Policy Brief - The Role of Retrospective Analysis in an Era of Deregulation: Lessons from the U.S. Mercury and Air Toxics Standards

Mary Evans, Karen Palmer, Joseph Aldy, Meredith Fowlie, Matthew Kotchen, and Arik Levinson[†]

November 30, 2020

Abstract:

As of late 2020, the Trump administration had initiated almost one hundred rollbacks of U.S. environmental regulations. A careful assessment of the benefits and costs of rolling back an existing regulation can and should inform such decisions. When assessing the potential rollback of an existing regulation, analysts can often learn from the regulation's implementation through retrospective analysis as well as from advances in scientific knowledge. We discuss recent actions concerning the Mercury and Air Toxics Standards (MATS) to illustrate the potential lessons from doing so. In the case of MATS, advances in science have shed light on broader exposure pathways and previously unquantified health effects, suggesting that the benefits of reducing mercury emissions may exceed previous estimates. At the same time, changes in the energy sector have altered the mix of fuels used to produce electricity, which impacts both the benefits and costs of the regulation.

[†] Aldy: Harvard University, NBER, Resources for the Future, and Center for Strategic and International Studies (joseph_aldy@hks.harvard.edu); Kotchen: Yale University and NBER (matthew.kotchen@yale.edu); Evans: Claremont McKenna College (Mary.Evans@claremontmckenna.edu); Fowlie: University of California, Berkeley and NBER (fowlie@berkeley.edu); Levinson: Georgetown University and NBER (Arik.Levinson@georgetown.edu); Palmer: Resources for the Future (Palmer@rff.org). Elements of this article were developed in a report supported by the External Environmental Economics Advisory Committee (E-EEAC), an organization whose mission is to provide independent advice on the state-of-the-science with regard to the benefits, costs, and design of the U.S. Environmental Protection Agency's environmental programs. The report is available at http://www.e-eeac.org/mats-report. The views expressed in this article reflect those of the authors.

As of late 2020, the Trump administration had initiated almost one hundred rollbacks of U.S. environmental regulations, most of which have been implemented by the U.S. Environmental Protection Agency (EPA).[1] For decades, prospective benefit-cost analysis (BCA) at EPA has provided valuable information on proposed environmental regulations to policymakers and the public. Similarly, a careful assessment of the benefits and costs of *rescinding* an existing regulation can and should inform any such decision.[2] Indeed, such an analysis is required for the elimination or modification of significant U.S. federal regulations (OMB, 2018). In the absence of a formal BCA for a proposed rescission, a retrospective analysis of the original regulation as well as advances in scientific knowledge can provide valuable information for public decision-making.[3]

Rescinding an existing regulation is not the same as failing to adopt it for at least two reasons. First, when rescinding an existing regulation, compliance costs that have been incurred are sunk and thus do not become benefits upon elimination of the regulation. Second, during the period between initial adoption and rescission of a regulation, market conditions, technologies, and scientific knowledge may have changed. For these reasons, the benefits of rescission will not, in general, equal the costs of adoption, nor will the costs of rescission equal the benefits of adoption. When assessing a proposed new regulation, analysts must rely heavily on predictions of what the uncertain future will bring. In contrast, with a proposed rescission, analysts often have the benefit of learning from the regulation's implementation as well as from subsequent advances in scientific knowledge.

[1] The source of this information, *The New York Times*, uses the term "rollback" to refer to a rule or regulation being weakened, either through rescission or modification. We adopt this terminology. While our discussion focuses on rescission, as this is the action most relevant for the U.S. Mercury and Air Toxics Standard, our arguments apply generally to any rollback. URL: https://www.nytimes.com/interactive/2020/climate/trump-environment-rollbacks.html. Accessed on November 9, 2020.

[2] Krupnick et al. (2018) summarize the results of BCAs for the rollback of six regulations related to the oil and gas sector. See https://www.rff.org/topics/environmental-economics/benefit-cost-analysis/costs-and-benefits-repealing-regulations/.

[3] A retrospective analysis looks backward to examine the actual consequences of an implemented regulation, whereas a prospective analysis looks forward to estimate the expected consequences of a proposed regulation.

In many cases, retrospective analysis provides an opportunity to learn whether an implemented regulation achieved its objectives and to identify its implications for social welfare (Cropper et al., 2018). Retrospective analysis can also shed light on the tradeoffs associated with a proposed rescission. To be clear, a retrospective analysis is not the same as a BCA for a rescission. A retrospective analysis assesses whether a regulation, once implemented, promoted economic efficiency compared to a baseline without the regulation.[4] It asks, based on what we now know, what are the regulation's estimated net benefits to date? In contrast, a BCA for a rescission asks, what are the net benefits going forward of *eliminating* the regulation today? In this article, we examine recent actions concerning the U.S. Mercury and Air Toxics Standards (MATS), which limit emissions of mercury and other air toxics from power plants, to illustrate how retrospective analysis combined with new scientific discoveries can inform the evaluation of a proposed regulatory rollback. First, we provide background on the regulatory context for MATS. In the subsequent three sections, we discuss how a recent decision that undermines the legal basis for MATS could have benefitted from examining changes that had occurred since the adoption of MATS. We conclude with a summary of lessons for future proposals to modify existing regulations.

Background on MATS

In 2012, EPA determined that it was "appropriate and necessary" to regulate mercury and other hazardous air pollutants from coal- and oil-fired electricity generating units (EGUs).[5] This determination triggered a requirement under the Clean Air Act to propose regulations on emissions of these pollutants from these facilities, which resulted in MATS.[6] However, the U.S. Supreme Court ruled in 2015 that EPA

[4] For a discussion of the methods for conducting retrospective analysis, see Kopits et al. (2014) and Aldy et al. (2020).

[5] EPA's support of the "appropriate and necessary" finding relied on three factors: (1) electricity generating units are the largest domestic source of mercury emissions, and they emit other hazardous air pollutants; (2) these emissions pose a hazard to public health; and (3) effective emissions controls exist.

[6] EPA's efforts to regulate mercury from EGUs predate MATS. See EPA (2005).

must consider costs when making an "appropriate and necessary" determination. In response, in 2016, EPA issued a supplemental "appropriate and necessary" finding, which referenced results from a 2011 BCA of MATS as one justification for the supplemental finding. The 2011 BCA found that the expected benefits of MATS in 2015 – $33 to $90 billion – far exceeded the estimated $9.4 billion in compliance costs in 2015. EGUs began complying with MATS in April 2016.

In May 2020, EPA rescinded its twice-issued "appropriate and necessary" finding for MATS. While removing the legal basis for MATS is technically different from rescinding the regulation itself, the implications were similar: coal companies immediately challenged MATS's legitimacy (Reilly, 2020). To support its action to rescind the "appropriate and necessary" finding, EPA produced a benefit-cost memo (EPA, 2020), which emphasized the mercury-specific benefits of MATS, along with the estimated compliance costs from the 2011 BCA. The memo downplayed the significant public health benefits of MATs from reductions in fine particulate matter, arguing that such co-benefits should receive less weight than benefits directly linked to reductions in mercury.[7] The implicit conclusion was that the costs of MATS exceed its benefits and hence the regulation *is not* appropriate and necessary. By using the present tense, EPA blurred the distinction between asking whether MATS, which is based on the results of a BCA, *was* appropriate and necessary in 2011, whether it *has been* appropriate and necessary in retrospect, and whether it *would be* appropriate and necessary to continue enforcing MATS today.

Accounting for Advances in Scientific Knowledge

When EPA estimates the benefits and costs of a proposed regulation, it does so on the basis of the body of scientific knowledge at the time. When rescinding an existing regulation, however, EPA can consider advances in scientific knowledge since the regulation was proposed. In the case of MATS, almost a

[7] In the 2011 BCA, a majority of the expected monetized benefits of MATS were from reductions in fine particulate matter. Because these benefits are not directly linked to the regulation's focus, they have been referred to as co-benefits. See Aldy et al. (2020a and 2020b).

decade passed between EPA's 2011 BCA and its 2020 rescission of the "appropriate and necessary" finding. Indeed, scientists have made important advancements since 2011 that are relevant to the MATS regulation. We highlight two here.

First, we now better understand how mercury emissions from EGUs are deposited in fresh, coastal, and international waters, and their implications for exposure through the seafood supply (e.g., Sunderland et al., 2018). However, in its 2020 rescission, EPA relied on the 2011 BCA, which only monetized the benefits to children's IQ that were associated with a reduction in methylmercury exposure from self-caught freshwater fish. By retaining this narrow focus in 2020, EPA declined an opportunity to more accurately account for emissions pathways and population exposure.

Second, recent findings highlight the potential implications of accounting for the lower risk of cardiovascular illnesses associated with reduced methylmercury exposure. For example, Giang and Selin (2016), whose analysis incorporates these cardiovascular benefits, find that the benefits from reduced mercury emissions under MATS could significantly exceed those reported in EPA (2011, 2020).[8] Because the 2011 BCA described but did not monetize this benefit category, it did not inform the 2020 rescission decision.

Accounting for an Evolving Electricity Market and Power Plants' Compliance Decisions

The estimated costs and benefits reflected in a BCA of a proposed regulation depend on assumptions about an uncertain future, which may depart substantially from those assumptions. In the case of MATS, the original analysis did not anticipate dramatic changes in the U.S. electricity market that significantly affected emissions and compliance costs. For example, EPA (2011) predicted that in 2015, nearly 50% of electricity generation would come from coal and 18% would come from natural gas. In fact, by 2015,

[8] See also Rice et al. (2010).

coal and natural gas each represented roughly one-third of generation. These differences largely reflect the unanticipated fall in natural gas prices.

These unanticipated energy sector developments suggest that both the compliance costs and the benefits of MATS were likely lower than projected by EPA (2011). Indeed, actual investments in pollution control under MATS covered less than half of the generating capacity that EPA (2011) projected, and for the most part, the investments that were made used the least costly abatement technologies (EIA, 2017).[9]

The decline of coal-fired power generation resulted in changes in emissions that differ markedly from those projected by EPA (2011). Moreover, investments in pollution abatement equipment have already been made, and the costs of operating this equipment are low relative to the capital investments. Thus, it is inappropriate to use the baseline from the 2011 BCA to estimate, nearly a decade later, the benefits and costs of rescinding the "appropriate and necessary" finding. Ideally, there should be prospective analysis of the estimated net benefits of that reversal.

Learning from Retrospective Analyses

Because power plants began complying with MATS more than three years before EPA's 2020 decision to rescind, retrospective analysis can provide information on how much of the observed changes in the energy sector are likely attributable to MATS. Such analysis could also reveal the likely tradeoffs associated with a future rollback of the regulation. Two recent retrospective analyses offer insights for MATS.

Linn and McCormack (2019) construct a model of fossil fuel generators in the Eastern United States to explain the relative contributions of electricity demand, natural gas prices, wind generation,

[9] If actual operating costs (based on firms' adopted abatement strategies) exceed those reflected in the 2011 BCA, then using the 2011 estimates would underestimate the benefits of rolling back MATS.

and environmental regulations, including MATS, to the change in the role of coal in electricity generation. They find that market changes explained 80% of coal EGU retirements, while MATS was responsible for about 5.6 GW (14%) of retirements by 2015.

Coglianese et al. (2020) separate the changes in U.S. coal production since 2008 into those due to market trends and those due to environmental regulations. They find that declines in the price of natural gas explain about 92% of the decrease in coal production between 2008 and 2016, while regulations, including MATS, explain only about 6% of the drop in coal production. They attribute about 5.2 GW of coal EGU retirements to MATS.

These two retrospective analyses both find a smaller impact of MATS on EGU generation than was estimated prospectively in 2011. If the actual impacts of MATS were smaller than anticipated, then the 2011 BCA overestimated both the benefits and the costs of MATS, and thus using them in support of the EPA's 2020 decision is unsound.

Lessons for Analysis of Regulatory Repeal

We have identified several factors that contribute to differences between prospective and retrospective assessments of MATS. These factors pull in different directions. Accounting for scientific advances would likely increase the benefits of reducing mercury emissions and therefore increase the costs of rescinding MATS, while accounting for changes in the energy sector would likely decrease both the benefits and the costs of rolling back MATS. However, the overall impact of these factors on the estimated *net* benefits of rescinding MATS is unclear and requires further analysis. In the case of MATS, EPA's 2020 reversal of its "appropriate and necessary" determination ignores new science and electricity market changes. That leaves the door open for a new Administration to reassess whether continuing to enforce MATS would currently be appropriate and necessary after accounting for these changes. More broadly, retrospective analysis of existing regulations should inform any proposed regulatory modification,

whether for mercury or any other pollutant and whether the proposed change is a tightening or a rollback.

REFERENCES

Aldy, J., M. Kotchen, M. Evans, M. Fowlie, A. Levinson, and K. Palmer. 2020a. Deep Flaws in a Mercury Regulatory Analysis. *Science* 368 (6488): 247-248.

Aldy, J., M. Kotchen, M. Evans, M. Fowlie, A. Levinson, and K. Palmer. 2020b. Co-Benefits and Regulatory Impact Analysis: Theory and Evidence from Federal Air Quality Regulations. Forthcoming in Matthew Kotchen, James H. Stock, and Catherine Wolfram (eds) *Environmental and Energy Policy and the Economy*, volume 2, University of Chicago Press.

Aldy, J., M. Auffhammer, M. Cropper, A. Fraas and R. Morgenstern. 2020. Looking Back at Fifty Years of the Clean Air Act. *Journal of Economic Literature*, forthcoming.

Coglianese, J., Gerarden, T.D., Stock, J.H. 2020. The effects of fuel prices, environmental regulations, and other factors on U.S. coal production, 2008-2016. *The Energy Journal* 41(1): 55-81.

Cropper, M. L., R. D. Morgenstern, and N. Rivers. 2018. Policy Brief—Facilitating Retrospective Analysis of Environmental Regulations. *Review of Environmental Economics and Policy* 12(2): 359-370.

Energy Information Administration. 2017. Coal plants installed mercury controls to meet compliance deadlines. *Today in Energy,* September 18, 2017.

Environmental Protection Agency. 2005. Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units, *Federal Register* 70 (95): 28605-28700. URL: https://www.govinfo.gov/content/pkg/FR-2005-05-18/pdf/05-8447.pdf

Environmental Protection Agency. 2011. *Regulatory impact analysis for the final mercury and air toxics standards*. EPA-452/R-11-011. December 2011.

Environmental Protection Agency. 2020. Compliance Cost, HAP Benefits, and Ancillary Co-Pollutant Benefits for "National Emission Standards for Hazardous Air Pollutants: Coal-and Oil-Fired Electric Utility Steam Generating Units -- Reconsideration of Supplemental Finding and Residual Risk and Technology Review." April 15.

Giang, A.; Selin, N. E. 2016. Benefits of mercury controls for the United States. *Proceedings of the National Academies of Sciences* 113(2): 286-291.

Kopits, E., A. McGartland, C. Morgan, C. Pasurka, R. Shadbegian, N. B. Simon, D. Simpson, and A. Wolverton. 2014. Retrospective Cost Analyses of EPA Regulations: A Case Study Approach. *Journal of Benefit–Cost Analysis* 5(2): 173–93.

Krupnick, A. A. Fraas, J. Huetteman and I. Echarte. 2018. The Economics of Regulatory Repeal and Six Case Studies, Resources for the Future Report, November.

Linn, J.; McCormack, K. 2019. The roles of energy markets and environmental regulation in reducing coal-fired power plant profits and electricity sector emissions. *RAND Journal of Economics* 50(4): 733-767.

Office of Management and Budget. 2017. Memorandum M-17-21, §II, Guidance Implementing Executive Order 13771, Titled "Reducing Regulation and Controlling Regulatory Costs", April 5, 2017. URL: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2017/M-17-21-OMB.pdf.

Reilly, Sean. 2020. Lawsuit marks first step in legal brawl over toxics rule. *E&E News*. May 22.

Rice, G.E.; Hammitt, J.K.; Evans, J.S. 2010. A Probabilistic characterization of the health benefits of reducing methyl mercury intake in the United States. *Environmental Science and Technology* 44: 5216-5224.

Sunderland, E. M.; Li, M.; Bullard, K. 2018. Decadal changes in the edible supply of seafood and methylmercury exposure in the United States. *Environmental Health Perspectives* 126: 017006-1-017006-6.