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Essays On Electricity Regulation and Restructuring

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ESSAYS ON ELECTRICITY REGULATION AND RESTRUCTURING

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ABSTRACT

The study of the regulation of the electric power industry is important to understanding the role of the industry in the economic development of this country. These essays attempt to clarify the analysis and accentuate the salient features of regulation and the restructuring of the electric power industry and the organization of the firms that make up the industry.

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CHAPTER ONE
ISSUES IN ELECTRICITY RESTRUCTURING

As of 2007 the state of restructuring in the United States is uncertain. The paradigm for restructuring, California suspended its transition plan. And what restructuring has occurred in the rest of the country is partial and less certain. But the case for restructuring is not closed. Regulators in many states are continuing to manage the transition to a more competitive generation market, albeit with trepidation. There is also a lack of commitment to continue restructuring that is necessary to minimize the regulatory costs of restricted markets.

It has been over 80 years since the imposition of major federal regulation of the electric power industry. From the early 1990's until 2005 Congress undid most of the regulatory changes imposed by past federal administrations. While this is the most important initial step, undoing 80 years of the industry's structural sclerosis and regulatory intransigence[1] is going to take more than 2 years.

Electricity has a long history in the United States. Due to the peculiar nature of electricity generation, regulation of the industry started shortly after the industries creation. While early restructuring was limited to the states, perceived widespread abuse of the holding company structure lead to the passage of the Public Utilities Holding Companies Act of 1935 (PUHCA). PUHCA was broadly opposed by investor owned utilities who saw the regulation as a major curtailment of their business practices.[2] By the 1970s the industry had changed due to a combination of technological innovation, environmental regulation, and price shocks. These forces combined with monolithic

[1] Gordon 1992
[2] Trebing 2000

regulation held over since the 1930s created a demand for regulatory change by the electric power industry. The result was the passage of the Public Utility Regulatory Policy Act (PURPA) in the late 1970s and the Energy Policy Act of 1992 (EPAct) in the early 1990s. The electric power industry endorsed the laws as they mitigated the excesses of PUHCA.[3]

The Federal Energy Regulatory Commission (FERC), following a mandate in the EPAct, issued Orders 888 and 889, mandating the unbundling of generation and transmission and their provision at non-discriminatory rates. Subsequently in the early nineties, many states began planning to implement restructuring. Twenty two states passed restructuring legislation and three states passed regulatory orders designed to transition electricity markets in the states to competitive wholesale electricity generation.

There has been a significant amount of research and commentary on electricity restructuring. A consensus has developed on what is necessary to implement competition in electricity markets, but there is disagreement among scholars about some of the details of restructuring. This essay attempts to clarify the disparities between perspectives and highlight the salient features of a successfully restructured generation market.

Who and Why of Restructuring

An electric power industry is important to the sustained development of any industrial nation. Its importance is understated in that society currently has poor substitutes for the electricity in the provision of readily accessible energy; electric power's value is derived as a substitute for less convenient alternatives. Its ready acceptance as the clean

[3] Trebing 2000

alternative made it an early candidate for a combination of regulation and subsidy at every level, especially after 1910.[4] Scale economies added to this, but as the industry matured, regulation prevented the industry from adapting and developing into its most efficient form. Because of state regulation, the industry adapted in separate state and regional forms that impose costs and dispense rents beyond other forms of market allocation. The total effect has been to cause systematic price differences that cannot be mitigated through arbitrage.

In the last fifteen years the federal government and the states began to restructure their regulatory environments in response to observed differences in average prices across states, independent of fuel costs. Especially from 1996 and on, the differences and changes were patently obvious in the state level data. The states have proceeded along two paths: either they have restructured regulation or they have continued with their chosen level of regulation.

[4] Jarrell 1978

Table 1.1

Restructuring Versus Non-Restructuring States With Respect to the Mean Year

Legislative Outcome	Variable	1996	1997	1998	1999	2000	2001	2002
No Restructuring	States With Less Than Avg Costs	18	17	20	18	18	18	18
	States With More Than Avg Costs	8	9	6	8	8	8	8
	States With Less Than Avg Rev	22	22	22	22	22	22	22
	States With More Than Avg Rev	4	4	4	4	4	4	4
Restructured	States With Less Than Avg Costs	13	10	12	12	12	12	12
	States With More Than Avg Costs	11	14	12	12	12	12	12
	States With Less Than Avg Rev	11	10	10	10	12	12	13
	States With More Than Avg Rev	13	14	14	14	12	12	11

Source: EIA

The main incentive to restructure came from notable differences in prices between various states. Table 1.1 contains the number of states greater than or less than the mean average cost and average revenue from 1996 through 2002. For the non-restructuring states, a significant proportion had average costs less than the total average through 2002. These states had the least incentive to restructure. 18 of 26 had less than average costs, while 8 of 26 had greater than average costs. Looking at the restructuring states, it was split down the middle. Based on costs, most states with the lowest costs never bothered to restructure, while the states with the highest costs generally did restructure. Looking at average revenue, the best proxy for actual prices in the states, of the states that did not restructure, only 4 had higher than average prices from 1996 through 2002. For the restructuring states, it is heavily dependent on the year. Three quarters of the high priced states restructured, while a third of the low priced states would restructure. Costs and prices were both driving restructuring through the 90s. If only costs were driving

restructuring, then there would be no difference in restructuring between states based on average revenue and costs.

Table 1.2

Average Revenue by Sector and Fuel Costs

		Year								
Legislative Outcome	Variable	1996	1997	1998	1999	2000	2001	2002	2003	Avg
No Restructuring	Average Revenue (cents/kWh): Residential	7.5	7.5	7.6	7.6	7.7	7.9	7.9	8.1	7.7
	Average Revenue (cents/kWh): Commercial	6.7	6.6	6.6	6.5	6.6	6.8	6.8	7.0	6.7
	Average Revenue (cents/kWh): Industrial	4.6	4.5	4.4	4.4	4.6	4.8	4.7	4.9	4.6
	Average Revenue (cents/kWh): All	6.2	6.1	6.1	6.1	6.3	6.5	6.5	6.7	6.3
	Fuel Cost (cents/kWh)	2.8	2.7	2.1	2.1	3.1	3.3	2.8	*	2.7
Restructured	Average Revenue (cents/kWh): Residential	9.4	9.5	9.3	9.1	9.1	9.4	9.2	9.4	9.3
	Average Revenue (cents/kWh): Commercial	8.1	8.1	7.9	7.7	7.7	8.2	8.1	8.2	8.0
	Average Revenue (cents/kWh): Industrial	5.5	5.4	5.3	5.2	5.5	6.2	6.0	6.1	5.6
	Average Revenue (cents/kWh): All	7.7	7.7	7.6	7.4	7.5	8.1	7.9	8.0	7.7
	Fuel Cost (cents/kWh)	4.2	4.8	3.9	3.7	5.5	6.1	4.4	*	4.7

* Data is unavailable after 2002
Source: EIA

In the nineties a change in the structure of the electric industry became inevitable. Looking at the difference in average revenue[5] beginning in 1996 and through 2003 in Table 1.2 and the figures below, there were strong incentives for states with the highest electric rates to implement restructuring.

[5] Average revenue is a proxy for price in the states.

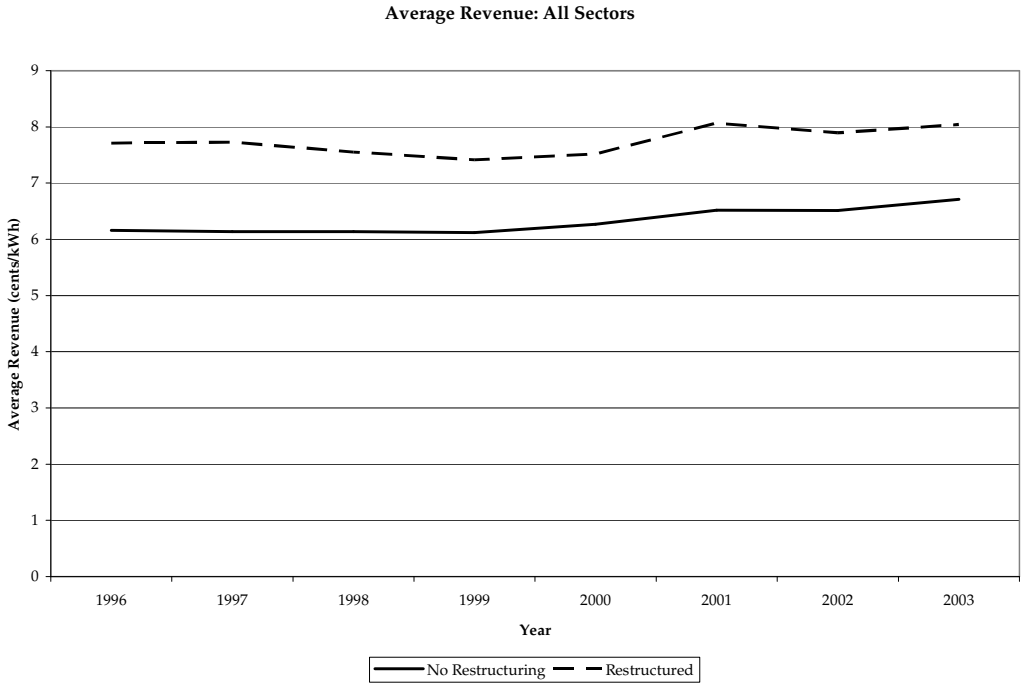

Figure 1.1

Looking at the mean average revenue across all sectors there is almost a cent and a half difference in average revenue between the states that restructured and those that did not. Note that restructuring means that the state enacted restructuring legislation between 1996 and 2001. Non-restructuring states may have conducted studies, but no serious efforts to restructure were completed. No state has enacted restructuring legislation since 2001 and a few have rescinded and scaled down restructuring in response to the California debacle.

Brief History of Electric Utility Regulation[6]

The electric utility industry has been regulated since its inception in1879. The states granted franchises for incorporation while the municipalities awarded franchises to firms. Substantial competition occurred at the municipal level under the franchise scheme. While today franchises are exclusive and designed to limit certain forms of competition, there is no indication that municipalities limited the number of franchises it was willing to grant. This was especially true in larger cities.[7]

While there are economies of scale in regulation and state level regulation could be more efficient that local regulation, Jarrell[8] suggests that the move from municipal to state regulation ultimately benefited producers. This is especially obvious as the utilities changed their stance on state regulation after 1910, going from opposition to endorsement. Beginning in 1907, New York State, Wisconsin, and Georgia created the first statewide regulatory commissions. Most states followed Wisconsin's model. Today almost every state has a regulatory commission that is responsible for monitoring the behavior of public service entities within the state.

The Great Depression brought substantial changes to the electric power industry through regulation. Prior to the Depression there was substantial concentration in the electric power and natural gas markets. A substantial amount of speculative behavior occurred at this time through the holding companies that controlled a substantial portion of production in parts of the United States. Only four states directly controlled the

[6] Viscusi et al, Demsetz, and FERC

[7] In 1887 there were six electric light companies existing in New York City. Chicago had 45 different firms with the right to operate in 1907.

[8] Jarrell 1978

activities of holding companies as of 1929: New York, Massachusetts, Alabama, and New Jersey.[9]

Discussion in the early thirties concerned the ability of states to regulate interstate holding companies. Many did not consider the holding company equal to a public utility in a legal sense because the holding company did not have the electric power and it did not serve the public. The states often extended the definition of a public utility for regulatory purposes to include the controlling holding company by stock ownership. But despite extending the definition to include holding companies on paper, they did not regulate holding companies in practice. The United States Supreme Court only allowed a very general indirect regulation of the holding companies by the states, leaving many substantive issues undefined. The Illinois Supreme Court held that the regulator does not have general discretion in the regulation of the holding companies, or even the utilities directly:

> The Commission is not the financial manager of the corporation and it is not empowered to substitute its judgment for that of the directors of the corporation; nor can it ignore items charged by the utility as operating expenses unless there is an abuse of discretion in that regard by the corporate officers.[10]

Subsequent decisions by the United States Supreme Court would grant regulators the authority to scrutinize the interactions of holding companies and their utility subsidiaries.

[9] Lilienthal 1929
[10] State P. U. C. *ex rel*. Springfield v. Springfield G. & E. Co.,291 Ill. 209, 234, 125 N. E. 891 (1920), in Lilienthal 1929

The courts did not allow a per se justification by regulators to disallow costs incurred by utilities in their dealings with holding companies, only when those costs were incurred in bad faith. The states did not have jurisdiction over "imprudent or improvident [securities] issues" by holding companies, with the exception of liens. By statute in many states, regulators were allowed to regulate the acquisition of capital by holding companies. Ultimately the courts held that consumers were to be protected by the vigilance of the commissions regardless of ownership or the financial position of the owners. As of 1929 the status of the state regulation of holding companies was as follows:

1. Direct regulation was negligible, but there were instances of it.
2. Relations between holding companies and operating companies were regulated by control over all contracts between the operating company and its parent company which may affect rates, or service to the consumer.
3. Acquisition by holding companies of operating company securities was regulated in many states, by the commission's power to prevent such transfers. The scope of the power was an issue.
4. The states had no control of holding companies' non-lien securities. [11]

By 1931 the Supreme Court had ruled that regulators had to effectively separate intrastate from interstate "property, expenses, and revenues" in determining the rate base allowed.[12] The courts and various commissions held that the state regulators were

[11] Ibid.
[12] Editorial, Harvard Law Review 1931

qualified to deal with the holding companies with regard to the regulation of public utilities. New York led the initiative by giving regulators access to data and records as they pertained to the controlling holding companies and strengthening the regulators' power to control the relations between the utilities and holding companies. In the United States Senate, the Couzens bill was introduced to allow for the interstate regulation of the transmission of electricity. But ultimately the courts left the regulation of public utilities and indirectly their holding companies to the states, as the regulation was viewed as principally a local problem.[13] State regulation was viewed as failing despite the aforementioned control exercised by state regulators.

The Public Utility Holding Company Act of 1935 (PUHCA) was a measure enacted to prevent what was seen as unnecessarily risky behavior on the part of highly concentrated firms and the continued merger of firms for the purposes of market foreclosure. One commentator notes,

> The utility holding company structure undoubtedly helped disguise unscrupulous practices, such as the bilking of subsidiaries through service contracts, inappropriate depreciation techniques, and the use of inflated property values, all of which contributed to the collapse of the holding companies.[14]

The act required firms to receive Securities and Exchange Commission (SEC) approval before merging or making acquisitions. It also prevented non-utilities from

[13] Lilienthal 1931
[14] Geddes 1996

owning utilities, and it required firms to incorporate in the states in which they operated so that the state could regulate the firms as necessary.

Regulation of electric power at the national level was originally entrusted to the Federal Power Commission (FPC). The FPC was founded in 1920 to coordinate hydroelectric projects under federal control. Originally the commission consisted of one executive secretary that operated at the convenience of three cabinet secretaries: war, interior, and agriculture. His staff was derived from the staffs of the three cabinets, making for an ineffective office. In the Federal Power Act of 1935 the scope of the commission was extended to include the interstate transmission of electricity and natural gas. Through the sixties, resulting from several Supreme Court decisions, the power of the commission was extended to intrastate transactions, as long as the firms that were parties to the transactions transmitted power or gas across state lines. In 1977 the FPC was reorganized as the Federal Energy Regulatory Commission (FERC).

Regulation Under Increasing Returns to Scale

From the inception of the industry, it has been held that vertically integrated power production—power generation, transmission, and distribution—was a decreasing cost industry and therefore required significant regulation. Even at the municipal level, exclusive territories were granted to firms in order to promote efficiency in production and distribution, but often the exclusive territory was a de facto arrangement.

Despite the restructuring that occurred in the 1930's, there was very little remotely competitive about power markets until recently. Joskow notes[15] that throughout the 50's and 60's investor owned utilities (IOUs)[16] earned rates of return that, while regulated, still granted them rents due to the low and stable price of fuel. IOUs often granted rate reductions without incentives from regulators. Demand grew continuously at about 7 percent per year.[17]

Beginning in the early 70's and coinciding with energy shocks, utilities began requesting frequent and significant rate increases due to increased fuel prices. At the same time they began searching for alternatives to the fossil fuel generation that had been common up until then. One of the major new technologies was nuclear power generation. There was also the realization that larger central generating facilities were more efficient. With the need to increase capacity, joint ownership of capacity became common.

Through the late 60s and early 70s IOUs began investing heavily in new nuclear generating capacity. But there was a decline to 1.6 percent per year in peak demand growth.[18] Consequently nuclear programs stalled as the decade ended. Utilities were left holding or building significant capacity even while fuel prices began to fall through the mid 80's. Although prior to the fall in energy prices, estimates of potential crude oil costs had reached $100 per barrel.

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[15] Joskow 1989
[16] Throughout this paper the focus is tacitly on IOU's and their regulation. Nothing meaningful has changed about the structure of municipal and cooperative power markets. They generally have exemption from most FERC oversight.
[17] Studness 1995
[18] Studness 1995

Despite the excess capacity, utilities still enjoyed the protections of regulation, with its incentives. Even as the energy crisis ebbed through the 80's, producers continued to invest heavily in new capacity. In a competitive environment the fall in fuel prices in the mid-eighties would have driven the price of electricity down to a level that would have made continued investment in new capacity unthinkable. Managers failed to note this and regulators ignored it throughout the eighties.[19]

The Importance of the Public Utilities Holding Company Act (PUHCA)

PUHCA was an additional hindrance to the development of an efficient electric power market. While a few holding companies were involved in less than reputable transactions that ultimately caused the demise of the holding company, some of the restructuring under the holding companies was a transitory, competitive response to the prevailing corporate structure: a reorganization to effect a more competitive, efficient industry. This view implies that PUHCA halted beneficial industry change in mid transition, leaving the industry in regulation induced limbo until recently.[20]

There were considerable restrictions placed on holding companies that could not qualify for an exemption to PUHCA. If a holding company was subject to enforcement under PUHCA:

- The holding company had to operate as a single integrated entity
- SEC restrictions mandated that transfers between subsidiaries be made "at cost."

[19] Studness 1995
[20] Gordon 1992

- The holding company had to engage only in activities related to the provision of electricity.
- Public utilities could not own both gas and electricity.
- The SEC had to approve all mergers and acquisitions and issuances of securities, as well as regulating the financial structure.[21]

As it became apparent to experts in the regulation of electric utilities that the industry was changing, PUHCA was acknowledged to be a major cause of continued inefficiency in the industry. Many aspects of regulation have changed since 1935, and financial analysis and accounting standards have evolved. PUHCA has been credited with limiting the choice of organizational structure, restricting the market for corporate control, and limiting the ability of utilities to diversify across regions and industries. By not being allowed to adjust to modern market conditions, utilities were handicapped by inappropriate regulation and oversight and were exposed to suboptimal incentives that ultimately raise cost to the final consumer.[22] PUHCA was an example of the problems associated with regulation: a resistance or inability to change to accommodate market forces.

While legislative change has been slow, Congress has not been deaf. With the passage of the Electricity Policy Act of 2005, PUHCA was effectively repealed.

[21] Joskow 1989
[22] Geddes 1996

Transition to Competitive Wholesale Generation Market

The movement toward restructuring came with the passage of the Energy Policy Act of 1992 (EPAct). EPAct gave the FERC the authority to design a plan to proceed with power market restructuring throughout the United States. The plan came to fruition with Order 888 and 889. Order 888 required utilities to establish procedures for implementing non-discriminatory transmission tariffs with the intent of promoting wholesale generation competition—effectively procedures for implementing wholesale wheeling nationwide. Order 889 was designed to establish the Open Access Same-Time Information System or OASIS. OASIS allows for wholesale generators access to real-time information about pricing, demand, and capacity with the intention of facilitating wholesale competitive markets. These changes were necessary to develop a competitive, interstate market for wholesale power. Non-discriminatory tariffs are necessary to prevent vertically integrated utilities from exercising discriminatory market power. Additionally real-time information eliminates the central problem associated with the electric power industry: the continuous, physical market clearing requirement imposed by technology. Without real-time information, opportunities for the exercise of market power would develop as markets are unable to adapt symmetrically to changing conditions. This is the current problem with retail electric competition without real-time pricing.

While EPAct did not grant FERC the authority to impose retail wheeling—allowing markets to develop independent of regulatory jurisdiction and transmission ownership—several states have implemented their own deregulatory schemes, most infamously California, although most of the others have not faired as badly for various reasons. By

February 2003 significant portions of the country were actively restructuring retail electricity markets.[23] The entire northeast—west to Illinois and north of North Carolina with the exception of Vermont, West Virginia, Kentucky, Indiana, and Wisconsin—was actively restructuring in 2003. Other states that restructured are Texas, Arizona, and Oregon. The rest of the country either has delayed restructuring or is not currently interested in restructuring at this time. California is notable for suspending restructuring after being one of the original states to restructure.

Issues:

Most past analysis has looked at persistent issues that emerge with restructuring: concentration and market power; the consequences of market trading of electricity; transition costs; organization and governance of transmission; and the adequacy of consumer and environmental protection.[24] These issues will form the core of any analysis of restructuring.

Given that states appeared to be intent on restructuring their energy markets, it is important to understand the peculiar nature of electric power generation. On a broad level, the market is structured in three tiers: generation, transmission, and distribution. No restructuring plan has suggested that transmission and distribution should be restructured. It is assumed best to run transmission and distribution as franchise monopolies, with regulation. Due to congestion, there is a significant body of analysis on

[23] EIA
[24]Trebing 2000

the proper role of the regulator in determining the efficient provision of transmission infrastructure.

Joskow acknowledges that electricity has its own unique attributes.[25] Electricity is very difficult to store at low cost and generally requires "just-in-time" production and consumption. There are very low short run demand and supply elasticities resulting in very volatile spot markets. Due to the physics of electricity, there are opportunities for market power at different points in power networks that can adversely affect market prices independent of electricity demand.

There is a consensus that the restructuring that is occurring is not deregulation. [26] Trebing outlines the general features of restructuring legislation.[27] The states began to restructure beginning in 1996 with Rhode Island followed by California, Pennsylvania, and Massachusetts. Generally the legislation included some mechanism for stranded cost recovery.[28] Most laws have included price caps on service for limited periods. And they required some separation of transmission and distribution from generation at the state level. While they differed in the details, most restructuring initiatives would include variations of these themes.

In restructuring, the markets developed various participants. Restructuring has given rise to marketers, brokers, and resellers who operate within spot and futures markets, regionally, to deliver power at something resembling competitive prices. As these are economic agents, they have incentives to optimize given the structure created by regulators and legislators in the states. Any analysis of restructuring issues has to focus

[25] Joskow 2003
[26] Hogan 2002, Trebing 2000, Wolak 2001, and Joskow 2003
[27] Trebing 2000
[28] Stranded costs are the difference between the accounting value and market value.

on the incentives of these agents. As an example, a lack of bilateral, real-time information would allow a broker or reseller to take advantage of short-term market asymmetries—allowing for rent-seeking when the planned "market" does not allow for offsetting behavior by other financially interested parties.

Transition Costs:

Restructuring is not free of cost. Transition costs accrue because the optimal decisions made when the states' markets were heavily regulated are different from the optimal decisions made under less stringent regulation. The decisions required for capacity planning require years to implement, as seen in the case of nuclear generation. As a result, regulators and politicians have felt compelled to smooth the transition from regulation to competition for the incumbent firms. While regulators and incumbents have been in favor of transition charges placed on market participants, competitors who are not entitled to the transfers have opposed them as anticompetitive subsidies for incumbents. Another possible reason to oppose the transition charge is because the investments themselves may not have been prudent, even when utilities faced the capacity uncertainty described. And there is anecdotal evidence that transition charges have thwarted the development of competitive generation.

Transition charges are principally tied to the issue of the recovery of stranded costs. The term "stranded cost" is unique to the electricity restructuring, but it is essentially a term to describe sunk costs, or those costs incurred by the firm that are not taken into account when making the decision to produce or not. Stranded costs in this case include

investments in capacity made during the late seventies and eighties that were made with the expectation of high fuel costs. Many are nuclear investments but there are some that include plants fired by alternative fuels and coal.

The idea behind stranded costs is that the firm is unable to recoup the cost of capital as the price of electricity falls, or the returns to capital fall below the cost of capital. But to further complicate the problem, utilities complain that the decision to incur these costs was made while the utilities were still under the regulator's oversight and were therefore prudent investments when they were made, given information about future fuel costs. Utilities also claim that a "regulatory compact" exists or existed with regulators and that these costs were incurred under the full and justified expectation that rates would be adjusted to allow for the recovery of construction costs.

Several authors argue that the argument for the recovery of stranded cost is dubious at best. There is no economic efficiency argument that can be made regarding the recovery of stranded cost. [29] The basis for any argument is equity and morality. While the value of capital falls as a result of a decline in expected future returns relative to book value, or the accounting or historical value of capital, this does not affect the decision whether the utility will continue to produce or not. It does have an effect on the market value of the utility, but it does not impact the future solvency of the firm.

As regulatory policy, Maloney and Sauer suggests that firms should not be allowed to collect stranded costs.[30] The role of the regulatory commission is to act as a proxy for market forces[31]—their decisions should approximate what would prevail if competitive

[29] Maloney, McCormick, and Sauer
[30] Maloney and Sauer 1998
[31] Actually, the role of the regulatory commission is to as an agent of the legislature, with its own incentives, but that issue will be addressed later.

markets were available. The regulator acts in response to decisions by utilities, making decisions designed to approximate market outcomes. The utility still acts as a profit maximizing firm, with both quality and rate of return determined by the regulator. Further, as investors voluntarily accept risk in a market environment, their return is determined by market conditions and firm decisions. Consumers, or their agents, do not voluntarily accept risk by contracting with monopoly utilities. It is unjust for consumers to bear risks that should be borne by investors making voluntary decisions. Market data bears this out. Maloney and Sauer cites two studies that show utility bond rates in excess of government bond rates. If investors had not expected risk, then bond rates should not have been different. It is irrelevant whether the risk is a result of ex ante firm response to regulators' restructuring or other unforeseen circumstances, the premium exists in either case. It is improper for government to compensate producers for firms' mistakes or regulatory uncertainty.

Furthermore, some of the investments in capital made by utilities may not have been prudent. Studness notes that, even after fuel prices fell in the mid eighties, many utilities continued to expand capacity.[32] Based on unrealistic expectations of future demand, utilities continued to invest in capacity even though current fuel prices had fallen – they never heeded standard market signals. The new capacity caused an 18 percent decline in the book value from 1974 to 1983, yet they continued to invest in capacity.

The arguments in favor of stranded cost recovery are less convincing. One line of reasoning holds that, if stranded costs cannot be recovered, then the quality of utilities' debt will fall, raising the cost of capital to utilities. Maloney and Sauer shows us the fallacy of the reasoning. The argument implies that the risk inherent in the electricity

[32] Studness 1995

production was being borne by parties other than the utilities, such as consumers. Consumers, through inflated rates, are subsidizing firms' debt.

Another argument in favor of stranded cost recovery holds that a regulatory compact exists between utilities and government. First, there is no explicit agreement—it is at best implicit. Second, to suggest that there is a compact is to imply that consideration has been extended, that the compact is a bilateral agreement. It is not apparent that this compact, if it exists, is at all bilateral. That the states are willing to depart from the agreement after 100 years implies that consideration has not been rendered and that the states have found a more efficient means by which to ensure the provision of electric power.

The courts have weighed in on the issue of stranded cost recovery at various times, albeit tangentially. In Duquesne Light Co. v. Barasch from 1989, the court held that there was no constitutional guarantee of the recovery of stranded cost by holding that, "A state scheme of utility regulation, such as is involved here, does not 'take' property simply because it disallows recovery of capital investments that are not 'used and useful in service to the public'."[33] It has been suggested that true, regulated marginal cost pricing would violate the taking clause, but changing the rules by allowing competition is consistent with the court's findings in Federal Power Commission v. Hope Natural Gas Co. In that case from 1944, the courts found that states were not bound by any particular formula in determining the appropriate rates for interstate natural gas sales.[34] With the exception of setting rates at or near the true marginal cost of electricity, changing the rules seems not to violate the takings clause of the constitution.

[33] http://www.hemplinglaw.com/cases/488US299.htm
[34] http://www.hemplinglaw.com/cases/320US591.htm

Smith[35] places stranded costs within the restructuring framework. Utilities had a legal obligation to maintain capacity in the face of dynamic demand and cost conditions. It is possible that extensive capital investments would be necessary in the face of energy uncertainty, especially in the late seventies. The early investment in nuclear energy could be justified as a long term hedge against the uncertainty of fossil fuel prices. In the heavily regulated period, cheap base load capacity would be a long term goal of utilities. Nuclear investments represented cheap base capacity, especially given the uncertainty of oil prices at the time.

While California's restructuring allowed the IOUs to recover stranded cost, the utilities were not allowed to recover full stranded costs. Smith makes the argument that a quid pro quo existed between regulators and the IOUs. By demanding that capacity be provided in the long run, IOUs were to be guaranteed to be compensated in the long run at a guaranteed rate of return. But the agreement was implicit. There is no reason why regulators would be required to guarantee the recovery of stranded costs.

But as one commentator[36] points out, while stranded costs have been allowed, market prices of generating assets have been greater than the estimated value before the bids, the value that determines stranded cost. In almost every case where utilities divested generating assets, the assets brought higher than estimated value in the market as measured by sale prices. Fossil fuel generation has not had the problem of stranded costs, but this is not necessarily true of nuclear generation. Trebing observes[37] that utilities have foisted the importance of stranded cost recovery on regulators for the entire restructuring period. Unfortunately reality has betrayed the IOUs. Potential new

[35] Smith in Bilas 1999
[36] Bilas 1999
[37] Trebing 2000

competitive entry has seen these stranded assets priced well above book value, on at least one occasion 93.4% above book value.[38] A case where the argument in favor of stranded cost recovery may be valid involves the prudent investments in nuclear capacity. These assets have little value in the market, making them quintessentially stranded. Fortunately the marginal cost associated with nuclear production continues to make these assets viable for base load generation, and evidence exists of planned investments in nuclear capacity.[39]

Concentration and Market Power:

In the United States, competition has been stalled in electric power industry since prior to the passage of PUHCA. All states have incumbent power producers who have acted as the default provider of electric power. This is a direct consequence of PUHCA. Most restructuring plans have explicit provider of last resort provisions to protect consumers from the discipline of competition. The result has been the inadvertent creation of market power in the restructured markets. By creating default providers, competition on the retail level is undermined. By having the default provider provision, incumbents are guaranteed market share undermining new entry by firms. [40]

Besides the presence of incumbent power providers, there are other opportunities for the exercise of market power in restructured markets. Before any decision to restructure is undertaken, expected persistent market power should not exist in the restructured

[38] Trebing 2000
[39] Duke Power. "Duke Power Selects Cherokee County Site for Nuclear Plant Application." News release, Mar. 16, 2006
[40] Bilas 1999

market.[41] One of the major failures of many restructuring plans has been price controls enacted to prevent the persistent exercise of market power. Incumbent power providers, combined with price controls to prevent market power that should not exist anyway, guarantee that competition in generation will not occur.[42]

The importance of price controls in preventing competition is also expressed in Crow.[43] California fixed retail rates for utility distribution companies. Crow notes it was the fixed retail rates that prevented competition in the California market. As the wholesale spot prices rose in 2001, it was the new entrants who left the market as they could not compete with the regulated incumbents. Pennsylvania also had similar problems as California, albeit to a lesser extent. When wholesale power prices rose in Pennsylvania, the new retailers were abandoned in favor of the traditional utilities and rate caps. Crow discusses retail pricing at length. Like other analysis of electricity regulation, the consensus is that California's restructuring plan, with price caps and the competitive transition charges, prevented entry by competing firms. Whatever advantage entrants could get was consumed by the competitive transition charge. As noted in Hogan,[44] when the legislature decoupled electricity prices from reality by fixing retail prices—when wholesale prices rose—the utility distribution companies affected, PG&E and SCE, were forced to purchase at the wholesale rate, but sell at the fixed rate, driving PG&E into bankruptcy and SCE to the brink. The state of California had to enter the market on their behalf to purchase electricity, as the wholesale generators would not sell to the insolvent utilities. The lesson, as with transmission, is that arbitrary market

[41] Hogan 2002
[42] Bilas 1999
[43] Crow 2002
[44] Hogan 2002

interference by regulators and legislators, divorced from economic reality, can have serious effects on emerging restructured markets. Wolak[45] suggests that the ability to offer a menu of options to retail consumers based on a portfolio of spot and future contracts is all that is necessary to ensure competition in the market. The problems in California could be avoided by employing such a market design. The private contract approach could have eliminated the need by the state of California to enter the wholesale market.

Organization and Governance:

The organization and governance of restructured electricity markets is an important aspect of the restructuring. It is important to know what is the role of the regulator in the restructured market.

Since the passage of PUHCA in 1935 and prior to recent legislative changes, the states were the dominant regulator because PUHCA limited the geographic scale of IOUs and required incorporation in the primary state they serviced. The result has been a patchwork of regulations across the United States. At the federal level, the FERC regulates the interstate IOUs. With both federal and state regulation there is overlap, but not always cooperation between FERC and the state regulators. State and federal regulators often have divergent goals.

Wolak[46] argues that wholesale electricity markets in the United States will not yield consumer benefits relative to the vertically integrated formerly regulated utilities due to

[45] Wolak 2001
[46] Wolak 2001

the divergent goals of regulators between the retail and wholesale segments of the electricity market. Wolak holds that it is because of these divergent goals that tangible benefits to consumers have not accrued.

Wolak[47] notes that neither public utility commissions (PUCs) nor incumbent IOUs benefit from the introduction of wholesale competition. Because FERC is responsible by statute of enforcing just and reasonable rates, the PUCs can often pursue their own goals that include collaborating with the IOUs, with plausible deniability. FERC's policies may also conflict with what legislators and PUCs believe should be optimal policies to protect consumers.

The role of FERC in the restructured market will be less proactive and should not be to bail out consumers for their lack of foresight. On the national level because of the responsibility mandated in the Federal Power Act, Wolak outlines two alternative means by which FERC can implement competitive restructuring: eliminate the just and reasonable rate standard of the Federal Power Act when a market makes the transition to the ISO[48] model of wholesale competition, and FERC can issue an order stating that, at a pre-specified date, all transactions are per se just and reasonable because they involve voluntary trades between willing buyers and sellers. The date should be two or three years in the future.

Because of lags in market response caused by the time required to build new generation, the two or three year condition is necessary. Wolak does not mention the possibility of the placement and installation of small-scale natural gas generation technology, notably microtrubines, which could be used to fill the market void. This is

[47] Wolak 2001
[48] Independent System Operator

conditional on the assumption that the turbine technology would be cheaper than existing peak-load generation. But if micro-turbine technology is not feasible and the lag is not built into regulation, consumers could be required to pay inflated rates for as long as two or three years.

The state regulators have different incentives to guide their decisions. When regulators demand forward contracts and the spot price falls below the forward price, there is pressure from legislators and consumer advocates. But once the regulator allows aggressive competitors to eschew forward contracting, in favor of greater risk in the spot market, there is no pressure because no forward price exists. Fortunately Wolak outlines a solution. The competitive market will solve the problem of spot price risk by allowing retailers to provide a menu of pricing options from which customers can choose. With customer choice, the consumer makes his own choice of risk to bear. These incentives require two features for effective, competitive restructuring: the regulator must be immune from the consequences of allowing wholesalers to mitigate risk in forward markets and must focus regulation on protecting consumers by limiting the incentives of wholesalers to speculate in electricity markets.

In transmission there is a more proactive role for the regulator at the national level. Trebing[49] documents that FERC has continued to have a hand in establishing guidelines for transmission organization and governance. In December of 1999 FERC issued Order 2000. It set general guidelines for transmission organization, calling for the "voluntary" formation of regional transmission organizations and an end to vertically integrated supply systems and greater innovation in pricing to promote regional transactions.

[49] Trebing 2000

Other research has noted the importance of regulators in state markets. Hogan,[50] citing Joskow and Schmalensee, notes the importance of managing externalities associated with a constrained transmission system. The regulator will need to monitor the accumulation of rents by transmission firms.

There is almost no disagreement on the ability of competitive markets to manage capacity in the generation market. Given the base load, peaking units cover the peak demand in times of intense power use. But economists have underappreciated the problem of capacity in the transmission system. While Hogan refers to transmission capacity constraints as externalities, because they are congestion, this characterization leads one to treat the transmission problem the same as any other congestion problem. As a result, it is indeterminate property rights that are the important issue when dealing with transmission.[51] The potential for rents exists when congestion is present, but most transmission management schemes ignore the important role of congestion rents in the market allocation process. By allowing rents to accrue to the owners of transmission capacity, allowing for entry in transmission and long-term contracting in transmission services, firms can efficiently supply transmission capacity, even with variable demand through the day.

Regulators have other functions in the states besides monitoring the behavior of wholesalers and retailers and transmission rents. Plant site selection would continue to be the responsibility of regulators. Others have noted that it was site selection problems that contributed to the failure of restructuring in California.[52]

[50] Hogan 2002
[51] Demsetz 1968
[52] Bilas 1999

Consumer and Environmental Protections:

Consumer and environmental protections have occupied a considerable portion of the analysis of electricity restructuring. The general view is that protections are necessary to prevent wholesale generators from exercising market power, but this view is not universal.

Wolak's market framework[53] provides the optimal plan for consumer protection: no protection. But this solution is not as draconian as it seems. His premise allows for consumers to select the service they prefer, based on the risk-return tradeoff between future and spot market contract portfolios held by electricity retailers. The competitive market will solve the problem of spot price risk by allowing retailers to provide a menu of pricing options for the customer to choose from. With customer choice, the consumer makes his own choice of risk to bear.

Trebing[54] does not allow for market determination of consumer preferences. Much like state restructuring legislation, Trebing's vision of consumer protection is derived from the lack of real-time demand pricing in the market. Environmental and consumer protections are a significant feature because residential and commercial customers have not had the same influence in the market as larger industrial customers. Residential and smaller commercial customers have been in a relatively disadvantaged position because of their diffuse interests. Trebing acknowledges three options for direct consumer protection in the states: price cap regulation, procurement aggregation, and the certification of deregulated suppliers. All three options require vigilance from the

[53] Wolak 2001
[54] Trebing 2000

regulator, unlike Wolak's model. Trebing accommodates funding or subsidizing high cost markets or low income consumers.

The contrast in the two approaches is striking. Wolak's model requires only the will to credibly force consumers to potentially pay the spot price of electricity. Trebing, while protecting consumers, requires successive layers of regulation. Parsimony would suggest that Wolak's vision to be the most efficient restructuring strategy.

Wolak does not directly address environmental policy in electricity restructuring, but his approach facilely accommodates consumer preferences in electricity consumption. Currently many types of technology are inefficient in the fixed price market. With real-time demand pricing, these technologies become cost effective in peak hours. Customers will also have the opportunity to invest in the technology of their choice through specialty retailers. One example is solar panels:

> Consequently, a solar panel or other durable but high cost generating technology is a hedge against having to pay very high spot prices. The risk of high spot prices during the hottest hours of the summer when the solar panel is most effective provides strong incentive for a rational consumer to invest.[55]

Many other technologies that are of low capital cost, but costly to operate would also fall into this category.

Trebing observes that most restructuring plans require regulation for the provision of "earth friendly" energy alternatives. The adoption of "Renewable Portfolio Standards" (RPSs), a policy that dictates the minimum amount of electricity that must be generated

[55] Wolak 2001, p. 37

from renewable sources, has been adopted by restructuring states as a means of instituting environmental policy in electricity generation.

Comparing the heavily regulated approach that comes with environmental mandates such as RPSs, versus the market approach that comes with real-time demand pricing, the latter is more efficient in determining the market allocation of environmental goods.

Consequences of Market Restructuring of Electricity:

Due to the unique characteristics of electricity, most analysis has focused on the form of the restructured market. With planned markets, expect unexpected consequences, especially considering persistent, long-term regulation. Market trading of electricity can refer to trading on formalized markets, or it can refer to the development of retail and wholesale markets. As restructuring attempts to resemble more efficient markets, it is irrelevant to talk about formal exchanges or mutually beneficial exchanges. The term will be used to describe all exchange in the restructured markets.

A substantial number of mergers and acquisitions have occurred since changes in federal rules were enacted. They have served to expand substantially the territories of the original distributing utility. Trebing notes that cross-industry mergers between gas and electric utilities have become more common in the last decade. He cites 22 acquisitions of gas companies since the start of the latest industry merger wave in the early nineties. If mergers and acquisitions in the industry continue, the question of whether the consolidation will lead to further competition, or oligopoly and sophisticated market structure and pricing strategies, will have to be addressed. Trebing notes that many

studies have found pricing well above marginal energy costs in the states that have enacted restructuring.

There are several studies that have analyzed vertical mergers and acquisitions in the industry. Brennan[56] observes that vertical mergers in the industry limit the provision of complements, rather than substitutes, and their characterization as "vertical mergers" is misleading. Market power that is horizontal in the input market is germane to the analysis. Convergence mergers are irrelevant if the generator is gas fired—the gas producer already has market power. Efficiency in vertical mergers occurs when "double marginalization" is prevented. This is when suppliers of the input and producers of the final good both exercise market power to limit production. By engaging in a vertical merger, the combined firm can more efficiently exercise market power, raising profits for the firm and lowering prices for consumers.

Hunger[57] analyzes mergers and acquisitions from the perspective of "raising rival's cost." If the a merger occurs, the upstream gas producer can exercise his market power to both capture rents and—by raising rival's cost in the downstream market—increase profits for both the gas-fired subsidiary and non gas-fired producers by increasing rival gas-fired firm's cost.

Most analysis of restructuring looks at the importance of energy trading to the stability of the market. The conflict focuses on the effects of energy trading for consumers. Trebing[58] claims that energy trading is bad for consumers. He also claims that energy trading leads to price risk for consumers. Unfortunately he leaves these claims unsubstantiated in his analysis.

[56] Brennan 2001
[57] Hunger 2003
[58] Trebing 2000

Other analysts believe energy trading is necessary for the basic stability of the market. Crow[59] notes the importance of dynamic electricity markets. In that electricity markets are dynamic, it is important that market participants be able to mitigate risk through long-term contracting. The gaming that occurred in California can be directly attributable to the failure to design other than spot markets for electricity.

Wolak[60] echoes the belief in the dynamics of markets and incentives. It is necessary for real-time demand pricing to be implemented in order for a stable market to develop. Markets are bilateral. While regulators in most states have been willing to relinquish control over the wholesale generation side of the market, they have been reluctant to extend the freedom to the retail consumption side. Wolak reinforces that regulators not relinquishing control of the retail side of the market is sufficient to create the conditions necessary for gaming by wholesale producers in the market. Regulators must relinquish real-time control of the market to create the conditions for efficient competition.

Wolak has three criteria that must be met before any real benefits will be generated in restructured markets:

1. Real-time metering must be implemented so that real-time demand pricing can occur concomitant with pricing in the wholesale market
2. Retail competition must be implemented in a way that does not favor incumbent utilities
3. There must be continued monitoring of the retail market by regulators in such a way that the interests of consumers are enhanced, rather than hindered, by competition

[59] Crow 2002
[60] Wolak 2001

By creating a market structure that follows these general guidelines, an efficient and sustainable market structure can be created.

Due to the physical characteristics of electricity, there is an incentive conflict in the creation of electricity markets. Consumers only have the incentive to make forward market purchases of electricity that are necessary to mitigate market risk only when a retail market infrastructure exists. But the retail market infrastructure that exists does not penalize the purchase of energy on the spot market due to price and bid caps. Wolak's basic premise is that the only way market efficiency can come about in electricity markets is if consumers have an incentive to change their behavior. But as long as regulators do not require consumers to bear the costs of their decisions, consumers will never change their behavior.

Unlike most analysis of market policies, Wolak does not believe anything other than real-time demand pricing will deliver benefits to consumers. The belief is based on the understanding that load profiling already provides nearly efficient prices if prices are uniform for a month. Gains from competition derive from the ability of consumers to respond to real-time market prices.

On the production side, consumers benefit when producers can compete on different product dimensions. When real-time metering is not present, the only dimension for competition is in monthly average price to consumers. Without real-time metering, there is asymmetric treatment of incumbent retailers to other retailers. As shown earlier, preferential treatment of incumbents will prevent entry by competitors, dissipating the benefits of restructuring.

An additional problem with conflicting visions of market restructuring is the coordination of generation and transmission. With uniform monthly pricing based on load profiling, fluctuations in energy consumption allow for differing levels of congestion in the transmission grid. This creates several problems on the transmission side of the market. Because of congestion, the ISO must actively manage the distribution of power at nodes along the grid. A failure to manage this congestion can lead to failures in the entire system. With congestion, there is the opportunity for the pricing of transmission capacity due to scarcity of inter-marginal capacity. But with the pricing of capacity, congestion rents can accrue. Most analysts do not believe that rents should accrue to the owners of scarce capacity, and this is consistent with the regulator's mentality of electricity production.

There is another way of looking at the problem that is consistent with Wolak's real-time pricing. Because consumers change their behavior in response to real-time pricing, this will affect the structure of locational rents that could potentially accrue with transmission pricing. As consumers respond to real-time price signals—either as industrial and commercial producers change their schedules to minimize their exposure to prices, or as individuals making lifestyle decisions to optimize in the face of price signals—it may make a substantial portion of transmission management unnecessary. Consumers will smooth their load profiles in response to pricing signals. This smoothing has the effect of making the congestion problem, if not irrelevant, significantly muted.

There is empirical evidence from New England that changes in the structure of demand could mitigate transmission constraints. Hale et al.[61] notes that the assumption that the transmission grid can effectively transmit power from high cost to low cost

[61] Hale 2000

regions is untested. Their model of the U. S. Northeast suggests that current capacity, as of 1997, would not allow for price equalization across the regions due to specific transmission constraints in key areas. They observe that, "Policies that allow competition only among electric generators without additional changes in the design and regulation of the transmission system will not deliver the dramatic price reductions that motivated policymakers to introduce competition in generation."[62] Hale suggests that prices are extremely sensitive to transmission line limits and the addition of small generators in areas where transmission congestion exists. If true, it suggests that changes in peak demand could have the same effect as changes in capacity, something that could be achieved with real-time pricing. Hale suggests that changes in regulation and the behavior of deregulated generators could enhance or hinder interstate price equalization. But even with regulatory uncertainty, changes in the structure of consumer demand to real-time pricing could substantially affect nodal pricing and constraints.

If consumers are induced to change their consumption by responding to real-time pricing, the role of the regulator changes from focusing on the management of congestion to monitoring the portfolio decisions of retailers. This is the new role of the regulators: to mitigate risky behavior by retailers.

An additional issue with restructuring is the decision by firms to create qualifying facilities. Dismukes and Kleit[63] observe that retail rates across the states vary widely, a condition that can lead to different incentives for cogenerators across states. Theoretically three states can exist for a cogenerating firm. The cogenerator can purchase all of its electricity from utilities if the retail price is less than the long run

[62] Hale 2000
[63] Dismukes 1999

marginal cost (LRMC) of the potential cogenerator. Another scenario is for the LRMC of the potential cogenerator to be greater that the LRMC, or "avoided cost," of utilities, but less than retail price. In this case the firm "self-generates." This scenario is socially inefficient because the cost to the cogenerator at this point is less than retail price, but greater than the utility's avoided cost. Finally, if the LRMC of the cogenerator is less than the avoided cost of the utilities, then the firm produces its own power and sells the rest back to the utility at a price equal to avoided cost.

If the real-time market leads to overall lower prices and lower peak-load prices, then firms are less likely to make the decision to invest in cogeneration, leading to more efficient production as industrial firms purchase from utilities at competitive rates. Firms that face a flatter hourly cost curve are more likely to avoid cogenerating when the firm's cost is greater than utilities' avoided cost.

An additional incite from Dismukes is the existence of potentially stranded assets among industrial generators within states. If large savings were to occur, firms whose former incentive was to install cogenerating facilities now have stranded assets of the same sort as utilities.

Conclusion:

Many issues have to be reconciled before constructive restructuring can occur. Because consumers do not recognize electricity as a good, a combination of smooth transition and tough love may be required to effectively transition markets away from the former command and control model of the past, to a more efficient, consumer responsive model for the future. There is a sense among analysts that this is the case.

Some commentators have determined that, in the rush to reinvent competition in electricity markets, there were significant lapses in analysis. Specifically there is a lack of understanding in determining efficient transmission and distribution.[64]

There is also the sense that restructuring may not be in the interests of some consumers right now. Crow suggests that retail competition may not be desirable due to transactions costs associated with switching suppliers. But ultimately the lesson derived from Crow is that restructuring should be given time to work and to be done right.[65]

States will continue to fail at restructuring when they do not coordinate national and state policies, continue to follow policies that do not require discipline by consumers, and follow policies that strive to promote fairness by giving incumbent utilities advantages that stifle competition in newly restructured markets. Until control is relinquished over prices and preferences, there will be failures in restructuring.

[64] Bilas 1999
[65] Crow 2002

CHAPTER TWO
THE EVOLUTION OF THE ECONOMIC THEORY OF REGULATION AND ITS CONSEQUENCES FOR ELECTRICITY RESTRUCTURING

The economic theory of regulation is important to understanding the relationship between government, the electric utility industry, and the industry's customers. It is fundamentally the expansion into the direct regulation of firm's economic activity that has led to the current structure of the electric utility industry in the United States. But in studying the effect on the industry of government regulation at the state and national level, it is important to understand the general theory of regulation in the context of all economic activity.

Any modern analysis of economic regulation since the late sixties should acknowledge the seminal contribution of George Stigler and the Chicago tradition of economic analysis. In a series of papers beginning with Stigler's "The Economic Theory of Regulation" in 1971, there occurred several important advances in the analysis of regulation. In chronological order—Stigler, Posner, Peltzman, and Becker contributed incrementally to develop an understanding of the demand and supply of regulation and its application to electricity markets.

Stigler on Regulation

Stigler[66] observes that the heart of regulation lies in the coercive powers of the state:

[66] Stigler 1971

> The state—the machinery and power of the state—is a potential resource or threat to every industry in the society. With its power to prohibit or compel, to take or give money, the state can and does selectively help or hurt vast number of industries.[67]

But Stigler does not believe regulators are arbitrary in their edicts. Stigler's theory of regulation relies on the rationality of political systems to provide and extract resources from members of society—independent of their endowment or ability.

The economic theory of regulation relies on the ability of the state to coerce citizens. The result is a requirement that citizens must appeal to government for the benefits of regulation. According to Stigler, industries generally seek four policies:

1. Direct subsidy of money to the industry
2. Control over the entry of new rivals
3. The suppression of substitutes or complements
4. The administration of price controls

While industries attempt to gain these controls from regulators, there are limitations on industry that thwart change. Smaller firms generally gain more from regulation in proportion to their size than larger firms do. Dealing with legislatures and bureaucracies has a cost. And political processes automatically admit outsiders whose interests differ from that of the industry.

The benefits that accrue to an industry or other special interest will be generally less than or equal to the damage caused to the rest of the community. Additionally Stigler notes that there are costs to obtaining legislation above and beyond what the group

[67] Stigler 1971

demanding regulation may incur. The nature of government decisions requires that the decision process be fundamentally different from the market process. To that end, voters employ representatives with wide discretion. The political process also does not allow participation in proportion to knowledge or interest in response to the requirement of participation by all actors. Ultimately, any group seeking regulation must be willing to deliver votes and resources to representatives in order to benefit from the political process.

Stigler finds that the regulators will act in ways that benefit their support base, subject to the implicit costs of providing regulation. Stigler's thesis that there is a demand—in response to benefits that industry could hope to accrue—as well as a supply of regulation—subject to the cost or provision of regulation by representatives or regulators—forms the basis of the economic theory of regulation.

Posner on Regulation

According to Posner[68] in concurrence with Stigler, prior to 1958 with the founding of the *Journal of Law and Economics*, the professional consensus held that markets operated inefficiently and that government regulation is costless. Stigler refutes both hypotheses. Under the assumption of inefficiency and market failure we would expect regulation in highly concentrated industries and in industries that generate substantial external costs and benefits, neither which is the case.

The public interest theory of regulation, according to Posner, holds that regulation is enacted with a public purpose, but is mismanaged so that the public purpose is never

[68] Posner 1974

achieved. This view ignores the evidence that groups lobbying for the regulation often desire socially undesirable results. The second criticism is that there is little evidence that mismanagement is occurring. And the evidence that does exist is consistent with theories that hold that regulation is often designed to be suboptimal from an economic standpoint. There is also no persuasive theory to explain why regulatory agencies would be less efficient than other organizations. Agency heads have an incentive to enforce diligence and honesty, and his employees may one day want to work outside of the regulatory bureau, a prospect difficult if he is shown to be incompetent in the bureau.

Many of the tasks assigned to regulatory agencies are often intractable. An important example is public utility regulation. The regulator is required, if he is to regulate effectively, to determine independently the costs of the regulated entity—an impossible task given the incentives of the regulated. Another problem with regulation is the cost of effective legislative supervision. As monitoring is costly and the legislature loses interest through time, the legislature may eventually neglect to monitor the regulatory agency, especially as regulation propagates.

There are significant problems with this formulation of the public interest theory. There is no mechanism for the public interest to be translated into legislation. Coase through Posner suggest that the moral difference between political and private action may prevent the legislator from enacting regulation contrary to the public interest. By this view, exploitation is limited by the disapprobation of his constituency. Another approach suggests that, because there are only two dominant parties, political collusion could occur as the leaders of the parties impose their own policy preferences as the public interest.

Posner points out that there are similarities between cartels and regulatory devices regulators use to benefit the regulated. Cartels have both costs and benefits. The benefits are pertinent because regulation often has the same effect, which is to raise price above competitive levels. Just like cartels, the rise in price at best does not exceed the price that would be observed if a perfectly enforced cartel were present. Cost is also relevant. As Stigler[69] notes, assuming that it is costly to be a member of the cartel, it is in the interests other individuals who may be in the industry to remain outside of the cartel—the free-rider problem.

Posner observes that the pattern of cartelization and regulation often differ. Regulation is demanded in industries that are difficult or unfeasible to cartelize. These industries lack good substitutes for regulation if they are to avoid competition. According to economic theory, ceteris paribus, firms in industries with relatively high price elasticities of demand will demand regulation in the absence of cartelization and concentration. Regulation is negatively related to price elasticity of demand across industries. In addition, favorable regulation requires intercession in the political process; cartelization is an entrepreneurial phenomenon. The ability of an industry to acquire regulation is proportional to its costs of participating in the political process. The differences in costs of cartelization and the cost of political participation will determine whether firms engage one or the other activities. While industries with a large number of participants will engage in political activities, it is cheaper for smaller industries to cartelize.

Posner states that, while size does limit the political influence of many industries, their size is favorable in encouraging legislation. There is a limit to this theory as it does

[69] Stigler 1971 and 1974

not give us the number of members that maximize the likelihood of regulation. Posner believed that a relatively highly concentrated industry with many employees is optimal, as the cost of cartelization is low and the potential political coalition is large in the form of employees. Through bargaining the larger employee organization can share in the distribution of profits. The notable exception to this thesis is the heavy counter industry regulation as seen in the auto industry. But as with many regulations, it is not apparent that all regulation that is contrary on its face is contrary in practice, the cross subsidy of complements such as roads being an example.

The problem with highly concentrated firms demanding regulation is that the cost of collusion falls with concentration. While high levels of employment may contribute to the allocation of favorable regulation, the ease of cartelization offsets the benefits of employment scale.

Another paradox of regulated industries, according to Posner, is the bipolar organization: regulated industries are both atomistic as in farming, or high concentrated. Atomistic industries would suffer from endemic free-riders, while highly concentrated industries would have less incentive to demand regulation. But Posner justifies the paradox by explaining that monopolistic industries gain from preventing entry, third parties often benefit from regulation that directly benefits a particular industry, and the concentration or monopoly that exists may be the result of existing regulation.

Posner notes several features of regulatory regimes that suggest that the regulatory process is "designed to achieve the ends posited by the economic theory of regulation."[70] Legislatures reduce monitoring costs by delegating rule-making to administrative agencies. Given the arguments that specialized agencies are more competent in

[70] Posner 1974

regulation than the courts and that agencies are more insulated than courts from political considerations, Posner suggests that the existence of the agencies in lieu of the courts is evidence in support of the interest group theory.

Posner also notes that third parties often benefit from regulation. The coalition of the regulated and third parties ultimately sustains regulation. As evidence Posner observes that the CAB (Civil Aeronautics Board) has never regulated non-price competition by the airlines. As airlines compete in terms of service, they may purchase more equipment than otherwise, suggesting that upstream airline suppliers would also be a benefited interest group.

Posner notes that there are significant problems with the empirical implications of the economic theory of regulation.

- The evidence could support any interest group theory. The details do not allow for delineating different theories.
- The empirical evidence that has been observed has not been systematic, suggesting that much explanation of regulation comes from anecdotes rather than a consistent set of studies.
- The observed regulation is difficult to reconcile with economic theory.
- The evidence that currently exists rejects the public interest rationale for most regulation.
- It is difficult to trace the effects of regulation.
- Why is regulation framed in public interest policy and rhetoric?

While Posner has difficulty reconciling some features of the economic theory of regulation with other alternatives, Posner represents an important step in the understanding of the interaction of the political process and the incentives to regulate.

Peltzman on Regulation

Peltzman[71] is the formalization of Stigler and Posner into refutable implications of the economic theory of regulation. Stigler clarified the limitations of the "capture" theory of government regulation—the major alternative to the naïve "public interest" theory of regulation—by noting both a demand for and cost to supplying regulation. Posner further informally investigated the incentives and implications of Stigler's theory. But it is Peltzman that formalizes the economic theory of regulation.

Peltzman begins his formal expansion of the theory by noting the essential commodity that is transacted for in the political market is wealth transfers, with constituents on the demand side and political representatives on the supply side. Essentially regulation in Peltzman's model is a bidding process between concentrated interests acquiring the privilege to tax the diffuse interests in the political process. It is interest group size relative to the cost of using the political process that determines the success of the appeal for regulation. Peltzman finds that political group size will be limited by the growth in lobbying and campaign cost and the presence of "free riders" among the group that is seeking transfers.

Among the important conclusions of Peltzman is that, even when a single interest gets all of the benefits of regulation, the benefit will be less under government organization

[71] Peltzman 1976

than under pure monopoly. Additionally, he finds that the regulator's constituency will not generally be limited to one economic interest. And because of the difficulties in translating a tax into political opposition, the regulator will tax the many to concentrate the benefits on the politically favored few. These effects will result in three propositions about the assignment of benefits of regulation:

1. Given imperfect information about the gains and losses of regulatory decisions, the size of the winning constituency will be restricted.
2. The winners will still not get the full potential gain from political action.
3. Even aligning economic interests into winners and losers, some of the losers will be admitted into the winning coalition.

Under the rubric of price-entry regulation, Peltzman's formalization has several empirical implications:

- During depressions producers generally receive protection, while during expansions regulation favors consumer protection.
- "Government intervention and regulation are both normal goods."
- "Regulatory lag" is generally stronger during demand changes than during cost changes.
- Producer protection will yield to consumer protection as an industry's technology progresses and output grows.
- The most profitable firms should have the lowest prices.
- Economies of scale and elastic demand tend to favor consumers in the competition for regulation.
- Regulation reduces risk.

There are some implications about the structure of regulated prices. Peltzman finds that regulated prices will deviate from those found under pure monopoly, but they will also deviate from those under pure competition. The regulator taxes profits by attenuating profitable price discrimination. Peltzman further finds that "cross subsidization" will take place. Posner[72] first observed that "internal subsidization" often occurs in regulated industries. The profits associated with serving one group will be used to subsidize sales to a second group. Electric sales to rural customers are often subsidized by sales to urban customers as fixed costs associated with distribution and transmission are higher for rural customers.

An implication of the form of price regulation is the necessity of further regulation to prevent entry when cost of service differs among customers in order to prevent "cream skimming," or the competition for low cost-of-service customers. Additionally, regulators will encourage entry when differences in elasticity of demand exist among customer segments in order to prevent profit maximizing price discrimination. Both phenomena can be explained by the political gains associated with preventing price discrimination or abetting cross subsidization.

Peltzman finds that the political contribution to regulation is to force a more uniform treatment of consumers. This is in addition to creating both winners and losers among the winning coalition; and while there are winners, they never gain the full potential benefit of regulation.

[72] Posner 1971

Becker on Regulation

Becker[73] contributed to the analysis of regulation by modeling the competition between various groups vying for political influence. Individuals through group membership use the political process to influence the structure of taxes, subsidies, and other political transfers.

A political equilibrium in the Becker model suggests that all groups maximize their income by optimally spending on political pressure, given the productivity of expenditures and the behavior of other groups. The model also requires that changes in influence of a group that affects taxes and subsidies will affect the subsidies and taxes of other groups. The result is a political game that is zero-sum: the net of taxes and subsidies has to equal zero.

There are several countervailing forces in political competition. Free riding will impose costs on producing pressure. Deadweight costs affect the equilibrium by encouraging the efforts of taxed groups and simultaneously discouraging the efforts of subsidized groups. And groups are only politically active as long as additional pressure raises their influence.

Out of the basic model Becker proposes several resulting propositions. The ability to produce efficiently political pressure tends to lower taxes or increase subsidies for the affected group. Perhaps more importantly, it is relative effectiveness at producing political pressure that affects transfers rather than absolute effectiveness. Due to the relative—rather than absolute—effect of political pressure, Becker suggests that too much has been made of the importance of the free rider problem.

[73] Becker 1983

The treatment of deadweight losses is important to the equilibrium in the Becker model. There is a bias towards efficiency enhancement built in to the Becker model. Increases in deadweight costs reduce equilibrium subsidies. Taxes and subsidies that generate or exacerbate deadweight losses will be less persistent than efficiency-enhancing taxes and subsidies. This creates a tendency to maintain the status quo. Becker notes that this is not the same a laissez-faire policy because there is still a tendency for government to protect the affected sector from unforeseen shocks.

Becker notes that, at least for the political sector, "sunk costs are *not* sunk." Due to the short-run inelasticity of supply and firm-specific human capital, political groups will be effective in promoting protection from industry shocks. The longer the "shock," the more ineffective protections will be for groups harmed by the shocks as the deadweight costs associated with protections increase.

An additional insight from the Becker model concerns the success of relatively small groups to relatively larger groups. When small groups lobby for subsidies or protections, they are generally more successful than taxed groups who are relatively larger. This is due to the diffusion of costs associated with taxing a large group, relative to the smaller subsidized group. Additionally, the smaller group will be smaller than the efficient size to most lobby effectively due to the diffusion of benefits of the subsidy relative to the effectiveness of additional lobbying.

Becker and Posner[74] converge under the auspices of internal subsidization. Becker proposes that public enterprises may be more efficient than private enterprises due to the effects of internal subsidization. Taking subsidies into account, the output of public versus private enterprises are comparable. And if subsidization is an objective of public

[74] Posner 1971

enterprises, then the public enterprise may be more efficient than the private enterprise, all else equal. This assumes that subsidies provided by public entities are more efficient than through private enterprises. Cross-subsidization is an important characteristic of many industries that have substantial public components—including railroads, electricity, and other publicly provided services.

Becker also notes that cooperation among pressure groups can have important, efficiency-enhancing effects. Because the relative effect of political pressure is important, the optimal strategy for pressure groups involves cooperation. The existence of laws that limit political competition can limit wasteful expenditures by pressure groups. Given the criticism of the McCain-Feingold Act of 2002, the Becker model is one instance proponents can note a positive theoretical effect from the legislation.

Equilibrium in the Becker model relies on an assumption that each group acts independently of others. Consequently it is not appealing if a limited number of pressure groups are assumed. Assuming the existence of a large number of pressure groups, then the equilibrium observed where the marginal benefits of lower taxes or higher subsidies is equal to the marginal cost of additional political pressure. Even assuming that pressure groups respond to additional efforts by counter-groups, then the presence of free-riding will have offsetting effects.

An intriguing aspect of Becker's model is the irrelevance of voter preferences. Becker assumes that information costs counter any preference that independent voters may have. There is a cost associated with a voter becoming informed about a particular issue otherwise irrelevant to them, save for taxation effects. As the number of voters increases, the marginal voter has less incentive to acquire additional information. The

irrelevance of voter preferences is a major divergence from previous modeling of political pressure groups that emphasized coalition formation dependent on fixed preferences of voters. The irrelevance of voter preferences also explains why new information contrary to the interests of powerful pressure groups often has little effect on policy. Pressure groups actively attempt to offset contrary information with selective information of their own.

Electricity and the Economic Theory of Regulation

The economic theory of regulation has significant application to the regulation of electric utilities. In order for firms to gain from the political process, it is necessary for firms to contribute, directly, to the political process. Fortunately federal election reporting requirements allow the public to observe how the industry contributes to the political system. Figure 2.1 shows the total contributions made by electric utilities in the 2006 election cycle:[75]

[75] Center For Responsive Politics

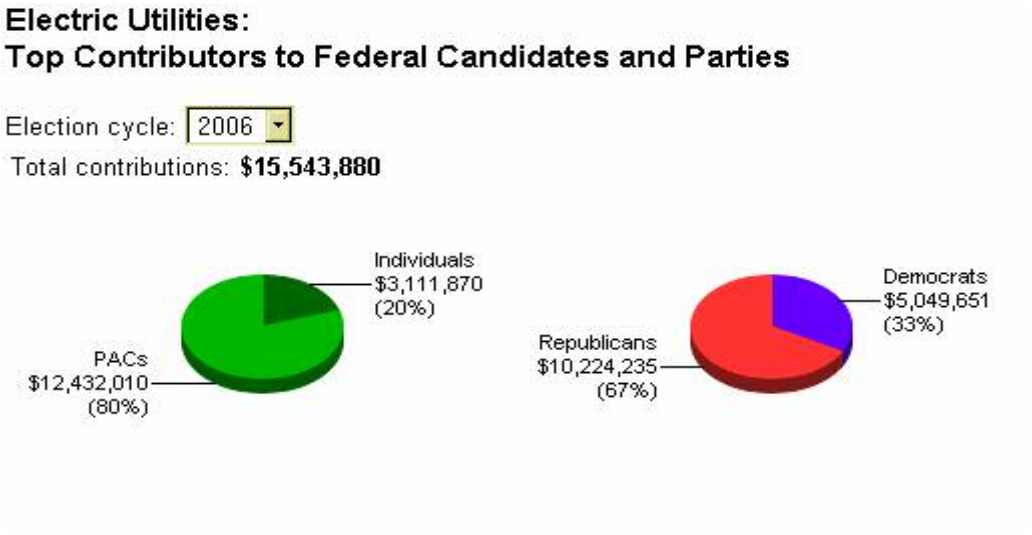

Figure 2.1

Total contributions were $15.5 million in 2006. The electric utility industry ranked 20th out of 80 industries that contributed to political campaigns in the 2006 election cycle.

Total Industry Contributions to Political Campaigns

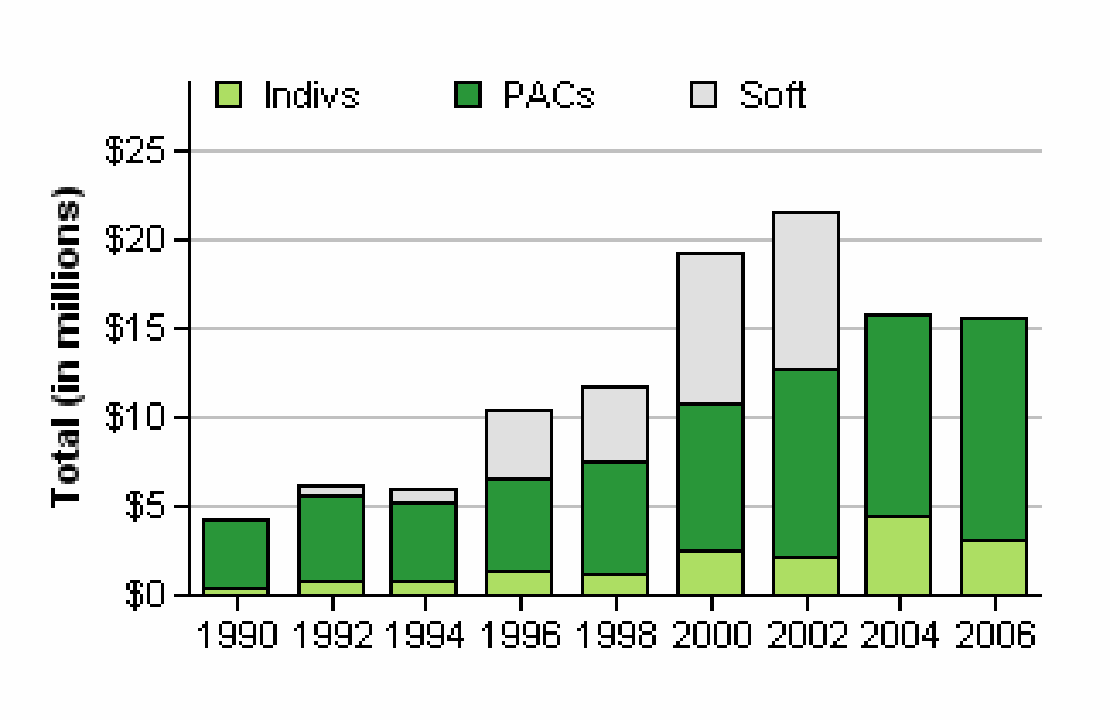

Figure 2.2

Figure 2.2 above represents total contributions by the electric utility from 1990 to 2006[76]. While contributions have been declining since 2002, especially given the drop due to the ban on soft money contributions, there have been significant contributions and increases since 1990 in money from PACs (political action committees) as restructuring has occurred in the electric utility industry. This is evidence that the industry actively lobbies for regulation or restructuring. The run up and drop from 2004 to 2006 can be attributed to the passage of the Energy Policy Act of 2005, the legislation that effectively repealed PUHCA[77]; with passage, continual contribution became unnecessary. Political

[76] Center For Responsive Politics
[77] Public Utility Holding Company Act

contributions by the utility industry are widespread and are evidence of the industries interest in regulatory legislation on the national level.

Contributions By Year

Election Cycle	Rank†	Total Contributions	Contributions from Individuals	Contributions from PACs	Soft Money Contributions	Donations to Democrats	Donations to Republicans	% to Dems	% to Repubs
2006*	21	$15,786,454	$3,247,146	$12,539,308	N/A	$5,200,808	$10,314,652	33%	65%
2004*	25	$15,747,208	$4,332,195	$11,415,013	N/A	$5,309,526	$10,432,358	34%	66%
2002	15	$21,530,922	$2,159,024	$10,569,013	$8,802,885	$7,238,764	$14,285,479	34%	66%
2000	20	$19,236,552	$2,511,468	$8,284,009	$8,441,075	$6,196,780	$13,018,182	32%	68%
1998	21	$11,740,845	$1,103,198	$6,480,424	$4,157,223	$4,124,946	$7,608,021	35%	65%
1996	28	$10,440,703	$1,312,514	$5,316,476	$3,811,713	$3,539,271	$6,896,432	34%	66%
1994	29	$5,981,025	$703,262	$4,470,411	$807,352	$3,247,204	$2,723,571	54%	46%
1992	31	$6,126,586	$865,021	$4,689,456	$572,109	$3,463,508	$2,653,624	57%	43%
1990	22	$4,281,667	$317,136	$3,964,531	N/A	$2,370,788	$1,910,879	55%	45%
Total	24	$110,871,962	$16,550,964	$67,728,641	$26,592,357	$40,691,595	$69,843,198	37%	63%

Figure 2.3

Figure 2.3 shows by year the composition of contributions[78]. Beginning in 1992, the start of state restructuring, the electric utility industry began rising in rank compared to 80 other industries across the United States. The trend continued until the peak in 2002, the beginning of the end of the wave of industry restructuring. After 2002 the industry fell to 25th in industry contributions, but began rising to 21st in 2006. This coincides with the repeal of much of PUHCA in the Energy Policy Act of 2005.[79]

As there is evidence of industry interest in the political process, what form should we expect regulation to take in the Stigler-Posner-Peltzman-Becker regulatory framework? Peltzman gives an indication of the form regulation takes once the decision to regulate is

[78] Center for Responsive Politics
[79] The flip in percentage of party contributions coincides with the change in party control of Congress in 1994. A flip in party contributions should occur with the next report in 2008.

made. While regulation at the state level was dominant prior to the passage of PUHCA[80], it is probably not a coincidence that it passed a few years subsequent to the start of the Depression as incomes were rising. Peltzman suggests that economic expansion is conducive to consumer protection, which PUHCA is almost universally understood to be.[81] And regulation is considered to be a normal good; it expands with income.

Another implication on legislation is the dynamic effects between producer and consumer protection. Peltzman concludes that producer protection yields to consumer protection as technology progresses and output grows. Early in the history of electricity regulation there was a significant move towards preventing entry into electricity production, especially at the state level. Larger cities often had several suppliers of electricity, making regulation by the formation of franchise monopolies convenient for states and municipalities.[82] Jarrell[83] suggests that municipal franchises were often very competitive and the move from municipal to state regulation was ultimately beneficial for utilities. But as output grew and the effective scale of utilities grew, regulation switched to consumer protection, especially with the enactment of PUHCA in 1935. Continuing through the 80s and 90s, production technology developed and in response, beginning in 1992, the industry was restructured in many states. The changing structure of regulation generally benefited consumers, allowing for adaptations by the industry that ostensibly lowered the average cost to consumers.

Winston[84] cites numerous studies that reinforce the view that deregulation has benefited consumers, but much of the benefit was unintended in form. Economists

[80] Jarrell 1978
[81] Gordon 1992
[82] Demsetz 1968
[83] Jarrell 1978
[84] Winston 1993

reliably predict the beneficial price effects. But economists have a poor track record in predicting the form of the restructured industry—failing to foresee the formation of hubs in the airline industry, among others. This will occur in the electric power industry, especially since the repeal of much of PUHCA in 2005. Provisions in PUHCA limited the geographic scope of IOUs. IOUs were limited in their ability to diversify into other industries, and technology and regulation limited the ability of utilities to take advantage of real-time pricing until relatively recently. These are potential non-price changes that could occur with a change in regulation.

Peltzman observed that regulation reduces risk. This would suggest that price volatility would decline with regulation, which may be true. But wages in the electric industry would also reflect the reduced risk to workers. Hendricks[85] has shown that in regulated industries, with the exception of trucking, that regulation tends to have a negative effect on wages, despite collective bargaining. If wages are lower in industries that are regulated, then the wage differential between the regulated and unregulated occupational categories could reflect the security in the implicit contract[86] between workers and employers in the regulated industry relative to the unregulated industry across similar occupational groups.

[85] Hendricks 1977
[86] Gordon 1974, Rosen 1985

The Regulatory Implications for Restructuring in the Stigler-Posner-Peltzman-Becker Framework

Peltzman suggests the form that regulation and subsequent restructuring will take. According to Stigler, Posner, Peltzman, and Becker—regulation should have several characteristics. The size of the winning coalition will be restricted due to the presence of uncertainty and free riders. The winners will not receive the full potential gains from regulation. And finally, the winners will have to admit a sub coalition of the losers. All three factors have been observed in the form of regulation that has developed in the electric power industry.

Under every form of regulation, the industry has included only a subset of the potential winners from among the utilities. Producers of electricity are a diverse group. Originally the utilities were private firms, the IOUs, but they also include the federal government in the form of TVA[87] and the Bonneville Power Administration, various state agencies such as Santee-Cooper in South Carolina, and numerous municipal companies and rural cooperatives that supply power to specific cities and counties. There has historically been competition between the private and public utilities. They have independently lobbied for and against exclusive territories and wheeling arrangements, but they share incentives. They both have a vested interest in limiting the scale and scope of competition, keeping each other out, while reaping the benefits of regulation. As with the initial regulation of the industry, there will continue to be attempts to limit the winners among the coalition of producers, with competing interests among the producers.

[87] Tennessee Valley Authority

The demanders represent a large interest as well. Among pricing groups, three broad categories are present: the industrial, commercial, and residential customers. There is substantial price discrimination among the customer classes possibly representing variations in the cost of service among the groups. There are substantial fixed costs in distribution to residential and some commercial customers, relative to the cost of service to industrial customers. But within the three classes there are substantial subsets that are potentially their own coalition.

Among the residential customer base are several sub coalitions that potentially ally with producers. The rural customers are one potential group. Posner[88] notes that regulators enforce internal subsidization by requiring IOUs to provide electricity to rural customers in exchange for regulatory protection. With the subsidy, rural residents benefit from the industries' regulation at the expense of more urban residents. Utilities are often asked to subsidize schools and fire departments in exchange for exclusive franchises. Environmental interests benefit as well. Most restructuring plans include accommodations for "green power," power from renewable or other renewable sources. There are also benefits for the poor and other classes of consumers. These include subsidies in the winter and other specialized programs.

[88] Posner 1971

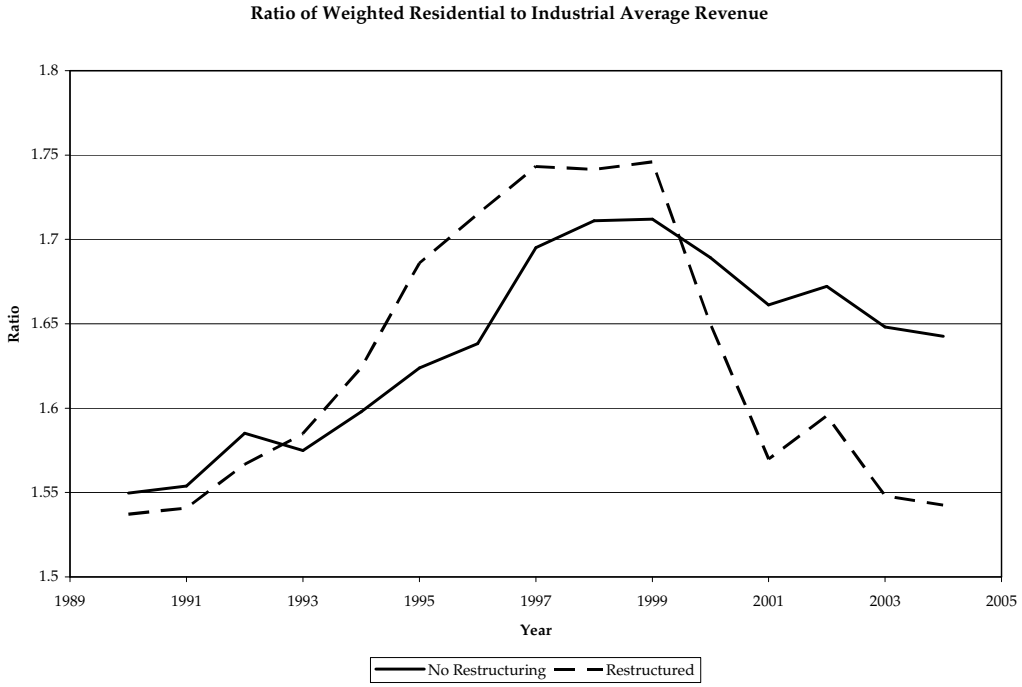

Figure 2.4

The Chicago theory of regulation notes that while there are winners and losers to regulation, the winners never get the maximum benefit of regulation. Each commentary on regulation noted different ways in which winners pay for the regulation they receive. Peltzman[89] provides the most refutable implication for regulation in that there is never optimal price discrimination. The losers lose, but they never lose everything. In shielding or manipulating markets, the winners are never able to fully exploit their gains.

Restructuring is an apt term to describe the changes in state electricity regulation. Figure 2.4 is a graph of the ratio of residential to industrial weighted average revenue from 1990 to 2004: the higher the ratio, the greater the degree of price discrimination between industrial and residential customers. While the ratio in the restructured states is

[89] Peltzman 1976

comparable to the non restructuring states prior to 1993, they begin to diverge soon after. The beginning of state restructuring occurred around 1996, the point at which the mean difference in ratios between restructuring and non-restructuring states is greatest. After 1996, there is convergence between non-restructuring and restructuring state ratios until 2000, when the restructuring states finally surpass the non-restructuring states.

The volatile changes in ratios between restructuring and non-restructuring states are consistent with Peltzman's model of regulation if it is assumed that restructuring was not deregulation. From 1992 until 1996 represents a period of regulatory lag as federal regulation of the industry began to change. In 1996 the first states to enact restructuring began passing legislation. After 2000, many states began to change the nature of restructuring in response to California and Pennsylvania's experience with restructuring. The 1992 through 1996 period represents a time in which federal efforts were leading states efforts, possibly achieving de facto deregulation as the industry experienced a wave of mergers and acquisitions. The future restructuring states experience increasing residential to industrial ratios, consistent with regulatory lag. 1996 through 2000 represents a period in which state restructuring was adapting to changes in federal regulation and changes in industry structure—a period of subtle re-regulation. Again, the restructuring states are responding to changes in federal regulation if price discrimination is a bellwether of regulation. Finally the period after 2000 is consistent with state efforts to back-pedal in response to negative outcomes in California and Pennsylvania—a regulatory hangover, the response being re-regulation. While the story is stylized, it is consistent with other experiences in restructuring and deregulation.[90]

[90] Winston 1992

Another measure of the effect of regulation is the relative difference in average revenue and cost per BTU. Figure 2.5 is the percentage difference in average revenue and cost per BTU, a measure of marginal cost:

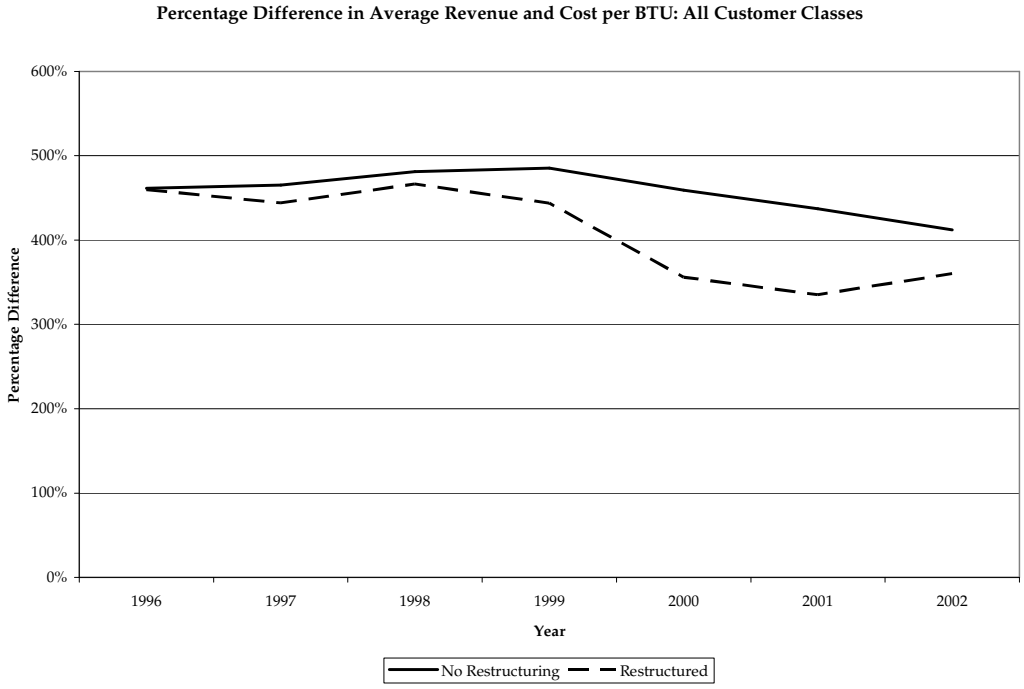

Figure 2.5

The percentage difference between average revenue and cost are similar across customer classes. Beginning in 1996, the restructuring states allowed a much smaller premium than the non-restructuring states. Especially after 1999, the restructuring states allowed much less cost pass-through than the non-restructuring states.

There were many differences between restructuring on non-restructuring states when looking at the aggregated state-level data. Noting the inflation adjusted trends could be useful in determining trends in prices across the periods, a consequence of restructuring. Below is average revenue across all three sectors, adjusted for inflation, from 1996 to 2003:

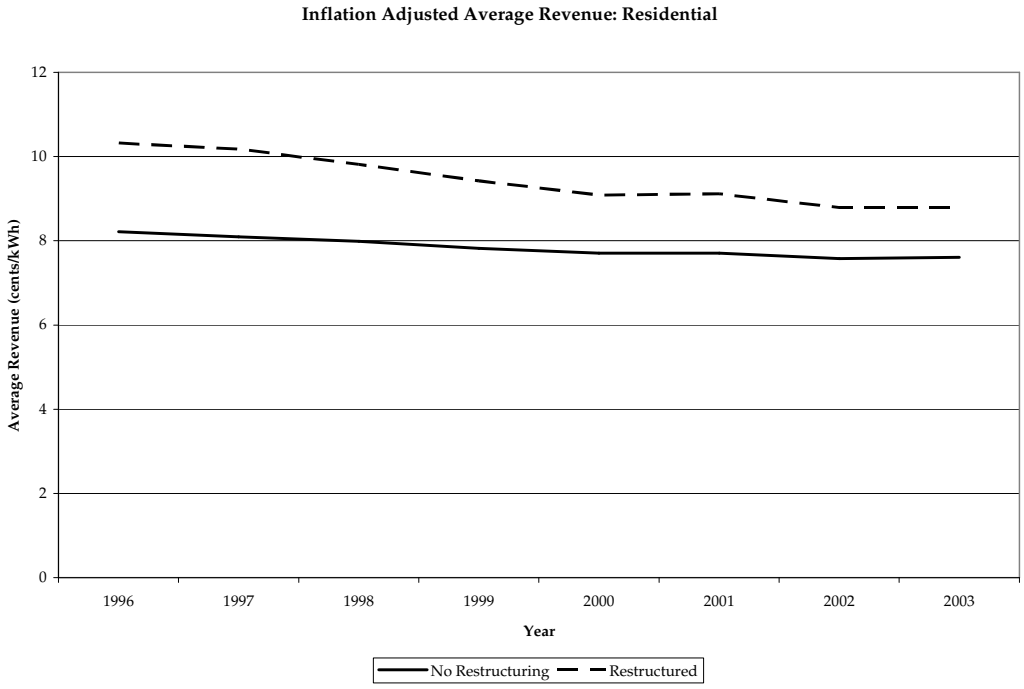

Figure 2.6

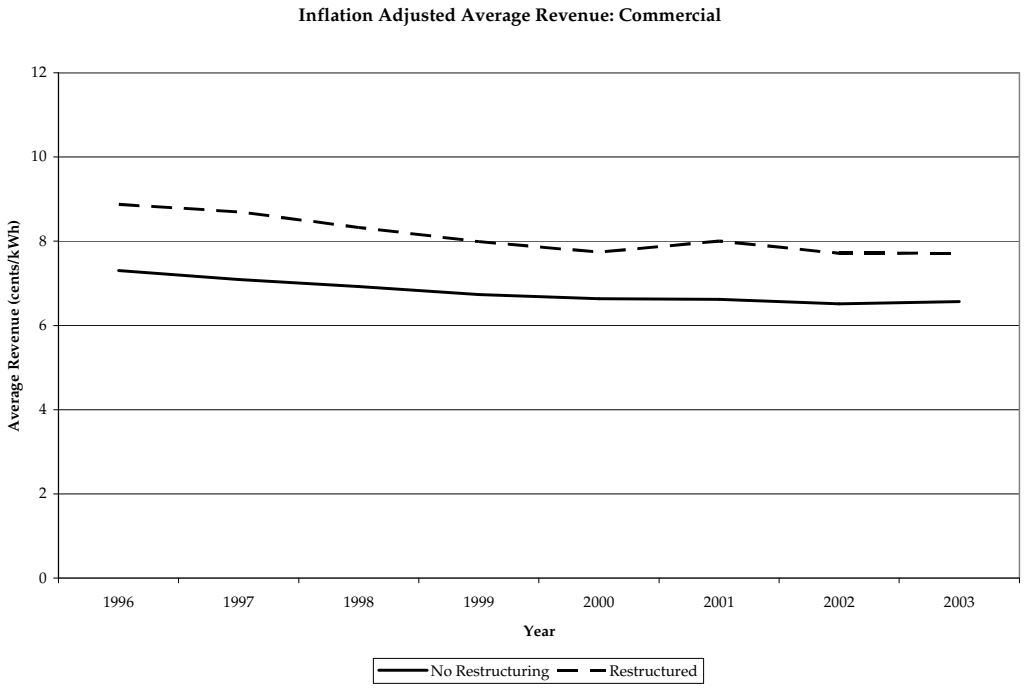

Figure 2.7

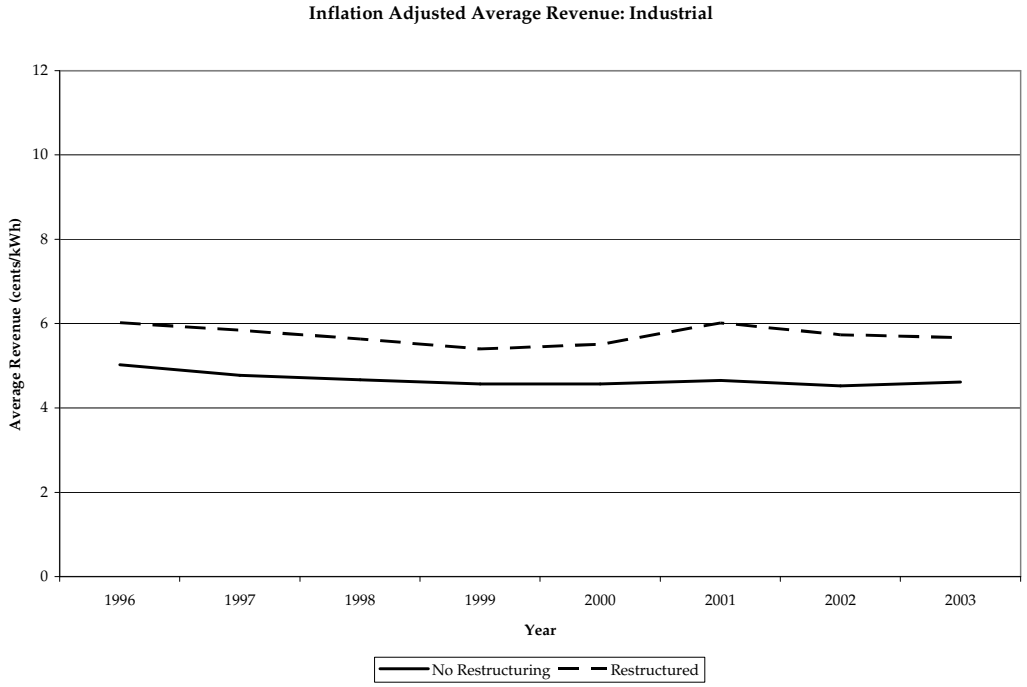

Figure 2.8

There is a clear trend in declining average prices, relative to consumer goods, throughout the period. This is evidence that politicians were not responding to increases in price relative to other consumer goods, but to differences observed between their home states and other states.

Looking at average revenue, there are substantial differences between restructuring and non-restructuring states in every sector. Through the early 90s, commercial customers in the restructuring states often paid more than residential customers in non-restructuring states. There was also a substantial difference in average revenue to residential customers in the early restructuring period compared to the commercial and industrial sectors. Expect differences between sectors and the restructuring and non-restructuring states, but the convergence of rates by sector indicates that restructuring affected residential rates. Regulators in the restructuring states allowed a substantial

amount of cost to pass through to residential customers in restructuring states, relative to the commercial and industrial customers.

More indicative of the impact of the difference in rates is revenue per customer. Revenue per customer is a measure of what households and firms pay per year. It takes into account both quantity demanded and price paid by the customer.

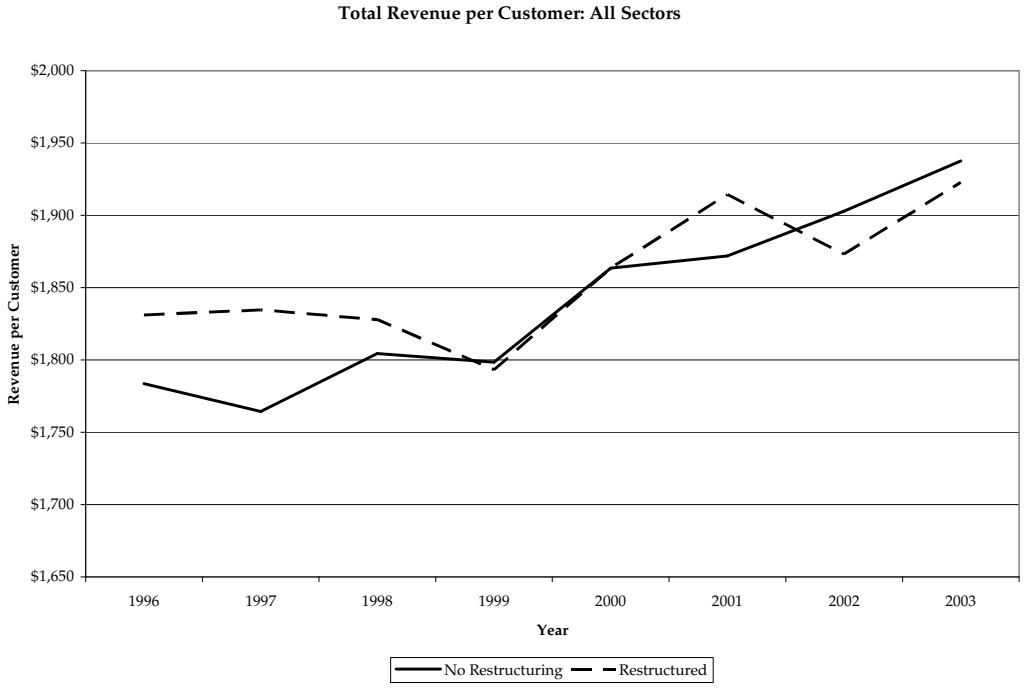

Figure 2.9

Looking at restructuring and non-restructuring states, there is no clear trend in converging or diverging revenue per customer. Neither is there a clear trend in the individual sector data, suggesting that restructuring may have had no effect on overall consumer welfare.

Table 2.1

Relative Difference in Revenue per Customer in Restructuring and Non-Restructuring States

	1996	1997	1998	1999	2000	2001	2002	2003	Avg
Residential	-6.5%	-4.7%	-8.1%	-8.2%	-9.9%	-9.3%	-12.6%	-10.7%	-8.5%
Commercial	31.4%	24.5%	22.9%	20.8%	20.5%	18.9%	17.8%	16.3%	22.4%
Industrial	-2.7%	-20.8%	-17.7%	-25.1%	-16.8%	-24.6%	-31.0%	-21.4%	-19.8%
All	2.7%	4.0%	1.3%	-0.3%	0.0%	2.3%	-1.6%	-0.8%	1.2%

Source: EIA

Looking at the individual sector data in Table 2.1, the residential sector had a relatively modest, but improving benefit from 1996 through 2003. The commercial sector did not benefit at all in the relative sense, although 2001 through 2003 shows some relative improvement. The biggest relative benefit went to the industrial sector, who from 1996 to 1997 had a 20% increase in relative benefit that was maintained through 2003. While there were clear benefits to residential and industrial customers, the benefit to commercial customers offsets both to a degree, reflecting no clear trend in overall consumer expenditures.

Table 2.2

Relative Difference in Total Revenue Between Restructuring and Non-Restructuring States

	1996	1997	1998	1999	2000	2001	2002	2003	Avg
Residential	56.8%	58.7%	52.2%	50.9%	46.3%	48.7%	43.1%	43.9%	50.9%
Commercial	108.2%	94.2%	90.2%	84.7%	82.9%	86.3%	82.7%	80.4%	89.9%
Industrial	40.2%	49.1%	45.6%	38.6%	42.2%	51.1%	44.8%	48.1%	44.5%
All	70.2%	71.2%	65.9%	61.9%	60.5%	66.2%	59.9%	59.2%	65.1%

Source: EIA

Table 2.2 is the relative difference in revenue between restructuring and non-restructuring states. There is a decline in the relative difference in total revenue between 1996 and 2003 in the residential sector, suggesting convergence between the restructuring and non-restructuring states over the restructuring period. The commercial sector shows an even stronger decline in relative revenues through the restructuring period. There

appears to be no clear trend in convergence in the industrial sector, although removing 2001 suggests a slight decrease. Comparing all three, with the exception of 2001, there appears to be convergence between the restructuring and non-restructuring states in terms of total revenues generated by sales. Convergence suggests that restructuring had some modest effect, possibly due to a competitive response to lower prices in the non-restructuring states.

Table 2.3 represents the price-cost margin by sector. The price-cost margin is a measure of allowed cost pass-through by regulators or competition, as cost in this case refers the marginal costs associated with average fuel prices in a state in a given year. The difference in average revenue and fuel costs by sector can be explained by differing costs of service and price discrimination, although variation between restructuring and non-restructuring states is most likely due to regulatory treatment rather than other exogenous causes. Consistent with the differing cost of service explanation and price discrimination, the margin is greatest for residential consumers in the restructuring and non-restructuring states. The commercial margin is higher than industrial ratio, reinforcing cost of service and price discrimination as explanations of differences regardless of regulatory stance.

Table 2.3

Price-Cost Margin

		1996	1997	1998	1999	2000	2001	2002	Avg
No Restructuring	Residential	62.3%	64.6%	72.1%	71.7%	59.7%	58.3%	64.3%	64.7%
	Commercial	57.6%	59.6%	67.8%	67.1%	53.1%	51.4%	58.5%	59.3%
	Industrial	38.3%	40.0%	52.2%	51.5%	31.8%	30.8%	40.3%	40.7%
	All	54.2%	56.5%	65.5%	65.0%	50.4%	49.3%	56.6%	56.8%
Restructured	Residential	55.6%	49.6%	58.1%	59.6%	39.1%	34.7%	52.2%	49.8%
	Commercial	48.4%	41.0%	50.7%	52.4%	28.6%	25.6%	45.5%	41.7%
	Industrial	23.9%	12.1%	27.1%	29.5%	-0.4%	1.0%	26.7%	17.1%
	All	45.9%	38.1%	48.5%	50.3%	26.4%	24.0%	44.3%	39.6%

Source: EIA

The greatest differences occurred for industrial consumers in 2000 and 2001, a period when many restructuring provisions went into effect. But there was also substantial change in the residential and commercial sectors, consistent with the implementation of provisions in the restructuring states.

Table 2.4

Price-Cost Margin Without California

		1996	1997	1998	1999	2000	2001	2002	Avg
No Restructuring	Residential	62.3%	64.6%	72.1%	71.7%	59.7%	58.3%	64.3%	64.7%
	Commercial	57.6%	59.6%	67.8%	67.1%	53.1%	51.4%	58.5%	59.3%
	Industrial	38.3%	40.0%	52.2%	51.5%	31.8%	30.8%	40.3%	40.7%
	All	54.2%	56.5%	65.5%	65.0%	50.4%	49.3%	56.6%	56.8%
Restructured	Residential	57.8%	51.7%	60.1%	61.7%	44.2%	42.1%	56.6%	53.5%
	Commercial	50.9%	43.5%	52.8%	54.7%	34.1%	33.5%	50.0%	45.6%
	Industrial	27.4%	15.6%	30.2%	32.9%	7.5%	11.3%	32.2%	22.5%
	All	48.5%	40.7%	50.8%	52.9%	32.3%	32.3%	49.0%	43.8%

Source: EIA

Table 2.4 is the price-cost margin without the California data. California was unusual due to the problems specific to the California restructuring plan, specifically binding price caps on retail rates. Some of the other restructuring states also had price caps, but they were never binding. Removing California from the data shows that there was a precipitous decline in price-cost margin even without the effect from California,

suggesting that the convergence of price and cost was not isolated to the effects of California.

Table 2.5

Relative Difference in Restructured to Non-Restructured Price-Cost Margin

	1996	1997	1998	1999	2000	2001	2002	Avg
Residential	-10.7%	-23.3%	-19.3%	-16.8%	-34.4%	-40.5%	-18.9%	-23.4%
Commercial	-15.9%	-31.2%	-25.2%	-22.0%	-46.2%	-50.3%	-22.2%	-30.5%
Industrial	-37.5%	-69.8%	-48.1%	-42.8%	-101.3%	-96.8%	-33.7%	-61.4%
All	-15.3%	-32.6%	-26.0%	-22.6%	-47.5%	-51.2%	-21.7%	-31.0%

Source: EIA

Comparing the restructuring and non-restructuring groups in Table 2.5, the non-restructuring states have a consistently greater price-cost margin. It is consistent across years and sectors compared to the restructuring group. This is evidence that the restructuring had an overall effect of lowering the degree of price discrimination and cost pass-through allowed by regulators.

Table 2.6

Relative Difference in Restructured to Non-Restructured Price-Cost Margin Without California

	1996	1997	1998	1999	2000	2001	2002	Avg
Residential	-7.2%	-19.9%	-16.6%	-13.9%	-26.0%	-27.8%	-12.1%	-17.6%
Commercial	-11.6%	-27.0%	-22.0%	-18.5%	-35.8%	-34.8%	-14.6%	-23.5%
Industrial	-28.4%	-61.0%	-42.1%	-36.1%	-76.5%	-63.3%	-20.0%	-46.7%
All	-10.6%	-28.0%	-22.5%	-18.6%	-35.8%	-34.4%	-13.4%	-23.3%

Source: EIA

Removing California from the data, as in Table 2.6, there is still and strong and consistent effect.

The uncertainty of industry structure complicates restructuring, as restructuring is an uncertain path. Wolak[91] observes that real-time pricing could provide substantial benefits for all classes of consumers. There are economies of scope that are available to IOUs

[91] Wolak 2001

that were unavailable prior to 2005 because of PUHCA. These are only two examples of changes in the industry that restructuring could possibly affect. The broader implication with respect to deregulation versus restructuring, or re-regulation, is that no one can predict what the potential benefits are, outside of price, as a result of deregulation as opposed to restructuring. If the industry successfully lobbies for barriers to entry in return for price regulation, then the potential gains through innovation resulting from changes in industry form and structure may never materialize. The principal result of effective political jockeying by the industry will be to slow change and innovation of any form.

Conclusion

A general regulatory theme is observable. From the introduction of state commission regulation, as opposed to municipal franchise agreements,[92] there have been competing interests. The producers have lobbied for exclusive territories and the price regulation that comes with it. Consumers have always demanded protection from the unfettered ravages of unprincipled monopoly utilities. And various interests—from environmentalists, individual customer sub-classes, and other governmental agencies—have lobbied for special accommodation. What will result will be a function of production technology, costs in each state, and the ability of special interests in the individual states to extract beneficial regulation.

As production costs have declined with technology, and the efficient scale of production has changed, it is advantageous to all market participants for the form of

[92] Jarrell 1978

regulation to change. Consumers will have some concessions on pricing, but they will never get true competitive prices reflecting a conventionally competitive rate of return, in contrast to the return allowed under rate of return regulation. Utilities will be forced to concede on pricing in response to technological changes, but they will continue to price discriminate. And the price discrimination that occurs will be suboptimal from the perspective of the utilities. While the industry will admit new producers, the industry will demand concessions that will deter entry by competitors. The industrial customer sector will benefit in proportion to its demand elasticity for electricity and the influence it can muster in the legislature. The ability of the industrial customer, relative to commercial and residential customer, to influence regulation will determine whether the industrial customer becomes a beneficiary of industry regulation. The same will be true for environmental and advocates for the poor. But ultimately the general class of commercial and residential customers will lose in the competition for regulation.

Stigler, Posner, Peltzman, and Becker's contributions to the economic theory of regulation have enlightened the understanding of the regulation of the electric power industry. Their insights into the structure and form of regulation have aided in understanding the form restructuring would take in the last 10 years. By recognizing that it is the confluence of various interests groups, rather than naïve belief in the public interest or the cynical machinations of industry lobbyists looking to "capture" the regulator, the economic theory of regulation has broadened and enlightened the economist's understanding of restructuring in the electric utility industry.

CHAPTER THREE
MODELING THE LEGISLATIVE AND REGULATORY EFFECTS OF STATE LEVEL ELECTRICITY RESTRUCTURING

Introduction

The electric industry in the United States has been undergoing significant structural change throughout the nineties because of a hundred years of relatively high cost state and federal regulation. There is the question of whether restructuring in the form of the deregulation of wholesale generation markets has resulted in a decline in cost per kilowatt-hour (kWh) to customers. The customer classes include industrial, commercial, and residential customers.

An issue that is inextricably related to the cost to firms is the role of regulators or the utility commissions within states in creating and determining the conditions that led to restructuring. There is irrefutable evidence that throughout the regulatory period the state regulators have acted on the behalf of consumers in limiting prices firms charged consumers; regulation prevented the exercise of monopoly pricing power. But at the same time, evidence exists that regulators granted significant rents to utilities in exchange for stable output and prices. With the enactment of restructuring legislation, legislatures have focused attention away from maintaining stability and elected to allow for the competitive production of power with coordination to both promote competition and limit disruptions.

The political process within the regulatory agency is also an important consideration in determining whether states restructure or not. A political as well as economic decision occurs when the level of cost allowed to pass-through to customers, or the rate of return to the firm, is determined by regulators in the states. While regulators

operate as an agent of the legislature in the determination of industry regulation, they often have incentives that differ from those of the legislature.

The model simultaneously determines whether restructuring occurs as a function of the legislature's structure and expected savings from restructuring. At the same time, fuel costs and the structure of the regulatory regime determine the price of electricity in the state, with average revenue used as a proxy.

Who are the Regulators?

In modeling regulation, it is important to understand who is doing the regulating.[93] The state regulatory agencies represent a diverse group with a variety of jurisdictions and responsibilities. Most states combine responsibility for transportation along with utilities and other regulated services. The federal government as well separates communications from the regulation of electricity and gas. Even at the federal level communications are the responsibility of the Federal Communications Commission (FCC) while electric utilities and interstate natural gas are the responsibility of the Federal Energy Regulatory Commission (FERC). Most states limit the regulatory separation to distinctions between transportation and other monopolistic services. Even at the federal level, the Interstate Commerce Commission (ICC) prior to its dissolution regulated transportation. As an example of the diverse industries that the regulator is

[93] The following is based on the National Association of Regulatory Utility Commissioners (NARUC) report: Profiles of Regulatory Agencies of the United States and Canada: Yearbook 1995-1996. The last available year for the yearbook was 1996. NARUC was founded in 1889 as a quasi-governmental nonprofit corporation. Its stated goal is "to serve the consumer interest by seeking to improve the quality and effectiveness of public regulation in America."

asked to regulate, the Virginia State Corporation Commission (Virginia SCC) is responsible for:

- Setting IOU rates
- Licensing insurance companies and agents
- Examining Insurance Companies
- Investigating the sale of unregistered securities
- Registering investment advisors
- Examining state chartered banks
- Licensing money order sellers
- Assessing for local taxation the property of IOUs[94]

While the regulator's responsibility is expansive in Virginia, this is in no way unique to Virginia. Many other states have endowed their state regulatory commissions with broad oversight of many diverse industries. Besides IOUs and other utilities, these industries include steam heating companies, docks and wharves, landfills, warehouses, weights and measures, and water carriers.

The members of these commissions are also a diverse group. Most states do not require specific professional backgrounds for commission members, although many do require that a member be a qualified attorney. Even though most states do not require that attorneys sit as commissioners, most have commissioners sitting. The majority of the rest include engineers, businessmen, professional civil servants, accountants, and the

[94] NARUC 1996, p.250

occasional economist. There are a few interesting occupations sitting. A priest sits on the Virgin Island PSC and a journalist on the Minnesota PUC.

Many of the states do not have a specific age requirement for commission members, although many require that commission members be qualified electors of the state. What age requirements that do exist generally run from 18 to 30. Roughly a third must take an oath of office, and most are appointed (44 states). The 12 states that elect commissioners include Alabama, Arizona, Georgia, Louisiana, Mississippi, Montana, Nebraska, the New Mexico State Corporation Commission, North Dakota, Oklahoma, South Dakota, and the Texas Railroad Commission. Two Texas commissions and a New Mexico commission are appointed. An interesting study would be to understand what makes for an elected versus and appointed commission. Why the Texas RC is distinct from the Texas PUC or the Texas Natural Resources Conservation Commission is not clear.

Sitting on a commission can lead to various conflicts of interest. Most states have addressed this problem by placing constraints on commissioners' conduct, although 21 of the commissions have not. Of interest is that 8 of the 12 states that have commissions that are elected do not place restraints upon commissioners to not work for the regulated industries after leaving the commission. Of the states that do place constraints on commissioners, most of the constraints are statutory although many are commission rules. The legislatures are seemingly aware of the potential for regulatory corruption and have addressed it. Examples of restrictions include the Michigan PSC:

> For six months after leaving the Commission, a commissioner shall not be retained or employed by any public utility or public service subject to the jurisdiction and control of the commission.[95]

or New Hampshire PUC:

> No Commissioner shall accept any employment with any utility under the control of the Commission until two years after separation form the Commission.[96]

Most states have similar restrictions on post employment. The states that enacted restructuring disproportionately had post commission employment restrictions. While this would seem to refute a hypothesis that commissions act in the interest of electric producers, the states that do not have post commission employment restrictions are disproportionately in the South and rural Midwest, states like Alabama and the Dakotas, where electricity rates have historically been low and therefore would have little incentive to restructure.

The commissions are unremarkably similar in their ethical restrictions. All have statutory codes of ethics, propriety requirements, prohibitions on financial interests in the regulated entities, prohibitions on the acceptance of gifts, and they are allowed to eat at public meetings. But, as explained before, post-agency representative employment and past employment by advocates are neither excluded nor prohibited universally.

[95] NARUC. p.377
[96] NARUC. p.378

Most commissioners are employed full time. Arkansas, Louisiana, and Delaware are explicitly part time, and they do allow for outside employment. Whether full-time commissioners are allowed outside compensated employment is split—some do, but many do not.

The compensation of commissioners reflects their responsibilities and locations. The highest goes to officials in Connecticut, California, Virginia, and Ohio. The lowest tier not including part-time commissioners includes Mississippi, North Dakota, Montana, and Nebraska. The tendency is for populous states with more infrastructure to have the highest paid commissioners while mostly rural, sparsely populated states with little infrastructure to have the lowest paid. Compensation of commissioners reflects the responsibility of the job.

The Model

The model for the decision follows Sass and Leigh.[97] Sass and Leigh develops a model that predicts a difference in motorcycle fatalities between states that passed a motorcycle helmet law, and those that did not. This paper applies a similar model to differences in price per kWh between state that passed electricity restructuring and those that did not.

The premise for the model is that there are significant differences in the average price of electricity across the states that cannot be fully explained by differences in fuel costs. Other factors including the level of competition as a result of restructuring activity

[97] Sass 1991

are important in determining the average price of electricity across states. The model is designed to determine, based on the structure of legislatures and regulatory bodies, the probability that a particular state will pass restructuring legislation.

Whether a state passes restructuring legislation in a particular year is a binary outcome—it either happens or it does not—although in one case, California, legislation eventually reverts to the previous regime. Except in the case of California, it may be appropriate to use a regime change model that drops observations once the regime has changed. The regime change model is estimated in the results.

Theory says that legislators base their decisions on the perceived net benefit of, or demand for, a particular proposal. The result is a probit model:

$$L_{it}^{*} = Z_{it}\gamma + u_{0it} \text{ where } L_{it} = \begin{cases} 1 & \text{if } L_{it}^{*} \geq 0 \\ 0 & L_{it}^{*} < 0 \end{cases} \tag{1}$$

where L_{it}^{*} is the net benefit of restructuring legislation in state *i* and year *t*. Z_{it} is a vector of observed state variables and u_{0it} an error term.

The expected price of electricity is modeled as follows:

$$E(P) = (\alpha_1 - \alpha_2)\cdot\Phi + (\beta_1 - \beta_2)X\cdot\Phi + \alpha_2 + \beta_2 X + (\sigma_{2u} - \sigma_{1u})\cdot\phi \tag{2}$$

The α_1 and α_2 represent constants, β_1 and β_2 are vectors of slope coefficients, *X* is a vector of exogenous variables, and the subscripts *1* and *2* represent states that enacted restructuring legislation and those that did not in the 8 years represented by the data. The Φ and ϕ terms are the standard normal cumulative distribution and density functions evaluated at γZ. Φ is $\Pr(L=1)$, while $1-\Phi$ is $\Pr(L=0)$. The first two terms represent the expected difference in price with the random assignment of restructuring; the final term $(\sigma_{2u} - \sigma_{1u})\cdot\phi$ is a measure of the bias caused by non-random selection.

Assuming $E(P) = A\Phi + BX \cdot \Phi + C + DX + (\sigma_{2u} - \sigma_{1u}) \cdot \phi$ we can derive the coefficients α_1, α_2, β_1, and β_2 by adding the coefficients *A, B, C,* and *D* to get what we need.

$$\begin{aligned} \alpha_1 &= A + C \\ \alpha_2 &= C \\ \beta_1 &= B + D \\ \beta_2 &= D \end{aligned} \tag{2a}$$

The expected price with restructuring legislation (P_L) and without (P_{NL}) can now be estimated.

$$\begin{aligned} P_L &= \alpha_1 + \beta_1 X \\ P_{NL} &= \alpha_2 + \beta_2 X \end{aligned} \tag{2b}$$

One would expect that the difference in price across states would have some effect on whether a state restructured or not. Following Sass and Leigh, an equation is specified:

$$L_{it} = Z_{it}\gamma + \rho(P_L - P_{NL}) + u_{0it} \tag{3}$$

where P_L and P_{NL} represent price in states with restructuring legislation and price in state without restructuring legislation. Combining equations (2) and (3) the final reduced form equation is:

$$L_{it} = Z_{it}\gamma + \rho((\alpha_1 + \beta_1 X) - (\alpha_2 + \beta_2 X)) + \rho(u_{1it} - u_{2it}) + u_{0it} \tag{4}$$

To obtain a result, estimate (4) using probit and obtain estimates of the values of Φ and ϕ. Substitute those results into equation (2) and estimate by OLS, incorporating ϕ to adjust the covariance. The predicted difference in prices obtained in (2) is used as an explanatory variable in the estimation of (3) by directly predicting expected average revenue in the law and no law regime.

The Explanatory Variables

Shughart and Tollison suggest that the legislative process can be modeled in terms of supply and demand. On the demand side the percentage of customers by class is important in determining legislative events. By default industrial, transportation, and "other" customers are grouped in the model. Industrial customers are intense users of electricity and they represent a concentrated interest group. Commercial customers fall in the middle. While the cost of electricity is a substantial portion of commercial customer's budgets, they are a large and diffuse group. At the other extreme are residential customers whose interests are the most diffuse and electricity makes up a relatively small portion of their overall budgets. Despite this, many states have consumer advocates who represent the interests of residential customers in rate cases. Industrial and commercial customers have an obvious interest in restructuring legislation designed to lower the average price, as is the stated intent of most restructuring legislation. An examination of the legislation yields that most states that have passed or intend to pass restructuring legislation have initiated industrial and commercial restructuring before residential restructuring.

While industrial and commercial customers are obvious beneficiaries, residential customers and other special interests can exert different lobbying pressure. The consumer advocate may often demand various cost controls in the perceived interest of residential customers. In a few cases the consumer advocate has opposed restructuring on the premise that restructuring removes price controls that limited market power of

utilities. Environmental groups, while usually in favor of restructuring, ensure that special "green power" restrictions and incentives are imposed on utilities.

Finally there are the utilities themselves—most importantly the IOUs. The problem of stranded cost recovery has been the major issue in whether or not utilities support restructuring. But as noted, stranded costs more often than not are a smoke-screen for the true interests of the IOUs—the guaranteed rate of return that the status quo grants them. One commentator has pointed out that stranded cost recovery is unnecessary given that the market value of generation assets has been greater than the pre-sale estimated value, the value used for stranded cost determination.[98]

The supply of legislation and regulation can be explained by the structure of the state legislatures and regulatory agencies. Shughart and Tollison,[99] note that for a given legislature's size, the ratio of the house to the senate will give an indication of the relative power of lobbying within the state legislature. The greater the ratio, the less likely a given law will pass within a legislature. Assuming that the cost of influencing votes increases at an increasing rate as McCormick and Tollison[100] suggest, the cost of influence is greater the more disparate the size of the legislative houses. The cost of a vote in the larger house is greater than the savings from losing the vote in the smaller house, making influencing both houses jointly more costly. Shughart and Tollison also note that the legislature's size can affect the chances that legislation will pass a legislature. The larger the legislature, the less likely legislation will pass because it is more difficult for legislators to come to a consensus. On the other hand, the value of a legislator's vote is less in large legislatures. This makes monitoring legislators relatively

[98] Bilas 1999
[99] Shughart 1985
[100] McCormick 1981

easy for interest groups and lessens the cost of votes through competition among legislators. The length of the legislative session is another important indicator of the probability that legislation will be enacted. The longer the legislative session, the more likely legislation will be passed. There is simply more time to pass legislation.

Sass and Leigh notes that there is intransigence in the law. When a law exists, it is more likely that the law will stay in effect in the next year since no action is necessary to have the law in the next period. A lagged binary variable accommodates this effect. Similarly, when either a law exists or does not there is a tendency for the status quo to be maintained; all legislation is costly to enact in some way. A +1 variable signifies the existence of a law in the previous period; a -1 is assigned to the periods in which there was no law in the previous period.

Regulatory commissions in the regulated environment are responsible for the rate of return allowed for utilities, especially IOUs. For this reason it is expected that the structure and rules governing the regulatory commissions within the states would have an effect on the price of electricity within the states. In the model it is the structure of the regulatory commissions along with average fuel prices that determine average revenue per kWh of electricity.

For the regulatory commissions, an effect can be expected for several factors. The staggering of commissioner's terms is one instance. Salant argues that the staggering of terms between regulatory commissioners and the heads of IOUs can have an effect on the allowed rate of return to IOUs.[101] Commissioners in their last part of their terms have no incentive to allow IOUs to collect on investments in infrastructure because they will not be present to reap the benefits from increases system reliability that come with those

[101] Salant 1995

investments. Likewise, the managers of IOUs do not have an incentive to invest in infrastructure in the last part of their terms because they will not collect on the benefits. His analysis finds that the staggering of terms between managers of firms and regulators will lead to optimal investments in new capacity, given finite horizons. Salant's conclusions suggest that commissions with staggered terms for commissioners will tend to allow for higher returns to investments by IOUs. The staggering of terms of commissioners is used because manager data is difficult to obtain, and because the terms of commissioners are staggered, it is more likely that the terms of the commissioners will be staggered relative to managers of IOUs. Higher returns to IOUs translate into higher rates, or average revenue, for customers.

Many commissions have restrictions on post-employment after commission members leave office, having the potential effect of favoring IOUs in rate cases and other regulatory hearings. Salant suggests that the opportunity for post-commission employment in the private sector could be socially beneficial, leading to more optimal regulatory outcomes. Commissioners with a potential stake in the health of IOUs are more likely to allow for higher rates of return than commissioners who are indifferent.

Given that post-employment opportunities exist, there is potential for corruption of the regulator-IOU relationship. Salant notes that the media, public interests groups, and lobbyists heavily monitor the regulatory process, thereby decreasing the potential for corruption, but the opportunity still exists. But given other conditions, it should be expected that the larger the commission, the less opportunity there is for corruption and the lower we should expect electricity rates. Also the larger the commission, the less

likely a consensus on the level of rates and the more likely commissions will agree on low rates.

The length of the term of office has the effect of reinforcing the tenure of the commissioners. With longer commission terms, the more likely commissioners are to act in their own interests, at the expense of the public. Longer terms also increase the likelihood of corruption.

Whether or not the commission members are elected could have an effect on their performance in office. Besley and Coate[102] suggest that elected regulators are more pro-consumer than appointed regulators. They point out that political parties are more likely to choose regulators that are pro-stakeholder in the regulatory preferences, as opposed to pro-consumer. Pro-stakeholder candidates are more likely to use resources in a way favorable to the gubernatorial candidate than pro-consumer candidates. By being pro-consumer, it is expected that elected candidates are less likely to allow for rate increases than pro-stakeholder candidates. They also imply that a pro-consumer regulator will be less effective when firms can affect the future employment in states with fewer constraints on post commission employment. Mixon finds that states with appointed regulators tend to have larger commissions that states with elected commissioners. This is consistent with elected commissions having incentives more closely aligned with consumer preferences as opposed to appointed commissions whose preferences are more closely aligned with those of the party in power.

The qualifications of commissioners can have effects on the regulatory outcome. Expect that commissioners with a professional background would be better informed or qualified to determine what rates utilities should be allowed to pass on. On the other

[102] Besley 2003

hand, professionals may be less likely to be pro-consumer, even if elected, given their qualifications.

Minority party representation on a commission would be expected to counter tendencies towards regulatory capture. Savitski looked specifically at the initiation of regulation, noting that Republican state administrations were less likely to initiate state regulation of utilities. It should be expected that Republican appointed commissions would tend to favor IOUs. Appointment of Democratic regulators would tend the thwart pro-industry regulation. A Democratically controlled commission would tend toward more pro-consumer regulation. This tendency could be countermanded by a Republican on a regulatory commission.

The Data

Using data culled from the Energy Information Agency (EIA), the Federal Energy Regulatory Commission (FERC), the National Association of Regulatory Utility Commissioners (NARUC), Council of State Government (CSG), and the internet—a dataset was assembled with information about legislatures, regulatory commissions, state-level aggregate variables, and cost per BTU for the 50 states and the District of Columbia for 8 years beginning in 1996 and ending in 2003. The District of Columbia was later removed from the set because of data irregularities. Table 3.1 is a summary of the non-binary statistics used in the analysis:

Table 3.1

Summary Statistics

Variable	Mean	Standard Deviation	Min	Max
Session Length	58.49	52.7	0	210
House To Senate Ratio	2.9	2.18	0	16.67
Legislature Size	147.64	59.65	49	424
Percentage of Customers Industrial	0.005	0.004	0	0.035
Percentage of Customers Commercial	0.118	0.018	0.083	0.189
Percentage of Customers Residential	0.868	0.023	0.798	0.911
Number of Utilities	25.32	38.49	0	184
Avg Revenue Per kWh All Sectors	7	2.13	3.9	14.47
Avg Revenue Per kWh Industrial	5.11	1.83	2.74	12.2
Avg Revenue Per kWh Commercial	7.33	2.05	4.17	15.02
Avg Revenue Per kWh Residential	8.48	2.31	4.95	16.73
Number of Commissioners	3.92	1.22	3	7
Term of Office	5.42	0.94	4	8
Cost Per BTU	0.09	0.11	0	0.7

In the analysis, average revenue across all sectors was used as the dependent variable. All other measures of average revenue have a similar magnitude. Average revenue from what is described as "other" sources is omitted. It is uncertain what "other" really describes, but it includes transportation and municipal power expenditures. In 2002 the classification of transportation and "other" changed. They became convenient to ignore as they made up only a small proportion of total expenditures. They also contained a few outliers.

Fuel cost is measure in dollars per BTU. Across the states they range from very low to $0.70 per BTU, more than 7 times the mean. The year 2003 is a problem because cost per BTU was not reported in the EIA data after 2002.

The legislative data in the analysis is for 2003. It is assumed that the structure of legislatures does not change significantly from 1996 to 2003. Legislative sessions averaged 59 days with a maximum of 210. Some states alternated legislative session length year to year, having longer and shorter session in odd and even years. Some states had no statutory session length. The effect of these states for a given year is captured in a dummy for no session length. The House to Senate ratio ranges from 0 to about 17. The 0 is for Nebraska, which has a unicameral legislature. The 17 corresponds to New Hampshire, which has an extremely large House of Representatives relative to the Senate. When measuring the effects of House to Senate ratio on legislative outcomes, it is important to control for the absolute size of the legislature. The legislature's size is the sum of the House and the Senate in each state. The largest legislature is New Hampshire's with 424 legislators. The smallest is Nebraska's with 49.

The regulatory variables are from the year 1996 as published in the NARUC yearbook. Most of the regulatory variables are recorded as 0 or 1 dummy representing whether states had elected regulators, whether the position required professional qualifications, if the minority party is represented, and if there are any post-employment constraints on regulators. Additional variables include the number of commissioners, ranging from 3 to 7, with an average of almost 4. The length of the regulatory term of office ranged from 4 to 8 years, at over 5 on average.

The Results

Table 3.2 shows the results of the probit regressions of legislative outcome as a function of state legislative variables with the expected difference in price (average revenue) and the original probit specification without the expected difference in price. The regressions were estimated using random effects, pooled, pooled with restricted coefficients, and a regime-switching probit models. The random effects probit model is more appropriate if we assume that there is unobserved variation across states that is unique to the state. Given the relatively small time interval relative to the cross section, the random effects estimator may be more appropriate, except that the random effects model introduces econometric issues that are currently intractable. The pooled probit assumes that there are no unobserved differences in legislation determination. It is consistent with Sass and Leigh and is the benchmark with which the other models are compared.

The restricted coefficient model comes from equation (4) above. The ρ term changes if the coefficients are not restricted so that $\frac{\tilde{\alpha}}{\alpha_L - \alpha_{NL}} = \frac{\tilde{\beta}}{\beta_L - \beta_{NL}}$ where $\tilde{\alpha} = \rho(\alpha_L - \alpha_{NL})$ and $\tilde{\beta} = \rho(\beta_L - \beta_{NL})$. The fifth specification is the regime switching model. Sass and Leigh assume that changes in legislation are difficult but are subject to change year after year. In the case of motorcycle helmet laws, legislation was repealed or changed at the behest of motorcyclists in many states. With the exception of California, there was no repeal—per se—in the states that elected to commit to electricity restructuring. But once California reverted to its previous regulatory regime, many states

amended their laws to limit desultory effects, limiting restructuring. Because of the lack of reversion, a regime switching model may be appropriate.

Comparing the first two specifications in column (2), leaving the expected difference in average revenue out does not affect the significance of the coefficients or their magnitude, with the possible exception the percentage of residential and commercial customers. The effect on the magnitude of the commercial and residential coefficients suggests that their influence on legislation is correlated with the expected savings from the legislation, or that their effect on the legislature is a function of how much they stand to benefit.

Comparing specifications (2) and (3), there is no serious difference between the random effects and pooled model across specifications with respect to the effect of the difference in average revenue. The signs are also consistent, signifying that there are probably no significant unobserved state differences to bias the outcome of the regression. Given that the random effects estimate is probably econometrically suspect, this is further evidence that it is safe to ignore unobserved effects in the model.

The best alternative comparison to the pooled model is the restricted coefficients model. Comparing results (2) and (4), there are similar effects with respect to session length and House to Senate ratio. Additionally, the effect of having no session length is correct in sign and significant at the 5% level, reinforcing Shughart and Tollison's result of the effects of legislature structure and rules on the passage of legislation. The number of utilities is of the wrong sign, but insignificant except in the regime switching model.

Table 3.2

Results From the Regression of Legislative Outcome on State Parameters

Variable	Predicted Sign	(1)	(2)	(3)	(4)	(5)
		Pooled Probit	Pooled Probit	Random Effects Probit	Restricted Coefficients	Regime Switching
Session Length	+	0.01	0.01	0.01	0.01	-0.009
		(2.87)**	(2.74)**	(2.26)*	(3.25)**	(2.22)*
No Session Length	+	0.34	0.29	0.50	0.50	-1.413
		(1.23)	(1.00)	(1.17)	(1.96)*	(2.95)**
House to Senate Ratio	-	-0.25	-0.26	-0.32	-0.23	-0.074
		(2.89)**	(2.96)**	(2.39)*	(2.70)**	(0.52)
Legislature Size	?	0.01	0.01	0.02	0.01	-0.004
		(4.81)**	(4.86)**	(3.32)**	(4.53)**	(0.73)
Percent Commercial	?	-8.15	-5.90	-5.16	-14.70	-34.199
		(0.59)	(0.42)	(0.21)	(1.02)	(1.88)
Percent Residential	?	14.45	17.70	24.07	7.75	-23.609
		(1.33)	(1.52)	(1.15)	(0.66)	(1.51)
Number of Utilities	+	-0.01	-0.01	-0.01	-0.01	-0.012
		(1.44)	(1.54)	(1.21)	(1.36)	(2.33)*
Difference in Expected Average Revenue	-		-0.65	-0.64	-1.27	-0.326
			(0.81)	(0.44)	(0.23)	(2.58)**
Constant		-11.14	-14.09	-19.63	-4.76	22.532
		(1.02)	(1.22)	(0.95)	(0.40)	(1.47)
Observations		400	400	400	400	262
Number of _state				50		

Absolute value of z statistics in parentheses

* significant at 5%; ** significant at 1%

While not statistically significant, the increase in magnitude of the percent commercial and decrease in magnitude of percent residential coefficients reinforces that differences in expected average revenue are correlated with the effect of commercial customers on the outcome of legislative decisions. The fall in percentage of residential customers suggests that their diffuse interest is less correlated with changes in average revenue. The increased commercial effect and decreased residential effect is consistent

with theories of regulation[103] that suggest coalitions of winners and losers, with commercial interests at the margin, influence changes in regulation. Residential customers, a large and diffuse group, will consistently lose in the competition for regulation. The regime switching model conflicts in some ways with the other probit estimates of the effect of legislatures on restructuring outcomes. The effect of session length conflicts with the other estimates, and they are significant.

[103] Stigler 1971, Posner 1974, Peltzman 1976, Becker 1983

Table 3.3

Estimated Coefficients of Variables In Average Revenue Regressions

Variable	Predicted Sign	Pooled Probit (1)	Random Effects Probit (2)	Restricted Coefficients (3)	Regime Switching (4)
Staggered Terms For Commissioners	+	-0.111 (1.52)	-0.13 (1.82)	-0.231 (3.87)**	-0.096 (1.40)
Number of Commissioners	+	0.023 (1.82)	0.023 (1.86)	0.017 (1.57)	0.025 (2.31)*
Term of Office	+	0.032 (1.81)	0.037 (2.15)*	0.061 (4.11)**	0.038 (2.54)*
Requires Professional Qualifications	-	-0.029 (0.91)	-0.03 (0.94)	-0.042 (1.68)	-0.056 (1.99)*
Minority Party Represented	-	-0.127 (3.32)*	-0.127 (3.38)**	-0.075 (2.76)**	-0.12 (3.85)**
No Post-Employment Constraints	+	-0.046 (1.33)	-0.034 (0.99)	-0.077 (2.44)*	-0.249 (7.64)**
Elected	-	-0.182 (3.88)*	-0.187 (4.07)**	-0.186 (4.76)**	-0.152 (3.57)**
Cost Per BTU	+	0.636 (3.41)*	0.644 (3.52)**	0.31 (2.63)**	0.279 (2.26)*
φ	?	0.14 (1.07)	0.225 (1.78)	0.169 (1.46)	-1.756 (6.85)**
Constant		1.73 (14.69)**	1.712 (14.94)**	1.849 (19.43)**	1.888 (17.69)*
Mean Difference in Average Revenue (cents/kWh)		0.209	0.208	-0.154	2.626
Observations		400	400	400	400
R-squared		0.34	0.33		0.36

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

The results of the regression of expected average revenue across all classes of consumer on the cost per BTU and the regulatory variables for the law and no-law states is in Table 3.3. The φ term compensates for the bias introduced by the correlation of the error terms in the law and no-law cases with the iid error term. To not take this step would cause the difference in average revenue between the law and no-law cases to be biased.

The differences in results (1) through (4) in Table 3.3 are a result of the which model is used to estimate results (2) through (5) in Table 3.2. There appears to be no significant difference between the pooled and random effects models, results (1) and (2), further suggesting that there are no unobserved effects, allowing us to ignore the dubious, random-effects specification. The coefficients of everything but the φ term are used to calculate the expected difference in average revenue in the law and no-law regimes for results (2) through (5) in Table 3.2.

With respect to the regulatory determinants of average revenue from electricity across states, cost per BTU of energy is the most obvious and important determinant of this proxy for price. Additionally minority party representation and popular election are of the correct sign and statistically significant in (1), (3), and (4). Term of office is significant in (3) and (4), but not in column (1). The coefficient for the staggering of terms for commissioners is the wrong sign in all cases, but only statistically significant in column (3). This could result from commissioners' inability to conspire in the regulatory process. The other regulatory variables have the correct sign but are also not statistically significant. The columns (2) through (5) from Table 3.2 are based on the assumption that the decision to enact restructuring legislation is dependent on the expected difference in

price with and without the legislation. Based on the assumption that there is little to be gained from assuming the random effects are necessary, (2), (4), and (5) represent the results of assuming the dependence of legislation on expected difference in price. The negative coefficient in all specifications indicates that the greater the difference in expected price between the law and no-law cases, the more likely the legislation is going to be adopted. The assumption of legislators is to expect no-law price to be greater than the price with the law, and hence their difference to converge or be negative. The states implementing restructuring pay about $0.0021 per kWh more based on the probit estimate (2) and $0.0263 per kWh based on the regime switching estimate (4). Estimate (3), with the restricted coefficients, suggests a different outcome. By restricting the coefficients, the estimate for the explained difference changes so that the states that did not implement restructuring, the no-law states, pay a premium of $0.0015 per kWh.

The legislature structure has some strong results. The longer legislatures are in session, the more likely they are to enact restructuring is a significant result. The result is consistent with the theory of the effect of session length on the adoption of laws. The ratio of House to Senate size is consistent with legislation being more difficult to pass in states with a greater disparity in legislative house size. Additionally, the legislature size is significant in determining the passage of legislation.

Column (4), the restricted coefficient model, is the most fundamentally correct specification for this data. The pooled unrestricted estimates conform closely, but the regression must compensate for the ρ term, as in the restricted model.

Unfortunately the percentage of commercial and residential customers does not seem to influence the passage of legislation. Neither does the number of utilities in the

regulator's jurisdiction. Most importantly, the difference in expected price as proxied by the difference in average revenue does not have a statistically significant effect on the passage of restructuring within these models, despite having the appropriate sign. This does not mean that significant savings cannot be had by restructuring. The model also currently omits a variable to account for pro-industry or pro-consumer differences in legislation.

Conclusion

The model presented makes an argument for the simultaneous determination of legislative outcomes using electricity markets. Because neither legislators nor regulators work in a vacuum, it is expected that legislators react to the regulators' decisions, through prices, in the legislature's decision to pass restructuring, especially given the exogenous determination of input costs and regulatory structure by state.

Unfortunately it cannot be determined from the data that legislators are reacting to expected prices as their signal. But it is likely that legislators do observe some other aspects of the regulatory process and react accordingly.

While it cannot be determined that legislators are reacting to expected differences in price when determining their votes on restructuring legislation, there is evidence that the structure of the legislature has a significant effect on legislative outcomes. Additionally, the structure of the regulatory commissions is important in determining prices in the regulated market, using average revenue as a proxy.

CHAPTER FOUR
MODELING MERGERS AND ACQUISITIONS IN REGULATED INDUSTRIES: THE ELECTRIC POWER INDUSTRY

A wave of mergers and acquisitions in the electric power industry occurred from the late nineties through 2003. The wave occurred concomitantly with restructuring at both the state and federal level. Changes in federal rules instituted by FERC probably had some effect on the incentives of firms to engage in mergers and acquisitions. But the major wave of restructuring occurred in response to changes in state regulatory structure. There is evidence, albeit weak, that firms responded in the non-restructuring states to restructuring in other states. Through a model and general examination of the data, changes in the industry through mergers and acquisitions will be shown to have occurred in response to changes in regulatory structure in the states that restructured.

The electric power industry emerged throughout the country in pockets. Generation was on a small scale, usually serving cities. Being dispersed, individual utilities developed in isolation. As this occurred, states began to regulate the industry, attempting to fix the duplication problems and other industry irregularities. But like any industry, a certain amount of scale is necessary for the efficient production of the good or service. Up through the twenties, rampant mergers and acquisitions occurred in the industry, driving down the average cost of power but leading to increased concentration. New interstate utility holding companies developed. These new holding companies were unregulated due to constitutional limitations on the individual state's ability to regulate interstate commerce.[104] After the stock market crash, when the financial malfeasance of the interstate holding companies became apparent, the federal government stepped in.

[104] Energy Information Agency 1993

The Roosevelt administration halted the wave of mergers and acquisitions occurring in the industry. The passage of the Public Utility Holding Company Act of 1935 (PUHCA) was the major legislation that ended consolidation in the electric utility sector. PUHCA limited the relationship that regulated firms had with their regulated subsidiaries while empowering the states to take a more active role in the intrastate regulation of utilities.

Beginning in the late seventies several events occurred to cause legislators to reconsider the regulation of gas and electric utilities. Fossil fuel costs rose, and gas turbine technology became more efficient. The Three Mile Island incident brought renewed scrutiny to the nuclear power industry, increasing the costs of using nuclear power technology. Both of these events changed how firms operated in the market. As a result, Congress passed the Public Utility Regulatory Policies Act (PURPA) to encourage the more efficient use energy sources in the United States. PURPA created a class of producers called qualifying facilities that enhanced the stock of generation, leading to more efficient and diverse production of power from combined-cycle sources[105].

Beginning in the late eighties, great changes in technology precipitated changes in the regulation of utilities. The Energy Policy Act of 1992 empowered FERC with the tools to open up energy markets without giving it explicit authority to mandate retail wheeling—the sale of energy across non-contiguous buyers and sellers. States responded by enacting legislation that allowed generators greater flexibility in the competitive production of electricity.

[105] Combined-cycle generation refers to generation other than from dedicated generators, usually industrial generation from the waste heat of industrial processes. The excess heat is used to run generation that is used or sold to utilities.

Throughout the nineties and into the first decade of the 21st century, firms have merged and acquired competitive businesses with the ultimate goal of increasing their competitive viability in the face of a changing regulatory environment. The present paper attempts to show that legislative changes have an effect in driving mergers and acquisitions in the electric power industry by decreasing the market value of firms in restructuring states. As firm value declines in the restructuring states, firms attempt to recoup lost market capital by merging or acquiring competing firms.

Mitchell and Mulherin have studied the conditions under which firms will merge when faced with industry shocks. Their hypothesis maintained that corporate takeovers represented the least cost means of coping with industry-specific economic shocks[106]. They studied the effect of industry-specific changes in regulation or market structure. Looking specifically at the 1980's they found that takeover activity occurred disproportionately at the industry level. The industries they observe with the greatest takeover activity also had the greatest fundamental shocks—or shocks such as deregulation, technological change, or others that caused fundamental industry change. They found that the most robust results were in industries with the greatest stock market performance. While Mitchell and Mulherin studied a variety of industries, they avoided industries that experienced significant state and federal regulation, notably the electric power and banking industries.

Other authors have looked at vertical mergers in the electric utility industry. Vertical mergers have been called convergence mergers to describe mergers between upstream natural gas and downstream electric generators. While this paper does not directly examine these mergers, they are worth mentioning.

[106] Mitchell and Mulherin, 1996

Brennan[107] analyzes vertical mergers by noting that vertical mergers are an "oxymoron;" they limit the provision of complements, rather than substitutes, as in traditional horizontal mergers. The market power that is a problem is horizontal in the input market. Brennan notes that convergence mergers are neutral if the generator is gas fired—the gas producer already has market power. Convergence mergers can eliminate the double marginalization: the existence and exercise of market power in vertical markets by multiple, independent firms. By eliminating the duplication of market power, the merger raises profits for the market participants and decreases price for consumers, increasing overall market efficiency.

Hunger[108] reaffirms Brennan's conclusions. Hunger looks at the merger review process and concludes that traditional merger analysis does not adequately capture the ability of firms to "raise rivals cost," establishing the necessary conditions for firms to raise rivals cost by merging with upstream firms. It notes that if a gas company has substantial market power in the upstream market, the electric generator can create infra-marginal rents for non-gas fired generators in the downstream market by the exercise of market power in the upstream market. This is in addition to the ability to capture rents in the upstream market with the naked exercise of market power by gas producers. It does not matter if the generator owns gas generators or not, just as long as he benefits from higher electricity prices.

Mergers and acquisitions in the electric power industry were different from mergers in other industries in many ways. Regulators scrutinized mergers much more in the electric power industry due to multi-tiered regulation. Not only does the federal

[107] Brennan, 2001
[108] Hunger, 2003

government through PUHCA limit the scope of mergers—into complementary industries such as gas—states often entered to limit the scale of mergers. But state regulation does not prevent the federal government from limiting scale. The Federal Energy Regulatory Commission (FERC) still maintains oversight of interstate mergers in the utility industry.

In the late eighties the regulatory environment began to change for the industry. The first significant change occurred with the passage of the Energy Policy Act of 1992 (EPAct). This piece of legislation authorized FERC to begin the process of deregulating electricity markets at the federal level. With Order 636, FERC mandated the unbundling of transmission and distribution from generation. The practical effect of the order was to allow for the separation of transmission and distribution costs from generation costs. With Order 888 FERC instituted the "open access" rule: generation was no longer limited to large co-generators or transmission and distribution owning utilities. By allowing for the separation of transmission and distribution, states were now free to pass unilateral restructuring without interference from federal regulators.

With Order 888 and restructuring within the states, utilities faced a regulatory environment unlike any in the last 60 years. As Mitchell and Mulherin had shown, with changing costs and regulations, industries adapt by instituting corporate restructuring: mergers, acquisitions, and takeovers. From 1996 through 2005 the electric power industry went through a wave of corporate restructuring unlike any since prior to the passage of PUHCA. Not only did private utilities begin acquiring smaller utilities and spinning off transmission and distribution assets as mandated by many states, but new classes of power producers—many of whom did not own either transmission or distribution assets—entered the market.

The data for this study was derived from COMPUSTAT financial data, Value Line investor surveys, FERC, and Energy Information Agency (EIA) data collected from power plants across the country. The COMPUSTAT data is from 1996 through 2004. The study ignores years prior to 1996 as there were few mergers or acquisitions prior to 1996. The COMPUSTAT data was also limited to firms that had SIC numbers consistent with firms in the electricity generation, transmission, or distribution industry. Firms that specialized in the production or distribution of natural gas were excluded, even though their inclusion would be consistent in the estimation of the benefits or mergers and acquisitions that is hypothesized. They were omitted because there were no EIA data on those firms.

FERC must approve all interstate mergers and acquisitions; it has the most complete compendium of mergers and acquisitions and therefore is the source for all approved mergers and acquisitions analyzed. FERC also maintains a database of financial information in a proprietary format. Unfortunately FERC does not acquire financial data on all IOUs, only the largest, so the COMPUSTAT data was also used. The market value regression uses the absolute change in sales and lagged liability to asset ratio for all of the firms who took part in a merger or acquisition from 1996 to 2003. By using absolute change, the study picks up the effect Mitchell and Mulherin observe, that changing industry sales may induce firms to merge or acquire other firms in response to positive and negative industry shocks.

This study borrows data from a previous study[109] of the effects of state restructuring on price, or specifically average revenue, based on Sass and Leigh[110]. The model

[109] Davis 2006
[110] Sass and Leigh 1991

estimates the probability of a merger based on the estimated value of the merger relative to not merging and the absolute percentage change in sales and liability to asset ratio:

$$M_{it}^{*} = Z_{it}\gamma + u_{0it} \quad \text{where} \quad M_{it} = \begin{Bmatrix} 1 \text{ if } \mathrm{M}_{it}^{*} \geq 0 \\ 0 \text{ if } \mathrm{M}_{it}^{*} \leq 0 \end{Bmatrix} \tag{1}$$

M_{it} represents the value of the merger to an acquiring firm. If the merger has a positive net value then it proceeds with a binary value of 1. If a merger in a given year has a negative value, then we observe no merger and a binary value of 0.

The vector Z_{it} is a collection of firm-specific characteristics such as the absolute value of the percentage change in sales and liability to asset ratio. Absolute percentage change in sales will indicate whether the firm is facing a shock that affects sales, either positively or negatively, within the industry. When facing a shock, firms are more likely to engage in restructuring activities either to mitigate negative shocks or to take advantage of a shock by acquiring assets that were previously uncompetitive.

The lagged liability to asset ratio gives an indication of whether a firm is attempting to merge or acquire another firm in a previous period. If a firm is planning a merger or acquisition, then the firm will issue new debt in order to acquire a firm or merge in the next period.

Another determinate of the attractiveness of a merger is the potential gains from the merger. Equation (2) estimates the expected value of the natural log of market capitalization by state as a function of the standard normal probability density function

(ϕ) and standard normal cumulative density function (Φ) and a vector of determinants of firm value by state (X).

$$E(\text{Market Capitalization}) = (\alpha_1 - \alpha_2)\Phi + (\beta_1 - \beta_2)X\Phi + \alpha_2 + \beta_2 X + (\sigma_{2u} - \sigma_{1u})\phi \quad (2)$$

Included in the vector of state specific effects are heating and cooling degree days for a year, the cumulative deviation in heating and cooling degree days for a year, the number of utilities in the state as of 1995, the average cost per Btu of energy within the state, and whether the state enacted restructuring legislation in a given year.

Heating and cooling degree days per year are used as a measure of energy demand in each state. A heating or cooling degree day is calculated for each degree difference in temperature from 65 degrees Fahrenheit. The cumulative heating and cooling degree days in December is used as a measure of total heating and cooling degree days for the year. The cumulative deviation in December is used to determine the total cumulative deviation for the year.

Each observation is an instance of a firm listed in the COMPUSTAT data that could be reconciled with the CRSP data by id number—a combination of PERMNO and CUSIP reconciled originally in a separate list.

Equation (3) is the probit estimate of firm specific effects including the difference in market capitalization between firms that do not merge (C_1) and those that do (C_2).

$$M_{it} = Z_{it}\gamma + \rho(C_1 - C_2) + u_{0it} \quad (3)$$

Equation (4) is the probit estimate substituting the expected value derived in equation (2) above:

$$M_{it} = Z_{it}\gamma + \rho\left(\left(\alpha_1 + \beta_1 X\right) - \left(\alpha_2 + \beta_2 X\right)\right) + \rho\left(u_{1it} - u_{2it}\right) + u_{0it} \qquad (4)$$

Estimation requires estimating equation (4) to get estimates of Φ and ϕ. Equation (2) is then estimated using the values of Φ and ϕ to determine the coefficients α_1, α_2, β_1, and β_2. These coefficients are then used to determine the expected difference in market capitalization from merging where the subscript "1" is for non-merging firms and "2" represents merging firms.

Table 4.1 is the results of models (1) and (3) above:

Table 4.1

Regression of Probability of a Merger or Acquisition

	Expected Sign	W/o Diff in Mkt Cap	With Diff in Mkt Cap
Absolute Change in Sales	+	-2.033	-2.245
		(1.43)	(1.62)
Lagged Sales of Firm	+	0.174	0.097
		(0.28)	(0.16)
Lagged Negative Sales Dummy	-	-0.297	-0.217
		(0.75)	(0.55)
Lagged Liability to Asset Ratio	-	-0.931	0.12
		(0.41)	(0.05)
Difference in Market Capitalization	-		0.052
			(2.30)*
Constant	?	-0.481	-0.096
		(0.30)	(0.07)
Mean Difference in Market Capitalization (Non Mergers Mkt Cap - Mergers Mkt Cap)			-27.886
Observations		190	190

Absolute value of z statistics in parentheses
* significant at 5%; ** significant at 1%

The predicted sign for absolute percentage change in sales and lagged sales effect are positive. To capture an effect, the absolute value is taken to determine a total shock. While the lagged sales are consistent with mergers and acquisitions occurring in response to an unexpected shock, the small test statistic suggests the result is unimpressive. The negative sign on current period absolute change in sales implies that an increase in absolute change in sales for a year decreases the probability of a merger or acquisition in the current year. Another interpretation is that an expected change in sales will decrease the probability of a merger or acquisition in the coming year. Mitchell and Mulherin

observe that sales growth have no effect on merger or acquisition activity, but changes relative to other industries do have an effect, and shocks have an effect. Because this study only looks at the electricity industry, changes with respect to other industries are unobserved. The results do not confirm Mitchell and Mulherrin's result that shocks do affect merger or acquisition activity.

The negative result for current year shocks suggests that an expected shock decreases the probability of a merger or acquisition in the current period, assuming that firms plan mergers and acquisitions a period ahead. If negative shocks are controlled for, they perfectly predict 62 observations of non merger or acquisitions activity. This result suggests that negative shocks do not drive merger or acquisition activities in the data, reinforcing the conclusion that firms do not respond to expected negative changes in business activity by merging or being acquired. The statistically insignificant coefficient on the lagged negative sales dummy implies that unexpected negative shocks have no effect on merger or acquisitions activities.

The sign for lagged liability to asset ratio is positive when changes in market capitalization are accounted for and negative when they are not, implying that increases in the issuance of debt in a year correspond to increases in merger and acquisition activities in the next and debt structure is correlated with changes in the expected market value of the firm. This is consistent with the intuition that firms use debt to finance mergers and acquisitions as proposed by Blair[111]. Unfortunately no statistically significant effect is observed on mergers and acquisitions.

The difference in market capitalization from equation (3) is included. The coefficient of the expected difference is positive. This is inconsistent with a hypothesis that as the

[111] Blair, Margaret. The Deal Decade. Brookings Institution Press. 1993

expected difference in market capitalization rises, the more likely firms are to engage in merger and acquisition activity. The result does not support a hypothesis that IOUs engage in merger activity to increase market value, relative to the expectation based on the value of other firms in the industry. Finally, the expected market value of the non-merging firms is on average $28 million less than the merging firms, supporting a conclusion that mergers increase market value. But $28 million is a very small difference considering the value of even the smallest IOUs is in the billions.

Table 4.2 lists the coefficients from the expected market capitalization regression. The only significant effect is for the total deviation in heating days in a year. The coefficients on all other variables are statistically insignificant.

Cost per BTU of fuel has a weak negative effect, consistent with rising energy costs decreasing firm value. The number of heating and number of cooling days are also of the expected sign. As heating days increase, demand for electricity should fall in areas that use heating intensively, as electric heating is less efficient for intensive use than alternatives. Cooling days are also of the correct sign, indicating that in warm climates, the intensive use of air conditioning, and therefore electricity, would contribute to higher market value of firms. Cumulative deviations in heating and cooling days should have positive effects on firm value due to the costs associated with adapting to changes in temperature in warm climates, and the cost of using short-run, electric heat in cooler climates.

Restructuring is of the correct sign, although not statistically significant, but it is close. The restructuring variable uses state of incorporation to determine whether the firm was affected by restructuring in the states or not. The use of state of incorporation

as the determiner of restructuring is valid because utilities were required under PUHCA to register in the state in which they provided service and there were geographic limits to mergers and acquisitions under the prevailing regulation.[112]

Table 4.2

Regression of Market Capitalization on State Determinants of Firm Value

	Predicted Sign	Coefficient
Cost Per BTU	-	-0.437
		(0.49)
Number of Utilities	-	0.001
		(0.16)
Heating Days	-	-0.000212
		(1.29)
Cumulative Deviation in Heating Days	+	0.0014
		(2.06)*
Cooling Days	+	0.0002613
		(1.39)
Cumulative Deviation in Cooling Days	+	-0.0012
		(0.86)
Restructured	+	0.45
		(1.61)
φ	?	-16.841
		(1.91)
Constant	?	14.937
		(37.94)**
Observations		190
R-squared		0.15

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

[112] EIA 1993

There are other reasons why firms in the electric utility industry may merge or acquire other firms. There is substantial evidence that the firm restructuring is occurring in response to changes in regulation instituted by FERC under the Energy Policy Act of 1992 (EPAct). The model also looked at restructuring specifically in the states, but did not include mergers and acquisitions across industries, specifically electric and gas mergers.

Table 4.3

Mergers and Acquisitions by State of Incorporation: 1997 to 2004

State of Incorporation	Year								State Totals
	1997	1998	1999	2000	2001	2002	2003	2004	
CA	2								**2**
CO	2			1					**3**
DC	1				1				**2**
DE	2				1				**3**
FL				1					**1**
IA	2	1		2					**5**
IL	1		2			1		1	**5**
IN				1	1				**2**
KS			1						**1**
KY		2		1					**3**
MA			4	1					**5**
MD	1		1						**2**
ME				1					**1**
MN	1			2					**3**
MO	1		1	3		1		1	**7**
NC	1	1		2		1			**5**
NJ					1				**1**
NV			3	2					**5**
NY	1		2	2	3				**8**
OH	3			1	1				**5**
OR	1			1		1			**3**
PA			1						**1**
SD				1					**1**
TX	1			1					**2**
VA			1						**1**
WI	2	2							**4**
Year Totals	**22**	**6**	**16**	**23**	**8**	**4**	**0**	**2**	**81**

Table 4.3 is mergers and acquisitions by state from 1997 to 2004. Due to data limitations the table represents a more complete set of mergers than in the model. 1997 was an important year for mergers and acquisitions in the industry with a total of 22 individual firm actions, mostly with other IOUs, for a total of merger or acquisition transactions of 11 or more, if gas electric mergers are included. 1997 coincides with the first big push for industry restructuring within the states. 1999 and 2000 were also important years for mergers and acquisitions in the industry, with 16 and 23 individual firm actions. Both years correspond with substantial changes in state level restructuring.

Table 4.4

Mergers and Acquisitions: Restructuring States

Restructuring State	Year								State Totals
	1997	1998	1999	2000	2001	2002	2003	2004	
CA	2								**2**
DC	1				1				**2**
DE	2				1				**3**
IL	1		2			1		1	**5**
MA			4	1					**5**
MD	1		1						**2**
ME				1					**1**
NJ					1				**1**
NV			3	2					**5**
NY	1		2	2	3				**8**
OH	3			1	1				**5**
PA			1						**1**
TX	1			1					**2**
VA			1						**1**
Year Totals	**12**	**0**	**14**	**8**	**7**	**1**	**0**	**1**	**43**

Table 4.4 is mergers and acquisitions in restructuring states. The years 1997, 1999, 2000, and 2001 were the most active for mergers and acquisitions in restructuring states. After 2001, merger and acquisitions activity falls off, possibly as a response to changes states made in reaction to California's restructuring problems.

Table 4.5, merger and acquisition activity in non-restructuring states, indicates that merger and restructuring activity was not limited to restructuring states, undermining the hypothesis that state restructuring was driving mergers and acquisitions. But even in the non-restructuring states activity was clustered in 1997 and 2000. This could indicate that firms in the non-restructuring states were reacting to regulatory uncertainty, the possibility of restructuring in their state of incorporation, or that they were reacting to merger and acquisition activity in restructuring states.

Table 4.5

Mergers and Acquisitions: Non-Restructuring States

	Year								
State	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**State Totals**
CO	2			1					**3**
FL				1					**1**
IA	2	1		2					**5**
IN				1	1				**2**
KS			1						**1**
KY		2		1					**3**
MN	1			2					**3**
MO	1		1	3		1		1	**7**
NC	1	1		2		1			**5**
OR	1			1		1			**3**
SD				1					**1**
WI	2	2							**4**
Year Totals	**10**	**6**	**2**	**15**	**1**	**3**	**0**	**1**	**38**

Another indication of what may be driving restructuring in the states is in Figure 4.1. Figure 4.1 is average market capitalization for firms in restructuring versus non-restructuring states. Prior to 1999, in the middle of the merger and acquisitions wave, IOUs in non-restructuring states enjoyed a billion dollar premium over IOUs in the restructuring states. Firms in the restructuring states, where pressure to merge or acquire or be acquired was greater due to changes in the structure of regulation, were increasing market value relative to IOUs in the non-restructuring states. After 1999, and consistent with Table 4.5, IOUs in the non-restructuring states embarked on a wave of restructuring, attempting to catch up to firms in the restructuring states. In the restructuring states, mergers and acquisitions began in 1999 and continued through 2001, as seen in Table 4. Firms in the restructuring states had a premium of almost a billion dollars in market capitalization after 1999.

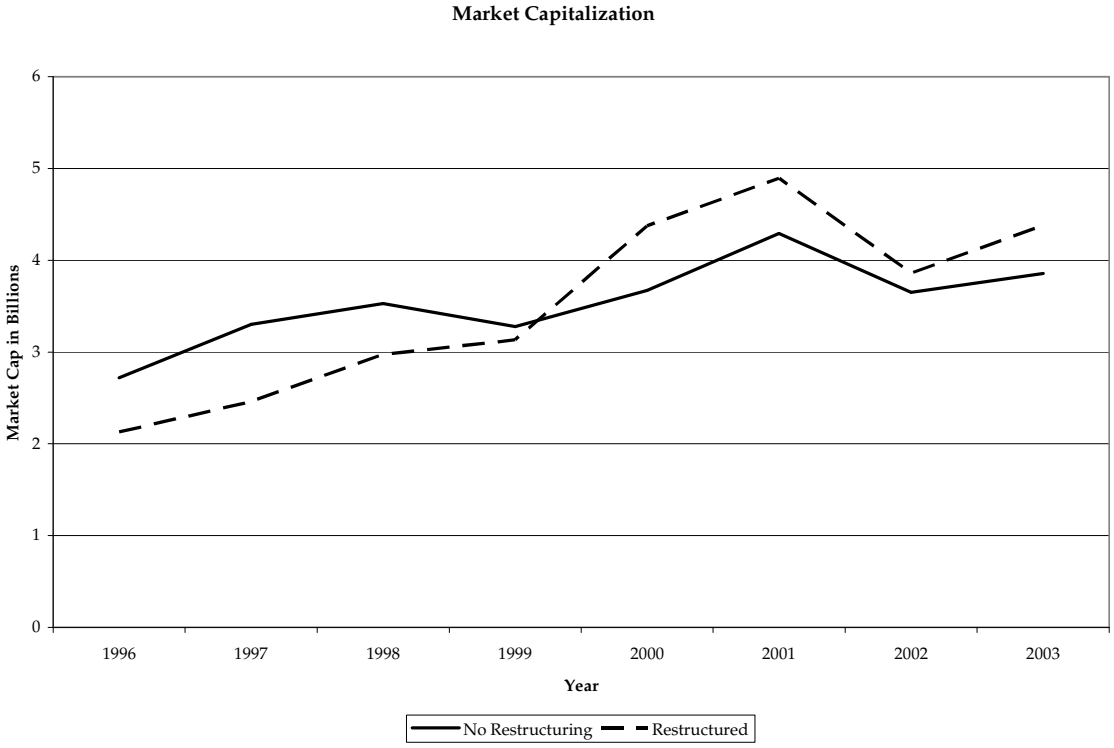

Figure 4.1

The results of the empirical model, with the weak effect of restructuring driving mergers and acquisitions, combined with the evidence from Tables 4.4 and 4.5, that mergers and acquisitions in the restructuring states were leading those in the non-restructuring states, and the change in market capitalization in the restructuring versus non-restructuring states, indicate that state restructuring possibly drove the wave of mergers and acquisitions in the electric power industry.

Given the regulatory conditions under which IOUs operate, it is difficult to explain well what drives mergers and acquisitions across firms and states through time. But we know they occur. Any explanation would have to include the incentives for the IOU to merge or acquire other firms. It is well understood[113] that the manager has an incentive to increase value for the shareholder as well as potentially consolidating his management

[113] Jensen 1976

position. It is reasonable to believe that the manager will make those decisions that increase the market value of the firm while faced with regulatory constraints imposed by the states.

Mitchell and Mulherin have shown that firms when faced with regulatory change and market pressure engage in merger and acquisition activity to mitigate the negative market effects. Blair showed that firms use debt to finance merger and acquisition activity. Combined these explain some of what drives merger and acquisition activities among IOUs. But this does not explain particular state-specific incentives to engage in these activities. This paper addresses those concerns by estimating differences in market value of firms that engage in mergers and those that do not.

The paper shows that changes in market capitalization can explain the occurrence of mergers and acquisitions, while climate and the enactment of restructuring legislation can weakly explain some of the difference in market value that potentially drives the incentive to merge or acquire. Looking at trends in the timing of mergers and acquisitions between restructuring and non-restructuring states suggests that firms in the restructuring states were responding to restructuring, while firms in the non-restructuring states were responding to IOU's responses in the restructuring states. Management may perceive benefits to maintaining market value relative to other IOUs in the industry, or they perceive structural change as an opportunity to grab assets that were undervalued prior to major industry restructuring. Either scenario is plausible but irrelevant. The important result is that firms seem to respond to restructuring by changing firm structure, suggesting that regulation in the industry created incentives that were undone in the wave of restructuring occurring from 1996 to 2003.

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