on happiness).

shorter commutes by examining housing prices or wages—WBA would simply determine the well-being of individuals as they are in the process of commuting. It would then compare that number to those individuals' well-being when they are engaged in some leisure activity—whatever they might have more time for if their commutes were shortened. The difference between those two figures, aggregated over the total reduction in commuting times, is the welfare gain from such a project. The results that WBA will generate are likely to be more reliable than those that contingent valuation surveys (or revealed preference studies) are currently producing.[232]

2. *Wealth Effects*. Because they involve asking individuals how much they would pay for a benefit (or to avoid a cost), contingent valuation surveys will suffer from all of the same wealth effects that plague revealed preference studies, described in Part III.A.2. Respondents will necessarily filter their responses through the lens of their own finances: a wealthy person might think nothing of paying $10,000 for cleaner skies, whereas a poorer individual would be highly unlikely to suggest such a price. Of course, these prices are decoupled to some degree from individual wealth because contingent valuation surveys do not actually require respondents to pay anything. But this is a disadvantage, not an advantage. Instead of values that are distorted somewhat by wealth, contingent valuation surveys produce values that are distorted significantly by their hypothetical nature.[233]

There are undoubtedly advantages to using average WTP values, but even that approach has significant limitations. First, the population of people affected by some potential government action may not be "average." For instance, imagine a project that would produce cleaner skies over Los Angeles. CBA would run into significant problems if it attempted to gauge the value of this project by surveying all Californians regarding their willingness to pay for improved air quality. Many of the surveyed individuals would live in areas that already have clean air, and would thus value a project to improve air quality less than a typical Angeleno. Consequently, a

232. As a matter of last recourse, WBA could also ask individuals to predict their well-being if they were to receive some benefit or suffer some harm. This would be the contingent valuation version of WBA, and as such it would be subject to all of the problems with affective forecasting and hypothetical questions we describe here. But at least it would circumvent issues related to wealth and the translation of welfare into dollars, *see infra* Part III.B.2, and thus even this approach might well be superior to standard contingent valuation studies.

233. *See supra* Part III.B.1 and III.B.2.

survey that encompassed all Californians would understate the benefits of cleaner skies in Los Angeles in particular.

Second, average WTP values provide no information as to *where* a potential project should be sited when there are multiple possibilities that might affect different populations of people. More generally, they are not useful in deciding between similar projects that affect different populations. The only workable approach in such a situation is to evaluate the actual effect of the project on the different groups, a task that cannot be accomplished using average WTP values.

As we described in Part III.A.2, WBA avoids the problems caused by wealth effects because it does not require translating costs and benefits into dollars. By relying directly on self-evaluations of well-being, WBA simply sidesteps the biases and errors that are introduced when individuals are asked to price nonmonetary goods. To be certain, WBA requires aggregating interpersonal welfare states, and there is no guarantee that each individual is reporting her welfare identically on any given scale. Yet there is no reason to believe that these self-reports will be systematically biased in any given direction, and differences should wash out over large sample sizes, as we explained above.[234] The same cannot be said for wealth effects and CBA.

C. Willingness-To-Pay Measures and WBA: A Summary

What all of this means is that CBA will have great difficulties in pricing costs and benefits via either revealed preference or contingent valuation studies.[235] This is significant because the pricing of nonmonetary goods is essential—even central—to CBA. Nearly every governmental regulation or project will produce some nonmonetary benefits and costs, and in many cases the nonmonetary benefits (reducing risks to life, in particular) form the entire basis for the regulation. Accordingly, the difficulties inherent in converting costs and benefits to dollars that we describe here will necessarily limit the accuracy and usefulness of CBA as a welfarist decision procedure.

WBA, by contrast, has no such problem. Instead of trying to isolate the amount of money that some individual might demand in return for accepting a low-probability risk to her life, or might

234. *See supra* Part II.B.

235. CBA's less common alternative for valuing life, contingent valuation surveys, is inferior to WBA on grounds that we discuss in Part III.B.

hypothetically be willing to pay for some uncertain benefit, WBA simply adds up the positive experiences of life that individuals stand to lose or gain under a given project. For instance, to evaluate a regulation that reduces the risk of death from some workplace-safety hazard, WBA would aggregate the positive experiences that would be lost if an individual were to die early[236] and then multiply that total by the odds of early death. After multiplying the resulting number by the number of people affected by a proposed regulation, regulators would then compare it with whatever diminution in positivity may be associated with enacting the regulation (due to increased consumer costs or some other factor).

To be sure, WBA's process is imperfect in practice. It relies on self-reports as proxies for well-being because science has not yet provided a perfect hedonimeter.[237] Moreover, WBA relies on estimates of likely outcomes, and it provides only a window into expected human well-being without resolving how to weigh that against other potential values. But relying on estimated outcomes is as much a feature of CBA or anything else as it is of WBA: no one can predict the future with certainty. Similarly, CBA, like WBA, is merely a gauge of human welfare that does not resolve or factor in welfare-unrelated considerations. The only unique disadvantage of WBA is its reliance on self-reports as proxies, but that imperfection is outweighed by those of CBA, which uses proxies such as the wage premium that are far more removed from actual well-being.[238]

D. Wealth and Welfare

Before we proceed, we must pause to consider an entirely separate line of argument that defenders of CBA might offer. The argument is that WBA is fundamentally misguided *precisely because* it attempts to measure welfare directly, rather than wealth. In so doing, WBA will naturally capture distributional effects: movements

236. Had the person lived, she would have experienced many moments that were, instead, extinguished by her death. WBA would aggregate the expected number and average level of positivity of those moments to determine how much positive life experience her early death deprived her of.

237. *Cf.* F.Y. EDGEWORTH, MATHEMATICAL PSYCHICS: AN ESSAY ON THE APPLICATION OF MATHEMATICS TO THE MORAL SCIENCES 98–102 (London, C. Kagan Paul & Co. 1881) (hypothesizing about a hedonimeter); Colander, *supra* note 72, at 216–19 (reviewing psychophysic concepts that "dovetail[] with Edgeworth's description of the hypothesized hedonimeter").

238. *Cf.* Bronsteen, Buccafusco & Masur, *supra* note 27, at 1630–32, 1636 (comparing CBA and WBA using a hypothetical example).

of money from wealthier individuals to poorer individuals will increase welfare and be judged favorably by WBA, whereas CBA would view them as neutral. In the preceding pages we have treated this as an advantage of WBA. After all, if the goal is to improve welfare, it makes sense to measure welfare. But defenders of CBA might instead cast it as a disadvantage. This argument has several related strands, which we describe and address in turn.

We begin with the most fundamental and conceptual critique. Some defenders of CBA might argue that it should not be concerned with welfare at all, only with consumption and efficiency.[239] CBA, by using monetary values, will lead to a maximization of aggregate wealth and therefore aggregate consumption. If welfare increases linearly with consumption, as many economists believe,[240] then maximizing consumption will maximize welfare as well. If there are distributional concerns that implicate welfare, those can be addressed subsequently through the tax system. Economists generally believe that it is more efficient to allocate resources via taxes and transfers than through regulations and new policy proposals.[241] Accordingly, agencies should concentrate on maximizing aggregate wealth and consumption, and welfare and distributional concerns should be left to the tax system. If agencies were to switch to a welfarist decision procedure such as WBA, they would be measuring the wrong quantity.

Another way of describing this critique of WBA would be to say that CBA will lead to outcomes that are Kaldor-Hicks efficient, while WBA may not.[242] For instance, in the example we used in Part III.A.2, the government could locate the waste dump in the poorer area, and then, using the tax system, transfer $25,000 from each of the rich individuals to the poorer individuals, leaving each better off than before the project was begun.

---

239. We thank David Weisbach for suggesting this point to us. This is contrary to many of the most sophisticated modern defenders of CBA, who describe it as a welfarist "decision procedure." *See, e.g.*, Adler & Posner, *supra* note 13, at 194.

240. *See, e.g.*, David Weisbach, *Toward a New Approach to Disability Law*, 2009 U. CHI. LEGAL F. 47, 90 n.90 (stating the common assumption that welfare is quasi-linear in consumption, or linear with respect to all goods other than medical care).

241. *See generally* Louis Kaplow & Steven Shavell, *Why the Legal System Is Less Efficient Than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667 (1994) (arguing that the tax system is more efficient at redistributing wealth than are legal rules such as agency regulations).

242. *See, e.g.*, BOARDMAN ET AL., *supra* note 123, at 32; E.J. MISHAN, COST-BENEFIT ANALYSIS 390 (1976). For a definition of Kaldor-Hicks efficiency, see *supra* note 123.

We believe that this critique is misguided for a number of reasons. First of all, even if it is true that welfare does not increase linearly with consumption, there are very strong reasons to believe that CBA will not lead to decisions that maximize consumption or are Kaldor-Hicks optimal. The reason is that the prices CBA must rely upon are likely to be highly inaccurate, in the sense that they deviate from what individuals would actually be willing to pay or accept under conditions of better information.

For instance, imagine that a workplace-safety regulation could save 10 lives at a cost of $100 million. If the value of a statistical life, based upon wage-risk studies, is $7 million, then the regulation will not be cost-benefit justified and the agency will not promulgate it. But what if that value of a statistical life (VSL) is far too low because of individuals' affective forecasting errors? If the true VSL—what individuals would be willing to pay if they could accurately anticipate their own future welfare—were much higher, then the agency's failure to promulgate the regulation will decrease welfare. This is entirely apart from whether any compensating transfer takes place. Conversely, imagine a workplace-safety regulation that will prevent 10 workers from each losing a finger but cost $3 million. If workers have indicated a willingness to pay $500,000 to avoid losing a statistical finger, then CBA would favor promulgating this regulation. But what if that figure is far too high because workers are failing to anticipate their own adaptation? Workers acting under full information, including knowledge of their own adaptation, might be willing to pay only $100,000 to save a statistical finger. If that is the case, then this regulation will similarly decrease welfare, again irrespective of whether any compensating transfer takes place.

The entire premise of our argument for WBA is that these types of individual forecasting and prediction errors are commonplace and systematic, not merely random or occasional. Over the past decade, hedonic psychology has provided abundant evidence in support of this point. If we are correct, then CBA will lead to welfare-diminishing results regardless of whether the tax system is properly distributing wealth. CBA will not even lead to proper determinations of efficiency when the prices it relies upon are distorted.

In addition, it would be remiss not to note that the Kaldor-Hicks argument rests upon a tenuous assumption: that the tax system actually will be used to transfer wealth appropriately. Absent such a transfer, a project that is Kaldor-Hicks efficient could well lead to a decrease in welfare, as the example in Part III.A.2 demonstrates. This

is why even some of CBA's most sophisticated defenders have acknowledged that "Kaldor-Hicks efficiency has zero moral relevance."[243] It is of course difficult to speculate as to whether these welfare-enhancing compensating transfers will occur in a meaningful fraction of cases, and little reliable data exists. But there is every reason to believe that they will be rare, not least of all because they involve redistributions from politically powerful groups and individuals (the wealthy) to groups and individuals with much less political power (the poor).[244]

A second, more practical criticism within this line of argument might be that if agencies can generate aggregate well-being gains by redistributing wealth, they will spend all of their time redistributing wealth to the exclusion of other projects and regulations that could lead to greater overall improvements in welfare.[245] For example, the EPA might spend all of its energy transferring wealth from rich to poor, rather than regulating hazardous chemicals. But this point presupposes that wealth redistribution will dominate WBA in ways that are unconnected to the core purposes of the agencies. As our sketch of a WBA reveals, this is not the case. The hedonic literature suggests a relatively tenuous connection between money and welfare for many Americans, so if anything dominates WBA, it is saving lives by requiring cleaner air or increased safety.[246] Those are the core missions of many federal agencies, such as the EPA and OSHA. It is

243. Adler & Posner, *supra* note 109, at S265.

244. *See* Lee Anne Fennell & Richard H. McAdams, *Introduction* to FAIRNESS IN LAW AND ECONOMICS (Lee Anne Fennell & Richard H. McAdams eds., forthcoming 2013) (manuscript at 5) (on file with the *Duke Law Journal*) ("Any proposed distributive change, whether accomplished through legal rules or through tax policy, elicits a certain amount of political resistance. This resistance may impede movement to a preferred distributive position, or cause great welfare losses in the process of achieving such movement."); Edward J. McCaffery, *Bifurcation Blues: The Perils of Leaving Redistribution Aside* 2–3 (N.Y. Univ. Sch. of Law Colloquium on Tax Policy & Pub. Fin., Working Paper No. 2), *available at* http://www.law.nyu.edu/ecm_dlv4/groups/public/@nyu_law_website__academics__colloquia__tax_policy/documents/documents/ecm_pro_074659.pdf (suggesting that "real-world tax policy is not up to the burdens that the bifurcation strategy places on it—it is not, that is, situated to redistribute in any meaningful way"); *cf. Share of GDP for Bottom 99th, 95th, and 90th*, VISUALIZING ECON. (Oct. 17, 2006), http://visualizingeconomics.com/blog/2006/10/17/share-of-gdp-99th-95th-90th (showing that the proportion of wealth held by the richest Americans has risen over the past 35 years and implying that wealth transfers from wealthy to poor have become less common over time). *See generally* MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS (1965) (setting forth an interest-group theory of politics).

245. We thank Eric Posner for suggesting this point to us.

246. *See supra* note 71.

true that WBA could result in forcing manufacturers to spend much more money to avoid pollution than CBA does, but this is not because WBA is dominated by the welfare effects of redistributing money. Instead, it is because WBA is weighing the relative welfare effects of money and life more accurately than CBA does.

For that matter, agencies do not have open-ended mandates to act in the public interest; they have authority over specific regulatory domains and types of activities. Congress and the president could simply order the EPA to engage in welfare-justified environmental regulation, or to ignore distributional consequences, and then separately promulgate a welfare-enhancing tax code if it believed that to be appropriate. This is, of course, essentially the current governmental division of labor. There is no reason to believe that WBA would be an open invitation for agencies to disregard their regulatory missions. Indeed, even if it were true that redistribution played a large role in WBA, the upshot would simply be that agencies should investigate how to enact welfare-justified regulations most efficiently. WBA could be adjusted to reduce or eliminate the weight it assigns to redistribution when assessing regulations, and then WBA could be used again separately to assess distributional consequences and recommend tax-and-transfer solutions.

Finally, CBA's defenders might offer an even more limited variation on the themes of these arguments. Although CBA will occasionally support projects that diminish welfare, WBA could equally favor projects that diminish wealth. To take the simplest possible example, a project that causes a wealthy individual to lose $1100 and a poor individual to gain $1000 would pass a WBA test (because it would increase welfare), just as it would fail a CBA test. Over time, defenders of CBA might say, single-minded use of WBA would lead to a diminution in national (or worldwide) wealth, with long-term negative consequences.[247] For instance, a welfare-enhancing but wealth-diminishing project might be so expensive that the government would later be unable to implement an additional (superior) welfare-enhancing project, leading to the loss of future welfare gains.[248]

---

247. We thank Michael Livermore for suggesting this point to us.

248. This amounts to an argument that WBA may be path dependent. *Cf.* Masur & Posner, *supra* note 15 (arguing that CBA is not similarly path dependent, with the exception of projects and regulations that cause substantial unemployment).

This argument is correct so far as it goes, though it hardly offers a reason to prefer CBA to WBA. A methodology that can lead directly to welfare-diminishing results (CBA) is not uniformly preferable to one that might conceivably lead indirectly to welfare-diminishing results at some point in the indefinite future (WBA). Nevertheless, it is because of the strength of this argument that we see potential value in CBA as a complement to WBA. Although we have argued that WBA could replace CBA in the current role that CBA plays, it does not necessarily follow that CBA should be left with no role at all.[249]

Agencies should employ both methodologies. A full specification of how an agency might decide among competing projects when CBA and WBA disagree, as they often will, is beyond the scope of this project. But we can offer a brief sketch. It would be a mistake for an agency to promulgate a regulation that fails a WBA test even if it passes a CBA test, for that regulation will likely decrease welfare.[250] On the other hand, a regulation that barely passes a WBA test and drastically fails a CBA test may be undesirable as well. For regulations that pass WBA but fail CBA, agencies should scrutinize the ratio of net WBUs gained to net dollars lost. When that ratio is very low—small welfare gains at the expense of significant decreases in wealth—the agency generally should not promulgate the regulation on welfarist grounds, due to the possible indirect harm to welfare of wasting dollars that could more efficiently increase welfare by being spent otherwise either now or later. One potential way in which agencies could determine which ratios are too low might be to examine these ratios across large numbers of regulations, past and present, to determine how a given regulation compares with historical precedent.

Needless to say, when WBA and CBA conflict, we favor placing greater weight on well-being analysis for the many reasons set forth in this Article. But we are not unmindful of the valuable role that CBA could play as a complement to WBA.

---

249. Of course, as we explained above, even CBA's ability to measure increases and decreases in wealth is compromised when the prices it relies upon are distorted. Nonetheless, the results generated by CBA are almost certainly highly correlated with changes in wealth.

250. There may certainly be non-welfarist grounds for promulgating regulations, but these are separate from what either CBA or WBA tries to measure.

IV. WBA AND THE VALUE OF LIVES

When a regulation would save lives, the value of those lives must be assessed so that the value of saving them can be compared with the costs necessary to do so.[251] In Parts I and III, we discussed the basic mechanisms by which CBA determines the value of a life. In Part IV, we now explore the many subtleties that those mechanisms ignore and the ways in which WBA accounts for those subtleties.

For CBA, every death is typically counted as equivalent to every other death; and although many within the CBA community have suggested ways to address this problem, some of their most important suggestions have rarely been implemented and would constitute only partial solutions anyway.[252] As CBA is currently conducted, a slow, painful death can be equated with a quick death in one's sleep. The deaths caused by a terrorist attack can be equated with those that occur in skiing accidents. And the death of a 12-year-old is typically deemed to diminish overall welfare no more than the death of a 90-year-old.[253] Moreover, CBA often counts all lives equivalently—*not* on supportable moral grounds but on insupportable welfarist grounds—such that a life with a debilitating but nonfatal disease is said to have as much welfare as a life with perfect health. The problem with all of these equivalencies is that such differences affect overall welfare, and CBA's stated purpose (like that of WBA) is to measure overall welfare. Because WBA accounts for the actual effects on welfare of different types of lifesaving regulations, it measures the benefit side of the ledger more accurately than does CBA.

---

251. Some may find it distasteful to place a value on saving a life, but when policy choices must be made and trade-offs are necessary, there is no alternative. Any decision will involve such a valuation, so it is a virtue that CBA and WBA make their valuations explicit rather than hidden.

252. Recent tweaks to CBA have, on occasion, made slight ameliorations to this problem. But as we discuss in Part IV.B, these improvements are far less effective than is WBA at solving the problem.

253. Endless arguments could be made on each side about the moral validity of equating the deaths of the young with those of the old, but CBA cannot avail itself of those arguments. Like WBA, CBA is simply a tool for measuring aggregate welfare. Its conclusions, like those of WBA, purport to tell us whether a regulation increases or decreases quality of life on the whole. Once that verdict is in, policymakers can decide what to do with it, and their decision may well involve making welfare-independent moral judgments. But when analyzing aggregate welfare alone, as CBA does, it is indefensible to equate preserving one year of life with preserving 70 years of life. The latter unquestionably increases welfare more than does the former, for precisely the reason that saving a life at all increases welfare: it grants more time to live.

To be sure, CBA has means at its disposal of trying to address these problems, and it actually employs some of them. For example, it can ask people how much money they would pay to avoid certain sorts of risk to life rather than other sorts of risk to life. But that approach has the core limitation shared by everything based on willingness to pay: it focuses on people's unreliable predictions of how certain risks would affect them, rather than on direct measurements of how those risks do affect them. WBA solves this problem, as we discuss below.

In Part IV.B, we discuss CBA's capacity to address the problem of equating all lives notwithstanding their differences in length and quality. First, though, we turn to the issue of equating types of death.

A. Not All Types of Death Are Equivalent

1. *Different Types of Threats to Life.* When policymakers consider whether a proposed health and safety regulation is worth its cost, the standard cost-benefit approach is to consider how many lives are actually likely to be saved.[254] This approach, which differentiates among risks only in the quantitative terms of their likelihood and magnitude, is widely favored by proponents of CBA.[255] Indeed, those proponents treat this approach as a strength precisely because it elevates true dangerousness over public misperceptions thereof.[256]

Critics of CBA, however, have attacked this approach by pointing out the degree to which it is at odds with people's actual views of risk and actual preferences toward regulation.[257] For example, a CBA analysis by Robert Hahn in 1996 indicated that the number of lives likely to be saved by increased airline security was far too low to justify the expense.[258] Of course, this analysis did not foresee the attacks of September 11, 2001, but the more interesting issue surrounds what the analysis would have concluded if it had foreseen those attacks. As Ackerman and Heinzerling note, the

254. ACKERMAN & HEINZERLING, *supra* note 12, at 130.

255. *E.g.*, STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION 61–63 (1993); John D. Graham, *Making Sense of Risk: An Agenda for Congress*, *in* RISKS, COSTS, AND LIVES SAVED 183, 193–95 (Robert W. Hahn ed., 1996); Timur Kuran & Cass R. Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683, 753 (1999); Neil D. Weinstein, *Optimistic Biases About Personal Risks*, 245 SCIENCE 1232, 1232 (1989).

256. *See* sources cited *supra* note 255.

257. *See generally* ACKERMAN & HEINZERLING, *supra* note 12, at 123–52.

258. Robert W. Hahn, *The Cost of Antiterrorist Rhetoric*, 19 REGULATION 51, 54 (1996).

number of people (about 3000) who died on September 11 is dwarfed by the number who die from many other causes that are potential subjects of regulation.[259] Hahn's study itself suggests that "side impact standards for automobiles and cabin fire protection in aircraft," which are "two-hundred times more cost-effective" than proposals for safeguarding airplanes from terrorism, may well have been favored by CBA under any circumstances.[260] For critics, this demonstrates CBA's inadequacy.[261]

It seems very likely, however, that most Americans would prefer to have thwarted the 9/11 attacks even if doing so had required public expenditures that could have saved lives more efficiently if directed elsewhere. Such a preference would accord with other findings about the way people perceive risk.[262] Rather than focusing only on the likelihood and magnitude of harm, they also consider the nature of the risk.[263] "When a hazard is unfamiliar, uncontrollable, involuntary, inequitable, dangerous to future generations, irreversible, man-made, and/or catastrophic, ordinary people are likely to view it as risky,"[264] whereas "a hazard that is familiar, controllable, voluntary, equitable, dangerous only to the present generation, reversible, natural, and/or diffusely harmful is unlikely to generate much concern in the populace."[265] These views raise important questions about how to regulate public health and safety. Many regulatory matters such as those involving nuclear power and toxic waste would be resolved one way via CBA and a very different way via the views of the public.[266]

What WBA adds to the picture is a way of counting the crucial fact that people's *feelings* about risk—not just the statistical probability of a risk—affect their well-being.[267] Although the fact that a risk is "dreaded" does not make that risk any likelier, "[p]rolonged exposure to dreaded risks frequently leads to deep and widespread anxiety, depression, and distrust."[268] In cataloging these effects, one

259. ACKERMAN & HEINZERLING, *supra* note 12, at 123–24.

260. Hahn, *supra* note 258, at 54.

261. ACKERMAN & HEINZERLING, *supra* note 12, at 123–24, 136–38.

262. Paul Slovic, *The Perception of Risk*, 236 SCI. 280, 282 (1987).

263. *Id.*

264. ACKERMAN & HEINZERLING, *supra* note 12, at 130.

265. *Id.*

266. Slovic, *supra* note 262, at 285.

267. Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025, 2036–37 (1999).

268. ACKERMAN & HEINZERLING, *supra* note 12, at 131.

scholar has noted the anger, confusion, and fear produced by the risks,[269] as well as their deleterious effects on couples[270] and children.[271] Another scholar has written at length about the "trauma" imposed by dreaded risks.[272] Yet another scholar focuses on the breakdown of trust that those risks tend to cause.[273]

Anxiety, depression, and distrust can diminish well-being substantially, and these tangible effects on people clearly must be counted by any tool that aims to measure well-being. Indeed, even Hahn's CBA study that argued against airplane antiterrorism measures acknowledged the possibility that people might "benefit psychologically" from such measures.[274] That study further acknowledged: "It may be that people are willing to pay large sums to feel safer," but it concluded that "absent concrete research supporting this assertion, the money would be far better spent" elsewhere.[275]

In contrast to studies like that one, WBA can be used to forecast the effects of regulation on people's well-being. By using hedonic data from communities that have been subjected to the relevant risks, WBA captures the harms that CBA has been so extensively criticized for missing. The reason that people's qualitative judgments of risks matter is that those judgments themselves influence, sometimes profoundly, people's experience of life. Such influence is the thing that WBA exists to measure.

It is essential to note that WBA does not ignore the actual likelihood and magnitude of harm on which CBA focuses. Actual deaths, of course, eliminate well-being and are thus profoundly weighted in any WBA calculus. This is especially significant because the harshest critics of CBA, in pushing for a more democratic approach to risk assessment, can be insufficiently sensitive to quantitative measures. Hazards that are "familiar," "equitable," and

269. MICHAEL EDELSTEIN, CONTAMINATED COMMUNITIES: THE SOCIAL AND PSYCHOLOGICAL IMPACTS OF RESIDENTIAL TOXIC EXPOSURE 44–46 (1988).

270. *Id.* at 93–95 (noting that, for example, "[s]pouses sometimes held their mates responsible for getting them into the situation or for their coping strategy," frequently resulting in substantial "marital strife").

271. *Id.* at 98–105.

272. *See generally* KAI ERIKSON, A NEW SPECIES OF TROUBLE: EXPLORATIONS IN DISASTER, TRAUMA, AND COMMUNITY 226–42 (1994).

273. Paul Slovic, *Perceived Risk, Trust, and Democracy*, 13 RISK ANALYSIS 675, 677–80 (1993).

274. Hahn, *supra* note 258, at 54.

275. *Id.*

"natural"[276] still ought to be taken very seriously if they are likely to kill many people. So WBA provides an appropriate mediating measure between the critics' focus on psychological triggers of risk and the lament of CBA practitioners that the public is simply irrational.

2. *Different Types of Death*. CBA also chooses not to differentiate between quick deaths and slow, painful ones,[277] and this weakness of CBA reveals one of WBA's strengths. The reason that people hope to avoid painful deaths is, simply and obviously, that people dislike pain because it decreases their well-being. If we hold constant the time at which a person will die[278] and contrast two different sets of "circumstances preceding death"[279]—one in which the person is in pain and miserable, and the other in which the person is pain-free and relatively happy—several things become clear: (1) the person is better off in the pain-free scenario, (2) the reason for this is that she feels better in the pain-free scenario, (3) the amount by which she is better off is the amount by which she feels better, multiplied by the amount of time during which she feels better, and (4) the better a tool of analysis takes account of these facts, the better it captures the likely effects of a policy on human well-being. WBA is designed precisely to account for these considerations. CBA ignores them in practice, and even in theory it could address such concerns only via proxies that are less reliable and less direct than those of WBA.

3. *How One Person's Death Affects Another Person's Welfare*. CBA counts death as a cost to the person who died,[280] but not as a cost to others who may be affected by that person's death. We mimicked that practice in our example of WBA earlier in this Article, but in actual policymaking this is a mistake that should be corrected.

---

276. ACKERMAN & HEINZERLING, *supra* note 12, at 130.

277. *See id.* at 70–71 ("[T]he circumstances preceding death are important: sudden, painless death in pleasant circumstances is different from agonizing, slow deterioration surrounded by medical technology.").

278. If the time of death would actually differ, such that a slow death would increase the length of life, then of course this should be factored in as well. WBA does factor it in, whereas CBA does not. *See infra* Part IV.B.

279. ACKERMAN & HEINZERLING, *supra* note 12, at 71.

280. Or, to use CBA's preferred terminology, it counts the cost of subjecting the members of a population to an increased risk of death. We believe that this amounts to the same thing. *See supra* note 42.

WBA is well-positioned to do so, because hedonic data already exist about the effect of people's deaths on those close to them.[281] By contrast, CBA would have to add this element by asking people how much money they would be willing to pay to avoid losing a loved one (or to avoid a risk to that person's life). Such an approach implicates all of the problems with CBA we discuss throughout this Article, such as wealth effects, hypothetical questions, and people's difficulty in thinking about infinitesimally small numbers, among others. But the largest problem, as may always be the case with CBA, is that it requires people to guess the effect of something on their life in the future. How much welfare do people lose when their loved ones die? Instead of relying on what people predict the effect will be, along with their capacity to convert that effect into dollar figures, it is better to rely on measures of how such deaths actually affect people's happiness, as measured by their in-the-moment self-reports at various stages of time after the deaths. Hedonic studies measure precisely that.[282]

B. CBA's Attempted Improvements

When considering whether or not to regulate a risk to human health, CBA quantifies the value of that risk primarily by determining the number of lives likely to be saved by regulation and multiplying it by the statistical value of a human life. The value of a statistical life (VSL) is computed using the various methods described in Parts I and III. Accordingly, its reliability suffers from the methodological limits discussed above. In addition, CBA's use of statistical lives also has conceptual faults. When determining an average value for lives saved, VSL treats the lives saved by regulation indiscriminately. In doing so, VSL ignores essential data regarding both the length and quality of the lives protected. Regulations that prolong or improve the quality of life without "saving" it are not counted by CBA formulas relying on VSL.[283]

Over the past several decades, scholars and policymakers have developed new tools to overcome VSL's limitations. This Section discusses two such tools—"value of statistical life years" (VSLYs) and

281. *See, e.g.*, Oswald & Powdthavee, *supra* note 80.

282. *See, e.g.*, *id.*

283. As we explain in the next Section, no regulation actually *saves* lives; it merely prolongs them. To the extent CBA focuses on saving lives, it is measuring the value of lives that presumably would have ended more or less immediately without the regulation.

"quality-adjusted life years" (QALYs). The movement toward VSLYs and QALYs represents an acknowledgment of the limitations of traditional CBA methods. The inadequacy of equating all lives saved with one another is the impetus for moving beyond VSL. But VSLYs and QALYs are merely way stations on the road from CBA to WBA. They are efforts to bend CBA to be more sensitive to the nuances it has been ignoring. But no such tweaks can solve the problem as comprehensively as can WBA, as the following Subsections explain.

1. *Statistical Lives and Life Years*. When standard CBA is applied to regulations that seek to protect human health and welfare, policymakers calculate the benefits side of the equation by predicting the number of lives likely to be saved by the proposed regulation.[284] To compare the number of lives saved to the costs of the regulation (for example, in higher prices, unemployment, etc.), the value of those lives must be monetized. Thus, each life saved must be assigned a specific monetary value. CBA derives this value—known as VSL—by reference to the various techniques discussed in Parts I and III: revealed preference and contingent valuation studies.[285]

As noted in Part III, the techniques used to derive VSL have considerable methodological limitations. Perhaps more importantly, however, the conceptual relationship between VSL and the welfare-maximizing goals of regulation is deeply strained.[286] By focusing solely on lives saved, CBA's use of VSL entirely ignores data that are relevant to judging the value of regulation. For VSL, the length of the life saved is immaterial.[287] By ignoring longevity, CBA risks creating highly counterintuitive results. Imagine, for example, that the government has a finite supply of a vaccine for a deadly disease that has recently broken out, and it can provide that vaccine either to 100 children or 101 hospice patients. Under CBA, using the VSL approach, the government should prefer to give the drug to the hospice patients, because doing so would potentially save one

284. *See* REVESZ & LIVERMORE, *supra* note 13, at 47 (explaining that reduced mortality risk is one of the greatest justifications for the EPA's cost-benefit decisions).

285. *Id.* at 47–49.

286. We do not here discuss other extra-welfarist goals of regulation.

287. Cass R. Sunstein, *Lives, Life-Years, and Willingness To Pay*, 104 COLUM. L. REV. 205, 208 (2004); *see also* James K. Hammitt, *Valuing Changes in Mortality Risk: Lives Saved Versus Life Years Saved*, 1 REV. ENVTL. ECON. & POL'Y 228, 229–31 (2007) (discussing differences between VSL and VSLY measures).

additional life. We doubt, however, that anyone would suggest that giving the vaccine to the hospice patients increases overall welfare. After all, the benefit from the drug will likely only prolong the lives of the hospice patients for a few weeks, whereas the children might be expected to live for decades.

In response to these kinds of problems, scholars have suggested that regulators consider instead the number of "life years" at issue.[288] Rather than relying simply on statistical lives, researchers should calculate the value of a statistical life year (VSLY), which involves dividing the VSL by the average life expectancy of the subjects of the studies.[289] VSLY has an estimated value of approximately $180,000.[290] Looking again at the vaccine example from the perspective of VSLY, the answer is obvious and intuitive: 100 children × 50 life years per child × $180,000 = $90 million; 101 hospice patients × 0.1 life years per patient × $180,000 = $1.8 million. By considering the number of life years saved by regulation, the VSLY method offers a closer proxy for the actual welfare value at stake.[291]

Nonetheless, the VSLY approach has been criticized both for its lack of empirical support and the potential outcomes that it generates.[292] These concerns are based on the claim that VSLY inappropriately undervalues the lives of older people. Empirically, in surveys of WTP to avoid risk, there is mixed evidence about whether older people actually value risk less than younger people, as VSLY would suggest.[293] Although some studies show that willingness to pay to avoid risk declines with age, as one might expect, some show no difference and others show the inverse.[294] According to Richard

---

288. Sunstein, *supra* note 287, at 206 ("[I]t is sensible to think that government should consider not simply the number of lives at stake, or the VSL; it should concern itself also or instead with the number of life-years at stake, or the value of statistical life-years . . . .").

289. REVESZ & LIVERMORE, *supra* note 13, at 78.

290. *See id.* (using $180,000 as an example VSLY value).

291. Sunstein, *supra* note 287, at 208 ("If the goal is to promote people's welfare by lengthening their lives, a regulation that saves five hundred life-years (and, let us say, twenty-five people) is, other things being equal, better than a regulation that saves fifty life-years (also, let us say, twenty-five people).").

292. We do not here discuss concerns about whether VSLYs enact illegal age discrimination. For discussion, see *id.* at 220.

293. REVESZ & LIVERMORE, *supra* note 13, at 81 ("Relevant studies have found that the willingness to pay does not resemble the constant age-dependent discount postulated by proponents of the life-years method.").

294. *See* Alberini et al., *supra* note 227, at 771 (finding no significant difference between older and younger people); V. Kerry Smith, Mary F. Evans, Hyun Kim & Donald H. Taylor, Jr., *Do the Near-Elderly Value Mortality Risks Differently?*, 86 REV. ECON. & STAT. 423, 423 (2004)

Revesz and Michael Livermore, the failure to observe a decrease in WTP should not be surprising in light of the typically higher wealth of older people and the greater scarcity of the limited years they have remaining.[295]

In situations in which the data appear to diverge from the theory, however, it is just as possible that the data are misleading as it is that the theory is incorrect. There are a number of plausible explanations for the finding that older people are sometimes willing to pay more to avoid risk than younger people. Many of these explanations do not undermine the idea that saving more life years saves more welfare. For example, as Revesz and Livermore note, older people typically have greater wealth than younger people do, and wealth is strongly correlated with increased WTP.[296] If the greater WTP on the part of older people is based upon wealth, it should be treated as a confounding factor rather than evidence of welfare. Additionally, "older people have less to do with their money" and fewer other options for spending it, as saving is not a strong priority.[297] Further, when valuing goods and risks in contingent valuation studies, people often demonstrate significant "scope neglect." For instance, they are often willing to pay the same amount to save 1000, 10,000, or 100,000 birds from some type of hazard.[298] Plausibly, then, when 40-year-olds and 70-year-olds are asked to value losing "the rest of your life" they may treat these different time periods similarly.

Whereas opponents of VSL contend that the use of VSLY exacts a "senior death discount"[299] because it treats the lives of older people as less valuable than those of younger people, we view this discrepancy as consistent with our intuitions about the remaining welfare associated with those lives. Younger people will, on average, have greater welfare left to enjoy than do older people. As Cass Sunstein has suggested, people placed behind a "veil of ignorance" would overwhelmingly favor regulations that save more life years.[300]

(finding that older people have *higher* WTP than younger people); Viscusi & Aldy, *supra* note 195, at 50 (finding that older people have *lower* WTP than younger people).

295. REVESZ & LIVERMORE, *supra* note 13, at 80–81.

296. *Id.*

297. Sunstein, *supra* note 287, at 233.

298. Desvousges et al., *supra* note 106, at 113.

299. REVESZ & LIVERMORE, *supra* note 13, at 79 (quotation marks omitted).

300. Sunstein, *supra* note 287, at 214–15 ("If people do not know how old they are, would they have the slightest difficulty concluding that it is better to eliminate a 1/50,000 risk faced by one million teenagers than a 1/50,000 risk faced by one million senior citizens?").

To the extent one is trying to maximize welfare, it is better to save 30-year-olds than 80-year-olds.

2. *Quality-Adjusted Life Years*. We consider the VSLY approach to be a substantial improvement over the VSL technique traditionally favored by CBA. However, although VSLY directs attention to welfare-relevant data overlooked by VSL, the life-years approach itself ignores a meaningful component of the value of risk regulation: the *quality* of the years saved. As with the VSL approach, this has the potential to create counterintuitive results. For example, the life-years approach would be indifferent between (1) a program that extended the lives of 100 people for 10 years with those years spent in poor health, and (2) a program that extended the lives of 100 people for 10 years with those years spent in excellent health. Despite people's capacity to adapt hedonically to certain types of poor health,[301] there is almost certainly a greater welfare gain in the second program because poor health will almost always be associated with meaningful hedonic penalties.[302]

To remedy this shortcoming, some scholars have recommended adopting quality-adjusted life years (QALYs) in cost-benefit analysis.[303] The QALY was initially developed in the related field of cost-effectiveness analysis to provide data on the efficient use of scarce resources in medical decisionmaking.[304] Unlike the VSL and VSLY approaches, QALYs were not initially designed with respect to standard welfare theory,[305] but some commentators[306]—including courts[307] and agencies[308]—see value in the use of QALYs in CBA. As

301. Bronsteen, Buccafusco & Masur, *supra* note 112, at 1527–28.

302. *Id.* at 1531.

303. *See* Sunstein, *supra* note 287, at 246.

304. Milton C. Weinstein, George Torrance & Alistair McGuire, *QALYs: The Basics*, 12 VALUE HEALTH S5, S5 (2009).

305. Amiram Gafni, *Economic Evaluation of Health-Care Programmes: Is CEA Better Than CBA?*, 34 ENVTL. & RESOURCE ECON. 407, 408 (2006).

306. Adler, *supra* note 209, at 1044.

307. Am. Trucking Ass'ns v. EPA, 175 F.3d 1027, 1039 (D.C. Cir. 1999) (suggesting that QALYs may be used by agencies to develop tools for judging harm), *rev'd in part sub nom.* Whitman v. Am. Trucking Ass'ns, 531 U.S. 457 (2001).

308. Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. 15,404, 15,411 (proposed Mar. 31, 2003) (codified at 21 C.F.R. pt. 800 (2012)).

yet, however, QALY analysis faces a number of methodological hurdles before it can be successfully incorporated into CBA.[309]

QALY analysis requires researchers to determine the relative values of living in different health states. The goal is to arrange various health states along a quantitative, cardinal dimension in which 1.0 is equivalent to perfect health and 0 is death.[310] The quality-adjusted value of a health state is then multiplied by the number of life years spent in that state to determine the QALY.[311] Thus, if a treatment option will extend a person's life by 10 years but in less than full health (say, 0.7), it generates 7 QALYs. Such a treatment would be preferred over a treatment that extended a person's life by 12 years at worse health (say, 0.4 = 4.8 QALYs) or one that extended the person's life 5 years in full health (5 QALYs).

To generate values for the necessary quality adjustments, researchers rely on three principle survey techniques. Subjects may be asked to use rating scales such as the EuroQol, a five-item scale that asks subjects to simply compare health states that differ on a variety of dimensions such as pain, mobility, and self-care.[312] In time trade-off studies, subjects are asked to choose between being in a state of poor health for a set period of time or being in full health for a shorter period.[313] In "standard gamble" studies, subjects choose between ill health for a period of time or a treatment that has a chance of restoring them to full health and a chance of death.[314] Researchers then use the subjects' responses to calculate the relative value of, say, walking with a cane and being confined to a wheelchair.

The first difficulty with adopting QALY analysis as part of traditional CBA is determining how to monetize QALYs. When QALYs are used in cost-effectiveness analysis in healthcare decisionmaking, no effort is made to quantify the value of a QALY. Instead, different programs may be compared to one another or a

309. *See generally* John Broome, *Qalys*, 50 J. PUB. ECON. 149 (1993).

310. Thomas Klose, *A Utility-Theoretic Model for QALYs and Willingness To Pay*, 12 HEALTH ECON. 17, 20 (2003). A QALY is "a utility-based, cardinal, interpersonally comparable, and time-dependent measure of effectiveness based on preferences over health and time." *Id.* at 17.

311. Gafni, *supra* note 305, at 412.

312. *How To Use EQ-5D*, EUROQOL GRP., http://www.euroqol.org/about-eq-5d/how-to-use-eq-5d.html (last visited Apr. 7, 2013).

313. Cam Donaldson, Stephen Birch & Amiram Gafni, *The Distributional Problem in Economic Evaluation: Income and the Valuation of Costs and Consequences of Health Care Programmes*, 11 HEALTH ECON. 55, 60–61 (2002).

314. *Id.* at 60.

program may be compared to an arbitrary threshold.[315] This resistance to quantifying the value of health and life has likely played a role in making QALYs attractive to healthcare professionals,[316] but it has done so at the cost of providing a clear decision rule.[317] To provide such a rule, scholars have attempted to calculate a constant WTP-per-QALY figure that can be plugged in to CBA. As yet, however, no clear number has been developed.[318] This difficulty may arise for some of the same reasons that calculating the value of a life year is a problem—framing effects, prospect theory, scarcity, and the like.[319]

More problematic, however, is the method that researchers use to elicit QALY values. Just as contingent valuation studies suffer from having people attach monetary values to things like health and the environment that are difficult to think about and monetize, QALY studies often require healthy individuals to make value judgments about health states that they have never experienced. To be valuable in welfare analysis, QALYs should reflect how people feel *in* various states of health. Instead, when healthy people are asked about states of poor health they will tend to provide answers about how they feel *about* those health states.[320] A rich empirical literature that we have discussed in a previous article demonstrates individuals' inability to accurately assess the value of health states they have not experienced.[321] Healthy people regularly overestimate both the magnitude and duration of the hedonic impact of many negative health states, including cancer, dialysis treatment, paralysis, and colostomy.[322] When asked to think about these negative health states, healthy people suffer from a number of cognitive and affective

315. *See* Richard A. Hirth, Michael E. Chernew, Edward Miller, A. Mark Fendrick & William G. Weissert, *Willingness To Pay for a Quality-Adjusted Life Year: In Search of a Standard*, 20 MED. DECISION MAKING 332, 333 (2000).

316. Gafni, *supra* note 305, at 410.

317. Hirth et al., *supra* note 315, at 332.

318. Hirth and his coauthors found WTP/QALY figures ranging from $24,000 to $428,000 with an average of $265,000, but they failed to find "a strong central tendency." *Id.* at 338–39; *see also* Paul Dolan & Richard Edlin, *Is It Really Possible To Build a Bridge Between Cost-Benefit Analysis and Cost-Effectiveness Analysis?*, 21 J. HEALTH ECON. 827, 838 (2002) (concluding that reconciling CBA and CEA is impossible and recommending that the debate focus on determining which approach is more appropriate for a given situation).

319. *See* Daniel Kahneman, *A Different Approach to Health State Valuation*, 12 VALUE HEALTH S16, S16 (2009).

320. *See* Daniel M. Hausman, *Valuing Health*, 34 PHIL. & PUB. AFF. 246, 256 (2006).

321. Bronsteen, Buccafusco & Masur., *supra* note 112, at 1526–35.

322. For a review, see Paul Dolan & Daniel Kahneman, *Interpretations of Utility and Their Implications for the Valuation of Health*, 118 ECON. J. 215, 221–22 (2008).

biases that hinder their judgment: they neglect the role of hedonic adaptation, they focus primarily on the transition from good to poor health, and their attention is focused on the health domain to the exclusion of other domains.[323] Thus, in time trade-off and standard gamble studies, healthy people are willing to give up significantly more remaining life than are current patients.[324] This results in biased QALY scores that overestimate the welfare losses from many health states.[325]

Although asking current or former patients to respond to these studies might help, it is unlikely to resolve all measurement issues. Time trade-off and standard gamble studies, like contingent valuation and revealed preference studies, rely on what Daniel Kahneman has called *decision utility*: subjects make judgments about the value of past or future states of the world. In addition to the prediction problems listed above, such studies also suffer from cognitive biases associated with recollection of past states. For example, colonoscopy patients have been shown to prefer longer, more painful procedures to shorter, less painful ones when the former ended with a period of diminished but still significant pain.[326] It is also possible that current and former patients who are adapting or have adapted to their conditions may neglect the preadaptation period during which their condition was causing substantial welfare losses.[327]

3. *Well-Being Units*. Our proposal to replace CBA with WBA is based on the ability of WBA to solve the conceptual and methodological limitations associated with measuring the value of

323. *Id.* at 223.

324. *See, e.g.*, David L. Sackett & George W. Torrance, *The Utility of Different Health States as Perceived by the General Public*, 31 J. CHRONIC DISEASES 697, 702 (1978) (reporting QALYs for dialysis treatment of 0.39 and 0.56 for healthy subjects and patients, respectively). Often, patients are willing to sacrifice no or very little life, resulting in QALY scores at or near 1.0 for a variety of diseases. *See* Erik Nord, Norman Daniels & Mark Kamlet, *QALYs: Some Challenges*, 12 VALUE HEALTH S10, S10–11 (2009) (noting that "unwillingness to trade lifetime in elicitations of experienced utility" is an issue).

325. It is worth noting that other relatively minor negative health states prove surprisingly resistant to adaptation, such as ringing in the ears and chronic headaches. To the extent that the public does not predict the substantial hedonic losses associated with these conditions, QALY scores will underestimate welfare losses. *See* Bronsteen, Buccafusco & Masur, *supra* note 112, at 1541.

326. Donald A. Redelmeier & Daniel Kahneman, *Patients' Memories of Painful Medical Treatments: Real-Time and Retrospective Evaluations of Two Minimally Invasive Procedures*, 116 PAIN 3, 7 (1996).

327. Dolan & Kahneman, *supra* note 322, at 225.

life. WBA incorporates the valuable corrections offered by VSLYs and QALYs while avoiding their shortcomings. As noted in Part IV.B.1, CBA's preferred tool, VSL, provides a weak proxy for general intuitions about welfare because it neglects data about both the longevity and the quality of life. The VSLY and QALY approaches go some distance toward solving this issue, but they run into problems of their own.

The well-being units that we propose can be thought of as QALYs derived from experienced utility rather than decision utility. By using elicitation techniques that more or less directly measure subjective well-being, WBA can generate a more accurate measure of both the quantity and quality of the value of life. Ecological-momentary assessment, day-reconstruction method, and quality-of-life surveys provide data on the lived experiences of people in a wide variety of states.[328] Accordingly, they can measure the value of a broader spectrum of experiences, including not just health risk but also the impact on well-being of social, professional, and environmental factors. WBA is also more attuned to the importance of emotional well-being, including positive emotions, which are almost entirely ignored by CBA.[329]

In addition to proving a more nuanced and accurate picture of the quality of life, the techniques used by WBA avoid a number of the methodological problems faced by various versions of CBA. The cognitive biases that hinder contingent valuation, revealed preferences, and QALY studies are substantially muted in WBA. Respondents are only asked to answer simple questions rating their current level of happiness. Such questions do not require them to value nonmarket goods, make complex health trade-offs, or predict or remember different experiences. As such, they are less susceptible to wealth effects, demand effects, framing effects, and affective forecasting errors.[330] Unlike traditional CBA and QALY analysis, which require people to make incredibly difficult judgments about the monetary or health value of things they have never experienced,

328. *See supra* Part II.B.

329. The converse is similarly true. Matthew Adler notes that CBA analyses "almost never enumerate and price the distressing mental states, such as fear, anxiety, worry, panic, or dread, that are causally connected to environmental, occupational, and consumer hazards and would (or at least might) be reduced by more stringent regulation." Adler, *supra* note 209, at 997.

330. For a description of the distortions to CBA caused by these biases and errors, see *supra* Part III.

WBA directly tracks people's experiences and the emotions that those experiences create.

Finally, because WBA does not attempt to translate experiences into money, it avoids difficult problems associated with monetizing QALYs. In WBA, the costs and benefits of proposed policies are hedonized, and their impact on people's well-being is weighed. To the extent that a policy increases or decreases wealth, the effects of the changes in wealth on welfare will be measured directly.[331] Moreover, the value of a year at a certain level of well-being is less likely to be altered by the effects of age or wealth than are VSLs, VSLYs, and QALYs.

V. DISCOUNTING IN CBA AND WBA

One of the most intractable problems within CBA involves the choice of a discount rate.[332] CBA is based upon monetary values, and the value of money is not constant across time.[333] A dollar is not worth the same amount in 2011 as it was in 2001, much less 1911. It is better to have one dollar today than one dollar one year from today. In addition, governmental projects and regulations do not always produce benefits in the same years that they generate costs.[334] For instance, a regulation that banned emphysema-causing chemicals in the workplace might create immediate costs—firms that used those chemicals would have to eliminate them immediately and find safer (and presumably more expensive) alternatives. But the benefits would arrive only several years later, because emphysema is a slow-onset disease that typically takes years to develop.[335] CBA would thus measure the costs of such a regulation in 2011 dollars, and the benefits in (for instance) 2021 dollars, which are less valuable. To make a true apples-to-apples comparison, the agency would then be

331. *See, e.g.*, Oswald & Powdthavee, *supra* note 106, at 1071 (discussing the possibility of estimating monetary compensating variations for changes in well-being).

332. *See* Adler & Posner, *supra* note 215, at 1142 (showing that agency freedom to choose a different discount rate for every regulation has led to large disparities in measuring benefits).

333. Lisa Heinzerling, *Risking It All*, 57 ALA. L. REV. 103, 107–08 (2005) (explaining the concept of a discount rate).

334. *See, e.g.*, Cass R. Sunstein & Arden Rowell, *On Discounting Regulatory Benefits: Risk, Money, and Intergenerational Equity*, 74 U. CHI. L. REV. 171, 180 (2007) (using the regulation of arsenic as an example of a government program that would impose present costs but provide benefits in the form of reduced cancer rates decades in the future).

335. *See Chronic Obstructive Pulmonary Disease*, NAT'L CTR. FOR BIOTECHNOLOGY INFO. (May 1, 2011), http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001153.

forced to discount the 2021 benefits to present value—effectively determining what those 2021 benefits are worth in 2011 terms.

The mathematics behind such discounting are easy. What is difficult is determining the proper discount rate to use. That is, how much less is a benefit in 2012 worth than a benefit in 2011? Ten percent less? Seven percent? Five or three percent? The answer can have a significant impact upon regulatory decisions. For instance, consider the question of how aggressively the United States should regulate to reduce greenhouse-gas emissions. In 2009, the Obama administration convened a multiagency working group to determine how much harm was being done to the world economy by global warming on account of greenhouse-gas emissions.[336] The working group calculated the cost to the world for each ton of carbon dioxide emitted, in U.S. dollars.[337] Many of the harms from global warming will only occur 50 or even 100 years from now, and so it was necessary to discount those harms to present-day dollars. However, as is often the case, the agency could not settle on a single discount rate. Instead, it reported the cost of carbon emissions at three different discount rates: 2.5 percent, 3 percent, and 5 percent. The results are reported in Table 4, below.

Table 4: Worldwide Cost of Emitting One Ton of Carbon Dioxide at Various Discount Rates (in 2011 dollars)[338]

Discount rate:	5%	3%	2.5%
Cost:	$4.90	$21.90	$35.70

As is evident from the table, the choice of discount rate has a tremendous effect on the estimate of harm. Halving the discount rate, from 5 percent to 2.5 percent, more than *septuples* the cost of each ton of carbon dioxide. This is because a cost or benefit that occurs in the distant future must be discounted heavily when translating it into 2011 dollars—the value of the cost decreases 5 percent (or 2.5 percent) *per year*. Over several decades, small differences in the discount rate compound into substantial divergences in overall costs. Accordingly, it is no exaggeration to say that the choice between a 2.5 percent discount rate and a 5 percent discount rate could determine

336. *See* Jonathan S. Masur & Eric A. Posner, *Climate Regulation and the Limits of Cost-Benefit Analysis*, 99 CALIF. L. REV. 1557, 1561.

337. *Id.* at 1577–79.

338. *Id.* at 1580 (listing values for 2011).

whether the United States regulates greenhouse-gas emissions fairly stringently, or not at all.[339]

Why is it difficult for agencies and other decisionmakers to select a discount rate? The reason is that there is no agreement about precisely why discounting is necessary; and even when there is agreement on the reasons for discounting, there is no agreement on what discount rate would be proper given the rationale behind discounting.

The predominant reason that future costs and benefits must be discounted is the "time value of money"—the fact that one dollar is not worth the same amount at every point in time. This is partly because of inflation: one dollar buys fewer goods and services in 2011 than it bought in 1911.[340] It is also because money can earn interest if it is saved, rather than spent. For instance, imagine a regulation that would require an expenditure of $10,000 in 2011 and yield $15,000 of benefits in 2021. Is this regulation worth enacting? One approach is to consider how much $15,000 is worth in 2021, compared with $10,000 in 2011. This would involve calculating the rate of inflation and determining which sum of money has more purchasing power in the given year. If this approach is correct, then the discount rate should be the long-term rate of inflation, which is approximately 2.4 percent.[341] Another approach is to ask how much the original $10,000 would be worth in 2021 if it were invested, instead of being spent on complying with the regulation.[342] If this approach is correct, then the discount rate should be the typical long-term rate of return on an investment of that size.[343] There is a great deal of disagreement

339. *See id.* at 1598–99 (arriving at the same conclusion); David Weisbach & Cass R. Sunstein, *Climate Change and Discounting the Future: A Guide for the Perplexed*, 27 YALE L. & POL'Y REV. 433, 440 (2009) ("[B]ecause of the potentially profound effect of discount rates, these figures are central to major disagreements over climate change policy.").

340. *See Overview of BLS Statistics on Inflation and Prices*, BUREAU OF LABOR STAT., U.S. DEP'T OF LABOR, http://www.bls.gov/bls/inflation.htm (last updated Mar. 1, 2012).

341. *See* BUREAU OF LABOR STAT., U.S. DEP'T OF LABOR, CPI DETAILED REPORT: DATA FOR DECEMBER 2012, at 78 tbl.24 (2013), *available at* http://www.bls.gov/cpi/cpid1212.pdf. The average inflation rate between 2002 and 2012 was calculated by the authors based upon the data provided by the Bureau of Labor Statistics.

342. *See, e.g.*, Weisbach & Sunstein, *supra* note 339, at 435–36.

343. *See generally* Paul A. Samuelson, *An Exact Consumption-Loan Model of Interest With or Without the Social Contrivance of Money*, 66 J. POL. ECON. 467 (1958).

regarding what that rate of return is, but most estimates place it at 7 percent.[344]

Thus, even when the discount rate is based purely on the time value of money, different approaches to calculating that value can produce widely divergent results. Many administrative agencies avoid this issue by refusing to decide between these approaches and calculating cost-benefit analyses with both of them. For instance, the Office of Management and Budget recommends that agencies use a 7 percent discount rate but perform cost-benefit analyses with both 3 percent and 7 percent discount rates.[345] Most agencies follow this advice, including OSHA and the EPA.[346] Yet the choice among those discount rates is often determinative of whether a regulation produces more benefits than costs.[347] Consider the emphysema example from the previous paragraphs. At a 3 percent discount rate, the regulation would provide approximately $11,160 in benefits, discounted to their 2011 value.[348] But at a 7 percent discount rate, the regulation provides only $7,600 in benefits—far below the $10,000 in costs.[349]

CBA has no way to avoid these difficulties. But WBA does. Unlike money, well-being is time invariant. Five WBUs in 2021 are worth just as much in welfare terms as 5 WBUs in 2011. Indeed, the entire reason that the value of money varies over time is that the amount of well-being it can be used to purchase varies over time. Thus, there is no need to discount in order to accommodate the time-value of well-being. Many of the difficulties with discounting that force EPA to report results at two different discount rates, and the

344. *See* OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, CIRCULAR A-94, GUIDELINES AND DISCOUNT RATES FOR BENEFIT-COST ANALYSIS OF FEDERAL PROGRAMS 9 (1992), *available at* http://www.whitehouse.gov/omb/circulars_a094 ("Constant-dollar benefit-cost analyses of proposed investments and regulations should report net present value and other outcomes determined using a real discount rate of 7 percent. This rate approximates the marginal pretax rate of return on an average investment in the private sector in recent years.").

345. OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, CIRCULAR A-4, REGULATORY ANALYSIS 33–34 (2003), *available at* http://www.whitehouse.gov/omb/circulars_a004_a-4.

346. *See, e.g.*, Masur & Posner, *supra* note 15, at 672 (describing OSHA's use of both 7 percent and 3 percent discount rates in a CBA of hexavalent chromium exposure standards).

347. *See*, *e.g.*, *id.* at 673 (reporting the divergent results for a CBA of an OSHA regulation conducted at 3 percent and 7 percent discount rates); Masur & Posner, *supra* note 138, at 629 tbl.5 (reporting the same for an EPA regulation).

348. The calculation is $\$15{,}000 / (1.03)^{10} = \$11{,}161.41$.

349. Similarly, the calculation is $\$15{,}000 / (1.07)^{10} = \$7{,}625.24$.

interagency climate change working group to do so at three different rates, are simply irrelevant to WBA.

That is not to say that WBA will necessarily be able to avoid discounting entirely. We noted above that there is no agreement on precisely why (or whether) discounting should occur. In the preceding paragraphs, we described a leading theory: inflation and the possibility of investment interest alter the value of money over time. However, there are other candidate theories that are not so easily dealt with by WBA. For instance, it might be that individuals simply have pure time preferences for immediate gratification over later benefits.[350] Someone might prefer having 6 WBUs today and 5 WBUs tomorrow to the reverse. This could be driven by the fear that the individual will die before she is able to enjoy the more distant rewards, or it could simply be human impatience.[351] Alternatively, there might be some separate moral reason to privilege present welfare over future welfare (for example, a duty to one's own generation), or conceivably the reverse (a duty to future generations).[352]

We take no position on whether discounting is appropriate for any of these reasons, though we note that the case for doing so has not been conclusively established.[353] If discounting is appropriate, then well-being analysis will have to include discounting as well. But for CBA, this discounting would be *above and beyond* any discounting that might be necessary due to inflation and interest rates. CBA would have two sets of problems to sort through. WBA simplifies the issue at least by half. And when it comes to such a thorny and yet potentially decisive issue as what discount rate to select, that constitutes progress.

---

350. *See* Revesz, *supra* note 11, at 997–1002 (describing the argument for pure time preferences); *see also* IRVING FISHER, THE THEORY OF INTEREST: AS DETERMINED BY IMPATIENCE TO SPEND INCOME AND OPPORTUNITY TO INVEST IT 25–32 (1930) (same).

351. Revesz, *supra* note11, at 997–1002.

352. *See* Weisbach & Sunstein, *supra* note 339, at 445.

353. *See* Tyler Cowen & Derek Parfit, *Against the Social Discount Rate*, *in* JUSTICE BETWEEN AGE GROUPS AND GENERATIONS 144, 155 (Peter Laslett & James S. Fishkin eds., 1992) (arguing that pure time preferences are irrational). We note as well that there is a significant literature regarding whether a zero discount rate (which is equivalent to a decision not to discount) would produce one or more paradoxes. *See, e.g.*, Sunstein & Rowell, *supra* note 334, at 175–77 (2007); W. Kip Viscusi, *Rational Discounting for Regulatory Analysis*, 74 U. CHI. L. REV. 209, 216–17 (2007). Further research will be necessary to determine whether these paradoxes would apply with the same force—or with any force—to WBA employing WBUs.

CONCLUSION

For decades, cost-benefit analysis has been the primary tool by which policymakers analyze prospective laws and administrative regulations. Hundreds of millions of lives have been affected profoundly by the answers that CBA generates. All along, critics from within and without have pointed to the fact that CBA relies primarily on mechanisms—such as contingent valuation surveys (how much would you pay to save 20,000 birds?) and wage premiums (how much more do dangerous jobs pay than safe ones?)—that have been demonstrated to yield unreliable and invalid data. But CBA persists because no compelling rival account has emerged to replace it.

We offer well-being analysis as an alternative. WBA aims to measure how people actually experience their lives: what makes them happy and unhappy, and what they enjoy and dislike. Instead of introducing the distortions created by using money as a proxy for people's quality of life, WBA analyzes that quality directly. Psychological studies of hedonic well-being have yielded data that pass the same canonical tests of social science that CBA's studies fail. Those hedonic studies, which form the backbone of WBA, provide the same capability for numerical comparison of policy choices as does CBA. The difference is that WBA's answers avoid many of the pitfalls that plague CBA.

Although WBA is not meant to answer the ultimate question of what policies should be chosen,[354] we think it improves upon CBA in playing a key role in the decisionmaking process: the role of assessing policies' effects on the quality of human life. That need not be the only consideration in making policy,[355] but it is at minimum an important one.

Scholars, regulators, and even heads of state have known for years of CBA's weaknesses. But they have felt compelled nonetheless to accept CBA on the ground that an attempt at rigorous comparison is preferable to the absence of any comparison at all. WBA offers a viable alternative or complement. The question is not whether WBA is perfect—no tool of social policy is—but rather whether it constitutes an improvement upon the status quo. The answer may well be yes.

---

354. Adler & Posner, *supra* note 13, at 52–61. We adopt the same "weak welfarist" position that Adler and Posner favor, using WBA in addition to or in place of CBA to measure welfare.

355. *Id.*