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ABSTRACT

In the realm of environmental policy instrument choice, there is great divergence between the recommendations of normative economic theory and positive political reality. Four gaps stand out. First, despite the advantages of market-based policy instruments, they have been used to a minor degree, compared with conventional, command-and-control instruments. Second, pollution-control standards have typically been much more stringent for new than for existing sources, despite the inefficiency of this approach. Third, in the few instances in which market-based instruments have been adopted, they have nearly always taken the form of grandfathered tradeable permits, rather than auctioned permits or pollution taxes, despite the advantages in some situations of these other instruments. Fourth, the political attention given to market-based environmental policy instruments has increased dramatically in recent years. We search for explanations for these four apparent anomalies by drawing upon intellectual traditions from economics, political science, and law. We find that all fit quite well within an equilibrium framework, based upon the metaphor of a political market. In general, explanations from economics tend to refer to the demand for environmental policy instruments, while explanations from political science refer to the supply side. Overall, we find that there are compelling theoretical explanations for the four apparent anomalies, although these theories have yet to be empirically verified.

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THE POSITIVE POLITICAL ECONOMY OF INSTRUMENT CHOICE IN ENVIRONMENTAL POLICY

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1. INTRODUCTION

The design of environmental policy requires that two central questions be addressed: (1) what is the desired level of environmental protection? and (2) what policy instruments should be used to achieve this level of protection? With respect to the second question, thirty years of positive political reality in the United States have diverged strikingly from the recommendations of normative economic theory. Our purpose in this paper is to explain why.

Four gaps between normative theory and positive reality merit particular attention. First, economists have consistently urged the use of "market-based" or "economic-incentive" instruments -- principally pollution taxes or charges[1] and systems of tradeable permits[2] -- rather than so-called "command-and-control" instruments, such as design standards, which require the use of a particular technology, or, as is more commonly the case, performance standards, which prescribe the maximum amount of pollution that a source can emit.[3] At least in theory, market-based instruments minimize the aggregate cost of achieving a given level of environmental protection,[4] and provide dynamic

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[1]The development of the notion of a corrective tax on pollution is generally credited to Pigou (1920).

[2]The initial proposal for a system of tradeable permits to control pollution was by Dales (1968), and was first formalized by Montgomery (1972), although much of the literature can be traced back to Coase (1960).

[3]Performance standards could specify an absolute quantity of permissible emissions (that is, a given quantity of emissions per unit of time), but more typically these standards establish allowable emissions in proportional terms (that is, quantity of emissions per unit of product output or per unit of a particular input). We use the term "standard" to refer somewhat generically to command-and-control approaches. Except where stated otherwise, we refer to proportional performance standards.

[4]As is well known, a necessary condition for the achievement of such cost-minimization is that the marginal costs of abatement be equal for all sources (Baumol and Oates 1988). In theory, pollution taxes and systems of marketable permits induce this effect, at least under specified conditions.

incentives for the adoption and diffusion of cheaper and better control technologies.[5] Despite these advantages, market-based instruments have been used far less frequently than command-and-control standards (U.S. Congress, Office of Technology Assessment 1995).

Second, when command-and-control standards have been used, the required level of pollution abatement has generally been far more stringent for new sources than for existing sources. This dual system may actually worsen pollution by encouraging firms to keep older, dirtier plants in operation.[6]

Third, in the relatively rare instances in which market-based instruments have been adopted, they have nearly always taken the form of tradeable permits rather than emission taxes,[7] although economic theory suggests that the optimal choice between the two is dependent upon case-specific factors.[8] Moreover, the initial allocation of such permits has been through "grandfathering," or free initial distribution based on existing levels of pollution,[9] rather than through auctions, despite the apparent economic superiority of the latter mechanism.[10] Thus, we can say that there are four

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[5]Market-based systems can provide continuous dynamic incentives for adoption of superior technologies, since under such systems it is always in the interest of firms to clean up more if sufficiently inexpensive clean-up technologies can be identified (Milliman and Prince 1989; Jaffe and Stavins 1995).

[6]New plants ought to have somewhat more stringent standards because their abatement costs are lower, although such standards should be linked with actual abatement costs, not with the proxy of plant vintage. When new source standards are sufficiently more stringent, however, they can give rise to an "old-plant" effect, precluding plant replacements that would otherwise take place (McCubbins, Noll, and Weingast 1989; Stewart 1981). There is empirical evidence that differential environmental regulations lengthen the time before plants are retired (Maloney and Brady 1988; Nelson, Tietenberg, and Donihue 1993).

[7]Taxes (so-called unit charges) have been used in some communities for municipal solid waste collection (U.S. Congress, Office of Technology Assessment 1995). Gasoline taxes serve primarily as revenue-raising instruments, rather than environmental (Pigouvian) taxes *per se*. Interestingly, the European experience is the reverse: environmental taxes are far more prevalent than tradeable permits, although the taxes employed have typically been too low to induce pollution abatement (Stewart 1996). A more comprehensive positive analysis of instrument choice than we provide here would seek to explain this difference between the European and U.S. experiences.

[8]With perfect information, tradeable permits sold at auction have the same effect as a tax. Under conditions of uncertainty, the relative efficiency of tradeable permits and fixed tax rates depends upon the relative slopes of the relevant marginal benefit and marginal cost functions (Weitzman 1974; Yohe 1978; Stavins 1996).

[9]The sulfur dioxide (SO_2) allowance program -- a tradeable permit program to reduce acid rain -- mandated by the Clean Air Act amendments of 1990 provides for annual auctions in addition to grandfathering, but such auctions involve less than 3 percent of the total allocation (Bailey 1996). These auctions have proven to be a trivial part of the overall program (Joskow, Schmalensee, and Bailey 1996).

[10]With perfect information and no transactions costs, trading will result in the economically efficient outcome independently of the initial distribution of permits (Montgomery 1972; Coase 1960; Hahn and Noll 1982). Under more realistic scenarios, however, there are compelling arguments for the superiority of auctioned permits. First, auctions are more cost-effective in the presence of certain kinds of transactions costs (Stavins 1995). Second, the revenue raised by an auction mechanism can be used to finance a reduction in some distortionary tax (Goulder, Parry, and Burtraw 1996). Instruments that restrict production (that pollutes) -- such as tradeable permits -- can create entry barriers that raise product prices, reduce the real wage, and exacerbate pre-existing labor supply distortions, an effect that can be offset if the government sells (auctions) the permits, retains the scarcity rents, and recycles the revenue by reducing

alternative market-based instruments available: taxes, revenue-neutral taxes, auctioned permits, and grandfathered permits.[11] Despite the numerous trade-offs that exist in normative economic terms, the U.S. experience has been dominated by one choice -- grandfathered permits.

A fourth, conceptually different, gap, between prior and current political practice, is also worthy of attention. In recent years, the political process has been more receptive to market-based instruments,[12] even though they continue to be a small part of the overall portfolio of existing environmental laws and regulations. After being largely ignored for so long, why have incentive-based instruments begun to gain acceptance in recent years?

Commentators have advanced various explanations for the existence of these four gaps between normative theory and positive reality. Some explanations emerge from formal theories. Others take the form of informal hypotheses: they purport to explain certain aspects of environmental policy, but are not part of a formal theory of political behavior. In this paper, we review, evaluate, and extend these explanations. Moreover, we place these disparate explanations within the framework of an equilibrium model of instrument choice in environmental policy, based upon the metaphor of a political market.

This framework -- informed by intellectual traditions within economics, political science, and law -- enables us to organize and synthesize existing theories and empirical evidence about observed departures of normative prescription from political reality. The scope of the paper, however, is limited. Our emphasis is on the control of pollution rather than the management of natural resources. We treat Congress, rather than administrative agencies, as the locus of instrument choice decisions; and we view legislators (rather than regulators) as the "suppliers" of regulation.[13] Moreover, we focus exclusively on the choice among the instruments, such as tradeable permits, taxes, and standards, used to achieve a given level of environmental protection. We do not explore the related issues of how the level of protection is chosen or enforced. Nor do we address why Congress

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distortionary labor taxes (Fullerton and Metcalf 1966). Third, auctions provide greater incentives for firms to develop substitutes for regulated products, by requiring firms to pay for permits rather than giving them rents (Hahn and McGartland 1989). Fourth, the revenue raised by auctions may provide administrative agencies with an incentive to monitor compliance (Ackerman and Stewart 1985). Fifth, grandfathering, if accepted as general practice, could lead unregulated firms to increase their emissions in order to maximize the pollution rights that they obtain if there is a transition to a market-based system (Dewees 1983).

[11]In a deterministic setting and abstracting from a set of other issues, a revenue-neutral emission tax can be designed which is equivalent to a grandfathered tradeable permit system. Likewise, under such conditions, a simple emission tax will be roughly equivalent to an auctioned permit system.

[12]Beginning in the 1970's, the U.S. Environmental Protection Agency (EPA) offered states the option of employing variants of tradeable permits for the control of localized, criteria air pollutants (Hahn 1989). More significantly, tradeable-permit systems were used in the 1980's to accomplish the phasedown of lead in gasoline (Kerr and Maré 1995) and to facilitate the phasedown of ozone-depleting chloroflourocarbons (CFC's); and in the 1990's to cut nationwide SO_2 emissions by 50 percent by the year 2005 (U.S. Environmental Protection Agency 1996), to achieve ambient ozone reductions in the northeast, and to implement stricter local air pollution controls in the Los Angeles metropolitan region.

[13]We do not intend, however, to deny the importance of executive branch departments and administrative agencies, such as the EPA. For example, the intra-firm emission trading programs of the 1970's were largely the direct creation of EPA.

chooses to delegate authority to administrative agencies in the first place (Fiorina 1982). Finally, our outlook is positive, not normative: we seek to understand why we have the set of tools we do, rather than which tools are desirable.

In Part 2 of the paper, we review the relevant intellectual traditions in economics, political science, and law; and in Part 3, we present the key features of our equilibrium framework. In Part 4, we consider the demand for environmental policy instruments; and in Part 5, we examine the supply side. Finally, in Part 6, we present some conclusions.

2. INTELLECTUAL TRADITIONS

Positive theories of policy instrument choice find their roots in the broader study of government regulation, a vast literature which has been well-reviewed elsewhere (Romer and Rosenthal 1987). For our purposes, the literature can be divided into three approaches to explaining government regulation: *demand-driven* explanations; *supply-driven* explanations; and explanations incorporating the interaction between demand and supply.

Explanations that draw heavily on the demand for regulation are grounded largely in economics. Not surprisingly, economists have generally concentrated on the demand for economic (rather than social) regulation, devoting most attention to the interests of affected firms. The "economic theory of regulation," initiated by Stigler (1971) and developed further by Posner (1974), Peltzman (1976), and Becker (1983), suggests that much regulation is not imposed on firms but demanded by them, as a means of harnessing the coercive power of the state to restrict entry, support prices, or provide direct cash subsidies.[14] A related strand of literature, following Buchanan and Tullock (1962) and Tullock (1967), has likewise emphasized rent-seeking behavior.

In many of these economic analyses, the supply side -- the political process itself -- is virtually ignored (Laffont and Tirole 1993; Romer and Rosenthal 1987). In an approach that typifies this demand-driven approach, Buchanan and Tullock (1975) examine private industry's preferences for regulation and simply assume that those policy preferences will prevail. Similarly, Becker (1983) models the resource allocation decisions of competing interest groups and assumes that the policy outcome depends solely on the relative pressures exerted by interest groups.

Even when they model political processes, however, economic explanations of regulation have often remained driven by firm demand. In Stigler's analysis (1971) and Peltzman's elaboration (1976), the state enacts the program of whichever industry (or, more generally, interest group) offers

[14]Stigler's (1971) influential paper has been characterized as breaking with a previously dominant view (among economists) that regulation was initiated to correct market imperfections; see, for example, the discussion in Posner (1974). It is worth noting that as far back as Schattschneider (1935), political scientists recognized the importance of economic interests among groups pressuring Congress. The "capture theory of regulation" in political science was already well developed by the time of Stigler's work. Stigler's main contribution was less his recognition that economic interests will seek favorable regulation than his introduction of that insight into the economics literature and his application of economic models of behavior (i.e., treating political parties as resource maximizers) to explanations of policy formulation.

the most resources to the governing party; regulation goes to the "highest bidder."[15] Thus, private industry will tend to be regulated where and when the benefits to firms from government regulation are highly concentrated, but the costs are widely dispersed.[16] The "government" simply acts to maximize an exogenous "political support function" and thus caters to the more powerful group. Hahn (1990) follows a conceptually similar tack, modeling a single policy maker's decision as responding to a weighted sum of industry interests and environmental interests; but he does not seek to explain the determinants of either supply or demand.

Political actors are included in these analyses, but they are treated as economic agents reacting somewhat mechanically to the resources or the demands of interest groups. In many cases, as in the Stigler-Peltzman model, they have no interest other than collecting political contributions. Moreover, government is treated as a monolith, controlled by a single political party, with regulatory agencies and legislatures combined into a single unit. There is no room in these accounts for constituency pressures, variation among legislators, slack between legislative direction and the actions of administrative agencies, or other supply-side phenomena.

Political scientists and economists studying the supply side of regulation (and of legislation more generally) have focused on the voting behavior of legislators and the institutional structure of the legislature. The standard approach by political scientists to explaining voting behavior has generally been based upon interview and survey data. In this way, Kingdon (1989) argues that Congressmen are most influenced by colleagues and constituents in deciding how to vote. To explain voting behavior and examine regulatory policy, several researchers have sought to estimate the relative importance of ideology, constituent interests, and interest groups in roll-call voting (Kalt and Zupan 1984; Kau and Rubin 1979; Peltzman 1984). Kalt and Zupan (1984) find that legislators vote not only based on the economic interests of their constituents (as the economic theory of regulation assumes), but also on the basis of their ideology.[17]

A second line of inquiry on the supply side has investigated the role of institutional structure in the legislature. The policy outcome in Congress depends not only on the voting preferences of individual legislators, but also on features such as decision rules, the order of voting, and especially the powers of committees (and their chairmen) to control the agenda of the legislature.[18] Further, expectations of subsequent problems of overseeing implementation of regulatory policy by administrative agencies may influence legislators in their choice of regulatory procedures and instruments (McCubbins, Noll, and Weingast 1987, 1989).

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[15] The Stigler-Peltzman model is essentially a policy auction.

[16] Peanut regulation provides an excellent example of the effect of concentrated benefits and diffuse costs (Viscusi, Vernon and Harrington 1995). Quotas, import restrictions, and price supports combined in 1982-1987 to transfer an average of $255 million a year from consumers to producers, with a deadweight loss of $34 million. The annual cost to each consumer was only $1.23; each peanut farmer, on the other hand, gained $11,100. Peanut farmers clearly had an incentive to preserve the program, while any individual consumer had little to gain from dismantling it.

[17] Their econometric analysis has been criticized by Jackson and Kingdon (1992).

[18] A review of the recent literature on Congressional institutions is provided by Shepsle and Weingast (1994).

Just as the Stigler-Peltzman model incorporates politicians but remains fundamentally demand-driven, the approach taken by Denzau and Munger (1986), Grier and Munger (1993), and others acknowledges the role of interest groups but is driven by supply-side factors. There are discussions of the costs to legislators of supplying legislation to interest groups, but the models rely on a "supply price" determined solely by the characteristics of legislators.[19]

Relatively few works have taken an equilibrium approach by considering the interaction of the supply and demand for regulation. Those that have considered such linkages have typically focused on the role of campaign contributions. Ben-Zion and Aden (1974) modeled campaign contributions from profit-maximizing firms to vote-maximizing politicians. In their model, candidates choose optimal policy positions that balance the need to get votes (by moving towards the policy preferences of voters) and the need to secure campaign funds (by moving towards the preferences of contributors).[20] In a similar vein, Austen-Smith (1987) develops a game-theoretic model of campaign contributions by interest groups and policy positions adopted by legislators.

Kau, Canaan and Rubin (1982) consider legislative outcomes directly, modeling the determination of campaign contributions, legislator's floor votes, and constituents' votes, but without advancing a theoretical model of legislative behavior. Finally, Campos (1989) explicitly considers the interaction of interest group demand and legislative supply of policy instruments. In his model, the choice of regulatory instrument is the equilibrium of a game between interest groups (who choose how much to allocate to lobbying in support of their preferred instrument) and legislators (who vote for the instrument that maximizes their support, taking into account the contributions from the interest groups).

Despite the relative scarcity of equilibrium models of positive political economy, the metaphor of a "political market" has frequently been employed in the public choice literature. The works that have used the market metaphor seem to have had three distinct markets in mind. One market is the market for votes *within* a legislature: legislators are at once demanders and suppliers of votes as they engage in vote-trading and logrolling. Other market models focus on the distribution of wealth resulting from legislation: the demanders are the beneficiaries of legislation and the suppliers are the losers, with politicians serving as brokers between the two groups (Rowley 1993). Finally, perhaps the most prevalent conception of the "political market" focuses on the exchange between legislators and constituents or interest groups: our work falls within this general tradition. In previous work, the identity of demanders and suppliers has varied; the market has been in electoral votes (with legislators "paying" for votes with legislation) and in legislation (with voters

[19]Silberman and Durden (1976) and Durden, Shogren, and Silberman (1991), in their empirical studies of interest group contributions, seem to have in mind a "market model" of interest group contributions to legislators where interest groups offer campaign contributions and votes in return for political support.

[20]Bengal and Ben-Zion (1975) extend the model to consider the case where politicians derive utility from adopting a platform close to their personal policy preferences.

paying for the policies with their votes).[21] In our framework, the market is in units of effective political support (for particular public policies).

In the remainder of this paper, we develop our own metaphor of a political market involving legislators, constituents, and interest groups in the context of instrument choice in environmental policy. This market framework supplements existing work by simultaneously considering the demand for regulation, the supply of regulatory options, and the equilibrium outcome -- the choice of policy instrument in the legislature. In this way, we strive to synthesize works from the demand side and supply side, using them as building blocks of the equilibrium framework. We also seek to suggest a richer sense of the supply side than is found in existing equilibrium models such as that of Campos (1989), incorporating legislator ideology as well as a fuller description of the opportunity costs of supplying legislation.[22]

3. A MARKET FRAMEWORK FOR EXAMINING INSTRUMENT CHOICE

In order to develop a framework within which various existing positive political economy theories can be synthesized, we consider a "political market" embodied in a legislature, and we focus on a single "commodity": legislators' support for a given instrument in a specific policy context.[23] A schematic view of this political market is provided in Figure 1. Demands for various degrees of support come from diverse interest groups, including environmental advocacy organizations, private firms, and trade associations. Each of these entities has its own demand function: a decreasing marginal willingness to pay for the legislature's policy support (an outcome of each entity's distinct utility-maximization process), where "payment" is in the form of political currency: resources (monetary and other contributions, and/or endorsements or other forms of support) that can facilitate legislators' re-elections. The aggregation of these diverse demands is made complex by the possibilities of free-riding because of the public good nature of regulation.

Next, we posit that each individual legislator seeks to maximize her expected utility, which involves the satisfaction that comes from being a member of the legislature, now and in the future. The result is the legislator's political-support supply function, the shape of which is determined by her ideological predisposition, her perception of her constituents' preferences, and the increasing

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[21]Peltzman, for one, was clear that the demanders were constituents and the suppliers legislators: "[the essential commodity being transacted in the political market is a transfer of wealth, with constituents on the demand side and their political representatives on the supply side" (1976, p. 212).

[22]As noted above, we focus on Congress as the locus of policy instrument choice. Extending the framework to cover regulatory agencies and the courts would introduce several interesting but complex issues. For regulatory agencies, for example, it is important to deal with issues such as the principal-agent relationship between the agency and Congress; the degree and nature of congressional oversight; the possibly conflicting goals of the agency head and career bureaucrats; the objective function of the bureaucrats (for example, job security, power, protection of expertise); and the way in which policy demanders provide payoffs to the agency.

[23]By "specific policy context," we are simply referring to the fact that the demand for instruments and the supply of instrument options are both linked to the specific environmental problems for which the instruments are being considered. Also, as we discuss below, the legislature in our framework selects a policy instrument from among a range of options, including alternative policy instruments plus the status quo.

opportunity cost of providing additional support for the policy instrument (in terms of opportunity cost of expended effort, foregone future electoral votes in her home district, and discomfort associated with departures from one's ideology). Since each legislator supplies units of a homogeneous product called "effective support" (at differing costs), the individual legislators' supply functions combine to yield an aggregate supply function at the level of the legislature.

Thus, for each instrument, a competitive equilibrium in the legislature is given by the intersection between the aggregate political-support supply function and the aggregation of relevant demands.[24] Levels of effective support provided by individual members of the legislature are hence equivalent to the amounts they are willing to provide at the competitive equilibrium "price," the points of intersection of their supply functions with the infinitely elastic demand they face. The aggregate support is simply the sum over legislators of their individual levels of effective support. The legislative outcome — the choice of a policy instrument — then depends upon the relative degrees of support generated for alternative policy instruments.

In the following sections of this part of the paper, we describe the political market's commodity and currency, and then turn to more detailed expositions of the origins of regulatory demand and supply, respectively. Finally, we discuss the nature of political market equilibria and the legislative outcomes that result.

3.1 The Political Market's Commodity and Currency

We view each legislator as supplying some degree of support for a given regulatory instrument. Interest groups seek to secure support from legislators in the political market. Importantly, we take this commodity to be *homogeneous* among legislators. That is, the support produced by one legislator is equivalent to (a perfect substitute for) support produced by any other legislator. Hence, we think of this commodity as "effective support."[25] It is a measure of impact (output), not of effort (input).

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[24]We implicitly assume that the effective support provided by individual legislators can be observed. In many situations, this is a reasonable assumption, but in many others, it is not. We leave to future work the explicit incorporation of this uncertainty.

[25]It might be argued that interest groups ultimately care about votes, which at the level of an individual legislator reduces to a binary variable. But there are several reasons to focus on support, rather than on votes alone. First, this approach facilitates comparisons among several instruments, since the outcome of the legislative process is the instrument that garners the most effective support. Second, empirical analysis has largely failed to link campaign contributions with legislators' votes (Hall and Wayman 1990), while campaign contributions have been found to be highly correlated with legislators' participation in committees, itself closely linked with the notion of "effective support" (Grier and Munger 1993; Silberman and Durden 1976). Third, the fate of most prospective legislation is determined before it reaches the floor for a vote. The agenda-setting powers of committees make them virtual arbiters of whether or not bills reach the floor for voting (Shepsle and Weingast 1987). Once a bill reaches the floor, norms of deference may lead many members of Congressmen to follow committee recommendations, either because of implicit logrolls among committees (Weingast and Marshall 1988) or because of recognition of committees' greater expertise (Kingdon 1989). Votes of committee members are usually less critical than how vigorously members provide support (Hall, 1987; Mayhew 1974). Hence, securing the support of a relatively small number of legislators (each of whom is a highly efficient producer of effective support) may be the primary goal of interest groups, even though the groups ultimately care about the outcome of floor votes. This reality is captured by our framework, with its focus on levels of "effective support."

To be sure, different legislators require different amounts of effort to produce a unit of effective support. These variations in productivity are due to such factors as the size and effectiveness of members' staffs, their seniority, their committee assignments, and their leadership positions, including committee chairmanships. Moreover, a legislator's effort may encompass a much larger range of activities than simply voting for a given instrument: among other things, a legislator might hold hearings, attend committee markups, draft or sponsor legislation, insert statements into committee reports, propose amendments, seek to influence colleagues, or make behind-the-scenes deals.[26]

We take the political currency in this market to be resources for the legislator's re-election: not only votes, but also monetary and other contributions.[27] An environmental interest group, for example, may publicly endorse a candidate for office, or may volunteer time and effort to mobilize votes in a legislator's district. Other forms of "payment" (assistance) to legislators -- such as time spent drafting legislation, or policy information provided to the legislator -- are also valued by a legislator seeking reelection, since association with the interest group may increase the legislator's support, and the time saved by the legislator may be spent on activities that generate home district votes. We incorporate home district votes, financial contributions, and nonmonetary contributions in the currency of "resources," and we adopt a monetary numeraire simply for purposes of convenience.

3.2 Origins of Demand for Environmental Policy Instruments

We now explore the nature of demand by firms and individuals, dividing the latter category into three overlapping groups: consumers, workers, and environmentalists. Then we consider the role of interest groups, such as trade associations and environmental organizations.

3.2.1 Firms and Individuals

Firms are affected by environmental regulation through the costs they incur to produce goods and services. Consider a price-taking firm that wishes to maximize its profit from producing a single product and that employs a set of factors in its production, each of which has some cost associated with it. One of these factors or inputs is the set of relevant features of the regulatory environment. In seeking to maximize profits, the firm chooses levels of all its inputs, including the efforts it puts into securing its desired regulatory environment. By solving its maximization problem, the firm derives its demand functions for all its inputs, including its demand for the environmental policy instrument. In this simplest model, individual firms have a decreasing marginal willingness to pay

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[26]Denzau and Munger (1986) describe the range of services legislators can offer interest groups. Silberman and Durden (1976) analyze a similar measure of legislator participation, which they call "political support effort." It is worth noting that these models generally treat as an output what in our framework is an input: namely, the effort exerted by the legislator, used to produce effective support. We have incorporated differences among legislators in effectiveness and productivity into the supply side (production of effective support) rather than the demand side (demand of interest groups for support from different legislators). For further discussion of the ways in which Congressmen can participate in policy making, especially in committee, see: Hall (1987, 1996); and Hall and Wayman (1990).

[27]Monetary contributions can be used to finance advertising campaigns, literature production and distribution, and other activities that increase the probability of a legislator being re-elected.

to secure particular policy instruments.[28] At a minimum, a firm's demand for a policy instrument is a function of output and input prices, including the "price of legislators' support."[29]

The choice of environmental policy instruments can also have an effect on individuals. For example, individuals can be affected by the level of environmental quality that results from the use of a particular instrument,[30] or by the costs of environmental protection that are reflected in the prices of the goods and services they buy. Individuals might even derive some direct utility from knowing that a particular type of policy instrument was employed. These effects can be reflected in a utility function. The arguments of this function consist of the vector of public and private goods about which the individual cares; each such good has a price associated with it. In maximizing his utility, the consumer is subject to a budgetary constraint. The result is a set of demand functions for all private and public goods, including demand functions for any environmental policy instruments that, either directly or indirectly, affect the individual's utility. Thus, individuals, like firms, can have a decreasing marginal willingness to pay to secure particular policy instruments.[31] Their demand for a policy instrument is a function of their income and of the relative prices of relevant goods, including the price of securing support for their preferred instrument.

Individuals can be thought of as having attributes of "consumers," "environmentalists," and "workers." These three categories are neither mutually exclusive nor exhaustive. We think of individuals as "consumers" to the degree that the choice of environmental policy instrument affects them through its impact on the prices of goods and services; as "environmentalists" to the degree that they are affected by the impact of instrument choice on the level of environmental quality; and as "workers" to the degree that they are affected by environmental policy through its impact on the demand for labor, and hence their wages.

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[28]The maximized objective function is the firm's profit function. Hotelling's Lemma establishes that the factor demand functions are downward sloping as long as the profit function is convex.

[29]This stylized framework implicitly assumes that firms are profit-maximizing (or cost-minimizing) atomistic units, and thus that there is no significant principal-agent slack between managers and shareholders. There is little doubt that this assumption departs from reality in many cases, but we leave its investigation to future research.

[30]We said at the outset that we were restricting our attention to the policy instruments used to achieve a *given* level of protection. As we note below, however, the choice of cost-effective instruments, for example, can lead to the adoption of more stringent environmental standards.

[31]The maximized utility function is the individual's indirect utility function. By Roy's Identity, we know that the demand functions are downward sloping, as long as the utility function has the usual properties. It is possible that over a certain region the demand function will be *increasing*. For example, a unit of support for an instrument will be virtually worthless at very low levels of support, since adoption of that instrument will be extremely unlikely. We assume, however, that the demand function is decreasing over the *politically relevant* range, in which adoption of the instrument is a realistic possibility. It might be argued that if a legislature was composed of a single legislator and there was perfect information, demand functions for political support would (in the case of support relevant for voting) be a step function with a single step: interest groups would have no willingness-to-pay below some level of (adequate) support, and no willingness-to-pay above a sufficient level of support. But in a multi-member body, more support from individual legislators can always be worth something, and if there is uncertainty about how much support is sufficient, the demand function is likely to be downward sloping over at least some range.

3.2.2 Interest Groups

Because there are significant costs of lobbying and because the target of demand -- the public policy -- is a public good,[32] an individual and even a firm will receive relatively small rewards for any direct lobbying efforts. For individuals, the marginal costs of lobbying are likely to outweigh the perceived marginal benefits over much of the relevant range of lobbying activity, and individuals will undersupply lobbying, hoping instead to free ride on the efforts of others. Although some large firms maintain offices in Washington, D.C. to facilitate direct lobbying of the Congress, most of the demand for public policies from both firms and individuals is transmitted through organized interest groups.

The free-riding problem that stands in the way of individual lobbying efforts can also be a significant obstacle to the formation of interest groups (Olson 1965). For an interest group to organize, it must find a way to overcome the free-riding problem: it must offer its members enough benefits to make the costs of membership worthwhile. For a citizen group, such as an environmental advocacy organization, these benefits are likely to include: "material incentives," (Wilson 1973) such as newsletters, workshops, or gifts; "solidarity incentives," essentially the benefits derived from social interaction; and "purposive incentives," the personal satisfaction derived from membership in an organization whose activities one supports (Rothenberg 1992).

Among citizen groups, taxpayer and consumer organizations may face greater free-riding problems than environmental groups: their lobbying actions are likely to have an even wider range of potential beneficiaries; they may be able to offer fewer material incentives; and they lack the compelling moral mission that may drive the purposive incentives motivating members of environmental groups. Of course, labor unions are able to overcome free-riding problems through mandatory dues payments (Olson 1965; Wilson 1973). To the extent that these funds are used for lobbying efforts, we might expect unions to be especially well-represented in the political arena. But since unions dedicate most of their campaign contributions to securing favorable labor policy, unions as a group have only rarely been influential (or even active) in environmental policy debates.

In order to overcome their own set of free-rider problems, trade associations can offer a range of benefits to their members that nonmembers do not enjoy, including: influence over policy goals; information on policy developments; reports on economic trends; and participation in an annual convention (Olson 1965). Compared with citizen groups, trade associations may have significant advantages in overcoming free-riding: they are usually smaller, making the contributions of each member more significant; and even substantial annual dues may be negligible costs for member firms (Wilson 1973). Hence, we might expect that private industry interests will be over-represented in the political process relative to citizen groups.

Interest groups do not simply aggregate the political demands of their members. Indeed, an interest groups' utility maximization problem may diverge significantly from those of its members as a result of a principal-agent problem: the members (and donors) are principals who contract with

[32]Regulation may not always be nonexclusive. Loopholes, narrowly-applying clauses in statutes, and bureaucratic exemptions can all afford special treatment for some firms or narrowly defined categories of consumers. This possibility may provide enough incentive for some individual firms to lobby.

their agent -- the interest group (or, more precisely, its professional staff) -- to represent their views to the legislature.[33] As in many such contractual relationships, the output exerted by the agents may not be directly observable or controllable by the principal. The principal-agent problem is probably far more serious for environmental advocacy groups than for private industry trade associations.[34]

Principal-agent slack between what the members want and what the interest group actually does arises because the organization's staff has its own self interests. A trade association, for example, may not only want to maximize the profits of its member firms; it may also seek to expand its membership or to increase revenue from member dues. Similarly, the objective function of an environmental group may include not only the level of environmental quality, but also factors such as membership size, budget, and reputation among various constituencies that affect the organization's health and viability.[35]

In seeking to secure as much support as possible in the legislature for its preferred outcome, an interest group must decide how to allocate its scarce resources. The total benefits to an interest group of the legislature's support for an instrument rise with the degree of support offered, but there are decreasing marginal returns. As in the case of individuals and firms, a unit increase in support when the legislature is already very favorably disposed to one's position is worth less than a unit increase in support by a lukewarm or previously unsupportive legislature. This characteristic produces a downward-sloping demand function: an interest group's marginal willingness-to-pay for support decreases as the legislature's total support increases.[36]

3.3 Origins of Supply of Environmental Policy Instruments

We consider a legislator who derives utility from a constellation of factors made possible by being a legislator: making public policy, doing good things for the country or for her district, satisfying ideological beliefs, having prestige and the perquisites of office, and so on. To continue

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[33]In the typical principal-agent relationship, the principals (in this case, the firms) know their own interests and wish to ensure that the agent (here the trade association) acts in accordance with those interests. It is conceivable, however, that interest group staff may be *leading* the charge for policy changes that will benefit member firms, while those firms remain largely ignorant about the policy issues at stake (Bauer, Pool, and Dexter 1963).

[34]An environmental organization may have a hundred thousand members or more scattered across the country, paying scant attention to the operational priorities of the organization (let alone the details of its day-by-day activities). Trade associations, on the other hand, may be dominated by a large producer, with an incentive to monitor the association's activities; and their boards of directors may be made up of executives from member firms. Moreover, trade associations have many fewer members, and therefore the stake of each in the organization is greater, and monitoring is more likely to be worthwhile. On the other hand, trade associations have their own set of problems. Among these are the possible necessity of obtaining an expression of consensus from member firms prior to undertaking specific lobbying efforts.

[35]Lowry (1993) treats the agency problem in environmental groups extensively. He argues that because members and patrons cannot observe the outputs or effort of their agents directly, they must instead make funding and membership decisions based on a group's inputs: its expenditures on lobbying, member materials, advertising, and fund raising.

[36]Up to this point, we have examined lobbying activities of interest groups exclusively in terms of their demand-side effects. It can also be argued that some such activities are intended to and may succeed in shifting legislators' supply functions. We examine this possibility below.

getting utility from these factors, the legislator must be reelected. We assume that legislators seek to maximize their expected utility. In choosing a policy position (level of support for a proposed instrument), therefore, the legislator takes into account the effort required to provide that support, the inherent satisfaction she derives from providing that level of support, and the effects her position will likely have on her chances of reelection.[37]

Thus, our framework allows for the legislator's supply function to consist of three components: (1) the opportunity cost of time (effort) required to provide a given degree of support for a policy instrument; (2) the psychological cost of supporting an instrument *despite* one's ideological beliefs (if supporting the instrument is consistent with one's ideological beliefs, then this is a "negative cost," i.e. a benefit); and (3) the opportunity cost (in terms of reduced probability of reelection) of supporting an instrument not favored by one's electoral constituency (this is also a "negative cost" if supporting the instrument is consistent with one's constituents' positions).

The first component emerges from the individual legislator's productivity in providing support. As indicated in Figure 2, the legislator's input is "effort"[38] and the relevant output is "effective support." Some legislators are more efficient producers of effective support from a given amount of effort than others for a host of reasons, including the size and effectiveness of their staffs, their seniority in the legislature, and — importantly — their membership and leadership on relevant committees. By placing a value on the opportunity cost of time and effort, we can derive an opportunity cost function (Figure 3), and from that, the related marginal opportunity cost of effort, represented by the upward-sloping line emanating from the origin in Figure 4.[39]

Next, we posit that a legislator derives disutility from acting inconsistently with her ideology. Thus, we introduce the psychological cost of supporting a policy that is inconsistent with one's ideological beliefs. As suggested above, this cost would be negative (a benefit) if one were ideologically predisposed to favor the particular policy. In either case, it is conceivable that these marginal (psychological) costs might be increasing or decreasing (in absolute value) with the degree of support, but for ease of presentation we portray this marginal cost as constant in Figure 4. In this case, the legislator's ideology has no effect on the slope of the combined marginal cost function; rather, ideology shifts the function upwards (for inconsistency with ideology) or downwards (for consistency with ideology).

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[37]This notion of legislators' goals is consistent with Fenno's (1973, 1978) description of Congressmen as having three basic objectives: re-election, influence within the House, and good public policy. In our framework, "influence within the House" and "good public policy" are combined in "being a legislator." If the legislator wishes to continue to be a legislator in the future, she will also value reelection.

[38]This includes the use of other resources, but may be thought of as being denominated in units of time.

[39]In the face of the overwhelming claims on their time and resources — both in Washington and in their home districts — a Congressman's time and effort carries a significant opportunity cost (Bauer, Pool, and Dexter 1963; Kingdon 1989; Fenno 1978). Effort invested in providing support for one bill could have been spent working on other legislation that would satisfy ideological goals, reflect voters' objectives, and/or attract votes, dollars, and other resources; or visiting the home district and supplying constituency services such as help dealing with the bureaucracy (Denzau and Munger 1986, Grier and Munger 1993). Note that the marginal cost function is assumed in the figure to be linear, simply to keep the explication simple.

Finally, we can consider the third component of the legislator's supply function: the opportunity cost corresponding to the reduced probability of reelection due to supporting an instrument not favored by one's electoral constituency. This effect can be either direct in the form of lost votes from constituents unhappy with the legislator's position, or indirect as a result of the opposition of interest groups unhappy with the legislator's position, which through protest and grassroots mobilization could affect the constituents' assessment of the legislator.[40] Again, this is a "negative cost" if supporting the instrument is consistent with one's constituents' positions.[41] As with ideological costs, these marginal electoral opportunity costs could be increasing or decreasing with the level of the legislator's support, but to keep things simple we draw them as constant (and positive) in Figure 4.[42]

The overall (individual) marginal cost function — the legislator's supply-of-support function — is simply the vertical summation of these three components: opportunity costs of effort, ideological costs, and constituency costs (Figure 4). The amount of support for a policy instrument that a legislator would supply at zero price, that is, in the absence of any contributions helpful to advancing the member's goals, including her re-election, is represented in Figure 5 as the "preferred point," the intersection of the supply function with the horizontal axis. In this framework, the legislator can be induced to offer greater degrees of support than this preferred point by offers of "political compensation" that offset the legislator's opportunity costs arising from such support.

Thus, the legislator has an upward-sloping marginal opportunity-cost or supply function, beginning at her preferred degree of support along the horizontal axis. The intersection of the supply function with the horizontal axis can take place at either a positive or a negative degree of support (see S_1 and S_3, respectively, in Figure 5). A politician who is strongly opposed to a given instrument because of a combination of her own ideology and her constituents' preferences will have a supply function with a negative intercept on the horizontal axis (and a positive intercept on the vertical axis). For such a legislator, a positive, non-marginal shadow price of political compensation is required for any positive degree of support to be forthcoming (see point A in Figure 5).

A legislator's supply function is affected by several exogenous factors. First, an exogenous increase in the negative impact of a given instrument on a legislator's constituents (for example, the construction in the legislator's district of a new factory that would have to pay pollution taxes) would increase the legislator's opportunity costs of supporting that instrument. Conversely, an exogenous

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[40]Congressmen tend to take into account the preferences of the people who voted for them, i.e. their "supporting coalition" (Kingdon 1989) or their "reelection constituency" (Fenno 1978). A conservative legislator whose reelection constituency is anti-regulatory, for example, will not be affected by a minority group of environmentalists calling for command-and-control regulation.

[41]Departing from the preferences of constituents reduces the probability of the legislator's reelection. This reduced probability can be evaluated in terms of the resources required to maintain a constant probability of reelection.

[42]In the figure, we represent both ideological costs and electoral costs as being positive; i.e., support for the policy is essentially inconsistent both with the legislator's own ideology and her constituents' preferences. It is not inconceivable that these could be of opposite sign, but in a representative democracy, that would be the exception, not the rule. As stated by Fenno (1978, p. 142): "'If your conscience and your district disagree too often,' members like to say, 'you're in the wrong business.'"

increase in the benefits of an instrument to the legislator's constituents (for example, the expansion of a firm in the district that produced a mandated abatement technology) would decrease the legislator's opportunity costs.

Second, the position of the legislator's political party is also relevant. Parties supply funds and organizational support in re-election campaigns. Moreover, leadership posts in the party offer opportunities for increased effectiveness in the legislature. Obviously, parties are likely to be more generous with legislators who are loyal.[43]

Third, the actions of other legislators will have a bearing on the costs of supplying support because of the possibilities for vote trading. For example, one legislator may care a great deal about the level of environmental protection chosen, while having only a slight preference for standards over taxes; another legislator may care less about the exact level but have a strong preference for taxes over standards, perhaps because of her own market-oriented ideology. In a logroll, both legislators could gain from vote trading, and such a logroll would affect both legislators' costs of supplying support for a given instrument.

Fourth and finally, it is both the intent and the consequence of some lobbying activities to shift legislators' supply functions. In other words, in addition to being the primary demanders for alternative forms of regulation, organized interest groups can also play a role in determining the position and shape of legislators' supply functions. Lobbyists might attempt to: affect a legislator's ideologically-based perception of the merits of a proposed policy instrument (Kingdon 1989); affect a legislator's perceptions of her constituents' policy preferences (Austen-Smith and Wright 1994); and/or affect a legislator's effort-support production function through, for example, provision of information or technical support (Bauer, Pool, and Dexter 1963).

3.4 Formation of Equilibria and Legislative Outcomes

Up to this point, we have focused on the origins of supply and demand for a single policy instrument. In many contexts, there will be a *set* of possible instruments considered for achieving a given policy goal: for example, a standard, tax, and a system of tradeable permits. In addition, there will exist the possibility of doing nothing, i.e. maintaining the status quo. Hence if N alternative instruments are under consideration, then there will be N+1 possible choices of action.[44] We view each option as defining a "political market" for effective support.[45] On the demand side, each policy instrument may have an associated set of interest groups seeking to secure support for it. On the supply side, each policy instrument gives rise to its own set of legislator supply functions. A single legislator may be more efficient at producing support for one instrument than for another;

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[43]Party leaders may conceivably also become effective demanders for policy instrument support by offering various resources to legislators in exchange for support, in which case the parties are essentially functioning as interest groups.

[44]We simply take the choice set of instruments as given. Important questions remain regarding how it is determined, but these are beyond the scope of this paper.

[45]An interest group can demand and a legislator can supply support for more than one instrument. Although this may at first seem counterintuitive, recall that each legislator's supply function for a given instrument may include the possibility of opposition.

she may have different ideological attitudes towards different instruments; and the preferences of her reelection constituency may vary across instruments, as well.

The legislative outcome is the choice of one of the N+1 alternatives arising from the interactions of interest groups' demands for and legislators' supplies of support for alternative instruments. The degree of aggregate support for each instrument results from an equilibrium established in the legislature, and the outcome in the legislature favors the policy instrument with the greatest degree of total support.

In the following sections, we examine the component parts of this process. We first consider the nature of the aggregation of demand for a policy instrument across interested individuals and groups, and the aggregation of supplies of support for a policy instrument across members of the legislature. Then, we consider the formation of equilibria in the legislature for alternative policy instruments and the consequent choice of political outcome. Finally, we discuss alternative approaches to modeling this political market.

3.4.1 Aggregation of Demand for Policy Instrument Support

Typically, more than one interest group will be pressing for support from the legislature. How is such interest group demand to be aggregated? In the classic model associated with Stigler (1971) and Peltzman (1976), the "winner takes all": the highest bidder wins, and gains control over regulation. In Becker's (1983) model, competing interest groups participate in a zero-sum game along a single dimension: one group is taxed, the other subsidized, and each tries to improve its lot at the expense of the other. In an actual legislature, interest groups may be opposed to one another or aligned in support of the same instrument.

The most obvious approach for aggregating interest-group demand functions might be simply to sum, at each level of willingness-to-pay, the degrees of support that each group demands at that price. Such demand aggregation makes sense for private goods, but the support the legislature provides is essentially a public good. Hence, an efficient approach might involve taking a given level of support and summing up what each interest group is (marginally) willing to pay for that degree of support; that is, vertical summation rather than horizontal summation of individual demands. But such an (efficient) approach is unlikely to reflect positive reality, as long as free-rider problems among interest groups exist. Therefore, the aggregate demand thus calculated represents the upper bound of actual aggregate demand -- that is, the demand which would be experienced in the absence of free riding.

3.4.2 Aggregation of Supply of Policy Instrument Options

Since, in this framework, the degree of support by individual legislators is denominated in terms of homogenous units of "effective support," where the differences among legislators are incorporated in the production functions that underlie these individual marginal opportunity cost of effort functions (as well as the individual marginal ideology and electoral cost functions), the appropriate aggregation to derive the supply function for the legislature is the horizontal summation of the supply functions of individual legislators. As we noted above, some legislators' supply functions may extend to the left of the vertical axis (for example, S_3 in Figure 5), corresponding to

opposition to the instrument in question. Therefore, when the individual legislator supply functions are horizontally added, the aggregate supply function for the legislature represents the relevant *net* supply of support. Like the supply function for an individual legislator, the aggregate function for some instruments may intersect the vertical axis at a positive price.

3.4.3. Equilibrium Support in the Legislature for a Policy Instrument

We treat the legislature as operating as if it were a competitive market for the support for policy instruments. Given the homogeneity of the commodity that is demanded and supplied, the number of members in the two houses of Congress, and the number of active interest groups, this seems like a reasonable first approximation. Thus, the equilibrium, aggregate level of "effective support" that is provided for the policy instrument is that level for which aggregate supply equals aggregate demand (Q^* in Figure 6). This level is associated with a shadow price (P in Figure 6) representing the aggregate marginal willingness to pay for support in the legislature's equilibrium.

There are two cases of interest in which the aggregate supply and demand functions will not intersect in the politically relevant positive orthant. One is the case in which the demand function intersects the horizontal axis to the left of the legislature's "aggregate preferred point" (see the gap between points B and E_A in Figure 7); that is, the maximum support demanded in the aggregate by interest groups (at zero price) is less than the legislature would provide on its own. In this case of "excess supply," it is reasonable to assume that the legislature will provide support at its preferred point (E_A). Given the likelihood of free-riding among interest groups, it would not be surprising if in certain instances the aggregate demand by interest groups fell short of the support a strongly committed legislature was willing to provide absent any lobbying. In this case the competitive equilibrium price is zero, and so each legislator provides support at her own preferred point.

The second special case of interest might arise when a legislature so strongly opposes an policy that its upward-sloping aggregate supply function intersects the vertical axis at a positive price (point C in Figure 7). In this case, the supply function could conceivably lie entirely above the interest groups' aggregate demand function. The political price that such a legislature would require for a positive degree of support is simply greater than the interest groups' overall reservation price for obtaining such support (point D in Figure 7).

In this competitive political market framework, an individual legislator will tend to supply support for a particular policy instrument up to the point where her marginal opportunity costs of doing so are equivalent to the infinitely elastic demand for support she faces from interest groups, represented by the horizontal line through the point P in Figure 5 (derived from the equilibrium in Figure 6). Thus, a set of legislators with supply functions represented by S_1, S_2, and S_3 (Figure 5), would provide effective support of Q_1, Q_2, and Q_3, respectively.

The legislator with supply function S_3 provides a negative level of support, i.e. opposition. An interest group might benefit from contributing to this legislator in the hope of reducing her

degree of active opposition,[46] just as it can benefit by increasing the support of a "friendly" legislator. It would take a level of demand (and political compensation) equivalent to point A in Figure 5 to move this same legislator to a position of inaction or indifference.

On the other hand, legislators such as those represented by S_1 and S_2 in Figure 5 derive benefits (negative costs) from supporting an instrument, no matter what the position of relevant interest groups. Not surprisingly, such friendly legislators end up supplying even greater levels of support in response to interest group demand.

3.4.4 Legislative Outcomes

How do individual levels of support for policy instruments translate into policy outcomes? If our interest is in aggregate quantity of support (as defined), then total support is simply equal to the sum of the individual levels of equilibrium support, which is identical to the original market equilibrium. On the other hand, institutional processes that translate individual levels of support into a collective decision (for example, various kinds of voting mechanisms) may involve very different sorts of aggregation. In general, institutional features of the legislature will influence the nature of the appropriate aggregation.

First, the committee structure of Congress (especially in the House of Representatives) gives different legislators widely different levels of influence over policy.[47] Thus, legislators vary greatly in the effectiveness of the support they can supply for a given instrument. But in our framework, with its focus on degrees of *effective* support, this reality is already incorporated (through the political support production functions) and has no effect on the appropriate aggregation; it remains one of simple summation of individual equilibria.

Second, legislative outcomes are affected by voting rules. The number of votes necessary for passage, taking into account the veto power of the executive, determines the level and distribution of support needed to pass a bill.[48] Furthermore, the order of voting on amendments and

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[46]Hall and Wayman (1990) examine legislator participation in committees, and argue that interest groups give contributions to "hostile" legislators in order to reduce their participation, i.e. their opposition.

[47]Norms of deference, backed up by repeated interactions and the threat of retaliation, give members of committees and subcommittees significant influence over policies under their jurisdiction (Shepsle and Weingast 1987; Weingast and Marshall 1988). Agenda-setting or "gate keeping" powers give committees the right to send bills to the floor or table them in committee. Standing committees are also heavily represented on the conference committees that are established to reconcile differences between the chambers before final passage. Power is particularly concentrated in the hands of committee chairs, who hold sway over the committee's agenda and the bills it reports to the floor. Given the importance of committee composition, policy outcomes may differ markedly from the preferences of the legislature as a whole; with low committee turnover, and given the importance of seniority, the status quo may persist long after support in the full legislature has ebbed (Shepsle and Weingast 1984).

[48]In the U.S. Congress, a bill needs a bare majority in the House of Representatives, but may have to clear a higher hurdle in the Senate to bring closure to debate. If the President vetoes the bill, of course, two-thirds majorities in both houses are required to enact legislation.

the nature of the final vote also affect the outcome.[49] This brings us to the important issue of how support is translated into votes. Whereas our "degree of support" is a continuous variable, it may produce a binary variable, a vote. Any empirical implementation of this framework would need to address the linkage.[50] For our purposes, however, we can focus on the reality that — in general — the policy instrument chosen will be the alternative that has garnered the greatest aggregate support.

3.4.5 Alternative Equilibrium Frameworks

Other conceptual frameworks of this political market can certainly be developed. One interesting alternative approach would be to give greater emphasis to the differences that exist among individual legislators in terms of the nature of support they can provide. Thus, rather than quantifying support in terms of perfectly homogenous units of "effective support," we could recognize that the "uniqueness" of support from any single legislator (particularly from powerful members of the legislature) may be interpreted as leading to a set of monopoly political markets, rather than a single competitive political market.

Thus, at one extreme, if each member of the legislature is a monopoly supplier of her unique type of support and thus faces a downward-sloping demand for her support, we have a set of monopoly equilibria, one for each member of the legislature, with each member equating her marginal cost (individual supply function) with the "marginal revenue" function associated with the policy demands she faces, and thus determining her equilibrium (and utility-maximizing) level of support.

This extreme case of multiple monopoly suppliers seems to be a less reasonable approximation of political reality than the perfectly competitive case. But it does illustrate the possibility of developing alternative models of imperfect competition that may do a better job of capturing important characteristics of these political markets. Various models of cooperative and noncooperative oligopoly may capture significant elements of legislative relationships.[51] We leave such explorations for future efforts. Instead, for purposes of developing a conceptual framework within which we can organize and synthesize existing political economy theories, we proceed with the basic competitive framework.

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[49]In the Congress, a bill, as modified by successful amendments, is considered opposite the status quo in the final vote. This arrangement favors the status quo and requires that each bill be compared ultimately with the status quo rather than with other alternatives.

[50]For example, discrete-choice econometric models that have as their theoretical basis the existence of an unobserved latent variable are an obvious candidate.

[51]For example, the respective roles played by committee chairs and members may be modeled as a monopolist operating in the context of a competitive fringe.

4. DEMAND FOR ENVIRONMENTAL POLICY INSTRUMENTS

Demand-side explanations for the choice among environmental policy instruments can be separated into four sectors of regulatory demand: firms, environmentalists, consumers, and labor.

4.1 Firms

Firms will tend to demand the policy instruments that promise the highest profits (or the least losses) from regulation. While all environmental regulation imposes costs of compliance on firms, not all instruments impose the same costs to achieve a given regulatory goal. Positive political economy explanations of firm demand for environmental regulation can be divided into three principal categories: firm preferences for one instrument over another can arise from lower aggregate costs of compliance to industry as a whole; the presence of rents and entry barriers; and differential costs of compliance across firms in a given industry.[52]

4.1.1 Lower Aggregate Costs to an Industry as a Whole

All else being equal, firms will naturally tend to prefer regulatory instruments that have lower aggregate costs for the industry as a whole. Because market-based approaches are likely to be more cost-effective than command-and-control instruments, this thinking would suggest that private industry, as a whole, would be more supportive of market-based approaches in general. However, there is a crucial distinction between the aggregate costs for *society* and aggregate costs for private industry. Cost-effective instruments, by definition, minimize costs to society; but they vary in the proportion of that cost they place on polluters. The use of market-based instruments, in general, does not guarantee that firms' compliance costs will be less than under command-and-control.

We can expect that firms will oppose regulatory instruments that shift a greater cost burden onto industry. For example, the virtually unanimous opposition by private industry to pollution taxes can be explained by under such schemes firms pay not only their private costs of compliance, but also the costs of tax payments to the government for all residual emissions.[53] Similarly, under tradeable permit schemes, firms bear equivalent costs if the initial distribution of the permits is by means of an auction. In contrast, under a tradeable permit scheme with grandfathered permits, existing firms do not bear any cost for their residual emissions.[54]

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[52]There are other plausible explanations for firms' preferences. Firms may simply support the continuation of the status quo, which is generally the command-and-control approach, because replacing familiar policies with new instruments can mean that existing expertise within firms becomes less valued (Kelman 1981, Stewart 1996). For example, lobbyists -- the agents in a principal-agent relationship -- may be expected to rationally resist the dissipation of their human capital (Hahn and Stavins 1991). It has also been suggested that market-based instruments may be opposed simply because they are not well understood (Kelman 1981, Welch 1983), and there is at least anecdotal evidence that this has been the case. Such lack of understanding can also affect the supply side, and we discuss this later.

[53]On this point, see Kelman 1981; Crandall 1983; Hahn and Noll 1990; and Arnold 1995. Actually, firms pay less than the full amount of the tax; a share is passed on to consumers.

[54]Grandfathering distributes the rents from permits to firms that participate in the initial allocation (Dewees 1983), in contrast with an auction (Yohe 1976).

These arguments suggest that private industry, as a whole, will prefer grandfathered permits *and* standards to other instruments. Grandfathered permits are cost-effective and minimize the burden placed on industry -- at least on existing firms. Emissions standards may not fare as well on the total-cost criterion, but are likely to be preferred by firms to auctioned permits or taxes.

4.1.2 Generation of Rents and Erection of Entry Barriers

Certain types of regulations can actually augment firms' profits through the generation of rents and the erection of entry barriers. In general, firms will earn rents if a regulatory instrument drives price above average cost. Consider the simple case of a command-and-control standard that sets an allowable level of aggregate pollution for each firm, where firms can meet the standard only by reducing their output (Buchanan and Tullock 1975). If the industry is initially made up of many identical firms, each facing an identical demand, with classical average and marginal cost functions, in the absence of regulation each firm will produce at the intersection of its marginal and average cost curves, and make zero profits. The environmental standard has the effect of reducing total production and therefore raising price along the aggregate demand curve. If the environmental restriction is not exceptionally severe, the new price will be above average cost for all firms. Firms, therefore, earn rent: the difference between the price they receive for their product and their cost of production. If entry is prohibited, existing firms will continue earning rents into the future; even if not, the rents will last until enough new firms enter to reestablish competitive equilibrium at the new price. Hence, in this very simple model, firms may prefer standards to no regulation at all, and firms will prefer standards to taxes, since a tax is a charge for a resource that otherwise is free.[55]

Firms, however, are not limited to the single response of cutting output. They can also reduce emissions by adopting a new technology or changing their input mix. In this more general and realistic scenario, depending on the stringency of the standards and other factors, command-and-control standards can still have the effect of providing rents to regulated firms (Maloney and McCormick 1982). Here, too, under certain conditions, firms may prefer command-and-control standards to no regulation at all.[56]

It is important to note that the enhanced industry profitability that results from rents will be sustainable over the long term *only* in the presence of entry restrictions. Thus, firms regulated by a rent-generating instrument, such as command-and-control standards, will benefit if that instrument

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[55]Even if the restriction is severe enough to impose losses on firms, they will prefer standards to taxes, which impose new costs. In the long run, under a tax scheme, firms will exit the industry until a new zero-profit equilibrium is reached; but in the short term, firms will lose money. The tax reduces each firm's present value of income, whether it remains in the industry or exits. Firms will therefore oppose the introduction of pollution taxes.

[56]Pollution restrictions raise both the average and marginal cost curves. Each firm will produce at the level where restricted marginal cost intersects the per-firm demand curve. If the minimum average cost under regulation is to the left of this point, the price (marginal cost) will exceed average cost, and firms will earn rents. Maloney and McCormick (1982) identified three conditions that are sufficient for regulation to enhance producer profits: (1) output under regulation corresponds to some cost-minimizing level of output in the absence of regulation; (2) pollution increases with output; and (3) average costs increase more at higher levels of output under regulation. The necessary and sufficient condition for higher profits is that the intersection of average and marginal cost under regulation lie to the left of the firm's demand curve.

is linked to a mechanism that imposes barriers to entry. In theory, such a mechanism might prohibit new entry outright, but a more politically feasible approach would impose higher costs on new entrants (Stigler 1971, Rasmusen and Zupan 1991).

This body of theory helps explain why private firms (and their trade associations) may have strong demands for command-and-control standards, which create rents, and especially for considerably more stringent command-and-control standards for new sources, which create barriers to entry.[57] The theory thereby provides the beginnings of an explanation for the prevalence of such instruments in U.S. environmental laws. Further, theory indicates that under certain conditions the regulated industry will be better off under such a scheme than under no regulation.

Although the theoretical arguments are strong, there are no conclusive empirical validations of these demand-side propositions. Direct empirical tests of firm demand for instruments -- such as analyses of resources devoted to lobbying for instruments as a function of firms' stakes in an issue -- are virtually nonexistent. Instead, most empirical work in this area simply seeks to measure the benefits an industry receives under regulation. Thus, it is not instrument demand that is examined, but an underlying premise for such demand. Maloney and McCormick (1982) employed financial market event analysis in two regulatory cases to test whether the value of regulated firms, as measured by stock market prices, was positively affected by the announcement of regulation, as the economic theory of regulation would suggest. They found that cotton-dust standards promulgated by the U.S. Occupational, Safety, and Health Administration (OSHA) raised the asset value of cotton producers, consistent with the notion that regulation increased firms' profits by creating rents. But a more comprehensive study by Hughes, Magat, and Ricks (1986) reached the opposite conclusion.

This discussion also provides a positive political economy explanation for why market-based instruments have virtually always taken the form of grandfathered tradeable permits, or at least of why private firms should be expected to have strong demands for this means of permit allocation. In tradeable permit schemes, grandfathering: (1) conveys scarcity rents to firms, since existing polluters are granted valuable economic resources for free; and (2) provides entry barriers, in that new entrants must purchase permits from existing holders. Hahn and McGartland (1989) provide anecdotal evidence for rent-seeking in the decision making process over EPA's implementation of the Montreal Protocol restricting the use and production of CFCs. They argue that a rent-seeking model explains the positions of large producers, such as DuPont, that supported grandfathered tradeable permits and opposed other implementation schemes, including an auction proposal.

The preceding discussion does *not* provide a compelling explanation for the prevalence of command-and-control standards over grandfathered tradeable permits. In principle, either instrument

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[57]Other barriers to entry result, for example, from the permitting requirements for new sources under the prevention of significant deterioration (PSD) and non-attainment programs under the Clean Air Act, as well as by non-attainment programs' offset requirements for new sources. The significance in a positive sense of scarcity rents as a major explanation for the prevalence of particular forms of environmental regulation has important normative implications, as well. This is because in the presence of pre-existing tax distortions, the distribution of these rents can have efficiency implications (Fullerton and Metcalf 1996). It is ironic that precisely that mechanism that facilitates political acceptance of some environmental policies (transmission of scarcity rents to the regulated sector) may also undo some or all of the welfare gains that would have been forthcoming.

could provide sustainable rents to existing firms. We must search elsewhere for positive political economy explanations of this phenomenon.

4.1.3 Differential Costs Across Firms in an Industry

A different explanation for the landscape of environmental policy instruments arises from the existence of differential costs of environmental compliance across firms. Because of this heterogeneity, a firm may support policy instruments that impose costs on it, as long as those costs affect it less than the industry average and thus give it a competitive advantage (Leone and Jackson 1981, Oster 1982). For example, firms with large refineries for which lead reduction involved relatively low costs were supportive of the tradeable permit system by which the leaded content of gasoline was reduced in the 1980's (Kerr and Maré 1995), whereas firms with smaller refineries were vehemently opposed.[58] Similarly, the largest producers of chloroflourocarbons (CFC's) -- DuPont and Imperial Chemical Industries -- supported a ban on CFC's in large part because they were best able to develop substitutes (Oye and Maxwell 1995). Other empirical work, however, has cast doubt on the proposition that firms advocate instruments based on inter-industry or intra-industry transfers. Leone and Jackson (1981) found that legislators with a paper producer in their districts voted against water pollution control legislation, regardless of whether the producer stood to gain or lose relative to its competitors.[59]

Another form of cost differential arises as a result of the erection of barriers to entry. It is important to distinguish here between the entry of new firms and the expansion of existing firms. The entry barriers of environmental regulation generally apply to both situations. Thus, within an industry, firms with no plans to expand would derive a greater benefit from entry barriers, which could discourage further growth by their competitors.

Conversely, firms with ambitious expansion plans relative to their existing operations would benefit from weaker barriers. Such firms would also try to structure barriers in a manner that gave them an advantage relative to newcomers. For example, the "bubble" program of the Clean Air Act makes these barriers less onerous for existing firms because they can engage in intra-firm emissions trading.[60] Under this program, a firm can reduce the emissions of an existing source by an amount at least equal to the emissions of the new source, instead of having to take the more costly step of

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[58]The small refineries' opposition is discussed in the case they brought to stop or delay the program: Small Refiner Lead Phasedown Task Force v. EPA, 705 F.2d 506 (D.C. Cir. 1983). Another example of such intra-industry differentials, and the resulting splintering of lobbying strategy, occurred when the National Coal Association (NCA) divided over the question of scrubber requirements in clean air legislation. A universal scrubber requirement would have preserved demand for eastern coal, which had higher sulfur content than its cleaner western competition. The NCA split between eastern and western coal producers and stayed out of the debates leading up to the 1977 Clean Air Act Amendments (Ackerman and Hassler 1981).

[59]These authors note that firms may oppose regulation out of uncertainty concerning how the legislation will be implemented, since cost predictions depend on subsequent rule making decisions by administrative agencies.

[60]The bubble program typically permits only geographically contiguous trades. Thus, even among existing firms with expansion plans, the benefits of the program depend on where the expansion is contemplated.

meeting the command-and-control standard otherwise applicable to new sources.[61] The Clean Air Act's "netting" policies, which allow intra-firm trading across time periods, also make expansion by an incumbent easier than entry by a new firm.

The mechanism for allocating tradeable permits might also produce different winners and losers within an industry. Under a grandfathering scheme that allocated permits on the basis of emissions at the time of establishment of the tradeable permit scheme, firms that invested in pollution abatement prior to regulation stand to lose, relative to their more heavily polluting competitors (Hahn and Noll 1990).[62] Such firms might conceivably prefer the allocation of permits by means of an initial auction.[63]

4.2 Environmental Organizations

As noted above, we anticipate that the utility of an environmental advocacy group will be affected by both the organization's well-being and the level of environmental quality. First, organizational well-being may be measured partly by budgetary resources, which are a function of donor contributions. This financial concern can affect an organization's demand for specific policy instruments if such support attracts members, persuades donors to make contributions, or, more broadly, increases the visibility and prestige of the organization. Hence, an organization's demand for a given policy instrument is likely to be affected (*ceteris paribus*) by several factors: the likelihood that the instrument will be chosen by policy makers;[64] the degree to which the organization can be clearly identified with supporting the instrument; the magnitude of potential funding gains due to distinguishing itself from other environmental groups; and the ability to offer donors and members a compelling argument, on environmental-quality grounds, in support of the instrument.

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[61]A general system of tradeable permits would eliminate this advantage.

[62]Also, small firms might be particularly supportive of grandfathering out of concern that auctions will be dominated by larger players (Hahn and McGartland 1989). Similarly, since the transition to a grandfathered-permits system is likely to involve less uncertainty than an auction, it might receive disproportionate support from risk-averse firms.

[63]Some supporting evidence is provided by the establishment of a market in takeoff and landing slots at the nation's busiest airports. Since 1968, peak-hour takeoffs and landings have been restricted at LaGuardia, John F. Kennedy, O'Hare, and Washington National Airports. Until 1986, these "slots" were allocated by a scheduling committee composed of the airlines using a given airport. In that year, the Federal Aviation Administration (FAA) replaced the committee-allocation system with a system of grandfathered tradeable permits. In the months before the proposal was to go into effect, Congress held hearings and considered whether to overrule the FAA. At the hearings, large airlines, which already held most of the slots, supported grandfathering. In contrast, upstart airlines with few slots that were looking to expand -- such as People's Express, Republic and Western -- vigorously opposed grandfathering, calling for a large percentage of existing slots to be auctioned or distributed by lottery. See: U.S. Congress, House of Representatives 1986.

[64]We need to distinguish here between strategic and tactical decisions by advocacy groups. The strategic decision by an environmental organization to express demand for a policy instrument and get it on the agenda for consideration is probably positively related to perceived probability of success; but the tactical decision to allocate resources (express demands) for an instrument already on the agenda may well be negatively related to probability of success.

A prominent example is provided by the Environmental Defense Fund's (EDF) enthusiastic and effective support of the SO_2 allowance trading system adopted as part of the Clean Air Act Amendments of 1990. With the Bush Administration eager to back up the President's claim of being "the environmental President," and with key senior staff in the Administration having strong predispositions to the use of market-based approaches, the proposal had a chance of succeeding. EDF had already become a champion of market-based approaches to environmental protection in other, less nationally prominent, domains. Now it faced an opportunity to strengthen that position and solidify its reputation as a pragmatic environmental organization willing to adopt new strategies involving less confrontation with private industry. By supporting tradeable permits, EDF could seize a market niche in the environmental movement, distinguishing itself further from other groups. Importantly, EDF was able to make a powerful argument for tradeable permits on environmental, as opposed to economic, grounds: the use of a cost-effective instrument would make it politically possible to achieve greater reductions in sulfur dioxide emissions than would otherwise be the case.

EDF is an outlier in this realm. Most environmental advocacy groups have been relatively hostile towards market-based instruments. This should not be terribly surprising. Because of their interest in strengthening environmental protection, environmental organizations might be expected to prefer command-and-control approaches to market-based schemes for three reasons. The first reason is *philosophical*: environmentalists have portrayed pollution taxes and tradeable permits as "licenses to pollute" (Kelman 1981),[65] and they have voiced concerns that damages from pollution -- to human health and to ecological well-being -- are difficult or impossible to quantify and monetize, and thus cannot be summed up in a marginal damage function or captured by a Pigouvian tax rate (Kelman 1981).

Second, environmental organizations may oppose market-based schemes on *strategic* grounds. Once implemented, permit levels and tax rates may be more difficult to alter than command-and-control standards. If permits are given the status of "property rights," an attempt to reduce pollution levels in the future may meet with "takings" claims and demands for government compensation (Hahn and Noll 1990). This concern, however, can be alleviated by an explicit statutory provision (like that contained in the acid rain provisions of the Clean Air Act Amendments of 1990) stating that permits do not represent property rights, or by "sunset" provisions that specify a particular period of time during which a permit is valid.

Likewise in the case of pollution taxes, if increased tax rates become desirable in response to new information about a pollutant or about the response of firms to the existing taxes, adjustment may be unlikely because raising tax rates is politically difficult. Furthermore, taxes have long been treated as "political footballs" in the United States (as in the recent case of calls to reduce gasoline taxes). Hence, environmental organizations might oppose pollution taxes out of fear that they would be reduced or eliminated over time. A related strategic reason for why environmentalists might oppose the use of tax instruments is that a shift from command-and-control to tax-based environmental regulation would shift authority from environment committees in the Congress,

[65]This criticism overlooks the fact that under conventional command-and-control regulations, firms receive these same licenses to pollute for free (Hahn and Stavins 1991).

frequently dominated by pro-environment legislators, to tax-writing committees, which are generally more conservative (Kelman 1981).

These strategic arguments refer, for the most part, to pollution taxes, not to market-based instruments in general. Indeed, one reason environmental groups, such as EDF, have endorsed the tradeable permits approach is that it promises the cost savings of taxes, without the drawbacks that environmentalists associate with tax instruments.

Third, environmental organizations may object to decentralized instruments on *technical* grounds. Although market-based instruments are theoretically superior in terms of cost effectiveness, problems may arise in translating theory into practice (Hahn and Axtell 1994). For example, an emission tax or tradeable permit scheme can lead to localized "hot spots" with relatively high levels of ambient pollution. While this problem can be addressed, in theory, through the use of permits or charge systems that are denominated in units of environmental degradation (Revesz 1996), the design of such systems might be perceived as excessively cumbersome.

4.3 Labor

Since unions seek to protect jobs, they might be expected to oppose instruments likely to lead to plant closings or other large industrial dislocations. Under a tradeable permit scheme, for example, firms might close their factories in heavily polluted areas, sell permits, and relocate to less polluted areas (Hahn and Noll 1990). In contrast, command-and-control standards have generally been tailored to protect aging plants. The threat of factory dislocation is a likely explanation of support from northern, urban members of Congress for the "prevention of significant deterioration" (PSD) policy in clean air regulation, which has discouraged movement of industry out of urban areas in the northeast, into high-quality air sheds in the South and West (Crandall 1983, Pashigian 1985). Depending on the tradeoffs between job creation effects and job preservation effects, labor might support stricter command-and-control standards for new sources.

There are other examples of labor concern over the choice of environmental policy instruments. In the 1977 debates over amendments to the Clean Air Act, eastern coal miners' unions fought to include a command-and-control standard that effectively required scrubbing, thereby seeking to ensure continued reliance on cheap, high-sulfur coal from the east, over cleaner western coal (Ackerman and Hassler 1981). Likewise, in the debates over the SO_2 allowance trading system in the 1990 amendments to the Clean Air Act, the United Mine Workers opposed the system because it would create incentives for the use of low-sulfur coal from largely non-unionized mines in Wyoming's Powder River Basin over high-sulfur coal from eastern, unionized mines.

4.4 Consumers

Because of obstacles to organizing, arising from free-rider and limited-information problems, consumer groups typically have not expressed strong demands for environmental policies. To the extent they do have preferences over instruments, we would expect them to favor those instruments that minimize any increases in the prices of consumer goods and services, and this would seem to

suggest cost-effective (hence, market-based) instruments over command-and-control.[66] But in practice, organized consumer groups have tended to ally themselves with environmental organizations on most issues, pursuing environmental-quality interests, rather than broader consumer interests. The latter concerns have more often been voiced by "taxpayer organizations," but these groups usually do not become involved in the relative minutiae of choice of environmental policy instruments. Hence, environmental interest groups have been effectively unopposed by other public interest organizations.

5. SUPPLY OF ENVIRONMENTAL POLICY INSTRUMENTS

There are several plausible positive political economy explanations for the nature of the supply of environmental policy instruments. First, legislators and their staffs are thought to be predisposed by their predominantly legal training to favor command-and-control approaches to regulation (Kneese and Schultze 1975).[67] Similarly, unfamiliar policy instruments may require legislators to spend time learning about them before they can provide substantial support, thereby giving rise to a status quo bias in favor of the current regime of command-and-control regulation.[68] Both these effects may become weaker in the coming years, as a result of the increasing understanding of economics among lawyers as well as among legislators and their staffs (Hahn and Stavins 1991).[69]

Second, ideology plays a significant role in instrument choice. A conservative lawmaker who generally supports the "free market" might be predisposed to support market-based instruments; a legislator with more faith in government and less faith in the private sector might, all else equal, prefer a command-and-control approach. Kelman (1981), in his survey of congressional staff members, found that support and opposition to effluent charges was based largely on ideological grounds: Republicans who supported the concept of pollution charges, for example, offered as a

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[66]It is also possible to distinguish among types of market-based instruments and types of command-and-control instruments. This is because any environmental policy instrument that generates privately-retained scarcity rents (such as new-source performance standards, grandfathered tradeable permits, and others) raises consumer prices, relative to a policy that does not generate such rents (Fullerton and Metcalf 1996).

[67]A related argument is that legislators favor command-and-control regulation simply because it is familiar to them.

[68]This argument assumes that a legislator — or at least her staff — needs to understand an instrument in order to support it. Although such understanding might not be a pre-condition for voting in favor of the instrument, it is more necessary for other forms of support, such as insertion of a statement into the legislative history, efforts to get a bill through committee, or attempts to persuade other legislators. Moreover, a lack of understanding may prove to hurt the legislator in her re-election campaign if the news media or an opponent seek to make it an issue. Thus, the greater the prominence of an issue, the more important it will be for a legislator to have a compelling rationale for her position. Responding to this need, interest groups may supply legislators with justifications for supporting given policies (Fenno 1978; Kingdon 1989)

[69]Thus, outreach efforts by economists and others may be thought to have both demand-side and supply-side effects. On the demand side, increased understanding of market-based instruments may have increased the demand for these instruments by various interest groups. On the supply side, increased understanding reduces learning costs for legislators. Since both effects are rightward shifts of the respective functions, the outcome is unambiguous in terms of increased degrees of support.

reason the assertion that "the free market works," or "less government intervention" is desirable, without any real awareness or understanding of the economic arguments for market-based programs. Likewise, Democratic opposition was largely based upon analogously ideological factors, with *little* or no apparent understanding of the real advantages or disadvantages of the various instruments.

Third, constituents react to their *perceptions* of the costs and benefits to themselves and others of a particular policy, regardless of the real costs and benefits (McCubbins and Sullivan 1984, Hahn 1987). The more visible the benefits, the greater the demand for an instrument; the more visible the costs, the greater the opposition and thus the political costs to the legislator. The importance of *perceived* costs and benefits is a consequence of the limited information most voters have about the details of public policy.[70] Hence, politicians are likely to prefer command-and-control instruments because they tend to *hide* the costs of regulation in the price increases passed on to consumers (McCubbins and Sullivan 1984).[71] In contrast, market-based instruments, though they impose lower total costs, generally impose those costs directly, in the form of effluent charges or prices paid for permits.[72] Grandfathered permits fare better on the visibility criterion than auctioned permits or taxes, since no money is exchanged at the time of the initial allocation.[73]

Fourth, voters' limited information may also lead politicians to engage in symbolic politics: the use of superficial slogans and symbols to attract constituent support, even when the policies actually implemented are either ineffectual or inconsistent with the symbols employed. Such symbolism offers the legislator political benefits at little opportunity cost. Command-and-control instruments are likely to be well suited to symbolic politics, because strict standards -- strong statements of support for environmental protection -- can be readily combined with less visible exemptions (Hahn and Noll 1990).[74] Congress has on several occasions passed environmental laws with strict compliance standards, while simultaneously including lax or insufficient enforcement

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[70]A rational voter will choose to remain ignorant on most issues, because the costs of gathering information are likely to outweigh the nearly insignificant benefits from voting knowledgeably (Downs 1957). In contrast, organized interest groups with large stakes in an issue are likely to be well informed -- and thus to be over-represented in the political process. These issues raised by asymmetric information are particularly relevant to instrument choice, because votes on instrument choice are often much more technical than votes on policy goals, and therefore attract less attention from average voters (Hamilton 1995).

[71]The point that politicians prefer (*ceteris paribus*) those regulatory instruments that make their associated costs invisible to consumers is related to the more general notion that legislators will seek to disguise transfers to special interests (Coate and Morris 1995).

[72]As national pressures to lower the budget deficit increase, however, the cost savings and potential government revenue offered by auctions and taxes are more likely to be politically attractive (Hahn and McGartland 1989).

[73]Hahn (1987) emphasized the importance of observable costs and benefits in explaining why Wisconsin chose a largely state-funded pollution-credit program over an effluent charge. The instrument offered visible job creation, by favoring the construction of new facilities, at the expense of diffuse, less visible costs to widely distributed third parties. In contrast, the market-based alternative would have appeared to sacrifice jobs while its cost-saving benefits would have been less evident.

[74]Of course, the reliance of political symbols on voter ignorance may be countered by interest groups, which are likely to be better informed.

measures. Tradeable permits and taxes offer neither the powerful symbolic benefits of declaring strict standards, nor as convenient a range of options to undermine their practice.[75]

Fifth, if politicians are risk averse, they will prefer instruments that involve more certain effects.[76] With respect to environmental policy instruments, uncertainty is likely to arise with respect to the distribution of costs and benefits among the affected actors and to the implementation of the legislative decision by the bureaucracy. The *flexibility* inherent in permits and taxes creates uncertainty about distributional effects and local levels of environmental quality (McCubbins and Page 1986). Typically, legislators are more concerned with the distribution of costs and benefits -- in particular their geographic distribution -- than with a comparison of total benefits and costs (Hahn and Stavins 1991). For this reason, aggregate cost-effectiveness -- perhaps the major advantage of market-based instruments -- is likely to play a less significant role in the legislative calculus than whether a politician is getting the best deal possible for her constituents (Shepsle and Weingast 1984). Moreover, politicians are likely to oppose instruments (such as tradeable permit schemes) that may induce firms to close business and relocate elsewhere, leading to *localized* unemployment (Hahn and Noll 1990).[77] Although there will be winners as well as losers from such relocation, potential losers are likely to be more certain of their status than potential gainers. This asymmetry creates a bias in favor of the status quo.[78]

For the same reason, grandfathering of tradeable permits is more likely to attract a winning coalition than auctions, since grandfathering allows leeway in rewarding firms and distributing the costs and benefits of regulation among jurisdictions. Joskow and Schmalensee (1995) have examined the political process of allocating sulfur dioxide emissions permits in the 1990 amendments to the Clean Air Act. Their focus was on empirically measuring the role of interest group politics and rent-seeking in how those permits were allocated, but another point is made clear by their work: that allocating permits by grandfathering can produce fairly clear "winners" and "losers" among firms and states. An auction, on the other hand, would allow no such political maneuvering.

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[75]See, however, Joskow and Schmalensee (1995), for an examination of Congressional attempts along these lines in the SO_2 allowance trading program.

[76]As McCubbins, Noll, and Weingast state, "Legislators are likely to behave as if they are risk averse, even if they are personally risk neutral, if their constituents punish unpredictable policy choices or their reelection probability is nearly unity" (1989, p. 22).

[77]Tradeable permits may be more likely to be adopted in cases where the industry to be regulated is relatively dispersed and homogeneous with respect to abatement costs (Hahn and Noll 1990). But such homogeneity also means that the gains from a market-based approach are more limited.

[78]The Clean Air Act Amendments of 1977 provide an example of legislation built upon such compromises (Hahn and Noll 1990). Stringent standards for urban non-attainment areas were offset by industry-specific exemptions and by measures preventing relocation of urban factories to less polluted areas, the so-called policy of Prevention of Significant Deterioration (PSD). The winning coalition would likely not have held up under a tradeable permit scheme, which would have allowed rust belt firms to purchase pollution permits from firms in cleaner areas and thus to relocate. On the other hand, a tradeable permit scheme that prevented inter-regional trading could presumably have protected northern factory jobs just as well.

Sixth, command-and-control instruments offer Congress greater control with respect to the implementation of legislative outcomes by administrative agencies. To ensure that the interests of the winning coalition are protected in implementation, Congress may, in effect, prescribe administrative rules and procedures that favor one group over another (McCubbins, Noll, and Weingast 1987). Such a practice, in theory, protects intended beneficiaries of legislation by constraining the scope of subsequent executive intervention in implementation. If stacking the deck is an important aspect of policy making, it is more likely to be successful in the context of command-and-control legislation. Market-based instruments leave the allocation of costs and benefits up to the market, treating polluters identically (Hahn and Noll 1990). Standards, on the other hand, allow the administrative agency greater control and therefore open up possibilities for stacking the deck. For example, Congress might place the burden of proof in standard-setting onto the administrative agencies to favor industry; or legislators might include citizen-suit provisions allowing legal action to force the enforcement of standards to favor environmental groups.

Seventh, bureaucrats are less likely to undermine the legislative decision if their preferences over policy instruments are accommodated. Administrative decision makers are likely to oppose decentralized instruments on several grounds: they are familiar with command-and-control approaches; market-based instruments may not require the same kinds of technical expertise that agencies have developed under command-and-control regulation; and market-based instruments imply a scaled-down role for the agency by shifting decision making from the bureaucracy to private firms, undermining the prestige of the agency and the job security of its staff (Hahn and Stavins 1991).

6. CONCLUSIONS

We have attempted to synthesize the seemingly diverse strands of the positive political economy literature by viewing them as relating to component parts of a political market framework. In this framework, interest groups have demands for particular instruments. Legislators, in turn, provide political support for such instruments. The demands of the various interest groups are aggregated, as are the supplies of support from individual legislators. The interaction of such aggregate demand and supply produce a legislature's equilibrium level of aggregate support, with each member simultaneously determining her effective support level. The effective support levels of the various legislators are combined, in an institutional context, to produce the legislature's choice of policy instrument.

This framework is far from complete. We have focused on the decisions of individual legislators, while leaving unanswered questions of how individual (and continuous) legislator support translates into binary votes and how such support or votes are aggregated to the level of the legislature. For example, we do not deal with competition among legislators, only briefly have we considered the role that congressional committees and other institutions play in structuring and influencing instrument choice, and we have not explained how instrument choices are framed. Likewise, we have only explored a competitive legislative model as a first approximation, and have commented briefly on alternative approaches. These issues represent promising avenues for extending this framework and building a workable model of instrument choice.

In this paper, we have taken a modest step toward a unified framework for positive analysis of policy instrument choice. This framework may permit greater understanding than approaches that focus almost exclusively on one component of the problem at a time. Thus, for example, if one considers only the benefits that a particular industry derives from a proposed regulatory program, one might be led to conclude that a program will be forthcoming if the benefits are sufficiently high. Attention to questions of supply shows why this might not be the case. If the legislature prefers the status quo to the instrument demanded by the interest group, and if the legislature's aggregate supply function is sufficiently inelastic, there may be no equilibrium under which the legislature provides positive support for the demanded instrument. Indeed, the supply function of such a legislature might be above the industry demand function everywhere in the politically relevant domain. Similarly, whether a large shift in the demand for a particular instrument resulting from exogenous factors causes a comparable shift in the actual support provided by the legislature depends on the elasticity of supply. There will be relatively little change in equilibrium support if supply is inelastic, but a far larger change if supply is elastic.

This framework helps us to organize and — to some degree — synthesize available explorations of the four gaps with which we introduced the paper -- three gaps between economic prescription and political reality and one gap between past and current political practices. With respect to the first -- the predominance of command-and-control over market-based instruments despite the economic superiority of the latter -- firms are likely to prefer command-and-control standards to auctioned permits and taxes. Standards produce rents, which can be sustainable if coupled with sufficiently more stringent requirements for new sources. In contrast, auctioned permits and taxes require firms to pay not only abatement costs to reduce pollution to a specified level, but also costs of polluting up to that level. Environmental interest groups are also likely to prefer command-and-control instruments, for philosophical, strategic, and technical reasons.

On the supply side, command-and-control standards are likely to be supplied more cheaply by legislators for several reasons: the training and experience of legislators may make them more comfortable with a direct standards approach than with market-based approaches; the time needed to learn about market-based instruments may represent significant opportunity costs; standards tend to hide the costs of pollution control while emphasizing the benefits; and standards may offer greater opportunities for symbolic politics. Finally, at the level of the legislature, command-and-control standards offer legislators a greater degree of control over the distributional effects of environmental regulation. This feature is likely to make majority coalitions easier to assemble, because legislative compromise is easier in the face of less uncertainty, and because the winning coalition can better guarantee that its interests will be served in the implementation of policy.

The second gap -- that when command-and-control standards have been used, the standards for new sources have been far more stringent than those for existing sources, despite the potentially perverse incentives of this approach -- can also be understood in the context of our market framework. Demand for new source standards comes from existing firms, which seek to erect entry barriers to restrict competition and protect the rents created by command-and-control standards. In turn, environmentalists often support strict standards for new sources because they represent environmental progress, at least symbolically. On the supply side, more stringent standards for new sources allow legislators to protect existing constituents and interests by placing the bulk of the pollution control burden on unbuilt factories.

Many of these same arguments can also be used to explain the third gap: the use of grandfathered tradeable permits as the exclusive market-based mechanism in the United States, despite the disadvantages of this allocation scheme. Like command-and-control standards, tradeable permits create rents; grandfathering distributes those rents to firms, while auctioning transfers the rents to government. Moreover, like stringent command-and-control standards for new sources, but unlike auctioned permits or taxes, grandfathered permits give rise to entry barriers. Thus, the rents conveyed to the private sector by grandfathered tradeable permits are, in effect, sustainable.

Moreover, grandfathered tradeable permits are likely to be less costly for legislators to supply. The costs imposed on industry are less visible -- and less burdensome -- for grandfathered permits than for auctioned permits or taxes. Also, grandfathered permits offer a greater degree of political control over the distributional effects of regulation, facilitating the formation of majority coalitions. In both these respects, grandfathered permits are somewhat analogous to command-and-control standards.

The fourth and final gap -- between the recent rise of the use of market-based instruments and the lack of receptiveness such schemes had encountered in the past -- can be credited to several factors. These include the increased understanding of and familiarity with market-based instruments; niche-seeking by environmental groups interested in both environmental quality and organizational visibility; increased pollution control costs, which create greater demand for cost-effective instruments; attention to new, unregulated environmental problems without constituencies for a status quo approach; and a general shift of the political center toward a more favorable view of using the market to solve social problems. Overall, the image is one of both demand and supply functions shifting rightward, thus leading to greater degrees of political support for these market-based instruments over time.[79]

To the extent that some of the current preference for command-and-control standards reflects simply a desire to maintain the regulatory status quo, the aggregate demand for a market-based instrument is likely to be greatest and the political opportunity costs of legislators providing support is likely to be least when the status quo instrument is essentially non-existent, that is, when the environmental problem has not previously been regulated (Hahn and Stavins 1991). Hence, in the future, we should be more optimistic about introducing such market-based instruments for "new" problems, such as global climate change, than for existing, regulated problems, such as abandoned hazardous waste sites.

We end with some thoughts about how a market framework can generate empirical work on the positive political economy of instrument choice for environmental regulation. So far, most of the academic work in this area has been theoretical; very few arguments have been subjected to empirical validation. Several of the existing empirical studies have addressed the question of why firms might support particular instruments, rather than whether firms actually provide such support. There have been no empirical studies that have constructed demand functions by determining how much firms actually are willing to pay -- for example in the form of lobbying expenses and campaign

[79]It is also possible that changes in some of the institutional features identified above affected individual legislator degrees of support. For example, changes may have occurred that led to particular legislators taking on important committee positions, thus changing their production functions, and hence their opportunity costs.

contributions -- to secure particular outcomes. Similarly, there has been no work seeking to determine the nature of demand by interest groups other than industry. In particular, the motives of environmental organizations merit more consideration. We have discussed the possible self-interested motives of such organizations, and how their demands for particular policy instruments may be motivated by niche seeking. But whether their expenditures in the political process comport with this theory remains essentially untested.

On the supply side, there are substantial impediments to empirical work. The existing studies have primarily attempted to determine the factors that affect legislative votes on particular programs (for example, Hamilton 1995; Pashigian 1985). In recent years, however, Congress has enacted a greater proportion of legislation by voice vote, rather than recorded vote. There has also been a shift from votes on comparatively narrow bills to votes on omnibus bills, which make it virtually impossible to determine a legislator's actual position with respect to specific components. Thus, there is now less new data than previously with which to perform studies of legislative voting behavior.

Legislative voting studies also share a substantial problem: distinguishing votes which reflect a legislator's true views about a bill from votes cast as part of an implicit logrolling trade, in which a legislator votes in favor of a program that she otherwise opposes in order to obtain a more valuable *quid pro quo*.[80] Moreover, as we argued above, a vote constitutes only one component of the support that a legislator can extend to a bill. But the other components of support, of course, are less well suited to quantitative analysis.[81] Thus, in some cases, the best way to explore empirically the supply side of the equilibrium framework may be through detailed case studies of the legislative decision making process, such as that undertaken by Ackerman and Hassler (1981).

The metaphor of the market will, in the end, be an imperfect and incomplete description of political behavior. But there are real advantages of considering instrument choice within this framework, and from developing more fully the details of the market metaphor and its implications. The ultimate test of the usefulness of such a framework will be the extent to which it enables reliable predictions of the choices legislatures make, and the extent to which it facilitates the design of policy instruments that are both economically rational and politically successful.

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[80]Kau and Rubin (1979) sought to measure the importance of logrolling with a conditional probability model that examined votes as a function of one another, but that approach raises numerous problems (Jackson and Kingdon 1992).

[81]Silberman and Durden (1976) attempted to overcome this problem by using patterns of votes on a series of amendments as a proxy for a continuous underlying support variable. Such series of closely related votes, however, are rarely available, particularly in the case of instrument choice. In a different approach, Hall and Wayman (1990) examined the relationship between campaign contributions and degrees of participation in committee activities.

FIGURE 1:
AN EQUILIBRIUM FRAMEWORK FOR EXAMINING THE POLITICAL MARKET

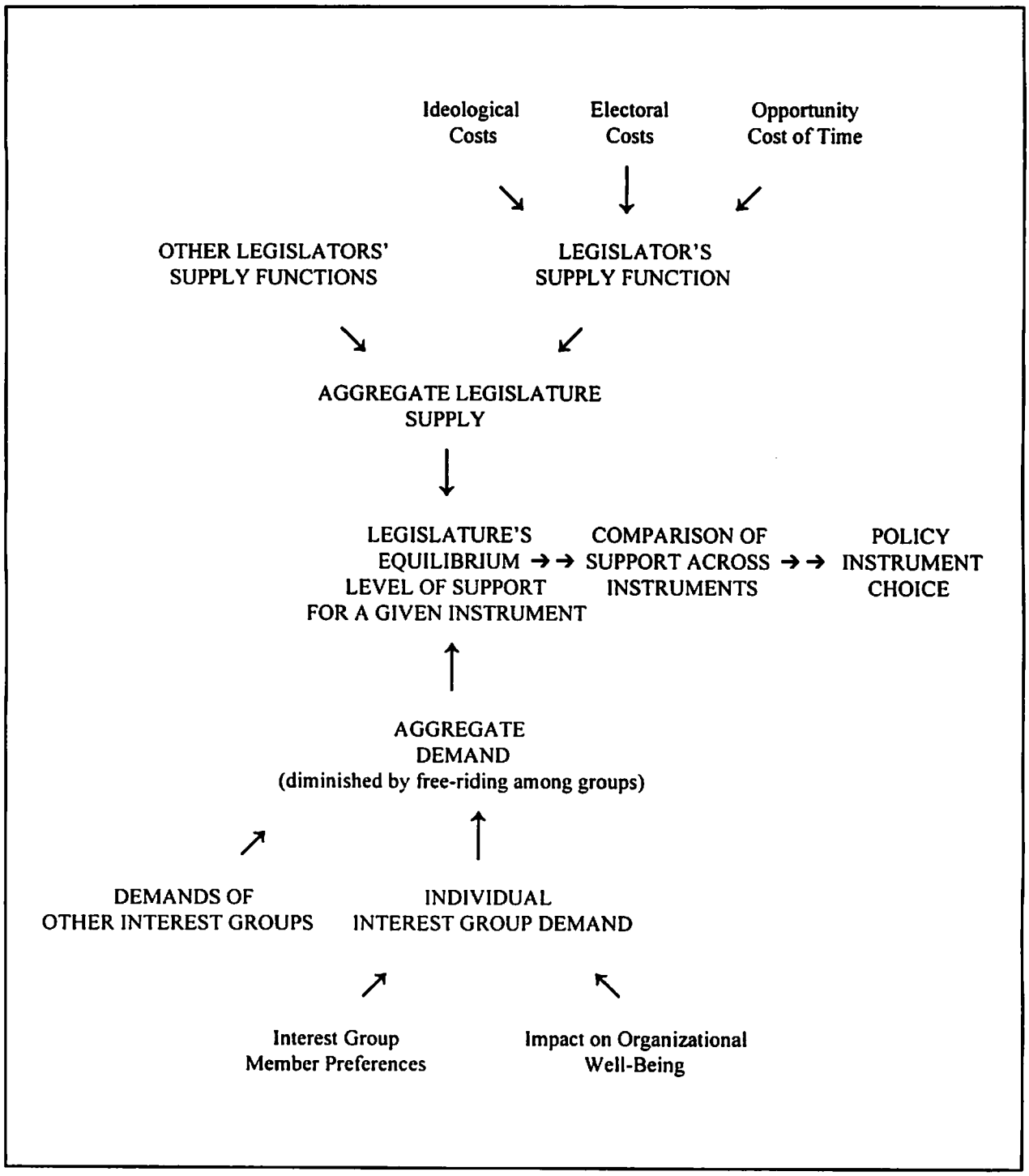


FIGURE 2:
POLITICAL-SUPPORT PRODUCTION FUNCTION

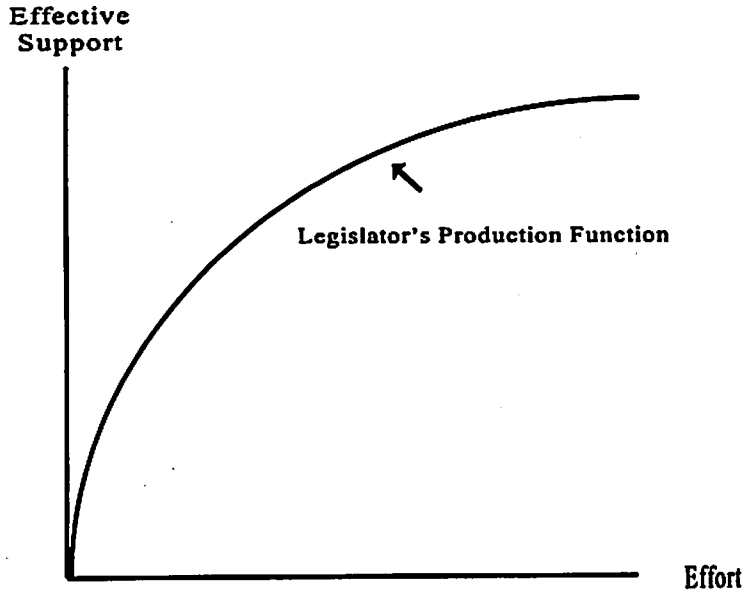


FIGURE 3:
POLITICAL-SUPPORT COST FUNCTION

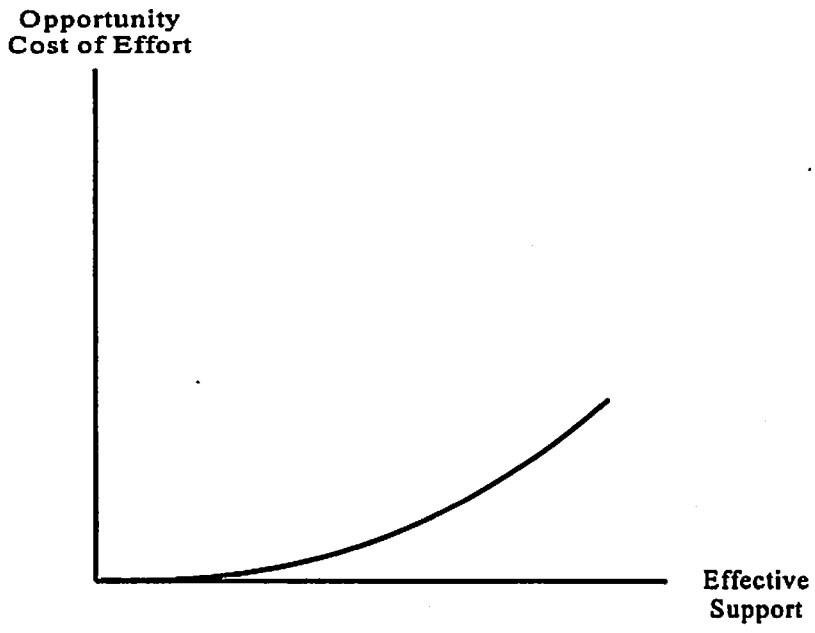


FIGURE 4:
OPPORTUNITY COSTS AND THE SUPPLY OF POLITICAL SUPPORT BY AN INDIVIDUAL LEGISLATOR

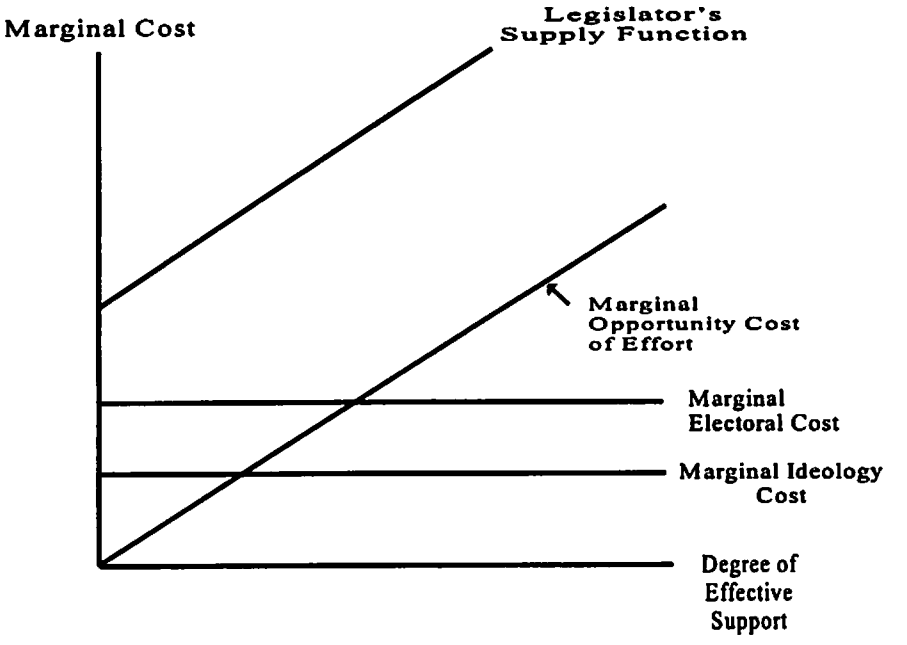


FIGURE 5:
SUPPLIES OF POLITICAL SUPPORT BY INDIVIDUAL LEGISLATORS

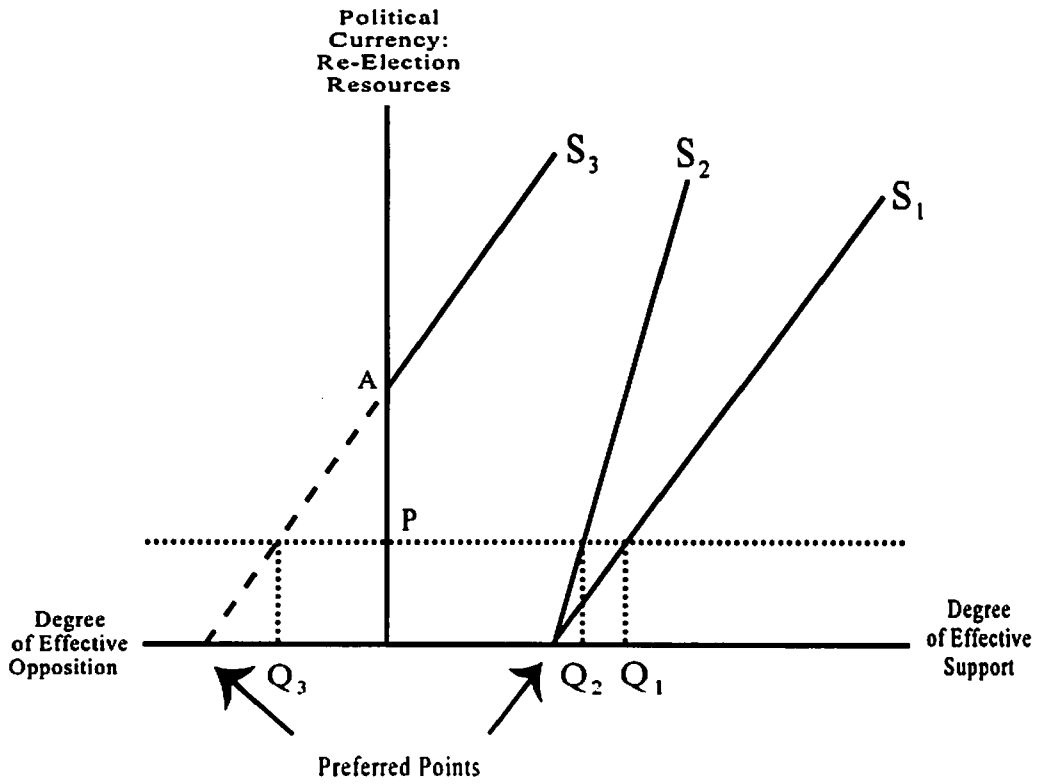


FIGURE 6:
AGGREGATE DEMAND AND AGGREGATE SUPPLY OF POLITICAL SUPPORT AND THE FORMATION OF A LEGISLATIVE EQUILIBRIUM

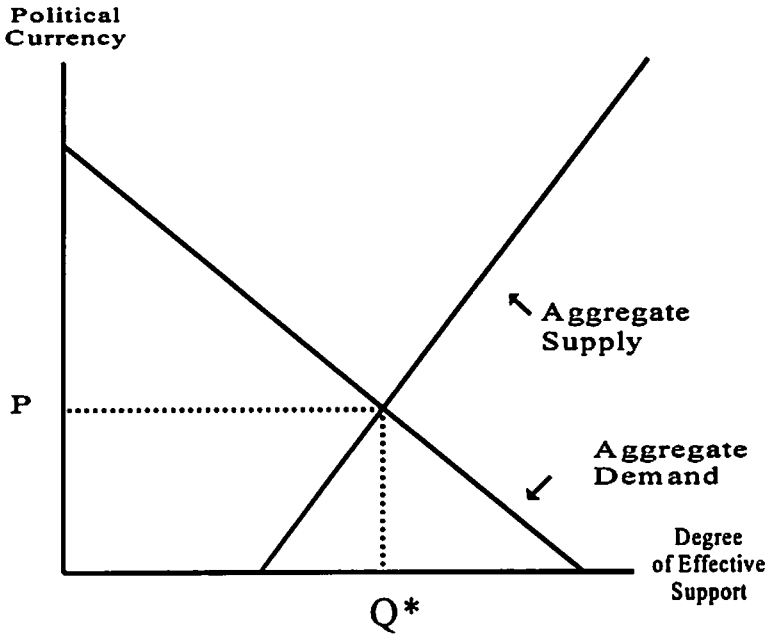
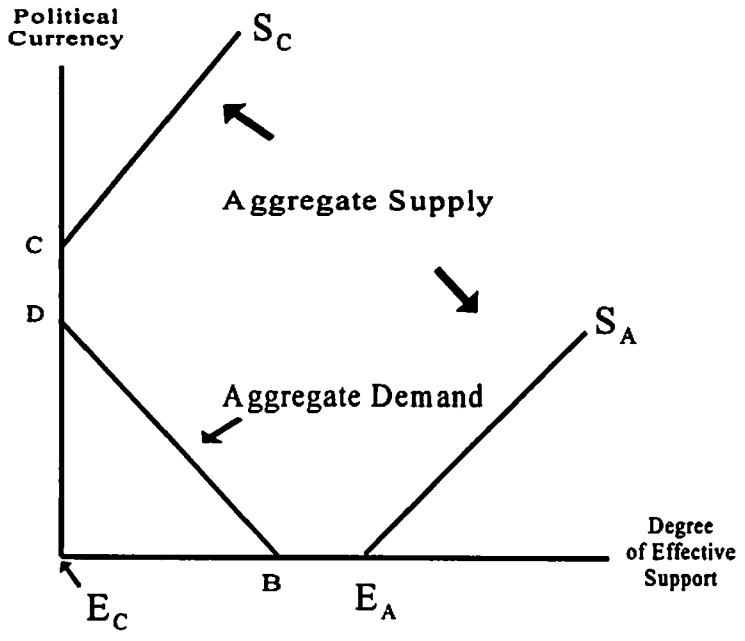


FIGURE 7:
DEGENERATE CASES IN THE POLITICAL MARKET



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