Meetings with costly participation: An empirical analysis

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Abstract

Voluntary meetings with costly participation are ubiquitous as an institution for resource allocation. Despite their importance in economic life, such meetings are little studied. This paper is an empirical analysis of participation at public meetings. We investigate basic and previously unaddressed questions about meetings with costly participation. Who goes? Does attendance vary with observable characteristics? Do meeting attendees represent the interested population? We find that the opinions of participants do not represent the opinions of the entire regulated population and that small changes to meeting protocols have the potential to manipulate the sample of participants. We also find surprisingly strong evidence that the opinions of participants are extreme relative to the whole population. These results lay a foundation for the problem of tailoring meeting protocols to achieve particular welfare objectives. J.E.L. classification: D72, D78, Q22, Q28. Keywords: meetings, committees, regulation, fisheries.

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Voluntary meetings with costly participation are ubiquitous as an institution for resource allocation. Examples include faculty meetings, parent teacher association meetings, and condominium association meetings. Moreover, the requirement that regulators allow and encourage public participation is an almost universal feature of the US regulatory process.[1] Hence an analysis of voluntary participation in costly meetings is relevant to many allocation problems, including most regulatory decisions taken in the United States.

Despite their importance in economic life, meetings with costly participation are little studied and basic questions about them are unanswered. Who goes? Does participation vary with observable characteristics? Do meeting participants represent the interested population? Our analysis provides answers to these questions and also tests some predictions made by the small theoretical literature interested in meetings. More importantly, our results lay a foundation for the problem of tailoring meeting protocols to achieve particular welfare objectives.

We use data describing participation at public meetings held by the regulators of the Mid-Atlantic surf clam and ocean quahog fishery to investigate the decision to participate in the regulatory process. These data show that participation rates are higher for larger firms, that participation rates decrease with travel costs, and that participation rates are higher for more influential firms. Finally, and perhaps most interestingly, firms that prefer extreme policies are much more likely to participate in public meetings than firms that prefer moderate policies.

Our results indicate that laws designed to encourage public participation in the regulatory process, like those in the US (see footnote 1), probably do not serve to elicit information about the preferences of a representative or average member of the public. To the contrary, our results suggest that such laws serve to elicit the opinions of individuals most interested in the regulation, and individuals with the most extreme tastes. Finally, our results indicate that small changes to meeting protocols have the potential to manipulate the sample of participants. In particular, if such a change is desired, small changes in meeting protocol may cause the participants to be

[1] The Administrative Procedure Act requires that all US federal regulatory agencies "shall give interested persons an opportunity to participate in the rule making through submission of written data, views, or arguments with or without the opportunity for oral presentation"(Title 5 *U.S. Code* §553(c), 1988 edition.). In *Corrosion Proof Fittings v. Environmental Protection Agency* the Supreme Court showed its willingness to require that public opinion be adequately consulted. (In this case, the court vacated proposed regulation because the Environmental Protection Agency prematurely ended public hearings and deprived the public of sufficient opportunity to "comment [on], analyze, and influence the [regulatory] proceedings". In this case public participation is mandated by the Toxic Substances Control Act rather than the Administrative Procedure Act.)

more representative of the population. While the literature has not yet fully analyzed the welfare implications of such changes in meeting protocols, a review of the available evidence suggests that a change in meeting protocols to encourage the participation of individuals with moderate preferences is probably desirable if the decision under consideration is a contentious one, but not otherwise.

1 Relevant literature and its implications

Relatively few papers provide positive analyses of patterns of participation. Osborne, Rosenthal, and Turner (2000) analyze participation patterns at meetings where participation is costly and the outcome is a compromise among those who attend. Feddersen (1992) analyzes costly voting in majority rule "elections" where agents simultaneously choose a policy and whether or not to vote. Although the authors consider different institutions, basic features of their models and results are similar.

Both papers consider "spatial models". That is, an outcome or policy is a point in space and agents have preferences over these points. In particular, each agent's utility is maximized at a single policy and declines as the selected policy is further from this bliss point. In both papers participation is costly and an agent decides to participate on the basis of how much his participation affects the outcome, taking as given the participation behavior of other agents. If and only if the value of the change in outcome associated with participation is greater than the participation cost does the agent participate. All else equal, agents with lower participation costs will be more likely to participate, agents whose participation causes a larger shift in the outcome will be more likely to participate, and agents who value a marginal change in the outcome more highly will be more likely to attend.

Osborne *et al.* (2000) argue that, in equilibrium, agents whose bliss points are near the anticipated outcome are less likely to participate than those whose bliss points are far from the outcome. That is, agents with moderate preferences do not participate in meetings. Intuitively, participation by agents close to the outcome does not move the outcome enough to justify their participation costs. Feddersen (1992) shows that, in equilibrium, agents in a region adjacent to the outcome do not attend. This results in patterns of participation similar to those predicted by Osborne *et al.* (2000).

A related inquiry examines the way that various collective choice institutions aggregate private information about an uncertain state of the world. While much of this literature does not allow for endogenous participation, there are two noteworthy exceptions, Feddersen and Pesendorfer (1996) and Li, Rosen and Suen (2000).

Feddersen and Pesendorfer (1996) consider the ability of elections, with costless voting, to aggregate private information when abstention is possible. They find that only agents who do not strongly prefer one outcome to another ever abstain from voting. Li, Rosen and Suen (2000) consider the ability of a quite different institution, committees, to aggregate information. Like Feddersen and Pesendorfer (1996), when abstention is permitted, Li *et al.* (2000) find that agents who (1) strictly prefer one outcome or (2) have an unambiguous signal in favor of one outcome, are more likely to participate in committee meetings. Thus, like Osborne *et al.* (2000) and Feddersen (1992) both Feddersen and Pesendorfer (1996) and Li *et al.* (2000) find that agents who prefer extreme outcomes are more likely to participate in a collective decision.

In sum, several different models of the participation decision indicate that:

1. *Agents who are more sensitive to small changes in outcome are more likely to attend.*

2. *Agents with lower participation costs are more likely to attend.*

3. *Agents with more power to move the outcome more are more likely to attend.*

4. *Agents with moderate positions are less likely to attend.*

There is, to our knowledge, only one empirical paper examining patterns of participation at public meetings. Bulkley, Miles, Pearson, and Bernhard (1999) find that members of England's House of Lords are less likely to participate in house meetings and vote if they are not affiliated with a party than if they are. If we posit that unaffiliated Lords are more politically moderate than party members this may be evidence that meetings are attended by extremists. On the other hand, one probable function of parties is to "get out the vote", so this conclusion is not compelling. Bulkley *et al.* (1999) also find that participation is sensitive to costs of participation.

There is considerable anecdotal evidence to suggest that meetings tend to attract extremists. The regulation of New England federal fisheries and Rhode Island state fisheries depends on the results of regulatory meetings which are open to public participation. George Allen (1991) describes a conflict between conservation-minded sport fishers and extraction-minded commercial fishers in Rhode Island. Both groups took fairly extreme positions and the attendance at two successive public hearings was lopsided in different directions, producing a policy that was first pro-conservation and then pro-extraction. Similarly, the record of the public hearings held by the New England Fishery Management Council (1985, p. 9.45) describes a conflict between two different groups of fishers (gillnetters and trawlers), who attended successive public hearings in lopsided proportions. As in Rhode Island, the result was a policy that first favored one group, then the other.

This phenomena is not unique to fisheries. Hearings held by the FCC to establish a "home automation standard" were initially attended by representatives of the cable TV industry and TV manufacturers. Participation by these two groups encouraged the FCC to endorse a standard very detrimental to their competitors. These competitors eventually became involved and argued for a different standard. The FCC chose the regulation endorsed by the cable TV and television manufacturing firms, and saw this regulation superseded by legislation initiated by a member of congress sympathetic to the competing firms (Barron 2000).

In sum, the anecdotal evidence suggests that public participation affects the decisions taken at regulatory meetings in a variety different industries, and that participants at these meetings appear to have preferences for policies that are extreme relative to those of the affected population.

2 Background

To more thoroughly investigate participation in costly meetings we collected firm-level data from the Mid-Atlantic Surf Clam and Ocean Quahog fishery. Our data are well suited to our inquiry into participation behavior for three reasons. First, it describes the universe of firms interested in the regulatory process, whether they participate in the process or not.[2] Second, our data allows us to identify individual "fishing firms", collections of vessels, processing plants and harvest permits

[2] To our knowledge similar data has not been considered elsewhere, although analyses of firm characteristics conditional on participation in the regulatory process are not uncommon, e.g., Ando (1997), Cropper *et al.* (1992).

(Individual Tradable quota) with a common owner. Enumerating the assets that comprise a firm is essential to an investigation of how firm characteristics influence participation. Finally, as we will argue below, the nature of the regulatory decisions in this fishery is particularly simple, and corresponds closely to models used in theoretical analyses of participation decisions.

The Mid-Atlantic Clam fishery targets surf clams and ocean quahogs in state and federal waters off the coasts of Virginia, Maryland, Delaware, and New Jersey.[3] Vessels harvest clams year round by towing dredges across the underwater clam beds and then pumping the clams to the surface using hydraulic pumps. Vessels deliver unshelled clams to land-based processing plants. Processing plants extract the clam meat. After resale, clam meat is used primarily in chowder and seafood soups. Surf clam and ocean quahog landings in the Mid-Atlantic region in 1990 had an ex-vessel value of $23.49 million and $13.86 million, respectively.

Prior to October 1990, the fishery was regulated with vessel entry limitations and harvest time restrictions. Since October 1990 the fishery has been regulated with an individual tradable quota (ITQ) program. At the inception of this program regulators distributed quota to vessel owners according to a formula that increased both with vessel size and historic harvest levels. In the first and subsequent years the regulators choose a total allowable catch (TAC) for the each type of clam. Resource users are allowed to harvest a share of the TAC determined by the amount of ITQ that they own or rent. During 1990-1994, the period examined in this study, the higher-valued surf clam[4] is harvested and regulated more intensively than ocean quahogs. In particular, the TAC for surf clams is consistently harvested, while 15-20% of the ocean quahog TAC is not harvested.

We compile our data primarily from three sources; (1) National Marine Fisheries Service logbook data that records all fishing and processing activity in the clam fishery, (2) a public record of ITQ ownership maintained by the Mid-Atlantic Fishery Management Council, and (3), a list of the participants in each regulatory meeting that is constructed from the minutes of these meetings.

The logbook data records every vessel's harvesting behavior, and the processing plant which

[3] Overwhelmingly both types of clams are harvested in the Middle Atlantic Bight, federal waters off the New Jersey coast and the Delmarva Peninsula. During 1990-1992 more than 95% of surf clams and virtually all ocean quahogs were harvested in this region.

[4] Surf clams are larger and produce a sweeter more tender meat than the ocean quahog.

purchases each trip's harvest. Thus the logbook data identifies all active vessels and processing plants in the fishery during the 1990-94 study period. The record of ITQ ownership lists the name of each person or firm that owns ITQ and the number of shares held. Using this information, along with some supplementary vessel and plant ownership information provided by the Mid-Atlantic Fishery Management Council and the National Marine Fisheries Service, we matched vessels, processing plants and ITQ holdings to firms. To confirm that ownership of vessels, processing plants and ITQs was attributed to the correct firm, we then consulted industry members. We also consulted industry members to confirm that we matched meeting participants to the correct firms.

2.1 Industry organization

Any US citizen may own tradable quota, and few restrictions are placed on quota trading other than a requirement that no individual own more than 20% of the total available permits for each clam species. The market for the sale of quota is active, particularly in the first year of the program.[5] Quota rental is also common. A detailed description of the operation of the ITQ program in this fishery is available in Committee to Review Individual Fishing Quotas (1999).

Table 1 describes the ownership of fishing vessels, processing plants, and ITQ's in the final year of the limited entry management program (1990) and the first four years of the ITQ program (1991-1994). Columns 1-5 show that many firms own both fishing vessels and a processing facility. This table also shows that the numbers of harvesting, processing, and quota owning firms all declined. Physical capital employed in the fishery also appears to decrease: The number of vessels decreases from 124 to 57 and the number of processing plants from 18 to 14.[6] Firms owning quota in 1994 were more likely to specialize in surf clams or quahogs than they were in 1990,[7] although a slightly larger share of firms own both processing plants and vessels in 1994

[5] In the initial year of the ITQ program, 33.31% of the total surf clam ITQ traded hands and 63.53% of the ocean quahog quota was traded. Ownership stabilized in the subsequent years. During 1991-1994, annual trades of surf clam ITQ ranged between 0.98% and 11.95% of the total available quota. Annual trades of ocean quahog ITQ ranged between 0% and 14.51% of the total quota during 1991-1994.

[6] Rumors that the initial allocation of ITQs would depend on historical catch records may have delayed the abandonment of some vessels until the ITQ program was in place. Many of the exiting vessels were scrapped.

[7] Surf clam only fishing time restrictions caused vessels to diversify production to take advantage of otherwise idled vessel capital and labor services (Strand, Kirkley, and McConnell, 1981). Under ITQs, vessels focus harvesting efforts on a single clam species to exploit apparent returns to specialization (Mid-Atlantic Fisheries

	Physical Assets					ITQ Assets				All Assets
	1	2	3	4	5	6	7	8	9	10
Year	Harvest Firms	Vessels	Process. Firms	Process. Plants	Unique Firms	SC	OQ	Unique Firms	Pure Quota Owners	Unique Firms
1990	36	124	18	22	48	54	54	54	21	69
1991	32	76	16	20	42	48	37	53	25	67
1992	30	66	17	20	42	47	37	52	24	66
1993	29	62	18	21	42	47	36	52	25	67
1994	25	57	14	17	34	45	35	51	29	63

Table 1: **Capital and ITQ Asset Ownership in the MA Clam Fishery.** Columns describe: 1-Number of firms that own fishing vessels. 2-Number of active vessels in the fleet. 3-Number of firms that own processing plants. 4-Number of active processing plants. 5-Number of firms that own physical capital. 6-Number of firms that own surf clam quota. 7-Number of firms that own ocean quahog quota. 8-Number of firms that own quota. 9-Number of firms that own quota but not physical capital. 10-Total number of firms active in fishery.

than in 1990.

Lastly, the ITQ program has allowed the emergence of a class of pure quota owners who own quota but do not own physical capital (column 9). Many of these firms harvested clams prior to the ITQ management program and so were allocated quota, but subsequently sold their vessel(s). About one third of firms fall into this class. Pure quota owners are much smaller than other firms on average. Not only do they own no physical capital, but their holdings of quota are also small. An average pure quota owner holds 17,000 bushels of each type of quota, versus 63,000 bushels of surf clam and 125,000 bushels of ocean quahog quota for an average firm that also owns physical capital.

2.2 Regulatory process

All fisheries operating in federal waters along the middle Atlantic coast are regulated by the Mid-Atlantic Fishery Management Council. A subcommittee of this council, the Surf Clam and Ocean Quahog Committee, is responsible for recommending TACs for the surf clam and ocean quahog fisheries to the council. The Surf Clam and Ocean Quahog Committee convenes a Science and Statistics Committee to review the available scientific information and formulate a policy recommendation. In each year, the Science and Statistics Committee recommends a TAC to the

Management Council, 1996).

No.	Date	Location	Type	Represented Firms	Represented Firms (% of year's total)
1	8/13/90	Essington, PA	C, S	6	8.7 %
2	9/19/90	Hauppauge, NY	M, A	8	11.6 %
3	8/19/91	Dover, DE	C, A	4	6.0 %
4	9/5/91	Philadelphia, PA	M	1	1.5 %
5	8/27/92	Essington, PA	C, A	10	15.2 %
6	9/16/92	Essington, PA	M, A	6	9.1 %
7	5/5/93	Essington, PA	C, A	11	16.7 %
8	6/2/93	Norfolk, VA	M	3	4.5 %
9	12/15/93	Virginia Beach, VA	M	0	0%
10	9/12/94	Essington, PA	C, A, S	17	27.0 %
11	9/29/94	Philadelphia, PA	M, A	10	15.9 %

Table 2: **Public attendance at meetings where the TAC for surf clams and ocean quahogs was selected.**'C' indicates Surf Clam and Ocean Quahog Committee meeting, 'M' indicates Mid-Atlantic Fisheries Management Council meeting, 'A' indicates a meeting where industry advisors were requested to participate. 'S' indicates a meeting of the Science and Statistics Committee. The Science and Statistics Committee typically meets immediately before the Surf Clam and Ocean Quahog Committee.

Surf Clam and Ocean Quahog Committee which accepts or amends the recommendation (or calls for more research), and passes it to the full council. The full council then accepts or amends the recommendation, or asks for more research to be done.[8] The council's decisions are taken by a majority vote of members.[9] Table 2 provides summary information about the meetings where the TAC for surf clams or ocean quahogs was discussed between 1990 and 1994.

Members of the public who participate in a council or committee meeting are usually permitted to speak only during a question and answer period, and they must bear their own transportation costs. A small number of individuals have special status as "industry advisors" to the council. When these individuals participate in a council or committee meeting in their role as advisors, they are permitted to participate in council or committee debates, but not vote. Industry advisors are compensated for travel to those meetings where the council requests their

[8] A Science and Statistics Committee meeting is not convened in years where the scientific information available to the Surf Clam and Ocean Quahog committee about stock abundance is easy to interpret.

[9] Council members are selected by the governors of the affected states and are approved by the Secretary of Commerce. Broadly, council members are industry representatives, representatives of state fisheries and environmental bureaucracies, and academics. For details of the selection and appointment process see Title 16 *U.S. Code* §1852, 1988 edition.

presence.

In all, the administrative record indicates that 115 individuals attended a meeting. 43 of these individuals are linked to a particular clam fishing firm, 36 are bureaucrats, 25 are linked to other fisheries, 3 are academics, 2 are environmentalists and 6 are of unknown affiliation. Firms are usually represented by a principal or employee, although firms hire lobbyists occasionally. We note that none of the 25 individuals linked to other fisheries attended meetings of the Science and Statistics Committee or of the Surf Clam and Ocean Quahog Committee.

All of the 25 individuals linked to other fisheries appear at meetings of the Mid Atlantic Fishery Management Council, meetings where only a small part of the agenda is devoted to the clam fishery. Although our record of attendance does not specify which of the several sessions of the full council meeting that an individual attends, we have no record that any of the individuals linked to other fisheries ever commented during the sessions devoted to the clam fishery. Thus we regard it as highly probable that these individuals did not attend sessions addressing clam issues at all, and we make no further effort to analyze their attendance behavior.

These data correspond to the theoretical models used to analyze participation decisions in two important regards. First, participation by firms affects the outcome of the meetings. While there are undoubtedly many ways to influence fisheries regulation, one way is to participate in a council or committee meeting. By mandate of the Magnuson-Stevens act, all committee and subcommittee meetings are open to the public, and, while only the council members ultimately vote on the TAC, public participation can potentially influence the choice of TAC either by influencing the decisions taken at the subordinate committees, or by influencing the voting behavior of the various council members. The anecdotes presented earlier provide dramatic examples of policies being affected by public participation in other similar meetings. While we do not see such dramatic responses to participation in the clam fishery, a staff member at the Mid-Atlantic Council tells us that "Industry input is always considered very seriously by the Council. For example, the staff recommended a 5% increase in the surf clam quota for the year 2002. Primarily at the request of industry, the Council voted to increase it by 10%."[10]

Second, the choice of a TAC is the choice of a real number. Thus the choice of TAC's for surf

[10] Clay Heaton, personal communication, November 2001.

clams and ocean quahogs is the choice of a policy from a two dimensional policy space. This sort of policy space is commonly considered in the theoretical literature, and corresponds exactly to the one considered by Osborne *et al.* (2000) and Feddersen (1992).

Our data does not correspond to theoretical models in one regard. In most years, the council addresses decisions other than the choice of TAC.[11] These other decisions are all transitory, and appear on the council's agenda for at most a few consecutive years. Thus the policy space is in fact somewhat more complicated than the choice of an element of the real plane. Given that the council typically makes two separate decisions, one on a transitory issue and one on the TAC, the reasonableness of our decision to analyze only the choice of TAC hinges on the two decisions being made independent of each other.

The administrative record indicates that the two decisions are independent. First, transitory issues are often discussed at meetings where they are the sole topic of debate (we exclude such meetings from our sample). Second, we do not see transitory issues linked to the choice of TAC in debate, e.g., statements such as, "The decision on the TAC depends on the decision on the transitory issue" do not occur in the administrative record. Thus, on the basis of the administrative record, it is reasonable to think that firms' preferences over the TAC do not change very much with the decision made on the transitory issue. This conclusion is also consistent with the nature of the transitory decisions, for example refinements of enforcement procedures or the inclusion or exclusion of the relatively small and remote Maine clam fishery in the ITQ program. These are decisions that should have only a minor impact on most firms. It seems likely that for most firms the decisions on most of these transitory issues will have only minor effects on the marginal product of quota, and hence on their preferrences over the choice of TAC.

Finally, while we have no reports that it actually occurs, the existence of an additional decision raises the possibility of "vote trading". Since the council addresses several very disparate transitory issues over the study period, and since such vote trading is presumably specific to the transitory issue, vote trading arrangements are probably transitory. This, together with the lack of anecdotal evidence for vote trading, leads us to think that vote trading is not an important determinant of our results.

[11] For example, the details of enforcement issues, or whether an experimental fishery for Maine clams was in fact an allowable experiment or an attempt by a (very remote) fishery to operate outside the ITQ program.

3 Estimation and Results

Our unit of observation is a firm's decision to participate in a particular meeting. Let A_{im} denote a meeting indicator variable that takes the value of one if firm i attends meeting m, and the value of zero otherwise. The attendance probability is $\Pr(A_{im} = 1) = F(\beta' z_{im} + \lambda_t + \alpha_i)$ where F is the logistic cumulative distribution function, z_{im} is a vector of firm and meeting characteristics, β is a common parameter vector, λ_t is an unobserved time-specific effect, and α_i is an unobserved firm-specific effect. Time-specific effects control for unobserved year to year differences in the economic environment or the fact that in each year the council is making a new decision which may inspire more or less interest in the average firm. The firm-specific effect, or incidental parameter, is interpreted as firm $i's$ unobserved preferences for participating in meetings. A firm i that is active throughout the five year study period would account for $M_i = 11$ observations. Our panel is incomplete because some firms exit or enter the fishery during the study period. There are 85 unique firms which account for 703 observations.

The parameter of interest, β, can be estimated under the assumption that firm-specific effects are random or fixed components of preferences. Because all active firms in the clam fishery are represented in our data, we observe the population and thus all of the relevant firm-specific effects. This feature favors the fixed effects specification (Hsiao, 1986; Mundlak, 1978). On the other hand, the random effects specification uses variation across firms ignored by the fixed effects specification (Chamberlain, 1980). Furthermore, despite the similar error structure, the two procedures reflect very different characteristics of the sample. The random effects estimation uses within firm variation, and also cross-sectional variation between the 25 firms that attend at least one meeting and the 60 firms that never attend. The fixed effects estimation, however, makes exclusive use of within firm variation for the 25 firms that attend at least one meeting.

Given the merits of each specification we estimate β under both the fixed and random effects assumption and report the results in Table 4 and Table 4a. We find extremely similar results. Under the fixed effects assumption, we estimate β by maximizing a conditional likelihood function. Under the random effects assumption, the likelihood function contains multiple integrals and we estimate β with numerical optimization techniques. The exact specifications of these likelihood functions are given in the appendix.

3.1 Size, travel distance and advisor status

In this section we first examine the effect of size, distance, and advisor status, on participation behavior. We have four measures of the size of a firm, the number of vessels owned, the number of processing plants owned, the number of bushels of surf clam and ocean quahog quota owned. To control for large variation in processing plant size, each processing plant is weighted by an estimate of its relative clam processing capacity.[12] Hereafter, references to the plants variable are understood mean capacity weighted processing plants. Variation in vessel sizes is far less pronounced and did not warrant such an adjustment.

To measure travel distance we calculate the distance from the geographic center of the zip code containing a firm's mailing address, to the geographic center of the zip code containing the meeting site.

Table 3 reports average firm size, travel distance, and the number of firms with advisor status for the 85 unique firms that participated in the clam fishery from 1990-1994. We also report average size, distance and status measures for meeting participants and non-participants. On average, participating firms have more capital than non-participating firms. This is true for every measure of capital that we use, vessels per firm, processing plants per firm, and ITQ's per firm. Table 3 also shows that the variance in capital holdings is larger among participating firms than among non-participating firms. This reflects the fact that many large firms specialize in one type of capital. If all of the firms which are large by one measure of physical capital attend, many firms that are zero by another measure also attend. On the other hand, firms that do not participate are small by all measures of capital.

Table 3 also shows that participating firms are located about 94 miles closer to the meeting site than non-participating firms, on average. All firms with advisor status attended at least one meeting.

Table 4 (4a) presents the fixed (random) effects regression results. All models include annual dummy variables to control for unobserved time-specific effects; e.g. the interest or importance of each year's decision. Our investigation revealed that after firms sold their physical capital and became pure quota owners they were less likely to participate in meetings. Consequently, all

[12] The mean capacity plant is assigned a weight of unity. Plant capacity is taken to be the maximum annual quantity of processed clams observed during the study period.

	Full sample	Participants	Non-participants
Firms	85	25	60
Vessels	0.91	2.36	0.31
	(1.70)	(2.40)	(0.59)
Plants	0.24	0.69	0.06
	(0.87)	(1.49)	(0.22)
Surf Clam ITQs	36.09	89.53	13.83
('000 bushels)	(84.94)	(143.27)	(14.42)
Ocean Quahog ITQs	70.97	175.02	27.62
('000 bushels)	(189.81)	(315.71)	(65.20)
Distance	211.86	145.76	239.41
(miles)	(149.24)	(70.63)	(164.49)
Advisors	10	10	0

Table 3: **Descriptive statistics for size, distance and advisor status.** A firm is classified as an attendee if it attended at least one of the eleven meetings. Reported values are averages across firms and years. Standard deviations are in parentheses.

models also include a dummy variable that is one if a firm owns only quota, and zero otherwise. The models that we report do not include ocean quahog ITQ holdings. The two types of quota were initially handed out to boat owners according to a similar formula, and over the whole sample the correlation between surf clam and quahog ITQ's is 0.829. We included both quota variables in several regression models but found the estimated variance of both coefficients to be large and the coefficient estimates to be unstable.[13] Given this, and since the surf clam TAC is binding while the ocean quahog TAC is not, we report only results that exclude ocean quahog ITQ's.

The model in Column 1 of Table 4 and Table 4a predicts participation behavior as a function

[13]Further analysis confirmed the collinearity between the number of vessels owned by a firm and its ITQ holdings. An ordinary least squares regression with surf clam ITQ's as the dependent variable and vessels and ocean quahog ITQ's as independent variables has an adjusted R-squared of 0.738. The correlation between vessels and ocean quahog ITQ's is 0.543.

of vessels, plants, and surf clam ITQ's. We find that participation probabilities are increasing in the number of plants and vessels, and that the effects of these variables are statistically significant. We also see that pure quota owning firms participate in meetings less often. These findings persist in the other specifications presented in the two tables.

The sign of the parameter associated with the ITQ variable is negative, and significantly different from zero in models 2 and 3 in Table 4. A negative but statistically insignificant effect is indicated for the random effects specification in Table 4a. Since participation increases with all other measures of size and Table 3 shows that participating firms own more ITQ than non-participating firms, this result is perplexing. One possibility is that colinearity between quota ownership and vessels prohibits identification of the effect of surf clam ITQ's on attendance. Quotas were initially handed out only to vessel owners, and so vessels and surf clam ITQ's are correlated. Over the whole sample, the correlation of vessels with surf clam ITQ's is 0.642. If we exclude vessels the results (not reported) indicate that surf clam ITQ's have a positive effect on participation but the parameter is not significant at conventional levels. A second possibility is that the effect of ITQ's is non-linear, although experiments testing for such non-linear effects were inconclusive.

The regression results, along with the descriptive statistics reported in Table 3, provide strong support for the hypothesis that firms with big investments in physical capital are more likely to participate in the regulatory process. The evidence that large holdings of quota increase participation is less strong. Table 3 shows that firms with large quota holdings are more likely to attend, while the regression results are inconclusive. In sum, the data appear to provide considerable support for the claim that large firms are more likely to participate in the regulatory process.

We now turn our attention to the role of travel distance. Model 2 of Table 4 finds that participation probability decreases with the distance that a firm must travel to a meeting. While this result is not surprising, it is at least possible that the choice of meeting site is endogenous. This would occur if, for example, the council tried to hold meetings near firms that it thought were likely to participate or if firms that wanted to participate lobbied for meetings close to home.

The Mid-Atlantic Council has a policy of rotating meeting sites through the different states in its jurisdiction, and of holding meetings in hotels that offer special rates to government and a free shuttle to the nearest airport. In addition, meetings of the Mid-Atlantic Council discuss policy for many fisheries, spread over several states. In all, it seems unlikely that the Council meetings are moved for the convenience of the firms in our sample, and hence unlikely that these meeting sites are endogenous. The meetings of the Surf-Clam and Ocean Quahog Committee and Science and Statistical Committee meetings discuss only issues that are relevant to the firms in our sample, and so their locations may depend upon firm characteristics. We find, however, that an average advisor is located 20 miles further from meetings where advisors are invited to participate, than from meetings where advisors are not invited to participate. This suggests that, firm locations do not have an important impact on meeting locations, even for subcommittee meetings. In sum, the council meeting locations almost certainly do not depend upon firm characteristics, while the subcommittee meeting locations do not appear to depend upon firms characteristics in any important way.

Since the primary cost of meeting participation is the opportunity cost of travel and participation time, to the extent that the owners of large firms have higher opportunity costs of time than the owners of smaller firms suggests the hypothesis that big firms will be less likely to participate than small. Since employees (and occasionally lobbyists) can and do represent firms at meetings, we suspect that this intuition is irrelevant. The cost of participation is the opportunity cost of the participation by a person qualified to represent the firm's interests, not the cost of participation by the firm's owner. It is not clear that this cost should vary with firm size. As a further test of this hypothesis, we duplicated models 1 and 2 of Table 4 but also include the product of distance with vessels and plants as explanatory variables. If bigger firms have higher opportunity costs of time, then this interaction term should be negative. We find that the size/distance interaction is insignificant in all specifications (and that other coefficient estimates were stable). From this we conclude that the effects of travel costs on meeting attendance do not vary with firm size.

We now consider the effect of advisor status on meeting participation. We wish to estimate the difference in participation rates at meetings where firms are invited to participate as advisors and meetings where they are regular members of the public. We also wish to measure the effect that compensating firms for their travel costs has on meeting attendance.

Table 4: Conditional Logit Regression Results

	1	2	3	4	5	6
Vessels	0.341** (0.139)	0.375** (0.142)	0.395** (0.156)	0.517** (0.178)	0.506** (0.172)	0.54** (0.192)
Plants	1.547** (0.776)	1.755** (0.754)	1.979** (0.909)	1.274 (1.157)	1.460 (1.032)	1.725 (1.563)
Surf Clam ITQ	-0.411 (0.261)	-0.474* (0.263)	-0.632** (0.307)	-0.373 (0.281)	-0.367 (0.275)	-0.596** (0.352)
Pure quota firm	-2.178** (1.123)	-2.173* (1.156)	-2.501** (1.311)	-4.108** (2.081)	-3.721* (2.019)	-4.994** (2.335)
Distance	--	-0.888** (0.341)	-0.808** (0.375)	--	-0.841** (0.360)	-0.757** (0.418)
Advisor Meeting	--	--	2.700** (1.629)	--	--	3.578** (2.094)
Comp. Distance	--	--	-0.396 (0.910)	--	--	-0.180 (1.170)
Position	--	--	--	1.767 (1.271)	1.819 (1.238)	2.126* (1.310)
Position^2	--	--	--	3.803** (1.603)	3.403** (1.535)	4.545** (1.747)
λ_{1990}	-3.036** (0.768)	-2.760** (0.782)	-2.414** (0.797)	-3.145** (0.862)	-2.787** (0.878)	-2.234** (0.930)
λ_{1991}	-4.119** (0.805)	-4.458** (0.862)	-4.216** (0.915)	-4.159** (0.932)	-4.473** (0.979)	-4.283** (1.154)
λ_{1992}	-1.415** (0.516)	-1.476** (0.521)	-1.523** (0.541)	-1.042* (0.553)	-1.118** (0.557)	-0.896** (0.588)
λ_{1993}	-2.181** (0.500)	-1.693** (0.528)	-1.394** (0.542)	-1.726** (0.515)	-1.276** (0.550)	-0.721* (0.572)
Cond. Log Likelihood	-71.007	-67.131	-63.210	-65.129	-61.972	-55.696

All columns report the results of fixed effect logit estimations of attendance probabilities. Standard errors are reported in parentheses. Columns 3 and 6 report the results of a second stage regression where the two advisor variables are replaced by their predicted levels. The standard errors reported in these two columns are corrected as described in the text. ** - indicates parameter is significantly different from zero at or above 95% confidence level. * - indicates parameter is significantly different from zero at or above 90% confidence level.

Table 4a: Random Effects Logit Regression Results

	1	2	3	4	5	6
Vessels	0.346**	0.333**	0.331**	0.407**	0.384**	0.380**
	(0.126)	(0.124)	(0.126)	(0.138)	(0.135)	(0.139)
Plants	0.924**	0.910**	0.600**	0.757**	0.714**	0.360
	(0.300)	(0.302)	(0.305)	(0.341)	(0.348)	(0.356)
Surf Clam ITQ	-0.181	-0.205	-0.363	-0.176	-0.159	-0.317
	(0.229)	(0.230)	(0.257)	(0.252)	(0.253)	(0.286)
Pure quota firm	-1.803**	-1.903**	-1.762**	-2.968**	-2.813*	-2.900*
	(0.750)	(0.785)	(0.774)	(1.486)	(1.511)	(1.591)
Distance	--	-0.791**	-0.734**	--	-0.832**	-0.828**
		(0.269)	(0.292)		(0.279)	(0.313)
Advisor Meeting	--	--	2.595*	--	--	2.665*
			(1.390)			(1.482)
Comp. Distance	--	--	0.113	--	--	0.277
			(0.877)			(0.921)
Position	--	--	--	0.100	0.395	0.430
				(0.736)	(0.763)	(0.762)
Position^2	--	--	--	1.859*	1.853*	2.123**
				(0.983)	(0.996)	(1.053)
$\overline{\alpha}$	-2.120**	-0.968	-1.303**	-3.114**	-1.959**	-2.430**
	(0.549)	(0.635)	(0.668)	(0.806)	(0.844)	(0.905)
σ	2.036**	2.057**	1.864	2.302**	2.341**	2.230**
	(0.444)	(0.438)	(0.433)	(0.503)	(0.536)	(0.532)
λ_{1990}	-2.659**	-2.360**	-1.847**	-2.690**	-2.325**	-1.764**
	(0.651)	(0.650)	(0.643)	(0.674)	(0.678)	(0.671)
λ_{1991}	-3.860**	-4.044**	-3.572**	-3.850**	-4.030**	-3.585**
	(-0.747)	(0.766)	(0.804)	(0.769)	(0.796)	(0.849)
λ_{1992}	-1.399**	-1.468**	-1.450**	-1.234*	-1.274**	-1.207**
	(0.497)	(0.510)	(0.528)	(0.513)	(0.527)	(0.547)
λ_{1993}	-2.226**	-1.817**	-1.346**	-2.074**	-1.615**	-1.097**
	(0.499)	(0.515)	(0.527)	(0.503)	(0.525)	(0.541)
Simulated Log Likelihood	-152.855	-147.243	-140.217	-150.217	-144.346	-136.583

All columns report the results of random effect logit estimations of attendance probabilities. Standard errors are reported in parentheses. Columns 3 and 6 report the results of a second stage regression where the two advisor variables are replaced by their predicted levels. The standard errors reported in these two columns are biased downward as described in the text. ** - indicates parameter is significantly different from zero at or above 95% confidence level. * - indicates parameter is significantly different from zero at or above 90% confidence level.

According to industry sources, when the council selects industry advisors, it does so by soliciting volunteers. Nearly all volunteers are accepted.[14] Since volunteering to be an advisor is essentially an offer to participate in many meetings, we expect that the same factors that influence a firm's decision to participate in a meeting also affect its decision to become an advisor. This suggests that advisor status is endogenous and that the decision to become an advisor is correlated with the decision to attend a particular meeting. We obtain unbiased and consistent estimates of the advisor effects by using a two-stage estimation procedure (Greene 2000; Murphy and Topel, 1985).

The first stage estimation models the decision to become an advisor. The dependent variable (1 if a firm is an industry advisor and 0 otherwise) is estimated with standard logit regression. The fitted probability of becoming an advisor from the first-stage model is then used to construct two variables used in the second-stage model. The first variable, Advisor Meeting, is set equal to the fitted probability of being an advisor if the meeting in question is one where advisors are asked to participate, and 0 otherwise. The second variable, Compensated Distance, is the interaction of Advisor Meeting with the distance of a firm's home zip code from the meeting site zip code.

We report these two stage results in models 3 and 6 of Table 4 and Table 4a. The explanatory variables for the first stage model are the average of vessels, plants, and ITQ's, and distance to meetings for each firm in the data. Alternative first stage explanatory variables, including pre-1990 firm characteristics, had little effect on the second-stage estimate of β, or its estimated variance. For the fixed effect models we also correct the standard errors of the second stage regressions. It is not clear how to implement the Murphy and Topel (1985) error correction for the random effects model. Thus we present uncorrected, downward biased, standard errors for the two stage random effects models in columns 3 and 6 of Table 4a. Since the standard error correction for the fixed effect model was slight, we expect that the bias in Table 4a is slight. Additional details for the two-stage estimation procedure are presented in an appendix.

The coefficient on Advisor Meeting in model 3 of Table 4 is positive and significant. Firms are more likely to participate when they are provided an opportunity to speak during the debate

[14] Lee Anderson, (personal communication 2000).

over the TAC. The results also indicate that compensating advisors for their travel costs does not significantly alter meeting attendance. These results are robust to the alternate specification presented in model 6 of Table 4, and to the random effects error structure.

3.1.1 Discussion

The first hypothesis suggested by the theoretical literature is that firms that are more sensitive to small changes in outcome are more likely to attend. Consider two firms, one of which employs two vessels, and one of which employs one. If all vessels are identical a 1% change in the TAC affects the big firm's equilibrium harvest level by twice as much as the small firm. If profits vary directly with equilibrium harvests, then the fact that big firms are more likely to participate than small is consistent with the hypothesis that firms that are more sensitive to small changes in outcome are more likely to attend.

The second hypothesis suggested by the theoretical literature is that firms with lower participation costs are more likely to attend. Since travel costs are directly related to travel distance, the finding that participation rates decrease with distance is consistent with the hypothesis that firms with lower participation costs are more likely to attend. The finding that compensating firms for distance traveled to advisor meetings does not significantly increase attendance indicates that it is probably time costs rather than pecuniary travel costs that influence participation decisions. Given that individuals with advisor status tend to run large fairly large firms, this is a plausible finding.

The third hypothesis suggested by the theoretical literature is that firms with more power to move the meeting outcome more are more likely to attend. It is plausible that large firms are more influential than small firms. Thus, the fact that big firms are more likely to participate than small is also consistent with the hypothesis that firms with more power to move the meeting outcome more are more likely to attend.

The advisor status variables provide a more conclusive test of the hypothesis that firms with more power to move the meeting outcome more are more likely to attend. As their title suggests, industry advisors are selected to provide feedback from industry to the council. It seems reasonable to think that these firms have more power to move policy than firms which the council has not singled out for special treatment. In model 3 of Table 4 we see that firms with advisor status are more likely to participate in meetings where they are permitted to exercise their special status. This is not due to the fact that advisors are compensated for travel distance, since we control for compensated distance.

In sum, we find considerable evidence that size, travel distance and advisor status all affect participation rates. These findings are consistent with the first three hypotheses suggested by the theoretical literature.

A competing explanation for attendance is that firms with better information are more likely to attend. At first glance, this explanation appears to be plausible. For example, a firm which owns more fishing vessels is likely to have better information about the state of the clam stock, while a firm that sells more clams is likely to have better information about demand conditions. So that our finding that larger firms are more likely to participate is consistent with better informed firms participating.

Unfortunately, the data does not allow us to disentangle the effects of size from the effects of information quality. Having said this, the theoretical literature on meetings as a device for the aggregation of information, as opposed to preferences, suggests that information aggregation is unlikely to be an important function of meetings.

The ability of meetings to aggregate information will be hampered by two problems. First, information about the state of the world is a public good. In an environment where it is costly to report one's signal to the regulator we should expect that agents will free ride on the reports of others.[15] Second, if agents have different preferences over outcomes and they have private information, then they will have an incentive to not reveal their private information in order to skew the decision toward their preferred outcome. Analyses of this problem e.g. Li *et al.* (2000) suggest that in equilibrium, agents "garble" their signals by reporting the intervals in which their signals lie, or that uniformed agents will submit signals which favor their own preferred position (Banerjee and Somanathan, 2001). This too works against the use of meetings to aggregate information.

[15] The importance of this public goods problem is illustrated by the "Kitty Genovese" game.

3.2 Extremism effects

We now examine the hypothesis that firms with more extreme positions are more likely to participate in meetings.

To start, consider the problem of measuring the "extremeness" of a firm's preferred or profit maximizing choice of TAC. Since we do not observe firms' preferences directly, we are faced with the difficult problem of constructing an index which co-varies with these preferences.

It is at least plausible that preferences over TAC will vary with firm size. Thus one probable implication of the hypothesis that moderate firms are less likely to participate is that participation varies with size in a non-linear way. Such an effect, if it exists, could not be distinguished from other size effects. Thus we would like to look for an index which varies with a firm's profit maximizing choice of TAC, but not with a firm's size.

We know from the administrative record that firms do disagree about the level of the TAC, so that any model which predicts agreement is not defensible. Our premise is that a firm which is more specialized in physical capital (vessels and processing plants) or quota, will have more extreme preferences over the TAC than a firm which is relatively more diversified.

Our premise is consistent with the description of preferences given by meeting participants at a September 1992 meeting in Essington, PA, "If you own allocation [quota], you want a small quota, and if you don't own allocation you want a bigger quota, ...". That is, preferences over the TAC vary with the degree of specialization in physical capital versus quota. Another participant at this meeting gives a less complete description consistent with similar preferences, "If you have a lot of quota that you control, the less of it there is the more valuable."

Our premise is also consistent with a variety of models of rent division. A simple model illustrating this is given in figure 1 and in the following discussion. Let Q denote the quantity of clams harvested, $S(Q)$ the industry supply, and P the price for processed clam meats.[16] There is one clam species, one extraction sector, and all markets are competitive. The TAC is $\overline{Q}$, and $r(Q)$ is the rental price for a unit of quota. Let Q^* denote the quantity of clams at which marginal rent to the clam stock declines to zero. At Q^* the rental price of quota is zero. With the introduction

[16]Figure 1 depicts a constant price for clam meats. While 1994 surf clam production accounted for 46.58% of US supplies, substitutability across clam species and existence of an import market suggests that the demand for processed clams is elastic.

of a binding TAC, $\overline{Q} < Q^*$, the rental price of quota is strictly positive, $r(\overline{Q}) = P - S\left(\overline{Q}\right) > 0$.

In Figure 1, at TAC level $\overline{Q}$, profits for the extraction sector are given by the shaded area, while profits for the quota owners are given by the hatched area. Profits for the extraction sector are *increasing* in Q and reach a maximum when $Q = Q^*$. Profits for quota owners are maximized when $r(Q)Q$ is maximized. This occurs at a value of $\widetilde{Q}$ which is strictly smaller than Q^*. Given $\widetilde{Q} < Q < Q^*$, quota owner profits are *decreasing* in Q. Thus, quota owners and physical capital owners disagree about the size of the TAC. The assumption which drives the disagreement between quota owners and capital owners is that the supply curve is upward sloping.[17] We can imagine several reasons for such a positive slope. For example, decreasing returns to a fixed stock of clams, or decreasing returns to fixed physical capital. Thus, this simple model provides a foundation for our premise that a firm's preference over the TAC will vary with specialization into physical capital or quota. In particular, firms which are more specialized in quota prefer a TAC near the low extreme of the interval $\left[\widetilde{Q}, Q^*\right]$, while firms that are more specialized in physical capital prefer a TAC near the high end of this range.

It remains to construct an index to measure the extent to which a firm is specialized in physical capital or quota ownership. One such index is,

$$(1) \qquad position = \frac{\max\left\{\text{Harvested bushels, Processed bushels}\right\} - \text{Bushels of quota owned}}{\max\left\{\text{Harvested bushels, Processed bushels}\right\} + \text{Bushels of quota owned}}.$$

A firm is more extreme as it is more specialized in quota or physical capital. Firms which own more quota, all else equal, get a smaller value of the above index. Firms which harvest or process more clams get a larger value. In order to reduce the extent to which our index varies with firm scale, it is normalized by a measure of firm size. In principle, this will allow us to distinguish between the effects of size and position on firm attendance behavior.

This position index has an astonishing ability to predict firms' statements at meetings. The administrative record reports at least some firms' comments at meetings. Comments are rare relative to attendances, and in most of the meetings we observe, the discussion of the surf clam TAC is uncontentious, with firms' comments overwhelmingly in favor of whatever the committee

[17] Otherwise, extracting firms make zero profits at all levels of the TAC and would not disagree with the quota owners about the level of the TAC.

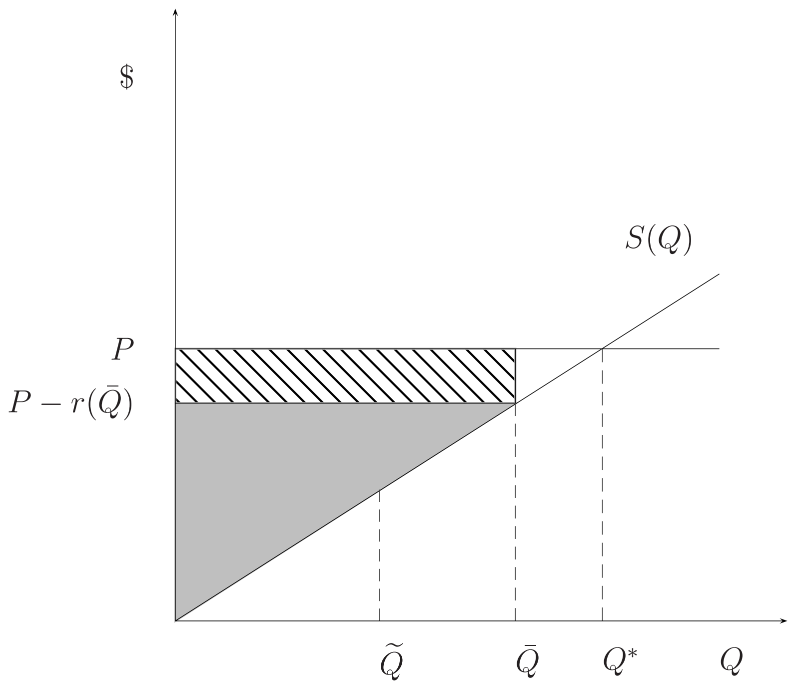

Figure 1. A simple model of rent division. $S(Q)$ is industry supply, P the price for processed clam meats. The TAC is $\overline{Q}$, and $r(Q)$ the rental price for a unit of quota. Q^* denotes the quantity of clams at which marginal rent to the clam stock declines to zero. At TAC $\overline{Q}$, profits for the extraction sector are given by the shaded area, while profits for the quota owners are given by the hatched area. Profits for the extraction sector are increasing in Q and reach a maximum when $Q = Q^*$. Profits for quota owners are maximized when the area $r(Q)Q$ is maximized. This occurs at a value of $\widetilde{Q}$ which is strictly smaller than Q^*. Given $\widetilde{Q} < Q < Q^*$, quota owner profits are decreasing in Q.

or council has proposed. However, in 1994, there was an extensive and contentious debate about whether to raise or lower the surf clam quota. Ten members of the public spoke about the level of the quota, three for a decrease and seven for an increase. We are able to calculate the position index for the firms that each of the ten individuals represent. Of the seven who favored an increase, only one had a position indexs value below the sample mean of 0.16. Of the three who favored a decrease, two were negative, and one was 0.18, very slightly above the sample mean. In sum, firms that spoke for a decrease were specialized in quota ownership and had low values of the position index while firms that spoke for an increase were specialized in physical capital and had high values of the position index. This is precisely the pattern suggested by participants' descriptions of preferences, and by our simple model of rent division. Thus there is surprisingly strong support for the claim that the position index does, in fact, vary systematically with firms' preferences over the TAC.

Figure 2a presents a histogram showing participation rates conditional on *position*[18] for the whole sample of firms. Figure 2b duplicates 2a, but restricts the sample to firms which attend at least one meeting. Since this is the sample used by the fixed effects estimator, figure 2b shows attendance conditional on *position* for the sample used by the fixed effect estimator, while figure 2a shows the corresponding information for the sample used by the random effects estimator. If, before conditioning on other factors, more extreme firms are more likely to participate in meetings then the histograms should take higher values at the edges than the middle. The histograms clearly suggest that attendance is non-linear in *position*. Moreover, the histograms also show (to many people we ask) that firms near the sample average have relatively low participation rates, while all regions with high participation rates are away from the middle.

Figure 2 displays attendance rates conditional only on *position*. We would also like to check whether more extreme firms are more likely to attend after we control for firm size, travel distance and advisor status. To do this models 4 through 6 in Table 4 and Table 4a report regression results which include *position* and $position^2$ as explanatory variables. If firms with more extreme positions are more likely to attend then we should see that the second order term is positive and the linear terms are small enough in magnitude that the minimum of the *position* quadratic lies

[18] In this figure, as in the subsequent analysis, *position* is calculated on the basis of a firm's involvement in the surf clam fishery only.

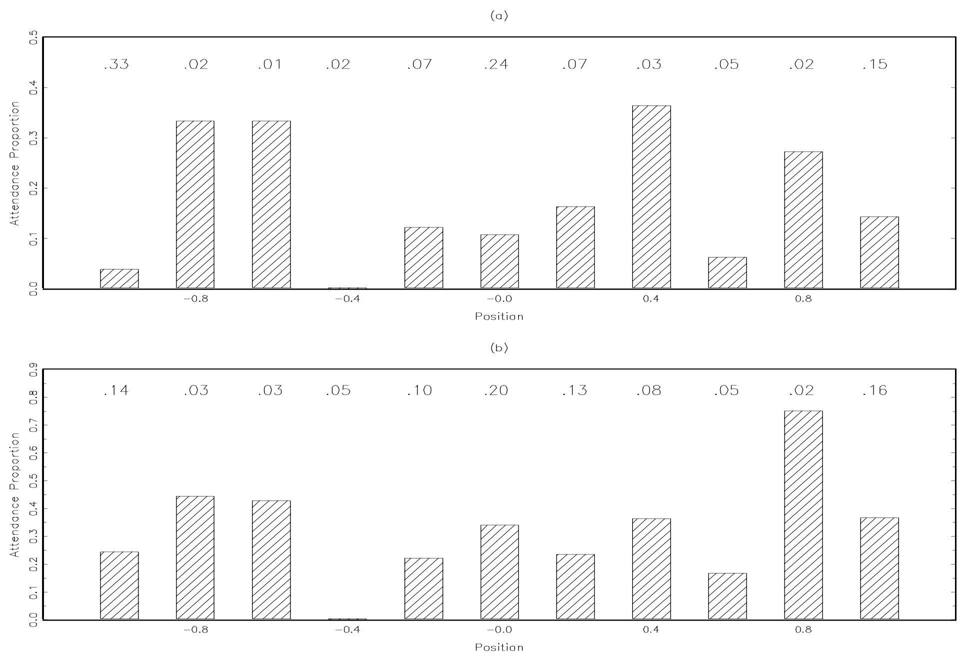

Figure 2: **Attendance conditional on position.** Figure 2a displays attendance rates conditional on position for the whole sample of observations. Figure 2b displays attendance rates conditional on position for the sample of firms that attended at least one meeting. In both histograms the horizontal axis indicates the value of Position, The vertical axis the attendance rate.Numbers above the bins indicate the share of observations that lie in a given bin. Thus in figure 1a, 33% of observation lie in the bin at position -1.0, and these firms have an attendance rate of 3%. In both figures we see low attendance rates among firms with moderate positions.

in the interior of $[-1, 1]$.

Models 4-6 of Table 4 repeat models 1-3 but include the linear and quadratic *position* terms. The coefficients for the first order terms are positive but statistically significant only in model 6. The coefficient associated with the $position^2$ term is positive and statistically significant at or above the 95% confidence level in all models. The magnitude of the linear *position* term is such that the minimum of the quadratic in *position* occurs at about -0.2 (about -0.1 for Table 4a). Thus these results indicate that firms whose positions are near the middle of the $[-1, 1]$ range of the position variable are less likely to attend than are firms with positions near the extremes of this interval.

Including the position measures does not affect the remaining parameter estimates in any meaningful way, with one exception. In both the fixed and random effects estimations, adding position variables reduces the magnitude and significance of both Plants and ITQ coefficients relative to the corresponding regression without the position variables, i.e. model 4 compared with 1, 5 with 2, and 6 with 3. In some instances this causes fixed effects coefficient estimates, but not the random effects estimates, to cross the borders of conventional significance thresholds. Thus, a comparison of tables 4 and 4a shows that relying on within firm variation does not allow us to simultaneously identify Position, Plant, and ITQ effects at standard levels of significance. Identifying these effects simultaneously is possible if we make use of between firm variation.

In summary, the data appear to strongly support the hypothesis that firms with more extreme positions attend. In particular the result persists if we condition only on size and distance, and if the we condition on size, distance and advisor status. Finally, the result is visible (to many people we ask) in the raw data as summarized by the histograms of Figure 2.

While the support for the hypothesis that moderates are less likely to attend is strong, a caveat is necessary. The results in Table 4 are conditional on including the indicator variable for pure quota owning firms. If we do not include this variable then the effect of $position^2$ remains positive, but statistical significance declines to roughly the 10% level. To understand why this occurs, note that about one third of our sample consists of pure quota owning firms. In addition to being very small and probably very poorly informed, pure quota owners have extreme values of the position index.[19] Therefore, despite their extreme positions, it is reasonable that these

[19] Also, the animosity of fishermen towards absentee quota owners is strong and well documented. This too may

firms simply do not care enough about the TAC to bear the cost of participating in the regulatory process. If we do not include a pure quota owner dummy, we attribute the low attendance rates of these firms to their extreme position. Since these firms account for about one third of our sample, this overwhelms the finding that for the rest of the sample, more extreme firms are more likely to attend. By including the pure quota owner dummy variable, we are allowing the regression to attribute the low participation rate of these firms to their status as pure quota owners rather than to their extreme position.

4 Conclusion

Our analysis indicates that firm size, attendance costs, and advisor status all have statistically significant effects on the likelihood of participation in the regulatory process. More surprisingly, we also find strong evidence that firms that prefer more extreme policies are more likely to participate. To get a sense for the magnitude of these effects, we calculate the impact of a one-standard-deviation increase in explanatory variables on attendance probability, all else equal.[20] The fitted parameters from model 6 of Table 4 are used for this purpose. A one standard deviation increase in vessels and plants causes a 0.036 and 0.050 increase in the probability of attending a meeting. Granting advisor status increases the probability of attending a advisor meeting by 0.019. An increase in travel distance to meeting sites reduces attendance probability by 0.035. Lastly, a one standard deviation increase in Position^2 increases the probability of attendance by 0.061. Since the average attendance probability is 0.108, these calculations suggest that relatively small changes in physical capital, distance, and position have quite important impacts on attendance rates. Similarly, the opportunity to exercise advisor status is also an important determinant of attendance behavior.

Our findings suggest that meetings with costly participation will not elicit participation by a

provide a disincentive for participation by pure quota owners (Committee to Review Individual Fishing Quotas 1999).

[20] The fixed effects logit model does not recover estimates of the incidental parameters. We estimate the change in attendance at the value $\overline{\alpha}$ that equates the observed and predicted attendance rates, holding β, and λ_t at their estimated values. The change in attendance probabilities is calculated as $\frac{1}{N}\sum\left[F(\beta'(z_{im}^{j}+\frac{1}{2}s^{j})+\alpha+\lambda_t)-F(\beta'(z_{im}^{j}-\frac{1}{2}s^{j})+\alpha+\lambda_t),\right]$ where s^j is the sample standard deviation for explanatory variable j.

representative sample of the regulated population. This institution will oversample large firms, nearby firms, and firms with extreme preferences. We also find that firm participation rates responds positively to minor changes in meeting protocol, in our case the granting of advisor status.

Altogether, our results provide a basis for predicting when an economic environment will produce particularly polarized and contentious meetings and when an economic environment will produce meetings where the preferences of participants are more representative of the regulated population. The results also indicate that it may be possible to manipulate the participation rates of individual firms by granting firms special status. By using these tools to encourage participation by under-participating firms, meeting participation can be manipulated to be more or less representative of the regulated population.

We note that, unless we regard "representativeness" as intrinsically good, the welfare implications of such changes in meeting protocol are at present ambiguous. On the basis of the theory developed in Osborne *et al.* (2000) we would conclude that meetings which are more representative are probably desirable since such meeting are less likely to exhibit the randomness of outcome that may occur at highly polarized meetings. The anecdotes described earlier suggest that such vacillation by regulators is a real phenomena, and it is difficult to imagine that it does not impose large costs on the regulated population. On the other hand, Borgers (2000) argues that meetings with purely voluntary participation welfare dominate a variety of other meeting formats, in particular those where attendance is compulsory and the meetings are perfectly representative. Since Borgers' analysis does not allow for the sort of randomness that is possible in Osborne *et al.* (2000), and Osborne *et al.* (2000) do not attempt welfare analysis, it remains unclear whether compulsory or voluntary attendance should be preferred. A tentative conclusion suggested by these papers, however, is that voluntary attendance ought to be preferred for decisions which are not expected to be contentious, but for decisions which are expected to be contentious, some modification of the meeting protocol should be made to encourage participation by moderates.

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5 Appendix: Logistic estimation with panel data

The estimate of β is obtained by maximizing the likelihood of observing the M_i vector of attendance events is $A_{i1}, A_{i2}, ..., A_{iM_i}$, for all firms $i = 1, ..., N$, where M_i is the number of meeting periods in which firm i was active in the clam fishery. The fixed effects conditional logit log likelihood function is

$$\text{(A1)} \qquad \ln L = \sum_i \ln \left[\exp(\beta' \textstyle\sum_{M_i} z_{im} A_{im}) / \sum_{d \in B_i} \exp(\beta' \sum_{M_i} z_{im} d_m) \right],$$

where,

$$\text{(A2)} \qquad B_i = \{d = (d_1, ..., d_{M_i}) | d_m = 0 \text{ or } 1 \text{ and } \textstyle\sum_{M_i} d_m = \sum_{M_i} A_{im}\},$$

(time effects parameters and year dummy variables have been subsumed into β and z_{im}, respectively in equation (A1)). The random effects log likelihood function for the logit probability F is

$$\text{(A3)} \qquad \ln L = \sum_i \ln(\int \Pi_{M_i} F(\beta' z_{im} + \lambda_t + \alpha)^{A_{im}} (1 - F(\beta' z_{im} + \lambda_t + \alpha))^{1 - A_{im}} dG(\alpha | \overline{\alpha}, \sigma^2)),$$

where G is the normal univariate distribution function with mean $\overline{\alpha}$ and variance σ^2.

5.1 Two-stage estimation procedure

A firm's decision to become an advisor and attend meetings can be characterized by a system of $M_i + 1$ discrete decisions. Let V_i take the value of one if firm i chooses to become an advisor and the value of zero otherwise. We wish to maximize the likelihood of observing $(V_i, A_{i1}, A_{i2}, ..., A_{iM_i})$ for all i.

In the first-stage, the probability that firm i chooses to become an advisor is $\Pr(V_i = 1) = F(\gamma' x_i)$ where x_i is a vector of explanatory variables, and γ is a parameter vector. The first-stage log likelihood function is

$$\text{(A4)} \qquad \ln L_1 = \sum_i \left[V_i \ln F(\gamma' x_i) + (1 - V_i) \ln(1 - F(\gamma' x_i)) \right],$$

Let $\widehat{\gamma}$ denote the value of γ that maximizes $\ln L_1$. The fitted probability of becoming an advisor, $F(\widehat{\gamma}' x_i)$, is used to construct two second stage regressors, Advisor Meeting, and Compensated Distance. These variables are included in the set of regressors for the second stage model. If standard regularity conditions are met for both log-likelihood functions, the two-stage procedure yields consistent and asymptotically normally distributed estimates of β.

Since the second stage likelihood contains the predicted advisor variables, they are conditional on $\widehat{\gamma}$. We follow Murphy and Topel (1985) to obtain asymptotically correct standard errors for β under the fixed effects specification. Denote the second stage conditional log likelihood in equation (A1) as $\ln L_2$. Let $\mathbf{H}_1$ and $\mathbf{H}_2$ denote the inverse information matrices for the maximized likelihood functions $\ln L_1$ and $\ln L_2$ respectively. The asymptotically correct variance-covariance matrix for β is

(A5)
$$\mathbf{H}_2^* = \mathbf{H}_2 + \mathbf{H}_2 \left[C\mathbf{H}_1' C' - R\mathbf{H}_1' C' - C\mathbf{H}_1' R' \right] \mathbf{H}_2,$$

where

(A6)
$$C = E\left(\frac{\partial \ln L_2}{\partial \beta} \frac{\partial \ln L_2}{\partial \gamma}\right),$$

(A7)
$$R = E\left(\frac{\partial \ln L_2}{\partial \beta} \frac{\partial \ln L_1}{\partial \gamma}\right).$$

Estimates of C and R are obtained as

(A8)
$$\widehat{C} = \frac{1}{N} \sum_i \left(\frac{\partial \ln L_{i,2}}{\partial \widehat{\beta}} \frac{\partial \ln L_{i,2}}{\partial \widehat{\gamma}}\right),$$

(A9)
$$\widehat{R} = \frac{1}{N} \sum_i \left(\frac{\partial \ln L_{i,2}}{\partial \widehat{\beta}} \frac{\partial \ln L_{i,1}}{\partial \widehat{\gamma}}\right).$$

As noted in the text, we experimented with different first stage explanatory variables and got similar results. Reported results are based on first stage regression that used explanatory variables: a constant, firm average values for the number of vessels, plants, surf clam ITQ's, and distance to meeting sites during the 1990-1994 study period.

The first stage regression yielded reasonable results. The simple correlation between the fitted probability of becoming an advisor, $F(\widehat{\gamma} x_i)$, and the actual indicator for advisors was 0.645. The reported standard errors in models 3 and 6 of Table 4 are derived following equation (A5) with $\mathbf{H}_1$ and $\mathbf{H}_2$ replaced by their estimated counterparts.