JOINT CENTER

AEI-BROOKINGS JOINT CENTER FOR REGULATORY STUDIES

Regulatory Reform: Assessing the Government's Numbers

Robert W. Hahn

Working Paper 99-6

July 1999

Mr. Hahn is director of the AEI-Brookings Joint Center for Regulatory Studies, a resident scholar at AEI, and a research associate at Harvard University. I would like to thank Jonathan Siskin for his excellent research assistance and analytical insights. I would also like to thank Petrea Moyle, Irene Chan, Fumie Yokota, and Leigh Tripoli for providing analytical support and editorial assistance. In addition, I would like to thank Art Fraas, Arlene Holen, Harold Furchtgott-Roth, Al McGartland, Robert Litan, Randall Lutter, Randall F. Lyon, John F. Morrall, Robert Shelton, Brett Snyder, and Jens Svenson for their help in framing various parts of the analysis. The views expressed in this paper are those of the author and do not necessarily reflect the views of any individuals or institutions with which the author is affiliated

J O I N T C E N T E R

In response to growing concerns about understanding the impact of regulation on consumers, business, and government, the American Enterprise Institute and the Brookings Institution have established the new AEI-Brookings Joint Center for Regulatory Studies. The primary purpose of the center is to hold lawmakers and regulators more accountable by providing thoughtful, objective analysis of existing regulatory programs and new regulatory proposals. The Joint Center will build on AEI's and Brookings's impressive body of work over the past three decades that has evaluated the economic impact of regulation and offered constructive suggestions for implementing reforms to enhance productivity and consumer welfare. The views in Joint Center publications are those of the authors and do not necessarily reflect the views of the staff, council of academic advisers, or fellows.

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

Executive Summary

This paper provides the most comprehensive assessment to date of the costs and benefits of federal regulatory activities. The assessment, based on the government's own numbers, shows that the net benefits for final regulations promulgated from 1981 to mid-1996 approach a net present value of $1.6 trillion. The analysis also shows that the government can significantly increase the net benefits of regulation. Less than half of final regulations pass a neutral economist's benefit-cost test. Net benefits could increase by approximately $280 billion if agencies rejected such regulations. Net benefits could also increase if agencies replace existing regulations with more efficient alternatives, or if agencies substantially improve regulatory programs.

The efficiency of individual regulations varies by agency and by the type of risk the regulation is designed to reduce. Regulations from the Department of Transportation comprise over half of the total net benefits of final regulations, although they account for less than 10% of all regulations. The net benefits of regulations from the Environmental Protection Agency account for only about a third of total net benefits, primarily because of 19 Clean Air Act regulations with high net benefits, although two-thirds of all regulations are EPA regulations. On average, regulations that reduce cancer risk are less efficient than other social regulations, and EPA cancer regulations appear less efficient than other cancer regulations. Regulations that reduce the risk of car, fire, or work-related accidents are generally more efficient than regulations that reduce the risk of cancer and heart disease. The study also shows that the efficiency of regulations has not declined over time, as some scholars suggest. Furthermore, the introduction of formal regulatory oversight by the OMB does not appear to influence the cost-effectiveness of regulations.

The paper shows that agency compliance with regulatory impact analysis requirements in Reagan's Executive Order 12291 and Clinton's Executive Order 12866, the basis for agency estimates of the costs and benefits of regulation, is usually superficial. As a result, the quality of such analyses is generally poor. Partly because of the poor quality of analyses, it appears that agencies do not often use the analyses to improve regulatory outcomes. If Congress and the White House are serious about regulatory reform, they must cooperate to enforce the regulatory impact analysis requirement. Successful enforcement requires high-level political support, statutory language requiring all agencies to adhere to established principles of economic analysis, and rigorous review of agency analyses by an independent entity. At this time, it is unclear whether law makers are willing to exert the political muscle necessary to achieve real reform.

Regulatory Reform:
Assessing the Government's Numbers

Robert W. Hahn

Overview

The political earthquake that shook Washington in November of 1994 brought with it a call for regulatory reform. The call came not just from conservative Republicans, although they vigorously supported reform. The call also came from many Democrats, who recognized that Washington bureaucracies were not working as well as they could and were, in many instances, standing in the way of progress. The bipartisan support for some kind of regulatory reform stemmed from the public's growing awareness of the unintended consequences of government regulation. Philip Howard highlighted some examples in his bestselling book, *The Death of Common Sense*.[1] Howard showed that laws and regulations deterred Mother Theresa and the Missionaries of Charity from building a homeless shelter in the South Bronx. An inflexible regulation also forced Amoco to spend five times as much money to reduce one-fifth as much benzene at its Yorktown refinery than it would have spent using an alternative approach. The message is clear—our regulatory system is broken and is in urgent need of repair.

This paper provides the most comprehensive assessment to date of the impact of federal regulatory activities on the economy.[2] It is based on a review of all rules with regulatory impact analyses (RIAs) that I could locate from 1981 through mid-1996, a total of 168 final and proposed

1. Howard (1995).
2. The study builds on my earlier work, a study of 92 environment, health, and safety regulations from 1990 to mid-1996, and is part of an ongoing project to track the costs and benefits of federal regulation. I added 76 regulations to the original database, some from 1981-1990 and some from 1995-1996. In the database, there are 115 rules from the Environmental Protection Agency (EPA), 28 from the Department of Labor (DOL), 13 from the Department of Transportation (DOT), 5 from Health and Human Services (HHS), 4 from the United States Department of Agriculture (USDA), 2 from Housing and Urban Development (HUD), and 1 from the Consumer Product Safety Commission (CPSC). I did not include the last three agencies in my original analysis. The study also covers operating agencies within the DOT not included in the original analysis, such as the Federal Aviation Administration, the Federal Railroad Administration, and the Research and Special Programs Administration. The original study only included the National Highway, Traffic, and Safety Administration. See Hahn (1996) for more information about the original study.

rules.[3] I also examined the preamble of the *Federal Register* notice for each rule, which typically summarizes the information that the RIA presents.[4,5] I estimated the net benefits of 106 final regulations and 36 proposed regulations, calculated the cost-effectiveness of 52 final regulations and 14 proposed regulations, and estimated benefit-cost ratios for 105 final regulations and 18 proposed regulations.[6] The net benefits of final regulations approach a net present value of $1.6 trillion. About 81 percent of the total benefits from final rules result from the estimated reduction in the risk of death, disease, and injury. Nonfatal benefits account for about 53 percent of that total. The remaining 19 percent of benefits are from air pollution reduction, the only pollution reduction benefits consistently quantified by agencies.[7] These benefits can include health and mortality risk reduction benefits as well as other benefits, such as materials damages.

The analysis presented in this paper builds on pathbreaking work done at the Office of Management and Budget (OMB) beginning in the early 1980s and subsequent works by regulatory scholars.[8,9] Officials at the OMB ranked health, safety, and environmental regulations in terms of cost-effectiveness, and found that the cost-effectiveness of regulations varies across a wide spectrum.

---

3. Agencies have produced RIAs for every regulation since Reagan's Executive Order 12291, issued in 1981. A RIA includes the agency's estimates of the benefits and costs of the regulation, in addition to other information designated in the executive order. Reagan's order required agencies to produce a RIA for each proposed and final "major" rule, defined generally as a rule with an estimated annual impact on the economy of $100 million or more. President Clinton's Executive Order 12866, issued in 1993, changed the term "Regulatory Impact Analysis" to "Economic Analysis" and the term "major" to "economically significant," but otherwise did not significantly change the RIA requirement. I use the acronym "RIA" throughout this paper because it is more frequently used than "EA." Clinton's order also changed the requirement that the benefits of a regulation must "outweigh" the costs to a requirement that the benefits of a regulation must "justify" the costs. The Clinton executive order further places more emphasis on the distributional impacts of regulations. Clinton intended the change in terminology to increase the weight attached to unquantifiable benefits and costs in agency analyses, but it is unclear whether this change occurred. The impact of the two orders on the regulatory process differs, not because of subtle substantive variation, but because the Reagan Administration and the Clinton Administration implemented the orders very differently. The Clinton Administration, for example, focused more on cooperation with the agencies.
4. The preamble often clarifies how the agency will implement the regulation, thus shedding light on the likely benefits and costs.
5. I use the words *rule* and *regulation* interchangeably in this paper.
6. I was not able to calculate net benefits, cost-effectiveness, and benefit-cost ratios for all rules in the database because the agencies did not provide sufficient information to complete these calculations for all rules.
7. Air pollution reduction benefits are from reduction in ambient levels of carbon monoxide, hydrocarbons, nitrogen dioxide, particulate matter, and sulfur dioxide.
8. See, for example, Weidenbaum and DeFina (1978), Litan and Nordhaus (1983), Hahn and Hird (1991), Hopkins (1991), and Winston (1993, 1998).
9. Morrall (1986).

Scholars further found that agencies are not maximizing the net benefits of regulation. My study further supports the discoveries of these scholars. The results of the studies imply that agencies should reallocate resources to regulations with higher net benefits, or to regulatory strategies that are more cost-effective than strategies agencies currently employ. They also imply that a more consistent approach to regulatory analysis is necessary to ensure that agencies choose the best regulatory policies and programs.

Scholars have designed reform proposals that push for improvements in the regulatory process, such as strengthened executive regulatory oversight and the increased use of economic analysis.[10] As a result of these proposals, in addition to increasing public support for regulatory reform, every president since Nixon has advocated some type of reform.[11] The real impact of these reform efforts is questionable, however. This paper therefore also provides guidance for further reform of the regulatory process. It discusses the extent to which federal agencies have cataloged information on the benefits and costs of regulatory activities, the role of benefit-cost analysis in the regulatory process, factors affecting the efficiency of regulation, and the relationship between a statute's economic analysis requirements and the net benefits of regulations from that statute. The study shows that further use of economic analysis, as well as enforcement of economic analysis requirements, is necessary to improve regulatory outcomes.

In the first section of the paper, I comment on the quality of agency estimates of the costs and benefits of regulation. In Section II, I present the key analytical results concerning the net benefits of federal regulations for which the agency provided enough information to calculate net benefits. I also estimated the cost-effectiveness of selected regulations. Section III evaluates the relationship between the wording of statutory economic analysis requirements and the efficiency of regulations. In the fourth section, I discuss whether regulatory impact analyses have improved the regulatory process. Finally, I conclude with suggestions for further regulatory reform.

I. How Complete Are the Government's Numbers?

---

10. See, e.g. Breyer (1993) and Weidenbaum (1997).
11. For a description of regulatory reform efforts since Nixon, see Hahn (1998).

As a result of Reagan's regulatory impact analysis requirement in Executive Order 12291, more information about the benefits and costs of federal regulation is available than ever before.[12] The agency RIAs do not, however, generally adhere to established principles of benefit-cost analysis and are not subject to review by an independent entity. As a result, the information provided in RIAs tends to vary in quality and quantity by agency and by type of regulation. The evaluation of the benefits and costs of regulation is therefore more difficult than it would be if the agencies applied a consistent analytical approach. Nevertheless, many scholars have used the RIA data to evaluate the regulatory process.[13] The work of these scholars, as well as the analysis presented in this paper, has generally focused on agency compliance with economic analysis requirements in the Reagan and Clinton executive orders and the quality of agency analyses. Scholars have found that the information provided in the RIA is often not complete, and that the level of detail and analytical sophistication varies across agencies and types of regulations. Common deficiencies cited throughout much of the literature include inadequate consideration of alternatives, poor treatment of uncertainty, incomplete

12. Clinton's Executive Order 12866, which builds on Reagan's executive order, requires agencies to include the following information in a RIA: a statement of the potential need for the proposal, an examination of alternative approaches, an assessment of benefits and costs, the rationale for choosing the regulatory action, and a statement of statutory authority.

13. Grubb et al. examined all RIAs prepared in 1981 and attempted to determine whether the requirements of Executive Order 12291 had improved regulatory outcomes (Grubb, Whittington, and Humphrey, 1984). The General Accounting Office reviewed three Environmental Protection Agency analyses and made several recommendations to the agency to improve future analyses for rulemaking (GAO, 1984). In response to the GAO's recommendations, the EPA evaluated sixteen RIAs prepared in the first five years after Reagan issues Executive Order 12291 (Environmental Protection Agency, 1987a). After briefly summarizing each analysis and subsequent regulatory decision, the EPA discussed the strengths and weaknesses of the analyses and outlined ways to improve their usefulness. The OMB evaluated nine RIAs from five different agencies on the basis of several criteria including: whether there was a discussion of market failure, an evaluation of suitable alternatives, a reasonable treatment of uncertainty, a clear statement of the baseline, and an appropriate use of discounting (Office of Management and Budget, 1988). In related articles, Fraas (1991) and Fraas and Luken (1991) reviewed the U.S. experience in using economic analysis to develop environmental policy. The authors noted tremendous variation in the quality and role of the analyses and then highlighted three well-prepared EPA RIAs that were important in the policy process. McGarity reviewed five RIAs from four agencies with a detailed examination of bureaucratic processes associated with regulatory development (McGarity, 1991). Goodstein, examining two RIAs in detail, sought to answer whether the EPA was doing good analyses and whether the analyses influenced decisionmaking (Goodstein, 1995). Rusin et al. evaluated six EPA RIAs and one Occupational Safety and Health Administration RIA (Rusin et al., 1996). They examined whether each RIA discussed the need for regulatory activity, evaluated possible alternatives, estimated benefits and costs, and provided a rationale for choosing the proposed action. In the most comprehensive review of individual RIAs to date, Morgenstern examined the role of economic analysis in environmental decisionmaking (Morgenstern, 1997). In that study, twelve EPA RIAs were evaluated by separate authors with a particular focus on estimated impacts and the value of RIAs in regulatory decisions.

estimation of benefits and costs, as well as various methodological errors.[14] The analysis presented in this paper supports the findings of other regulatory scholars related to the quality of agency RIAs.

My analysis of RIAs shows that they lack analytical consistency and that agencies only superficially comply with the requirements in the Reagan and Clinton executive orders. I found, for example, that the discount rate used by the agency varies across regulations, and agencies do not always indicate the year in which specified benefits and costs apply. Agencies may show such information only in particular years instead of presenting full streams of benefits and costs. Perhaps most importantly, in many cases the agency did not complete its quantitative analysis of benefits or cost savings. Since the lack of quantification makes it difficult to hold agencies accountable for their decisions, I closely examined the quantification issue. I examined the Environmental Protection Agency (EPA) particularly carefully because other scholars have noted that the EPA tends to quantify benefits and costs less than other agencies.

In this analysis, I do not address whether the numbers contained in the RIAs are biased, although it is an important issue. I have argued elsewhere that I believe that agencies are likely to overstate net benefits.[15] I argued that bureaucrats in agencies have an incentive to overstate benefits and understate costs.[16,17] Rather than repeat the arguments contained in my 1996 study, let me simply state that the issue requires more thorough research. Moreover, I am dubious that it will be resolved in a way that satisfies different interest groups. Ultimately, I believe that the solution rests on devising an institutional structure that gives agencies the incentive to provide less biased information. The focus of this study is to evaluate the government's numbers, however, regardless of bias.

Table 1 shows the number and percentage of regulations for which agencies quantified some part of benefits and costs.[18] For 98 percent of the cases, agencies reported information on costs.

---

14. The General Accounting Office has conducted three additional studies within the last three years that support these conclusions. See GAO (1997), GAO (1998), and GAO (1999).

15. Hahn (1996).

16. While industry has an incentive to overstate costs in materials it provides to the agency, the agency has some discretion to determine which cost estimates to use.

17. See, e.g. Harrington, Morgenstern, and Nelson (1999) for an alternative perspective. While these authors find costs are overstated in many cases, they also find that the assumed level of compliance is overstated. Thus, the bias in costs estimates is less clear for any given level of compliance. See also OMB (1998) for a discussion of this issue.

18. The benefit and cost numbers developed throughout this paper are based on agency analyses, many of which are incomplete. Nonetheless, the numbers summarize the official information that is publically available.

Table 1: Regulatory Scorecard, 1982 to Mid-1996[a]

	Total	CPSC	DOL Health	DOL Safety	DOT	EPA	HHS	HUD	USDA
Number of Rules[b]	168	1	15	13	13	115	5	2	4
Costs/Savings Assessed	164	1	15	13	13	111	5	2	4
	98%	*100%*	*100%*	*100%*	*100%*	*97%*	*100%*	*100%*	*100%*
Benefits or Cost Savings Assessed[c]	146	1	15	13	13	95	5	2	2
	87%	*100%*	*100%*	*100%*	*100%*	*83%*	*100%*	*100%*	*50%*
Human Health Impacts Estimated	94	1	15	12	9	49	4	2	2
	56%	*100%*	*100%*	*92%*	*69%*	*43%*	*80%*	*100%*	*50%*
Benefits Monetized	44	1	1	3	4	26	5	2	2
	26%	*100%*	*7%*	*23%*	*31%*	*23%*	*100%*	*100%*	*50%*

a. The following acronyms are used in the scorecard: CPSC=Consumer Product Safety Commission; DOL=Department of Labor; DOT=Department of Transportation; EPA=Environmental Protection Agency; HHS=Department of Health and Human Services; HUD=Department of Housing and Urban Development; USDA=United States Department of Agriculture

b. The scorecard includes 121 final rules and 47 proposed rules.

c. This category includes fatal and nonfatal human health benefits from reduction in the risk of cancer, heart disease, lead poisoning, and car, fire, and workplace accidents, termed "Human Health Impacts." It also includes benefits from pollution reduction and any other benefits or cost savings that the agency quantified or monetized.

Agencies assessed benefits, cost savings, or both for 87 percent of the rules. The EPA and the U.S. Department of Agriculture (USDA) are the only agencies that did not assess benefits, cost savings, or both for all regulations.[19] An agency's decision to quantify the benefits of a regulation or cost savings appears to depend on the specific agency and the type of regulation. For example, agencies quantified benefits with measurable human impacts, such as mortality and morbidity, for 56 percent of rules. Agencies addressing safety risks estimate benefits with human impacts more often than agencies addressing health and environmental risks.[20] This can be explained, in part, because some environmental risks, such as those attached to ecosystem degradation, are difficult to quantify.[21] Fewer agencies attempted to monetize the benefits of the rule than to quantify its physical effects. While the Department of Health and Human Services (HHS), the Department of Housing and Urban Development (HUD), and the Consumer Product Safety Commission (CPSC) monetized benefits for all rules, only about one-fourth of all rules included monetized benefits. A few agencies, such as the Occupational Safety and Health Administration (OSHA), often highlighted significant cost savings.[22] Less than a third of the rules with quantified benefits include monetized benefits. I relate this difference, in part, to specific
agency policies stemming from statutory limitations restricting the consideration of benefits or costs.

19. Agencies often differentiate between compliance costs and cost savings resulting from a rule. Cost savings generally take the form of avoided costs of cleanup, property damage, resource replacement, litigation, and training, in addition to savings from waste minimization, productivity gains, fuel economy benefits, and savings based on the value of lost product (e.g., from oil spills). I combine cost savings and benefits in this analysis, although economists generally believe that most estimates of cost savings are implausible. Cost savings imply that regulations can save companies money, and therefore that some companies are not maximizing profits. In my database, for example, the inclusion of cost savings leads to 10 regulations that save money. In addition, cost savings are difficult to estimate and are probably much smaller than agencies predict. See van der Linde and Porter (1995) and Palmer et al. (1995) for a discussion of cost savings.

20. I define health benefits as benefits resulting from cancer, heart disease, and lead poisoning risk reduction. I define safety benefits as benefits resulting from a reduction in the risk of disabling injuries, injuries that require a person to miss work, and injuries that do not require a person to miss work. Disabling injuries are permanent, while the other injuries are temporary. By definition, these injuries result from car, fire, and workplace accidents, or the malfunction of consumer products.

21. Rules addressing safety risks estimate the benefits from mortality and morbidity reduction in all but two cases. In contrast, rules addressing health and environment risks estimate these benefits about half the time. Note that all agencies, except for the Department of Labor, are not distinguished by the type of regulatory risks they address. My analysis of the Department of Transportation, for example, includes ten safety rules as well as three U.S. Coast Guard rules aimed at oil pollution prevention in the health and environment category.

22. OSHA is a part of the DOL. I divided the DOL regulations in my database into health and safety categories for my analysis because of the large number of rules in each of these categories relative to other agencies. All DOL Health regulations referred to throughout the paper are OSHA health regulations. DOL Safety regulations are OSHA safety regulations and Mine Safety and Health Administration regulations.

The OSHA, for example, is restricted from using a benefit-cost framework as a basis for health standards. While the agency quantifies significant benefits with human impacts in all fifteen rules examined in this study, OSHA monetized those benefits in only one case. I later examine the implications of attaching a dollar value to quantified benefits that the agency did not monetize.

Table 2 shows a detailed breakdown for the EPA because the majority of regulations promulgated from 1981 to mid-1996 are EPA regulations. The table shows that the agency assessed costs for nearly all of their rules, but did not quantify benefits or cost savings for twenty of the rules. Many of the rules lacking benefit estimates are process-oriented, such as rules that require third parties to gather information or outline the structure of government programs.[23] The benefits of process-oriented rules are often difficult to identify, much less quantify. Almost two-fifths of the regulations quantify benefits with measurable human impacts, but only one-half quantify the benefits of pollution reduction.[24] Only 23 percent actually monetize such benefits.

II. What Do the Government's Numbers Tell Us?

As is clear from the previous section, the government's numbers are often the result of incomplete, and sometimes even flawed, analysis. Nevertheless, the government's numbers are the only available source of data on which it is possible to base a comprehensive review of major regulations. I therefore used these estimates to aggregate the net benefits of regulation and to identify factors that explain variation in regulatory efficiency. I only report, however, the conclusions that I believe are defensible despite weaknesses in the original data. My assessment of the government's numbers yields four important conclusions. First, aggregate estimates of agency net benefits based

23. Examples include a rule assessing the extent to which general federal actions conform to state or federal implementation plans under the Clean Air Act, a rule outlining the operating permits program of the Clean Air Act, and a rule promulgating data requirements for pesticide registration. The EPA only qualitatively described the benefits of these rules.

24. Numerous rules promulgated under the Resource Conservation and Recovery Act estimate the amount of waste affected by the rule. If the agency did not quantify the pollution reduction benefits, however, I did not include the rule in the "Pollution Reduction Quantified" category in table 2.

Table 2: Regulatory Scorecard: Breakdown for Environmental Statutes, 1982 to Mid-1996[a]

	EPA	CAA	CERCLA	CWA	FIFRA	RCRA	SDWA	TSCA
Number of Rules[b]	115	62	5	14	2	19	8	5
Costs/Savings Assessed	111	61	5	13	2	17	8	5
	97%	*98%*	*100%*	*93%*	*100%*	*89%*	*100%*	*100%*
Benefits or Cost Savings Assessed[c]	95	55	0	12	1	17	7	3
	83%	*89%*	*0%*	*86%*	*50%*	*89%*	*88%*	*60%*
Pollution Reduction Quantified	63	54	0	8	0	1	0	0
	55%	*87%*	*0%*	*57%*	*0%*	*5%*	*0%*	*0%*
Human Health Impacts Estimated	49	20	0	6	1	13	7	2
	43%	*32%*	*0%*	*43%*	*50%*	*68%*	*88%*	*40%*
Benefits Monetized	26	13	0	7	0	2	3	1
	23%	*21%*	*0%*	*50%*	*0%*	*11%*	*38%*	*20%*

a. The EPA is the primary agency responsible for implementing the following environmental statutes: CAA=Clean Air Act; CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; CWA=Clean Water Act; FIFRA=Federal Insecticide, Fungicide, and Rodenticide Act; RCRA=Resource Conservation and Recovery Act; SDWA=Safe Drinking Water Act; TSCA=Toxic Substances Control Act

b. The scorecard includes 82 final rules and 33 proposed rules.

c. This category includes fatal and nonfatal human health benefits from reduction in the risk of cancer, heart disease, lead poisoning, and car, fire, and workplace accidents, termed "Human Health Impacts." It also includes benefits from pollution reduction and any other benefits or cost savings that the agency quantified or monetized.

on the government's own numbers are positive. Second, the government can increase the net benefits of regulation. Less than half the rules pass a neutral economist's benefit-cost test. Net benefits would increase substantially if agencies rejected such rules. Third, net benefits exhibit a wide range, suggesting that a reallocation of regulatory resources could increase the aggregate net benefits of regulation. Fourth, it is possible to explain some of the variability in regulatory efficiency using regression analysis. Regulations designed to reduce cancer risks, for example, are less cost-effective than other regulations. More research is necessary to fully understand why significant variation exists, however. In this section, I describe the methodology I used to aggregate and compare the government's estimates of the benefits and costs of regulation, the results of the sensitivity analysis, and the results of a regression analysis designed to explain the observed variation in efficiency between regulations.

Methodology

I used the government's numbers provided in the regulatory impact analyses to aggregate the benefits and costs of regulations from 1981 to mid-1996, to determine which regulations pass a benefit-cost test, and to identify factors that explain variation in regulatory cost-effectiveness estimates.[25] My analysis of the RIAs takes agency estimates of the impact of regulations on the economy as given. I use these agency estimates to calculate the present value of the benefits and costs of a particular regulation or regulatory alternative. I then calculated the net benefits of each regulation, defined as the difference between benefits and costs, and aggregated the net benefits of all regulations. I also calculated the net benefits of regulation by agency, and by environmental statute. I further calculated the cost-effectiveness of regulations by dividing the cost of the regulation by the benefits, such as the number of lives saved.

To make the analysis consistent across different programs and regulations, and to allow for

25. The database primarily consists of "major" and "economically significant" regulations, as defined by Reagan's and Clinton's executive orders. It includes a few rules that may not be considered major in their final form, but I evaluated them on the presumption that they could be major. Although the CPSC is not covered by the executive orders, I included one rule from the CPSC that probably would have been designated as "major" if it was subject to review. I also reviewed rules from the Nuclear Regulatory Commission, which voluntarily complies with many executive order requirements.

aggregation of net benefits, it was necessary to convert all dollar estimates to the same dollar base year to correct for inflation, and to further discount all dollar estimates to reflect the social opportunity cost of investing in the regulation. I first used the Consumer Price Index to convert all annualized estimates of cost and benefits for each regulation to 1995 dollars. Next, I aggregated the benefits and costs of each regulation using the base year of implementation identified by the agency in the RIA. If the agency did not identify a base year, I used the year after the date the agency published the regulation in the *Federal Register* as the base year. Finally, I calculated the present value of net benefits of all regulations using 1996 as the base year. If a rule reported costs or benefits from a year after 1996, for example, I discounted values back to 1996. Likewise, if a rule had benefits and costs before 1996, I discounted the values forward to 1996. I describe the impact of varying the base year on my final estimates later in this section, when I discuss the results of my analysis.

I also introduced a common discount rate because agencies often chose different discount rates for their analyses. The real discount rate for the base case is 5 percent, with 3 and 7 percent used in the sensitivity analyses. I discussed the choice of discount rate in more detail in my original study.[26] I also monetized some benefits that the agencies chose not to monetize. For health risk reduction regulations, agencies often provided estimates of the number of lives the agency expected the rule to save, in addition to the number of injuries the agency expected the rule to avert. To monetize these benefits, I used standard willingness-to-pay estimates based on labor market studies of risk-dollar tradeoffs for fatal and nonfatal risks. Willingness-to-pay estimates represent the amount an individual is willing to pay to reduce a specified risk or to protect the environment. The willingness-to-pay to avoid a risk of fatality is referred to as the implicit "value of life."[27] The value of life for the base case is \$5 million, with values of \$3 and \$7 million used in the sensitivity analyses.[28] I further used a consistent set of willingness-to-pay values for reducing nonfatal risks of injury and disease, called a

26. See Hahn (1996, 216–19).
27. This terminology is somewhat misleading and has led to unnecessary controversy. Economists are trying to measure what people are willing to pay for small changes in the probability of reducing different kinds of health and safety risks, not the value of saving a life.
28. Viscusi (1993).

fatality index, since these values also varied by agency.[29] I value a chronic disease or disabling injury at one-third of a life, workday-lost injuries at one-hundredth of a life, and non-workday-lost injuries at one-two-hundredth of a life, based on work by the Department of Transporation's (DOT) National Highway Traffic Safety Administration (NHTSA) and work summarized by Viscusi.[30] I adjust nonfatal injuries from car accidents by using NHTSA's equivalent life calculation.[31] For the value of reducing a unit of pollution for the five air pollutants in the database, my estimates are based on previously published studies and selected numbers from the EPA's RIAs.[32,33] Table 3 summarizes values for key parameters.

Unless otherwise specified, I presume that regulations will be in force for at least twenty years. If the RIA specified a longer time frame, I used that time frame. If benefits accrued over a longer time frame because a disease or illness has a latency period between the exposure and the

29. Unless otherwise noted, I updated all estimates to 1995 dollars by using implicit price deflators for the gross domestic product from Council of Economic Advisers (1997).

30. See National Highway Traffic Safety Administration and Federal Highway Administration (1991) and Viscusi (1992).

31. I did not include disease and injury benefits that did not fit into fatality index categories, and I therefore may have understated benefits. Examples include reductions in diseases unique to only one or a few regulations, such as incidence of reduced IQ levels as a result of lead exposure. When agencies monetized these benefits, I included agency valuations in an alternative scenario. While aggregate benefits increase by less than 5 percent, the inclusion of those nonstandardized benefits is significant in a few rulemakings. For example, a 1992 Health Care Financing Administration rule addressing clinical lab improvements had annual costs of over $1 billion in selected years. Using a willingness-to-pay model for improved laboratory conditions and information on the cost of false negatives and positives, the Health Care Financing Administration determined that the benefits ranged from $.5 billion to $5 billion annually. The agency did not specify the year dollars in the rule, but presumably the estimates are in 1991 or 1992 year dollars. As I am skeptical of some of those numbers, I include them only in an alternative scenario.

32. I did not take the estimates of the benefits of pollution reduction directly from any particular study. I based the estimates on a review of a variety of studies, the most important of which are Harrison et al. (1992), Rowe et al. (1995), and the EPA's RIA for municipal waste combustors (Environmental Protection Agency 1994). I believe the final estimates represent a reasonable range of estimates. Al McGartland of EPA reviewed these estimates and offered valuable feedback, but he is in no way responsible for the final choice of estimates. More refined estimates would take into account the level of pollution, population density, and differences in seasonal effects.

33. All agencies, including the EPA, did not often provide quantified estimates of environmental benefits other than air pollution reduction benefits. My analysis therefore only includes air pollution reduction benefits. To calculate the total benefits of a rule, I combine the benefits from health and safety risk reduction with the benefits from air pollution reduction. The estimates of air pollution reduction benefits may, however, include some benefits from morbidity and mortality risk reduction, in addition to environmental protection. There is consequently a possibility of overlap between the air pollution reduction estimates and the health and safety risk reduction estimates because both may include mortality and morbidity reduction benefits. The effect of this overlap is small, however, because it pertains only to the benefits from cancer risk reduction. Of all the pollutants included in the analysis, only the estimates of the benefits of particulate matter and sulfur dioxide reduction appear to include mortality benefits. These mortality benefits do not significantly overlap with the cancer risk reduction benefits, and I therefore do not believe that the overlap affects the results of my analysis.

Table 3: Key Parameters of the Model[a]

	Low Value	Base Value	High Value
Discount Rate	3%	5%	7%
Implicit Value of Life	\$3,000,000	\$5,000,000	\$7,000,000
Value of Pollution Benefits (per ton)			
Carbon Monoxide	\$0	\$0	\$100
Hydrocarbons	\$100	\$1,000	\$2,500
Nitrogen Oxides	\$100	\$1,000	\$2,500
Particulate Matter (PM 10)	\$2,500	\$10,000	\$30,000
Sulfur Dioxide	\$100	\$700	\$1,000

a. I adjusted all dollar figures to 1994 dollars using implicit price deflators (Economic Report of the President 1995). I updated these figures to 1995 dollars in the rest of this paper.

onset of the problem, I discount the benefits back to the present. If the stream of benefits is not given, I discount the average annual benefits by using average latency periods. If the agency specified a preferred alternative or scenario in the RIA or the *Federal Register* notice, I evaluate that alternative. If the agency did not specify a preferred alternative, I examine an average of the most likely set of alternatives.

The Net Benefits of Regulation from 1981 to Mid-1996

The net benefits of federal regulation approach a net present value of $1.6 trillion for final rules and $325 billion for proposed rules.[34] More regulations in the database have negative net benefits than positive net benefits. Rules with positive net benefits average about $40 billion in net benefits, however, while rules with negative net benefits average -$2.3 billion.[35] Table 4 summarizes the results of the analysis.[36] Table 5 analyzes EPA rules in more detail on the basis of specific statutes because about two-thirds of the final rules are EPA rules. Table 4 covers thirty-two fewer regulations than Table 1 because I excluded some rules to represent more accurately the impact of regulations over the time period.[37] The table provides aggregate estimates for each agency as well as a combined estimate for all agencies. The first part of the table summarizes the results for final

34. The net benefits estimate for final rules does not include two rules on stratospheric ozone that, according to the EPA, have net benefits in trillions of dollars. These rules are included in Table 1. While these rules probably have positive net benefits, the EPA's estimates probably overstate the actual benefits significantly. I therefore did not include these rules. For a detailed analysis of the EPA's aggregate estimates of clean air benefits, see Lutter (1998).

35. Sixty final regulations in the database have negative net benefits, while 46 regulations have positive net benefits. Of the proposed regulations, 18 have negative net benefits and 13 have positive net benefits.

36. Table 4 distinguishes between gross costs and net costs because, as discussed earlier in this paper, agencies frequently distinguish between compliance costs and cost savings resulting from a rule. Gross costs are direct compliance costs. Net costs represent the difference between gross costs and any cost savings or additional costs associated with the rule. I compute net benefits as benefits minus net costs.

37. I excluded rules from the net benefits calculation in three circumstances. First, I excluded general rules that overlapped specific regulatory requirements. The EPA, for example, sets goals for the concentration levels of criteria pollutants but separately promulgates rules to ensure compliance with those standards. Second, I excluded a few rules for which the basis for the estimates was unclear. I may eventually enter these rules in the database. Finally, I excluded 17 rules that I determined the agency was unlikely to finalize. Seven of these 17 rules are related to the EPA's benzene standards, proposed in 1989 and 1990. These seven benzene decisions were part of a bundle of eleven benzene decisions promulgated by the EPA in two major rules, although I treated them each as a separate data point. I left the other four benzene decisions in the database

Table 4: Net Benefits of Regulations, 1982 to Mid-1996[a]

	TOTAL	CPSC	DOL Health	DOL Safety	DOT	EPA	HHS	HUD	USDA
FINAL									
Number of Regulations	106	1	9	10	9	70	3	1	3
Gross Cost	$601.9	$1.3	$43.8	$20.6	$59.9	$444.0	$29.0	$0.9	$2.5
Net Cost	$395.8	$0.7	$43.8	-$15.3	$53.1	$283.6	$28.5	-$0.9	$2.5
Benefits	$1,948.6	$5.9	$55.0	$83.2	$997.4	$764.2	$23.9	$0.1	$18.9
Net Benefits[b]	$1,552.8	$5.3	$11.2	$98.6	$944.3	$480.7	-$4.6	$1.0	$16.5
PROPOSED									
Number of Regulations	30	n.a.	3	1	3	19	2	1	1
Gross Cost	$100.8	n.a.	$2.7	$1.8	$4.0	$84.7	$3.5	$1.3	$2.7
Net Cost	$37.3	n.a.	$2.7	$1.8	$3.7	$65.1	-$39.7	$0.9	$2.7
Benefits	$362.0	n.a.	$4.6	$38.8	$2.9	$85.0	$230.8	$0.0	$0.0
Net Benefits	$324.8	n.a.	$1.8	$37.0	-$0.9	$19.9	$270.5	-$0.9	-$2.7

a. All figures are in billions of 1995 dollars. Aggregate totals may not add due to rounding.

b. I calculated net benefits by subtracting net costs from benefits.

Table 5: Net Benefits of Regulations: Breakdown for Environmental Statutes, 1982 to Mid-1996[a]

	EPA[b]	CAA	CERCLA	CWA	FIFRA	RCRA	SDWA	TSCA
FINAL								
Number of Regulations	70	35	5	8	2	11	5	4
Gross Cost	$444.0	$192.0	$34.0	$30.7	$7.6	$121.6	$43.6	$14.6
Net Cost	$283.6	$127.7	$34.0	$30.2	$7.6	$26.8	$43.6	$13.6
Benefits	$764.2	$714.3	$0.0	$1.2	$0.0	$0.4	$48.1	$0.2
Net Benefits[c]	$480.7	$586.6	-$34.0	-$29.0	-$7.6	-$26.4	$4.5	-$13.4
PROPOSED								
Number of Regulations	19	10	n.a.	4	n.a.	2	3	n.a.
Gross Cost	$84.7	$34.0	n.a.	$6.0	n.a.	$15.7	$28.9	n.a.
Net Cost	$65.1	$18.5	n.a.	$2.1	n.a.	$15.6	$28.9	n.a.
Benefits	$85.0	$46.7	n.a.	$0.1	n.a.	$0.7	$37.5	n.a.
Net Benefits	$19.9	$28.2	n.a.	-$2.0	n.a.	-$14.8	$8.6	n.a.

a. Aggregate totals may not add due to rounding.

b. The EPA is the primary agency responsible for implementing the following environmental statutes: CAA=Clean Air Act; CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; CWA=Clean Water Act; FIFRA=Federal Insecticide, Fungicide, and Rodenticide Act; RCRA=Resource Conservation and Recovery Act; SDWA=Safe Drinking Water Act; TSCA=Toxic Substances Control Act

c. Net benefits are calculated by subtracting net costs from benefits.

rules, and the second part summarizes the results for proposed rules.[38] In each section of the table, I list the number of regulations for which either cost or benefit and cost information was available, specify whether the rule passes a benefit-cost test, and provide aggregate information on benefits and costs. It is clear from the table that although total net benefits of regulation are positive, net benefits vary dramatically by agency.

Table 4 shows that aggregate net benefits are positive for final rules from each agency with the exception of the HHS.[39] This is not true for proposed rules, as only the Department of Labor (DOL), EPA, and HHS have positive aggregate benefits.[40] The analysis indicates that safety regulations, which reduce the risk of car, fire, or workplace accidents, have higher net benefits than other regulations. DOL safety regulations, for example, have higher net benefits than DOL health regulations, both for final and proposed rules. In addition, the net benefits of Department of Transportation regulations, designed primarily to increase motor vehicle safety, far exceed the net benefits of other agencies. The net benefits of DOT regulations account for over half of the total net benefits from regulation, even though these net benefits result from less than 10% of all regulations used to calculate net benefits.

The net benefits of EPA regulations account for approximately one-third of the total net benefits, yet the EPA promulgated 67% of the regulations in the database. In addition, EPA's net benefits are positive only because of 19 Clean Air Act rules with high net benefits. All EPA rules promulgated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Clean Water Act (CWA), the Toxic Substances Control Act (TSCA), and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) have negative net benefits. Since TSCA and FIFRA are regarded as "balancing" statutes, meaning that they contain statutory language that

38. The estimates of benefits and costs in the RIAs of proposed rules are not as robust as the estimates for final rules because agencies often significantly change their estimates between the proposed and final stages of the rulemaking process, in response to OMB comments and for other unknown reasons. Agencies also never finalize some proposed rules. In addition, the year of implementation for proposed rules is unknown, which makes the timing of the benefits and costs difficult to estimate. I therefore attach more significance to the results of my analysis of the final rules, although analysis of the proposed rules reveals some interesting patterns.

39. HHS rules show positive net benefits, however, when nonstandardized, monetized benefits are included. HHS net benefits are negative because of Health Care Financing Administration rules with negative net benefits. The net benefits of Food and Drug Administration rules are positive.

40. For proposed rules, all agencies except the DOT have positive net benefits if I include nonstandardized, monetized benefits.

require agencies to balance the costs and benefits of regulations, it is remarkable that all EPA rules authorized by these statutes have negative net benefits. A closer look at the two FIFRA rules and the four TSCA rules reveals that the EPA either identified benefits for these regulations and did not quantify the benefits, or simply did not identify any benefits.[41] Table 5 shows that five of seven statutes have regulations that result in net costs. Only regulations based on the Clean Air Act (CAA) and the Safe Drinking Water Act (SDWA) yield positive net benefits. In the case of the SDWA, one regulation addressing lead and copper accounts for over 95 percent of the benefits of all SDWA regulations. Without one rule that substantially reduces lead content in gasoline, net benefits for the CAA drop from about $590 billion to just over $200 billion. Proposed regulations show a similar pattern with a wide range of net benefits for regulations.

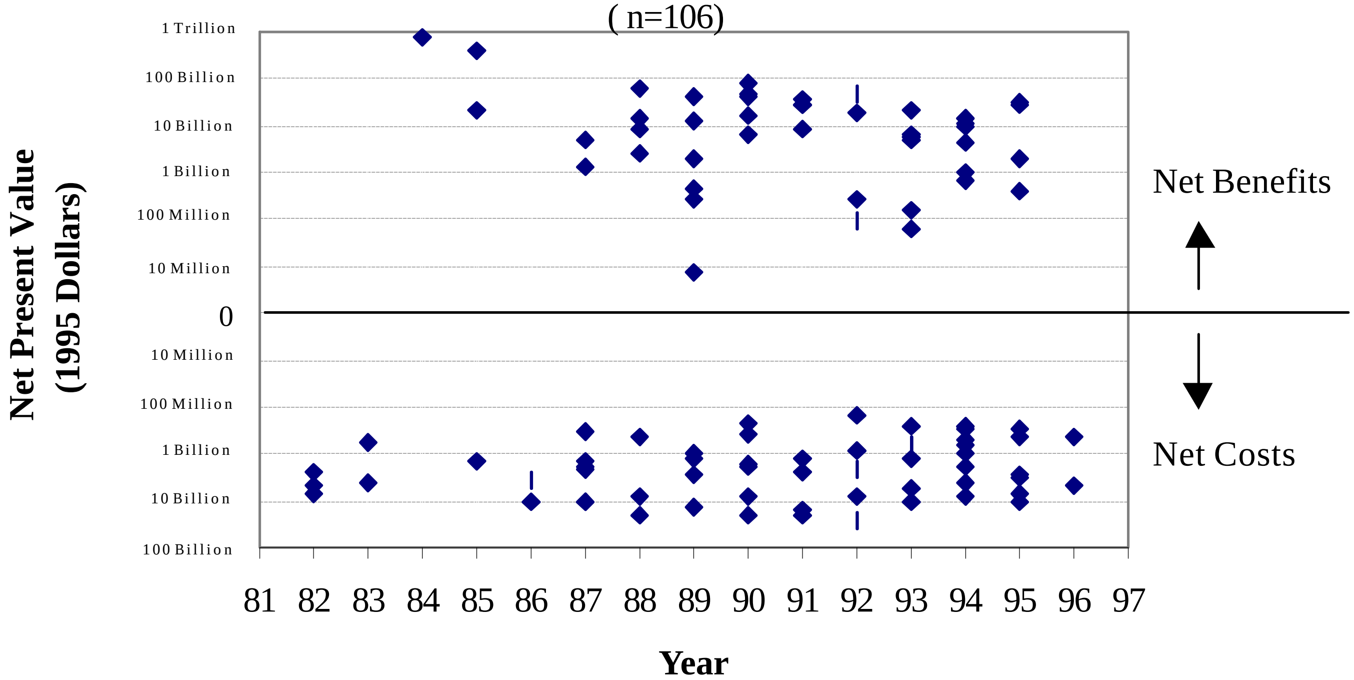
Figure 1 provides an overview of the distribution of net benefits of final rules over time.[42] The results reveal two interesting patterns also found in my earlier study.[43] First, I find no distinct time trend for benefits and costs. Second, most rules with net benefits tend to range from $10 billion to less than $100 billion. In contrast, most rules with net costs range from $0 to $10 billion.[44] While less than half of all final rules pass a benefit-cost test, aggregate net benefits are positive because many of the rules that do pass have substantial benefits. For example, just two rules–the DOT's automatic restraints in cars and the EPA's lead phasedown in gasoline--account for just over 70 percent of total net benefits of regulation.

I examine the impact of varying key parameters on the benefits and costs of individual regulations because I made a number of critical assumptions to standardize the data. Table 6 shows the impact of varying the discount rate and the value of benefits for final rules. A reduction in the value of benefits from the base-case scenario to the "low" scenario reduces net benefits by $941 billion. An increase in the value of net benefits to the "high" scenario increases net benefits to $2,699

41. The two FIFRA regulations are a 1992 rule setting worker protection standards for agricultural pesticides and a 1982 rule outlining data requirements for pesticide registration. The four TSCA regulations are a 1989 rule pertaining to the manufacture, importation, processing, and distribution of asbestos, a 1987 rule pertaining to materials that contain asbestos in schools, a 1985 rule pertaining to the manufacture, processing, and distribution of polychlorinated biphenyls (PCBs), and a 1983 rule outlining premanufacture notification and review procedures.
42. The figure uses a modified logarithmic scale. The logarithm of net benefits is on the top half of the figure for all rules that have positive net benefits. The logarithm of net costs is on the bottom half of the figure for all rules that have positive net costs.
43. Hahn (1996).
44. Thirty rules with net costs did not clearly quantify any benefits that I monetized for my calculations.

Figure 1: Net Benefits of Final Major Regulations as a Function of Time[a]

(n=106)



a. The figure uses a modified logarithmic scale. The logarithm of net benefits is on the top half of the figure for all rules that have positive net benefits. The logarithm of net costs is on the bottom half of the figure for all rules that have positive net costs.

Table 6: Sensitivity Analysis of the Net Benefits of Final Rules[a]

	Discount Rate		
Value of Benefits	3%	5%	7%
Low Values	$590	$612	$593
Base Values	$1,580	$1,553	$1,477
High Values	$2,806	$2,699	$2,541

a. All estimates are in billions of 1995 dollars. The number of rules that pass a benefit-cost test is given in parentheses.

billion. Variations in the discount rate have a less pronounced impact. Decreasing the discount rate from 5 percent to 3 percent increases net benefits by $27 billion, while increasing the discount rate from 5 percent to 7 percent decreases net benefits by $56 billion.[45]

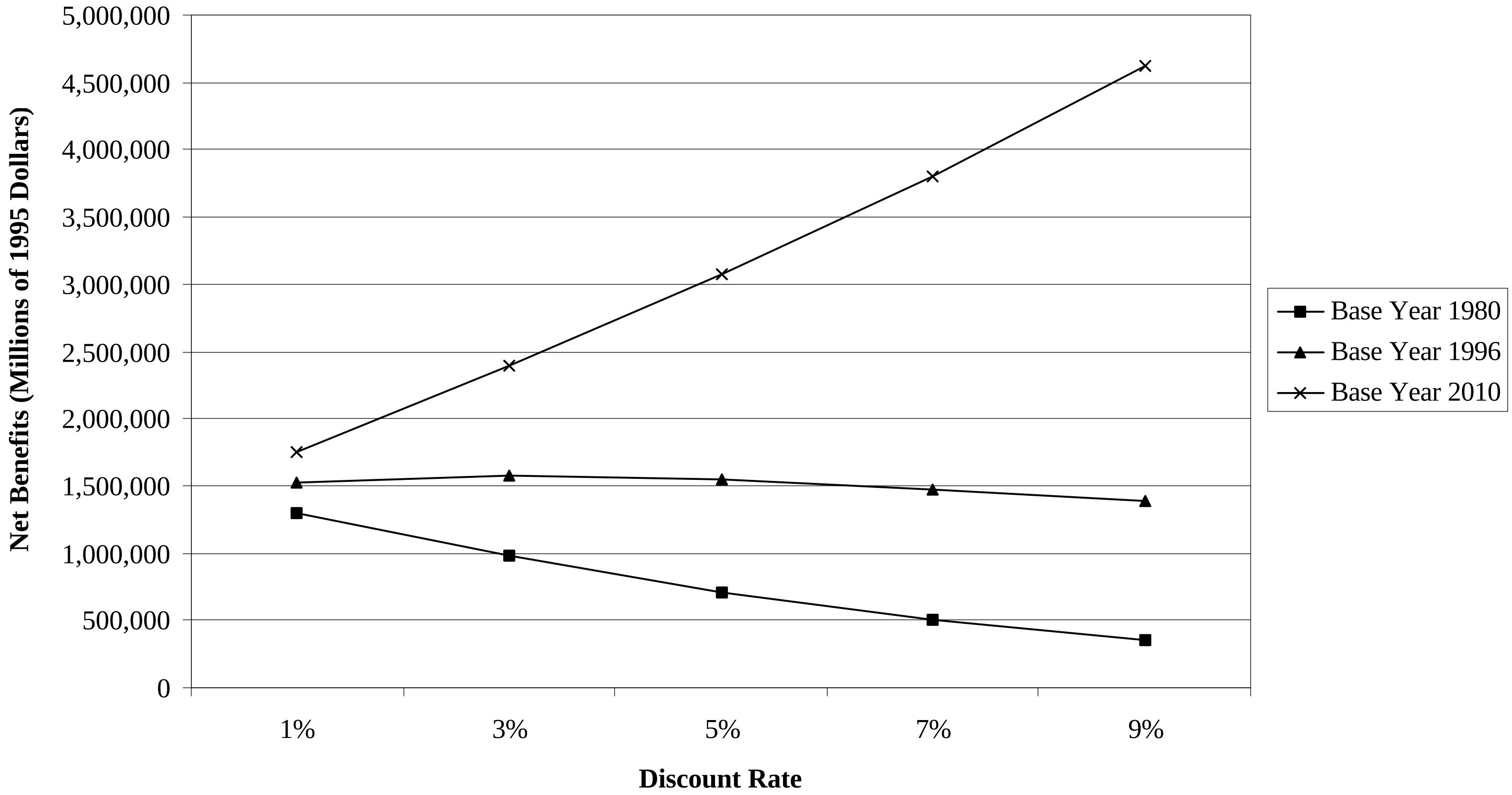
Varying the base year for the present value calculation has a significant effect on the magnitude of the estimates. It was necessary to choose a base year to standardize the data, but the choice was difficult because the benefits and costs of regulations accrue over different periods of time from 1981 onwards, and therefore have different base years. The choice of an earlier base year than 1996, the year that I chose for this analysis, lowers the net benefits of regulations because the value of benefits in the future decreases for regulations promulgated later. If I use a different base year, all net benefits would change by a factor of $(1 + r)^t$, where r is the discount rate and t is the difference between the new and the original base year. For example, using a 5 percent discount rate and 1980 as a base year instead of 1996, the analysis would yield the present value of net benefits at roughly half the original estimate. Similarly, using 2010 as the base year would nearly double the present value estimate. This analysis suggests that the aggregate benefit numbers need to be treated with great care because there is no obvious choice for a base year. I chose 1996 for the base case because that was the "present" for my analysis. I could just as easily have chosen 1980 or 1981, however, in which case I would have obtained a substantially lower estimate.

In addition, the choice of a base year greatly affects how net benefits vary with changes in the discount rate. Figure 2 shows the net benefits as a function of the discount rate for base years 1980, 1996, and 2010. Table 6 shows how total net benefits vary with changes in the discount rate. For the 1980 case, all parts of the benefit-cost stream are discounted backward because all rules are implemented after 1980. In addition, as Figure 1 shows, the aggregate net present value of benefits from regulations implemented in any given year is positive for most years.[46] Therefore, I observe a

45. In general, as the discount rate increases, future costs and benefits are valued less. If benefits occur farther in the future than costs, which is generally the case, net benefits should also decrease. The opposite should hold true when the discount rate is decreased. In this calculation, however, certain components of health benefits actually increase in value with higher discount rates. This means that the net benefits of a rule can increase or decrease with changes in the discount rate, which is what I observe here.
46. The exceptions are 1982, 1983, 1986, 1987, and 1996. But the values are much smaller than the positive values of other years.

Figure 2: Aggregate Net Benefits of Final Regulations as a Function of the Discount Rate

(Base Case Benefits Values)



decline in net present value as the discount rate increases.[47] In contrast, for the 2010 case, most parts of the benefit-cost stream would be discounted forward, so I observe an increase in net benefits as the discount rate increases. For 1996, the base year used in the calculations of this paper, some parts of the benefit-cost stream are discounted forward while others are discounted backward. The net effect is that net benefits do not change much with changes in the discount rate.[48] Varying values for other parameters, such as average age of death, latency periods, and derivation of the fatality index, generally has a less pronounced effect on the results.

Why Some Regulations are More Efficient than Other Regulations

A regulation's benefit-cost ratio or its estimated cost-effectiveness are measures of its efficiency. If society is spending its regulatory resources efficiently, it is maximizing the net benefits of regulation. While cost-effectiveness estimates and benefit-cost ratios are not better measures of efficiency than net benefits estimates, they allow the comparison of regulations if the information about regulatory costs and benefits is insufficient to estimate net benefits. In environmental, health, and safety regulation, a common definition of cost-effectiveness is the resources used for each statistical life saved by the regulation.[49] A benefit-cost ratio is the sum of the benefits and cost savings from a regulation divided by the costs of the regulation. In this section, I use cost-effectiveness estimates and benefit-cost ratios primarily to examine factors that could explain the variation in regulatory efficiency.

47. The intuition can be drawn by evaluating a set of positive cash flows over time, say from 1980–2010. First, take the present value of that stream (analogous to a base year of 1980). As the discount rate increases, the present value goes down because each component of the benefit stream decreases in value. Next, consider a future value of that stream in 2010 (analogous to a base year of 2010). By the same logic, each component increases with an increase in the discount rate. Finally, a base year in between 1980 and 2010 increases some early values in the stream and reduces the later values. I cannot know the result of varying the discount rate without making further assumptions about the nature of the benefit stream.
48. For the 1996 base year, net benefits actually increase by a small amount as the discount rate increases when it is low.
49. Another measure, frequently used in environmental regulation, is the cost per ton of pollutant reduction. This measure is typically used for Clean Air Act regulations. I use the cost per life saved measure because it applies to a broader class of regulations in the database. Neither measure includes some of the benefits from ecosystem protection that agencies cannot easily quantify.

Cost-Effectiveness Estimates as a Measure of Regulatory Efficiency

The regression analysis based on cost-effectiveness estimates shows that: 1) regulations that address cancer risks are generally less cost-effective than other regulations; 2) cancer regulations promulgated by the EPA appear less cost-effective than other cancer regulations; 3) it is difficult to measure whether the Office of Information and Regulatory Affairs (OIRA) has increased the efficiency of the regulatory process[50]; and 4) the cost-effectiveness of regulations does not vary systematically over time.[51] Figure 3 graphs the logarithm of the cost-effectiveness of each regulation, identified by the year of promulgation, against time.[52] Figure 3 shows that the cost-effectiveness of regulation exhibits a wide variation over time, within agencies and across agencies. Cost-effectiveness estimates range from $60,000 to $38 billion per life saved, with a median value of about $6 million per life saved. To put the cost-effectiveness estimates in perspective, if the government spent the entire Gross National Product (GNP) on reducing accidental deaths and environmentally induced cancers, the maximum the government could spend per life saved is $68 million.[53] If I applied that

---

50. President Carter created the OIRA with the Paperwork Reduction Act of 1980, but the Act was not implemented until the end of 1980. For the purpose of the analysis, I therefore assumed that OIRA was created January 1, 1981. Before Reagan introduced the RIA requirement in 1981, data on the benefits and costs of regulations were sparse. As a result, the Hahn-Morrall dataset contains estimates for only 10 rules from the period 1967 to 1980, while there are estimates for 71 rules from 1981 to 1995.

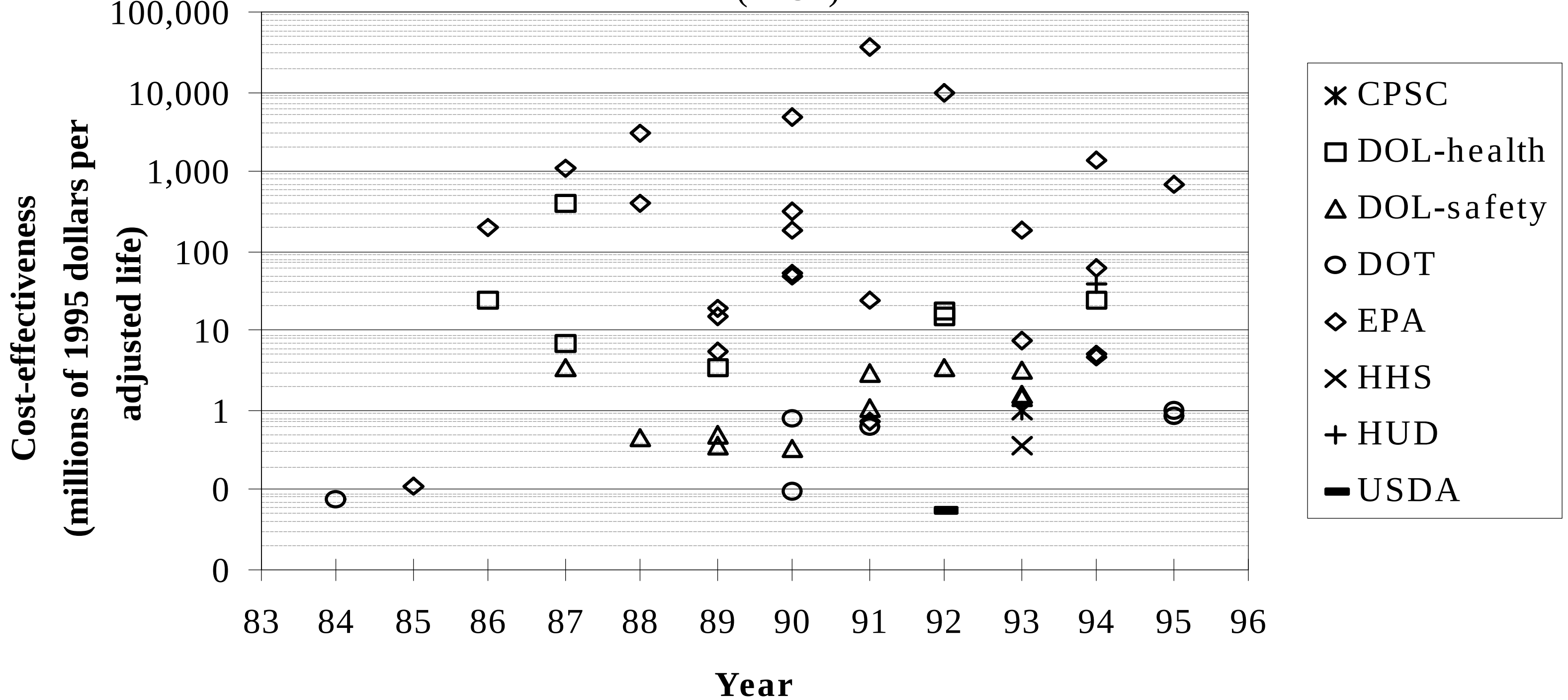
51. To calculate the cost-effectiveness of regulations, I use a methodology similar to that of Morrall, Tengs and Graham, and Tengs et al. See Morrall (1986), Tengs and Graham (1996), and Tengs et al. (1994). I define costs as direct, or gross, costs. I define effectiveness in terms of "adjusted" lives and life-years. Lives and life-years are adjusted to account for significant nonfatal diseases and injuries by using the fatality index discussed in my earlier work. I compute cost-effectiveness by dividing the annualized cost by the annualized lives or life-years saved as a result of the regulation. I use "life-years" instead of "lives" because life-years better account for the effect of a premature death or variation in the number of years an individual must live with the consequences of a nonfatal injury or disease. For example, the use of life-years accounts for the fact that a child has more years of life remaining than an elderly person. The discount rate for the base case is 5 percent.

52. As with the calculation of the net benefits discussed earlier in the paper, modification of key parameters can significantly impact cost-effectiveness estimates and therefore the results of the analysis. My cost-effectiveness estimates do not appear sensitive to changes in key parameters. Changes in the parameters did not result in differences greater than an order of magnitude. The sensitivity analysis also did not modify the relative ranking of rules based on the cost-effectiveness estimates.

53. I base this estimate on data from 1993. The Gross National Product estimate is from the Council of Economic Advisers (1997), and I adjusted it to 1995 dollars. The number of deaths from both cancer and accidents are from the U.S. National Center for Health Statistics (1995). I assume that 2 percent of cancer deaths are induced by environmental causes (Ames and Gold, 1996).

Figure 3: Cost-effectiveness of Selected Final Environmental, Health, and Safety Regulations

(n=52)



"GNP test" to all final regulations, one-fourth—thirteen of fifty-

two—would fail. For the EPA, one-half—twelve of twenty-four—would fail the test.[54] In other words, for a significant number of regulations, the government would exhaust the GNP simply by investing in regulations aimed at reducing a small portion of the cancer risk faced by society. Such imprudent investments leave no money for the basic necessities of life. The high cost-effectiveness estimates and the variability in cost-effectiveness across regulations and agencies suggest that there is significant potential for achieving much greater risk reduction at a lower cost to society, a point made by several authors.[55]

Table 7 summarizes three cost-effectiveness regressions and one benefit-cost ratio regression.[56] One of the cost-effectiveness regressions is based on the data assembled for this study, and the other two combine data from the study with data from earlier studies by Morrall.[57] The dependent variable in all regressions is the natural logarithm of the cost-effectiveness of regulation.[58] For the Hahn regression, I used the natural logarithm of the cost per life-year saved and for the Hahn-Morrall pooled regression I used the natural logarithm of the cost per life saved.[59] I also used slightly different estimates for the cancer variable in the Hahn regression. The Hahn-Morrall OIRA regression adds a dummy variable for regulations promulgated before the creation of OIRA to the

54. Seven of the rules that would not pass are regulations from the Resource Conservation and Recovery Act.

55 . See, for example, Goklany (1992), Morrall (1986), Tengs and Graham (1996), and Hahn (1996).

56. The benefit-cost ratio regression is discussed further in the next section.

57. I evaluated 52 final regulations, and Morrall evaluated 29 final regulations. Before pooling these regulations, I tested for structural stability between the Hahn data and the Morrall data by applying the Chow test. I could not reject the null hypothesis that the two regressions are the same. Hence, pooling of the data is reasonable. The regulations represent only a fraction of the regulations evaluated by Hahn and Morrall, who respectively evaluated 144 and 47 final regulations. The regulations used in the regression are the only ones for which it was possible to calculate cost-effectiveness, however. The agency did not estimate benefits for a large number of the regulations, for example, which made the calculation of cost-effectiveness impossible. Eighteen regulations overlapped between Hahn's database and Morrall's database. For the Hahn-Morrall pooled regression, I used the Hahn estimates for the overlapping regulations. Of the overlapping eighteen regulations, four of the cost-effectiveness estimates differed by more that an order of magnitude. I believe that this difference is the result of Morrall's adjustments to the agency's numbers, since I took the agency's numbers as given. Morrall adjusted the agency numbers on the basis of a detailed analysis of specific rules to correct agency errors (Morrall, 1986). I ran a regression with Morrall's estimates for the overlapping regulations, and the results of the regression did not change. My cost-effectiveness analysis has an advantage over Morrall's analysis because a third party can more easily reproduce it.

58. I initially used the value for cost-effectiveness, but none of the results were significant. The logarithmic function narrows the range on cost-effectiveness and provided a better fit to the data.

59. The Hahn-Morrall Pooled regression uses cost per life saved because the cost per life-year saved data are not available for the Morrall estimates.

Table 7: Regression Results[a]

Cost-Effectiveness[b]	*n*	R^2	Constant	Year		Cancer		EPA-Cancer		OIRA	
Hahn	52	0.662	-181.72	0.089	(.9)	3.62*	(4.1)	2.17*	(2.5)		
Hahn-Morrall	81	0.643	-91.1	0.05	(1.3)	3.76*	(6.21)	1.06*	(1.7)		
Hahn-Morrall/OIRA	81	0.652	-215.6	0.11*	(1.9)	3.67*	(6.1)	1.21*	(1.9)	1.38	(1.4)
Benefit-Cost Ratio[c]	***n***	R^2	**Constant**	**Year**		**Health**		**EPA-Health**			
Hahn	105	0.172	-277.0	0.14	(1.5)	-3.19*	(-2.7)	-0.36	(-.4)		

a. All regressions use only final rules. All variables with a t-statistic that is significant at the 10 percent level using a two-tailed test are marked with a (*). T-statistics are shown in parentheses.

b. The dependent variable in the Hahn cost-effectiveness regression is the natural logarithm of the cost per adjusted life-year saved. The dependent variable in the Hahn and Morrall pooled cost-effectiveness regression is the cost per life saved. Life-years and lives are adjusted based on a fatality index created by Viscusi (1992). See description in text for more information.

c. The dependent variable in the Hahn benefit-cost ratio regression is the natural logarithm of the adjusted benefit-cost ratio. The benefit-cost ratio is defined as the sum of benefits and cost savings divided by gross costs. The benefits include life-years and lives saved, which are adjusted based on a fatality index created by Viscusi (1992). See description in text for more information. The logarithm is adjusted by a small constant to include zero values.

Hahn-Morrall pooled regression. I used only final regulations for all regressions.[60] I tested the following hypotheses: 1) cancer regulations are less cost-effective than other regulations; 2) cancer regulations promulgated by the EPA are less cost-effective than other cancer regulations; 3) regulations promulgated before the creation of the Office of Information and Regulatory Affairs are less cost-effective than other regulations;[61] and 4) regulations have decreased in cost-effectiveness over time, as measured by the date the agency published the rule in the *Federal Register*.[62]

I expected a regulation designed to reduce the risk of cancer would be less cost-effective than other regulations because agencies appear to regulate cancer risks more stringently than noncancer risks. Agencies may, for example, regulate cancer risks more stringently because of public "dread" of cancer risks, which may translate into political support for cancer regulations.[63] The median cancer regulation is over seventy times as costly per life saved as the median noncancer regulation.[64] On the basis of a review of the data and research of other economists, I also expected that cancer regulations promulgated by the EPA are less cost-effective than other cancer regulations. Figure 3,

[60] Since this analysis contains only final rules, there are 13 fewer observations than the Hahn-Morrall pooled regression in Hahn (1996) because that regression included proposed and rejected rules. I decided to use only final rules because the agency's estimates of the benefits and costs may change significantly between proposed and final rules, and because agencies may never finalize some proposed rules. The agency did not take final action on eleven of the proposed rules I reviewed, for example. A general examination of these rules suggests that as the cost-effectiveness of a rule increases, it is less likely an agency will take final action on that rule. The basis for an agency's decision not to take final action is often unclear, however, and it is possible that poor cost-effectiveness is not the primary reason. I am hesitant to attribute such agency decisions to enlightened agency behavior or effective OIRA oversight as Viscusi (1996) suggests. The EPA, for example, withdrew a 1992 proposed rule to revise a program related to enhanced monitoring requirements for vehicles although the rule was relatively cost-effective. It is possible that other factors influence an agency's decision not to take action, but identification of these factors was beyond the scope of my study. Moreover, the number of no-action rules I examined is small and comprises primarily a series of EPA rules to reduce health risk from benzene in 1989 and 1990. It is difficult to draw defensible conclusions from such a small sample. To test the influence of proposed rules, I included proposed rules for which agencies provided estimates in the Hahn and the Hahn-Morrall pooled regressions. The explanatory power of the model decreased as a result of including proposed rules. I also included a dummy variable for proposed rules in both regressions. The dummy variable was not significant in either model.

[61] President Carter established the Office of Information and Regulatory Affairs in the OMB with the Paperwork Reduction Act of 1980. The original purpose of the Office of Information and Regulatory Affairs was to improve the efficiency and effectiveness of government operations, including review of proposed regulations and changes in agency procedures. President Reagan and President Clinton eventually expanded the review responsibilities of the Office of Information and Regulatory Affairs to include review of regulatory impact analyses of proposed and draft final rules.

[62] Morrall's data includes some minor rules as well as some regulations before the development of formal RIAs, while the Hahn data includes only "major" regulations and "economically significant" regulations, as defined by Reagan's Executive Order 12291 and Clinton's Executive Order 12866.

[63] Public perception of risk and its influence on agency priorities has been extensively discussed in the literature. See, for example, Slovak et al. (1985), Viscusi and Magat (1987), and Sunstein (1996).

[64] Noncancer regulations in the database primarily are regulations pertaining to health risk resulting from lead poisoning and poor nutrition. These regulations are widely regarded as relatively cost-effective compared to other regulations.

suggests that EPA regulations in general are relatively poor in terms of cost-effectiveness compared with the regulations of other agencies. The median final EPA regulation costs about $120 million per life saved, more than eight times higher than the median for DOL health regulations and more than eighty times higher than the median for all other agencies.[65] It is not clear from Figure 3, however, whether EPA regulations are less cost-effective because they are EPA regulations, or because they are cancer regulations.[66] I further expected that regulations promulgated before the creation of the OIRA are less cost-effective than regulations promulgated after the creation of OIRA because of the positive impact of OIRA review of draft regulations. I only tested this variable in the Hahn-Morrall pooled regression because my original dataset does not contain any regulations prior to the creation of OIRA. Finally, I presumed that cost-effectiveness declines over time as agencies use the low-cost options for saving lives first, although new scientific information about risk or the introduction of new technologies to reduce risk could reverse this effect.

The results of the Hahn regression and the two regressions based on the Hahn-Morrall pooled data are similar. Cancer is the only variable that is highly significant in all three regressions.[67] The magnitude of the difference in cost-effectiveness between cancer regulations and other social regulations is somewhat surprising. My analysis suggests that cancer regulations are approximately 42 times less cost-effective than other regulations. Cancer regulations could be as little as five time less cost-effective or as great as 142 times less cost-effective than other social regulations.[68] There is some evidence that EPA cancer regulations are less cost-effective than other cancer regulations, but it is not convincing because the coefficient is only marginally significant.[69] The results from the

65. This finding excludes one HUD safety rule addressing improved wind standards for manufactured housing. The cost-effectiveness of the rule is approximately one-fourth that of the median EPA regulation. Although that rule ranks poorly in terms of its cost-effectiveness, it actually results in net cost savings when the agency considers extensive property damage losses. Therefore, I do not include the rule in that comparison.

66. Out of 33 total EPA regulations in the database, 29 are cancer regulations. Forty out of the 81 total regulations in the database are cancer regulations.

67. A coefficient is "marginally significant" if it is significant at the 10 percent level by using a two-tailed *t*-test, "significant" if it is significant at the 5 percent level, and "highly significant" if it is significant at the 1 percent level.

68. The interpretation of this and other regression coefficients is based on the conversion of the coefficients from the natural logarithm. The range is based on a calculation of a 95% confidence interval.

69. To measure whether EPA cancer regulations are less cost-effective than other cancer regulations, I included an interaction variable for EPA and Cancer in the original regression. The EPA-Cancer variable and the Cancer variable are highly correlated (correlation coefficient = .75), however, so I expected some instability in the model. I was somewhat surprised that the EPA-Cancer variable was marginally significant in the Hahn-Morrall pooled regression. The EPA-Cancer variable was highly significant in a regression that did not include the Cancer variable, however.

Hahn-Morrall pooled regression show that cancer regulations are approximately twice as cost-effective as EPA cancer regulations, although the EPA cancer regulations could be slightly more cost-effective than other cancer regulations or as much as nine times less cost-effective.[70] More research is necessary to determine whether EPA cancer regulations are more or less cost-effective than other cancer regulations.[71]

Contrary to my expectations, the OIRA variable is not significant.[72] The lack of evidence of OIRA's impact on the process appears to result from of a lack of observations prior to the creation of OIRA and the difficulty of finding an appropriate measure of OIRA's impact. It is unclear why OIRA review does not significantly affect cost-effectiveness estimates, although it is probably a function of the lack of adequate data prior to the creation of OIRA.[73] Only 10 rules in the Hahn-Morrall data set were promulgated before the creation of OIRA. Alternatively, it is possible that the data mask the impact of OIRA because agencies simply did not propose or finalize rules for several years after the creation of OIRA. For example, there were no cost-effectiveness estimates for regulations in the Hahn-Morrall pooled dataset for 1981 and 1982, the first two years after the creation of OIRA. Another possibility is that it is difficult to measure the impact of OIRA from information on the benefits and costs of final rules. The impact of OIRA may, for example, be integrally tied to the actions of high-level political officials related to delaying, modifying and rejecting rules. These actions are not easily observed. It is also difficult to measure how the cost-effectiveness of a regulation might have changed as a result of suggestions made by OIRA to the agencies. Further analysis is therefore necessary to determine the extent to which OIRA has had an impact on the cost-

In addition, the EPA-Cancer variable was statistically significant in the Hahn regression. The standard errors of both the EPA-Cancer variable and the Cancer variable in both the Hahn and the Hahn-Morrall pooled regression increase relative to regressions in which only one of the variables is included, which is probably a result of the collinearity.

70. Again, the range is calculated based on a 95% confidence interval.

71. In addition, the data may be biased. The dataset could include, for example, EPA regulations that are among the most cost-effective of all EPA rules because the EPA did not quantify the costs and benefits of less cost-effective rules. Alternatively, some EPA rules that are very cost-effective may not be in the database because the EPA promulgated them before Reagan's Executive Order required agencies to submit information on the costs and benefits of regulations.

72. The results of the regression on Morrall's complete data set, described in Hahn (1996), are similar to the results of the Hahn and the Hahn-Morrall Pooled regressions. The cancer variable is significant and the EPA variable is insignificant in the 1996 Morrall regression, although the year variable is significant.

73. I present the regression with the OIRA variable only to stimulate discussion about how to quantitatively measure its impact. The OIRA variable and the Year variable are highly correlated (correlation coefficient = -.77), and as a result the model is unstable. As a result of this instability, I believe, the year variable in this model is significant.

effectiveness of regulations.[74]

The evidence that the year of promulgation does not influence cost-effectiveness is strong, and the result is consistent with Figure 3. Figure 3 shows that the cost-effectiveness of regulations as a function of time does not follow any obvious pattern.[75] The result could arise for several reasons. New hazards continuously emerge, for example, that may result in relatively cost-effective regulation. In addition, differences in the priorities of different administrations could affect cost-effectiveness estimates.[76] Another possible explanation is simply that concerns with cost-effectiveness rarely drive agencies' agendas. Instead, they are driven by laws that Congress passes as well as crises that spring up from time to time. I have found some evidence that agencies do not set priorities on the basis of relative risks or cost-effectiveness. For example, the EPA only recently began seriously examining the relative rankings of risks.[77] Even to this day, the agency has done very little work on prioritizing regulations in terms of cost-effectiveness. The same is true of most other agencies. Another possible explanation is that social regulation already reached the point of diminishing returns by the early 1980s. Congress passed most of the major environmental statutes, such as the most comprehensive versions of the Clean Water Act and the Clear Air Act, in the early 1970s. A time series dating back to the early 1970s might therefore show a time trend. Finally it is possible that technological improvement lowers the cost of meeting some regulatory objectives.

---

74. The OIRA variable was not significant in any specification of the model presented in this paper, including a model in which the only independent variables were the cancer variable and the OIRA variable. I also tried to capture the impact of the regulatory impact analysis requirement in Reagan's Executive Order 12291 and Clinton's Executive Order 12866. I created dummy variables for each of these orders. According to my results, neither order significantly affected cost-effectiveness estimates. This result is probably also related to the lack of observations prior to 1981, however.

75. The pattern over time appears to be driven in part by the type of rules promulgated in a particular year. Specific agencies often prepare analyses with similar characteristics. All National Highway Traffic Safety Administration rules, for example, estimated health benefits but did not monetize those benefits, while all HHS rules estimated and monetized benefits and passed a benefit-cost test.

76. I also tested whether the the political affiliation of the administration affected cost-effectiveness estimates, but there is no significant relationship. This result may be a function of the definition of the variable. Many rules developed under one administration are promulgated under a subsequent one, but I used the year of promulgation to determine to link each regulation with a particular administration. The Clinton administration, for example, promulgated many of the rules associated with the 1990 Clean Air Act Amendments Congress passed during the Bush administration. I further tested the hypothesis that rules promulgated during election years are less cost-effective than other regulations, as believed by many diligent observers of the regulatory process, but my results indicate that the election year also does not significantly affect cost-effectiveness. Again, this result may be a consequence of the limitations of the data. More work must be done to determine whether these variables impact regulatory efficiency.

77. Environmental Protection Agency (1987b).

Benefit-Cost Ratios as a Measure of Regulatory Efficiency

The benefit-cost ratio regression includes regulations with no quantified benefits and regulations with air pollution reduction benefits that are not included in the cost-effectiveness estimates, and therefore provide an alternative measure of regulatory efficiency.[78] The results of the benefit-cost ratio regression, presented in Table 7, support the results of the cost-effectiveness regressions. Regulations that reduce the risk of cancer, heart disease, and lead poisoning (termed "health" regulations) have lower benefit-cost ratios than regulations that reduce the risk of car, fire, or work-related accidents ("safety" regulations). In addition, it appears EPA health regulations have lower benefit-cost ratios than other health regulations. Finally, the benefit-cost ratios of regulations do not vary systematically over time.

A benefit-cost ratio is the sum of benefits and cost savings divided by gross costs.[79] The benefit-cost ratio database contains 105 regulations, 24 more than the cost-effectiveness regression.[80] The regression is based only on data collected for this study, and does not include regulations from the Morrall database used for the cost-effectiveness regressions. The benefit-cost ratio regression uses the natural logarithm of the benefit-cost ratio as the dependent variable.[81] It also uses a health variable

78. I only included air pollution reduction benefits because the agencies did not generally quantify any benefits from pollution reduction other than from air pollution reduction. According to the EPA, these benefits are large and may therefore significantly affect the results of the regression. Pollution reduction benefits can change the cost-effectiveness estimates by orders of magnitude and in some cases can even change the sign of the estimates. See Hahn (1996, 229) for details. The benefit-cost ratios of regulations with air pollution benefits are affected by my general valuation of air pollution reduction benefits, however, discussed earlier in this paper. These benefits are subject to a great deal of uncertainty because of our incomplete understanding of the science and the difficulty of measuring society's willingness to pay for improvements in air quality. Moreover, the willingness-to-pay estimates could vary dramatically depending on the level of pollution and the location.

79. I have fifty-two final rules with data on cost-effectiveness and net benefits. A comparison of the natural logarithms of the standard measures of cost-effectiveness and the benefit-cost ratio revealed a correlation of −.80 when costs savings are included in the measurement of the benefit-cost ratio and −.96 when cost savings are excluded. This suggests that the measures result in a relatively similar ranking of rules for that particular case.

80. The benefit-cost ratio regression contains the same 52 regulations for which Hahn-Siskin estimates of cost–effectiveness are also available. It further contains an additional 53 regulations, 32 of which have no quantified benefits, and 21 of which have quantified benefits only from air pollution. I ran a regression using only the 52 regulations that were also used in the Hahn cost-effectiveness regression, and the results of my benefit-cost ratio regression did not change. The R-squared of the benefit-cost ratio regression with only 52 regulations increased from .17 to .31 relative to the regression with 105 regulations, however.

81. I transformed the logarithmic function by adding a small constant (.001) to include rules with no benefits or cost savings. Changing the size of the constant did not significantly affect my results.

instead of the cancer variable used in the cost-effectiveness regressions.[82] Of the 105 regulations in the database, 84 are health regulations. The regulations span from 1982 to 1996, but 67% of the regulations are from 1990 to 1996. There are 25 regulations in the database with zero benefits because the agency did not quantify benefits or cost savings, but did include some estimate of the costs of the regulation.[83] While most of the benefit-cost ratios for regulations are low (57% of regulations have a ratio is less than 1), there are eight benefit-cost ratios in the database that range from 12 to 61. Of these eight regulations, five are safety regulations and three are health regulations.

Similar to the cost-effectiveness regressions, the benefit-cost ratio regression was designed to test the hypotheses that health regulations are less efficient than other social regulations, that EPA health regulations are less efficient than other health regulations, and that the benefit-cost ratios of regulations have decreased over time. The results of the benefit-cost ratio regression are similar to the cost-effectiveness regressions because the health variable is significant, and the EPA variable and the year variable are both insignificant. The signs on both the EPA and the health variable are negative, as expected. The analysis strongly suggests that health regulations have lower benefit-cost ratios than other regulations, but there is less support for the hypothesis that EPA health regulations have lower benefit-cost ratios than other regulations because of complications from collinearity.[84]

The results of the regressions may be affected by the limitations of the original data. Although this analysis is more comprehensive than any other analysis to date, the regressions are based on only a subset of my original database because of the absence of cost and benefit estimates for the majority of the regulations. In addition, technological advancements and scientific discoveries may reveal that agencies originally understated the benefits of existing rules. Finally, variation in the assumptions agencies and program offices use to estimate benefits and costs affect the results of such analytical exercises. These regressions are therefore primarily designed to provide an initial starting point from

82. As a result of the broad range of qualitative health benefits, the specification of many EPA rules into cancer and noncancer categories is difficult. The health variable includes all cancer regulations, in addition to regulations that reduce the risk from lead poisoning and heart disease. A few rules do not clearly fit into either the health or the safety category. Examples include U.S. Coast Guard rules to reduce the frequency and severity of oil spills and USDA rules that address the treatment and care of animals. I dropped these rules from the regression.

83. Eliminating these regulations from the regression did not change the results.

84. Like the cost-effectiveness regressions, however, the EPA-Health variable and the Health variable are highly correlated (correlation coefficient = .71). Out of the 84 health regulations in the database, 69 are EPA health regulations. Not surprisingly, the EPA-Health variable is highly significant in a regression that excludes the Health variable. The Health variable is also highly significant in a regression that excludes the EPA-Health variable.

which to launch a more thorough investigation of the factors that influence the efficiency of regulations.

III. Statutory Restrictions on Regulations and Economic Efficiency

Information on the political forces that affect regulations may explain some variability in regulatory efficiency. Political forces affect the efficiency of regulations because each statute is the result of a debate between legislators that reflects the beliefs of individual representatives as well as the prevailing degree of public support for regulatory reform. The result of the heated and often partisan debate is a significant amount of variation in the stringency of statutory balancing requirements, which should determine the degree to which agencies balance the costs and benefits of regulations. To determine whether balancing requirements affect regulatory outcomes, I first examined the degree to which statutes allow agencies to consider benefits and costs as they design regulations.[85] I then compared the net benefits of regulations promulgated under the different statutes. I find that statutory limitations appear to have little effect on the efficiency of rules.

The statutory language that requires agencies to consider benefits and costs varies tremendously across and even within statutes, and the language is often ambiguous.[86] Agencies and courts have determined that some statutes preclude agencies from considering costs. Numerous environmental, health, and safety statutes, such as the Occupational Safety and Health Act and most parts of the Clean Air Act, restrict the use of benefit-cost analysis in regulatory decisionmaking. Congress attempted to address widespread concern about statutory restrictions on balancing benefits and costs with a "supermandate" provision in many of the regulatory reform bills proposed in the 104th Congress. A supermandate provision means that the balancing language in the regulatory reform bill will supplement and, to the extent they conflict, will supersede requirements of authorizing statutes. The bill proposed by the 104th Congress required agencies to apply a limited benefit-cost test

85. See, for example, Magat, Krupnick, and Harrington (1986).
86. While the CAA prohibits the EPA from considering costs or welfare benefits when it sets primary national ambient air quality standards, the agency is required to consider such factors as technical feasibility, affordability, and cost-effectiveness in setting standards for motor vehicles and new or modified stationary sources.

to proposed and final regulations.[87] To examine the possible effect of restrictions on the expected benefits from regulations, I place statutes into two categories—statutes that allow balancing and statutes that do not allow or restrict balancing.[88] While the categorization is crude, the methodology allows a rough comparison of rules resulting from the two types of statutes. The balancing language in two statutes, the Resource Conservation and Recovery Act and safety standards under the Occupational Safety and Health Act does not specify whether the agencies should consider benefits and costs during the rulemaking process. These agencies have, however, often interpreted the statutes to limit the consideration of costs.[89] Hence, I consider two scenarios—one that designates the two statutes as a separate category and one that includes the two statutes in the "Balancing Not Allowed/Restricted" category. I then use the information from the regulatory scorecard and the net benefits of regulations to sort the regulations into different categories as shown in Table 8. I hypothesize that rules from limiting statutes are less economically efficient than rules resulting from other statutes. Hence, a lower percentage of those rules would pass a benefit-cost test.[90]

The analysis leads to the following conclusions. First, the degree to which agencies can consider benefits and costs varies tremendously and is often dependent on agency interpretation. Second, most rules are authorized under statutes that allow limited balancing.[91] Many of these rules are EPA rules. Third, while the type of analysis conducted across and within agencies varies

---

87. See, for example, *Risk Assessment and Cost Benefit Act of 1995*, 104th Cong., 1st sess., H.R. 1022, and *Comprehensive Regulatory Reform Act of 1995,* 104th Cong., 1st sess., S. 343. The language in the House version is stronger.
88. For that categorization, I relied on Environmental Protection Agency (1987a), Fraas (1991), Rhomberg (1997), and Downing (1995).
89. In *International Union, UAW* v. *OSHA*, 938 F.2d 1310 (1991), the District of Columbia Circuit Court remanded OSHA's interpretation of the Occupational Safety and Health Act, which was restricted only by "feasibility," and suggested that benefit-cost analysis was consistent with the language of the act (Office of Technology Assessment 1995). Environmental Protection Agency (1987a) indicates that, while the Resource Conservation and Recovery Act is silent with regard to the appropriate consideration of costs, benefits and costs not related to human health and the environment should not be considered in rulemaking.
90. Since agencies are required by executive orders to estimate and, to the extent feasible, to quantify the benefits and costs of all major rules, I would not expect significant differences in the completeness of analyses.
91. On the basis of the rules reviewed in the regulatory scorecard, more than 60 percent of rules clearly falls into that category while an additional 18 percent of rules arguably would be placed in that category.

Table 8: Statuatory Limitations on Balancing

	Agency Analyses[a]		Author's Calculations[b]	
	Number of Rules	Benefits Exceed Costs	Number of Rules	Benefits Exceed Costs
I. Balancing Allowed[c]	15	20%	15	47%
II. Balancing Not Allowed/Restricted[d]	71	14%	63	37%
III. Unclear [e]	25	32%	19	53%
Subtotal II and III[f]	96	19%	82	40%

a. Based on an analysis of all final rules from 1982 through mid-1996. These are the same final rules used in Table 1 and Table 2.

b. Based on an analysis of final rules from 1982 through mid-1996. These are the same rules used to calculate aggregate net benefits. The results of the net benefits analysis are separated by agency in Table 4 and Table 5.

c. Statutes include Oil Pollution Act (DOT), Transportation Safety Act (DOT), Federal Insecticide, Fungicide, and Rodenticide Act (EPA), Toxic Substances Control Act (EPA), and Food, Drug, and Cosmetic Act (HHS). Note that FIFRA does not limit the balancing of benefits and costs in general rulemaking. The statute does, however, place such limits in setting registration requirements. The FIFRA rules that apply to registration requirements are therefore placed in the "Balancing Not Allowed/Restricted" category.

d. Statutes include Occupational Safety and Health Act (DOL), Clean Air Act (EPA), Comprehensive Environmental Response, Compensation, and Liability Act (EPA), Clean Water Act (EPA), Federal Insecticide, Fungicide and Rodenticide Act (EPA), and Safe Drinking Water Act (EPA).

e. Statutes include Occupational Safety and Health Act (DOL) and Resource Conservation and Recovery Act (EPA).

f. The subtotal represents all statutes that could arguably be placed in the "Balancing Not Allowed/Restricted" category.

tremendously, rules from statutes without limitations on balancing pass a benefit-cost test according to agency analyses more frequently than do rules from statutes with limitations (48 percent versus 15 percent).[92] Such a pattern does not hold within the EPA.[93] Fourth, a clear pattern does not emerge when I examine the frequency that rules pass a benefit-cost test according to my calculations (50 percent versus 38 percent).[94] The analysis of the frequency of rules that pass a benefit-cost test in different categories is quite sensitive to the valuation of health and welfare benefits. The percentage of Clean Air Act rules that pass a benefit-cost test, for example, drops from 54 percent to 20 percent when I use the low valuation of pollution benefits.

Although this preliminary analysis suggests that statutory limitations appear to have little effect on the efficiency of rules, the results must be interpreted with care. My analysis uses very crude measures for the degree to which statutes constrain agencies. Moreover, isolating the impact of any single factor in the complex regulatory process is difficult, as the statistical analysis in the previous section shows. Finally, my analysis does not attempt to measure the efficiency gains associated with alternatives the agencies did not select or consider as a result of the restrictions.[95]

IV. The Influence of Regulatory Impact Analyses on the Regulatory Process

Scholars have undertaken less work to determine the impact of RIAs on the regulatory process than to identify analytical flaws in analyses. Since the impact of RIAs is difficult to measure, the literature has only provided anecdotal evidence of impacts on the process. In a few cases, for

---

92. That result is probably driven by the fact that rules from statutes without limitations more frequently monetized benefits (48 percent versus 22 percent). The comparison is 48 percent versus 18 percent when OSHA-safety and Resource Conservation and Recovery Act rules are included in the “with limitations” category.

93. None of the rules authorized by the Federal Insecticide, Fungicide and Rodenticide Act and the Toxic Substances Control Act—the two statutes that allow benefit-cost balancing—pass a benefit-cost test. Almost 18 percent of other EPA rules pass a benefit-cost test according to agency calculations.

94. The comparison is 50 percent versus 42 percent when OSHA-safety and Resource Conservation and Recovery Act rules are included in the "with limitations" category. In addition, when nonstandardized yet monetized benefits are included in the base case, the comparison is 59 percent versus 38 percent.

95. Provisions under the executive orders and the Unfunded Mandates Reform Act of 1995 require agencies to choose the least burdensome alternative to a regulation, or describe in the rule making record why the agency did not select the least burdensome alternative. Agencies are not required to quantify the efficiency losses from not choosing the least burdensome alternative, however. In addition, sometimes choose the least burdensome alternative from a pre-defined set of alternatives that exclude potentially efficiency enhancing approaches to regulation.

example, RIAs have had a substantial impact and led to more efficient rulemaking.[96] In other cases, RIAs did not aid the rulemaking process, or agencies just used the RIAs to help justify political decisions. Furthermore, agencies often could not use the RIAs because some statutes preclude the balancing of benefits and costs or the consideration of costs. To address the gap in the academic literature, I applied a benefit-cost test to the regulations in my database. The purpose of the test is to determine whether agencies appear to use information on the relationship between benefits and costs to make regulatory decisions. I expected that a high percentage of the regulations would pass a benefit-cost test if agencies consistently use the RIA information to make decisions. I found, however, that the majority of regulations do not pass a benefit-cost test. I also surveyed agency officials to get a sense of the internal view of the impact of economic analysis on the regulatory process. My preliminary research suggests that economic analysis does not have a significant impact on the regulatory process, although more research is necessary to fully evaluate the impact.

For the purpose of this analysis, a rule passes a benefit-cost test if the quantified monetary benefits exceed quantified costs. Table 9 shows the fraction of regulations that agencies stated would pass a benefit-cost test, and that I found would pass a benefit-cost test after I standardized the agency's numbers.[97] I found that agencies stated that a rule passes a benefit-cost test for 23 percent of all rules—39 of 168. Agencies did not monetize benefits for many of these rules, however. Nine rules pass a benefit-cost test without monetizing benefits because of net cost savings. Of the rules for which the agency monetized benefits, 75 percent—30 of 44—pass a benefit-cost test.[98] Of the twenty-six EPA rules that monetize benefits, fifteen pass the benefit-cost test. An additional four rules pass the test without monetizing benefits because of significant cost savings.

Since agencies often did not monetize benefits and used different assumptions to estimate

---

96. RIAs tend to have a greater impact on the process if they contain relatively complete estimates of benefits and costs, and if agencies use the RIA information in the early stages of the rulemaking process. For example, scholars frequently refer to an EPA rule to reduce lead in gasoline as an RIA that influenced the agency's decision because it was thorough and well-prepared. See, for example, Fraas (1991). For a good study of several RIAs, see also Morgenstern (1997).

97. My analysis of the benefits and costs of regulations is based not only the government's numbers, but also on my assumptions concerning a discount rate and valuation of benefits. Since agencies used a variety of assumptions to estimate costs and benefits, it was necessary to use a consistent discount rate and the values for benefits to compare regulations and aggregate net benefits.

98. Five rules out of the forty-four rules that pass a benefit-cost test with monetized benefits pass a benefit-cost test on the basis of net cost savings or monetized benefits. An additional three rules pass a benefit-cost test if I use the more favorable range of agency's calculations to estimate benefits and costs.

Table 9: Rules Passing a Benefit-Cost Test[a]

	TOTAL	CPSC	DOL Health	DOL Safety	DOT	EPA	HHS	HUD	USDA
ALL RULES[b]	168	1	15	13	13	115	5	2	4
Agency Found Benefits Exceed Costs	23%	100%	7%	38%	31%	17%	100%	100%	50%
FINAL RULES[c]	106	1	9	10	9	70	3	1	3
Monetized Benefits Exceed Costs	43%	100%	33%	100%	78%	31%	33%	100%	33%
PROPOSED RULES	30	n.a.	3	1	3	19	2	1	1
Monetized Benefits Exceed Costs	43%	n.a.	33%	100%	33%	42%	100%	0%	0%

	TOTAL	CAA	CERCLA	CWA	FIFRA	RCRA	SDWA	TSCA
ALL EPA RULES[d]	115	62	5	14	2	19	8	5
Agency Found Benefits Exceed Costs	17%	16%	0%	21%	0%	16%	25%	20%
FINAL EPA RULES[e]	70	35	5	8	2	11	5	4
Monetized Benefits Exceed Costs	31%	54%	0%	0%	0%	18%	20%	0%
PROPOSED EPA RULES	19	10	n.a.	4	n.a.	2	3	n.a.
Monetized Benefits Exceed Costs	42%	60%	n.a.	25%	n.a.	0%	33%	n.a.

a. The following acronyms are used in the table: CPSC=Consumer Product Safety Commission; DOL=Department of Labor; DOT=Department of Transportation; EPA=Environmental Protection Agency; HHS=Department of Health and Human Services; HUD=Department of Housing and Urban Development; USDA=United States Department of Agriculture, CAA=Clean Air Act; CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; CWA=Clean Water Act; FIFRA=Federal Insecticide, Fungicide, and Rodenticide Act; RCRA=Resource Conservation and Recovery Act; SDWA=Safe Drinking Water Act; TSCA=Toxic Substances Control Act.

b. This calculation is based on the universe of rules introduced in Table 1. It includes 121 final rules and 47 proposed rules. The number of rules presented in the table is the total number of rules in the database. The percentage estimate is the percent of total rules for which the agencies stated the benefits exceed the costs.

c. The calculation for final rules and proposed rules is based on the universe of rules introduced in Table 4. There are 16 fewer final rules and 17 fewer proposed rules than are included in the calculation for "All Rules" because I excluded some regulations. See footnote 36 in the text for a description of excluded rules.

d. The calculation for all EPA rules is based on the universe of rules introduced in Table 2. It includes 82 final rules and 33 proposed rules.

e. The calculation for final and proposed EPA rules is based on the universe of rules introduced in Table 5. There are 12 fewer final rules and 14 fewer proposed rules because I excluded some regulations. See footnote 36 in the text for a description of excluded rules.

benefits, I standardized the agency estimates and applied the benefit-cost test again. Table 9 shows that 43 percent of all final rules—46 of 106—pass a benefit-cost test after I standardized the agency numbers. Table 9 also shows that three of thirty-five final EPA regulations would pass a benefit-cost test for statutes other than the Clean Air Act. Nineteen of thirty-five final regulations would pass for the Clean Air Act. In addition, forty-three percent of proposed rules—13 of 30—also pass the test. Absent my adjustment to the agency's numbers, 25 percent of proposed rules—12 of 47—and 22 percent of final rules—27 of 121—pass a benefit-cost test. The higher number of rules that pass with my standardized estimates is largely because I monetize benefits in several cases that the agencies did not monetize benefits. While all regulations addressing safety risks pass a benefit-cost test, regulations addressing health and environmental risks pass less frequently. In the case of OSHA, for example, only three of nine final health regulations would pass a benefit-cost test. In the case of the EPA, only twenty-two of seventy would pass such a test.

Table 10 shows how the number of rules passing a benefit-cost test varies with assumptions about the discount rate and the valuation of benefits. The number of rules that pass a benefit-cost test is most dependent on the value of the benefits. When I use low values at a 5 percent discount rate, fifteen fewer final rules pass a benefit-cost test than in the base case. This result is predominantly driven by the values of air pollution reduction, as twelve fewer Clean Air Act rules pass the test.[99] When I use high values at a 5 percent discount rate, four additional rules from the Clean Air Act pass a benefit-cost test. In other words, changes in the value of a unit of air pollution reduction have a marked effect on the net benefits of Clean Air Act rules. The analysis also reveals that the number of rules passing a benefit-cost test does not change dramatically when I vary the discount rate for a given value of benefits.

Varying values for other parameters, such as average age of death, latency periods, and derivation of the fatality index, generally does not have a pronounced effect on the number of rules that pass a benefit-cost test. The number of rules that pass a benefit-cost test does not change when I value lives instead of life-years, for example. Similarly, while over 65 percent of the benefits from

99. In assessing individual regulations, I view the values for pollution reduction used here as very rough approximations. For example, if many of the proposed emission reductions occur in areas that are already in compliance with the air quality standards, the values used in the base case probably overstate the benefits. One example where the benefits are likely to be overstated is for reductions in nitrogen oxide emissions in the Northeast.

Table 10: The Number of Rules Passing a Benefit-Cost Test[a]

	Discount Rate		
Value of Benefits	**3%**	**5%**	**7%**
Low Values	31	31	31
Base Values	45	46	45
High Values	50	50	49

a. The table shows the number of rules passing a benefit-cost test under various assumptions about the discount rate and the value of benefits.A rule passes a benefit-cost test if the benefits of the rule exceed the costs. The analysis is based on standardized agency estimates of net benefits.

NHTSA are nonfatal, all of the final rules still have positive net benefits, even when I quantify only benefits from reduced fatalities. This sensitivity analysis suggests that my estimates of the number of rules that pass a benefit-cost test are relatively robust.[100]

In addition to varying key parameters, there are other factors that the reader should consider when interpreting my results. To calculate net benefits, I treat a regulation as a single unit of analysis. Such treatment does not show parts of a regulation that fail a benefit-cost test, or could be improved, even when the impact of the entire rule is positive. Thus, simply because a regulation has positive net benefits does not mean that the agency has maximized net benefits or that the agency could not have improved the regulation. The EPA, for example, could have achieved significantly higher net benefits had it refined its rule to reduce exposure to copper and lead in drinking water. Similarly, the OSHA could have refined its rule to limit asbestos to achieve very similar results at a much lower cost.[101]

My analysis thusfar implies that agencies do not seriously consider the relationship between benefits and costs when making regulatory decisions. I cannot fully support this conclusion because of the degree of uncertainty associated with the estimates of the benefits and costs of regulation, outlined in the preceding section. Also, measuring the impact of the RIA is difficult because it requires extensive interviews with agency officials. I performed some sensitivity analysis of my final tallies because of this uncertainty. The analysis of the information provided in RIAs provides only summary information about the use of economic analysis in the rulemaking process, and excludes independent agencies since they are not covered by either Reagan's Executive Order 12291 or Clinton's Executive Order 12866.

To obtain more specific information about the impact of economic analysis in executive branch and independent agencies, I interviewed current and past agency officials and examined agency dockets, annual reports, and individual rules and decisions. I focused on the procedures that federal agencies employ to catalog information on the benefits and costs of future and existing regulatory activities.[102] This analysis complements a survey conducted by Thomas

100. The only exception to that observation is the number of CAA rules that pass a benefit-cost test with changes in the value of pollutant reduction.
101. Hahn (1996, 223–34).
102. The survey is designed to estimate the impact of future agency actions and to evaluate existing programs. Regulatory activities covered include major and minor rulemaking as well as other activities, such as licensing, enforcement, letters of opinion, administrative orders, and exemptions.

Table 11: Federal Regulatory Agencies' Efforts to Catalog Cost and Benefit Information

Agency[a]	Estimates of the Future Costs and Benefits of New Regulatory Activities		Aggregate Estimates of the Costs and Benefits of Regulatory Activities[b]
Executive	*Major Rules*[c]	*Non-Major Actions*[d]	
Department of Agriculture	Partial	No evidence	No
Department of Commerce*	Partial	No evidence	No
Department of Energy*	Partial	No evidence	No
Department of Housing and Urban Development	Partial	No evidence	No
Environmental Protection Agency	Partial	Partial	Partial
Food and Drug Administration	Partial	Partial	No
National Highway Traffic Safety Administration	Partial	Partial	Partial
Occupational Safety and Health Administration	Partial	Partial	No
Independent			
Commodity Futures Trading Commission	No		No
Consumer Product Safety Commission	Partial		No
Federal Communications Commission	No		No
Federal Energy Regulatory Commission	Partial		No
Federal Trade Commission	No		No
Federal Reserve Board	No		No
Federal Deposit and Insurance Corporation	No		No
Nuclear Regulatory Commission	Partial		No
Securities and Exchange Commission	No		No
Surface Transportation Board*[e]	No		No

a. For agencies marked with a (*), I have relied primarily on Bliley (1996).

b. This category does not imply that an agency does not have enough information to estimate aggregate costs and benefits, but rather that an agency does not provide this information. For example, executive agencies may be able to put together a rough calculation of aggregate costs and benefits by compiling RIA estimates.

c. All executive branch agencies are required to prepare RIAs for major or economically significant rules. The analyses do not, however, always include comprehensive or complete estimates of costs and benefits. Hence, they are characterized as "partial."

d. Some agencies frequently estimate the costs and benefits of non-major actions. Unfortunately, my examination of the non-major universe is not exhaustive. Thus, I am not able to describe the size of the subset of non-major rules for which costs and benefits have been estimated. For other agencies, I have found no evidence that estimates are provided for non-major actions.

e. The Interstate Commerce Commission was abolished and replaced by the Surface Transportation Board in 1996.

J. Bliley, Jr., chairman of the House Committee on Commerce.[103] In 1996, Congressman Bliley sent a survey to federal agencies under the committee's jurisdiction.[104] The survey asked the agencies to explain how they accounted for costs in the regulatory process and requested a list of documents describing that information for fiscal year 1995 and earlier years.

Table 11 summarizes the results from the agencies surveyed by Bliley and Hahn. The table is divided into two parts; the first covers executive agencies, and the second covers independent agencies. For executive agencies, the table reports the extent to which they estimate the benefits and costs of new major rules and nonmajor rules and activities. In addition, the table reports whether the agency has attempted to provide aggregate estimates of the economic impacts of its regulations. The second part of the table is the same as the first except that it does not distinguish between major and nonmajor rules, since independent agencies are not subject to oversight under the executive orders. For the most part, I found that the agencies at least superficially comply with economic analysis requirements. All eight of the executive branch agencies I analyzed prepare RIAs for major rules. In addition, some of those agencies, such as OSHA, many operating agencies within the DOT, and the EPA, estimate the benefits and costs of a subset of nonmajor rules and activities. Of the independent agencies, only the CPSC and the Nuclear Regulatory Commission generally estimate the benefits and costs of rules and licensing activities.[105] Only a limited number of agencies systematically evaluate the benefits and costs of existing regulatory activities, however. None of the independent agencies provides such cumulative estimates.[106] Of all the executive branch agencies, only the NHTSA and the EPA provide that information. These two agencies provide only partial estimates, however. The NHTSA along with the Federal Highway Administration have routinely estimated the cumulative impacts of their programs over time.[107] The EPA has estimated the historical cost of all environmental regulation as well as benefits and costs of particular programs.[108] The table reveals that agencies provide very limited information on the benefits and costs of individual regulations. Moreover, only two agencies attempt to provide aggregate estimates of the impacts of their regulatory programs.[109]

Although agencies rarely provide estimates of aggregate benefits and costs, many review existing programs under statutory requirements, agency initiatives, legislation, and executive programs. While agencies have previously provided measures of success, such as the reduction in the number of pages in the Code of Federal Regulations, they have generally not completed thorough assessments of the effectiveness of such review efforts. In what is probably the most rigorous review

103. See Bliley (1997) and Furchtgott-Roth (1996).
104. The agencies include the Consumer Product Safety Commission, the Department of Commerce, the Department of Energy, Department of Health and Human Services, the Environmental Protection Agency, the Federal Communications Commission, the Food and Drug Administration, the Federal Energy Regulatory Commission, the Federal Trade Commission, the Interstate Commerce Commission, the Nuclear Regulatory Commission, the Occupational Safety and Health Administration, the Securities and Exchange Commission, and the Surface Transportation Board.
105. See Nuclear Regulatory Commission (1995). Although primarily a law enforcement agency, the Federal Trade Commission has requirements in place to examine the projected benefits and any adverse economic effects of rules (Bliley 1997, 114). In addition, the Federal Energy Regulatory Commission has completed benefit-cost analyses of recent rules associated with the restructuring of the natural gas and electricity industries.
106. Both the Consumer Product Safety Commission and the Nuclear Regulatory Commission indicated, however, that they could calculate the total costs of regulations to their agency, other government agencies, and the private sector (Bliley 1997).
107. See National Highway Traffic Safety Administration and Federal Highway Administration (1991).
108. See Environmental Protection Agency (1990, 1996). As discussed previously, those estimates are often incomplete and may be methodologically flawed and systematically biased. See, for example, Hahn (1996).
109. Most agencies probably have some information on the impact of their programs, but have not compiled it because Congress or the White House does not require agencies to present such information to the public.

program among all agencies, the NHTSA continually reviews the effectiveness of existing regulations and often examines whether it has realized the projected benefits and costs.[110] Without a comprehensive examination, which is beyond the scope of this study, it is almost impossible to quantify the real savings that have resulted from agency reviews of their existing regulatory structure.[111] Thus, I remain skeptical of the benefits that agencies claim to have produced from those programs.

V. Conclusions and Policy Recommendations

My analysis of the impact of federal regulatory activities on the economy shows that the net benefits of regulation are positive, that less than half of final regulations pass a strict benefit-cost test, that the quality of agency regulatory impact analyses is poor, and that the efficiency of regulations varies depending on the agency and the type of risk the regulation is designed to reduce. In sum, society could spend its regulatory dollars more wisely, and a system to allocate regulatory dollars efficiently does not exist. To improve the regulatory process, Congress and the White House must enforce the economic analysis requirements they support in public. They must take advantage of existing reform proposals designed to improve agency decision making, based on decades of work by regulatory scholars.[112] The success of such efforts requires high-level political support, adherence to established principles of benefit-cost analysis, and rigorous review of agency analyses of regulations by an independent entity.[113]

This study, along with the work of other scholars, suggests that agencies must improve the quality of regulatory impact analyses. Agencies could dramatically improve the quality of RIAs by standardizing assumptions across analyses, providing a better treatment of uncertainties, defining baselines clearly, using peer-reviewed scholarship when available, and presenting results clearly.[114] In addition, agencies could use retrospective studies of actual impacts to complement prospective studies. Such analyses would provide a better assessment of actual benefits and costs than agencies currently provide, and would help agencies improve prospective analytical techniques. The improvement of regulatory impact analyses is important, but it is only one component of a larger reform effort. An effective reform effort requires law makers to establish principles for reform and then to identify a feasible reform agenda. Elsewhere, I articulate those principles in more detail with my colleagues and offer an agenda for reform.[115] Here, I summarize two key points.

First, regulatory reform should increase the accountability of elected officials for the regulations they support. Regulations frequently impose costs on society–sometimes as much as billions of dollars annually–that are higher than many direct government expenditure programs. To a large extent, federal bureaucrats now make many regulatory decisions with the tacit acquiescence

---

110. See Katzen (1994).
111. When the Government Performance and Results Act of 1993 is fully implemented, I may have more complete information to assess the effectiveness of agency review programs. Under the act, agencies are required to prepare strategic plans, comprehensive mission statements, and annual program evaluations.
112. See, for example, Arrow et al. (1996).
113. See e.g., Smith (1984), Arrow et al. (1996), Graham and Wiener (1995, Chapter 11).
114. For more detailed discussions of those improvements, see Arrow et al. (1996), Hahn (1996), and the Office of Management and Budget (1996).
115. See, for example, Arrow et al. (1996) and Crandall et al. (1997).

of legislators, the president, or both. One way society can hold elected officials accountable, for example, is if information on the benefits and costs of regulations is accessible on the Internet. Agencies could, for example, make all regulatory impact analyses available on-line. The government should also provide more information on the benefits and costs of regulation. An annual regulatory accounting statement produced by the OMB or the Council of Economic Advisers (CEA), or both, is a step in the right direction.[116] Such a statement should initially focus on the incremental benefits and costs of regulations, but the OMB or CEA could also develop estimates of the aggregate impacts of regulation where feasible. Congress should require both executive branch agencies and independent regulatory agencies to help produce such estimates. If agencies examine carefully the economic impacts of their regulations on real people more carefully, I believe they will develop more effective and less wasteful regulation.

Second, regulatory reform should place greater emphasis on protecting the economic well-being of consumers and producers. As this analysis has shown, the economic benefits and costs of a regulation are often not a decisive factor in determining whether to implement a rule. It is critical for policymakers to consider significant economic impacts when designing a regulation. Congress must revisit the original statutes and limit the scope of federal regulation to activities that agencies can justify on economic grounds. Congress should also consider establishing a congressional or independent agency responsible for replicating key findings used to support regulations before agencies finalize the regulations.

In a sense, my recipe for reform is deceptively simple. Some would say it is simplistic. It calls for better information to make legislators more accountable and a larger role for economic analysis in both the design and implementation of laws designed to protect the public health and welfare. Congress is already starting to require agencies to provide more and better information about regulatory decisions. Given today's political climate, a larger role for economic analysis may not be possible. I hope, however, that as the public increasingly understands the importance of economic analysis, law makers will respond by allowing economics to play a more prominent role in the regulatory process. If Congress helps agencies to more effectively target social regulation, Americans will continue to enjoy a high standard of living and know that their government is able to tackle the nation's most important social problems. If Congress continues to allow agencies to create regulations without adequate attention to the full economic consequences, the standard of living that most citizens enjoy will slowly but surely erode. I offer my simple reform agenda in the hope of engaging legislators and policymakers interested in taking constructive action to improve the regulatory process.

116. Hahn and Litan (1997).

References

Ames, Bruce N., and Lois S. Gold. 1996. "The Causes and Prevention of Cancer: Gaining Perspectives on Management of Risk." In *Risks, Costs, and Lives Saved: Getting Better Results from Regulation,* ed. Robert W. Hahn. New York and Washington, D.C.: Oxford University Press and AEI Press.

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. *Benefit-Cost Analysis in Environmental, Health, and Safety Regulation: A Statement of Principles.* Washington, D.C.: AEI Press.

Bliley, Thomas J., Jr. 1997. *Survey of Federal Agencies on Costs of Federal Regulations,* Staff report prepared for the Committee on Commerce, U.S. House of Representatives. Washington, D.C.: Government Printing Office.

Breyer, Stephen G. 1993. *Breaking the Vicious Circle: Toward Effective Risk Regulation.* Cambridge, MA: Harvard University Press.

Council of Economic Advisers. 1997. *Economic Report of the President, 1997.* Washington, D.C.: Government Printing Office.

Crandall, Robert W., Christopher DeMuth, Robert W. Hahn, Robert E. Litan, Pietro S. Nivola, and Paul R. Portney. 1997. *An Agenda for Federal Regulatory Reform.* Washington, D.C.: AEI Press and Brookings Institution Press.

Downing, Donna M. 1995. "Cost Benefit Analysis and the 104th Congress: Regulatory Reform, 'Reg-icide,' or Business as Usual?" Master's thesis, George Washington University, National Law Center, Washington, D.C.

Environmental Protection Agency. 1987a. *EPA's Use of Benefit-Cost Analysis 1981–1986*. Washington, D.C.: Government Printing Office.

______. 1987b. *Unfinished Business: A Comparative Assessment of Environmental Problems*. Washington, D.C.: Government Printing Office.

Fraas, Arthur. 1991. "The Role of Economic Analysis in Shaping Environmental Policy." *Law and Contemporary Problems* 54: 113–25.

Furchtgott-Roth, Harold. 1996. "Neglect of Costs in Federal Regulation: Benign or Malignant." Paper presented at conference, Regulatory Reform: Making Costs Count, December 9, at American Enterprise Institute, Washington, D.C.

General Accounting Office, Resources Community and Economic Development Division. 1984. "Benefit-Cost Analysis Can Be Useful in Assessing Environmental Regulations, Despite Limitations." RCED-84-62, April 6.

______, General Government Division. 1997. "Regulatory Reform: Agencies' Efforts to Eliminate and Revise Rules Yield Mixed Results." GGD-98-3, October 2.

______, Resources, Community, and Economic Development Division. 1998. "Regulatory Reform: Agencies Could Improve Development, Documentation, and Clarity of Regulatory Economic Analyses." RCED-98-142, May 26.

______, General Government Division. 1999. "Regulatory Reform: Some Agencies' Claims Regarding Lack of Rulemaking Discretion Have Merit." GGD-99-20, January 8.

Goklany, Indur. 1992. "Rationing Health Care While Writing Blank Checks for Environmental Hazards." *Regulation* (Summer): 14–15.

Goodstein, Eban. 1995. "Benefit-Cost Analysis at the EPA." *Journal of Socio-Economics* 24(2): 375–89.

Gore, Al. 1995. *Common Sense Government: Works Better and Costs Less*, Third report of the National Performance Review. Washington, D.C.: Government Printing Office.

Graham, John and Jonathan B. Wiener. 1995. *Risk v. Risk: Tradeoffs in Protecting Health and the Environment.* Cambridge and London: Harvard University Press.

Grubb, W. Norton, Dale Whittington, and Michael Humphrey. 1984. "The Ambiguities of Benefit-Cost Analysis: An Evaluation of Regulatory Impact Analyses under Executive Order 12291." In *Environmental Policy under Reagan's Executive Order: The Role of Benefit-Cost Analysis*, ed. V. Kerry Smith. Chapel Hill and London: University of North Carolina Press.

Hahn, Robert W. 1996. "Regulatory Reform: What Do the Government's Numbers Tell Us?" In *Risks, Costs, and Lives Saved: Getting Better Results from Regulation*, ed. Robert W. Hahn. New York and Washington, D.C.: Oxford University Press and AEI Press.

______. 1998. "Government Analysis of the Benefits and Costs of Regulation." *Journal of Economic Perspectives* 12: 201-10, Fall.

______. 1998. *State and Federal Regulatory Reform: A Comparative Analysis,* Working Paper 98-3. Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies. November.

Hahn, Robert W., and John A. Hird. 1991. "The Costs and Benefits of Regulation: Review and Synthesis." *Yale Journal on Regulation* 8: 233–78.

Hahn, Robert W., and Robert E. Litan. 1997. *Improving Regulatory Accountability*. Washington, D.C.: AEI Press and Brookings Institution Press.

______. 1998. *An Analysis of the Second Government Draft Report on the Costs and Benefits of Federal Regulations*, Working Paper 98-1. Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies. September.

Harrington, Winston, Richard D. Morgenstern, and Peter Nelson. 1999. *On the Accuracy of Regulatory Cost Estimates*, Discussion Paper 99-18. Washington, D.C.: Resources for the Future. January.

Harrison, David, Jr., Albert L. Nichols, John S. Evans, and Douglas J. Zona. 1992. *Valuation of Air Pollution Damages*. Cambridge: National Economic Research Associates.

Hopkins, Thomas D. 1991. *Cost of Regulation,* RIT Public Policy Working Paper. Rochester, NY: Rochester Institute of Technology.

Howard, Philip K. 1995. *The Death of Common Sense: How Law Is Suffocating America*. New York: Random House.

Katzen, Sally. 1994. "The First Year of Executive Order No. 12866." Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C., December 20.

Litan, Robert E., and William D. Nordhaus. 1983. *Reforming Federal Regulation.* New Haven: Yale University Press.

Lutter, Randall W. 1998. *An Analysis of the Use of EPA's Clean Air Benefit Estimates in OMB's Draft Report on the Costs and Benefits of Regulation*, Comment 98-2. Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies. October.

Magat, Wesley, Alan Krupnick, and Winston Harrington. 1986. *Rules in the Making: A Statistical Analysis of Regulatory Agency Behavior.* Washington, D.C.: Resources for the Future.

Morgenstern, Richard D., ed. 1997. *Economic Analysis at EPA: Assessing Regulatory Impact*. Washington, D.C.: Resources for the Future.

Morrall, John F. 1986. "A Review of the Record." *Regulation* 10: 25–34. November–December Updated by the author.

National Highway Traffic Safety Administration and Federal Highway Administration. 1991. *Moving America More Safely: An Analysis of the Risks of Highway Travel and the Benefits of Federal Highway, Traffic, and Motor Vehicle Safety Programs*. Washington, D.C.: Government Printing Office.

Nichols, Albert L. 1997. "Case Study: The RIA for the 1985 Lead-in-Gasoline Phasedown." In *Economic Analysis at EPA: Assessing Regulatory Impact,* ed. Richard D. Morgenstern. Washington, D.C.: Resources for the Future.

Nuclear Regulatory Commission. 1995. *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,* Final report, NUREG/BR-0058 Revision 2. Washington, D.C.: Government Printing Office.

Office of Management and Budget. 1988. "The Role of Regulatory Impact Analysis." Regulatory Program of the United States Government, Executive Office of the President, April 1, 1987–March 31, 1988.

______. 1996. "Economic Analysis of Federal Regulations Under Executive Order No. 12866." Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. January 11.

______. 1998. "Report to Congress on the Costs and Benefits of Federal Regulations." Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C..

Palmer, Karen, Wallace E. Oates, and Paul R. Portney. "Tightening Environmental Standards: The Benefit-Cost or the No-Cost Paradigm?" *Journal of Economic Perspectives* 9: 119-132. Fall.

Porter, Michael and Class van der Linde. 1995. "Toward a New Conception of the Environment-Competitiveness Relationship." *Journal of Economic Perspectives* 9: 97-118. Fall.

Rhomberg, Lorenz. 1997. "Federal Agency Risk-Assessment and Risk-Management Practices." In *Risk Assessment and Risk Management in Regulatory Decision-Making.* Final Report of the Commission on Risk Assessment and Risk Management, vol. 2. Washington, D.C.: Commission on Risk Assessment and Risk Management

Rowe, Robert D., Lauraine G. Chestnut, Carolyn M. Lang, Stephen S. Bernow, and David E. White. 1995. *The New York Environmental Externalities Cost Study: Summary of Approach and Results.* Boulder, CO: RCG Hagler Bailly, January.

Rusin, Michael, Robert C. Anderson, Thomas J. Lareau, G. Prasad Rao and Arthur Wiese. 1996. *Analysis of the Costs and Benefits of Regulation: A Review of Historical Experience,* Discussion Paper No. 804R, Policy Analysis and Strategic Planning Department. Washington, D.C.: American Petroleum Institute. December.

Slovic, Paul, Baruch Fischoff, and Sarah Lichtenstein. 1985. "Regulation of Risk: A Psychological Perspective," in *Regulatory Policy and the Social Sciences,* ed. Roger Noll. Berkeley, CA: University of California Press.

Smith, V. Kerry, ed. 1984. *Environmental Policy Under Reagan's Executive Order: The Role of Benefit-Cost Analysis.* Chapel Hill and London: The University of North Carolina Press.

Sunstein, Cass R. 1996. "Congress, Constitutional Moments, and the Cost-Benefit State." *Stanford Law Review* 48(2): 247-310.

Tengs, Tammy, and John D. Graham. 1996. "The Opportunity Costs of Haphazard Social Investments in Life-Saving." In *Risks, Costs, and Lives Saved: Getting Better Results from Regulation*, ed. Robert W. Hahn. New York and Washington, D.C.: Oxford University Press and AEI Press.

Tengs, Tammy, Miriam E. Adams, Joseph S. Pliskin, Dana Gelb Safran, Joanna E. Siegel, Michael C. Weinstein, and John D. Graham. 1994. *Five Hundred Life-Saving Interventions and Their Cost-Effectiveness*. Cambridge: Harvard Center for Risk Analysis.

U.S. National Center for Health Statistics, Center for Disease Control and Prevention. 1995. "Monthly Vital Statistics Report: Advance Report of Final Mortality Statistics, 1992." Vol. 43, No. 6, Supplement, March 22.

Van Houtven, George L., and Maureen L. Cropper. 1994. "When Is a Life Too Costly to Save?" Policy Research Working Paper 1260, World Bank, Environment, Infrastructure, and Agriculture Department.

Viscusi, W. Kip. 1992. *Fatal Tradeoffs: Public and Private Responsibilities for Risks*. New York: Oxford University Press.

Viscusi, W. Kip. 1993. "The Value of Risks to Life and Health." *Journal of Economic Literature* 31: 1912-46. December.

Viscusi, W. Kip. 1996. "The Dangers of Unbounded Commitments to Regulate Risk." In *Risks, Costs, and Lives Saved: Getting Better Results from Regulation*, ed. Robert W. Hahn. New York and Washington, D.C.: Oxford University Press and AEI Press.

Viscusi, W. Kip and Wesley A. Magat. 1987. *Learning About Risk*. Cambridge: Harvard University Press.

Weidenbaum, Murray. 1997. "Regulatory Process Reform." *Regulation* (Winter): 20–26.

Weidenbaum, Murray, and Robert DeFina. 1978. *The Cost of Federal Regulation of Economic Activity*. American Enterprise Institute Reprint No. 88. Washington, D.C.: American Enterprise Institute.

Winston, Clifford. 1993. "Economic Deregulation: Days of Reckoning for Microeconomists." *Journal of Economic Literature* 31: 1263–89.

Winston, Clifford. 1998. "U.S. Industry Adjustment to Economic Deregulation." *Journal of Economic Perspectives* 12: 89-110. Summer.