Exerpt From: *The Political Economy of Environmental Protection*

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"We are in a position more and more completely to say how far the waste and destruction of natural resources are to be allowed to go on and where they are to stop. It is curious that the effort to stop waste, like the effort to stop forest fires has often been considered as a matter controlled wholly by economic law. I think there could be no greater mistake." Gifford Pinchot (1910, *The Fight for Conservation,* reprinted in Nash (1967)).

I

II   Chapter 1: Introduction and Overview of the Political Economy of Environmental Protection

In principle, environmental policy concerns all matters which directly or indirectly affect the manner and the extent to which human society makes use of nonhuman resources. Rules which allow or promote hunting and farming imply that some fauna and flora become more common and others less so. Property rights which encourage mining and manufacturing imply that some minerals become less common and others more so. Mankind can not sustain itself without relying on nature for fundamental necessities, and any use of natural resources, naturally, alters the environmental balance in discernible ways.

The role of politics in determining the manners in which natural resources may be utilized is pervasive. Political decisions largely determine the feasible uses of natural resources by defining and enforcing fundamental property rights and entitlements over matters with environmental consequences. Government policies affect population magnitudes and densities through affects on birth rates, mortality rates, land use and patterns of migration. Government policies affect the environment through policies and expenditures which affect the rate of return and thereby the accumulation of new knowledge and technologies.

By determining the rules of the game, political decisions determine the extent to which humanity is empowered to transform the world, the processes used, and the waste products produced.[1]

Only a subset of the broad range of environmentally relevant policies is principally motivated by environmental concerns. These policy areas are often referred to as environmental law or environmental protection. The papers in this volume focus on the political and economic underpinnings of such policies. Other recent volumes have addressed economic and game theoretic aspects of environmental policies, but have neglected the political processes by which environmental policies are actually adopted and implemented. This book remedies that neglect by examining political factors which influence environmental policies. Analysis of the politics of broader policies which have environmental ramifications is, of course, also of interest, but focusing on environmental policies per se reduces the number of factors to be examined to manageable numbers. This allows a more systematic analysis and facilitates empirical testing of the analyses developed.

The first section of this introductory chapter addresses several conceptual issues raised by environmentalists in the greater green debate who approach environmental policy as a "crisis area" rather than as an ongoing policy concern. Section II develops a rational choice perspective on environmental politics in order to provides a frame of reference for the papers included in the volume. Section III develops an overview and summary of the papers included in the volume. Section IV provides a few concluding remarks.

A. Environmental Controversy

The focus of the various policies of "environmental protection" is not really about protecting the world's nonhuman resources from mankind, as the term seems to suggest. Nor is environmental protection an attempt to minimize the effect of human activities on nonhuman natural processes.[2] While it may be technologically feasible to completely isolate mankind from nature in a hermetically sealed self-sufficient enclave, all but the most extreme environmentalists envisage a world in which man continues to flourish and range over a largely unrestricted domain. That is to say, environmental policies take for granted the existence of some

greater than minimal human impact on the environment. At root, environmental policy is a matter of determining the "appropriate use" of natural resources by mankind.

Most environmental controversies concern alternative interpretations of the phrase "appropriate use" and the political processes that determine which interpretation(s) will be implemented as policy. Opinions differ widely about the "appropriate use" of natural resources for a variety of reasons. Individuals disagree about the role of nature in what might be called "the good life." Some individuals are highly appreciative of nonhuman processes of transformation. Others find nature disorderly, dirty, and dangerous. Clearly the untrammeled original "natural" state is more attractive to those whom believe that material comforts impoverish the soul, than for those who believe that physical discomfort distracts one from higher ends. Disagreements also exist over assessments of man's responsibility to other species, and over such scientific matters as the resilience and stability of meteorological and ecological systems.

Differences in economic circumstances and comparative advantage also play a role in determining the range of opinion. To a builder, the "appropriate use" of a piece of land may be to provide a comfortable habitat for humans through appropriate modifications in the location, arrangement and assortment of natural and man made resources present at the site and elsewhere. A builder might wish to clear the "site" and build houses. To a farmer, its "appropriate use" may involve a somewhat less radical transformation of the existing state of nature, although it may also entail removing current residents from the site and moving in new residents -- clearing, plowing and planting corn. To a naturalist, its "appropriate use" may entail erecting legal or physical barriers around the site to exclude those who have other ideas about "appropriate use."

Stated in an economist's terms, *individuals disagree about the extent to which various human and nonhuman processes of transformation add or decrease value.* These differences lead individuals to adopt different levels of "environmental protection" in their own lives -- making more or less use of pesticides, motor cars, sidewalks, imported flowers and the like -- and to disagree about the relative merits of public policies which affect the manner and extent to which natural resources may be utilized. It is these differences which political arrangements confront when making policy decisions. And, it is these disagreements which make the political economy of environmental protection a subject of interest to those who wish to understand the political and economic processes which characterize man's lawful relation to nature.

B. The Problem of Environmental Management Is Not New

Although the volume of environmental regulation in the U. S. has increased substantially during the past thirty years, these laws are by no means the first American efforts to adopt rules for the purpose of restricting or redirecting man's use of the environment. As early as 1626, the Plymouth Colony passed ordinances regulating the cutting and sale of timber on colony lands (Meyer, 1966). In 1652, the first public water supply was constructed in Boston. In 1657, the burgomasters of New Amsterdam issued an ordinance prescribing that the streets be kept clean, and that all rubbish and filth be deposited at certain designated places (Sopper, 1966). In 1681, William Penn required that new land owners leave an acre of forest standing for every five acres cleared in his ordinance for the disposal of lands(Meyer. 1966).

Rules to control access to common property resources, to regulate waste disposal and assure potable supplies of water, of course, predate these American efforts by many centuries. Appreciation of the environment's role in health and beauty coincide with the dawn of written history. To take a relatively modern example, well after sunrise, consider Aristotle's (330 B. C. / 1969 p. 278) discussion, in passing, of policies concerning water and air quality in his characterization of the ideal community.

"I mention situation and water supply in particular because air and water, being just those things that we make most frequent and constant use of, have the greatest effect on our bodily condition. Hence in a state which has [the] welfare [of its citizens] at heart, water for human consumption should be separated from water for all other purposes."

Community waste disposal sites and burial grounds have greatly facilitated the research of archeologists in what surely must be an unanticipated consequence of the environmental regulations adopted by the civilizations of antiquity.

Environmental prerequisites to a comfortable and healthy life have long been a practical matter at the core of economic prosperity.[3] What has varied through time has been the efficacy of efforts to mold nature into more useful and pleasing forms as the aesthetic assessments and technological feasibility of alternative uses of natural and human resources have varied. The fundamental environmental policy issues are today, as ever, where to draw the line and where the line will be drawn.

C. A Digression on Technological and Legal Foundations of the Environmental Commons

Natural resource management issues may usefully be subdivided into two areas: those regarding the management of stationary resources and those regarding the management of freely circulating resources. Both these areas have long been subjects of government regulation, and both exhibit similar problems insofar as free access to either sort of natural resources tends toward excessive use: what Hardin (1968) termed the tragedy of the commons. However, the cost, effectiveness and feasibility of alternative management methods differs substantially across these two types of resources. Regulating access to stationary resources is generally less problematic than regulating access to freely circulating resources because monitoring costs are lower and the problems associated with mismanagement are more obvious.

Historically, a variety of management methods have been used to limit access to stationary resources in order to promote their productive and sustained use. One broad class of methods widely used for centuries involves the assignment of "use rights" for particular stationary resources, such as grazing lands, gardens, or lodging sites. Here the political authorities do not directly regulate the use of natural resources, but rather define and protect the use rights of lawful "owners."[4]

In cases where "use rights" are exclusive *and* tradable, markets for "use rights" give owners incentives to consider both the current and future productivity of the resource over which they have control. The current income and resale value of a well managed site tends to be higher than one that is poorly managed. Exclusive and marketable "use rights" also create a low cost method whereby resources may be shifted from more talented resource managers. Better managers are naturally willing to pay a higher price for use rights than poor managers because they anticipate greater output from the same resources.

Few would argue that privatization solves all the problems of managing stationary resources, but the efficiency of the property rights solution as a method of encouraging the production of valued services for humankind is attested to by the fact that formal chains of title to real estate in Western Europe and in the Eastern United States generally predate current governments, often by several centuries.[5] The property rights solution to the management of stationary resources is relatively permanent and unobtrusive, and requires little political oversight on a day to day basis.[6] Monitoring the unauthorized use of privately owned resources is largely undertaken by property owners themselves, which further reduces the cost of the this solution to the commons problem.

Management of freely circulating resources is more problematic, and is, partly for this reason, of greater modern policy interest. Circulation and diffusion give air and water systems a substantial capacity for dissipating and neutralizing many of the undesired byproducts of farming, manufacturing, and transport. Circulation and diffusion also imply that access to these resources is largely unimpeded by inconvenient distances, no trespassing signs, or fences. These properties have long been relied on (at least implicitly) as inputs in the production process. It is, after all, what makes fire, farming, and indeed breathing, possible. Unregulated free access to these systems eventually leads to over exploitation of their productive capacities in much the same manner as was true for stationary resources. New users gain average net benefits from use rather than marginal net benefits. Marginal net benefits are below average benefits (and may even be negative) because a large proportion of productivity losses are borne by other users in the form of reduced air or water quality.

The same properties of the air and water systems which make them valuable inputs for production and as a vehicle for waste disposal also make them difficult to regulate and/or to privatize. Communities can not

assign use rights to *particular units* of freely circulating air and water in the same manner that they can for land and mineral resources.[7] Air and water are unlike railroad box cars and cattle in that particular "pieces" of air or water can not be readily identified, isolated, or therefore assigned to particular "owners." This contrasts with, for example, homogeneous acreage in a featureless desert or plain which can be assigned to owner/users on the basis of geometric coordinates. Tradable rights to *use* air and water can be established, but such rights are *user rights to a common property resource* rather than ownership in the usual sense.[8]

Politics in areas of communal resource management is nearly unavoidable. Controversy over appropriate access to communal resources is likely because common ownership implies that decisions to curtail, maintain and/or increase "use rights" directly affects the interests of all other users of the common property resource. The physical properties of circulating natural resources imply that a relatively large number of affected parties will disagree over the importance of controlling particular point sources of effluent emissions. Diffusion generally diminish the impact of effluents as distance from the point of origin increases. Consequently, even if there were no other disagreement regarding acceptable emission rates, diffusion provides a physical basis for political controversy at all levels of government with authority over the affected parties. (Ingberman and Faulhaber analyze some political implications of such effects in chapter 8 of this volume.)

III   The Politics of Environmental Protection

The aim of this section of the introduction is to develop a frame of reference for the more particular analyses of the rest of this volume. All the papers in this volume use the tools of modern political science and economics to analyze various determinants of specific policy areas. None of the authors explicitly address all the complex relationships between the politics and economics of environmental regulation, but rather develop as narrow or abstract a model as useful for the subject examined. The framework developed below provides an overarching model of political/economic interaction which allows the papers to be linked up to form a general analysis of environmental politics.

Environmental policies reflect the interests of those empowered to make policy decisions given their personal, economic, and political constraints. Constitutional and legal arrangements determine which individuals are empowered to make environmental policy decisions in a democracy, and to whom such policy makers are accountable. Economic considerations determine the real cost and feasibility of alternative policies. These political and economic constraints may be so binding that policy makers have little discretion over policy. Elected representatives and the bureaucracy may unfailingly advance the perceived policy interests of their electorate. Or, political and economic constraints may allow so much discretion that government decision makers simply do as they please on environmental matters.[9]

Inasmuch as the environmental policies of interest are generated by human actions, all politically relevant demands for environmental quality are at root personal demands. Consequently, models of individual choice in various political and nonpolitical settings can be used to analyze the determinants of environmental policy. The rational choice approach to political economy is used throughout this volume and is illustrated below with an analysis of an individual's private and political demand for environmental quality. Mathematics is used to develop rigorously an internally consistent model of economic and political relationships, but is not essential to the perspective developed.

A. Environmental Choice: The Private Demand for Environmental Quality

Suppose that an individual must allocate some personal holding of natural resources (perhaps a piece of forest land) between its current natural state valued for its own sake and a production process which yields desired outputs and undesirable effluents. The environmental tradeoff is represented with a production function that includes effluents as an "input" into the production of desired outputs, $Y_i = f(R^P_i, E_i, T)$. Desired output, Y_i, increases as more natural resources are devoted to production, R^P_i ($Yi_{R_{Pi}} > 0$). And, for any given use of natural resources, desired output increases as more effluents, E_i, are released ($Yi_{Ei} > 0$).[10] Advances in technological knowledge, T, increase the extent to which desired outputs can be obtained from a given use of natural resources ($Yi_{TR_{pi}} > 0$)

and diminish the extent of effluents that need be generated ($Yi_{TEi} < 0$). The resources that the individual devotes to production (R^p_i) reduces what remains in its natural state for other purposes ($R^n_i = R^o_i - R^p_i$).[11]

The individual's allocative decision is represented as an attempt to maximize a utility (objective) function defined over natural resources (possibly including leisure), produced goods, and effluents, given existing production technology, T, environmental knowledge, I, and a personal endowment of natural resources, R^o_i. Individuals control the extent to which their own resources are used to produce desired and undesired outputs (Y_i and E_i), but not the overall level of effluents confronted by the individual. The ambient pollution level, E, is the sum of all producers in the area of interest, $E = \sum^N_{i=1} (E_i)$. The repulsiveness of this pollution varies with its level and the individuals knowledge, I, of its harmful or unattractive nature.

In order to simplify exposition, without significant loss of generality for the purposes of this illustration, each decision variable is treated as if it is single dimensioned, although it is clear in fact that each is multidimensional. The effects of time and uncertainty are also neglected, or subsumed in the functional form of U_i.[12] As in the above, the resource use and output of a typical individual is characterized as an effort to maximize:

$$U_i = u_i(R^n_i, Y_i, E, I) \tag{1}$$

subject to:

$$Y_i = f(R^p_i, E_i, T) \tag{1.1}$$

$$E = \sum^N_{i=1} E_i \tag{1.2}$$

and:

$$R^o_i = R^n_i + R^p_i \tag{1.3}$$

Substitution allows the decision to be cast in environmental terms as a choice of nonproduction uses of resources and effluent emissions.

$$U_i = u_i(R^n_i, f(R^o_i - R^n_i, E_i, T), \Sigma E_i, I) \tag{2}$$

Differentiating with respect to R^n_i and E_i and setting the result equal to zero allows the individual's utility maximizing private environmental policy to be characterized as that combination of R^n_i and E_i which satisfies:

$$U_{Rn} = U_Y Y_{Rp} \tag{3.1}$$

$$-U_E = U_Y Y_E \tag{3.2}$$

or dividing:

$$U_{Rn} / - U_E = Y_R/Y_E \tag{3.3}$$

The individual's personal choice of environmental quality is determined jointly by objective and subjective tradeoffs. Generally, the greater are the objective effects of alternative effluent and natural resource rates on personal income, the less interest individuals have in preserving natural resources or limiting their emissions of effluents. The greater the marginal appreciation of natural resources for their own sakes or marginal distaste for effluents, the less inclined individuals will be to devote natural resources to manufactured goods.

Equation 3.3 summarizes these trade offs. Resources are retained in their natural state (withheld from production) and effluents are emitted in the combination where the marginal rate of (private) substitution between natural resources and pollution equals their technological rate of substitution in production. The implicit function theorem allows the individual's preferred use of natural resources and effluent emissions (pollution) to be characterized as functions of the various parameters of the individual's optimization problem:

$$R^n_i = r_i (R^o_i, \sum^N_{j \ne i} E_j, T, I) \tag{4.1}$$

and

$$E_i = e_i (R^o_i, \sum^N_{j \ne i} E_j, T, I) \tag{4.2}$$

Together, these equations characterize the individual's private demand for environmental quality as functions of various parameters of the individual's choice problem. Desired environmental quality varies with the extent of

natural resources controlled, technological and cultural knowledge, and the effluent emissions of other individuals.[13]

These "best reply" functions can be used to characterize an overall equilibrium levels of private environmental quality. A private environmental quality (Nash) equilibrium occurs when all individuals in the region of environmental interdependence have simultaneously chosen the utility maximizing use of effluent emissions and natural resource usage, given those of other relevant individuals.

A good deal of normative environmental analysis stresses the fact that the likely Nash equilibrium of the above private environmental quality game is not Pareto optimal. Consequently, mutual gains to trade exist which might be realized through government policies which coordinate or control individual propensities to pollute. (Werner Pommerehne in Chapter 11 of this volume explores an unusual case where these mutual gains are realized through a contracting process.) On the other hand, previous work has largely neglected the fact that *political interest in environmental protection would exist even in the unlikely case that the private environmental quality equilibrium is Pareto optimal.*

B. The Political Demand for Environmental Protection

An individual's political demand for environmental quality differs from his private demand in that one's political demand for environmental quality does *not* have to take the behavior of other polluters as given. At the political level, the environmental choices of other individuals can be controlled, or at least influenced, with the coercive powers of government. In other details, assessment of an individual's preferred environmental policy is fundamentally similar to the individual's private choice characterized above. Environmental policy preferences are again the outcome of a combination of the objective and subjective effects of policy alternatives.

Some insight into an individual's policy predilections can be obtained by examining the tradeoffs faced by a typical individual in choosing parameters of a specific environmental policy. Suppose that an individual is attempting to determine his most preferred combination of "Pigovian" taxes on effluent emissions and natural resource use. Taxes are

to be imposed on all natural resources used in production (t^p), and/or on all effluent emissions (t^e). As generally assumed in the public finance literature, the tax receipts are to be returned as demigrants to all tax payers within the government's jurisdiction ($G = [\Sigma t^p R^p_i + \Sigma t^e E_i]/N$). One effect of the environmental taxes is to increase the marginal cost of manufactured goods at the individual level. Another is to increase the wealth of individual's who use below average natural resources in production and emit below average levels of effluents. Other uses of the tax revenue would have implied similar, if more subtle and indirect, distributional effects. Both the environmental and redistributive effects will influence policy preferences.

The individual's manufactured income constraint, equation 1.1, becomes $Y_i = f(R^p_i, E_i) - t^p R^p_i - t^e E_i + G$. Pigovian user taxes reduce the rate at which desired outputs can be obtained from inputs, which tends to decrease the extent to which resources are used in production (ΣR^n_i rises), and decreases effluent emissions (ΣE_i falls). The taxes simultaneously effect the choices of all individuals in the polity, and thereby the Nash equilibrium resource use and effluent emissions. Consider an individual at a pretax equilibrium:

$$U^* = u(R^{n*}, f(R^{o*} - R^{n*}, E^*, T) - t^p(R^{o*} - R^{n*}) - t^e E^* +$$

$$[\Sigma t^p(R^{o*} - R^{n*}) + \Sigma t^e E_i]/N, \Sigma E^*_j, I) \tag{5}$$

where the "starred" variables denote demand functions as developed above for effluent emission and natural resource, augmented to include tax arguments.[14] Differentiating with respect to the two taxes, and appealing to the envelop theorem yields first order conditions describing the individual's preferred "Pigovian" tax scheme:

$$U_Y[-(R^{o*} - R^{n*}) + \Sigma(R^{o*} - R^{n*})/N] + U_E E^*_{tp} = 0 \tag{6.1}$$

$$U_Y[-E^* + \Sigma(E_j^*)/N] + U_E E^*_{te} = 0 \tag{6.2}$$

In both equations, the first term characterizes the net marginal cost of the tax in terms of the marginal utility of reduced personal consumption of desired manufactured goods (which can be thought of as personal

income). The second characterizes the marginal utility from the overall reduction in emissions caused by the tax.

Note that these first order conditions imply that *even in cases where the environmental effects of "environmental" policy tools are negligible at the margin, the preferred tax rate may, none the less, be greater than zero.* Individuals who receive positive net receipts from the environmental tax and demigrant program as a whole will prefer a relatively more aggressive "environmental" policy for pecuniary reasons. Individuals who lose at the margin from the environmental tax and demigrant program will prefer a relatively less stringent "environmental" policy. Only the average voter, who receives no net transfer from the tax/demigrant policy, evaluates policy parameters strictly in terms of their effect on the perceived environmental quality. The redistributional effects of environmental policy influence voters and their representatives, and may motivate the activities of politically active interest groups.

Application of the implicit function theorem to equations 6.1 and 6.2 allows an individuals ideal Pigovian tax program to be characterized as a function of parameters of his optimization problem.

$$t_i^e{}^* = r_i (R_i^o, T, I, N) \tag{7.1}$$

and

$$E_i^n{}^* = e_i (R_i^o, T, I, N) \tag{7.2}$$

As in the case of the private demand for environmental quality, the preferred public policy varies with one's initial natural resource wealth, R_i^o, the technology of production, T, and knowledge of the dangers, I, or lack thereof, of effluent levels. The political demand is also affected by the number of effluent emitters, N. The shape of the demand for environmental fees (taxes) is affected by the shape of the individual's own utility function, those of all others in the relevant polity, and the production function for manufactured goods.[15] As time passes and parameters of the individual's choice problem change, an individual's interest in environmental quality will also change.

C. Political Institutions, Discretion, and Environmental Politics

In deterministic pure voting models of politics, the median voter's preferred environmental tax policy is the policy adopted.[16] In the above model, if the median voter bears close to the average tax burden, the program will generate the median voter's preferred level of environmental quality. If he bears less than the average tax burden he will tend to prefer higher than optimal tax levels and more stringent than optimal levels of environmental quality.

Richer models of political processes take account of other institutional features of modern democracies which allow individuals to affect political outcomes through such means as lobbying or campaign contributions. Institutional details and the technology of persuasion determine the relative importance of votes cast and dollars spent in such

efforts at persuasion, then voter preferences are decisive insofar as representatives are interested in being reelected. In this case, and in the case where interest group pressure is symmetric about the median, median voter preferences will determine policy. If voter opinion is perfectly malleable, then dollars spent during and after the campaign are decisive. See Becker (1983). In the more likely intermediate cases, non-voting avenues of political pressures may cause policies to diverge from median voter preferences.

[Figure 1 about here]

Political and legal institutions affect the methods chosen by individuals who endeavor to influence environmental policies by affecting the marginal cost-effectiveness of alternative methods of influence. In democracies, it is generally less costly to cast votes than to testify before relevant legislative committees or regulatory commissions. Consequently, more individuals cast votes than participate in regulatory hearings. A modest interest in changing or maintaining current environmental policies may be sufficient reason to vote, but not to lobby congress or make contributions to lobbying groups. Those with more intense interests in changing environmental policy will avail themselves of many more channels of influence.

Nonvoting channels of influence exist in democracies because the link between ordinary citizens and environmental policies is indirect. After election to office, representatives may, in principle, vote any way they wish on a piece of legislation. The legislation is subsequently implemented by an unelected bureaucracy.

A single representative can not be held accountable for the stringency of environmental law because he/she is only one of many charged with developing environmental rules. Moreover, a few unanticipated votes over environmental policies are unlikely to substantially change the a representative's future electoral prospects. Individuals vote for representatives based on their anticipated voting behavior over a large number of issues. Even in areas where candidate policy positions are well known, most voters can do little more than choose the least objectionable candidate from among those with a chance of winning the election.[17]

Given the potential for candidate discretion, it is somewhat surprising to find that the median voter model does a good job of predicting many government policy parameters. A substantial body of evidence suggests that the policies adopted by democratic governments are broadly consistent with maximizing the welfare of the median (or average) voter.[18] On the other hand, the evidence is not so great as to rule out at least a modest exercise of representative discretion.[19] In chapter 4, Dennis Coates develops statistical evidence that campaign contributions of environmental and anti-environmental interest groups, as well as the personal characteristics of representatives, have had modest effects on the voting behavior of elected representatives.

Once environmental legislation is passed, its implementation, and a good deal of the regulatory detail, are left to a largely invisible chain of command within departments and agencies with authority over the matters of interest. Again, at least superficially there appears to be scope for considerable bureaucratic discretion and thus a role for effective interest group activities. There are a variety of reasons why the legislature may grant some discretion to the bureaucracy: the advantages of specialization, the desirability of making use of case specific knowledge, or congressional desires to shift controversial decisions to another branch of government.

Both specific and incidental authority have impacts on environmental legislation insofar as final regulations and guidelines are often drafted by regulatory agencies rather than the legislature. To the extent that bureau decision makers have personal or institutional policy preferences, environmental polices will tend to reflect the economic, aesthetic and ideological interests of those bureaucratic decision makers.[20]

On the other hand, there is a body of theoretical and empirical work that suggests that the various bureaucracies are responsive to the desires of congress and congressional oversight committees, and thereby to the interest of average or median voters. Environmental policies adopted by the bureaucracy may also, indirectly, reflect electoral considerations.[21] However, the evidence is not so compelling as to rule out all possibility of discretionary behavior by bureaucratic policy makers. Chapters 5, 6, and 7 of this volume suggest that the Environmental Protection Agency does exercise some of its potential discretion. Chapter 5 provides evidence of the exercise of unauthorized discretion.

D. Interest Groups, Persuasion and Environmental Politics

One widely used method by which interest groups attempt to influence environmental policy is the strategic dissemination of policy relevant information. Interest groups subsidize the dissemination of information to voters, congress, and the bureaucracy which highlights the relative merits of their preferred policies.[22] Such information can increase or decrease an individual's demand for environmental quality because definitive information about the merits of alternative environmental policies does not exist. If the information provided is impartial and unbiased, or perfectly filtered by recipients, it would tend to improve the legislative process by reducing voting and regulatory mistakes.[23] On the other hand, to the extent that interest groups are able to manipulate voters and/or their representatives by strategically providing biased or incomplete information, they may be able to direct environmental policies toward their own goals, away from those of the average or median voter.

Anecdotal evidence of the persuasiveness of interest group activities is wide spread, but there is relatively little systematic empirical evidence of the effectiveness of interest group informational campaigns.

Chapters 6 and 7 of this volume provide statistical evidence that interest group *testimony* at public hearings have had significant effects on environmental and natural resource policy decisions made by environmental regulatory agencies.[24]

Of course, not all environmentally relevant information is generated by interest group activities. General scientific, aesthetic and technological advances also tend to affect the public and private demand for environmental quality in several ways. (1) Technological advances tend to reduce the effective price of desired manufactured goods relative to environmental quality, and leads to an increase in manufactured outputs.[25] (2) Increased productivity implies that personal incomes rise, which tends to increase the demand for all normal goods, including environmental quality. (3) As knowledge and appreciation of natural phenomena increases, more subtle forms of environmental quality may be discerned and demanded.

(4) Moreover, technological advances may directly and indirectly affect the balance of political power within a polity. For example, some forms of technological advance tend to decrease the marginal cost of organizing and sustaining interest group activities. Higher personal incomes together with reduced costs tend to increase the number of potential subscribers to policy advocacy services.[26] If contributions to interest groups supporting environmentally more stringent rules increase faster than for groups opposing greater stringency, then interest groups will tend to reinforce the increased popular demand for more environmental quality. If not, interest groups may reduce net pressures for more stringent environmental regulations. In either case, the increased effectiveness of resources invested in political activities tends to cause a more visible and intense political conflict over environmental policies as technology improves through time.[27]

IV   An Overview of the Book:

V   Political Economy of Environmental Protection

VI   Analysis and Evidence

VII

The papers in this book analyze the political economy of specific environmental policy issues in detail. While no single paper aims at the totality of environmental issues, together the papers shed considerable light on important links in the political chain which jointly determine environmental policies.

A. Interest Groups and Environmental Legislation

The analysis above suggests that voter interests, interest group activities and bureaucratic discretion all affect environmental policies. However, the direction of influence and the relative importance of these competing interests remains to be examined. Chapters 2 and 3 analyze the extent to which interest groups may determine the policy instruments used to address environmental problems. Chapter 3 attempts to determine empirically the extent to which campaign contributions by interest groups and legislator discretion affect environmental policy.

In chapter 2, Buchanan and Tullock analyze the extent to which economic interest groups prefer standards over effluent charges as policy instruments for pollution management. Standards tend to diminish the profits of firms by less than equivalent Pigovian taxes. (Under standards firms pay for effluent reducing equipment. Under a Pigovian tax, firms purchase similar effluent reducing equipment, and generally pay a tax on their remaining effluent emissions.) Consequently economic interest group activities tend to support standards over, what to economists is the generally more desirable regulatory device, Pigovian taxes.

In Chapter 3, Leidy and Hoekman explore the extent to which international trade concerns may affect domestic and international environmental policies. They argue that firms in either a large or small open economy have even stronger reasons to lobby for inefficient environmental policy measures, output controls, than those identified by

Buchanan and Tullock. They argue that inefficient environmental regimes strengthen the trade-policy linkage in several ways. For example, inefficient environmental regimes often establish precedents for market sharing which may be extended to foreign firms. These barriers to entry tend to increase profits over those which would have been associated with market competition under nonprotectionist trade policies.

In chapter 4, Dennis Coates analyzes the extent to which the campaign contributions of interest groups have had an impact on votes cast by representatives in the US House of Representatives. The empirical work focuses on roll call votes on the Walker amendments to the Oregon and California bills designating federal lands as wilderness areas. These amendments gave the secretary of agriculture authority to waive provisions of the bill that increase unemployment. In the case of the Oregon proposal the secretary of agriculture could take unilateral action. In the case of the proposed amendment to the California bill, the secretary of agriculture could take such action only if requested by the state of California. Both amendments were voted down. Coates analyzes the role that campaign contributions, representative characteristics, political party, the ideology of the representative's district, and characteristics of the electorate played in casting votes using ordered probit analysis. He finds that all these factors affected voting at the margin, although campaign contributions were not decisive.

B. The Environmental Bureaucracy

Once enacted, environmental legislation is implemented by standing organizations who are delegated authority by the legislature. How that discretion is used, and the extent to which it opens up regulatory processes to efforts by special interest groups, is analyzed in the papers in chapters 5, 6 and 7.

In Chapter 5, George Van Houtven demonstrates that the EPA does not have a monolithic objective function. Different subunits of the EPA make use of their discretion in different ways. For example, the National Emissions Standards for Hazardous Air Pollutants grants the agency no explicit authority to take account of the costs and benefits of regulatory costs. The Toxic Substances Control Act (asbestos ban), explicitly directed the EPA to take account of costs and benefits when

banning particular uses of asbestos and other toxics. In both cases, the EPA appears to have taken account of the costs and benefits of program regulations, but in a manner opposite to what might have been expected given the legislative mandates. Greater weight was given to net benefits under NESHAP than under ToSCA. In both cases, the EPA's reliance or non-reliance on cost benefit analysis was challenged in the courts (in the former by environmental groups and in the later by business interests). And in both cases, the EPA was found to have strayed too far from their legislative mandates.

In Chapter 6, Maureen Cropper, William N. Evans, Stephen Berardi, Maria Duela-Soares, and Paul Portney analyze the effects of cost/benefit analysis and interest group lobbying activities on the EPA decisions to allow the continued use of various cancer causing pesticides between 1975 and 1989. By law, the agency is encouraged to take account of economic costs and benefits. Their results reveal that agency officials did account for economic costs and benefits. However, their results also reveal that the testimony of interest groups also affected the probability that a particular pesticide use could be continued. The testimony of environmental groups increased the probability that a pesticide use would be canceled. Testimony by grower organizations reduced the probability that a permitted use would be ended.

In Chapter 7, Farrow and Hoagland examine the extent to which economic analysis and political interests have affected Department of Interior decisions regarding planned and actual sales of offshore drilling leases. The offshore leasing process consists essentially of two stages. In the first stage, tracts of undersea land are evaluated for their marine and geological properties, hearings are held, and a subset of the range of possible lease sites is announced. Subsequently, the original list of sites may be modified as a result of further analysis, pressure and debate, as leases between the federal government and oil firms are consummated. Their analysis suggests that interest group activities have had significant effects on both stages of the leasing process, but generally have had stronger effects on the leases actually consummated than on the original planning list. In the final analysis, they could not reject a pure interest

group model where the efforts of oil companies and environmental groups completely determined the leasing outcome.

C. Relations between Governments

There are many cases in which a government interested in improving environmental quality within its own jurisdiction can not do so on its own authority because local environmental quality is partly decided by regulations adopted by neighboring governments. In these cases, the problem of environmental regulation becomes similar to the original externality problem of coordinating private environmental protection.

In chapter 8, Gerald Faulhaber and Dan Ingberman analyze properties of alternative institutional solutions to the local government NIMBY game. They examine three institutional arrangements for locating waste facilities: (i) market, (ii) centralized democratic government, and (iii) centralized democratic government with host veto. They find that the assignment of bargaining power is crucial to the efficiency of these alternative regimes. If information is observable and the potential host community has bargaining power, then either competitive or monopoly markets for the NIMBY activity (waste disposal) generates efficient location of facilities. Similar results are obtained for majoritarian central government. The strong conclusion of their analysis is that bargaining power rather than market versus government determines the efficiency of policy outcomes in the settings explored.

A related problem faced by firms is the extent to which governments will respond to locational decisions to locate environmentally risky facilities with new more stringent environmental regulations. Most communities prefer that noxious, but necessary, waste dumps to be located elsewhere, which gives rise to the NIMBY (not in my back yard) game among communities. In chapter 9, James Hamilton analyzes the locational choices of private waste disposal firms who are able to locate in several alternative communities. However, once a site is chosen firms bear a risk that communities will change their environmental regulations (or demand greater compensation) in response to the firm's locational choice. Hamilton demonstrates that the likelihood of political responses to locational choice is a prospective cost which influences the siting of NIMBYs. Statistical evidence supports his analysis in that a proxy for

anticipated regulatory response is found to influence the locational choices of firms.

D. Environmental Treaties

The problems confronting national governments in addressing international environmental problems are similar to those of local governments. International environmental problems can not be entirely (or in some cases even partly) controlled by any single government. However, international environmental problems differ from those of local governments in that there exists neither a higher level of government from which broader regulations can be solicited nor an effective enforcement system to enforce agreements reached between affected countries.

The most widely used solution to international environmental problems is a Coasian contract between interested governments, that is to say, an environmental treaty. In chapter 11, Werner Pommerehne provides a detailed examination of a specific instance of a local Coasian solution between two neighboring towns on the German/French border. The mayor of the German town of Klenbittersorf fearing effluents from an upwind incinerator planned by the French community of Grosbliederstroff, encouraged his constituents to donate money for upgrading the French incinerator.   Somewhat surprisingly, the mayor obtained sufficient voluntary contributions and loans for this purpose.

Of course, not every environmental agreement between governments will actually advance the environmental goals espoused. In Chapter 11, Todd Sandler demonstrates that sub-global carbon tax treaty may have little effect on atmospheric carbon oxide levels when non-signatory nations react in an optimizing fashion.   The analysis is cast in terms of carbon emissions and the current interest in prospects for global warming, but his results apply to many other forms of international air or water pollution. The analysis compares and contrasts the equilibrium policies that obtain under Nash equilibrium, and various forms of leader-follower equilibria. He argues that cooperative supranational agreements on the environment must be judged in light of the responses that nations outside the agreement may make.

In the end, domestic political institutions and interests determine whether a nation signs even imperfect environmental treaties. In Chapter 12, I examine the extent to which elections affect the propensities of governments to regulate environmental matters.   Democracies tend to be materially more prosperous nations than dictatorships. Were democracies not more inclined than dictatorships to regulate environmental matters, they would also tend to have more polluted environments than dictatorships. The paper demonstrates that the relative price of environmental protection for dictators is greater than that faced by median voters. Consequently, dictators may tend to adopt *less* stringent environmental rules than democracies in otherwise similar situations. Estimates of propensities to sign international treaties on the environment, specifically the Vienna Treaty and Montreal Protocol on CFC emissions, are consistent with this conclusion. Dictatorial countries were much less inclined to sign these two CFC agreements than were democracies.

Overall, the papers in this book indicate that electoral constraints are not completely binding. Consequently, environmental policies reflect a variety of political and economic factors, including but not limited to special interest group activities. The statistical evidence developed suggests that neither cost-benefit considerations nor voter interests are entirely neglected in the development and implementation of environmental policies.[28]

VIII   Conclusion

 Environmental politics may be thought of as a form of institutional production where new laws are created which induce individuals to alter the manner in which they use natural resources.[29] Productive environmental rules increase "value" for relevant decision makers by redirecting the use of resources in a manner which improves environmental quality sufficiently to offset perceived costs.

The value enhancing characteristics of such environmental policies is, as is the case of ordinary market production, at root a subjective matter, which may or may not have an objective counterpart. Individuals may determine whether they expect alternative policies improve environmental quality, from their own perspective.   But there are rarely external criteria by which environmental judgements may be brought into complete accord. The pattern of environmental regulations and sanctions that we

actually observe reflect the influence of political decision makers as constrained by the political institutions under which policies are adopted.

The various positive analyses of this volume sheds indirect light on the manner in which policy proposals should be evaluated in light of political-economic concerns. The papers by Ingberman and Faulhaber, Todd Sandler, and Congleton suggest that in many cases institutions are the root of environmental problems. This contrasts with the usual economic approach to environmental problems where political and legal institutions are ignored or taken as given. An implication of the analyses of this volume is that policy proposals should be based on the realistic assessment of the likely implementation of alternative rules under existing political and institutions. Proposed institutional reforms should analyze incentives for the exercise of undesirable and desirable discretion along the chain from voters to final environmental policies.[30] Not all institutional or rule changes are politically, legally, or behaviorally feasible. Would that we all simply did what was best in all circumstances.

In conclusion, it is worth remembering that substantial progress has been made on environmental issues through time in spite of the difficulty of the problems addressed. Organized human society has faced difficult political choices regarding environmental degradation and economic growth from the dawn of history. On going communities living in more or less fixed locations have necessarily addressed and solved the problems of refuse disposal and water quality confronted. Scientific advances have allowed nearly intractable local problems to be readily addressed. More recently as man's impact and wealth have increased, large scale regional air and water quality problems have been addressed. While it can not be claimed that economic development has been accomplished in the least costly manner, most would agree that air and water quality in developed countries is better today than it was forty years ago.

Now, even more ambitious environmental concerns have been raised, as large scale biological systems and global climate have been added to the list of environmental necessities. However, the essential problem of managing environmental quality, although larger in scope, has not changed very much. In the end, whether public policies exacerbate or moderate the relationship between politics, pollution and prosperity reflects the political balance between the interests of individual voters, and the pressures of economic and environmental interest groups.

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[1] See Dryzek (1987) for a thoughtful and ambitious green perspective on the scope of a comprehensive environmental policy.

[2] Some environmentalists seem to make this argument. See for example Goodin (1992).

[3] Natural phenomena play such an important role in both hunting and agricultural based societies that very often nature has been used as the basis of extensions into metaphysical and religious realms. Even today, various forms of nature worship or pantheism are among the most common world religions.

[4] Ostrom (1990, ch. 3) analyzes a variety of long standing methods of managing access to common property resources including: grazing lands in the Swiss Alps, communal forest land in Japan, and canal systems in Spain. She concludes (p. 90) that enduring methods for resolving commons problems share eight characteristics: (i) clearly defined boundaries, (ii) congruence between appropriation and provision rules and local conditions, (iii) collective choice arrangements, (iv) monitoring for appropriate behavior, (v) graduated sanctions, (vi) conflict resolution methods, (vii) minimal rights to organize locally, and for larger commons problems, (viii) organization of monitoring, enforcement, and conflict resolution as "nested" enterprises.

[5] See Macfarlane (1978) for an overview of English property law during the medieval period.

[6] The above argument is not meant to imply that privatization has very often been adopted with the conscious intent of solving commons problems. Rather, it is likely that regions of the world which adopted ownership rights avoided commons problems that others societies using more politicized methods had to cope with. Through time, as legal institutions evolved, better assignments of use rights tend to supplant management methods which yielded significantly inferior outputs.

It may be argued that there has been a gradual restriction of private use rights through time. Often these restrictions do not substantially restrict the uses of the stationary resource, but rather access to *circulating* resources which pass under, over, or through the stationary resource. For example, modern rules governing solid waste disposal attempt to ensure that "disposal" is undertaken in a manner which does not affect local water or air quality.

[7] One can own bottles of air or water. But, generally bottled air and water are only temporarily partitioned from the common circulating air and water systems. "Purchase" of a bottle of water is more analogous to renting than owning an asset.

[8] See Block (1990) for several extended discussions of the merits of market based environmental regulation. These discussions generally neglect the fact that determining the optimal quantity of use permits, and/or the range of uses (permissible effluent rates) allowed are bound to remain ongoing political/regulatory issues.

[9] The role of political institutions in determining discretion can be easily made concrete. Imagine the different circumstances of a dictator and member of the House of Representatives. The level of support that the representative requires to be maintained in office is clearly greater than that required for a dictator. Consequently, dictators have greater discretion over environmental policies than a elected representatives have.

[10] Such a trade off is typical of many primitive and sophisticated production methods. A farmer may get more farm crops using "slash and burn" than by carefully harvesting the forest first, for a given use of his resources, but "slash and burn" involves generates more effluents than carefully harvesting the forest would have.

[11] Natural resources are assumed to have the properties of a pure private good and be privately held for the purposes of this exercise. Any notional value placed on the total stock of natural resources are neglected, as are various negative externalities associated with maintaining resources in their natural state (pests and predators). Moreover, other external effects of using natural resources in manufacture are neglected. Harvesting a field or a forest may leave an unattractive stubble. These non-effluent types of externalities are neglected here in order to focus attention on decisions affecting effluent emission and subsequent diffusion.

[12] Uncertainty and time can be incorporated in the model explicitly by characterizing an intertemporal and stochastic environmental trade off. For example, rather than $Y_i = f(R^p_i, E_i, T)$, one could use $E_i \sim f(Y_i, R^p_i, T, t)$. In this case, environmental damages are uncertain, and depend on time, t, production of the desired output, Y_i, technology, T, and production use of the natural resource, R^p_i. Expected utility is $U^e = \iint u_i(R^n_i, Y_i, E, I, t) f(Y_i, R^p_i, T, t)\, dt\, dE$. Note that this implies that, for a given technology, expected utility can be written as a function of $R^n_i, Y_i, E,$ and I.

[13] Differentiating with respect to $R^o_i, T,$ and I allows the comparative statics of the individual's demand for environmental quality to be characterized.

[14] These augmented reaction functions are calculated by replacing the original production relationship in equation 1.1 with $Y_i = f(R^p_i, E_i) - t^p R^p_i - t^e E_i + G$, and adding a new constraint representing the assumed relationship between tax receipts and the demigrant program $(G = [\Sigma t^p R^p_i + \Sigma t^e E_i]/N)$ to the original private optimization problem. The private demand for personal holdings of natural resources and effluent emissions are determined as before to characterize augmented reaction functions of the form:

$$R^n_i = r_i (R^o_i, \sum_{j \ne i}^{N} E_j, T, I, G, t^p, t^e)$$

and

[9]   The role of political institutions in determining discretion can be easily made concrete.   Imagine the different circumstances of a dictator and member of the House of Representatives. The level of support that the representative requires to be maintained in office is clearly greater than that required for a dictator.   Consequently, dictators have greater discretion over environmental policies than a elected representatives have.

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[15]   Differentiating with respect to R^o_i, T, I, and N would again allow the comparative statics of the individual's political demand for environmental quality to be characterized.

[16]   The most enduring models of electoral equilibrium suggests that voters in the middle of the distribution of voter preferences (the median or average voter) tend to get their policy preferences advanced.   In order to win elections in winner take all districts, candidates are generally drawn toward relatively moderate positions on all issues, including environmental policies, as a prerequisite to winning the election. See Mueller (1989) for an overview of the modern public choice literature. See Black (1958) for the first modern treatment of the median voter theorem. See Enelow and Hinich (1984) for demonstrations that the Nash equilibrium of a contest between uncertain but vote maximizing candidates tends to be at the mean of the distribution of voter ideal points. In the case of a symmetric distribution of voter ideal points, the median and average voter are the same.

[17]   This is of course an implication of both the median voter and stochastic/average voter models. The range of opinion on environmental and other issues suggests that only district median voters will see their representative's votes as truly "representative."

[18]   The median voter model has been widely used in the empirical and theoretical public finance literature to characterize the fiscal policies of democratic federal, state, and local governments. See for example Holcombe (1980), Denzau and Grier (1984), Congleton and Shughart (1990) for empirical evidence on the predictive performance of median voter models of policy formation. None of these models fit the data so well as to rule out other factors. However, the results do suggest that policies do "on average" advance the interests of the median voter. The unexplained residual may interpreted as evidence of discretionary behavior.

[19]   A fairly large literature on what has come to be called "Congressional shirking" has been able to find limited (and somewhat controversial) evidence of statistically significant shirking. See Kalt and Zupin (1984). Although Congressmen appear to have substantial opportunity for discretionary behavior, they do not appear to ignore the interests of their constituents, nor to exploit systematically the discretion that they would appear to have.

[20]   Indeed, individuals especially interested in environmental policy matters may seek out jobs in the relevant bureaus with the express goal of having an impact on policy.

[21]   See for example Stigler (1971), Niskanan (1971), Breton and Wintrobe (1975), Pelzman (1976) or Weingast and Moran (1983) for models of bureaucratic discretion. Weingast and Moran argue that congressional oversight committees may perfectly control bureaucracies through their control of bureau budgets.

$$E_i = e_i \ (R^o_i, \sum_{j \neq i}^{N} E_j, \ T, I, G, t^p, t^e \ )$$

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[22] Interest groups may also legally make strategic contributions to candidates and engage in single issue voting. Interest groups may also use various forms of legal (and illegal) bribes to induce congressmen or regulators to adopt rules which advance interest group goals rather than the perceived goals of a typical voter. The recently regulated revolving door formerly allowed regulators to take lucrative jobs with those they had regulated in their agency jobs. Although I know of no statistical test of the effect of this reform, one expects that representative "shirking" would tend to diminish as a consequence.

[23] Congleton and Sweetser (1992) demonstrate that even unbiased information can have deleterious effects insofar as increased knowledge of the distributional effects of policies may make even net benefit increasing policies more problematic to pass.

[24] It bear noting that observed policy changes tends to understate their overall effect on the polity. Lobbying activities are not often one sided, and the efforts of opposing interest groups may largely offset each other, yielding little change in policy. For nearly every politically active group that gains relatively large benefits from a particular party there is another which bears large losses. In such cases, the efforts of each side may be highly effective, yet policies may be only modestly affected. Moreover, such lobbying efforts are a dead weight loss for society as a whole insofar as scarce economic resources have been devoted to jointly ineffectual activities. The same "result" could have been achieved at a lower cost had competing parties mutually reduced their efforts.

[25] Technological advance reduce production costs (often by using resources in a manner which reduces effluent outputs), make whole new product areas and effluents possible, and/or induce changes in the methods used to appreciate environmental quality. The latter may increase overall effluent emissions even if effluents per unit of output have been reduced.

[26] Congleton and Sweetser (1992) develop evidence that the extent and impact of interest group activities tends to increase with technological advances which reduce the cost of information production and dissemination.

[27] It is, thus, not surprising that the most visible and intensely politicized debates over environmental policies occur in countries which make the most use of technologically sophisticated production and communication methods. Nor, is it surprising, for the same reasons, that the intensity of environmental debate is often greatest in areas where environmental quality is highest.

[28] Not all of this discretion reduces welfare. The bureaucracy (fortunately) often takes greater account of costs and benefits or regulations than required, or permitted, by their enabling legislation.

[29] Examples of informal codes of conduct include: Don't litter, recycle, buy and think green. A popular green bumper sticker around Washington area is "think globally,

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[29] Examples of informal codes of conduct include: Don't litter, recycle, buy and think green. A popular green bumper sticker around Washington area is "think globally, act locally." Such rules apply to a wide array of environmentally relevant private decisions.

Most formal legal regulations that are thought of as "environmental protection" deal with problems of waste disposal. That is to say, the laws restrict or enable the disposal of that subset of the products produced by manufacture which are themselves valueless or worse. However, it bears noting that these "environmental" problems are often partly the result of other policies which promote more extensive use of natural resources and/or create (implicit) rights to *freely* use common resources, such as the air or water, for purposes of waste disposal.

[30] As in ordinary production, the role of scientific information about the properties of alternative transformation processes is relevant to the assessment of the relative merits of alternative environmental rules. An understanding of the properties of natural human processes under existing rules is, in this sense, prior to any claim that existing rules are less productive than they might be. In cases where formal legal methods are to be employed, as opposed to persuasion or economic contracting, an understanding of political processes becomes central to any examination of existing environmentally relevant rules, and to any forecasts of the likely time path that such rules will follow in the future.