



J O I N T C E N T E R
AEI-BROOKINGS JOINT CENTER FOR REGULATORY STUDIES

Has Economic Analysis Improved Regulatory Decisions?

Robert W. Hahn and Paul C. Tetlock¹

Working Paper 07-08

April 2007

This paper is forthcoming in the *Journal of Economic Perspectives*.

This paper can be downloaded without charge from the Social Science Research Network (SSRN) electronic library at: <http://ssrn.com/abstract=982233>

¹ Robert Hahn is co-founder and executive director of the AEI-Brookings Joint Center and a scholar at AEI. Paul Tetlock is an assistant professor of finance at the University of Texas at Austin, McCombs School of Business. The authors would like to dedicate this paper to Art Fraas and John Morrall—two outstanding civil servants who have over the years shared their anecdotes, insights, and data on the regulatory oversight process. The authors would like to thank Don Arbuckle, Ken Arrow, Robert Crandall, Scott Farrow, John Graham, Robert Litan, Tom Lyon, John Morrall, Roger Noll, Andrea Renda, Fernando Salas, Kerry Smith, Cass Sunstein, Tim Taylor, Scott Wallsten, Cliff Winston, and participants at conferences at Stanford, the University of Pennsylvania and the University of Washington for helpful suggestions. Caroline Cecot and Katrina Kosec provided valuable research assistance. This research was supported by the AEI-Brookings Joint Center and Groupe d'Economie Mondiale de Sciences Po. The views in this paper are solely those of the authors.



J O I N T C E N T E R
AEI-BROOKINGS JOINT CENTER FOR REGULATORY STUDIES

In order to promote public understanding of the impact of regulations on consumers, business, and government, the American Enterprise Institute and the Brookings Institution established the AEI-Brookings Joint Center for Regulatory Studies. The Joint Center's primary purpose is to hold lawmakers and regulators more accountable by providing thoughtful, objective analysis of relevant laws and regulations. Over the past three decades, AEI and Brookings have generated an impressive body of research on regulation. The Joint Center builds on this solid foundation, evaluating the economic impact of laws and regulations and offering constructive suggestions for reforms to enhance productivity and welfare. The views expressed in Joint Center publications are those of the authors and do not necessarily reflect the views of the Joint Center.

ROBERT W. HAHN
Executive Director

ROBERT E. LITAN
Director

COUNCIL OF ACADEMIC ADVISERS

KENNETH J. ARROW
Stanford University

MAUREEN L. CROPPER
University of Maryland

JOHN D. GRAHAM
*Pardee RAND Graduate
School*

PHILIP K. HOWARD
Common Good

PAUL L. JOSKOW
*Massachusetts Institute
of Technology*

DONALD KENNEDY
Stanford University

ROGER G. NOLL
Stanford University

PETER PASSELL
Milken Institute

RICHARD SCHMALENSEE
*Massachusetts Institute
of Technology*

ROBERT N. STAVINS
Harvard University

CASS R. SUNSTEIN
University of Chicago

W. KIP VISCUSI
Vanderbilt University

All AEI-Brookings Joint Center publications can be found at www.aei-brookings.org

© 2007 by the authors. All rights reserved.

Executive Summary

In response to the increasing impact of regulation, several governments have introduced economic analysis as a way of trying to improve regulatory policy. This paper provides a comprehensive assessment of government-supported economic analysis of regulation. We find that there is growing interest in the use of economic tools, such as benefit-cost analysis; however, the quality of analysis in the U.S. and European Union frequently fails to meet widely accepted guidelines. Furthermore, the relationship between analysis and policy decisions is tenuous. To address this situation, we recommend pursuing an agenda that allows economics to play a more central role in regulatory decision making. In addition, we suggest that prediction markets could help improve regulatory policy and improve measurement of the impact of regulation.

Has Economic Analysis Improved Regulatory Decisions?

Robert W. Hahn and Paul C. Tetlock

1. Introduction

Most citizens are familiar with regulation in their everyday lives. The government requires that you obtain a license to drive a vehicle; that you get a permit if you want to expand your home; and that you and your belongings are inspected before traveling on an airplane.

Businesses, too, are quite familiar with regulation. Pharmaceutical companies need to get approval for drugs and medical devices; toy manufacturers need to comply with safety standards; and automobile manufacturers need to comply with safety and environmental standards. In some cases, the government restricts entry into businesses. For example, there are tight restrictions on foreign ownership of airlines, and there are limitations on who can practice medicine and law. In addition, government regulators place constraints on what utilities can charge for energy and electricity.

Work on the costs and economic impact of U.S. regulation suggests that costs, and sometimes benefits, can be sizable. The U.S. Office of Management and Budget (OMB) provides a rich source of information on the costs of federal regulation. In its 2006 summary, OMB examines regulations that generate over \$100 million in costs or benefits annually and which monetize a substantial portion of the costs and benefits. The annualized costs of these major U.S. federal regulations from 1995-2005 are estimated to range from \$37 billion to \$44 billion (2001 dollars).² The corresponding benefits were estimated to be in the range of \$94 billion to \$449 billion (OMB, 2006b). In addition, because regulations are often in place for many years, the cumulative effects can be staggering. In the U.S. it is estimated that the cost of complying with environmental protection alone is more than \$170 billion (1990 dollars) annually (Environmental Protection Agency, 1990).

All this regulation has not escaped the notice of politicians. Some elected officials blame regulation for slowing down the pace of economic progress, while others point to

² All dollar numbers are converted to 2005 dollars using the Consumer Price Index from the Bureau of Labor Statistics to adjust for inflation, unless otherwise noted.

the benefits that can result from regulations aimed at improving workplace safety and the environment.

Less widely recognized, perhaps, is that economics has played and will continue to play an important role in how governments understand and implement regulations. In 1981, President Reagan set up an office within the OMB whose primary aim was to improve the quality of regulations using economic analysis. More recently, Prime Minister Tony Blair (2005) gave a speech in which he argued that risk cannot be eliminated, that it should be managed wisely, and that impact assessments were needed to help set priorities.

The interest in managing regulation by using economic analysis extends far beyond Washington and London. Economic analysis, such as benefit-cost analysis, is becoming more widely used as a tool for informing regulatory decisions in developed and developing countries. Indeed, the European Union and Mexico have embraced this idea, as have many states in the U.S.

Formal regulatory evaluation typically includes a requirement that regulatory agencies perform some kind of economic analysis, usually benefit-cost analysis, before promulgating a regulation. A key reason for such regulatory evaluation is to guide agencies to more efficient decisions in regulatory proceedings.

Regulatory evaluation is sometimes done by the agency implementing a regulation, but it can also be done by a government agency or department whose primary task is to help improve regulations by using economic analysis. In the U.S., the regulatory agency typically does a benefit-cost analysis of a proposed regulation and its alternatives. This is then sent, along with the proposed regulation, to analysts at the president's Office of Management and Budget, who review the proposal. The OMB either offers suggestions for improving the regulation or accepts the regulatory proposal as is. Such centralized oversight can help with interagency coordination, setting priorities, and implementing more cost-effective and economically efficient regulation.

Using economic analysis to inform regulatory decisions is interesting and important for at least two reasons. First, because regulation uses a sizable amount of resources, it is reasonable to ask whether the benefits of regulation are worth the costs. As we document later, there is evidence to suggest that existing regulations leave

substantial room for improvement. Many regulations would not pass a benefit-cost test; others could yield much higher net benefits with appropriate modifications.

Second, the efficiency of the regulatory evaluation process itself is a key determinant of whether policy makers implement efficient regulations. For governments to make informed choices, it is essential that economic analyses of proposed regulations properly identify, quantify, and monetize benefits and costs of these proposals. At the same time, the limitations of benefit-cost analysis, such as difficulties in monetizing key benefit and costs, need to be appreciated. An efficient regulatory process will generally use benefit-cost analysis as an input into important regulatory decisions, but will not allow such analysis to dictate decisions.

This paper starts by explaining how such benefit-cost analyses are done. It will then bring some news that may be welcome to economists seeking research topics, but unwelcome to economists in their role as citizens. Despite the considerable costs and potential benefits of regulation, the quality of government analyses of regulation falls far short of basic standards of economic research, and it does not appear to be getting any better over time. Thus, although there is some evidence economic analysis *can* improve the benefit-cost ratio of regulations, there is insufficient evidence that economic analysis of regulatory decisions has actually had any substantial impact. Indeed, we do not even have answers to basic questions like whether benefit-cost analyses tend to overstate benefits, perhaps out of regulatory zeal, or whether they overstate costs, perhaps because they fail to recognize how innovation will reduce the costs after regulations are imposed.

2. Connecting Regulation, Economic Analysis and Efficiency

The precise definition of regulation is the subject of some dispute. At the broadest level, regulation could include any attempt by the government to affect human behavior. Economists typically analyze regulatory policies designed to address various market failures, such as externalities, asymmetric information, and market power (Bator, 1958; Joskow and Noll, 1981; Lave, 1981). Examples include price controls or entry restrictions, regulation of pollution and safety in the workplace, and information disclosure requirements.

Benefit-cost analysis is a tool that is frequently used by economists who analyze regulation. An example of a benefit-cost analysis that played an important, if not pivotal role in improving the efficiency of regulation was the economic analysis of the regulation phasing lead out of gasoline. Upon entering office in 1981, the Reagan administration had targeted that regulation for elimination. The regulation would have required refiners to reduce lead in gasoline more quickly because of the health hazards it posed when released into the air. According to Christopher DeMuth, who was the OMB official in charge of reviewing the regulation: “A very fine piece of analysis persuaded everyone that the health harms of leaded gasoline were far greater than we had thought, and we ended up adopting a much tighter program than the one we had inherited. At the same time, the introduction of marketable lead permits saved many hundreds of millions of dollars from the cost of that regulation” (DeMuth, 1994).

Both the initial analysis and final analysis had an impact on the shaping of this rule. The initial analysis found the benefits to so greatly outweigh the costs that more detailed analysis was quickly organized. The final analysis found that tightening the lead standard more than had been proposed could result in net benefits between \$4 and \$20 billion (1983 dollars) over 4 years (Nichols, 1997).

The benefits, totaling over \$20 billion, came from reduced vehicle maintenance, reduced emissions, and reduced lead-related health damages. Lead caused the premature wear of exhaust systems and spark plugs and made more frequent oil changes necessary. Analysts found that the benefits of reducing the otherwise necessary maintenance totaled about \$3 billion (Nichols, 1997).

The analysis also considered the frequency of “misfueling,” or using leaded gasoline in vehicles built to use unleaded gasoline. Misfueling caused damage to catalysis, which increased air pollution emissions of hydrocarbons, carbon monoxide, and nitrogen oxides. The benefits of reducing harmful emissions from misfueling were estimated to be about \$600 million. In addition, the analysis found that the reduction in lead in gasoline would result in benefits of almost \$2 billion for children. This figure was based on the sum of the avoided costs of medical treatment and remedial education from the decrease in the number of children with hazardous levels of lead in their blood. (Nichols, 1997)

Another sizable benefit included in the analysis was the reduction in problems associated with high blood pressure due to lower blood lead levels in adults. The estimated reduction in medical costs, lost wages, and the value of reduced mortality risk exceeded \$18 billion (Nichols, 1997).

Analysts monetized costs using a complicated linear programming model of the refinery sector, which produced estimates of total costs of less than \$2 billion. In addition, they estimated that a provision in the marketable lead permit system that allowed banking of early lead reduction credits for future use would save an additional \$200 million in costs. (Nichols, 1997)

The preceding example demonstrates how economic analysis can improve regulation. Unfortunately, governments implement many regulations where the costs probably exceed the benefits. For example, Morrison, Winston, and Watson (1999) did an analysis of Airport Noise and Capacity Act of 1990, which specified noise limits around airports. They found the costs were likely to exceed benefits by \$5 billion (1995 dollars). The Act called for the elimination of a large amount of aircraft from U.S. airports that did not meet new noise level limits. This meant that about 27 percent of the value of the industry fleet would have to be replaced earlier than planned. The authors found that the costs of this premature replacement would be about \$10 billion.

The benefits of noise regulation—quieter residential environments around airports—were found to be about \$5 billion. Morrison, Winston, and Watson (1999) determined the noise reduction in decibels and valued it based on estimates of homeowners' willingness to pay, assuming that a one decibel reduction in noise level raised the present value of homes by one percent. They found that the costs exceeded the benefits by roughly \$5 billion. The authors then used the results of their analysis to propose an alternative solution to the noise problem that could have resulted in net benefits of \$200 million.

These examples suggest that it is not always straightforward to estimate the benefits and costs of individual regulations. Estimating benefits can involve a long chain of reasoning that links basic science to health effects to the monetization of those effects. Costs are also difficult to estimate because it is hard to gauge how firms will respond and how technology will evolve. Furthermore, it can be quite difficult to estimate how a

regulatory policy will affect different segments of the population. Such distributional concerns, while important, have not been a primary focus of benefit-cost analysis.

Scholars have, however, used benefit-cost analysis and related tools to suggest how regulations might be improved—*e.g.*, Morrall (1986), Tengs and Graham (1996), and Winston (2006). Less widely appreciated is that research reveals that a significant number of regulations would be likely to fail a benefit-cost test based on benefits and costs that were actually monetized. For example, using OMB's (2006b) numbers on the 95 major rules from 1995 to 2005 for which substantial benefits and costs were monetized, we find that 14 of 95 are likely to fail a benefit-cost test.³ These analyses suggest that some regulations would have benefited from redesign while others should not have been implemented in the first place. For these regulations, annualized costs exceeded annualized benefits by roughly \$2.8 billion.

Furthermore, research based on government analyses suggests that some health, safety, and environmental regulations that primarily address cancer may end up costing more lives than they save. An extreme, hypothetical example can help illustrate how this can happen. Suppose a regulation aimed at improving safety in the workplace really does nothing, but forces firms to incur a billion dollars in compliance costs. Assuming that some of this spending would be diverted from expenditures on health care, the regulation would have the net effect of harming the health of workers and consumers and shortening life expectancy. Hahn, Lutter, and Viscusi (2000) found that just over half of the 24 regulations they examined are likely to bring about an unintended increase in the risk of dying. At the same time, they note that aggregate mortality risk declines for the entire set of regulations, primarily because a few regulations in their sample yield large reductions in risk.

3. The Impact of Economic Analysis in the Regulatory Process

Many countries and states have a requirement to do some kind of economic analysis before implementing a regulation. President Reagan signed an executive order in 1981 that required a benefit-cost analysis for each new major regulation for agencies in

³ When the agency did not provide a best estimate, we used the midpoint of its range as our point estimate.

the executive branch. All presidents since that time have continued this practice. There are similar initiatives in many OECD countries and the EU, but the U.S. is probably the world's leader in implementing some form of government sponsored benefit-cost analysis to inform significant regulatory decisions.

This section reviews attempts to measure the impact of economic analysis of regulations on outcomes and also summarizes information on the quality of regulatory impact analyses (RIAs) – which are required to include an evaluation of the costs and benefits of regulations. A key issue is whether the use of economic analysis in the regulatory process has made a big difference. Research to date suggests two findings: economic analysis probably has had an impact in particular cases, and there is little evidence that such analysis has had a large overall impact, though we cannot rule out this possibility.

Observation 1: The quality of government-sponsored economic analysis of regulations appears to fall far short of economic guidelines.

Regulatory scholars and the U.S. Office of Management and Budget have offered a number of guidelines for applying benefit-cost analysis to regulatory issues. These include quantification of costs, benefits, and net benefits to the extent feasible, and consideration of alternatives. OMB also advises on the treatment of inflation, discount rates, and uncertainty (OMB, 1992; Arrow *et al.*, 1996). Based on evidence from 48 RIAs done during the Clinton administration, Hahn *et al.* (2000) argue that agencies often fail to comply with the analytical requirements in OMB guidelines.

A more comprehensive study by Hahn and Dudley (2004) finds that economic analyses prepared for environmental regulations typically do not provide enough information to make decisions that will maximize the efficiency or effectiveness of a rule. A summary of their results, based on a sample of 74 regulations, spanning three administrations, is shown in Figure 1. They find that a significant percentage of the analyses in all three administrations do not provide some very basic economic information, such as information on net benefits and policy alternatives. For example, 69 percent of the analyses in the sample failed to provide any quantitative information on net benefits. A little over half of the analyses quantified at least some benefits of policy

alternatives. RIAs tended to calculate either cost effectiveness or net benefits, but rarely both. The absence of these RIA components illustrates how difficult it would be for a decision maker to use basic quantitative information on net benefits or cost effectiveness.

Impact assessment (IA) is the European counterpart of a U.S. RIA. An impact assessment is required for all major European Commission initiatives and should contain an evaluation of the social, economic, and environmental impacts of various policy options associated with a proposal. The Commission encourages estimates to be expressed in qualitative, quantitative, and, where appropriate, monetary terms (Commission of the European Communities, 2002).

Researchers are beginning to evaluate the European system, and the results appear to have some similarities with the United States. Using a “scorecard” approach that assesses whether an analysis included particular items, they find that IAs fail to discuss many important categories of information.

Renda (2006) provides the most comprehensive European study to date. All 70 Impact assessments of major proposed initiatives completed by the European Commission by June 2005 are evaluated using a scorecard similar to that used by Hahn and Dudley (2004). Renda finds that many important IA components are frequently missing. For example, the IAs seldom estimated costs, almost never quantified costs to businesses, did not specify specific benefits, and virtually never compared the costs and benefits. In addition, alternatives were seldom compared and discount rates were almost never specified.

It is possible to do a comparison of Renda’s results with those of Hahn and Dudley; however, it is important to recognize that the studies involve different scorers, different samples, and different time periods. For example, Renda focuses on 95 recent IAs, while Hahn and Dudley focus on 74 environmental RIAs from the Reagan presidency through the Clinton presidency.

Table 1 shows 6 categories measuring whether a particular analysis provided point or range estimates for costs, benefits and net benefits. The U.S. scorecards were better in 5 of 6 categories. The sole exception was one where they were both poor – the provision of a best estimate of net benefits. For that case, the overall percentages differed by about a percentage point.

The frequent failure of analyses to quantify and monetize benefits need not reflect a weakness in agency practice or oversight. For example, science may not exist to inform quantification and monetization. Moreover, the degree to which benefits and costs can be monetized will vary across regulations. There is at least some evidence, however, that suggests that there are weaknesses in both agency practice and evaluation in the U.S. and Europe. Though it is nearly impossible to test whether EPA did everything it could have done, Hahn and Dudley (2004) examine whether the agency utilized the available information it developed in its benefit-cost analysis. Of the 60 RIAs that monetized at least some costs and considered at least one alternative, 11 did not monetize at least some costs of alternatives. In addition, two RIAs quantified lives saved, but did not monetize any benefits, even though the Value of Statistical Life has been studied extensively.

Observation 2: The quality of regulatory analysis in the U.S. does not appear to have changed much over time.

If a regulatory oversight agency were in place for a period of time, one might think that the quality of analysis would improve. Unfortunately, Hahn and Dudley (2004) found no clear trend in the quality of benefit-cost analysis across administrations or across time. They note, for example, that there is some improvement in the calculation of net benefits and cost effectiveness, but also some decline in the consideration of alternatives. Furthermore, using their data, we find that the quality of regulatory analysis, as measured by the total number of items included in their scorecard, did not significantly differ across time periods. Of the 76 yes or no items in their scorecard, regulations before the end of 1990 include an average of 30.0 items, whereas regulations after 1990 include 30.5 items.

Interestingly, Renda (2006) suggests regulatory oversight in the European Union may be getting worse. His study finds that almost all scorecard items decline over the three years for which he has data. For example, the percentage of IAs quantifying or monetizing at least some costs, quantifying or monetizing at least some benefits, and the percentage quantifying costs and benefits of alternatives all declined each year from 2003 to 2005.

Graham, Noe, and Branch (2006) claim that things may have improved under the George W. Bush Administration. They argue that the overall rate of net benefits is larger and that the average benefit to cost ratio for major rules was about thirteen in the first forty-four months of the Bush Administration, as compared to about five during the previous nine years.

The calculation may be misleading for two reasons. First, comparisons of benefit-cost ratios exclude many costly regulations without monetized benefits—*e.g.*, homeland security and environmental regulations with benefits that are difficult to monetize (OMB, 2005). In 2003-2004 alone, costs summing to over \$3 billion had no monetized benefits. Second, even if these average benefit-to-cost ratios accurately represent the true average benefit-cost ratios over these two periods, it does not necessarily follow that the improvement is due to more effective oversight.

Observation 3: Economic analysis can improve regulation, but it is not clear whether economic analysis used in regulatory decisions has had a substantial impact.

There have been a number of case studies of regulatory analyses and regulations. Morgenstern (1997) asked economic analysts to describe their experience with benefit-cost analysis of a particular environmental regulation during the review period at EPA. His basic finding was that all authors agreed that economic analysis improved the quality of the rule being considered. Although the authors were all economists involved with the rule rather than disinterested observers, we think that their unanimous view is instructive. They identified reductions in cost in all twelve cases and increases in benefits in five of the twelve, implying at least some increase in net benefits in each case.

A key issue is the kind of improvement that actually resulted from a particular analysis. A sentiment expressed by some of the authors who argued that analysis made a big difference in the rule was that such analysis did not typically change how the problem was framed in any dramatic way. In other words, benefit-cost analysis was helpful in hashing out the details of a rule, such as choosing a level of stringency, but it often did not consider whether there may be an entirely different solution to the problem.

Other research on regulatory analyses reveals some deeper economic problems with environmental, health and safety regulation. Figure 2 plots data on the cost per

statistical life saved--a measure of how effective a regulation is at extending the life-span of the affected population (Morrall 2003).⁴ The figure consists of 79 final regulations, broken down into three categories: regulations aimed at improving safety (“safety”); regulations aimed primarily at reducing cancer (“toxin control”); and a miscellaneous category labeled “other.”

Two key trends are evident from the data. First, the toxin control regulations appear to cost more at the margin than do safety regulations for each statistical life saved (Tengs *et al.*, 1995). Second, there is substantial variation within and across both the safety and the toxin control categories (Morrall, 2003; Tengs *et al.*, 1995). The cost per statistical life saved ranges from \$100,000 to \$100 billion (2002 dollars). In addition, the variation in the cost per statistical life saved increases significantly in the 19 years after 1986 than in the 19 years before 1986, suggesting that there may now be greater potential gains in reallocating resources across life-saving investments. This research on cost effectiveness suggests that we are probably allocating resources aimed at saving lives inefficiently. For example, there appear to be ample opportunities for increasing the number of statistical lives saved and lowering the expenditures for toxin control regulations. At the very least, the data strongly suggest that society could save more statistical lives and reduce expenditures on life-saving regulations.

There have been very few attempts to estimate systematically the impact of economic analysis of regulation on actual decisions. One study by Farrow (2000) provides a statistical analysis of regulatory oversight using U.S. data. Farrow uses the decision to reject or accept a proposed regulation as his dependent variable. He then examines whether rules that are rejected have a higher cost per statistical life saved, after controlling for other variables. He considers sixty-nine proposed regulations over the period 1967 to 1991. Farrow’s main findings are that regulatory oversight had at best a slight effect on the cost per statistical life saved. Rejected rules were only slightly more expensive than rules that were adopted. Additionally, the cost per statistical life saved of

⁴ Morrall (2003), p. 230, uses the term “opportunity costs of statistical lives saved” (OCSLS), but we use cost per statistical life saved in the interest of simplicity. Although we present the data as point estimates, we note that there is substantial uncertainty in these estimates. To update the data through 2005, we have added three recent data points to Figure 2 that are not in Morrall (2003).

final regulations was not better than it was for proposed regulations; and there was no evidence that the cost per statistical life saved decreased over time (Farrow, 2000).

Observation 4: *Thus far, comparisons of ex ante and ex post estimates of regulatory impacts do not tell us much about systematic biases.*

If policy makers had a crystal ball about the impacts of policy, it would be much easier to design more efficient regulations. Typically, though, they only have access to some crude *ex ante* estimates of economic impacts, which are made before a policy is implemented. In recent years, there has been considerable interest in ascertaining whether there are systematic biases in these *ex ante* estimates when compared with *ex post* estimates, which are made after a policy is implemented.

A number of researchers have highlighted the possibility of such biases. Some suggest that costs may be understated due to errors of omission, such as the time spent by high-level management on regulatory issues and the possible adverse consequences for innovation. Others claim that costs are systematically overestimated by industry, academic and government analysts alike, sometimes because firms naturally find cheaper ways to achieve regulatory objectives when the regulation is actually in force. Harrington, Morgenstern, and Nelson (2000) investigate the issue of validity of estimates by comparing *ex ante* and *ex post* estimates of costs and benefits of 28 rules. They conclude that costs are often overestimated prior to rule implementation and suggest that benefits are also overestimated. Seong and Mendeloff (2004) suggest that benefits can be overestimated when agencies assume that firms will fully comply with regulations.

OMB (2005) did a more comprehensive analysis of 47 rules for which *ex ante-ex post* comparisons were available. The OMB analysis suggests that benefits are much more likely to be overestimated than underestimated, costs are slightly more likely to be overestimated than underestimated, and the benefits-cost ratio is more likely to be overestimated than underestimated. OMB points out that the sample is not random. In fact, Harrington (2006) finds that even small changes in the rules included in the OMB study can drastically change its conclusion.

Evaluating the actual impact of regulations once they are enacted and comparing them with earlier predictions has theoretical appeal. However, in practice, there are three

significant limitations of these kinds of comparisons, particularly in regard to their usefulness in improving future regulations.

The first limitation is simply the infrequency with which careful, comprehensive *ex post* studies are conducted because of data and funding limitations, and little interest on the part of most governmental agencies. A second problem is that academics may select biased samples of regulations—*e.g.*, inefficient regulations where there is likely to be a publishable finding or applications that have a novel element, such as the performance of market-based approaches for environmental control. A third issue is that results from regulatory analyses could differ for several reasons including the author, data, model, key assumptions, and source of funding (Thompson, Segui-Gomez, and Graham, 2002). Until we resolve some of the substantial uncertainties in comparisons of regulatory analyses, it is premature to assume that biases go in a particular direction. Notwithstanding these limitations, we think *ex ante-ex post* comparisons of regulations by scholars and practitioners could be useful for enhancing our understanding of biases in economic analysis.

4. Learning from Experience

The preceding analysis suggests that the use of economic analysis in improving regulations has hardly been an overwhelming success. There is no evidence it has had a significant general impact, the economic analysis supporting it is frequently done poorly (if at all), and there is only anecdotal evidence to suggest that it made a difference.

There are several explanations for this rather dismal state of affairs. One is political: some interests groups see value in using economic analysis to inform regulatory decisions while others do not. Presidents clearly value using such analysis, but Congress may believe that regulatory evaluation done within the executive branch unduly limits its authority. Similarly, a regulatory agency may not want to have such analysis when it conflicts with its narrow agenda. Another explanation for the poor quality of economic analysis is that it is simply hard to do. It may be quite difficult, for example, to develop a reasonable estimate of the benefits of a particular homeland security regulation or a rule that calls for increased financial disclosure. A third explanation is that civil servants may

not be equipped to do the kind of analyses that are being required. We are not persuaded by this explanation because there are many good economists in the federal government, and the government can also hire consultants to help with such analysis. A fourth explanation is that it takes time for these economic tools to gain acceptance. We believe there is some truth in this, as ideas like benefit-cost analysis move from the classroom to the real world.

The failure of scholars to demonstrate a clear impact of economic analysis on policy raises the question of whether some form of regulatory evaluation is still worth supporting. To answer that question, we need to articulate the benefits and costs of reviewing regulation in a static and dynamic context. In a static setting, one would compare the expected present values of net benefits from the policy refined by the regulatory evaluation process with the status quo policy. Factors that influence these net benefits include a change in the policy goal, the date at which a regulation is announced, the implementation schedule and the enforcement mechanism. The impact of possible delay, which some critics point to as a significant cost of regulatory evaluation, would also be considered in such a calculation. The impact of delay could be negative or positive, depending on the net benefits of the policy that was selected.

While we will assess some of the static costs and benefits of reviewing regulation below, we do not attempt to quantify the dynamic costs and benefits because the necessary data do not exist. In a dynamic context, legislators could change laws and bureaucrats could change regulations and analysis in response to regulatory evaluation. For example, it is possible that lawmakers would attempt to bypass the regulatory evaluation process.

Notwithstanding the limitations on data on the benefits and costs of regulatory evaluation, we provide three arguments why several economists, including ourselves, still support introducing economic tools and improving their use throughout the world—*e.g.*, Arrow *et al.* (1996). First, it is difficult to measure the impact of doing economic analysis on policy outcomes. Therefore, the fact that we do not find much evidence should not be cause for alarm. Moreover, the evidence may come primarily from specific cases in which analysis has been helpful in affecting policy decisions. For example, Schultze

(1996) notes that the Council of Economic Advisers played a key role in stopping the supersonic transport during the Nixon years.

Second, our personal observations are consistent with the spirit of scholars and practitioners such as Schultze (1996). One of the authors was closely involved with the drafting of the White House version of the 1990 Clean Air Act Amendments, and saw firsthand how analysis helped inform decisions about shaping various aspects of that bill. For example, early draft proposals to regulate toxic air emissions would have required pollution controls that were either infeasible or extremely costly relative to the benefits. The final law contained less draconian measures, partly as a result of the economic analysis. While it is true that politics mattered, we think analysis helped at the margins. Moreover, these margins frequently had efficiency implications in the billions of dollars.

Third, the direct costs of regulatory evaluation in the U.S. appear to be small compared with the likely benefits, though we cannot prove it. Our best estimate, admittedly crude, is that the costs of reviewing regulations are on the order of \$100 million annually. The cost estimate consists of two parts: the cost of doing the analysis and the cost of conducting the review process that uses the analysis. The average economic analysis of a major regulation costs about \$700,000 (Congressional Budget Office, 1997). This figure includes resources spent directly by the regulatory agency and consulting expenses used to produce an economic analysis. The cost of OIRA staff resources used reviewing a major regulation is on the order of \$20,000, which pales in comparison to the resources spent on the analysis itself.⁵ This leads to a total cost of analysis for a major regulation of roughly \$720,000. It also leads to the observation that the costs of review are typically small relative to the costs of initial analysis for major federal regulations that are subject to OMB review.

⁵ We make the following calculation: $0.5 \times (\% \text{ of FTEs working on reviews})(\text{OIRA budget}) / (\text{economically significant rule reviews})$, or, $0.5 \times (0.40)(\$7 \text{ million}) / (82) = \$17,000$. For the percentage of OIRA staff working on reviews, see GAO (2003), which gives the number of full-time employees primarily responsible for reviews in 2003. We assume this ratio still holds. For the current OIRA budget, see OMB (2006a). For the number of economically significant regulations, we use the number reviewed in 2005; see RegInfo.gov. Because the full-time employees responsible for economically significant regulatory reviews also review hundreds of non-significant regulations and paperwork under the Paperwork Reduction Act, we multiply the estimate by 0.5 to approximate the time actually spent on economically significant regulatory review. Over the period 2000-2005, this estimate ranges from \$20,000 (2004) to \$12,000 (2001) with a mean of \$16,000 because of differences in the OIRA budget and the number of economically significant rules year each.

The preceding analysis raises the question of whether the benefits of reviewing regulation are likely to exceed the costs. There are about 100 major regulations reviewed each year, leading to a total cost of regulatory review of roughly \$72 million annually (about 100 times \$720,000).⁶ We think, but cannot show definitively, there are many regulatory proposals for which net benefits are increased by at least a billion dollars annually as a result of analysis and evaluation—the removal of lead from gasoline being one example and the market-based approach for cutting sulfur dioxide emissions being another.⁷ Thus, we think the current system is likely to have benefits in excess of costs if we make two key assumptions: all proposed policies would have been implemented without regulatory review; and the costs of policy delay from reviewing regulations are small.⁸ Also, if one assumes that the economic analysis of a major regulation would be done for other reasons (i.e., the cost of doing the analysis can be treated as sunk), then the additional cost of \$20,000 per major regulation is probably trivial compared with the potential benefits of reviewing regulations.

The potential benefits of effective regulatory evaluation could easily exceed the benefits attained by the current system. If more effective regulatory reviews would have eliminated just the major regulations with negative monetized net benefits from 1995 to 2005, the incremental net benefits of improved review would have exceeded \$250 million per year.⁹

Finally, there is no obvious attractive alternative to doing some kind of analysis for key regulatory decisions, assuming that one objective of reviewing regulations is to increase economic efficiency. As Stigler (1982b) argues, “it takes a theory to beat a theory.”

Government analysis can and does make a positive difference in a variety of settings. Some analysis is better than no analysis in identifying potential problems in the

⁶ From 2001 to 2005, the annual number of economically significant rule reviews ranges between 82 and 111, according to RegInfo.gov.

⁷ See the discussion, for example, in Morgenstern and Landy (1997), pp. 457-459; 463.

⁸ To our knowledge, there has not been a systematic empirical study of how the introduction of a regulatory review mechanism could change the nature of the policy proposals that are considered.

⁹ For the 14 out of 95 major rules with negative net benefits, we divide the total annualized negative net benefits of \$2.8 billion by 11 years to obtain \$250 million per year. If regulations with negative net benefits remain in place for more than one year, \$250 million per year represents a substantial underestimate of the total costs to society that could have been avoided with better regulatory review.

regulatory process. Viscusi (1996), for example, has argued that “regulatory reforms that improve the assessment of regulation and incorporate unbiased risk assessment procedures can potentially enhance the performance of regulatory policies.” Under the right circumstances, good regulatory analysis can do even more to promote social welfare, provided that decision makers have an incentive to listen. As Stigler (1982a) notes, however, it is also important to have an understanding of why political outcomes deviate from those that might be preferred by economists. Such an understanding can lead to a more realistic assessment of the impacts of changes in rules, procedures, and institutions (*e.g.*, Shleifer, 2005).

The preceding arguments generally support some kind of economic analysis being used in regulatory decisions. Even though current review of regulations is likely to be justified on economic grounds, the process can be improved. There are two basic ways of improving the process. The first is to explore ways of doing better analysis. The second is to examine institutional and political changes that would make better use of the analysis. We consider both of these briefly.

There are a host of mechanisms that could improve analysis, including peer review, improving data quality, attracting better analysts, and following standard procedures for doing good analysis. Peer review poses problems because it is difficult to get good reviewers for this kind of work. Improving data and getting better analysts has potential if the government is willing to allocate the resources and do more outsourcing of analyses. Issuing guidelines for good analysis is problematic unless there is a mechanism to ensure that those guidelines will be followed. Because these kinds of ideas have been addressed elsewhere, we will not dwell on them here. Rather, we wish to offer one alternative that could represent a methodological breakthrough.

Recall that there are analytical challenges in assessing the overall impact of regulatory evaluation as well as the likely impact of specific regulations. One potentially constructive approach for addressing both problems is the introduction of prediction markets. Prediction markets are markets for contracts that yield payments based on the outcome of an uncertain future event, such as next year’s GDP. These markets frequently outperform both experts and opinion polls (Berg *et al.*, 2003; Wolfers and Zitzewitz, 2004).

One way of learning about the impact of regulatory evaluation would be to set up a market for contracts based on key indicators, such as GDP or an overall price index (Hanson, 2003). While these indicators are imperfect measures of economic welfare, they may be better measures than we currently have. For example, the government could issue one contract that paid off an amount proportional to future GDP if a particular legislative measure were implemented; and a second that paid off an amount proportional to future GDP if the measure were not implemented. The difference between the prices of the two contracts could, in principle, capture the overall impact of regulatory evaluation on future GDP.

The same kind of prediction market contracts also could be introduced for estimating the expected costs and benefits of individual regulations. Examples of proxies for costs and benefits could include pollution levels, deaths from disease, and key price or quantity indices, such as energy or housing. These prediction markets could also provide information on how the expected net benefits of regulation change over time. Thus, they offer a radically different approach to measuring the impact of the regulatory process.

Prediction markets are not without problems, however. For example, it may be difficult to define reasonable proxies for costs and benefits. In addition, such markets measure correlation between policies and outcomes, whereas a decision maker is typically interested in causality.

We offer the preceding applications of prediction markets to suggest that there may be ways of dramatically improving the information available to decision makers in the future. At the same time, we recognize that better analysis is not, by itself, enough. There need to be institutional and political changes if regulatory evaluation is to be more effective.

One promising institutional change in the U.S. would be for Congress to create a Congressional Office of Regulatory Analysis that would complement the regulatory evaluation mechanism within OMB. Such an office is likely to be a cost-effective investment because it does not need to improve regulation much to pay for itself. Among other things, it could stimulate healthy competition between two government institutions with analytical responsibility for regulation, in much the same way that the two agencies that work on budget issues (OMB and the Congressional Budget Office) help keep each

other honest. Furthermore, Congress may want to ask this office not only to consider regulations, but laws that give rise to regulations. If it is true that laws drive regulation, it may be quite beneficial to do economic analysis of proposed laws. Europe, for example, does not solely focus on regulations, but allows for analysis of a wide range of instruments that correspond roughly to guidelines, laws, and regulations. It is an open question as to whether Congress would support such an office, but it may choose to do so simply to get a better understanding of the likely impact of regulation on different constituencies.

Another change that could improve regulatory evaluation in other countries and the European Union is for governments to issue an annual report, similar to OMB's report on the costs and benefits of federal regulation. That report should contain, among other things, the number and percentage of final regulations that pass a benefit-cost test based on factors that can be quantified and monetized, something that OMB's report does not currently contain. We believe such a report has the potential to add to our knowledge as well as promote greater transparency and accountability.

In the U.S., there are at least three ways of elevating benefit-cost balancing in decision making. All would involve a greater degree of political commitment than seems likely at present. One is for the president to require benefit-cost analysis for *all* major regulatory decisions made by the federal government, to the extent permitted by law. A second is for Congress to pass statutes that allow or mandate benefit-cost analysis. Finally, Congress could also allow the courts to strike down regulations that clearly fail a benefit-cost test.

5. Conclusions and Future Research

This paper has assessed what we know about the use of economic analysis in informing regulatory decisions. In specific cases, scholars have suggested that analysis does matter at the margins. However, there is not strong support for the view that economic analysis has had a significant general impact. Furthermore, there is evidence to suggest that the quality of regulatory analysis for a significant fraction of regulations does

not meet widely accepted guidelines. This is true both in the U.S. and in the European Union.

Given these unimpressive results, where should we go from here? Perhaps what is needed is a more disciplined and formal commitment to benefit-cost balancing, led by the president and Congress, along with comparable officials abroad. As noted above, such a commitment could entail mandating benefit-cost analysis of important regulations in statutes. Congress could also codify a version of the current executive order requiring benefit-cost analysis. It may also want to consider subjecting some proposed laws to at least a crude benefit-cost analysis prior to voting on them. Already, Congress often asks for estimates of the budgetary impacts of laws and proposed laws.

There are several ways in which social scientists could contribute to our understanding of the role of economic analysis in regulatory decisions. First, scholars could help identify the conditions under which particular forms of analysis, and particular expenditures on economic analysis, might yield more or less efficient policies. For example, cost-effectiveness analysis may be most useful in eliminating the most inefficient projects, such as a very wasteful chronic toxin regulation or a bridge to nowhere. Second, researchers could help contribute to the development of analytical tools that could improve evaluation. Possibilities include the prediction markets discussed above and new approaches for valuing the benefits from regulation. Third, researchers could contribute to the development and improvement of data sets that are used as inputs for statistical models that inform regulatory decisions, such as government inventories on private expenditures on pollution control.

Economists may also consider affecting the regulatory process more directly by doing timely benefit-cost analyses of important regulations and programs. In the past, economic studies of key sectors of the economy, such as transportation and energy, have been important factors in the decision to deregulate, or partially deregulate, those industries (Noll, 2006). Thus, academic economists can induce change by adding to our understanding of the impact of regulation.

While we have suggested that the government's economic analysis of regulatory decisions can be useful, we want to end on what we think is a realistic note. More widespread use of economic analysis can affect both the supply and demand for

regulation. On the supply side, such analysis has the potential to yield alternatives that increase the net benefits of achieving regulatory goals. On the demand side, such analysis can change the demand for regulation by making the positive and negative effects of regulation more widely known. In some instances, one might expect that politicians and bureaucrats would see little value in changing demand in that way. Politicians, in particular, tend to be more concerned with distributional issues than efficiency. Without significant support from key elected officials, we suspect that most attempts at introducing or strengthening the role of economic analysis will have a modest impact at best. That is, economic analysis cannot be expected to drive the political process.

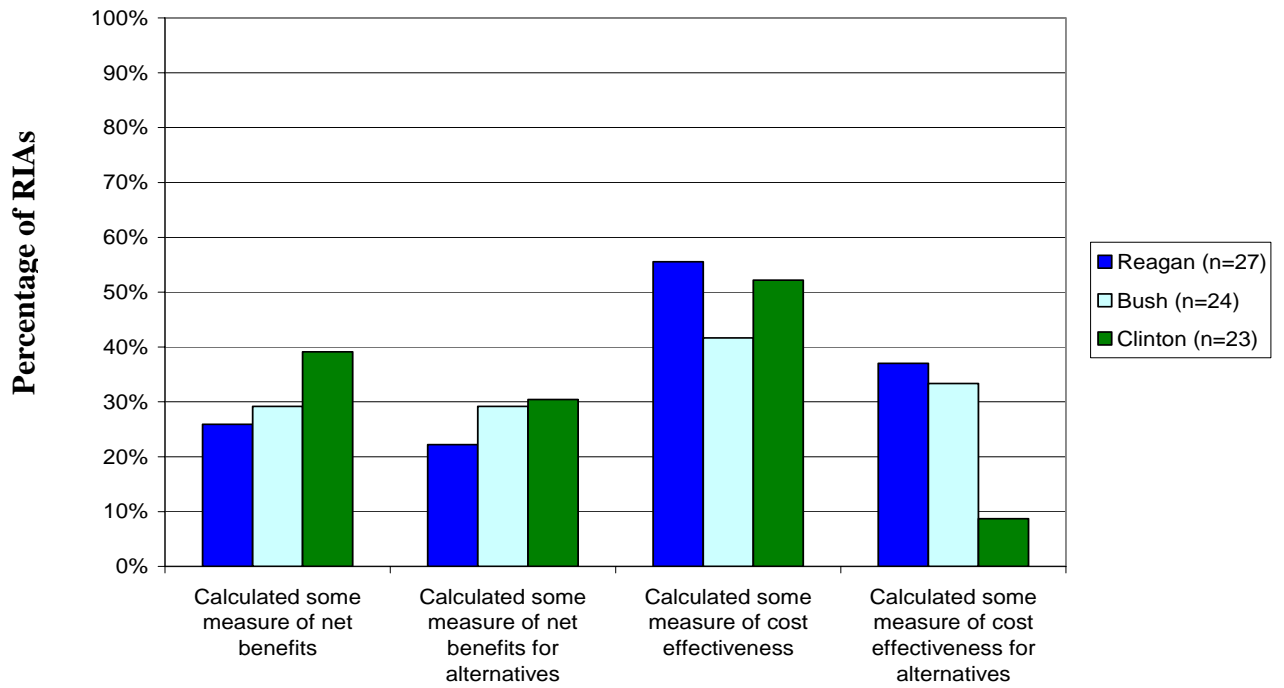
Nonetheless, in a world where the number of trillion dollar economies is increasing and regulatory impacts are frequently measured in the billions, margins matter. Thus, economists should pay more attention to how economic analysis can contribute to improving such margins, insofar as that is possible.

Table 1
Summary of U.S. Regulatory Impact Analyses and EU Impact Assessments

	Percent of Analyses in U.S. Study Including Scorecard Item (n=74)	Percent of Analyses in European Study Including Scorecard Item (n=70)
Estimation of Total Costs		
Provided best estimate of total costs	65%	19%
Provided range of total costs	34%	13%
Estimation of Total Benefits		
Provided best estimate of total benefits	22%	13%
Provided range of total benefits	26%	3%
Estimation of Net Benefits		
Provided a best estimate of net benefits	12%	13%
Provided a range of net benefits	20%	4%

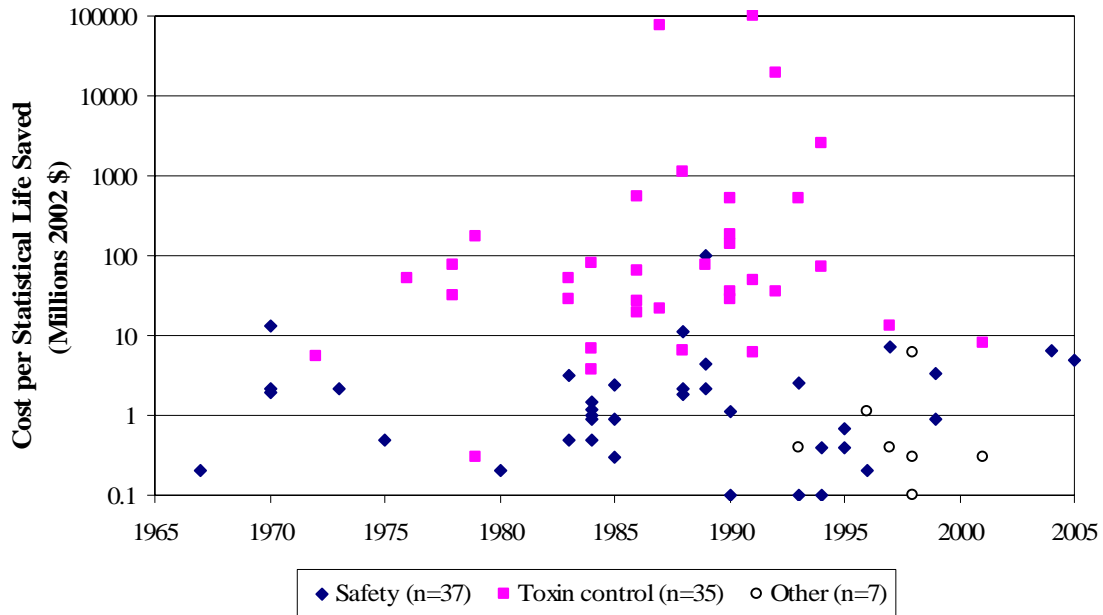
Notes: U.S. Study figures taken from Hahn and Dudley (2004), based on regulatory impact analyses. European Study figures taken from Renda (2006), based on impact assessments. See text for details. Numbers are rounded to nearest percent.

Figure 1
Analysis of Net Benefits and Cost Effectiveness of Regulatory Impact Analyses
(n=74)



Source: Hahn and Dudley (2004).

Figure 2
Cost Effectiveness of Safety, Toxin Control, and Other Regulations
(n=79)



Notes: Based on Morrall (2003), pp. 230-231, with 3 regulations added to update the dataset through 2006. “Safety” denotes that a regulation was aimed at reducing safety risk. “Toxin control” denotes that the regulation was aimed at controlling toxins associated with cancer. “Other” denotes that a regulation fell into a category other than safety or cancer. While Morrall (2003) uses the term “Opportunity Cost of Statistical Life Saved,” we use the term “Cost per Statistical Life Saved.”

References

- Arrow, Kenneth J., Maureen L. Cropper, George C. Eads, Robert W. Hahn, Lester B. Lave, Roger G. Noll, Paul R. Portney, Milton Russell, Richard Schmalensee, V. Kerry Smith, and Robert N. Stavins. 1996. "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?" *Science*. April, 272: pp. 221-222.
- Bator, Francis M. 1958. "The Anatomy of Market Failure." *Quarterly Journal of Economics*. August, pp. 351-379.
- Berg, Joyce, Forrest Nelson, Robert Forsythe, and Thomas Rietz. 2003. "Results From a Dozen Years of Election Futures Markets Research." Working Paper. University of Iowa.
- Blair, Tony. 2005. "Risk and the State." Policy Matters 05-15. Washington, DC: AEI-Brookings Joint Center for Regulatory Studies.
- Commission of the European Communities. 2002. "Communication from the Commission on Impact Assessment."
- Congressional Budget Office. 1997. "Regulatory Impact Analysis: Costs at Selected Agencies and Implications for Legislative Process." CBO Papers.
- DeMuth, Christopher. 1994. "Christopher DeMuth," in *American Economic Policy in the 1980s*. Martin Feldstein, ed. Chicago and London: The University of Chicago Press, pp. 504-511.
- Environmental Protection Agency. 1990. "Environmental Investments: The Cost of a Clean Environment." Report of the Administrator of the Environmental Protection Agency to the Congress of the United States.
- Farrow, Scott. 2000. "Improving Regulatory Performance: Does Executive Office Oversight Matter?" Related Publication 00. Washington, DC: AEI-Brookings Joint Center for Regulatory Studies.
- General Accounting Office. 2003. "OMB's Role in Reviews of Agencies' Draft Rules and the Transparency of Those Reviews." Report to Congressional Requesters.
- Graham, John D., Paul R. Noe, and Elizabeth L. Branch. 2006. "Managing the Regulatory State: The Experience of the Bush Administration." *Fordham Urban Law Journal*. 33, pp. 1-44.

- Hahn, Robert W., Jason Burnett, Yee-Ho I. Chan, Elizabeth Mader, and Petrea Moyle. 2000. "Assessing Regulatory Impact Analyses: The Failure of Agencies to Comply With Executive Order 12,866." *Harvard Journal of Law and Public Policy*. 23, pp. 859-871.
- Hahn, Robert W. and Patrick Dudley. 2004. "How Well Does the Government Do Cost-Benefit Analysis?" Working Paper 04-01. Washington, DC: AEI-Brookings Joint Center for Regulatory Studies.
- Hahn, Robert W., Randall W. Lutter, and W. Kip Viscusi. 2000. *Do Federal Regulations Reduce Mortality*. Washington, DC: AEI-Brookings Joint Center for Regulatory Studies.
- Hanson, Robin. 2003. "Shall We Vote on Values, But Bet on Beliefs?" Working Paper. George Mason University Department of Economics.
- Harrington, Winston. 2006. "Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews." Discussion Paper 06-39. Washington, DC: Resources for the Future
- Harrington, Winston, Richard Morgenstern, and Peter Nelson. 2000. "On the Accuracy of Regulatory Cost Estimates." *Journal of Policy Analysis and Management*. 19:2, pp. 297-332.
- Joskow, Paul L. and Roger G. Noll. 1981. "Regulation in Theory and Practice: An Overview," in *Studies in Public Regulation*. Gary Fromm, ed. Cambridge, MA: MIT Press, pp. 1-65.
- Lave, Lester B. 1981. *The Strategy of Social Regulation: Decision Frameworks for Policy*. Washington, DC: Brookings Institution.
- Morgenstern, Richard D., ed. 1997. *Economic Analysis at EPA: Assessing Regulatory Impact*. Washington, DC: Resources for the Future.
- Morgenstern, Richard D., and Marc K. Landy. 1997. "Economic Analysis: Benefits, Costs, Implications," in *Economic Analysis at EPA: Assessing Regulatory Impact*. Richard D. Morgenstern, ed. Washington, DC: Resources for the Future, pp. 455-478.
- Morrall, John F. 1986. "A Review of the Record." *Regulation*. 10:2, pp. 30-34.
- _____. 2003. "Saving Lives: A Review of the Record." *Journal of Risk and Uncertainty*. 27.

- Morrison, Steven A., Clifford Winston, and Tara Watson. 1999. "Fundamental Flaws of Social Regulation: The Case Of Airplane Noise." *Journal of Law and Economics*. 42, pp. 723-743.
- Nichols, Albert L. 1997. "Lead in Gasoline," in *Economic Analysis at EPA: Assessing Regulatory Impact*. Richard D. Morgenstern, ed. Washington, DC: Resources for the Future, pp. 49-86.
- Noll, Roger G. 2006. "Still Reforming Regulation." Washington, DC: AEI-Brookings Joint Center Distinguished Lecture.
- Office of Management and Budget. 1992. "Circular A-94: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."
- _____. 2005. "Validating Regulatory Analysis: Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities." Washington, DC: Office of Information and Regulatory Affairs.
- _____. 2006a. "Budget of the United States Government Fiscal Year 2007."
- _____. 2006b. "Draft 2006 Report to Congress on the Costs and Benefits of Federal Regulations" Washington, DC: Office of Information and Regulatory Affairs.
- RegInfo.gov. "Where to find Federal Regulatory Information.," through the Office of Management and Budget. Last accessed October 2006.
- Renda, Andrea. 2006. *Impact Assessment in the EU: The State of the Art and the Art of the State*. Brussels: Center for European Policy Studies.
- Schultze, Charles L. 1996. "The CEA: An Inside Voice for Mainstream Economics." *Journal of Economic Perspectives*. 10:3, pp. 23-39.
- Seong, Si Kyung and John Mendeloff. 2004. "Assessing the Accuracy of OSHA's Projections of the Benefits of New Safety Standards." *American Journal of Industrial Medicine*. 45, pp. 313-328.
- Shleifer, Andrei. 2005. "Understanding Regulation." *European Financial Management*. 11:4, pp. 439-451.
- Stigler, George J. 1982a. "Economists and Public Policy." *Regulation*. 6:3, pp. 13-17.
- _____. 1982b. "The Process and Progress of Economics." Nobel Memorial Lecture: Stockholm.

- Tengs, Tammy O., Miriam E. Adams, Joseph S. Pliskin, Dana Gelb-Safran, Joanna E. Siegel, Michael C. Weinstein, and John D. Graham. 1995. "Five-Hundred Life-Saving Interventions and Their Cost-Effectiveness." *Risk Analysis*. 15:3, pp. 369-390.
- Tengs, Tammy O. and John D. Graham. 1996. "The Opportunity Costs of Haphazard Social Investments in Life-Saving," in *Risks, Costs, and Lives Saved*. Robert W. Hahn ed. New York: Oxford University Press.
- Thompson, Kimberly M., Maria Segui-Gomez, and John D. Graham. 2002. "Validating Benefit and Cost Estimates: The Case of Airbag Regulation." *Risk Analysis*. 22:4, pp. 803-811.
- Viscusi, W. Kip. 1996. "Economic Foundations of the Current Regulatory Reform Efforts." *Journal of Economic Perspectives*. 10:3, pp. 119-134.
- Winston, Clifford. 2006. *Government Failure Versus Market Failure: Microeconomics Policy Research and Government Performance*. Washington, DC: AEI-Brookings Joint Center for Regulatory Studies, available at <<http://www.aei-brookings.org/publications/abstract.php?pid=1117>>
- Wolfers, Justin and Eric Zitzewitz. 2004. "Prediction Markets." *Journal of Economic Perspectives*. 18:2, pp. 127-142.