The CRS report attempts to estimate the cost to the U.S. automobile industry of meeting the more stringent Senate requirements.9/ The report finds that meeting emission standards and their associated warranty costs for passenger vehicles, light trucks, and heavy trucks would cost between $1.40 billion and $3.9 billion (in 1988 dollars) annually.10/ In addition, required changes in the performance of fuels (for example, with respect to volatility or sulfur or oxygen content), would increase the cost of buying fuels (and, therefore, of operating vehicles) by between $1.29 billion and $2.97 billion annually. The total annual cost of buying and operating cars, trucks, and motorcycles manufactured in the United States would rise by between $2.69 and $6.87 billion (again in 1988 dollars)--the midpoint of this range being $4.78 billion.

This is an estimate of compliance costs and, as such, is unrelated to final economic effects on the automobile industry. These costs would add to the cost of producing domestic automobiles and, therefore, raise the price and lower the quantity of U.S. vehicles sold. CRS estimates that these proposed regulations would lead to a loss of output in the auto (including trucks) industry of up to $10.6 billion annually. But its calculations are not based on the effect of compliance costs on vehicle prices and sales. Instead, CRS takes a "worst case" approach and calculates losses on the basis of assumptions regarding how many newly produced vehicles would go out of production for failure to meet the environmental standards. For example, CRS assumes that 300,000 six- and eight-cylinder cars would go out of production for this reason. Some buyers might prefer to buy smaller U.S. cars or to buy the same larger car later; in addition, the output lost to imports would total 75,000 of the 300,000 units. Assuming that these larger cars had an average wholesale price of $20,000 (an admittedly "worst case" assumption), lost output would total $1.5 billion and employment losses would total 30,000 assuming a ratio of one job to every $50,000 in output.

The estimates made by CRS represent a technological view rather than an economic calculation of impact. Elsewhere in its report, for example, CRS assumes that the average cost per passenger vehicle of installing new equipment would be $100. Losses in sales of all passenger vehicles, therefore, should be roughly equal to the extent to which the demand for them would decline if their price were to rise by this amount. Given an average sticker price of $10,000, the price of a car would rise by 1 percent. Using commonly assumed levels of the sensitivity of demand to the price of cars, this would lead to a decline in domestic sales of about 54,000 units annually.11/ At $10,000 per unit, this yields total sales losses of $540 million. The CRS report suggests passenger vehicle output losses between zero and $3.0 billion.

The CRS estimates of output and employment losses in the automobile industry are at best a partial description of the economy's adjustment to ozone

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9. Ibid.

10. This estimate includes the cost of an on-board vapor recovery system, an estimate for which is provided separately in the CRS report.

11. A demand elasticity of 0.8 was used for this calculation.

regulations. The study concludes that output losses would range from zero to $10.6 billion: using its ratio of one job for each $50,000 in output, an estimated employment loss of 212,000 would result, or roughly 20 percent of total automobile employment. But if $10.6 billion worth of automobiles and trucks were not sold, those dollars would find some alternative use. Households would purchase mass transportation, or choose to spend the income not spent on cars on other purposes. Businesses would substitute other forms of freight services for trucks. Thus, the estimated effects on the automobile industry are not economywide effects. While they are important for automobile-producing regions, communities, and workers, they do not show whether a proposed regulation is beneficial in the aggregate.

Impacts on Small Business

The ozone attainment proposals raise the possibility that VOC control expenditures will be imposed on a large category of relatively small emission sources. To the extent that small sources are correlated with small businesses, the likelihood of a disproportionately large burden on small businesses increases. For example, New Jersey's emissions inventory shows that 24 times as many sources would be included in a VOC control program that adopted a 25-ton emission threshold as would be included in a 100-ton program. It is often argued that small businesses may suffer under a pollution control program that does not make allowance for the limited ability of small firms to raise the necessary capital for purchasing pollution control equipment, as well as their limited ability to take cost-minimizing actions. Government data on the costs and effects of the ozone attainment proposals do not permit a detailed assessment of this issue. Given the potential costs to small businesses under the Senate and House bills, this lack of data and analysis is problematic.

TRADE EFFECTS

A common concern with domestic environmental regulatory programs is that they may place certain domestic industries at a competitive disadvantage relative to foreign producers. This concern is predicated on the assumption that foreign producers are able to sell products in this country at lower prices than domestic products because they are not forced to incur the same level of environmental pollution control costs. To the extent that this assumption is valid, domestic purchases of imported goods would be favored over their U.S.-produced counterparts, and domestic goods would be more difficult to market abroad, resulting in domestic employment losses and a widening of the U.S. trade deficit.

Several historical studies of pollution control cost impacts suggest that international differences in environmental policies have only marginal effects on the overall competitiveness of domestic industries.12/ The reasons are several:

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12. See especially, Congressional Budget Office, *Economic Efficiency and Environmental Regulation* (1985) and Congressional Budget Office, *How Federal Policies Affect the Steel Industry* (1987).

- Environmental regulations do not differ much in stringency among most major developed countries. In less developed countries the differences may be greater, although most analyses have not carefully investigated this possibility.

- The effect of other cost and policy variables on the prices of imported versus domestic products far exceed those associated with environmental regulations. Differences in raw material costs, labor costs, and government trade policy, for example, are much more likely to affect domestic and foreign costs of production than are environmental cost differentials.

- Finally, in the case of several specific industries, changes in world-wide demand and supply appear to have more impact on U.S. production than do cost differences alone.

While a strong case can be made that past environmental pollution control expenditures did not have a significant impact on aggregate domestic trade flows, it is possible that the additional expenditures associated with the new ozone attainment provisions would affect certain industries and certain firms that are already feeling import pressures. It has been argued that the mobile source provisions would lead to increased sales of smaller imported vehicles. Without detailed industry-specific data, or a formal analysis of ozone controls in other countries, it is difficult to address this possibility. But certain industries would be more likely than others to experience some additional import pressure, particularly if the pollution control costs constituted a significant portion of their costs of production. Table 7 shows current levels of import penetration for selected industries that are likely to bear a significant burden of ozone compliance costs.

IMPACTS ON CONSUMERS

Most of the ozone attainment proposals call for VOC reduction strategies that will impose some costs directly on consumers or the public. Although the public bears the ultimate costs of most environmental programs through increased prices, reduced returns to stockholders, and increased taxes or fees, several provisions of H.R. 3054 and S. 1894 would affect consumers directly. Two potential classes of costs stand out in this regard: direct costs in the form of fees or charges--for example, those associated with inspection and maintenance requirements; and inconvenience costs related to Stage II and transportation control programs. A third category, that has recently received some attention, incudes direct and inconvenience costs associated with controls on VOC emissions from consumer products.

Direct Consumer Costs

Several analyses of the costs of vehicle inspection and maintenance programs have argued that they would result in increased repair costs to consumers. Most

TABLE 7. IMPORT INDICATORS AND ESTIMATED OZONE ATTAINMENT COSTS FOR SELECTED INDUSTRIES

Standard Industrial Classification	Industry	Import Penetration Ratio a/ (In percents) 1982	1983	1984
1311	Oil and Gas Extraction: Petroleum	27.5	24.6	23.4
20	Food and Kindred Products	3.6	3.8	4.2
22	Textile and Mill Products	5.4	5.5	7.2
26	Paper and Allied Products	6.1	6.1	6.9
28	Chemical and Allied Products	4.5	5.2	6.1
2911	Petroleum Refining	7.3	8.7	10.4
30	Rubber and Miscellaneous Plastic Products	5.1	5.4	5.9
33	Iron and Steel	14.9	11.5	15.2
37	Transportation Equipment	15.4	14.9	16.6
5541	Motor Vehicles	20.6	19.7	20.7

SOURCE: Congressional Budget Office. Import penetration ratios from the Department of Commerce, U.S. Industrial Outlook data base.

a. Ratio of imports to new supply, where new supply equals product shipments plus imports.

of the proposals provide for a repair-cost waiver, under which the owner of a vehicle that fails an inspection can pass by spending a certain amount to tune or repair the car. The required expenditure level is $200 under both the House and Senate bills. It is likely that many car owners would eventually incur these costs anyway. The true impact of the inspection and maintenance programs would be the extent to which the costs were incurred earlier than they would have been without such a requirement. The cost should be estimated by comparing the present value of vehicle repair costs in the absence of legislation with the present value of repair costs under inspection and maintenance programs. This method of assigning a repair cost to the bills would probably lead to a significantly lower estimate than has been made in the analyses mentioned above.

Inconvenience Costs

It has been argued that the use of Stage II equipment would require greater effort and attention on the part of consumers who fill their own gasoline tanks. Similarly, the transportation control plans, depending on their extent and design, might require car drivers to adopt different commuting patterns or driving habits. In addition, requirements for periodic inspection and maintenance of vehicles might also be associated with consumer inconvenience if drivers would prefer to forgo the inspection process.

To the extent that consumers would be willing to pay some amount to avoid having to change their current behavior, these provisions would impose real costs that are not taken account of in the compliance cost estimates presented earlier. This class of costs is very difficult to estimate, however. Such costs are not generally reflected in any set of market prices, and cannot be directly observed. Some estimates of potential consumer inconvenience cost have been developed, as shown in Table 8. The estimate of $25 per car for onboard controls was derived by an automobile company using existing customer service data; it assumed that the requirement would force car manufacturers to reduce the trunk size of vehicles with onboard canisters (an assumption that EPA disputes). The EPA estimate of $0.01 per gallon for Stage II is best described as a guess, but appears to be based on the level of consumer resistance in areas where Stage II controls have been implemented. The uncertainty that accompanies both the basis for and the techniques used in deriving these estimates suggests that they should be viewed as rough attempts to assign some cost to these categories, rather than as an accurate representation of consumers' willingness to pay.

Consumer inconvenience costs are analagous to many of the unmeasurable benefits of environmental regulation except that they affect the cost side of the analysis. Ideally, such costs would be included in any measure of the social welfare effects of the legislative proposals. Unfortunately, these costs--like the benefits--are excluded from the following discussion of macroeconomic effects. The importance of this omission is difficult to assess, given the uncertainty over the absolute level of inconvenience costs. The EPA estimates of Stage II inconvenience costs suggest that they might be significant. On the other hand, inconvenience costs may diminish as consumers come to accept the new requirements after an initial learning period. Several states have noted that consumer resistance tends to fall over time.

TABLE 8. AVAILABLE ESTIMATES OF THE ANNUAL CONSUMER INCONVENIENCE COSTS OF SELECTED OZONE ATTAINMENT PROVISIONS (In millions of 1988 dollars)

Provision	Estimated Costs Low	High
Stage II	141	209
Onboard	309	309
Enhanced Inspection and Maintenance	a/	a/
Transportation Control Measures	a/	a/

SOURCE: The Stage II costs are EPA estimates reported in 52 FR 31162, August 19, 1987. The onboard estimates were based on an estimate of $25 per car used by the Motor Vehicle Manufacturers Association multiplied by an estimated 12 million new cars annually. The estimate is reported in "EPA: Ozone and the Clean Air Act," serial #100-25, Subcommittee on Oversight and Investigation, April 27, 1987, p. 1607.

a. No estimate.

MACROECONOMIC IMPACTS

Beyond its effects on specific industries or sectors, environmental legislation is presumed to have a negative impact on the national economy. This presumption is supported by most of the economic literature on the subject. Nevertheless, studies conducted during the 1970s and 1980s showed that the effects on specific indicators of economic performance varied widely in magnitude and were not always negative. The most recent studies tend to confirm a depressing effect, although the estimated levels of impact still vary considerably. Most macroeconomic and growth accounting analyses suggest that expenditures on pollution control plant, equipment, and maintenance are likely to displace national output on a 1:1 to 1:3 ratio.13/ That is, one dollar of required pollution compliance expenditures results in a one- to three-dollar loss in real gross national product. More recent estimates derived by the Congressional Budget Office also fall into this range.

Previous Studies of the Macroeconomic Impact

Empirical investigations of the net economic impact of pollution abatement compliance expenditures over the past two decades present an array of possible outcomes ranging from small expansionary effects to quite large negative impacts; some studies report losses in real output and employment, and increases in prices, while others report opposite effects on these same variables. A brief review of the principal studies will highlight some of the more important issues.

Expansionary Effects. At first glance, the results of a few studies that find environmental regulatory requirements to have a positive effect on overall economic performance would appear counterintuitive.14/ Pollution abatement expenditures are generally seen as increasing the costs of producing any given level of output, thus increasing prices and decreasing productivity. An opposite effect would seem to require that pollution control spending actually enhance the ability of the economy to produce goods and services. For this to be true, environmental regulation would have to result in a new mix of output that is more valuable than the preregulatory mix. Alternatively, environmental regulation might lower the costs of producing a given output mix by increasing the supply of inputs (such as clean water or more forests) to the production of goods and services.

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13. Paul Portney, "Macroeconomic Impacts of Environmental Regulations," in Henry Peskin, Paul Portney and Allen Kneese, eds., *Environmental Regulation and the U.S. Economy* (Baltimore: Johns Hopkins University Press, for Resources for the Future, 1981). See also Adam Rose, "Modeling the Macroeconomic Impact of Air Pollution Abatement," *Journal of Regional Science*, vol. 23, no. 4 (1983). See also Congressional Budget Office, *Environmental Regulation and Economic Efficiency* (1985).

14. Rose, in "Modeling the Macroeconomic Impact," cites six studies that suggest expansionary effects, eight that suggest contractionary effects.

It is possible that some industries may enjoy cost savings stemming from environmental pollution control requirements.15/ These effects alone, however, are unlikely in themselves to generate macroeconomic expansion. Existing macroeconomic models are unlikely to capture improvements in economic efficiency that might arise from regulation intended to correct environmental market failures. Further, the economic data upon which these studies rely do not include many of the potential benefits upon which the cost-saving argument relies. For example, one analysis of environmental benefits found that over 90 percent of the benefits, including productivity gains, resulting from two air pollution control programs were not included in the national economic accounts.16/

The more likely reason for the expansionary findings of certain studies lies in the assumptions they used. Some of these studies rely on a model structure with fixed production coefficients that treat pollution control spending as simply increasing aggregate demand for goods and services. Alternatively, other studies employ a model approach that assumes (or generates internally) an economy that is at less than full employment. In these circumstances, spending on environmental pollution control can have a directly stimulative effect on the economy, and pollution abatement expenditures need not displace other "productive" spending--at least in the short run. This is not to say that environmental regulatory programs cannot have a net positive impact on the economy, since it is possible that beneficial impacts could outweigh negative ones. Rather, it is more reasonable to assume that long-run gross macroeconomic impacts would be negative even though short-run effects might be expansionary.

Negative Macroeconomic Impacts. Most recent studies using econometric techniques show that mandated increases in environmental pollution control compliance expenditures produce negative, or contractionary, measured macroeconomic effects. In very general terms, pollution control spending is found to increase the costs of producing national output, thus resulting in reduced output, reduced employment, and higher prices. These negative consequences, over time, outweigh the short-term increases in investment and consumption that may accompany increased regulatory requirements.

Using the net impact of pollution abatement expenditures on real output (GNP) as one indicator of macroeconomic impact, it is possible to construct a relationship or "multiplier" between a dollar expended on pollution control and the dollar value of output loss. One survey of past studies suggests that this ratio may be in the range of 1:1 to 1:3.17/ This means that one dollar in

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15. John Jenarich, "Environmental Control," *Nation's Business*, vol 67 (1979) and Michael Royston, "Making Pollution Prevention Pay," *Harvard Business Review*, vol. 58 (1980).

16. Myrick Freeman, "Some Issues in the Estimation and Use of Benefit Measures," report prepared for U.S. Council on Environmental Quality (February 1980).

17. Rose, "Modeling the Macroeconomic Impact."

additional pollution control spending would result in a one- to three-dollar loss in national output--that is, an environmental program with compliance expenditures of $10 billion might be associated with a real output loss of $10 billion to $30 billion.

A recent study conducted for the National Association for Manufacturers by Data Resources, Inc., paints a significantly different picture. Using a large-scale econometric model of the U.S. economy, the study finds that previous Congressional proposals to curb acid rain would result in economywide output losses of 4.1 dollars to 5.8 dollars for every dollar spent on control. According to the DRI study, a $53 billion dollar investment in acid rain controls over a five-year period would elicit a cumulative $222 billion loss in GNP by the year 2000. Job losses associated with this output effect would be in the tens of thousands. Interestingly, the DRI study shows expansionary effects in the first few years, followed by increasingly large negative effects that keep the economy below its original growth path.

The magnitude of the impacts suggested by DRI are outside the bounds established by most other studies--up to several times larger for the worst case. More important, DRI finds that pollution control costs incurred over a limited number of years could have continuing and presumably permanent negative effects on the economy from which it would never recover. While it would not be surprising for the economy to experience negative effects during a circumscribed transition period, the negative effects ought to lessen as the economy adjusted to a new set of prices (for example, to increased energy prices). One possible explanation of the DRI estimates may be the model's response to electricity price increases resulting from acid rain control legislation (the subject of DRI's analysis). It may also be that the model had not yet reached long-run equilibrium in the reported simulation period. Nevertheless, this would appear to represent a severe worst case at the very least, even though DRI describes the estimated impacts as representing lower bounds.

Alternative Macroeconomic Impact Estimates

It is not within the scope of this paper to reconcile the differences between the DRI results and those of earlier analyses. It is possible, however, to construct a set of comparative estimates in the hope of narrowing the range of potential output effects associated with environmental compliance costs. To this end, the paper has used two different approaches, selected for their computational simplicity and accessibility, to illustrate the potential impact of pollution control expenditures on economic output.

The first approach employs a very simple model to address the hypothetical question, "What might real national output have been if the labor and capital devoted to pollution abatement had been available for other uses?" As illustrated by the work of Denison and others, this method--called growth accounting--assumes that the entire output of the economy can be represented

by a single equation relating capital and labor to output.18/ In these models, capital and labor expenditures on environmental control are assumed to perfectly displace other "productive" expenditures. By subtracting environmental expenditures from total expenditures on capital and labor over an historical time period, these models have been used to estimate the impact of regulation on output (and productivity). If the historical relationship between labor, capital, and output can be assumed to remain unchanged in the future, these models provide a crude basis for predicting the impact of new pollution control expenditures on future output. For example, if in the past, a 1 percent increase in capital expenditures has resulted in a 0.5 percent gain in output, a growth-accounting framework would assume that a 1 percent increase in pollution capital expenditures would result in a 0.5 percent loss in output. Of course, this multiplier would increase when the effects of environmental labor expenditures are added into the calculation.

By design and assumption, environmental expenditures can only have a negative impact on output in a growth accounting framework. By assuming that production costs are not affected by pollution control requirements, growth accounting models cannot reflect the wide range of possible consumer and producer responses that would be considered in a more sophisticated analysis. As a result, these models are generally considered to provide upper bound estimates of the economic effects of environmental spending. For the purposes of this paper, the growth accounting perspective offers a relatively simple way to represent the potential macroeconomic impact of environmental regulation under a very confining set of assumptions.

The second approach involves the use of a PC version of the DRI macro model to simulate the effects of a $10 billion pollution abatement program. The DRI model is a multiequation forecasting model that treats the economy in substantially more detail than the simple growth-accounting framework. Expenditures on labor and capital were increased for any given level of output to account for the required pollution abatement costs. Because the manner in which new pollution control expenditures are introduced differ from their counterparts in the DRI study discussed earlier, they may not be directly comparable.

The results of these two comparative analyses confirm the consensus findings of the earlier studies: pollution control expenditures reduce measured national output. The expenditures result in higher prices, in response to increases in the costs of producing the new output levels. The impact on employment is less determinate, but small losses are indicated. The magnitude of the estimated output losses is smaller than that suggested by the DRI acid rain study. Under the growth-accounting model, the ratio of a dollar of

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18. Edward Denison, *Accounting for Slower Economic Growth: The United States in the 1970s* (Washington, D.C.: The Brookings Institution, 1979). See also Congressional Budget Office, *Environmental Regulation and Economic Efficiency*, for a brief review of growth accounting models as well as other possible approaches for estimating macroeconomic effects.

pollution control expenditures to a dollar of output loss is in the range of 1:1 to 1:1.8 over the period 1972-1985.19/ Using the PC version of the DRI macro model over the period 1990-2000, the ratio ranges from 1:1.3 to 1:3, depending on assumptions concerning the manner in which labor and capital are affected by pollution control spending. This appears to be a likely range for the effects of pollution abatement expenditures on measured economic output.

Limitations of the Macroeconomic Analyses

All of the empirical analyses discussed here share some common limitations and uncertainties, although in varying degree. Two of these are most important from a broader policy perspective:

- None of the available analyses captures fully the potential for changes in production or consumption. To the extent that producers and consumers react to environmental regulatory constraints by adopting new production methods, new goods and services, or new consumption patterns, the costs and impacts of regulation are likely to be substantially less than those presented here.

- None of the available studies includes, in any substantial way, the benefits of environmental regulation. Because many of these benefits cannot be directly measured in an economic sense, they do not enter the national economic accounts. Hence the output losses estimated by these studies cannot be interpreted as real changes in social welfare. Although the macroeconomic results are important, they do not show whether society is better off or worse off as a result of environmental regulation.

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19. These results are based on an exponential relationship between output and capital and labor inputs over the period 1972-1985. It was assumed that 56 percent and 44 percent of all pollution abatement expenditures were devoted to capital and labor, respectively, in that period.

CHAPTER III

PUBLIC COSTS OF ENVIRONMENTAL REGULATION

Pollution control requirements lead to expenditures by federal, state, and local governments. Broadly speaking, these are associated with the design, implementation, and enforcement of environmental programs as well as with the direct costs to various levels of government of complying with regulations. While the public-sector costs are generally much smaller than the private-sector costs, they can be substantial enough to affect the allocation of social resources. Further, while analyses of public-sector costs share several characteristics with analyses of private-sector costs, their interpretation may differ. This chapter explores some of the key issues surrounding the assessment of public environmental costs within the context of the current Congressional proposals relating to ozone.

PUBLIC-SECTOR AND PRIVATE-SECTOR COSTS

From a broad perspective, the public-sector costs of environmental regulation resemble private costs: social resources are diverted by legislative specifications. The level and type of government expenditures on regulatory programs, like those of the private sector, are dictated by the specific requirements of the programs. In addition, public-sector cost analyses share some of the same general estimation characteristics as private-sector analyses--they are largely extrapolated from past compliance activities and are subject to uncertainties concerning the estimation baseline.

Because environmental regulation reflects the desire to shift the costs of environmental protection to polluters, some would argue that environmental legislation should not result in any increased public costs. Under this view, all the costs for developing, implementing, and enforcing these programs should be passed on to polluters in the form of fees, tolls, or excise taxes (unless, of course, the public sector itself is responsible for the pollution). In this sense, defining costs as "public" is more a matter of the type and nature of the regulatory activity involved than of who ultimately pays or should pay.1/ Public costs, therefore, are those that originate in the public sector, rather than just those that are financed by general taxes.

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1. This discussion ignores the issue of differing efficiencies between levels of government--whether one level of government may be better able than another to carry out a specific regulatory requirement. It also ignores the question whether in some instances the private sector could do a better job.

ESTIMATING PUBLIC COSTS OF ENVIRONMENTAL REGULATION

Estimates of public costs share many of the same characteristics, limitations, and uncertainties as private-sector compliance cost estimates. They tend to be based on best before-the-fact judgments concerning activities that are likely to be carried out by various levels of government. These judgments often rely on past experience of the Environmental Protection Agency (EPA) and on estimates of the cost of developing similar regulations and programs, or on the experience of one or more states that have already implemented a particular control measure. This approach may overestimate actual public costs to the extent that EPA and the states may learn from past experience and develop or implement subsequent programs more effectively. Alternatively, costs may be understated if past regulatory activities were addressed to lower-cost opportunities. Also important is the degree to which certain program requirements can be handled by existing government activities without requiring new resources or reductions in other program activities. States or localities may find that existing activities satisfy new legislative requirements; thus, the "choice of a baseline" is a crucial issue in defining public costs.

Public cost analyses of environmental regulation are perhaps most affected by assumptions concerning the baseline from which costs will be incurred. The baseline used in many analyses reflects current law; specifically, the assumption is made that the states and EPA will implement only those controls currently mandated by law. This could be misleading for two opposing reasons. First, it is quite likely that some states will pass new laws, or EPA will issue new requirements even if a legislative proposal is not enacted. Second, uncertainty about the pending Congressional legislation could slow states' implementation of current programs and delay EPA enforcement of various sanctions or penalties. In either case, there is often no certainty as to what would happen in the absence of legislation, suggesting that some costs commonly associated with the legislation could be incurred anyway.

A related problem is that of mapping out definitively what kinds of similar environmental programs have already been put in place at various levels of government. Many current environmental legislative proposals, such as the Senate and House Clean Air Act proposals, are amendments to or reauthorizations of established pollution control programs that have been implemented to various degrees in each state. The progress of the states in responding to past legislation is often far from uniform, creating uncertainty as to the regulatory "baseline" currently in effect in each state. In addition, many states may have programs in place even without federal legislative guidance, such as programs to control emissions of air toxics. Uncertainty as to the future nature and extent of existing programs, therefore, complicates the estimation of the incremental public cost of new legislation, particularly at the state and local level.

A further characteristic of public cost analyses is that they often represent, like private-sector compliance cost estimates, the first-order cost burden of regulation to government. But not all of these costs will be paid directly by federal, state, or local tax revenues. While many past environmental public-

sector costs were paid from general revenues, state and local governments have increasingly looked to alternative funding mechanisms that place more of the cost burden on those responsible for the pollution, or on other sources outside their tax bases. While the EPA is faced with statutory and programmatic restrictions in its ability to charge fees to recover costs, state and local agencies typically have much more flexibility. Although some are limited in their ability to pass costs along by state law or public opinion, many state agencies are increasingly willing to pass on incremental public costs through increased permit and user fees. The percentage of public costs that might be passed on to other parties is difficult to predict and might have little impact on the actual level of total environmental control costs, but it is critical to understanding how pollution control costs are distributed.

Public-sector costs may also ultimately deviate from these "first-order" estimates because of economic "feedback." If a jurisdiction finds that it must curtail economic growth to attain national ambient standards, it faces lower tax receipts and greater spending requirements. As regulations grow more strict, this effect becomes increasingly important as a source of public-sector costs.

OZONE ATTAINMENT--A CASE STUDY IN PUBLIC COSTS

Many of the current proposals to reauthorize the Clean Air Act provide examples of public costs that illustrate the general characteristics of the public costs of most environmental control programs. The ozone attainment provisions of these proposals specifically contemplate a rather wide range of government programs and activities raising these issues. A brief review of several of these proposals provides a basis for better understanding the nature of public costs.

Most of the existing analyses of the public costs associated with ozone attainment proposals have focused on the Senate bill. CBO has previously prepared a formal cost estimate for S. 1894 that includes its ozone attainment provisions and the impact of the bill on state and local costs.2/ The uncertainties and limitations associated with estimates of state and local cost estimates made a precise estimate of the budgetary impact of some of these provisions difficult.

While the Congressional Research Service (CRS) and the Office of Technology Assessment (OTA) have not attempted to estimate the effect of these bills on state, local, or federal government budgets, they have analyzed several provisions the costs of which would initially be the burden of state and local governments--for example, inspection and maintenance programs. The CRS and OTA estimates say very little about how these costs will be distributed or their

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2. For a full discussion of the federal costs of these bills see: Congressional Budget Office, cost estimate included in *Clean Air Standards Attainment Act of 1987*, Report No. 100-231, Senate Committee on Environment and Public Works, to accompany S. 1894, pp. 308-317.

final budgetary impact, but indicate some of the cost burdens that will be placed initially on state and local governments.

Costs of Selected Ozone Attainment Provisions

The public costs of environmental programs are usually considered in three major categories: research and development, abatement and control--which includes regulation and standards development and implementation--and enforcement. All of the cost elements discussed below, with the exception of stationary source inspection costs, fall into the abatement and control category. This is not to ignore the other public cost categories as they may apply to ozone attainment proposals, but to focus on the broader characteristics. In addition, all of the public costs reviewed here are incurred by state and local governments except for federal compliance costs and the federal costs of reviewing state plans; state and local costs constitute probably the bulk of the public costs associated with ozone and are the most difficult to assess. Finally, while the list of specific ozone attainment provisions discussed here is by no means exhaustive, it encompasses the provisions that are most likely to lead to significant public costs and reflects most of the issues presented earlier.

State Implementation Plan (SIP) Revision and Review. Under the Clean Air Act, efforts to attain national ambient air quality standards are coordinated through a system of federally approved state programs set out in State Implementation Plans (SIPs). This program is ongoing; even in the absence of new legislation, states are required to move forward with attainment initiatives. Thus, current law and the legislation now before Congress would require states to develop and submit revised SIPs for nonattainment areas. Under the provisions of both H.R. 3054 and S. 1894, extensive federal involvement would also be required in all phases of the SIP process including plan development, review, and implementation. These requirements illustrate the difficulties involved with choosing a baseline. States are already incurring the costs of SIP revision and review. In fact, states continuously update their SIPs as new regulations are developed or on the basis of new information. For example, an EPA study of selected state air agencies showed that 1987 state expenditures for SIP review ranged from 2 percent to 34 percent of their air pollution control budgets.3/ EPA also incurs costs continuously in reviewing the many SIP revisions that are submitted each year, and provides guidance and technical support. The range of current SIP activities makes determining whether federal and state costs would increase, decrease, or remain the same under each bill difficult.

For example, H.R. 3054 would not require that states update their inventories or run new air dispersion models in revising their SIPs. As these are normally the most time-consuming and costly parts of SIP revision, it is likely

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3. See the 1987 pilot exercise to define state/local program activities and resource costs, Regional Programs Office, Office of Air Quality and Standards, EPA, Research Triangle Park, North Carolina. (Updated draft, November 6, 1987, Table III.)

that state expenditures for SIP revision will, on average, stay the same. EPA expenditures are likely to rise, however, as the agency attempts to inventory emissions and run the necessary model for the states in carrying out SIP review and attainment monitoring.

S. 1894 would have similar effects on federal and state SIP expenditures, but for a different reason. The bill would likely increase the amount states would need to spend on SIP revision by requiring that states improve their inventories and run more sophisticated models, but it would authorize a one-time appropriation to the states of $75 million to complete this SIP revision process. CBO estimated that, if appropriated, this amount would be sufficient to cover all incremental state costs, thereby distributing the initial cost of revising SIPs to federal taxpayers rather than to specific nonattainment area tax bases.

Enhanced Inspection and Maintenance (I/M). Motor vehicle emission inspection and maintenance programs have been introduced in many areas of the country as part of state implementation programs to control ozone. Both bills would expand the number of jurisdictions that would be required to have vehicle I/M programs. They would also expand the scope of these programs beyond what is required by current law. Based on information provided by EPA, CBO estimated that the added annual cost of this provision could reach $900 million for S. 1894 with some additional cost for the initial investment in new equipment. Using the same information, the annual costs under H.R. 3054 would probably be about $100 million to $150 million less than under the Senate bill. Most of the cost difference between the bills results from the inclusion of more states within transport areas in S. 1894. While both bills require that cities in attainment in regions where transport of ozone is a problem implement some controls, including I/M, the Senate bill defines the transport area to include five Midwestern states (Ohio, Indiana, Illinois, Michigan, and Wisconsin) that are not included under H.R. 3054. This difference would extend coverage of I/M programs to 34 additional attainment cities with approximately 7 million vehicles.

These costs are based on a per-car estimate of $13 for establishing an enhanced program and $5 for enhancing an established program. Other Congressional agencies have used per-car estimates ranging from $4 (CRS) to $20 (OTA) for establishing an enhanced program. The CRS estimate is derived from an earlier EPA draft study, while the OTA estimate uses data from a more recent study of California's I/M program. Based on fees currently charged by some states with nonenhanced programs,4/ the CBO estimates seem reasonable, but the range associated with per-car estimates reflects the margin for error that must accompany this and most other cost estimates. More information is available concerning the cost of establishing an I/M program than for virtually any other provision involving public costs of these bills, and yet estimates still vary by up to 500 percent.

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4. "Air Permits and Emissions Fees," State and Territorial Air Pollution Program Administrators (STAPPA) and Association of Local Air Pollution Control Officials (ALAPCO), April 1987.

The I/M provisions also highlight the uncertainty over how much of the initial cost burden will be incurred by the states or passed on to the public through fees. State air agencies' budgets currently total approximately $270 million. If these agencies were forced to bear all the costs of even the lowest I/M estimate by CRS, $280 million (not including repair costs), their current budgets would double--an extremely unlikely result. A more likely result is that many states would set fees high enough to cover a large proportion of these costs. Some state legislatures, however, do not allow I/M fees or else set fee limits at levels insufficient to cover the costs of enhanced programs.

Transportation Control Measures (TCM). Under S. 1894, jurisdictions in severe areas are required to use TCMs to offset any projected growth in vehicle-miles traveled. These measures may include requiring the use of methanol-powered vehicles, imposition of commuting restrictions, or development of mass transit systems. Severe nonattainment regions must adopt a list of TCMs or obtain offsetting reductions elsewhere. Because of the long list of controls already required by S. 1894, these areas would probably adopt many of these measures, but it is impossible to be certain. CRS has estimated that if 15 areas used TCMs to reduce areawide VOC emissions by 1 percent, the costs to these jurisdictions would be approximately $220 million a year.5/ CRS suggests that the actual public cost of these measures could be as low as $0 or as high as $5 billion annually. The high cost would apply if the 10 worst areas were forced to install a major new mass transit system. No costs would result if areas chose alternative strategies or only adopted measures with costs that could be offset by increased revenues (such as from tolls).

Compliance Costs. In addition to incurring expenditures to design and implement ozone reduction programs, all levels of government may also be subject to costs of complying with these programs. For example, both S. 1894 and H.R. 3054 require that some percentage of new vehicles in certain areas be capable of using alternative fuels with lower emission characteristics. CRS estimated that complying with the provisions in S. 1894 could result in between 150,000 and 600,000 federal, state, and local government vehicles converting to use compressed natural gas or methane, at a cost ranging between $11 million and $99 million annually.

Other ozone attainment provisions that might impose governmental compliance costs include the national standards on traffic and military coatings (such as road and ship paints), and the requirement that smaller sources be required to obtain permits and be subject to reasonably available control technology (RACT) requirements. The national standards would certainly effect the Departments of Defense and Transportation to the extent they increased the cost of these coatings. Including smaller sources in the control system would be likely to increase the number of government-owned facilities subject to emission reduction requirements. California for example, estimates that of the 1,085

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5. Congressional Research Service, "Ozone and Carbon Monoxide Nonattainment, An Analysis of Title I of the Proposed Clean Air Standards Attainment Act." Report No. 87-7515, September 10, 1987, pp. 10-11.

existing sources of VOC and NO_X that would be subject to regulation under S. 1894, 70 are government-owned.

Stationary Sources: Permits and Inspections. In order to ensure compliance with federal and state environmental laws, regulations, and standards, the EPA coordinates and oversees enforcement efforts with state and local agencies. In the case of air pollution from stationary sources, enforcement takes the form of issuing permits and making periodic inspections. EPA currently requires that states issue permits to major sources of VOCs and NO_X. The permits specify technology requirements and allowable emission levels over time. Since many of the enforcement methods and activities that might be associated with the proposed legislation would probably resemble those currently in use, additional costs to states might be minimal. An important exception, however, involves a change in the definition of a major source, under S. 1894, from a unit with the potential to emit 100 tons or more to a unit with the potential to emit 25 tons or more per year. EPA estimates that if states were required to issue permits to these smaller facilities and inspect them even every fifth year, it would take 1,500 new man-years nationally, roughly doubling states' current expenditures on these activities.

WHAT IS EXCLUDED?

Besides focusing solely on the public costs of selected provisions of ozone attainment proposals (and thus overlooking other possible public costs, such as research and development), this chapter has excluded an important potential public cost element that is not captured by the three major categories. Just as most estimates of private costs do not consider the macroeconomic effects that legislation may have, most estimates of public costs do not consider the total public costs of bringing an area into attainment with the ozone standard. Beyond the costs of the specific set of controls that would be necessary in each nonattainment area, public costs are affected by how the area-specific controls would affect local tax bases, unemployment benefits, and so on.

While such an analysis is beyond the scope of this paper, the link between public-sector costs and economic feedbacks is worth mentioning. It is often assumed that because H.R. 3054 requires fewer specific controls than S. 1894, thereby allowing greater state flexibility, the bill would impose significantly lower public costs. There is no reason to suppose, however, that the ultimate state and local effects of the two bills would be significantly different. Both the Senate and House bills are dominated by the same ultimate enforcement mechanism--jurisdictions must attain the standard within a given time period or be subject to very damaging sanctions, including severe limitations on economic growth. Unless the specific requirements in the Senate bill result in more control than actually necessary to reach attainment, or states are willing to risk the imposition of sanctions, it is likely that states will choose to implement similar control measures under either proposal and will bear similar costs.