THE POLITICAL ECONOMY OF MARKET-BASED ENVIRONMENTAL POLICY: THE U.S. ACID RAIN PROGRAM*

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Abstract

The U.S. acid rain program enacted in 1990 gave valuable tradable sulfur dioxide emissions permits—called ''allowances''—to electric utilities. We examine the political economy of this allocation. Though no Senate or House votes were ever taken, hypothetical votes suggest that the actual allocation would have beaten plausible alternatives. While rent-seeking behavior is apparent, statistical analysis of differences between actual and benchmark allocations indicates that the legislative process was more complex than simple models suggest. The coalition of states that produced and burned high-sulfur coal both failed to block acid rain legislation in 1990 and received fewer allowances than in plausible benchmark allocations. Some of these states may have received additional allowances to cover 1995–99 emissions by giving up allowances in later years, and some major coal-producing states seem to have focused on benefits for miners and on sustaining demand for high-sulfur coal.

I. Introduction and Summary

Despite the attractive efficiency properties of ''market-based'' approaches to internalizing environmental externalities, such as emissions taxes or tradable emissions permit systems, these approaches have rarely been used.[1] United States environmental policy has relied instead on a vari-

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[1] For discussions of other environmental programs employing economic instruments, see Thomas H. Tietenberg, Emissions Trading: An Exercise in Reforming Pollution Policy (1985); Robert W. Hahn & Gordon L. Hester, Marketable Permits: Lessons for Theory and

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ety of source-specific ''command and control'' regulations that specify limits on emissions rates or mandate particular control technologies. Title IV of the 1990 Clean Air Act Amendments (1990 CAAA, Public Law 101-549) established the first large-scale, long-term U.S. environmental program to rely on tradable emissions permits (called ''allowances'' in the 1990 legislation) to control emissions. Its target was electric utility emissions of sulfur dioxide (SO_2), the major precursor of acid rain.

Any tradable permit scheme for controlling emissions must specify a quantity cap or emissions ceiling for each of the geographic emissions markets within which emissions permits can be traded. This emissions cap, in turn, defines the total endowment of emissions permits that will be in circulation in each emissions market. Any tradable permit scheme must also adopt a method for distributing those permits—by giving them away, by selling them at auction, or by some other means. The choice necessarily has distributional implications, and, in the presence of transactions costs or other barriers to trading, it has efficiency implications as well.[2] Because emissions permits are valuable and decisions about their distribution are made by political institutions, these decisions are likely to be highly politicized, reflecting rent-seeking behavior and interest group politics. In the U.S. acid rain program, the expectation was that allowances would be worth about $5 billion per year once the program was fully operational.

In this article, we examine how Congress, influenced by the executive branch and various special interests, distributed what was essentially (as we discuss below) a fixed endowment of SO_2 allowances among electric utilities in the process of crafting acid rain legislation. The literature contains essentially no empirical work on the distributional implications of alternative market-based control mechanisms, largely because there have been few applications of such mechanisms.[3] In particular, little attention has been devoted to how interest group politics and associated rent-seeking behavior

Practice, 16 Ecology L. Rev. 361 (1989); and National Economic Research Associates, Inc., Key Issues in the Design of NO_x Emission Trading Programs to Reduce Ground-Level Ozone, ch. 2 (1994). Roger G. Noll, Economic Perspectives on the Politics of Regulation, in 2 Handbook of Industrial Organization 1254 (R. Schmalensee & R. D. Willig eds. 1989), at 1275, discusses some of the political reasons such programs are rare.

[2] On efficiency implications in this context, see Robert N. Stavins, Transactions Costs and Tradeable Permits, 29 J. Envtl. Econ. & Mgmt. 133 (1995).

[3] For related work, see Noll, *supra* note 1; Bruce A. Ackerman & William T. Hassler, Clean Coal and Dirty Air (1981); Robert W. Crandall, An Acid Test for Congress? 8 Regulation 21 (1984); Robert W. Hahn & Roger G. Noll, Barriers to Implementing Tradeable Air Pollution Permits: Problems and Regulatory Interactions, 1 Yale J. Reg. 63 (1983); and B. Peter Pashigian, The Effects of Environmental Regulation on Optimal Plant Size and Factor Shares, 27 J. Law & Econ. 1 (1984), and Environmental Regulation: Whose Self-Interests Are Being Protected? 23 Econ. Inquiry 551 (1985).

affect the allocation of permits in a tradable permit system. This is a serious gap in the literature. The political acceptability of market-based mechanisms for internalizing environmental externalities will depend heavily on their distributional implications. Whenever valuable property rights are created by legislation,[4] the associated allocation decisions are likely to be highly politicized in much the same way as tax legislation or appropriations bills.[5] Understanding better how the political process deals with such allocational issues can help us to design environmental programs that are both economically efficient and politically acceptable.

It is difficult to apply some of the tools of modern political economic analysis to complex legislation of this sort, particularly when there are no meaningful votes.[6] However, since allowances are homogeneous and can be traded and banked, the distributive implications are easy to quantify. In this case, the allocation of allowances is similar to the allocation of government funds through the legislative appropriations process.[7] The availability of detailed data on the initial allocation of allowances permits analysis of the incidence of individual legislative provisions, as well as analysis of winners and losers under alternative allowance allocation schemes.[8]

The next section provides a brief overview of the tradable SO_2 allowance program created by the 1990 CAAA. Section III reviews important aspects

[4] Technically, the SO_2 allowances created by the 1990 CAAA are not property rights, since Congress can change the number of allowances issued or do away with them altogether without raising a constitutional claim for compensation (see Section 403(f) of the 1990 CAAA). In all other respects, however, allowances are treated as property rights. They are freely tradeable, a variety of market mechanisms are mediating transactions, and the EPA consciously allocated allowances to eligible parties for years beyond 2010 to provide confidence that they would be treated as durable property rights. All this would clearly make it politically difficult to alter allowance allocations in the future in response to new information about costs or benefits of reducing SO_2 emissions.

[5] Related research on congressional spending decisions has been performed by Lisa J. Kiel & Richard B. McKenzie, The Impact of Tenure on the Flow of Federal Benefits to SMSAs, 41 Pub. Choice 285 (1983); David P. Baron, Distributive Politics and the Persistence of Amtrak, 52 J. Pol. 883 (1989); and Steven D. Levitt & James M. Poterba, Congressional Distributive Politics and State Economic Performance, Pub. Choice (in press).

[6] See Noll, *supra* note 1, at 1270–72, for a general discussion of the use of empirical voting models to test interest group theories of legislative politics; see also Joseph P. Kalt & Mark Zupan, Capture and Ideology in the Economic Theory of Politics, 74 Am. Econ. Rev. 243 (1984); Pashigian, Environmental Regulation, *supra* note 3; and Sam Peltzman, How Efficient Is the Voting Market? 33 J. Law & Econ. 27 (1990).

[7] See, for example, Levitt & Poterba, *supra* note 5, and the literature they discuss.

[8] We have data on the allocation of allowances to individual *combustion units*, each of which consists of a combustion device (boiler or turbine) used to power one or more *generating units*, each of which consists of a single electric generator. Most combustion units power a single generating unit, so our use of the term *unit* for the sake of brevity in what follows should cause no confusion. A generating *plant* often houses several generating units, which may be of different scales, vintages, or types.

of earlier debates on legislation affecting SO_2 emissions. Section IV discusses the political development of the 1990 acid rain program. Section V examines the comparatively simple allocation of allowances in Phase I of that program, covering calendar years 1995 through 1999. Section VI discusses in more detail the provisions for allocating allowances in the first 10 years of Phase II, 2000–2009. Section VII compares distributional aspects and other features of the resulting allocation and of benchmark alternative allocation schemes. Section VIII presents the results of hypothetical votes by both Houses of Congress between actual and benchmark Phase II allocation patterns. Section IX employs regression analysis to relate differences between actual and benchmark patterns to a variety of variables designed to capture the influence of important interest groups, congressional leadership and committee influence, and state and national electoral politics. Section X presents a few concluding comments.

II. The 1990 Acid Rain Program in Brief

Acid rain (or, more properly, acid deposition) occurs when sulfur dioxide (SO_2) and nitrogen oxides (NO_x) react in the atmosphere to form sulfuric and nitric acids, respectively.[9] These acids then fall to earth, sometimes hundreds of miles downwind from their source, in either wet or dry form. In North America, acid rain is a concern mainly in the northeast United States, particularly in the Adirondacks and New England, and in southeast Canada. It has been argued that in those areas acid rain damages aquatic life and harms trees in sensitive forest areas. The dominant precursor of acid rain in the United States is SO_2 from coal-fired and, to a much smaller extent, oil-fired power plants. These emissions are the focus of the tradable allowance program adopted in 1990.[10]

Title IV of the 1990 CAAA represents a fundamental change in the regu-

[9] U.S. General Accounting Office (GAO), Allowance Trading Offers an Opportunity to Reduce Emissions at Less Cost, at 13 (Report GAO/RCED-95-30, December 1994).

[10] Electric utilities accounted for about 70 percent of 1985 U.S. SO_2 emissions: coal-fired units accounted for 96 percent of this total, and oil-fired units accounted for the remainder; U.S. Environmental Protection Agency (EPA), National Air Pollutant Emission Trends, 1900–1993 (Report EPA-454/R-94-027, October 1994). The other 30 percent of emissions is accounted for by a wide variety of industrial, commercial, and residential boilers and process sources (including smelters and paper facilities), as well as by the use of diesel fuel for transportation. Aside from certain voluntary opt-in provisions contained in the 1990 CAAA, including these other sources in the allowance program was not given serious consideration. These sources are generally individually much smaller than utility sources and are much more diverse. Moreover, there were no systematic ''baseline'' emissions data available for these sources to provide a basis for allocating allowances to incumbents. On this issue, see Nancy Kete, The Politics of Markets: The Acid Rain Control Policy in the 1990 Clean Air Act Amendments, 217–21 (unpublished Ph.D. dissertation, Johns Hopkins Univ., 1992).

latory framework governing air pollution in the United States. Previous air pollution regulations focused on individual *sources,* their emission *rates,* and the application of specific *control technologies* to individual sources with certain attributes. The 1990 acid rain law, on the other hand, focuses on *aggregate* emission levels rather than individual sources, deals with the *emissions* of SO_2 rather than emission rates, places an aggregate *cap* on SO_2 emissions, and gives polluters extensive flexibility in choosing whether and how to reduce emissions at specific sources. The importance of this change of approach goes well beyond the introduction of interutility trading. In particular, the 1990 law gave utilities with multiple fossil-fired generating units enormous and unprecedented flexibility in complying with emissions limits even if they traded no allowances at all with other utilities.

Title IV of the 1990 CAAA was advertised as requiring a 10 million ton per year reduction in SO_2 emissions from 1980 levels by the year 2000. To achieve this goal, the law created a cap on SO_2 emissions from electric generating plants of roughly 9 million tons per year, effective in the year 2000 and beyond. This emissions cap was to be achieved in two phases. During Phase I (1995 through 1999), the 261 dirtiest generating units (in 110 generating plants) were required to reduce their emissions by roughly 3.5 million tons per year beginning in 1995.[11] In Phase II (2000 and beyond), virtually all fossil-fueled electric generating plants become subject to the national cap on aggregate annual SO_2 emissions. (All states had Phase II units except Idaho, which had no fossil-fueled generating units, Alaska, and Hawaii.)

The Phase I reductions and the Phase II cap were enforced through the annual issuance of tradable emissions allowances, each of which permits its holder to emit 1 ton of SO_2 in a particular year or any subsequent year.[12] Each unit has 30 days after the end of each year to deliver to EPA valid allowances sufficient to cover its emissions during the year. At that time the EPA cancels the allowances needed to cover emissions. Failure to produce the necessary allowances subjects the utility to substantial financial penalties and the need to make additional future emissions reductions. Allowances good in any particular year but not needed to cover SO_2 emissions in that year may be ‘‘banked’’ for future use. Owners of individual units

[11] These units are simply listed in table A of the 1990 law; they correspond to 263 *combustion* units. These units were selected because they had an emissions rate (ER) greater than 2.5 pounds of SO_2 per million Btus of heat input and a nameplate capacity of at least 100 megawatts.

[12] In fact, these allowances are like checking account deposits; they exist only as records in the EPA's computer-based allowance tracking system. This system contains accounts for all affected generating units and for any other parties that want to hold allowances. It can be used to transfer allowances from one account to another.

are free to decide what mix of emissions reductions and allowance transactions they will employ to meet each year's allowance constraint, and essentially no restrictions are placed on emissions reduction techniques. There is also no restriction on who may buy or sell allowances. Brokers have acquired some in hopes of future price increases, for instance, and environmentalists have acquired some in order to reduce emissions more than the law requires.

The units subject to Phase I reductions were issued a total of roughly 5.7 million allowances for each of the 5 years included in Phase I. The basic allocation formula for each unit in Phase I involved multiplying an emissions rate (ER) of 2.5 pounds of SO_2 per million Btus of heat input times baseline heat input (generally the unit's 1985–87 average). As we discuss in Section V, however, there were significant departures from this formula in the final bill, the most important of which was designed to favor the use of eastern high-sulfur coal. Phase I obligations cannot be met by shifting electricity production from a Phase I unit to units not affected by Phase I.

During Phase II, each utility generating unit is allocated a specific number of SO_2 allowances per year out of the roughly 9 million per year made available for the entire country. (When various bonuses are taken into account, about 9.4 million allowances are available annually from 2000 until 2009, and 8.95 million tons are available annually thereafter.) The allocation rules for the years 2000–2009, which we analyze in detail below, are specified in about 30 statutory provisions. The provisions for 2010 and subsequent years are only slightly less complex. During Phase II, utilities can cover their emissions with the allowances they were allocated, can buy allowances, sell allowances, or bank allowances for future use. Any individual or firm is free to buy and sell allowances as well.

In addition to giving allowances to each generating unit, the EPA has conducted small annual revenue-neutral allowance auctions since 1993. The auctioned allowances are acquired by the EPA by holding back 2.8 percent of the allowances issued to each unit, and each unit in turn receives a pro rata share of the proceeds of the auction. The auction provision was a response to concerns by independent power producers and rapidly growing utilities that an active market for allowances would not emerge, concerns strengthened by assertions during debates on the 1990 CAAA that utilities would hoard their initial allocations and refuse to sell at any price.[13]

[13] Until recently, some allowances were also held back for sale at a fixed price (which turned out to be well above market prices); any excess supply was later auctioned. Karl Hausker, The Politics and Economics of Auction Design in the Market for Sulfur Dioxide Pollution, 11 J. Pol'y Anal. & Mgmt. 553 (1992), discusses the political economy of these institutions; Paul L. Joskow, Richard Schmalensee, & Elizabeth M. Bailey, The Market for Sulfur Dioxide Emissions, Am. Econ. Rev (in press).

This type of flexible compliance mechanism requires an accurate method for measuring emissions and tracking allowances. Title IV requires utilities to install continuous emissions monitoring equipment, and the EPA's regulations contain powerful financial incentives to ensure that these monitors are operating accurately.

After the 1990 legislation was passed, EPA set up an Acid Rain Advisory Committee to assist it in developing the regulations required to implement Title IV and to provide advice on interpreting the statutory language. The EPA also created three internal teams to come to a consensus interpretation of the complex and interrelated allowance allocation provisions contained in Title IV. In order to record and defend its decisions, EPA documented the Phase II allocation methods in detail and produced the National Allowance Data Base (NADB) and Supplemental Data File (SDF).[14] The NADB and SDF are essentially large spreadsheets that display the calculations used to allocate allowances to each of 3,842 existing and planned electric units and, in order to do this, provide a good deal of unit-specific information from which allocations under alternative rules can be computed. These spreadsheets are the main source of data for the analysis that follows.

III. Historical Background on Federal Control of SO_2 Emissions

The structure of the 1990 acid rain program cannot be understood apart from the history of federal efforts to limit electric utility emissions of SO_2. The 1970 Clean Air Act Amendments, the first significant federal air pollution legislation, led to the establishment of national maximum standards for ambient concentrations of SO_2. States were largely responsible for meeting these standards in each local area. The 1970 Amendments also imposed a new source performance standard (NSPS) applicable only to emissions from *new* power plants, which took effect in 1971. According to the NSPS, the emissions rate (ER) for new coal plants could not exceed 1.2 pounds of sulfur dioxide per million Btus of fuel burned (0.8 pounds/mmBtu for oil). These regulations created a significant gap between the emissions rates of many existing plants and the rates permitted for new plants, thus providing a strong incentive to extend the lives of old, dirty plants.[15] Furthermore, in order to help meet the local ambient SO_2 standards, the states required some

[14] U.S. Environmental Protection Agency (EPA), Acid Rain Division, Technical Documentation for Phase II Allowance Allocations (March 1993).

[15] Pre-1970 plants were still subject to controls under State Implementation Plans (SIPs) required by the Clean Air Act to ensure that each state came into compliance with national ambient air quality standards. There was wide variation among the states in the aggressiveness of their SIPs and how they affected existing plants.

existing and new power plants to have high smokestacks to disperse emissions over a wider area. By keeping SO_2 in the atmosphere longer, however, tall stacks may increase ambient concentrations at other locations. They also generally encourage the formation of sulfates and sulfuric acid and thus increase the total amount of acid deposition, which may affect geographic areas hundreds of miles away.

Congress next amended the Clean Air Act in 1977. Ambient concentrations of SO_2 were again the focus of attention; acid rain was still not an issue. The political solution that emerged from the 1977 legislation and subsequent EPA rule making satisfied environmentalists, high-sulfur coal interests, and Midwestern utilities.[16] It required coal-fired plants built after 1978 both to meet the ER ≤ 1.2 constraint *and* either (*a*) to remove 90 percent of potential SO_2 emissions (as determined by the sulfur content of the fuel burned) or (*b*) to remove 70 percent of potential SO_2 emissions and to operate with ER < 0.6. This ''percent reduction'' standard required all new coal plants to operate with flue gas desulfurization facilities—generally referred to as ''scrubbers''—even if they burned low-sulfur coal.[17] This provision significantly reduced the advantage of low-sulfur coal as a means of compliance and effectively imposed a lower emissions rate on new sources in the West than in the East. As Ackerman and Hassler have stressed, this provision gave environmentalists the tighter NSPS they sought, but it raised the costs of SO_2 control and may well have dirtied the air on balance by encouraging utilities to burn high-sulfur coal and by strengthening incentives to extend the lives of old, dirty plants.[18] It is also generally viewed as a victory for high-sulfur coal producers and miners, since the scrubbing provisions reduced what would otherwise have been a very significant economic disadvantage for high-sulfur coal. Conversely, of course, Appalachian and, to a lesser extent, Western producers of low-sulfur coal lost. This legislation was viewed as a victory for most Midwestern and Northeastern coal-burning utilities and their customers, since old plants generally remained relatively lightly controlled,[19] and slow economic growth meant

[16] For more on this episode, see Ackerman & Hassler, *supra* note 3, Kete, *supra* note 10, at 158–59; Richard E. Cohen, Washington at Work: Back Rooms and Clean Air (1992), ch. 2; and Paul L. Joskow & Richard Schmalensee, The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program (MIT Ctr. for Energy & Environmental Policy Res., Working Paper 96-003, March 1996), Section 3.

[17] Oil-fired units built after 1978 also had to meet the 1971 ER constraint (ER ≤ 0.8) and to remove 90 percent of potential emissions; they faced no percent reduction requirement if ER < 0.2, however. To avoid simply sending SO_2 emissions long distances downwind, the 1977 legislation sharply limited the use of tall smokestacks as a compliance strategy.

[18] Ackerman & Hassler, *supra* note 3.

[19] Controls had been imposed on some old plants by state environmental agencies in order to meet ambient SO_2 standards. The stringency of these controls varied greatly, however, and

there was little need to build new plants meeting the NSPS.[20] The big losers were those states, mainly in the West, that were using nearby low-sulfur coal and growing rapidly. Scrubbing effectively required these states to engage in costly cleanup of what was already clean coal and to bear a disproportionate share of cleanup costs because they were building a disproportionate share of new fossil-fueled capacity.

Total U.S. emissions of SO_2 peaked in the early 1970s and declined steadily during the 1980s. The focus of Clean Air Act regulation on new generating units, however, served to extend the economic lives of old, dirty plants that were not burdened with significant control costs. As a consequence of this ''new-source bias,'' by 1985 83 percent of power plant SO_2 emissions came from generating units not meeting the 1971 NSPS, and 63 percent were from units with ER $\geq$ 2.5.[21] By 1990, over two-thirds of acid rain precursors emitted by power plants were emitted by plants constructed before 1970.[22]

Table 1 shows that there were huge interstate differences in aggregate and per capita emissions in the mid-1980s. Differences in per capita emissions reflected differences in the amount of electricity generation per capita (largely reflecting differences in economic and industrial structures), in the use of coal of various types (reflecting accidents of geography and history), and in the vintages of generating plants in use. Per capita emissions tended to be highest in Midwestern states that had grown relatively little since 1970 and that are located near high-sulfur coal deposits. Emissions tended to be lowest in states that had new power plants and had made relatively little use of coal.

IV. Federal Acid Rain Legislation[23]

Acid rain gradually emerged as a serious environmental and political issue only after 1977 because of pressures from environmental groups, Northeastern states, and, especially, Canadian objections to transborder pollution flows, arising from concerns about the effects of acidic deposition on prop-

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they were rarely if ever as strict as the NSPS standard. Nonetheless, in part because of these controls, utility SO_2 emissions declined steadily after the mid-1970s, despite increased coal consumption.

[20] In the late 1970s, the technology of choice for meeting incremental generating capacity needs in the East, the South, and portions of the Midwest was nuclear power.

[21] These statistics were calculated using the National Allowance Data Base, described above. As noted above, Phase I covered only large units with ER $\geq$ 2.5.

[22] Kete, *supra* note 10, at 118.

[23] Joskow & Schmalensee, *supra* note 16, treat this history in more depth.

TABLE 1

HIGHEST AND LOWEST BASELINE SO_2 EMISSIONS PER CAPITA

Pounds/ Capita	Thousands of Tons	State	Pounds/ Capita	Thousands of Tons	State
1,029.5	962.5	West Virginia	53.6	42.7	Utah*
550.9	1,519.7	Indiana	53.5	82.7	Colorado*
548.4	126.7	Wyoming*	52.6	151.3	Virginia
439.3	806.6	Kentucky	44.6	396.8	New York
427.8	138.2	North Dakota	41.8	16.6	Montana*
425.6	2,303.1	Ohio	38.1	60.9	Connecticut
381.7	957.4	Missouri	32.5	68.5	Louisiana*
347.4	1,037.1	Georgia	27.9	62.8	Washington
341.0	807.2	Tennessee	25.9	97.8	New Jersey
281.0	557.5	Alabama	20.7	12.2	Maine
221.8	69.9	Delaware	6.8	3.3	Rhode Island*
197.9	1,174.7	Pennsylvania	4.3	1.3	District of Columbia
177.3	1,013.2	Illinois	.7	.9	Oregon
155.5	373.1	Wisconsin	.6	.2	Vermont*
143.0	72.6	New Hampshire	.5	6.8	California*

NOTE.—Emissions per capita are baseline sulfur dioxide emissions in pounds (from the National Allowance Data Base) divided by the average of 1980 and 1990 population. Baseline emissions for generating units operating in 1985 are generally the product of each unit's 1985 emission rate and its average 1985–87 fuel consumption. Emissions in thousands of tons are baseline generating unit sulfur dioxide emissions in thousands of tons (from the National Allowance Data Base). All states with emissions of 500,000 tons or more are shown except for Florida (635.2) and Texas (641.5). The only state with emissions of 50,000 tons or less not shown is South Dakota (25.8).

* Designated as a ''Clean State'' under sec. 406 of the 1990 CAAA because baseline average emissions rate (ER) from fossil fuel-fired steam generating units did not exceed 0.8 pounds per million Btu. ''Clean States'' not shown, with per capita emissions in parentheses, are the following: Arizona (70.50), Arkansas (63.55), Nevada (112.92), New Mexico (101.99), Oklahoma (60.66), and Texas (82.81).

erty, trees, and aquatic life.[24] Many acid rain bills were proposed by Western and Northeastern senators and representatives during the 1980s.[25] This

[24] On the early history of this issue, see Ackerman & Hassler, *supra* note 3, at 66; U.S. General Accounting Office (GAO), An Analysis of Issues concerning ''Acid Rain'' (Report GAO/RCED-85-13, December 1984); and Joseph A. Davis, Acid Rain to Get Attention as Reagan Changes Course, Cong. Q., March 22, 1986, at 675. To help resolve scientific disputes about the damages caused by acid rain, Congress created the National Acid Precipitation Assessment Program (NAPAP), which spent about $600 million through the end of 1990 (NAPAP, 1989 Annual Report to the President and Congress 7 (June 1990)). Its work had no visible effect on the 1990 legislative debates, however; see Leslie Roberts, Learning from an Acid Rain Program, 251 Science 1392 (1991), and Acid Rain Program: Mixed Review, 252 Science 1302 (1991). Among the reasons offered for NAPAP's lack of impact are its focus on ''good science'' instead of policy-relevant analysis and its lack of political support from the environmental community.

[25] See Cohen, *supra* note 15, at 36–44; Robert Hanley, Turning Off Acid Rain at the Source, N.Y. Times, December 11, 1983, at A12; Robert W. Crandall, Air Pollution, Environmentalists, and the Coal Lobby, in The Political Economy of Deregulation: Interest Groups in the Regulatory Process (Roger G. Noll & Bruce M. Owen eds. 1983); and the following pages in the indicated annual numbers of the Congressional Quarterly Almanac: 1982, at 425–34; 1983, at 340–41; 1984, at 340–42; 1986, at 137; 1987, at 299–301; 1988, at 142–48.

legislation generally called for reductions of from 6 to 12 million tons of SO_2 emissions per year from 1980 levels, targeted the dirtiest generating units for cleanup, and often involved some variant of the ER $\leq$ 1.2 constraint that had been applied to new units since 1971. In part because costs of cleanup varied considerably among existing units, these proposals often provided for more flexibility than traditional command and control regulation by, for instance, applying emissions limits at the state level rather than unit by unit.[26] Because the costs of these control strategies would have been heavily concentrated in a few Midwestern states, and projections suggested that electric rates there would have to rise significantly to cover those costs, some of the proposals included a national electricity tax to help to pay for cleanup costs and to ''share the pain.'' Some proposals included mandatory scrubbing, while others did not.

During the 1980s, Midwestern and Appalachian high-sulfur coal-producing states generally opposed *any* new acid rain controls, while Western and Northeastern states opposed both a national electricity tax and any additional scrubbing requirements. Acid rain legislation was effectively blocked in the House by John Dingell (D-Mich.), who became chairman of the powerful House Energy and Commerce Committee in 1981. His main concern was that any legislation amending the Clean Air Act would likely tighten auto emission standards significantly, and he accordingly blocked all such legislation.[27] In the Senate, acid rain legislation was effectively blocked by the majority leader, Robert Byrd (D-W.Va.). West Virginia, with high per capita emissions of SO_2 and high production of high-sulfur coal burned in other states, was potentially a big loser from acid rain legislation. Completing the constellation of major ''Just Say No!'' forces on acid rain was President Ronald Reagan, who opposed environmental regulation generally.[28]

The political strength of the environmental movement grew dramatically as the decade of the 1980s proceeded, fueled in part by the Reagan administration's apparent intransigence.[29] Population continued to shift to the West and South, and the number of high-sulfur coal miners dwindled as high-

[26] E. H. Pechan & Associates, Comparison of Acid Rain Control Bills (EPA Contract No. 68-WA-0038, Work Assignments 94 and 116, OTA Contract Ls-5480.0, November 1989), compare six contemporary acid rain proposals.

[27] See, for instance, Cohen, *supra* note 16, at 29–32.

[28] Crandall, *supra* note 3, discusses other obstacles to assembling a winning pro-control coalition during the 1980s.

[29] The Sierra Club's membership increased more than sixfold between 1980 and 1990 (personal communication with Club officials), and the share of respondents agreeing with the following statement increased from 45 percent to 80 percent between 1981 and 1989 (Roberto Suro, Concern for the Environment, N.Y. Times, July 2, 1989, at A1): ''Protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost.''

sulfur coal production fell and productivity improved dramatically.[30] The 1988 presidential election was won by George Bush, who had promised to be ‘‘the Environmental President’’ and had advocated looking ‘‘to the marketplace for innovative solutions’’ to environmental problems. George Mitchell (D-Maine), an ardent proponent of acid rain controls, succeeded Robert Byrd as Senate majority leader. Even before Bush’s inauguration, staff at EPA, in the vice president’s office, and elsewhere in the executive branch began work on a set of proposed amendments to the Clean Air Act that would deal with acid rain, as well as toxic air pollutants, urban smog, and other air quality issues.[31] Work on acid rain was heavily influenced by an emissions-trading proposal that had been circulated during 1988 by the Environmental Defense Fund (EDF). Though there were concerns about both the workability of the EDF proposal and the size of the emissions reductions it required (12 million tons from 1980 levels), relying on tradable permits to control acid rain would respond to Bush’s call to look ‘‘to the marketplace’’ and could reduce control costs. Moreover, it was hoped that EDF’s support would provide protection against knee-jerk antimarket attacks from other environmental groups. While some EPA staff clearly preferred traditional command and control methods, strong support developed within the agency, and the basic idea of using tradable permits to control acid rain was adopted by the Bush administration without much internal warfare.

The administration’s Clean Air proposal was announced in general terms in June 1989, and draft legislation was released the following month. In the House, the administration’s bill went to the Committee on Energy and Commerce, still chaired by John Dingell (D-Mich.). The acid rain Title was sent to the Subcommittee on Energy and Power, chaired by Philip Sharp (D-Ind.). Indiana had large emissions from old dirty plants, and while Sharp had earlier joined in supporting some modest acid rain control proposals, he opposed stringent controls targeted at existing plants without significant cost sharing with other regions. He had advocated paying for acid rain abatement through a national electricity tax.

On the Senate side, the administration’s bill went to the Subcommittee on Environmental Protection, chaired by Max Baucus (D-Mont.), of the Committee on Environment and Public Works, chaired by Quentin Burdick (D-N.Dak.). Fifteen of the 16 members of the full committee were also

[30] Between 1980 and 1990, the average daily employment of miners in Eastern mines (both high-sulfur and low-sulfur) fell from 202,039 to 115,216 (Coal Data (National Coal Association, various years)).

[31] For a contemporary view of this process, see Margaret E. Kriz, Politics in the Air, Nat’l J., May 6, 1989, at 1098.

members of the Environmental Protection Subcommittee, and Burdick was not much interested in environmental policy, so all the action was in the Baucus subcommittee. Montana, a state that both produces and uses low-sulfur coal, was one of the losers in the 1977 amendments.

The Senate and House committees differed substantially in regional composition and support for environmental legislation.[32] Five of 16 senators on Environment and Public Works were from New England, where concerns about acid rain were high. On the House side, however, New Englanders were outnumbered 41 to 2 on Energy and Commerce. While the Senate committee had representation from neither the states with the highest SO_2 emissions nor the largest Eastern coal-producing states, these states were well represented on Energy and Commerce. Only 31 percent of the senators on Environment and Public Works were from states with (old, dirty) Phase I plants, as compared to 56 percent of representatives on Energy and Commerce. As one might expect, the Senate committee had members who were substantially more inclined to support environmental legislation than their counterparts in the House.

In mid-November, after four days of debate and one day of markup, the Senate Committee on Environment and Public Works approved Clean Air legislation written by its staff by a 15–1 vote.[33] The president threatened to veto the committee's bill unless its costs were reduced substantially, and the bill was poorly received on the Senate floor. In an attempt to produce acceptable legislation, the majority leader, Senator Mitchell, convened a set of closed-door sessions involving senators and administration officials beginning in early February. These meetings were open to all senators and their staffs, and states with large stakes in the acid rain Title were well represented when it was discussed.

The Senate negotiators modified the administration's relatively simple rules for determining Phase II allowance endowments. They also brought forward the starting dates of both phases by a year, thus producing greater

[32] Joskow & Schmalensee, *supra* note 16, provide more on the points in this paragraph.

[33] At the insistence of Alan Simpson (R-Wyo.), representing a state that both produced and burned large quantities of low-sulfur coal, the committee bill contained a provision purporting to repeal the ''percent reduction'' provision of the 1977 amendments. This provision was retained in the final legislation, and the EPA was given 3 years to produce a new NSPS. As of January 1998, however, it had not yet done so. The repeal provision requires that any new NSPS allow no unit to emit more than it would have been allowed to emit under the 1978 NSPS. But this requirement is a ''Catch-22,'' since the 1978 NSPS always requires that emissions be less than the sulfur content of the coal burned (the essence of ''percent removal''). Thus the only way to ensure that a unit emits no more than it would have been allowed to emit under the 1978 NSPS is to install a scrubber! In addition, we are told that state regulations effectively require scrubbing in areas where new coal-fired plants have been built, so that there has not been strong industry pressure to revise the 1978 NSPS.

emissions reductions in 1995 and 2000 than the administration's proposal.[34] In response to efforts by Robert Byrd (D-W.Va.) and other senators from states producing high-sulfur coal, the incremental 1995 reductions were given back as ''bonus'' allowances for utilities that installed scrubbers rather than switching to low-sulfur coal in Phase I. The incremental reductions in 2000 were given back over the 2000–2009 period through a number of provisions.

A major issue in these negotiations and, after an agreement between the administration and the Senate leadership was unveiled in early March 1990, on the Senate floor was the so-called Byrd Amendment. This provision would have provided generous financial aid to high-sulfur coal miners whose jobs were eliminated by Clean Air legislation. The administration and the Senate leadership opposed this amendment and prevailed by a single vote.[35]

The bill subsequently developed in the House also modified the administration's simple allocation rules, but it retained the original administration start dates and ceilings for Phase I and Phase II.[36] Like the Senate bill, it provided incentives for scrubbing. A provision authorizing unemployment and job-training benefits for displaced workers was added on the House floor; it was not restricted to miners and had a much smaller price tag than the Byrd Amendment.

The acid rain Title produced by the conference committee was based

[34] See Kete, *supra* note 10, at 210.

[35] For discussions of this episode, see Richard E. Cohen, When Titans Clash on Clean Air, Nat'l J., April 7, 1990, at 849; and Phil Kuntz & George Hager, Showdown on Clean-Air Bill: Senate Says ''No'' to Byrd, Cong. Q., March 31, 1990, at 983. Senator Byrd called on longstanding relationships with his Democratic colleagues and on his power as chairman of the Appropriations Committee, and Democrats voted with him (and against the Senate leadership) 38 to 16. In addition, all Republicans from Midwestern and Appalachian coal-producing states voted for the Byrd Amendment, except for Senator Warner (R-Va.), despite strong administration and Republican leadership opposition. Finally, Senators Cochrane (R-Miss.) and McClure (R-Idaho) voted for the Byrd Amendment, and thus against both the White House and the Republican Senate leadership, even though they represented no high-sulfur coal miners. Senator Symms (R-Idaho) was talked out of doing likewise only in the last minute of voting. Given that these three senators were in the bottom 20 in terms of the AFL-CIO's evaluations of lifetime voting records, it seems unlikely that they were casting prolabor votes for ideological reasons. Strategic motives are suggested by the facts that these three senators were in the bottom 10 in terms of the League of Conservation Voters' ratings of 1989–90 voting records and that the president had threatened to veto any legislation containing the Byrd Amendment. It is most plausible that these senators hoped that passage of the Byrd Amendment would force the president to carry out his veto threat and thus likely kill new clean air legislation.

[36] For a detailed comparison of the acid rain provisions of the House and Senate bills, see ICF Resources, Inc. (ICF), Comparison of the Economic Impacts of the Acid Rain Provisions of the Senate Bill (S. 1630) and the House Bill (S. 1630) (draft report prepared for the U.S. Environmental Protection Agency, July 1990).

mainly on the Senate bill, while the House prevailed on most of the rest of the legislation.[37] A relatively small provision for aiding displaced workers (Title XI) based on the House bill was added,[38] and the Senate's provisions for allocating allowances were modified.

The provisions of the law allocating allowances in Phase I remained fairly simple, but 8 dense pages of about 30 complex and convoluted provisions were developed to govern Phase II allocations. In order to ensure that the intended constraints on *total* Phase II emissions were satisfied in the face of a rising tide of proposed special interest provisions, work on the Senate/administration bill had quickly incorporated an overarching ''ratchet'' provision. This provision, which was not controversial and was retained in the final legislation, in effect said that at the end of the day total allocations under (almost) all other provisions would be scaled down to a specified total.[39] This provision had the effect of making negotiations about allowance allocations into a zero-sum game. It also implied that, all else equal, benefits from rules changes that would *decrease* somebody else's allowances would be widely shared. Thus, at least in the negotiations that led up to the passage of the Senate bill, debates about allowance allocations were conducted primarily in terms of proposed rules for *increasing* particular allocations, which were typically supported by arguments about fairness under autarchy.

V. Phase I Allowance Allocations

Table A of the 1990 CAAA lists the Phase I units and specifies allowances to be allocated to each. Eight of these units were added to table A before the Senate bill was passed in April. Though these additions were justified by technical corrections to earlier work, it is interesting that five of the eight units, accounting for 84 percent of the allowances allocated to these units, were located in Minnesota, New York, and Wisconsin. The two Wisconsin units had been retired in 1988, so that adding them to Phase I

[37] See Cohen, *supra* note 15, ch. 10; and Alyson Pytte, A Decade's Acrimony Lifted in the Glow of Clean Air, Cong. Q., October 27, 1990, at 3587.

[38] Of the total authorization of $250 million, less than $29 million had been spent for all displaced workers as of May 1995 (telephone interview, Employment and Training Administration, U.S. Department of Labor).

[39] When the EPA figured out the allocations required by the statute in 1992, the ratchet's operation reduced Phase II allowances by about 9.6 percent from the total implied by strict application of the other allocation provisions in the bill. The ''ratchet'' had the effect of reducing annual Phase II ''basic'' allowances from 9.876 to 8.90 million tons and thus, if ''bonus'' allowances are taken as fixed, of reducing total annual allowances allocated in the first 10 years of Phase II from 10.115 to 9.139 million tons (EPA, *supra* note 14, at 5). The large size of the ''ratchet'' announced in early 1992 was a great surprise to those involved in the process, most of whom had expected a ratchet of less than 5 percent.

clearly made their owners better off by the value of the allowances they were given. Since all three of these states had significant acid rain legislation on the books by 1990, adding the Minnesota and New York units to Phase I *and* using their 1985 emissions rates to determine their allowance allocations probably made the owners of these units better off as well.

Most commentators describe the annual table A allowance allocations as equal to emissions (in tons) from baseline fuel use and an ER of 2.5 pounds per million Btus.[40] The EPA's NADB reveals that this formula is only approximately correct. Moreover, table A does not fully describe the Phase I allocations. The table A allocations differ by more than 1 percent from those produced by applying this formula to the NADB data, which we will call the *Basic Rule*, in 44 cases. The absolute value of the difference exceeded 1,000 allowances per year for 17 units.[41] Most, but not all, of these differences reflect departures from the administration's original table A proposal. In large part, at least, these differences reflect the fact that the NADB contains more recent data than those employed in computations underlying table A.

Table 2 shows that at the state level, the table A allocations of Wisconsin, Indiana, and Missouri are well above those implied by the 2.5 ton/mmBtu Basic Rule, while Pennsylvania's is noticeably lower. The third column of Table 2 also shows the effects of two ''bonus'' provisions: Section 404(h), which affected one unit in Iowa, and Section 404(a)(3), which affected all units in Illinois, Indiana, and Ohio except for three plants that sell mainly to Department of Energy uranium-processing plants.[42] This latter provision was added in response to Midwestern pressures for some form of cost sharing—with care taken not to allocate valuable allowances to plants that sold electricity under cost plus arrangements back to federal facilities. It is worth noting as well that representatives from Indiana and Illinois were chairman and ranking member, respectively, of key House subcommittees. Ohio had the highest total emissions of any state in the country, and two representatives on the House Energy and Power Subcommittee, one of

[40] See, for instance, Reinier Lock & Dennis P. Harkawik, eds., The New Clean Air Act: Compliance and Opportunity, at 24 (1991).

[41] This does not count large, almost exactly offsetting differences for units 1 and 2 of Georgia Power's Bowen plant. These differences seem almost certain to reflect some sort of error or the correction of another sort of error.

[42] Hausker, *supra* note 13, at 567, notes that the Midwest bonus provision, added late in conference, was the single breach in the zero-sum barrier imposed by the ratchet provision. A third bonus provision, Section 404(e), would provide Phase I allowances to Union Electric in Missouri and Phase II allowances to both Union Electric and Duke Power. Because of pending litigation, however, no allowances had been issued under this provision by late 1995. Only about 4,000 allowances had been allocated under a final bonus provision, Section 404(f), which rewards using conservation or renewable energy to reduce emissions.

TABLE 2

PHASE I ALLOWANCE ALLOCATIONS BY STATE

State	Basic Rule	Table A Difference	Bonuses	Final Allocation	Absolute/% Difference from Rescaled Basic Rule	Extension Allowances
Alabama	230,947	−7	0	230,940	−10,381/−4.30	3,428
Florida	129,792	3,338	0	133,130	−2,492/−1.84	33,248
Georgia	581,599	1	0	581,600	−26,123/−4.30	0
Illinois	353,191	4,709	36,356	394,256	25,201/6.83	0
Indiana	640,855	9,485	66,724	717,064	47,424/7.08	104,323
Iowa	37,555	2,735	1,350	41,640	2,398/6.11	0
Kansas	4,226	−6	0	4,220	−196/−4.44	0
Kentucky	278,637	−387	0	278,250	−12,903/−4.43	82,587
Maryland	140,066	−526	0	139,540	−6,818/−4.66	7,110
Michigan	42,334	6	0	42,340	−1,896/−4.29	0
Minnesota	4,409	−139	0	4,270	−337/−7.32	0
Mississippi	54,609	1	0	54,610	−2,452/−4.30	0
Missouri	345,101	7,889	0	352,990	−7,612/−2.11	0
New Hampshire	32,207	−17	0	32,190	−1,463/−4.35	0
New Jersey	20,811	−31	0	20,780	−966/−4.44	6,242
New York	147,393	3,587	0	150,980	−3,034/−1.97	11,673
Ohio	863,191	89	96,920	960,200	58,237/6.46	167,442
Pennsylvania	536,121	−1,981	0	534,140	−26,063/−4.65	76,441
Tennessee	386,183	247	0	386,430	−17,100/−4.24	111,374
West Virginia	496,528	1,342	0	497,870	−20,961/−4.04	96,131
Wisconsin	130,004	13,376	0	143,380	7,356/5.55	0
Total	5,455,761	43,709	201,350	5,700,820	0/.0	700,000

NOTE.—Basic Rule allocations are computed by multiplying an emissions rate of 2.5 times baseline fuel consumption, in tons. The Table A Difference is the difference between the table A and Basic Rule allocations. Bonuses are from sec. 404(h) for the George Neal North unit 1 in Iowa and from sec. 404(a)(3) for units in Illinois, Indiana, and Ohio. The second to last column is the final allocation minus (Basic Rule rescaled to same total)/that difference expressed as a percentage of rescaled Basic Rule. The final column gives annual average Phase 1 extension allowances received, from sec. 404(d), after reallocations among utilities.

whom (Thomas Luken, D) had been heavily involved in debates over acid rain legislation proposed earlier in the 1980s.

The second to last column in Table 2 shows a comparison of the Final Allocation in the 1990 law with the Basic Rule allocation scaled up to a total of 5,700,820 tons. None of the differences exceed 10 percent of the Basic Rule benchmark, but at an expected price of $200/ton, a thousand-ton annual difference corresponds to a million dollars a year. The positive differences (gains) are much more concentrated than the negative differences (losses): the top three gainers (Ohio, Indiana, and Illinois) accounted for 93 percent of total gains, while the top three losers (Georgia, Pennsylvania, and West Virginia) accounted for 52 percent of the losses. Only four states have positive differences in excess of 5,000 tons per year, while eight states have negative differences of that magnitude.

One hypothesis that explains some of these differences is that the states that burned more coal than they produced, including Indiana and Ohio, focused their attention on acquiring additional allowances, while the states that produced more than they burned, including Pennsylvania and West Virginia, focused their attention on providing incentives for scrubbing and direct financial benefits for displaced coal miners. However, Georgia, which produced no coal, and Illinois, which produced about twice as much as it burned in 1990, conspicuously fail to fit this pattern.[43]

The last column in Table 2 shows the effects of a final important Phase I provision. In response to pressure from high-sulfur coal states, 3.5 million allowances (the ‘‘gain’’ from moving the start of Phase I from 1996 to 1995) were set aside to encourage the use of ‘‘technology’’ (that is, scrubbers) as an emissions reduction technique in preference to fuel switching. The main beneficiaries of this provision were utilities in Ohio, Tennessee, Indiana, and West Virginia and the high-sulfur coal interests in these and nearby states.[44]

[43] Both states had high total emissions and high emissions rates. Georgia had no representation on the Senate Committee on Environment and Public Works or the Senate leadership. On the House side it had nobody on the House Energy and Power Subcommittee and only one junior member (J. Roy Rowland, D) on the full Energy and Commerce Committee. It was represented on the House leadership by the Minority Whip (Newt Gingrich, R). Illinois also had no well-placed representation on the Senate side, but it had the ranking member of the Health and Environment Subcommittee (Edward Madigan, R), a member of both involved subcommittees (Terry Bruce, D), and a third member of the full committee (Cardiss Collins, D). As we discuss below, Georgia fared poorly in both Phase I and Phase II, while Illinois fared well in both phases. Illinois would have appeared to have done even better in Phase I if Illinois Power had applied for scrubber extension allowances, as had been expected when Title IV was being debated.

[44] Again, Georgia got nothing out of the scrubber bonus allowances, but it also had no high-sulfur coal miners to protect. Illinois miners benefited from the scrubbing incentives, and it was generally expected in 1990 that Illinois utilities would apply for a large number

Even though the Phase I allowance allocations have generally been described as following a simple rule, it is clear that the actual allocations were significantly influenced by special interest rent seeking. In addition to the differences between the table A allocations and those implied by the Basic Rule, large special allocations of allowances were given to three of the five states with the highest SO_2 emissions (see Table 1): Ohio, Indiana, and Illinois. All three also had substantial high-sulfur coal mining interests. Pennsylvania, West Virginia, and Kentucky, which had both relatively high aggregate emissions and more important high-sulfur mining interests, were not covered by this special provision. However, these six states plus Tennessee (with emissions just above Kentucky's but few high-sulfur miners) acquired almost all the bonus allowances made available to Phase I units that chose to reduce emissions by scrubbing. Georgia, number 4 in emissions, benefited from neither the special allocation nor the scrubber bonus.

This pattern suggests that Phase I allowances were used partially to compensate three of the high emissions states that were well represented on the key committees. Phase I allowances were also used to subsidize scrubbers in response to high-sulfur coal-mining interests. There is some evidence that the states with important coal-mining interests focused more on increasing scrubber allowances than on securing earmarked allowances. Georgia, which was not represented on the relevant committees, did particularly badly overall in the Phase I allowance allocation process.

VI. Statutory Provisions for Phase II Allocations

Calculations of a generating unit's Phase II allowance allocations generally begin with ''baseline'' emissions, determined by the recorded emissions rate for 1985 and average heat input from fuel burned during 1985–87.[45] The simple rule at the core of Phase II allocates allowances equal to each unit's baseline fuel use times the lesser of its actual 1985 emissions rate and 1.2 pounds of SO_2 per million Btu, expressed in tons. The statute contains over 30 individual provisions that specify exactly how Phase II allowances are to be allocated. These rules fall into three general categories.

The first category contains provisions that specify variations from the simple rule above based on fuel type, unit age, unit capacity, and capacity

of extension allowances. Illinois Power eventually decided not to install scrubbers because its regulators refused to preapprove such investments for rate-making purposes. Illinois Power then became an important early purchaser of allowances.

[45] Special provisions were included for units that were not in operation in 1985 or were still under construction in 1990 when the Act was passed. Emissions rates for 1985 were used in all other cases because NAPAP (see note 24 *supra*) had constructed particularly good emissions data for that year.

utilization during the base period. These allocation rules were generally advertised as dealing with various ‘‘technical issues’’ associated with the fuel and operating attributes of units in these categories during the base period. These rules include special provisions for units that operated at low capacity factors during the baseline period due to mechanical problems or unusually low demand along with special allocations for small coal plants for which control options were particularly limited and costly. Other ‘‘technical arguments’’ supporting, for example, a special allocation for units that happened to burn lots of gas during the baseline period because gas prices were unusually low during that time, are more difficult to accept as being ‘‘nonpolitical.’’ As we show below, the allocation rules in this first category generally shift allowances from relatively dirty states to relatively clean states, especially those with oil/gas generating units.

The second category of allocation rules consists of those rules that are narrowly focused on special interests—either individual states or individual utilities. Table 3 provides the clearest examples. This table was developed by categorizing all Phase II units by applicable allocation rules and then searching for rules that appeared to be narrowly focused on a single state or a small number of generating units. Table 3 should remove any doubt that interest group politics was at work in the development of the U.S. acid rain program. Some of these provisions are clearly the work of influential legislators. Senator Burdick used his chairmanship of the Committee on Environment and Public Works to ensure that his constituents in North Dakota got special allocations for the lignite-fired units that generate electricity there by inserting Section 405(b)(3). In addition, Congressman Dingell seems to have provided regulatory relief for Detroit Edison through Section 405(I)(2).

It is more difficult to relate some of the other provisions in Table 3 directly to well-positioned congressmen from the states that benefited from them. Florida was not represented in the leadership of either House or Senate, and Senator Bob Graham (D-Fla.) and Congressman Michael Bilirakis (R-Fla.) were the only Floridians on the relevant committees. Nonetheless, Senator Graham managed to secure thousands of incremental allowances for Florida through Section 405(I)(1).[46] Section 405(c)(3) originated in the House, even though Springfield, Missouri, was represented by a first-term Republican not

[46] See Kete, *supra* note 10, at 207–10. The impact of this provision is capped in the statute at 40,000 allowances annually. Florida may have been treated well in part because it was a large state with competitive races for both senator and governor in prospect for the fall of 1990. (See Table 8 below for the definition of ‘‘competitive’’ used here.) At least one of the other Florida-specific provisions in Table 3 was added to the Senate bill at the insistence of the Republican leadership to give Florida’s other senator, Connie Mack (R), something for which he could also claim credit.

TABLE 3

INCIDENCE OF SELECTED SPECIAL PHASE II (2000–2009) PROVISIONS

Section	Coverage	No. of Units, States (Systems) Affected	
404(h)	Phase I units 1990 ER < 1.0, ≥60% ER drop since 1980; system ER < 1.0	1	Iowa (Iowa Public Service)
405(b)(3)	Large lignite units with ER ≥ 1.2 in a state with no nonattainment areas	5	North Dakota
405(b)(4)	State has >30 million KW capacity; unit barred from oil use, switched to coal between 1/1/80 and 12/31/85	4	Florida (Tampa Electric)
405(c)(3)	Small unit, ER ≥ 1.2, on line before 12/31/65; system fossil steam capacity >250 MW and <450 MW, fewer than 78,000 customers	2	Missouri (City of Springfield)
405(c)(5)	Small units with ER ≥ 1.2; systems >20% scrubbed, rely on small units, have large units expensive to scrub	23	Ohio (Ohio Edison), Pennsylvania (Pennsylvania Power)
405(d)(5)	Oil/gas units awarded a clean coal technology grant as of 1/1/91	1	Florida (City of Tallahassee)
405(f)(2)	Operated by a utility providing electricity, steam, and natural gas to a city and one contiguous county; or state authority serving same area	48	New York (Consolidated Edison, Power Authority of the State of New York)
405(g)(5)	Units coverted from gas to coal between 1/1/85 and 12/31/87 with proposed or final prohibition order	3	Arizona (Tucson Electric), New York (Orange & Rockland Utilities)
405(I)(1)	States with >25% population growth 1980–88 and 1988 electric generating capacity >30 million KW	134	Florida
405(I)(2)	Large units with reduced actual or allowable emissions meeting five conditions on emissions and growth	6	Florida (Florida Power Company), Michigan (Detroit Edison)

on Energy and Commerce. Section 405(g)(5) was broadened in conference to include Tucson Electric, even though Arizona was not represented on the conference committee.[47] Finally, Section 404(h) originated in the House, even though the only Iowan on Energy and Commerce, Tom Tauke (R), was not on Energy and Power and was campaigning vigorously (though ultimately unsuccessfully) against an incumbent Democratic senator.

[47] Morris Udall (D) of Arizona was appointed to the conference, but specifically to deal with issues other than acid rain; Cong. Record, June 6, 1990, at S-7541.

These examples make it clear that the ability of a utility to obtain favorable Phase II allocation provisions in the statute did not necessarily depend on having one or more of the members of its state's congressional delegation on a key committee or in the leadership. States like Florida were of ''partisan'' political importance because of the presence of close races for the Senate or governor or their expected importance in the next presidential election. Utilities could also gain influence with influential members of Congress representing other areas through their trade associations, PACs, and political contributions. The existence of these alternative pathways through which legislators can be influenced is consistent with the difficulty scholars have had in finding strong empirical linkages between congressional appropriations and the concentration of interest groups in particular states and the seniority and committee assignments of their representatives in Congress.[48] We encounter similar difficulty in the regression analysis discussed below.

As compared with legislation in other areas, we do not believe that there is anything unusual about the provisions in Table 3. The EPA data simply make it easier to identify beneficiaries of these rules than of, say, functionally equivalent provisions in the tax code. Nor do we believe these are the only ''special interest'' allocation rules included in Title IV—just the most obvious. For example, Section 405(f)(1) provides special bonuses for oil/gas units with very low emissions rates during the baseline period. Units in over 30 states get some benefit from this provision, but the bulk of the benefits are concentrated in California, Florida, and New York.

The third category of Phase II allocation rules provides for general allocations of bonus allowances to units located in groups of states that fall neatly into the ''clean'' and ''dirty'' camps. As we discussed above, Section 405(a)(3) allocates 50,000 additional allowances each year to Phase I units located in 10 ''dirty'' Midwestern states. Section 406 made 125,000 allowances per year available to units in ''clean states,'' which the governor of any of these states could access at his option in lieu of accepting other bonus allowances to which the units were entitled. (See Table 1 for the definition and list of ''clean states.'') These allocations clearly reflect efforts to ''buy off'' two well-organized groups of states with utilities at opposite ends of the dirty/clean spectrum.

VII. Alternative Allocation Rules and the Distribution of Phase II Allowances

Given the number and complexity of Phase II allocation rules, interactions between them, and the global ratchet, it does not appear either practi-

[48] See Levitt & Poterba, *supra* note 5, and the references they cite.

TABLE 4

INITIAL PHASE II ALLOWANCE ALLOCATIONS CONSIDERED

Allocation	Code	Correlation with States' Final Allocations: Total	Correlation with States' Final Allocations: Per Capita	Description
Proportional Reduction	PR	.882	.811	Baseline emissions ratcheted down by 42.3% to equal total Phase II allowances (i.e., the total in the Final Allocation)
Simple Rule	SR	.989	.985	(1) Units on line before 1986 receive (1985 heat input) × Max (1985 ER, 1.2), expressed in tons; (2) units on line in 1986 or later receive unratcheted basic allowances per Section 405(g); (3) allocations are ratcheted up by 8.5% to equal total Phase II allowances
Base Case	BC	.996	.991	(1) Allowances are allocated using basic provisions in the law that distinguish units by baseline emissions rate, fuel type, and vintage (for units on line in 1986 or later) as described in note 51; (2) allocations are ratcheted down by 1.4% to equal total Phase II allowances
Final Allocation	FA	. . .	. . .	Actual allocation of Phase II allowances, as provided for in the law
Cost Minimization	CM	.956	.887	Allocation of allowances that minimizes estimated total compliance cost in 2005 on the assumption that transactions costs rule out interstate trading; linear state-level marginal cost curves estimated from table A-16 in ICF, *supra* note 36, assuming intercepts are $115, as described in note 52 *infra*

cal or interesting to use the EPA data to try to sort out the effects of each individual provision as we did for Phase I in Table 2. Nor is there any simple, systematic way to tie these provisions to specific interest groups or legislators, since there are no votes to observe either on individual provisions or on the acid rain Title itself in isolation from the rest of the 1990 Amendments. Instead, we have elected to structure our analysis around the allocation patterns produced by the statute and by the four benchmark alternative allocation rules (PR, SR, BC, and CM) defined in Table 4 and discussed in more detail in the next several paragraphs. We perform a variety of direct comparisons in this section and then use hypothetical voting and regression techniques for further analysis in Sections VIII and IX, respectively.

A. Alternative Allocations

The *Proportional Reduction* (PR) allocation is a natural starting point for most academic discussions, though it has been found to lack attractive distributional properties in several contexts.[49] The PR allocation implies that in the absence of interstate trading, all states would reduce their emissions by the same proportion to achieve the Phase II emissions cap. This rule implicitly ignores the fact that some states were already clean, and these states generally faced relatively high abatement costs.[50]

The *Simple Rule* (SR) resembles the core rule of the initial administration bill as well as some earlier proposals. Like those bills, it reflects the maximum emissions rate for new coal sources (ignoring the ''percent reduction'' requirement) in effect since the 1970 Clean Air Act Amendments. Each unit operating in 1985 is initially allocated allowances equal to its baseline fuel use times the lesser of its actual emissions rate and 1.2, expressed in tons. This allocation rule leads to significantly *lower* aggregate allowances than is provided for by Title IV. Thus, these initial allocations are then ratcheted *up* by 8.5 percent so that total allowances under SR equal the actual Phase II cap. The basic idea is to bring old generating units, which account for the bulk of SO_2 emissions, into conformity with the 1971 NSPS in aggregate. Because the ratchet up from this basic principle to the actual Phase II allocations is so large, following this rule makes it possible to meet the statutory emissions limit by allowing all existing coal units to operate with emissions rates substantially above 1.2 pounds per million Btu on average and to provide all other units with allowances well in excess of their baseline emissions.

The *Base Case* (BC) was produced by using the six basic provisions in the final law that distinguish units by baseline emissions rate, fuel type, and age—what we referred to in Section VI as the first category of allocation rules.[51] Our original idea was that differences between the SR and BC allo-

[49] See Tietenberg, *supra* note 1, ch. 5.

[50] See, for instance, Crandall, *supra* note 3, at 27.

[51] Base Case allowances were allocated as follows before ratcheting down, dividing the results of these formulas by 2,000 to convert to tons. (1) All units that began operation in 1985 or earlier and had ER $\geq$ 1.2 received baseline fuel use (in Btus) $\times$ 1.2, following Section 405(b)(1). (2) All units that began operation in 1985 or earlier and had $0.6 \leq$ ER < 1.2 received baseline fuel use $\times$ min [actual 1985 ER, maximum allowable 1985 ER] $\times$ 1.2, following Section 405(d)(2). (3) All other units (with ER < 0.6) that began operation in 1985 or earlier, except units that derived more than 90 percent of their total fuel consumption (on a Btu basis) from gas during 1980–89 (the ''>90 percent gas'' units), received baseline

cations would have primarily technical rationales, with political influences affecting primarily the difference between BC and the *Final Allocation* (FA) actually employed. As we noted above and will demonstrate below, reality was not so tidy. The high pairwise correlations between FA and each of PR, SR, and BC shown in Table 4 reflect the huge interstate differences in emissions levels.

Finally, we used preenactment, state-level compliance cost estimates from a widely circulated report prepared to inform the legislative process to produce an estimate of the allowance allocation that would have minimized total compliance costs in the absence of interstate trading.[52] Other cost analyses were also developed for and considered in the legislative process and would, of course, imply different cost-minimizing allocations, so the *Cost Minimization* (CM) allocation considered here is more illustrative than definitive. This allocation is of interest both because of actual and perceived market imperfections,[53] and because autarchy was implicitly assumed in much of the actual debate about ''fair'' allowance allocations. Table 4 shows that the CM allocation is also highly correlated with the FA allocation, again reflecting the importance of baseline interstate differences.

Many in Congress seemed to believe that there would be significant obstacles to interstate allowance trading. It is thus of some interest to use our estimated marginal cost functions, along with consistent estimates of un-

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fuel use × min [0.6, maximum allowable 1985 ER] × 1.2, following Section 405(d)(1). (4) All >90 percent gas units received baseline fuel use × 1985 ER, following Section 405(h)(1). (5) Units that began operation between 1986 and 1990 received estimated fuel consumption at a 65 percent operating factor × the unit's maximum allowable 1985 ER, following Section 405(g)(1). Finally, (6) all covered units under construction and expected to begin operation after 1990 received estimated fuel consumption at a 65 percent operating factor × min [0.3, the unit's maximum allowable ER], following Sections 405(g)(3) and 405(g)(4).

[52] Table A-16 in ICF, *supra* note 36, contains state-by-state estimates of emissions in 2005 (*a*) with no controls and (*b*) with a common marginal cost of control ($572/ton) that was projected to reduce total emissions to near the actual Phase II cap. These data imply a point on each state's estimated marginal cost of abatement schedule for 2005. To determine those schedules fully, we assume linearity and a common intercept. Table A-16 in ICF, *supra* note 36, gives the total cost of control for the case analyzed, including the cost of reducing utility NO_x emissions by 10.556 million tons. Comparing the total cost of SO_2 control implied by an assumed intercept value with the ICF total cost gives an implied cost per ton of NO_x reductions. An intercept value of $115 gives a cost per ton in the center of the range discussed by ICF, *supra* note 36, at C-12. (Intercept values of $80 and $150 yielded very similar results; see Joskow & Schmalensee, *supra* note 16, table 5.) The CM allocation was then computed by equating estimated marginal costs across states and setting total emissions equal to the Phase II cap. ICF, *supra* note 36, table A-16, projected California and Vermont to have zero SO_2 emissions in 2005 even with no controls; they received zero allowances under CM. At the other extreme, Oregon and the District of Columbia were projected to find it uneconomic to reduce emissions at all, even at an allowance price of $572/ton; their CM allocations equal baseline 2005 emissions.

[53] Stavins, *supra* note 2.

controlled emissions,[54] to estimate the total expected allocation-specific compliance costs in 2005 in the absence of interstate trading. These calculations imply that PR would impose costs about 30 percent above their minimum value, while SR, BC, and FA are estimated to involve total cost between 5 and 10 percent above the minimum. These latter differences seem unlikely to be much above the noise in this exercise. These results suggest that in the presence of transactions costs there was at least a plausible *efficiency* case for rejecting PR in favor of any of the other allocations.[55]

B. Gainers and Losers by Type of Generating Unit

Since utility service areas do not map easily into House districts, and since the Senate had somewhat more influence on the final allowance allocations than the House, states are the natural units of political economic analysis. However, most of the Phase II allocation provisions do not relate directly to states but, rather, to generating units with different attributes. The distribution of different types of generating units among the states is thus the main determinant, as a matter of arithmetic rather than of causality, of the effects of different allocation rules on individual states. To understand the latter effects, we begin with an analysis of how those rules treat generating units with different characteristics.

Table 5 summarizes baselines emissions by and allowances allocated to generating units of various types in Phase II under SR, BC, and FA.[56] Under SR, ''dirty'' units are allocated allowances equal to only about 40 percent of baseline emissions, while both ''moderate'' and ''clean'' units receive allocations above their baselines. If the Phase II allowance allocation process had been used partially to ''buy off'' the states with many dirty generating units, which were the main targets of the whole acid rain program, we would have expected to see allowances allocated to dirty units to be *increased* as we move from SR to BC and from BC to FA. Table 5 shows exactly the opposite: both moves *decrease* the aggregate allowances of dirty units, particularly large, very dirty units. (Table A units fall in this cate-

[54] From ICF, *supra* note 36, table A-16.

[55] One often-invoked principle of equity is equality of sacrifice. Using the coefficient of variation of states' estimated per capita compliance costs as a measure of inequality of sacrifice, PR is estimated to involve substantially less inequality than the other four allocations (Joskow & Schmalensee, *supra* note 16, table 5). Using this measure, CM and SR have the least inequality of sacrifice and FA the most. While these estimates must clearly be treated with considerable caution, the outcome of the political process suggests that the equity considerations that drove it are not well summarized by equality of sacrifice.

[56] Since the calculations leading to the CM allocation could only be done at the state level, a breakdown of this allocation by unit type is not possible. PR allocations are directly proportional to baseline emissions.

TABLE 5

EMISSIONS AND PHASE II ALLOWANCE ALLOCATIONS BY UNIT TYPE

		IMPLIED INITIAL ALLOWANCE ALLOCATIONS		
UNIT TYPE	BASELINE EMISSIONS	Simple Rule (SR)	Base Case (BC)	Final Allocation (FA)
Dirty: $1.2 \leq$ ER:	13,004	5,375	4,887	4,745
ER ≥ 2.5, ≥ 75 MW	9,451	2,901	2,645	2,412
Other dirty	3,553	2,465	2,242	2,333
Moderate: $.6 \leq$ ER < 1.2	2,793	2,881	3,107	3,186
Clean: ER $< .6$:	363	394	772	864
Coal	298	323	475	510
Oil/gas	61	67	292	303
Gas (>90%)	4	5	4	50
New: Came on line 1986–90	230	250	238	209
Other: Planned, exempt, etc.	305	239	134	135
Total	16,695	9,139	9,139	9,139

NOTE.—Emissions and allowances are expressed in thousands of tons of SO_2. ER is the baseline emissions rate in pounds of SO_2 emitted per million Btu of fuel burned. Baseline emissions generally equal (1985 emissions rate × 1985–87 average fuel use) for all units on line in 1985.

gory.) Moreover, all other unit types on line by 1985 receive allowances under FA that in aggregate exceed their baseline emissions. This pattern is consistent with ''We're already clean, don't pick on us!'' having been a more effective equity argument than any notion of equal sacrifice. It is also consistent with a desire of senators from the ''clean'' Western states to pay back the Midwestern and Appalachian states for the mandatory scrubbing provision in the 1977 law.[57] Finally, along with the results of Section V, it is also broadly consistent with high-emissions states being willing to accept fewer Phase II allowances in return for more Phase I allowances.

Clean units do much better under BC than under SR.[58] The higher allocation to clean units mainly represents a gain by clean oil/gas units. The formula involved was nominally a response to an argument that these units had burned an ''unusual'' amount of gas in the base period, so that their baseline emissions were ''abnormally''—and thus ''unfairly''—low. In connection with both this provision and the ''clean states'' provision discussed below, it is instructive to consider the possible role of Senator Ben-

[57] See Margaret E. Kriz, Dunning the Midwest, Nat'l J., April 14, 1990, at 893, on this point.

[58] The lower allocation to ''Other'' under BC than under SR is an artifact; it primarily reflects a legislative decision to exempt some cogenerators and other units from the program altogether.

nett Johnston (D-La.) in promoting provisions favorable to gas-burning units. Senator Johnston represented a major gas-producing and gas-consuming state and chaired the Energy and Natural Resources Committee. Though this committee had broad oversight authority for federal economic regulation of electric utilities and could have plausibly asserted jurisdiction over aspects of the 1990 legislation, it did not do so. Moreover, it would have been natural for gas-burning electric utilities without more direct influence on the relevant committees to turn to Senator Johnston for assistance.

Differences between BC and FA reflect more than a score of other provisions, some of which appear in Table 3. Their most striking implication in Table 5 is the huge increase in allowances for units burning more than 90 percent gas. This results mainly from the ‘‘clean states’’ provision, Section 406, discussed above. This provision allocated a pool of bonus allowances to units in ‘‘clean’’ states in proportion to generation, not baseline emissions.

Table 5 shows that only the dirtiest large units did less well under FA than under BC, even though their FA endowments were increased by explicit bonuses for Phase I units. Small dirty units (<75 megawatts) receive more allowances under FA than BC because they are explicitly favored in the final legislation. In fact, because of bonuses for low capacity utilization (rationalized, of course, by arguments that the base period was unusual) and the special provisions affecting Florida and North Dakota listed in Table 3, allowances were also higher for large units with baseline emissions rates between 1.2 and 2.5.

C. Gainers and Losers by State

To examine the state-level implications of alternative allocation rules, we compute the differences between the corresponding implied allocations. The computation reveals that a shift from PR to SR would impose costs mainly on a few Midwestern states and provide benefits to most others. In addition, there is a good deal of similarity in the differences between the three most plausible alternative benchmark allocations (SR, BC, and CM) and the actual allocation (FA).[59] Accordingly, Table 6 displays the states with the largest (in absolute value) differences between FA and the average of the SR, BC, and CM allocations.

Table 6 reveals that Pennsylvania, West Virginia, and Kentucky, which all burn dirty coal and are large net producers of dirty coal, did particularly

[59] The major exception is Ohio, which receives many fewer allowances under CM than under SR or BC because ICF, *supra* note 36, estimates it to have the lowest abatement costs in the nation.

TABLE 6

STATES WITH LARGEST PHASE II GAINS AND LOSSES VERSUS AVERAGE BENCHMARK ALLOWANCE ALLOCATION

Average Gain			Average Loss		
Absolute	Percent	State	Absolute	Percent	State
61,727	202.03	California*†	93,666	18.17	West Virginia
58,992	27.58	New York†	88,052	13.95	Pennsylvania*
57,126	15.39	Illinois*†	50,057	15.93	Tennessee
29,839	33.87	Louisiana	31,359	7.65	Kentucky
27,460	5.64	Florida	25,759	16.56	Virginia
27,168	20.65	North Dakota†	20,215	34.04	Washington*
19,311	16.33	Wyoming*	19,943	5.89	Alabama
18,590	35.00	Utah	15,687	4.06	Michigan†
18,190	17.26	Minnesota	14,945	2.82	Indiana†
15,515	30.75	Connecticut	13,984	17.18	New Jersey
13,383	11.12	Iowa	12,889	8.09	Maryland
12,678	11.07	Oklahoma	11,351	2.68	Georgia*
11,880	4.30	Missouri*	9,597	5.30	Wisconsin
11,513	18.21	Nebraska	6,194	4.77	Kansas*

NOTE.—Absolute gains and losses are differences between the state's actual (FA) allowance allocation and the average of its allocations under the SR, BC, and CM benchmarks. Percent gains and losses are absolute gains and losses as percentages of the average of the three benchmark allocations.

* States represented in Senate or House leadership. (The other state represented was Maine, which had an average gain of 2,597 (28.22%).)

† States represented in Senate or House committee leadership. (The other states represented were Montana, which had an average loss of 1,621 (5.24%), and Rhode Island, which had an average gain of 1,117 (47.28%).)

poorly in Phase II.[60] One hypothesis that explains this is that these states' congressional delegations focused on obtaining benefits for miners, consistent with what we observe for Phase I allocations, both as direct financial assistance and in the form of incentives to scrub, rather than on obtaining additional Phase II allowances. On the other hand, Illinois, which produced more than twice as much high-sulfur coal as it burned, did well in obtaining allowances in both Phases,[61] while Georgia, which produced no coal, did poorly in both Phases. Ohio and Indiana did much better in Phase I than in Phase II; this may reflect an atypically high valuation of near-term benefits.

Many of the clean states did rather well in Phase II, especially California and Louisiana. These states could focus on Phase II allocations since they had no Phase I units. Similarly, less than 40 percent of utility SO_2 emissions

[60] Recall that they also did poorly in Phase I; see Table 2. In Phase I, however, they did benefit significantly from the bonus allowances for scrubbing.

[61] Illinois' senators occupied no relevant leadership positions; in the House it was represented by the Minority Leader, Robert Michel (R), and by the Ranking Member of the Subcommittee on Health and the Environment, Edward Madigan (R).

in New York and Florida, which also did well in Phase II, were from Phase I units—as compared to over 70 percent in Ohio, Indiana, Illinois, West Virginia, and Georgia. Examination of the Senate and House committee and leadership structures, however, would not suggest that Louisiana or Florida would be winners in this game.[62] Indeed, the two best-positioned congressmen, Chairmen Dingell and Sharp, represented states that wound up doing particularly poorly in Phase II—though Sharp's state, Indiana, did well in Phase I.

Overall, the passage of acid rain legislation aimed at existing dirty units was a loss for the Appalachian and Midwestern coalition that had prevailed in the 1977 debate on SO_2 control. One might have thought that these states, which had the most to lose from this legislation, would have been able to mobilize their well-organized opposition to SO_2 controls and their representation in key leadership positions to obtain a disproportionate share of the allowances, to help to compensate for their high cleanup costs. However, Table 6 reveals that, with a few exceptions, including Illinois and Ohio, the opposite generally occurred. Not only did the states that produced and burned dirty coal lose in the large when they failed to block the passage of an acid rain law, they also generally lost in the small in the contest over the allocation of Phase II allowances. West Virginia and Pennsylvania, historically among the most aggressive opponents of acid rain legislation, were the biggest losers. On the other hand, a broadly distributed set of states that relied primarily on clean coal and gas-fired generation to produce electricity did well relative to these benchmarks. This result is consistent with the Phase II allowance allocation game being one of what Wilson has called ''majoritarian politics,''[63] once the 1977 coalition lost its effort to keep the game from being played at all.

[62] New York and California do not seem likely winners either. New York was represented in the relevant leadership only by the ranking member on Energy and Commerce, Congressman Norman Lent (R). Lent was not generally thought to be nearly as powerful as Chairman Dingell, and Lent's district was not served by Consolidated Edison. California was represented here by Henry Waxman (D), Chairman of Energy and Commerce's Subcommittee on Health and the Environment. Chairman Waxman was primarily concerned with (and only had jurisdiction over) other parts of the 1990 legislation. The Senate majority whip, Alan Cranston (D-CA) took no visible part in the administration-Senate negotiations. California's other senator, Pete Wilson (R), was active in those negotiations, but his focus was on auto-related provisions. As we noted above, some of Louisiana's success in the Phase II ''game'' may reflect the efforts of Senator Bennett Johnston (D), who had some power in this setting because he chaired the Energy and Natural Resources Committee. California's significant gain on clean oil/gas units would then have been in part a byproduct of Senator Johnston's efforts on behalf of similar units in Louisiana.

[63] James Q. Wilson, The Politics of Regulation, in The Politics of Regulation (J. Q. Wilson ed. 1980).

VIII. Hypothetical Votes on Phase II Allocations

As is often the case with complex legislation, the details of Title IV were largely worked out behind closed doors. There was never a recorded vote on any aspect of allowance allocations. Since it is very difficult to deny a determined minority, let alone a majority, the right to offer an amendment on the Senate floor, the lack of *any* votes suggests, at least, that FA was some sort of majority rule equilibrium.[64]

One can explore quantitatively the plausibility of this notion by making some assumptions about voting behavior and seeing how obvious alternatives would have fared in hypothetical votes.[65] Because it is impossible to define the relevant set of alternatives rigorously or to defend ignoring linkages between allowance allocations and other issues in this and other legislation, this approach cannot provide a rigorous test of any hypothesis.[66] Nonetheless, it is interesting to see what can be learned by a simple analysis of hypothetical votes among the alternative Phase II allocations defined in Table 4.

The results of a number of simulated votes are contained in Table 7. It is assumed here that senators and representatives vote for the alternative giving their state more allowances—but only if the difference is noticeable. Given the complexity of the Phase II allocation process, states in which actual differences are relatively small could easily have gotten the sign wrong in the heat of debate. Moreover, as others have observed, if constituents are

[64] To be clear, since there is an alternative allocation with the same total number of allowances that can defeat any proposed allocation, there is no majority rule equilibrium in a game in which vectors of unit-specific allocations compete for votes. (*Proof:* Let X be a proposed equilibrium vector of unit-specific allocations, and let $W(X)$ be the set of elements of X that correspond to units represented (in whatever sense is relevant) by any arbitrary majority of legislators. Let X' be a vector formed from X by increasing all elements in $W(X)$ by ϵ and decreasing all other elements by the common amount necessary to equate the sum of the elements of X' to the sum of the elements of X. Then X' defeats X under majority rule, so X is not an equilibrium.) However, any votes would not have been on allowance vectors but, rather, on a limited set of alternative allocation rules. (Similarly, tax legislation is about the rules in the tax code, not the vector of real after-tax household incomes.) As our discussion should have made clear, significant analytical effort would have been required to determine the incidence of alternative systems of rules, putting proposed amendments to a bill on the floor at a significant disadvantage.

[65] We are unaware of any previous applications of this technique, though we would not be surprised to learn that some exist.

[66] On its face, for instance, dropping the special treatment of North Dakota lignite plants (Section 405(b)(3)) would seem to be a clear winner: one small state loses and all others win. But the others do not win much, and Senator Burdick, the powerful chairman of the Environment and Public Works Committee, would have been furious at the amendment's sponsors and supporters.

TABLE 7

RESULTS OF SIMULATED VOTES ON PHASE II ALLOWANCE ALLOCATION CHANGES

CHANGE AND VOTING TEST	STATES DROPPED	SENATE			HOUSE			ELECTORAL VOTES		
		Yea	Nay	Margin	Yea	Nay	Margin	Yea	Nay	Margin
PR → SR:										
None	0	70	24	46	303	126	177	379.5	147	232.5
$\lvert\Delta\rvert \geq 5\%$	3	68	20	48	302	102	200	376.5	120	256.5
$\lvert\Delta\rvert \geq 10\%$	7	62	18	44	257	99	158	327.5	115	212.5
PR → CM:										
None	0	62	32	30	235	194	41	300.5	226	74.5
$\lvert\Delta\rvert \geq 5\%$	1	60	32	28	228	194	34	292	226	66
$\lvert\Delta\rvert \geq 10\%$	6	54	28	26	199	184	15	258	212	46
SR → BC:										
None	0	48	46	2	220	209	11	274.5	252	22.5
$\lvert\Delta\rvert \geq 5\%$	15	40	24	16	178	91	87	223.5	115.5	108
$\lvert\Delta\rvert \geq 10\%$	31	28	6	22	147	3	144	178.5	9	169.5
SR → FA:										
None	0	50	44	6	209	220	−11	261	265.5	−4.5
$\lvert\Delta\rvert \geq 5\%$	15	40	24	16	170	113	57	212.5	139	73.5
$\lvert\Delta\rvert \geq 10\%$	22	34	18	16	158	75	83	194	92.5	101.5
BC → FA:										
None	0	42	52	−10	207	222	−15	251	275.5	−24.5
$\lvert\Delta\rvert \geq 5\%$	19	28	28	0	138	106	32	170	136.5	33.5
$\lvert\Delta\rvert \geq 10\%$	34	18	8	10	39	24	15	56	35.5	20.5
CM → FA:										
None	0	48	46	2	242	187	55	290.5	236	54.5
$\lvert\Delta\rvert \geq 5\%$	7	40	40	0	197	168	29	236.5	210.5	26
$\lvert\Delta\rvert \geq 10\%$	13	38	30	8	193	111	82	230.5	142.5	88

NOTE.—For each change, congressional delegations or electors of states that gain enough to pass the voting test indicated are assumed to vote yea; delegations/electors of states that lose enough are assumed to vote nay. The average of 1988 and 1992 electoral votes was used to tabulate the final three columns.

not much affected,[67] legislators may be free to indulge their own preferences—which may depend on ideology, logrolling, PAC contributions, or a host of other factors. We have assumed three different thresholds of concern: any change at all, any change above 5 percent in absolute value, and any change above 10 percent in absolute value. Those legislators whose states' allowance changes do not pass the relevant threshold are assumed to divide their votes evenly; for the sake of clarity they are simply omitted from the vote counts in Table 7. For the sake of completeness we have applied the same calculations to electoral votes (including those of the District of Columbia).

Table 7 makes clear that PR is a political nonstarter as well as potentially expensive (Section VII*A* above): a change from PR to SR or to CM passes overwhelmingly in both Houses under any of our thresholds of concern. There are just too many relatively clean states that would suffer under PR for it to gather a majority against any alternative that concentrates the pain in a smaller number of dirty states. This is consistent with SR being at the core of most proposals made during the 1980s and with those proposals having been blocked from passage by powerful legislators from states that this change makes worse off, as discussed above. Once these legislators could no longer simply block acid rain legislation, majoritarian politics increased their pain by reducing the allowances below those they would have received under proportional reduction. This is also broadly consistent with the ultimate rejection of efforts to fashion a cost-sharing program built around a national tax on electricity, a possibility that was seriously discussed during the 1980s. Such a tax would, of course, have benefited precisely those states that lose from a shift from PR to SR, BC, or CM.

A change from SR to BC also passes both Houses, as well as the electoral college. Note that its margin increases uniformly as we impose a stricter voting test. The actual allocation of allowances (FA) defeats CM in the House and electoral college and generally wins in the Senate as well. On the other hand, if we assume that every loss of allowances, no matter how relatively or absolutely small, leads to a ''Nay'' vote, FA fails in the Senate against BC and in the House against both BC and SR. When even a 5 percent threshold of significance is imposed, however, FA beats both alternatives easily in the House, easily beats SR in the Senate, and needs only a nudge to beat BC in the Senate.

On the whole, Table 7 supports the notion that the Phase II allowance allocation provisions were crafted with sufficient (implicit or explicit) concern for their viability on the floors of both chambers to make them no less

[67] See, for instance, Kalt & Zupan, *supra* note 6.

attractive than at least some obvious alternatives. If this had not been the case, one would expect to have seen votes involving alternative allocation provisions.

IX. Estimating Political Determinants of Allowance Allocations

Our analysis thus far does not suggest that the Phase II allowance allocations can be easily explained by a small number of ''standard'' political economy variables. We appear to be dealing with a process of majoritarian politics (once the dam holding back acid rain legislation was broken) combined with a number of special interest provisions to satisfy narrow constituencies. Committees of jurisdiction were not unimportant in the legislative process, but, particularly in the Senate and in conference, issue-specific groups of legislators played critical roles.[68]

Because an abundance of quantitative information is available here, we can use regression analysis to examine whether and how variables measuring the importance of various interest groups, the presence of senators and congressmen in leadership positions, and competitive races for Senate, governor, and/or president in particular states help explain the observed allowance allocation in ways consistent with various theories of distributive politics. This analysis is similar in spirit (and results) to the extensive literature that relates congressional appropriations to various political variables (and that fails to find strong support for any simple theories of distributive politics).[69]

As above, our analysis concentrates on the Phase II allocation for years 2000—2009, both because it is more complex and important (in expected dollar terms) than the Phase I allocation and because it involves a larger sample size. Because of the importance of complex interstate differences in initial conditions, we focus on explaining *differences* between the states' actual allocations (FA) and the average of the allocations implied by our three benchmarks: SR, BC, and CM. (See Table 6 above.) This variable is defined as ΔPHASEII in Table 8.[70]

We focus on differences in numbers of allowances because allowances are homogeneous property rights that should have the same market value no matter to whom they are given. Therefore, the political cost of getting

[68] Cohen, *supra* note 16, stresses that this bill was not atypical of recent experience in this last regard.

[69] See, for instance, the references cited in note 5, *supra.*

[70] Joskow & Schmalensee, *supra* note 16, describe the generally minor differences between the results for this average variable and those obtained for each of the three differences involving individual benchmark allocations.

an incremental allowance for one's own constituents should not depend heavily on the state in which they happen to reside. Nonetheless, we performed a number of experiments involving percentage and per capita differences, without obtaining results qualitatively different from those reported below.

As Table 8 describes, we employed several exogenous variables intended to capture interstate variations in the importance of interest groups involved in debates about acid rain legislation. These include a variable that measures projected job loss in the coal-mining industry as a result of the legislation (HSMINERS),[71] variables that distinguish between clean and dirty states with different levels of SO_2 emissions (EMISSIONS) and different emissions rates (EMRATE),[72] and a variable designed to measure interest in relying on scrubbers by applications for Phase I extension allowances to support scrubber investments (PH1EXT).

One might expect that states for which HSMINERS is large would be very interested in obtaining allowances as compensation for losses of mining jobs. On the other hand, allowances are given to electric utilities, not miners. It is thus at least equally plausible, particularly in light of some of the results of Section VII, that representatives of these states would have neglected the pursuit of allowances in favor of seeking aid for displaced miners and/or attempting to strengthen incentives to scrub. Thus while states with high values of HSMINERS cared more than others about the acid rain program, it is unclear whether that concern should be expected to produce more or fewer Phase II allowances.

We would expect EMISSIONS and/or EMRATE to have positive coefficients if the ''dirty'' states were able to use the Phase II allocation process to make up for some of what they lost through passage of acid rain legislation aimed at existing dirty plants. Negative coefficients, on the other hand, would be consistent with clean states having been able to use the allocation process to their advantage—the pattern suggested by Section VII. Finally, we would expect PH1EXT to be negative if the states interested in scrub-

[71] Two other conceptually weaker mining-related variables were computed. (1) Except for Kentucky and West Virginia, which are divided into two regions each, ICF, *supra* note 36, projections of mining job losses are based on state-level net employment changes, rather than gross flows out of high-sulfur mining. (2) Aid actually received by May 1995 under the displaced worker provision (Title XI) that was pushed hard by mining-state representatives (see Section 4, above) amounted to less than $29 million and could not have been well anticipated in 1990. Both these variables were highly correlated with HSMINERS, and neither outperformed it significantly in regressions.

[72] We also considered using emissions from or allowances given to Phase I units as independent variables, but both were almost perfectly correlated with EMISSIONS ($\rho = 0.96$). The share of state emissions accounted for by Phase I plants did not suffer from this infirmity, but its coefficient never approached statistical significance in any experiment.

TABLE 8

VARIABLES EMPLOYED IN PHASE II REGRESSION ANALYSIS

Variable	Mean	Max	Min	SD	Description
ΔPHASEII	.00	61.7	−93.7	28.4	Difference between actual (FA) Phase II allowances and the average of allocations under SR, BC, and CM, thousands of tons per year from 2000 to 2009
HSMINERS	1.18	21.6	0	3.64	Estimated number of miners of high-sulfur coal, thousands: product of (fraction of 1992 demonstrated reserves with >1.68 lbs. sulfur per million Btu [from U.S. Energy Information Admin., U.S. Coal Reserves: An Update by Heat and Sulfur Content (DOE/EIA-0529, 1992), table C-1]) and (average daily employment of coal miners in 1990 [from National Coal Assn., Coal Data 1994, at 11–20])
EMISSIONS	348	2,303	.16	473	Baseline SO_2 emissions, thousands of tons
EMRATE	1.49	4.20	.01	1.03	State average SO_2 emission rate from fossil-fueled electric generating units, pounds per million Btu of fuel burned
PHIEXT	16.6	190	0	42.1	Phase I extension allowances requested for generating units in the state, average per year from 1995 to 1999, thousands of tons
SEN	.27	1	0	.45	Competitive Senate election dummy variable: equals one if state has a competitive Senate race in 1990 (races labeled ‘‘Best Bets’’ or noncompetitive in Nat’l J., March 17, 1990, were excluded), zero otherwise
GOVEV	6.14	50.5	0	9.95	Competitive and important governor’s election: product of (a dummy variable for competitive governors race, constructed like SEN) and (the average of the state’s 1988 and 1992 electoral votes)

SWINGEV	10.0	48.2	.65	8.85	Important swing state: product of {[1 − |RPCT − 53.4|/50], where RPCT is the percentage of the state's popular vote cast for Bush in the 1988 Presidential election, and 53.4 is the sample mean of RPCT} and {the average of the state's 1988 and 1992 electoral votes}
HLEAD	.10	1	0	.31	Number of House leadership slots (5 total) filled by the state's delegation
HCR	.12	2	0	.39	Number of House committee (Energy and Commerce) and subcommittee (Energy and Power, Health and Environment) chairmanships and ranking member slots (6) filled by the state's delegation
HCOMM	1.35	8	0	1.84	Number of House committee (Energy and Commerce) slots (43) plus number of subcommittee (Energy and Power) slots (22) filled by the state's delegation
SLEAD	.08	1	0	.28	Number of Senate leadership slots (4) filled by the state's delegation
SCR	.06	1	0	.24	Number of Senate committee (Environment and Public Works) and subcommittee (Environmental Protection) chairmanships and ranking member slots (4) filled by the state's delegation
SSUB	.29	1	0	.46	Number of Senate subcommittee (Environmental Protection) slots (14) filled by the state's delegation
ΔPHASEI	.00	58.2	−26.1	13.7	Actual Phase I allowances minus allocation under rescaled Basic Rule (from Table 2), thousands of tons per year

NOTE.—Except as noted, data are from EPA (principally the NADB) and standard references on U.S. politics. Sample size = 48: Alaska, Hawaii, and Idaho are excluded from the sample, as from the acid rain program, and the District of Columbia is included.

bing (either because it was the least-cost control option or because of pressures to save high-sulfur coal miners' jobs) gave up Phase II allowances in exchange for greater scrubber incentives during Phase I.

We also computed two sets of more narrowly defined ''political'' variables. In the spirit of models of partisan distributive politics, variables in the first set are designed to measure states' electoral importance when the 1990 legislation was being considered. These variables include a dummy variable indicating whether there was a competitive election for the Senate expected in 1990 (SEN), the national importance of an upcoming competitive governor's race (GOVEV), and a variable that measures the importance of a state as a ''swing state'' in the 1988 presidential election (SWINGEV). Since 1990 was an election year, it seems plausible that states would have had more clout in the zero-sum allowance allocation game if they had a competitive senatorial race (SEN) or if they were an important state with a competitive gubernatorial race (GOVEV). It also seems plausible that important states that were swing states in the 1988 presidential race (SWINGEV) would have extra bargaining strength.[73] If these electoral importance variables influenced allocations, they should have positive signs. Since the issues in the acid rain program, and in the allowance allocation process in particular, did not reflect a clear split between Democrats and Republicans, we have not included variables measuring party affiliations or ideological ratings of each state's legislators.

The second set of political variables reflects the nonpartisan distributive politics literature, which implies that the ability of an individual legislator or a group of legislators with similar interests to affect acid rain legislation depends, in part, on whether they occupy positions on key committees or subcommittees or hold leadership positions that provide special influence over the provisions of the bill reported to the Senate or the House floor.[74] The variables in this second set include the number of House and Senate leadership posts (HLEAD and SLEAD), the number of House and Senate committee and subcommittee chairmanships and ranking member slots filled by a state's representatives (HCR and SCR), and the number of committee and/or subcommittee slots filled by a state's representatives in the

[73] One might also suspect that rich states would have more clout, all else being equal (perhaps because of the presence of campaign contributors), but income per capita had essentially no explanatory power in any equation.

[74] See Barry Weingast & M. Moran, Bureaucratic Discretion or Congressional Control, 91 J. Pol. Econ. 765 (1983); Barry Weingast & W. J. Marshall, The Industrial Organization of Congress; Or, Why Legislatures, Like Firms, Are Not Organized as Markets, 96 J. Pol. Econ. 132 (1988); Kenneth A. Shepsle & Barry R. Weingast, When Do Rules of Procedure Matter? 46 J. Pol. 206 (1984), and The Institutional Foundations of Committee Power, 81 Am. Pol. Sci. Rev. 85 (1987).

House and Senate (HCOM and SSUB). The leadership in the House (HLEAD) and Senate (SLEAD) generally has seats at any negotiating table about which they care. Committee membership and, especially, chairmanship or service as the ranking minority member can convey issue-specific influence via agenda control.

As we discussed in Section IV, on the House side both the Energy and Commerce Committee (chaired by Congressman Dingell) and two of its subcommittees played important roles in the Clean Air process, though only one of the subcommittees (chaired by Congressman Sharp) dealt with the acid rain program explicitly. Thus HCR counts all chairmen and ranking members involved in Clean Air, while HCOMM gives extra credit for membership on the subcommittee that dealt with the acid rain program. On the Senate side the process was very different. The Senate bill was essentially written in negotiations with the administration in early 1990. While Senator Baucus generally chaired the negotiation sessions, Senator Mitchell assumed the chair at key moments and was heavily involved throughout the process. Similarly, while most senators in the room at any one time were likely to be members of Senator Baucus's Subcommittee on Environmental Protection, the sessions were open to all senators, and many nonmembers participated personally on issues with which they were particularly concerned and had staff in regular attendance. The variables SCR and SSUB attempt to reflect the essential elements of this process.[75] We would expect all the congressional control variables in this second set to have positive coefficients.

Some of our regressions also included ΔPHASEI, a variable, taken from Table 2, that measures how well or poorly a state did in the Phase I allocation process relative to the ER $= 2.5$ benchmark.[76] Our idea here is that states that did relatively well in Phase I for reasons not reflected in our Phase II independent variables might also have done well in Phase II, reflecting the same unobserved political forces. This variable is clearly endogenous, and its coefficient cannot be given an unambiguous structural interpretation.[77]

[75] Idaho, with one subcommittee member, Steve Symms (R), was excluded from our sample because it had no fossil-fueled generating units and was thus not included in the allowance allocation process.

[76] This variable does not reflect actual or anticipated extension (scrubber bonus) allowances; it is from the second-last column in Table 2.

[77] Several additional variables were employed in a variety of unsuccessful experiments. One might expect that representatives of states with high electricity rates or expecting to need large numbers of allowances to accommodate growth would both be particularly interested in obtaining incremental allowances and particularly able to argue effectively for them, especially in light of Florida's ability to obtain Section 405(I)(1), but a range of experiments failed to support either hypothesis. (We used the product of the 1980–90 population growth

Table 9 presents illustrative estimation results for a series of equations in which ΔPHASEII is the dependent variable and alternative combinations of the three sets of variables discussed above are the independent variables. In the equation described in the first column of Table 9, as in all other equations estimated with a large number of plausible independent variables, most coefficients are not significantly different from zero.

Several ''political'' variables in that equation never had significant coefficients in any specification, and we drop them from further consideration. One of these was SEN, even though all of SEN's correlations with the other independent variables were less than 0.25. In addition, neither HCOMM nor SSUB ever had significant coefficients, perhaps reflecting the general decline in the importance of committees and the concomitant rise in the importance of other issue-specific groups stressed by Cohen.[78] The coefficient of SCR was never significant, even though that of HCR was positive and significant in all specifications.

Finally, the coefficient of HLEAD was generally negative and sometimes significant. Four of the five House leadership slots were filled by representatives from Georgia, Illinois, Missouri, and Pennsylvania—all high-emissions states. (The correlation of HLEAD with EMRATE is 0.44.) It seems most likely that there is no real ''leadership effect,'' since a negative effect is implausible and SLEAD never had a positive and significant coefficient. The negative HLEAD coefficient simply tells us that ''dirty'' states did poorly in Phase II allocations despite being well represented in the House leadership. Accordingly, we drop both HLEAD and SLEAD from further consideration.

Dropping the variables just discussed leads us to the second equation in Table 9. That equation has two groups of independent variables, with high intragroup correlations and low intergroup correlations. The first group consists of four variables that we think of as measuring ''dirtiness'': HSMINERS, EMISSIONS, EMRATE, and PHIEXT. The lowest of the six pairwise correlations among these variables is 0.38, and the second-lowest is 0.49. The second group consists of three variables that we think of as measuring political/electoral ''clout'': GOVEV, SWINGEV, and HCR. The

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rates and baseline emissions as a measure of growth-related allowance ''needs.'') Optimistic economists might expect that states with high baseline average or marginal costs would be both eager and able to obtain incremental allowances, all else being equal, but coefficients of such variables (based on ICF, *supra* note 36, as above) never approached statistical significance. Finally, we attempted to measure the importance of two other Clean Air issues, ozone nonattainment and alternative fuels, that might have been involved in cross-Title deals. Specifically, variables measuring the percentage of each state's population in severe or extreme ozone nonattainment areas and each state's production of corn and natural gas (inputs into alternative fuels) never had significant and sensible coefficients in any specification.

[78] Note 16 *supra*.

TABLE 9

Phase II Regression Results

Independent Variable	Dependent Variable = ΔPHASEII					
Constant	−4.032	5.142	1.746	4.094	−2.646	−5.412
	(10.55)	(8.770)	(3.618)	(7.810)	(3.983)	(5.386)
HSMINERS	−.043	−.814	...	...	...	−2.660*
	(1.194)	(1.088)				(.976)
EMISSIONS	−.0311	.023	...	...	...	...
	(.0220)	(.020)				
EMRATE	1.400	−4.642	...	−9.054*	...	...
	(6.534)	(5.849)		(3.708)		
PHIEXT	−.604*	−.421*	−.334*	...	−.466*	...
	(.198)	(.158)	(.078)		(.065)	
SEN	−4.594	...	...	...	...	...
	(9.026)					
GOVEV	.393	.555	...	...	...	...
	(.593)	(.530)				
SWINGEV	−1.012	−.522	...	.942*	1.039*	.854*
	(1.030)	(.731)		(.433)	(.299)	(.404)
HLEAD	−22.79	...	...	...	...	...
	(15.02)					
HCR	30.67*	27.82*	30.47*	...	...	...
	(14.24)	(12.68)	(8.328)			
HCOMM	3.923	...	...	...	...	...
	(3.894)					
SLEAD	.788	...	...	...	...	...
	(13.84)					
SCR	9.549	...	...	...	...	...
	(13.85)					
SSUB	9.481	...	...	...	...	...
	(8.183)					
ΔPHASEI	...	...	...	...	1.140*	.745*
					(.200)	(.260)
R^2	.538	.461	.403	.184	.630	.379
SE	22.67	22.58	22.40	26.20	17.83	23.11

Note.—Standard errors are in parentheses. Sample size = 48.
* Significant at 5%.

lowest of the three pairwise correlations among these variables is 0.58. Within each of these groups, the different variables are conceptually quite distinct. If their performance in regression experiments could also be clearly distinguished, it might be possible to base a structural story on the results. These data, however, are not so kind.

Note first that in the second equation in Table 9, only one variable from each of these two groups has a coefficient that is significant at the 5 percent level. Similarly, in the 18 equations (not shown) with two variables from each group, at most one from each group is significant. In the 12 regressions with only one variable from each of these groups, however, all ''dirtiness'' coefficients are negative, all ''clout'' coefficients are positive, all 24 slope coefficients are significant at 5 percent, and 16 are significant at 1 percent. The third and fourth columns in Table 9 show the specifications within this set with the highest and lowest values of R^2, respectively.

These results provide strong evidence that ''dirty'' states tended to do poorly relative to our benchmarks in Phase II, while states with ''clout'' tended to do well. Unfortunately, high correlations within our two groups of independent variables make it impossible to use these data to determine with any confidence what elements or aspects of ''dirtiness'' and ''clout'' were most important. We are thus unable to discriminate among a large number of plausible structural hypotheses.

We ran the same set of 12 regressions just discussed using ΔPHASEI as the dependent variable and restricting the sample to the 21 Phase I states. All coefficients of both ''dirtiness'' and ''clout'' variables were *positive,* though only one of each was significant at 5 percent. These results at least suggest that the dirtiest states concentrated on Phase I, where they did relatively well on average, at the expense of Phase II, where they fared less well. These results also suggest that the ''clout'' variables are at least correlated with the ability to affect the legislative process positively—at least in the context of acid rain in 1990.

Finally, we re-ran the 12 regressions with one ''dirtiness'' variable and one ''clout'' variable on the right, adding ΔPHASEI as a third independent variable. All coefficients of ''dirtiness'' variables were negative and significant at 5 percent; all coefficients of ''clout'' variables were positive and significant; and all coefficients of ΔPHASEI were positive and significant. The last two columns of Table 9 show the specifications among these 12 with the highest and lowest R^2 values, respectively. These results suggest that states that managed to do well in Phase I for reasons not correlated with our ''dirtiness'' and ''clout'' variables also did well in Phase II. Unfortunately, there seems to be no way to use these data to tell what sorts of forces this effect might reflect, and the complex legislative history summarized above provides no obvious candidates.

This analysis suggests four tentative conclusions. First, and perhaps most important, there does not appear to be any simple, structural theory of distributive politics that is well supported by the data. In particular, the failure of most congressional leadership and committee membership variables seems inconsistent with theories in which power over most legislation is concentrated in the hands of a few people who happen to occupy key positions. This result does not in any sense refute the literature that emphasizes the role of committees, subcommittees, and leadership positions in congressional behavior, however. After all, Congressman Dingell and Senator Byrd managed to block Clean Air legislation for a decade, with the help of a Republican president opposed to new environmental legislation. But, once acid rain legislation got through the gate, the distribution of influential committee assignment and leadership positions did not help much in predicting allowance allocations. As our discussion of Table 3 indicates, some legislators with key committee posts clearly used them to benefit their constituents through the allocation process, but others did not, and several states without obvious influence on the relevant committees or in the leadership did quite well.

Second, there is good evidence that ''dirty'' states—those on average with many high-sulfur coal miners, high total emissions and emissions rates, and much interest in using scrubbing to comply with Phase I emissions limits—did relatively poorly in the Phase II allowance allocation game, all else equal. There is weak evidence suggesting that the very dirtiest states did relatively well in Phase I, suggesting in turn a willingness to give up Phase II allowances to obtain Phase I allowances from states less concerned with Phase I compliance. Third, there is strong evidence that states with political ''clout''—because they were large states that were swing states in the 1988 presidential election, or because they were large states that happened to have competitive gubernatorial campaigns in 1990, or because they had representatives in the House Energy and Commerce leadership—tended to do well in Phase II, and weak evidence that they also did well in Phase I, all else equal.[79]

Finally, there is strong evidence that states that did well relative to our Phase I benchmark, holding ''dirtiness'' and ''clout'' constant, also did well in Phase II. In a way, this just reaffirms our first tentative conclusion: something not captured by any of our ''dirtiness'' and ''clout'' variables produced positive results in both phases. We do not know whether this factor primarily reflects differences in legislators' effectiveness, logrolling on issues outside the acid rain Title (or even completely outside the Clean Air

[79] At the suggestion of an editor, we ran a number of regressions using as dependent variables SUM = D(ΔPHASEII) + ΔPHASEI and DIF = D(ΔPHASEII) − ΔPHASEI, where $D = (1.05)^{-5}$ is a discount factor reflecting the 5 years between the starts of Phases I and II. As before, at most one ''dirtiness'' and one ''clout'' variable was significant at the 5 percent level in any one regression. In both SUM and DIF regressions involving one variable from each group (12 regressions each), all ''dirtiness'' coefficients were negative and all ''clout'' coefficients were positive. In the SUM regressions, none of the ''dirtiness'' coefficients and eight of the ''clout'' coefficients were significant. In the DIF regressions, all of the ''dirtiness'' coefficients were significant, along with six of the ''clout'' coefficients. These results are consistent, at least, with the notions that the ''dirtiest'' states gave up Phase II allowances in exchange for Phase I allowances and that ''clout'' was valuable. Mechanically, however, these results reflect the high correlations between ΔPHASEII and both SUM ($\rho = 0.91$) and DIF ($\rho = 0.80$).

bill), or other effects. Whatever this factor reflects, it appears likely from our earlier work that Illinois had it and Georgia did not.

We do not believe that these regression results should be interpreted as implying that interest group politics, congressional influence, or considerations of state and federal electoral politics did not play an important role in the allocation of SO_2 allowances. Our earlier discussion shows that there is clearly evidence of rent-seeking behavior and congressional influence at work. However, these effects are apparently too subtle and too complex to be captured in any but the crudest way in this kind of summary regression analysis. This is consistent with the results of related work analyzing congressional appropriations.

X. Conclusions

Environmental regulation is an excellent example of interest group politics mediated through legislative and regulatory processes. The history of federal regulations governing power plant emissions of SO_2 represents, in many ways, a classic case. Concentrated and well-organized interests in a few states that produced and burned high-sulfur coal were able to shape the Clean Air Act Amendments of 1970 and, particularly, 1977 to protect high-sulfur coal and impose unnecessary costs on large portions of the rest of the country. During most of the 1980s, the Midwestern and Appalachian utility and mining elements of this coalition managed to use their control over key congressional leadership positions, combined with presidential opposition to new environmental legislation, to block new acid rain legislation. However, once it became clear that acid rain legislation was likely to be enacted as part of a larger reform of the Clean Air Act, our analysis indicates that this coalition was unable to avoid appreciable control costs by obtaining a disproportionate share of emissions allowances.

With regard to Phase I allowances (apart from scrubber bonuses), three of the states with the greatest emissions and cleanup requirements (Ohio, Indiana, and Illinois) did relatively well compared to other states, while four others (Pennsylvania, West Virginia, Kentucky, and Georgia) did relatively poorly. Aside from Illinois, the utilities and, indirectly, high-sulfur coal miners in these states benefited from bonus allowances allocated to Phase I units that scrubbed. However, aside from Illinois, the traditional coalition of high-sulfur coal producers and high-sulfur coal users were not able to claw back a disproportionate share of Phase II allowances. Indeed, they lost even more during the legislative allocation process than they would have if several simple alternative allocation rules had been utilized. Specifically, the relatively larger number of clean states with little to gain per capita were more successful in Phase II than the relatively small number of ‘‘dirty’’ states with much to lose per capita.

If anything, the resulting allocation of Phase II allowances appears more to be a majoritarian equilibrium than one heavily weighted toward a narrowly defined set of economic or geographical interests. It is not strongly consistent with the predictions of standard models of interest group politics or of congressional control. In some cases, influential senators and congressmen managed to capture special benefits for their constituents. In other cases, particular states did much better (or much worse) in the allocation process than might have been predicted by simple theories of distributive politics. On average relatively ''dirty'' states did poorly in Phase II (perhaps because they were more concerned with Phase I and benefits for miners), while states with political ''clout'' did relatively well in both Phases. These results do not have great explanatory power, however, and we can only conclude that the fight to grab allowances, within a range of allocations that could not be easily defeated in the Senate or House, reflects both a more complex and a more idiosyncratic pattern of political forces than one might expect from previous work on the political economy of clean air.

Of course, none of this takes away from the fact that Title IV of the 1990 Clean Air Act Amendments put in place a major long-term program to reduce pollution using an innovative tradable emissions permit system. At least in theory, the allowance system gives utilities enormous flexibility in meeting aggregate emissions reductions goals and may thus allow them to meet those goals at much lower cost than under traditional command and control approaches. Demonstrating this theory in the large-scale acid rain program may lead to fundamental changes in environmental policies and significant reductions in their costs.

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