# ESSAY

## THE REAL WORLD OF COST-BENEFIT ANALYSIS: THIRTY-SIX QUESTIONS (AND ALMOST AS MANY ANSWERS)

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*Some of the most interesting discussions of cost-benefit analysis focus on exceptionally difficult problems, including catastrophic scenarios, "fat tails," extreme uncertainty, intergenerational equity, and discounting over long time horizons. As it operates in the actual world of government practice, however, cost-benefit analysis usually does not need to explore the hardest questions, and when it does so, it tends to enlist standardized methods and tools (often captured in public documents that are binding within the executive branch). It is useful to approach cost-benefit analysis not in the abstract but from the bottom up, that is, by anchoring the discussion in specific scenarios involving tradeoffs and valuations. In order to provide an understanding of how cost-benefit analysis actually works, thirty-six stylized scenarios are presented here, alongside an exploration of how they might be handled in practice. A recurring theme is the importance of authoritative documents, which may be altered only after some kind of formal process, one that reflects a form of "government by discussion." Open issues, including the proper treatment of nonquantifiable values, are also discussed.*



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> The world of costs and benefits (which includes taking note of the badness of nasty actions and of violation of freedoms and rights) is quite a different decisional universe from the sledge-hammer reasoning of consequence-independent duties and obligations.
>
> — Amartya Sen[1]

## I. ON (NOT) ADMIRING THE PROBLEM

When I was in government, a colleague had an unusual and constructive phrase. After lengthy and intense discussions of options, and of the difficulties associated with each, he would respond, "Ok, we have now admired the problem. What are we going to do about it?" The response was important, because it shifted the group's attention from people's concerns, worries, and objections, and toward exactly what was needed, which was a sense of the best, or the least bad, solutions.

### A. *Hard Questions*

The world of regulation is full of admirable problems. For example, there is an elaborate literature on the problems of risk and uncertainty, and also on how regulators should deal with them.[2] Situations of risk exist when we can identify outcomes and assign probabilities to each of them.[3] Situations of uncertainty exist when it is possible to identify outcomes but not to assign probabilities.[4] Both situations create serious

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1. Amartya Sen, The Discipline of Cost-Benefit Analysis, *in* Rationality and Freedom 553, 561 (2002) [hereinafter Sen, Discipline].

2. For relevant discussion, see generally Richard A. Posner, Catastrophe: Risk and Response (2004) (defining catastrophes and catastrophic risks, and exploring how to approach both); Cass R. Sunstein, Worst-Case Scenarios (2007) [hereinafter Sunstein, Worst-Case Scenarios] (discussing prevention of especially bad outcomes, and analyzing uses and limits of cost-benefit analysis); Martin L. Weitzman, Why the Far-Distant Future Should Be Discounted at Its Lowest Possible Rate, 36 J. Envtl. Econ. & Mgmt. 201 (1998) (exploring discount rates long-term).

3. See Frank H. Knight, Risk, Uncertainty and Profit 19–20, 230–32 (Univ. of Chi. Press 1971) (1921) (defining risk as "*measurable* uncertainty," uncertainty as "*unmeasurable*" risk, and "value of estimates" as probability judgment used in economics based on estimates of value rooted in opinion).

4. See id. at 20 (describing uncertainty as "unmeasurable" and "non-quantitative"). For relevant discussion, with references to the economic and philosophical literature, see generally Posner, supra note 2, at 8–9, 171–75 (discussing role of uncertainty and risk in cost-benefit analysis); Sunstein, Worst-Case Scenarios, supra note 2, at 8–9, 146–52, 159–67

challenges for regulators.[5] We can imagine, for example, a regulation for which estimates of both benefits and costs span a wide range. Perhaps regulators cannot identify the probabilities that ought to be assigned to various points along the continuum. Even if they can do so, it may not be self-evident what ought to be done when benefits exceed costs at some points within the respective ranges, but fail to do so at others.

We can easily imagine cases in which there is a risk of catastrophe—involving, say, climate change, financial meltdowns, and terrorist attacks—but in which regulators cannot specify the relevant probabilities, or identify the contribution of the particular regulation to reducing the central risks.[6] We can imagine cases with "fat tails,"[7] perhaps confounding cost-benefit analysis, perhaps suggesting that the quantified benefits of risk reduction are far higher than initially anticipated. We can imagine cases in which the discount rate greatly matters, so that a regulation is justified with a low rate, but not with a high one.[8] We can imagine cases in which certain benefits are hard to quantify and monetize; consider protection of privacy, prevention of discrimination, and prohibition on the denial of health insurance to those with preexisting conditions.

All of these are admirable problems, and it is admirable, and sometimes highly illuminating, to admire them. Indeed, the admiration may well be a necessary condition for deciding how to handle them. But the act of admiring problems has its own benefits and costs. One benefit, of course, is improved understanding, which is a good in itself. Another benefit is improved practice and policies. A cost is associated with the very effort to resolve difficult and potentially intractable problems—a cost that may loom especially large if those problems do not arise often.

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(discussing distinction between uncertainty and risk in context of worst-case scenarios and also exploring relevant psychology).

5. See Sunstein, Worst-Case Scenarios, supra note 2, at 146–67 (evaluating various theoretical methods regulators use to address risk and uncertainty). It is also possible to imagine problems of "ignorance," for which neither outcomes nor probabilities can be specified.

6. See Posner, supra note 2, at 171–75 (exploring interplay of catastrophic risk and uncertainties in cost-benefit analysis).

7. A fat tail is an abnormal probability distribution featuring an unusually large number of extreme events. Imagine, for example, a population with an average weight of 180 pounds, but with a significant number of people weighing more than 350 or less than 100. See generally Martin L. Weitzman, Additive Damages, Fat-Tailed Climate Dynamics, and Uncertain Discounting, Econ.: Open-Access, Open-Assessment E-Journal (Oct. 28, 2009), http://www.economics-ejournal.org/economics/journalarticles/2009-39/version_1/count (on file with the *Columbia Law Review*) (discussing role of fat tails in analysis of damages from climate change).

8. The discount rate establishes the present value of future benefits or costs. It would, for example, establish the current value of benefits that would not be enjoyed until 2030. With a higher discount rate, future benefits have a low present value. For valuable discussion, see generally Christian Gollier, Pricing the Planet's Future: The Economics of Discounting in an Uncertain World (2013) (exploring proper approach to discounting under various scenarios).

With respect to both practice and policies, it is important to understand the extent to which answers to the hardest and most interesting questions will actually matter, and how, and when. It is also important to understand how cost-benefit analysis operates in the real world of government practice.

### B. *Quantification and Authoritative Documents*

From 2009 to 2012, I was privileged to serve as Administrator of the Office of Information and Regulatory Affairs (OIRA), and in that capacity to help oversee the issuance of over 2,000 regulatory actions.[9] For over three decades, OIRA has coordinated review of significant rules from executive agencies.[10] OIRA review, as it is called, involves the assessment (by OIRA and many other offices and agencies involved in the process) of draft regulations, both proposed and final, which are scrutinized for legality and for consistency with presidential priorities. As part of OIRA review, a great deal of attention might well be given to the agency's account of costs and benefits, and to its judgment that the benefits justify the costs (to the extent permitted by law).[11]

While serving as OIRA Administrator, I helped to implement Executive Order 13,563, "Improving Regulation and Regulatory Review," an exceedingly important document that places a high premium on analysis of costs and benefits.[12] Indeed, that Executive Order operates as a kind of mini-constitution for the regulatory state. Under Executive Order 13,563, agencies may proceed only if the benefits justify the costs and only if the chosen approach maximizes net benefits (unless the law requires otherwise).[13] A key provision of Executive Order 13,563 states that "each agency is directed to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible."[14]

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9. OIRA reviewed 2,304 regulatory actions from January 21, 2009 (when I began as Senior Advisor to the Director of the Office of Management and Budget) to August 10, 2012 (when I left the federal government); it reviewed 1,989 regulatory actions from the date of my confirmation (September 10, 2009) to August 10, 2012. See Review Counts, Reginfo.gov, http://www.reginfo.gov/public/do/eoCountsSearchInit?action=init (enter "09/10/2009" into "From" field and "08/10/2012" into "To" field) (on file with the *Columbia Law Review*) (last visited Nov. 7, 2013) (providing number of review counts by date range).

10. For a detailed description, see generally Cass R. Sunstein, Commentary, The Office of Information and Regulatory Affairs: Myths and Realities, 126 Harv. L. Rev. 1838 (2013) [hereinafter Sunstein, Myths and Realities] (offering account of OIRA's role, particularly in promoting interagency coordination and aggregation of dispersed information).

11. See id. at 1864.

12. Exec. Order No. 13,563, 3 C.F.R. 215 (2012), reprinted in 5 U.S.C. § 601 app. at 816–17 (2012) [hereinafter Exec. Order No. 13,563].

13. Id. § 1(b).

14. Id. § 1(c).

This language reflects an unprecedented emphasis on the importance of quantification—as demonstrated by the fact that in the Administration's first three years, the net benefits of economically significant regulations under President Obama exceeded $91 billion, more than twenty-five times the corresponding figure under President George W. Bush, and more than six times the corresponding figure under President Clinton.[15] Indeed, those benefits rose to $159 billion for the first four years.[16] At the same time, Executive Order 13,563 recognizes that some values are difficult or impossible to quantify, including "human dignity," and it authorizes agencies to consider those values where appropriate and consistent with law.[17] As this Essay shows, these provisions have proved relevant in several important cases.[18]

During my period in government, a high percentage of the most admirable problems came to my attention. In fact, all the problems sketched at the beginning of this Essay came across OIRA's viewscreen at one time or another. To take just one example, I helped convene an interagency working group that settled on values for the social cost of carbon.[19] In 2010 dollars, the central value, used as the basic number for

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15. OMB, 2012 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities 59 fig.2-1 (2012) [hereinafter OMB, 2012 Report], available at http://www.whitehouse.gov/sites/default/files/omb/inforeg/2012_cb/2012_cost_benefit_report.pdf (on file with the *Columbia Law Review*). These numbers are based on technical analyses within the executive branch. For the most part, the measures of benefits and costs have remained the same across administrations; hence, the disparities reflect genuine differences, not differences in accounting.

16. The draft 2013 report shows net benefits of $159 billion for the first four fiscal years. OMB, 2013 Draft Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act 64 fig.2-1(b) (2013), available at http://www.whitehouse.gov/sites/default/files/omb/inforeg/2013_cb/draft_2013_cost_benefit_report.pdf (on file with the *Columbia Law Review*).

17. Exec. Order No. 13,563, supra note 12, § 1(c).

18. For more detailed discussion, see generally Cass R. Sunstein, Nonquantifiable, 102 Calif. L. Rev. (forthcoming 2014) [hereinafter Sunstein, Nonquantifiable], available at http://ssrn.com/abstract=2259279 (on file with the *Columbia Law Review*) (exploring role of human dignity and other nonquantifiable variables).

19. See generally Interagency Working Grp. on Soc. Cost of Carbon, U.S. Gov't, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (2010) [hereinafter Interagency Working Group, 2010 Technical Support Document], available at http://www.epa.gov/oms/climate/regulations/scc-tsd.pdf (on file with the *Columbia Law Review*) (summarizing interagency process through which social cost of carbon estimates were developed). For additional background on the development of values for the social cost of carbon, see generally Michael Greenstone et al., Estimating the Social Cost of Carbon for Use in U.S. Federal Rulemakings: A Summary and Interpretation (Mass. Inst. of Tech. Dep't of Econ. Working Paper Series, Working Paper No. 11-04, 2011), available at http://ssrn.com/abstract=1793366 (on file with the *Columbia Law Review*). For assessments, see Jonathan S. Masur & Eric A. Posner, Climate Regulation and the Limits of Cost-Benefit Analysis, 99 Calif. L. Rev. 1557, 1577–99 (2011) (criticizing U.S. government calculations); William Nordhaus, Estimates of the Social Cost of Carbon: Background and Results from the Rice-2011 Model 24–25 (Yale Univ., Cowles Found. for Research in Econ., Cowles Found. Discussion Paper

calculating the benefits of greenhouse gas reductions, was $21.40 per ton in 2010, with a range from $4.70 to $64.90.[20] These values were used to establish the benefits of regulatory efforts to reduce greenhouse gas emissions, and they played a significant role in many rulemakings.[21] In 2013, an interagency working group produced updated values based on more recent scientific and economic models (emphasizing in particular the risk of sea-level rise), producing a central value of approximately $36 per ton in 2013; the resulting numbers will play a large role in regulatory decisions in the future.[22]

It is also true, however, that the most difficult problems appear quite rarely, and when they do, the executive branch usually has standardized methods for handling them. These methods are often captured in authoritative documents that are both meant and understood to bind executive agencies even though they lack the force of law (in the sense that they set out purely internal requirements and hence cannot be used in court). The Office of Management and Budget's Circular A-4, issued in 2003, is the formal, binding guidance document that governs the analysis of regulatory impacts, and it outlines many of those standardized methods.[23] (It is noteworthy that Circular A-4 was issued in the George

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No. 1826, 2011) [hereinafter Nordhaus, Estimates of the Social Cost of Carbon], available at http://dido.econ.yale.edu/P/cd/d18a/d1826.pdf (on file with the *Columbia Law Review*) (same).

20. Interagency Working Group, 2010 Technical Support Document, supra note 19, at 28 tbl.4; see infra Appendix A (displaying Interagency Working Group's social cost of carbon estimates).

21. For example, the social cost of carbon has been used in rules involving greenhouse gas emissions and fuel economy for light and heavy vehicles, and also in rules involving energy efficiency for a range of appliances, including small motors and refrigerators. See, e.g., Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 75 Fed. Reg. 25,324, 25,520–24 (May 7, 2010) (codified as amended at 40 C.F.R. pts. 85–86, 600; 49 C.F.R. pts. 531, 533, 536–38 (2010)); Energy Conservation Program: Energy Conservation Standards for Residential Refrigerators, Refrigerator-Freezers, and Freezers, 76 Fed. Reg. 57,516, 57,559–61 (Sept. 15, 2011) (codified as amended at 10 C.F.R. pt. 430 (2013)).

22. Interagency Working Grp. on Soc. Cost of Carbon, U.S. Gov't, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, at 13 tbl.2 (2013), available at http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf (on file with the *Columbia Law Review*); see infra Appendix A (displaying Interagency Working Group's revised social cost of carbon values). A further technical revision, offering only minor changes, was done in November 2013. Interagency Working Grp. on Soc. Cost of Carbon, U.S. Gov't, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, at 2–3, 13 tbl.2 (rev. ed. 2013) [hereinafter Interagency Working Group, November 2013 Technical Support Document Update], available at http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf (on file with the *Columbia Law Review*).

23. OMB, Exec. Office of the President, Circular A-4: Regulatory Analysis (2003) [hereinafter OMB, Circular A-4], available at http://www.whitehouse.gov/sites/default/files/omb/assets/regulatory_matters_pdf/a-4.pdf (on file with the *Columbia Law Review*).

W. Bush Administration and continues in the Obama Administration; its longevity attests to its technical character.) I shall rely on that document for much of this discussion.

One of my central points is that within the executive branch, it is understood that Executive Order 13,563, the formal documents that set out the official analysis of the social cost of carbon, Circular A-4, and similar or related documents are binding until they are changed. For that reason, some of the hardest questions cannot legitimately be revisited during the process of rule review. To be sure, authoritative documents can be altered. But within the executive branch, it is agreed that their alteration requires some kind of formal internal process, calling for significant time, effort, and commitment from a large number of public officials—and perhaps a period of public comment as well.[24]

In that process, diverse officials within the Executive Office of the President, and very possibly the executive branch as a whole, must work together to agree on a new approach. For example, the social cost of carbon emerged from a process, convened by OIRA and the Council of Economic Advisers (CEA), involving a large number of agencies and departments, and it reflects the outcome of an extended, elaborate process of deliberation, reason-giving, and ultimate consensus.[25] In some cases, the executive branch might well choose to make the new approach available to the public for comment before it is finalized; a period of public comment might even be legally obligatory. Any such process will also require a substantial investment of resources. For this reason, it is no light thing to attempt a revision of authoritative documents, which have survived a high degree of internal and perhaps external scrutiny. Agencies and departments (including OIRA and others within the Executive Office of the President) are not permitted to reject such documents, in whole or in part, in the context of particular rules, even if they do not entirely agree with them.

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The Obama Administration issued several documents—also binding inside the executive branch—that offer significant clarifications. See, e.g., OIRA, Regulatory Impact Analysis: Frequently Asked Questions (FAQs) (2011), available at http://www.whitehouse.gov/sites/default/files/omb/assets/OMB/circulars/a004/a-4_FAQ.pdf (on file with the *Columbia Law Review*); OIRA, Regulatory Impact Analysis: A Primer [hereinafter OIRA, Regulatory Impact Analysis Primer], available at http://www.whitehouse.gov/sites/default/files/omb/inforeg/regpol/circular-a-4_regulatory-impact-analysis-a-primer.pdf (on file with the *Columbia Law Review*) (last visited Nov. 7, 2013).

24. For example, Circular A-4 resulted from an extensive process that involved both peer review and public comment: "In developing this Circular, OMB first developed a draft that was subject to public comment, interagency review, and peer review." OMB, Circular A-4, supra note 23, at 1.

25. See Interagency Working Group, 2010 Technical Support Document, supra note 19, at 1–3 ("Technical experts from numerous agencies met on a regular basis to consider public comments, explore the technical literature in relevant fields, and discuss key model inputs and assumptions.").

C. *Processes and Constraints*

The central goal of this Essay is to describe the real world of cost-benefit analysis, and to do so by explaining how numerous problems are likely to be approached in actual practice. With respect to cost-benefit analysis, current practices remain inadequately understood, in part because of a failure to appreciate the role of binding documents. But part of the problem lies in undue abstraction and a neglect of the actual or likely resolution of specific problems. To provide a better understanding, this Essay offers a wide range of concrete scenarios, attempting to explain how each of them would be handled.

The Essay relies on existing public documents and understandings, informed by my own experience. Scrutiny of the agency's analysis of costs and benefits is often an important part of what is typically described as "OIRA review." It is important to see that in reality, such review is not merely OIRA review but emphatically interagency review, involving many public officials, prominently including (and not limited to) those who work at the CEA, the National Economic Council (NEC), the Domestic Policy Council (DPC), the Office of Science and Technology Policy (OSTP), the Council on Environmental Quality (CEQ), and the United States Trade Representative (USTR).[26] When a rulemaking agency's initial analysis of costs and benefits is scrutinized, OIRA itself may not be the central actor. Because of its unique role within the executive branch, CEA, with its technical expertise, often plays a significant role in the review of cost-benefit analyses.[27] Questions and concerns may well be raised by others, perhaps including agencies and departments outside of the Executive Office of the President, which will have specialized knowledge of their own. For example, the Department of Transportation (DOT) is likely to have a great deal of information about the transportation sector; a rule that affects that sector (from another agency or department) will likely benefit from the DOT's views. Those views may well include judgments about costs and benefits.

The judgments and conclusions described here are an outgrowth of the process of interagency review, undertaken in the shadow of authoritative documents, which may be issued by the President (with an Executive Order or Presidential Memorandum), by the Office of Management and Budget (OMB),[28] or by OIRA itself.[29] The term "OIRA

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26. For a detailed account of the interagency process of cost-benefit analysis, see generally Sunstein, Myths and Realities, supra note 10.

27. See id. at 1867 ("Indeed, CEA may turn out to be the agency's most important interlocutor, because of its expertise and central role in economic analysis. If CEA believes that the agency's estimates are correct or that they include serious errors, CEA's view will receive considerable attention.").

28. E.g., OMB, Circular A-4, supra note 23 (establishing guidance for implementation of § 6(a)(3)(c) of Executive Order 12,866).

29. E.g., Memorandum from Cass R. Sunstein, Adm'r, Office of Mgmt. & Budget, to the Heads of Executive Departments and Agencies, and of Independent Regulatory

review" appears in several places, but it should be understood throughout that this process involves a large number of offices, and of these, OIRA may be far from the most important. Public comments also matter a great deal, and they may well raise questions and doubts about the analysis of costs and benefits in proposed rules. When it is working well, the process of OIRA review is a concrete exemplification of the idea of "government by discussion," which puts a high premium on the exchange of reasons in the public sphere, and which therefore acts as a safeguard against error.[30] Discussion and reason-giving are the lifeblood of the process of OIRA review.

A few institutional clarifications: Some of the discussion here explores the question whether an agency will be authorized to proceed. Under Executive Orders 13,563 and 12,866, executive agencies[31] must submit all significant rules to OIRA, and those rules may not be published in the Federal Register until OIRA has "completed its review."[32] Sometimes regulatory actions are under OIRA review for long periods, perhaps even a year or more.[33] Agency heads, including heads of Cabinet departments, fully understand the relevant requirements. While interagency discussions can contain a measure of substantive disagreement, and while those disagreements may not be simple to resolve, the process itself is one that all parties accept—which may be unsurprising in light of the fact that since the Reagan Administration, all Presidents,

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Agencies (Feb. 2, 2011), available at http://www.whitehouse.gov/sites/default/files/omb/memoranda/2011/m11-10.pdf (on file with the *Columbia Law Review*) (establishing guidance for implementation of Executive Order 13,563).

30. See Amartya Sen, The Idea of Justice 324–27 (2009) (exploring government by discussion as characteristic of democracy).

31. Hence independent agencies are not subject to the process of OIRA review—a longstanding exclusion, beginning with President Reagan's Executive Order 12,291, issued in 1981, which covers only executive agencies. Exec. Order No. 12,291, § 1(d), 3 C.F.R. 127, 128 (1982), reprinted in 5 U.S.C. § 601 app. at 473–76 (1988) (defining "agency" as "'agency' under 44 U.S.C. 3502(1)"), revoked by Exec. Order No. 12,866, 3 C.F.R. 638 (1994), reprinted as amended in 5 U.S.C. § 601 app. at 802–06 (2012) [hereinafter Exec. Order No. 12,866]. Note, however, that an important executive order from President Obama states that independent agencies "should" follow certain principles laid out in Executive Order 13,563. Exec. Order No. 13,579, § 1(c), 3 C.F.R. 256, 257 (2012), reprinted in 5 U.S.C. § 601 app. at 817–18.

32. Exec. Order No. 12,866, supra note 31, § 8.

33. See, e.g., Jim Morris, "Chemicals of Concern" List Still Wrapped in OMB Red Tape, Ctr. for Pub. Integrity (May 15, 2013, 8:27 AM), http://www.publicintegrity.org/2013/05/13/12649/chemicals-concern-list-still-wrapped-omb-red-tape (on file with the *Columbia Law Review*) (identifying Environmental Protection Agency (EPA) proposal that had been under review for extended period of three years). For an explanation of time extensions for the review process, see Sunstein, Myths and Realities, supra note 10, at 1847 n.39.

whether Republican or Democratic, have essentially committed themselves to that process.[34]

Under Executive Order 12,866, there is a well-established process for resolving continuing or serious disagreements, with the President as the ultimate arbiter.[35] In addition, the OIRA process is subject to law. When Congress says that agencies must move forward with a particular approach, or that costs are not relevant, its will is controlling insofar as it is expressed in law. Everything said here is subject to an important general proviso: "to the extent permitted by law."[36]

It is also essential to see that multiple statutory requirements govern the rulemaking process, and of these, the most important is the Administrative Procedure Act.[37] In particular, agencies must respect the requirements for public participation[38] and the prohibition on arbitrary action.[39] The OIRA process pays careful attention to these requirements, and there are special efforts to ensure that proposed rules call for public comments and that final rules attend carefully to those comments.[40]

This Essay does not attempt to provide any kind of justification of cost-benefit analysis, or to explore how it might be defended against its critics.[41] The central idea is that an analysis of costs and benefits can increase the likelihood that regulation will actually promote social wel-

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34. See generally Sunstein, Myths and Realities, supra note 10, at 1853–59 (discussing process of OIRA review, including OIRA's role in facilitating interagency discussion of regulatory actions and President's role in review).

35. See id. at 1856–58 (discussing process of "elevation," by which disagreements between relevant staff must be resolved at higher levels).

36. Exec. Order No. 12,866, supra note 31, § 1(b).

37. 5 U.S.C. §§ 551–559, 701–706 (2012).

38. Id. § 553(c) ("[T]he agency shall give interested persons an opportunity to participate in the rule making through submission of written data, views, or arguments with or without opportunity for oral presentation.").

39. Id. § 706(2)(A) (instructing reviewing court to hold unlawful agency actions that are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law").

40. See, e.g., Sunstein, Myths and Realities, supra note 10, at 1841 ("OIRA and agencies also work closely together to ensure that public comments are adequately addressed in final rules, perhaps by modifying relevant provisions in proposed rules.").

41. Both Cass R. Sunstein, Simpler: The Future of Government 147–72 (2013) [hereinafter Sunstein, Simpler], and Cass R. Sunstein, Risk and Reason 28–52 (2002) [hereinafter Sunstein, Risk and Reason], explore the question of justification. See generally Matthew D. Adler & Eric A. Posner, New Foundations of Cost-Benefit Analysis 62–100 (2006) (defending cost-benefit analysis as decision procedure designed to promote social welfare); Matthew D. Adler, Well-Being and Fair Distribution: Beyond Cost-Benefit Analysis 57–153 (2012) (arguing for welfarist approach but not for cost-benefit analysis); Cass R. Sunstein, The Value of a Statistical Life: Some Clarifications and Puzzles, 4 J. Benefit-Cost Analysis 237 (2013) [hereinafter Sunstein, The Value of a Statistical Life] (exploring relationship between cost-benefit analysis and welfare).

fare,[42] but that idea raises a host of further questions.[43] My goal is not to answer those questions but to explain the existing framework for analyzing costs and benefits, with reference to authoritative documents and their likely operation in different contexts.

It is natural to wonder about the role of political considerations in the assessment of costs and benefits. After all, OIRA is part of the Executive Office of the President, and many White House offices do participate in the process of OIRA review.[44] Nonetheless, the assessment of costs and benefits is highly technical, and not at all political. In my experience, purely political considerations *never* played a decisive role in the ultimate assessment. To be sure, people with different values and commitments might resolve ambiguities in one direction rather than another. Economists and other analysts might disagree on questions of valuation. But any resolution is subject not to politics but to careful technical scrutiny, to ensure that it fits with relevant law, science, and economics.

The remainder of this Essay has a simple structure. It divides the thirty-six scenarios into eight categories, starting with the basics and then turning respectively to seven other topics:

1. valuation of statistical mortality risks;
2. cobenefits (understood as ancillary or indirect benefits that come from a regulation) and risk-risk tradeoffs (understood to arise when a regulation, designed to reduce one risk, ends up increasing another risk);
3. wide ranges (which occur when agencies cannot specify benefits or costs, and acknowledge that they will fall at some point within a wide range);
4. benefits that are hard or impossible to quantify[45] (such as human dignity);
5. net benefits (which turn out to be far more important than cost-benefit ratios);
6. discount rates; and

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42. For discussion of the relation between cost-benefit analysis and social welfare, see supra note 41 (citing relevant sources); see also Sen, Discipline, supra note 1, at 562–63, and particularly the suggestion that with its emphasis on "explicit valuation, broadly consequentialist reasoning, and additive accounting[], general cost-benefit analysis is a very ecumenical approach. It is compatible, for example, with weights based on willingness to pay as well as some quite different ways of valuation . . . which may supplement or supplant the willingness-to-pay framework." Id.

43. See generally Adler, supra note 41, at 57–153 (exploring welfarism and its relationship to cost-benefit analysis); Sen, Discipline, supra note 1 (exploring uses and limits of cost-benefit analysis).

44. See Sunstein, Myths and Realities, supra note 10, at 1848–49 (discussing role of White House in review process, noting "[a]gencies may also engage closely with White House offices when considering important and controversial rules").

45. See, e.g., Sen, Discipline, supra note 1, at 568–69 (discussing intrinsic value of freedom).

7. climate change (which of course raises an assortment of distinctive issues).

Each of the scenarios is brisk and highly stylized. A full picture would include not only a description of the various dollar figures, but also an understanding of what, concretely, those figures mean. To enable readers to compare the stylized scenarios with reality, Appendix B provides actual cost-benefit figures from a wide range of recent regulations.

## II. THE BASICS

1. The annual costs of a regulation are $200 million. The annual benefits are $400 million. The rulemaking agency identifies only two alternatives: issuing or not issuing the regulation.[46] In the process of OIRA review, the numbers will be carefully scrutinized, and some questions will be asked about their accuracy and meaning. But if those questions have good answers, this is an easy one in favor of proceeding.[47] The regulation also has the standard characteristic of most economically significant regulations[48] that agencies submit to OIRA: If both benefits and costs are monetized, the monetized benefits are usually significantly

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46. This is highly artificial. Typically agencies work to explore more than two alternatives, and the process of interagency review focuses on alternatives as well. See Exec. Order No. 13,563, supra note 12, § 1(b) ("[E]ach agency must . . . identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior . . . ."); see also Office of Regulatory Analysis & Evaluation, U.S. Dep't of Transp., Final Regulatory Impact Analysis: Corporate Average Fuel Economy for MY 2017–MY 2025: Passenger Cars and Light Trucks 92–109 (2012) [hereinafter DOT, Corporate Average Fuel Economy], available at http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FRIA_2017-2025.pdf (on file with the *Columbia Law Review*) ("In developing today's . . . standards, the agency developed and examined a wide variety of alternatives.").

Of course the law may narrow the range of available options. Note, however, that regulatory impact analyses frequently discuss alternatives that the law does not permit agencies to select, just as agencies often discuss costs even when they are legally irrelevant. The reason for such discussions is to promote transparency: The public, and relevant policymakers, ought to appreciate these facts even if agencies' hands are tied.

47. This and other examples focus on total costs and benefits, not marginal costs and benefits. If an alternative approach would deliver $390 million in benefits but cost $50 million, it would have higher net benefits, and would for that reason be preferred under Executive Order 13,563. Importantly, agencies must show that the benefits justify the costs and that the chosen approach maximizes net benefits (to the extent permitted by law). See supra note 13 and accompanying text.

48. Under Executive Order 13,563, incorporating Executive Order 12,866, a full regulatory impact analysis is required only for economically significant regulations, which generally qualify as such because they have an impact of $100 million or more per year. For discussion, see Sunstein, Myths and Realities, supra note 10, at 1850–52 (explaining scope of OIRA review). For this reason, this Essay focuses on economically significant regulations.

higher than the monetized costs.[49] For regulations that are submitted to OIRA or published in the Federal Register, and for which benefits and costs are monetized, agencies usually find substantial net benefits.[50]

This is hardly an accident.[51] Under Executive Order 13,563, the benefits must "justify" the costs, and while I shall spend some time with that idea,[52] the easiest way to show justification is to establish that the monetized benefits are simply higher than the monetized costs. If the monetized benefits are lower than the monetized costs, agencies may choose not to submit the draft rule at all, unless there are special considerations (such as a legal obligation or important nonquantifiable benefits).[53] If the costs exceed the benefits, agencies might devote their resources to other rules, or work to identify an approach for which benefits exceed costs. As Appendix B reveals, *the monetized benefits exceeded the monetized costs for nearly every recent economically significant rule for which agencies monetized both benefits and costs.*[54]

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49. See infra Appendix B (providing estimated costs and benefits of recent major rules). Any of the recent OMB reports on the benefits and costs of federal regulations has the relevant figures. See, e.g., OMB, 2011 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities 103–36 (2011) [hereinafter OMB, 2011 Report to Congress], available at http://www.whitehouse.gov/sites/default/files/omb/inforeg/2011_cb/2011_cba_report.pdf (on file with the *Columbia Law Review*) (providing monetized cost and benefits estimates for rules over various periods).

50. See infra Appendix B (providing numerous examples of such regulations).

51. Note also that the numbers are subject to considerable internal and external scrutiny. See Sunstein, Myths and Realities, supra note 10, at 1867 ("Because of the requirements of Executive Order 13,563, the agency's assessment of costs and benefits is likely to be subject to considerable internal scrutiny."). Moreover, there is no evidence that agencies systematically skew costs and benefits calculations in self-serving directions. Sunstein, Simpler, supra note 41, at 174–80 (showing no systematic bias in cost-benefit ratios, as both costs and benefits are under- and overestimated with roughly equal frequency). Hence there is no support for the view that the numbers are unreliable because agencies are regularly attempting to support decisions made by political leaders. Nonetheless, ex ante and ex post numbers often differ, and it remains important to continue to scrutinize rules on the books and to reassess them in light of that scrutiny. This is a central goal of Executive Order 13,563, and in particular the important requirement of a periodic "regulatory lookback" at rules on the books. See Exec. Order No. 13,563, supra note 12, § 6 (calling for "retrospective analysis").

52. See infra Part VII (providing scenarios to show that net benefits are what matter).

53. See generally Sunstein, Nonquantifiable, supra note 18 (discussing role of nonquantifiable values in cost-benefit analysis and "breakeven" analysis designed to incorporate nonquantifiable benefits into assessment).

54. An agency might submit a rule for which the monetized costs exceed the monetized benefits because the law requires its promulgation notwithstanding the outcome of a cost-benefit test. One example is the DOT's "Positive Train Control Rule," which requires certain freight and passenger railroad operations to install systems on trains and tracks to enable automatic control. See OMB, 2011 Report to Congress, supra note 49, at 23, 97 (recognizing that aggregate monetary costs outweighed aggregate monetary benefits for Positive Train Control Rule, and noting there was "clear statutory mandate" for rule); see also infra Appendix B (showing monetary benefits of rule as less than $.1 billion, and costs as $.7 billion).

2. Same as scenario 1, but the agency provides a benefits range of $400 million to $700 million. There are only two alternatives: issuing or not issuing the regulation.[55] This is also likely to be an easy one in favor of proceeding. To be sure, the process of OIRA review (again involving a large number of officials) will devote considerable attention to the sheer width of the benefits range. Why is the agency unable to narrow the range? Do the uncertainties involve economics? Do they involve science?[56] A great deal of time might be spent on these questions in an effort to promote a better understanding, within the federal government and within the public at large, of the likely effects of the regulation. One goal will be to narrow the range, to the extent that doing so reflects the best available evidence.[57] But on the facts as stated, it seems clear that the agency ought to proceed.

3. The annual costs of a regulation are $200 million. The annual benefits range from $50 million to $75 million. Unless the law requires the agency to proceed, or unless significant nonquantifiable benefits are involved,[58] the agency is unlikely to attempt to go forward with this regulation. If it submits the rule to OIRA, many questions will be asked for one simple reason: Executive Order 13,563 requires the benefits to justify the costs. If the monetized benefits are much lower than the monetized costs, it may nonetheless be possible to show that the benefits "justify" the costs; perhaps nonquantifiable benefits are anticipated to be

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55. See supra note 46 (discussing process of narrowing alternatives).

56. Note, for example, that for regulations that reduce particulate matter emissions, the benefits ranges tend to be very large because of competing scientific studies. For example, EPA provided the following cost-benefit conclusion for its final rule on air toxics standards:

> EPA estimates that this final rule will yield annual monetized benefits (in 2007$) of between $37 to $90 billion using a 3% discount rate and $33 to $81 billion using a 7% discount rate. The great majority of the estimates are attributable to co-benefits from 4,200 to 11,000 fewer $PM_{2.5}$-related premature mortalities.

Health & Envtl. Impacts Div., EPA, EPA-452/R-11-011, Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards, at ES-1 (2011), available at http://www.epa.gov/mats/pdfs/20111221MATSfinalRIA.pdf (on file with the *Columbia Law Review*).

For an evaluation of the EPA's calculation of benefits from air pollution regulation, see generally Art Fraas & Randall Lutter, Uncertain Benefits Estimates for Reductions in Fine Particle Concentrations, 33 Risk Analysis 434 (2013) [hereinafter Fraas & Lutter, Uncertain Benefits Estimates] (proposing new approach to treatment of uncertainty in calculating benefits from air pollution reduction); see also Art Fraas & Randall Lutter, Reply to Letter by Fann, Lamson, Anenberg, and Hubbell, Regarding Fraas & Lutter Article: "Uncertain Benefits Estimates for Reductions in Fine Particle Concentrations," 33 Risk Analysis 757 (2013) (underscoring EPA's "limited progress" toward improving estimations of health benefits and uncertainty).

For greenhouse gas emissions, there is also a range of values for the social cost of carbon. See infra Appendix A.

57. See Exec. Order No. 13,563, supra note 12, § 1(c) ("[E]ach agency is directed to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible.").

58. Discussed in Part VI, infra, in scenarios 22–25.

large and to provide that justification. But this will not be easy to establish.[59]

4. The annual costs of a regulation are $200 million. The benefits range from $50 to $205 million. The agency invokes the "precautionary principle," which (to oversimplify greatly) states that agencies should take precautions even against risks that are speculative or unproven.[60] The agency contends that because the benefits justify the costs at the highest end of the range, it should be entitled to go forward. This claim will be met with many questions. It is noteworthy, and highly revealing, that the precautionary principle does not appear in the governing executive orders; cost-benefit balancing is endorsed instead.[61] The agency will therefore be required to show that the benefits justify the costs, and because the costs exceed the benefits for most of the range, it will not be easy to do so.

There are, however, several possibilities. If the statute requires the agency to proceed, or if it forbids consideration of costs, the question may well be at an end; agencies must follow the law. And if the agency can show that the high-end estimate is by far the most probable, so that the expected value of the rule exceeds $200 million, the benefits would appear to justify the costs. If the agency can show that the rule would produce significant nonquantifiable benefits, it may be able to proceed even if, taking account solely of quantified benefits, the expected value of the rule is negative.[62] But on the facts as stated, the review process will give careful scrutiny to the rule, because the costs exceed the benefits at most points in the range.

## III. VALUATION OF MORTALITY RISKS

5. The annual costs of a regulation are $200 million. The regulation is expected to prevent forty premature deaths. The agency uses $7 million as the value of a statistical life (VSL),[63] which specifies the monetary value of a life saved.[64] The agency therefore estimates the benefits as

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59. See infra Part VI (discussing nonquantifiable or hard-to-quantify benefits further).

60. For discussion, see Cass R. Sunstein, Beyond the Precautionary Principle, 151 U. Pa. L. Rev. 1003, 1004–08, 1011–20 (2003) (describing and criticizing precautionary principle's effect of paralyzing regulatory action).

61. See supra text accompanying note 13 (discussing Executive Order 13,563's emphasis on cost-benefit analysis).

62. See infra Part VI (demonstrating how to account for nonquantifiable or hard-to-quantify benefits).

63. For detailed evaluation of the use of VSL in cost-benefit calculations, see generally Sunstein, The Value of a Statistical Life, supra note 41.

64. See id. at 238–39 (providing simplified example of calculating VSL in monetary terms).

$280 million. In the absence of various imaginable problems,[65] the regulation will likely go forward, because $7 million is within the range recommended by OMB for the VSL,[66] and also within the range suggested by the current technical literature.[67] Note in this regard that the DOT, building on that literature, adopted a revised estimate of $9.1 million in 2013, with suitable adjustments for future years.[68]

An important clarification: With these values, the government is not actually "valuing life." It is valuing the reduction of mortality risks—typically by eliminating low-level risks of, for example, 1 in 100,000. When it is said that a life is "worth" $7 million in such cases, what is really meant is that people are willing to pay $70, on average, to eliminate a risk of 1 in 100,000 (or perhaps that they are willing to accept $70, on average, to accept such a risk).[69] Instead of valuing lives as such, or even statistical lives, the government is valuing statistical mortality risks.

6. The annual costs of a regulation are $200 million. The regulation is expected to prevent ten premature deaths. The agency contends that the VSL is $21 million and that the regulation is therefore justified. The

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65. For example, the numbers might not reflect reality or there might be another approach with higher net benefits.

66. OMB Circular A-4 does not prescribe a specific number, but recommends a range of $1 million to $10 million. OMB, Circular A-4, supra note 23, at 29–30. Note that in practice, agencies do not greatly differ on VSL; their judgments are concentrated between $7 million and $9 million. See, e.g., infra note 72 (comparing various agency approaches to VSL).

67. See generally W. Kip Viscusi, The Heterogeneity of the Value of a Statistical Life: Introduction and Overview, 40 J. Risk & Uncertainty 1, 7 (2010) [hereinafter Viscusi, Heterogeneity] (noting median value of $7.6 million); W. Kip Viscusi & Joseph E. Aldy, The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World, 27 J. Risk & Uncertainty 5 (2003) (collecting evidence on valuation of mortality risks).

68. Memorandum from Polly Trottenberg, Under Sec'y for Policy, Dep't of Transp. & Robert S. Rivkin, Gen. Counsel, Dep't of Transp., to Secretarial Officers and Modal Administrators, Dep't of Transp. (Feb. 28, 2013), available at http://www.dot.gov/sites/dot.dev/files/docs/DOT%202013%20Signed%20VSL%20Memo.pdf (on file with the *Columbia Law Review*).

69. There is a well-known disparity between "willingness to pay" and "willingness to accept," with the latter number typically being higher. See Cass R. Sunstein, Endogenous Preferences, Environmental Law, 22 J. Legal Stud. 217, 223–30 (1993) (explaining disparity between willingness to pay and accept). To the extent that labor market studies are used to determine VSL, agencies are relying on willingness to accept. Note in addition that the two figures do not appear to diverge in this context. Thomas J. Kniesner et al., Willingness to Accept Equals Willingness to Pay for Labor Market Estimates of the Value of Statistical Life (Vanderbilt Univ. Law Sch., Vanderbilt Law & Econ. Research Paper No. 13-06, 2012), available at http://ssrn.com/abstract=2221038 (on file with the *Columbia Law Review*) (contending disparity does not occur for labor market estimates). There is, however, an unresolved question about whether bounded rationality of various sorts might "impeach" the numbers that emerge from revealed preference studies. See, e.g., Tali Sharot, The Optimism Bias: A Tour of the Irrationally Positive Brain, at iv–xvii (2011) (exploring tendency toward unrealistic optimism, with reference to both behavioral and neurological evidence).

regulation is not likely to proceed (unless some statute says that it must). The $21 million figure is inconsistent with OMB guidance, which has a recommended ceiling of $10 million,[70] and is in any case well outside of the range of the technical literature, which shows little support for values as high as $21 million.[71] The agency will have to produce a special justification to go forward, and it will not be easy for it to do so. And indeed, this example is wildly hypothetical, because no agency now uses a VSL in the vicinity of $21 million.[72]

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70. E.g., OMB, Circular A-4, supra note 23, at 30 ("A substantial majority of the resulting estimates of VSL vary from roughly $1 million to $10 million per statistical life.").

71. See OMB, 2012 Report, supra note 15, at 17 n.20 (suggesting agencies use VSL values ranging from $6.7 million to $12.2 million in 2010 dollars).

72. For a decision invalidating a rule with what the court thought to be excessive cost-benefit ratios, see Corrosion Proof Fittings v. EPA, 947 F.2d 1201, 1217, 1229 (5th Cir. 1991) (striking down EPA regulation in part because of high costs in relation to benefits).

OMB's 2012 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities contains a relevant overview of the practices of various agencies with respect to VSL:

> Two agencies, EPA and DOT, have developed official guidance on VSL. In its 2011 update, DOT adopts a value of $6.2 million ($2010), and requires all the components of the Department to use that value in their RIAs. EPA recently changed its VSL to an older value of $6.3 million ($2000) and adjusts this value for real income growth to later years. In its final rule setting a new primary standard for nitrogen dioxide, for example, EPA adjusted this VSL to account for a different currency year ($2006) and for income growth to 2020, which yields a VSL of $8.9 million. . . .
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> . . . Although the Department of Homeland Security has no official policy on VSL, it recently sponsored a report through its U.S. Customs and Border Protection, and has used the recommendations of this report to inform VSL values for several recent rulemakings. This report recommends $6.3 million ($2008) and also recommends that DHS adjust this value upward over time for real income growth (in a manner similar to EPA's adjustment approach).

OMB, 2012 Report, supra note 15, at 18 n.20.

Note that after these words were written, the DOT raised its VSL to $9.1 million. Trottenberg & Rivkin, supra note 68. For an explanation of the DOT's guidance on VSL, see id. For the EPA's treatment of VSL in its regulatory impact analysis regarding nitrogen dioxide, see Health & Envtl. Impact Div., EPA, Final Regulatory Impact Analysis (RIA) for the $NO_2$ National Ambient Air Quality Standards (NAAQS) 4-8 n.11 (2010), available at http://www.epa.gov/ttn/ecas/regdata/RIAs/FinalNO2RIAfulldocument.pdf (on file with the *Columbia Law Review*). For the Department of Homeland Security's treatment of VSL, see Lisa A. Robinson, Valuing Mortality Risk Reductions in Homeland Security Regulatory Analyses, at v–vi (2008), available at http://www.regulatory-analysis.com/robinson-dhs-mortality-risk-2008.pdf (on file with the *Columbia Law Review*).

The Department of Labor's Occupational Safety and Health Administration (OSHA) and the Food and Drug Administration (FDA) have also used VSL in individual rule-makings. In setting a permissible exposure limit for hexavalent chromium, OSHA specifically referred to EPA guidance to justify a VSL of $6.8 million in 2003 dollars. See Occupational Exposure to Hexavalent Chromium, 71 Fed. Reg. 10,100, 10,305 (Feb. 28, 2006) (codified as amended at 29 C.F.R. pts. 1910, 1915, 1917–1918, 1926 (2012)). Additionally, the FDA has used values of $5 and $6.5 million in 2002 dollars in its rule-makings to monetize mortality risks. Food Labeling: *Trans* Fatty Acids in Nutrition Labeling, Nutrient Content Claims, and Health Claims, 68 Fed. Reg. 41,434, 41,489 (July

7. Under Approach A, the annual costs of a regulation are $200 million. Under that approach, the regulation would save fifty-one lives annually. Under Approach B, the annual costs of the regulation are $300 million, and the regulation would save sixty lives annually. If a statistical life is valued at $4 million, Approach A is justified by the monetized figures, and Approach B is not. If a statistical life is valued at $7 million, both approaches are justified, and Approach B is better, because it has significantly higher net benefits. Because the technical literature supports a VSL of $7 million or higher,[73] OIRA and other interagency reviewers might well ask the agency to give serious consideration to Approach B. The agency would be entitled to use a VSL of $7 million (or higher) and to proceed on the ground that it has chosen the approach that maximizes net benefits. If it favors Approach A, it will be asked why it has done so.[74]

8. The annual costs of a potential regulation, offering a new approach to safety in some area, are $200 million. The regulation is expected to save thirty lives. The agency uses a VSL of $4 million, and for that reason, it is reluctant to proceed. It submits a draft rule that explains why it is maintaining the status quo. In the interagency process, there will be considerable interest in going forward with the new approach, because (as noted) the technical literature supports a VSL of $7 million or higher (very plausibly $9 million or so).[75]

9. The annual costs of a regulation are $200 million. The agency uses a VSL of $8 million. The regulation is expected to prevent twenty-four premature deaths. The relevant deaths involve cancer. The agency argues that it should be able to use a "cancer premium,"[76] understood as

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11, 2003) (codified as amended at 21 C.F.R. pt. 101 (2012)); Labeling Requirements for Systemic Antibacterial Drug Products Intended for Human Use, 68 Fed. Reg. 6062, 6076 (Feb. 6, 2003) (codified as amended at 21 C.F.R. pt. 201). The FDA has also used a monetary value of the remaining life-years saved by alternative policies. See Labeling Requirements for Systemic Antibacterial Drug Products Intended for Human Use, 68 Fed. Reg. at 6076 (applying 3% and 7% discount rates to calculate value of remaining life-years); OMB, 2012 Report, supra note 15, at 18 n.20. The FDA's latter approach of using the monetary value of life-years saved is sometimes described in terms of the "value of a statistical life-year" (VSLY). See Lisa A. Robinson, How US Government Agencies Value Mortality Risk Reductions, 1 Rev. Envtl. Econ. & Pol'y 283, 293–94 (2007) (exploring VSLY practice at several agencies).

73. See, e.g., Viscusi, Heterogeneity, supra note 67, at 7 (noting median value of $7.6 million).

74. No agency uses a VSL as low as $4 million; agencies tend to be in the range of $6 million to $9 million. OMB, 2012 Report, supra note 15, at 17 n.20.

75. See supra note 73 and accompanying text.

76. There is a large and growing literature on the question of whether agencies should use such a premium. See EPA, Valuing Mortality Risk Reductions for Environmental Policy: A White Paper 20–26 (2010), available at http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0563-1.pdf/$file/EE-0563-1.pdf (on file with the *Columbia Law Review*) (exploring how VSL for cancer risk might differ from VSL for risks not associated with lengthy and painful illness). See generally Cass R. Sunstein, Bad Deaths, 14 J. Risk & Uncertainty 259 (1997) [hereinafter Sunstein, Bad Deaths] (discussing how will-

an increase in VSL. The agency contends that because people would be willing to spend an extra amount to avoid mortality risks associated with cancer, it should be able to increase the VSL by 10%, thus ensuring that the benefits exceed the costs. This is an open question and a legitimate subject for discussion. The technical literature has not reached a final judgment on the question whether there should be a "cancer premium."[77] At the very least, it will be acceptable for the agency to do a sensitivity analysis in which it increases the VSL because cancer, an especially dreaded illness, is involved.[78] It is possible that with reference to the sensitivity analysis, the agency will be able to conclude that the benefits "justify" the costs.

10. The annual costs of a regulation are $1 billion. The annual benefits are $650 million. The majority of those benefits would come from preventing seventy deaths, with each statistical life being valued at $8 million. The agency notes that of the seventy deaths, forty involve children under the age of five. It contends for reasons of equity, and because many "life-years" are at stake, it is reasonable to proceed, notwithstanding the fact that the monetized benefits fall far short of the monetized costs.[79] Under a "life-years" approach, the agency does not

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ingness to pay might vary across risks); Trudy Ann Cameron et al., Willingness to Pay for Health Risk Reductions: Differences by Type of Illness (June 2009) (unpublished manuscript), available at http://pages.uoregon.edu/cameron/vita/Cameron_DeShazo_Johnson_0619091.pdf (on file with the *Columbia Law Review*) (discussing variation in willingness to pay across different mortality risks). EPA's Scientific Advisory Board has generally supported the use of a cancer premium. Sci. Advisory Bd., EPA, EPA-SAB-11-011, Review of Valuing Mortality Risk Reductions for Environmental Policy: A White Paper (December 10, 2010), at 12 (2011), available at http://yosemite.epa.gov/sab/sabproduct.nsf/298E1F50F844BC23852578DC0059A616/$File/EPA-SAB-11-011-unsigned.pdf (on file with the *Columbia Law Review*) ("[T]he SAB suggests that the magnitudes of cancer and other hazard-specific differentials should be evaluated as part of an integrated process used to estimate the value of mortality risk reduction and how it varies with risk and individual characteristics, using some of the methods described above.").

77. See, e.g., Sunstein, Bad Deaths, supra note 76, at 276–77 (discussing further work necessary to determine appropriate "bad death premium").

78. The EPA did such an analysis in the context of arsenic. See Sunstein, Risk and Reason, supra note 41, at 175.

79. Consider here the DOT's proposed rule to increase rear visibility in motor vehicles, which grapples with issues of this kind. The rule states:

> [T]he quantitative analysis does not offer a complete accounting. We have noted that well over 40 percent of the victims of backover crashes are very young children (under the age of five), with nearly their entire life ahead of them. Executive Order 12866 also refers explicitly to considerations of equity. ("(I)n choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including . . . equity)["]), and there are strong reasons, grounded in those considerations, to prevent the deaths at issue here.

Federal Motor Vehicle Safety Standard, Rearview Mirrors, 75 Fed. Reg. 76,186, 76,238 (proposed Dec. 7, 2010) (to be codified at 49 C.F.R. pts. 571, 585).

Circular A-4 states:

emphasize VSL, but instead calculates the number of life-years to be saved and multiplies that number by some monetary figure.[80] The question whether and how to proceed is a legitimate topic for discussion; the underlying issues are open ones.[81] Drawing on contingent valuation studies, some research suggests that parents' VSL for their children is double their VSL for themselves.[82] Whether or not this research is sufficiently advanced or solid for government use, it identifies an issue that is entitled to exploration in the OIRA process.

11. The annual costs of a regulation are $300 million. It would prevent forty premature deaths annually. The agency uses a VSL of $8 million, and it concludes that the benefits justify the costs. The agency acknowledges that nearly all of those deaths would involve elderly people—typically extending their lives by merely a few months. In the public comment process,[83] some people object that it is not reasonable to use the standard VSL for very brief extensions of life. These objections will not go unnoticed in interagency discussions. To be sure, Circular A-4 does not call for reducing the VSL in such cases.[84] But the relevant

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> The age of the affected population has also been identified as an important factor in the theoretical literature. However, the empirical evidence on age and VSL is mixed. In light of the continuing questions over the effect of age on VSL estimates, you should not use an age-adjustment factor in an analysis using VSL estimates.

OMB, Circular A-4, supra note 23, at 30. But it allows consideration of the value of statistical life-years:

> Another way that has been used to express reductions in fatality risks is to use the life expectancy method, the "value of statistical life-years (VSLY) extended." If a regulation protects individuals whose average remaining life expectancy is 40 years, a risk reduction of one fatality is expressed as "40 life-years extended." . . . You should consider providing estimates of both VSL and VSLY, while recognizing the developing state of knowledge in this area.

Id.

80. See Cass R. Sunstein, Lives, Life-Years, and Willingness to Pay, 104 Colum. L. Rev. 205, 206, 226–28 (2004) (suggesting agencies should focus on number of life-years saved, and discussing how to monetize life-years).

81. See generally Sean Hannon Williams, Statistical Children, 30 Yale J. on Reg. 63 (2013) (discussing economic value of risks to children and urging increase in usual VSL).

82. See id. at 69–78 (surveying various studies on "child premium," and noting studies suggesting parents' valuation of their children's lives is double their VSL for themselves).

83. Recall that under the Administrative Procedure Act, 5 U.S.C. § 553 (2012), rules are generally proposed to the public for a comment period before they can be finalized. Supra note 38 and accompanying text. Those comments play a large role in the process of OIRA review. See Sunstein, Myths and Realities, supra note 10, at 1843, 1862 ("[T]he review process relies above all on interagency comments and written comments from the public. When rules change as a result of review, it is usually because of interagency or public comments, not because of meetings.").

84. See OMB, Circular A-4, supra note 23, at 30. It states:

> The age of the affected population has also been identified as an important factor in the theoretical literature. However, the empirical evidence on age and VSL is mixed. In light of the continuing questions over the effect of age on VSL

question might well be discussed in the review process, with no obvious resolution.

12. The annual costs of a regulation are $350 million. It is anticipated to prevent thirty premature deaths each year. The agency uses a VSL of $9 million. The agency adds that the regulation would prevent a specified number of accidents or illnesses, and also a specified amount of

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> estimates, you should not use an age-adjustment factor in an analysis using VSL estimates.
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> Another way that has been used to express reductions in fatality risks is to use the life expectancy method, the "value of statistical life-years (VSLY) extended." . . . Those who favor this alternative approach emphasize that the value of a statistical life is not a single number relevant for all situations. In particular, when there are significant differences between the effect on life expectancy for the population affected by a particular health risk and the populations studied in the labor market studies, they prefer to adopt a VSLY approach to reflect those differences. You should consider providing estimates of both VSL and VSLY, while recognizing the developing state of knowledge in this area.
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> . . . In any event, when you present estimates based on the VSLY method, you should adopt a larger VSLY estimate for senior citizens because senior citizens face larger overall health risks from all causes and they may have accumulated savings to spend on their health and safety.

Id. (footnote omitted).

There were intense controversies over what was called the "senior death discount" in the Bush Administration. See Katharine Q. Seelye & John Tierney, E.P.A. Drops Age-Based Cost Studies, N.Y. Times (May 8, 2003), http://www.nytimes.com/2003/05/08/us/epa-drops-age-based-cost-studies.html (on file with the *Columbia Law Review*) ("Critics call the policy the 'senior death discount' and say the administration is turning on older Americans as a rationale to weaken environmental regulations."). For discussion of VSL variation by age, see generally Joseph E. Aldy & W. Kip Viscusi, Age Differences in the Value of Statistical Life (Res. for the Future, Discussion Paper No. 07-05, 2007), available at http://www.rff.org/documents/RFF-DP-07-05.pdf (on file with the *Columbia Law Review*) (discussing age-based VSL variation due to revealed preferences in accepting job fatality risks); W. Kip Viscusi & Joseph E. Aldy, Labor Market Estimates of the Senior Discount for the Value of Statistical Life (Res. for the Future, Discussion Paper No. 06-12, 2006), available at http://www.rff.org/RFF/documents/RFF-DP-06-12.pdf (on file with the *Columbia Law Review*) (examining reduction of VSL for older workers due to their greater risk vulnerability). For a discussion of VSL reduction, see Sci. Advisory Bd., supra note 76. The review states:

> While it is clear from economic theory that individual WTP [willingness to pay] may vary with individual and risk characteristics, the SAB [Science Advisory Board] acknowledges that the objectives, methods, and principles underlying benefit-cost analysis and particularly the values of mortality risk reductions and other non-market goods are often misunderstood or rejected as inappropriate by many participants and commentators on the policymaking process. In the past, for example, the [EPA] was criticized for considering VRRs [values of risk reduction] that differ by individuals' age. However, as acknowledged in the White Paper, values for health risk reductions are not "one size fits all." Applying a willingness to pay value to a targeted population (such as low income or elderly) that exceeds that group's willingness to pay for reduced risk could result in decisions that ultimately reduce the well-being of the targeted group.

Id. at 7.

property damage. The value of these benefits exceeds $85 million. If the numbers survive interagency scrutiny, and if there is no other problem (such as an alternative approach that would have higher net benefits), the regulation will go forward, because the benefits justify the costs.

## IV. WIDE RANGES

13. The annual costs of a regulation are $200 million. Approach A would have annual benefits of $400 million to $900 million, and Approach B would have annual benefits of $500 million to $1 billion. There will be considerable discussion of what accounts for the width of the ranges, and of whether an understanding of the underlying materials suggests that the ranges can be narrowed. If, for example, the agency is using several scientific studies, one question will be whether one of them is best, and whether the best study can be used to narrow the range or to produce a point estimate (understood as a specific number reflecting the agency's best judgment).[85]

In principle, the estimates should be subject to probability weighting to come up with some kind of expected value. And if the range is as wide as it is because the agency is using a VSL range of $1 million to $10 million[86] (although this would be highly surprising and indeed unprecedented), the interagency process will work toward using the technical literature to see if a single number can be used as the primary estimate. A great deal of work would be done to try to achieve greater precision and confidence in the numbers. It would be necessary to know much more about Approach A and Approach B to be confident, but it is not impossible that Approach B is preferable to Approach A along every dimension.

14. The annual costs of a regulation are $200 million. The annual benefits range from $150 million to $400 million. Here as well, a great deal of work would be done to explore the benefits range. In principle, and as in scenario 13, the estimates should be subject to probability weighting. Perhaps regulators can conclude that there is a 75% chance that the benefits are $150 million, a 10% chance that the benefits are

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85. See supra note 56 (showing wide range of estimated benefits of reducing particulate matter, and that differences stem from different scientific studies, not from economics); see also Fraas & Lutter, Uncertain Benefits Estimates, supra note 56, at 435–36 & tbl.II (summarizing differing methodologies of various studies). Different scientific assessments also played a role in the detailed discussion of different possible estimates in connection with the hours of service rule for truck drivers. See Analysis Div., Fed. Motor Carrier Safety Admin., RIN 2126-AB26, 2010–2011 Hours of Service Rule: Regulatory Impact Analysis 4-1 to 5-17 (2011), available at http://www.fmcsa.dot.gov/documents/hos/2011_HOS_Final_Rule_RIA.pdf (on file with the *Columbia Law Review*) (incorporating various studies into calculation of health and safety benefits).

86. This range is consistent with Circular A-4. As noted, however, the lower end of this scale does not fit with the technical literature, and hence serious questions would be raised by any effort to use that lower end.

$150 million to $200 million, a 10% chance that the benefits are $200 million to $300 million, and a 5% chance that the benefits are $200 million to $300 million. In practice, however, this kind of assignment is usually quite difficult or perhaps even impossible. In the absence of full-scale probability weighting, many questions would be asked about whether the low ends of the range are the most probable, so that there is a realistic chance that the costs will exceed the benefits. Suppose—as is not unimaginable—that it is not possible to do more than to state the existence of a range. It would be tempting to consider using the midpoint[87] for purposes of analysis, if only for reasons of convenience. But this approach runs into obvious objections and concerns, because there is no reason, in the abstract, to think that the midpoint is correct.[88]

15. The annual costs of a regulation are $1.5 billion. The annual benefits range from $800 million to $2 billion. A great deal of work would be done to explore the benefits range, and in fact, the agency will be asked to do a formal uncertainty analysis (involving a probabilistic analysis of relevant uncertainties), because the costs exceed $1 billion.[89] To the extent feasible, the various points within the range must be subject to probability weighting, to come up with some kind of expected value. It is possible, of course, that existing information does not make such weighting feasible, but participants in the review process, including the agency itself, are likely to explore the economic and scientific questions to obtain a better understanding of the range.

16. The annual costs of a regulation are $200 million. Under Approach A, the annual benefits would be between $100 million and $400 million. Under Approach B, the benefits would be between $50 million and $700 million. As in previous scenarios, there would be a great deal of interest in understanding what accounts for these ranges and whether they might be narrowed. There would be interest in exploring the possibility that Approach B has a higher expected value and should therefore be chosen.

17. The annual costs of a regulation are $200 million. The annual benefits range from $25 million to $225 million. It will be noticed that for most of the range, the benefits are significantly lower than the cost. Reviewers will ask whether the agency can show that the higher ends of

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87. See, e.g., OMB, 2011 Report to Congress, supra note 49, at 21 fig.1-1, 55 fig.2-1, 56 tbl.2-2, 57 tbl.2-3, 58 tbl.2-4 (using middle of range for some accounting purposes).

88. Perhaps one or another end of the scale can be shown to be more probable. The use of the middle of the range seems to suggest some kind of "Principle of Insufficient Reason," and it is not clear if that principle can be defended, even under circumstances of uncertainty. For discussion and relevant literature, see Sunstein, Worst-Case Scenarios, supra note 2, at 166, 316 nn.76–78 ("The Principle of Insufficient Reason says that when people lack much information about probabilities . . . they will act as if each probability is equally likely.").

89. See OMB, Circular A-4, supra note 23, at 41 ("For rules that exceed the $1 billion annual threshold, a formal quantitative analysis of uncertainty is required.").

the range are more likely than the lower, or whether special circumstances are involved.

## V. COBENEFITS AND RISK-RISK TRADEOFFS

18. A regulation designed to reduce mercury emissions would also serve to reduce emissions of other air pollutants, including particulate matter.[90] While the benefits of mercury reductions cannot be monetized (because of the limitations of the existing science), the benefits of reducing particulate matter can be, and they clearly exceed the costs of the regulation. The agency invokes the cobenefits as part of its assessment of costs and benefits, and as a central factor in its explanation of why the benefits justify the costs. Commentators on the proposed rule object that cobenefits should not be considered, because the rule is designed to reduce mercury emissions. Under OMB Circular A-4, the agency is certainly entitled to consider the cobenefits.[91] What the agency is required to do is to offer a full accounting, understood as a complete description of all benefits and costs.[92] Cobenefits are unquestionably part of that full accounting, and must be counted alongside (and equivalently to) other benefits.

19. A regulation designed to increase fuel economy would also have effects on safety. The evidence (speaking hypothetically)[93] suggests that

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90. This example is realistic. See National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units, 77 Fed. Reg. 9304, 9428–32 (Feb. 16, 2012) (codified as amended at 40 C.F.R. pts. 60, 63 (2012)) (finding significant cobenefits in form of particulate matter reductions in analysis of mercury rule).

91. See supra note 56 (citing and quoting regulatory impact analysis for mercury rule that considered cobenefits in analysis).

92. Circular A-4 states:

> Your analysis should look beyond the direct benefits and direct costs of your rulemaking and consider any important ancillary benefits and countervailing risks. An ancillary benefit is a favorable impact of the rule that is typically unrelated or secondary to the statutory purpose of the rulemaking (e.g., reduced refinery emissions due to more stringent fuel economy standards for light trucks) while a countervailing risk is an adverse economic, health, safety, or environmental consequence that occurs due to a rule and is not already accounted for in the direct cost of the rule (e.g., adverse safety impacts from more stringent fuel-economy standards for light trucks).

OMB, Circular A-4, supra note 23, at 26. Of course the agency should avoid double counting; the benefits must be genuinely attributable to the rule in question, and they must not be counted more than once in the analyses that accompany more than one rule. It would, for example, be a mistake to claim benefits from one rule when they are actually attributable to another, or to claim the same benefits twice. Because the benefits ranges of particulate matter reductions are so large, see supra note 56, and because they play a role in many important regulations, both the scientific and the accounting questions continue to deserve careful attention.

93. In its recent rule on fuel economy standards, the DOT did include additional costs from increased traffic congestion, vehicle accidents, and highway noise in its calculations. 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and

those effects will be negative, in the sense that there will be a modest increase in deaths and accidents. The agency is required to discuss those negative effects and to include them in its full accounting.[94] Risk-risk analysis, understood as an assessment of the risks that would be introduced by efforts at risk reduction, is a standard part of cost-benefit analysis, and ancillary risks usually cannot be ignored.

20. The principal benefits of an energy efficiency requirement (applicable to refrigerators) would come in the form of savings for consumers. The rule would also provide significant benefits in terms of air pollution reductions (including greenhouse gas reductions) and energy security (understood as the national security benefits that come from reduced dependence on foreign oil). Nonetheless, the costs would greatly exceed the benefits if the agency did not include consumer savings. In the public comment period, some commentators contend that there is no market failure, that consumers should be able to make such choices as they like, and that the government cannot legitimately treat private savings to consumers as "benefits."[95] The agency is entitled to reject this contention; however private, such savings would seem to count as benefits, and nothing forbids the agency from counting them as such. Agencies have long considered private savings as benefits.[96]

At the same time, the agency will have to meet two challenges. *First*, it will have to identify the relevant market failure; Executive Order 12,866 generally requires it to do so.[97] The agency may well be able to

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Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62,624, 62,999 (Oct. 15, 2012) (codified as amended at 40 C.F.R. pts. 85–86, 600 (2012)). For a recent discussion of the empirical issues, see generally Mark R. Jacobsen, Fuel Economy and Safety: The Influences of Vehicle Class and Driver Behavior, Am. Econ. J.: Applied Econ., July 2013, at 1, 1–26 (finding that recent regulatory provisions have prevented potential adverse effects of fuel economy rules on safety).

94. See supra note 92 (quoting relevant provision of OMB Circular A-4).

95. See generally Ted Gayer & W. Kip Viscusi, Overriding Consumer Preferences with Energy Regulations (Vanderbilt Univ. Law Sch., Vanderbilt Law & Econ. Working Paper No. 12-24, 2012), available at http://ssrn.com/abstract=2111450 (on file with the *Columbia Law Review*) (arguing against counting private savings as benefits in context of appliances and vehicles).

96. See, e.g., Assessment & Standards Div., EPA, EPA420-R-04-007, Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines, at ES-2, 6-2 to -90 (2004), available at http://www.epa.gov/otaq/documents/nonroad-diesel/420r04007.pdf (on file with the *Columbia Law Review*) (discussing savings of "nonroad equipment users" and "owners" as benefits); U.S. Dep't of Energy, Regulatory Impact Analysis: Energy Conservation Standards for Consumer Products: Covering: Fluorescent Lamp Ballasts, at R-1 to -2, R-6 (1999), available at http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/regulatory_impact.pdf (on file with the *Columbia Law Review*) (listing, among others, "total projected amount of energy savings likely to result directly from the imposition of the standard" as factor in cost-benefit analysis).

97. See Exec. Order No. 12,866, supra note 31, § 1(b)(1) ("Each agency shall identify the problem that it intends to address[,] []including, where applicable, the failures of private markets . . . .").

rely on behavioral market failures associated with the energy paradox,[98] suggesting that with respect to energy efficiency, consumers do not always make decisions that serve their long-term interests.[99] Potential reasons include a lack of salience and myopia. In explaining the fuel economy rules issued in 2012, for example, the DOT referred to:

> phenomena observed in the field of behavioral economics, including loss aversion, inadequate consumer attention to long-term savings, or a lack of salience of relevant benefits (such as fuel savings, or time savings associated with refueling) to consumers at the time they make purchasing decisions. Both theoretical and empirical research suggests that many consumers are unwilling to make energy-efficient investments even when those investments appear to pay off in the relatively short-term. This research is in line with related findings that consumers may undervalue benefits or costs that are less salient, or that they will realize only in the future.[100]

*Second*, the agency will have to investigate whether energy efficiency requirements might result in less desirable refrigerators. The reason is that if they do so, they will be imposing a cost, which must be considered as part of the full accounting. A consumer welfare loss is unquestionably a cost, and possibly a high one. If, for example, refrigerators will cool less well, or if they will be less pleasing aesthetically, there will be an offsetting loss, potentially sufficiently high as to raise questions about the agency's basic analysis. The process of review will devote considerable attention to that possibility.

21. Same as scenario 20, but the rule is designed to increase the fuel economy of vehicles. The agency invokes private fuel savings and time savings as benefits. It notes that consumers would save a great deal of

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98. For a discussion of the energy paradox, see Adam B. Jaffe & Robert N. Stavins, The Energy Paradox and the Diffusion of Conservation Technology, 16 Resource & Energy Econ. 91, 92–94 (1994) (describing energy paradox as "inadequate diffusion of apparently cost-effective energy-conserving technologies").

99. For a valuable overview, showing the complexity of the underlying issues and the amount that remains to be learned with respect to consumer behavior, see generally Hunt Allcott & Michael Greenstone, Is There an Energy Efficiency Gap?, J. Econ. Persp., Winter 2012, at 3 (urging that existing evidence of consumer error is equivocal). For an important discussion of externalities and internalities, see generally Hunt Allcott et al., Energy Policy with Externalities and Internalities (Nat'l Bureau of Econ. Research, Working Paper No. 17977, 2012), available at http://www.nber.org/papers/w17977 (on file with the *Columbia Law Review*). On behavioral market failures, see generally Cass R. Sunstein, The Storrs Lectures: Behavioral Economics and Paternalism, 122 Yale L.J. 1826, 1842–52 (2013) (identifying present bias and time inconsistency, ignoring shrouded attributes, unrealistic optimism, and probability problems as forms of behaviorial market failure); Cass R. Sunstein, Why Nudge? The Politics of Libertarian Paternalism (forthcoming Mar. 2014) (on file with the *Columbia Law Review*) (exploring behavioral market failures as basis for regulation). For examples of energy paradox issues in the context of fuel-efficient vehicles, see infra note 102.

100. DOT, Corporate Average Fuel Economy, supra note 46, at 983 (footnote omitted). It is true that the underlying questions deserve continuing investigation.

money at the pump, and also that they would have to go to the gas station far less often, thus saving time (and it monetizes that benefit). The agency finds that because these (private) benefits are high, the costs of the proposed regulation are justified. But without these benefits, the regulation could not easily be justified in that way.

As in scenario 20, commentators object that the private fuel savings should not be counted, and also that time savings should not be counted, because consumers are perfectly able to take account of both of those savings in deciding which vehicles to buy.[101] The answer will depend on the evidence (which continues to develop), but if it offers a reasonable explanation, the agency will be entitled to reject the objection. Again, as in scenario 20, it should identify the market failure[102] and explore the possibility of consumer welfare losses, which would unquestionably count as costs.[103]

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101. See supra note 95 and accompanying text (discussing criticism of counting private savings as benefits).

102. In a relevant rule, the EPA identified the problem as follows:

> The central conundrum has been referred to as the Energy Paradox in this setting (and in several others). In short, the problem is that consumers appear not to purchase products that are in their economic self-interest. There are strong theoretical reasons why this might be so:
>
> – Consumers might be myopic and hence undervalue the long-term.
> – Consumers might lack information or a full appreciation of information even when it is presented.
> – Consumers might be especially averse to the short-term losses associated with the higher prices of energy efficient products relative to the uncertain future fuel savings, even if the expected present value of those fuel savings exceeds the cost (the behavioral phenomenon of "loss aversion")
> – Even if consumers have relevant knowledge, the benefits of energy-efficient vehicles might not be sufficiently salient to them at the time of purchase, and the lack of salience might lead consumers to neglect an attribute that it would be in their economic interest to consider.

Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 75 Fed. Reg. 25,324, 25,510–11 (May 7, 2010) (codified as amended at 40 C.F.R. pts. 85–86, 600 (2012) (footnotes omitted); 49 C.F.R. pts. 531, 533, 536–538 (2012)).

103. In particular, the DOT conducted a sensitivity analysis with consumer welfare losses and found that even if such losses are very high, the benefits of its fuel economy rules justify the costs. See Office of Regulatory Analysis & Evaluation, U.S. Dep't of Transp., Final Regulatory Impact Analysis: Corporate Average Fuel Economy for MY 2012–MY 2016: Passenger Cars and Light Trucks 419–33 & tbl.VIII-18 (2010), available at http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE_2012-2016_FRIA_04012010.pdf (on file with the *Columbia Law Review*) (indicating positive private benefits of fuel economy rule to vehicle buyers, even accounting for 25% or 50% overestimation of fuel savings or omission of welfare losses).

VI. BENEFITS, HARD OR IMPOSSIBLE TO QUANTIFY

22. The annual costs of a regulation are $200 million. The regulation would increase water quality, but it would have no beneficial effects on human health. The agency is unable to use standard market measures to quantify and monetize other benefits (for example, aesthetic or recreational benefits). The agency relies on contingent valuation studies (sometimes called "stated preference" studies), which rely on hypothetical questions to identify people's willingness to pay for regulatory benefits. The relevant studies suggest that people would be willing to pay a significant amount to improve water quality in the relevant respects. Though many people are highly skeptical of contingent valuation studies, reliance on such studies is not forbidden by OMB Circular A-4.[104] The interagency process will devote careful scrutiny to the relevant studies to ensure that they are credible and meet appropriate standards.[105]

23. The annual costs of a regulation are $200 million. The monetized annual benefits are $175 million. The regulation is designed to promote building access for people in wheelchairs, and the agency believes that the $25 million shortfall is not fatal, because nonquantifiable values, above all human dignity, are involved. Those values will be subject to discussion and they may well be sufficient to justify the regulation.

This example is not entirely hypothetical. As part of a regulation increasing building access for disabled people, the Department of Justice (DOJ) included a provision designed to protect wheelchair users by requiring new bathrooms to contain sufficient space for them. The cost of this provision was relatively high.[106] The DOJ acknowledged that "the

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104. OIRA, Regulatory Impact Analysis Primer, supra note 23, at 9 states:

> To the extent possible, agencies should estimate people's valuations of benefits and costs using revealed preference studies based on actual behavior. . . .
>
> If the goods or attributes of goods that are affected by regulation—such as preserving environmental or cultural amenities—are not traded in markets, it may be difficult to use revealed preference methods. . . .
>
> In the absence of an organized market, it is difficult to estimate use and non-use values. When studies are designed to elicit such values either though [sic] indirect market studies or stated preference methods, agencies should pay careful attention to characterization of the uncertainties. However, overlooking or ignoring these values may significantly understate the benefits and/or costs of regulatory action.

105. For recent discussion, see generally Richard T. Carson, Contingent Valuation: A Practical Alternative When Prices Aren't Available, J. Econ. Persp., Fall 2012, at 27 (defending contingent valuation measures as sufficiently reliable); Jerry Hausman, Contingent Valuation: From Dubious to Hopeless, J. Econ. Persp., Fall 2012, at 43 (objecting that contingent valuation studies cannot measure actual preferences).

106. Nondiscrimination on the Basis of Disability in State and Local Government Services, 75 Fed. Reg. 56,164, 56,170 (Sept. 15, 2010) (codified as amended at 28 C.F.R.

monetized costs of these requirements substantially exceed the monetized benefits."[107] The DOJ's response to this concern, offered as part of its final rule, is worth quoting at length:

> [T]he additional benefits that persons with disabilities will derive from greater safety, enhanced independence, and the avoidance of stigma and humiliation—benefits that the Department's economic model could not put in monetary terms—are, in the Department's experience and considered judgment, likely to be quite high. Wheelchair users, including veterans returning from our Nation's wars with disabilities, are taught to transfer onto toilets from the side. Side transfers are the safest, most efficient, and most independence-promoting way for wheelchair users to get onto the toilet. The opportunity to effect a side transfer will often obviate the need for a wheelchair user or individual with another type of mobility impairment to obtain the assistance of another person to engage in what is, for most people, among the most private of activities. . . . [I]t is important to recognize that the ADA is intended to provide important benefits that are distributional and equitable in character. These water closet clearance provisions will have non-monetized benefits that promote equal access and equal opportunity for individuals with disabilities . . . .[108]

24. Same as scenario 23, but the costs of the regulation are $1 billion, not $200 million, and so the shortfall is $825 million. The question is whether that shortfall, which is (obviously) significant, can be justified by reference to nonquantifiable values. Authoritative documents do not give specific answers. To resolve the question, many agencies have found it useful to engage in what is called "breakeven analysis" (implicit in scenario 23).[109] Under this approach, agencies do not quantify unquantified or unmonetized benefits (because they are by hypothesis unable to do so), but instead specify how high such benefits would have to be in order for the benefits to justify the costs.[110] The question would therefore be: Are the dignitary and related benefits of the rule worth an expenditure of $825 million?[111] An expenditure of $1 billion, not

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pt. 35 (2013)) ("The standards requiring sufficient space in single-user toilet rooms for a wheelchair user to effect a side or parallel transfer are among the most costly (in monetary terms) . . . but also . . . one of the most beneficial in non-monetary terms.").

107. Id.

108. Id.

109. See generally Sunstein, Nonquantifiable, supra note 18 (offering broad discussion of breakeven analysis and its treatment by government agencies).

110. Id.

111. Note that in a rule involving building access for people in wheelchairs, the DOJ spoke explicitly of breakeven analysis, in a passage that is worth quoting at length:

> The requirements relating the [sic] water closet clearances are among the most costly (in monetary terms) of the new provisions. Although the *monetized* costs of these requirements substantially exceed the *monetized* benefits, the

supported by monetizable benefits that come anywhere close to that figure, would face a heavy burden of justification.

We can imagine some polar cases. Suppose that the regulation would benefit relatively few people—that the number of disabled people who would have access to bathrooms, as a result of the regulation, would be around 200 per year. If so, the question would be whether it would be worthwhile to spend over $46 million annually for each. Recall that some studies suggest that the value of a statistical life ranges around $7–$9 million;[112] in that light, a $46 million annual expenditure would seem difficult to defend. By contrast, suppose that the regulation would benefit many people, say 20,000 annually. In that event, the per-person cost would be $46,250. That is still a substantial amount, and some people might think it too high to provide adequate justification, but it would warrant a discussion.

25. Same as scenario 24, but the regulation is designed to protect clean water, not disabled people. Suppose that the agency does not rely on contingent valuation studies but suggests that the nonquantifiable benefits are substantial and justify the costs. Here as well, breakeven analysis would be invoked. Relevant questions would be: How many water

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> benefits that have not been monetized (avoiding stigma and humiliation, protecting safety, and enhancing independence) are expected to be quite high. . . .
>
> We estimate that the costs of the requirement as applied to out-swinging doors will exceed the monetized benefits by $454 million, which when annualized over 54 years equals a net cost of approximately $32.6 million a year.
>
> We estimate that people with the relevant disabilities will use a newly accessible single-user toilet room with an out-swinging door approximately 677 million times per year. Dividing the $32.6 million annual cost by the 677 million annual uses, we conclude that for the costs and benefits to break even in this context, people with the relevant disabilities will have to value safety, independence, and the avoidance of stigma and humiliation at just under 5 cents per use.
>
> . . . .
>
> We estimate that people with the relevant disabilities will use a newly accessible single-user toilet room with an in-swinging door approximately 8.7 million times per year. Dividing the $19.14 million annual cost by the 8.7 million annual uses, we conclude that for the costs and benefits to break even in this context, people with the relevant disabilities will have to value safety, independence, and the avoidance of stigma and humiliation at approximately $2.20 per use.

Disability Rights Section of the Civil Rights Div., Dep't of Justice, Final Regulatory Impact Analysis of the Final Revised Regulations Implementing Titles II and III of the ADA, Including Revised ADA Standards for Accessible Design 142–43 (2010) (footnote omitted), available at http://www.ada.gov/regs2010/RIA_2010regs/DOJ%20ADA%20Final%20RIA.pdf (on file with the *Columbia Law Review*). Relevant additional discussion, including estimates of the value people with disabilities place on avoiding stigma (based on revealed preference studies), can also be found in the DOJ's Regulatory Impact Analysis. Id. at 68–146.

112. See supra note 63 and accompanying text (discussing VSL).

bodies? What kinds of improvements? What would those improvements actually achieve? Would they help human beings, and if so how? An expenditure of $1 billion would not be easy to defend, assuming that the quantifiable benefits are in the range of $175 million, and unless the law required the agency to proceed, the rule would encounter serious questions.

Suppose, however, that once we investigate the details, we find that the rule would achieve a great deal—for example, because it would protect a very large number of water bodies, and do a great deal for them, with a wide range of aesthetic and ecological benefits (including the protection of fish and wildlife). Once these questions are explored, there may well be enough to justify a serious discussion. If, by contrast, the number of water bodies is relatively small, and the benefits to them would not be great, a significant expenditure would not be easy to justify under breakeven analysis.[113]

26. The annual costs of a regulation are $100 million. It has no easily monetized benefits. Its principal benefits would accrue to animals, in the form of longer and healthier lives (and let us stipulate far less suffering as well). One possibility would be to use contingent valuation studies to obtain monetary equivalents, though it might be challenging to make such studies credible and reliable.[114] (Note that such studies would not necessarily capture the gains to animals themselves.) Another possibility would be to engage in breakeven analysis here as well. As before, a degree of quantification may be helpful short of monetization. Would there be benefits for human beings? Of what kind? How many animals would be helped? A very large number? How much would they be helped? A great deal? Answers to those questions might well prove to be clarifying.[115]

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113. Note that a framing effect might seem relevant here—and lead in unfortunate directions. Suppose, for example, that a rule has a cost of $100 million and that it would provide water quality benefits. The benefits would need specification, but suppose it were asked: Should each citizen of the United States be willing to spend just 33 cents annually to improve water quality? Or 1 cent per month? Or 1/30 of a cent per day? Questions of this sort might make seemingly high costs appear quite low. Suppose that a rule would cost $1 billion and save 100 lives per year. On standard cost-benefit grounds, the rule would not be so easy to defend. But suppose it were asked: Would each American be willing to spend $3 annually to save 100 lives?

The problem with these narrow frames is that they mask the economic effect of costly rules, and make it difficult or impossible to establish priorities and make sensible comparisons and tradeoffs. It might as well be asked: Would Americans be willing to spend $1 billion per year to save 1/3 of a life per day? If the focus shifts to monthly or daily expenditures (why not hourly?), high costs quickly turn into small ones, and their aggregate effects are masked.

114. See Peter A. Diamond & Jerry A. Hausman, Contingent Valuation: Is Some Number Better than No Number?, J. Econ. Persp., Fall 1994, at 45, 47–58 (discussing problems with contingent valuation studies); Hausman, supra note 105, at 44–52 (same).

115. See Sunstein, Nonquantifiable, supra note 18 (manuscript at 17–18) (explaining application of breakeven analysis in cases with hard-to-monetize factors).

27. A regulation is designed to reduce the risk of a financial crisis by stabilizing the financial system. Its annual costs are projected to be $400 million. The agency states that the regulation would make a crisis less likely, but it cannot quantify the extent of the effect. In its regulatory impact analysis, the agency describes the cost of a crisis, if it should occur, and states that if the rule reduces the risk even by a very small percentage (which is specified), its benefits will justify its costs. These claims will receive considerable scrutiny in the review process, and a great deal of work will be devoted to asking whether more information might be obtained and whether the agency's analysis can be made more disciplined. Under the circumstances, a form of breakeven analysis might turn out to be the best that can be done.[116]

28. The annual costs of a regulation are $200 million. The annual benefits are $180 million. The benefits will be enjoyed by low-income workers, who will be protected from serious safety risks. The costs will be imposed on companies that produce a good enjoyed mostly by wealthy people. Let us stipulate that the costs will fall on wealthy consumers. The agency contends that while the benefits do not "exceed" the costs, the distributional impact matters, and that impact supports its conclusion that the benefits "justify" the costs. It insists that because low-income workers would be helped, and wealthy consumers generally would pay the bill, the distributional impact counts strongly in favor of the regulation. In principle, this argument is fully available under, and even invited by, Executive Order 13,563, which explicitly refers to "distributive impacts,"[117] and which therefore authorizes agencies to consider whether certain demographic groups (such as the poor) would disproportionately benefit from regulation.

## VII. NET BENEFITS

29. The costs of a regulation, under Approach A, would be $250 million. The benefits would range from $350 million to $400 million. Under Approach B, the costs of the regulation would be $1 million, and the benefits would be $250 million. The strong presumption would be in favor of Approach B. Although the benefits are significantly smaller, the net benefits are higher. In principle, and under Circular A-4, net benefits are what matter.[118]

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116. OIRA does not review rules from independent regulatory commissions, and hence reviews rules of this kind only if the Department of the Treasury is involved. See supra note 31.

117. See Exec. Order No. 13,563, supra note 12, § 1(c); see also John D. Graham, Saving Lives Through Administrative Law and Economics, 157 U. Pa. L. Rev. 395, 516–24 (2008) (contending OIRA process should attend to people below poverty line and regulations should have net benefits for them).

118. See OMB, Circular A-4, supra note 23, at 10 ("The size of net benefits . . . indicates whether one policy is more efficient than another. The ratio of benefits to costs is not a meaningful indicator of net benefits and should not be used for that purpose. It is

30. The costs of a regulation, under Approach A, would be $1 billion. The benefits would be $200 million. Under Approach B, the costs would be $20 million, but the benefits would be merely $1 million. Approach A has a cost-benefit ratio of 5 to 1, whereas Approach B has a cost-benefit ratio of 20 to 1. While Approach B seems unlikely to meet the requirements of the applicable Executive Orders (because its costs exceed its benefits), it is far preferable to Approach A because *what matters is the net benefits figure, not the cost-benefit ratio.*[119] To see this fundamental point, consider a rule with costs of $1 and benefits of $10, and compare that rule with one having costs of $300,000 and benefits of $400,000. The first has a benefit-cost ratio of 10 to 1, and the second has a far inferior 4 to 3 ratio. But the net benefits figure is a much better measure of the actual effects of the rule on social welfare. Net benefits of $100,000 are far better than net benefits of $9, and net benefits are what matter.

## VIII. DISCOUNT RATES

31. The costs of a regulation are $200 million. At a 7% discount rate, the benefits are $150 million. At a 3% discount rate, the benefits are $210 million. The agency proposes to use a 3% discount rate. If it can explain that proposal, consistent with Circular A-4, it is possible that the agency may proceed. Perhaps the agency can defend its choice by showing that the principal effect of the regulation would be on private consumption, as a result of an increase in the price of certain goods, and that the regulation would not alter or displace the use of capital (for example, by requiring companies to move their activities from one use to another). Thus Circular A-4 offers this guidance[120]:

> As a default position, OMB Circular A-94 states that a real discount rate of 7 percent should be used as a base-case for regulatory analysis. The 7 percent rate is an estimate of the

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well known that considering such ratios alone can yield misleading results."); see also supra note 13 and accompanying text (discussing Executive Order 13,563's mandate that agencies maximize net benefits). Note that in the context of deicing airplanes, the EPA finalized an approach with far lower costs, and also lower benefits, than the approach that it proposed. Compare Effluent Limitations Guidelines and New Source Performance Standards for the Airport Deicing Category, 77 Fed. Reg. 29,168, 29,178 tbl.V-1 (May 16, 2012) (codified as amended at 40 C.F.R. pts. 9, 449 (2012)) (calculating annualized cost of $3.5 million and benefit of 16.4 million pounds of total pollutant removals), with Effluent Limitations Guidelines and New Source Performance Standards for the Airport Deicing Category, 74 Fed. Reg. 44,676, 44,707 tbl.VIII-6 (proposed Aug. 28, 2009) (calculating annualized cost of $91.3 million and benefit of 45.2 million pounds of total pollutant removals).

119. See OMB, Circular A-4, supra note 23, at 10 ("The ratio of benefits to costs is not a meaningful indicator of net benefits and should not be used for that purpose.").

120. See id. at 36 ("If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate in addition to calculating net benefits using discount rates of 3 and 7 percent.").

> average before-tax rate of return to private capital in the U.S. economy. . . . It approximates the opportunity cost of capital, and it is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector. . . .
>
> . . . .
>
> The effects of regulation do not always fall exclusively or primarily on the allocation of capital. When regulation primarily and directly affects private consumption (e.g., through higher consumer prices for goods and services), a lower discount rate is appropriate. The alternative most often used is sometimes called the "social rate of time preference." . . . If we take the rate that the average saver uses to discount future consumption as our measure of the social rate of time preference, then the real rate of return on long-term government debt may provide a fair approximation. Over the last thirty years, this rate has averaged around 3 percent in real terms on a pre-tax basis.[121]

Under this analysis, it follows that the choice between 7% and 3% depends on whether the costs of regulation fall on the allocation of capital or on private consumption. In practice, agencies have often used both measures,[122] and as a general rule, the choice between 7% and 3% has not mattered to the ultimate decision about whether and how to proceed. The reason is that the benefits typically justify the costs with either measure. While Circular A-4 gives criteria for making the choice between the two discount rates, it may be difficult to know where the cost of a regulation falls;[123] if the initial expense must be borne by companies, might consumers ultimately pay? Lacking clear answers to that question, agencies might use both numbers.

32. The costs of a regulation are $200 million. At a 7% discount rate, the benefits are $120 million. At a 3% discount rate, the benefits are $170 million. At a 2% discount rate, the benefits are $205 million. The agency contends that the appropriate discount rate is 2%. There are no issues of intergenerational equity; the principal benefits would occur in the next fifteen years. The regulation will run into serious questions and

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121. Id. at 33. The central idea here is that when people are deciding whether to save money for future consumption, they use an average discount rate of about 3%. Note that this analysis is sharply criticized in William Nordhaus, The Climate Casino: Risk, Uncertainty, and Economics for a Warming World 189 (2013) [hereinafter Nordhaus, Climate Casino] ("Unfortunately, the OMB discussion is completely confused. The 7 percent rate is a risky rate of profit on leveraged corporate capital, while the 3 percent rate is a risk-free borrowing rate by the U.S. federal government. . . . The difference is the risk premium on leveraged corporate capital . . . .").

122. See, e.g., DOT, Corporate Average Fuel Economy, supra note 46, at 10–11 & tbl.1.

123. But see the objections in Nordhaus, Climate Casino, supra note 121, at 189 (suggesting 7% figure is "risky rate of profit on leveraged corporate capital," while 3% is "risk-free borrowing rate by the U.S. federal government").

doubts. Issued after a process of public comment and peer review, OMB Circular A-4 calls for discount rates of 7% and 3%, and it does not allow agencies to depart from those figures (with a qualification for very long time horizons, in part because of considerations of intergenerational equity[124]). Until OMB Circular A-4 is changed, it is understood to be binding, because it reflects the official position of the U.S. government.

## IX. CLIMATE CHANGE

33. The annual costs of a regulation are $200 million. As a result of air pollution reductions, the regulation would produce monetized health benefits of $50 million. It would also eliminate ten million tons of carbon dioxide emissions. The central value for the social cost of carbon is now around $36,[125] and hence the ten million ton reduction is valued at $360 million. The benefits of the regulation appear to justify the costs. If the numbers are reliable, and unless there is a legal problem of some kind, the regulation can probably go forward.

34. Same as scenario 33, but the annual costs are $450 million, not $200 million. The agency notes that many people believe that a low discount rate is justified for the climate change problem, and that with an appropriately low rate—say, 2%—the regulation is justified. This argument would be unsuccessful. The official discussion of the social cost of carbon includes a discussion of the discount rate problem and settles on a particular approach, which is explained at length in that discussion.[126] The document was a product of an interagency process, and it reflects the position of the U.S. government. Until it is changed through an appropriate process, it is binding.

35. The annual costs of a regulation are $450 million. The regulation would produce annual health benefits, as a result of air pollution reductions, of $30 million. It would also eliminate five million tons of carbon dioxide emissions annually. The central value for the social cost of carbon is $36, and hence the ten million ton reduction is valued at $360 million. In light of standard requirements, the benefits of the regulation do not appear to justify the costs, and serious questions will be raised in the process of interagency review.

Invoking the latest work by economists and scientists, however, the agency contends that the social cost of carbon figure is too low and that it

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124. There are other considerations as well. See generally Richard G. Newell & William A. Pizer, Discounting the Distant Future: How Much Do Uncertain Rates Increase Valuations?, 46 J. Envtl. Econ. & Mgmt. 52 (2003) (explaining when interest rates vary over time, relevant calculation suggests right rate is toward lower end of range).

125. Interagency Working Group, 2010 Technical Support Document, supra note 19, at 28.

126. Id. at 17–33. For a valuable discussion of discount rates in connection with climate change and more generally, see Nordhaus, Climate Casino, supra note 121, at 182–94.

should be at least $50 per ton, in which case the benefits would justify the costs. This argument would be unsuccessful. The social cost of carbon was a product of an interagency process, and it reflects the official position of the U.S. government. Until it is changed through an appropriate process,[127] it is binding.

36. Same as scenario 35, except that the agency notes that the social cost of carbon is a range, not a point estimate, and that at the higher end of the range, the relevant figures are $57 and $109. The agency contends that with these values, the benefits justify the costs, because the central value should not be decisive. For this reason, the agency argues that it should be able to exercise its discretion and proceed. This contention would be an appropriate matter for discussion.

## CONCLUSION

The goal of this Essay has been to explore how certain highly stylized problems are likely to be handled, in an effort to cast light on the real world of cost-benefit analysis. Inside the government, the central decisions are made by reference to authoritative documents and long-standing practices—a combination of quasi-statutory law and quasi-common law, highly technical in character, for cost-benefit analysis. As noted, it is natural to wonder about the role of political factors (such as electoral considerations and public reactions as such) in the assessment of costs and benefits, but as I have suggested, such considerations are generally regarded as irrelevant, and at least in my experience, strictly political considerations did not affect the numbers used in cost-benefit analysis. That analysis is, and is agreed to be, a technical enterprise.

Needless to say, serious objections might be mounted against some existing practices. The area of climate change raises especially vexing questions, and some people have questioned the analysis that underlies the current social cost of carbon.[128] One of the central points here is an institutional one. Substantive judgments are embodied in binding documents and settled practices. Any changes must typically be the product of an extended process, which involves many officials and sometimes a public comment period, and which likely bears fruit only if and when a consensus emerges. When it functions well, that process embodies an admirable form of "government by discussion."

To be sure, the resulting constraints can cause real problems, because those constraints might ensure that decisions that are imperfect or worse remain entrenched for significant periods. A form of status quo

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127. Recall that such a process would require many officials to work together to produce a revision in the existing numbers.

128. See generally Masur & Posner, supra note 19, at 1577–99 (questioning approach adopted by U.S. government in 2010); Nordhaus, Estimates of the Social Cost of Carbon, supra note 19, at 24–25 (same).

bias—well known within behavioral economics[129]—is unquestionably part and parcel of government practice. But the constraint is also an important safeguard. By ensuring both internal and external scrutiny of new initiatives, it increases the likelihood that they will take effect only if their foundations are genuinely secure.

129. See generally William Samuelson & Richard Zeckhauser, Status Quo Bias in Decision Making, 1 J. Risk & Uncertainty 7 (1988) (exploring human tendency to favor status quo).

APPENDIX A

REVISED SOCIAL COST OF $CO_2$, 2010–2050 (FROM 2013 WORKING GROUP, IN 2007 DOLLARS PER METRIC TON OF $CO_2$)[130]

| Discount Rate Year | 5.0% Avg | 3.0% Avg | 2.5% Avg | 3.0% 95th |
|---|---|---|---|---|
| 2010 | 11 | 32 | 51 | 89 |
| 2015 | 12 | 37 | 57 | 109 |
| 2020 | 12 | 43 | 64 | 128 |
| 2025 | 14 | 47 | 69 | 143 |
| 2030 | 16 | 52 | 75 | 159 |
| 2035 | 19 | 56 | 80 | 175 |
| 2040 | 21 | 61 | 86 | 191 |
| 2045 | 24 | 66 | 92 | 206 |
| 2050 | 26 | 71 | 97 | 220 |

ANNUAL SCC VALUES, 2010–2050
(FROM 2010 WORKING GROUP, IN 2007 DOLLARS)[131]

| Discount Rate Year | 5.0% Avg | 3.0% Avg | 2.5% Avg | 3.0% 95th |
|---|---|---|---|---|
| 2010 | 4.7 | 21.4 | 35.1 | 64.9 |
| 2011 | 4.9 | 21.9 | 35.7 | 66.5 |
| 2012 | 5.1 | 22.4 | 36.4 | 68.1 |
| 2013 | 5.3 | 22.8 | 37.0 | 69.6 |
| 2014 | 5.5 | 23.3 | 37.7 | 71.2 |
| 2015 | 5.7 | 23.8 | 38.4 | 72.8 |
| 2016 | 5.9 | 24.3 | 39.0 | 74.4 |
| 2017 | 6.1 | 24.8 | 39.7 | 76.0 |
| 2018 | 6.3 | 25.3 | 40.4 | 77.5 |
| 2019 | 6.5 | 25.8 | 41.0 | 79.1 |

130. Interagency Working Group, November 2013 Technical Support Document Update, supra note 22, at 13 tbl.2.

131. Interagency Working Group, 2010 Technical Support Document, supra note 19, at 39 tbl.A1.

| | | | | |
|---|---|---|---|---|
| 2020 | 6.8 | 26.3 | 41.7 | 80.7 |
| 2021 | 7.1 | 27.0 | 42.5 | 82.6 |
| 2022 | 7.4 | 27.6 | 43.4 | 84.6 |
| 2023 | 7.7 | 28.3 | 44.2 | 86.5 |
| 2024 | 7.9 | 28.9 | 45.0 | 88.4 |
| 2025 | 8.2 | 29.6 | 45.9 | 90.4 |
| 2026 | 8.5 | 30.2 | 46.7 | 92.3 |
| 2027 | 8.8 | 30.9 | 47.5 | 94.2 |
| 2028 | 9.1 | 31.5 | 48.4 | 96.2 |
| 2029 | 9.4 | 32.1 | 49.2 | 98.1 |
| 2030 | 9.7 | 32.8 | 50.0 | 100.0 |
| 2031 | 10.0 | 33.4 | 50.9 | 102.0 |
| 2032 | 10.3 | 34.1 | 51.7 | 103.9 |
| 2033 | 10.6 | 34.7 | 52.5 | 105.8 |
| 2034 | 10.9 | 35.4 | 53.4 | 107.8 |
| 2035 | 11.2 | 36.0 | 54.2 | 109.7 |
| 2036 | 11.5 | 36.7 | 55.0 | 111.6 |
| 2037 | 11.8 | 37.3 | 55.9 | 113.6 |
| 2038 | 12.1 | 37.9 | 56.7 | 115.5 |
| 2039 | 12.4 | 38.6 | 57.5 | 117.4 |
| 2040 | 12.7 | 39.2 | 58.4 | 119.3 |
| 2041 | 13.0 | 39.8 | 59.0 | 121.0 |
| 2042 | 13.3 | 40.4 | 59.7 | 122.7 |
| 2043 | 13.6 | 40.9 | 60.4 | 124.4 |
| 2044 | 13.9 | 41.5 | 61.0 | 126.1 |
| 2045 | 14.2 | 42.1 | 61.7 | 127.8 |
| 2046 | 14.5 | 42.6 | 62.4 | 129.4 |
| 2047 | 14.8 | 43.2 | 63.0 | 131.1 |
| 2048 | 15.1 | 43.8 | 63.7 | 132.8 |
| 2049 | 15.4 | 44.4 | 64.4 | 134.5 |
| 2050 | 15.7 | 44.9 | 65.0 | 136.2 |

## APPENDIX B
## ESTIMATED BENEFITS AND COSTS OF RECENT MAJOR RULES

### MAJOR RULES REVIEWED WITH ESTIMATES OF BOTH ANNUAL BENEFITS AND COSTS, OCTOBER 1, 2010–SEPTEMBER 30, 2011 (BILLIONS OF 2001 DOLLARS)[132]

| Agency | RIN[133] | Title | Benefits | Costs |
|---|---|---|---|---|
| HHS | 0910-AG41 | Cigarette Warning Label Statements | 0.2<br>Range:<br>0–9.0 | <0.1 |
| HHS | 0938-AQ12 | Administrative Simplification: Adoption of Authoring Organizations for Operating Rules and Adoption of Operating Rules for Eligibility and Claims Status (CMS-0032-IFC) | 1.0<br>Range:<br>0.9–1.1 | 0.4<br>Range:<br>0.3–0.6 |
| DOL | 1210-AB07 | Improved Fee Disclosure for Pension Plan Participants | 1.6<br>Range:<br>0.8–3.3 | 0.3<br>Range:<br>0.2–0.4 |
| DOL | 1210-AB35 | Statutory Exemption for Provision of Investment Advice | 10.9<br>Range:<br>5.8–15.1 | 3.0<br>Range:<br>1.6–4.2 |
| DOE | 1904-AA89 | Energy Efficiency Standards for Clothes Dryers and Room Air Conditioners | 0.2<br>Range:<br>0.2–0.3 | 0.1<br>Range:<br>0.1–0.2 |

132. OMB, Exec. Office of the President, Draft 2012 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities 26 tbl.1-5(a) (2012), available at http://www.whitehouse.gov/sites/default/files/omb/oira/draft_2012_cost_benefit_report.pdf (on file with the *Columbia Law Review*).

133. "RIN" refers to the Regulation Identifier Number, a number attached to each regulatory action for the purpose of allowing the public to have greater access to information relating to particular regulatory actions. See Memorandum from Cass R. Sunstein, Adm'r, Office of Mgmt. & Budget, Exec. Office of the President, to the President's Management Council (Apr. 7, 2010), available at http://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/IncreasingOpenness_04072010.pdf (on file with the *Columbia Law Review*).

| | | | | |
|---|---|---|---|---|
| DOE | 1904-AB79 | Energy Efficiency Standards for Residential Refrigerators, Refrigerator-Freezers, and Freezers | 1.8<br>Range:<br>1.7–3.0 | 0.8<br>Range:<br>0.8–1.3 |
| DOE | 1904-AC06 | Energy Efficiency Standards for Residential Furnaces, Central Air Conditioners and Heat Pumps | 0.9<br>Range:<br>0.7–1.8 | 0.5<br>Range:<br>0.5–0.7 |
| EPA | 2040-AF11 | Water Quality Standards (Numeric Nutrient Criteria) for Florida's Lakes and Flowing Waters | <0.1 | 0.1<br>Range:<br>0.1–0.2 |
| EPA | 2050-AG50 | Oil Pollution Prevention: Spill Prevention, Control, and Countermeasure Rule Requirements—Amendments for Milk Containers | 0 | (0.1) |
| EPA | 2060-AP50 | Cross State Air Pollution Rule (CAIR Replacement Rule) | Range:<br>20.5–59.7 | 0.7 |
| DOT | 2125-AF19 | Real-Time System Management Information Program | 0.2 | 0.1 |
| DOT | 2127-AK23 | Ejection Mitigation | 1.5<br>Range:<br>1.5–2.4 | 0.4<br>Range:<br>0.4–1.4 |
| DOT & EPA | 2127-AK74;<br>2060-AP61 | Commercial Medium- and Heavy-Duty On-Highway Vehicles and Work Truck Fuel Efficiency Standards | 2.6<br>Range:<br>2.2–2.6 | 0.5<br>Range:<br>0.3–0.5 |

( ) indicates negative.

MAJOR RULES REVIEWED WITH ESTIMATES OF BOTH ANNUAL BENEFITS AND COSTS, OCTOBER 1, 2009–SEPTEMBER 30, 2010
(BILLIONS OF 2001 DOLLARS)[134]

| Agency | RIN | Title | Benefits | Costs |
|---|---|---|---|---|
| DOJ | 1117-AA61 | Electronic Prescriptions for Controlled Substances | 0.3–1.3 | <0.1 |
| DOJ | 1190-AA44 | Nondiscrimination on the Basis of Disability in Public Accommodations and Commercial Facilities | 1.1<br>Range:<br>1.0–2.1 | 0.6<br>Range:<br>0.5–0.7 |
| DOJ | 1190-AA46 | Nondiscrimination on the Basis of Disability in State and Local Government Services | Range:<br>0.2–0.3 | Range:<br>0.1–0.2 |
| DOL | 1218-AC01 | Cranes and Derricks in Construction | 0.2 | 0.1 |
| DOE | 1904-AA90 | Energy Efficiency Standards for Pool Heaters and Direct Heating Equipment and Water Heaters | 1.4<br>Range:<br>1.3–1.8 | Range:<br>1.0–1.1 |
| DOE | 1904-AB70 | Energy Conservation Standards for Small Electric Motors | Range:<br>0.7–0.8 | 0.2 |
| DOE | 1904-AB93 | Energy Efficiency Standards for Commercial Clothes Washers | Range:<br>0–0.1 | <0.1 |
| EPA | 2050-AG16 | Revisions to the Spill Prevention, Control, and Countermeasure (SPCC) Rule | 0 | (0.1) |
| EPA | 2060-AO15 | NESHAP: Portland Cement Notice of Reconsideration | Range:<br>6.1–16.3 | Range:<br>0.8–0.9 |
| EPA | 2060-AO48 | Review of the National Ambient Air Quality Standards for Sulfur Dioxide[135] | 10.5<br>Range:<br>2.8–38.6 | 0.7<br>Range:<br>0.3–2.0 |

134. OMB, 2011 Report to Congress, supra note 49, at 25 tbl.1-5(a).

135. A footnote here in the 2011 Report to Congress reads:

> The agency provided benefit and cost estimates for 2020. In order to annualize, as with previous NAAQS rulemakings, OMB assumed that the benefits and costs would be zero in the first year after the rule is finalized, the benefits and costs would increase linearly until year 2020, and the benefit and cost estimates would equal the 2020 estimates thereafter.

Id. at 25 n.35.

| | | | | |
|---|---|---|---|---|
| EPA | 2060-AP36 | National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (Diesel) | Range: 0.7–1.9 | 0.3 |
| EPA | 2060-AQ13 | National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines—Existing Stationary Spark Ignition (Gas-Fired) | Range: 0.4–1.0 | 0.2 |
| EPA | 2070-AJ55 | Lead; Amendment to the Opt-out and Recordkeeping Provisions in the Renovation, Repair, and Painting Program | Range: 0.8–3.0 | 0.3 |
| DOT | 2120-AI92 | Automatic Dependent Surveillance—Broadcast (ADS-B) Equipage Mandate to Support Air Traffic Control Service | Range: 0.1–0.2 | 0.2 |
| DOT | 2126-AA89 | Electronic On-Board Recorders for Hours-of-Service Compliance | 0.2 | 0.1 |
| DOT | 2130-AC03 | Positive Train Control | <0.1 | 0.7 Range: 0.5–1.3 |
| DOT | 2137-AE15 | Pipeline Safety: Distribution Integrity Management | 0.1 | 0.1 |
| DOT & EPA | 2127-AK50; 2060-AP-58 | Light-Duty Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards[136] | 11.9 Range: 3.9–18.2 | 3.3 Range: 1.7–4.7 |

( ) indicates negative.

136. A footnote here in the 2011 Report to Congress reads:

> DOT and EPA estimates differ somewhat due to programmatic differences between the two rules and differences in estimation modeling. The range of cost and benefit are based [sic] the total cost and benefits estimates for model years 2012–2016 in DOT's RIA, annualized over the life of those vehicles. The primary estimates are based on the total cost and benefits estimates for model years 2012–2016 in EPA's RIA annualized at 7% over the life of those vehicles.

Id. at 26 n.36.

ESTIMATES OF THE TOTAL ANNUAL BENEFITS AND COSTS OF MAJOR RULES REVIEWED, OCTOBER 1, 2008–SEPTEMBER 30, 2009 (MILLIONS OF 2001 DOLLARS)[137]

| Agency | Title | Benefits | Cost |
|---|---|---|---|
| DOE/ EE | Energy Efficiency Standards for Commercial Refrigeration Equipment | 196 Range: 186–224 | 81 Range: 69–81 |
| DOE/ EE | Energy Efficiency Standards for General Service Fluorescent Lamps and Incandescent Lamps | 1,924 Range: 1,111–2,886 | 486 Range: 192–657 |
| HHS/ AHRQ | Patient Safety and Quality Improvement Act of 2005 Rules | 93 Range: 69–136 | 97 Range: 87–121 |
| HHS/ CMS | Revisions of HIPAA Code Sets | 209 Range: 77–261 | 217 Range: 44–238 |
| HHS/ CMS | Updates to Electronic Transactions (Version 5010) | 1,988 Range: 1,114–3,194 | 1,090 Range: 661–1,449 |
| HHS/ FDA | Prevention of Salmonella Enteritidis in Shell Eggs | 1,284 Range: 206–8,583 | 74 Range: 48–106 |
| HUD/ OH | Real Estate Settlement Procedures Act (RESPA); To Simplify and Improve the Process of Obtaining Mortgages and Reduce Consumer Costs (FR-5180) | 2,303 | 884 |
| DOT/ FAA | Part 121 Pilot Age Limit | 35 Range: 30–35 | 4 |

137. OMB, 2010 Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities 22 tbl.1-4 (2010), available at http://www.whitehouse.gov/sites/default/files/omb/legislative/reports/2010_Benefit_Cost_Report.pdf (on file with the *Columbia Law Review*).

| | | | |
|---|---|---|---|
| DOT/ FAA | Washington, DC, Metropolitan Area Special Flight Rules Area | 239 Range: 10–839 | 92 Range: 89–382 |
| DOT/ FMCSA | Hours of Service of Drivers | 0–1,760 | 0–105 |
| DOT/ FMCSA | New Entrant Safety Assurance Process | 472–602 | 60–72 |
| DOT/ NHTSA | Passenger Car and Light Truck Corporate Average Fuel Economy Model Year 2011 | 1,665 Range: 857–1,905 | 979 Range: 650–1,910 |
| DOT/ NHTSA | Reduced Stopping Distance Requirements for Truck Tractors | 1,250 Range: 1,250–1,520 | 46 Range: 23–164 |
| DOT/ NHTSA | Roof Crush Resistance | 652 Range: 374–1,160 | 896 Range: 748–1,189 |
| DOT/ PHMSA | Pipeline Safety: Standards for Increasing the Maximum Allowable Operating Pressure for Gas Transmission Pipelines | 85 Range: 85–89 | 13 Range: 13–14 |
| EPA/AR | Review of the National Ambient Air Quality Standards for Lead | 455–5,203 | 113–2,241 |