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Reflections on the Conduct and Use of Regulatory Impact Analysis at the U.S. Environmental Protection Agency

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Reflections on the Conduct and Use of Regulatory Impact Analysis at the U.S. Environmental Protection Agency

Richard D. Morgenstern*

Introduction

This paper reflects on the conduct and use of Regulatory Impact Analyses (RIAs) by the federal agency that conducts the largest number by far of such analyses for nontransfer rules and accounts for both the greatest total costs and the greatest net benefits of any regulatory agency, namely the US Environmental Protection Agency (EPA). As Granger Morgan aptly put it, the objective of such policy studies—typically in the form of cost–benefit or cost-effectiveness analysis—is “to evaluate, order and structure incomplete knowledge so as to allow decisions to be made with as complete an understanding as possible of the current state of knowledge, its limitations and its implications” (1978, 971). This paper examines some basic questions about RIAs at EPA: First, what do we know about the quality, including the accuracy, of these studies? Second, although RIAs clearly provide some basic information to decisionmakers and the general public, do they actually influence regulatory outcomes? If so, how do we know this to be the case, and is there a linkage between the quality of RIAs and their influence on policy?

The Quality of RIAs

In light of the recent 30th anniversary of Executive Order 12291, which established the requirement for RIAs, it is natural that retrospective assessments of these tools be conducted. The basic requirements placed on agencies over the three decades have remained relatively constant, although some of the details have changed. Under all relevant Executive Orders issued the agencies are mandated to examine alternative policy approaches, and consider significant costs and benefits, including those that cannot be quantified. Executive Order 12866, issued in 1993, places more emphasis on distributional issues and on the public transparency of the

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regulatory process. It also calls for agencies to ‘justify’ the regulatory costs rather than demonstrate that ‘benefits outweigh the costs.’

In fact, the results of various studies suggest that well-done RIAs can bring added discipline and rigor to the rulemaking process. Clearly, they oblige decisionmakers and analysts to think critically about the implications, both positive and negative, of the regulations they propose. Although regulatory review does not add to the formal legal hurdles associated with rulemaking, it does place some limited responsibility on regulators to explain why a regulation with negative net benefits should go forward. For these reasons, successful RIAs are thought by many observers to improve the decisions made by government agencies.

Beyond this stated purpose, RIAs can serve several other functions as well. First, the need to prepare an RIA provides regulators with a framework for thinking through the consequences of regulations, determining what they do and do not know about these consequences, and subsequently eliciting information from the regulated community and the general public. Second, the RIA requirement often encourages capacity-building in regulatory agencies, which must have expertise in economics, policy analysis, and statistics in order to prepare the studies or supervise their preparation by consultants. Third, the completed RIA, in turn, informs and potentially instructs Congress, the general public, and the advocates on all sides. As a result, RIAs can help set the terms of the debate over the proposed regulation. Of the many disputes that typically attend the regulatory process, the RIA can help determine which are factual, and therefore potentially able to be resolved by more data or analysis, and which are more philosophical in nature and thus less amenable to scientific or technical analysis. Further, an RIA can improve the understanding of the implications of federal regulatory activity by officials in *all* branches of government. As Paul Portney once observed, these officials “would know less about regulation than they know now were it not for the development of ... a tradition of scrutinizing regulatory proposals” (1984).

Notwithstanding the apparent gains from conducting RIAs, there are clearly costs as well. Using a formal audit procedure, a 1996 General Accounting Office study found that costs of 27 RIAs prepared by EPA between 1990-1996 ranged from \$46,000 to \$3.8 million (unadjusted for inflation), suggesting great variation among individual analyses. An even broader range of estimates emerged from a Congressional Budget Office (1997) study of RIAs conducted by EPA, the National Highway Traffic Safety Administration, the Federal Aviation Administration, and the Coast Guard. Estimates of the direct costs of relatively large RIAs by Morgenstern and Landy (1997) were on the order of \$1 million apiece in 1995\$ at EPA, including both staff time and extramural expenditures. Updating for inflation and the increasing complexity and

sophistication of the newer studies would increase the estimated direct costs of the typical large RIA, perhaps closer to \$2 million apiece in today's dollars.¹ However, as a percentage of the \$100 million annual threshold costs (or benefits) of the rules to which the RIA requirements apply, even a onetime cost of \$2 million is still a modest burden.

Turning to the issue of RIA quality, the criteria for assessing the success or failure of RIAs are not well established in the literature. Two approaches have been used. One involves an academic-style evaluation wherein the RIAs are treated as stand-alone documents; the other focuses on the accuracy of the implicit predictions the RIAs make about regulatory outcomes. Arguably, RIAs should also be judged in a larger context: whether they advance the objectives of the overall regulatory process.

Scorecard Analyses and Report Cards

The most extensive examination of RIA content can be found in studies by Robert Hahn and colleagues (2000, 2002) based on a scorecard approach keyed to a number of objective criteria. Initially, the authors examined 48 RIAs in federal agencies in the United States prepared between 1996 and 1999, paying particular attention to two aspects: whether the RIAs met the legal requirements of the executive order, and whether they satisfied the guidelines produced by the Office of Management and Budget (OMB). Their conclusion: RIAs often do not contain all the items required by the relevant executive orders and OMB guidelines. Whereas 90 percent of the RIAs examined monetized costs, only 50 percent monetized benefits and 29 percent calculated net benefits. Just two-thirds of the RIAs discussed alternatives to the regulation, and only 25 percent of the cases calculated benefits and costs of alternatives. Hahn and colleagues also subjected the contents of RIAs to two other tests: whether they had executive summaries (only half of the RIAs had one), and whether benefits and costs were properly discounted to account for the time value of money (86 percent of the RIAs examined used OMB-specified discount rates throughout). The fact that so many RIAs omit this information led Hahn and colleagues to conclude that RIAs as a group have serious quality problems.

A follow-up study by Hahn and Dudley (2007) focused exclusively on the EPA, based on a sample of 74 RIAs issued by the agency between 1982 and 1999, roughly balanced among the Reagan, Bush, and Clinton administrations. Using a scorecard similar to the one in the earlier

¹ Unquantified are the indirect costs (or benefits) of any delays that may be associated with RIAs, as well as the effects of any uncertainties that the RIAs may introduce.

studies, the authors found that while all the RIAs monetized at least some costs, not all provided estimates of total costs. Beyond that, a significant percentage of the analyses done by the EPA did not report the benefits, consider alternatives to the selected policy option, adequately discount costs and/or benefits, or present an executive summary aimed at making the results more accessible to the general public. Further, Hahn and Dudley reported no statistically significant changes in the observed quality of RIAs over the 17-year sample period or across the three presidential administrations studied. Overall, they concluded that the EPA RIAs fall far short of the formal requirements, although they also observed a great deal of variation among individual RIAs.²

An advantage of the scorecard method is that it does not require detailed knowledge of the assumptions and calculations involved in a particular analysis, nor does it require judgments about the accuracy of the results or the soundness of the methods. The definition of quality depends solely on whether the RIA follows the basic requirements set forth in official guidance. In that sense, it is relatively objective and thereby reproducible by others.

The principal disadvantage of the approach is that it focuses entirely on a checklist of requirements and not on the substance of the analysis. Thus, an RIA could receive a high score and still be poorly done. Similarly, the scorecard used by Hahn and Dudley (2007) did not consider the broader impacts that RIAs may have on the process, such as whether they increase transparency, encourage debate, or change policy in any significant way.

A further concern with the scorecard analyses is that they treat all RIAs the same, regardless of the size or policy significance of the underlying regulation. Although the hypothesis has not been tested, arguably the results reported by Hahn and colleagues might have been different if the RIAs had been weighted by a measure of the economic importance of the rule, such as the expected costs or benefits. EPA budgets resources for preparation of RIAs based in part on the economic significance of individual regulations, i.e., on the anticipated benefits or costs. The authors may have been correct that the typical RIA is deficient in many areas, but it also could be that the RIAs representing the lion's share of benefits and costs are of higher quality.

²²²² Interestingly, Hahn and Tetlock (2008) also report results from a European-based scorecard analysis by Renda that comes to quite similar conclusions regarding the quality of pre-regulatory studies in the EU.

Another study in the scorecard genre worthy of mention is by Jerry Ellig and Patrick McLaughlin, researchers at the Mercatus Center at the George Mason University. Since 2008 they have been issuing a report card on the quality and use of regulatory analyses on both transfer and nontransfer rules at more than a dozen federal agencies, including the EPA (Ellig and McLaughlin 2010). The approach attempts to go beyond the ‘yes/no’ scoring of the checklist to include a qualitative evaluation of how well the RIA was performed.³

The regulatory evaluation is based on 12 criteria, grouped into three categories: openness (how easily a reasonably intelligent reader can find, understand and verify the assumptions and data used?); analysis (how well does the analysis identify and assess alternatives, calculated costs and benefits, etc?); and use (how much did the analysis affect decisions in the proposed rule, and what provisions did the agency make to track the rule’s effectiveness?). A 5 point scale is used to grade performance on the various criteria.

Although the Mercatus criteria have not been tested against the scorecard approach, there is clearly a good deal of overlap, especially in the categories of openness and analysis. Overall, Ellig and McLaughlin find that the average quality across all covered agencies is ‘not high’ although, as they note, it scores somewhat better on a percentage basis than in the Hahn et al. scorecards. The greatest strengths they identify are in the area of accessibility and clarity. The greatest weaknesses are in retrospective analysis. Interestingly, the RIAs conducted by the EPA consistently rank at or near the top of the 17 agencies considered for all three categories of openness, analysis, and use. Also of interest is their finding that the quality of the analysis is positively correlated with its apparent use in regulatory decisions, a point we return to below.

Ex Ante–Ex Post Comparisons

Another approach for assessing RIAs is to examine the outcomes of regulations ex post and compare actual results to their predicted values in the RIA. If RIAs cannot accurately predict what will happen when a regulation is adopted, they will eventually lose credibility and hence value in the decisionmaking process. In fact, assessment of RIA performance is only one of two good reasons for conducting ex post analysis; an even more important reason is to assess the performance of the regulation itself. Fortunately, ex post analysis is already institutionalized in federal legislation, at least in a limited way. In the well-known 812 studies, named after a section

³ In some cases the report card also covers the regulatory flexibility analysis accompanying the rule.

of the 1990 Clean Air Act Amendments, EPA is required to review both the retrospective and prospective costs and benefits of the act. Earlier legislation required EPA to issue a Cost of Clean report every five years, estimating the costs imposed on society by agency regulations and, to the extent possible, the monetary value of the benefits. EPA also publishes periodic reports on levels of ambient air quality and estimated pollutant emissions into air and water.

These studies, however, mostly focus on the effectiveness of the regulation, which for environmental rules means the reduction of pollution or of measured risk, and in some cases improvements in environmental quality. Costs are often ignored. Even when they are included, such as in the 812 studies or the earlier Cost of Clean report, the analyses are based exclusively on modeled outcomes and are generally quite aggregate in nature, which prevents consideration of the performance of individual regulations. These analyses contain no *actual* measurement of either costs or benefits, even for the retrospective studies.

In the late 1990s, I worked with my RFF colleagues Winston Harrington and Peter Nelson to study the ability of regulators to estimate the cost of individual regulations by comparing the cost estimates produced during the rulemaking process with the actual costs incurred in implementing the regulation (see Harrington et al. 2001). Although the expectation is that an analysis done after implementation of a regulation, when more complete information is available, will provide a better measure of the true impact or cost than one done in advance, multiple explanations can be given for the possible discrepancies between the two, some not related to the quality of the original study, such as other policy changes adopted after the RIA was completed.

Arguably, comparisons of ex post outcomes with ex ante predictions provide an essential element of ground truthing to the practice of regulatory evaluation and modeling. The comparison of regulatory outcomes with the predictions made in the RIA can demonstrate the credibility and legitimacy of the effort to develop ex ante estimates of regulatory costs.

We were surprised that despite extensive efforts to contact a wide range of government and nongovernment experts around the world, in the end we could find only about two dozen pairs of ex ante–ex post studies that considered both the effectiveness and cost of regulations. More than half the sample was from EPA regulations, but we also had a few from the Occupational Safety and Health Administration (OSHA) and other agencies. In almost all cases, the constraint on case selection was the unavailability of an ex post study, or at least an ex post study that estimated regulatory costs. For ex ante studies, we relied exclusively on estimates prepared by the government and ignored those developed by interest groups.

At first blush, it seems odd that ex post studies of regulatory effectiveness are more common than ex post cost studies. In principle, neither the benefits (effects) nor the costs of regulation are observable. Although the world with the regulation is observed, the counterfactual is not. If this were the only factor at work, however, it would suggest that ex post studies of effectiveness and cost ought to be comparably available, not that studies of one should be rarer than the other. Perhaps part of the explanation is that government authorities, who produce most of the estimates of regulatory performance, have more incentive to estimate the benefits of regulation than the costs.

It is also quite likely that ex post estimation of costs is more difficult to conduct than ex post estimation of pollution abatement, environmental improvement, or other measures of environmental performance. Instead of the model plant or hypothetical cost estimates generally used in ex ante studies, an ex post analysis requires information on the actual expenditures of the plants subject to the regulation. It also requires the analyst to distinguish among different types of expenditures, such as transfer payments and true economic costs.

Even when proprietary information of this sort is available to the analyst, it may be difficult to interpret. Abatement costs are notoriously subject to joint cost allocation problems, because plant activities to comply with one regulation can increase (or decrease) plant output or make it more (or less) difficult to comply with other regulations. For example, analysts are still arguing about the costs incurred by the automobile industry in complying with the 1970 Clean Air Act Amendments. To what extent can the cost of electronic fuel injection, which was disseminated from a small group of high-performance vehicles to the entire fleet during the 1980s, be attributed to the pollution abatement regulations? If no such regulations had existed, would the Corporate Average Fuel Economy (CAFE) regulation, which was also enacted about this time, have diffused this technology through the industry as rapidly? In the absence of both regulations, would competitive pressures have done the job?

Some regulations also have costs that are difficult to estimate because they are not readily observable in market transactions. For example, the cotton dust regulation issued by OSHA in the 1970s considered, as an alternative to stringent limits on cotton fibers within textile plants, less stringent limits accompanied by mandatory use of respirators by some plant workers. The cost of this alternative would have to include a measure of workers' discomfort and inconvenience associated with respirator use, unless it was fully compensated by wage increases (in which case the wage increases would measure the cost), as well as the increased risk resulting from worker noncompliance. Similar considerations have arisen with asbestos and pesticide regulations.

In making the ex ante–ex post comparisons, we classified the individual case studies in one of three categories: overestimates, underestimates, or accurate estimates of the costs, as measured by the ratio of the ex ante to the ex post costs. Our (quite arbitrary) standard was that a rule was considered accurate if this ratio lay between 0.75 and 1.25. That is, we defined accuracy to include a 25 percent margin of error.

Examination of the relatively small collection of cases available to us in the late 1990s produced some surprising conclusions about cost estimates generated in RIAs. We expected to find support for one of the two stories frequently told about ex ante studies: either the industry view that government cost analyses tend to underestimate true costs or the view of public interest groups and, arguably, regulatory agencies that they tend to overestimate costs. Overall, we found that overestimates were more common. At the same time, we also found that the effects of the regulation—the emissions or risk reductions—were overestimated as well. To the extent that unit costs could be calculated, we found no clear bias toward over- or underestimation. The main reason the costs and benefits were overestimated was a failure to implement the regulation as fully as expected.

Interestingly, we also found one category of regulations where both total and unit costs were almost always overestimated in the RIAs: economic incentive-based rules. The unit costs were generally overestimated because the environmental improvement was underestimated. This was something of a surprise, inasmuch as the main criticism of economic incentives dating from the early 1970s (mainly of price instruments such as effluent fees) was that they could not be relied on to achieve the desired environmental results. In our sample, the reverse was true: the performance of economic incentive-based rules exceeded ex ante expectations. This reduced costs below estimated levels.

Another conclusion of our research was that there were systematic differences among government agencies in the accuracy of the cost estimates. For regulations promulgated by EPA, we found no overall bias in regulatory estimates in our sample, which included a number of economic incentive rules. For regulations issued by OSHA, however, we found that RIAs usually overestimated costs substantially. The results for OSHA have been supported by a subsequent analysis by Seong and Mendeloff (2003), which shows that the estimated costs and benefits of workplace safety regulations are seriously overestimated. The authors also note that internal OSHA procedures require that RIAs assume complete implementation, perhaps in part accounting for the overestimates.

A 2005 OMB analysis updated and extended our earlier work, based on a sample of 47 case studies of ex ante–ex post comparisons, twice as many as available for our original study (OMB 2005). Some of the additional studies involved regulations from agencies that we did not consider, including the National Highway Traffic Safety Administration (NHTSA) and Nuclear Regulatory Commission (NRC). OMB also included some studies that appeared after our study came out.

The OMB analysis concluded that both benefits and costs are more likely to be overestimated than underestimated, but the benefit overestimates are larger than the cost overestimates. As a result, OMB found that the cost–benefit ratio is overestimated 50 percent more often than it is underestimated. That is, the predicted performance of the regulation is better than its actual performance. Recall that our earlier work also found, similar to OMB, that both the total costs and total effects of regulations are overestimated. However, we found no apparent bias in the overall estimate of unit costs or cost-effectiveness. In a follow-up study, Harrington (2006) revisited the sample used by OMB, expanding the total number of ex ante–ex post comparisons to 60, including about two dozen cases excluded by OMB, a few of which were issued subsequent to the OMB analysis. Similarly to our original work, the Harrington review found no bias in estimates of cost–benefit ratios. There were slightly more underestimates of the cost–benefit ratio in his full sample, and slightly more overestimates in a subsample with pesticide regulations excluded.

Regardless of one’s take on the outcomes of the ex ante–ex post comparisons, the results clearly demonstrate the value of such analysis. Although it is gratifying to see an increase in the number of ex post studies now available for such comparisons, the sample size is still quite limited. Equally important is the absence of randomness in the selection of cases. Independently conducted studies typically appear for idiosyncratic reasons, often dependent on the initiative of individual researchers, which may introduce selection bias. The general rarity of comprehensive ex post analyses that examine physical outcomes and costs begs the question about what barriers exist to complete such analyses. One barrier is clearly institutional: the need to find a home for audits of regulatory performance, cost, and other implications of regulation. EPA and other line agencies that prepare the rules in the first place appear to be reluctant to undertake such studies. Although budget constraints may be part of the story, another factor is that many in these agencies would consider it outside the scope of their mission. Most regulators faced with a choice of funding a study of the performance of an existing regulation or a study of the potential need for a new regulation would have an easy choice. Also, some may question whether the promulgating agency would have conflicts that would get in the way of a balanced assessment.

Another barrier is data. Those who have tried to do ex post studies of regulatory outcomes quickly run into numerous data problems. Some of these, relating to the definition of costs and the difficulties of allocating joint costs, were noted previously. In addition, there are often problems in determining what the outcomes were. This may be a particular problem in a federal system such as that of the United States, where data on regulatory outcomes often exist but are stored by state rather than federal agencies and therefore difficult to assemble. Further, by its very nature, regulatory analysis involves both “with and without” analysis, not “before and after” analysis. That is, it involves an understanding of what the world was like before the regulation was imposed *and* what would have happened in its absence. This “baseline” problem is more than a data issue; it is also a challenge for modeling. The world will be observed either with the regulation or without it; one cannot rewind the tape of real-world outcomes and play it again.

Some of these well-known problems of policy analysis can be reduced by the RIA itself. In particular, a well-done RIA will have data on the pre-regulatory environment and models establishing the baseline. Beyond that, the analysts preparing the RIA are in the best position of anyone to determine how much time must elapse before a useful ex post analysis can be performed, as well as the data and models that may be needed to complete it.

One useful addition to the regulatory process to consider is the design of a potential ex post analysis at the time the rule is issued, including when the analysis should be done, how it could be done, and what it would cost. Sometimes the data required may already be collected by one or more agencies; other times new data collection efforts will be needed. With this information in hand, policymakers can decide at the time the regulation is issued whether to invest in the data and model development that would permit an ex post analysis. For a relatively modest investment in data development, the cost of a subsequent ex post analysis could be substantially reduced and its quality greatly improved.

How RIAs and Regulatory Review Have Changed Rulemaking

What is the role of RIAs in the decisionmaking process? Is there any evidence that they actually influence regulatory decisions, especially because some of the governing statutes limit the role of economic analysis in environmental policymaking? Not surprisingly, this is a challenging issue from a methodological perspective, as determining the “influence” of an RIA often involves subjective judgments based on information typically unavailable outside the agency. Even inside the agency, the situation can be murky.

Anecdotally, there are numerous cases where RIAs seem to have played an important role in the final regulatory decision. High-profile rules such as arsenic in drinking water or the recently repropounded cooling water intake rule immediately come to mind. Less well-known water regulations involving construction and development or meat and poultry products are other examples. However, since this information has not appeared in the published literature, I am reluctant to make firm claims about it. Fortunately, there are a number of published papers that have attempted to shed light on this important issue.

One early study of the impact of regulatory documents by Wesley Magat, Alan Krupnick, and Winston Harrington (1986) examined the effect of the quality of regulatory support documents generally on the outcomes of the effluent guidelines regulatory process during the 1970s. Two documents were examined: the development document and the economic analysis. The former provided technical information on the industry, its technological options for wastewater treatment, and the one identified as the basis of the regulation; the latter assessed the effects of the proposed regulation on costs, prices, profits, plant closures, and unemployment. The authors used a fairly elementary definition of document quality: Were the numbers consistent? Did the report leave a trail that a careful reader could follow to connect the input data with the outputs.

Overall, Magat and colleagues found that document quality, defined in this simple way, made a substantial difference in how much the agency changed the regulation during the rulemaking process. The more coherent the document, the more the effluent standards changed. For example, when the development document failed their quality test, the promulgated best practicable technology (BPT) standards were made less stringent for biochemical oxygen demand (BOD) and for total suspended solids (TSS) compared to the proposed standards. This is not meant to imply that a more stringent regulation is better, only that document quality can affect the regulatory outcome. Of course, it is also possible that poor documentation simply indicated an industry that was difficult both to regulate and to characterize in a technical report.

As noted, the Ellig and McLaughlin report card considers the use of RIAs in regulatory decisions as one of its major criteria in its cross-agency analysis. The average score for all agencies in this category is less than 40 out of 100. For the EPA, the score is somewhat higher, 50 out of 100. Although not a ringing endorsement of EPA's reliance on RIAs in decisionmaking, it does indicate a stronger commitment to the goals of the executive orders than most other agencies.

Beyond the Mercatus report card, I am aware of only one study that examines the effect of regulatory review more generally on the rulemaking process. Scott Farrow (2001) used multivariate statistical methods to examine a database of 69 regulations proposed by several US agencies and reviewed by OMB, of which 7 were sent back to the agency for further consideration and eventually dropped. This database, first developed by John Morrall, and updated and refined by Farrow and others, consisted of health and safety regulations for which researchers were able to calculate the implicit value of saving a life. Cost per life saved became the cost-effectiveness standard by which these regulations were judged.

The purpose of Farrow's study was to examine several potential effects of regulatory review, including whether rules with poor cost-effectiveness were more likely to be rejected, and whether the cost-effectiveness of rules improved during the regulatory review process. The results suggested that the regulatory review process had at best a modest effect on cost-effectiveness. Rejected rules were only slightly less cost-effective than rules that were adopted, and the cost-effectiveness of rules did not improve during the process. However, the small sample size suggests caution in interpreting the results. With only seven failures, their characteristics could easily be unduly influenced by even a single observation. In addition, many of the rules analyzed were of the 1980s vintage, when the regulatory review process at OMB was relatively new and, arguably, different from what it is today. A further qualification to this study is that it could not take account of the potential effects of the existence of the review process on the proposed rule and the preparation of the RIA. If regulators within an agency know its proposed rules will later be scrutinized and possibly returned to them if they are not deemed to be cost-effective, that knowledge is likely to affect their behavior. Overall, although this study was creative in design, it was not conclusive.

In addition to these limited number of quantitative analyses aimed at assessing the usefulness of RIAs in decisionmaking, there is a small body of case study evidence to draw on, including a study I conducted based on a dozen EPA rules issued in the 1980s and 1990s (Morgenstern 1997). The underlying case studies, conducted principally by current or former EPA analysts, represented quite detailed assessments of government regulations, examining not only the preparation of the RIA and, to a limited extent, the comparison of ex post results with ex ante expectations, but also how the RIA is used in the rulemaking process.

In looking at these cases, two qualifications should be kept in mind. First, this is definitely a nonrandom sample. The regulations examined were generally high-visibility cases—large in both expected costs and benefits (e.g., lead in gasoline) or having direct effects on household behavior (such as the Enhanced Inspection and Maintenance rule for light-duty

vehicles). The RIAs, like the retrospective studies of these rules, were reasonably complete and carefully done. Second, the authors of these case studies were closely connected to the regulatory processes they were writing about, either as EPA officials or as consultants or other close observers outside the agency. The advantage provided by this set of authors is their intimate familiarity with the regulatory histories. At the same time, the authors' close involvement in the rulemaking processes might lead one to question their detachment. Attempts were made to answer this criticism by subjecting each case study to peer review by outsiders who were almost as knowledgeable and did not have a connection to the issue.

One of the clearest lessons of these case studies is the critical importance of timing to the usefulness of RIAs. Several case study authors noted the fact that many RIAs are not initiated until after the regulatory process is well under way, often after the preferred alternative has been selected, at least on an informal basis (Morgenstern and Landy 1997). In this situation, the usefulness of the RIA is clearly undermined. Worse, it puts pressure on the analyst not to deliver bad news about benefits and costs, especially regarding the preferred alternative, leading to cynicism about the role of RIAs in the regulatory process. Even in cases where the RIA got off to a late start, however, the authors of all 12 of these case studies each believed his or her RIA did have an effect, although often it was not as influential as it could have been. According to the case study authors, all the RIAs led to improvements that decreased costs, and 5 of the 12 introduced changes that increased benefits—although, as the authors noted, with multiple influences on the process, it is difficult to ascribe with certainty any specific influences to the RIAs.

The case study authors also credited the RIAs with other contributions. In the organic chemicals effluent guidelines, the RIA identified cross-media pollution (e.g., volatilizing organic chemicals into the air rather than discharging them into the water) as an important issue; it had been overlooked in other analyses up to that point (Caulkins and Sessions 1997). Other studies identified and quantified new benefits. The RIA for the leaded gasoline rule found, for example, that the monetized benefits of reduced blood pressure dwarfed other benefits of reduced lead exposure and led to a tightening of the rule (Nichols 1997). The innovative market studies done in the asbestos study found that for many products, the cost of a ban would be modest because of the ready availability of substitutes (Augustyniak 1997).

Some RIAs also promoted regulatory alternatives that were innovative, at least for their time. The leaded gasoline rule examined the use of refinery averaging and banking, both of which became cornerstones of the policy governing the lead phasedown between 1984 and 1988. The RIA on chlorofluorocarbon (CFC) regulations also examined a banking and trading

alternative that was adopted in the final regulation (1991). Trading was also examined in the RIA for asbestos, but it was ultimately discarded because of agency inexperience and serious practical difficulties, such as asbestos embedded in imported products.

A recently published analysis concerning the use of economic analysis in actual decisionmaking is by John Graham (2008), drawing on his experience as administrator of OMB's Office of Information and Regulatory Affairs, 2001-2006. He focuses on the particular role played by the OMB in using analysis to advance 'life saving' regulation in what he labels a "pro-business Republican administration" (Graham 2008, 465). Graham cites the RIAs on both the highway diesel rule and the off-road diesel regulation, as well as the analytic work underlying President George W. Bush's Clear Skies Initiative (later embodied in a series of EPA rules) and the analyses of the CAFE standards for cars and light-duty trucks as examples where the preregulatory work had substantial impact on the final rules.

Like the regulations examined in my earlier work, Graham's sample can also be criticized as nonrandom and focused on particularly large rules. Nonetheless, as a respected scholar and, in the early 2000s, an insider involved in the regulatory process, Graham's conclusion about the important role the economic analysis played in shaping the regulation is an important addition to the literature on this issue.

Concluding Observations

Returning to the basic questions posed at the outset of this paper, what can really be said about the quality of RIAs developed by EPA? What is the verdict on their use in actual decisionmaking? And are higher-quality RIAs more influential?

Not surprisingly, the answer to the first question depends on how you define quality: whether the focus is on adherence to the formal requirements for the studies or on a more performance-oriented metric. If quality is measured as formal compliance with OMB or agency guidelines via scorecard or report card approaches, then a substantial number of EPA RIAs are clearly substandard. Further, there is no apparent pattern of improvement over time. Thus, one cannot attribute the shortcomings of the early RIAs to the novelty of the process. As Hahn and Dudley (2007, 205,207) note, the method "...is a useful but imperfect tool for evaluating RIAs...low scores...strongly suggest noncompliance with executive orders and OMB guidelines, but they don't prove it." At the same time, no attempt has been made to weight the RIAs by their economic importance. It is certainly possible that the RIAs for larger rules follow the guidelines more closely.

Alternatively, if quality is measured by the accuracy of the estimates, based on ex ante–ex post comparisons, then a more positive story emerges. Notwithstanding concerns about possible sample bias in the still quite limited dataset, a growing body of evidence suggests that although agencies generally overestimate the total costs of their major rules, at least in the case of EPA the limited estimates of unit pollution reduction costs tend to be reasonably accurate, defined to include a 25 percent margin of error. The principal reason the two metrics differ is that the agency also tends to overestimate the environmental results achieved by its rules. The most complete cross-agency evidence suggests that the results are over-estimated in roughly the same proportion that costs are over-estimated. Overall, society pays less but also gets less. As various authors have noted, the paucity of retrospective studies, especially of the costs, is a serious barrier to better understanding true regulatory impacts.

Although neither the scorecard/report card nor the ex ante-ex post comparison approach is without its critics, I would give greater weight to the latter. Overall, EPA deserves decent marks in this area.

Turning to the actual use of RIAs in decisionmaking, a somewhat murkier picture emerges. Beyond the limited statistical evidence, most of the available data are drawn from qualitative studies conducted by former insiders who were involved in the process. In effect, these are retrospective assessments from the perspective of individuals who participated in particular rulemakings being evaluated. Despite the obvious limitations of such an approach, there is a reasonable diversity of published examples, including those from multiple EPA programs and covering different time periods, to support the view that many RIAs have played a significant role in regulatory outcomes. Recall the evidence on rules issued in the 1980s and 1990s that the effect of the RIAs is to reduce costs *and* increase the total benefits of the rules examined, for a clear increase in net benefits. Especially in an agency with certain statutory prohibitions on the use of economic analysis, this is no small accomplishment.

Informal discussions with current EPA and OMB staff suggest that the published literature indicating significant influence of RIAs on agency decisionmaking represents but a fraction of the cases where these analyses have played such a role. In fact, the influence of RIA seems to be growing over time to include multiple programs and reach beyond the very large rules identified in the literature to cover smaller ones as well. Of course this view is not universal. Some observers see the glass as half empty rather than the other way around. For example, Hahn and Tetlock (2008, 78) lament the ‘dismal state of affairs’ regarding the use of economic analysis in improving regulations.

In closing, I turn to a very thoughtful paper by Albert Nichols (1997) on the lead phasedown program at EPA in the mid-1980s. In reflecting on the prominent role played by the RIA in that regulation, Nichols emphasized the need for the analysis to precede the early phases of regulatory decisionmaking, and the importance of strong management support for the analysis within the agency. He also cited the fact that the RIA generally supported stringent regulation as another reason for its influence in this rule.

Most importantly, Nichols links RIA quality to the influence it has in the regulatory process. Weak analyses, he argues, are typically ignored. The same point is made by John Graham about a number of rules promulgated during his tenure. In their report card, Ellig and McLaughlin establish a statistical link between their measure of RIA quality and what they term ‘apparent use’ in regulatory decisions. Based on my own experience in government, now a bit dated, I too would argue that sophisticated RIAs, especially if they are able to address controversial policy issues, are much more likely to affect regulatory outcomes than poorly done ones.

Finally, I would point to the recent recommendations developed by Lisa Heinzerling, Winston Harrington and myself for steps to improve both the content and use of RIAs. While some of our recommendations are as basic as the observation made by Nichols that key elements of the RIA need to precede regulatory decisionmaking, other involve methodological suggestions for expanding the analysis of nonquantified benefits.

Although it is easy to find cases of RIAs that were poorly done and that were largely ignored in the regulatory process, there is growing, albeit still relatively soft, evidence that the system is working. Policymakers increasingly recognize the value of timely, high-quality economic and technical analyses capable of speaking to both general and technical policy audiences to assist in decisionmaking and ensure the integrity of the regulatory process.

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