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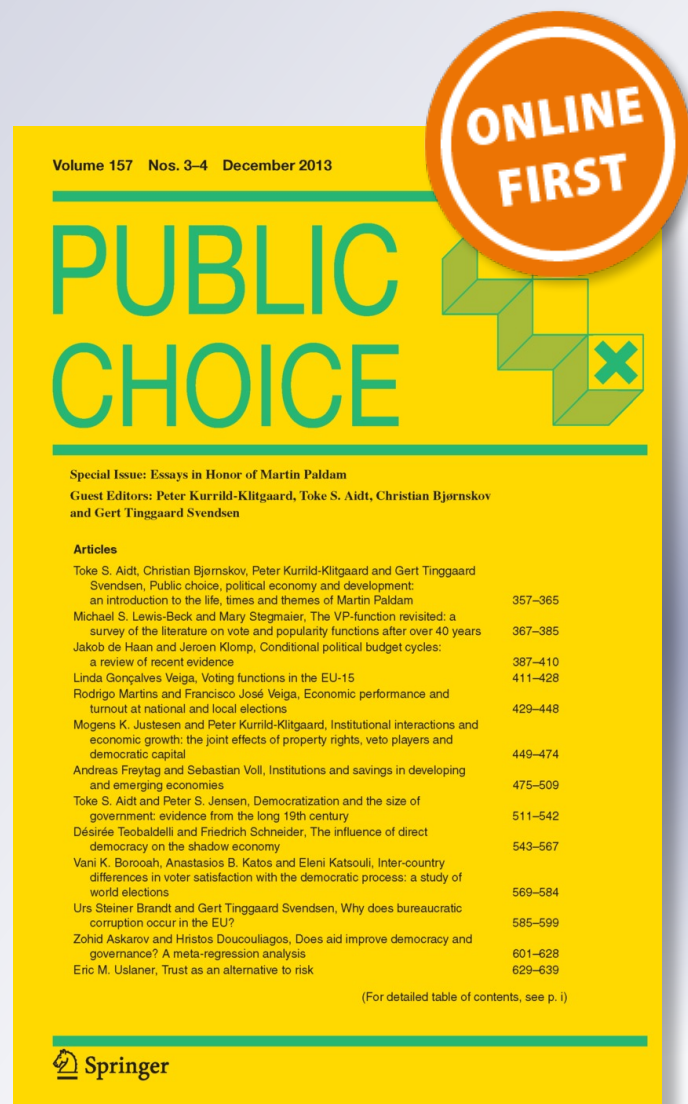
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# The impact of consumer advocates on regulatory policy in the electric utility sector

Adam R. Fremeth · Guy L.F. Holburn · Pablo T. Spiller

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**Abstract** We examine the effect of consumer advocate participation in administrative procedures on regulatory policy. We use a unique panel database of rate reviews conducted for US electric utilities from 1980 to 2007 to assess how state consumer advocates affect Public Utility Commission decisions on utilities' allowed financial returns and rate structures. We find first that utilities experience fewer rate reviews in states with consumer advocates, consistent with utilities strategically postponing requests for rate increases. Second, after controlling for observed and unobserved state characteristics, we find that PUCs in states with consumer advocates permit returns on equity that are on average 0.45 percentage points lower than states without advocates—equivalent to a \$7.9 million (3.7 %) reduction in average utility operating income, all else equal. Third, consumer advocates are associated with lower residential rates relative to other customer classes. Our findings provide statistical support for the thesis that institutionalizing interest group representation in administrative procedures is one way for legislatures indirectly to influence agency-determined policies.

**Keywords** Electric utilities · Consumer advocates · Special interest groups · Regulation

**JEL Classification** H70 · H73 · K23 · L51 · L94 · Q48

## 1 Introduction

Administrative procedures such as rules of intervenor participation, public notice, evidentiary standards and judicial review govern the ways in which agencies formulate and implement regulatory policies. Whether such procedures have a material impact on policy outcomes has been the subject of scholarly debate. Legal experts have argued that procedural

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requirements ensure that agencies follow due process, thereby improving the transparency and legitimacy of their decision-making; in this view, their effect on policy is deemed largely to be neutral (Mashaw 1985; Rossi 1997). In contrast, political scientists have contended that specific administrative procedures are chosen strategically by legislatures to ensure that agency-formulated policies favor selected groups (De Figueiredo and Vanden Bergh 2004; McCubbins et al. 1987, 1989). Despite these competing predictions, however, there is scant empirical research that provides evidence for whether or how administrative procedures shape actual policy decisions.

Here we present the first statistical analysis of the impact on agency policy orders of a specific administrative procedure, intervenor participation in agency hearings. Our focus is on the participation of public consumer advocates in utility regulatory proceedings in the United States. Since the early 1970s, 33 states have created publicly funded consumer advocates that have rights to intervene in formal rate review hearings and administrative processes conducted by state regulatory agencies—Public Utility Commissions (PUCs)—and also the right to appeal agency decisions to state courts. Unlike regulatory agency commissioners, consumer advocates do not make policy decisions or determine policy agendas. Their impact, if any, operates through the provision of information on policy proposals and policy consequences to agency commissioners and staff, and potentially to courts and legislatures.

We use data on all major (1,349) rate reviews conducted for US electric utilities between 1980 and 2007, covering states with and without consumer advocates, to determine whether advocates affect regulatory agency decisions on two aspects of regulatory policy—the allowed return on equity (ROE) and the structure of utility rates.<sup>1</sup> Since legislative acts and judicial precedent do not specify particular methodologies for calculating the allowed ROEs or the rate structures, agency commissioners have some discretion in their policy decisions.<sup>2</sup> In contrast to prior analyses of agencies' allowed ROE decisions that have utilized almost exclusively cross-sectional data, we use time series data and an instrumental variable for the consumer advocate, which allows us to control for unobserved state characteristics that may be correlated with the presence of pro-consumer institutions in a state.<sup>3</sup> Our statistical analysis suggests that consumer advocates are associated with a redistribution of rents from utilities to customers (through a 0.45 percentage point reduction in the allowed ROE) and also between customer classes, specifically favoring residential consumers (by tilting the rate structure to the advantage of the residential class). Larger utilities appear especially likely to have their rate requests targeted for scrutiny and to be contested by advocates. We thus find evidence consistent with the view espoused in the political science literature that the choice of procedural design in agency regulation provides a means for legislatures to influence the direction of agency policy-making. Although our estimates of the magnitudes of these effects are specific to the institutional environment within the United States, our general conclusions are likely to be of interest to policy-makers implementing regulatory and administrative reforms in other countries.

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<sup>1</sup>The rate structure consists of the different rates charged to residential, industrial and commercial customers.

<sup>2</sup>As the New Mexico Public Utility Commission commented about its discretionary powers, “[*there is*] a zone of reasonableness between confiscation [of utility assets] and extortion [of consumers] in which the Commission has great discretion in setting just and reasonable rates” (New Mexico PUC Brief, Supreme Court Case No. 24,148, PNM Gas Services v. NMPUC 1998).

<sup>3</sup>See, for example, Hagerman and Ratchford (1978).

## 2 Related literature

Legal scholarship on the direct participation of citizens or intervenors in administrative procedures has emphasized normative or moral benefits, such as reinforced notions of modern democracy, affirmation of political ideals of access and fairness, and enhanced legitimacy of rule-making processes (Mashaw 1985). Against these advantages, scholars have contended that participation can also generate negative consequences: by introducing additional information that requires deliberation, citizens and advocates can delay, and increase the costs of, agency procedures. Direct participation may in fact obfuscate and divert limited agency resources from salient policy issues, thereby reducing the quality of agency decision-making (Rossi 1997). Although this literature does not explicitly focus on the issue of bias, an implicit assumption is that participation by citizens or advocates does not materially influence the direction of agency decisions.

Research in positive political theory on the other hand has argued that legislatures use the design of administrative procedures as a means of controlling agency policy decisions (De Figueiredo et al. 1999; De Figueiredo and Vanden Bergh 2004; Epstein and O'Halloran 1994, 1996; McCubbins et al. 1987, 1989). Attention has focused especially on how legislatures control the degree of representation of certain interest groups, such as environmental or consumer advocates, in administrative processes: enabling favored interest groups to organize and to participate in agency proceedings is claimed to affect policy rulings by changing the informational environment upon which agencies base their decisions (McCubbins and Schwartz 1984).

Intervenors may provide new evidence about policy alternatives and consequences, or about the actions of regulated entities, that agencies must respond to and incorporate in their final rulings. They also act as monitors of agency behavior on behalf of the legislature, potentially triggering legislative committee investigations or sanctions aimed at preventing regulatory capture by other interests or agency 'drift'.<sup>4</sup> Thus, by requiring agencies to admit selected intervenors or interest groups into their decision-making arenas, legislatures can "stack the deck" in favor of important constituents and ensure that policy responds to those groups' preferences. Recent scholarship argues that greater political uncertainty about future election outcomes further increases the incentives for incumbent governments to shape intervenor representation in agency processes, since they are faced with diminished prospects of being able to monitor agency behavior in the future (De Figueiredo and Vanden Bergh 2004; Holburn and Vanden Bergh 2006). This stream of research thus predicts that the participation of consumer advocates in administrative procedures will be reflected in a pro-consumer tendency in agency policy decisions.

## 3 Consumer advocacy in the regulation of public utilities

State legislatures established public consumer advocates for the utility sector mainly during the 1970s and 1980s when utility costs and rates were rising steeply, leading to concerns at the time about 'capture' of regulatory agencies by regulated entities (Gormley 1981, 1983; Stigler 1971). As the Arkansas legislature noted in 1980, "The people of Arkansas need

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<sup>4</sup>By 'drift' we mean that by delegating policymaking authority to a regulatory agency, legislators introduce the risk that the policy choice of the agency is different from the policy preference of the legislature.

**Table 1** States with statutory consumer advocates

State	Year	Legislation
Alabama	1977	§ 37-1-16
Arizona	1983	40-461
Arkansas	1981	23-4-301
California	1996	SB 960
Colorado	1984	40-6.5-104
Connecticut	1975	16-2a
Delaware	1978	29-8716
Florida	1974	Fla. Stat. § 350.061
Georgia	1981	46-10
Hawaii	1976	§ 269-651
Illinois	1983	§ 220 ILCS 10/1
Indiana	1981	IC 8-1-1.1
Iowa	1983	§ 475A.1
Kansas	1989	66-1222
Maine	1981	35-A M.R.S. § 1701
Maryland	1976	Art. 78 § 57
Massachusetts	1973	ALM GL ch. 12, § 11E
Missouri	1977	§ 386.700 R.S.Mo.
Montana	1973	§ 69-1-211
Nevada	1981	Nev. Rev. Stat. Ann. § 228.300
New Hampshire	1981	RSA 363:28
New Jersey	1974	52.27E
New York	1970	NY CLS Exec § 550
North Carolina	1977	N.C. Gen. Stat. § 62-15
Ohio	1976	§ 4911
Pennsylvania	1976	71 P.S. § 309-1
South Carolina	1978	§ 37-6-601
Tennessee	1994	§ 65-4-118
Texas	1983	Tex. Rev. Civ. Stat. art. 1446c
Utah	1977	§ 54-10a-101
Vermont	1981	30 V.S.A. § 1
West Virginia	1980	§ 24-1-1
Wyoming	2003	37-2-401

aggressive and effective representation in utility rate hearings and other utility-related proceedings.<sup>5</sup> Sixteen states created consumer advocates during the 1970s, 14 states during the 1980s, and a further three states after 1990 (see Table 1). Differences between states and over time in economic and political conditions partly account for why some states created advocates in a particular year while others choose not to do so. States that adopted consumer advocates tended to have had greater utility fuel cost increases, and to have been governed by precarious majority Democrat coalitions in the legislative and executive branches (Holburn and Vanden Bergh 2006). No state, as far as we are aware, has dismantled a consumer

<sup>5</sup>Arkansas Code 23-4-302(3), Public Utilities and Regulated Industries.



advocacy office though several states have amended the original enabling legislation, often strengthening advocates' powers.<sup>6</sup>

Consumer advocates operate as independent institutions, separate from Public Utility Commissions, that have the authority and public funding to represent consumer interests in proceedings before state agencies and courts. Generally, the state governor or attorney general, with the advice and consent of the legislature, appoints the head consumer advocate.<sup>7</sup> The average consumer advocate office had a budget of \$1–\$2 million in 2009, with a staff of 10–15 personnel. Advocates typically have a mandate to represent all consumer classes rather than a specific segment, such as low income or elderly consumers.<sup>8</sup> It is not uncommon, though, for private advocacy organizations to also intervene in regulatory proceedings, for instance the American Association of Retired Persons (AARP), state industrial electricity user groups or state residential user groups (e.g., Vermont Electricity Consumers Coalition), to advance their members' specific interests—although PUCs have some discretion whether to grant them intervenor status in rate reviews (Doucet and Littlechild 2006). In states without public consumer advocates, consumer interests are protected primarily by PUCs, which have mandates to consider the welfare of multiple interest groups in making policy in the “public interest”.

Consumer advocates, by participating in administrative processes, can influence policy by changing the informational environment that forms the basis for PUC decisions (Fremeth and Holburn 2012). Regulatory policy in the utilities sector is determined primarily by periodic rate reviews conducted by PUCs, who have broad discretion to determine the financial rates of return that utilities are allowed to earn; the allowable level of utility operating costs and capital investments (termed the *rate base*); and the rates that utilities can charge different customer classes for their services (Joskow 1974).<sup>9</sup> Advocates have a right to receive all regulatory filings and evidence provided by regulated utilities to PUCs in rate cases, which permits them to scrutinize the validity of utility claims. Consumer advocates can then potentially shape PUC decisions on specific policy elements by participating in rate review hearings. Advocates may also lobby PUCs to initiate rate reviews if they believe utilities' earnings are excessive, though this is rarely achieved given the evidentiary hurdles for advocates in demonstrating excess earnings (Fremeth and Holburn 2012).

Advocates generally contest utility or PUC staff proposals during rate reviews when they believe such proposals to be unjustified, presenting their own testimony, evidence and wit-

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<sup>6</sup>The following four states have implemented legislative changes to the scope of advocate authority: California (2001, 2003, 2006), Kansas (2008), New Jersey (1994, 2005) and South Carolina (2004).

<sup>7</sup>Consumer advocates are appointed by governors in 15 states, by attorneys general in seven states and by other means (e.g., legislative committee) in 11 states.

<sup>8</sup>For example, in Arkansas, the legislation that established the Consumer Utilities Rate Advocacy Division stated that the “Division shall represent the state, its subdivisions, and *all classes* of Arkansas utility rate payers. . . to advocate the holding of utility rates to the lowest reasonable level” (Arkansas Code 23-4-302(3), Public Utilities and Regulated Industries; emphasis added).

<sup>9</sup>Utilities tend to trigger rate reviews in response to rising costs (Joskow 1974). Since rates cannot be adjusted otherwise, reviews are an important mechanism by which utilities can restore their profitability after periods of cost inflation. Upon initiation of a rate review, a series of public hearings is held wherein the utility, PUC staff and other intervenors (including consumer advocates), present arguments before the commission or administrative law judge about the appropriate estimate of utility costs and level of profitability. Commissioners, after considering all evidence and testimony presented, make a majority decision on several factors: the allowed rate of return, the allowed rate base and the rate structure. While most rate reviews result in rate increases, utilities typically receive only a fraction of the total increase requested and, for electric utilities during the 1980s, ten percent of all rate cases led to a reduction or no change in rates. See Hyman (2000) for a more detailed description of the rate review process.

nesses. They also sometimes negotiate directly with utilities in advance of making joint policy proposal submissions to PUCs (Littlechild 2009a, 2009b). In doing so, advocates may use novel data and methodologies that support relatively pro-consumer positions, for example by arguing for lower allowed rates of return. As an illustration, the Citizens Utility Board (CUB) in Illinois challenged the basis for Commonwealth Edison's (ComEd's) request for a \$337 million increase in annual utility rates in 2006, which it had filed with the Illinois Commerce Commission (ICC). The CUB hired an independent expert witness who testified that ComEd's requested return on equity of 11.0 % was too high and that an appropriate return, estimated using a different valuation methodology, should be substantially lower (Fremeth and Holburn 2009). In its final ruling, the ICC commented on the value of the CUB's approach and, although it did not adopt the CUB's exact recommendation, it substantially lowered the allowed return on equity to 10.045 %, which was even lower than the ICC staff's recommended 10.19 %. In addition, when monitoring utility expenditures advocates may demand their exclusion from the allowed rate base, in whole or in part, if they consider them to be imprudent.<sup>10</sup> In the same 2006 Commonwealth Edison rate case discussed above, the Citizens Utility Board challenged ComEd on many of its claimed operations, maintenance, depreciation and other expenses. While in some cases the ICC did not agree with the CUB's arguments or evidence, in others it did agree and modified its position accordingly.

Consumer advocates can thus present new information about utility costs that, as long as it is credible, will bias downwards PUC commissioner beliefs about true utility costs and the appropriate allowable rate of return. PUC commissioners cannot simply ignore consumer advocates' arguments in their decision-making process: under due process requirements, as established in state generic administrative procedure acts and acts specifically governing PUC procedures, PUC decisions must have some reasonable basis in the evidence presented. Commissioners must therefore justify why one position on any given issue is more reasonable than the alternatives. Without some substantiation, commissioners run the risk of being overturned by the courts on the basis of arbitrary or capricious behavior. In sum, we expect that by providing more evidence in favor of relatively pro-consumer policies, the participation of consumer advocates during rate reviews will result in lower allowed rates of return, rate bases and, hence, lower consumer rates, than would otherwise be the case. As we discuss below, both effects influence the incentives of utilities to file for rate reviews.

Consumer advocates can also have an impact on the rate structure, which determines the proportion of utility fixed costs borne by different customer classes. Since PUCs determine the share of utility costs that residential, commercial and industrial customer classes should each bear, a reduction in rates for one class implies, *ceteris paribus*, an increase in rates for other classes. Consumer advocates are appointed by elected state politicians—governors or attorneys general—which implies that they will be particularly receptive to the welfare of residential consumers (i.e., the voting population). We anticipate that consumer advocates will tilt the residential-to-non-residential rate ratio to the benefit of residential

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<sup>10</sup>The rate base is the level of capital investment expenditures that the PUC deems prudently incurred and on which the utility is allowed to earn a return. Changes in the rate base arise as the PUC formally approves new investments that the utility has recently completed, for example, the completion of new electric generation capacity or the extension of transmission facilities. The allowed rate of return is usually set in reference to the utility's weighted cost of capital so that it may raise new capital on the debt or equity markets in order to finance future investments. The appropriate rate of return will fluctuate over time as broader capital market conditions and interest rates change, though the official allowed rate of return can only be adjusted accordingly in the context of a rate review. Since rate reviews are costly and lengthy procedures, PUCs may allow utilities to earn actual profits that imply a rate of return somewhat higher than the allowed rate.



customers and to the detriment of non-residential (industrial and commercial) customers. However, the composition of a utility's customer base is likely to have a moderating effect: utilities with larger percentages of industrial customers will have rate structures that favor such well-organized private interests, and the impact of advocates on residential rates will be diminished.

Consumer advocates affect regulatory outcomes not only through their direct influence on PUC policy decisions during rate reviews but also through their *ex ante* impact on utility expenditures and investments. Since it is difficult for regulatory agencies or courts to determine whether each aspect of a utility's cost base was prudently incurred, utilities have some discretion to inflate costs above levels that would obtain in a competitive environment—for example, by “gold plating” assets or by tolerating managerial slack—anticipating the formal approval of such costs during future rate reviews (Averch and Johnson 1962; Baron and Myerson 1982). The existence of pro-consumer regulatory institutions, however, increases the risk that such costs or expenditures will be aggressively challenged during rate hearings and ultimately fully or partially disallowed by the PUC. Anticipating a more pro-consumer decision-making environment, utilities thus have an incentive to maintain tighter control over their costs than would be the case when no consumer advocate participated in rate reviews. Consequently, when utility costs increase as a result of economic or technological shocks, total costs are less likely to reach the level at which the utility triggers a rate review. In general, then, as a result of stronger cost management, utilities are less likely to initiate rate reviews in relatively pro-consumer regulatory environments, including those with a consumer advocate.

Larger utilities are at greater risk of confronting advocate opposition during rate reviews: advocates, who operate on fixed budgets, must generally allocate their resources strategically to the cases and issues that yield the greatest benefit per dollar spent. Utilities with larger consumer bases will be more attractive targets for advocate scrutiny during rate cases than smaller utilities. As the New Hampshire Office of Consumer Advocate commented, “the OCA dedicates most of its limited resources to the dockets which involve important policy or precedent, or which would cause a particularly burdensome economic or service-quality impact”.<sup>11</sup> The impact of consumer advocates on PUC decisions will thus be magnified for larger utilities.

Our analysis suggests several empirically testable effects of consumer advocates on regulatory policy and utility strategy, all else equal: *first, the allowed return on equity will be lower for utilities in states with consumer advocates; second, the presence of consumer advocates will discourage utilities from filing for rate reviews; third, these effects will be exaggerated for larger utilities; and finally, utilities in states with consumer advocates will exhibit lower residential rates relative to other consumers' rates.* In the next section we test the extent to which consumer advocates in the United States have had the predicted effects.

## 4 Empirical analysis

### 4.1 Methodology

Since rate reviews are costly to conduct and can have important financial consequences, utilities will call for a rate review only following a threshold economic or technological

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<sup>11</sup>See the Biennial Report of the Office of Consumer Advocate, available at <http://www.oca.nh.gov/biennialreport.html>.

“shock” that increases utility costs and reduces earnings. Similarly, PUCs may initiate rate reviews if they have credible information that utility earnings exceed the permitted level (Fremeth and Holburn 2012). This implies that there is a potential sample selection problem in using observed rate review information, as the incidence of reviews is not randomly generated. Normal OLS regression models using observed rate review data may thus yield biased estimates of the impact of consumer advocates on allowed ROE decisions. In order to produce unbiased coefficients we estimate a Heckman two-stage sample selection model that incorporates the utility’s and PUC’s decisions to initiate a rate review:<sup>12</sup>

#### Initiation of Rate Review

$$\Pr(\text{Initiate}) = X_1\beta_1 + \delta\text{Advocate}_{it} + \varepsilon_1 \quad (1)$$

#### Allowed Return on Equity

$$\begin{aligned} (\text{Allowed Return on Equity}|\text{Initiate} = 1) &= X_2\beta_2 + \gamma_1\text{Advocate}_{it} + \varepsilon_2 \\ \text{Correlation}(\varepsilon_1, \varepsilon_2) &= \rho_1 \end{aligned} \quad (2)$$

The first stage of our empirical approach is a probit regression that predicts the probability of a rate case being initiated.  $\text{Advocate}_{it}$  is a dummy variable reflecting the presence of a consumer advocate in state  $i$  in year  $t$ . The vector  $X_1$  comprises two sets of variables: the first consists of political, demographic and institutional variables that affect the regulatory climate and which thus capture utilities’ expectations that new investments will be passed through by the PUC into final rates. The second set includes variables that influence utility costs independently of managerial effort, for example changes in fuel prices.<sup>13</sup>

The second stage is an OLS regression that estimates Eq. (2) and which includes the inverse Mills ratio ( $\lambda$ ) from the first stage to control for sample selection. The coefficients of both equations and the  $\rho_1$  parameter are estimated jointly by maximum likelihood which yields consistent and unbiased estimates of  $\beta_2$  and  $\gamma_1$ . Equation (2) estimates the PUC’s *Allowed Return on Equity* conditional on observing a rate review. Vector  $X_2$  includes measures of the regulatory climate (as in  $X_1$ ) and which additionally affect the allowed rate of return. To satisfy the exclusion requirements of the Heckman (1979) selection model, several variables included in  $X_1$  are excluded from  $X_2$  (Cameron and Trivedi 2010). A statistically significant estimate of  $\lambda$  indicates that a sample selection process exists (Shaver 1998; Wooldridge 2002). However, interpretation of variable coefficients is not straightforward because of the nonlinearity of the inverse Mills ratio (Sigelman and Zeng 1999).<sup>14</sup>

In order to test the impact of consumer advocacy on the rate structure of a utility we estimate Eq. (3) using OLS wherein the dependent variable is *Residential-to-non-Residential Rate Ratio* $_{ijt}$ , the ratio of a utility’s kilowatt hour price of electricity for residential customers to that of non-residential customers for utility  $j$  in state  $i$  in year  $t$ . The data used are the retail rates for electricity, which included all costs related to generation, transmission,

<sup>12</sup>Roberts et al. (1978) also estimate a sample selection model but do not consider the impact of political, institutional or economic factors on the utility’s decision to initiate a review or on the PUC’s allowed ROE.

<sup>13</sup>It is not possible to use observed changes in utility costs as an independent variable in the initiation equation since observed costs reflect managerial effort as well as the impact of exogenous factors. As we assume that managerial effort is chosen by the utility in response to the regulatory climate, including observed costs in the model could yield biased coefficient estimates.

<sup>14</sup>We used the ‘Heckman’ command in Stata followed by the ‘Margins’ command to obtain the marginal effects of variables on *Allowed Return on Equity* conditional on observing a rate review.

and distribution. In this model,  $Advocate_{it}$  is the primary variable of interest. Vector  $X_3$  includes measures of the regulatory climate (as in  $X_1$ ) and also of economic factors that may additionally affect the allowed rate structure.

$$Residential\ Rate\ Ratio_{ijt} = X_3\beta_3 + \gamma_2 Advocate_{it} + \varepsilon_3 \quad (3)$$

For each model we consider the potential for correlation between the error term and our variable of interest,  $Advocate_{it}$ . It is plausible that unobserved factors could explain the presence of a consumer advocate and the outcomes that we are estimating. In addition to our core analyses we adopt an instrumental variable (IV) approach and include it in conjunction with the selection models.<sup>15</sup> The instrument and IV method are discussed in greater detail below.

## 4.2 Data and measurement

We begin with a discussion of the rate review initiation and allowed ROE models, following with the rate structure model. We use information on every major electric utility rate review completed from 1980 to 2007, covering 1,349 rate cases and 186 utilities.<sup>16,17</sup> All rate reviews have common features, specifically PUC decisions on a utility's allowed rate base for its regulated operations, the return on equity and the rate structure. By utilizing a panel dataset we are able to control for state fixed effects, leading to more accurate estimation of the impact of the variables under consideration. In particular, including state fixed effects enables us to address the potential concern that unobserved (and time invariant) state characteristics that are correlated with the presence of pro-consumer regulatory institutions may in fact account for the estimated impact on policy. We have also clustered the errors by utility in all models to address potential autocorrelation in the panel.

We first estimate the role of consumer advocates in shaping the initiation of a rate review and then, conditional on initiation, how advocates influence the ROE that a utility is allowed to earn. For Eq. (1) we construct a panel data set from 1980 to 2007 and set  $Rate\ Review_{ijt}$ , the dependent variable, equal to one in any year when a rate review occurred and equal to zero otherwise.<sup>18</sup> On average, electric utilities experienced a rate review every 3.6 years during the sample period, requesting an average revenue increase of \$76 million.<sup>19</sup>

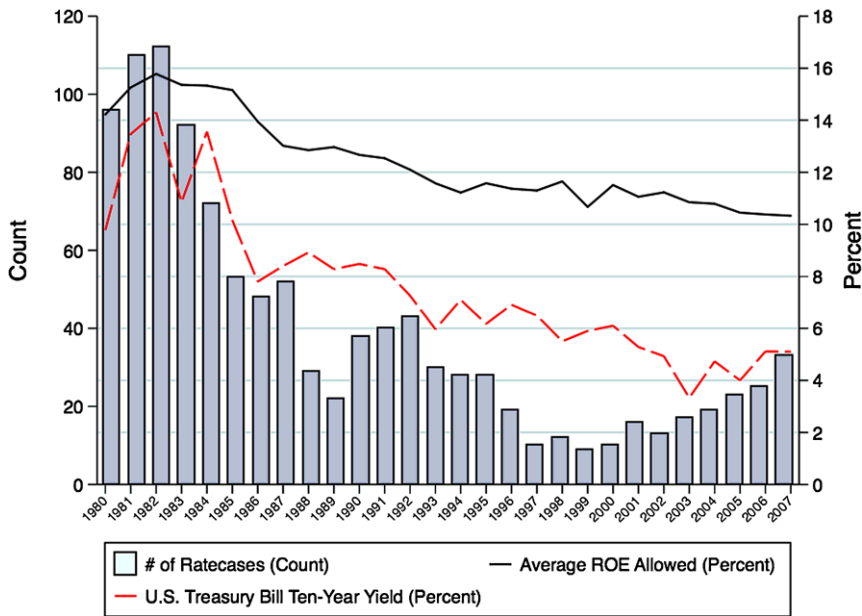
<sup>15</sup>For models including the IV as part of the Heckman procedure we follow the direction of Wooldridge (2002: 567) and Semykina and Wooldridge (2010) for estimating models in the presence of endogeneity and selection.

<sup>16</sup>The data were compiled from a utility rate review report conducted by Regulatory Research Associates (RRA), a subsidiary of SNL Financial. The data are available by subscription from [www.snl.com](http://www.snl.com). Rate cases are classified as major if the rate request was \$5 million or greater, or if the PUC's decision resulted in a rate revision of \$3 million or more. Interim rate orders or non-rate of return related revenue adjustments owing, for example, to tax revisions or fuel cost changes, are excluded. Our data panel is unbalanced due to industry consolidation during the period, resulting in 4842 utility-year observations.

<sup>17</sup>The initiation of rate reviews in the State of Wisconsin follows a slightly different path than in other states since the Wisconsin Public Service Commission requires utilities to file for rate reviews automatically every two years. For the purposes of our analysis we have included the five Wisconsin utilities and their associated rate cases. Excluding Wisconsin from our sample reduces the sample size by 140 observations and does not make either a quantitative or qualitative difference in the results of our analysis.

<sup>18</sup>In unreported analyses we include only those reviews initiated by utilities and find quantitatively and qualitatively similar results. Information on which party initiated a rate review was identified from media sources, private consulting company reports, and Public Utility Commission documents.

<sup>19</sup>Data on utility rate increase requests are available from Regulatory Research Associates.



**Fig. 1** Average annual allowed return on equity, 1980–2007

We then estimate Eq. (2) using rate review observations. The dependent variable is *Allowed Return on Equity*<sub>ijt</sub> for utility *j* in state *i* in year *t*. Over the 28-year panel, the average ROE allowed was 13.5 % with a standard deviation of 2.0 %.<sup>20</sup> Figure 1 shows how both average allowed ROEs and long-term interest rates have declined since the mid 1980s.

Of primary interest here is the participation of an independent consumer advocate during rate hearings. *Advocate*<sub>it</sub> is a dummy variable set equal to one if the legislature previously had enacted a statute establishing an advocacy office in the state. Information on consumer advocate legislation was gathered from the National Association of State Utility Consumer Advocates (NASUCA) and state government websites. Other independent variables are used as controls, and include economic, political, demographic and institutional factors, both state- and utility-level, that are predicted to affect rate review initiation decisions, PUC rulings on the allowed ROE and rate structure, or both. These variables enter Eqs. (1), (2), and/or (3) independently based on the logic applied by the decision making parties, either the utility or the PUC. We rely on academic research (Bonardi et al. 2006; Fremeth and Holburn 2012; Gormley 1981, 1983; Hagerman and Ratchford 1978; Primeaux and Mann 1986; Roberts et al. 1978) as well as practitioner literature (Goodman 1998; Hyman 2000) to guide our choices over which control variables enter each model.

For the rate review initiation and allowed Return on Equity models, we include statewide measures that reflect the relative bargaining strengths of competing interest groups within a state. Industrial consumers tend to be more organized, through industry trade associations, than residential consumers; using data from the Energy Information Administration (EIA), we created *Industry*<sub>it</sub> which measures the annual industrial consumer class share

<sup>20</sup> An allowed Return on Equity was formally specified in 1,095 out of the 1,349 rate cases in the sample. In the other 254 cases, utility rates were adjusted but no allowed ROE was determined.

of electricity consumption in each state.<sup>21</sup> *Manufacturing<sub>it</sub>* proxies for the intensity of the manufacturing sector in a state and is operationalized as manufacturing jobs per 1,000 state population (using data from the Bureau of Labor Statistics). We proxy for the influence of environmental organizations, which have been active in energy policy formulation, by using *Sierra Club<sub>it</sub>*, which is the membership of Sierra Club per 1,000 state population. The national headquarters of the Sierra Club provided us with the data on annual membership by state. Since interest groups' lobbying pressures may be stronger in states with higher retail utility rates, we control for the cost of utility fuel purchases since these account for a large fraction of total retail electricity rates: *Fuel Cost<sub>it</sub>* is the average price of fuel per Btu purchased by electric utilities within a state (these data also were obtained from the EIA).

Apart from interest group pressures, political preferences may reflect ideological factors (Kalt and Zupan 1984). Holburn and Vanden Bergh (2006) identified how Democrat-controlled state governments were more likely to support the creation of statutory consumer advocates. We thus include an indicator variable, *Democrat Government<sub>it</sub>*, equal to one when a state has a Democrat governor and Democrat majorities in both the upper and lower houses of the legislature, and zero under all other political contexts. Beyond partisan affiliation, the political environment of the state legislature may also influence PUC decision-making. Fremeth and Holburn (2012) find that the strength of political party rivalry is an indicator of a pro-consumer regulatory environment as politicians tend to seek regulatory rulings or policies that favor voters in forthcoming elections: *Legislature Rivalry<sub>it</sub>* ranges theoretically from a value of one in states where the legislature is split evenly between the two political parties—implying maximum political rivalry—to a value of zero where the majority party holds all legislative seats (see Eq. (4)).

$$\begin{aligned} & \textit{Legislature Rivalry}_{it} \\ &= 1 - \frac{(\textit{Majority party seats in Legislature} - \textit{Minority party seats in Legislature})}{\textit{Total seats in Legislature}} \quad (4) \end{aligned}$$

We expect that more politically contested environments will be associated with fewer utility-initiated rate reviews and lower allowed ROEs. Data on the composition of state legislatures were obtained from The Council of State Governments. In addition to political composition of the legislature, we also include *Democrat Commissioners<sub>it</sub>*, which measures the percentage of PUC commissioners that were members of the Democrat party (Smart 1994). We collected this information from individual PUC websites, the National Association of Regulatory Utility Commissioners (NARUC), local newspaper reports and from PUC offices directly.

In both the review initiation and allowed ROE models we include a dummy variable, *Elected PUC<sub>it</sub>*, set equal to one if PUC commissioners in a state are elected and zero if appointed. We capture the ability of the PUC to scrutinize utility testimony and evidence with *PUC Staff<sub>it</sub>*, a variable measuring the number of full-time PUC employees per 1,000 state population. All else equal, we expect that PUCs with larger staffs will be more successful in contesting utility demands for higher rates, thus resulting in fewer utility initiated rate reviews and lower allowed ROEs. *Commissioner Tenure<sub>it</sub>* is a variable that identifies the average years of experience in office of the PUC commissioners. More experienced commissioners will have more tacit knowledge, enabling them to more closely scrutinize and

<sup>21</sup>Utility-specific data on the proportion of industrial consumers are unavailable for the 1980–1989 period. We thus use the state-level variable, *Industry*, as a proxy for the organized industrial consumer competition that utilities may confront.

contest utility arguments in rate reviews (Fremeth and Holburn 2012). Information on the selection method of PUC commissioners, the number of PUC staff members, and the tenure of PUC commissioners was obtained from NARUC's annual publications and from state PUC websites.

In addition, two sets of control variables enter the rate review initiation and allowed ROE models separately. In the former, changes in utility costs since the last rate review are a central motivation for a utility to initiate a new rate review since, if allowed by the PUC, higher rates will lead to larger revenues and profits. We include two factors that affect utility costs independently of managerial effort (the choice of which is related to the regulatory climate). The variable  $\Delta Fuel Cost_{ijt}$  measures the percentage change in  $Fuel Cost_{it}$ , a utility's average per unit fuel costs since the last rate review, and is driven mainly by external market forces. Increases in the cost of utilities' fuel purchases, as occurred during the early 1980s, directly reduce utility profits, thereby increasing the incentive for utilities to initiate rate reviews.<sup>22</sup>  $\Delta Interest Rate_{ijt}$ , the change in the interest rate on ten-year Treasury bills since the utility's last rate review, measures exogenous fluctuations in the cost of capital and hence in the cost of servicing long-term debt. Again, we expect that increases (decreases) in the interest rate will push utilities (PUCs) towards triggering rate reviews, as found in prior research (Bonardi et al. 2006; Fremeth and Holburn 2012).  $\Delta Fuel Cost_{ijt}$  and  $\Delta Interest Rate_{ijt}$  are excluded from the allowed ROE outcome equation and satisfy the exclusion restrictions required for more robust identification when using the Heckman procedure. In the allowed ROE equation, we include the variable  $Interest Rate_t$ , which is the interest rate on ten-year Treasury bills, representing the risk-free rate used by PUCs in the calculation of a utility's allowed ROE (Goodman 1998).<sup>23</sup> Annual data on interest rates came from the US Bureau of Economic Analysis.

In addition, in both the rate review initiation and allowed return on equity models we include  $Utility Market Share_{ijt}$  and  $Utility Size_{ijt}$ : the former captures a utility's share of total electricity sales in the state and the latter the utility's annual sales in megawatt hours (MW h). We speculate that dominant utilities (accounting for larger shares of the state's total power consumption) will be more successful at achieving their regulatory objectives. Prior research has also found that larger utilities achieve higher Allowed ROEs (Hagerman and Ratchford 1978). Data on utility sales came from the Federal Energy Regulatory Commission (FERC) Form 1.

Finally, in both models we include  $Deregulate_{it}$ , an indicator variable that identifies whether the state had deregulated wholesale and retail electricity markets. By 2007, 15 states and the District of Columbia had implemented deregulation reforms, though natural monopoly elements of the sector—transmission and distribution—have remained regulated

<sup>22</sup>Some states adopted automatic fuel adjustment clauses (FACs) during the 1980s that allowed utilities to pass through fuel costs without requiring a formal rate review. However, since such clauses rarely allowed utilities to pass through 100 % of the cost increases, fuel-cost-triggered rate reviews were not eliminated completely.

<sup>23</sup>Although  $Interest Rate_t$  is included in the second stage of the Heckman model it does not enter the first stage initiation model for several reasons. First, rate review initiation decisions are triggered by changes in utility costs and earnings since the last rate review rather than the level of costs per se (Bonardi et al. 2006; Fremeth and Holburn 2012). Second, since  $Interest Rate$  is highly correlated ( $\rho = 0.6$ ) with  $\Delta Interest Rate_{ijt}$  including it creates statistical problems of multicollinearity. Third, no prior literature that models rate review initiation decisions empirically includes the level of the interest rate as a variable, just the change since the last rate review (Bonardi et al. 2006; Fremeth and Holburn 2012). Our approach is thus consistent with prior research. Including  $Interest Rate_t$  in the first stage does not change our primary results qualitatively although statistical significance levels are weaker owing to multicollinearity.



by PUCs. It is possible that the decision by a state government reflects a pro-consumer sentiment since such reforms, by strengthening competition in the electricity sector, were generally expected to reduce costs and consumer rates. In this case, we would expect deregulation to be associated with lower allowed ROEs and a lesser incentive for utilities to file for rate reviews. The source for this variable is the EIA's report on the "Status of State Electric Industry Restructuring Activity".<sup>24</sup>

We use OLS to estimate Eq. (3), for which the dependent variable is *Residential-to-non-Residential Rate Ratio*<sub>ijt</sub>. The variable is measured as the average residential rate divided by the average non-residential rate charged by a utility in a particular year.<sup>25</sup> For the analysis of this model we focus on the 1990–2007 period owing to data availability constraints and we consider all utility-year observations. *Advocate*<sub>it</sub> is our primary variable of interest as we predict that a public consumer advocate will shape PUC decisions in favor of residential customers. We include a number of control variables that are likely to influence the rate structure: *Elected PUC*<sub>it</sub>, *Commissioner Tenure*<sub>it</sub>, *PUC Staff*<sub>it</sub>, *Legislature Rivalry*<sub>it</sub>, *Democrat Government*<sub>it</sub>, *Democrat Commissioners*<sub>it</sub>, and *Deregulate*<sub>it</sub>. We introduce *Gross State Product*<sub>it</sub> (per 1000 population) to capture the wealth of the residents of a state. Wealthier states may be better able to afford rate structures that favor industry and commerce at the expense of residential ratepayers. To capture the influence of such non-residential customers we include *Non-Residential Sales (Utility)*<sub>ijt</sub>, which is a utility-specific measure of the power sold to industrial and commercial customers as a proportion of a utility's total power sold. These data come from FERC Form EIA-861 and are only available from 1990 to 2007.

Table 2 contains descriptive statistics for all of the above variables for each model.

## 5 Empirical results

### 5.1 Rate review initiation

Tables 3, 4a, 4b and 5 present the results of the empirical analysis. Table 3 reports the estimation of the rate review initiation model. The negative and statistically significant coefficient on *Advocate* in each specification suggests that rate reviews are less likely to be initiated in states for which consumer advocates have statutory jurisdiction. The estimated effect is economically meaningful: on average, utilities are 14 percentage points less likely to experience rate reviews in states with consumer advocates than in states without advocates, all else equal. Relatively large utilities (as measured by market share) are even less likely to experience reviews, which is consistent with a consumer advocate strategy of focusing limited resources on regulatory proceedings involving larger utilities—the anticipation of which discourages larger utilities from filing for rate increases. This interaction between *Advocate* and *Utility Market Share* is illustrated in Fig. 2, where we apply the approach developed by King et al. (2000) for interpreting interactions in non-linear models. As depicted in this figure, utilities with market shares one standard deviation ( $\sigma = 27.9\%$ ) larger than the mean ( $\bar{x} = 26.8\%$ ) are 23 percentage points less likely to experience rate reviews in a state with a consumer advocate than in a state without one.

<sup>24</sup>This report is available at: [http://www.eia.gov/cneaf/electricity/page/restructuring/restructure\\_elect.html](http://www.eia.gov/cneaf/electricity/page/restructuring/restructure_elect.html).

<sup>25</sup>We gathered utility-specific rate data from FERC Form EIA-861. Form EIA-861 identifies rates by electricity product-type, including Bundled, Energy, and Delivery. Our analysis focuses on Bundled products (which includes costs for generation, transmission, and distribution) to ensure comparability across states and time.

**Table 2** Descriptive statistics

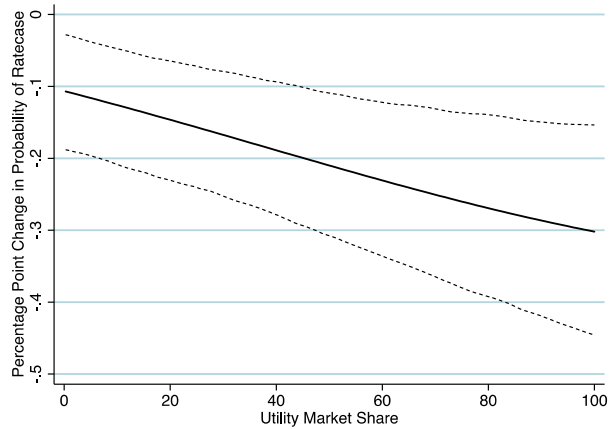
Variable	Mean	Std Dev	Minimum	Maximum
<i>Panel A</i> Rate review initiation model				
<i>Rate Review</i> (Dependent variable)	0.278	0.448	0.000	1.000
<i>Advocate</i>	0.619	0.485	0.000	1.000
<i>Sierra Club</i>	1.788	1.209	0.286	8.477
<i>Manufacturing</i>	6.649	2.690	1.184	14.185
<i>Industry</i>	34.921	11.986	10.789	66.795
<i>Utility Market Share</i>	26.797	27.942	0.276	100.000
<i>Democrat Commissioners</i>	0.561	0.302	0.000	1.000
<i>Legislature Rivalry</i>	0.729	0.222	0.057	1.000
<i>Democrat Government</i>	0.502	0.500	0.000	1.000
<i>Commissioner Tenure</i>	4.005	2.761	0.000	21.333
<i>PUC Staff</i>	0.040	0.027	0.005	0.159
<i>Elected PUC</i>	0.147	0.354	0.000	1.000
$\Delta$ <i>Fuel Cost</i>	14.878	64.683	-93.723	949.456
$\Delta$ <i>Interest Rate</i>	-1.068	2.625	-10.970	8.190
<i>Fuel Cost</i>	1.859	1.084	0.550	9.809
<i>Utility Size</i>	12.350	16.031	0.171	106.827
<i>Deregulate</i>	0.096	0.296	0.000	1.000
<i>Panel B</i> Allowed return on equity model				
<i>Allowed Return on Equity</i> (Dependent variable)	13.519	2.011	9.100	19.100
<i>Advocate</i>	0.576	0.494	0.000	1.000
<i>Sierra Club</i>	1.660	1.220	0.286	8.477
<i>Manufacturing</i>	7.374	2.878	1.304	14.185
<i>Industry</i>	35.052	11.529	11.591	66.795
<i>Utility Market Share</i>	30.849	26.339	0.298	100.000
<i>Democrat Commissioners</i>	0.603	0.300	0.000	1.000
<i>Legislature Rivalry</i>	0.708	0.237	0.057	1.000
<i>Democrat Government</i>	0.569	0.495	0.000	1.000
<i>Commissioner Tenure</i>	3.482	2.522	0.000	17.000
<i>PUC Staff</i>	0.039	0.025	0.005	0.158
<i>Elected PUC</i>	0.105	0.306	0.000	1.000
<i>Interest Rate</i>	9.429	3.193	3.330	14.300
<i>Fuel Cost</i>	1.928	1.011	0.586	8.781
<i>Utility Size</i>	12.427	14.794	0.322	90.563
<i>Deregulate</i>	0.035	0.183	0.000	1.000
<i>Panel C</i> Residential-to-non-residential rate ratio model				
<i>Residential-to-non-Residential Rate Ratio</i> (Dv)	1.383	0.223	0.895	2.805
<i>Advocate</i>	0.625	0.484	0.000	1.000
<i>Non-Residential Sales (Utility)</i>	63.904	7.887	34.910	88.857
<i>Democrat Commissioners</i>	0.516	0.296	0.000	1.000
<i>Legislature Rivalry</i>	0.768	0.193	0.184	1.000
<i>Democrat Government</i>	0.426	0.495	0.000	1.000
<i>Commissioner Tenure</i>	4.269	2.424	0.000	17.000
<i>PUC Staff</i>	0.037	0.024	0.005	0.154
<i>Elected PUC</i>	0.119	0.324	0.000	1.000
<i>Gross State Product</i>	30.940	5.545	18.527	59.670
<i>Deregulate</i>	0.099	0.299	0.000	1.000

**Table 3** Rate review initiation

Variable	Model 1	Model 2	Model 3 (IV)	Model 4 (IV)
<i>Advocate</i>	-0.436*** (0.114)	-0.333*** (0.125)	-0.355** (0.140)	-0.322*** (0.096)
<i>Advocate</i> × <i>Utility Market Share</i>		-0.006*** (0.002)		-0.005** (0.002)
<i>Sierra Club</i>	-0.253*** (0.054)	-0.248*** (0.054)	-0.252*** (0.053)	-0.247*** (0.054)
<i>Manufacturing</i>	0.059** (0.025)	0.060** (0.025)	0.061** (0.027)	0.063** (0.027)
<i>Industry</i>	-0.004 (0.009)	-0.004 (0.009)	-0.004 (0.009)	-0.004 (0.009)
<i>Utility Market Share</i>	0.010*** (0.001)	0.012*** (0.002)	0.010*** (0.002)	0.012*** (0.002)
<i>Democrat Commissioners</i>	0.310*** (0.088)	0.311*** (0.088)	0.309*** (0.076)	0.310*** (0.076)
<i>Legislature Rivalry</i>	-0.894*** (0.185)	-0.901*** (0.185)	-0.902*** (0.211)	-0.908*** (0.211)
<i>Democrat Government</i>	0.111 (0.071)	0.109 (0.071)	0.107 (0.071)	0.105 (0.071)
<i>Commissioner Tenure</i>	-0.034*** (0.011)	-0.035*** (0.011)	-0.034*** (0.013)	-0.034*** (0.013)
<i>PUC Staff</i>	-2.179 (2.011)	-2.061 (2.017)	-2.131 (2.792)	-1.989 (2.819)
<i>Elected PUC</i>	-0.102 (0.358)	-0.155 (0.371)	-0.087 (0.440)	-0.151 (0.434)
$\Delta$ <i>Fuel Cost</i>	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
$\Delta$ <i>Interest Rate</i>	0.041*** (0.009)	0.041*** (0.009)	0.042*** (0.009)	0.042*** (0.009)
<i>Fuel Cost</i>	0.076** (0.031)	0.074** (0.032)	0.075** (0.031)	0.073** (0.032)
<i>Utility Size</i>	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.003)	-0.003 (0.002)
<i>Deregulate</i>	-0.323*** (0.107)	-0.327*** (0.107)	-0.316*** (0.099)	-0.321*** (0.099)
<i>Constant</i>	0.328 (0.477)	0.291 (0.478)	0.224 (0.510)	0.188 (0.505)
<i>N</i>	4842	4842	4842	4842
PSEUDO <i>R</i> -squared	0.124	0.125	0.122	0.124
Log-likelihood	-2508.61	-2506.82	457.54	791.03
State Fixed Effects	Yes	Yes	Yes	Yes

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ . Robust standard errors clustered by utility in parentheses

**Fig. 2** Marginal effect of consumer advocate on probability of utility rate review initiation, conditional on value of Utility Market Share. *Dashed lines* represent 95 % confidence intervals



The results for the control variables are largely as expected since utilities initiate the vast majority of reviews: we observe fewer rate reviews in states where environmental interests are well represented (as measured by Sierra Club membership), political party competition in the state legislature is more contentious, PUCs have greater resources, and PUCs have more experienced commissioners. The magnitudes of the estimated effects are not insignificant. For instance, increasing the *Commissioner Tenure* variable by one standard deviation from the mean reduces the probability of rate review initiation by approximately six percentage points—consistent with more experienced regulatory organizations more effectively monitoring utility management and operations. We find that utilities are more likely to initiate reviews in states with larger manufacturing bases—manufacturers might have been expected to oppose utility rate increase requests—though this finding may be because of an opposing demand for additional infrastructure investment and enhanced supply reliability. Somewhat surprisingly, we find that more representation by Democrats on PUCs is associated with a greater propensity for utilities to initiate rate reviews. This may reflect a Democrat policy emphasis on encouraging new infrastructure investment as a mechanism for regional economic development.

## 5.2 Allowed return on equity

Turning now to the *Allowed Return on Equity* model (Tables 4a, 4b), we find that consumer advocates have a statistically significant effect in each model on PUC decisions on the allowed return on equity established during rate reviews. This result is robust to the inclusion of the inverse Mills ratio, which is positive and statistically significant—providing evidence of a sample selection effect in which utilities strategically initiate rate reviews more frequently when they anticipate higher allowed ROEs. Furthermore, neither the condition number nor the average variance inflation factor (VIF) indicate that collinearity between the regressors and the Mills ratio impacts the robustness of the results (Puhani 2000).<sup>26</sup> Comparing model 1 to models 2 and 3, we note that incorporation of the sample selection correction affects the estimated effect of a consumer advocate. In model 1, *Advocate* is associated with

<sup>26</sup>The condition number is an alternative measure of multicollinearity and is calculated as the square root of the ratio of the largest eigenvalue to individual  $i$ th eigenvalues of a matrix. A large condition number indicates a nearly singular matrix; condition numbers greater than 30 typically indicate significant multicollinearity.

**Table 4a** Allowed return on equity

Variable	Model 1	Model 2 (Heckman)	Model 3 (Heckman)	Model 4 (IV)	Model 5 (IV)	Model 6 (IV & Heckman)	Model 7 (IV & Heckman)
<i>Advocate</i>	-0.329** (0.143)	-0.778*** (0.158)	-0.762*** (0.175)	-0.879*** (0.203)	-1.094*** (0.255)	-1.064*** (0.283)	-1.082*** (0.202)
<i>Advocate × Utility Market Share</i>			-0.005** (0.002)		-0.007** (0.003)		-0.004** (0.002)
<i>Sierra Club</i>	-0.441*** (0.080)	-0.501*** (0.101)	-0.498*** (0.101)	-0.467*** (0.065)	-0.469*** (0.065)	-0.509*** (0.096)	-0.509*** (0.087)
<i>Manufacturing</i>	0.133*** (0.045)	0.184*** (0.052)	0.187*** (0.052)	0.119*** (0.033)	0.123*** (0.033)	0.168*** (0.039)	0.170*** (0.038)
<i>Industry</i>	0.021 (0.014)	0.020 (0.015)	0.019 (0.015)	0.021** (0.011)	0.020* (0.011)	0.018 (0.014)	0.017*** (0.007)
<i>Utility Market Share</i>	0.005*** (0.002)	0.010*** (0.002)	0.011*** (0.003)	0.004** (0.002)	0.001 (0.002)	0.011*** (0.003)	0.010*** (0.003)
<i>Democrat Commissioners</i>	0.407*** (0.140)	0.654*** (0.148)	0.656*** (0.149)	0.426*** (0.112)	0.422*** (0.112)	0.650*** (0.180)	0.651*** (0.177)
<i>Legislature Rivalry</i>	-0.579 (0.405)	-1.229*** (0.409)	-1.218*** (0.412)	-0.530** (0.262)	-0.476* (0.262)	-1.275*** (0.351)	-1.254*** (0.280)
<i>Democrat Government</i>	0.056 (0.100)	0.190 (0.118)	0.194* (0.117)	0.150 (0.093)	0.162* (0.095)	0.177 (0.122)	0.180 (0.125)
<i>Commissioner Tenure</i>	-0.015 (0.019)	-0.062*** (0.023)	-0.062*** (0.023)	-0.019 (0.017)	-0.016 (0.017)	-0.064*** (0.018)	-0.064*** (0.014)
<i>PUC Staff</i>	5.560 (3.406)	2.991 (4.015)	3.056 (4.028)	4.676* (2.552)	4.873* (2.568)	3.552 (3.906)	3.517 (2.896)
<i>Elected PUC</i>	-2.217*** (0.485)	-2.900*** (0.630)	-3.016*** (0.648)	-2.210*** (0.370)	-2.339*** (0.373)	-3.060*** (0.585)	-3.143*** (0.392)
<i>Interest Rate</i>	0.392*** (0.015)	0.443*** (0.018)	0.444*** (0.018)	0.379*** (0.014)	0.379*** (0.014)	0.442*** (0.013)	0.442*** (0.009)
<i>Fuel Cost</i>	0.160*** (0.050)	0.234*** (0.050)	0.232*** (0.050)	0.169*** (0.042)	0.165*** (0.042)	0.236*** (0.043)	0.233*** (0.047)
<i>Utility Size</i>	-0.004 (0.003)	-0.004 (0.004)	-0.004 (0.004)	-0.002 (0.003)	-0.003 (0.003)	-0.004 (0.003)	-0.004 (0.004)
<i>Deregulate</i>	-0.717*** (0.199)	-0.868*** (0.208)	-0.860*** (0.208)	-0.788*** (0.167)	-0.756*** (0.165)	-0.964*** (0.226)	-0.950*** (0.237)
<i>Inverse Mills Ratio</i>		1.048*** (0.121)	1.052*** (0.119)			1.057*** (0.120)	1.057*** (0.053)
<i>Constant</i>	9.126*** (0.772)	7.790*** (0.919)	7.743*** (0.919)	9.915*** (0.664)	9.870*** (0.660)	8.333*** (0.809)	8.300*** (0.837)
<i>N</i>	1095	1095	1095	1095	1095	1095	1095
<i>R-Squared</i>	0.835			0.862	0.875		
<i>Log Likelihood</i>		-3549.05	-3546.25			-3555.34	-3552.37
<i>Condition Number</i>		18.76	19.65			17.42	18.10
<i>Average VIF</i>		1.78	1.92			1.69	1.72
<i>State Fixed Effects</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ . Robust standard errors clustered by utility in parentheses

**Table 4b** Marginal effect on allowed return on equity conditional on a rate review being observed

	Results from Model 3	Results from Model 7
<i>Advocate</i>	−0.387*** (0.103)	−0.766*** (0.233)
<i>Advocate</i> × <i>Utility Market Share</i>	−0.002** (0.001)	−0.002** (0.001)
<i>Sierra Club</i>	−0.311*** (0.074)	−0.318*** (0.068)
<i>Manufacturing</i>	0.145*** (0.041)	0.128*** (0.032)
<i>Industry</i>	0.012 (0.011)	0.011 (0.010)
<i>Utility Market Share</i>	0.003* (0.002)	0.003** (0.001)
<i>Democrat Commissioners</i>	0.309** (0.125)	0.299** (0.137)
<i>Legislature Rivalry</i>	−0.496 (0.388)	−0.529 (0.377)
<i>Democrat Government</i>	0.003 (0.095)	0.001 (0.078)
<i>Commissioner Tenure</i>	−0.019 (0.095)	−0.021 (0.015)
<i>PUC Staff</i>	4.197 (2.950)	4.429 (3.498)
<i>Elected PUC</i>	−2.560*** (0.418)	−2.714*** (0.465)
<i>Interest Rate</i>	0.444*** (0.018)	0.442*** (0.013)
<i>Fuel Cost</i>	0.136*** (0.049)	0.138*** (0.039)
<i>Utility Size</i>	−0.003 (0.003)	−0.003 (0.003)
<i>Deregulate</i>	−0.649*** (0.180)	−0.738*** (0.221)

Note: Robust standard errors clustered by utility in parentheses

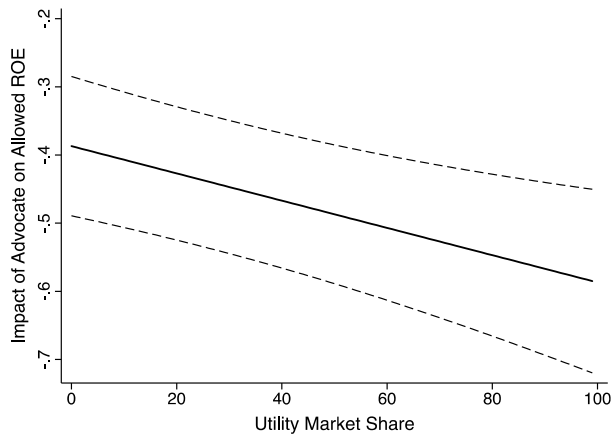
a 0.33 percentage point reduction in *Allowed Return on Equity*. However, when we include the inverse Mills ratio and calculate the marginal effect conditional on observing a rate review (Table 4b),<sup>27</sup> we estimate (using model 3) that advocates lower the allowed ROE by approximately 0.45 percentage points for the average utility.<sup>28</sup> For the average utility in our

<sup>27</sup>The marginal effects for the *Allowed ROE* equation are calculated using the *margins* post-estimation command in Stata (Cameron and Trivedi 2010: 347).

<sup>28</sup>To assess the conditional effect of an interaction term (i.e., how the effect of *Advocate* on *Allowed Return on Equity* changes as market share changes) we take the partial derivative of one variable (i.e., *Advocate*) with respect to the dependent variable (i.e., *Allowed Return on Equity*) and assess the result at levels of interest



**Fig. 3** Marginal effect of consumer advocate on allowed ROE, conditional on value of Utility Market Share



sample in 2007, with equity of \$1.75 billion and operating income of \$215 million, this is equivalent to a 3.7 % (\$7.9 million) reduction in annual operating income. This approximates a 0.56 % reduction in an average utility's revenue.<sup>29</sup> Reducing the revenue requirement proportionately across all customer classes, this is equivalent to a \$6.12 reduction in a residential customer's average annual bill. Finally, similar to the rate review initiation model, the negative impact of a consumer advocate is accentuated for utilities with larger market shares, as depicted graphically in Fig. 3. Utilities that operate as the sole electricity provider in a state (100 % market share) receive allowed ROEs that are 0.59 percentage points lower when an advocate is present (using the selection-corrected marginal effects from model 3 in Table 4b).<sup>30</sup>

Coefficient estimates for control variables are signed as expected and mainly statistically significant across the models. PUCs tend to set lower ROEs in states with stronger environmental representation and with elected commissioners. PUCs in states with *Sierra Club* membership one standard deviation above the mean tend to have ROEs that are 0.37 percentage points lower than otherwise. These results are consistent with the interpretation of the findings from the rate review initiation model in that utilities tend to postpone rate reviews when they anticipate less favorable outcomes. The deregulation variable is negative and statistically significant in all models, implying that PUCs may view the natural monopoly operations of utilities in deregulated states as relatively low risk. Finally, Democrat-dominated PUCs are associated with higher allowed ROEs, consistent with a greater tendency for utilities to initiate reviews in these environments.

### 5.3 Residential-to-non-residential rate ratio

As anticipated, consumer advocates are associated with rate structures that benefit residential consumers at the expense of non-residential (i.e., industrial and commercial) con-

for the other independent variable (i.e., when market share is set to its average of 30.85 % for rate case observations). The calculation is based on the results from the marginal effect on *Allowed Return on Equity* conditional on it being observed from model 3 in Table 4b is  $-0.387 + (-0.002)(30.85) = -0.45$ .

<sup>29</sup>In 2007, the average electricity service revenue of the utilities in our sample was \$1.395 billion.

<sup>30</sup>The calculation, based on the results from the marginal effect on *Allowed Return on Equity* conditional on it being observed from model 3 in Table 4b, is  $-0.387 + (-0.002)(100) = -0.59$ .

**Table 5**  
Residential-to-non-residential  
rate ratio

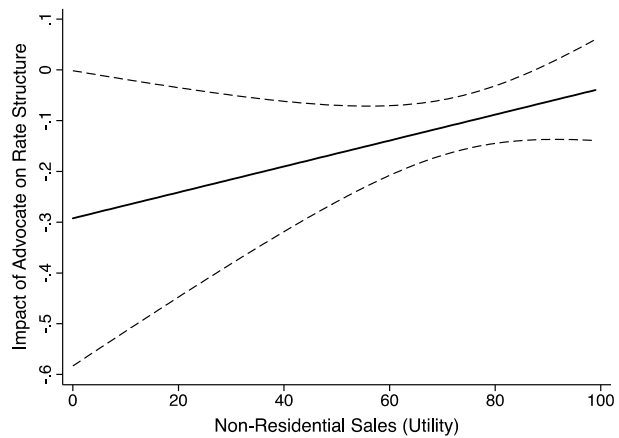
Variable	Model 1	Model 2	Model 3 (IV)
<i>Advocate</i>	-0.124** (0.058)	-0.292*** (0.083)	-0.451** (0.127)
<i>Advocate × Non-Residential Sales (Utility)</i>		0.003** (0.001)	0.007** (0.003)
<i>Non-Residential Sales (Utility)</i>	0.009*** (0.001)	0.008*** (0.002)	0.005** (0.002)
<i>Democrat Commissioners</i>	-0.017 (0.031)	-0.013 (0.031)	-0.003 (0.032)
<i>Legislature Rivalry</i>	-0.057 (0.088)	-0.056 (0.088)	-0.055 (0.084)
<i>Democrat Government</i>	0.009 (0.021)	0.008 (0.021)	0.007 (0.020)
<i>Commissioner Tenure</i>	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.004)
<i>PUC Staff</i>	0.612 (0.707)	0.500 (0.685)	0.344 (0.635)
<i>Elected PUC</i>	-0.044 (0.093)	-0.027 (0.088)	-0.004 (0.086)
<i>Gross State Product</i>	0.015*** (0.003)	0.015*** (0.003)	0.015*** (0.003)
<i>Deregulate</i>	0.213 (0.462)	0.212 (0.413)	0.212 (0.405)
<i>Constant</i>	0.194 (0.151)	0.336 (0.195)	0.610 (0.347)
<i>N</i>	3049	3049	3049
<i>R-Squared</i>	0.521	0.522	0.518
<i>State Fixed Effects</i>	Yes	Yes	Yes

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ . Robust standard errors clustered by utility in parentheses

sumers, *ceteris paribus*. Utilities in states with consumer advocates have residential to non-residential rate ratios that are 0.12 points lower than the average ratio of 1.38 (see model 1, Table 5). For a residential customer of the average utility in 2007, this is equivalent to a reduction of \$42 per year, or 3.6 %, in average annual electricity bills.<sup>31</sup> This estimate is significantly larger than the \$6.12 estimated annual bill reduction resulting from a lower allowed ROE, suggesting that the main effect of consumer advocates is to redistribute rents between customer classes, rather than between utilities and consumers in general. Some caution is warranted here, however, since the empirical identification in the fixed effect model relies on just three states that adopted consumer advocates between 1990 and 2007, the time period for this analysis. Further research is required to assess the robustness of this empirical estimate.

<sup>31</sup>This calculation is based on average rates in 2007 of \$0.102/kWh for residential customers and \$0.068/kWh for non-residential customers. We assume average residential consumption of 11,186 kWh per year. We restrict the weighted average of residential and non-residential rates to be the same in states with and without consumer advocates when estimating the impact of an advocate on residential rates.

**Fig. 4** Marginal effect of consumer advocate on residential-to-non-residential rate ratio, conditional on value of Non-Residential Sales (Utility)



Utilities that sell larger fractions of their electricity to industrial consumers tend to have higher residential to non-residential rate ratios. However, against our expectations we find evidence in Model 2 that advocates have a *greater* impact on the rate structure for utilities with relatively large non-residential customer bases. This relationship is depicted graphically in Fig. 4. For utilities with a non-residential customer base that is one standard deviation ( $\sigma = 7.9$ ) larger than the mean value ( $\bar{x} = 63.9$ ), advocates are associated with a 0.2 point reduction in the ratio of residential to non-residential rates. One interpretation is that this reflects strategic behavior by advocates who focus their resources on situations in which residential customers face stronger opposition by industrial groups in rate structure negotiations. No other control variables are statistically significant, with the exception of *Gross State Product* which is associated with higher residential rates relative to other customer classes.

#### 5.4 Instrumental variable analysis

The results of our empirical analysis so far suggest that the participation of consumer advocates in administrative procedures affects regulatory agency policy decisions. The sample selection model addresses the potential problem that we would underestimate the true impact of consumer advocates if utilities postpone rate reviews strategically in anticipation of advocate opposition during rate hearings. However, a concern still remains for our identification strategy since, even though we use state fixed effects to control for unobserved, time-invariant characteristics, other time-varying unobserved factors could explain both the presence of a consumer advocate in a state, or participation in regulatory hearings, and pro-consumer regulatory policy, which would then bias the estimated coefficient on *Advocate*.

To address this, we create an instrumental variable for *Advocate* using the existence of state-level ombudsman offices. State ombudsmen exist in 20 states and were created mainly during the 1970s and 1980s to investigate citizens' complaints against government agencies and offices. Ombudsmen are state-funded agencies that work to improve the effectiveness and responsiveness of state governments to citizen complaints. It is plausible that states with ombudsmen have a stronger pro-consumer policy 'sentiment' and, all else equal, a greater likelihood of funding a public utility consumer advocate than states without ombudsmen. Moreover, ombudsmen are unlikely to influence PUC decision-making since they do not intervene in utility rate cases—thereby satisfying the exogeneity requirement which makes the

presence of an ombudsman a good candidate for an instrument.<sup>32</sup> We gathered information on state ombudsmen from the Council of State Governments' Directory of Administrative Officials and the United States Ombudsman Association.

We instrument for *Advocate* using the existence of a state ombudsman with a two-stage least squares (2SLS) regression in each of our empirical models. In all cases the F-statistic for the first stage of the 2SLS approach is well above 10 and the instrument explains a significant percentage of the variation in *Advocate* (greater than 75 %).<sup>33</sup> Tables 3, 4a, 4b and 5 each contain results for models that include the instrumental variable for *Advocate*. The estimated coefficients are statistically significant and signed as expected, further supporting our initial results.

Consistent with the previous findings, the IV model suggests that advocates are associated with a smaller probability of observing a rate review (model 3, Table 3). For a utility of average size, the likelihood of experiencing a rate review is 8 % lower in states with consumer advocates than in states without them. To estimate the impact of *Advocate* on the *Allowed Return on Equity*, we apply Wooldridge's (2002) approach, which accounts for the presence of both regressor endogeneity and sample selection. In this approach, the instrument—based on the predicted values from an OLS regression in which *Advocate* is the dependent variable—is included in a Heckman selection model with adjusted standard errors. The instrumented variable in the *Allowed Return on Equity* model (model 7, Table 4b) indicates that advocates are associated with a 0.83 percentage point reduction in *Allowed Return on Equity* as compared to states without advocates, a larger effect than that estimated in the model without the instrument.<sup>34</sup> Finally, the rate structure for the average utility in states with advocates continues to favor residential customers, with a 0.44 point reduction in the ratio of residential to non-residential rates when using the instrument. This number also is substantially larger than that estimated in the model with the instrumented advocate. Overall, we conclude that our central findings on the influence of consumer advocates on policy outcomes are robust to controlling for potential endogeneity of advocates and, indeed, may be estimated conservatively.

## 6 Conclusion

The empirical analysis presented herein provides support for the thesis that interest group representation in administrative procedures and institutions has substantive implications for agency-determined policy outcomes. As far as we are aware, we provide the first statistical evidence that interest groups that participate in agency hearings by presenting information on policy consequences and alternatives, as opposed to voting on policy agendas or decisions, generate policy biases. Political decisions to “stack the deck” at the agency level in favor of particular interest groups thus appear not to be purely a matter of providing ‘pork’ or

<sup>32</sup>An illustrative example of the duties of a state ombudsman can be found in the legislation that established this office in Iowa in 1972. Iowa Code Chapter 2C established this independent office to “serve as an independent and impartial agency to which citizens can air their grievances about government. By facilitating communications between citizens and government and making recommendations to improve administrative practices and procedures, the Ombudsman is to promote responsiveness and quality in government.”

<sup>33</sup>Staiger and Stock (1997) suggest that an F-statistic less than 10 indicates a weak instrument.

<sup>34</sup>This calculation is based on the average utility in our sample and uses the results from the marginal effect on allowed ROE conditional on it being observed from model 7 in Table 4b. The calculation is  $-0.766 + (-0.002)(30.8) = -0.83$ .

visibility, but instead represent attempts to exercise political control over delegated policy domains. Although interest-group competition is difficult to measure accurately, the evidence reported in this article suggests that one way in which groups influence policy is by shaping the design of administrative institutions.

We find evidence that states that helped organize utility consumers by creating publicly funded consumer advocates led Public Utility Commissions to weigh consumer interests more heavily in their policy decisions, at least regarding utilities' allowed financial rates of return. Consumer advocates often claim credit for achieving lower electricity rates in specific rate cases though it is hard to validate such claims in the context of a single rate case decision when many potential factors could be responsible for the outcomes.<sup>35</sup> We provide the first independent support for the claim that, on average, consumer advocates do indeed bias rates downwards. Our results also suggest that consumer advocates disproportionately tend to favor residential customers, an effect that is apparent in the rate structure. All else equal, advocates are associated with lower residential rates relative to non-residential rates. Unfortunately, it is not possible to estimate the total effect of consumer advocates on allowed rates without incorporating their impact on the rate base. Due to data availability constraints we were unable to assess the effect of advocates on this dimension of regulatory policy. While we anticipate that consumer advocates will result in smaller utility rate bases—by discouraging imprudent expenditures—further empirical analysis is required. Our quantitative estimates of the effect of advocates on utility revenues and customer bills are therefore likely to understate the true impact. Our findings also suggest that part of the impact of consumer advocates on regulatory outcomes is generated by changes in the frequency of rate reviews. Consistent with expectations about the effect of a consumer advocate on PUC decisions, utilities appear to react strategically by postponing rate review initiation when advocates are present in a jurisdiction. Utilities thus deploy their ability to act as 'gatekeepers' to prevent opposing interests from competing against them in agency procedures.

There are a number of important limitations to our analysis that should lead to some caution in interpreting the results. First, although we have attempted to control for the potential endogeneity of consumer advocates at the state level by using an instrumental variable approach, it is still possible that the effect of advocates is not identified completely accurately. An alternative identification strategy, which could be the basis for future research, would be to measure the actual direct involvement of advocates and other intervenors during utility rate case hearings. Micro-level data on interest group competition and advocate participation in each rate case could provide a more accurate estimate of the impact of advocates on policy decisions, and identification of the conditions under which such effects are magnified or diminished. Second, while we find a significant impact of consumer advocates within the United States, similar results need not obtain in other countries where the institutional rules governing regulatory procedures are likely to differ. In the United Kingdom, for instance, even though the government has implemented US-style advocacy bodies, the reasoning and evidentiary requirements of the regulatory agency are substantially weaker than in the United States. Even though consumer advocates have substantial resources and procedural rights, regulatory officials need not necessarily incorporate or account for their claims in final decisions. Predicting the policy impact of consumer advocates in different

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<sup>35</sup>The following example is illustrative of credit-claiming: "The Office of the Ohio Consumers' Counsel had several successes in 2011 reducing charges to residential customers' electrical bills. American Electric Power customers benefited from the return of \$43 million in significantly excessive earnings and \$78 million of unjustified charges related to its 2009-11 electric security plan", available at <http://www.pickocc.org/annualreports/2011/pdfs/electric.pdf>.

countries thus requires close attention to the specific rules of the institutional environment. Despite these and other limitations, our paper makes an initial step toward a better understanding of how organized interest groups can shape regulatory agency policy decisions, an issue of concern in a broad range of regulated industries.

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