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Evidence on U.S. Electricity Prices: Regulated Utility vs. Restructured States

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ABSTRACT: Economic theory states that "free market" competition naturally achieves lower prices—thereby increasing efficiency and benefiting society. This is the first paper in the literature to use means testing to statistically analyze electricity prices, from 1970-2011, for states that restructure their electric utilities—pre-and-post restructuring—relative to U.S. electricity prices; thus determining whether restructured electricity utility states are more or less efficient, after restructuring, than before. This fundamental empirical evidence is sought to explain whether expected operating synergies are being realized and stockholders are gaining or losing relative value—once states restructure—and electric companies are merged or acquired. This paper's empirical results are timely and important to future energy policy—in this crucial to the economy electric power industry—and establish whether "free market" economic theory is being appropriately applied in states that restructure their vertically-integrated government-regulated natural monopoly electric utilities. Future research is suggested.

Keywords: Electric utilities; Restructuring; Operating efficiency; Free market competition
JEL Classifications: G31; G38; H44; K23

1. Introduction

Electricity is a necessity. The Edison Electric Institute (2014) reports residential electricity customers comprise 87.3% of the market, commercial 12.2% and industrial 0.5%. Since 1970, the typical United States (U.S.) household increases electricity consumption by 61%, with electricity demand projected to grow by 23%, through 2040. U.S. economic development and success are dependent on affordable electricity.

The vertically-integrated government-regulated natural monopoly electric utility model worked well in the U.S.—for nearly 100 years. However, some governors and state legislatures wish to reduce their states' electricity prices and are advised that electricity prices would naturally fall if "free market" competitive marketplaces were established (Mankiw, 2014). Consequently, beginning in the late 1990s, a limited number of states restructure their vertically-integrated government-regulated natural monopoly electric utilities—by instituting "free market" competition in the electricity generation and retail sales' sectors—while maintaining the middle-two sectors of transmission and distribution as a government-regulated natural monopoly.

The economic theory of "free market" competition naturally achieving lower electricity prices, in restructured electric utility states, is empirically tested. This research is the first in the literature to use means testing to statistically analyze electricity prices, from 1970 to 2011, for restructured states, pre-and-post restructuring, relative to U.S. electricity prices. The goal is to determine whether restructured electricity utility states are more or less efficient, before or after restructuring. This fundamental empirical evidence is sought to explain whether expected operating synergies are being realized and stockholders are gaining or losing relative value—once states restructure—and electric companies are merged or acquired. The answer will help set future energy policy—in this vital to the economy electric power industry—and establish whether "free market" economic theory is being appropriately applied in states that restructure their vertically-integrated government-regulated natural monopoly electric utilities, by permitting electricity generation and retail sales' "free market" competition.

The literature describes "free market" economic theory supporting electric utility restructuring. However, informed economists believe this theory is ahistorical, when applied to the vertically-integrated government-regulated natural monopoly electric power industry. Restructuring U.S. electric utilities into restructured "free market" generation and retail sectors and retaining

government-regulated transmission and distribution sectors may create less efficiency, if disassembling the whole makes the electric power industry less flexible and unable to cope with volatile electricity supply and demand requirements, at a reasonable cost.

The remainder of this paper is organized as follows. Section 2 discusses the literature relevant to U.S. electric utility restructuring. Section 3 presents the data source and statistical methods used to analyze "free market" competitive states' electricity prices—relative to U.S. electricity prices. Section 4 explains the empirical results. Section 5 discusses electric utility restructuring and why some states are re-regulating their electricity generation and retail sales' sectors. Section 6 offers conclusions, policy implications and a suggestion for future research.

2. Literature Review

Clifton, et al. (2011) explains the need for electricity restructuring, based on "free market" economic theory. Publicly-owned bureaucracies represent an obstacle to efficiency, because of the incentive problem, which thwarts entrepreneurial spirit. To remedy this, electricity suppliers, as with all general industrial goods and services providers, must be exposed to the pressures of "free market" competition. Government policy should unbundle what is presumed to be competitive electricity generation and retail sectors, from the non-competitive transmission and distribution sectors of electric utilities. Thus encouraging competition in an industry long held to be a vertically-integrated government-regulated natural monopoly. The World Bank and many international economic organizations expect that private-firm styles of management will transform former vertically-integrated electricity utility government-regulated natural monopolies into a high performing and efficient industry; thereby giving all residential, commercial and industrial electricity consumers a greater choice of services, at lower electricity prices—which will therefore benefit society as a whole.

Informed economists consider "free market" economic theory to be ahistorical, when applied to the vertically-integrated government-regulated natural monopoly electric utility industry. Efficient desirable organizational scope issues and difficult technical limitations make the vertically-integrated government-regulated natural monopoly electric utility industry unique (Girish and Vijayalakshmi, 2013). It is believed electric utility restructuring reformers are dismissing organizational and technical complexities and promote an oversimplified "free market" economic vision of electric utility policy and markets. Moreover, markets are not efficient (Prentis, 2011, 2012) and can be manipulated—either legally or illegally; consequently, markets are not a panacea (Prentis, 2013).

Hausman and Neufeld (2011) explain that electricity restructuring may be allowing electricity holding companies to consolidate market power, as in an earlier period. Shaky financial structure holding companies, in the 1920s, purchased electricity generating operating companies, using high leverage, amplified through pyramiding, whereby different levels of holding companies connected an operating company to a top holding company, who's direct investment—while tiny compared to total assets—nonetheless controlled the entire organizational structure. The huge leveraged profits promoted fraud and financial bubbles. This prompts the federal government, in the 1930s, to regulate the holding companies as electric utilities. Electric utility restructuring today may be unleashing the same destructive 1920's forces.

When restructuring a vertically integrated government-regulated natural monopoly electric utility, Wen and Yuan (2010) present an optimal design structure that satisfies government objectives—from a public finance perspective. Competition, upstream and downstream, is connected and substitutes for one another, and should be taken into account when designing the marketplace. If not, vertical externality may make the restructured industry less competitive, as a whole, when compared to each of its sectors**.** After restructuring, electricity prices are likely to be higher than the regulated electric utility price, if the marginal cost of public funds is high. Electricity prices are expected to be lower than the regulated electric utility price, if private management efficiencies are achieved.

Breslau (2013) studies the role of economics in developing market policy during the restructuring of U.S. electric utilities. Economic framing—not necessarily facts—shapes politics in the market building practices that form new institutions, by imposing specific terms for competing parties' legitimate struggle over new market rules. A key framing selling point for restructuring electric utilities is the promise of lower electricity prices, which may not be achieved in practice. Swadley and Yücel (2011) use a dynamic panel model and—based on price controls, participation rates, market

size, percentage of hydroelectric power generation and natural gas and coal rates—report mixed price findings.

Nakajima and Hamori (2010) study residential electricity price elasticity, using three cross-sections—all states (excluding Hawaii and Alaska) and the District of Columbia—restructured states vs. non-restructured states—and two time series—before restructuring and after restructuring. No substantial difference in the price elasticity is found, between restructured and non-restructured states, before and after restructuring. Restructuring electricity markets has not increased consumers' sensitivity to electricity prices. Hyman (2010) finds the reason may be because the promised significant benefits to residential electricity consumers, with restructured electric utility markets, have not been realized.

Billette de Villemeur and Pineau (2012) study electric regulated utilities vs. electric "free market" competitive states, under two jurisdictions: 1) regulated monopoly, selling electricity at average cost; and 2) competitive markets, selling electricity at marginal cost. Three different market structures are presented: 1) autarky—a closed or self-sufficient market; 2) a mixed-market structure with trade; and 3) a fully integrated market. The authors show a shift from vertically-integrated government-regulated natural monopoly electric utilities, to competitive markets, results in a decrease in electricity consumption.

Electric utility restructuring introduces additional risk and uncertainty of electricity price volatility into the marketplace. Rodriguez (2011) incorporates electricity non-storability and demand inelasticity factors and presents a backward stochastic differential equation model to value monthly, daily and hourly, physical swing options. Traders may use forward contracts and European calls to hedge spot electricity price risks.

Prentis (2014a) studies Texas Interconnection grid electricity prices, pre-and-post restructuring, relative to U.S. electricity prices. Texas Interconnection grid electricity prices rise about 60% faster than U.S. electricity prices, and increase about four times faster after restructuring, than before restructuring. Evidence suggests that the Electrical Reliability Council of Texas (ERCOT) is failing in its stated mission, "to ensure a reliable electric grid and efficient electricity market." Marketplace reforms are suggested to help ensure restructured electricity "free market" competition results improve, for all residential, commercial and industrial consumers.

Becker-Blease, et al. (2008) tests, as a result of U.S. electric utility restructuring, whether the strategy of merging or acquiring other electric utilities creates value for utility shareholders—by increasing stock price performance after the merger—in comparison with electric utilities that remain independent. The results show the post-merger stock prices never exceed and are often worse, when compared to stock prices of electric utility companies in regulated states. The report concludes that electric utility mergers and acquisition, resulting from restructuring—fail to achieve the expected synergies, decrease accounting-ratio measures of operating performance and efficiency, and reduce long-term post-merger stockholders' relative stock prices. Consequently, stockholder value is being destroyed, as a result of mergers and acquisitions in the restructured electric power industry.

Prentis (2014b) examines states that offer "free market" competition by restructuring their electric utilities, with North American Electric Reliability Corporation (NERC) reserve margin forecasts, from 2014-to-2023, to examine whether the restructured 15 states and District of Columbia (D.C.) are adding sufficient generating capacity to meet expected demand and providing high electrical system reliability, in comparison to the U.S. as a whole. Four of the six NERC U.S. Assessment Areas—that include the restructured 15 states and D.C.—do not meet NERC reference reserve margin standards and are considered unreliable. In comparison, the 18 NERC U.S. Assessment Areas, when taken together, remain above the NERC reference reserve margin standard. The data show that electric utility restructuring is negatively affecting maintaining high U.S. electrical system reliability standards, in the restructured states. Consequently, "Energy only" and "capacity markets" are failing to work as intended. A Minkowski Space business model is suggested to improve U.S. electricity energy policy.

3. Data and Methodology

The U.S. Energy Information Administration (EIA) Map (2014) identifies 15 states, plus the District of Columbia (D.C.), that are in different stages of restructuring their electricity markets. The EIA Map (2014) explains that "restructuring means that a monopoly system of electric utilities has been replaced with competing sellers," and also states that "restructured states" may be referred to as "deregulated states."

The EIA Map (2014) reports seven states have suspended electricity restructuring. For example, Montana has the lowest electricity costs in the region, prior to restructuring. After restructuring, and the sale of Montana Power Company's (MPC) power plants for $2.7 billion dollars—handled for large fees by Goldman Sachs—MPC transforms itself into Touch America, which promptly goes bankrupt. As a result of restructuring, electricity costs in Montana rise to some of the highest in the region. Restructuring also causes the loss of senior water rights on Montana's major rivers, jeopardizing irrigation for the Upper Missouri River Basin during serious droughts. NorthWestern Energy, Montana's government-regulated electric transmission and distribution utility, is acquiring or building generating plants—and plans to purchase the important hydroelectric dams, by the end of 2014—lost as a result of Montana's disastrous electric utility restructuring debacle (Ochenski, 2013).

California experiences large-scale blackouts during her electricity restructuring crisis of 2000-2001—driving Pacific Gas & Electric Co. into bankruptcy and nearly bankrupting Southern California Edison, which is saved only by a bailout from the state—resulting in California consumers paying billions of dollars more for electricity. Not surprisingly, California suspends her experiment in electricity utility restructuring. Examples of disastrous electric utility restructurings cause states such as Virginia to re-regulate their electric utilities, before restructuring is scheduled to begin. Twenty-eight states never attempt to restructure their generation-transmission-distribution-retail sales vertically-integrated government-regulated natural monopoly electric utility industries.

Illinois, Ohio, Michigan and Pennsylvania severely limit their electricity market restructuring during this 1970-2011 study period, and consequently, are not included in states that have effectively restructured their electricity markets. Illinois sets a lower than market electricity price cap through 2006. When the Illinois electricity price cap is scheduled to expire in 2007—residential and commercial rates threaten to increase 50%—forcing the Illinois legislature to subsidize electricity rates by one billion dollars, through 2011. Ohio, since her electric utility restructuring, has lowered electricity pricing below market rates and then capped them, which is only being lifted beginning in 2012. Michigan's electric utilities are not required to sell their generating power plants, and consequently, rely on wholesale power markets for only a small portion of their customers' power needs. Pennsylvania is slowly transitioning into a restructured electricity market while keeping electricity prices in check, by government dictate. Pennsylvania institutes electricity distribution rate caps, which incrementally expire by 2011. All but one of Pennsylvania's utilities retain their electricity generation plants, and generation rate caps—based on "stranded costs" recovery settlements—remain in effect for the majority of Pennsylvania's electricity consumers.

The 11 states and the D.C. that effectively restructure their vertically-integrated government-regulated natural monopoly electric utilities, and offer "free market" competitive marketplaces—and the year their electric utility industry is effectively restructured—are listed in Table 1.

Effectively restructured states may slowly transition into electric utility restructuring. For example, Maryland, during her electric utility restructuring, set capped electricity rates for all customers, from 2000 through 2007, and finally effectively restructures her electricity market in 2008. New Hampshire's state legislature delays the start of electric utility restructuring, until 2003. New Jersey allows electricity customers a choice on their electric power company, beginning on August 1, 1999; however, electricity prices are capped, until 2003.

U.S. Energy Information Administration (EIA) (2014) is the source of electric power price data for this study, from 1970-through-2011, both for the restructured electric utility states and for the U.S. electrical power system.[1] Linear least squares trend lines using Excel are fit to the restructured

[1] U.S. Energy Information Administration (EIA) --- Table ET7. Electric Power Sector Price and Expenditure Estimates by Source, Selected Years, 1970-2011, United States --- Prices in Dollars per Million BTU chart: Total Energy column --- is the electric power price data source for this research (click on: Change

state data, as well as for the U.S.—producing comparison equations of price changes, representing electrical operating efficiency. The SPSS statistical program compares relative price changes in restructured states' electric price data, relative to U.S. electricity prices, pre-and-post restructuring, for each state—using one-way ANOVA. The null hypothesis of the equality of the two population sample means, for each restructured state, for each year, is tested, to determine if there is a significant difference in means for restructured electricity prices—relative to U.S. electricity prices—before and after restructuring, in each state.

Table 1. Eleven States and the D.C. Offering Consumers "Free Markets" and Effective Year Restructured

Eleven Electricity "Free Market" Competitive States and D.C.	Year Electricity Utility Industry Is Effectively Restructured
Connecticut	2000
Delaware	2000
Maine	2000
Maryland	2008
Massachusetts	1998
New Hampshire	2003
New Jersey	2003
New York	2002
Oregon	2002
Rhode Island	1998
Texas	2002
District of Columbia (D.C.)	2001

Levene's test examines homogeneity of variance, and if significant, the more generalized Welch test is performed, which does not assume identical standard deviations in the data. In addition, group median instead of the mean calculations are tested and presented, using Brown-Forsythe; thus providing robustness against using non-normal data. The nonparametric Mann-Whitney U test compares mean ranks, and is presented because it is robust when sample populations do not fit specific distributions. This protects against falsely rejecting a true null hypothesis. Therefore, the significance of the results presented in this research are extensively tested and ensured.

4. Empirical Results

United States electricity prices increase 4.0% a year, from 1970-through-2011, denoted by its linear least squares trend line. During the same time, electricity prices for the 11 effectively restructured states and the D.C.'s mean increase is 8.9% a year, as shown in Table 2, by state. The effectively restructured 11 states and D.C. (restructured states) electricity prices rise about 220% faster than U.S. electricity prices, from 1970-2011.

U.S. electricity prices and electricity prices in each of the restructured states change yearly. To discover when electricity prices are rising fastest in the restructured states, relative price changes are computed. U.S. electricity prices are subtracted from the electricity prices in each of the restructured states, for each year, from 1970 through 2011. By comparing relative electricity price sample means for the U.S. and the restructured states, pre-and-post restructuring for each state, it is determined if electricity prices in the restructured states are increasing significantly faster after restructuring, than before restructuring, relative to U.S. electricity prices.

One-way ANOVA p-values—testing between group means for each "free market" competitive state's regulated vs. restructured data sets—and Levene's, Welch, Brown-Forsyth and Mann-Whitney U tests' significance levels are shown, where required, in Table 2.

State/Territory, to find price data for individual states), and is accessed using the following link: http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_prices/eu/pr_eu_US.html&sid=US

There is an extremely significant increase in relative electricity prices in Delaware, Maine, New York and Oregon, after their electric utilities restructure, than before restructuring. These four restructured electricity utility "free market" competitive states have become extremely significantly inefficient, after restructuring.

Table 2. One-way ANOVA—Testing Between Group Means for Each "Free Market" Competitive State

Eleven Electricity Competitive. States and D.C.	Electricity Price Increases: 1970-2011	One-Way ANOVA P-values	Levene's Test	Welch Test	Brown-Forsyth Test	Mann-Whitney U Test
Connecticut	4.1%	.881ns				
Delaware	6.2%	.000***	.328ns			
Maine	13.1%	.000***	.090ns			
Maryland	3.2%	.659ns				
Massachusetts	7.9%	.000***	.006**	.001**	.001**	.000***
New Hampshire	3.1%	.445ns				
New Jersey	2.8%	.683ns				
New York	6.0%	.000***	.065ns			
Oregon	9.9%	.000***	.798ns			
Rhode Island	14.1%	.000***	.000***	.000***	.000***	.000***
Texas	6.5%	.000***	.002**	.005**	.005**	.003**
District of Columbia (D.C.)	29.9%	.000***	.000***	.000***	.000***	.000***

Levene, Welch, Brown-Forsyth and Mann-Whitney U test significance levels are shown, where required.
*** extremely significant at $p < .001$; ** very significant at $< .01$; * significant at $< .05$;
ns - not significant at $p \geq .05$
Levene's tests for Delaware, Maine, New York and Oregon are not significant; therefore, no difference between population variances is assumed, and no further statistical tests are required.

Levene's tests for Massachusetts, Rhode Island, Texas and the District of Columbia (D.C.) are significant, hence, a difference between population variances is assumed. The Welch, Brown-Forsythe and the nonparametric Mann-Whitney U tests are performed. Rhode Island and the District of Columbia (D.C.) have an extremely significant increase in relative electricity prices after restructuring, becoming extremely inefficient during their electric utility restructuring periods. Massachusetts and Texas have a very significant increase in relative electricity prices, after restructuring, and are very significantly inefficient as a result of restructuring their electric utilities.

The relative electricity price mean values for each "free market" competitive state, pre-and-post restructuring, are listed in Table 3.

The relative electric power price means for restructured states, prior to restructuring, totals 5.9717, and after electric utility restructuring is 24.5647. Relative to U.S. electricity prices, from 1970-2011, the restructured "free market" competitive states have electricity prices, during their restructuring periods, increase over four times faster than increases in electricity prices prior to their restructurings. Extremely significant and very significantly higher relative electricity prices, evident after electric utility restructurings in eight restructured states, are an increased burden on electricity customers—placing these eight restructured states at a competitive disadvantage when attracting new jobs and industries.

5. Discussion

Connecticut, Maryland, New Hampshire and New Jersey have effectively restructured their electric utilities and have not experienced significant relative electricity price increases, post restructuring, but the following explains why these state's electricity prices remain controlled. New Hampshire (NH) effectively restructures her electricity market in 2003. The relative electric power price mean for 1970-to-2002 in New Hampshire is 0.2400, and for 2003-to-2011 is 0.3744. Relative to U.S. electricity prices, NH has electric prices, during her restructuring period, from 2003-2011, increase 56% faster than increases in NH's electricity prices, prior to electric utility restructuring, from 1970-2002, but is not significant.

Table 3. Relative Electricity Price Mean Values for Each "Free Market" Competitive State

Eleven Electricity "Free Market" Competitive States and D.C.	Regulated (R) and Restructured (D) Relative Electricity Price Mean Values
Connecticut	0.2157 (R) 0.2325 (D)
Delaware	0.6437 (R) 1.2658 (D)
Maine	0.4377 (R) 3.2142 (D)
Maryland	-0.0545 (R) 0.0050 (D)
Massachusetts	0.7604 (R) 1.7457 (D)
New Hampshire	0.2400 (R) 0.3744 (D)
New Jersey	0.2433 (R) 0.1867 (D)
New York	0.6669 (R) 1.3640 (D)
Oregon	-0.1056 (R) 1.8340 (D)
Rhode Island	1.2764 (R) 4.0036 (D)
Texas	0.1938 (R) 0.7970 (D)
District of Columbia (D.C.)	1.4539 (R) 9.5418 (D)

Relative to U.S. electricity prices, restructured states have electricity prices, during their market-based restructuring periods, increase over four times faster than increases in electricity prices, prior to their restructuring, from 1970-2011.

Public Service of New Hampshire (PSNH) is the largest electric utility in New Hampshire, and the only electric utility exempt from restructuring (Evans-Brown, 2013). PSNH president and COO Gary Long says, "We're a cost-based service, other companies are market based pricing, we serve as a price cap in the market" (Cohen, 2012). Mr. Long goes on to say that when building electric power plants, which may last forty-to-fifty years; the market's day-to-day focus makes power plant investment decisions problematic.

Currently, natural gas prices are the lowest they have been in a decade, according to the Federal Energy Regulatory Commission (FERC). Consequently, New England is becoming too dependent on natural gas, with 52% of the proposed new power plants being fueled by natural gas. PSNH has no plans to shut down its existing Merrimack and Schiller coal-fueled power plants, for at least fifteen years, because they are necessary as backup against spiking natural gas prices. Not surprisingly, the New England Power Generators Association, which represents independent generating companies producing two-thirds of New Hampshire's electricity, is pressuring NH lawmakers to force PSNH to shut down their coal-fired power plants.

New Jersey (NJ) effectively begins her electric utility restructuring in 2003, as the 6th highest priced state in the nation—and after restructuring—remains the 6th highest priced state in the nation (Public Sector Consultants, 2013). NJ achieves price stability over the past decade by importing 25%-to-35% of her electricity from other states. Also, NJ residents may choose to remain with their electric utility provider and pay a fixed price, determined at the annual Basic Generation Service (BGS) auction, which is not a market-reflective price, but a three-year average (Cerasaro, 2012).

The NJ legislature decides it is a mistake to rely so heavily on out-of-state electricity suppliers and passes a law that new electric generating plants are to be built in NJ. This is opposed by the Federal Energy Regulatory Commission (FERC) and challenged in court by independent out-of-state generating companies. NJ's experiment in electric utility restructuring is actually re-regulation. The underlying issue in dispute is who controls NJ's energy policy, federal or state authorities. This is occurring all without the anticipated natural reduction in electricity prices for NJ customers.

Maryland, since her effective restructuring in 2008, also has not achieved a reduction in relative electricity prices. Maryland has not been building sufficient electric power generation plants, during restructuring, relying instead on expensive out-of-state providers for up to a third of her electricity requirements (Public Service Commission of Maryland, 2012). Imported electricity prices include "scarcity markups" and "congestion charges," required in order to pass through the crowded Eastern Interconnection grid.

The Public Service Commission of Maryland (2014), concerned about potential blackouts and Maryland's reliance on out-of-state electricity, re-regulates and orders Baltimore Gas and Electric Co. and Potomac Electric Power Co to step outside the marketplace and build new generating plants, to meet Maryland's increasing electricity demand. Thus, Maryland sees ongoing structural flaws in the restructuring of her electric utilities, forcing re-regulation of Maryland's electricity marketplace.

Connecticut (CT) has electric prices, during the market-based restructuring period, from 2000-2011, increase about 8% faster than relative increases in electricity prices in the U.S., prior to CT's restructuring, from 1970-1999. Relative electricity price increases in Connecticut, pre-and-post restructuring, are not significant. However, Connecticut's electricity market retains substantial price-suppression regulation. The Connecticut Department of Energy & Environmental Protection (2014) Public Utilities Regulatory Authority (PURA) sets a low fixed "standard offer rate" that her regulated utilities—Connecticut Light & Power and United Illuminating—are required to offer CT electricity customers. This "standard offer rate" is used by CT customers as a benchmark—when comparing electricity rates from independent electricity providers—thus keeping CT electricity price increases in check.

To get around CT's "standard offer rate" price regulations, independent power suppliers use "bait and switch tactics," offering a low initial fixed rate for several months and then quickly switching to a month-to-month variable rate plan—charging a cancellation fee for CT customers to get out of their now high-priced contracts. The low fixed price teaser rate is a loss leader. Generation suppliers do not expect customers to closely monitor their electricity bills, when variable electricity prices increase 100%. Consumer advocates say Connecticut's electricity market fosters aggressive marketing tactics—therefore, "buyers should beware."

Thomas (2003) contends that what was supposed to be electric utility restructuring is actually re-regulation, because many new regulatory laws are created during the legislative process. These new regulatory institutions, created using new laws, were initially thought to be transitory—remaining in effect only until the new energy markets were established. Unexpectedly, re-regulation institutes complex and a seemingly permanent set of new regulatory arrangements, often protecting the new independent electricity suppliers and retailers. Electricity utility effective re-regulation, in the restructured states, is not harnessing the power of greater competition to lower prices. Instead, it is resulting in higher prices through re-regulation, and may eventually increase market concentration and power, resulting in bankruptcies and higher future electricity prices in the restructured states.

Electricity prices in the 11 states and the District of Columbia (D.C.) that have effectively restructured their electricity markets and allow "free market" competition, have gone up over four times faster, after restructuring than before restructuring, relative to U.S. electricity prices, and are a fundamental empirical reason why Becker-Blease, et al. (2008) find that mergers and acquisitions (M&A) of electric companies, in restructured states, do not increase relative shareholder value. The rational that electric companies need to grow to remain competitive and survive by achieving economies-of-scale—thereby attaining production, procurement, marketing and administrative synergies—is not valid, when the resulting combined M&A companies are significantly less efficient and raise electricity prices over four times faster than the national average. Restructuring of the electric power industry is not unlocking economies-of-scale synergies, but instead, reducing operating efficiencies.

6. Conclusions and Policy Implications

The economic theory of "free market" competition naturally achieving lower electricity prices in restructured electric utility states is empirically tested. U.S. Energy Information Administration (EIA) (2014) is the source of electric power price data for this study, from 1970-through-2011, which are analyzed using one-way ANOVA means testing for electric utility restructured states, pre-and-post restructuring, relative to U.S. electricity prices.

Of the 11 states and the District of Columbia (D.C.) that have effectively restructured their electricity markets and allow "free market" competition, electricity prices have gone up over four times faster, after restructuring than before restructuring, relative to U.S. electricity prices. Delaware, Maine, New York, Oregon, Rhode Island and the D.C. have extremely significant electricity price increases and are extremely less efficient, after their electric utilities restructure. Massachusetts and Texas have very significant electricity price increases and are very less efficient, after their electric utilities restructure. Connecticut, Maryland, New Hampshire, New Jersey have no significant relative price increases, pre-and-post restructuring; however, these four states retain substantial price-suppression regulation, through re-regulation of their electricity marketplaces. No effectively restructured electric utility state is statistically more efficient.

This paper finds the fundamental empirical evidence of significantly increased electricity prices in the effectively restructured states—when compared to the national average—is why stock prices are relatively worse for electric companies that go through mergers and acquisitions, after states restructure their vertically-integrated government-regulated natural monopoly electric utilities, when compared to stock prices of electric utility companies in regulated states. Mergers and acquisitions in the restructured electric power industry do not unlock economy-of-scale synergies, but conversely, reduce operating efficiencies. What is important is developing and implementing an appropriate economic policy that realistically assesses the unique organizational and technical limitations in the vertically-integrated government-regulated natural monopoly electric power industry.

The results presented do not support the economic theory that "free market" competitive marketplaces naturally achieve lower prices, in the electric power industry. Instead, electric company operating efficiencies are extremely and very significantly reduced in many restructured states, making society poorer. "Free market" economic theory is not being appropriately applied to electric utility restructuring. Unique technical and organizational limitations may be the reasons. Empirical evidence does not support the energy policy of additional states restructuring their electric utilities, using the existing market design. Future research will examine evidence from the Texas Interconnection grid, since restructuring, to determine the grid's economic efficient scale of production and optimal generating capacity utilization rate.

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