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Well-Being Analysis vs. Cost-Benefit Analysis (with J. Bronsteen & J. Masur) (symposium)

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Well-Being Analysis vs. Cost-Benefit Analysis

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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?

To answer that question, there needs to be a way of comparing seemingly incommensurable things like health and buying power. Two possible ways exist. The first is to ask how much money people are willing to pay for benefits like improved 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 for evaluating government policy. Moreover, it is the only systematic method that has ever been used for comparing the positive and negative effects of prospective laws and regulations. Every major regulation must, by law, be evaluated via CBA.[2] This has been the case since 1981, when President Reagan mandated it by executive order.[3] That order has been reaffirmed by every President since, including Presidents Clinton[4] and Obama.[5]

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[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 may be consumers (via higher prices), employees (via lower wages or job cuts), or business owners (via lower profits); but it must be someone.

[2] Exec. Order No. 13,563, 76 Fed. Reg. 3821 (Jan. 21, 2011).

[3] Exec. Order No. 12,291, 3 C.F.R. 127 (1982), *reprinted in* 5 U.S.C. § 601 note at 431-434 (1982), *reprinted as amended in* 5 U.S.C. § 601 note at 745-749 (2006).

[4] Exec. Order No. 12, 866, 3 C.F.R. 634 (1994) , *reprinted as amended in* 5 U.S.C. § 601 note at 745-749 (2006).

[5] *Supra* note 2.

Despite CBA's preeminence, however, it has been criticized harshly from the moment of its inception[6] to the present day,[7] and countless times in between.[8] More often than not, the criticisms are scathing.[9] Indeed, even CBA's most prominent defenders have written entire books and major articles prompted by their own acknowledgments of CBA's flaws.[10]

One example of those flaws is that the amount of money someone is willing to pay for a benefit like clean air depends in large part on the person's wealth. This "wealth effect" radically skews every cost-benefit analysis of a proposed regulation, yet CBA has no means of taking it into account.[11] Another flaw is that CBA's methodology requires learning how much money people would pay to reduce low-probability risks such as a 1-in-10,000 risk of death.

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[6] Steven A. Kelman, *Cost Benefit Analysis: An Ethical Critique*, 5 REGULATION 33 (1981).

[7] Alexander Volokh, *Rationality or Rationalism?: The Positive and Normative Flaws of Cost Benefit Analysis*, 48 HOUSTON L. REV. 79 (2011).

[8] *E.g.*, Amy Sinden, *Cass Sunstein's Cost-Benefit Lite: Economics for Liberals*, 29 COLUM. J. ENV. L. 191 (2004); Robert H. Frank, *Why Is Cost Benefit Analysis So Controversial?*, 29 J. LEGAL STUD. 913 (2000) (evaluating the various objections to cost-benefit analysis); Richard L. Revesz, *Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L.REV. 941 (1999); Thomas 0. McGarity, *A Cost-Benefit State*, 50 ADMIN. L. REV. 7 (1998); David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond Administrative Cost-Benefit Analysis*, 24 ECOLOGY L.Q. 545 (1997); Daniel Kahneman & Jack Knetsch, *Valuing Public Goods: The Purchase of Moral Satisfaction*, 22 J. ENVTL. ECON. & MGMT. 57 (1992); Thomas O. McGarity, *Media Quality, Technology and Cost-Benefit Balancing Strategies for Health and Environmental Regulation*, 46 L. & CONTEMP. PROB. 159, 179-91 (1983); Duncan Kennedy, *Cost- Benefit Analysis of Entitlement Problems: A Critique*, 33 STAN. L. REV. 387 (1981).

[9] *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 8, at 388 ("[T]he program of generating a complete system of private law rules by application of the criterion of efficiency is incoherent.").

[10] 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, NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS (2006); Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165 (1999).

[11] *E.g.*, *infra* Part III.A.2.

Every life-saving regulation requires of CBA this calculation, but people's brains are demonstrably ill-equipped to make it.[12]

Along these lines, an important if subsidiary contribution of this Article is to combine our own criticisms of CBA with those of others in order to make the case that CBA is an inadequate tool of policy analysis.[13] The only method ever used to compare laws' pluses and minuses—the method that has been mandated for the past three decades—is fundamentally flawed.

Yet it survives. No policymaker has seriously considered abandoning CBA, even though its use has been lamented almost universally for thirty years. The reason for its survival is evident and voiced often: no alternative exists.[14] Since any law will create both good and bad consequences, the only way to decide whether to enact it is to weigh the good against the bad. Asking how much people are willing to pay for the good, and thereby converting all consequences into dollar figures, is viewed as the lone option.

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 reduced. 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

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[12] *Id.*; 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.").

[13] *Infra* Parts III, IV, 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 in it that have been advanced by CBA's defenders.

[14] REVESZ & LIVERMORE, *supra* note 10; ADLER & POSNER, *supra* note 10. 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 (2010).

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.[15] But over the past fifteen years, such critics have been quieted by the success of these studies in producing replicable results that pass social science's rigorous tests of validity.[16]

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."[17] This view has also been endorsed by Great Britain's Prime Minister David Cameron,[18] France's President Nicolas Sarkozy,[19] three widely divergent winners of the Nobel Prize in Economics,[20] and a recent president of Harvard University.[21]

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[15] Daniel Kahenman et al., *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 . . . .").

[16] *Infra* Part II.B.

[17] G.A Res. 65/309, 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.*

[18] Roger Cohen, *The Happynomics of Life*, N.Y. TIMES, Mar. 13, 2011.

[19] Henry Samuel, *Nicolas Sarkozy Wants to Measure Economic Success in "Happiness,"* THE TELEGRAPH, Sept. 14, 2009.

[20] They are Joseph Stiglitz, Amartya Sen, and Daniel Kahneman. JOSEPH E. STIGLITZ, AMARTYA SEN & JEAN-PAUL FITOUSSI, REPORT BY THE COMMISSION ON THE MEASUREMENT OF ECONOMIC PERFORMANCE AND SOCIAL PROGRESS (2009); Daniel Kahneman & Robert Sugden, *Experienced Utility as a Standard of Policy Evaluation*, 32 ENVTL. & RESOURCE ECON. 161 (2005).

[21] DEREK BOK, THE POLITICS OF HAPPINESS (2010). In legal scholarship, Adam Kolber has done pioneering work in elucidating the value that experiential measures can bring to the law. *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.

In order to make this a reality, however, a methodology must be created for using the data from hedonic psychology to evaluate prospective laws.[22] 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.[23] We then explain how the flaws of CBA, some of which have long been recognized and others of which we expose here, would be corrected by WBA.[24]

Policymaking and social science are not like mathematics, and thus any tool of theirs will have imperfections. WBA is no exception, as we acknowledge in the ensuing parts. However, WBA cures most of the largest problems of CBA without introducing any new problems of comparable impact. It is capable of implementation right away, and even in its infancy can be expected to produce more accurate analyses than the ones CBA now produces after three decades of refinement. We demonstrate this point directly by using WBA to reengineer an actual CBA that was used to assess a clean-water regulation.[25]

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 CBA's shortcomings and provide a more accurate accounting of a prospective policy's effects on the quality of life.

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[22] *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. 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.

[23] *Infra* Part II.

[24] *Infra* Parts III, IV, V.

[25] *Infra* Part II.C.

I. HOW COST-BENEFIT ANALYSIS WORKS

How do elected officials and regulators decide what laws to make? They are surely influenced by political considerations,[26] 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.[27] Accordingly, regulators and elected officials and their staffs devote substantial time to identifying which policies are worth undertaking.[28]

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.[29] 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.[30] This view differs from those held by some economists (who view welfare as preference-satisfaction—i.e., getting what one wants) and some philosophers (who view welfare as the attainment of certain objective qualities or capabilities).[31] Importantly, however, the different conceptions of

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

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

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

[29] Adler & Posner, *supra* note 10, at 177.

[30] Bronsteen, Buccafusco & Masur, *supra* note 22, at 1590-95. We use the terms "welfare" and "well-being" interchangeably throughout this Article.

[31] *Id.* at 1601-1627.

welfare overlap in practice far more than they diverge.[32] 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 the quality of life is often difficult. In rare instances, a new policy may improve the lives of a group of people without negatively impacting others.[33] In almost every case, however, the benefits of a regulation to one group of people will come at the expense of costs borne by another group of people.[34] Policymakers thus need a tool that can tell them whether a proposed law or regulation would improve the overall quality of human life. Would it help those who benefit more than it would hurt those who are harmed?[35]

Suppose a regulation would reduce the amount of chemical pollution emitted into the waterways and in so doing 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

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[32] *Id.* at 1588, 1610, 1617. 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 most people reject this view. *Id.* at 1617-18.

[33] We know of no such Pareto-optimal regulations.

[34] 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 10, 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.

[35] 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 10, at 52-61; Bronsteen, Buccafusco & Masur, *supra* note 22, at 1589-90. Because overall well-being is one important consideration, however, both CBA and WBA are designed exclusively to measure it.

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 10 lives per year, but it would also drive up manufacturing costs substantially. 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. In order 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 the "revealed preference" study. If people have been faced with an opportunity to choose between some regulatory benefit or some amount of money in their actual lives, then 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 no revealed preferences are available, CBA uses a second method called "contingent valuation." This method involves distributing surveys that ask people how much they would be willing to pay for a benefit.

When analyzing actual regulations with tradeoffs like those of the clean-water regulation mentioned above, economists performing CBA would typically use the revealed preference method. 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 decide whether to work in risky jobs like firefighting, and the idea is as follows. A person has the choice between two jobs that are the same in every way except two: Job *A* is riskier than Job *B*, and in order to compensate for

that risk, Job *A* pays more than Job *B*. People who choose to be firefighters rather than office workers are said to have willingly accepted a low-probability risk of death in return for the benefit of higher wages. The amount of extra money that firefighters 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, 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.[36] Indeed, this is close to the actual number that economists employing CBA have produced.[37] 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.

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.[38]

B. CBA's Drawbacks Constitute Reasons To Improve, Not Abandon, the Weighing of Costs and Benefits

Despite its established position as the primary tool of agency policymaking, CBA is rife with problems. As we explain in detail in Parts III, IV, and V, the methods by which CBA generates monetary figures for regulatory effects exhibit a number of shortcomings that undermine its ability to serve as a proxy for welfare. The consequence of these limitations is that there are deep fissures between the results

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[36] Avoiding the *risk* is worth $600, but the regulators know that a certain number of people will *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 (i.e., a 1-in-1 "risk") is worth $6 million ($600 x 10,000).

[37] *E.g.*, W. Kip Viscusi, *How to Value A Life*, 32 J. ECON. & FIN. 311, 312–13 (2008); *see also, e.g.*, ENVTL. PROTECTION AGENCY, ARSENIC IN DRINKING WATER RULE: ECONOMIC ANALYSIS 5-28 (2000).

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

generated by CBA and true welfare. Accordingly, cost-benefit analysis has been subject to trenchant criticism and numerous proposals for reform.[39]

One way to understand the different approaches to regulatory analysis is to view them as four points along a spectrum. At one end is traditional CBA, and at the other end are the broadest critics of CBA, such as Frank Ackerman and Lisa Heinzerling.[40] Between those endpoints are sophisticated efforts to tweak CBA,[41] as well as WBA itself. The following Parts contrast WBA with both traditional and refined versions of CBA, but it is worth pausing briefly here to situate WBA with respect to the critics who at times seem to oppose any sort of quantitative analysis of risk.

The first thing to say on this score is that such critics acknowledge the necessity of analyzing and weighing likely outcomes: "analysis of costs and benefits . . . is an essential part of any systematic thought about public policy, and has always been involved in government decision making. Our criticism concerns the much narrower doctrine of Cost-Benefit Analysis, which calls for a specific, controversial way of expressing and thinking about costs and benefits."[42] These critics' dissatisfaction with CBA thus jibes with the project of WBA: "To say that life, health, and nature are priceless is not to say that we should spend an infinite amount of money to protect them. Rather, it is to say that translating [them] into dollars is not a fruitful way of deciding how much protection to give them."[43]

Despite those acknowledgments, though, the broadest critics of CBA at times seem to veer away from any sort of weighing or balancing approach, at least if such an approach involves some method of quantifying positive and negative outcomes.[44] The linchpin of Ackerman and Heinzerling's proposal for replacing CBA is a "holistic" approach to assessing potential policies.[45] Instead of

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[39] *E.g.*, FRANK ACKERMAN & LISA HEINZERLING, *supra* note 9; REVESZ & LIVERMORE, *supra* note 10.

[40] ACKERMAN & HEINZERLING, *supra* note 9.

[41] *E.g.*, ADLER & POSNER, *supra* note 10.

[42] ACKERMAN & HEINZERLING, *supra* note 9, at 211.

[43] *Id.* at 9.

[44] *Id.* at 234 ("[W]e must give up the idea, reassuring to many, that there is, somewhere, a precise mathematical formula waiting to solve our problems for us. In its place, we offer an attitude rather than an algorithm.").

[45] *Id.* at 210. In addition to advocating the holistic approach, Ackerman and Heinzerling make three other proposals. The first is to treat health, safety, and

analyzing the details of those policies, their overall costs and benefits would be conceived in broad terms.[46] To show how this would work, they give two examples:

> A holistic approach to the arsenic problem, for example, encourages us to ask whether it is worth the price of one or two bottles of water per person per year to ensure that everyone has tap water with the lowest possible level of arsenic. . . . For regulations to protect fish from power plants, the holistic approach makes us think about our willingness to pay a penny a day to avoid an underwater massacre.[47]

Such questions would be addressed to the public or to elected officials, rather than to regulatory agencies.[48]

It is not clear how this would work, however, in cases where the choices are not binary. Choosing the "lowest possible" level of arsenic in tap water might be desirable, but in many cases some balance must be struck between safeguarding environmental values and permitting economic activity. When choosing the level at which to cap emissions of particulate matter, for example, policymakers must seek to protect air quality without banning cars.[49] If there is a wide

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environmental regulations as moral imperatives rather than as subjects fit for zero-sum cost analysis, *id.* at 216-23; the second is to err on the side of precaution when assessing the dangers posed by potential hazards, *id.* at 223-29; and the third is to place a high value on the well-being of future generations, *id.* at 229-33. To the extent that Ackerman and Heinzerling would justify those three proposals on the ground that they are likely to increase overall well-being, those proposals could be pursued via WBA. To the extent that the proposals instead embody welfare-independent moral values, they are entirely consistent with the weak-welfarist approach to policymaking that we endorse. Bronsteen, Buccafusco & Masur, *Welfare as Happiness*, *supra* note 22, at 1589-90.

[46] ACKERMAN & HEINZERLING, *supra* note 9, at 214 ("[A]ssessment of overall impacts, not warring over minutiae, is what is needed to make a decision to 'buy' or not to 'buy' a proposed regulation.").

[47] *Id.*

[48] *Id.* at 215 ("In advocating a holistic approach to weighing costs and benefits, we have been talking about how elected representatives and the public should think about health and environmental problems . . . . Once a higher-level decision has been made, the agencies should carry it out, not reopen the debate.").

[49] *Cf.* ENVTL. PROTECTION AGENCY, POLICY ASSESSMENT FOR THE REVIEW OF THE PARTICULATE MATTER NATIONAL AMBIENT AIR QUALITY STANDARDS (2011), *available at*

range of options, each with a different cost, then how would that range be presented to the public in a holistic way? In such cases, it is also not clear what role regulators are envisioned to play.[50]

Whoever makes such choices, they will benefit from evidence of the likely effects of each option on human well-being. WBA supplies that evidence, and it does so in a way consistent with the principles that Ackerman and Heinzerling emphasize. It complies with their central decree that benefits must not be expressed in monetary units.[51] And although it relies on survey data, what is being surveyed is well-being itself, not willingness-to-pay, to which CBA's critics object on specific grounds that are inapplicable to WBA.[52] Unlike the "opaque technicalities that characterize cost-benefit studies in practice,"[53] WBA yields direct and straightforward conclusions about a policy's likely effects on the quality of people's lives.

Although the external critics of CBA caution their readers to "remember[] how many essential values are not illuminated by . . . narrow-beam numerical spotlights," they acknowledge in the same sentence that "[i]t is of course helpful, when evaluating broad public policies, to quantify everything that is measurable."[54] The breakthroughs of hedonic psychology have permitted measurement of well-being itself, and using that evidence to inform policymaking would be a major step forward.

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Over the past few decades, cost-benefit analysis has become one of the dominant tools of American policy and regulatory analysis. Its goal, in comparing the costs and benefits of a regulation, is to provide a rough proxy for the regulation's overall effects on the

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http://www.epa.gov/ttn/naaqs/standards/pm/data/20110419pmpafinal.pdf.

[50] Ackerman and Heinzerling still conceive an important role for regulators in their vision of policymaking, *supra* note 9, at 215 ("Most important decisions about health and the environment are filtered through administrative agencies like EPA before they can take effect; general instructions from Congress are refined and operationalized by the agencies."), but they do not specify in their examples how the respective roles of elected officials and agencies would actually play out.

[51] *See id.* at 212.

[52] *See id.* at 153-178, 213.

[53] *Id*. at 215.

[54] *Id*. at 212.

quality of human life.[55] Although it has been criticized along a number of different dimensions, CBA has made important contributions to our understanding of the tradeoffs involved in complex administrative measures. During the period of its development and maturation, CBA has become more sophisticated and rigorous.[56] Despite these advances, however, significant and intractable shortcomings remain. As we explain throughout this Article, CBA involves a number of limitations that undermine its value as a proxy for welfare. WBA cures many of these problems, and it offers the possibility of levels of analytical accuracy beyond what even the best versions of CBA could achieve. We thus propose replacing CBA with WBA as the primary welfarist decision tool. Part II outlines our proposal, including its analytic method and the data upon which it relies.

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.[57] That is no longer 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. 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.

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[55] *See* Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 194-95 (1999) (suggesting that CBA is the "decision procedure best justified in light of overall well-being").

[56] On the history of CBA, see REVESZ & LIVERMORE, *supra* note 10, at 9-45.

[57] *See, e.g.*, Adler & Posner, *supra* note 10.

A. WBA: The Basic Framework

WBA directly analyzes the effects of regulations on people's quality of life. To do that, it relies on data from hedonic psychology that measures 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.[58] 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, while the following section discusses the data upon which WBA relies. The final section of Part I 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 non-market costs and benefits. For CBA, market effects are relatively easy to handle, because computing their monetary value is straightforward. Non-market effects, however, are more difficult for CBA. As we will describe in greater detail below, CBA must apply a variety of problematic tools to monetize the value of 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

[58] *See* Daniel Kahneman et al., *Preface*, *in* WELL-BEING: THE FOUNDATIONS OF HEDONIC PSYCHOLOGY (Daniel Kahneman et al., eds. 1999) [hereinafter WELL-BEING].

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.[59] They are, in some respects, similar to the quality-adjusted life years (QALYs) that are becoming popular in health economics (although Part IV describes the differences between the measures and the advantages of WBUs over QALYs). WBA maps a person's SWB onto a scale that runs from zero to ten, where zero indicates death and ten indicates perfect happiness (subjectively defined). Each decile of the scale is equivalent and indicates a ten percent change in the person's SWB.[60] Moreover, the scale is identical across individuals, although, of course, the kinds of things that affect different individuals' SWB may not be.[61] 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, that person has experienced 700 WBUs (7.0 WBU/year × 100 years). If an event such as unemployment 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).

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.

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[59] *Cf.* Yew-Kwang Ng, *Happiness Is Absolute, Universal, Ultimate, Unidimensional, Cardinally Measurable and Interpersonally Comparable: A Basis for the Environmentally Responsible Happy Nation Index*, Monash Univ. Dept. of Econ. Discussion Paper 16/11, *available at* http://www.buseco.monash.edu.au/eco/research/papers/2011/1611happinessabsoluteng.pdf.

[60] This implies that the scale is *intra*personally cardinal.

[61] This implies that the scale is *inter*personally cardinal.

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.[62] The benefits, however, are trickier. Establishing a market price for the value of an arm is a fraught enterprise. We discuss the many possible shortcomings of CBA's attempts to do so in Part III. 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.[63] 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. Some data suggest that unemployment has a significant effect on long-term well-being even after workers become re-employed.[64] Thus, the welfare costs of unemployment may be much greater than CBA predicts. On the other side of the ledger, 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).[65] 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.[66] This is contrary to the predictions of healthy people, who typically assume that such disabilities will be devastating and discount the possibility that they

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[62] In practice, however, CBA typically ignores the costs associated with unemployment. *Infra* Part II.C.

[63] *See infra* Part III.

[64] *See* Richard E. Lucas et al., *Unemployment Alters the Set Point for Life Satisfaction*, 15 PSYCHOL. SCI. 8 (2004). We use this merely as an example. Other hedonic data cut in a different direction, *see* Andreas Knabe et al., *Dissatisfied with Life, but Having a Good Day: Time-Use and Well-Being of the Unemployed*, 2009, *available at* http://ideas.repec.org/p/ces/ceswps/_2604.html, and in practice WBA would take all of the relevant data into account. *Cf. infra* Part II(c).

[65] For an excellent summary of the initial research on hedonic adaptation, see Shane Frederick & George Loewenstein, *Hedonic Adaptation*, *in* WELL-BEING, *supra* note 58, at 302, 311–18.

[66] *Id.*

will adapt to the loss.[67] 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.[68]

While this example suggests that the regulation may be less valuable than CBA implies, in many other circumstances WBA will point in the direction of much more stringent regulation than CBA would suggest. For most regulations, the chief benefits will involve extending human lives, and the major costs will entail higher consumer prices. In the context of WBA, loss of life constitutes the ultimate hedonic cost, whereas many studies indicate that money has a relatively small effect on well-being.[69] When money is traded off against life, therefore, WBA is likely to favor health and safety regulations far 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 securing valid and reliable data.[70] 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.[71] These techniques allow the more or

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[67] 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); Peter A. Ubel et al., *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) [hereinafter Ubel et al., *Disability and Sunshine*] ("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)).

[68] *See infra* Part III.

[69] *E.g.*, 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).

[70] *See* David Colander, *Edgeworth's Hedonimeter and the Quest to Measure Utility*, 21 J. ECON. PERSPECTIVES 215 (2007).

[71] For a review of well-being measures, see ED DIENER ET AL., WELL-BEING FOR PUBLIC POLICY 46-66 (2009).

less direct measurement of people's happiness levels, overcoming the problem that had initially driven economists to seek monetary proxies for welfare. 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.[72] "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,[73] 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?"[74] 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. 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, 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.[75] For example, on average, the death of a parent will yield the loss of 0.25

[72] *See* Daniel Kahneman et al., *Back to Bentham: Explorations of Experienced Utility*, 112 Q.J. ECON. 375, 375 (1997).

[73] *E.g.*, *infra* Part III.A.3.

[74] *See* William Pavot & Ed Diener, *Review of the Satisfaction with Life Scale*, 5 PSYCHOL. ASSESSMENT 164 (1993).

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

life satisfaction points on a scale of 1-7 for a period of time, while the loss of a spouse will typically yield the loss of 0.89 points.[76]

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.[77] 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 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 or the order in which questions are posed, among other errors.[78]

2. Experience Sampling Methods

Researchers sought to overcome the limitations of life satisfaction surveys by developing 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.[79] 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 such studies

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

[77] *See* Lucas, *Reexamining Adaptation*, *supra* note 75, at 547. Between-subjects comparisons can be a problem if the two groups (e.g., 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.*

[78] *See* Alan B. Krueger et al., *National Time Accounting: The Currency of Life*, *in* MEASURING THE SUBJECTIVE WELL-BEING OF NATIONS 30 (Alan B. Krueger ed. 2009).

[79] *Id.*

provide a much more detailed picture of how people spend their time and how their experiences affect them.

ESM studies can be expensive to run, so 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. 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.[80] Similarly, the Princeton Affect and Time Survey (PATS) asks subjects to report and evaluate their experiences from the previous day.[81] It can be distributed via telephone and incorporated into other survey devices, enabling it to reach a larger population.[82]

3. The Quality of the Data

The ability to generate data is not the same as the ability to actually measure the thing sought to be measured. 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.[83] For example, a scale that reported very similar numbers 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.[84] Meta-analyses of different well-being tools have found high levels of reliability for both

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[80] *See* Daniel Kahneman et al., *A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method*, 306 SCIENCE 1776, 1776 (2004).

[81] Krueger et al., *supra* note 78, at 34-36.

[82] *Id.* at 36.

[83] DAVID L. STREINER & GEOFFREY R. NORMAN, HEALTH MEASUREMENT SCALES: A PRACTICAL GUIDE TO THEIR DEVELOPMENT AND USE (4th ed. 2008).

[84] DIENER ET AL., *supra* note 71, at 71.

life satisfaction and experience sampling methods.[85] This is especially true of more advanced multi-item measures.[86]

Just because a measure reliably provides consistent data does not mean that it is measuring what you want it to measure.[87] The ability to *actually measure* the thing sought to be measured is called validity.[88] Although a full review of the validity of well-being measures is unnecessary here,[89] 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 above. First, despite the rather different techniques used to collect data, the various measures of well-being tend to correlate with one another.[90] Overall life satisfaction is correlated both with the amount of positive and negative affect that a person feels[91] and with her satisfaction with the domains of her life.[92] 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,[93] facial expressions,[94] and neurological data.[95]

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[85] *Id.* at 72-73. Test-retest reliability results typically range from $r = 0.55$ to $r = 0.70$. 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.

[86] *Id.* at 74.

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

[88] 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 models of assessment.").

[89] For such a review, see DIENER ET AL., *supra* note 71, at 74-93.

[90] *Id*. at 70.

[91] Michael Eid & Ed Diener, *Global judgments of subjective well-being: Situational variability and long-term stability*, 65 SOC. INDICATORS RES. 245 (2004).

[92] *See* Ulrich Schimmack, *The Structure of Subjective Well-Being*, *in* THE SCIENCE OF SUBJECTIVE WELL-BEING (Michael Eid & Randy J. Larsen eds., 2007) 115.

[93] *See* E. Sandvik et al., *Subjective Well-Being: The Convergence and Stability of Self-Report and Non-Self-Report Measures*, 61 J. PERSONALITY 317 (1993); Heidi Lepper, *Use of Other-Reports to Validate Subjective Well-Being Measures*, 44 SOC. INDICATORS RES. 367 (1998).

[94] Tiffany A. Ito & John T. Cacioppo, *The Psychophysiology of Utility Appraisals*, *in* WELL-BEING, *supra* note 57, at 479.

Well-being measures also tend to be fairly stable over time and exhibit high test-retest reliability.[96] But despite their overall stability,[97] 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.[98] 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.[99] This suggests 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.

It is worth addressing an objection that is occasionally made to the use of self-reported well-being data. Some economists worry that these survey instruments lack interpersonal cardinality because different individuals may interpret the scales differently.[100] That is, a 7.0 on one person's scale may not be the same as a 7.0 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 6.0 to 7.0 was equivalent to another person's reported change from 6.0 to 7.0.

While some limited evidence for concern about cardinality exists in certain atypical 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. In order to determine the hedonic cost of

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[95] *Id.*; T.G. Dinan, *Glucocorticoids and the Genesis of Depressive Illness: A Psychobiological Model*, 164 BRIT. J. PSYCHIATRY 365 (1994).

[96] *See* Ed Diener & Richard E. Lucas, *Personality and Subjective Well-Being*, *in* WELL-BEING, *supra* note 58, at 213, 214.

[97] *See* Sandvik, *supra* note 93.

[98] *See* Lucas et al., *supra* note 64.

[99] *See* Oswald & Powdthavee, *supra* note 76. This is in contrast to findings that people's responses to contingent valuation surveys used in CBA display considerable scope neglect, i.e., they are willing to pay the same amount of money to save 2,000, 20,000, or 200,000 endangered birds. *See infra* note 260.

[100] In fact, concerns about the interpersonal cardinality of utility pushed economists towards monetization in the first place. *See* William Nordhaus, *Measuring Real Income with Leisure and Household Production*, *in* MEASURING THE SWB OF NATIONS, *supra* note 78, at 125.

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. This randomness will wash out across large numbers of people. In many of the situations most relevant to WBA, this is virtually certain to be the case.[101]

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.[102] These studies have been used, for example, by researchers to understand the hedonic impact of no-fault divorce laws on women in different states.[103] In other circumstances, the availability of ESM studies will enable more fine-grained analyses of regulations' effects on people's lives.

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[101] 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, and in the vast majority of cases it is counterintuitive to think they would do so.

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 78, at 20. The hedonic data are interpreted with respect to individuals and converted into externally comparable numbers. While this approach does not encompass all relevant data, it nonetheless constitutes an interpersonally cardinal scale.

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

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

C. Well-Being Analysis: An Example

How feasible is well-being analysis, and how would it differ from cost-benefit analysis? In order 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. 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 below yields results that are likely more reliable than those of the cost-benefit analysis that the Environmental Protection Agency 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 of it were conducted with the resources currently available to CBA.

1. EPA Regulation of Pulp and Paper Production: A Cost-Benefit Analysis[104]

The regulation we examine was promulgated by EPA under the Clean Water Act in 1998 to curb toxic effluents from pulp and paper mills.[105] Prior to 1998, pulp, paper, and paperboard mills used a

[104] Although our examples in the Introduction and first two parts 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.

[105] 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, 40 C.F.R. pts. 63, 261 & 430 (1998). The regulation 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, *Against Feasibility*

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.[106] Pulp and paper mills then release 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 eat the fish.

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.[107] "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.[108] 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.[109]

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.[110] The EPA refused to specify

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Analysis, *supra* note 14; Jonathan S. Masur & Eric A. Posner, *Regulation, Unemployment, and Cost-Benefit Analysis*, VA. L. REV. (forthcoming 2012) (hereinafter "*Regulation & Unemployment*"). EPA simultaneously regulated airborne emissions from pulp and paper mills under the Clean Air Act, but for ease of explication we limit our examination here to the Clean Water Act portion of the regulation.

[106] EPA, *supra* note 105, at 18,541–43.

[107] *Id.* at 18,542 (noting that, in mills used to provide data for Option A, "kappa factors for softwood furnish averaged .17 and all were less than .2").

[108] *Id.* at 18,541–42.

[109] *Id.* at 18,542.

[110] EPA, *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*, ch. 8, 8 (Oct. 27, 1997), *available at* http://www.epa.gov/ost/pulppaper/jd/pulp.pdf, at 8-12 (Table 8-6) (calculating the annual monetized benefits from reduction in cancer cases). EPA also stated that the regulations would reduce risk of non-cancer illnesses but did not report monetary estimates because of inadequate data. *Id.* at 8-14. In addition, EPA estimated that the regulation would reduce deaths among Native Americans who are subsistence anglers. *Id.* at 8-15 (Table 8-8). However, it declined to include this

a single monetary value of life, instead announcing that each life saved was worth between $2.5 and $9 million.[111] Second, reducing the quantity of dioxin released into fisheries would reduce the number of "fish advisories," during which fishing must cease, and thus increase the number of days that fishing could take place.[112] Third and finally, pulp and paper mills produce sludge, which must be disposed of. Reducing the amount of dioxin and furan in the sludge will allow the mills to dispose of the sludge via cheaper means.[113]

At the same time, the regulation also imposed significant costs. Mills were forced to switch from chlorine-based chemicals to more expensive alternatives and treat their effluents before they were released into the waterways.[114] Table 1 lists the annual costs and benefits, as calculated by EPA, of all three options the agency considered in its regulation of pulp and paper.

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benefit within the analysis because of uncertainty in the data. Although this decision is probably indefensible, we adhere to it here in the interest of parallelism between our WBA and EPA's CBA.

[111] *Id.* at 8-12 (Table 8-6).

[112] *Id.* at 8-23. 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 EPA did not end up including these figures in its benefit estimate. As with the benefits described above, we adhere to EPA's decision without endorsing it. *Id.* at 8-23, 8-24, 8-26 (Table 8-12).

[113] *Id.* at 8-25.

[114] *Id.* at ch. 5.

Table 1: Annual Costs and Benefits, EPA Pulp and Paper Regulation (in millions of 1995 dollars)[115]

	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.[116]

In addition, and importantly for our analysis, 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. This reduction in demand would force mills to lay off workers. As pulp and paper production declined, suppliers and affiliated industries would also suffer and be forced to lay off workers. However, EPA did not include these lost jobs in its cost-benefit analysis. This stemmed

[115] This Table was assembled using data found at EPA, *Economic Analysis*, *supra* note 110, at 5-25 (Table 5-16), 5-28 (Table 5-18), 8-12 (Table 8-6), 8-23, 8-25, 8-45, 8-23, 8-26 (Table 8-12).

[116] 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 (Table 8-13). Of course, this begs the question as to why the EPA didn't simply regulate only under the Clean Air Act if it produced substantial net benefits while regulation under the Clean Water Act produced substantial net costs.

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.[117] 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.[118]

We calculate here 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. Based upon those numbers, which we provide below, the job loss from Option TCF would have likely been quite substantial.

[117] *See* Masur & Posner, *Regulation & Unemployment*, *supra* note 105.
[118] *Id.*

Table 2: Annual Costs and Benefits, EPA Pulp and Paper Regulation, Including Unemployment Costs (in millions of 1995 dollars)[119]

	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[120]	-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 non-chlorinated 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. This is not atypical for 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

[119] This Table was assembled using data found at EPA, *Economic Analysis*, *supra* note 110, at 5-25 (Table 5-16), 5-28 (Table 5-18), 6-15 (Table 6-4), 6-34 (Table 6-14), 6-44 (Table 6-19).

[120] This figure is based upon an estimated yearly cost of $3300 per unemployed worker. *See* Masur & Posner, *Regulation & Unemployment*, at 105.

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 section.

2. EPA's Cost-Benefit Analysis as a Well-Being Analysis

In this section we re-engineer EPA's cost-benefit analysis as a well-being analysis. In order to do so, we convert the costs and benefits of the regulation into well-being units (WBUs). Wherever possible, we make this conversion directly. That is, we translate the benefits of reduced cancer deaths directly to WBUs, rather than adopting EPA's pricing of those lives and then converting the dollars into WBUs. Here, we will use mostly life satisfaction data, though we employ moment-by-moment measures of well-being when possible. Although life satisfaction is a less accurate measure of subjective well-being than moment-by-moment measures such as ESM and DRM, psychologists and economists have thus far generated life satisfaction data in substantially greater quantities.[121] (This would surely change if WBA became a tool of actual policy analysis and was given even a fraction of the funding CBA now receives.) 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.

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 benefits will accrue to the anglers who are able to fish with fewer interruptions. Compliance costs and sludge-related benefits will be

[121] *See supra* Part II.B.

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.[122] 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 income, which in 1998 was $38,885.[123]

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 three-fold increase in income was associated with a .11 increase in WBUs.[124] (Similarly, a two-thirds decrease was associated with a .11 decrease in WBUs.[125]) That is, an individual whose income increased from $100,000 per year to $272,000 per year would gain .11 WBUs per year. If that same individual's income decreased from $100,000 to $36,700 would lose .11 WBUs. The total gain or loss is given by the following formula:

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[122] 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, since money affects welfare in a logarithmic rather than linear fashion. We anticipate that our analysis may be criticized for placing too little weight on the value of money, so we choose the number "one 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 it still has only a small one. Our calculation on this point should thus be considered an upper bound on the welfare effect of monetary costs.

[123] U.S. Census Bureau, Money Income in the United States (1998), at v, *available at* http://www2.census.gov/prod2/popscan/p60-206.pdf.

[124] Nattavudh Powdthavee & Bernard van den Berg, *Putting Different Price Tags on the Same Health Condition: Re-evaluating the Well-being Valuation Approach* (unpublished manuscript 2011), at 32 (Table 3).

[125] *Id.*

(1) Welfare loss due to income decline = .11 WBU × (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.

Cancer Cases Avoided

EPA provides 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.[126] That welfare loss is .238 WBUs per year while the person is sick.[127] 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.[128] This is obviously a rough assumption, but it is no more rough than EPA's assumption that all lives are equivalently valuable and have a median value of $5.75 million.[129] The average American has a life satisfaction of 7.4 (again, on a scale of 0.0 to 10.0).[130] When an individual dies, she loses all of the welfare that she might otherwise have experienced throughout the remaining years of her life. 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 × (.238 WBU) + 30 × 7.4 WBU = 222.48 WBUs

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[126] *Id.*

[127] *Id.*

[128] 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: 2012, at 77. 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 too much more heavily than does CBA, we "round down" to make a very conservative estimate of 30 years.

[129] *See supra* Parts III.A.1, IV.C.

[130] Ed Diener & Carol Diener, *Most People Are Happy*, 7 PSYCH. SCI. 181 (1996).

Unemployment

Unemployment is one condition about which there exists substantial hedonic data, both moment-by-moment (DRM) and life satisfaction. Interestingly, however, the life satisfaction and moment-by-moment data differ significantly. Life satisfaction studies conclude that unemployment has a significant, long-term effect on well-being.[131] Unemployed individuals suffer a loss of 0.83 WBUs per year during the time that they remain unemployed.[132] Even after finding new employment, these same individuals lose 0.34 WBUs per year during the rest of their working lives.[133] On the other hand, a study of moment-by-moment affect found that the unemployed actually had *greater* well-being than people who held jobs.[134] Though this result may seem suspect, it was supported by very particularized findings. The unemployed enjoyed any given activity less than similarly situated employed individuals. That is, they enjoyed themselves less while socializing, or playing a sport, or reading, or even doing housework.[135] However, they were able to spend much more time in comparatively enjoyable pursuits, such as socializing or playing a sport, because they did not have to work.[136] The employed naturally spent much of their days at work, which is a relatively unpleasant activity for most people, according to the hedonic data.[137] The ability to spend more time engaged in pleasurable activities more than balanced out the decreased enjoyment of each individual activity. In the aggregate, being unemployed causes an individual to *gain* 0.084 WBUs.[138]

We apply a Condorcetian approach and employ the average of the two findings here.[139] Accordingly, we estimate that the

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[131] Richard E. Lucas, *Adaptation and the Set-Point Model of Subjective Well-Being: Does Happiness Change After Major Life Events?*, 16 CURRENT DIRECTIONS IN PSYCH. SCI. 75 (2007); Lucas et al., *supra* note 64.

[132] *See* Lucas et al., *supra* note 64.

[133] *Id.*

[134] Andreas Knabe et al., *Dissatisfied with Life but Having a Good Day: Time-Use and Well-being of the Unemployed*, 120 ECON. J. 867, 878 (2010).

[135] *Id.* at 876.

[136] *Id.*

[137] *E.g.*, *id.*

[138] *Id.* at 878. The number reported in the study is actually 0.168, but it was based on a scale that ran from -10.0 to 10.0. We normalize to our 0.0 to 10.0 scale.

[139] *See generally* Adrian Vermeule, *Many-Minds Arguments in Legal Theory*, 1 J. LEGAL ANALYSIS 1 (2009) (cataloguing the benefits and risks associated with

unemployed lose 0.373 WBUs per year (the average of -0.83 and 0.084) during the time they are unemployed, and they lose 0.17 WBUs per year (the average of -0.34 and 0) during the rest of their working years after becoming reemployed. We assume that the average person who becomes unemployed as a result of this regulation is out of work for six months (and thus loses 0.373 × .5 WBUs), and that after finding a new job she works for 15 additional years. Data on these quantities is unavailable, though it could easily be collected if an agency became interested in doing so.

EPA's CBA presents only yearly costs and benefits, not total costs and benefits. The agency annualized all costs over a 30-year period.[140] However, the agency calculated total (as opposed to yearly) unemployment. Accordingly, we divide the hedonic costs of being unemployed by 30 in order 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 = ((-0.373 × .5) + (-0.17 × 15))/30 = -0.0912 WBUs

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

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decision mechanisms that incorporate multiple points of view and sources of information).

[140] EPA, *Economic Analysis*, *supra* note 110, at 4-23.

Table 3: Well-Being Analysis of EPA's Pulp and Paper Regulation[141]

	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)	-282.22	-520.94	N/A
Total welfare effect (WBUs)	67.07	-160.52	N/A

This WBA diverges from 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. 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 may appear surprising to scholars steeped in cost-benefit analysis, but it is entirely consistent with reams of evidence demonstrating that

[141] This Table was assembled using data found at EPA, *National Emissions Standards*, *supra* note 105, at 18588 & 18591, and EPA, *Economic Analysis*, *supra* note 110, at 6-34 (Table 6-14) and 8-45.

changes in wealth and income have extremely small impact on individual well-being.[142]

This is not to say that policymakers should begin ignoring the effects of their regulations on wealth. As we explain below, regulations that increase welfare at the expense of vast amounts of wealth might eventually become self-defeating and eliminate future opportunities for welfare gains.[143] This is why we would not rule out preserving CBA as a complement to WBA. But the WBA we perform here indicates 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 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

In order 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.[144] These so-called "willingness-to-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.[145] For instance,

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[142] For a review of the extensive literature, see Ed Diener and Robert Biswas-Diener, *Will Money Increase Subjective Well-being? A Literature Review and Guide to Needed Research*, 57 SOC. INDICATORS. RES. 119 (2002).

[143] *See infra* Part III.A.1.

[144] 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.").

[145] 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

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.[146] Sometimes, however, cost-benefit analysis must place prices on costs or benefits that are not traded in a robust marketplace, such as clean air.[147] In these cases, where 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.[148]

Both revealed preference studies and contingent valuation studies are fraught with difficulties and significant sources of error. These difficulties have led to unresolvable 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 alternative. Yet well-being analysis, if 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 would constitute an improvement over the flawed status quo.

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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.").

[146] *See, e.g.*, W. KIP VISCUSI, RATIONAL RISK POLICY 46-47 (1998).

[147] 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 commodities and therefore do not have market prices.").

[148] *See, e.g.*, Daniel Kahneman et al., *Stated Willingness to Pay for Public Goods: A Psychological Perspective*, 4 PSYCHOL. SCI. 310 (1993); Richard H. Pildes & Cass R. Sunstein, *Reinventing the Regulatory State*, 62 U. CHI. L. REV. 1, 80 (1995) ("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.").

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.[149] 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.[150] 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.[151] If, for example, a job with an annual death risk of 1 in 10,000 paid $100 more per year than a comparable job with no risk, 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. Accordingly, accurate calculations of the value of life are absolutely essential to CBA. In addition, revealed preference studies could conceivably 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 are fraught with potential sources of error. Those 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 herculean effort and expense; the third is likely insuperable. WBA, by contrast, offers an elegant solution to many of the most difficult of these problems.

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[149] *E.g.*, Edna T. Loehman et. al., *Willingness to Pay for Gains and Losses in Visibility and Health*, 70 LAND ECON. 476 (1994) (examining how much people would pay for improved air quality).

[150] *See* VISCUSI, *supra* note 146 at 312–13 (stating that the literature on wage-risk tradeoffs has become the basis for government policy).

[151] *E.g.*, W. Kip Viscusi, *How to Value A Life*, 32 J. ECON. & FIN. 311, 312–13 (2008); *see also, e.g.*, ENVTL. PROTECTION AGENCY, ARSENIC IN DRINKING WATER RULE: ECONOMIC ANALYSIS 5-28 (2000).

1. Informational and Computational Problems

Economists favor revealed preference studies because they focus on individuals' actual economic decisions. However, that means that these studies must rely on individuals to make accurate and informed decisions regarding their own welfare. Errors in individual decision-making 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.[152] In study after study,[153] "survey respondents displayed an utter inability to modulate their willingness to pay for increases in safety according to how much those safety increases actually would diminish the probability of harm."[154] 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.[155] 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,

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[152] Jonathan S. Masur, *Probability Thresholds*, 92 IOWA L. REV. 1293, 1331-37 (2007).

[153] M.W. Jones-Lee et al., *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 83–114 (J.A. Caswell ed., 1995); Young Sook Eom, *Pesticide Residue Risk and Food Safety Valuation: A Random Utility Approach*, 76 AM. J. AGRIC. ECON. 760, 769 (1994); 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); M.W. Jones-Lee et al., *The Value of Safety: Results of a National Sample Survey*, 95 ECON. J. 49, 65–66 (1985).

[154] Masur, *supra* note *152*, at 1335.

[155] 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.").

for example) of their job.[156] 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 some of their capacity to influence management, drivers' wages failed to keep pace with those of comparable jobs in other industries.[157] 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).[158] 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 not happened 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

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[156] Maureen Cropper, James K. Hammitt, and Lisa A. Robinson, *Valuing Mortality Risk Reductions: Progress and Challenges*, 3 ANN. REV. RESOUR. ECON. 313, 317 (2012).

[157] MICHAEL H. BELZER, SWEATSHOPS ON WHEELS: WINNERS AND LOSERS IN TRUCKING DEREGULATION 21-22 (2000); ACKERMAN & HEINZERLING, *supra* note 9, at 87.

[158] *See, e.g.*, Janusz R. Mrozek & Laura O. Taylor, *What Determines the Value of Life? A Meta-Analysis*, 21 J. OF POL'Y ANALYSIS & MGMT. 253, 266-70 (2002).

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.[159] 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-tradeoffs, 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 workplace, nor must they be able to accurately grasp what it means to face a 1/100,000 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) in order to analyze a regulation that would protect workers from contracting emphysema in the workplace. CBA would examine the wages paid to workers in industries where emphysema is a workplace hazard, and then using regression analysis 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 above. 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-

[159] Janusz R. Mrozek and Laura O. Taylor, *What Determines the Value of Life? A Meta-Analysis*, 21 J. POL'Y ANALYSIS & MGMT. 253, 254 (2002); EPA, Valuing Mortality Risk Reductions for Environmental Policy: A White Paper (Dec. 10, 2010), at 85-88. Another indication of the spread of possible results from such studies is a meta-analysis that the EPA recently performed of thirty-seven hedonic wage studies. The standard deviation of the values of life among those thirty-seven studies was $14.1 million, or approximately *twice* the value that EPA currently places on a statistical life. *Id.* at 85-88 (standard deviation calculated by author).

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.[160]

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.

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.[161] 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 tradeoff. 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

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[160] *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 (2008) (using a longitudinal study to determine the hedonic cost of disability).

[161] W. Kip Viscusi and Joseph Aldy, *The Value of a Statistical Life: A Critical View of Market Estimates Throughout the World*, 27 J. RISK & UNCERTAINTY 5, 36-43 (2003) (finding an income elasticity between 0.5 and 0.6, such that a 10% rise in income would increase WTP by 5-6%); *see also* W. Kip Viscusi, *The Heterogeneity of the Value of Statistical Life: Introduction and Overview*, 40 J. RISK & UNCERTAINTY 1 (2010) (summarizing more recent research finding that WTP values are more sensitive to income than previously thought); 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 (2010) (finding an income elasticity approaching or exceeding 1.0, such that a 10% rise in income would increase WTP by 10%+).

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.[162] Because cost-benefit analysis involves translating harms and benefits into dollars, these "wealth effects" will affect cost-benefit calculations.

a) Wage Premiums and Other Revealed Preferences

Wealth effects play a large and undeniable role in wage premium studies, yet CBA ignores those effects. By focusing only on the wage premium of people in risky jobs, CBA impermissibly washes out the different values that would come from differently situated people. More fundamentally, the fact that rich people 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 individuals' own assessments of their well-being.

Yet the problem of wealth effects for revealed preference studies and CBA is even more general. In order 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 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.[163] 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

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[162] The reason is the declining marginal value of money. *See, e.g.*, 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."); 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.").

[163] 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).

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 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. (A waste storage facility might fit this description.) 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, while 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 x $50,000 = $25 million) than the 1000 poor people (1000 x $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 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 decision-maker 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.[164]

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. 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.

b) Wealth and Welfare

WBA also has a tremendous advantage over CBA when evaluating projects that increase wealth directly: it will be able to measure the actual welfare effects of those changes in wealth. This may seem counter-intuitive; after all, CBA is based upon counting and comparing different quantities of money. But the gap between money and well-being that only WBA recognizes speaks to one of the fundamental drawbacks of CBA and its limitations as a decision tool. This issue is not directly related to revealed preference studies or even willingness-to-pay more generally, but it is central enough to be worth noting here.

Consider a project that increases the income of a group of individuals $1000 per person.[165] Imagine that this project can be

[164] 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.

[165] A tax credit is the most obvious example of such a project, but there are many others that would fit this description. For instance, substantial spending on

directed to benefit either wealthy or poorer individuals. The project will obviously improve welfare to a much greater degree if it is directed to benefit the poorer population, again because of the declining marginal value of money—$1000 means more to someone making $30,000 than to someone making $300,000.[166] WBA will register and account for this fact because it tracks self-reports of actual well-being. The project that benefits the poor community will "score higher" in a properly conducted WBA.

CBA, on the other hand, will rate the project identically irrespective of whether it is directed to benefit poorer or wealthier individuals. In a CBA, money is money: $1000 in the hands of a rich person has the same value as $1000 in the hands of a poor person. CBA will thus underrate the welfare benefits of projects that increase the wealth of poorer individuals and overrate the welfare benefits of projects that increase the wealth of richer individuals. Just as wealth effects can cause CBA to misestimate the welfare effects of non-monetary benefits, they can similarly cause CBA to misestimate the welfare effects of monetary benefits. This bespeaks the limitations of CBA as a welfarist decision procedure.[167] Where wealth and welfare do not align, CBA will lead to erroneous results.

The point can be made even more starkly by imagining a project that takes $1000 from a poor person but provides $1100 to a wealthy person. It will pass a cost-benefit test simply because $1100 is greater than $1000. Yet such a project would almost certainly be welfare-diminishing; $1000 is likely worth far more to a poor person than $1100 is to a wealthy person. WBA would reject it, and rightly so, on precisely those grounds. By eliminating the need to translate welfare into dollars and instead measuring welfare more generally, WBA avoids the distortions that wealth effects can generate.[168]

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transportation infrastructure could lower the costs of an individual's yearly commute to work by hundreds or even thousands of dollars. An agency might be faced with a decision whether to invest transportation dollars in building a) a new subway line from downtown Chicago to the South Side of the city, in order to serve the lower-income people who live in that neighborhood; or b) a new high-speed rail line from Midtown Manhattan to Greenwich, Connecticut in order to serve the hedge fund managers who live in one location and work in the other.

[166] *See supra* note 162 and sources cited therein.

[167] *See* Adler & Posner, *supra* note 10, at 194.

[168] This is related to a point often made by both proponents and critics of CBA, namely that CBA aims to maximize efficiency while ignoring distributional considerations. *See, e.g.*, Amy Sinden, *In Defense of Absolutes: Combating the Politics of Power in Environmental Law*, 90 IOWA L. REV. 1405, 1415 (2005);

Despite the obvious force of this criticism, defenders of CBA have a rejoinder. They argue that making decisions based upon CBA will lead to outcomes that are Kaldor-Hicks efficient.[169] 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."[170] Or, put another way, a project is Kaldor-Hicks efficient if it were possible to make a transfer of wealth that would leave all parties better off than before the project was implemented.[171] For instance, in the example above, the government could implement the project, and then, using the tax system, transfer $1050 from the rich individual to the poorer individual, leaving each better off by $50 than before the project was begun.

Yet the strength of this rejoinder rests upon an extremely tenuous assumption: that the transfer will actually occur. Absent such a transfer, a project that is Kaldor-Hicks efficient could well lead to a decrease in welfare, as we have shown. This is why even some of CBA's most eloquent defenders have acknowledged that "Kaldor-Hicks efficiency has zero moral relevance."[172] 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

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Nicholas Kaldor, *Welfare Propositions of Economics and Interpersonal Comparisons of Utility*, 49 ECON. J. 549, 550-51 (1939); Adler & Posner, *supra* note 10, at 186 ("The purpose of CBA, as typically understood, is to separate out the distributional issue and isolate the efficiency issue, so that the agency will evaluate projects solely on the basis of their efficiency."). There is an important ambiguity within this statement that frequently leads to confusion. Some scholars imply that CBA focuses purely on maximizing overall utility—which, for our purposes, is equivalent to welfare—without regard to which individuals are benefitting from increased utility. *See, e.g.*, Sinden, *supra*, at 1415 ("Note that welfare economics single-mindedly pursues the goal of maximizing overall social utility and takes no position as to the distribution of utility or wealth."). This gives CBA too much credit, for as we have shown there can be projects that pass a cost-benefit test but actually decrease welfare. Other scholars, particularly economists who favor CBA, understand correctly that it is directed to maximizing wealth (or, equivalently, efficiency). *See, e.g.*, Adler & Posner, *supra* note 10, at 186. This is accurate, but as we have said it exposes the limitations of CBA as a welfarist decision procedure.

[169] *See, e.g.*, ANTHONY E. BOARDMAN ET AL., COST-BENEFIT ANALYSIS: CONCEPTS AND PRACTICE 53 (1996); E.J. MISHAN, COST-BENEFIT ANALYSIS 390 (1976).

[170] Sinden, *supra* note 168, at 1415.

[171] *See, e.g.*, BOARDMAN ET AL., *supra* note 169, at 53.

[172] Matthew Adler & Eric A. Posner, *Happiness Research and Cost-Benefit Analysis*, 37 J. Legal Stud. S253, S65 (2008).

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).[173]

CBA's defenders might offer one final related argument. While CBA will occasionally support projects that diminish welfare, WBA will equally favor projects that diminish wealth. For instance, 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 CBA would lead to a diminution in national (or worldwide) wealth, with long-term negative consequences.[174] 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.[175]

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 for this reason that we do not advocate entirely discarding CBA in favor of WBA. Both methodologies provide useful information, and agencies should employ both of them. A project that barely passes a CBA test and drastically fails a WBA test is almost certainly a mistake, but a project that barely passes a WBA test and drastically fails a CBA test is likely undesirable as well. Needless to say, we favor placing greater weight on well-being analysis for the

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[173] *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); *cf.* Visualizing Economics, Share of GDP for Bottom 99th, 95th, and 90th, *available at* http://visualecon.wpengine.netdna-cdn.com/wp-content/uploads/shareofgdp.gif (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).

[174] We thank Michael Livermore for suggesting this point to us.

[175] This amounts to an argument that WBA may be path-dependent. *Cf.* Jonathan S. Masur & Eric A. Posner, *Against Feasibility Analysis*, *supra* note 14 (arguing that CBA is not similarly path dependent, with the exception of projects and regulations that cause substantial unemployment).

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.

3. Affective Forecasting Errors

a) Practical Difficulties

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.[176] No practitioner of CBA has come close to implementing these types of solutions, though they remain theoretically possible.

However, revealed preference studies suffer in addition from a significant incurable flaw, one that WBA does not share. The flaw is that they rely upon affective forecasting: predicting how an individual will feel about an event or a condition before it happens. This is an activity that individuals often struggle greatly with. 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 air quality has been improved. In theory, then, home prices in the affected area will depend upon how much both current homeowners[177] and prospective purchasers value the improved air quality.[178] 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 state; and the prospective homeowner must estimate how valuable the improved air will be to her in the future.

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

[177] Jennifer Gerarda Brown, *The Role of Hope in Negotiation*, 44 UCLA L. REV. 1661, 1666 (1997).

[178] Paul Boudreaux, *An Individual Preference Approach to Suburban Racial Desegregation*, 27 FORDHAM URB. L.J. 533, 547 (1999).

Study after psychological study has shown that both of these exercises are fraught with error. Humans are notoriously bad at affective forecasting.[179] And they have surprising difficulty even *remembering* how they felt about an event or condition long after it has passed.[180] Although people usually do a good job of anticipating the valence of life events (i.e., 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.[181] 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 some 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.[182]

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[179] *See* Timothy D. Wilson & Daniel T. Gilbert, *Affective Forecasting: Knowing What to Want*, 14 CURRENT DIRECTIONS PSYCHOL. SCI. 131, 131 (2005) ("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."); 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).

[180] *See* Dylan M. Smith et al., *Misremembering Colostomies? Former Patients Give Lower Utility Ratings Than Do Current Patients*, 25 HEALTH PSYCHOL. 688, 691 (2006) (describing difficulties with remembering affective states).

[181] Wilson & Gilbert, *supra* note 179, at 131.

[182] *See* Matthew D. Adler, *Fear Assessment: Cost-Benefit Analysis and the Pricing of Fear and Anxiety*, 79 CHI.-KENT L. REV. 977, 1024 (2004); Cass R. Sunstein, *The Arithmetic of Arsenic*, 90 GEO. L. REV. 2255, 2268–75 (2002) (explaining how the EPA developed its arsenic regulations under the Clinton

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.[183] Studies used to determine the value of a statistical life fare little better; how can an individual reliably estimate the value of his or her own life or what it would be like to lose it? (We explain other problems with value-of-life calculations in Part IV below.)

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.[184] 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. 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

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administration); Office of Info. and Regulatory Affairs, Office of Mgmt. & Budget, 2011 Report to Congress on the Benefits and Costs of Federal Regulation and Underfunded Mandates on State, Local, and Tribal Entities, 18 (2011) (stating that OSHA developed its rule on occupational exposure to hexavalent chromium using $7 million value of life).

[183] *See* Jonathan S. Masur & Eric A. Posner, *Against Feasibility Analysis*, *supra* note 14 (describing a regulation in which the agency ignores certain health costs for lack of data); Office of Safety and Health Administration, Occupational Exposure to Hexavalent Chromium, 71 Fed. Reg. 10100, 10307 (2006), codified at 29 CFR § § 1910, 1915, 1917, 1918, 1929 (ignoring these risks).

[184] *See*, *e.g.*, Powdthavee & Berg, *supra* note 124 (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 & van den Berg rely on those types of sources. *See id.* at 9.

the future and past that revealed preference studies demand.[185] At a practical level, well-being analysis thus offers significant advantages over revealed preference studies.

b) Philosophical Divergence

The intractable practical problem presented by affective forecasting error is by itself a powerful reason to prefer WBA to CBA. But beyond even this important pragmatic concern, CBA's difficulties with affective forecasting go to the heart of the philosophical difference between CBA and WBA. Consider the wage studies that CBA uses to price lives. Even if the wage premium reflects the actual guess people would make as to whether the money or the risk-avoidance would give them more welfare, that guess may very well be mistaken. The real questions are these: how much would the money improve someone's enjoyment of life?; how much enjoyment of life would someone lose by dying younger than they otherwise would have died?; and how likely is it that a given regulation would save the person from that earlier death?

The point is well illustrated by a famous CBA study by Kip Viscusi showing that cigarette smoking produces greater benefits than costs because it kills people before they reach the age at which the cost of their care would have become a drain on society.[186] Another CBA study reached the same conclusion with respect to the Czech Republic.[187]

Why does Viscusi's study reach a conclusion so far out of line with most people's intuitions? The reason is that it under-counts the significance of people's deaths by assuming that their choice to smoke was in their own best interests.[188] Viscusi carefully analyzes the possibility that people are uninformed about the dangers or that they

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[185] *See supra* Part II.B.

[186] W. Kip Viscusi, *Cigarette Taxation and the Social Consequences of Smoking*, Nat'l Bureau of Econ. Res. Working Paper No. 4891 (1994). Other scholars have ridiculed Viscusi's conclusion that "'cigarette smoking should be subsidized rather than taxed.'" ACKERMAN & HEINZERLING, *supra* note 9, at 72 (quoting Viscusi, *supra*, at 33).

[187] Arthur D. Little International, Inc., *Public Finance Balance of Smoking in the Czech Republic*, *available at* http://hspm.sph.sc.edu/courses/Econ/Classes/cbacea/czechsmokingcost.html.

[188] Viscusi, *supra* note 186, at 19-29.

are unable to act on their preferences due to physical addiction.[189] But he rejects those possibilities, citing evidence of the elasticity of demand for cigarettes[190] and the survey evidence of people's knowledge of the risks.[191] For Viscusi, if people are choosing to smoke despite knowing that it is dangerous, then that must be because smoking and dying younger is better for those people than not smoking and living longer.

This approach cannot be dismissed as the mere product of bias or motivated reasoning.[192] Whatever Viscusi's goals, his methodology is grounded in the bedrock principle of CBA and of welfare economics more generally: people do what is best for them.[193] If there is something wrong with his conclusions, it is not because he misused CBA but because he used it. The problem with the study, and the reason it reaches an unacceptable conclusion, is that preference-satisfaction is not the same as welfare.

Suppose we could run the life of a person, Jill, on two parallel tracks. On both tracks, Jill would choose to smoke if she could, and she does so on track one. But on track two, cigarettes are unavailable, so she cannot use them. On track one, Jill dies young, whereas on track two, she lives a long and healthy life.[194] Her aggregate happiness, let us stipulate, is far greater on track two than on track one: this is the essential fact for WBA, and a fact that CBA deems irrelevant because it equates her choices with her well-being. We believe it is difficult to deny that Jill had greater welfare on track two. And it is no mystery how she could have made choices contrary to her interests on track one: the past several decades of scholarship have

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[189] *Id.*

[190] *Id.* at 20-21.

[191] *Id.* at 23-27.

[192] *Contra* ACKERMAN & HEINZERLING, *supra* note 9, at 41-42 (noting that Viscusi and other regulatory critics have "institutional homes" that are funded by "a Who's Who of American industry"). Along these same lines, the study of smoking in the Czech Republic, *supra* note 187, was commissioned by Philip Morris.

[193] *See, e.g.*, J.R. Hicks, *The Foundations of Welfare Economics*, 49 ECON. J. 696, 698 (1939) ("We assume each individual . . . to have a certain scale of preferences, and to regulate his activities in such a way as best to satisfy those preferences.").

[194] At least in theory, on track two Jill may have lost some of the value she derived on track one from smoking cigarettes—i.e., if smoking is pleasurable for her—but few would dispute that this value is outweighed by the value of living far longer and experiencing countless more moments of happiness from other sources.

been directed at demonstrating as much.[195] This is affective forecasting error writ large.

Thus CBA, which is linked inextricably with a preference-satisfaction conception of well-being,[196] cannot account for the fact that people often make bad choices even if they are not rendered helpless by addiction or by ignorance of relevant information. This weakness of CBA is a chief strength of WBA, because WBA connects welfare not with choices but with outcomes: whether people actually feel better and enjoy their lives more as a result of a policy decision. As we explained exhaustively in an earlier article, the quality of Jill's experience of life better captures the concept of her well-being than does the degree to which her preferences are satisfied.[197]

B. Contingent Valuations

Revealed preference studies are widely considered the best methodology for pricing costs and benefits. 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.[198] 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?

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[195] *E.g.*, Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998); Daniel Kahneman & Amos Tversky, *Choices, Values, and Frames*, 39 AM. PSYCHOLOGIST 341, 344 (1984); *supra* Part III.A.3.a.

[196] *See* ADLER & POSNER, *supra* note 10; Bronsteen, Buccafusco & Masur, *Welfare as Happiness*, *supra* note 22, at 1627-28.

[197] Bronsteen, Buccafusco & Masur, *Welfare as Happiness*, *supra* note 22 at 1616-27.

[198] 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.").

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.[199]) 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.[200] 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.

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.[201] 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.[202] The sections 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 around 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

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[199] *See, e.g.*, Matthew D. Adler & Eric A. Posner, *Implementing Cost-Benefit Analysis When Preferences Are Distorted*, 29 J. LEGAL STUD. 1105, 1118 (2000).

[200] *See supra* Section III.A.2; Malani, *supra* note 163.

[201] *See supra* Section III.A.1.

[202] *See* John M. Heyde, Comment, *Is Contingent Valuation Worth the Trouble?*, 62 U. CHI. L. REV. 331, 343 (1995) (summarizing criticisms of contingent valuation); Ackerman & Heinzerling, *supra* note 147, at 1558.

anything, which renders their speculation less trustworthy.[203] Subjects are rarely subject to any 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.[204] Subjects are asked 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.[205] This implicates all of the insurmountable problems related to affective forecasting that we described in the preceding section.[206] 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.[207] 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.[208]

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 1/1000 mortality risk, they should be willing to pay $5000 to eliminate a 5/1000 risk.[209] 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.[210] For

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[203] Frank B. Cross, *Natural Resource Damage Valuation*, 42 VAND. L. REV. 269, 317 (1989) ("Because people have little experience placing monetary value on unpriced natural resources, survey results may be hypothetical and inaccurate.").

[204] *See* Heyde, *supra* note 202, at 345-48.

[205] *See id.*

[206] *See supra* Section III.A.1.

[207] *See* Peter A. Diamond & Jerry A. Hausman, *Contingent Valuation: Is Some Number Better than No Number?*, 8 J. ECON. PERSP. 45, 49 (1994) (discussing the recurrent problems with contingent valuation surveys and providing an overview of alternative explanations for the responses given in willingness-to-pay questions).

[208] EPA, *supra* note 105, at 82-83. The EPA also conducted a meta-analysis of forty contingent valuation surveys of the value of life. The standard deviation of the value of life among those forty surveys was over $3 million. *Id.* (standard deviation calculated by author).

[209] *See* Cropper et al., *supra* note 156, at 327.

[210] *See id.* (surveying the literature).

instance, in one study respondents were only willing to pay 1.6 times as much to reduce a 5/1000 risk as they were to reduce a 1/1000 risk.[211] Many contingent valuation studies do not even include this type of validity test. In one recent meta-analysis of forty studies contingent valuation studies, only 50% of them incorporated a test for validity.[212] Of those that did include such a test, only 15% of the studies "passed" the test, in the sense that WTP was "nearly proportional to the risk reduction."[213] 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 consistently reliable and valid answers.[214] For instance, in order 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

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[211] Anna Alberini et al., *Does the Value of a Statistical Life Vary With Age and Health Status? Evidence From the US and Canada*, 48 J. ENVIRON. ECON. MANAG. 769 (2004).

[212] Cropper et al., *supra* note 156, at 328 (citing EPA, *supra* note 105).

[213] *Id.*

[214] ED DIENER ET AL., *supra* note 71, at 71-73.

Part II.[215] Yet even where 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 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.[216]

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 described in the section on revealed preference studies.[217] 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, while

[215] *See supra* Part II; *see also* Oswald & Powdthavee, *supra* note 76, at S232 (providing an example of sophisticated multivariate regression being used to isolate the effect of one factor on happiness).

[216] 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* Section III.B.2, and thus even this approach might well be superior to standard contingent valuation studies.

[217] *See supra* Section III.A.2.

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.[218]

Contingent valuation surveys do offer one additional mechanism for combating wealth effects. Unlike revealed preference studies, contingent valuation surveys can average WTP values across an entire population.[219] For instance, in order to determine the value of clean air to the people of California, a California agency might survey a representative cross-section of California citizens at all levels of income and wealth. The resulting value would represent the average willingness of all Californians to pay for clean air. This option is typically unavailable in revealed preference studies because it is rare that a true cross-section of the population purchases the same good in the same marketplace. For instance, wealthy people generally do not take jobs that involve a risk of death. Accordingly, essentially all wage studies involve only working-class respondents.

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 Los Angeleno. Consequently, a 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

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[218] *See supra* Section III.B.1.

[219] Ackerman & Heinzerling, *supra* note 147, at 1558 ("Researchers ask a cross section of the affected population how much they would be willing to pay to preserve or protect something that can't be bought in a store.").

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 above, 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 non-monetary goods. To be certain, WBA relies 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.[220] 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.[221] This is a decisive problem because the pricing of non-monetary goods is essential—even central—to CBA. Nearly every governmental regulation or project will produce some non-monetary benefits and costs, and in many cases the non-monetary 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 described 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 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, in order to evaluate a regulation that reduces the risk of death from some workplace safety hazard, WBA would aggregate the positive experiences that would be

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[220] *See supra* Part II.B.

[221] CBA's less common alternative for valuing life, contingent-valuation surveys, is inferior to WBA on grounds we discuss in Part III.

lost if an individual were to die early[222] 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 us with a perfect hedonimeter.[223] Moreover, it 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 dwarfed by those of CBA, which uses proxies such as the wage premium that are far more removed from actual well-being.[224]

IV. WBA MEASURES THE VALUE OF LIVES WITH GREATER NUANCE AND ACCURACY THAN DOES CBA

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.[225] 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.

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[222] 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 in order to determine how much positive life experience her early death deprived her of.

[223] *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); Colander, *supra* note 70, at 216–19.

[224] *Cf.* Bronsteen, Buccafusco & Masur, *Welfare as Happiness*, *supra* note 22, at 1630-32, 1636.

[225] Some may find it distasteful to place a value on saving a life, but where policy choices must be made and tradeoffs 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.

For CBA, every death is counted as equivalent to every other death.[226] A slow, painful death is the same as a quick death in one's sleep. The deaths caused by a terrorist attack are the same as those that occur in skiing accidents. And the death of a 12-year-old is the same as that of a 90-year-old.[227] Moreover, CBA counts all lives equivalently. A life with a debilitating but non-fatal disease counts as much as a life with perfect health. The problem with all of these equivalencies is that they affect overall welfare differently, 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 life-saving regulations, it measures the "benefit" side of the ledger more accurately than does CBA.

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.[228] This approach, which differentiates among risks only in the quantitative terms of their likelihood and magnitude, is widely favored by proponents of CBA.[229] Indeed, those proponents treat this approach as

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

[227] 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 eighty 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.

[228] ACKERMAN & HEINZERLING, *supra* note 9, at 130.

[229] STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION 61-63 (1993); Timur Kuran & Cass Sunstein, *Availability Cascades and Risk Regulation*, 51 STAN. L. REV. 683, 753 (1999); John D. Graham, *Making Sense of Risk: An Agenda for Congress*, *in* ROBERT W. HAHN ED., RISKS,

a strength precisely because it elevates true dangerousness over public misperceptions thereof.[230]

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.[231] 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.[232] 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 number of people (about 3,000) who died on September 11 is dwarfed by the number who die from many other causes that are potential subjects of regulation.[233] 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.[234] For critics, this demonstrates CBA's inadequacy.[235]

It seems very likely 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.[236] Rather than focusing only on the likelihood and magnitude of harm, they also consider the nature of the risk.[237] "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,"[238] whereas "a hazard that is familiar, controllable, voluntary, equitable,

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COSTS, AND LIVES SAVED 183 (1996); Neil D. Weinstein, *Optimistic Biases About Personal Risks*, 245 SCIENCE 1232, 1232 (1989).

[230] *Supra* note 229.

[231] ACKERMAN & HEINZERLING, *supra* note 9, at 123-52.

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

[233] ACKERMAN & HEINZERLING, *supra* note 9, at 123-24.

[234] Hahn, *supra* note 232, at 54.

[235] ACKERMAN & HEINZERLING, *supra* note 9, at 123-24, 136-38.

[236] Paul Slovic, *The Perception of Risk*, 236 SCIENCE 280, 282 (1987).

[237] *Id.*

[238] ACKERMAN & HEINZERLING, *supra* note 9, at 130.

dangerous only to the present generation, reversible, natural, and/or diffusely harmful is unlikely to generate much concern in the populace."[239] 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.[240]

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 the risk—affect their well-being.[241] "Prolonged exposure to dreaded risks frequently leads to deep and widespread anxiety, depression, and distrust."[242] In cataloging these effects, one scholar has noted the anger, confusion, and fear produced by the risks,[243] as well as their deleterious effects on couples[244] and children.[245] Another scholar has written at length bout the "trauma" imposed by dreaded risks.[246] Yet another scholar focuses on the breakdown of trust that those risks tend to cause.[247]

These tangible effects on people clearly must be counted by any tool that aims to measure well-being. Indeed, even the CBA study by Hahn that argued against airplane anti-terrorism measures acknowledged the possibility that people might "benefit psychologically" from such measures.[248] 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.[249]

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[239] *Id.*

[240] Slovic, *supra* note 236, at 285.

[241] Lisa Heinzerling, *Environmental Law and the Present Future*, 87 GEO. L.J. 2025, 2036-37 (1999).

[242] ACKERMAN & HEINZERLING, *supra* note 9, at 131.

[243] MICHAEL EDELSTEIN, CONTAMINATED COMMUNITIES: THE SOCIAL AND PSYCHOLOGICAL IMPACTS OF RESIDENTIAL TOXIC EXPOSURE 44-46 (1988).

[244] *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").

[245] *Id.* at 98-105.

[246] KAI ERIKSON, A NEW SPECIES OF TROUBLE: EXPLORATIONS IN DISASTER, TRAUMA AND COMMUNITY 226-42 (1994).

[247] Paul Slovic, *Perceived Risk, Trust, and Democracy*, 13 RISK ANALYSIS 675, 677-80 (1993).

[248] Hahn, *supra* note 232, at 54.

[249] *Id.*

In stark 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 "natural"[250] 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,[251] and this weakness of CBA reveals one of WBA's greatest 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[252] and contrast two different sets of "circumstances preceding death"[253]—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: (*i*) the person is better off in the second scenario; (*ii*) the reason for this is that she feels better

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[250] ACKERMAN & HEINZERLING, *supra* note 9, at 130.

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

[252] 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.C.

[253] ACKERMAN & HEINZERLING, *supra* note 9, at 71.

in the second scenario; (*iii*) 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 (*iv*) 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 far less reliable and more indirect than those of WBA.

B. Quantifying and Counting Existence Benefits

The primary focus of this Part is CBA's limitations in analyzing measures that save human life. But it is worth taking a brief detour to point out the equally severe flaws in CBA's approach to quantifying the benefits of measures that save the lives of non-human animals. When an environmental regulation would save animals, one category of benefit created is the use that people would get from those animals. CBA can attach prices to the amount that people "use" whales when they pay for tours designed to watch them,[254] or to the value a fisherman gets from having fish available for him to catch and sell.[255] But there is overwhelming evidence that people want government to spend money to save animals for reasons that relate to those animals' existence rather than just to the way in which people will use them.[256]

CBA has severe problems in accounting for such existence benefits. If it counts them at all,[257] it must rely on contingent-

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[254] *See* ERICH HOYT, WHALE WATCHING 2001: WORLDWIDE TOURISM NUMBERS, EXPENDITURES, AND EXPANDING SOCIOECONOMIC BENEFITS 7, *available at* http://www.cetaceanhabitat.org/pdf_bin/hoyt_ww_2001_report.pdf.

[255] National Pollutant Discharge Elimination System—Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 67 Fed. Reg. 17,122, 17,149 (Apr. 9, 2002) (to be codified at 40 C.F.R. pt. 9).

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

[257] Sometimes it does not count them at all. ACKERMAN & HEINZERLING, *supra* note 9, at 172 ("What is the value of the natural capital, the [fish] that would have gotten away? Zero, according to EPA's cost-benefit analysis (or perhaps according to OMB's marching orders to the agency)."). This is clearly at odds with CBA's own preference-satisfaction theory of well-being, because people express strong preferences for saving animals' lives.

valuation surveys to assess the amount of money people are willing to spend in order to save these animals, or the amount people would need to be paid in order to allow the animals to die. But in addition to the other problems associated with such surveys,[258] they fare particularly poorly in the context of existence benefits. For one thing, people often resist responding to the survey questions due to an inability or unwillingness to assign monetary prices to animals' lives.[259] Simply ignoring the non-responders, as CBA does, seems very likely to lead to results skewed downward from the actual average preference for how those lives should be valued. Moreover, even the responders are forced into a minefield of cognitive limitations. A famous study indicates that people would be willing to pay similar amounts to prevent the deaths of, respectively, 2,000, 20,000, or 200,000 migratory birds – a phenomenon known as "scope neglect."[260] Failing to count people's preference for avoiding animal deaths is inconsistent with CBA's preference-satisfaction model,[261] but CBA is ill-equipped to measure and incorporate those preferences.

Ackerman and Heinzerling devote a full chapter of their book to existence benefits,[262] and their primary objection to CBA on this score is that it fails to account for the moral dimension of people's preferences.[263] Indeed, to the extent that CBA is solely concerned with human welfare and defines welfare so as to exclude preferences for things outside of one's direct experience,[264] it does not incorporate existence benefits. That said, a refined version of the theory on which CBA rests could be aimed at measuring human welfare while acknowledging that its results must be weighed against welfare-unrelated values. Such an approach, dubbed "weak welfarism" and

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[258] *See* Part III.B, *supra*.

[259] Judy Clark et al., *"I Struggled with This Money Business": Respondents' Perspectives on Contingent Valuation*, 33 ECOLOGICAL ECONOMICS 45 (2000); *see also* ACKERMAN & HEINZERLING, *supra* note 9, at 164.

[260] WILLIAM H. DESVOUGES ET AL., MEASURING NON-USE DAMAGES USING CONTINGENT VALUATION: AN EXPERIMENTAL EVALUATION OF ACCURACY 66 (1992).

[261] *See, e.g.*, Adler & Posner, *supra* note 10, at 190 ("Modern economists hold that utility refers to the extent to which a person satisfies his or her (unrestricted) preferences.").

[262] ACKERMAN & HEINZERLING, *supra* note 9, at 153-78.

[263] *E.g.*, *id.* at 162.

[264] *See* ADLER & POSNER, *supra* note 10, at 34 (advocating for excluding remote benefits such as the survival of animals from the welfare calculus if such survival is not specifically known to the people whose welfare is being measured).

advocated by Eric Posner and Matthew Adler,[265] would solve the problem of failing to account for people's moral values with respect to existence benefits. WBA's analogous approach of weak hedonism would do the same.[266]

But the moral issue is not the only dimension of the problem involved in counting existence benefits. Another dimension is counting the actual harm people suffer from knowing that the animals died, or the benefit they accrue from knowing that the animals lived. Both orthodox welfarists[267] and adherents of a refined CBA[268] are committed to the proposition that such harm matters, yet CBA cannot count it: contingent-valuation surveys are simply not up to the task, and they are the only option within CBA's monetization framework.

WBA, on the other hand, can solve this problem. By gathering data on people's reported well-being both before and after endangered animals are killed or saved, for example, WBA can measure the effect of existence benefits on welfare. This intractable and indeed unsolvable problem for CBA is thus accounted for straightforwardly by WBA. It represents precisely the sort of question that WBA is designed to answer.

WBA's superiority in counting existence benefits goes beyond whales and birds: it extends to human beings themselves. CBA counts a person's death only as extinguishing her own welfare, thereby ignoring the effects the death may have on the welfare of others. Ackerman and Heinzerling explain this problem with CBA as follows:

> Another problem with the standard approach to valuation is that it asks individuals (either directly through surveys, or indirectly through observing wage and job choices . . .) only about their attitudes toward risk to themselves. . . . If [the question of existence values] makes sense for bald eagles and national parks, it must be at least as important when applied to safe drinking water and working conditions for other people. . . . We are not aware of any attempts to quantify the existence value of another person's life; but we are sure

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[265] *Id.* at 52-61.

[266] Bronsteen, Buccafusco & Masur, *Welfare as Happiness*, *supra* note 22, at 1589-90.

[267] *E.g.*, Hicks, *supra* note 193, at 698.

[268] ADLER & POSNER, *supra* note 10, at 34.

> that, if the value of life is a number in the first place, then there is a substantial existence value to the life of a stranger, let alone a relative or friend.[269]

Once again, the design of WBA is tailored to account naturally for such considerations. Scholars have already collected data on the hedonic effects of others' deaths, and, unsurprisingly, they are significant.[270] By excluding the value people place on others, CBA is ignoring hundreds of thousands of dollars in benefits from lives saved by regulation. In contrast, using hedonic data to assess proposed regulations fits neatly within WBA's established framework. This is a significant advantage, because CBA's failure to count these effects as losses systemically skews downward its assessment of the harms associated with policies that cause or allow death. Put simply, WBA provides a more accurate accounting of welfare than does CBA.

C. 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 significant *conceptual* faults. When determining an average value for lives saved, VSL treats the lives saved by regulation indiscriminately. In doing so, it 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.[271]

In recent years, scholars and policymakers have developed new tools to overcome VSL's limitations. This section discusses two such

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[269] ACKERMAN & HEINZERLING, *supra* note 9, at 69-70.

[270] *E.g.*, Oswald & Powdthavee, *supra* note 76, at S217 ("This paper presents a study of the impact upon a person's happiness of the death of a loved one—especially a child, a spouse, or a parent.").

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

tools —"value of statistical life years" (VSLYs) and "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 sections 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.[272] In order to compare the number of lives saved to the costs of the regulation (e.g., 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 the value of a statistical life (VSL)—by reference to the various techniques discussed in Parts I and III: revealed preference and contingent valuation studies.[273] For example, if people receive an average of $800 in hazard pay to compensate them for facing a 1 in 10,000 chance of death, the value of a statistical life would equal $800 × 10,000 = $8 million.[274] By combining the results of a number of these kinds of studies, EPA has determined VSL to be $6.3 million in year 2000 dollars.[275] Accordingly, a proposed regulation that would save 100 lives but cost $1 billion dollars would not be approved ($6.3 million × 100 = $630 million < $1 billion).

As noted above, the techniques used to derive VSL have considerable methodological limitations.[276] Perhaps more importantly, however, the conceptual relationship between VSL and the welfare-maximizing goals of regulation are deeply strained.[277] By

[272] *See* REVESZ & LIVERMORE, *supra* note 10, at 47.
[273] *Id.* at 47-49.
[274] This example is taken from Revesz and Livermore, *id.* at 49.
[275] *Id.*
[276] *See infra* Part III.
[277] We do not here discuss other extra-welfarist goals of regulation.

focusing solely on lives saved, CBA's use of VSL entirely ignores data that are relevant to judging the value of regulation. Regulation, after all, never *saves* lives (in the sense that people do not die); it merely prolongs lives.[278] By ignoring longevity, CBA risks creating highly counter-intuitive 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 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, while 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.[279] Rather than relying simply on statistical lives, researchers would instead 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.[280] Agencies that use VSLY currently employ a value of approximately $180,000.[281] 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.[282]

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[278] Cass R. Sunstein, *Lives, Life-Years, and Willingness to Pay*, 104 COLUM. L. REV. 205, 208 (2004).

[279] *Id.* 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 (VSLY).")

[280] REVESZ & LIVERMORE, *supra* note 10, at 78.

[281] *Id.*

[282] Sunstein, *supra* note 278, at 208 ("If the goal is to promote people's welfare by lengthening their lives, a regulation that saves five-hundred life-years (and, les 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.").

Nonetheless, the VSLY approach has been criticized both for its lack of empirical support and the potential outcomes that it generates.[283] 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.[284] 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.[285] According to Richard 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.[286]

In situations where the data appear to diverge from the theory, however, it is just as possible that the data are misleading than 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, that 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. But, as we argue in Part III, the enhanced WTP of older people should be treated as a confounding wealth effect 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.[287] Further, when valuing goods and risks in contingent valuation studies, people often demonstrate significant "scope

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

[284] REVESZ & LIVERMORE, *supra* note 10, 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.").

[285] *See* Viscusi & Aldy, *supra* note 161 (finding that older people have *lower* WTP than 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. & STATISTICS 423 (2004) (finding that older people have *higher* WTP than younger people); 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. ENVIR. ECON. & MANAGEMENT 769 (2004) (finding no significant difference between older and younger people).

[286] REVESZ & LIVERMORE, *supra* note 10, at 80-81.

[287] Sunstein, *supra* note 278, at 233.

neglect." As we mentioned in Part IV.B, they are often willing to pay the same amount to save one thousand, ten thousand, or one hundred thousand birds.[288] 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.

While opponents of VSL contend that the use of VSLY exacts a "senior death discount"[289] 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 overwhelming favor regulations that save more life-years.[290] To the extent one is trying to maximize welfare, it is better to be thirty years old than eighty years old.

2. Quality Adjusted Life Years

We consider the VSLY approach to be a substantial improvement over the VSL technique traditionally favored by CBA. But while 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 *i)* a program that extended the lives of 100 people for 10 years with those years spent in poor health, and *ii)* a program that extended the lives of 100 people for 10 years with those years spent in excellent health. Despite people's capacity to hedonically adapt to certain types of poor health,[291] there is almost certainly a greater

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[288] William H. Desvousges et al., *Measuring Natural Resource Damage with Contingent Valuation: Tests of Validity and Reliability*, *in* CONTINGENT VALUATION: A CRITICAL ASSESSMENT 91 (Jerry A. Hausman ed., 1993).

[289] REVESZ & LIVERMORE, *supra* note 10, at 79.

[290] Sunstein, *supra* note 278, 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?").

[291] John Bronsteen, Christopher Buccafusco & Jonathan S. Masur, *Hedonic Adaptation and the Settlement of Civil Lawsuits*, 108 COLUM. L. REV. 1516 (2008).

welfare gain in the second program because poor health will almost always be associated with meaningful hedonic penalties.[292]

To remedy this shortcoming, some scholars have recommended adopting quality-adjusted life years (QALYs) in cost-benefit analysis.[293] The QALY was initially developed in the related field of cost-effectiveness analysis (CEA) to provide data on the efficient use of scarce resources in medical decision-making.[294] Unlike the VSL and VSLY approaches, QALYs were not initially designed with respect to standard welfare theory,[295] but some commentators,[296] including courts[297] and agencies,[298] see value in the use of QALYs in CBA. As yet, however, QALY analysis faces a number of methodological hurdles before it can be successfully incorporated into CBA.[299]

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 where 1.0 is equivalent to perfect health and 0 is death.[300] 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.[301] 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).

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[292] *Id.*

[293] *See* Sunstein, *supra* note 278, at 246.

[294] Milton C. Weinstein et al., *QALYs: The Basics*, 12 VALUE IN HEALTH S5, S5 (2009).

[295] Amiram Gafni, *Economic Evaluation of Health-care Programmes: Is CEA Better than CBA?*, 34 ENVIR. & RESOURCE ECON. 407, 408 (2006).

[296] Adler, *supra* note 182, at 57.

[297] American Trucking Assoc., Inc. v. E.P.A., 175 F.3d 1027, 1039 (D.C. Cir. 1999) (suggesting that QALYs may be used by agencies to develop tools for judging harm).

[298] FDA, Medical Devices; Patient Examination and Surgeons' Gloves; Test Procedures and Acceptance Criteria, 68 Fed. Reg. 15,404 (proposed Mar, 31, 2003) (to be codified at 21 C.F.R. pt. 800).

[299] *See* John Broome, *Qalys*, 50 J. PUB. ECON. 149 (1993).

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

[301] Gafni, *supra* note 295, at 412.

In order 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 5-item scale that asks subjects to simply compare health states that differ on a variety of dimensions such as pain, mobility, and self-care.[302] 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.[303] 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.[304] 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 decision-making, no effort is made to quantify the value of a QALY. Instead, different programs may be compared to one another or a program may be compared to an arbitrary threshold.[305] This resistance to quantifying the value of health and life has likely played a role in making QALYs attractive to healthcare professionals,[306] but it has done so at the cost of providing a clear decision rule.[307] In order 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.[308] This difficulty may arise for some of the same reasons that calculating the value of a life-

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[302] *See* www.euroqol.org.

[303] Cam Donaldson et al., *The Distributional Problem in Economic Evaluation: Income and the Valuation Costs and Consequences of Health Care Programmes*, 11 HEALTH ECON. 55, 60 (2002).

[304] *Id.*

[305] *See* Richard A. Hirth et al., *Willingness to Pay for a Quality-adjusted Life Year: In Search of a Standard*, 20 MED. DECISION MAKING 332, 333 (2000).

[306] Gafni, *supra* note 295, at 410.

[307] Hirth et al., *supra* note 305, at 332.

[308] Hirth et al. find 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).

year is a problem—framing effects, prospect theory, scarcity, and the like.[309]

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 typically 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.[310] A rich empirical literature that we have discussed elsewhere demonstrates individuals' inability to accurately assess the value of health states they have not experienced.[311] 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.[312] When asked to think about these negative health states, healthy people suffer from a number of cognitive and affective 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.[313] Thus, in time trade-off and standard gamble studies, healthy people are willing to give up significantly more remaining life than are current patients.[314] This results in biased QALY scores that overestimate the welfare losses from many health states.[315]

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[309] Daniel Kahneman, *A Different Approach to Health State Valuation*, 12 VALUE IN HEALTH S16 (2009).

[310] Daniel M. Hausman, *Valuing Health*, 34 PHIL. & PUBLIC AFFAIRS 246, 256 (2006).

[311] Bronsteen, Buccafusco & Masur, *Hedonic Adapation*, *supra* note 291.

[312] 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).

[313] *Id.* at 223.

[314] *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 (1978) (reporting QALYs for dialysis treatment of 0.39 and .056 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 et al., *QALYs: Some Challenges*, 12 VALUE IN HEALTH S10, S10-11 (2009).

[315] It is worth noting that other relatively minor negative health states prove surprisingly resistant to adaptation, such as ringing in the ears and chronic

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.[316] It is also possible that current and former patients who are adapting or have adapted to their conditions may neglect the pre-adaptation period during which their condition was causing substantial welfare losses.[317]

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 life. WBA incorporates the valuable corrections offered by VSLYs and QALYs while avoiding their shortcomings. As noted above, CBA's preferred tool, the VSL, provides a weak proxy for general intuitions about welfare because it neglects data about both the longevity and 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 (WBUs) 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

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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, *Hedonic Adaptation*, *supra* note 29.

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

[317] Dolan & Kahneman, *supra* note 312, at 225.

in a wide variety of states.[318] 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.[319]

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 non-market 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.[320] 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, WBA directly tracks people's experiences and the emotions 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 ..[321] 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.

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[318] *See supra* Part I.

[319] 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 182, at 1.

[320] *See supra* Part III (describing the distortions to CBA caused by these biases and errors).

[321] *See e.g.* Oswald & Powdthavee, *supra* note 76.

Previous attempts to measure the value of life for purposes of policy analysis have suffered from a number of conceptual and methodological limitations. Although progress has been made with the introduction of VSLYs and QALYs, these methods still neglect vital information about well-being. WBA provides methods that yield much closer proxies for well-being and do not suffer from the same biases.

V. DISCOUNTING IN CBA AND WBA

One of the most intractable problems with CBA involves the choice of a discount rate.[322] CBA is based upon monetary values, and the value of money is not constant across time.[323] 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 as they generate costs.[324] 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.[325] 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. In order to make a true apples-to-apples comparison, the agency would then be 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

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[322] Adler & Posner, *supra* note 199, at 1142 (showing that agency freedom to chose a different discount rate for every regulation has led to large disparities in measuring benefits).

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

[324] Cass R. Sunstein & Arden Rowell, *On Discounting Regulatory Benefits: Risk, Money, and Intergenerational Equity*, 74 U. CHI. L. REV. 171, 180 (using arsenic as an example of regulations which would impose present costs but provide benefits in the form of reduced cancer rates decades in the future).

[325] *See* NIH, *Chronic Pulmonary Obstructive Disease*, *available at* http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001153/.

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 multi-agency working group to determine how much harm was being done to the world economy by global warming on account of greenhouse gas emissions.[326] The working group calculated the cost to the world for each ton of carbon dioxide emitted, in U.S. dollars.[327] Many of the harms from global warming will only occur fifty or even one hundred 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. (Below, we will explain why federal agencies are often incapable of coming to a conclusion about the proper discount rate.) Instead, it reported the cost of carbon emissions at three different discount rates: 2.5%, 3%, and 5%. The results are reported in Table 1, below.

Table 4: Worldwide Cost of Emitting One Ton of Carbon Dioxide at Various Discount Rates (in $ U.S.)[328]

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% to 2.5%, more than *septuples* the cost of each ton of carbon dioxide. This is because a cost that occurs in the distant future must be discounted many times in order to translate it into 2011 dollars—one discounting for each year in the interim. 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% discount rate and a 5% discount rate

[326] *See* Jonathan S. Masur & Eric A. Posner, *Climate Regulation and the Limits of Cost-Benefit Analysis*, ___ CAL. L. REV. ___ (forthcoming 2011), at *3, *available at* http://www.ssrn.com/abstract_id=1662147.

[327] *See id.* at *6.

[328] *See id* at *24.

could determine whether the United States regulates greenhouse gas emissions fairly stringently, or not at all.[329]

Why is it difficult for agencies and other decision-makers to select a discount rate? The reason is that there is no agreement about precisely why discounting is necessary; and even where 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.[330] 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 3.4%.[331] 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.[332] If this approach is correct, then the discount rate should be the typical long-term rate of return on an investment of that size.[333] There is a great deal of disagreement regarding what that rate of return is, but most estimates place it at 7%.[334]

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[329] *See id.* at *34 (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).

[330] *See* United States Department of Labor, Bureau of Labor Statistics, *Overview of BLS Statistics on Inflation and Prices*, *available at* http://www.bls.gov/bls/inflation.htm.

[331] *See* Long Term Inflation Data, *available at* http://inflationdata.com/inflation/inflation_rate/long_term_inflation.asp.

[332] *See, e.g.*, Weisbach & Sunstein, *supra* note 329, at 435-36.

[333] *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).

[334] *See* Office of Mgmt. & Budget, Exec. Office of the President, Circular A-94 Revised, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal

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 doing cost-benefit analysis with both of them. For instance, the Office of Management and Budget recommends that agencies use a 7% discount rate but perform cost-benefit analyses with both 3% and 7% discount rates.[335] Most agencies follow this advice, including the Occupational Safety and Health Administration and the EPA.[336] Yet the choice among those discount rates is often determinative of whether a regulation produces more benefits than costs. Consider the emphysema example from the previous paragraph. At a 3% discount rate, the regulation would provide approximately $11,160 in benefits, discounted to their 2011 value.[337] But at a 7% discount rate, the regulation provides only $7,600 in benefits—far below the $10,000 in costs.[338]

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—there is no such thing. By translating all quantities into WBUs, rather than into money, well-being analysis cuts the Gordian Knot presented by discounting. The irresolvable arguments that force the EPA to report results at two different discount rates, and the inter-agency climate change working group to do so at three different rates, are simply irrelevant to WBA.

Programs, at Sec. 8.b.1, *available at* http://www.whitehouse.gov/omb/circulars_a094 (1992) ("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.").

[335] *See* Arden Rowell, *The Cost of Time: Haphazard Discounting and the Undervalued Cost of Regulatory Benefits*, 85 NOTRE DAME L. REV. 1505, 1507 (2010); Office of Mgmt. & Budget, Exec. Office of the President, Circular A-4 on Regulatory Analysis 33-34 (2003).

[336] *See* Masur & Posner, *Against Feasibility Analysis*, *supra* note 14, at 672.

[337] The calculation is $15,000 / $(1.03)^{10}$ = $11,161.41.

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

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 the 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 preferences for immediate gratification over later benefits.[339] 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.[340] 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).[341]

We take no position on whether it is appropriate for any of these reasons, though we note that the case for doing so has hardly been established.[342] 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 problem as what discount rate to select, that constitutes meaningful progress.

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

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[339] *See* Richard L. Revesz, *Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L. REV. 941, 997-1002 (1999) (describing the argument for pure time preferences); IRVING FISHER, THE THEORY OF INTEREST: AS DETERMINED BY IMPATIENCE TO SPEND INCOME AND OPPORTUNITY TO INVEST IT 25-32 (1930) (same).

[340] Revesz, *supra* note 339, at 997-1002.

[341] *See* Weisbach & Sunstein, *supra* note 329, at 445.

[342] *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).

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 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 offer a meaningful gauge of the effects of prospective policies on people's quality of life, whereas CBA's answers do not.

Scholars, regulators, and even heads of state have known for years that CBA fails in its primary mission of revealing which of two policies is likely to make people better off in the aggregate. 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 creates the opportunity to make policy comparisons validly. 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. We find it hard to deny that the answer is yes.