Evaluation of the Manufacturers' Alliance (MAPI) Report on the "Economic Implications of EPA's Proposed Ozone Standard"

Evaluator:
Richard B. Howarth
Pat and John Rosenwald Professor
Environmental Studies Program
Dartmouth College

Incomplete

Explanation of Grade:

"The MAPI report is fundamentally flawed, resting on an analytical framework that is scientifically unsound and inappropriate for use in policy evaluation.

The report fails to apply standard statistical techniques that are taught to students specializing in the fields of statistics and econometrics.

The report would warrant a grade of "incomplete" if it were submitted as an undergraduate honors thesis or master's thesis in an academic program focusing on environmental policy analysis."

Evaluating IHS Global Insight's Evaluation of the Economic Impact of Proposed EPA Boiler/Process Heater MACT Rule on Industrial, Commercial, and Institutional Boiler and Process Heater Operators

Evaluator:
Jason F. Shogren
Department of Economics and Finance
University of Wyoming

D/F

<u>Explanation of Grade:</u>

<u>"Overall grade:</u>
Application—D
(lack of a serious accounting of economic behavior—no attempt to account for the behavioral elasticities of demand, a high end cost estimation, one-to-one mapping of upgrade costs to demand reduction, not addressing impacts in non-sector gainers within the economy, no accounting for R&D and new technology innovations and entrepreneurship)

Transparency—F
(Weak discussion on the basic economic role of responsiveness and substitution possibilities, multiplier justification is unclear, abatement cost assumptions incomplete, unclear, and inadequately justified)"

Review of Methodology in Fisher International: "Economic Impact of Pending Air Regulations on the US Pulp and Paper Industry"

Evaluator:
Charles D. Kolstad, PhD
Professor and Chair
Department of Economics
University of California

F

<u>Explanation of Grade:</u>

"If I were grading this, I would give it an F. The economics is all wrong (lack of an incidence analysis or acknowledgement of its importance; failure to draw on the relevant literature), which of course would be my main concern.

But the paper has some redeeming features -- the English grammar is decent and typically better than I see on a poor paper. Furthermore, I would want to encourage the student to work harder on the next assignment."

Evaluation of the Manufacturers' Alliance (MAPI) Report on the "Economic Implications of EPA's Proposed Ozone Standard"

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October 26, 2010

Overview

In September of 2010, the Manufacturers' Alliance (MAPI) released a 7-page report on the economic cost of reducing the primary National Ambient Air Quality Standard for ozone to 60 parts per billion (ppb). Based on a process involving comprehensive research and systematic review, USEPA reports that implementing a 60 ppb ozone standard would impose annual costs of $52-90 billion with accompanying benefits of $30-100 billion.[1] The MAPI report, in contrast, estimates an attainment cost of $1.0 trillion in the year 2020 with related impacts on employment and gross economic output. This disparity points to the importance of critically evaluating the methods employed in the MAPI analysis.

For the reasons described below, the MAPI report is fundamentally flawed, resting on an analytical framework that is scientifically unsound and inappropriate for use in policy evaluation. The report fails to apply standard statistical techniques that are taught to students specializing in the fields of statistics and econometrics. The report would warrant a grade of "incomplete" if it were submitted as an undergraduate honors thesis or master's thesis in an academic program focusing on environmental policy analysis.

Background: What Constitutes Best Practice?

A best-practice approach to estimating the cost of achieving ambient air quality standards requires an integrated analytical framework that accounts for:

- Local weather patterns and topography in each major air shed.
- The spatial distribution of pollutant emissions, including pollutant flows between air sheds.
- The specific sectors and technologies that generate emissions, including mobile sources such as vehicles and stationary sources such as factories and power plants.
- The cost of reducing emissions on a source-by-source and technology-by-technology basis.

Because weather, topography, development patterns, and the composition of economic activity differ fundamentally between air sheds, the cost of meeting air quality standards varies dramatically between regions. Arriving at scientifically sound cost estimates therefore requires a spatially disaggregated approach that is grounded in the relevant principles and methods from atmospheric science, engineering, and economics.

The MAPI Report

The MAPI report on the economic impact of achieving a 60 ppb ozone standard, in contrast, employs a mathematical model that accounts for the influence of just two variables, each of which is measured on a state-by-state basis:

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[1] USEPA, "Summary of the updated Regulatory Impact Analysis (RIA) for the Reconsideration of the 2008 Ozone National Ambient Air Quality Standard (NAAQS)," http://www.epa.gov/ttnecas1/regdata/RIAs/s1-supplemental_analysis_summary11-5-09.pdf.

1. The total level of manufacturing output.
2. The total level of activity in the petroleum refining sector.

To calibrate its model, MAPI quantifies the statistical correlation between these two variables and the economic impacts of pollution control based on estimates for 11 U.S. states provided by NERA Economic Consulting.[2] The resulting two-variable model is then used to extrapolate economic impacts to the 39 states not considered by NERA.

Evaluating the Report

In plain terms, the MAPI report is scientifically unsound and provides an inappropriate basis for policy evaluation because it ignores a variety of variables that are central in understanding the science and economics of air pollution. This conclusion is supported by two interrelated lines of argument.

First, the report fails to establish that its statistical model accurately characterizes the true causal relationship between pollution control costs, manufacturing activity, and refinery activity in the 11-state NERA sample. While the report demonstrates that there is a positive in-sample correlation between these variables, it is a truism to point out that correlation does not imply causality. More technically, the report's failure to include variables pertaining to weather patterns, the spatial distribution of emissions, the composition of the manufacturing sector, and emissions from mobile sources supports the hypothesis that the report may be affected by omitted variable bias. This arises when leaving important variables out of a statistical analysis leads to results that mischaracterize the relationship between the variables that are included. Statistics and econometrics students are taught to test for omitted variable bias as a basic and necessary step in the design and evaluation of statistical models. In the present context, MAPI's failure to address this issue compromises the report's quantitative findings.

Second, the MAPI report presents no evidence that the 11 states used to calibrate its model – Arkansas, Colorado, Illinois, Missouri, New Hampshire, New Mexico, North Carolina, Ohio, Pennsylvania, Tennessee and West Virginia – are representative of all 50 U.S. states with respect to variables other than total manufacturing output and refinery activity. In fact there is strong reason to believe that these states are *not* representative. All eleven of these states, for example, were nonattainment areas with respect to EPA's 8-hour ozone standard in 2008.[3] By way of contrast, the NERA sample does not include cost data for any of the 20 states – including Washington, Oregon, Minnesota, Mississippi, and Florida – that were in full compliance with the this standard because they have relatively clean air.

Common sense, engineering studies, environmental science, and basic economics all suggest that the cost of meeting specified air quality standards is comparatively low in regions characterized by low pollutant concentrations and/or favorable weather conditions. The MAPI report, in contrast, applies economic impact estimates from states with known air quality problems to states where compliance is likely to be easier and less costly.

Summary Comments

In its present form, the MAPI report would be viewed as "incomplete" if it were submitted as an undergraduate honors thesis or master's thesis in an academic program focusing on environmental policy analysis. To warrant a satisfactory grade, the analysis would need to be extended to account for interstate variability in variables such as weather, development patterns, and economic structure that are known to fundamentally affect both ambient air quality and the cost of achieving air quality standards.

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[2] NERA Economic Consulting, "Estimated Economic Impacts of EPA 2010 Ozone Proposal," 2010.
[3] See http://www.epa.gov/air/data/nonat.html?us~usa~United%20States.

Evaluating IHS Global Insight's Evaluation of the Economic Impact of Proposed EPA Boiler/Process Heater MACT Rule on Industrial, Commercial, and Institutional Boiler and Process Heater Operators

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October 16, 2010

The Council of Industrial Boiler Operators (CIBO) hired IHS Global Insight to quantify the potential economic impact of compliance (upgrade costs) to the proposed EPA standards. Based on their use of the IMPLAN model, IHS concluded: "every $1B spent on upgrade and compliance costs will put 16,000 jobs at risk and reduce US GDP by as much as $1.2B." In aggregate terms, the IHS report has "jobs at risk" ranging from 337,000 to 800,000 jobs over the long term period (depending on scenario). In contrast, the EPA reports a substantially lower range of -6000 to 12,000 lost jobs over the long run. The EPA report provides lower estimates because it accounts for the dynamic push-and-pull of economic behavior within a regulated market, discussed in more detail below.

Overall, the IHS study has two critical flaws. First, rather than using proper economic methods to estimate production changes resulting from pollution control costs, the authors make ad hoc assumptions that do not address basic economic principles. Second, the authors appear to assume the highest possible pollution control costs, without justification or caveats as to ways in which they could be overestimated.

<u>Ad hoc assumptions</u>

The authors make two unjustified assumptions. First, they claim that demand for goods in affected industries will decline by exactly the amount of estimated abatement costs. Second, they assume that only one sector, the regulated industries, will be affected by these costs.

The basic logic behind this approach is that new pollution abatement costs will increases prices and lower demand for goods and therefore workers in the regulated industries. At the same time, other industries will not be affected because the new environmental standards do not apply to them.

Both of these assumptions suffer from ad hoc justifications with respect to the elasticity of supply and demand, and to multiplier effects with respect to other sectors of the economy:

1. <u>Elasticity of demand.</u> When prices increase, production of products will decrease based on the assumed elasticities of demand and supply. This decrease in output then in part determines the reduction in employment. Conducting impact analysis for different industries and activities can differ based on the precision of the baseline data and if the default model specifications reflect the industry activity in the study region. The IHS report assumes: "For each affected sector, these capital expenditures were assumed to result in corresponding and equal decreases in output." This statement suggests the report did not consider any elasticities . These elasticities will vary across industry, which will have implications for production and jobs. To assume a one-to-one mapping from costs to output ignores basic economic theory and all the potential consumer and producer reactions within the market place. Elasticities are available in the literature for aggregate output in most industries. In its report the EPA used a 0.01% domestic production demand decrease based on the peer-reviewed economics literature estimates of elasticities. While one can debate the magnitude of the elasticity, at least it is discussed and implemented in their analysis.

2. Multiplier effects across industry sectors. Models like IMPLAN are driven by what one assumes about multipliers; multipliers serve to contract production and jobs in sectors where prices rise and demand declines, but expand production and employment if demand in other sectors increase. IHS ignores these other sectors. In reality, new jobs will turn up elsewhere for people, such that aggregate performance could be more balanced than the IHS numbers suggest. For example, workers will be needed to produce, install, maintain, and monitor pollution control equipment, and consumer expenditures will shift toward other goods and services in the economy. While IMPLAN is a popular tool that can be straightforwardly used to assess these types of inter-industry effects, the analysis is only as good as the assumptions made about economic interactions and the data entered into the model.

High abatement cost estimates

CIBO uses high-end estimates of capital costs to upgrade, resulting in huge job loss predictions. The IHS study has significantly greater costs (nearly 100 times greater than the EPAs) that they call "very conservative". The jobs at risk are 133 times greater than the EPA's worst estimate. This is a result of the problem discussed in the previous section, failure to account fully for all jobs lost and gained in different sectors in the economy, and it also reflects implicit and explicit assumptions about costs that inflate IHS's costs:

1. Actual implementation costs are notoriously hard to quantify because one can either focus on expensive old technologies that will be replaced or new technologies that are still tentative. The range of costs will vary widely according to how much weight one assigns the old and the new technologies that will likely be used. Here some of the data used is said to be based on median estimates of existing reports on cost data, which will reflect estimates of current technology, which may or may not be state of the art.
2. Costs are assumed to be incurred in one year—all the additional costs. This is unlikely due to accounting methods which allow the firms to spread the costs out over many years so as to smooth out the impact of the new regulations.
3. The cost estimates are one-snap shot in time. These estimates are based on current technology. No assumptions are made about potential innovations on new cost-cutting technologies; entrepreneurs exist who will find these cost estimates as a new business opportunity. One can overestimate the likely entrance of new technology, of course, to address environmental regulations; but to assume no change in technology for such a big cost difference is an assumption challenging to defend.

Overall grade:
Application—D
(lack of a serious accounting of economic behavior—no attempt to account for the behavioral elasticities of demand, a high end cost estimation, one-to-one mapping of upgrade costs to demand reduction, not addressing impacts in non-sector gainers within the economy, no accounting for R&D and new technology innovations and entrepreneurship)

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Review of Methodology in Fisher International: "Economic Impact of Pending Air Regulations on the US Pulp and Paper Industry"

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13 October 2010

I have reviewed the analysis commissioned by the American Forest & Paper Association from Fisher International (dated August 2010), addressing the impacts on the pulp and paper industry from EPA's proposed Boiler MACT (maximum achievable control technology) rule. In particular, I have focused on the methodology employed by Fisher and discussed briefly on pp 1-3 of the submission.

The analysis purports to estimate the increased costs borne by the industry from the proposed regulation, the number of mills that may be shut-down from the rule, and the number of jobs that may be lost from the rule. Unfortunately, the methodology is fundamentally flawed in many respects; thus the results reported are useless. I detail the problems with the methodology below.

The analysis begins with a propriety mill-by-mill engineering analysis of increased production costs due to the proposed regulations. Since no supporting description of this calculation is provided, I have no way of evaluating the appropriateness of the estimated engineering costs. Fisher then compares these costs to their estimate of total production costs to determine the extent to which a mill is "at risk" of shut down. This is a totally inappropriate way of gauging the risk of shutdown. It is well known in the economics literature that when a regulation applies to an industry, and industry incurs costs, it will pass all or part of those costs onto consumers. The extent to which industry can pass on these costs depends on foreign competition and the price sensitivity of consumers, among other things. Simply looking at the engineering costs of a rule, even if accurately estimated, overstates, perhaps substantially, the costs that are actually borne by the industry, its employees or its shareholders.

Furthermore, Fisher arbitrarily assumes that a firm with engineering costs exceeding 12.5% of total costs is at risk of closure. Not only is this approach to predicting closure flawed (as articulated in the previous paragraph), but this cut-off of 12.5% is completely arbitrary.

An additional problem in the analysis is that in converting capital costs to annual costs, Fisher assumes half of capital costs are funded by equity, which fully expenses the expenses in the year the cost is incurred. This is inappropriate. While equity may require a higher rate of return than debt, it is still amortized over a multi-year period. This error by Fisher tends to overstate the costs of the proposed rule.

Finally, even if the costs were calculated correctly, the method of calculating job loss is grossly inaccurate. As Morgenstern et al (2002) have pointed out, changes in employment from regulatory action are from three sources: losses due to contraction of the domestic industry due to price increase induced by regulations, abatement activities that require additional labor, and production processes post-regulation that may have different labor requirements. The first of these is negative, the second of these is positive, and the third of these is ambiguous. However, statistical estimates of employment effects of air rules suggest the employment consequences are modest. Morgenstern et al (2002) estimate a statistically insignificant number of jobs lost per million dollars of regulatory cost in the pulp and paper industry (in some industries there are actually job gains).

In addition, there will likely be job gains in the sector providing the pollution control equipment purchased by newly regulated firms.

In sum, the methods used by Fisher are fundamentally flawed. The resulting estimates of job losses are completely invalid.

If I were grading this, I would give it an F. The economics is all wrong (lack of an incidence analysis or acknowledgement of its importance; failure to draw on the relevant literature), which of course would be my main concern. But the paper has some redeeming features -- the English grammar is decent and typically better than I see on a poor paper. Furthermore, I would want to encourage the student to work harder on the next assignment

References:

Richard D. Morgenstern, William A. Pizer and Jhih-Shyang Shih, “Jobs versus the Environment: An Industry-Level Perspective,” *J. Env . Econ. Mgmt*, **43**:412-36 (2002).