Report to Congress
On the Costs and Benefits of Federal Regulations

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Introduction

This is the Office of Management and Budget's third report to Congress on the costs and benefits of Federal regulations.[1] As prescribed by Section 638(a) of the 1999 Omnibus Consolidated and Emergency Supplemental Appropriations Act (the Act), this report contains "an accounting statement and associated report," including:

> "(1) an estimate of the total annual costs and benefits (including quantifiable and nonquantifiable effects) of Federal rules and paperwork, to the extent feasible:
>
> (A) in the aggregate;
>
> (B) by agency and agency program; and
>
> (C) by major rule;
>
> "(2) an analysis of impacts of Federal regulation on State, local, and tribal government, small business, wages, and economic growth; and
>
> "(3) recommendations for reform.

In accordance with Section 638 (b), (c), and (d) of the Act, OMB has taken steps to:

> "(b) . . . provide public notice and an opportunity to comment on the statement and report,
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> "(c) . . . issue guidelines to agencies to standardize (1) measures of costs and benefits and (2) the format of accounting statements, and
>
> "(d) . . . provide for independent and external review of the guidelines and each accounting statement and associated report under this section."

In early October 1999, OMB prepared a draft of the guidelines referenced in Section 638(c) of the Act above and asked nine "independent and external reviewers" to provide comments.[2] In late October 1999, we then sent these draft guidelines to the agencies for comment and for their use in reporting the costs and benefits of their regulations. After revising the guidelines based on the comments from peer reviewers and the agencies, OMB issued the final guidelines as a Memorandum to

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[1] This report uses the terms "rule" and "regulation" interchangeably.

[2] The peer reviewers are listed in the Appendix.

the Heads of Departments and Agencies (M-00-08), dated March 22, 2000.[3] The Memorandum states the following: "The agencies are to use these guidelines in preparing the 'accounting statements' on the benefits and costs of regulations that OMB can then include in a report to Congress on the benefits and costs of Federal regulation." Furthermore, a key purpose of the Guidelines is to help agencies evaluate the consequences of regulatory action by providing a formal way to organize evidence on the relevant effects of the various alternatives considered during rulemaking. In this way, the regulatory action will be more transparent to the public, the regulated entities, Congress, and to other parts of the Executive Branch of the Federal government.

On January 7, 2000, we published a notice in the *Federal Register* announcing that the draft report was available both on our internet site and in hard copy or electronic form by request. [4] On February 11, 2000, we published the draft report in the *Federal Register* and scheduled the close of the comment period for January 21, 2000 (which we subsequently extended to February 22, 2000).

This final report revises the draft report based on the comments received from invited peer reviewers, members of the public, Federal agencies, and Members of Congress. The report is based on information provided by the agencies pursuant to Section 638(c) of the Act as well as other information from the agencies such as regulatory impact analyses for major rules and published reports on regulatory programs. In preparing the final report, we also relied upon peer-reviewed, published literature from outside of government.

Chapter I describes the selection of peer reviewers, their comments, and how we incorporated the comments in the report. It also identifies the public comments, summarizes them, and explains our responses to them.

Chapter II presents our estimates of the total annual aggregate costs and benefits of all current Federal regulations and paperwork. It also presents an analysis of the impacts of Federal regulation on State, local, and tribal government, small business, wages, and economic growth. Finally, Chapter II presents our estimates of the total annual aggregate costs and benefits by agency of the major final regulations issued between April 1, 1995 and March 31, 1999.

Chapter III uses agency regulatory impact analyses to present quantitative estimates and qualitative descriptions of the benefits and costs of the 44 major rules issued by Federal agencies for which we concluded review during the 12- month period between April 1, 1998 and March 31, 1999.

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[3] The Memorandum is reproduced in the Appendix and is on our web site as http://www.whitehouse.gov/OMB/memoranda/m00-08.pdf.

[4] The draft report is available at http://www.whitehouse.gov/OMB/fedreg/cbdraftreport2000.pdf.

This "regulatory year" (i.e., beginning in April and ending in March) is the same period we used for the first two reports.

Chapter IV presents our estimates of the costs and benefits of major Federal regulations for which we concluded review during the period April 1, 1995 to March 31, 1999. We included only the regulations for which we had quantitative information on both costs and benefits and used agency data as a starting point to produce our estimates. Consistent with the requirements of the Act, we use standardized measures of costs and benefits in order to produce estimates that could be more readily compared to each other. This information is used in our aggregate and agency-specific estimates of the total annual costs and benefits of Federal regulation in Chapter II.

Chapter V presents ten recommendations for reform of specific Federal regulations and describes new procedures we are directing agencies to follow that should provide a sounder foundation for estimating and presenting the costs and benefits of Federal regulations. These procedures are based in part on suggestions of several peer reviewers and members of the public seeking to make the regulatory development process more transparent and easier to follow for the public.

Finally, we provide an appendix that includes OMB Memorandum M-00-08: *Guidelines to Standardize Measures of Costs and Benefits and Format of Accounting Statements,* as well as information on the peer reviewers and public commenters.

Chapter I: Summary and Discussion of Public Comments

This chapter summarizes and discusses the 31 responses OMB received as a result of our requests for comments on the draft report.[5] We received comments from peer reviewers, members of the public, Federal agencies, and Members of Congress, and made changes to the text to incorporate their suggestions as appropriate. We intend to follow up on other suggestions for our next report.

II. Peer Reviewers' Comments

Section 638 (d) of the Act requires OMB "to provide for independent and external peer review" of the report. We asked five economists with both government and academic experience in cost benefit analysis of Federal regulations to review the report and give us their comments. The five are: Robert Hahn of the American Enterprise Institute, Robert Litan of the Brookings Institution, Scott Farrow of Carnegie Mellon University, Jason Shogren of the University of Wyoming, and Steve Polasky of the University of Minnesota. Two of the reviewers, Hahn and Litan, decided to combine their comments.

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[5] The peer reviewers and public commenters are listed in the Appendix.

In general the peer reviewers were complimentary about the overall report:

- "That report is the best of its kind in the world." (Hahn and Litan)

- "OMB and the authors are to be commended for its balanced presentation of material and its utilization of much current thinking on the topic." (Farrow)

- "A reasonable effort given the ambitious task." (Shogren)

- "I think this report does a very good job on an incredibly difficult task." (Polasky)

The peer reviewers also made general suggestions to improve the report.

Hahn and Litan offered ten specific recommendations for OMB to improve the report and work with Congress to improve the regulatory process. They suggested that OMB should:

1. "assess the quality of the regulatory impact analyses before using them."
2. "rely more heavily on its own expertise to inform judgments."
3. "continue to improve its presentation of aggregate estimates but focus more on incremental benefits and costs of new regulations."
4. "calculate net benefits of all major regulations and focus attention on those regulations with significant negative benefits."
5. "make it easier to compare across regulations by standardizing some key assumptions."
6. "include major regulatory initiatives at independent agencies."
7. "more carefully evaluate the strengths and weaknesses of the EPA Section 812 retrospective study."
8. "examine strategic reforms that could improve the regulatory process."
9. "offer suggestions on how Congress could help make regulations and the regulatory process more transparent."
10. "suggest that Congress require OMB and all federal agencies to produce an annual report on the benefits and costs of regulatory activities."

In a number of instances, we agree with the general direction of these suggestions and believe that we are doing most of them. We intend to continue our efforts to assess and improve the quality of RIAs, improve aggregate estimates while placing most of our effort on incremental analysis, calculate and use net benefits analysis where appropriate, work with the agencies to standardize key assumptions, include more information from the independent agencies, and carefully evaluate key reports such as the Section 812 retrospective study. We also intend to continue working with Congress and the agencies to further regulatory reforms such as making the regulatory process more transparent.

We do disagree with some of Hahn and Litan's suggestions. For example, we do not believe that strict benefit-costs tests complete with public scorecards should be the sole criterion for establishing regulatory policy. A strict numerical test leaves out important information such as qualitative costs and benefits, distributional and equity considerations, and the degree of uncertainty of the estimates. We do not believe that it would be constructive for us to give the agencies public scorecards for their regulatory analyses. Our experience suggests that ongoing and collegial discussions with the agencies about the quality of their analyses produce more solid and lasting results.

Finally, we note that we have implemented their suggestion that we direct the agencies to publish summary tables of their economic analyses of proposed regulations to improve transparency, although we do not feel that this should be mandated by statute as they propose. In the March 22, 2000, Memorandum, *Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements,* we asked the agencies to use these guidelines and format of the accounting statement to present summaries of the benefit and cost estimates for each major regulation and to provide a clear statement of the effects in a form that is easily usable by other readers of the rule. We expect the agencies to publish these summaries in the preambles of the *Federal Register* notices announcing their major rules.

Farrow suggested various ways for systematizing our reporting of costs and benefits of regulations such as using a national income accounting approach, checklists of best practices for regulatory analyses, and computerized templates. These are all good suggestions that we intend to explore. We believe, however, that our *Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements,* and our request that the agencies use these accounting statements and templates to summarize the information in their regulatory impact analyses of major rules fulfill the intentions of these suggestions.

Farrow also suggested several specific ways we could improve the report, such as using statistical distributional assumptions for ranges of costs and benefits, discussing regulatory designs, and looking at indirect costs more carefully. He also provided citations to literature on these and other subjects, which we are reviewing.

Shogren suggested that the $5.9 million estimate for value-of-statistical-life (VSL) -- one of the two approaches we discuss for valuing mortality reduction, the other being value-of-statistical-life-years (VSLY) -- is too high because workers who are less skilled at reducing on-the-job risks set the marginal wage rate, which will be higher than what workers more skilled at reducing on-the-job risks are willing to accept for the same job. When marginal wage rates are divided by average risks as is done as part of the calculation of VSL and VSLY, the result is an overestimate of the correct number. Since this point is new to the literature and original with Shogren, there is no consensus on this point and we make no adjustment.

Polasky expressed doubts about whether aggregating numbers across programs and agencies yields a meaningful total, a concern we also share and have emphasized in all three reports. Clearly the most useful information for improving specific regulations is information on the incremental changes in benefits, costs and impacts that are expected to result from marginal changes in specific regulations and regulatory provisions. Polasky also suggested a series of clarifying points for our discussions of the baseline problem and technological change. He, like the other reviewers, emphasized the need for OMB to play a coordinating role in determining what common values should be used in RIAs and what new regulatory reform initiatives should be pursued. We intend to continue to show leadership in this area.

II. Public Comments

We have grouped the comments of the rest of the public into the following categories and refer to them by their number as listed in the Appendix:

A. Aggregate Estimates

Some commenters suggested that the report should adopt a broader definition of "major rules." One commenter stated that the threshold for major rules should be lowered, and suggested that a guideline could be developed to break up economically significant rules into separate categories based on annual cost estimates (19). Another commenter stated that agency guidance, guidelines and interpretations that impose cost should be included in the report (11).

The Executive Order No. 12866 and the Congressional Review Act define a significant or major regulatory action to be any regulatory action that is likely to have an annual effect on the economy of $100 million or more, in addition to other criteria. A lowering of the benchmark to incorporate other regulations would be inconsistent with these directives and result in very burdensome procedures with little additional payoff. We believe that rules that are likely to have an annual effect of $100 million or more capture at least 90 percent of the costs added by all rules.

One commenter stated that aggregate estimates of the costs and benefits of economic regulations, in addition to social regulations, should be presented (18). Another commenter agreed with OMB's approach, but stated that the net benefit estimates for economic regulations should be presented (19).

This report does discuss and present an estimate of the benefits and costs resulting from economic regulations.

One commenter stated that the uncertainties associated with the aggregate estimates should be quantified (13). This sentiment was echoed by another commenter who suggested that the differences

in data quality and uncertainties should be taken into account when aggregating across federal activities (7).

We agree and did stress the uncertainties and differences in quality of the estimates. It is certainly important to note that there are different methods and different data sets of varying quality used in benefit-cost analyses. We are not currently aware of a way to develop quantified uncertainty estimates for aggregate benefit and cost estimates that incorporate the substantial differences underlying many of the individual analyses.

With respect to quantification and monetization issues, one commenter stated that the report does not adequately explain the assumptions used in monetizing benefits (22). Where agencies did not monetize a certain value, we used values that they had used in the past for other regulations. Another commenter stated that OMB's procedure for quantifying lower bound estimates is faulty since the true lower bound is the difference between the lower bound benefits and the upper bound costs (9).

The report uses the approach suggested by the commenter for estimating the lower bound. Nevertheless, we believe the approach to be somewhat arbitrary because uncertainty is best expressed by a distribution -- not a range. Thus, future reports will seek to improve on this estimation procedure.

While several commenters supported the report's discussion of value-of-statistical-life (VSL) vs. value-of-statistical-life-years (VSLY) as being useful (4, 6, 9), one commenter stated that OMB failed to draw a conclusion about the preferred method (11). In the absence of such conclusion, several commenters supported the use of VSLY over VSL (7, 9, 11, 23). Also a number of comments stated that the report should adopt a consistent value of a statistical life (4, 7, 9).

Our understanding of the literature and debate is that different values are appropriate for different circumstances and that the superiority of either VSL or VSLY over the other has not yet been established.

B. Methodological Issues - Incremental Costs

Four commenters suggested that OMB should provide information on the incremental costs and benefits of regulation (8, 9, 11, 31). Among these commenters, one suggested that OMB should obtain the necessary information from the regulatory impact analyses provided by the Agencies (8).

In order for OMB (or the Agencies) to estimate incremental benefits and costs, we need analysis that evaluates a continuum of alternative standards (for example, the level of stringency). The guidelines we recently issued ask for the evaluation of appropriate alternatives and list several forms of alternatives the agency should consider, including alternative levels of stringency. Unfortunately, many regulatory impact analyses provide only qualitative information (if any) on alternatives to the preferred option. Without necessary quantitative information on the alternatives, neither we nor the agency can

estimate incremental benefits and costs. We are hopeful that the newly issued guidelines will produce these improvements.

C. Evaluating Distribution Effects/Others

As noted by two commenters (14, 19), the report does not quantify distributional or equity effects. We agree that more information about the distributional or equity effects would be useful. The development of estimates of economic incidence often requires extensive additional analysis beyond that generally developed in a benefit/cost analysis. As a result, to the extent that agencies are offering information on distributional effects, this information provides a qualitative discussion of distributional effects. We are hopeful that the new guidelines will produce better information on the distributional and equity effects of regulation.

D. Effects on State, Local, and Tribal Government, Small Business, Wages, and Economic Growth

Several commenters thought that the report could have provided more information about regulatory impacts on State, local, and tribal governments, small business, wages and growth. (4, 9, 10, 29, 30, 31). In discussing these effects, we focused on the aggregate and theoretical impacts of regulation on these sectors and aspects of the economy. Some commenters suggested that we should have provided estimates of these impacts for individual regulations (3, 6, 18, 29, 30). We agree that this information is useful and is sometimes found in the individual RIAs or Regulatory Flexibility Analyses, but not in any systematic fashion. We have requested that the agencies include this information in the standardized accounting statements for all major rules and hope to provide it in summary form in next year's report.

Several commenters also thought we should have presented more information on the indirect costs and benefits of regulations as was presented in last year's report (9, 29). The Act does not ask specifically for this information in this year's report. The two previous reports, however, do discuss and present estimates of indirect costs and to a lesser extent benefits.[6]

E. Willingness-to-Pay and Willingness-to-Accept

Three commenters (5, 14, 22) expressed concern with the draft report's statement that the value of the benefits of regulation is best measured by society's willingness-to-pay (WTP) for these attributes. Two commenters (14, 22) were primarily concerned with the apparent exclusion of willingness-to-accept (WTA) as an appropriate measure. One commenter (5) recommended that we

[6] See OMB (1997) pp37-38 and OMB (1998) pp 23-24.

use WTA estimates exclusively. This commenter suggested that WTA estimates may be appreciably larger that WTP estimates.

We disagree with these comments. The common preference for WTP over WTA measures is based on empirical difficulties in estimating WTA. We believe that estimation difficulties are usually the primary reason for the large differences sometimes reported between WTP and WTA estimates. The recently issued *Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements* require the use of WTP measures to value goods that are not traded directly in markets.[7] As we stated in the "Best Practices" guidance we issued in 1996, either WTP or WTA can provide an appropriate measure of benefits, depending on the allocation of property rights. We also indicated then that the common preference for WTP over WTA measures was based on the empirical difficulties in estimating the latter. In theory, the two can diverge if income effects are large, if there are no substitutes for the amenity in question, or if there is a substantial degree of "loss aversion." Empirical support for these theories is not robust, and empirical difficulties in disentangling these effects from other factors have yet to be resolved.

F. Individual Rules: Ozone National Ambient Air Quality Standard

Two commenters suggested that the aggregate estimates should be adjusted to reflect the change in the status of ozone NAAQS. One commenter suggested that the costs and benefits of ozone NAAQS should be deleted from the aggregate estimate since the rule has been overturned in the courts (6). Since the decision to review the ozone NAAQS by the Supreme Court is still pending, we have not adjusted the aggregate benefit and cost estimates.

Another commenter stated that the estimates should reflect an unpublished article by Lutter (1999), which contends that the cost associated with the ozone standard is underestimated (13). We intend to follow this debate, but will wait for a consensus to develop in the peer reviewed literature before making any adjustments.

G. Environmental Benefits

Two commenters stated that the report under-estimates the benefits of federal health, safety and environmental regulations (5, 22). The report specifically acknowledges that some benefits of health, safety and environmental regulation are difficult to quantify and to monetize. At the same time, it also recognizes that some costs of regulations are also difficult to quantify and monetize. For example, much of the analyses conducted by agencies quantify compliance expenditures incurred, but fail to quantify lost consumer surplus and producer surplus associated with a particular regulatory action. While the

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[7] Recall that these guidelines were subject to independent and external peer under Section 638 of the Act.

compliance expenditures may be reported, the economy-wide costs are frequently not captured. Thus, both the benefits and the costs of health, safety and environmental regulation may be understated.[8]

One commenter stated that the report should provide empirical evidence to support the position that environmental protection would have occurred in the absence of regulation (14). The report made the observation in the context of a discussion about choosing the proper baseline that in some cases environmental benefits are provided in the absence of Federal regulation, for example, by State and local governments, judicial actions or private behavior. Executive Order No. 12866 establishes the burden of proof on agencies to show that Federal regulation is needed not that it is not needed. Non-federal air pollution control efforts date back to 1881 when the cities of Chicago and Cincinnati passed statutes to control smoke and soot from furnaces and locomotives (Portney 1990). In addition, even with Federal environmental regulation, some State and local efforts, particularly in California, continue to be more protective. These examples suggest that at least some States would provide some environmental protection in the absence of Federal regulation.

A commenter stated that the report should explain the conclusion that the "rising baseline" phenomenon applies to risks that are "latent, cumulative, insidious, of relatively low probability and uncertain (14)." These adjectives describe the sorts of things that many people fear and therefore have incentives to minimize through private rights of action, State and local regulation or their own behavior. Concerns about the quality of drinking water, toxic waste dumps, and pesticide residues on food have certainly given rise to both civil action and changes in consumer behavior, often without clear evidence of significant health effects.

A commenter stated that the report's assertion that gross domestic product (GDP) may measure regulatory costs adequately, but not capture the benefits of health and safety regulations is unsubstantiated in the draft report (6). We disagree. The important WTP benefits of health, safety, and environmental regulation -- prolonging life, reducing pain and suffering, and providing ecological diversity -- are not traded in markets or fully counted in GDP. Yet the compliance costs of achieving these objectives are based on market transactions and thus counted in GDP.

A number of comments criticized the report's discounting of future benefits and the discount rate used, 7 percent. Two commenters found the discounting of human lives disturbing (14, 22). One commenter stated that even if the concept is sound, the discount rate of 7 percent may be too high (5), while another stated that the agencies should consider empirical literature that seems to indicate that the discount rate in discounting of future fatal risks may be higher than 7 percent (7).

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[8] These points are discussed in greater detail in our two earlier reports. See OMB (1997) pp37-38 and OMB (1998) pp 23-24.

The report reflects the fact that the economics profession has reached a general consensus that discounting procedures are necessary to make meaningful comparisons of benefits and costs that occur in different time periods. The *Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements* (reproduced in the Appendix) reflect this fact. The discount rate of 7 percent is specified in the *Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements*, the "Best Practices" document, and OMB Circular A-94 as the appropriate discount rate to approximate the opportunity cost of capital for incremental private investment. These documents also specify that under appropriate circumstances other rates may be used as part of a sensitivity analysis.

H. Hahn/Hird Data: Shortcomings

Two commenters stated that the report should not rely on the Hahn/Hird study to provide aggregate estimates of the benefits and costs of environmental, health and safety rules (14, 22). Last year's report carefully outlines some of the shortcoming of this study and we have repeated some of these concerns in the final report. At the same time, it is the only study available that offers a comprehensive estimate of the benefits and costs of environmental, health, and safety regulation.

Chapter II: Estimating the Total Annual Costs, Benefits, and Impacts of Federal Regulations and Paperwork

I. Overview

This chapter presents estimates of the total annual costs and benefits of Federal rules and paperwork in the aggregate and by agency and agency program as required by Section 638(a)(1) (A) and (B) of the 1999 Omnibus Consolidated and Emergency Supplemental Appropriations Act (the Act). To do this, we build on the information found in Chapter I of the 1998 *Report to Congress On the Costs and Benefits of Federal Regulations* (OMB 1998) by using data and information newly available during 1999. These data include information:

- On costs and benefits of regulations provided by the agencies at our request pursuant to Section 638 (c) of the Act, which requires us to "issue guidelines to agencies to standardize measures of cost and benefits and the format of accounting statements."

- From the economic impact analyses that agencies prepare for major rules for which we completed review between April 1, 1998 and March 31, 1999.

- From other government reports and sources on the impacts of regulation and paperwork.

This chapter also analyzes the impacts of Federal regulation on State, local, and tribal government, small business, wages, and economic growth -- as required by Section 638 (a) (2) of the Act.

A. Estimation Problems

This is our third report estimating the total annual costs and benefits of Federal regulations. In our previous two reports (OMB 1997 and 1998), we included a detailed discussion of the methodological problems inherent in such an undertaking.[9] We recognize the importance of providing information to the public on the costs, benefits, and impacts of Federal regulations. Such information is useful for policymakers who are designing new regulations or revising existing ones to make them more cost efficient and fair. Nevertheless, any estimate of total annual costs and benefits can only be rough at best.

It is difficult, if not impossible, to estimate the actual total costs and benefits of all existing Federal regulations with accuracy. We lack good information about the complex interactions between the different regulations and the economy. A variety of estimation problems for individual and aggregate estimates distort the results in different ways. The difficulty of answering the following questions illustrate these problems:

1. What Baseline Should We Use?

In order to estimate the impact of a regulation, we need to know what would have happened if the regulation had not been issued. In other words, what is the baseline against which costs and benefits should be measured? The baseline problem has several dimensions. First, what happens in the absence of regulation is only an educated guess (since it never happened). Moreover, the greater the regulatory change, the less sure we are of the regulatory benefits and costs. The techniques of applied welfare economics, upon which benefit-cost analysis is based, hold only for marginal changes in economic activities. The larger the changes, the less certain we are of the accuracy of these techniques. Thus, we are more confident in our estimates of the costs and benefits of a small change in the level of automobile emissions than in the costs and benefits of all Clean Air Act regulations. We are even less confident in our estimates of the total costs and benefits of all regulations issued by the Federal Government since the early 1900s.

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[9] The first two reports also provide background information helpful for understanding and placing in context this third report. Together, the reports contain information on the history of regulation and its reform, the Administration's regulatory review program, the basics of economic analysis of regulations, and several case studies comparing various prospective and retrospective analyses of regulations.

Even if we disregard the problem of modeling large changes, significant difficulties remain. It is difficult to determine the baseline for the individual regulations that must be added together to get an aggregate estimate for all regulations. Statistical bias is always a potential problem when surveying firms and other regulated entities on their expected compliance costs. Both regulators and the regulated may have a stake in the survey results. The problem is potentially greater for prospective studies because they must predict both the baseline and the regulatory effects. Retrospective studies concern themselves only with the baseline. In general, the most precise estimates of the costs and benefits of regulation appear in retrospective studies done by individuals who are not interested parties, but who do seek to maintain their reputations as objective professional analysts.

2. What Costs Should We Measure?

Most of the studies of the costs of regulation produced to date measure the direct expenditures required by regulation. It is hard to do more. Yet, as Cropper and Oates (1992) point out, the cost to society of regulation is properly measured by the change in consumer and producer "surplus" [10] associated with the regulation and with any price and/or income changes that may result. At one extreme, ignoring the consumer surplus loss produced by a ban on the sale of a product understates costs to society. Even though compliance costs are zero, consumers are less well off because they can no longer buy the product. At the other extreme, calculating compliance expenditures based on pre-regulation output overstates costs because, if the firm raises prices to cover compliance costs, consumers may shift to other products to compensate partially for the accompanying welfare losses (Cropper and Oats 1992, p. 722). Actually estimating the changes in consumer and producer "surplus" caused by regulation requires data that is usually not easily obtained and assumptions that are at best only educated guesses.

3. What Is the Effect of Technological Change?

Many of the studies on which we must rely for cost and benefit estimates are dated. Over time the dynamic nature of the economy may affect the estimation of both benefits and costs. Technological improvements are often cited as the reason that predicted costs of compliance often turn out to be less than actual costs (Office of Technology Assessment 1995). Less well noted, however, is that technological progress also alters the benefits of regulation over time. Medical progress can reduce the future benefits estimated for health, safety and environmental regulations, just as productivity improvements in manufacturing reduce the costs of compliance of some regulations. New drugs or medical procedures can reduce the benefits of regulations aimed at reducing exposure to certain harmful

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[10] Consumer surplus refers to the incremental value of a product, as perceived by the consumer, over and above the price paid by the consumer for that product. Producer surplus refers to the incremental revenue received by the producer of a product over and above the producer's marginal costs of production.

agents such as an infectious disease. Regulations aimed at increasing the energy efficiency of consumer products or buildings may have their expected benefits reduced by new technology that lowers the cost of producing energy.

Technological change also leads directly to higher incomes, which allow people to demand better health and more safety. Business often responds to these demands by providing safer products and workplaces, even in the absence of regulation. Individuals with rising incomes may purchase or donate land to nature conservancies to provide ecological benefits – not to mention tax writeoffs. Yet, as on the cost side, the baseline that we use is generally the *status quo,* rather than a best guess as to what is likely to happen in the future.

4. How Do We Determine Causality?

It is often difficult to attribute changes in behavior to specific Federal regulations because there can be many other causal factors. In the environmental area, there are regulations from several different Federal agencies -- the Environmental Protection Agency (EPA), the Department of Agriculture (USDA), the Department of Energy (DOE), the Department of the Interior (DOI), the Department of Commerce (DOC) and the Department of Transportation (DOT) as well as numerous State and local government entities. The tort system, voluntary standards organizations, and public pressure also may cause firms to provide a certain degree of public protection in the absence of Federal regulation. As the General Accounting Office (GAO) points out, determining how much of the costs and benefits of these activities to attribute solely to Federal regulation is a difficult undertaking (GAO 1996).

5. How Do We Assess Older Regulations?

Once regulations are implemented and compliance has begun, public attitudes about the desirability of mandated actions often change. Regulations that were widely questioned before implementation – for example, airbags and family leave -- often find wide acceptance afterwards. If the National Highway Traffic Safety Administration's (NHTSA) regulations were eliminated, the automobile companies are not likely to discontinue all the safety features that NHTSA has mandated. Consumers now expect safer cars and seem willing to pay for them. Indeed, they often demand more safety than NHTSA requires.

This same phenomenon is taking place in the environmental area. Environmentally responsible behavior can be good for the bottom line. Rising per capita income and greater acceptance of regulation encourage such behavior, although their precise impact can be hard to measure. Changes in consumer preferences can create a "rising baseline" phenomenon, which reduces the ongoing significance of health, safety, and environmental regulations. Estimates of the aggregate regulatory costs and benefits that use a pre-regulation baseline as opposed to a post-regulation baseline may thus overestimate the current costs and benefits of those regulations.

6. Is There an "Apples and Oranges" Problem?

Most attempts to summarize the total costs and benefits of Federal regulations have simply added together a diverse set of individual studies. This is an inherently flawed approach. These individual studies vary in the quality, methodology, and type of regulatory impacts they include. They use different assumptions about baselines and time periods, different discount rates, different valuations for the same attribute, and different approaches to dealing with uncertainty. They also are seldom able to analyze the interaction effects among the tens of thousands of regulations. Although we are mindful of, and tried to correct for, these problems in our estimates, our numbers too should be used with caution.

7. Is It Enough To Know the Costs and Benefits?

Accurate assessment of costs and benefits does not necessarily give us information concerning the distribution of such effects. None of the analyses addressed in this report provides quantitative information on the distribution of benefits or costs by income category, geographic region, or any other equity-related factor. As a result, there is no basis for quantifying distributional or equity impacts, which often can be a key reason for regulation.

B. Types of Regulation

Since there are so many different types of Federal regulations, it is useful to break this heterogeneous body up into categories. Three main categories are widely used: social, economic, and process.

- *Social Regulation* seeks to benefit the public interest in one of two ways. It prohibits firms from producing products in certain ways or with certain characteristics that are harmful to public interests such as health, safety, and the environment. Examples would be OSHA's rule prohibiting firms from allowing in the workplace more than one part per million of Benzene averaged over an eight hour day, and the Department of Energy's rule prohibiting firms from selling refrigerators that do not meet certain energy efficiency standards. It also requires firms to produce products in certain ways or with certain characteristics that are beneficial to these public interests. Examples are FDA's requirement that firms selling food products must provide a label with specified information on its package and DOT's requirement that automobiles be equipped with certain kinds of airbags.

- *Economic Regulation* prohibits firms from charging prices or entering or exiting lines of business that might cause harm to the economic interests of other firms or economic groups. Such regulations usually apply on an industry-wide basis (for example, agriculture, trucking, or communications). In the United States, this type of regulation at the Federal level has often been administered by independent commissions such as the Federal Communications

Commission (FCC) or the Federal Energy Regulatory Commission (FERC). This type of regulation can cause economic loss from the higher prices and inefficient operations that often occur when competition is restrained.

- *Process Regulations* impose administrative or paperwork requirements such as income tax, immigration, social security, food stamps, or procurement forms. Most process costs result from program administration, government procurement, and tax compliance efforts. Social and economic regulation may also impose paperwork costs due to disclosure requirements and enforcement needs. These costs generally appear in the cost for such rules. Procurement costs generally show up in the Federal budget as greater fiscal expenditures.

1. Measuring the Impacts of the Different Types of Regulation

The impacts of regulation have several dimensions. Regulation either increases or decreases the total welfare or well being of society, or redistributes it among different groups. Usually it does both, but the relative degree varies significantly by type of regulation. The public purpose for a regulation usually takes one of two forms: to maximize society's welfare or to redistribute costs and benefits from one group to another.

Social Regulation often seeks to improve the efficiency of the market by correcting what economists call "market failures" -- for example, pollution or public health risks or other unintended consequences on third parties and unequal information between buyers and sellers. Such regulation affects the value of goods and services or welfare enjoyed by society. We measure the impact of a social regulation on society's welfare by estimating its net benefits: social costs subtracted from social benefits.

Redistributive effects or "income transfers" should also be measured, noted, and presented to policymakers to help in forming their decision. OMB has issued recommended procedures or "Best Practices," which are particularly useful for estimating the benefits and costs of social regulations. We have described and discussed these procedures in the two previous Reports to Congress on the Costs and Benefits Of Federal Regulation. As mentioned above in the introduction, we have provided additional guidance for the agencies for standardizing the measures of costs and benefits sent us for this and next year's report.

We can divide social regulation into several categories:

Environmental. The true social cost of regulations aimed at improving the quality of the environment is represented by the total value that society places on the goods and services foregone as a result of resources being diverted to environmental protection. (EPA's *Cost of a Clean Environment*, pp. 1-2, 1-3). These social costs include the direct compliance costs of the capital equipment and labor needed to meet the standard. They also include the more indirect consumer and

producer surplus losses from lost or delayed consumption and production opportunities that result from the higher prices and reduced output needed to pay for the direct compliance costs. In the case of a product ban or prohibitive compliance costs, almost all of the costs represent consumer and producer surplus losses. Most of the cost estimates used in this report do not include consumer and producer surplus losses because it is difficult and often impractical to estimate the demand and supply curves needed to do this type of analysis.

Further indirect effects on productivity and efficiency result from price and output changes that spread through other sectors of the economy. Estimates of compliance costs may understate substantially the true long-term costs of pollution control.[11] The estimates used in this report do not include these indirect and general equilibrium effects.

The benefits of environmental protection are represented by the value that society places on improved health, recreational opportunities, quality of life, visibility, preservation of ecosystems, biodiversity, and other attributes of protecting or enhancing our environment. This value is best measured by society's willingness-to-pay (WTP) for these attributes. Since many types of improvement in environmental quality are not traded in markets, benefits must be estimated by indirect means using sophisticated statistical techniques or "contingent valuation" survey methods. Such methods often have more difficulty with benefit estimation than cost estimation.

Other Social. This category of regulation includes rules designed to advance the health and safety of consumers and workers, as well as regulations aimed at promoting social goals such as equal opportunity, equal access to facilities, and protection from fraud and deception. These kinds of regulation, as well as environmental regulation, are concerned with controlling or reducing the harmful or unintended consequences of market transactions. Such consequences as air pollution, occupationally induced illness, or automobile accidents are commonly called "negative externalities." Regulations designed to deal with such externalities are said to "internalize" the externalities.

This can be done by regulating the amount of the externality, for example, banning a pollutant or limiting it to a "safe" level, or regulating how a product is produced or used. Social regulation may also require the disclosure of information about a product, service, or manufacturing process where inadequate or asymmetric access to information may place consumers, citizens, or workers at a disadvantage. The techniques and methodological concerns involved in the estimation of the social costs and benefits generated by these rules are similar to those involved in the estimation of costs and benefits of environmental regulation discussed above. In the results reported below, we further break "Other Social" into three categories: transportation, labor and other regulations. The third category includes food and drug safety, energy efficiency, and quality of medical care regulations.

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[11] See Jaffe, Peterson, Portney, and Stavins' survey (1995), p. 153.

Economic regulation, especially in the past, often served to transfer income among economic groups. In certain circumstances, however, such as when used to regulate natural monopolies, economic regulation can produce net social benefits. In the last twenty years, deregulation and improvements in technology have reduced entry barriers in a variety of sectors, including transportation, communications, energy, and financial services. To a large degree, economic regulation now serves more and more to promote competition, rather than to protect firms from it. The costs of economic regulation are usually measured by modeling or comparing specific regulated sectors with less regulated sectors, estimating the consumer and producer surplus losses that result from higher prices and lack of service, and estimating the excess costs that may result from the lack of competition. These costs are made up of efficiency losses, or costs to society, and income transfers that one group gains at the expense of another. The Hopkins (92) and Hahn and Hird (91) surveys of regulatory costs found that transfer costs were generally about two to three times the social costs of economic regulation.

Economic regulation may produce net social benefits when natural monopolies are regulated to simulate competition. Although Hahn and Hird (1991) argue that the dollar amounts of such efficiency benefits are small and short lasting in a dynamic and technologically vibrant economy, this is a judgment that is not the result of an empirical study. It is, however, based on the increasingly accepted view that the U.S. economy is becoming more competitive over time, with fewer long-lasting natural monopolies, and on evidence that much economic regulation seeks primarily to enhance one group at the expense of another.[12]

Process Regulation mainly serves to collect funds, allocate them among groups of recipients, and establish the conditions under which the government purchases or provides goods and services from and to the public. Although allocating and collecting funds can serve to transfer income between economic groups, the fiscal budget already accounts for government transfers and we do not provide separate estimates below. We do, however, provide estimates of the administrative costs to the public of providing the information needed by the government to collect these funds and provide these services because these estimates are not included in the fiscal budget. These costs are also real burdens to society, not government transfers. Government can reduce them by streamlining paperwork and red tape.

2. Other Types of Regulatory Impacts

As discussed above, analysts often use estimates of benefits and costs to measure the net impact of regulation on society as a whole. Executive Order No. 12866, Regulatory Planning and Review, issued by President Clinton on September 30, 1993, requires the agencies to measure such

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[12] Note that our definition of economic regulation does not include antitrust activities such as preventing the formation of monopolies through mergers or anticompetitive behavior.

impacts (Section 1(b)(6)). It also requires that the agencies analyze the effect of a proposed regulation on State, local, and tribal governments and on businesses of differing sizes (Section 1 (b)(9) and (11)). As mentioned, Section 638 (a)(2) of the Act asks for information on these impacts as well as on wages and economic growth.

Clearly, the impacts of regulation on these sectors are of special interest to policymakers and should be examined in a full analysis of regulatory impacts. The impacts on State, local, and tribal governments, small businesses, and workers can be measured by distributional analysis, which looks at the transfers of income among groups caused by regulations. Generally the analysis does not make value judgments about the merits of these transfers, leaving that up to policymakers. This approach is in contrast to Benefit Cost Analysis, which generally ignores income transfers and focuses on whether social benefits exceed social costs. Since distributional effects and net benefits are both important, both analyses should be presented to policymakers. Reflecting this philosophy, Executive Order No. 12866 states that agencies should select regulatory approaches that "maximize net benefits" taking into account distributional impacts and equity.

As required by the Act, we present estimates in section II of the costs and benefits of regulation and paperwork, and in section III present what we know about its distributional impacts.

II. The Costs and Benefits of Regulation and Paperwork

Our estimate of the total annual costs and benefits of Federal rules and paperwork starts with our estimates in last year's report. It then adds new information received from the agencies about previous regulations and about new regulations issued during the last year.

A. Social Regulation

1. Total Annual Costs and Benefits

Tables 1, and 2 presents our estimates of the total annual monetized costs and benefits of social regulation, per the approach presented in our 1998 Report.[13]

Table 1 relies on estimates from Hahn and Hird (1991) and EPA's *Cost of a Clean Environment* (1990) and Section 812 Retrospective Report (1997) to present a range of estimates for costs and benefits as of 1988.[14] The estimates of costs range between $84 billion and $140 billion and

[13] Our general approach follows the procedures we used in last year's report which discusses them in more detail. (See OMB 1998, pp 13-18).

[14] We discussed in detail the problems and uncertainties associated with these estimates in the two previous reports. We refer the reader to them for more specific

the benefits between $56 billion and $1.5 trillion annually. The $1.5 trillion upper- range estimate is dominated by EPA's Section 812 Retrospective Report, which estimates the benefits of the Clean Air Act from 1970 to 1990.

In last year's report we used EPA's upper range estimate for benefits of $3.2 trillion. EPA points out that the $3.2 trillion estimate was the upper bound, 95th percentile estimate generated by the Section 812 Retrospective Report for the year 1990, a value which EPA itself believes has a very small probability of being the correct estimate (that is, the probability that benefits are equal to or greater than $3.2 trillion is 5 percent). EPA's expected value for the benefits of 1970 to 1990 programs in the year 1990 is $1.45 trillion (in 1997 dollars). We have amended our report this year to incorporate EPA's expected-value estimate.

As we outlined at the beginning of this chapter, we confronted a number of critical estimation problems in developing benefit and cost estimates. The available studies, such as the Hahn and Hird study and the Section 812 Retrospective Report, also had to confront these problems and each study had to make difficult choices. As a result, each of these studies has advantages and disadvantages. The Retrospective Report's estimatee of $1 trillion to $1.5 trillion per year are substantially larger than the estimates presented by Hahn and Hird. The Hahn and Hird estimates were based on a 1982 study by Freeman that provided a synthesis of the available benefits literature. These estimates do not reflect the benefits associated with Clean Air Act initiatives in the 1980s, such as EPA's lead phasedown program. They also do not reflect the recent literature suggesting an association between exposure to fine particulate matter and premature mortality. In addition, the 1982 Freeman estimates were based on actual air quality improvement over the 1970s. They did not attempt to account for the benefits associated with preventing degradation in air quality. Finally, the Freeman estimates reflect the benefits and costs of air and water environmental regulation.

Insert Table 1

Insert Table 2

The Section 812 Retrospective Report estimates were developed through a multi-year EPA Science Advisory Board peer review process. It presents a more comprehensive set of the benefits and costs under the Clean Air Act over the period from 1970 to 1990. For example, it includes regulatory actions taken during the 1980s. In addition, these estimates also include the benefits and costs of preventing any deterioration in air quality. It also reflects the benefits and costs of all air pollution control efforts, not just the Federal Clean Air Act. After completing its 5-year review in a series of open public meetings, the Council concluded that the Section 812 Retrospective Report "is a

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information. The estimation problems discussed earlier in this report explain the general estimation problems with these types of aggregate estimates.

serious, careful study and employs sound methods along with the best data available. While we do not necessarily endorse all details of this study's findings, we believe that as a general matter that they are consistent with the weight of available evidence." (Council review closure letter to EPA Administrator Browner, p.1, EPA-SAB-Council-LTR-97-008, July 8, 1997).

A panel of regulatory experts convened by GAO expressed their scepticism about the magnitude of the Section 812 Retrospective Report estimates (GAO, 1999). These experts identified specific concerns about some of the assumptions in the Retrospective Report, including: (1) the assumption that air quality would have deteriorated significantly between 1970 and 1990 in the absence of the Clean Air Act, (2) the uncertainties in the causal relationship between an increase in the risk of premature mortality and exposure to particulate matter, and (3) the methods used to estimate the value that individuals would place on reducing health and mortality risks. GAO pointed out that these concerns are similar to the concerns expressed by OMB in last year's report. (See OMB 1998, pp. 25-35).

Table 2 provides estimates of the total annual monetized costs and benefits of social regulations issued between 1987 and the first quarter of 1999. As explained in last year's report, we based the cost estimates on the Regulatory Impact Analyses (RIAs) for major rules that agencies submitted to OMB under Executive Order No.12866 and its predecessor, Executive Order No. 12291. To estimate benefits, we used a combination of sources. For the years 1987 to 1995, we assumed that benefits bore the same ratio to our cost estimates for the four categories of regulations shown in Table 2 as they did in a study by Robert Hahn (1996) of major regulations issued between 1990 and mid-1995. We did this because we do not have our own systematic estimates of the benefits for major rules issued before 1995.[15] For the benefit estimates for 1995 through the first quarter of 1999, we used the information from agency-supplied RIAs modified for consistency with the *Best Practices* document as appropriate and extended to provide more monetized estimates of benefits and costs. We used consensus value estimates used by the agencies or found in the literature. Note that we present annualized cost estimates for the year 2000 for the new NAAQS for Ozone and Particulate Matter although no compliance costs for these new standards will be incurred in 2000.[16] We discuss these

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[15] Admittedly this is a crude estimation procedure because Hahn's inventory of rules begins in 1990 and ours extends back to 1987. Consequently, we are assuming that the relationship between costs and benefits that Hahn found for the later period extends back three years. Still, we know of no other approach to fill this gap in the data until RIAs for these years are re-examined. For further details see last year's report (OMB, 1998).

[16] The validity and enforceability of the 8-hour ozone and PM2.5 NAAQS has been called into question in a decision by the United States Court of Appeals for the District of Columbia Circuit. *American Trucking Ass'ns* v. *EPA*, 175 F.3d 1027, modified in part and reh'g en banc denies, 195 F.3d 4 (1999). The United States

estimates in detail in Chapter III. This RIA-based approach also has limitations and disadvantages. These limitations include (a) a varying set of baseline assumptions underlying the original RIAs, (b) differences in the risk and valuation assumptions and methods applied in different RIAs, and (c) the potential failure to reflect important interaction effects between major rules, such as the critical interactions between motor vehicle NOx and utility SO2 reductions in the formation of ambient particulate matter.

2. New Estimates for the 1990 Clean Air Act Amendments

EPA has also called to our attention its new study, *The Benefits and Costs of the Clean Air Act 1990 to 2010* (also called the Section 812 Prospective Report), (EPA 1999) to supplement the set of studies that served as the basis for the monetized estimates of benefits and costs in last year's report. This study -- like the Retrospective Report -- was developed through an EPA Science Advisory Board peer review process. It included three panels of independent economists, health and ecological scientists, and emissions and air quality modeling experts. The SAB Council parent committee concluded its review by stating that the Section 812 Prospective Report as with the Section 812 Retrospective Report, "is a serious, careful study that, in general, employs sound methods and data. While we do not endorse all details of the study, we believe that the study's conclusions are generally consistent with the weight of available evidence." (Council review closure letter to EPA Administrator Browner, p.1, EPA-SAB-COUNCIL-ADV-00-003, November 19, 1999). The Section 812 Prospective Report to Congress presents estimates of the benefits and costs of the regulatory programs mandated by the 1990 Clean Air Act Amendments (CAAA). EPA's new study estimates total annual costs for the CAAA of about $20 billion and total annual benefits of roughly $96 billion in the year 2000.[17]

Two specific programs account for 90 percent of the substantial benefit estimates in this Report. These two programs are (1) the pollution control initiatives directed toward reducing exposure to fine particulate matter and (2) the Title IV provisions directed at protecting stratospheric ozone.

These benefit estimates are considerably uncertain. For some of the specific uncertain variables underlying these estimates, EPA may have adopted assumptions which contribute to either overestimation or underestimation of benefits. With respect to underestimation, EPA could not quantify or monetize a number of benefit endpoints identified in the Section 812 Report. The inability to quantify

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disagrees with the Court's decision and is seeking Supreme Court Review. This report assumes that these standards will be implemented.

[17] The $20 billion in costs and the $96 billion in benefits are approximations and were derived by adding year 2000 estimates for Titles I-V with annualized equivalents of the net present value for Title VI over 1990 to 2075 for costs and 1990 to 2165 for benefits. (Table 8-3 of Prospective Report).

and monetize these effects may have resulted in the substantial underestimation of benefits. For example, EPA could not quantify and/or monetize a large number of health endpoints -- particularly those associated with air toxics effects -- and ecological endpoints. This inability reduced the overall benefits estimate. Ecological benefits which EPA could not value included gains to recreational and commercial fishing from decreased nitrogen deposition into estuaries, increased values from wildlife habitat improvements, biodiversity, and many other recreational values. Independent peer reviewers specifically highlighted each of these unquantified/unmonetized effects as a potentially significant source of underestimation in the overall benefit estimate.

As we noted in last year's Report, the causal relationship between fine particulate matter levels and premature mortality is substantially uncertain. A substantial body of published scientific literature report a correlation between elevated PM concentrations and increased mortality rates. The 1996 PM Criteria Document (U.S. EPA, 1996a) summarizes a great deal of this literature. While the Clean Air Scientific Advisory Committee pointed out that a causal mechanism has not been clearly established, the preamble to the 1997 PM National Ambient Air Quality Standards (U.S. EPA. 40 CFR 50, 1997) stated that, "the consistency of the results of the epidemiological studies from a large number of different locations and the coherent nature of the observed effects are suggestive of a likely causal role of ambient PM in contributing to the reported effects," which include premature mortality.

The National Academy of Sciences, in their report on research priorities for PM (National Academy of Sciences, 1998), states that:

> "The biological basis of most of the associations is essentially unknown at the ambient particulate levels at which the associations were observed. There is a great deal of uncertainty about the implications of the findings for risk management, due to the limited scientific information about the specific types of particles that might cause adverse health effects, the contributions of particles of outdoor origin to actual human exposure, the toxicological mechanisms by which the particles might cause adverse health effects, and other important questions." (p.2)

In addition, after noting the importance of supporting further prospective cohort mortality studies that consider multiple air pollutants, the SAB panel (Council) reviewing the draft Section 812 Prospective Report noted that the link between nitrates and mortality is also not well understood. (The Health and Ecological Effects Subcommittee of the Advisory Council on Clean Air Compliance Analysis, October 29, 1999, p.5.)

EPA has acknowledged these uncertainties, but has assumed -- for purposes of analysis -- a causal relationship between exposure to elevated PM and premature mortality, based on the consistent evidence of a correlation between PM and mortality reported in the scientific literature (U.S. EPA, 1996a). Consistent with the advice of the SAB Council, the Section 812 Prospective Report adopted the Pope et al (1995) study as the basis for estimating changes in PM-related mortality. The Section

812 Prospective Report states that the Dockery et al (1993) study offers a credible and reasonable alternative to the Pope study. Using the Dockery study would imply a doubling of the total benefits estimate for the year 2000. (See U.S. EPA, *The Benefits and Costs of the Clean Air Act, 1990 to 2010*, November 1999, p.110). In addition, consistent with SAB Council advice, the Section 812 Prospective Report treated reductions in all components of PM by making no distinctions among particles according to their chemical composition and treating all reductions in PM, both from directly emitted PM and from the secondary formation of PM, as equivalent.

Considerable uncertainty also exists with respect to the benefit estimates associated with protection of stratospheric ozone. Table 8-5 of the Prospective Report includes in its discussion of the various uncertainties that may affect the benefit estimates the following:

> "Major uncertainties include: estimating total cancer cases resulting from UV_B exposure; not accounting for future averting behavior; and not accounting for future improvements in the early detection and treatment of melanoma."

While recognizing that these uncertainties may result in an over-estimate of the benefits of Title VI, however, the Prospective Report relied on climate modeling dating from the mid-1980's and analysis developed over the period from 1988 to 1992. The only adjustments EPA made to the benefit estimates from this earlier analysis was to revise the discount rate to 5 percent and the value for reductions in premature mortality risks to $4.8 million (instead of the $3 million used in the earlier analysis). In fact scientists have learned much since the mid-1980's. EPA could have updated its analysis and adopted new information to provide an alternative estimate, as follows:

> -- the original RIA estimates assume worldwide compliance with international agreements. If other countries's compliance rates over the last decade were lower than expected, then benefits from U.S. control measures will be lower than estimated. Data reported to the United Nations Environment Programme's (UNEP) Ozone Secretariat in accordance with signatory countries' obligations under Article 7 of the Montreal Protocol (MP), however, indicate significant *over compliance* over the period 1986-1997. This suggests that benefits from U.S. control measures might be higher than estimated in the original analysis.
>
> -- important advances in our understanding of atmospheric chemistry occurred over the last decade. The information suggests a much slower recovery rate for stratospheric ozone than used in the estimates presented in the Section 812 Prospective Report. This implies substantially delayed program benefits.
>
> --the Section 812 Prospective Report incorporated the original RIA estimate that one percent of non-melanoma cancers result in premature mortality. Recent estimates of mortality associated with non-melanoma skin cancers, especially with the increased attention to skin

cancer, suggest that the expected reductions in premature mortality could be substantially lower than the 1.0 percent estimate in the original RIA.[18]

-- the baseline assumed continued population exposure patterns -- outdoor activity, sun bathing, etc. -- at levels comparable to exposure over the 1950's to 1970's without adjusting for averting behavior. Public education efforts, increased use of sunscreen, and other efforts starting two decades age are specifically directed toward reducing the adverse effect of UV_B exposure. At this time, we do not know whether the public health war on excess sun exposure will ultimately be successful; however, preliminary evidence from Australia's campaign to reduce the incidence of skin cancer and detect melanoma at an early stage suggest such efforts can be successful. (Council review letter to EPA Administrator Browner, p.4, EPA-SAB-COUNCIL-ADV-00-002, October 29, 1999.)

Finally, we note that the adoption of a value for the projected reduction in the risk of premature mortality is the subject of continuing discussion within the economic and public policy analysis community within and outside the Administration. In response to the sensitivity of this issue, we provide estimates reflecting two alternative approaches. The first approach -- supported by some and preferred by EPA -- uses a Value of a Statistical Life (VSL) approach. EPA prefers the VSL estimate of $5.9 million (1997$) developed for the Clean Air Act Section 812 benefit-cost studies. This estimate was derived from a set of 26 studies identified by EPA using criteria established in Viscusi (1992), as those most appropriate for environmental policy analysis applications. This approach, however, implicitly assumes that the willingness to pay to reduce mortality risks of the people in these 26 studies is the same as for the PM-vulnerable population.

For that reason, an alternative, approach is preferred by a number of others both within and outside the Administration. This approach was also developed for the Section 812 studies. It addresses one concern with applying the $5.9 million VSL estimate, which reflects a valuation derived mostly from labor market studies involving healthy working-age manual laborers to PM-related mortality risks that are primarily associated with older populations and those with impaired health status by adjusting for the age differences in the two populations. This alternative approach leads to an estimate of the value of a statistical life year (VSLY), which is derived directly from the VSL estimate. It differs only in incorporating an explicit assumption about the number of life years saved and an implicit assumption that the valuation of each life year is not affected by age.[19] It does not adjust for

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[18] The American Cancer Society reports that over a million cases of non-melanoma skin cancer are diagnosed in this country every year and that an estimated 1900 people are expected to die of non-melanoma skin cancer this year. (American Cancer Society, ACS News Today, May 1, 2000, www.cancer.org).

[19]Specifically, the VSLY estimate can be calculated by amortizing the $5.9 million mean VSL estimate over the 35 years of life expectancy associated with

differences in health status or other demographic differences. Under this alternative approach, the estimated mean VSLY is $360,000 (1997$); combining this number with a mean life expectancy of 14 years for the PM-vulnerable population yields an age-adjusted VSL of $3.6 million (1997$).

Both approaches are imperfect, and raise difficult methodological issues, which are discussed in depth in the recently published Section 812 Prospective Study, draft EPA Economic Guidelines, and the peer-review commentaries prepared in support of each of these documents. For example, both methodologies embed assumptions (explicit or implicit) about which there is little or no definitive scientific guidance. In particular, both methods adopt the assumption that the risk versus dollars trade-offs revealed by available labor market studies are applicable to the risk versus dollar trade-offs in the air pollution context.

EPA currently prefers the VSL approach because, essentially, the method reflects the direct application of what EPA considers to be the most reliable estimates for valuation of premature mortality available in the current economic literature. While there are several differences between the labor market studies EPA uses to derive a VSL estimate and the particulate matter air pollution context addressed here, those differences in the affected populations and the nature of the risks imply both upward and downward adjustments. For example, adjusting for age differences may imply the need to adjust the $5.9 million VSL downward, as would adjusting for health differences; but the involuntary nature of air pollution-related risks and the lower level of risk-aversion of the manual laborers in the labor market studies may imply the need for upward adjustments. In the absence of a comprehensive and balanced set of adjustment factors, EPA believes it is reasonable to continue to use the $5.9 million value while acknowledging the significant limitations and uncertainties in the available literature. Furthermore, EPA prefers not to draw distinctions in the monetary value assigned to the lives saved even if they differ in age, health status, socioeconomic status, gender or other characteristics of the adult population.

Those who favor the alternative, age-adjusted approach emphasize that the value of a statistical life is not a single number relevant for all situations. Indeed, the VSL estimate of $5.9 million (1997$) is itself the central tendency of a number of estimates of the VSL for some rather narrowly defined populations. When there are significant differences between the population affected by a particular health risk and the populations used in the labor market studies – as is the case here – they prefer to adjust the VSL estimate to reflect those differences. While acknowledging that the VSLY approach provides an admittedly crude adjustment (for age though not for other possible differences between the populations), they point out that it has the advantage of yielding an estimate that is not presumptively

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subjects in the labor market studies. The resulting estimate, using a 5 percent discount rate, would be $360,000 per life-year saved in 1997 dollars. This annual average value of a life-year can then be multiplied times the number of years of remaining life expectancy for the affected population.

biased. Proponents of adjusting for age differences using the VSLY approach fully concur that enormous uncertainty remains on both sides of this estimate – upwards as well as downwards – and that the populations differ in ways other than age (and therefore life expectancy). But rather than waiting for all relevant questions to be answered, they prefer a process of refining estimates by incorporating new information and evidence as it becomes available.

3. Combining Estimates of Annual Benefits and Costs

Because the EPA "Retrospective" and "Prospective" Reports provide a consistant framework for estimating of the benefits and costs of the Clean Air Act (CAA), we have elected to develop parallel estimates for the environmental programs. Table 3 presents both the estimates from Table 2 and the EPA Section 812 Prospective Report estimates to allow the construction of an aggregate estimate of the monetized benefits and costs of CAA regulation.

Table 3 presents estimates for the Clean Air Act using information on the benefits and costs of Clean Air Act regulation from EPA's Retrospective and Prospective Reports coupled with RIA benefit and cost estimates for several recent air rules. We have included an age adjusted estimate that reflects a different valuation for reductions in mortality-related risks because these risks are primarily associated with older populations. This approach yields benefit estimates of $1 to $1.6 trillion per year and cost estimates of $96 billion per year for Clean Air Act regulation. Thus, the net benefits of Clean Air Act provisions are on the order of $1 to $1.5 trillion per year.

Table 3 also presents estimates for all environmental-based regulation developed using benefit and cost studies published by Hahn and Hird (1991) and Hahn (1996), our own estimates of the cost of environmental regulations issued over the 1988 to 1995 period, and the compilation in Tables 11 to 14 (below) from RIAs of benefit and cost estimates for environmental rules issued over the 1995 to 1999 period. These estimates of the costs and benefits of environmental regulations include estimates for CAA regulations as well as other EPA regulations based on the RIAs EPA prepared at the time. We present this separate estimate because the new Section 812 Prospective Report offers a separate set of estimates specific to the Clean Air Act; it does not cover the benefits and costs of the regulations EPA issued over this period pursuant to its other environmental statutes. In addition, the estimates presented by the Section 812 Prospective Report also do not include some of the regulations EPA issued between 1995 and the first quarter of 1999, such as the recent regional haze final rule, because of the time and resources necessary to conduct this prospective assessment.

Table 4 combines the results from Tables 1, 2, and 3 to present our estimates for the existing costs of social regulation as of the first quarter in 1999. It shows that health, safety and environmental regulation produces between $25 billion and $1,653 billion of net benefits per year.

4. Costs and Benefits of Major Rules by Agencies

Table 5 lists the costs and benefits by agency and agency program for major regulations issued over the last four years (April 1, 1995 to March 31, 1999) as estimated in Chapter III. During this period, only seven agencies issued major rules. Of these, rules by EPA and HHS had the greatest impact. Those issued by EPA are expected to provide between $17 billion and $84 billion in annual benefits for society at an annual cost of about $28 billion. Those issued by HHS are expected to provide $12 billion to $14 billion in annual benefits at an annual cost of about $800 million.

B. Economic Regulation

In our 1997 and 1998 reports, we presented an estimate that the efficiency costs of economic regulation amounted to $71 billion. This is based on an estimate by Hopkins (1992) of $81 billion, which we adjusted downward by $10 billion to account for the deregulation and increase in competition that has occurred in the financial and telecommunications sectors since Hopkins' estimates were made in 1992. In a recent comprehensive report on regulatory reform in the United States by a panel of experts from around world, the OECD estimated that additional reforms in the transportation, energy, and telecommunications sectors would lead to an increase in GDP of 1 percent (OECD, 1999). One percent of the revised first quarter 1999 GDP of $9,073 billion is about $90 billion.

This estimate does not include the costs of international trade protection, which Hopkins included in his estimate of the cost of economic regulation. According to a recent study, the static gains from removing trade barriers existing in 1990 suggested potential gains of about 1.3 percent of GDP (Council of Economic Advisers, 1998) or $120 billion for the first quarter of 1999, assuming trade barriers have not changed.[20] These estimates taken together suggest that Hopkins' estimate may be too low.

As we discuss above, economic regulation also results in income transfers from one group to another. In our previous two reports, we used an approach used by Hahn and Hird, and Hopkins, to estimate transfers as a multiple of the efficiency losses. Based on the OECD estimate of efficiency losses, Hopkins' multiple of two (1992) gives rise to an estimate of transfer costs for economic regulation (not counting trade protection) of $180 billion.

Insert table 5

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[20] The CEA report also went on to state that studies of this type only capture static costs, fail to capture value of foregone varieties of products, quality improvements, and productivity enhancements that would take place in the absence of trade barriers, and thus understate the benefits from trade (CEA 1998, p. 238).

C. Process Regulation

The main costs of process regulation consist of the paperwork costs imposed on the public. Section 638(a)(1)(A) of the Act calls on OMB to examine the costs and benefits of paperwork. Currently OMB is in the process of revising its guidance on how the agencies should evaluate paperwork burden. OMB issued a notice in the *Federal Register* on October 14, 1999 (64 FR 55788) inviting comments on how best to improve the uniformity, accuracy, and comprehensiveness of agency burden measurement. In this notice, we raise the issue of expanding the reporting of burden to include a monetized value of time, and specifically seek comment on the idea of converting "burden hours" into a dollar measure of burden. If a dollar-equivalent value is calculated for burden hours, agencies and OMB could report a single estimate – in dollar terms – of paperwork burden that would combine monetized burden hours with the "cost burden" calculation. This would estimate out-of-pocket expenses that are not captured by the time-based measure of burden. While this approach has analytical appeal, it does pose significant methodological challenges.

In addition, the IRS has begun work on a new model that will estimate the amount of burden incurred by wage and investment taxpayers as a result of complying with the tax system. IRS has undertaken this study to improve our understanding of taxpayer burdens, to enable us to measure both current and future levels of burden, and to help us isolate the burden of particular tax provisions, regulations, or procedures. To help provide input into our consideration of methods to expand the reporting of burden to include monetized burden hours, the IRS paperwork burden study will include the development of a White Paper on the Monetization of Taxpayer Time. This White Paper will examine the issues surrounding monetization, review existing research, identify lessons learned, and discuss the implications for efforts to monetize taxpayer time.

In our *Information Collection Budgets*, published annually, we calculate paperwork burden imposed on the public, using information that agencies give us with their requests for information collection approvals.[21] We present below in Table 6 estimates of paperwork burden in terms of the hours the public devotes annually to gathering and providing information for the Federal government. At a future point in time, we hope to be able to provide information on the dollar costs of paperwork. At present we do not know how to estimate the value of the total annual benefits to society of the information the government collects from the public.

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[21] The Paperwork Reduction Act of 1995 requires Federal agencies to seek approval from OMB for each information collection sought from ten or more individuals or entities. As part of that request agencies must estimate the burdens that their individual collection requests impose on the public.

Table 6 shows our estimates of the expected paperwork burden hours for FY 1999 by agency. The total burden of 7,202 million hours is made up of 5,912 million hours for the Treasury Department (82 percent) and 1,290 million hours for the rest of the Federal government

Insert table 6

(18 percent). "Using the estimate of average value of time from our previous two reports ($26.50 per hour for individuals and entities that provide information to the government), we derive a cost estimate of public paperwork of $190 billion." Note, however, that (1) this is a rough average and should not be applied to individual agencies or agency collections, and (2) this estimate should not be added to our estimates of the costs of regulation because it would result in some double counting. Our estimates of regulatory costs already include paperwork costs. Many paperwork costs arise from regulations, often for enforcement and disclosure purposes.

III. The Other Impacts of Federal Regulation

Section 638 (a)(2) of the Act calls on OMB to present an analysis of the impacts of Federal regulation on State, local, and tribal government, small business, wages, and economic growth.

A. Impact on State, Local, and Tribal Government

Over the past four years, four rules have imposed costs of more than $100 million on State, local, and Tribal governments (and thus have been classified as public sector mandates under the Unfunded Mandates Act of 1995).[22] All four of these rules were issued by the Environmental Protection Agency. These four rules are described in greater detail below.

1. *EPA's Rule on Standards of Performance for Municipal Waste Combustors and Emissions Guidelines* (1995): This rule set standards of performance for new municipal waste combustor (MWC) units and emission guidelines for existing MWCs under sections 111 and 129 of the Clean Air Act [42 U.S.C. 7411, 42 U.S.C. 7429]. The standards and guidelines

[22] EPA's proposed rules setting air quality standards for ozone and particulate matter may ultimately lead to expenditures by State, local or tribal governments of $100 million or more. However, Title II of the Unfunded Mandates Reform Act provides that agency statements on compliance with Section 202 must be conducted "unless otherwise prohibited by law". The Conference report to this legislation indicates that this language means that the section "does not require the preparation of any estimate or analysis if the agency is prohibited by law from considering the estimate or analysis in adopting the rule." EPA has stated, and the courts have affirmed, that under the Clean Air Act, the air quality standards are health-based and EPA is not to consider costs.

apply to MWC units at plants with aggregate capacities to combust greater than 35 megagrams per day (Mg/day) (approximately 40 tons per day) of municipal solid waste (MSW). The standards require sources to achieve emission levels reflecting the maximum degree of reduction in emissions of air pollutants that the Administrator determined is achievable, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements.

EPA estimated the national total annualized cost for the emissions standards and guidelines to be $320 million per year (in constant 1990 dollars) over existing regulations. EPA estimated the cost of the emissions standards for new sources to be $43 million per year. EPA estimated the cost of the emissions guidelines for existing sources to be $277 million per year. The annual emissions reductions achieved through this regulatory actions include, for example, 21,000 Mg. of SO2; 2,800 Mg. of particulate matter (PM); 19,200 Mg of NOX; 54 Mg. of mercury; and 41 Kg. of dioxin/furans.

2. *EPA's Standards of Performance for New Stationary Sources and Guidelines for Control of Existing Sources: Municipal Solid Waste Landfills* (1996): This rule set performance standards for new municipal solid waste landfills and emission guidelines for existing municipal solid waste landfills to implement section 111 of the Clean Air Act. The rule addressed non-methane organic compounds (NMOC) and methane emissions. NMOC include volatile organic compounds (VOC), hazardous air pollutants (HAPs), and odorous compounds. Of the landfills required to install controls, about 30 percent of the existing landfills and 20 percent of the new landfills are privately owned. The remainder are publicly owned. The total nationwide annualized costs for collection and control of air emissions from new and existing MSW landfills are estimated to be $94 million per year annualized over 5 years, and $110 million per year annualized over 15 years.

3. *National Primary Drinking Water Regulations: Disinfectants and Disinfection Byproducts* (1998): This rule promulgates health based maximum contaminant level goals (MCLGs) and enforceable maximum contaminant levels (MCLs) for about a dozen disinfectants and byproducts that result from the interaction of these disinfectants with organic compounds in drinking water. The rule will require additional treatment at about 14,000 of the estimated 75,000 water systems nationwide affected by this rule. The costs of the rule are estimated at $700 million annually. The quantified benefits estimates range from zero to 9,300 avoided bladder cancer cases annually, with an estimated monetized value of $0 to $4 billion. Possible reductions in rectal and colon cancer and adverse reproductive and developmental effects were not quantified.

4. *National Primary Drinking Water Regulations: Interim Enhanced Surface Water Treatment* (1998): This rule establishes new treatment and monitoring requirements (primarily related to filtration) for drinking water systems that use surface water as their source and serve

more than 10,000 people. The purpose of the rule is to enhance protection against potentially harmful microbial contaminants. EPA estimated that the rule will impose total annual costs of $300 million per year. The rule is expected to require treatment changes at about half of the 1,400 large surface water systems, at an annual cost of $190 million. Monitoring requirements add $96 million per year in additional costs. All systems will also have to perform enhanced monitoring of filter performance. The estimated benefits include mean reductions of from 110,000 to 338,000 cases of cryptosporidiosis annually, with an estimated monetized value of $0.5 to $1.5 billion, and possible reductions in the incidence of other waterborne diseases.

While these four EPA rules were the only ones over the past four years to require expenditures by State, local and tribal governments exceeding $100 million, they were not the only rules with impacts on other levels of governments. For example, 18 percent of rules listed in the April 1999 Unified Regulatory Agenda cited some impact on State, local or tribal governments. In general, OMB works with the agencies to ensure that the selection of the regulatory option for all final rules fully complies with the Unfunded Mandates Reform Act. For proposed rules, OMB works with the agencies to ensure that they also solicited comment on alternatives that would reduce costs to all regulated parties, including State, local and tribal governments.

Agencies have also significantly increased their consultation with State, local, and tribal governments on all regulatory actions that impact them. For example, EPA and the Department of Health and Human Services engaged in particularly extensive consultation efforts over a wide variety of programs, on both formal unfunded mandates as defined by the Unfunded Mandates Reform Act and other rules with intergovernmental impacts. Agencies also made real progress in improving their internal systems to manage consultations better. This has helped them analyze specific rules in ways that reduce costs and increase flexibility for all levels of government and for the private sector, while implementing important national priorities.

This trend toward increased consultation is expected to continue. On August 5, 1999, President Clinton issued Executive Order No. 13132 entitled "Federalism." This Executive Order emphasizes consultation with State and local governments and greater sensitivity to their concerns. It also establishes specific requirements that Federal agencies must follow as they develop and carry out policies that affect State and local governments.

B. Impact on Small Business

The President explicitly recognized the need to be sensitive to the impact of regulations and paperwork on small business in his Executive Order No. 12866, "Regulatory Planning and Review," issued September 30, 1993. The Executive Order called on the agencies to tailor their regulations by business size in order to impose the least burden on society, consistent with obtaining the regulatory objectives. It also called for the development of short forms and other streamlined regulatory approaches for small businesses and other entities. The President also supported and signed into law

the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA). In the findings section of SBREFA, Congress stated that "... small businesses bear a disproportionate share of regulatory costs and burdens." This is largely attributable to fixed costs -- costs that all firms must bear regardless of size. Each firm has to determine whether a regulation applies, how to comply, and whether it is in compliance. As firms increase in size, fixed costs are spread over a larger revenue and employee base resulting in lower unit costs.

This observation is supported by empirical information from a study by the Office of Advocacy of the Small Business Administration (1995). That study found that regulatory costs per employee decline as firm size -- as measured by the number of employees per firm --

increases. Using data from Hopkins (1995), SBA estimates that the total cost of regulation (environmental, other social, the efficiency costs of economic, the transfer costs of economic, and process regulation) was 50 percent greater per employee for firms with under 20 employees compared to firms with over 500 employees.[23]

These results do not necessarily indicate, however, the extent to which reducing regulatory requirements on small firms would affect net benefits. That depends upon the differences between relative compliance costs per dollar of benefits, not on differences in costs per employee. If benefits per dollar of costs are smaller for small firms than large firms, then decreasing requirements for small firms while increasing them for large firms should increase net benefits.

C. Impact on Wages

The impact of Federal regulations on wages depends upon how "wages" is defined and on the types of regulations involved. If we define "wages" narrowly as workers' take-home pay, social regulation may have decreased average wage rates, while economic regulation may have increased them, especially for specific groups of workers. If we define "wages" more broadly as the real value or utility of workers' income, the directions of the effects of the two types of regulation are probably reversed.

1. Social Regulation

Social regulation is regulation directed at improving health, safety, and the environment. By a broad measure of welfare, such regulation can create benefits for workers that outweigh the costs. This

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[23] SBA estimated that average per employee regulatory costs were $5,106 for firms with under 20 employees compared to $3,404 for firms with over 500 employees. These estimates are based on 1992 conditions using 1995 dollars. Hopkins's own estimates found a 86 percent differential (See SBA 1995, pp 39-46).

is true even if real take-home pay decreases. Take home pay may decrease because compliance costs must be paid for by some combination of workers, business owners, and/or consumers through adjustments in wages, profits, and/or prices.

For occupational health and safety standards, while some portion of the costs might be absorbed by the business owner or passed on to the consumer, most of the cost effect is likely to fall on workers. As one leading text book in labor economics suggests: "Thus, whether in the form of smaller wage increases, more difficult working conditions, or inability to obtain or retain one's first choice in a job, the costs of compliance with health standards will fall on employees."[24] Viewed in terms of overall welfare, however, the regulatory benefits of improved health and safety improvements for workers can outweigh the costs. Where the benefits of regulation accrue mostly to workers, workers are likely to be better off if the value of the health benefits exceed compliance costs.[25] Although wages may reflect the cost of compliance with health and safety rules, the job safety and other benefits of such regulation can more than compensate for any monetary loss.

Workers as consumers benefitting from safer products and a cleaner environment may also come out ahead if product safety and environmental regulation produces significant net benefits for society.

2. Economic Regulation

For economic regulation, designed to set prices or conditions of entry for specific sectors, these effects may at times be reversed to some degree. Economic regulation can result in increases in income narrowly defined, but decreases in broader measures of income based on utility or overall welfare. Economic regulation is often used to protect industries and their workers from outside competition. Examples include the airline and trucking industries in the 1970's. These wage gains come at a cost in inefficiency from reduced competition, however, which consumers must bear. Moreover, real wages, which depend upon productivity, do not grow as fast without the stimulation of outside competition.[26]

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[24] From Ehrenberg and Smith's *Modern Labor Economics*, p 279.

[25] Based on a cost benefit analysis of OSHA's 1972 Asbestos regulation by Settle (1975), which found large net benefits, Ehrenberg and Smith cite this regulation as a case where workers' wages were reduced, but they were made better off because of improved health (p 281).

[26] Winston (1998) estimates that real operating costs declined between 25 and 75 percent in the sectors that were deregulated over the last 20 years -- transportation, energy, and telecommunications.

These statements are generalizations for the impact of regulation in the aggregate or by broad categories. Specific regulations can increase or decrease the overall level of benefits accruing to workers depending upon the actual circumstances.

D. Economic Growth

The conventional measurement of GDP does not take into account the market value of improvements in health, safety, and the environment. It does incorporate the direct compliance costs of social regulation. Accordingly, conventional measurement of GDP can suggest that regulation reduces economic growth.[27] In fact, sensible regulation and economic growth are not inconsistent once all benefits are taken into account.

The OECD (1999) estimates that the economic deregulation that occurred in the US over the last 20 years permanently increased GDP by 2 percent. The OECD also estimates that further deregulation of the transportation, energy, and telecommunication sectors would increase US GDP by another 1 percent. Jaffe, Peterson, Portney, and Stavins (1995) summarize their findings after surveying the evidence of the effects of environmental regulation on economic growth as follows: "Empirical analysis of the productivity effects have found modest adverse impacts of environmental regulation." Based on the studies that tried to explain the decline in productivity that occurred in the US during the 1970's, they placed the range attributable to environmental regulation from 8 percent to 16 percent (p. 151). The recent increase in productivity growth in the US coinciding with continued health, safety, and environmental regulation supports the notion that the negative growth effects of social regulation have been relatively small.[28]

As indicated above, conventionally measured GDP growth does not take into account the market value of the improvements in health, safety, and the environment that social regulation has brought us. If even our lower range estimate of the benefits of social regulation ($266 billion) were added to GDP, then the more comprehensive measure of GDP, one that includes the value of nonmarket goods and services provided by regulation, would be about 3 percent greater.[29] Focusing

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[27] Social regulation reduces growth by diverting resources from the production of goods and services that are counted in GDP to the production or enhancement of "goods and services" such as longevity, health, and environmental quality that generally are not counted in GDP.

[28] For the last three years, output per hour in nonfarm business has been growing as rapidly as it did on average during productivity's golden years from 1948 though 1973.

[29] Including the value of increasing life expectancy in the GDP accounts to come up with a more comprehensive measure of the full output of the economy is not as farfetched as it sounds. It was first proposed and estimated in 1973 by D. Usher in

on the effect of social regulation on economic growth is misleading if it does not take into account the full benefits of regulation.

More important than knowing the impact of regulation in general on growth is the impact of specific regulations and alternative regulatory designs on economic growth. As Jaffe *et al* put it: "Any discussion of the productivity impacts of environmental protection efforts should recognize that not all environmental regulations are created equal in terms of their costs or their benefits" (p. 152).

In this regard, market-based or economic-incentive regulations will tend to be more cost-effective than those requiring specific technologies or engineering solutions. Under market-based regulation, profit-maximizing firms have strong incentives to find the cheapest way to produce the social benefits called for by regulation. How you regulate can go a long way toward reducing any negative impacts on economic growth and increasing the overall long run benefits to society.

Chapter III: Estimates of Benefits and Costs of This Year's "Major" Rules

In this chapter, we examine the benefits and costs of each "major rule," as required by Section 638(a)(1)(C). We have included in our review those final regulations on which OMB concluded review during the 12-month period April 1, 1998, through March 31, 1999. This "regulatory year" (i.e. beginning in April and ending in March) is the same calendar period we used for last year's report.

The language in Section 638(a)(1)(C) of the Act, which sets out the category of rules to be considered for this report, differs from the language used to define "economically significant" in Executive Order No. 12866 (section 3(f)(1)). Section 638(a)(1)(C) also differs from similar definitions of economic significance found in the Unfunded Mandates Reform Act and subtitle E of the Small Business Regulatory Enforcement Fairness Act of 1996 -- Congressional Review of Agency Rulemaking. Given these varying definitions, we interpreted Section 638(a)(1)(C) broadly to include all final rules promulgated by an Executive branch agency that meet any one of the following three measures:

- rules designated as "economically significant" under section 3(f)(1) of Executive Order No. 12866

- rules designated as "major" under 5 U.S.C. 804(2) (Congressional Review Act)

"An Imputation to the Measure of Economic Growth for Changes in Life Expectancy" *NBER Conference on Research in Income and Wealth.*

- rules designated as meeting the threshold under Title II of the Unfunded Mandates Reform Act (2 U.S.C. 1531 - 1538)

We also include a discussion of major rules issued by independent regulatory agencies, although OMB does not review these rules under Executive Order No. 12866. This discussion is based on data provided by these agencies to the General Accounting Office (GAO) under the Congressional Review Act.

Between April 1, 1998 and March 31, 1999, OMB reviewed 44 final rules (listed in Table 7) that met the criteria noted above. Of these rules, HHS submitted 15; EPA eight; DOT six; USDA four; DOI two; and DOL, DOC, SBA, DOJ, PBGC, and Education, each submitted one. In addition, two of these rules were Federal Acquisition Regulations rules and one was a common rule issued by three agencies -- DOL, HHS, and Treasury. These 44 rules represent about 18 percent of the 255 final rules reviewed by OMB between April 1, 1998, and March 31, 1999, and less than one percent of the 4,752 final rule documents published in the *Federal Register* during this period. Nevertheless, because of their scale and scope, we believe that they represent the vast majority of the costs and benefits of new Federal regulations issued during this period.

Insert table 7

I. Overview

As noted in Chapter II of last year's Report, Executive Order No. 12866 "reaffirms the primacy of Federal agencies in the regulatory decisionmaking process" because agencies are given the legal authority and responsibility for rulemaking under both their organic statutes and certain process-oriented statutes, such as the Administrative Procedure Act, the Unfunded Mandates Reform Act, and the Small Business Regulatory Enforcement Fairness Act. The Executive Order also reaffirms the legitimacy of centralized review of regulations, including review of benefit-cost analyses that accompany agency rules. The Executive Order recognizes that in some instances the consideration of benefits or costs is precluded by law. Nevertheless, the Executive Order requires agencies to prepare and submit benefit-cost analyses even if those considerations are not a factor in the decisionmaking process. Again, it is the agencies that have the responsibility to prepare these analyses, and it is expected that OMB will review (but not redo) this work. In cases where the agency has substantial rulemaking discretion, the costs and benefits may be attributable to the regulation. In other cases, where the agency has limited discretion, the costs and benefits may be attributable primarily to the statute.

We found that the benefit-cost analyses accompanying the 44 final rules listed in Table 7 vary substantially in type, form, and format of the estimates the agencies generated and presented. For example, some agency estimates of benefits, costs, and transfers were monetized, some were quantified but not monetized, some were qualitative, and, most often, some were a combination of the three.

II. Benefits and Costs of Economically Significant/Major Final Rules (April 1998 to March 1999)

A. Social Regulation

Of the 44 rules reviewed by OMB and listed in Table 7, 22 are regulations we classify as "social regulations,"[30] that is, requiring substantial additional private expenditures and/or providing new social benefits.[31] EPA issued eight of these rules; HHS and DOT, three each; USDA and DOI, two each; DOC, DOL and Education, one each; and HHS/DOL/Treasury jointly issued one rule. Agency estimates and discussion are presented in a variety of ways, ranging from a purely qualitative discussion of, for example, the benefits related to the establishment of a minimum length-of-stay requirement for mothers and newborns (HHS/DOL/Treasury joint rule), to a more complete benefit-cost analysis of, for example, the costs and benefits associated with EPA's surface water treatment rule.

1. Benefits Analysis

Agencies monetized at least some benefit estimates in a number of cases including, for example: (1) FDA's estimate of $5.7 billion over 5 years from the additional transplants resulting from its transplant-related data rule; (2) EPA's estimate of $1.1 to $4.2 billion per year due to better air quality from its ozone transport (NOx SIP Call) rule; and (3) DOT's estimate of $360 million over ten years in highway safety improvements as a result of the reflector rule for trailers.

Specifically, of the 22 (non-transfer) rules listed in Table 6, agencies provided all quantified benefit estimates in a monetized form in ten cases. In two cases, agencies provided some quantified benefit estimates in monetized form, but did not monetize other, important quantified components of benefits. For example, DOL's analysis of its powered industrial truck operator training rule monetized the property damage reductions and out-of-pocket savings associated with injury reductions. However, DOL did not monetize the other aspects of those injuries (such as pain and suffering) nor the fatalities avoided. EPA's analysis of its non-handheld engines rule monetized the projected fuel savings, but not the estimated hydrocarbon and nitrogen oxide emission reductions.

In four cases, agencies provided quantified benefit estimates but provided no monetized estimates. These included: (1) DOT's 36 to 50 fatalities and 1,231 to 2,229 injuries prevented per year as a result of child seat rule; (2) EPA's 113,500 tons of volatile organic compound emission reductions per year from its architectural coatings rule; (3) EPA's annualized emission reductions of 786,000 tons of nitrogen oxides, 110,000 tons of hydrocarbons and 87,000 tons of particulate matter

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[30] The other 22 are "transfer" rules.

[31] Note that all dollar figures in Table 7 are in 1996 dollars unless otherwise noted.

from its nonroad diesel engines rule; (4) EPA's emission reduction estimate of 46,000 tons of nitrogen oxides from its steam generating units rule.

Finally, in six cases, agencies did not report any quantified (or monetized) benefit estimates. In many of these cases, the agency provided a qualitative description of benefits. For example, USDA's wood packing material rule discusses the potential benefits of avoiding the loss of forest products, commercial fruit, maple syrup, and tourism associated with a massive beetle infestation, but does not estimate the probability of such an episode. HHS's analysis of its length-of-stay rule for mothers and newborns includes only a qualitative discussion of the rule's positive impact on the overall health and well-being of those affected.

2. Cost Analysis

In 16 of the 22 (non-transfer) rules listed in Table 7, agencies provided monetized cost estimates. These include, for example: (1) HHS's estimate of $1.4 billion over five years in direct medical costs for its transplant-related data rule; (2) DOT's estimate of $152 million per year for its child restraint rule; and (3) EPA's estimate of $1.7 billion per year for its ozone transport rule.

For the remaining six rules, the agencies did not estimate costs. These rules included both USDA rules, DOI's two migratory bird hunting rules, DOC's endangered species listing rule and NHTSA's light truck fuel economy rule.

3. Net Monetized Benefits

Ten of the 22 (non-transfer) rules listed in Table 7 provided at least some monetized estimates of both benefits and costs. Of those, eight have positive net monetized benefits, that is, estimated monetized benefits that exceed the estimated monetized costs of the rules. For example, DOT's reflector rule will generate an estimated net benefit of about $140 million (present value) over 10 years. EPA's surface water treatment rule will result in an estimated net benefit of between $41 million and $1.3 billion per year.

In the case of certain health, safety, and environmental rules, the epidemiologic evidence may indicate, but not establish with certainty, that a causal link exists between the regulated substance and the occurrence of serious illness. Despite the lack of certainty, an agency may decide that regulation is appropriate. In calculating the benefits of such a rule, it is necessary to describe more than one possible outcome, reflecting the current state of knowledge referred to above. Thus, for example, two EPA rules resulted in monetized benefit estimates that included the possibility of both positive or negative net benefits. For example, EPA's disinfection byproducts rule was estimated to generate between $3.18 billion in net benefits and $701 million in net costs. This reflected the lack of certainty as to whether the rule would result in the prevention of bladder cancer.

4. Rules Without Quantified Effects of More Than $100 Million per Year

Seven of the 44 rules in Table 7 are classified as economically significant even though their quantified effects do not exceed $100 million in any one year:

USDA - Solid Wood Packing Material from China: Because of a lack of data, the USDA was not able to estimate the benefits and costs associated with regulating solid wood packing materials from China to prevent the importation of wood pests. USDA stated, however, that in the absence of regulatory action, the wood pests could significantly affect the forest products, commercial fruit, maple syrup, nursery, and tourist industries, which have a value of $41 billion.

USDA - Pseudorabies in Swine: In 1999, USDA began implementing a policy to accelerate the Federal eradication program for pseudorabies. Although USDA authorizes a $80 million fund for indemnity payments, the producers of the swine incur other costs such as the cost of cleaning and disinfection. USDA did not estimate these costs because it did not have sufficient information to determine the effect of its actions on the market. USDA believed it was important to act immediately because the severely depressed values of market swine presented a unique opportunity to significantly accelerate pseudorabies eradication in a cost-effective way through depopulation.

DOC - Endangered and Threatened Species of Salmonids: Based upon publicly available information, OMB determined that rules covering these species were major. Citing the Conference Report on the 1982 amendments to the Endangered Species Act, however, the agency did not perform a benefit-cost analysis of the final rules. This report specifically provides that economic impacts cannot be considered in assessing the status of a species.

HHS - Safety and Effectiveness of New Drugs in Pediatric Patients: FDA estimated that this rule will generate benefits of about $76 million per year. FDA also noted, however, that this should be interpreted as a lower bound, since the analysis covered only five illnesses and did not include any estimate for avoided pain and suffering. FDA expressed the belief that the benefits of the rule could easily exceed $100 million.

HHS - Over-The-Counter Drug Labeling: FDA estimated the benefits of this rule at $61 to $80 million/yr. In addition, the agency was unable to quantify several components of benefits that it believes are significant. These include increased consumer satisfaction and a reduction in less-severe adverse health outcomes.

DOT - Light Truck CAFE: For each model year, DOT must establish a corporate average fuel economy (CAFE) standard for light trucks, including sport-utility vehicles and minivans. (DOT also sets a separate standard for passenger cars, but is not required to revisit the standard each year). For the past four years, however, appropriations language has prohibited NHTSA from spending any funds to change the standards. In effect, the law has frozen the light truck standard at its existing level of 20.7

miles per gallon (mpg) and has prohibited NHTSA from analyzing effects at either 20.7 mpg or alternative levels. Although DOT did not estimate the benefits and costs of the standards, the agency's experience in previous years indicates that they may be substantial. Over 5 million new light trucks are subject to these standards each year, and the standard, at 20.7 mpg, is binding on several manufacturers. In view of these likely, substantial effects, we designated the rule as economically significant even though analysis of the effects was prohibited by law.

EPA - Petroleum Refining Process Waste - EPA estimated the cost of the rule at $20 to $40 million per year with an expected value of $30 million per year. Based on new cost information submitted to EPA after the close of the comment period, OMB determined that the rule as written could impose costs in excess of $100 million per year. EPA subsequently determined that the higher cost estimates are attributable to waste leachates not intended to be covered by the petroleum listing, and EPA published in the *Federal Register* another rule clarifying that leachates are excluded from this petroleum listing and other listings, and are deferred to Clean Water Act discharge standards. This deferral was in effect when the petroleum rule became effective; consequently, the impacts for the petroleum listing are correctly estimated to be $30 million.

B. Transfer Regulations

Of the 44 rules listed in Table 7, 22 were necessary to implement Federal budgetary programs. The budget outlays associated with these rules are "transfers" to program beneficiaries. Of the 22, two are USDA rules that implement Federal appropriations language regarding disaster aid for farmers; eleven are HHS rules that implement Medicare and Medicaid policy; one is an HHS rule providing assistance to needy families; three are DOT rules regarding grants to states to increase seatbelt usage and reduce intoxicated driving; one is an SBA rule regarding contracting; two are Federal Acquisition Regulation rules; one is a DOJ rule regarding immigration policy; and one is a Pension Benefit Guaranty Corporation (PBGC) rule regarding payment of premiums.

C. Major Rules for Independent Agencies

The Congressional review provisions of the Small Business Regulatory Enforcement Fairness Act (SBREFA) require the General Accounting Office (GAO) to submit reports on major rules to the Committees of jurisdiction in both Houses of Congress, including rules issued by agencies not subject to Executive Order No. 12866 (the "independent" agencies). We reviewed the information on the costs and benefits of major rules contained in GAO reports for the period of April 1, 1998 to March 31, 1999. GAO reported that four independent agencies issued twenty-four major rules during this period. We list the agencies and the type of information provided by them (as summarized by GAO) in Table 8.

In comparison to the agencies subject to Executive Order No. 12866, most independent agencies provided relatively little quantitative information on the costs and benefits of the major rules. As Table 8 indicates, seven of the twenty-five rules included some discussion of benefits and costs.

Four of the twenty-five regulations adopted by independent agencies monetized cost information; two regulations monetized the benefits.

The SEC provided information on the costs and benefits of six of the seven major rules it adopted (the seventh was an interpreted release) and monetized costs and/or benefits in five of those rules. For example, SEC estimated and monetized both benefits and costs for the "Over-the -Counter Derivative Dealers" regulation which set forth the conditions under which over-the-counter security dealers in the United States buy and sell derivative securities. Using data from the five regulated entities most likely to benefit from the deregulatory rule [63 FR 54362], the SEC estimated that costs would be $36 million and benefits would be $138 million. Similarly, the SEC monetized the costs ($5.6 million) associated with the "New Disclosure Option for Open-Ended Management Investment Companies" regulation which permitted investment companies to use a profile form when initially offering their securities to the public [63 FR 13968]. The SEC reported difficulties in obtaining standardized data due to wide variations within the securities industry (for example, in wages and bonuses) and the difficulty of monetizing benefits to the public (such as free and fair markets).

Insert table 8

Chapter IV: Estimates of Benefits and Costs of "Economically Significant" Rules, April 1995 - March 1999

This chapter presents the available benefit and cost estimates for individual rules reviewed by OMB between April 1, 1995 and March 31, 1999.[32] In assembling estimates of benefits and costs, we have:

(1) applied a uniform format for the presentation of benefit and cost estimates in order to make agency estimates more closely comparable with each other (for example, providing the benefit and cost streams over time and annualizing benefit and cost estimates); and

(2) monetized quantitative estimates where the agency has not done so (for example, converting tons of pollutant per year to dollars).

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[32] The summary of agency estimates for final rules from the current year (April 1, 1998 to March 31, 1999) is presented in Chapter II, Table 7. The summary of agency estimates for final rules from the preceding three years (April 1, 1995 to March 31, 1998) is presented in Tables 16 through 18 in the Appendix.

Adopting a format that presents agency estimates so that they are more closely comparable also allows, at least for purposes of illustration, the aggregation of benefit and cost estimates across rules. While we have attempted to be faithful to the respective agency approaches, we caution the reader that agencies have used different methodologies and valuations in quantifying and monetizing effects.

As noted in Chapters II and III, the substantial limitations of available data on the benefits and costs for this set of rules raise significant obstacles to the development of a meaningful aggregate estimate of benefits and costs for even a single year's regulations. For example in many cases, agencies identified important benefits of their rules that were not quantifiable. In such cases, we necessarily excluded them from the monetized estimates we develop in this Chapter. To the extent that these benefits are substantial, the monetized estimates will understate the total value of the benefits. The discussion below addresses other limitations in the data and outlines the steps we have taken in an effort to overcome some of them.

I. Monetized Benefit and Cost Estimates for Individual Rules

We have included in this Chapter only those major rules with quantified estimates of both benefits and costs. These include six rules from the 1995/96 period, 15 rules from the 1996/97 period, 13 rules from 1997/98 period, and 14 from 1998/99. We have excluded 17 rules without quantified estimates of either benefits or costs (see Table 9).

Insert table 9

Ten additional rules listed in Table 10 have also been excluded from further discussion because only quantified cost estimates were available and/or there were only relatively small benefit and cost estimates.

For some of the remaining rules, agencies quantified estimates of significant effects, but did not assign a monetized value to these effects. Some of the quantified effects -- for example, small changes in the risk of premature death or serious injury -- are identified as outcomes for a variety of rules. In a number of instances, agencies did assign monetized estimates to these outcomes.

Differences in valuation across rules are often critical, particularly in comparisons of individual rules or programs. The different approaches in the quantification and monetization of these effects across agencies can also result in an "apples and oranges" problem in aggregating estimates. Indeed, where effects have been quantified, but not monetized, the different quantitative effects cannot be aggregated because they are not expressed in common units. In order to address this problem, this section takes the additional step of assigning a monetized value in order to provide a more consistent set of estimates in those cases where agencies only quantified significant effects. We have not, however, attempted to quantify or monetize any qualitative effects identified by agencies where the agency did not at least quantify them.

As in the past, agencies continue to take different approaches toward rules that affect small risks of premature death. In some cases, such as FRA's roadway worker protection rule, agencies have quantified and monetized these effects in terms of statistical lives. In still other cases, such as DOL's industrial truck operator rule and NHTSA's child restraint rule, agencies have quantified risks of death in terms of life-years or lives, but have not monetized them. Finally, in some cases, such as FDA's animal feed rule, the agency did not develop any quantified estimate of the rule's mortality effects.

Estimates for the value of a statistical life varied across agencies. For the roadway worker rule, FRA used $2.7 million per statistical life. For the upper-bound estimates of EPA's ozone and PM NAAQS rules, the agency used $4.8 million per statistical life. For its mammography rule, FDA used $5 million per statistical life.

Similarly, agency estimates for the value of a statistical life-year have also varied. EPA used $120,000 per life-year to produce its lower-bound estimates of benefits in its ozone and PM NAAQS rules. FDA used $368,000 per life-year in its mammography rule. The differences in both VSL and VSLY, used by the agencies for different regulations, are explained in part by the differences in age and underlying health status. Moreover, there is a relatively rich body of academic literature on this subject, and the methodologies used and the resulting estimates vary substantially across the academic studies. The literature shows that experts differ on this subject. Based on this literature, agencies have each developed estimates they believe are appropriate for their particular regulatory circumstances.

Insert table 10

As a general matter, we have deferred to the individual agencies' judgment in this area. In cases where the agency both quantified and monetized fatality risks, we have made no adjustments to the agency's estimate. In cases where the agency provided only a quantified estimate of fatality risk, but did not monetize it, we have monetized these estimates in order to convert these effects into a common unit. For example, in the case of HHS's organ donor rule, the agency estimated, but did not monetize, statistical life-years saved (although it discussed its use of $116,500 per life-year in other contexts). We valued those life-years at $116,500 each. For NHTSA's child restraint rule, we used a value of $2.7 million per statistical life.

In cases where agencies have not adopted estimates of the value of reducing these risks, we used estimates supported by the relevant academic literature. For DOL's industrial truck operator rule, for example, we used $5 million per statistical life.[33] We did not attempt to quantify or monetize fatality

[33] As a result of OSHA's interpretation of the Supreme Court's decision in the "Cotton Dust" case, *American Textile Manufacturers Institute v. Donovan*, 452 U.S. 491 (1981), OSHA does not conduct cost-benefit analysis or assign monetary

risk reductions in cases where the agency did not at least quantify them. As a practical matter, the aggregate benefit and cost estimates are relatively insensitive to the values we have assigned for these rules because the aggregate estimates are dominated by EPA's rules revising the ozone and PM primary NAAQS.

II. Valuation Estimates for Other Regulatory Effects

The following is a brief discussion of our valuation estimates for other types of effects that agencies identified and quantified, but did not monetize.

- *Injury*. For the child restraint rule, we adopted the Department of Transportation approach of converting injuries to "equivalent fatalities." These ratios are based on DOT's estimates of the value individuals place on reducing the risk of injury of varying severity relative to that of reducing risk of death. For the OSHA industrial truck operator rule, we did not monetize injury benefits beyond OSHA's estimate of the direct cost of lost workday injuries.

- *Change in Gasoline Fuel Consumption.* We valued reduced gasoline consumption at $.80 per gallon pre-tax.

- *Reduction in Barrels of Crude Oil Spilled.* We valued each barrel prevented from being spilled at $2,000. This reflects double the sum of the most likely estimates of environmental damages plus cleanup costs contained in a recent published journal article (Brown and Savage, 1996).

- *Change in Emissions of Air Pollutants*. We used estimates of the benefits per ton for reductions in hydrocarbon, nitrogen oxide (NO_x), sulfur dioxide (SO_2), and fine particulate matter (PM) derived from EPA's Pulp and Paper cluster rule (October, 1997). These estimates were obtained from the RIA prepared for EPA's July, 1997 rules revising the primary NAAQS for ozone and fine PM. We note that in this area, as in others, the academic literature offers a number of methodologies and underlying studies to quantify the benefits. There remain considerable uncertainties with each of these approaches. In particular, the derivation and application of per-ton coefficients to value reductions in these pollutants requires significant simplifying assumptions. This is particularly true with respect to the relationship between changes in emitted precursors pollutants and changes in the ambient pollutant concentrations which yield actual benefits. As a result of these simplifying assumptions, the monetary benefit

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values to human lives and suffering.

estimates obtained by multiplying tons reduced by benefit estimates per-ton, which we derive from analyses of other rules, should be considered highly uncertain. For each of these pollutants, we used the following values (all in 1996$) for changes in emissions:[34]

Hydrocarbons:	$519 to $2,360/ton;
Nitrogen Oxides:	$519 to $2,360/ton;
Particulate Matter:	$11,539/ton; and
Sulfur Dioxide:	$3,768 to $11,539/ton.

The NO_x benefit estimate is based on benefit transfer values ranging from $520 to $2,360 per ton derived from a 1997 benefit analysis of VOC emission reductions, as noted above. This analysis required two key assumptions: 1) that NO_x reductions have no effect on particulate matter concentrations, and 2) that NO_x and VOC reductions contribute proportionately to ozone reductions. While reductions in VOC and NO_x emissions both lead to reductions in ambient concentrations of ozone, reductions in NO_x emissions also lead to reductions in particulate matter. In addition, reductions in NO_x may have a disproportionate impact on reductions in ozone. For these reasons, estimates of benefits based on the VOC transfer coefficients should be viewed with caution. All else equal, they are likely to underestimate actual NO_x -related benefits.

Benefit analysts continues to develop better methods, both for primary benefits analyses and for benefits transfer. Analysis of other recent EPA rules yield a range of estimates for the NO_x benefits per ton. For example, the OTAG SIP and the Section 126 rules limiting NO_x emissions from electric utilities yielded estimates of $960 to $2500 per ton and $1350 to $2100 per ton in 2007, respectively, and the recent Tier 2 rule limiting NO_x emissions from cars and light trucks yielded estimates of $4500 to $7900 per ton in 2030. Each of these analyses is arguably methodologically superior to the 1997 benefit analysis. Currently, we recognize that there are potential problems and significant uncertainties that are inherent in any benefits analysis based on $/ton benefits transfer techniques. The extent of these problems and the degree of uncertainty depends on the divergence between the policy situation being studied and the basic scenario providing the benefits transfer estimate.

Several factors may be responsible for uncertainty and variability in the benefits transfer values. These factors include sources of emissions, meteorology, transport of emissions, initial pollutant concentrations, population density, and population demographics, such as proportion of elderly and children and baseline incidence rates for health effects. In order to minimize the uncertainty associated with benefits transfer, benefit transfer values should be taken from situations that are similar to the rule being evaluated. For example, where possible, benefit transfer values for individual pollutants should be

[34] Where applicable, the lower (higher) end of the value ranges in all of the tables throughout this report reflect the lower (higher) values in these ranges.

based on primary benefits analyses for rules where the pollutant of interest, e.g. NO_x, is the primary pollutant controlled by the rule.

EPA notes that these additional issues are particularly relevant for the NO_x benefits transfer conducted for this report and that alternative benefits transfer analyses are available, including a benefits transfer estimate offered by EPA based on its recent analysis of the Tier 2 rule. Relative to the 1997 VOC rule, the benefits transfer based on the Tier 2 rule is (a) more focused on NO_x emissions, (b) based on more up-to-date data and methods, and (c) focused on sources more similar in character to the sources being evaluated in this report. The use of the Tier 2 benefits transfer estimate suggested by EPA would imply a significantly higher value for NO_x reductions than the $520 to $2,360 per ton estimate used in this report. We have agreed to work with EPA to evaluate alternative benefits transfer estimates prior to our next report.

In order to make agency estimates more consistent, we developed benefit and cost time streams for each of the rules. Where agency analyses provide annual or annualized estimates of benefits and costs, we used these estimates in developing streams of benefits and costs over time. Where the agency estimate only provided annual benefits and costs for specific years, we used a linear interpolation to represent benefits and costs in the intervening years.[35]

Agency estimates of benefits and costs cover widely varying time periods. While HHS analyzed the effects of providing transplant-related data from 1999 through 2004, other agencies generally examined the effects of their regulations over longer time periods. HHS used a 10-year period for its over-the counter drug labeling rule; DOL also used a 10-year period for its truck operator training rule. EPA's analyses on disinfection and enhanced water treatment rules evaluated the effects over a twenty-year period. The differences in the time frames used for the various rules evaluated generally reflect the specific characteristics of individual rules such as expected capital depreciation periods or time to full realization of benefits.

In order for comparisons or aggregation to be meaningful, benefit and cost estimates should correctly account for all substantial effects of regulatory actions, including potentially offsetting effects, which may or may not be reflected in the available data. We have not made any changes to agency monetized estimates. To the extent that agencies have adopted different monetized values for effects, for example, different values for a statistical life, or different discounting methods, these differences remain embedded in Tables 11 through 15. Any comparison or aggregation across rules should also consider a number of factors which the presentation in tables 11 through 15 does not address. For example, these rules may use baselines in regulations and controls already in place. In addition, these

[35] In other words, if hypothetically we had costs of $200 million in 2000 and $400 million in 2020, we would assume costs would be $250 million in 2005, $300 million in 2010, and so forth.

rules may well treat uncertainty in different ways. In some cases, agencies may have developed alternative estimates reflecting upper- and lower- bound estimates. In other cases, the agencies may offer a midpoint estimate of benefits and costs. In still other cases the agency estimates may reflect only upper-bound estimates of the likely benefits and costs.

III. Aggregation of Benefit and Cost Estimates Across Rules

In Table 15, we aggregated the estimates for individual rules from Tables 11 through 14 by year. This approach yields prospective estimates of the benefits and costs that Federal agencies expected before they issued major rules over the last three years.

We have several important observations to offer on these aggregate estimates. First, EPA's 1997 rules revising the NAAQS for ozone and particulate matter dominate the annualized and present value aggregates presented in Table 14. Changes in estimation methodology for these rules, as reflected by the "plausible range" adopted by the analysis for the EPA NAAQS rules for ozone and particulate matter, will have a marked effect on the aggregated benefit and cost estimates for the rules published over the period from April 1, 1995 to March 31, 1998. By the same token, the aggregate estimates are not very sensitive to different approaches for the remaining rules.

The presentation of these aggregates as annualized benefit and cost streams or as net present value estimates may obscure the actual timing of benefits and costs. In the case of OSHA's methylene chloride standard, our estimate assumes that the reduction in cancer deaths among exposed workers will not occur until the year 2017, based on an average 20 year lag from exposure to death from cancer.[36]

Similarly, the benefits and costs of the revised ozone and particulate matter NAAQS will only be recognized in the years after 2005. These estimates of "out-year" benefits and costs are not certain.[37] EPA will complete its next periodic review of the particulate matter NAAQS, scheduled for 2002, before it begins implementation of the revised particulate matter NAAQS. If this review yields a "mid-course" change in the standard, the estimates of benefits and costs could change. EPA has also

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[36] OSHA believes that this assumption is unrealistic and that many workers will avoid incurring cancer before 2017 as a result of the reduction in their methylene exposures brought about by the standard.

[37] The validity and enforceability of the 8-hour ozone and PM2.5 NAAQS has been called into question in a decision by the United States Court of Appeals for the District of Columbia Circuit. *American Trucking Ass'ns* v. *EPA*, 175 F.3d 1027, modified in part and reh'g en banc denies, 195 F.3d 4 (1999). The United States disagrees with the Court's decision and is seeking Supreme Court Review. This report assumes that these standards will be implemented.

expressed a continuing concern with the uncertainty of the full attainment cost estimates because EPA believes technological change over the next decade will yield lower-cost approaches that will achieve the revised NAAQS.

Insert tables 11 through 15

As noted above, there are significant methodological issues that need to be confronted when aggregating estimates from a set of individual rules (as presented in tables 11 through 14) in an effort to obtain an estimate of the total benefits and costs of Federal regulation. These issues include:

(1) Identification of a composite baseline that is compatible with the differing baselines used by the various agencies across rules (because the results can be distorted when the baseline used to derive the individual results differ in significant ways).

(2) The use of prospective estimates (versus retrospective estimates) of the benefits and costs of regulation, for example, the reliance on prospective estimates may well fail to reflect important changes in taste, innovation by the private sector, or changes in Federal/State/local regulation.

(3) The "apples and oranges" problem associated with combining estimates from different studies, including different measures of benefits and costs, double-counting of benefits and costs across related rules, differing approaches to uncertainty such as the use of upper- and lower-bound estimates versus the use of an upper-bound only estimate, and different discount rates.

A final reason that any regulatory accounting effort has limits is the lack of information on the effects of regulations on distribution or equity. None of the analyses addressed in this report provides quantitative information on the distribution of benefits or costs by income category, geographic region, or any other equity-related factor. As a result, there is no basis for quantifying distributional or equity impacts.

Chapter V: Recommendations for Reform

Section 638(a)(3) of the Act requires OMB to submit with its report on the costs and benefits and impacts of Federal regulation "recommendations for reform." In seeking to reform and make more efficient the regulatory process, OMB provides guidance to the agencies in regulatory planning and reviews individual regulations as provided by Executive Order No. 12866. In so doing, we coordinate policy concerns among the agencies and make numerous recommendations to the agencies to ensure that regulations are consistent with applicable law, the President's priorities, and the regulatory reform

principles of Executive Order No. 12866. The results of those recommendations and their consideration by the agencies during the regulatory decisionmaking process are reflected in final regulations and represent the Administration's regulatory reform efforts.

The most comprehensive accounting of the recommendations and regulations that agencies currently have under consideration is published annually in the Administration's Regulatory Plan. The Regulatory Plan contains a description of the most significant regulatory and deregulatory actions that the agencies plan to issue in either proposed or final form during the next fiscal year. The latest Regulatory Plan was published in the *Federal Register* on November 22, 1999 (64 FR 63883). This year, the Regulatory Plan contains 164 entries from 28 agencies.

The 164 regulations under development in the Regulatory Plan may be viewed as specific recommendations for regulatory improvement or reform based on statutory mandates and the Administration's priorities. Four agencies -- USDA, HHS, DOL, and EPA -- account for 100 of the 164 initiatives. The following is a sample of the Administration's specific regulatory reform efforts that either increase the regulated entities' flexibility, reduce paperwork burden, clarify the regulated entities' responsibilities with plain language, or substitute performance standards for command-and-control:

- The Food Safety and Inspection Service (FSIS) of USDA is reforming its regulations on imported livestock and poultry products by replacing command-and-control regulations with performance standards, which should benefit consumers and producers and expand international trade.

- FSIS also is reforming its egg product inspection regulations to move from a command-and-control and prior approval systems to a performance standard approach based on the Hazard Analysis and Critical Control Point (HACCP) system and pathogen reduction goals.

- The Food and Drug Administration of HHS is also developing a performance-based HACCP program and a labeling system rather than specifying good manufacturing practices to reduce food-borne pathogens in fruit and vegetable juices.

- HUD is developing four-year performance goals for Fannie Mae and Freddie Mac requiring them to purchase mortgages for low and moderate-income housing, special affordable housing, and housing in underserved areas. This will increase the number of affordable housing units without significantly crowding out traditional portfolio lending.

- The Bureau of Land Management of the Department of the Interior is revising its Federal oil and gas leasing operations regulations. It will use plain language to improve understanding of the rule. The rule will rely on performance standards, rather than prescriptive requirements, to allow greater flexibility to deal with unique geological or engineering circumstances.

- The Office of Federal Contract Compliance Programs of DOL is reforming its nondiscrimination and affirmative action obligations for government contractors under Executive Order No. 11246. It plans to reduce paperwork burdens, eliminate unnecessary regulations, and simplify and clarify regulations while improving the efficiency and effectiveness of the contract compliance program.

- The Occupational Safety and Health Administration of DOL is revising its injury and illness reporting and recordkeeping requirements to improve the quality and utility of the data, clarify and simplify guidance, and exempt small businesses in low hazard industries.

- The Federal Railroad Administration of DOT is developing a rule using careful analysis weighing the benefits of reduced collision probabilities with the costs imposed on society to determine when and how train whistles must be sounded at grade crossings.

- EPA is streamlining its requirements for revising operating permits issued by State and local permitting authorities for major sources of air pollution under the Clean Air Act. It will simplify the process for minor new source review actions that have little or no environmental impact.

- EPA is streamlining its public notification regulations for violations of drinking water regulations by public water systems. It will seek to give consumers better and more timely notification of the potential health risks from drinking water when violations occur.

These specific reforms, as well as many other efforts underway, are significantly improving the lives, health, and well-being of the American public.

In addition to these examples of improving the quality of individual regulations, we have as noted above issued guidelines to improve the quality of the data and analyses, on which regulatory actions are based. *The Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements,* which we issued in final form as Memorandum M-00-08 on March 22, 2000, (and include in the Appendix) should improve the quality of the data and analyses underlying major regulations, thereby leading to improvements in Federal regulation. To improve transparency and understanding by the public, agencies should also use the format of the accounting statements to summarize regulatory impacts in the preambles to the *Federal Register* notices announcing their rules. We believe these guidelines and accounting statement provide a sound foundation for estimating and presenting the benefits and costs of Federal regulation.

Appendix

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M-00-08 **March 22, 2000**

"Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements"

Introduction

These Guidelines are designed to help you, our regulatory agencies, do your job more effectively. They also will help us standardize the way we measure the benefits and costs of federal regulatory actions.

Why do we need to do Economic Analysis?

An economic analysis helps you evaluate the consequences of regulatory action. It provides a formal way of organizing the evidence on the key effects -- good and bad -- of the various alternatives you are considering in developing the regulation. This allows you to assess whether the benefits of an action are likely to outweigh the costs. Your evaluation of the consequences of alternative regulatory and non-regulatory actions helps direct resources -- those of society as a whole as well as for your agency -- toward the greatest social good.

Your economic analysis also informs others -- other parts of the Executive Branch of the Federal government, Congress, regulated entities and the public -- of the effects of your action (and assures them of its reasonableness). In order to accomplish this, you should present a "transparent" analysis. This includes:

- Identifying and evaluating reasonable alternatives to the proposed regulatory action,
- Stating the important assumptions and showing the sensitivity of the estimates to these assumptions.

What are the major parts of an Economic Analysis?

Your analysis should contain three basic elements:

(1) a statement of the need for the proposed action,
(2) an examination of alternative approaches, and
(3) an analysis of the benefits and costs of identified alternatives.

In preparing a benefit and cost analysis, you should

- identify a baseline. A benefit and cost analysis is an incremental analysis that compares a regulatory action with a baseline. Agencies often use the alternative of "no action" as their baseline. The selected baseline should represent your best assessment of the way the world would look absent the proposed rule.
- identify and evaluate the linkage between the direct action required (for example, the use of additional safety equipment on the job) and the desirable effects or benefits of the action (for example, a reduction in the risk of injury) for each of the identified alternatives.
- identify and evaluate the undesirable effects or costs of the action for each of the identified alternatives.

Finally, your economic analysis should present a summary of the benefit and cost estimates for each alternative and provide a clear statement of the effects in a form that is easily usable by other readers of the rule.

You will find that you cannot write a good regulatory analysis according to a formula. The preparation of high-quality analysis requires competent professional judgment. Different regulations may call for different emphases in the analyses, depending on the importance and complexity of the regulatory issues and the sensitivity of the benefit and cost estimates to key assumptions.

Why are we issuing these Guidelines?

Section 638(c) of the 1999 Omnibus Consolidated and Emergency Supplemental Appropriations Act and Section 628(c) of the Fiscal Year 2000 Treasury and General Government Appropriations Act requires OMB to issue guidelines to help agencies estimate the benefits and costs of Federal regulations and paperwork and summarize the results of the associated analysis.

These Guidelines draw from the "Best Practices" document developed in 1994 and 1995 by an interagency group co-chaired by the Department of Transportation and the Council of Economic Advisers. That "Best Practices" document in turn revised the "Regulatory Impact Analysis Guidance" published by OMB in 1990 after a two-year notice and comment period. You should use this document in estimating and presenting the benefits and costs of regulations. While it does not represent OMB guidance, you may use the Best Practices document as supplementary material to illustrate further specific issues or techniques. Section I provides guidelines for your preparation of the estimates and the associated agency report. Wherever possible, we use examples from recent regulatory analyses to illustrate important concepts. Section II sets out instructions and a suggested format for the accounting statement.

SECTION I: GUIDELINES FOR THE ANALYSIS OF BENEFITS AND COSTS OF MAJOR FINAL RULES

A. GENERAL CONSIDERATIONS

1. Is There a Need for the Regulatory Action? President Clinton's Executive Order 12866 states that "Each agency shall identify the problem that it intends to address (including, where applicable, the failures of private markets or public institutions that warrant new agency action) as well as assess the significance of that problem." To establish a need for the proposed action, you should explain whether the problem arises because of a significant market failure or some other compelling public need. If there is a significant market failure, you should describe the nature of this failure in both qualitative and quantitative terms. Since the existence of a market failure is not sufficient to justify government intervention, you should show that government intervention to correct the market failure is likely to do more economic good than harm. If the problem is not a significant market failure, you should provide an alternative demonstration of compelling public need. Such needs may include the improvement of governmental processes or distributional concerns.

If the action is a result of a statutory or judicial directive, you should state so clearly. You should also discuss the specific authority for your action, the extent of discretion available to you, and the regulatory instruments you might use.

2. What Alternatives Should I Evaluate? You should decide on and describe the number and choice of alternatives available to you and discuss the reasons for your choice. Alternatives that rely on incentives and offer increased flexibility are often more cost-effective than more prescriptive approaches. For example, user fees and information dissemination may be good alternatives to direct command-and-control regulation. Within a command-and-control regulatory program, performance-based standards may offer advantages over standards specifying design, behavior, or manner of compliance.

You should especially consider all appropriate alternatives for the key attributes or provisions of the rule.

What are some alternative regulatory actions I should consider?

- Informational Measures.
- Market-Based Approaches.
- Performance-Based Standards.
- Different Requirements for Different Segments of the Regulated Population.
- Alternative Levels of Stringency.

- Alternative Effective Dates of Compliance.
- Alternative Methods of Ensuring Compliance.

Can you give me more specific examples?

- **Informational Measures** - FDA requires labels showing the levels of nutrients and other ingredients that affect human health, rather than restricting these ingredients.
- **Market-Based Approaches** - EPA's "Acid Rain" program allows firms to trade permits to emit sulfur dioxide. This approach allows firms with high costs of controlling emissions to buy permits from low-cost firms, reducing the costs of the overall program while maintaining aggregate emissions reductions.
- **Performance Standards** - EPA sets automotive tailpipe emission standards in grams per mile traveled rather than requiring specific designs to achieve those ends. The National Highway Traffic Safety Administration (NHTSA) safety standards establish a permissible level of force that may act on occupants in a crash rather than setting specific mandatory vehicle designs.

Where there is a "continuum" of alternatives for a standard (for example, the level of stringency), you should generally analyze at least three options:

- the option serving as a focus for the Agency or program office regulatory initiative;
- a more stringent option that achieves additional benefits (and presumably costs more) beyond those realized by the preferred option; and
- a less stringent option that costs less (and presumably generates fewer benefits) than the preferred option.

You should choose options that are reasonable alternatives deserving careful consideration. In some cases, the regulatory program will focus on an option that is near or at the limit of technical feasibility or that fully achieves the objectives of the regulation. In these cases, the analysis would not need to examine a more stringent option. For each of the options analyzed, you should compare the anticipated benefits to the corresponding costs.

In some cases, you may decide to analyze a wide array of options. Thus, DOE's 1998 rule setting new energy efficiency standards for refrigerators and freezers analyzed a large number of options and produced a rich amount of information on their relative effects. This analysis -- examining more than 20 alternative performance standards for one class of refrigerators with top-mounted freezers -- enabled DOE to select an option that produced $200 more in net benefits per refrigerator than the least attractive option.

You should analyze the benefits and costs of different regulatory provisions separately when a rule includes a number of distinct provisions. If the existence of one provision affects the benefits or costs arising from another provision, the analysis becomes more complicated, but the need to examine

provisions separately remains. In this case, you should evaluate each specific provision by determining the net benefits of the proposed regulation with and without it.

Analyzing all possible combinations of provisions in this way is impractical if their number is large and interaction effects are widespread. You need to use judgment to select the most significant or relevant provisions for such analysis.

You should also discuss the statutory requirements that affect the selection of regulatory approaches. If legal constraints prevent the selection of a regulatory action that best satisfies the philosophy and principles of Executive Order No.12866, you should identify these constraints and estimate their opportunity cost.

3. <u>How Do I Choose a Baseline</u>? You need to measure the benefits and costs of a rule against a baseline. This baseline should be the best assessment of the way the world would look absent the proposed regulation. The choice of a proper baseline may require consideration of a wide range of potential factors, including:

- evolution of the market,
- changes in external factors affecting benefits and costs,
- changes in regulations promulgated by the agency or other government entities, and the degree of compliance by regulated entities with other regulations.

You may often find it reasonable to forecast that the world absent the regulation will resemble the present. If you do so, however, your baseline should reflect the future effect of current programs and policies. For review of an existing regulation, a baseline assuming "no change" in the regulatory program generally provides an appropriate basis for evaluating reasonable regulatory alternatives. When more than one baseline is reasonable and the choice of baseline will significantly affect estimated benefits and costs, you should consider measuring benefits and costs against alternative baselines. In doing so you can analyze the effects on benefits and costs of making different assumptions about other agencies' regulations, or the degree of compliance with your own existing rules. In all cases, you must evaluate benefits and costs against the same baseline. You should also discuss the reasonableness of the baselines used in these sensitivity analyses.

EPA's 1998 final PCB disposal rule provides a good example. EPA used several alternative baselines, each reflecting a different interpretation of existing regulatory requirements. In particular, one baseline reflected a literal interpretation of EPA's 1979 rule and another the actual implementation of that rule in the year immediately preceding the 1998 revision. The use of multiple baselines illustrated the substantial effect changes in EPA's implementation policy could have on the cost of a regulatory program. In the years after EPA adopted the 1979 PCB disposal rule, changes in EPA policy -- especially allowing the disposal of automobile "shredder fluff" in municipal landfills -- reduced the cost of the program by more than $500 million per year.

In some cases, substantial portions of a rule may simply restate statutory requirements that would be self-implementing even in the absence of the regulatory action. In these cases, you should use a pre-statute baseline. If you are able to separate out those areas where the agency has discretion, you may also use a post-statute baseline to evaluate the discretionary elements of the action.

4. <u>What Should I Do With Nonmonetized Benefits and Costs</u>? Although we prefer that agencies use acceptable monetized benefit and cost estimates, we recognize that monetizing some of the effects of regulations is difficult, if not impossible. Even quantifying some effects may not be easy.

a) What Should I Do With Benefits and Costs that are Difficult to Monetize?

You should monetize quantitative estimates whenever possible. Use commonly accepted values or procedures to monetize costs and benefits, and ensure that key analytical assumptions are defensible. If monetization is impossible, explain why and present all available quantitative information. For example, if you can quantify, but cannot monetize, improvements in water quality and increases in fish populations resulting from water quality regulation, you can describe benefits in terms of stream miles of improved water clarity for boaters and increases in game fish populations for anglers. You should also describe the timing and likelihood of such effects and avoid double-counting of benefits when estimates of monetized and physical effects are mixed in the same analysis.

b) What Should I Do With Benefits and Costs that are Even Difficult to Quantify?

Acceptable quantitative estimates of benefits and costs are preferable to qualitative descriptions of benefits and costs. Quantifying the effects of regulations can be difficult, however, and sometimes impossible. If quantification is difficult, you should present any relevant quantitative information along with a description of the unquantifiable effects. Such descriptions could include ecological gains, improvements in quality of life, and aesthetic beauty. For cases in which the presence of unquantifiable benefits or costs affects a policy choice, you should provide a clear explanation of the rationale behind the choice. Such an explanation could include detailed information on the nature, timing, likelihood, location, and distribution of the unquantified benefits and costs. Also, please include a summary table that lists all the unquantifiable benefits and costs, ordered by expected magnitude if possible.

5. <u>How Do I Take Into Account the Timing of Benefits and Costs</u>? To permit meaningful comparisons, you need to discount benefits and costs that occur in different time periods. The earlier that resources (goods or services) are available for consumption, the more people are willing to pay for them. One reason is that invested resources generally are productive. They earn positive rates of return. Another is that most people have needs they prefer to meet now rather than later. For example, in the absence of current assets, they willingly borrow (and pay interest) to satisfy those needs.

As a first step, you should consider presenting the streams of benefits and costs over time. These "raw" streams of benefits and costs can help you -- and your reader -- better understand the effects of alternative regulatory actions.

You should discount the constant-dollar benefits and costs that occur in different years to present values before combining them to get overall net benefits. You can deflate (that is, divide) benefit and cost estimates that are in nominal dollars by an appropriate inflation index to get constant dollar estimates. The stream of annualized estimates should begin in the year the final rule is published, even if the rule does not take effect immediately.

You will find the basic guidance on discount rates for regulatory and other analyses in OMB Circular A-94. The Circular specifies the use of a 7 percent real rate to discount the constant dollar estimates. The 7 percent rate is an estimate of the opportunity cost of capital, as measured by the before-tax rate of return to incremental private investment. We revised Circular A-94 in 1992 based on extensive review and public comment. It reflects the rates of return on low-yielding forms of capital, such as housing, as well as the higher rates of return on corporate capital.

In the A-94 guidance, we encourage you to present sensitivity analyses using other discount rates if you can justify the use of such alternative rates. An alternative that we often see used is the Asocial rate of time preference." The social rate of time preference reflects the discount rate at which society is indifferent between a payment now and a correspondingly larger payment in a future year. It may be lower than the average real return on investment because, as a result of taxes and other distortions, individuals do not receive the full return on their investments. The economics literature identifies the government borrowing rate as a good measure of the social rate of time preference and most analysts use the average rate on long-term Treasury bonds. In recent years, this rate has been roughly 3 percent.

You may also use an alternative method based on the "shadow price" of capital.[38] Please check with us before using this method. You need to explain clearly your reason for proposing to use this approach instead of the recommended one.

EPA's analysis of its 1998 rule setting both effluent limits for wastewater discharges and air toxic emission limits for pulp and paper mills developed present value estimates using discount rates of 3 and 7 percent for benefit and cost streams occurring over a 30 year period (See EPA, Economic Analysis ..., October 1997, pp.10-3 and 10-4). EPA phased in the recreational benefits over a two-year period reaching full value in year three. It phased in health benefits over a five year period reaching full value in

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[38] The Ashadow price@ of capital is the opportunity cost of diverting capital from one use to another. For a discussion of the shadow price approach, see Discounting for Time and Risk in Energy Policy by Robert C. Lind.

year six. EPA assumed that capital costs would occur in years one and twenty-one and operation and maintenance costs in years two through thirty. The analysis used OMB's recommended 7 percent discount rate, but also a 3 percent rate -- reflecting the social rate of time preference -- to show the sensitivity of its estimates to alternative rates.

Generally, economists do not adjust discount rates to account for the uncertainty of future benefits and costs. You should deal with risk and uncertainty using the principles presented in Section D.1 below, not by changing discount rates. Also, you should not adjust the discount rate for expected changes in the relative prices of goods over time. Instead, you should include directly any expected changes in relative prices in the benefit and cost estimates.

a) Special Case: Cost-Effectiveness Analysis - If you find it difficult to monetize benefits, you may consider using "cost-effectiveness" rather than "net benefits" analyses. If benefits occur at the same time as costs and the benefits remain the same over time, annualizing costs is sufficient and further discounting of non-monetized benefits is unnecessary. For example, the annualized cost per ton of reducing certain harmful emissions is often an appropriate measure of cost-effectiveness. If benefits occur later than costs -- such as improved health effects that occur only after long periods of exposure B you should discount for the delay between incurring the costs and the improvement in health effects.[39] In its 1998 rule, "Control of Emissions from Nonroad Diesel Engines," EPA estimated cost-effectiveness by using the 7 percent rate to discount both the costs and the emission reduction benefits over the useful life of the engines. As a general matter, cost effectiveness measures that account for all benefits and costs of the rule are preferable to those that omit substantial portions of either benefits or costs.

b) Special Case: Intergenerational Analysis - Special approaches may also be appropriate when comparing benefits and costs across generations. One approach is to follow the discounting method discussed above, and address the intergenerational equity and fairness issues explicitly, instead of modifying the discount rate.

One alternative approach is based on the perspective that this generation is concerned about the welfare of future generations and, in fact, is willing to defer consumption and invest or preserve resources for future use at a discount rate that is less than the discount rate used in making decisions within a generation. For this purpose, you could use as a discount rate a special rate of time preference based on the growth of per capita consumption. Again, check with us if you plan to use such an approach.

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[39] An equivalent approach is to determine the future value of costs as of the time you expect the benefits to occur.

B. BENEFIT ESTIMATES

You should discuss the expected benefits of the selected regulatory option for each major final rule in your accounting statement and associated report. How is the proposed action expected to provide the anticipated benefits? What are the monetized values of all of the potential real incremental benefits to society? To present your results, you should:

- Include a schedule of monetized benefits that show the type and timing of benefits and express the estimates in this table in constant, undiscounted dollars.
- List the benefits you can quantify, but cannot monetize, including their timing.
- Describe benefits you cannot monetize or quantify, such as decreases in the risk of extinction of endangered species.
- Identify or cross-reference the data or studies on which you base the benefit estimates.

What should I do if my benefit estimates are uncertain?

- Normally, you should calculate benefits (including benefits of risk reductions) that reflect the full probability distribution of potential consequences. Where possible, present probability distributions of benefits and include the upper and lower bound estimates as complements to central tendency and other estimates.
- If fundamental scientific disagreement or lack of knowledge prevents construction of a scientifically defensible probability distribution, you should describe benefits under plausible assumptions and characterize the evidence underlying each alternative.

1. What Key Concepts Do I Need to Know to Estimate Benefits? The concept of "opportunity cost" is the appropriate construct for valuing both benefits and costs. The principle of "willingness-to-pay" captures the notion of opportunity cost by measuring what individuals are willing to forgo to enjoy a particular benefit. Market prices provide the richest data for estimating benefits based on willingness-to-pay if the goods and services affected by the regulation trade in free markets.

Estimating benefits when market prices are hard to measure or markets do not exist is more difficult. In these cases, regulatory analysts need to develop appropriate proxies that simulate market exchange. Estimates of willingness-to-pay based on observable and replicable behavior generally are the most reliable. As one example, analysts sometimes use “hedonic price equations” based on multiple regression analysis of market behavior to simulate market prices for the commodity of interest.[40] Going

[40] The hedonic technique allows analysts to develop an estimate of the price for specific attributes associated with a product. For example, houses are a product characterized by a variety of attributes including the number of rooms, total floor area, and type of heating and cooling. If there is enough data on transactions in the housing

through the analytical process of deriving benefit estimates by simulating markets may also suggest alternative regulatory strategies that create such markets.

Other approaches may be necessary when a commodity is not directly or indirectly traded in markets. Valuation estimates developed using these approaches are less certain than benefit estimates derived from market transactions or based on behavior that is observable and replicable. While innovative benefit estimation methods are sometimes necessary, they increase the need for quality control to ensure that estimates conform closely to what would be observed if markets did exist.

Ultimately, the method selected to develop a monetized estimate should focus on a value for the specific attribute or benefit end-point of interest (for example, lost school-days). The transfer of a valuation estimate from an unrelated context (say, for example, the valuation of lost work-days from labor market studies) may yield a precise benefit estimate for the wrong attribute (that is, lost work-days).

You also need to guard against double-counting of benefits, since some benefits are embedded in other benefits. For example, when a regulation improves the quality of the environment in a community, the value of real estate in the community generally rises to reflect the greater attractiveness of living in a better environment. Simply adding the increase in property values to the benefits of improved public health would be double counting if the increase in property values reflects the improvement in public health. To avoid this problem you should separate the embedded effects on the value of property arising from improved public health.

2. <u>How Should I Value Benefits Directly Traded in Markets</u>? Economists ordinarily value goods and services at their market prices as the best measure of their value to society. In some instances, however, market prices may not reflect their true value to society. If a regulation involves changes to goods or services where the market price is not a good measure of the value to society, you should use an estimate that reflects the true value to society (often called the "shadow price"). For example, suppose a particular air pollutant damages crops. One of the benefits of controlling that pollutant is the value of the increase in crop yield as a result of the controls. That value is typically measured by the price of the crop. If the price is held above the market price by a government program that affects supply, however, a value estimate based on this price would overstate the true benefits of controlling the pollutant. In this case, you should calculate the value to society of the increase in crop yields by estimating the shadow price, which reflects the value to society of the marginal use of the crop. If the

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market, it is possible to develop an estimate of the implicit price for specific attributes, such as the implicit price of an additional bathroom or for central air conditioning. This technique can be extended, as well, to develop an estimate for the implicit price of public goods that are not directly traded in markets. For example, the analyst can develop implicit price estimates for public goods like air quality and access to public parks by adding measures for these attributes to the hedonic price equation for housing.

marginal use is for exports, you should use the world price. If the marginal use is to add to very large surplus stockpiles, you should use the value of the last units released from storage minus storage cost. If stockpiles are large and growing, the shadow price may be low or even negative.

3. How Should I Value Benefits That Are Indirectly Traded in Markets? Some benefits correspond to goods or services that are indirectly traded in the marketplace. Their value is reflected in the prices of related goods that are directly traded. Examples include reductions in health-and-safety risks, the use-values of environmental amenities (for example, recreational fishing or hiking and camping), and the value of improved scenic visibility. You should use willingness-to-pay measures as the basis for estimating the monetary value of such indirectly traded goods. When practical obstacles prevent the use of direct "revealed preference" methods based on actual market behavior to measure willingness-to-pay, you may consider the use of alternative "stated preference" methods based on survey techniques.

4. How Should I Value Goods That Are Not Traded Directly or Indirectly in Markets? Some types of goods -- such as preserving environmental or cultural amenities apart from their use and direct enjoyment by people (their so-called "nonuse" value) -- are not traded directly or indirectly in markets. Estimation of the benefits for these types of goods is even more difficult than for indirectly traded goods, because market-related transactions do not exist to provide data for willingness-to-pay estimates.

Stated preference methods using survey techniques, such as contingent valuation methods, may provide the only analytical approach currently available for estimating the values of many of these goods, particularly goods providing "nonuse" values. The lack of observable behavior for these goods, combined with their complex and often unfamiliar nature, calls for careful design and execution of these surveys. Confidence in their results requires rigorous analysis of the responses and full characterization of uncertainties. The use of studies that rely on the state of the art in survey design and implementation is important to assuring confidence in the results. In addition, these studies should satisfy checks on their internal consistency. For example, you should apply a "scope" test to show that individuals are willing to pay more for incrementally greater amounts of a good.

5. How Should I Account for Health and Safety Benefits? Regulations that address health and safety concerns may produce a variety of benefits -- those traded directly, those traded indirectly, and those not traded in markets. A key part of such regulations often is a reduction in the risk of illness, injury, or premature death. Above we outlined methods to use in developing benefit estimates; here we apply those methods to developing benefit estimates for these health and safety categories. Differences of opinion exist about the various approaches for monetizing risk reductions. In presenting health and safety benefits, you should include estimates of the risks both of nonfatal illness or injury and

of premature mortality. You should also describe any particular strengths or weaknesses characterizing the analyses you have used.

(a) Nonfatal illness and injury. Conceptually, a willingness-to-pay measure is superior to other measures, in part because it seeks to capture the value of pain and suffering and other quality-of-life effects. These quality-of-life effects can be a significant part of the benefits resulting from a particular regulatory action and should not be ignored. If well-conducted revealed-preference studies are available, you should consider these studies in developing your estimates. When well-conducted stated-preference studies are available, these studies can also provide estimates of the full willingness-to-pay for changes in morbidity risk.

Some agencies may find it impractical to develop such estimates because of the difficulty of measurement. Both revealed-preference and stated-preference studies may be unavailable or too unreliable to provide a solid base for evaluations. The only available estimates may be based on poorly designed and/or inappropriately applied stated preference studies (for example, contingent valuation surveys). Moreover, many injury-value estimates from stated preference studies are averages of specific combinations of injuries of varying severity. If the average injury severity in such a study differs greatly from the injury severity addressed by the regulatory action, that injury value will not accurately measure the value of the regulatory action. If these circumstances apply, you may prefer to describe reductions in risks of nonfatal illness or injury by using estimates of expected direct-costs-avoided (for example, cost-of-illness estimates).

Although you should use whatever approach is most appropriate, keep in mind that "cost-avoided" measures generally understate the true benefits. They may cause you to miss the value of reduced pain and suffering and other quality-of-life effects. If you choose to use such measures, you should acknowledge their limitations in identifying potential benefits from a regulatory action.

(b) Fatality risks. Since agencies often design health and safety regulation to reduce risks to life, evaluation of these benefits can be a key part of the analysis. In many cases, the expected reduction in fatality risk figures prominently as a reason for regulatory action. A good analysis must present these benefits clearly and show their importance. Agencies may choose to monetize these benefits to aid clear presentation. The willingness-to-pay approach is the best methodology to use if reductions in fatality risk are monetized.

Some describe the monetized value of small changes in fatality risk as the "value of statistical life" (VSL) or, less precisely, the "value of a life." The latter phrase can be misleading because it suggests erroneously that the monetization exercise tries to place a "value" on individual lives. You should make it clear that these terms refer to the measurement of willingness to pay for reductions only in **small** risks of premature death. They have no application to an identifiable individual or to very large reductions in individual risks. They do not suggest that any individual's life can be reduced to a mere monetary value. Their sole purpose is to help describe better the likely benefits of a regulatory action. Confusion about

the term "statistical life" is widespread. This term refers only to the sum of risk reductions expected in a population. For example, if the annual risk of death is reduced by one in a million for each of two million people, that is said to represent two "statistical lives" extended per year (two million x one millionth = two). If the annual risk of death is reduced by one in 10 million for each of 20 million people, that also is said to represent two “statistical lives” extended.

The adoption of a value for the projected reduction in the risk of premature mortality is the subject of continuing discussion within the economic and public policy analysis community. A considerable body of academic literature is available on this subject. The methods used and the resulting estimates vary substantially across these studies. Based on this literature, agencies are using estimates they believe appropriate for their particular regulatory circumstances. For example, in its “Roadway Worker Protection” rule, the Federal Railroad Administration (FRA) estimated benefits that include 22.9 discounted (statistical) lives extended over 10 years. Using a value of a statistical life of $2.7 million, the FRA monetized this component of benefits at $62 million. FDA adopted a value of $2.5 million per statistical life for its recent tobacco rule and $5 million for its mammography rule. EPA used a value of $4.8 million per statistical life in developing its upper end benefit estimates for its rule setting ambient air standards for ozone and particulate matter.

Another way that has been used to express reductions in fatality risks is to use "value of statistical life-years extended" (VSLY). For example, if a regulation protects individuals whose average remaining life expectancy is 40 years, a risk reduction of one fatality is expressed as “40 life-years extended.” Those who favor this alternative, age-adjusted approach emphasize that the value of a statistical life is not a single number relevant for all situations. In particular, when there are significant differences between the population affected by a particular health risk and the populations used in the labor market studies, they prefer to adjust the VSL estimate to reflect those differences. Based on this approach, FDA used a value of $116,500 per life-year for its tobacco rule and $368,000 per life-year in its mammography rule. You should keep in mind that regulations with greater numbers of life-years extended are not necessarily better than regulations with fewer numbers of life-years extended. Longevity may be only one of a number of relevant considerations pertaining to the rule.

The valuation of fatality risk reduction is an evolving area in terms of results and methodology. You should, accordingly, utilize valuation methods that you consider appropriate for the regulatory circumstances. You should present estimates based on alternative approaches, and if you monetize mortality risk reduction, you should do so on a consistent basis to the extent feasible. You should clearly indicate your methodology and document your choice of a particular methodology. If you use different methodologies in different rules, you should clearly disclose the fact and explain your reasons.

C. COST ESTIMATES

1. <u>What Key Concepts Do I Need to Know to Estimate Costs</u>? The preferred measure of cost is the "opportunity cost" of the resources used or the benefits forgone as a result of the regulatory action. Opportunity costs include:

- private-sector compliance costs;
- government administrative costs;
- losses in consumers' or producers' surpluses;
- discomfort or inconvenience; and
- loss of time.

You should include these effects in your analysis and provide estimates of their monetary values wherever possible.

The opportunity cost of an alternative includes the value of the benefits forgone as a result of choosing that alternative. The opportunity cost of banning a product -- a drug, food additive, or hazardous chemical -- is the forgone net benefit of that product, taking into account the mitigating effects of potential substitutes. The use of any resource has an opportunity cost regardless of whether the resource is already owned or has to be purchased. That opportunity cost is equal to the net benefit the resource could provide in the absence of the requirement. For example, if regulation of an industrial plant affects the use of additional land or buildings within the existing plant boundary, the cost analysis should include the opportunity cost of using the additional land or facilities. To the extent possible, you should monetize any such forgone benefits and add them to the costs of that alternative. You should also try to monetize any costs averted as a result of an alternative and either add it to the benefits or subtract it from the costs of that alternative.

In calculating the incremental costs of a new regulation, you should compare them to a baseline (ordinarily no regulation or the existing regulation and, in any event, always the same as the baseline used for the benefit analysis) or a less stringent alternative. Incremental costs do not include future costs that occur even in the absence of the regulation, or costs that have already occurred (sunk costs). You should include a schedule of monetized costs that shows the type of cost and when it would occur; please express the numbers in this table as constant, undiscounted dollars.

As with benefit estimates, the calculation of costs should reflect the full probability distribution of potential results. You should use probability estimates to assign a weight to extreme values and other possible outcomes. If fundamental scientific disagreement or lack of knowledge precludes construction of a scientifically defensible probability distribution, you should describe costs using plausible alternative assumptions and present the evidence underlying each one. This approach generally produces a reasonable basis for an appropriate level of regulatory action.

2. <u>What Is the Difference Between Real Costs And Transfer Payments</u>? Distinguishing between real costs and transfer payments is an important, but sometimes difficult, problem in cost estimation. Cost estimates should reflect real resource costs. Transfer payments are monetary payments from one group to another that do not affect total resources available to society. For example, a regulation that restricts the supply of a good, causing its price to rise, produces a transfer of income from buyers to sellers. The reduction in the value of the supply of the good is a real cost to society, but the transfer of income from buyers to sellers resulting from the higher price is not. You should not include transfers in the estimates of the benefits and costs of a regulation. Instead, address them in a separate discussion of the regulation's distributional effects.

D. OTHER KEY CONSIDERATIONS

1. <u>How Do I Treat Risk and Uncertainty</u>? The effects of regulatory actions are not known with certainty, but can be predicted in terms of their probability of occurrence. The term "risk" in this document refers generally to a probability distribution over a set of outcomes. When the outcomes in question are hazards or injuries, risk refers to the probabilities of different potential severities of hazard or injury. The risk of cancer from exposure to a chemical means a change in the probability of contracting cancer caused by that exposure. There also are risks associated with economic benefits and costs; the risk of a financial loss of $X means the probability of losing $X.

The term "uncertainty" often is used in economic assessments as a synonym for risk. In this document, we use uncertainty to express a different concept, namely, that our knowledge of the probabilities and sets of possible outcomes that characterize a probability distribution of risks -- based on experimentation, statistical sampling, and other scientific tools -- is itself incomplete. Uncertainty arises from a variety of fundamentally different sources. They include lack of data, variability in populations and natural conditions, limitations in fundamental scientific knowledge (both social and natural), a resultant lack of knowledge about key relationships, and the fundamental unpredictability of various phenomena. Cost estimates also may be uncertain due to unknowns about opportunity costs or the compliance strategies of regulated entities.

Analysts often rely on statistical probability distributions for the values of those key elements that affect the estimates of risks, benefits, or costs. In these cases, some estimate of central tendency -- such as the mean or median -- should be used in addition to ranges, variances, specified low-end and high-end percentile estimates, and other characteristics of the distribution.

Overall risk, benefit, and cost estimates cannot be more precise than their most uncertain component. You should report these estimates in a way that reflects the degree of uncertainty present to prevent creating a false sense of precision. You should report quantitative estimates as accurately as supported by the quality of the data and models used. In all cases, you should explicitly state the level of precision.

The principles of full disclosure and transparency apply to the treatment of uncertainty in developing risk, benefit, and cost information -- just as it does with the other elements of economic analysis. You must identify data, models, and their implications for risk assessment in the risk characterization. You must also explicitly identify and evaluate the inferences and assumptions chosen and assess the effects of these choices on the analysis. If the uncertainty in the estimates -- for example, fundamental scientific disagreement or lack of knowledge -- prevents construction of a scientifically defensible probability distribution, you should describe the benefits and costs under plausible alternative assumptions.

2. How Should I Treat Alternative Assumptions? If benefit or cost estimates depend heavily on certain assumptions, you should make those assumptions explicit and carry out sensitivity analyses using plausible alternative assumptions. If the value of net benefits changes from positive to negative (or vice versa) or if the relative ranking of regulatory options changes with alternative plausible assumptions, you should conduct further analysis to determine which of the alternative assumptions is more appropriate. Because different estimation methods may have hidden assumptions, you should analyze estimation methods carefully to make any hidden assumptions explicit.

EPA's analysis for the two 1997 rules revising primary National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter (PM) presented a plausible range of benefits estimates. The range reflected alternative assumptions for the estimates of specific benefit categories (See EPA, RIA for PM and ozone primary NAAQS, pp. ES-9 and 10). EPA listed high and low ozone benefit estimates, reflecting differences in the treatment of the possible effect of ozone on premature mortality, and high and low PM benefit estimates, reflecting differences in assumptions about different valuation approaches for reductions in premature mortality.

3. How Should I Treat Distributional Effects and Equity Considerations? Those who bear the costs of a regulation and those who enjoy its benefits often are not the same people. Regulations have "distributional effects" that affect different segments of the population and economy in various ways: by income groups, race, sex, industrial sector, and others. Regulations often distribute benefits and costs unevenly over time, perhaps spanning several generations. They also may distribute "transfer payments" unevenly. If these distributive effects are important, you should describe the effects of various regulatory alternatives quantitatively to the extent possible, including their magnitude, likelihood, and incidence of effects on particular groups. You should carefully analyze regulations that significantly affect outcomes for different groups. You should also analyze the changes in market prices caused by regulations, which may significantly redistribute income -- even if they are sometimes difficult to assess. Finally, you should list the time-streams of benefits and costs to provide a basis for judging distributional effects over periods of time, particularly when intergenerational effects are important.

Since generally accepted principles do not exist for determining when one distribution of net benefits is more equitable than another, you should describe distributional effects without judging their fairness. You should describe these effects broadly, focusing on large groups with small effects per capita, as well as on small groups experiencing large effects per capita. You should also note any equity issues

not related to the distribution of policy effects if they are important, and describe them quantitatively to the extent you can.

4. <u>What Should I Assume About Compliance</u>?

The effectiveness of proposed rules depends in part upon agency enforcement strategies, which may vary over time as priorities and budgetary constraints change. In cases where an enforcement strategy has not been established at the time of promulgation of the rule, you may assume complete compliance. In some cases, however, you may have reason to assume other levels of compliance as well. It is particularly important to do so where alternative enforcement strategies significantly affect the level of compliance or the costs of compliance. In that event, you should factor those assumptions into your analyses. Again, please use the same compliance assumption in estimating benefits and costs.

Section II: Accounting Statement

You need to provide an accounting statement with tables reporting benefit and cost estimates for each major final rule for your agency. You should use the guidance outlined above to report these estimates. We have included a suggested format for your consideration.

How Should We Categorize Benefits and Costs? To the extent feasible, you should quantify all potential incremental benefits and costs. You should report benefit and cost estimates within the following three categories:

monetized;
quantified, but not monetized; and
qualitative, but not quantified.

These categories are mutually exclusive and exhaustive. Throughout the process of listing preliminary estimates of costs and benefits, agencies should avoid double-counting. This problem may arise if more than one way exists to express the same change in social welfare.

Do We Need to Quantify and Monetize Whenever Possible? Yes, you should develop quantitative estimates and convert them to dollar amounts if possible. In many cases, quantified estimates are readily convertible, with a little effort, into dollar equivalents.

How Do We Deal With Time And Inflation? You should monetize and quantify effects as real, undiscounted streams of estimates for each year over the entire period for which you have estimated them. You should also annualize these same effects -- expressed in equal annual equivalents -- using the real discount rate specified in OMB Circular A-94 (currently, 7 percent), unless we agree to a different discount rate for a particular regulation. The stream of annualized estimates should begin in the year the final rule is published even if the rule does not take effect immediately. Please report all monetized effects in 1996 dollars. You may convert dollars expressed in different years to 1996 dollars using the GDP deflator.

How Do We Treat Risk and Uncertainty? You should provide central tendency or primary estimates as well as distributions about those estimates, where such information exists. When you provide only upper and lower bounds (in addition to best estimates), you should, if possible, use the 95 and 5 percent confidence bounds. Although we encourage you to develop estimates that capture the distribution of plausible outcomes for a particular alternative, detailed reporting of such distributions is not required.

The principles of full disclosure and transparency apply to the treatment of uncertainty. Where there is significant uncertainty and the resulting inferences and/or assumptions have a critical effect on the benefit

and cost estimates, you should describe the benefits and costs under plausible alternative assumptions. You may add footnotes to the table as needed to provide documentation and references, or to express important warnings.

In our discussion in Section I above, we identified some of the issues associated with developing estimates of the value of reductions in premature mortality risk. Based on this discussion, you should present alternative primary estimates where you use alternative estimates for valuing reductions in premature mortality risk.

How Do We Reflect Precision? Reported estimates should reflect, to the extent feasible, the precision in the analysis. For example, an estimate of $220 million implies rounding to the nearest $10 million and thus a precision of +/-$5 million; similarly, an estimate of $222 million implies rounding to the nearest $1 million and thus, a precision of +/-$0.5 million.

Do We Report Transfers Separately? Yes, you should report transfers separately and avoid the misclassification of transfer payments as costs or benefits. Transfers occur when wealth or income is redistributed without any direct change in aggregate social welfare. To the extent that regulatory outputs reflect transfers rather than welfare gains to society, you should identify them as transfers rather than costs or benefits. You should also distinguish transfers caused by Federal budget actions -- such as those stemming from a rule affecting Social Security payments -- from those that involve transfers between non-governmental parties -- such as monopoly rents a rule may confer on a private party. You should use as many categories as necessary to describe the major redistributive effects of a regulatory action. If transfers have significant effects in addition to distributional effects, you should evaluate them also.

What About Effects on State, Local, and Tribal Governments, Small Business, Wages and Economic Growth? You need to identify the portions of benefits, costs, and transfers received by State, local, and tribal governments. To the extent feasible, you also should identify the effects of the rule or program on small businesses, wages, and economic growth. Note that rules with annual costs that are less than one billion dollars are likely to have a minimal effect on economic growth.

OMB #: ***Agency/Program Office:***
Rule Title:
RIN #: ***Date:***

Category	*Primary Estimate*	*Minimum Est.*	*Maximum Est.*	*Source Citation (RIA, preamble, etc.)*
BENEFITS				
Annualized monetized benefits				
Annualized quantified, but unmonetized benefits				
Qualitative (unquantified) benefits				
COSTS				
Annualized monetized costs				
Annualized quantified, but unmonetized costs				
Qualitative (unquantified) costs				
TRANSFERS				
Annualized monetized transfers: Aon budget@				
from whom to whom?				
Annualized monetized transfers: Aoff budget@				
from whom to whom?				

Category	*Effects*	*Source Citation (RIA, preamble, etc.)*
Effects on State, Local, and/or Tribal Governments		
Effects on Small Businesses		
Effects on Wage		
Effects on Growth		

SELECTED FURTHER READINGS

Judith D. Bentkover, Vincent T. Covello, and Jeryl Mumpower, Eds., Benefits Assessment: The State of the Art. Dordrecht; Boston: D. Reidel Pub. Co.; Hingham, MA, U.S.A.: Sold and distributed in the U.S.A. and Canada by Kluwer Academic, 1986.

Jack Hirshliefer and John G. Riley, The Analytics of Uncertainty and Information. An advanced treatment of many issues related to risk and uncertainty. Cambridge; New York: Cambridge University Press, 1992.

Myrick Freeman, The Measurement of Environmental and Resource Values: Theory and Methods. A comprehensive high-level treatment of environmental valuation issues. Washington, D.C.: Resources for the Future, 1993.

Robert C. Lind, Ed., Discounting for Time and Risk in Energy Policy. An advanced treatment of issues related to public and private sector discounting. Washington, D.C.: Resources for the Future; Baltimore: Distributed by the Johns Hopkins University Press, 1982.

E. J. Mishan, Economics for Social Decisions: Elements of Cost-Benefit Analysis. Assumes some knowledge of economics. Chapters 5-8 should be helpful on the important subjects of producers' and consumers' surpluses (not discussed extensively in this guidance document). New York: Praeger, 1973.

Robert Cameron Mitchell and Richard T. Carson, Using Surveys to Value Public Goods: The Contingent Valuation Method. Provides a valuable discussion on the potential strengths and pitfalls associated with the use of contingent-valuation methods. Washington, D.C.: Resources for the Future; [Baltimore]: Distributed worldwide by the Johns Hopkins University Press, 1989.

V. Kerry Smith, Ed., Advances in Applied Micro-economics: Risk, Uncertainty, and the Valuation of Benefits and Costs. JAI Press., Inc., 1986.

Edith Stokey and Richard Zeckhauser, A Primer for Policy Analysis. Chapters 9 and 10 provide a good introduction to basic concepts. New York: W.W. Norton, 1978.

George Tolley, Donald Kenkel, and Robert Fabian, Eds., Valuing Health for Policy: An Economic Approach. An excellent summary of methods to value reduction in morbidity and extensions to life expectancy. Chicago: University of Chicago Press, 1994.

W. Kip Viscusi, Fatal Tradeoffs. Part I is a good starting point for the topic of valuing health and safety benefits. Other more technical sources are given in the bibliography. New York: Oxford University Press, 1992.