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Motivations for market restructuring: Evidence from U.S. electricity deregulation☆

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ABSTRACT

The purpose of this paper is to examine whether electricity restructuring was brought about due to the Public Interest Theory (that regulatory changes are undertaken to benefit society) or the Interest Group Theory (that groups hoping to gain from deregulation lobby for regulatory changes). From 1996 to 2002 eighteen states developed restructuring programs targeted at improving efficiency through the use of increased wholesale trading, abolition of 'cost of service' regulation, measures to open electricity production to non-utility entities, and the unbundling of transmission and distribution. Results indicate some evidence of the Public Interest Theory and strong evidence of the Interest Group Theory.

1. Introduction

Why do policy makers deregulate? The past three decades have seen a wave of industries become deregulated, from railroads to petroleum to banking. There are two opposing theories for why a sector of the economy may become regulated or deregulated. The first is that groups who stand to gain from certain changes in market conditions, lobby for specific conditions, and groups who stand to lose, lobby against them; for our purposes this will be referred to as the Interest Group Theory. The second theory is that regulators make changes to maximize a specific form of public welfare. This theory will be called the Public Interest Theory. At the tail end of the 20th century, electricity markets were introduced to restructuring. This restructuring was introduced at the state level with timing varying across states. This variation in timing provides an optimal situation in which to test the strength of the two competing theories.

Several papers study motivations for political policy changes. This paper is most similar in design to Knittel (2006). Knittel examines the influence of interest groups in the process of state adoption of restructuring and regulation in the beginning of the 20th century. In contrast this paper will investigate the decision to deregulate the electricity industry. Knittel finds strong evidence for the Interest Group theory and little evidence of the Public Interest Theory. Kroszner and Strahan (1999) investigate regulatory climate changes in the banking industry covering the decades of the 70s, 80s and 90s. They find strong evidence of the Interest Group Theory and some weak evidence of the Public Interest Theory.

Knittel and Krozner and Strahan expand on extensive literature investigating Public Interest vs. Interest Group Theories. The leading paper examining this question was by Peltzman (1976) in which he advanced a theoretical framework for the Interest Group Theory. If this theory holds true we would expect to see more deregulation in states where there was a stronger presence of parties who would expect to gain from deregulation, and less likely in states that had large concentrations of parties expected to lose. For instance, if deregulation was expected to hurt consumers we would expect less deregulation in states that had higher consumer power.

The competing approach is the Public Interest Theory. If current legislation granted firms the power to exercise higher prices and profits, deregulation would expose firms to competitive forces thus helping society. This theory contrasts with the Capture Theory which implies that regulators were "captured" by firms to draft legislation to benefit consumers. The Capture Theory of deregulation would imply instead

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that regulation favors consumers. Emmons (1997) find evidence of the Public Interest Theory in the context of electricity regulation surrounding the period of the New Deal,[1] while Stigler and Friedman (1962) find evidence to support Capture Theory. The Capture Theory is a subset example of the Interest Group Theory. For the purposes of this paper, we follow Kaserman et al. (1993) in investigating the Interest Group Theory vs. the Public Interest Theory and nesting the Capture Theory within the Interest Group Theory.

Electricity is a fundamental input for nearly all economic activities. As a consequence of reducing retail prices faced by consumers, the efficient generation of electricity has substantial potential to increase societal welfare. The reduction in prices was the stated goal of restructuring programs for electricity deregulation (EIA, 2009).[2] This paper examines empirically what market forces influenced the restructuring of electricity in the United States (U.S.) within the context of the Interest Group Theory and the Public Interest Theory. We add to the literature by being the first, to our knowledge, to examine the differences between the Interest Group Theory and the Public Interest Theory in terms of electricity deregulation in the U.S. Our study covers the time period between 1995 and 2006 which includes several years before restructuring took place therefore allowing us to identify the variables that contribute to restructuring. In addition, the majority of previous papers investigating these theories examine the effects of regulation not deregulation. Given the state of ongoing debate concerning deregulation and current banking failures, the question of motivations becomes increasingly important. We estimate a survival model specification using Cox's Specification and find support for both the Interest Group Theory and the Public Interest Theory.

The paper is organized as follows: Section 2 gives background information, describes the public interest hypothesis vs. the interest group hypothesis in the context of U.S. electricity generation restructuring and describes the sample. The empirical model is presented in Section 3. Section 4 presents the results and Section 5 concludes.

2. Background and sample characteristics

2.1. U.S. electricity background

The electricity industry is comprised of generation, transmission, and distribution. Until recently, U.S. electricity was typically supplied by vertically integrated utilities with a monopoly in their local geographical area. These utilities were either privately owned by shareholders or publically owned by cooperatives, municipalities, or state and federal governments. The Federal Energy Regulatory Commission (FERC) regulated wholesale sales and the transmission of electricity in interstate commerce while state Public Utility Commissions (PUCs) oversaw generation, retail sales, and intrastate transmission and distribution (United States Government Accountability Office, 2009). FERC and the PUCs typically employed cost-based regulation whereby wholesale and retail prices were set to cover the utilities' costs of production plus a "fair" return on investment. More recently, some states also experimented with incentive regulations that allowed utilities to benefit from cost reductions and innovations.[3]

Market restructuring commenced with the passing of the Federal Energy Policy Act of 1992 and FERC Order No. 888 in 1996. These measures permitted non-utilities[4] to enter wholesale markets and placed greater emphasis on market-determined prices. In 1996, California became the first state to pass independent market restructuring legislation that introduced competition into retail markets. Restructuring took on two forms: retail and wholesale. Retail restructuring was always done on a state by state basis while wholesale restructuring was largely done regionally. We define a state as restructured when 10% of customers have their choice of retail provider.[5,6] The initiative was aimed directly at investor-owned plants and included increased use of wholesale trading electricity, the unbundling of generation, transmission and distribution so that consumers could choose a supplier of generation services and the abolishment of cost-based regulation. Table 1 shows that by the end of 2002, 17 of these states, along with California, had actually implemented restructuring and permitted retail competition in electricity markets. By removing restrictions on revenue and exposing plants to competitive forces, market restructuring should have incented managers to increase plant efficiency in order to decrease costs. These reduced costs would generally be passed on to customers under competitive market forces.[7,8]

2.2. Public interest hypothesis

The Public Interest Theory proposes that regulatory changes occur as a result of regulators working towards the best solution for society as a whole. Under this hypothesis, regulators pursue regulatory changes in response to a situation where societal efficiency is lacking. We propose profit of firms to investigate this. Until recently, U.S. electricity was typically supplied by vertically integrated utilities with a monopoly in their local geographical area. These monopoly firms would be regulated under a cost-plus system where the firms would earn a "fair" rate of return above their costs. This quantity supplied under the fair rate, as we know from standard economic theory, is not necessarily the societal optimum and the quantity supplied is less than where demand meets marginal cost. However, in order to incent firms to stay in the market they must be given a price sufficient to, at a minimum, cover their average costs. States with greater profit, ceteris paribus, would be populated by firms exploiting a higher markup, thereby earning a greater profit and producing less, thus reducing societal welfare. This means that a positive coefficient on profits indicates that states with higher profits are more likely to restructure supporting the Public Interest Theory.

2.3. Interest group hypothesis

The Interest Group Theory asserts groups that stand to gain from restructuring will lobby decision makers for restructuring, and those that stand to lose will lobby against it. To investigate this theory, we propose to measure potential lobbying power of two important groups; residential consumers and industrial consumers. Because electricity restructuring was proposed to lower electricity rates, if residential or industrial consumers have a stronger presence in a state, under the Interest Group hypothesis, restructuring would be more likely.[9] To measure residential lobbying power we use the household income level of consumers in the state and the price they pay for electricity.[10] Income measures potential power and the price paid measures motivation for consumers. Finding that higher incomes and higher prices motivate restructuring would indicate the Interest Group Theory. To

[1] Emmons specifically finds evidence of the Contracting Theory. The Contracting Theory is the belief that regulation or deregulation is done to increase the supply of a good, in this case electricity. For the purposes of this paper the Contracting and Public Interest Theory are considered one and the same.

[2] http://www.eia.doe.gov/cneaf/electricity/page/fact_sheets/restructuring.html.

[3] For example, heat-rate programs set prices conditionally on the firm-level average heat rate. Individual utilities with a relatively low heat rate were able to retain incremental profits due to efficiency improvements.

[4] Firms that generate, buy, and/or sell electricity but are not involved in transmission.

[5] Other specifications where we use 5% and 20% were employed with nearly identical results. Those tables are available upon request.

[6] Defining a state as restructured when 10% of customers have their choice of retail provider follows from Craig and Savage (2013) finding that retail choice was the major driver of improvements in generating efficiency.

[7] Two states in our sample, Arizona and California, implemented, and then subsequently suspended, market restructuring prior to 2006. However, many other states enacted legislation without ever actually implementing active restructuring.

[8] In fact Craig and Savage (2013) find that the restructuring did improve generation efficiency by around ten percentage points.

[9] http://www.usatoday.com/money/industries/energy/2007-04-21-electricity_N.htm.

[10] Residential price may be thought of as a control as well. But we think that the combination of large lobbying potential and high prices have a particularly interesting relationship that will be discussed later.

Table 1
States with market restructuring.
Sources: NARUC (2009); NEAAP (2009); State PUC web sites.

Year passed	State	Year implemented	Current status
1996	California	1998	Suspended
1996	New Hampshire	1998	
1996	New York	1999	
1996	Pennsylvania	1999	
1996	Rhode Island	1998	
1997	Illinois	1999	
1997	Maine	2000	
1997	Massachusetts	1998	
1998	Connecticut	2000	
1999	Delaware	2001	
1999	Maryland	2000	
1999	New Jersey	1999	
1999	Ohio	2001	
1999	Texas	2002	
1999	Virginia	2002	Suspended
2000	Michigan	2001	
2000	D.C.	2001	

Table 2
State characteristics 1995–2006.

Variable	States with market restructuring		States without market restructuring	
	Mean	S.D.	Mean	S.D.
AVERAGE PROFIT	0.59	2.67	0.11	0.62
STATE INCOME	47.70	6.30	39.31	6.79
RES PRICE	10.66	2.29	8.22	2.30
INDUST DEMAND	14.19	53.55	5.38	26.01
GENERATING PLANTS	137.26	150.82	69.37	47.88
GINI	0.59	0.03	0.58	0.03
REP GOV	0.57	0.49	0.58	0.49
REP PUC	0.53	0.48	0.54	0.49
CAPACITY	267.26	252.68	167.11	144.16
COAL TON	11.18	20.36	24.08	62.03
CUSTOMERS	3.55	3.22	1.86	1.79
Number of states	17		34	

Notes: Number of observations is 612. Observations are left in, including post restructuring, as opposed to the survival analysis where observations post restructuring are dropped. S.D. is standard deviation.

measure for lobbying power of industrial customers we use the average industrial customers' size.[11] Finding that having larger industrial customers or larger industrial demand, leading to a greater likelihood of restructuring, is a finding for the Interest Group Theory.

2.4. Sample

We define an observation as a state-year, with our period spanning from 1995 to 2006, which gives 612 state-year observations. Since restructuring occurs at the state level this is an optimal unit of observation for this study. Data on net-generation were gathered from Ventyx Energy, 2007.[12] This data was then merged with information on the timing of market restructuring across states, obtained from the National Association of Regulatory Utility Commissioners (NARUC, 2009), the National Energy Affordability and Accessibility Project (NEAAP, 2009) and state PUC web sites. Lastly, we combined this with median personal income, the relative size of industrial customers, coal mining production, and electric utility revenue and policy makers' preferences for competition, obtained from the EIA (2009) and Census Bureau (2009).

Table 2 presents selected characteristics for states that implemented market restructuring during the sample period and states that did not. Restructured and non-restructured states are similar in terms of the political makeup of their state governments and PUCs. Compared to states that did not restructure, restructured states have a higher median income ($47,000 vs. $39,000) and larger average industrial customers (with the average customer purchasing 14,000 MWh vs. 5000 MWh). Additionally, the restructured price of electricity is about 2–2.5 cents more per kWh and restructured states have a larger average capacity of 267,000 MWh of sustained potential vs. 167,000 MWh of sustained potential. Lastly, the states that would eventually restructure have a higher average profit than those that did not (although the variation is large).

In summary, the gross sample comprises 612 state-year observations. Table 3 presents summary statistics for the entire sample. The average state median income was approximately $41,000 and the average residential consumer faced a price of 8.74 cents per kWh. Republican governors and PUCs are a majority in about 58 and 54% respectively of states over the sample time; about 21% of the uncensored observations are restructured. The average industrial customers purchased 7262 MWh of electricity per year, and had a fixed capacity of around 190,000 MWh of sustained electricity generation.

3. Empirical specification

Estimation of the empirical specification is modeled using Survival Analysis; applying hazard models pioneered by Cox (1972). The decision to restructure is an all-or-nothing decision, and in this context will be seen as a "death".[13] The decision comes down to whether to restructure. State legislatures are assumed to face the following marginal decision to restructure:

$$U_{st} = \beta W_{st} + \boldsymbol{\delta}' X_{st} + \boldsymbol{\gamma}' Z_{st} + \varepsilon_{st} \quad (1)$$

With U being the additional utility the legislators in state s in period t would receive from restructuring; $\boldsymbol{\delta}$ and $\boldsymbol{\gamma}$ being vectors of coefficients and β being a coefficient. W is the variable supporting the Public Interest Theory, X is a vector of variables supporting the Interest Group Theory and Z is a vector of control variables, all of which will affect the utility of the legislators associated with restructuring. Finally, ε is the error or disturbance term. The expected probability of deciding to become a restructured state is not observed, but the choice to restructure is observed:

$$\text{Restructuring} = 1 \text{ when } U_{st} > 0 \text{ and Restructuring} = 0 \text{ when } U_{st} < 0 \quad (2)$$

With the utility being unobserved. This yields the following probability model of restructuring:

$$P(U_{st} > 0) = P\left(\varepsilon_{st} < \beta W_{st} + \boldsymbol{\delta}' X_{st} + \boldsymbol{\gamma}' Z_{st}\right) = F\left(\beta W_{st} + \boldsymbol{\delta}' X_{st} + \boldsymbol{\gamma}' Z_{st}\right) \quad (3)$$

where $F()$ is assumed to be normally distributed. To test for the causes of restructuring the following empirical models are specified for state $s = 1,\ldots S$ in year $t = 1,\ldots T$:

$$RESTRUCTURE_{st} = \alpha_0 + \alpha_1 AVERAGE\ PROFIT_{st} + \alpha_2 STATE\ INCOME_{st} + \alpha_3 RES\ PRICE_{st} + \alpha_4 INDUST\ DEMAND_{st} + \boldsymbol{\gamma}' Z_{st} + e_{st} \quad (i)$$

[11] An alternative specification in which the industrial price is used is also employed. In this specification the results are almost identical except that the coefficient on industrial price is slightly larger and not quite statistically significant. Both prices are not employed due to collinearity issues with the inclusion of both and other control variables such as profit and number of customers.

[12] Ventyx Energy (formerly Global Energy Decisions) gathers data from FERC and other reporting services, and packages these data to private and government entities.

[13] While many states later reregulated the hazard identification uses the timing of events that led up to an all-or-nothing decision to identify the contributing causes. A logit or probit specification would assume that events lagged a specific way, or in the year of the decision to regulate, caused the decision to restructure. We believe that this specification is appropriate given the long legislative process needed to restructure.

Table 3
Summary statistics: all states.

Variable	Mean	S.D.	Min	Max
RESTRUCTURE	0.21	0.41	0.00	1.00
AVERAGE PROFIT	0.21	1.36	0.00	23.04
STATE INCOME	41.11	7.52	24.88	68.06
RES PRICE	8.74	2.51	4.95	23.35
INDUST DEMAND	7.26	33.98	0.23	282.40
GENERATING PLANTS	83.90	86.12	2.00	792.00
GINI	0.58	0.03	0.52	0.71
REP GOV	0.58	0.49	0.00	1.00
REP PUC	0.54	0.49	0.00	1.00
CAPACITY	188.55	177.77	1.39	1120.89
COAL TON	21.32	56.03	0.00	418.00
CUSTOMERS	2.22	2.28	0.19	12.69

Notes: Number of observations is 612. Observations are left in, including post restructuring, as opposed to the survival analysis where observations post-restructuring are dropped. S.D. is standard deviation.

and

$$RESTRUCTURE_{st} = \theta_0 + \theta_1 AVERAGE\ PROFIT + \theta_2 STATE\ INCOME_{st} + \theta_3 RES\ PRICE_{st} + \theta_4 INDUST\ DEMAND_{st} + \theta_5 STATE\ INCOME_{st} * RES\ PRICE_{st} + \boldsymbol{\delta}' Z_{st} + u_{st} \quad \text{(ii)}$$

The outcome variable of interest is *RESTRUCTURE* which is equal to one when restructuring will occur in the next year and zero otherwise, *AVERAGE PROFIT* is the state's average profit in cents per kilowatt hour, *STATE INCOME* is the median household income of the state's population in thousands of dollars,[14] *RES PRICE* is the average price of residential consumers in cents per kWh, *INDUST DEMAND* is the average amount of electricity in thousands of MWh purchased by industrial customers in the state, α_0, α_1, α_2, α_3, α_4, $\boldsymbol{\gamma}$, θ_0, θ_1, θ_2, θ_3, θ_4, θ_5, and $\boldsymbol{\delta}$ are parameters to be estimated, and e, and u are error terms.[15]

Eq. (i) tests between the Public Interest and the Interest Group Theories. The parameters of interest are α_1, α_2, α_3, and α_4. If the null hypothesis that $\alpha_1 = 0$ cannot be rejected we find no evidence of the Interest Group Theory. A finding of $\alpha_1 > 0$ would indicate that states with higher profits are populated by firms exploiting a higher markup, thereby earning a greater profit and producing less, thus reducing societal welfare and are more likely to restructure, supporting the Public Interest Theory. If the individual null hypotheses that $\alpha_2 = 0$, $\alpha_3 = 0$, and $\alpha_4 = 0$ cannot be rejected we find no evidence of the Interest Group Theory. A finding of $\alpha_2 > 0$ for higher median incomes and therefore more lobbying power, increases the likelihood of a state restructuring, which supports the Interest Group Theory. A finding of $\alpha_3 > 0$ indicates that states with high residential prices are more likely to restructure. A finding of $\alpha_4 > 0$ reveals that having a stronger presence of industrial consumers is positively associated with restructuring, supporting the Interest Group Theory. The interpretations for coefficients θ_1 and θ_4, have the same interpretation as α_1 and α_4. If we cannot reject the null hypothesis that $\theta_5 = 0$ then there is no relationship between the effect of higher median incomes and residential price. A finding of $\theta_5 > 0$ would mean that increasing lobbying power is more important as residential prices rise, while a finding of $\theta_5 < 0$ would reveal that as residential prices rise, increased lobbying power is less important.[16] An inability to reject the null hypothesis that $\theta_2 = 0$ or $\theta_3 = 0$ does not necessarily mean that we find no evidence of the Interest Group Theory; nor does a finding that $\theta_2 > 0$ and/or $\theta_3 > 0$ indicate that there is evidence of the Interest Group Theory. However, as we are interested in whether increased lobbying power increases the likelihood of restructuring, $\theta_2 + \theta_5 * RES\ PRICE = \partial RESTRUCTURE/\partial STATE\ INCOME$, becomes a key parameter. If we cannot reject the null hypothesis that $\theta_2 + \theta_5 * RES\ PRICE = 0$ then we find no evidence of the Interest Group Theory for residential customers. A finding that $\theta_2 + \theta_5 * RES\ PRICE > 0$ reveals that as median income and lobbying power increases, restructuring is more likely supporting the Interest Group Theory. We use the term *MARGINAL INCOME* to reflect $\theta_2 + \theta_5 * RES\ PRICE$ and present it in the regression results along with its standard error computed from the covariance matrix despite it not actually being a covariate.

In addition, we have a vector of control variables Z. This vector includes: *REP GOV* (equal to one when the state has a Republican governor and zero otherwise); *REP PUC* (equal to one when the state has a Republican dominated PUC and zero otherwise[17]); *CAPACITY* (maximum sustainable amount of MWh of electricity generated per hour[18]); *CUSTOMERS* (the number of residential customers in a state in millions of people); *GENERATING PLANTS* (number of generating unit plants in a state); *GINI* (the state Gini coefficient) and *COAL TON* (the amount of coal mined in a state in millions of tons). Table 4 provides a detailed description of the variables used in the empirical analysis and their sources.

4. Results

The empirical model and data are used to estimate the effect of interest group and public interest variables on the decision to restructure. We estimate specifications (i) and (ii) for all 51 states for the period 1995–2006.[19]

4.1. Specification (i)

Estimates of specification (i) for all states are presented in Table 5 in which we regress restructuring (*RESTRUCTURE*) on the Interest Group variables (*STATE INCOME*, *RES PRICE*, *INDUST DEMAND*), Public Interest variable (*AVERAGE PROFIT*), and the vector of state-year controls (Z). We model the decision to restructure using survival analysis. To investigate this structure, hazard models are implemented.[20] The first three columns use three different methods to interpret ties for "failures" (in our case, restructuring). The first is a Breslow approximation, the second is the marginal calculation, and the third is the partial calculation.[21] The last column is a different specification of the hazard function using stratified analysis, wherein the baseline hazard is allowed to vary by groups, in this case by region.

In general, the controls included in the vector Z are statistically insignificant, with few exceptions. The sign of the coefficient on Log(*AVERAGE PROFIT*),[22] α_1, is positive and statistically significant with the exception of when the stratified analysis is presented (column four), which gives support to the Public Interest Theory. The magnitude indicates that, all else being equal, an increase in average profit of 1% is associated with an increase in the probability of restructuring of between 1.1 and 1.4% using

[14] This is nominal median income. Nominal was used as other measures, including residential price, are in nominal terms. Specifically as energy price changes are used to estimate inflation and the de-trending of anything to real terms would result in high levels of collinearity.

[15] Log specifications are used for *INDUST DEMAND* and *AVERAGE PROFIT*, but not *RES PRICE* and *STATE INCOME* because in specification (ii) those two variables are interacted with each other. Results of specification (i) where interest group variables are employed as the log of those variables are qualitatively similar and are available upon request.

[16] This would be the case when prices reach a certain point where income is no longer important in gathering lobbying strength.

[17] In the case of ties or when independents were present, 0.5 was assigned.

[18] This is calculated during summer months when electricity generation is at a maximum.

[19] In survival analysis once an observation incurs a "death" (in this case restructuring) all future observations are dropped from the model.

[20] Hazard ratios are reported as opposed to hazard rates to allow for marginal interpretation.

[21] The Breslow approach assumes that all ties happened sequentially and independently. So all restructuring happened at exactly the same time and was independent of other states. This is highly unlikely. The difference between the marginal and partial calculations is that the marginal calculation assumes that failures do not happen concurrently but rather the researcher cannot accurately discern between two or more failure times, whereas the partial calculation assumes that failures are simultaneous and treats this as a multinomial problem. For our purposes the marginal and partial calculations can be assumed to fit the assumptions of restructuring better and are therefore considered more accurate.

[22] Log refers to the natural log.

Table 4
Variable descriptions.

Variable	Description
RESTRUCTURE	One when the plant is located in a state that will implement market restructuring, and this restructuring remains active in the next year, and zero otherwise. Source: NARUC (2009); NEAAP (2009); State PUC web sites.
COAL TON	Coal mined in the state (millions of tons): EIA (2009).
RES PRICE	Price of electricity for residential customers (cents per kWh): EIA (2009).
INDUST DEMAND	Size of the average industrial customer in thousands of mWh purchased per industrial customer: EIA (2009).
CAPACITY	Maximum sustainable amount of thousands of MWh of electricity generated: Ventyx Energy (2007).
CUSTOMERS	Number of residential customers in a state in millions of persons: Ventyx Energy (2007).
REP GOV	One when the state has a Republican governor and zero otherwise: State governor websites (2009).
REP PUC	One when the state has a Republican dominated public utility commission and zero otherwise: State PUC websites (2009); NARUC Blue books (2007); Personal calls (2007).
AVERAGE PROFIT	Average profit in cents per kWh constructed from approximated costs and generation data: EIA (2009).
GENERATING PLANTS	Number of generating unit plants in a state: EIA (2009).
GINI	State Gini Coefficient: US Census Bureau (2016).
STATE INCOME	Median income of the state's population in U.S. dollars divided by 1000: U.S. Census Bureau (2009).

the results from the first 3 columns. However, this positive result goes away when we allow for regional differences.

Investigating the interest group theory, we can reject the null hypothesis that the coefficient on *STATE INCOME* $\alpha_2 = 0$ in favor of the alternative, that $\alpha_2 > 0$ in 3 of the 4 hazard models. It is statistically significant and of a reasonable magnitude. Estimates indicate that a 1000 dollar increase in the median income in a state is associated with an increase in a higher "risk" of restructuring equal to approximately 9 to 13%. The estimate of α_3, the coefficient on *RES PRICE*, would indicate that an increase in price of one cent per kWH is associated with an increase in risk of approximately 20%, but this is statistically significant in only two of the estimation techniques and thus we cannot reject the null hypothesis that $\alpha_3 = 0$. The coefficient on Log(*INDUST DEMAND*), α_4, is statistically insignificant. Taken together, the finding that $\alpha_1 > 0$ along with the finding that $\alpha_2 > 0$, provides mixed evidence for the Interest Group Theory and the Public Interest Theory.[23] We believe that in this, our less preferred specification, the evidence appears to point more towards the Public Interest Theory. Certainly the coefficients on Log(*AVERAGE PROFIT*) are more strongly significant than those on *STATE INCOME* or *RES PRICE*, and certainly more strongly significant than Log(*INDUST DEMAND*). This is not overly surprising as we believe that *RES PRICE* and *STATE INCOME* have an important relationship that will be explored in specification (ii). Regardless we must acknowledge that in this specification the Public Interest theory seems more dominant. This may be as regulators, regardless of interest group tie-ins, cannot ignore the claims of high energy prices when electricity profits are so much larger than in other areas.

Table 5
Determinants of restructuring specification (i).

Log(*AVERAGE PROFIT*)	1.138***	1.357**	1.429**	0.636
	[0.174]	[0.543]	[0.579]	[0.575]
STATE INCOME	0.0805	0.0899*	0.104*	0.132**
	[0.0748]	[0.0510]	[0.0578]	[0.0599]
RES PRICE	0.208	0.204*	0.230*	0.0541
	[0.130]	[0.114]	[0.127]	[0.241]
Log(*INDUST DEMAND*)	−0.490*	−0.556	−0.612	0.111
	[0.283]	[0.404]	[0.432]	[0.557]
GENERATING PLANTS	0.00238	0.0102	0.00887	0.00113
	[0.0131]	[0.0115]	[0.0122]	[0.0114]
GINI	−5.378	−6.802	−6.953	−13.31
	[4.656]	[10.96]	[11.67]	[13.10]
REP GOV	0.758	0.581	0.578	0.116
	[0.831]	[0.790]	[0.853]	[0.994]
REP PUC	−0.352	−0.491	−0.485	−0.189
	[0.399]	[0.751]	[0.821]	[0.952]
CAPACITY	0.000287	−0.00342	−0.00308	0.000965
	[0.00105]	[0.00350]	[0.00384]	[0.00530]
COAL TON	0.0160***	0.0210*	0.0221*	0.007
	[0.00407]	[0.0120]	[0.0126]	[0.0189]
CUSTOMERS	0.177	0.437	0.47	0.366
	[0.353]	[0.345]	[0.376]	[0.447]
Breslow approximation for ties	Yes	No	No	No
Marginal calculation	No	Yes	No	No
Partial calculation	No	No	Yes	No
Stratified risk	No	No	No	Yes
Region fixed effects	No	Yes	Yes	No
Observations	490	490	490	490
Log likelihood	−53.09	−36.01	−35.8	−28.11

Notes: Robust standard errors in parentheses for the Breslow approximation clustered at the region level. Standard errors in parentheses for marginal and partial calculations. Estimates of fixed effects and time trends not reported. Hazard ratios are reported which can be interpreted as the percentage increase in risk. Log refers to the natural log.
*** Significant at the 0.01 level.
** Significant at the 0.05 level.
* Significant at the 0.1 level.

4.2. Specification (ii)

To further investigate the question, we include Table 6 using specification (ii) where we again regress restructuring (*RESTRUCTURE*) on the interest group variables (*STATE INCOME*, *RES PRICE*, *INDUST DEMAND*), public interest variable (*AVERAGE PROFIT*), and the vector of state-year controls (Z), but now allow for differing marginal effects of *STATE INCOME* via *RES PRICE*, by including the variable *STATE INCOME* ∗ *RES PRICE*. Looking first at the public interest variable, θ_1, we can see that *AVERAGE PROFIT* again is statistically significant and almost identically measured as before. However, again in the stratified model the result disappears, giving evidence of the Public Interest Theory. Investigating the Interest Group Theory, the coefficients on *STATE INCOME*, θ_2, and *RES PRICE*, θ_3 are generally statistically significant and positive across specifications. The coefficient θ_4 on Log(*INDUST DEMAND*) is statistically insignificant.

The estimate of θ_5, the coefficient on the interaction variable, is statistically significant and negative with the exception of the fourth model using the stratified analysis. This negative coefficient suggests that the marginal effect of additional income is decreasing in consumer price. This would be consistent with the idea that as prices rise, all consumers notice and so lobbying power becomes less important. The fact that the estimates of θ_2 and θ_3 are statistically significant does not necessarily support the Interest Group Theory. To understand the interpretation, the measure of interest is $\partial RESTRUCTURE/\partial STATE\ INCOME = 0.61–0.054 * RES\ PRICE$ for the first column of results. The average residential price of electricity prior to restructuring for states that would eventually restructure, is 9.32085 cents per kWh. Using this value we report the variable *MARGINAL INCOME* in Table 6 which is $\partial RESTRUCTURE/\partial STATE\ INCOME$ along with its standard error. Looking across specifications we can see that *MARGINAL INCOME* is consistently positive and statistically significant indicating that a 1000 dollar increase in the median income increases the likelihood of restructuring by between 10 and

[23] A log specification, in which all continuous variables had the natural log taken of them, was also estimated with similar results and is available upon request.

Table 6
Determinants of restructuring specification (ii).

Log(*AVERAGE PROFIT*)	1.127***	1.188**	1.336**	0.765
	[0.147]	[0.529]	[0.599]	[0.571]
*STATE INCOME * RES PRICE*	−0.0544**	−0.0561**	−0.0654**	−0.043
	[0.0262]	[0.0240]	[0.0282]	[0.0317]
STATE INCOME	0.610**	0.633***	0.728***	0.546*
	[0.278]	[0.241]	[0.277]	[0.314]
RES PRICE	2.673**	2.763**	3.210**	1.933
	[1.210]	[1.099]	[1.288]	[1.397]
MARGINAL INCOME	0.0992**	0.107**	0.114*	0.143**
	[0.0490]	[0.0518]	[0.0605]	[0.0607]
Log(*INDUST DEMAND*)	−0.539**	−0.5	−0.615	−0.0687
	[0.247]	[0.396]	[0.445]	[0.568]
GENERATING PLANTS	−9.38E−03	−0.00643	−0.00604	−0.01
	[0.0135]	[0.0127]	[0.0134]	[0.0138]
GINI	0.567	1.885	1.618	−7.355
	[3.734]	[11.40]	[12.57]	[14.20]
REP GOV	0.214	0.0938	0.163	−0.374
	[0.975]	[0.869]	[0.944]	[1.106]
REP PUC	0.119	0.0759	0.0388	0.239
	[0.668]	[0.808]	[0.900]	[1.060]
CAPACITY	0.00119	−0.00051	3.81E−05	0.00245
	[0.00100]	[0.00308]	[0.00378]	[0.00517]
COAL TON	0.0171***	0.0189	0.0212	0.00908
	[0.00488]	[0.0121]	[0.0132]	[0.0196]
CUSTOMERS	0.403	0.544	0.531	0.514
	[0.351]	[0.340]	[0.375]	[0.459]
Breslow approximation for ties	Yes	No	No	No
Marginal calculation	No	Yes	No	No
Partial calculation	No	No	Yes	No
Stratified risk	No	No	No	Yes
Region fixed effects	No	Yes	Yes	No
Observations	490	490	490	490
Log likelihood	−49.64	−32.84	−32.47	−27.18

Notes: Robust standard errors in parentheses for the Breslow approximation clustered at the region level. Standard errors in parentheses for marginal and partial calculations. Estimates of fixed effects and time trends not reported. Hazard ratios are reported which can be interpreted as the percentage increase in risk. Log refers to the natural Log.
*** Significant at the 0.01 level.
** Significant at the 0.05 level.
* Significant at the 0.1 level.

14% at the average residential electricity price. These results support the Interest Group Theory that higher consumer incomes combined with high prices lead to a greater probability of restructuring. We see specification (ii), which is our more preferred specification as tilting the body of evidence back towards the Interest Group Theory. Specifically when a more flexible model is included, one that allows for the interaction of strong lobbying potential from residential consumers and high prices, the Interest Group coefficients are now strongly significant. It should be noted though that Log(*AVERAGE PROFIT*) continues to be statistically significant indicating that legislators are still concerned with public interest.

5. Conclusion

The purpose of this paper is to examine whether restructuring was brought about due to the Public Interest Theory (that regulatory changes are undertaken to benefit society) or the Interest Group Theory (that groups which hope to gain from deregulation, lobby for regulatory changes). We focus on the period between 1995 and 2006 to investigate this question. Using hazard models to investigate the question, results indicate evidence of the Public Interest Theory and strong evidence of the Interest Group Theory. For the Public Interest Theory we find that a 1% increase in average profit is associated with an increase in the likelihood of restructuring of a little over 1%. For the Interest Group Theory, we find that stronger political influence of residential customers implies a greater chance of restructuring; controlling for other variables and residential price, an increase in median income of 1000 dollars (and thus more ability to lobby) increases the probability of restructuring of between 10 and 14%.

These findings expand on extensive literature investigating whether legislatures make regulatory changes in response to lobbying or for the good of societal welfare. We find, as does much of the written work, that the Interest Group Theory has more credence. We do, however, find additional evidence of the Public Interest theory as well. More investigation needs to be done finding specific and additional in-depth measures of lobbying power.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.eneco.2016.10.001.

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