

# Rethinking Cost-Benefit Analysis

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Richard L. Revesz<sup>2</sup> and Michael A. Livermore.<sup>3</sup> *Retaking Rationality: How Cost-Benefit Analysis Can Better Protect the Environment and Our Health*. New York: Oxford University Press. 2008. Pp. 236.

For almost thirty years ago, regulatory agencies have been required to perform cost-benefit analyses that are subject to review by the Office of Management and Budget (OMB).<sup>4</sup> Richard Revesz and Michael Livermore argue in *Retaking Rationality* that cost-benefit analysis (CBA) has been distorted and misused by conservative opponents of regulation. Eschewing any desire to make CBA a “master decisionmaking procedure capable of trumping all other values,” they argue only that it “can be useful without being the alpha and omega of policy analysis.” (p. 15) They advocate a series of useful reforms to provide more balance while keeping CBA as a key decision making tool.

*Rethinking Rationality* provides convincing support for environmentalist claims that cost-benefit analysis has been used as a screen for ideologically driven attacks on regulation.<sup>5</sup> These critiques, as Revesz and Livermore would be the first to say, showing that CBA has been used wrongly do not demonstrate that it is worthless as a tool for policy assessment. Nor do I take that position. As I have indicated in my previous work,<sup>6</sup> I think that CBA can be a useful analytic tool.

Revesz and Livermore’s suggestions for how to improve CBA are well taken. But in my view, what we do about embracing, improving or rejecting CBA has only a

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<sup>4</sup> For a description of the development of OMB’s role in regulatory oversight, along with sensible suggestions for improving cost-benefit analysis, see Daniel H. Cole, “Best Practice” Standards for Regulatory Benefit-Cost Analysis, 23 Res. in Law & Econ. 1 (2007).

<sup>5</sup> As Revesz and Livermore put it,

The association between cost-benefit analysis and the institutions of regulation has significantly tainted the practice of cost-benefit analysis in the eyes of many proregulatory interests such as consumer groups, organized labor, and environmentalists. This is mostly because of their negative feelings – often fully justified – about Office of Management and Budget (OMB) review. These feelings were especially justified in the early days of OMB review, under Presidents Ronald Reagan and George H.W. Bush, when OIRA was the place good regulations went to die. (p. 189)

<sup>6</sup> See Daniel A. Farber, *Eco-Pragmatism: Making Sensible Environmental Decisions in an Uncertain World* 116(1999) (proposing a “hybrid of feasibility analysis and cost-benefit analysis”).

marginal connection with the key issues facing environmental protection today. The debate over CBA has taken up a disproportionate amount of attention for environmental scholars compared to the real significance of the issue.

Part I of this review addresses Revesz and Livermore's charge that CBA has been distorted by the anti-regulatory agendas of many of its proponents. Those agendas may stem from other sources such as libertarian philosophy or from corporate influence, but they can hardly be justified as the result of neutral economic analysis. Historically, the use of CBA was rooted in this anti-regulatory agenda, and that agenda has continued to shape the work of prominent advocates and practitioners of CBA.

Thus, Revesz and Livermore make a compelling case that CBA has been warped by an antiregulatory ideological agenda and hampered implementation of valuable environmental policies. Indeed, as I will explain, their critique does not go far enough. Cost-benefit analysis has also been used as a means of violating clear statutory mandates. The use of CBA to delay or block implementation of these statutory mandates via CBA-based review of regulations by the Office of Management and Budget (OMB) is in serious tension with the presidential duty to "take care that the laws be faithfully executed."

Part II of this review argues that despite the validity of the indictment of CBA's implementation, this is really a side issue in terms of the key issues facing reforming CBA, or even eliminating it is mostly beside the points in terms of needed environmental developments. Revesz and Livermore focus mostly on the use of CBA to block regulation of toxic chemicals. The reforms that they propose would be helpful, but would not address the fundamental flaws of the current regulatory scheme. Current law places the burden on the government of developing toxicity information for each chemical, proving the existence of a significant risk, and justifying remedial measures. This chemical-by-chemical regulatory approach is hopelessly inadequate. CBA has been used to make a bad situation worse, but the real solution is to adopt a completely different approach of the kind followed by the European Union's REACH directive.

Following this discussion of toxics regulation, Part II considers the relevance of CBA to climate change, the biggest environmental problem facing the planet. Given the current state of the art, CBA has strikingly limited capacity to provide useful policy guidance. Like Revesz and Livermore, I think that the issues here are more ethical than economic. Rather than searching for economically efficient strategies to address climate change, we would be better to focus on precautionary mitigation strategies that limit the likelihood of catastrophic harm and robust adaptation strategies that work in a broad range of scenarios.

Part III addresses institutional questions. Revesz and Livermore close by considering two institutional issues: the future role of OMB in environmental policy and how to design safeguards against under-regulation. They offer cautious suggestions for reform. Less cautiously, I will suggest that OMB should be converted

into OMBS – the Office of Management, Budget, and Sustainability. In addition to Revesz and Livermore’s helpful solution to the under-regulation problem, I suggest a series of other action-forcing options that could be considered. These options are particularly promising in the context of climate adaptation, an area where the problem is more likely to be government inaction than overreaction.

Ever since Ronald Reagan took office, environmentalists have been playing defense against the conservative campaign against environmental protection. Understandably, environmentalists viewed CBA as simply another maneuver in the deregulatory campaign. We are hopefully moving into an era in which it is possible to think more constructively about what environmental law should be, rather than simply about what it should not be. As Revesz and Livermore argue, it is time to move past this focus on attacking CBA. The improvements in CBA that they suggest would be useful, and I hope that they influence the OMB’s use of CBA during the new presidential administration. But my own view is that fine tuning CBA will result only marginal policy improvements. We need to turn to other tools in order to make real environmental progress.

### I. CBA and Anti-Regulatory Ideology

Environmentalists have been outspoken critics of the use of CBA for government regulation. It is easy to lampoon this opposition as representing a kind of fanaticism that is blind to the cost of regulation. Actually, however, the critique is more nuanced. Consider the views of Frank Ackerman and Lisa Heinzerling, two leading environmentalist critics of CBA:

[A]nalysis of costs and benefits, in lowercase letters, is an essential part of any systematic thought about public policy, and has always been involved in government decision making. Our criticism concerns the much narrower doctrine of Cost-Benefit Analysis, which calls for a specific, controversial way of expressing and thinking about costs and benefits.<sup>7</sup>

In their view, “cost-benefit analysis promotes a deregulatory agenda under the cover of scientific objectivity.”<sup>8</sup>

Ackerman and Heinzerling may be wrong in seeing this as an inherent as an inherent aspect of CBA. But it does have some justification as an observation about the history of CBA in government, as Revesz and Livermore show.

#### A. *CBA and the Campaign against Health and Environmental Regulation*

##### 1. Conservative Ideology and the Development of Government CBA

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<sup>7</sup> Frank Ackerman and Lisa Heinzerling, *Priceless: On Knowing the Price of Everything and the Value of Nothing* 211(2004).

<sup>8</sup> *Id.* at 8-9. See also *id.* at 12 (“[c]loaked in the language of scientific objectivity, economic arguments have repeatedly played a partisan role”).

Shortly after taking office President Reagan signed Executive Order 12,291,<sup>9</sup> aimed at improving the efficiency of informal rulemaking by executive agencies. Section 2 directed that "major" regulations not be promulgated unless, "taking into account affected industries [and] the condition of the national economy," the potential benefits to society outweigh potential costs, and net benefits are at a maximum. The Office of Management and Budget was given the task of reviewing these analyses.

As Revesz and Livermore observe, conservative academics played an important role in building support for Reagan's antiregulatory agenda. One prime mover was William Niskanen, who viewed bureaucrats as dedicated only to expanding their budgets rather than the public interest. (p. 21) Another prime mover was Murray Weidenbaum, who viewed business firms as representing the general public interest (as proxies for consumers) while environmentalists were a special interest group. (p. 22). Weidenbaum chaired Reagan's campaign group on finance, and the campaign attacked government regulation with a broad brush, as when Reagan said that there are "literally thousands of unnecessary regulations . . . that have add \$130 billion to the cost of production in this country . . . And I would like to see us a little more free, as we once were." (pp. 24-25).

Another conservative economist from the rightwing American Enterprise Institute was appointed to head the new Office of Information and Regulatory Affairs (OIRA) at OMB. (p. 25). The new office operated in secrecy (p. 25), and it became clear that OIRA was operating as a funnel for industry lobbyists to influence the regulatory process. (p. 28)

In response, Congress refused to reauthorize funding for OIRA or to confirm the president's nominee to head the agency. (p. 29) President George H.W. Bush responded in turn by creating a new path for industry influence the Council on Competitiveness headed by Vice President Dan Quayle. (pp. 30-31) The Council was "sharply critical of any regulation and deeply solicitous of business interests." (p.30) The Council operated in secrecy, understandably so since both Quayle and the council's executive director secretly met with business leaders who made sizable political contributions. (p. 30)

In 1993, President Clinton issued an executive order maintaining the basic approach but attempting to streamline the process of OMB review. The rule was intended to reduce the number of regulations sent to OMB for approval and to make OMB's review more flexible.<sup>10</sup> Clinton increased the openness of the review process and required discussion of distributive impacts and equity as well as economic efficiency. (p. 33) Environmental groups did not participate in the revision of CBA at OMB or in EPA both for philosophical reasons and because of a lack of economic expertise. (p. 35) CBA apparently was not given heavy weight by the

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<sup>9</sup> 46 Fed. Reg. 13,193 (1981).

<sup>10</sup> See Ellen Siegler, *Executive Order 12866: An Analysis of the New Executive Order on Regulatory Planning and Review*, 24 *Env'tl. L. Rep.* 10,070 (1994).

Administration,<sup>11</sup> but OIRA retained its antiregulatory bias. For instance, in a dispute with EPA over the value to be assigned a statistical life, “it was OIRA officials, supposedly the protectors of cost-benefit analysis and economic efficiency, who were arguing against the use of the latest and most sound economic research.” (p. 51)

During the Clinton years, the Republicans seized control of Congress, motivated by the philosophy that “[t]he market is rational; the government’s dumb.”<sup>12</sup> They found a new group of antiregulatory economists to help rationalize their activities, including John Graham<sup>13</sup> and John F. Morall III.<sup>14</sup> (p. 37) The antiregulatory voices of the Reagan years continued to pursue their agenda and provide advocacy documents for conservatives. Rather than pursuing careers engaging in objective research in the academy or in nonpolitical think tanks such as Resources for the Future, they preferred the politicized setting of conservative think tanks dedicated to deregulation. Niskanen became the chairman of the libertarian Cato Institute, Miller joined Citizens for a Sound Economy, and Tozzi founded a for-profit, industry funded group, the Center for Regulatory Effectiveness.

In its first term, the Administration of George W. Bush pursued cost-benefit analysis with renewed fervor:

[T]he battle continued to rage when President George W. Bush appointed John D. Graham, a strong proponent of cost-benefit analysis from the Harvard Center for Risk Analysis, to head the office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget. . . . To the chagrin of public interest groups and the joy of industry-funded think tanks, OIRA greatly stemmed the flow of health, safety and environmental regulation during the Bush Administration. Although EPA promulgated several important regulations, most of which were required by statute, OSHA did not promulgate a single significant health standard during the entire four years.<sup>15</sup>

For instance, OMB assigned a benefit of only \$219,000 to a regulation preserving sixty million acres of roadless land within national forests, counting as a benefit only the saved expense of not building roads.<sup>16</sup>

Under the leadership of John Graham, OMB increased its transparency but also put forward controversial proposals, such as the proposal to count the deaths of senior citizens as less significant than the deaths of younger Americans. (p. 42)

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<sup>11</sup> Ackerman and Heinzerling, *supra* note , at 42.

<sup>12</sup> Ackerman and Heinzerling, *supra* note , at 24 (quoting former House Majority Leader Dick Armey).

<sup>13</sup> Ackerman and Heinzerling criticize Graham for pursuing funding for his Harvard Center for Risk Analysis from Phillip Morris, Ackerman and Heinzerling, *supra* note , at 132-133, but perhaps this was merely an oversight on Graham’s part.

<sup>14</sup> Names of other prominent antiregulatory advocates can be found in Ackerman and Heinzerling, *supra* note , at 40.

<sup>15</sup> Thomas O. McGarity, *The Story of the Benzene Case: Judicially Imposed Regulatory Reform Through Risk Assessment*, in *Environmental Law Stories* 169 (Richard J. Lazarus & Oliver A. Houck eds 2005).

<sup>16</sup> Ackerman and Heinzerling, *supra* note , at 6-7.

Despite improvements in transparency, the Government Accountability Office issued a blistering report about OIRA's opacity from public oversight as late as 2003. (p. 166) Under Graham's leadership, OMB was "extremely active, rejecting dozens of regulations each year."<sup>17</sup>

In an effort to embed the antiregulatory agenda within agencies such as EPA, Bush announced a new executive order placing political appointees as Regulatory Review Officers within the agencies. (p. 42) If the desire had been to improve the quality of cost-benefit analysis by agencies, professional government economists rather than political appointees would have been added to the agencies. Clearly, increased professionalism was not the goal. In short, as Revesz and Livermore put it, "[u]nder President George W. Bush, the link between the regulatory agenda and cost-benefit analysis has become nearly complete." (p. 42)

The push for CBA to environmental regulation clearly has had more to do with antiregulatory fervor than with a disinterested attachment to economic efficiency. Indeed, it is hard to see why anyone whose major concern was the nation's economic efficiency would devote much time to environmental regulation. The potential for combating economic waste in environmental regulation simply is not that great in comparison with other areas.

We can get a sense of the relative magnitudes by considering the impact of recent regulations, because these are most relevant to the question of whether economic waste from these regulations is worth worrying about. Revesz and Livermore provide a ballpark estimate of \$20 billion per year for the cost of complying with U.S. environmental regulations adopted in the last ten years. (p. 9) Suppose that half of this money is wasted (that is, that the benefits are only \$10 billion per year). Then we're wasting \$10 billion per year. This isn't trivial, but by today's standards, it's not big money. In a \$13 trillion economy (based on 2007 GDP), \$10 billion per year comes close to being a rounding error.

Of course, this very rough analysis is at best suggestive. Maybe without CBA these recent environmental regulations would have been an order of magnitude more expensive. Or maybe environmental regulations from previous decades produce much higher ongoing net costs for the economy today, although that seems quite unlikely.<sup>18</sup> On the other hand, maybe the environmental regulations in question are producing huge health and environmental benefits that more than

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<sup>17</sup> Ackerman and Heinzerling, *supra* note , at 169.

<sup>18</sup> An extensive CBA by EPA found that the value of air pollution regulations from 1970 to 1990 averaged about \$1 trillion per year, whereas total costs averaged around \$0.025 trillion. (These numbers are calculated from the report on cumulative figures given in Ackerman and Heinzerling, *supra* note , at 206). Cass Sunstein gives a \$130 billion figure for compliance costs with all environmental regulations in 2000. Cass Sunstein, *Cost-Benefit Default Principles*, 99 Mich. L. Rev. 1651, 1659 (2001). If we assume that benefits of regulation were only half of the costs (which seems implausible based on the EPA analysis discussed in the next footnote), then the amount in the text would have to be multiplied by six. U.S. GDP in 2000 was approximately \$10 trillion, so the waste would have amounted to .6% of GDP.

justify their costs, in which case investing resources to fine tune the efficiency of environment regulation should be a low priority.

Thinking that we can improve the efficiency of the economy by applying cost-benefit analysis to environmental regulations simply misunderstands the magnitudes involved. More likely, the economy would be better served if we moved all of the economists now working in OIRA and assigned them to dealing with health care, social security reform, and military, where the real money is.

This does not mean that rigorous analysis of the costs and benefits of environmental regulation is pointless – it's always good to improve. But it does raise a question about why OMB should devote significant resources to the exercise. A public choice explanation might be that these other programs impose unnecessary costs of wide public groups such as taxpayers while benefitting smaller, more easily organized groups such as health insurers or defense contractors whereas environmental and safety regulations benefit diffuse members of the public (such as people who breathe) while burdening more concentrated industry groups (such as utilities and manufacturing companies). A non-public choice explanation would focus on ideological opposition to government regulation on libertarian grounds.

Revesz and Livermore give persuasive arguments that other aspects of CBA as often practiced are biased against regulation. They point out that discount rates for cancer risks may be too low because they leave important psychological factors out of account (pp. 95-106). They call for upward adjustments and say that without these adjustments, “benefits attached to programs that reduce long-latency risks will be inappropriately low, and cost-benefit analysis will erroneously discourage the regulation of these risks.” (p. 106) They also point out that CBA tends to overestimate industry compliance costs, sometimes quite seriously. (pp. 140-141) Among the possible reasons, as Revesz and Livermore point out, are that estimates rely on industry supplied data, which is biased because of the industry’s interest in projecting high compliance costs to defeat regulations; and that estimates rely on existing technology or ignore other potential compliance measures such as process changes, thereby underestimating the ability of innovations to reduce costs.<sup>19</sup>

A study of the experience of EPA officials found that, regardless of the presidential administration, OIRA mainly functioned to undercut regulation:

When asked what kind of changes OIRA sought after performing cost-benefit analysis, 89% of respondents stated that OIRA never or only rarely sought changes that would make a regulation more protective of human health and the environment. In addition, 75% said that OIRA often or always sought changes that would make a regulation less protective of human health and the environment. When asked to what extent OIRA sought changes that would make a regulation less burdensome for regulated entities, 89% answered often or always. When asked to

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<sup>19</sup> *Id.* at 15-16.

what extent OIRA sought changes that would make a regulation more burdensome for regulated entities, 89% answered never or rarely.<sup>20</sup>

It is little wonder that environmentalists have viewed CBA with such grave suspicion. Although Revesz and Livermore are right that CBA can be used to justify regulation as well as oppose it, history seems to provide little evidence that the theoretical neutrality of CBA has any relationship with its actual practice by the government.

## 2. Anti-Regulatory Ideology and CBA Scholarship

The distortion of CBA by antiregulatory bias can be seen within the academy as well as within the government. Even less overtly politicized figures such as John Graham seem eager to grasp at any straw that would justify less regulation.

A prime example is risk-risk tradeoff, which Revesz and Livermore discuss at length. (pp. 45-55) It is plain that eliminating one risk may cause another risk to be substituted; Graham and others were quite correct to point this out. But Revesz and Livermore point out that Graham and his fellows have, with complete illogic, been willing to count only unintended increases in risks from regulation but not unintended decreases in risks. For example, the use of catalytic converters in automobiles has saved an average of 25,000 lives per year by eliminating suicides and accidental deaths from carbon monoxide poisoning. (p. 59). If we assign a value of \$1 million to each life, that's a \$25 billion saving per year (and arguably much higher if a more reasonable value of life is used<sup>21</sup>) – note that this cancels the entire cost of complying with all environmental regulations adopted in the past ten years. Graham and others have offered feeble explanations for their refusal to consider the countervailing unintended benefits of regulation, which Revesz and Livermore duly demolish. (pp. 61-62) Including one side of the balance sheet but not the other is hardly the hallmark of disinterested economic analysis.<sup>22</sup>

An even more telling episode is the eagerness with which many CBA advocates embraced the health-wealth hypothesis. Based on studies that show wealthier people are also healthier, CBA advocates concluded that “regulatory expenditures of over \$15 million per human life saved . . . will have net counterproductive effects” (p. 69) because the wealth loss will translate into an additional death.<sup>23</sup> John Graham, belying any claim at objectivity, “coined the

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<sup>20</sup> Lisa Schultz Bressman and Michael P. Vandenbergh, *Inside the Administrative State: A Critical Look at the Practice of Presidential Control*, 105 Mich. L. Rev. 47, 73 (2006). Notably, agency staff were considered more conservative and anti-regulatory than the political appointees at OIRA. *Id.* at 74.

<sup>21</sup> Kip Viscusi, the leading authority on the subject, recommends at \$6-7 million figure. See Ackerman and Heinzerling, *supra* note , at 82. Using \$6 million figure, the benefits would be \$150 billion per year in unanticipated benefits from this one regulatory measure.

<sup>22</sup> Interestingly, OMB itself has recognized this and now recommends that agencies consider both ancillary risks and ancillary benefits. (p. 212 n.184).

<sup>23</sup> Some might think this was an argument for health care reform.

inflammatory phrase *statistical murder* to characterize regulations that impose large economic costs.” (p. 70)

There certainly is nothing wrong with considering the health-wealth hypothesis as a matter for study. But the eagerness to embrace the hypothesis as proven fact is less justifiable. Revesz and Livermore explode any claim of this unthinking acceptance of the health-wealth hypothesis to intellectual respectability. The underlying studies showed only that health and wealth are correlated, not that wealth causes health. The causal connection appears to be true only for the lower end of the income spectrum, and we know very little about how regulations impacts the distribution of wealth.<sup>24</sup> (Besides, economics never tire of telling us that distributional issues should be addressed only through the tax-and-transfer system rather than the regulatory process. p. 14) Indeed, the most recent study seems to show that the correlation is spurious – both health and wealth are primarily driven by educational level. (p. 72)

The magnitude of the effect posited by the health-wealth hypothesis seems implausible in any event. Consider recent events. In the third quarter of 2008, households lost \$10 trillion in wealth from declines in the real estate and financial markets.<sup>25</sup> If it is true that a \$15 million loss corresponds to one additional death, this loss of wealth should translate into approximately 66,000 deaths. If the health-wealth hypothesis is correct, the financial firms whose activities triggered the economic collapse have been guilty of “statistical murder” on a massive scale, and the bodies should already be beginning to pile up.

Indeed, if the health-wealth relationship is correct, the implications go well-beyond economic policy to include all government policies that seek benefits other than increases in household income. For instance, increases in national security do not translate into wealth that can be used by households to avoid risk or purchase better health care. The taxes used to finance national security investments, however, do reduce discretionary household income. Thus, if the \$15 million per life figure is correct, the Defense Department is responsible for the “statistical murder” (to use John Graham’s phrase) of about 25,000 Americans per year.<sup>26</sup> Notably, advocates of the health-wealth connection have used the theory to justify environmental deregulation, but have not pursued the implications of the theory in favor of pacificism.

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<sup>24</sup> Moreover, it is unclear that the impact on individual households of regulation is big enough to impact health even if a casual relationship does exist. As Ackerman and Heinzerling point out, even a \$50 million loss amounts to only about a penny per week per household, “an amount unlikely to change either behavior regarding risk or life expectancy.” Ackerman and Heinzerling, *supra* note , at 57. Indeed, they ask, “[i]f everyone looks under the sofa cushion and finds a lost penny every week, will a life be saved as a result?” *Id.* at 57-58.

<sup>25</sup> <http://seekingalpha.com/article/110730-damage-report-2008-household-wealth-down-10-trillion>

<sup>26</sup> Compare Ackerman and Heinzerling, *supra* note , at 59 (using a \$7.5 million/life figure and calculating DOD-induce casualties at 50,000 Americans).

We can draw a similar lesson from the eagerness of CBA advocates to embrace other unproven methodologies. As Revesz and Livermore show, there is at best tenuous economic support for using life-years or QALYs (quality-adjusted life years) in lieu of lives saved in regulatory benefits. (pp. 77-93) Again, there is nothing wrong with economic research to explore these methodologies, but a disinterested advocate of sound economic analysis would have demanded much more evidence before advocating their use in policymaking. These techniques are simply not “ready for prime time.” Their appeal lies much more in their capacity to undercut the argument for regulation than in the economic evidence supporting them.

The politicization of CBA even in the academy can also be seen in recent debates over climate change. For example, William Nordhaus’s economic model of climate change has been quite influential.<sup>27</sup> Yet Nordhaus seems to be unable to control the urge to leap far beyond what his model can actually provide so as to strengthen his statement of the argument against serious action on climate change.

The description of the model by Nordhaus and his coauthor is replete with qualifications: “a major uncertainty in the model involves projecting the growth of . . . total factor productivity”<sup>28</sup>; “there are no well-established empirical regularities and very little history can be drawn upon” regarding the link between climate change and the economy<sup>29</sup>; there are “major uncertainties about the long-run trajectories of economic growth in different regions”<sup>30</sup>; regional growth models “are difficult to validate or estimate and are subject to large and growing projection errors as they run further into the future”<sup>31</sup>; and so forth.<sup>32</sup> Despite all of these qualifications, perhaps the model could reasonably be used as a basis for tentative policy recommendations in the absence of anything better.

But the limitations of the model miraculously fall by the wayside when Nordhaus has the opportunity to deliver a strong antiregulatory message. Speculative modeling results miraculously turn into proven fact in a modern version of transubstantiation: “for the United States, Japan, Russia, and China are essentially zero” until 2100 (assuming no catastrophe materializes)<sup>33</sup>; a delay of ten years in implementing mitigation “leads to a trivially small net loss”<sup>34</sup>; limiting global

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<sup>27</sup> As indeed they may have been, since the book describing the model is coauthored. William D. Nordhaus and Joseph Boyer, *Warming the World: Economic Models of Global Warming* (2000).

<sup>28</sup> Nordhaus and Boyer, *supra* note , at 17.

<sup>29</sup> *Id.* at 20.

<sup>30</sup> *Id.* at 47.

<sup>31</sup> *Id.* at 53.

<sup>32</sup> Some additional examples include statements that “there are no established methodologies for valuing catastrophic risk” (*id.* at 71); that findings of climate impact are “highly conjectural” and it is difficult “to make solid estimates of the impacts of climate change” (*id.*); and that “[g]iven the lack of any comprehensive estimates, the authors have made rough estimates here of the extent to which the economy and other institutions are vulnerable to climate change” (*id.* at 86).

<sup>33</sup> *Id.* at 96.

<sup>34</sup> *Id.* at 127.

emissions to 1990 levels causes a net “discounted loss of \$3 trillion”<sup>35</sup>; “an efficient climate-change policy would be relatively inexpensive and would slow climate change surprisingly little”<sup>36</sup>; and the “Kyoto protocol has no economic or environmental rationale.”<sup>37</sup> This is the language of political advocacy, not a disinterested report on a profoundly difficult area of research.

Similarly, Richard Toll contends on the basis of a meta-analysis that “[o]ne can therefore safely say that, for all practical purposes, climate change impacts may be very uncertain but it is unlikely that the marginal damage costs of carbon dioxide emissions exceed \$50/tC and are likely to be substantially smaller than that.”<sup>38</sup> A more accurate way of stating his findings would have been: “While all existing models are imperfect, an assessment of their overall predictions and uncertainties suggests that . . .” He might also have done better to unpack the terms “unlikely” and “likely” – considering peer-reviewed studies only, Table 3 of his own article<sup>39</sup> shows a mean marginal cost of \$50, a 10% probability that the cost is over \$125, and a 5% probability that the result is over \$245. If we used standard confidence intervals (5% to 95% range), the confidence interval for the \$50/ton estimate would go from -\$9 to +\$245.<sup>40</sup> In any event, saying that marginal damages are unlikely to be above \$50 and probably much lower is a rather misleading when \$50 is actually the mean estimate. Again, deregulatory advocacy seems to be playing the guiding role.

The antiregulatory ideology that seems to motivate these prominent CBA practitioners does not prove that their conclusions are wrong, still less that CBA is an invalid methodology. What the evidence does show is that in political terms, even within the academy, CBA has sometimes been less an end in itself than a means toward an anti-regulatory agenda. Environmentalists may have overreacted in rejecting CBA root-and-stock, but their intense suspicion of CBA is understandable.

#### B. CBA’s Legitimacy Deficit

An uninformed reader of *Rethinking Rationality* might come away with the impression that environmental law consisted of a mandate to EPA and OSHA to maximize social welfare or perhaps more generally to make appropriate tradeoffs between health, environment, and cost. Similarly, by requiring that decisions be based on cost-benefit analysis except where precluded by law, Reagan’s executive order and its successors give the impression that the exception is a rarity. Perhaps it would be a better world if Congress had given such broad mandates to regulatory agencies, but the reality is quite different. Revesz and Livermore speak of the “vast

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<sup>35</sup> Id. at 129.

<sup>36</sup> Id. at 174.

<sup>37</sup> Id. at 177.

<sup>38</sup> Richard S.J. Toll, *The Marginal Damage Costs of Carbon Dioxide Emissions: An Assessment of the Uncertainties*, 33 Energy Policy 2064, 2073 (2005).

<sup>39</sup> id. at 2071.

<sup>40</sup> It also turns out that much of the divergence between results is actually based on ethical disagreements, depending on how the model accounts for impacts on the poor (“equity weighting”) and on future generations (“discount rates”). Id. at 2072-2073.

discretion that is given to administrative agencies,” (p. 13) which might be thought to imply that agencies can adopt whatever decision standards they desire. No doubt many administrators wish that were the case. But in fact, agencies like EPA are immersed in a vast web of statutory requirements.<sup>41</sup>

Revesz and Livermore observe that “most major new environmental, health, and safety regulations must pass a cost-benefit test before they can be adopted.” (p. 11) Given that most regulatory statutes provide some test other than cost-benefit analysis, it’s hard to see how applying this extra-legal requirement for regulation can be legitimate.

A trio of Supreme Court cases drive home the lesson that agencies are given specific tasks by Congress rather than being directed to engage in open-ended balancing of costs and benefits. *American Textile Manufacturers v. Donovan*<sup>42</sup> involved section 6(b) of OSHA, which governs occupational health standards for toxic chemicals. This section directs the agency to “set the standard which most adequately assures, to the extent feasible . . . that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life.” The textile manufacturers argued that this provision required the agency to show that the benefits of the regulation had a reasonable relationship to costs. The Court rejected this argument based on the plain meaning of the word “feasible.” In the Court’s view:

Congress itself defined the basic relationship between costs and benefits, by placing the “benefit” of worker health above all other considerations save those making attainment of this “benefit” unachievable. Any standard based on a balancing of costs and benefits by the Secretary that strikes a different balance than that struck by Congress would be inconsistent with the command set forth in § 6(b)(5). Thus, cost-benefit analysis by OSHA is not required by the statute because feasibility analysis is.<sup>43</sup>

Similarly, in *Whitman v. American Trucking Associations, Inc.*,<sup>44</sup> the industry argued that EPA must use CBA in setting ambient air quality standards under the Clean Air Act. The provision in question, section 109(b)(1), direct EPA to set standards “the attainment and maintenance of which . . . are adequate to protect the public health” with an “adequate margin of safety.” In an opinion by Justice Scalia, the Court held that this provision precludes the use of CBA. Justice Scalia remarked

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<sup>41</sup> As Ackerman and Heinzerling put it: “Laws requiring agencies to identify the best technologies to address pollution, for example, do not allow administrative agencies (and reviewing courts) to reopen the basic debate about pollution and public policy.” Ackerman and Heinzerling, *supra* note , at 216.

<sup>42</sup> 452 U.S. 490 (1981).

<sup>43</sup> [cite]

<sup>44</sup> 531 U.S. 457 (2001).

that, “[w]ere it not for the hundreds of pages of briefing respondents have submitted on the issue, one would have thought it fairly clear that this text does not permit the EPA to consider costs in setting the standards.”<sup>45</sup> Moreover, because the statute frequently does call for the consideration of costs in other contexts, the Court said it had previously “refused to find implicit in ambiguous sections of the CAA an authorization to consider costs that has elsewhere, and so often, been expressly granted.”<sup>46</sup> Hence, industry had the burden of showing a “textual commitment of authority to EPA to consider costs” in setting the standards.<sup>47</sup> The industry was unable to do so.

A plausible fallback argument might be that, where the agency has a reasonable range of choices in applying a statutory standard, it may use CBA to choose within that permissible range. The Court in *American Trucking* rejected a similar argument that the statute’s “terms ‘adequate margin’ and ‘requisite’ leave room to pad health effects with cost concerns.”<sup>48</sup> But the Court found it “implausible that Congress would give to the EPA through these modest words the power to determine whether implementation costs should moderate national air quality standards.”<sup>49</sup>

The Court further emphasized the duty of agencies to exclude policy considerations unrelated to statutory mandates in *Massachusetts v. EPA*.<sup>50</sup> In *Massachusetts v. EPA*, states, local governments, and environmental organizations petitioned for review of EPA’s denial of their petition, which had asked EPA to begin a rulemaking to regulate greenhouse gas emissions from motor vehicles under the Clean Air Act.<sup>51</sup> EPA had argued that CO<sub>2</sub> is not a “pollutant” within the meaning of the Clean Air Act. It supported this argument with a grab bag of arguments intended to show that the CAA is poorly adapted to deal with climate change. EPA said that even if greenhouse gases were covered by the statute, it would exercise its discretion to avoid regulating because of these factors. In particular, EPA relied on the foreign policy dimensions of the climate change issue as a justification for not invoking domestic regulatory authority.

The Court found EPA’s interpretation of the CAA incompatible with the plain language of the statute:

The statutory text forecloses EPA’s reading. The Clean Air Act’s sweeping definition of “air pollutant” includes “any air pollution agent or combination of such agents, including any physical, chemical . . . substance or matter which is emitted into or otherwise enters the ambient air . . . .”

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<sup>45</sup> [cite]

<sup>46</sup> cite

<sup>47</sup> cite

<sup>48</sup> cite

<sup>49</sup> cite

<sup>50</sup> 127 S. Ct. 1438 (2007).

<sup>51</sup> 127 S. Ct. at 1449-1451.

§7602(g). On its face, the definition embraces all airborne compounds of whatever stripe, and underscores that intent through the repeated use of the word “any.” Carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons are without a doubt “physical [and] chemical . . . substance[s] which [are] emitted into . . . the ambient air.” The statute is unambiguous.<sup>52</sup>

The Court also found that EPA had considered impermissible extraneous factors in making its determination:

Although we have neither the expertise nor the authority to evaluate these policy judgments, it is evident they have nothing to do with whether greenhouse gas emissions contribute to climate change. Still less do they amount to a reasoned justification for declining to form a scientific judgment. In particular, while the President has broad authority in foreign affairs, that authority does not extend to the refusal to execute domestic laws.<sup>53</sup>

These cases involved provisions that precluded consideration of costs in setting a regulatory standard. There are many other provisions of environmental law that do provide for consideration of costs, but Congress generally has simply instructed the agency to engage in open-ended balancing of costs and benefits. Instead, it gives more specific directions, usually in the form of describing the level of pollution control technology in a given context. For instance, in various different settings, the Clean Air Act calls for the use of:

- Reasonably Available Control Technology for existing sources in nonattainment areas based on average industry;
- Best Demonstrated Available Technology for categories of new sources based on cost and other factors;
- Best Available Control Technology for new sources in areas that exceed required air quality standards based on the maximize feasible pollution reductions;
- Maximum Achievable Control Technology for major sources of hazardous air pollutants requiring existing sources to match the best twelve percent of the industry and new sources to match the best controlled existing source; and
- Lowest Achievable Emissions Reduction for new or modified stationary sources in nonattainment areas requiring the most stringent existing

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52 Id. at 1459.

53 Id. at 1463.

emissions limited achieved in practice or included in any state implementation plan.<sup>54</sup>

The application of these standards is not always clear, and it is possible that some of them allow for the use of CBA. But it would clearly be unreasonable to view all of them as allowing CBA since that would collapse into one the multifarious standards that Congress so carefully distinguished.

The upshot of all this is the relatively few environmental statutes allow the kind of open-ended balancing that CBA provides. Congress has carefully specified the factors to be considered in setting environmental standards, usually in terms of public health or delineated levels of technological feasibility. For an agency to base a decision on other factors such as CBA would be unlawful.

Importing legally irrelevant factors into a decision violates the basic precepts of modern administrative law. In *Citizens to Preserve Overton Park, Inc. v. Volpe*,<sup>55</sup> the Court held that agencies must provide a reasoned explanation of their decisions based on the relevant statutory factors. Being within the range of reasonable outcomes is not enough; instead, the reviewing court “must consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.”<sup>56</sup> Thus, when the agency acts, it must do so on the basis of a judgment about the legally relevant factors, not based on extralegal considerations.

Nor does Congress typically give EPA broad discretion to refuse to regulate. Environmental statutes such as the Clean Air Act are replete with regulatory deadlines intended to force EPA’s hand. As *Massachusetts v. EPA* makes clear, EPA cannot shirk these congressional mandates based on extralegal factors.

Courts are understandably reluctant to look beyond an agency’s formal explanation of its action in order to determine whether OMB pressure based on extralegal considerations shaped the decision.<sup>57</sup> But this does not excuse efforts to exert such pressure. Article II of the Constitution makes it the duty of the president to “take

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54 This summary is derived from Daniel A. Farber, Jody Freeman, Ann E. Carlson, and Roger W. Findley, *Cases and Materials on Environmental Law* 539 (7th ed. 2006). For a listing of the similar set of standard under the Clean Water Act, see *id.* at 673-674.

55 401 U.S. 402 (1971).

56 401 U.S. at --.

57 White House influence on EPA rulemakings tends to be concealed rather than reflected in the record before a reviewing court:

According to 63% of EPA respondents, only rarely or sometimes were changes arising from White House involvement apparent in the record. This number actually understates the issue because a full 30% indicated that they had no knowledge of the contents of the record. Of the respondents who had awareness of the contents of the record, 90% stated that the record either rarely or sometimes did not contain evidence of White House involvement; the remaining 10% said it never did.

Bressman and Vandenberg, *supra* note , at 81

care that the laws be faithfully executed,” not to “take care that executive branch actions survive judicial review.” Faithfully executing the laws means applying the legal standards prescribed by Congress, not the legal standards that the president wishes Congress had prescribed.

In short, for most provisions of the environmental statutes that govern EPA, it is not permissible to shape regulations based on CBA or to block regulations that fail to satisfy CBA. Advocates of CBA may or may not be right that CBA is the best way to set environmental standards. That is an argument that they should make to Congress. Under existing law, it is not an argument that the executive branch can lawfully give effect to under most environmental statutes.

This does not make the debate over the value of CBA irrelevant or negate the helpful suggestions for reform made by Revesz and Livermore. There are surely at least some statutes that do allow the use of CBA, such as the provision of the Toxic Substance Control Act discussed in section III(A) below. In those settings, if CBA is used, Revesz and Livermore’s suggestions about its application would be quite helpful.

Moreover, there is more to environmental policymaking than executing existing environmental mandates. CBA is potentially relevant to arguments about changing existing standards and tackling new problems like climate change. If CBA is used in those settings, Revesz and Livermore’s suggestions would again be helpful. As we will see, however, CBA is tangential to the major issues facing environmental law today.

### III. CBA’s Marginal Relevance to Environmental Reform

#### A. *CBA and Toxic Chemicals*

CBA places heavy reliance on quantitative estimates of risk, yet these estimates are quite imprecise. Risk assessment is “a complex, judgment-filled process”, rather than “a simple matter of scientific observation,” and “the uncertainties operate as a serious limitation on the ability of risk assessment to quantify risk.”<sup>58</sup>

CBA has clearly contributed to the dysfunctionality of U.S. toxics regulation. *Corrosion Proof Fittings*<sup>59</sup> is a *bête noire* among environmentalists for this reason. The case involved section 6(a) of the Toxic Substances Control Act, which is triggered by a finding of a reasonable basis to conclude that the chemical substance presents an “unreasonable risk” of injury to health or the environment. Having made such a finding, EPA may by rule apply one or more of seven types of

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<sup>58</sup> John S. Applegate & Celia Campbell-Mohn, Risk Assessment: Science, Law and Policy, 14 Nat. Res. & Env't. 219, 220 (2000); Alon Rosenthal et al., Legislating Acceptable Cancer Risk from Exposure to Toxic Chemicals, 19 Ecology L.Q. 269, 220 -221, 278 (1992).

<sup>59</sup> *Corrosion Proof Fittings v. EPA*, 947 F.2d 1201 (5th Cir. 1991).

restrictions listed in section 6(a) “to the extent necessary to protect adequately against such risk using the least burdensome requirements.” The restrictions range from prohibiting the manufacture or distribution of the chemical to directing the manufacturer to give notice of the risk of injury. Section 6(c) mandates a hybrid rulemaking procedure, including informal hearings and a limited right of cross-examination. Under section 19(c), a court of appeals must set aside a rule adopted under section 6 if the court finds that the rule is not supported by “substantial evidence in the rulemaking record.”

In *Corrosion Proof Fittings*, the court vacated a final EPA rule that would have prohibited the manufacture, importation, processing, and distribution of asbestos in almost all products. The rule was ten years in the making and represented the first time EPA had used its authority under section 6 to place a comprehensive ban on a dangerous substance. The court held that EPA had violated TSCA by not considering adequately the benefits and costs of less burdensome alternatives to a complete ban, by not allowing public comment and cross-examination on methodology adopted at the last minute by EPA to support its benefits calculation, and by not evaluating the toxicity of likely substitute products (some of which were also carcinogens) that would replace asbestos in its various applications.

The court emphasized that TSCA is not a “zero-risk” statute, and that the substantial evidence standard for judicial review under TSCA is less deferential than the arbitrary and capricious standard of the Administrative Procedure Act. The court said that while agency rules have a presumption of validity, “[t]he burden remains on the EPA . . . to justify that the products it bans present an unreasonable risk, no matter how regulated.”<sup>60</sup> With respect to cost-benefit analysis, the court said that, while “Congress did not dictate . . . an exhaustive, full-scale cost-benefit analysis, it did require the EPA to consider both sides of the regulatory equation, and it rejected the notion that the EPA should pursue the reduction of workplace risk at any cost.”<sup>61</sup> The court concluded, “[U]ntil an agency ‘can provide substantial evidence that the benefits to be achieved by [a regulation] bear a reasonable relationship to the costs imposed by the reduction, it cannot show that the standard is reasonably necessary.’”<sup>62</sup>

Asbestos had been one of only six substances banned under TSCA.<sup>63</sup> Thus, the statute has proved useless as a means of reaching chemicals that are already on the market. It is easy to blame CBA for this outcome. But the real problem is hidden

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<sup>60</sup> cite

<sup>61</sup> cite

<sup>62</sup> For criticism of the decisions, see Thomas O. McGarity, *Some Thoughts on “Deossifying” the Rulemaking Process*, 41 Duke L.J. 1385 (1992) (the decision is “lacking in deference to the agency’s exercise of expertise and policy judgment” and “full of attempts to impose on the agency the judges’ own views of the proper role of regulation in society”).

<sup>63</sup> Schapiro, *supra* note 3, at 133.

in the facts. It had taken EPA ten years to conclude its proceeding on asbestos. At that rate, with or without CBA, not much is going to be done to address toxic chemicals.

It is also easy to blame CBA for the failure of OSHA to guard against toxic exposures in the workplace. No doubt, if OSHA had followed the statute rather than being squelched by OIRA, it would have done more to deal with this problem. But the basic problem is not CBA. Rather, it is the statutory scheme itself:

In the regulation of chemicals, manufacturers are not required to do any testing unless commanded by the EPA, and the EPA must justify its demand with some scientific evidence. Due in part to this formidable burden, in the nearly thirty years of its regulatory authority, the EPA has issued testing mandates for fewer than 200 chemicals. Most of the remaining chemicals, which include approximately 75,000 individual chemical substances, are effectively unrestricted and often unreviewed with regard to their health and environmental impacts. Even when there is considerable information indicating that a chemical is unsafe, as there was in the case of asbestos, the EPA still must engage in a long and difficult regulatory struggle before imposing the "death penalty" on the hazardous chemical.<sup>64</sup>

What data is available generally does not include exposures,<sup>65</sup> let alone toxicity rate at environmental exposure levels. Thus, the basic problem is that the regulatory scheme generates no risk information about the large number of chemicals in the market, relies on chemical-by-chemical precautions against toxic releases, and places the burden on the agency to establish the existence of a significant risk for each chemical. This is a recipe for failure, with or without CBA.

Even if we had better data on risk levels, imposing regulatory restrictions is an arduous process. For example, in *Industrial Union Department, AFL-CIO v. American Petroleum Institute*,<sup>66</sup> a leading case on risk regulation, OSHA compiled

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<sup>64</sup> Wendy Wagner, *Missing Information: The Scientific Data Gap in Conservation and Chemical Regulation*, 83 Ind. L. J. 629, 629-630 (2008). Similar conclusions were reached in studies by the European Commission:

The European Commission sponsored several studies of the data gap in preparing its legislative proposal for REACH, a complete overhaul of the European Union's chemical regulation system. The absence of chemical information was a major motivation for the overhaul, just as it had been thirty years earlier with TSCA (plus ça change, plus c'est la même chose). One such study concluded that publicly available base data existed for only 14% of the HPV chemicals studied, less than a base set existed for 65%, and no data existed for 21%.

John Applegate, *Bridging the Data Gap: Balancing the Supply and Demand for Chemical Information*, 86 Tex. L. Rev. 1365, 1383 (2008).

<sup>65</sup> Applegate, *supra* note , at 1383.

<sup>66</sup> 448 U.S. 607(1980).

fifty volumes of evidence and conducted seventeen days of hearings to justify restrictions on occupational exposures to benzene.<sup>67</sup> Apart from the fact that the Supreme Court required the agency to create even more of a record on remand, it is obvious that this kind of effort can only be made infrequently.

## 2. More Promising Avenues for Reform

### *B. New Approaches to Toxic Chemical Regulation*

The European REACH directive<sup>68</sup> represents a much more promising approach. REACH was enacted at the end of 2006.<sup>69</sup> It contains “the most rigorous testing requirements of any regulatory regime in the world, requires registration of all existing and new chemicals produced or imported in volumes of a ton or more per year per manufacturer or importer.”<sup>70</sup> This measure was prompted in part by widespread concerns about toxic chemicals in products for children.<sup>71</sup>

REACH makes special provision for high risk chemicals. To obtain authorization for these chemicals, firms will have to show that the risks are sufficiently controlled or that the benefits of using the chemicals exceed the risks. They must also discuss the existence of safer alternative substances or technologies, and must submit plans to substitute these safer alternatives if available (or plans for R & D if no such substance currently exists.)<sup>72</sup> Thus, unlike U.S.

Note that for these chemicals, the burden is on the manufacturer or importer to justify use of the chemical. Substances imported or manufactured in amounts

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<sup>67</sup> *Id.* at 696-697 (Marshall, J., dissenting).

<sup>68</sup> Regulation 1007/2007 of the European Parliament and of the Council; and Directive 2006/12 of the European Parliament and of the Council, 2007 O.J. (L 396) 1 (EC) (concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, and repealing or amending the relevant Council and Commission Directives.).

<sup>69</sup> For discussion of REACH, see John S. Applegate, *Synthesizing TSCA and REACH: Practical Principles for Chemical Regulation Reform* (2008) (available at <http://ssrn.com/abstract=1183942>); Mark Schapiro, *Exposed: The Toxic Chemistry of Everyday Products and What's at Stake for American Power* (2007); Christian Hey, Klaus Jacob, and Axel Volkery, *Better Regulation by New Governance Hybrids? Governance Models and the Reform of European Chemicals Policy* (Environmental Policy Research Center, Free University of Berlin) (2006) (available on [www.ssrn.com](http://www.ssrn.com)); David Wirth, *The EU's New Impact on U.S. Environmental Regulation*, 31 *Fletcher Forum of World Affairs* 91 (2007) (available at <http://ssrn.com/abstract=1028733>); DaeYoung Park, Me-Young Son, Kwi-Ho Lee, Duk-Chan Yoon, Xiong Cong, *REACHing Asia: Recent Trends in Chemical Regulation of China, Japan, and Korea* (2007). A detailed comparison of REACH with U.S. and Canadian chemical regulation can be found in Environmental Defense Fund, *Not That Innocent: A Comparative Analysis of Canadian, European Union and United States Policies on Industrial Chemicals* (2007).

<sup>70</sup> Wirth, *supra* note 3, at 100.

<sup>71</sup> Schapiro, *supra* note 3, at 136.

<sup>72</sup> REACH in Brief, at 5. Certain substances are singled out for special treatment. PBTs, vPvBs and those CMR substances for which a safe level cannot be defined, cannot be authorized based on adequate control of risk. In six years, the Commission will review whether endocrine disrupters should also be excluded from the adequate control route. *Id.* at 13.

exceeding one ton must have a technical dossier giving background information, while a chemical safety report is required if the amount is over 10 tons. Testing requirements are set forth in annexes to the agreement.<sup>73</sup>

REACH uses a mix of regulatory techniques. Public disclosure of risk information and the use of self-regulation along the supply chain go beyond traditional regulation. On the other hand, the authorization requirements for chemicals of special concerns are classic prescriptive regulations, differing from the norm only in that the burden of proof is on industry. One risk is that industry will deemphasize the self-enforcement provisions of the law in order to avoid exposing problems that might lead to heavier regulation.<sup>74</sup> Yet, industry also has incentives to voluntarily switch away from chemicals of high concern or from those whose tests suggest possible risks in order to avoid the possible burdens of regulation.

Elsewhere, I have discussed several lessons of REACH for U.S. policymakers, It illustrates the power of “next generation” environmental policies to mold industry behavior, including the potential for public disclosure requirements to trigger market pressures against toxics sources, the desirability of avoiding grandfathering of existing facilities and products, and the advantages of using supply-chain leverage to broaden the impact and effectiveness of regulation. These features of REACH are likely to be followed in new environmental legislation in the EU and elsewhere.

The more fundamental points are that REACH provides incentives to use substitutes for potentially toxic chemicals rather than focusing its efforts on chemical-by-chemical regulation, that it uses market incentives as much or more than direct regulation, and that it places the burden of developing toxicity information and establishing need for using toxic chemicals on the user rather than the government.

Trying to improve U.S. toxics regulation by reforming or even eliminating CBA is like putting lipstick on a pig (or, to recall a phrase from the recent presidential campaign, on a pitbull.) Certainly, the incremental improvements suggested by Revesz and Livermore should be used to whatever extent CBA remains part of the process. But to make serious progress in addressing toxics issues, we need something quite different, along the general lines of REACH.

### *B. CBA and Climate Change*

#### 1. The Inability of CBA to Drive Climate Policy Analysis

For policymaking purposes, we would like to know not only how much climate change to expect, but what costs these changes will impose on society and what it would cost to ameliorate climate change. Unfortunately, our knowledge of these economic issues is still quite crude.

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<sup>73</sup> REACH in Brief, at 6.

<sup>74</sup> See Hey, Jacob and Volkery, *supra* note 3, at 13.

There are now about a dozen models that link climate change predictions to economic analysis.<sup>75</sup> These models differ in a number of dimensions: their focus on the energy sector or reliance on a broad macroeconomic analysis, the degree to which they analyze localized versus average global impacts, and their treatment of uncertainty.<sup>76</sup> Model results differ correspondingly.

For example, the Mendelsohn model estimates impacts for five market sectors and find positive economic effects for temperature increases up to about 4 °C, whereas the Toll model finds small net economic losses at all levels in terms of global output but estimates the losses to be twice as high when measured in terms of individual welfare rather than dollars (because many of the costs fall on poorer populations).<sup>77</sup>

The Nordhaus model included a broader range of impacts (market and non-market) and also made the first effort to take into account the economic costs of potential catastrophic impacts.<sup>78</sup> The Nordhaus model found nonlinear effects of climate change, so that a 6 °C change produces about twice as much harm as a 4 °C change.<sup>79</sup> Despite these attractive features, the Nordhaus model also has significant limitations where modeling had to be based on assumptions rather than data or theory. To take a few examples:

- The calculations of the impact of sea level rise exclude storms, impacts on undeveloped lands, and storm damage, which the authors attempt to compensate for with what they consider a conservative estimate.<sup>80</sup>
- The shift away from carbon intensive energy sources is assumed to follow historical trends, rather than reflecting incentives for new technologies.<sup>81</sup>
- The cost of catastrophic harm was roughly estimated via a survey of experts followed by some “assumptions” about the degree of harm.<sup>82</sup>

In contrast to Nordhaus, the Stern Report used a model called PAGE2002IAM and finds considerably higher levels of harm.<sup>83</sup>

Models also differ in their assessments of the costs of complying with the Kyoto Protocol, with the range running from negligible losses to at least one to two

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<sup>75</sup> For a list, see McGuffie and Henderson-Sellers, *supra* note , at 242.

<sup>76</sup> *Id.* at 240-243 (treatment of uncertainty is tabulated on p. 242).

<sup>77</sup> Stern Report, *supra* note , at 166-167.

<sup>78</sup> *Id.* at 167.

<sup>79</sup> *Id.* at 167.

<sup>80</sup> Nordhaus, *supra* note , at 76.

<sup>81</sup> *Id.* at 51. Compare Richard S.J. Tol, *Carbon Dioxide Emissions for the USA*, [www.ssrn.com/abstract=932508](http://www.ssrn.com/abstract=932508) (noting that the “model cannot anticipate structural breaks. This is a humbling conclusion for a 100 year forecast.” And “history-based projections are not robust to radically new technologies.”)

<sup>82</sup> Nordhaus. at 87-88.

<sup>83</sup> Stern, *supra* note , at 186.

percent of GDP, annually.<sup>84</sup> The models differ in terms of three critical assumptions about the timing of abatement efforts, the types of policy instruments used, and the likelihood of technological innovation.<sup>85</sup> Other relevant factors include the willingness of economic actors to substitute away from high carbon technologies and trends in energy efficiency.<sup>86</sup>

There are similar difficulties in modeling the costs of mitigating and adapting to climate change. Most of the model results are in the range of two to five percent of GDP in 2050. However, the range spans from a four percent *gain* in GDP due to reduced use of carbon to a fifteen percent *loss* of GDP.<sup>87</sup> A meta-analysis shows that key factors in explaining these differences include the following: whether revenue from carbon taxes is recycled; what kinds of technological changes are assumed; whether shifts in energy sources have non-climate benefits; and whether the model includes international carbon trading.<sup>88</sup> Hopefully, economists will be able to narrow the uncertainty, but it is discouraging that at this point they cannot even agree on the sign of the economic effect.

Remarkably, many of the models assume that placing a higher price of carbon will not cause an increased innovation toward clean technologies. If it is true that financial incentives do not affect the rate of innovation, the entire law of intellectual property is radically misguided. One wonders if the same economists would be willing to support a proposal to abolish IP rights in energy technologies on the ground that technological innovation is exogenous.

Many of the individual elements of the economic impact analysis are the subjects of serious debate. For instance, economists hotly dispute the net effect of climate change on agriculture, with some finding an overall positive effect on U.S. agriculture (but with very large regional variations),<sup>89</sup> while others find substantial negative effects.<sup>90</sup> If we do not even know the sign of important elements of the economic impact, predicting overall impact (taking into account all of the feedback loops of the economy) is obviously going to be difficult.

Modeling the systemic economic impact of climate change as well as the costs of adaptation and mitigation involves tremendous challenges, particularly if the

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<sup>84</sup> Jason F. Shogren and Michael A. Toman, *How Much Climate Change is Too Much?*, in *Climate Change Economics and Policy: An RFF Anthology* 42 (Michael A. Toman ed. 2001).

<sup>85</sup> *Id.*

<sup>86</sup> *Id.* at 43.

<sup>87</sup> Stern Report, *supra* note , at 269.

<sup>88</sup> *Id.* at 271.

<sup>89</sup> See Oliveir Deschenes & Michael Greenstone, *The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather*, 96 *Amer. Econ. Rev.* 354 (2007) (but note that this study excludes possible impacts of increased in extreme events such as storms and droughts).

<sup>90</sup> Wolfram Schlenker, W. Michael Hanemann & Anthony C. Fisher, *The Impact of Global Warming on U.S. Agriculture: An Econometric Analysis of Optimal Growing Conditions*, 88 *Rev. Econ. and Statistics* 113 (2006).

projection goes out more than a few years.<sup>91</sup> Even Nordhaus and his coauthor emphasize that “attempts to estimate the impacts of climate change continue to be highly speculative.”<sup>92</sup> To begin with the model, the economic model must build on the outputs of climate models, which are themselves uncertain. Then there is the difficulty of forecasting the future trajectory of the economy over future decades. This clearly cannot be done in detail – for example, no forecaster in 1970 would have predicted the explosive growth of personal computers, let alone the Internet, neither of which existed at the time.

Even efforts to forecast at a cruder level must rely heavily on the assumption that the future will on average be much like the recent past – for example, that technological progress will continue at something like its current pace and that some unforeseen catastrophe will not cause an economic crash. Even predictions for specific economic sectors are difficult. Past experience with models that project energy use do not lend much confidence to these predictions: the projections have generally been too high, by as much as a factor of two.<sup>93</sup> Projecting adaptation is made more difficult by the institutional barriers that may prevent optimal use of adaptation – for instance, the history of federal flood control gives little ground for optimism.<sup>94</sup> To the extent that climate change scenarios are based on projections of future emissions, they implicitly make assumptions about future political and economic developments, which are also imperfectly known (to say the least).

Two general problems with cost-benefit analysis have particular relevance for climate change. First, non-market benefits are difficult to assess, yet ecosystem damage is a critical factor in assessing climate change.<sup>95</sup> Second, climate change

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<sup>91</sup> A good overview of modeling issues can be found in J.C. Huracade, *et al.*, *Estimating the Costs of Mitigating Greenhouse Gases*, in *Climate Change 1995: Economic and Social Dimensions of Climate Change: Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change* (James P. Bruce, Hoesung Lee & Erik F. Haites eds. 1996). Of course, in the decade since this report, models have improved in their capacity to handle these issues.

<sup>92</sup> Nordhaus and Boyer, *supra* note , at 86.

<sup>93</sup> Stephen J. DeCanio, *Economic Models of Climate Change: A Critique* 138-143 (2003).

<sup>94</sup> See Matthew D. Zinn, *Adapting to Climate Change: Environmental Law in a Warmer World*, 34 *Ecology L.Q.* 61 (2007) (adaptation may not be successfully managed to minimize ecological or other impacts).

<sup>95</sup> For a vigorous critique of the way cost-benefit analysis treats environmental and health benefits, see Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 *U. Pa. L. Rev.* 1553 (2002). Some economists advocate the use of "contingent valuation" studies to measure how much people are willing to pay for non-use values. Contingent valuation is essentially a survey technique. People are given information about an environmental issue and then asked if they would be willing to pay a certain amount to solve the problem. There is a great deal of dispute about whether contingent valuation, even if done carefully, provides a genuine measure of preferences. Cass Sunstein, for example, finds many contingent valuation analyses difficult to take seriously. He stresses what he describes as the "astonishing and devastating fact" that willingness to pay seems constant regardless of the scale of the environmental problem. Cass R. Sunstein, *Free Markets And Social Justice* 142-43 (1997). For an environmentalist critique of contingent valuation, see John Heyde, *Is Contingent Valuation Worth the Trouble?*, 62 *U. Chi. L. Rev.*

requires the use of discounting because of the long time spans involved, yet the legitimacy of discounting is contested, as is the choice of discount rate.<sup>96</sup>

One reason for the disparities between different models are disagreements about the discount rate. This is a critical factor in analyzing climate change.

Outputs of various economic models are so far apart as to make it perilous to rely on any one model or even a small subset. According to a recent review, “cost estimates of Kyoto emissions reductions diverge by a factor of about 500 (and not all estimates show an economic loss.)”<sup>97</sup> As noted earlier, there is also evidence of a systematic bias in ex ante economic studies to overestimate the cost of complying with environmental regulations. In any event, estimates of mitigation costs must be taken with a large grain of salt.

On the book jacket, Judge Richard Posner remarks that “in noncommercial settings, cost-benefit analysis often cannot yield definitive conclusions without the analyst’s adopting assumption that may be politically charged.” That may or may not be accurate as a general statement, but it is clearly true regarding CBA of climate change. We do need to make intelligent decisions about climate mitigation, but CBA cannot help us make them.

## 2. Climate Mitigation, Uncertainty and Precaution

In terms of mitigation efforts, the weaknesses of current economic models of climate change make cost-benefit analysis quite problematic. Simply put, the uncertainties seem to swamp the ability of the models to provide reliable information on costs and benefits. Moreover, the economic models must rely on scientific models of climate that also presents significant (though smaller) uncertainties.

There seems to be a broad consensus among economists that uncertainty about climate change is not an excuse for inaction. As Thomas Schelling says, “this idea that costly actions are unwarranted if the dangers are uncertain is almost unique to

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331 (1995). Another approach for valuation of non-market costs and benefits is the concept of ecosystem services. For discussion, see *Symposium*, 20 Stan. Env. L.J. 309 (2001); James Salzman, *Creating Markets for Ecosystem Services: Notes from the Field*, 80 NYU L. Rev. 870 (2005).

<sup>96</sup> For discussions of the discounting issue, see Daniel Farber, *From Here to Eternity*, 2003 U. Ill. L. Rev. 289 (2003); Lisa Heinzerling, *The Temporal Dimension in Environmental Law*, 31 Envtl. L. Rep. 11,055, 11,067 (2001). Over longer time periods, the results of changes in discount rates are even more dramatic, as Cass Sunstein explains:

If an agency chooses a discount rate of 2%, the outcome will be very different from what it would be if an agency were to choose a discount rate of 10%; the benefits calculation will shift dramatically as a result. If a human life is valued at \$8 million, and if an agency chooses a 10% discount rate, a life saved 100 years from now is worth only \$581. "At a discount rate of 5%, one death next year counts for more than a billion deaths in 500 years."

Cass R. Sunstein, *Cost-Benefit Default Principles*, 99 Mich. L. Rev. 1651, 1711 (2001).

<sup>97</sup> Tulkens and Tulkens, *supra* note , at 8.

climate.”<sup>98</sup> “In other areas of policy, such as terrorism, nuclear proliferation, inflation, or vaccination,” he continues, “some ‘insurance’ principle seems to prevail: if there is a sufficient likelihood of sufficient damage[,] we take some measured anticipatory action.”<sup>99</sup> Nobel Laureate Kenneth Arrow suggests that we should take uncertainties into account by basing our policies on anticipated harm about 50% higher than the median expected harm, in order to account for the element of risk.<sup>100</sup> Innovative theoretical work by the eminent environmental economist Martin Weitzman suggests that uncertainty about possible catastrophic climate change should loom large as a justification for controlling climate change.<sup>101</sup>

If we cannot rely on CBA for guidance, how should we make decisions about climate mitigation?

One way to control for model uncertainty is called robust optimal control. Under this approach, to correct for uncertainty about the correctness of their preferred model, policymakers consider alternate models that are close to their baseline model, in the sense of being statistically hard to distinguish from the baseline model. In the climate change context, the implication is that policymakers should react more aggressively and pursue more stringent mitigation strategies.<sup>102</sup>

### 3. Climate Adaptation: Focusing on Robustness rather than Efficiency

Adaptation planning requires an assessment of how climate will impact human activities and how to respond to those changes. These assessments flip current practices in environmental law around: instead of asking how human activities impact the environment, we instead begin by asking how environmental change will impact humans. A climate impact assessment would contain three key components: (1) identification of possible climate alterations, (2) analysis of how these climate changes would impact human society or natural ecosystems, and (3) an analysis of alternative methods of addressing the impacts.<sup>103</sup>

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<sup>98</sup> Thomas C. Schelling, *Climate Change: The Uncertainties, the Certainties, and What They Imply About Action*, *Economists’ Voice* 4 (July 2007) (published at [www.bepress.com/ev](http://www.bepress.com/ev)).

<sup>99</sup> *Id.*

<sup>100</sup> Kenneth J. Arrow, *Global Climate Change: A Challenge to Policy*, *Economists’ Voice* 4 (July 2007) (published at [www.bepress.com/ev](http://www.bepress.com/ev)).

<sup>101</sup> Martin L. Weitzman, *The Role of Uncertainty in the Economics of Catastrophic Climate Change* (May 2007), available at <http://ssrn.com/abstract=992873>. Weitzman shows that even a small degree of uncertainty about a single model parameter can become magnified into substantial economic risk.

<sup>102</sup> Michael Funk and Michael Paetz, *Environmental Policy Under Model Uncertainty: A Robust Optimal Control Approach* (CESifo Working Paper No. 1938 March 2007). In essence, robust optimal control requires the policymaker to consider alternative models that are in some sense close to the preferred model but that produce more drastic predictions – thus, it could be considered as a way of considering plausible worst-case scenarios. *Id.* at 2.

<sup>103</sup> If the government proposes an action that has significant environmental impacts, major economic costs, or a potential effect on an endangered species, climate impacts might be considered through an

The difficulty is the great amount of uncertainty surrounding adaptation needs. Climate models differ in terms of the severity of climate change that they predict for any given future emissions path, and the future emissions path depends on mitigation limits that are not yet known. Downscaling the models to predict local impacts introduces further uncertainties. These uncertainties make the use of conventional CBA unreliable. Fortunately, some alternative decision tools have been developed that may be useful.

RAND researchers are developing methods to use computer assistance in scenario planning.<sup>104</sup> The key is a technique called Robust Decision Making (RDM):

RDM uses computer models to estimate the performance of policies for individually quantified futures, where futures are distinguished by unique sets of plausible input parameter values. Exploiting recent advances in computing power, RDM evaluates policy models once for each combination of candidate policy and plausible future state of the world to create large ensembles of futures. These ensembles may include a few hundred to hundreds of thousands of cases.<sup>105</sup>

This technique provides a method for examining many potential scenarios in order to determine which characteristics of the scenarios are critical to the success or failure of particular strategies. The RAND technique has considerable potential:

For policy problems that have a large or unlimited number of possible policy approaches, RDM provides a systematic way of exploring these possible policies to efficiently identify and evaluate the policies that are likely to be robust. RDM first uses visualization and statistical analysis to identify policies (from the initial set) that perform well over many possible states. RDM then uses data-mining techniques to reveal under which future conditions such policies are vulnerable to poor performance. Examination of these key vulnerabilities (which can be considered “scenarios”) can suggest ways to craft new policies that hedge against the vulnerabilities. The analysis then identifies one or more new candidate robust policies and re-evaluates the performance of all policies against the different plausible future states.

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environmental impact statement, cost-benefit analysis or biological opinion under the Endangered Species Act. But these mechanisms may not directly apply because the government is ignoring the fact that change is occurring due to climate change, not because of any active government plans. The need for adaptation rather than proposing a new project that should trigger these forms of review. In any event, these existing assessment methods are all flawed. [reword and emphasize this point]

<sup>104</sup> David G. Groves, *New Methods for Identifying Robust Long-Term Water Resources Management Strategies for California* (2006), available at [http://www.rand.org/pubs/rgs\\_dissertations/2006/RAND\\_RGSD196.pdf](http://www.rand.org/pubs/rgs_dissertations/2006/RAND_RGSD196.pdf).

<sup>105</sup> *Id.* at 125. See also David G. Groves and Robert J. Lempert, *A New Analytic Method for Finding Policy-Relevant Scenarios*, 17 *Global Change* 73 (2007).

Through each iteration, the candidate policies become increasingly robust, and those key scenarios to which the policies are vulnerable are identified.<sup>106</sup>

These methods may be especially useful when we must make large, long-term investments in infrastructure such as dams, water supply systems, or major power plants. Investments that fare well under some future scenarios may do badly in others, and a major purpose is to choose investments that are resilient across the most relevant risks. Computerized scenario analysis can help us determine the key areas in which investments vary in their resilience, so that policymakers can make informed choices between them.

Scenario analysis may also help determine what factual issues are critical for deciding between options. This makes it possible to focus research on policy-relevant issues. We should not consider the degree of uncertainty to be fixed forever. One role of modeling is to help us identify research priorities.

We have fairly good methods for analyzing situations in which risks can be quantified with reasonable confidence. We need improved methods for dealing with situations where such estimates do not exist or are subject to considerable uncertainty. The RAND methodology is a good start toward achieving such improved methodologies.

### III. Institutional Issues

#### A. *Transforming OMB*

Revesz and Livermore call for important changes at OIRA. They recommend that OIRA's guidelines on CBA be based on notice-and-comment rulemaking, perhaps with judicial review. They also argue that "OIRA should be subject to the same rules regarding transparency, such as the rules concerning public meetings, that govern agencies." (p. 172). Finally, they suggest that OIRA could play a coordinating role by alerting agencies to situations where their rules may conflict, convening working groups of agencies with overlapping jurisdiction and helping to formulate a centralized policy. (p. 177) They also see a role for OIRA in "harmonizing scientific procedures," such as providing uniform guidelines on determining cancer risks. (p. 177-179) Finally, they call on OIRA to help identify areas of under-regulation (see Part B below) and to consider distributional effects. (pp. 180-183).

The trouble is that OIRA is massively unsuited to perform these roles. Its expertise is in economics, not the sciences, so scientific coordination is a poor assignment. A 2003 study of OIRA noted that: "Of the three Branch Chiefs who occupied that position at the close of the relevant study period, two were economists and one was a lawyer. OIRA's two-and-a-half-dozen desk officers, most of whom have advanced degrees, are trained in public policy, policy analysis, \*842

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<sup>106</sup> *Id.*

economics, or statistics.”<sup>107</sup> Until John Graham hired a few scientists during the George W. Bush Administration, OMB had no scientists on its staff.<sup>108</sup> Economists usually eschew distributional issues outside of fiscal policy, also making the agency a poor choice. And staff members who have spent their entire careers doggedly trying to block environmental and safety regulation are poor bets as scouts for new regulatory opportunities.

Nevertheless, these are tasks that presidents may well want someone to perform, as well as OIRA’s traditional tasks of guiding agency’s use of CBA. Because of OMB’s established role in agency oversight, it makes sense to keep these functions under OMB’s umbrella. But once we begin to consider the scope of the environmental issues involved, a different way of defining OMB’s role becomes appealing.

At the highest levels, we must also recognize that no one in the White House has the job of disaster response. Yet federal disaster response requires action by many agencies – not just FEMA but also the Defense Department, the Center for Disease Control, the Environmental Protection Agency and others. White House coordination of these executive branch activities is crucial. Just as the White House has a Council of Economic Advisors, it needs to have an official or board charged with national disaster oversight – not necessarily day-to-day management during disasters (which is FEMA’s responsibility), but rather a budgetary and policy supervision role. This official would also be in charge of monitoring organizational problems in the agencies charged with disaster prevention and response. Moreover, a natural part of the official’s portfolio would be disaster prevention efforts, where the aim should be to avoid ever again being caught unprepared for a “predictable surprise” like Katrina.

Such an integrated approach to catastrophic risk is lacking. One lesson from Katrina is that disasters are not just engineering failures, they are social system failures and failures of government. Societal infrastructures can collapse just as surely as physical ones can. Consequently, disaster prevention cannot be considered in isolation from disaster response plans, mechanisms for compensation and risk spreading, and reconstruction planning. All of these issues are tightly coupled, yet the linkages receive little attention.

### *B. Action-Forcing Techniques*

Revesz and Livermore point out that CBA generally applies when a new regulation has been proposed, rather than applying to efforts to deregulate or being used to identify the need to regulate new areas. (pp. 151-161). OMB has made token efforts to identify areas for increased regulation but nothing comparable to

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<sup>107</sup> Steve Croley, *White House Review Of Agency Rulemaking: An Empirical Investigation*, 70 U. Chi. L. Rev. 821, 841 (2003).

<sup>108</sup> Ackerman and Heinzerling, *supra* note , at 111.

OMB's ongoing campaign to identify existing regulations that should be relaxed. (p. 156)

One possible justification for this disparity might be that action agencies generally have a bias of their own in favor of regulation. There is little to support such a theory. (pp. 163-165) EPA officials are said to have a particular enthusiasm for their agency's mission and a faith in regulatory solutions (p. 164) – but given that the agency's mission and the corresponding regulations are mandated by law, it is hard to see this as a fault in need of correction.

Revesz and Livermore argue that CBA has “an important role to play in centralized review, but not exclusively to check agencies. It must also spur them to action.” (p. 173) In order to provide this role to OIRA, they suggest that OIRA should review denials of petitions by citizens asking for the government to engage in rulemaking. If the CBA makes a “strong enough case for regulation,” OIRA would either “mediate between the agency and the groups, or issue a finding of fact that a regulation is justified.” A court would then give less deference to the agency's decision against regulation, and the agency would at least have to develop a reasoned response to OIRA. (p. 174)

Climate adaptation is a particularly good example of the reasons why we need mechanisms of the kind described by Revesz and Livermore to prompt government action. Neither CBA as presently instituted nor existing environmental review processes address this issue. Existing environmental assessment procedures are triggered by agency *actions* – they do not require assessments of the status quo but only of proposed changes in the status quo. There is nothing to prevent an agency from simply ignoring an emerging problem; NEPA kicks in only when the agency considers actually doing something rather than sitting still.<sup>109</sup>

The reactive nature of the assessment process may be appropriate in contexts where the status quo is presumptively desirable, appropriate, and/or unchanging, but it is definitely not acceptable when dealing with climate adaptation, where the whole point is that the status quo will become unsustainable due to climate change. For example, “[p]roactive adaptation to climate change may necessitate periodic reassessment of the adequacy and preparedness of relief systems and programs, particularly in light of changing frequency and intensity of extreme events.”<sup>110</sup> Yet, it is difficult to craft a general mandate that would require agencies to identify the key areas under their jurisdiction where assessment of adaptation needs is a priority.

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<sup>109</sup> By its terms, NEPA requires an environmental assessment only when the agency is considering a proposal to take action, not when it is completely passive. For example, the government was not subject to NEPA when it failed to halt actions by private parties on public lands. See *Defenders of Wildlife v. Andrus*, 627 F.2d 1238 (D.C. Cir. 1980); Comment, *Inaction as Action Under NEPA: EIS Not Required for Interior's Failure to Halt Alaskan Wolf Hunt*, 10 Env. L. Rep. 10055 (1980).

<sup>110</sup> Easterling, *supra* note , at 25.

There are a series of potential responses to this problem of policing agency failure to assess adaptation needs:

- 1) A petition process akin to that used under the Endangered Species Act for listing species, where citizens could petition the agency to list a “critical adaptation need.” For this to be effective, some specific metrics to determine the significance of an adaptation need would be required.
- 2) Investigative reports by independent bodies such as the Government Accountability Office or the National Academy of Science.
- 3) A system of prizes for citizens who successfully identify high priority needs for climate impact assessment. The prize would be awarded by an independent entity but would be funded out of the agency’s operating budget, providing a small “stick” in addition to publicity impacts.
- 4) Adoption of legal rules making agencies liable for negligent failure to engage in climate adaptation. California law in effect provides a mechanism for this in the context of flood control.<sup>111</sup> The use of risk markets (akin to the presidential prediction markets such as <http://www.biz.uiowa.edu/iem/>) trading long-term risk contracts for key climate impacts such as water supply impairments or flood frequency, with the parameters being set at levels that would indicate a failure of current systems.

Several of these techniques are promising. The use of outside reviewers such as GAO should be regularized as a way of checking for overlooked adaptation needs. A less conventional approach is the use of prizes, but this might provide a way of opening the process to broader public participation. In any event, we need to be attentive to the danger that agencies will take the status quo for granted and consider adaptation issues only when required to do so in the context of specific project proposals.

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<sup>111</sup> The modern development of flood liability in California began with *Belair v. Riverside County Flood Control District*. 764 P.2d 1070, 47 Cal. 3d 550, 253 Cal. Rptr. 693 (1988). In *Belair*, a flood control levee on the San Jacinto gave way, flooding parts of the City of San Jacinto. The California Supreme Court took this occasion to establish a new rule for determining the state’s responsibility for flood damages, based firmly on the need to spread the risks created by unreasonably flawed flood control systems:

Permitting recovery where the public entity's unreasonable conduct constitutes a substantial cause of damage to property owners negates the apprehension commonly associated with a rule of absolute liability - the discouragement of beneficial flood control improvements - yet properly compensates for losses unfairly incurred. . . . Reasonableness, in this context, is not entirely a matter of negligence, but represents a balancing of public need against the gravity of private harm.”  
*Id.* at 1079-1080, 47 Cal. 3d at 565-566, 253 Cal. Rptr. at 702-703 (internal citations omitted).

## IV. Conclusion