BUREAU OF THE CENSUS

Statistical Brief

Measuring the Productivity Impact of Pollution Abatement

This Brief summarizes findings of a study of the relationship between pollution abatement costs and the productivity of manufacturing plants. Analysts found that the productivity impacts were considerably greater than expected—about three times as large as previous research had estimated.

The study is based upon two U.S. Census Bureau data bases: the *Pollution Abatement Cost and Expenditures survey and the Longitudinal Research Data Base.*

Oil, Paper, and Steel Have High Abatement Costs.

Regulation of environmental pollution includes air, water, solid waste, and hazardous waste controls. Researchers analyzed pollution abatement data on manufacturing plants from 1979 through 1985 in three major industrial sectors of the U.S. economy: oil, paper, and steel.

Abatement costs, as a percentage of total annual operating expenditures, are consistently greater for these industries than for the manufacturing sector in general. As such, these industries provide a clear vantage point for an examination of the ultimate productivity costs of pollution abatement.

Higher Spending Translates into Productivity Reductions.

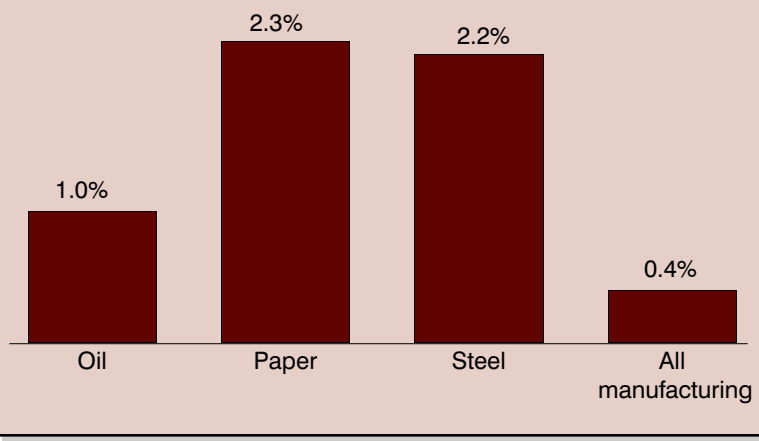
Productivity is measured by the ratio of the product derived from a manufacturing plant (output) to the resources—labor, capital, and materials—used by the plant (inputs). When plants use labor, capital, and materials for pollution abatement, rather than for the production of marketable goods, inputs are raised without increasing output; thus, productivity is lowered, imposing a cost on the plant.

Traditionally, there has been an assumption that a dollar spent on pollution abatement reduces productivity by only that dollar, i.e., a plant spending 1 percent of annual operating costs on pollution abatement would reduce its productivity by 1 percent. This study tested that assumption. As measured by the Pollution Abatement Cost and Expenditures survey, abatement costs included primarily the following factors:

- Depreciation of pollution abatement capital equipment.
- Energy to run the equipment.
- Labor needed for equipment operation and maintenance.

Pollution Abatement Costs (Industry Data)

As percent of Total Annual Operating Costs



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Dollar-for-Dollar Assumption Is Mistaken.

When the responses from the survey were analyzed—using a sample of 107 oil refineries, 120 pulp and paper mills, and 60 steel mills—the reported costs did not account for all of the productivity reductions. Instead, the data showed that productivity was reduced by the equivalent of 3 to 4 dollars per dollar of pollution abatement costs. The total reduction in productivity for the plants in the study was—

- 3.20 percent for oil refineries.
- 5.32 percent for paper mills.
- 7.62 percent for steel mills.

Abatement Cost Measures Are Incomplete.

How could 1 dollar of reported abatement costs reduce a manufacturing plant's true productivity by 3 or more dollars?

One explanation is that the plant may have underreported its costs. If a plant identified only one-third of its abatement costs, 1 dollar in reported costs would translate into 3 dollars in true costs, resulting in a 3-dollar impact on productivity.

- For example, managerial time spent preparing for Federal and State inspections or for redesigning the production process to reduce emissions is unlikely to be reported in cost estimates. The survey only asks about labor needed for operation and maintenance of the abatement equipment.

Another explanation is that pollution abatement expenditures reduce the productivity of other inputs.

- For example, putting a "baghouse" on a smokestack may require changing the operating pressure of a boiler, reducing its efficiency and, hence, reducing productivity.

The above examples show possible reasons for earlier cost estimates, assuming dollar-for-dollar reductions, appearing to be substantially understated—either in dollar terms or in percentage reduction of the plant's overall productivity.

The present results, by contrast, are based upon highly detailed information: microdata that matches plant level abatement cost data from the Census Bureau survey to productivity data for the same manufacturing plants in the Longitudinal Research Data Base.

Productivity Does Not Tell All.

These measures of productivity losses reflect the costs, not the benefits, of environmental regulation. Reductions in pollution certainly improve the health of workers and the population at large. Other businesses also may benefit from cleaner air and water. These benefits cannot be measured with the data used here. Therefore, one cannot conclude from this report that pollution abatement costs outweigh the benefits; just that the costs are substantially larger than previously thought to be.

The full research report upon which this information is based contains complete descriptions of the data bases, the statistical methods used, and data limitations.

This Brief is one of a series that presents information of current interest based upon research conducted at the Center for Economic Studies (CES) of the U.S. Census Bureau. The CES houses highly specialized longitudinal microdata files on the U.S. manufacturing sector. One of the Center's missions is to develop projects and procedures for enhancing researcher access to these files with confidentiality protection. For further information, contact Robert H. McGuckin, 301-763-2337.

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Total Productivity Reductions
Percent Reduction in Productivity