

**Regulatory Risk, Market Uncertainties, and Firm Financing Choices:
Evidence from U.S. Electricity Market Restructuring[#]**

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Abstract

Based on the universe of rate-regulated electric utilities in the U.S., we examine why firms alter their financing decisions when transitioning from a regulated to a competitive market regime. We find that the significant increase in regulatory risk after the passage of the Energy Policy Act, state-level restructuring legislations, and divestiture policies have reduced leverage by 15 percent. Policies that encouraged competition, and hence increased market uncertainty, lowered leverage by another 13 percent on average. The ability to exercise market power allowed some firms to counter this competitive threat. In aggregate, regulatory risk and market uncertainty variables reduce leverage between 24.6 and 26.7 percent. We also confirm findings in the literature that firms with higher profitability and higher asset growth have lower leverage, and those with more tangible assets are more levered. Firms with greater access to internal capital markets and those with a footloose customer segment use less debt, while those actively involved in trading power in the wholesale market use more debt.

Key Words: Capital Structure, Regulation, Competition, Restructuring, Electric Utility
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“Our goals are to control costs while maintaining superior customer service, extract maximum value from our existing wholesale and utility assets, implement a long-term plan for generating capacity and fuel stability, lead Louisiana in service reliability and protect our investment-grade credit rating by reducing debt”. Quote from Cleco Corp (Louisiana)

“In a nutshell, the government that had created this regulated industry was saying, “We don’t want to regulate you anymore. Here’s your business. Good luck.” However, the restructuring process initially generated more questions than answers, as the various players in the market tried to understand how the configuration of this industry might need to change.” C. John Wilder (CEO, TXU)¹

Introduction

Regulated firms traditionally display a high leverage ratio (Spiegel and Spulber, 1997) compared to competitive firms, and this paper shows how various policy instruments can align a regulated firm’s capital structure with those of competitive industries. We find that policies that increase the effective competitive pressure on firms, or increase the risk of financial distress lower leverage. However, firms with market power have the ability to counter this competitive threat and take on more debt. These findings are particularly relevant for today’s financial environment. A significant blame for the recession that began in 2007 can be attributed to the high leverage ratio of banks, and the policy discussion on ways to reduce this leverage is a hot button issue. This paper offers important insights into how leverage can be reduced without a command and control type of mandated cap on bank leverage.

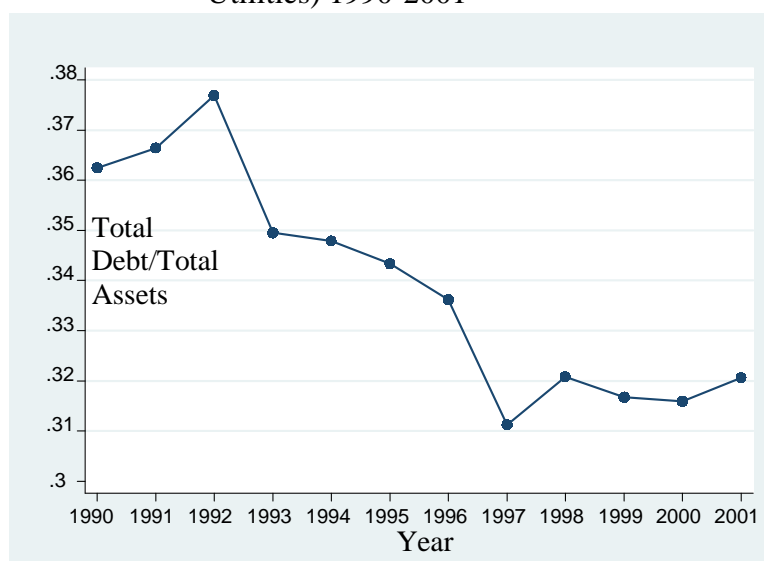
Capital structure decisions are at the core of a firm’s financial strategy and have important long-term implications for firm behavior. Cash-constrained firms can either use

¹“Leading change: An interview with TXU's CEO” by Warren L. Strickland. The McKinsey Quarterly, 29th March 2007.

equity or debt financing when they borrow from the market to finance their investments. Each choice has associated costs and benefits, and influences risk-taking and investment behavior^{2,3}, agency issues⁴, and impacts R&D, innovation and technology adoption decisions.⁵ Hence understanding a firm’s capital structure choice is a crucial step to understanding how a firm evolves and survives in a given environment.

Leverage (total debt/total assets) is perhaps, the most common variable used to characterize a firm’s capital structure choice (Bradley, Jarrell and Kim,1984; Fama and French, 2002; Rajan and Zingales, 1995; Titman and Wessels, 1988). In the U.S., rate-regulated electric utilities have experienced two sharp drops in leverage ratios (Figure 1) that appear to have coincided with two federal restructuring orders - the 1992 Energy Policy Act and the 1996 FERC retail competition orders – that formally deregulated the electricity industry and instituted wholesale competition.

Figure 1: Mean Leverage Ratio (195 U.S. Electric Utilities) 1990-2001



² Hirth and Uhrig-Homburg (Forthcoming, 2010); Kale and Noe (1995); Kühn (2002); Mauer and Sarkar (2005); Norton (1985); Spiegel (2003)

³ The earliest work on this topic assumes that investment should be independent of a firm’s financial structure (Modigliani and Miller (1958)). However, the vast amount of research that followed has shown that although this works in theory, in practice this may not be the case. See Myers (2001).

⁴ Baumol (1965); Jensen and Meckling (1976); Myers (1977); Myers and Majuf (1984); Shleifer and Vishny (1989); Childs et al. (2005)

⁵ Hall et. al. (1990); Himmelberg and Peterson (1984); Spiegel (1996)

We have a unique ‘natural experiment’ with the deregulation of electric utilities in the U.S., that allows us to observe financing choices for the same firm in both the regulated and competitive regimes. The restructuring process changed the stable operating environment of utilities by altering regulatory conditions and the market environment, and engendered two types of uncertainties: (1) regulatory risk arising from uncertainties about the emerging institutional structure and the policy environment, and (2) market uncertainties arising from demand fluctuations, price competition and threats to market share. Non-regulated manufacturing firms have to primarily contend with the latter type of uncertainty when making capital structure decisions. Utilities on the other hand, have to respond to both kinds of uncertainty simultaneously. Most existing literature has focused on financing decisions of non-regulated or purely regulated firms. We add an important missing piece to the literature by showing how the transition from regulation to competition alters the financing structure of firms. The experience of the U.S. electric utility industry can serve as a valuable lesson for other industries in transition.

This study is one of the few papers that document the impact of restructuring on a firm’s capital structure. Additionally, to the best of our knowledge, this is the first to show what specific policies and aspects of the competitive process put pressure on firms to lower their dependence of debt-financing.⁶ We find that deregulation and its associated restructuring policies have led to a 25 to 27 percent decrease in leverage ratios. We find that any policy that decreases earnings stability, or increases competition and threatens market share, lowers debt levels. Additionally, the existence of effective competition has a greater effect on firm financing than the mere size of the competitive segment. Firms with market power have the ability to counter this competitive threat and are willing to take on more debt. We also confirm earlier findings that firms with higher profitability and higher asset growth have lower leverage, and

⁶ While Ovtchinnikov (2010) also examines the capital structure decisions of newly deregulated firms, his focus is on how deregulation affects the “traditional” determinants of leverage (e.g. profitability, asset tangibility, earnings volatility and growth opportunities) and how a firm’s leverage responds to these factors after deregulation.

firms with greater tangible assets are more leveraged. In addition firms that have greater access to internal capital markets, or ones with a footloose customer base, use less debt.

The remainder of the paper is organized as follows. Section 1 provides a review of financing decisions of non-regulated versus regulated firms, and documents the theoretical and empirical findings in the literature. Section 2 briefly discusses the transition of the U.S. electricity industry from a regulated to a competitive regime, and the changes associated with the restructuring process. Section 3 describes the data and key variable construction. Section 4 explains the empirical methodology and results, and the last section concludes.

1. Literature Review

1.1 Financing Choices of Non-Regulated Firms

There is a large literature that studies the capital structure decisions of non-regulated manufacturing firms, and attempts to explain why the internal-external financing shares and the debt-equity ratio of various firms differ.⁷ The seminal work in this area by Modigliani and Miller (1958) showed that in perfect capital markets, the choice between debt and equity financing does not affect firm value or the cost of capital. However, their results hold under stringent conditions of competitive, frictionless and complete capital markets where capital flows to its most efficient use, and the cost of capital is determined by business risk alone. These conditions are not often found in reality, and empirical evidence suggests that financing does matter.

There are several theories that explain the observed capital structure choices of firms. The tradeoff theory posits that firms ‘tradeoff’ between value-enhancing tax savings and the potential for financial distress when determining the mix of debt and equity financing. In the U.S., interest is tax-deductible. Thus a firm that pays interest on debt also pays lower taxes

⁷ Harris and Raviv (1991) review the theoretical literature. Myers (2001) provides a more recent perspective on the state of capital structure theory and empirical evidence, from which we draw on for our discussion in this section.

because of this 'interest tax shield'. This in turn increases the value of a firm with a greater proportion of debt to equity financing. However there is also a cost attached to high debt levels, specifically, a greater threat of bankruptcy. Thus, this theory predicts moderate debt-levels for firms. Empirical evidence shows that the tax shield motivation (MacKie-Mason, 1990) and factors related to financial distress risk, such as the amount of tangible assets (which can be used as loan collateral for example), are significantly related to leverage ratios. The problem with the tradeoff theory however, is that it cannot explain the existence of very low debt-levels in very profitable companies (Myers, 1984). If the interest tax shield is indeed enough motivation to hold more debt, then we should observe the opposite relationship between leverage and profits. The pecking order theory attempts to explain this empirical regularity to some extent.

The pecking order theory (Myers and Majluf, 1984; Myers, 1984) suggests that firms have a preference ordering, and use internal funds first, followed by debt, and they resort to equity last. If capital investment requirements are greater than internal funds then firms prefer issuing debt, since with debt the asymmetric information problem between managers and new shareholders is less severe than with equity. The documented negative empirical relationship between leverage and profitability is consistent with a preference for internal funds over debt financing, although overall evidence for this theory has been mixed (Helwege and Liang, 1996; Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003; Bulan and Yan, 2009). Moreover, Myers (2001) argues that this theory does not show how information asymmetry affects firm financing, and why firms do not use other available alternatives to alleviate such information problems.

The two above theories assume that the incentives of managers are aligned to that of shareholders. However, it is well understood that even the best crafted incentive contracts cannot perfectly align interests, and managers will take action according to their self-interest. Jensen's free cash flow theory (1986) holds that a firm with large amounts of free cash flow,

that significantly exceeds its profitable investment opportunities, may hold higher levels of debt since this may increase their value, despite higher threats of bankruptcy. Debt in this case, forces managers to pay out the extra cash instead of investing it in inefficient 'empire-building'. These three main theories in conjunction provide valuable insights into a non-regulated firm's financing behavior.⁸

1.2 Regulation and Capital Structure Decisions

The capital structure choices of regulated firms are significantly different from that of non-regulated firms.⁹ For regulated utilities, where prices are influenced by debt levels, the incentives for holding debt may be quite different. Bradley, Jarell and Kim (1984) document that regulated industries have the highest debt-to-value ratios with electric and gas utilities second only to airlines. In the literature, three alternative hypotheses have been proposed to explain the level of debt held by utilities. Two are based on regulators treating the capital structure of regulated firms as exogenous, and the third treating it as an endogenous variable.

According to Klein et. al. (2000), both theory and empirical research suggests that "the existence of price regulation in the output market provides the regulated entity with incentives to utilize additional levels of debt to finance the operations of the firm". Several studies have shown that regulated utilities choose high debt levels to induce rate (price) increases since regulators set rates at a level that accounts for the firm's costs which includes the cost of debt, thereby insuring the firm against possible financial distress (Chen and Fanara, 1992; Dasgupta and Nanda, 1993; Spiegel and Spulber, 1994, 1997; Rao and Moyer, 1994; Taggart, 1981). Taggart (1985) provides a second explanation and attributes such high debt levels to the "safer business environment" created by regulation. Both the above explanations assume that the

⁸More recently, the trend has been to combine the insights of all three models into a unified theory of capital structure.

⁹ In a sample of Compustat firms from 1990-2001, on average, debt is 22 percent of assets for non-regulated manufacturing firms, compared to 34 percent for regulated utilities. See table 3A.

capital structure of the regulated firm is exogenous to the regulator, who reacts passively to the given mix of debt and equity while setting prices.

De Fraja and Stone (2004) provide a third alternative explanation for high leverage ratios in regulated firms. They model the regulator's price setting behavior under two assumptions, when the utility's capital structure is exogenous, and when regulator decisions can influence such financing choices. They show that there is a tradeoff between lower prices and higher price volatility as debt levels increase. When the capital structure is endogenous, a social welfare maximizing regulator sets a low price that is subject to some volatility. This implies that the optimal capital structure is one with higher debt-levels, given that debt finance is cheaper than equity. They argue that this is the case in countries such as the U.K., where regulatory actions induce firms to hold higher levels of debt (sometimes 70 to 80 percent) when compared to U.S. utilities (35 to 40 percent), where regulators typically take the capital structure as given.

Other empirical work has also indirectly investigated the link between regulation and financing by focusing on cross-country institutional factors¹⁰. However, Rajan and Zingales (1995) have shown that certain fundamental institutional differences between the G-7 countries cannot adequately explain the observed differences in capital structure across these countries. Thus there is a need to focus on industries within a country to understand the effect of regulation on capital structure, and particularly how the financing structure changes when firms transition from a regulated to a deregulated regime.

There is paucity of papers that investigate this issue, i.e. what happens to a firm's capital structure when a regulated industry is deregulated, and subject to competitive forces. Extending the logic from the earlier studies that focus on why regulated industries carry high leverage ratios, we should expect a decrease in leverage since the incentive to induce rate increases by carrying higher leverage will no longer be present. Additionally, the change from a regulated

¹⁰See for example, Booth, Aivazian, Demirguc-Kunt and Maksimovic (2001) and La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998).

and hence safer environment, to a competitive and uncertain one will result in more conservative financial choices for the firm and lead to a further decline in leverage. This is supported by Derwenter and Malatesta (2001) who compare state-owned and private firms, and find that government backed firms lower their debt levels following privatization. A similar conclusion is reported by Ovtchinnikov (2010). Based on a sample of all non-financial firms in Compustat from 1966-2006, he finds that deregulation changes the operating environment of firms by affecting their profitability, asset tangibility, earnings volatility and growth opportunities. The combined changes in these capital structure determinants led to a decline in leverage. On average, he finds that regulated firms decreased their leverage from 42.3 percent in the regulated phase to 31.9 percent in the deregulated phase.

This inter-industry research on how deregulation impacts the leverage ratio of companies is important in increasing our understanding of what general factors influence the financial decision-making of firms when they migrate from a regulated to a competitive regime. However, as MacKay and Phillips (2005) find, most of the variation in firm financial structure is due to intra-industry variation. Our paper contributes to understanding this intra-industry variation. The deregulation of the U.S. electric utility industry provides an unique opportunity to observe financing choices for the same firm in both the regulated and competitive regimes. By focusing on a single industry during a time when the institutional environment changed, we can isolate the effect of specific regulatory and market factors that influence a firm's capital structure. Moreover, we can exploit the considerable variation in inter-state deregulation speed and modality in the U.S. electric utility industry to get a more powerful test of the impact of deregulation on leverage decisions. Since our findings have broad policy implications, the experience of the U.S. electric utility industry can also serve as a valuable lesson for other industries in transition.

2. U.S. Electricity Restructuring

The electric utility industry in the U.S. has been traditionally organized as a vertically integrated regulated monopoly.¹¹ The main players in the market were the investor owned utilities (IOUs), which accounted for more than three-quarters of the energy generated. These firms were for-profit privately owned entities who had service monopolies in particular geographical regions, and controlled generation, transmission and distribution of electricity. , , They were overseen by the Federal Energy Regulatory Commission (FERC) and state regulators (public utility commissions or PUCs) whose primary task was to set prices and determine the price structure^{12,13} The PUCs in each state were also responsible for scrutinizing major investments in generation, transmission and distribution by the utilities. The price setting mechanism used was the “cost of service ratemaking”¹⁴ and the rates were fixed and could not be changed without PUC authorization. The regulators determined the “revenue requirement”¹⁵ of utilities based on their operating costs, depreciation, taxes and its “rate-base” (total net investment or capital costs) and a regulator determined rate of return that was considered a ‘fair’ return on investment. Then based on the total revenues required by the utility, retail rates were set for different groups of customers. Thus if an utility carried more debt and had to service the interest, its operating costs would increase, leading regulators to increase the ‘revenue requirement’ predictions, and hence increase rates. Additionally, this type of regulation provided a stable earnings environment and insured the utilities against bankruptcy, leading to even higher leverage ratios.

¹¹ This was predicated on the view that efficient generation, transmission and distribution were a natural monopoly (Scherer, 1980; Khan,1971).

¹² The PUCs determined the rates for each customer group (price structure) such as homeowners, businesses, large industrial customer etc.

¹³ “Regulation can be viewed as an administered contract between the regulated firm and the ratepayers, with the regulatory agency serving as the arbitrator of this contract” (Pechman, 1993).

¹⁴ This involved five main steps. The first four taken together determined the total revenue that a utility may earn – this was termed the “revenue requirement”. The fifth step was the “rate structure” – that determined how much different customers would be charged such that the “revenue requirement is fulfilled.

¹⁵ Thus the revenue requirement equation was given by: Revenue Requirement = Operating Costs + Depreciation + Taxes + (Rate Base)*(Regulator Determined Rate of Return)

All this changed during the nineties when “cost-based” regulation paradigms gave way to competitive electricity markets (DOE/EIA, 2000; Joskow, 1999, 1997, 1989; Hogan, 1995, 1997, 1998)¹⁶. The Energy Policy Act (EPA) of 1992 gave rise to open-access transmission grids for wholesale transactions¹⁷ and made retail wheeling¹⁸ (or retail access) possible. In 1996 FERC Orders 888 & 889¹⁹ furthered wholesale competition by providing open access non-discriminatory transmission tariffs and provided the groundwork to begin retail wheeling. Order 888 stated that utilities which own transmission networks must provide transmission services to other power generators at cost-based non-discriminatory prices. Provisions were also laid out governing the recovery of stranded costs by utilities. Stranded costs are potential losses that a utility may face due to “the decline in value of electricity-generating assets’ (CBO, 1998) when the industry is restructured. Order 889 required each public utility to participate in an Open Access Same-Time Information System (OASIS). This was done to facilitate wheeling by third parties that did not own transmission capacities. Regulators in many states also took a proactive role in promoting competition in the generating sector²⁰ in response to these legal changes.

¹⁶ Utilities began trading power amongst themselves since the 1970s. This was done by informal agreements since FERC did not allow utilities to wheel power. However, the movement towards deregulation had started more than a decade earlier. In 1978, the Public Utility Regulatory Policies Act (PURPA) required utilities to purchase power from non-utility generators at “avoided cost”¹⁶ prices that were determined by the state. This was done to give a boost to small renewable energy producers. Following PURPA, there was a steady increase in the number of independent power producers, and by the early 1990s more than half of the new plants being built were owned by non-utilities. Thus on one hand, there was an increased demand from independent power producers (IPP) to sell in the open market and not be tied to utility contracts. On the other hand, smaller utilities such as municipal power plants and coops wanted to buy power from these IPPs.

¹⁷ On the wholesale side FERC took several steps to ensure increased competition. It required utilities to provide a detailed account of their transmission capacities, it expanded the range of services that the utilities were required to provide to wholesale traders and it made it clear that approval of application for mergers or changing competitive rates by IOUs were subject to their filing open access transmission tariffs with comparable service provisions.

¹⁸ With retail wheeling, retail consumers could shop around for the best rates while purchasing power much like the present telecom situation. After the California fiasco in 2001, some states suspended deregulation activities while others slowed down the pace of restructuring. In the analysis that follows, we exclude such cases by looking at the time period from 1990-2000 only. For details on the California case please see: Borenstein (2002), Borenstein et al (2002) and Cohen et al (2004).

¹⁹ FERC Order 888 – “Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Service by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities” and Order 889 – “Open-Access Same-Time Information System”. For a detailed provision of the orders please refer to DOE/EIA (1997)

²⁰ Competition has been focused on the generation sector with distribution and transmission still being viewed as natural monopolies.

The passing of the EPAct and the FERC orders led to major changes in the incentive structure of IOUs and altered the organizational structure of the electricity industry (restructuring). Each state followed a different trajectory regarding restructuring the industry. Some, like California and New York, were at the forefront of restructuring while others, such as Alabama, had not taken any concrete steps towards restructuring by 2001. However, even in states that were taking a cautious approach towards restructuring, there was an expectation that eventually the market would be competitive and firms tried to position themselves to better take advantage of the changing market structure. Expectations about restructuring policies and future competition gave rise to waves of asset divestitures, mergers and acquisitions. One major consequence of the restructuring process was the voluntary divestiture of generating capacity by IOUs. States promoted this trend because the simultaneous ownership of generation and transmission capacity may engender market power. Furthermore, in the late 1990s mergers became quite frequent in the industry as companies strove to achieve the “critical mass” that was necessary to survive in a competitive environment.

The onset of restructuring also altered the nature of financial distress costs for the U.S. electric utility: firms were subjected to the volatility of market transactions and increased uncertainty about their future earnings. A utility’s expectations of future earnings were likely to be lower than their stable pre-deregulation levels, and the precision of their expectations were likely lower as well. This would increase the probability that debt payments may not be met and thus decrease a firm’s incentives to undertake debt (Bradley, Jarrell and Kim, 1984; Titman and Wessels, 1988). In addition, the financial market was also uncertain about how the industry was going to change and hence, may have undervalued these firms reducing its debt-capacity, and lowering leverage after restructuring. This paper analyzes the transition of firms from a regulated to a competitive environment and models the impact of regulatory changes and market uncertainties on its financing decisions. This is a step towards furthering our

understanding of the financing choices of regulated versus competitive firms, and has implications for future investments and the emerging industry structure.

3. Data and Key Variables

Based on all regulated U.S. electric utilities²¹ that filed FERC Form 1 from 1990-2001, we model the leverage ratio (L_{ijt}) of firm i in state j in year t , as a function of regulatory risk (R_t and R_{jt}), market uncertainty (M_{jt}), firm characteristics (F_{ijt}), and firm (u_i), state (S) and year fixed effects (T).

$$L_{ijt} = (R_t, R_{jt}, M_{jt}, F_{ijt}, u_i, S, T) \quad (1)$$

We need two types of data to estimate the above model: 1) information on federal and state-level restructuring policies that capture the regulatory and market uncertainties, and 2) firm level data on financial and other firm characteristics. The state-level restructuring variables are constructed from the Energy Information Administration's (EIA) "Status of State Electric Industry Restructuring Activity as of February 2004"²². Tables 1A and 1B provide the summary statistics and the dates for the restructuring and stranded cost recovery policies respectively. Firm level data is primarily drawn from FERC Form 1, and comprise detailed financial data (derived from accounting statements) and operational data such as the amount of electricity generated and sold, the fuel mix, and share of sales of residential, commercial and industrial customers.²³ Our final estimation sample has 183 utilities and a total of 1724 firm-year observations. The unbalanced nature of the panel arises partly because of mergers, but mainly due to random missing observations. Table 2 provides the summary statistics for regulatory,

²¹ It would have been interesting to compare privately owned utilities not subject to regulation and see whether post-restructuring these IOUs behave the same manner as the existing unregulated firms. However, the lack of data prevents us from undertaking this exercise.

²² This publication outlines the regulatory orders, legislations and the investigative studies that have been undertaken by each state till present.

²³ We also use several EIA publications from 1990-2003 to validate and supplement the Form 1 data.

market and firm characteristics. The following sections discuss the dependent and explanatory variables in detail.

3.1 Leverage

We use book leverage (total debt / total assets where total debt equals long-term debt plus short-term debt or notes payable) as our key dependent variable.^{24, 25} To illustrate the differences between regulated utilities and other firms, we use non-regulated U.S. manufacturing firms²⁶ as a benchmark (Table 3A). We find that the median utility has a leverage ratio of 33 percent compared to 18 percent for the median manufacturing firm, for our sample period. This confirms earlier findings that leverage ratios are significantly higher for regulated firms (Bradley, Jarrell and Kim, 1984). To further explore the differences between firms in a regulated versus competitive environment, we split the electric utilities into two cohorts²⁷ based on restructuring status (Table 3B). The pre-restructuring group comprises firms located in states that have not passed a final restructuring legislation, and are thus the regulated entities. The post-restructuring cohort includes utilities located in states that have passed such legislation,²⁸ and hence face competitive market forces. We find significant differences between these groups on two dimensions.

First, both mean and median leverage is lower for utilities that face potential competition, i.e. they are located in states that have passed a restructuring legislation. Second, these utilities also display a higher standard deviation when compared to those in regulated states. Along similar lines, Dewenter and Malatesta's (2001) find that state-owned enterprises

²⁴ We believe that this is the relevant leverage measure for our analysis since the variation in non-debt liabilities is minimized in this measure due to our single industry focus. For a more detailed discussion on this issue and on alternative leverage measures, see Rajan and Zingales (1995).

²⁵ Many companies in our sample are wholly-owned by a holding company and hence, we do not observe their stock price and cannot construct a market leverage ratio as other studies do.

²⁶ We use COMPUSTAT data for SIC codes 2000-3999. We exclude outliers.

²⁷ This is only one way to slice the data – we could have compared the pre and post 1996 leverage ratios of all firms to see if the FERC orders had any impact irrespective of what the states did. Or we could have separated the sample by the date when a state begins a deregulation investigation. However, for the purpose of this paper, we believe that this current scheme is appropriate.

²⁸ Firms enter the post-restructuring cohort only when their specific state passes a restructuring legislation. Some firms are only in the pre-restructuring group if they are located in a state that never passes such legislation, while other firms may switch groups when the legislation is passed by their home state.

are usually more leveraged than privately held ones and leverage decreases with privatization. Although IOUs were not state-owned as such, the reasons for which state-owned firms hold more debt apply to them, such as a very low or non-existent probability of default and borrowing at a favorable interest rate. Such systematic differences hint at underlying changes in the capital structure decisions of the IOUs that we study and form the basis of our inquiry into factors that can explain these observed patterns.

3.2 Regulatory Risk and Market Uncertainties

3.2.1 Regulatory Risk

Restructuring did not happen in a monolithic fashion, and was not achieved by any single law change. We thus use multiple variables that measure *regulatory risk* and codify the formal rules and bylaws in state restructuring bills and federal orders.²⁹ These include the formal passing of restructuring legislation at the state and federal level, expected restructuring, stranded cost recovery procedures and divestiture policies. First, to capture the different stages of the legislative process, we construct five dummy variables, two at the federal level, and three showing the progression of restructuring in each state. At the federal level, the *EPA Act dummy* equals 1 after the Energy Policy Act was passed in 1992, and the *FERC Order dummy* equals 1 after 1996. These capture the overall effect of federal law changes that made wholesale competition possible. It was only after these changes that customers such as municipalities could shop around for power and move away from the vertically integrated utilities that had served all their needs previously. The threat of losing a portion of their captive customers and consequently losing a stable revenue base would increase the probability of financial distress.

²⁹ Grout and Zalewska (2006) study regulated UK firms and find that the regulation change (from price-cap to profit-sharing between firms and customers) significantly impacted the systematic risk of firms. Similarly, we argue that the regulatory changes introduced during restructuring changes affected the risk that firms faced, which could potentially impact their leverage decisions.

Thus we should observe a decrease in utility leverage, especially after the EPAct that formalized the wholesale competition process.

As alluded to earlier, there is considerable heterogeneity in the nature and pace of restructuring activity at the state level. For utilities, state-level policies are very important since they determine the amount of regulatory risk and market uncertainty that the firms are going to face in the emerging competitive landscape. There are three common stages that each state traverses along its journey from regulation to restructuring. These stages are captured by three dummies: (i) the *deregulation investigation dummy* takes the value 1 if the state has “Investigations Ongoing or Orders and Legislation Pending”, (ii) the *retail competition order dummy* takes the value 1 if there is an “Order Issued for Retail Competition”, and (iii) the *legislation enactment dummy* equals 1 if the state has “Legislation Enacted to Implement Retail Access”. The base case is given by states that exhibit “No Activity” regarding deregulation.³⁰ Each stage of the legislative process has different levels of uncertainty associated with it, and we use the three alternative dummies to investigate which stage has a greater effect on a firm’s capital structure decision. We expect a negative relationship between these dummies and leverage since movement away from a stable regulated environment increases the probability of financial distress, and hence makes debt less attractive.

To construct the above dummies a utility is uniquely assigned to the state where it has service territories since it will be subject to the regulations of that state. In the current scenario, a holding company can own utilities in several states, but each of those individual utilities has service territories primarily in one state. For example, Entergy has five regional utilities under its umbrella (Entergy Gulf States, Entergy Louisiana, Entergy Arkansas, Entergy Mississippi, Entergy New Orleans). Each utility operates as a separate entity in its geographical location and is bound by the regulations of that particular state, i.e. Entergy Gulf States operates in Texas only and no other state. Our data is at the utility level. Therefore for majority of the utilities we

³⁰ These classifications are taken from EIA’s “Status of State Electric Industry Restructuring Activity”, May, 2000.

do not have the complication of a utility having a part of its operations in a restructured state, and another part in a regulated state. For utilities with multiple service areas, we assign them to the state in which they are incorporated.³¹

Next we construct a *stranded cost recovery dummy* that captures a state's policy on stranded cost recovery. Stranded costs are potential losses stemming from earlier large-scale capital expenditures in generation assets that were often incurred at the behest of regulators.³² How much of this loss can be recouped after restructuring will affect firm value. This dummy is 1 if either a 'reasonable' or full recovery is allowed and is 0 if the recovery type has not been specified or there is no policy on the recovery of such costs.³³ This dummy turns on when the stranded cost policies are passed (Table 1B). The existence of a specific recovery policy should have a positive impact on leverage as firms are assured of recouping some cost.

Next we use a *divestiture dummy* that shows whether regulators wanted to spur market competition by encouraging the divestiture of generation assets by utilities that wanted to remain in the regulated transmission and distribution segments of the business.³⁴ This dummy equals 1 if a state encourages or mandates divestiture of generation assets and is 0 otherwise. It turns on when formal legislation that lays out the divestiture policies in a state is passed. It is quite likely that generation assets will be undervalued by the market during this period of uncertainty, thus lowering the collateral value of divesting firm assets, and constraining their ability to incur more debt.

³¹ FERC Form 1 provides both the state where the utility is incorporated and the states where it has service areas. Later in the paper we create a dummy variable that accounts for utilities with multiple service areas (mixed regulation dummy).

³² Examples of such are investments in nuclear power plants and alternative power generating plants. Under regulation, firms were guaranteed to recoup their investment over a certain period of time. However, restructuring may leave such assets 'stranded', i.e. firms may not be able to recoup their investments when the market opens, since in the restructured environment market forces determine the price of generating assets.

³³ Some states such as Massachusetts, New Jersey and Ohio have a 'fixed' recovery mechanism implying that utilities in those states can recover all their stranded costs by levying a 'fixed' competitive transition charge (CTC) on customers, leading to very low regulatory risk. Other states such as California, New York and Texas allow for the recovery of 'reasonable' stranded costs only, while some states like Minnesota and Washington have not specified the type of recovery, leading to greater regulatory risk.

³⁴ It was felt that the simultaneous ownership of generation and transmission capacity by the same company could lead them to discriminate against third parties who wanted to use their transmission networks.

The last regulatory risk variable is a *performance based regulation (PBR) dummy*. Before restructuring, states had traditionally adopted cost-of-service regulation, where utilities could pass on their costs to customers. This dampened incentives to increase efficiency and lower costs since a lower cost would result in lower electricity rates for the utilities. By 2001, eight states³⁵ adopted some form of performance based regulation, the most typical of which were the adoption of price caps. Under a price cap regulation, rates cannot rise above the mandated ceiling, but the utility can reap the benefits of efficiency if it lowers costs. The initial rates are periodically adjusted to reflect inflation and productivity improvements. Imposition of price caps would affect the profitability of firms, and consequently their capital structure decisions.

The aforementioned restructuring variables capture the legislative changes when they occur. However, utilities may have formed a fairly good expectation about the emerging status of restructuring in their home states. Since leverage can potentially affect the future decisions of a firm, expectations about future changes in the institutional structure of the industry should affect the capital structure decision today. Additionally, firm unobservables may influence both the leverage decision and the restructuring legislation, making them endogenous. To capture this expectation-driven endogenous behavior we use two alternative variables. First, we use a dummy variable to capture states whose electricity price was higher than the national average in a particular year (*high electricity price state dummy*). The state electricity price is a good predictor of the varied status of electricity reform in different states (Ando Palmer, 1998; Sanyal, 2001). Utilities could have made a fairly good prediction about the possibility of restructuring in their states by surveying these prices since higher-priced states had a greater chance of embarking on a restructuring program in an attempt to decrease these rates. This dummy is 1 if the average electricity price per megawatt-hour in the state was greater than the

³⁵ California, Connecticut, Maryland, Massachusetts, Nevada, Oregon, Rhode Island, West Virginia.

average US price between 1990 and 1996 and takes the value 0 otherwise.³⁶ We expect this variable to have a negative impact due to the reasons cited above for the deregulation investigation dummy.

Additionally, we also construct the *probability of restructuring* to capture a firm's expectation about the status of restructuring in the state in 1998.³⁷ This probability is obtained from an ordered probit specification that models the state restructuring status (as captured by the restructuring dummies) in 1998 as a function of state economic and political factors and the financial characteristics of utilities prevalent in 1993³⁸. This variable captures the single realization of a firm's expectation about legislation being enacted to initiate retail access in the state in 1998 based on the information in 1993. It is zero before 1993, takes the constant probability value from the model for all periods after 1993 until the state enacts retail access legislation, after which the probability becomes 1. We discuss this variable in greater depth when we discuss endogeneity issues later in the paper. We expect this variable to lower leverage ratios for the same reasons actual restructuring decreased leverage.

3.2.2 Market Uncertainty

In addition to regulatory risk, utilities are exposed to *market uncertainty*, i.e. varying degrees of potential competitive threat. It is conceivable that two utilities with exactly the same regulatory risk may organize their capital structures differently if they face different levels of market uncertainty.³⁹ We construct three measures based on potential market share changes due to: size of the competitive segment, existence of effective competition, and increased market

³⁶ We choose 1996 as the cutoff date because this variable loses its information content after that year. States such as California began their restructuring in 1996, and this dummy is no longer a good predictor of restructuring due to endogeneity between electricity prices and restructuring policies.

³⁷ See Ando and Palmer (1998)

³⁸ We cannot use any information after 1993 since electricity price, one of the primary predictors of restructuring, is endogenous after state initiate investigations into restructuring, which began after EAct (1992).

³⁹ All market uncertainty variables have values equal to zero before the announcement of a start date for retail access, i.e. the date when residential customers are free to choose their electricity providers. For states which have not announced retail access dates, the values are zero.

power. To measure the *size of the competitive segment*, i.e. the potential market share loss due to competition, we use the percentage of customers eligible to switch providers once retail access is implemented.⁴⁰ All else equal, a utility which may potentially lose a greater number of customers will face higher market uncertainty and greater pressures to decrease prices. This would adversely affect its earnings and consequently hamper its ability to undertake debt, lowering the leverage ratio. As a robustness check we also use the percentage of customers who have already switched providers. Till 2001 14 states had mandated the percentage of customers eligible to switch from their incumbent utility.⁴¹

Enacting a retail access order may have little effect on financing decisions if firms know that after the order it is going to be business as usual, and there is no real threat from new entrants. To capture whether the threat of competition is real, we construct an *effective competition dummy* based on default provider policies that the state has adopted. These policies specify which company gets to supply power to a customer who has not actively chosen an electricity provider. High inertia and transaction costs may prevent customers from switching providers⁴² if the incumbent utility is the mandated default provider, or there is no policy in place. The dummy equals 0 in this case. If states have decreed that any company, including non-utilities can be default providers, then there will be more competition since the incumbent utility will not automatically be the default, and will have to compete for customers. The dummy is 1 in this case.⁴³ We expect a negative coefficient on this dummy since a utility's debt capacity is

⁴⁰ For example, if only 10 percent of the customers can freely choose power providers then the competitive threat to the incumbent utility is not that large. In the worst case, all of the eligible customers switch to a competitor and the incumbent loses 10 percent of its market. However, if say, all customers are free to choose then potentially the incumbent could lose its entire market.

⁴¹ Arizona, California, Connecticut, Illinois, Maine, Maryland, Massachusetts, Michigan, Montana, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island

⁴² Being under a regulated monopoly for decades, with all charges consolidated under a single bill, switching to a new provider may prove difficult for customers (especially residential) due to inertia. Hence even with all the competitive apparatus in place, there may be no real competition in the market. Foreseeing such an outcome, many states have adopted policies about which generating companies can be the default provider.

⁴³ We do not have information on the exact dates that these default provider policies were passed. So they are turned on when a state passes the retail competition order. Thus, this dummy is 1 if any company can be a default provider and the state has passed a retail competition order (i.e. the retail competition order dummy = 1). It is zero otherwise.

reduced if it is not the mandated default provider, and is therefore subject to more volatile future earnings.

For some utilities the threat of competition may come from out of state utilities. For example, a utility located in a state that has restructured will not only face potential competition for its customers from utilities and independent power producers in its own state, but if neighboring states that have also restructured then out of state utilities may find it profitable to enter. Thus we create the *number of competitors from neighboring states* as the number of utilities in neighboring states if the neighboring state has at least passed a retail competition order and if the state belongs to the same regional transmission authority (RTO). The threat of losing a large number of customers to outside competition is greater if there are more potential competitors. Thus we expect a negative coefficient on this variable since utilities may face higher market risks and greater pressures to decrease prices in the face of competition and this will adversely affect their debt capacity.

Last, we use a *potential market power dummy* to gauge whether the utility may have the opportunity to exercise market power after restructuring to counteract the instability in earnings flow. If an incumbent utility owns both the transmission wires and competitive generation assets, there may be a tendency to favor its own competitive affiliates during network congestion⁴⁴, thereby pricing out other generators. This may prevent competitors from entering the market. Thus the potential market power dummy is 1 if states have no policy about separating the regulated-monopoly and competitive segments of a utility's business⁴⁵, and is

⁴⁴ Two important features differentiate network infrastructures such as transmission lines in the electric utility industry. First, like all networks they suffer from congestion, and second, they are owned by private utilities that provide transmission and distribution service to competing generators.

⁴⁵ This measure is based on how states view the separation of powers between different segments on a utility that operate in both the competitive generation and regulated transmission market. Some states have mandated that there must be either 'corporate' or 'functional' separation (Malloy & Amer, 2000) between the monopoly and competitive segments of a company.

zero otherwise.⁴⁶ If there is no separation, then there is a potential for protecting its market share by exercising market power and hence utilities may be more willing to take on debt in these states. One caveat of this measure of market power is that vertically integrated companies are the larger firms that also tend to be publicly traded. The sharp increase in stock prices in the latter half of our sample period might affect these firms' perceptions regarding their optimal leverage ratios.⁴⁷ To address this concern, we include a dummy variable that equals one if the firm is publicly traded on an exchange. In unreported analysis, we find that this variable is insignificant while our findings continue to hold.

3.3 Firm Characteristics

3.3.1 Financial Attributes

Following Rajan and Zingales (1995), we construct several firm financial characteristics that have been shown to impact capital structure decisions: *firm size* (total assets⁴⁸); *asset growth* (annual growth in total assets⁴⁹ or excess generation capacity⁵⁰); *return on assets*, ROA (earnings before interest, taxes, depreciation and amortization / total assets) and *tangible assets* (net plant and nuclear fuel / total assets). All dollar variables are in 2000 constant dollars. We expect larger firms and ones with more tangible assets to have higher leverage since their debt

⁴⁶ Again, the exact date of the policy announcement is not known, hence we assume that the announcement date coincides with the passing of the retail competition order. Thus, the dummy is 1 if there is no policy and the state has passed a retail competition order (i.e. the retail competition order dummy =1), and is zero otherwise.

⁴⁷ We thank an anonymous referee for pointing this out.

⁴⁸ We have also used total sales instead of total assets: our results are unchanged.

⁴⁹ Growth opportunities are commonly defined as discretionary, future investments. We follow Fama and French (2002) and Titman and Wessels (1988) and use asset growth as a measure of growth opportunities. The most common proxy for growth opportunities is the market-to-book ratio (or average q). Recall however that we cannot observe stock prices and hence are unable to construct this measure. Both studies also use the ratio of research and development (R&D) to total assets or sales as a proxy for growth opportunities. Due to missing data for R&D, we lose a lot of observations using this measure. The results with R&D, however, are similar to those reported here.

⁵⁰ We thank the anonymous referee for this suggestion. For generating plants, a better measure of growth opportunities may be the annual amount of excess capacity (total nameplate capacity – total generation) each plant has (we aggregate up the excess capacity of each plant to the utility level). If a utility has a large amount of excess capacity then its growth opportunities may be limited. Thus firms with substantial excess capacity are unlikely to be undertaking much investment in the foreseeable future and so might be expected to have relatively high leverage. In contrast, those firms that are currently operating at close to full capacity would anticipate future investment and potentially factor that into their capital structure decision. Thus this capacity-utilization measure might do a better job of capturing anticipated future investment. Additionally we can also use the change in capacity utilization in each year (i.e. excess capacity growth) and the results are similar.

capacity is higher (consistent with the tradeoff theory). Profitability should have a negative impact on leverage since more profitable firms have a lesser need to undertake debt and can finance their investments from cheaper internal funds (consistent with the pecking order theory). In addition, growing firms should have lower leverage ratios either because they mitigate the debt overhang problem by using more equity financing, or they may accumulate financial slack today in order to take advantage of future opportunities (Myers, 1977, 1984; Myers and Majluf, 1984).

In addition, many utilities belong to holding companies and we include two variables to characterize this: a *holding company dummy*⁵¹ that is 1 when a utility joins a holding company, or is acquired by a holding company, or was a part of the holding company before our sample period; and a *holding company size* variable that captures the size of the parent in terms of the number of its subsidiaries. Holding companies vary greatly in size. Some like the American Electric Power Corporation have twelve utilities under its umbrella while others have just one utility. Being part of a large holding company may allow the utility greater access to financing sources both from within and outside the holding company structure, consequently altering their debt capacity, i.e. a utility may be able to borrow more as its holding company serves as its “guarantor”. Moreover, a greater number of utilities under a holding company could potentially provide some diversification benefits, resulting in a great debt capacity overall. On the other hand, the holding company structure also permits the use of net operating losses of one utility to offset positive income of another utility, resulting in lower overall (federal) taxes at the holding company level. In this case, a greater number of utilities under the holding company could dampen the tax shield benefits of debt.

Last we include a *merger dummy* to control for the post restructuring merger wave in the electric utility industry, since mergers significantly altered the size and debt capacity of firms.

⁵¹ When we could identify the exact date when the utility joined the holding company, the dummy is 1 from that date. Otherwise, if we know that a certain utility belongs to a holding company, the dummy is 1 through out the sample period.

This dummy equals 1 when a firm is part of a merger in a particular year. A priori the effect of mergers on leverage is unclear, since a merger may either increase or decrease leverage depending on the financial structure of the two companies and the nature of the merger.

To investigate whether these firm characteristics were affected by restructuring, we divide the observations into pre and post-restructuring cohorts (Appendix Table 3C) and find some systematic differences between the two groups. First, the ratio of tangible assets to total assets, and asset growth are both lower for utilities in restructured states. It is quite plausible that because of the heightened uncertainty during the period of deregulation, firms were more cautious in their investment decisions (McDonald and Siegel, 1986), as reflected in this slow down of asset growth. Second, mean holding company size is greater for restructured firms and this may be due to the increased mergers and acquisitions in the restructured phase. Third, profitability is lower for restructured firms, although the difference is not significant. Prior work has shown that the efficiency of U.S. electric utilities increased after restructuring (Delmas and Yesim, 2003; Fabrizio et al., 2007),⁵² and we find that this reported productivity increase does not translate to higher profitability for the period under consideration.⁵³ Last, we note that firm size is not significantly different in the two periods.

3.3.2 Non-Financial Firm Attributes

For the power industry, non-financial firm characteristics also play a crucial role in determining how each utility reacts to the regulatory and competitive forces. We specify five firm-specific traits that we believe may directly impact a utility's financial decisions in light of industry restructuring. The first variable is *wholesale market participation* and is constructed as

⁵² There is a substantial theoretical and empirical literature that shows deregulation to be productivity enhancing (Baily et al., 1993; Evans & Kessides, 1993; Bertolotti & Poletti, 1997; Djankov & Hoekman, 2000).

⁵³ One possible explanation could be that in the short-term costs associated with restructuring may put downward pressure on profits.

the ratio of electricity sales for resale⁵⁴ to total electricity sales for a company. The higher this resale share the greater the company presence in the wholesale market. The wholesale market had been deregulated for some time before the passing of the two FERC Orders in 1996. Thus, utilities which have a strong presence in the wholesale market are already familiar with the workings of a competitive electricity market and should be better positioned to take advantage of deregulation in the retail market and manage the market risks better. On average, we expect this variable to have a non-negative impact on leverage since firms with greater wholesale market experience may find ways to reduce their exposure to market risks and thus may be willing to take on more debt. However, the reverse may also be true. Greater exposure to wholesale competition implies greater revenue uncertainty, thus adversely affecting leverage.

Second, we use two proxies to capture the amount of *potential stranded costs* for a particular utility. The expected amount of stranded costs faced by a firm is important in determining how it reacts to the various regulatory risks vis-à-vis its capital structure decision. For instance, a utility with very low stranded costs may not alter its leverage even if located in a state with stringent stranded cost recovery policies as opposed to another utility with high levels of stranded costs. We use the *share of capital expenditure on nuclear plants* as one such proxy, and construct this as the amount (in dollars) of capital expenditure on nuclear plants as a proportion of total capital expenditure in that year. Newly built nuclear facilities are one of the largest sources of costs that utilities may not be able to recover once the state transitions away from the regulatory environment and this variable captures a portion of such stranded costs.⁵⁵ In addition, we use the *share of IPP supplied power* as the other proxy⁵⁶. This is measured by the amount of megawatt hours supplied by independent power producers to a particular utility as a share of total power sold by the utility. After PURPA was passed in 1978, major utilities were

⁵⁴ Sales for resale are sales to other electric utilities.

⁵⁵ This variable is an upper bound on the nuclear stranded cost variable as some utilities may already have fully recovered the cost of building their nuclear facilities.

⁵⁶ This variable is not a clean proxy for stranded costs since this variable also shows how strong the IPP presence is in the state, and hence the potential competition that utilities may face once the state has restructured. But either way, we expect the coefficient to be negative.

obligated to buy all the power that qualifying⁵⁷ IPPs could supply at “avoided cost” rates. If a utility is locked into a long-term contract with an IPP at above market rates, then they would be unable to pass this cost to their customers after deregulation and the difference between the market rate and the contract rate would be “stranded”.

Third, we use the *share of industrial sales* as measured by megawatt hours of electricity sold to industrial customers as a proportion of the total electricity sold by the firm. In most states that began retail competition, industrial customers were the first segment that could choose a retail provider, and unlike residential customers, were more likely to switch providers if competing generators could provide lower rates. Thus the higher the share of industrial customers, the greater is the exposure to market uncertainty and lower expected debt to asset ratios after restructuring. From Appendix Table 3C we find that utilities have been losing industrial customers after restructuring.

Restructuring was primarily aimed at generating companies and utilities whose primary business was distribution should be unaffected. Thus generation companies should have lower leverage ratios compared to distribution companies. This is captured by a *generation company dummy* that takes the value 1 if the sale of the utility’s own generation is more than 75 percent of the total electricity sold and zero otherwise.⁵⁸ Additionally, we construct an *input-cost volatility proxy* given by the ratio of fossil fuel generation to total generation for each utility. Compared to hydro and nuclear utilities, fossil fuel based plants⁵⁹ are often subject to fuel price shocks, and thus suffer from greater cost-side uncertainties making them less willing to undertake debt. Comparing pre and post- restructuring periods (Appendix Table 3C) we find

⁵⁷ Most of the qualifying facilities were renewable generation sources or various co-generation facilities.

⁵⁸ The generation company dummy=1 if generation in MWH/total sales in MWH . 75 %. For robustness purposes we vary this definition and construct the dummy so that it takes the value 1 if the generation share is 80, 85 or 90 percent. This makes no substantive change in the results.

⁵⁹ Those that relied primarily on coal and natural gas as their major source of fuel.

that the share of fossil fuel in total generation is lower in the restructured phase⁶⁰, and thus the effect of this variable on leverage may be different in the two periods.

Last, we account for the fact that some utilities have multiple service areas, and may thus be subject to multiple regulatory regimes. In our data there are 33 utilities⁶¹ that have service areas in multiple states. To account for this we follow the strategy adopted by Fabrizio et. al (2007 – footnote 38). We assign these utilities to the state where they are incorporated and then create a dummy (*Mixed Regulation Dummy*) to account for cross-state service areas and for “mixed regulation” that these utilities are subject to. It is possible that firms that are subject to multiple sets of regulation face greater uncertainty which would lower leverage.

4. Empirical Methodology and Results

4.1 Difference-in-Difference Model

Prior to estimating the effect of various restructuring policies on firm leverage, we first confirm that the decline in leverage ratios was not just a secular downward trend having little to do with the restructuring policies, and then investigate which stage of the restructuring process had the greatest impact on the financial structure of the utilities. We estimate a simple difference-in-difference model⁶² given in (2).

$$L_{ijt} = \alpha + \theta Treat_{jt} + \sum_{t=1992,1996} \lambda_t R_t + \sum_{P=1}^p \delta_P F_{ijt-1} + \sum_{J=1}^j \chi_j S + \sum_{k=1}^K \pi_k RTO + \sum_{t=1}^8 \phi_t T + u_i + \varepsilon_{ijt-1} \quad (2)$$

⁶⁰ Most restructuring activity was aimed primarily at fossil-fuel based plants and a number of utilities sold these off, especially in states that encouraged or mandated divestiture. Thus input-cost volatility for these firms would decrease after restructuring.

⁶¹ Alcoa, Appalachian Pwr. Co., Black Hills Pwr. Inc., Carolina Pwr. & Light Co., Delmarva Power and Light, Duke Pwr. Co., El Paso Electric Co, Interstate Pwr. Co., Idaho Pwr. Co., Electric Energy Inc., Indiana Michigan Pwr. Co., Indiana-Kentucky Elec. Corp., Kansas City Pwr. & Light Co., Kentucky Utilities Co., MDU Resources Group, Monangahela Pwr. Co., Montana Pwr. Co., New England Pwr. Co., Oklahoma Gas and Elec. Co., Old Dominion Elec. Coop, Otter Tail Pwr. Co., Pacificorp, Potomac Edison Co., Potomac Electric Power Co., Sierra Pacific Pwr. Co., South Beloit Water Gas & Elec. Co., Southwestern Elec. Pwr. Co., Southwestern Public Service Co., Susquehanna Electric Co, Texas-New Mexico Pwr. Co., Union Elec. Co., Wisconsin Electric Power Co, Wisconsin Public Service Corp.

⁶² We refer the reader to Bertrand et. al for a detailed discussion of this specification.

where: L_{ijt} is the leverage ratio for firm i in state j in year t , and is a function of state restructuring activity ($Treat_{jt}$), federal deregulation orders (R_t), lagged firm characteristics (F_{ijt-1}), and state (S), regional transmission authority (RTO), and year (T) dummies. u_i is the firm fixed effect and ε_{ijt-1} is the first-order autocorrelated idiosyncratic error which we include due to the persistence in leverage ratios over time. $Treat_{jt}$ is the treatment dummy that captures whether a state has undergone a particular restructuring stage in the given year. In our estimations in Table 4, we use three alternative treatment dummies: the deregulation investigation dummy (column 1), the retail competition order dummy (column 2), and the legislation enactment dummy (column 3) to investigate which stage of restructuring activity had the greatest impact on firm financial decisions. θ is the difference-in-difference coefficient that captures the effect of the treatment on the treated. If any of the restructuring stages was responsible for significant changes in the financial structure of firms and the decline in leverage, we expect θ to have a negative sign.

When estimating the model shown in equation 2, we have to choose the appropriate technique that will yield unbiased coefficient and standard error estimates. As mentioned above, there is persistence in leverage (especially in our data), and we hypothesize that past errors may influence current ones. This implies that errors may be autocorrelated and we cannot assume that the errors are identically and independently distributed. Additionally, it is not unreasonable to assume that in our model errors are heteroscedastic, i.e. each firm (panel) has a specific variance-covariance matrix, and that the disturbances are contemporaneously correlated across panels. To estimate the parameters of such models where the errors are autocorrelated and heteroscedastic, Beck and Katz (1995) propose the following: first, use the Prais-Winsten methodology to correct for autocorrelation, and second, to use the Beck and Katz technique to obtain heteroscedasticity-consistent standard errors. We use this methodology in our main regressions. In the tables that follow, we report the common autocorrelation coefficient (ρ).

In addition, we also correct for time-invariant characteristics of firms, states and the broader transmission areas. In the model, firm fixed effects will capture all firm unobservables that do not vary by year, such as say a particular corporate culture that may make a firm more or less likely to undertake debt. The state fixed effects capture attributes such as a high-electricity price state that is more pre-disposed towards deregulation (Ando and Palmer, 1998), or very pro-active regulators in state such as California and New York. The RTO dummies capture the common characteristics of each transmission networks shared by utilities that belong to that network. The year dummies absorb the macro shocks (excludes 1993 and 1997 since these are collinear with the federal regulatory order dummies).

We find that the estimate for θ is insignificant in column (1), and is negative and significant in columns (2) and (3). This indicates that preliminary investigations in a state had little impact on a firm's financing choices. Leverage ratios declined when an actual order was passed or legislation enacted, since at that point restructuring was probably inevitable, and firms expected a competitive landscape in the future. When an order is passed leverage ratios decline by 2.4 percent and after legislation is enacted it drops by 3.4 percent.⁶³

Table 4 also shows that the 1992 Energy Policy Act had a much larger impact on leverage than the state-level restructuring plans. An average firm experienced an 8.5 percent decrease in leverage after EPAct. As discussed earlier, EPAct formalized the process of wholesale competition in the electricity market and thus exposed utilities to greater earnings volatility and higher uncertainty about future income potential. This may have made utilities unwilling to hold more debt, since the financial safety net of regulated rates was significantly smaller as they increased their participation in the wholesale market. In addition, the financial market may have also been uncertain about how the industry is going to change and hence, may have undervalued these firms, decreasing their debt capacity.

⁶³ However, when both order and legislation dummies are included, we find that firms change their financing decisions only after states enacted formal restructuring legislation and leverage decreases by 3 percent.

Surprisingly, in the estimated model, the 1996 FERC orders had no impact on leverage as may have been expected from Figure I which showed a sharp decline after 1996. One reason may be that these orders were little more than follow-on orders to the 1992 EPAct, and firms had already adjusted their leverage after EPAct. It could also be that the negative and highly significant year dummies after 1997 are capturing the effect of the FERC Orders on leverage.

4.2 Firm Characteristics

All coefficients on firm characteristics are remarkably robust across specifications in all tables, and are consistent with previous findings (Bradley, Jarrell and Kim, 1984; Titman and Wessels, 1988; Rajan and Zingales, 1995; Barclay, Smith and Watts, 1995; Fama and French, 2002). First, we find that firm size does not affect the capital structure decisions of firms. This result, although different from that of non-regulated firms, may not be entirely surprising given that our sample consists of rate-regulated utilities. Usually one observes a positive effect of size on leverage since large firms may have lower default probabilities and hence higher debt levels. However, if default probabilities are near zero, as with regulated utilities, one should not expect a significant effect of size on leverage.

Second, more profitable firms rely less on debt to finance investments, and a 1 percent increase in profitability decreases leverage by 0.1 percent, suggesting that more profitable firms use internal funds and less debt. Third, the coefficient on the ratio of tangible assets to total assets is positive and significant, and a 1 percent increase in the ratio, increases leverage by 0.3 percent. Tangible assets are used as collateral for borrowings and hence more collateral value translates into higher debt capacities and higher debt levels. Last, the negative coefficient on asset growth, lends support to the hypothesis that firms with high growth opportunities are more likely to forego profitable investments if they are highly levered (Myers, 1977).

The holding company size variable is negative and significant, suggesting that firms belonging to large holding companies may have greater access to internal capital markets and

use less external debt. In addition, we also find that firms with a larger industrial customer base have lower debt ratios. (Recall that industrial customers were the first to experience retail competition.) If utility A has 10 percent more industrial customers than utility B, we would expect A's leverage to be 1.1 percent lower than that of B. We attribute this to the greater competitive pressure faced by utility A. To retain this low-inertia (or footloose) customer segment, it had to lower its price or risk losing market share. The wholesale market participation variable is positive and significant implying that utilities that were large players in the wholesale market were more leveraged. Last, being a generation company, having undergone a merger, input-cost volatility, or the proxies for stranded costs⁶⁴ did not influence a utility's financing choices.

4.3 Extended Model

The earlier model indicates that restructuring lowered leverage ratios. However, using one dummy variable to characterize the restructuring policies fails to capture their complexity and omits other associated policy changes. We have explained that states differed not only in their pace of deregulation, but also in terms of laying the groundwork for future competition and in other regulatory provisions. In addition, the summary statistics (Table 3C) show that firm characteristics are different for regulated and restructured firms, and should influence leverage differentially in the pre and post-restructured regimes. The specifications that follow, augment the earlier model by adding several regulatory risk (R_{jt}) and market uncertainty (M_{jt}) variables in

⁶⁴ The coefficient on the share of IPP power is significant at 12 percent showing a weak negative effect of the variable on leverage.

$$\begin{aligned}
L_{ijt} = & \alpha + \lambda R_{1992} + \sum_{K=1}^3 \beta_K R_{jt} + \sum_{H=1}^3 \gamma_H M_{jt} + \sum_{P=1}^P \delta_P F_{ijt-1} + \sum_{J=1}^J \chi_J \mathbf{S} \\
& + \sum_{k=1}^K \pi_k RTO + \sum_{T=1}^8 \phi_T \mathbf{T} + u_i + \varepsilon_{ijt-1}
\end{aligned} \tag{3}$$

addition to the EPAct and restructuring dummies. Similar to the difference-in-difference model, we estimate the equation outlined below using the Prais-Winsten methodology and correct the errors for first-order autocorrelation and panel heteroscedasticity, and control for firm (u_i), state (S) and year (T) fixed effects.

Table 5 column 1 presents the results for this extended model.⁶⁵ As before, firms decreased leverage by 8.7 percent after the 1992 Energy Policy Act. However, with the additional regulatory and market uncertainty variables, the legislation enactment dummy becomes insignificant. The primary regulatory risk seems to arise from the policies regarding the divestiture of generation assets. We find that utilities whose state encouraged divestiture of generation assets, reduced leverage by 6.3 percent. This could either be due to the market undervaluing the assets and reducing a firm's debt capacity, or firms reacting to future earning instability brought about by these policies. Stranded cost recovery and performance based regulation policies show no significant effect on financing decisions although they are in the direction we expect. In aggregate, the regulatory risk factors decreased leverage by about 15 percent.

The market uncertainty variables show that a firm with higher market uncertainty holds less debt. As the size of the competitive segment increased by 1 percent, firms reduced their debt ratios by 0.06 percent. This effect is apparently small but it is of great economic significance since 9 out of the 14 states had mandated that 90 percent or more of customers

⁶⁵ The table presents the coefficients. Using those values, for dummy variables we calculate the semi-elasticity and for continuous variables we calculate the elasticities. All are evaluated at the mean.

were eligible to switch.⁶⁶ This implied that their entire market was in play, and utilities serving these markets would face greater competitive pressures, more earnings volatility and hence greater default probabilities, which in turn would decrease leverage. For instance, a utility would decrease its leverage by 6 percent if it was located in a state where 100 percent of the customers could choose their electricity providers, compared to a utility in a state where no customers had such a choice. The other 7 states allowed between 0.3 to 91.4 percent of customers to switch. When all 14 states are taken into account, on average, 60 percent of customers were allowed to switch. This implies that leverage would decline by 3.6 percent.

We also find that if the state encouraged competition by allowing any company to be the default provider, thus intensifying competition for customers who had not chosen a provider, firms decreased leverage. Introducing effective competition reduced debt levels by 7.8 percent, one of the largest policy effects. In addition, if the number of competitors in neighboring states increases by one, utilities decrease their leverage by only 0.3 percent. On average, the number of competitors increased by 5.3, hence we would expect a 1.6 percent decrease in leverage. Thus policies that encouraged competition, and hence increased market uncertainty, lowered leverage by 13 percent on average. In addition, if utilities expected to exercise greater market power in the future, they were more likely to take on higher debt, i.e. about 2.1 percent higher, when compared to utilities in states where there was no potential for exercising market power. Overall, we find that the regulatory risk and market uncertainty variables are associated with a 28 percent decline in leverage.

In sum, we find that deregulation and its associated restructuring policies have led to significant lowering of debt ratios. Particularly, any policy that decreased the earnings stability, or increased competition and threatened market share lowered debt ratios. We also find that the existence of effective competition had a greater effect on firm financing than the size of the

⁶⁶ California, Connecticut, Maine, Massachusetts, New Jersey, Pennsylvania, Rhode Island had made 100% customers eligible while New York and Maryland made more than 90% of customer eligible to switch.

competitive segment. Firms with market power had the ability to counter this competitive threat and stabilize earnings, and were thus willing to take on more debt. We also confirm earlier findings that firms with higher profitability and asset growth have lower leverage, and firms with greater tangible assets and higher wholesale market participation were more leveraged. In addition, firms belonging to a holding company, or ones with a footloose customer segment used less debt.

In column 2, we add the high price state dummy to account for the expectation a firm may have had about the status of restructuring in its home state. As discussed earlier, a high price state was more likely to restructure than a low price one. However, we do not find any effect of this variable on leverage. In column 3, we add the mixed regulation dummy to control for utilities whose service areas span multiple states, thus subjecting them to multiple regulatory regimes. This variable has no measurable effect on our findings, a result which Fabrizio et. al (2007) have found in their analysis as well. Thus we drop these two variables from latter specifications. In column 4, we use the annual amount of excess capacity as an alternative measure for asset growth. As explained earlier, firms with higher excess capacities will have low future growth opportunities, and thus might be expected to have relatively high leverage and viceversa. We find that this is indeed the case. All other results remain unchanged.

4.4 Robustness Checks – Alternative Specifications and Truncation Corrections

To check the robustness of the above results we use three alternative estimation techniques in Table 6.⁶⁷ Column (1) presents a linear fixed effects model as a benchmark. This does not correct for correlated errors or panel-level heteroscedasticity. We find that the main results from Table 5 hold, and correcting the errors for first-order auto-correlation and panel-level heteroscedasticity, and including state fixed effects in Table 5 may be responsible for the

⁶⁷ We have estimated several other models (random effects with clustered errors, linear fixed effects with AR(1) and a random effects tobit) and for brevity, do not present them here. The results are very robust to these alternative specifications.

minor differences.⁶⁸ The Prais-Winsten or fixed effects models however, do not account for the specific nature of the dependent variable, which is in shares (total debt/total assets), and is thus bound between zero and one. Column 2 and 3 in Table 6 correct for this truncation.

In column 2, we use a logit transformation⁶⁹ of the dependent variable and estimate the specification using the Prais-Winsten method used for Table 5. The coefficients presented in column 2 are for the transformed dependent variable. When we calculate the elasticities with reference to the original variable we find that the results are almost identical to those in Table 5, except for the share of nuclear generation which is now negative. Since this share was a proxy for the amount of stranded costs, it implies that utilities with greater amounts of such costs had lower leverage. In column 3 we use a truncated regression model to further check the robustness of our results, and again find that all coefficients of interest are similar to those presented in Table 5. Finally, in column 4, we use feasible generalized least squares estimation (FGLS) with standard errors corrected for autocorrelation and panel level heteroscedasticity, as an alternative to the Prais-Winsten methodology. Our main findings are robust to these alternative specifications.

5. Firm Attributes and Restructuring Policies

5.1 Pre and Post Restructuring Effects

The specification in Table 7 augments the model in Table 5 by adding interaction terms between the legislation enactment dummy and firm attributes. These interactions capture the differential impact of regulatory policies on leverage depending on individual firm characteristics. For firm attributes, column 1 shows the pre-restructuring effect and column 2 shows if the effect is different after restructuring. From column 1 we find that the results are similar in sign, significance and magnitude to those of Table 5 column 1, except the market

⁶⁸ The potential market power variable has no impact on leverage in the fixed effects model, and the input-cost volatility variable is negative and significant showing that higher volatility implies a lower leverage ratio.

⁶⁹ The dependent variable for the logit transformation is $\log(y/(1-y))$ where y denotes the leverage ratio.

power dummy and asset growth variable which are not significant in Table 7 column 1, and profitability, which now has an even greater negative effect on leverage. Most of these variables have the same effect on leverage before and after restructuring as evident from the insignificant coefficients of the interaction terms in column 2. However, the pre and post results are significantly different for three firm characteristics.

All else equal, we observe that firms with a higher share of industrial customers had a lower leverage ratio before restructuring when compared to the after restructuring period. In the pre-restructuring phase the leverage of say, utility A, would be 0.9 percent lower than that of another utility B, which had 10 percent less industrial customers than A. However, after restructuring, the difference would only be half that number. As discussed earlier, industrial customers were willing to switch providers if rates are favorable. Thus, utilities whose primary constituents were such large customers were under greater price pressure, which would lower their incentives for holding debt. However, after restructuring, the industrial customer segment may have less of an effect on leverage since a majority of states did not open large portions of their market to competition and utilities did not feel threatened about losing their industrial customer base, at least in the short-term. This would lead to continued earnings stability in the future, and reduce the need to lower debt levels.

The next two variables relate to the stranded cost proxies. The capital expenditure on nuclear plants has a negative and significant effect on leverage after restructuring. It shows that after restructuring, firms with a larger share of stranded costs lowered their debt levels since they would presumably take a hit in their earnings if the costs could not be recovered. In addition, the share of IPP supplied power however, has a negative and significant coefficient in the pre-restructuring period, with a 1 percent increase in IPP supplied power leading to a 0.02 percent decrease. As mentioned before, this decrease could be a result of the anticipated stranded costs that utilities may have to bear because of the above-market contracts with the IPPs or this may signal the reaction of utilities to potential competitive threat. On the other

hand, in the post-restructuring period, the coefficient on this variable is positive, although small (0.009), implying that utilities with a larger share of IPP contracts may have had to borrow greater amounts to service the contracts after markets are restructured.

5.2.1 Policy Interactions

In Table 8 we investigate additional interactions between some policy variables and firm characteristics. It is conceivable that certain restructuring policies will only affect particular sets of firms depending on their individual characteristics. For example, larger firms may be able to handle market competition better than their smaller firm counterparts and leverage may not be as adversely affected. For column (2) we find that larger firms actually increase their leverage as the number of competitors in neighboring states increase. Next, we interact the potential market power dummy with the return on assets and the share of tangible assets variable and investigate whether having market power increases firm profitability and tangible assets. We find that profitability is unaffected, but firms with a high ratio of tangible assets decrease their leverage after they have market power. This is counter intuitive since their debt capacity should have increased, as they could have ensured earnings stability if they had market power.

Next we investigate whether utilities with a smaller share of footloose industrial customers or a higher wholesale market participation rate have higher leverage compared to firms with a less stable customer base or a lower wholesale market participation depending on the size of the competitive segment after restructuring. We find no effect. We also hypothesize that the divestiture policies should affect generation firms and not distribution companies. Again there is no difference between these two types of companies. Last, the stranded cost recovery policies should only affect utilities that are expected to have a high level of stranded costs. For example, in California, the stranded costs policies would affect the Pacific Gas and Electric Company much more than San Diego Gas and Electric since the former had large stranded costs in part due to its Diablo Canyon nuclear facilities while San Diego Gas and

Electric had negligible stranded costs. Indeed, we find that the interaction term between the stranded cost recovery policy dummy and the share of capital expenditure on nuclear facilities is negative and significant. From these results we may argue that most of the policies affected utilities across the board, and there was limited differential impact between various different types of utilities.

5. Attempts at Solving Endogeneity

All the above specifications show that firms did indeed change leverage ratios in response to federal and state-level restructuring policies. However, there are two drawbacks to these models. First, the restructuring policy dummies capture the legislative changes when they occur, and a firm's expectations about restructuring are not factored into the model. Additionally, these specifications treat the state-level legislations as exogenous to the firm's operations. Utilities are usually large players in state regulatory politics may actually influence restructuring legislation. To capture the expectation-driven behavior of firms and correct for endogeneity of state policies we use a two stage model in Table 9A.

Based on research by a number of scholars in the field (Ando & Palmer, 1998; White, 1996; Peltzman, 1976; Stigler, 1971) we first estimate an ordered probit specification⁷⁰ that models the state restructuring status in 1998 as a function of state economic and political factors and the financial characteristics of utilities prevalent in 1993. As the dependent variable we consider the status of electricity restructuring in a state at the end of 1998, and is constructed as

⁷⁰ The framework is based on a latent regression model. Suppose we have a model: $u^* = \beta'x + \varepsilon$ u^* is unobserved, β is a vector of parameters to be estimated, x is a vector of explanatory variables and ε is the error term. For the restructuring model, suppose the regulator is a social welfare maximizer and perceives an increase in social welfare if the power industry is restructured. He will restructure only when the utility from changing the status quo is positive. Let his original utility be zero and new utility level be u^* . The regulator also has a threshold utility level that determines whether he will move to the next stage or not. When each threshold is crossed due to factors previously mentioned, restructuring progresses from one level to another. Therefore what we observe is the actual level of deregulation (denoted by *restruc*) and utility function of the regulator. Therefore we have:

$$restruc = 0 \quad \text{if } u^* \leq 0, \quad restruc = 1 \quad \text{if } 0 < u^* \leq \lambda_1, \quad restruc = 2 \quad \text{if } \lambda_1 < u^* \leq \lambda_2, \quad restruc = 3 \quad \text{if } \lambda_2 < u^*$$

The cutoff points (λ s) are estimated along with the β . We assume that ε follows a standard normal distribution with mean 0 and variance 1.

follows: *the status of restructuring (legislation enactment) in 1998* is a continuous index that equals 0 if states exhibit “No Activity” regarding deregulation, it equals 1 if the state has “Investigations Ongoing or Orders and Legislation Pending”, it equals 2 if there is an “Order Issued for Retail Competition”, and the restructuring index equals 3 if the state has “Legislation Enacted to Implement Retail Access”. The independent variables, which we discuss below,⁷¹ are from 1993 – before EPAct had any significant influence and this avoids further endogeneity problems.

The results of the estimation of the ordered probit model are given in Tables 9A column 1. Prior work has shown that the most important factor that spurred the restructuring process is the *level of electricity prices* in different states. Evidence suggests that the high priced states (California, the New England states) were the first to begin restructuring, thus the average price level in a state is included as an explanatory variable. The coefficient of price in 1993 is positive and significant at 1 percent. This validates the claim that high priced states were the first ones to restructure. This result is intuitively appealing as theory suggests that if the price gets high enough such that it can no longer be supported within any regulatory framework – restructuring occurs (White, 1996).

The price level is not the sole factor determining the pace of restructuring – what also matters is the price in neighboring states. Ando and Palmer argue that IOUs will have an incentive to push for deregulation if the price in the neighboring states is high and they perceive that a profit could be made by selling power to these states. The coefficient of *'export' price gap* (difference between the state's price and that of the highest price neighbor bounded at zero) is

⁷¹ The price data and the share of municipals and cooperatives were collected from EIA-861 data file: 1993 “Annual Electric Utility data”. The share of revenue from industrial customers was obtained from EIA-826 data file, which contained 1993 state level “Monthly Electric Utility Sales/Revenue Data”. The rating about legislators in a state is from the League of Conservation Voters “national Environmental Scorecard” for 1993. We use both the senate and the house rating. Stranded cost estimates are from Moody's publication “New Moody's Survey Shows Many Changes in Estimated stranded Costs and Prices”.

positive and significant implying that the utilities were favorable to restructuring when the 'export' price gap was large.

The incentive of retail customers to push for restructuring is measured by the '*import price gap*' (difference between the state's price and lowest price in a neighboring state bounded below at zero). Customers will exert pressure for restructuring if they perceive that their own state's price is far higher than that of the neighboring state's as they expected restructuring to lead to a decrease in prices. The 'import' price gap however, is negative and significant implying that customers discouraged restructuring as this gap widened. The *weighted standard deviation of utility-level average prices* is used as another explanatory variable. The weight used is the utility-level electricity sales revenue. If the variance in prices is large within the state, then customers of high priced utilities would pressure for restructuring. On the other hand, the customers of low priced utilities would be against such a move as it may increase their price. A priori the effect of this variable on restructuring is ambiguous. We find that this variable had little impact on restructuring. Theory suggests that since residential customers are dispersed and atomistic it would be difficult for them to mobilize a critical mass to exert any meaningful influence. Thus the large industrial and commercial customers, who are fewer in number, would have more influence. To measure this effect, the *share of industrial customers* is constructed as the amount of revenue generated from the industrial customers divided by the total electricity revenue. However we find that the industrial customers have little effect on the state restructuring status.

In addition, Ando and Palmer (1998) argue that a larger presence of municipalities and electric co-operatives obviates the need for restructuring. The size and strength of munis and co-ops (*share of munis and co-ops*) is measured by the share of state electricity revenue attributed to municipalities and electric co-operatives. The coefficient on this variable is significant and negative. This implies that in states where the municipalities and electric co-operatives account for a large amount of power sold, the pace of restructuring has been slow. We also include a

green state proxy variable to measure the power of environmental groups in each state. A pro-active and strong environmental group may affect the deregulatory process in a different way than a weak group. This is constructed from the League of Conservation Voters' dataset that tracks the voting record of state house and senate members on 'green' issues and rates states according to it. It is conceivable that a strong environmental group may hinder restructuring as it may adversely affect the environment through a decrease in environmental R&D, which the regulators will no longer be able to influence. In addition, we include a dummy for the *party in state congress* that takes the value 1 if the Republicans were in power in the state congress. Republicans in power may hasten the restructuring process since it signals less involvement of government in business. The environmental group proxy and the party in congress are insignificant, implying that neither environmental groups nor the affiliation of the party in state congress had much influence on the restructuring process.

Next, Ando and Palmer (1998) use the *stranded costs* of the state utilities as an explanatory variable for two reasons. First, utilities perceiving a benefit from restructuring coupled with full stranded cost recovery may pressure the regulatory commission to move towards deregulation. Second, consumers in high stranded cost states may apply pressure for restructuring on the belief that there will be less than full stranded cost recovery and they will stand to gain from restructuring. However, we believe that a third explanation may be more appropriate. Large stranded costs are manifestations of past regulatory decisions gone wrong (like the high priced long-term contracts under which the California IOUs were obliged to buy power from the 'Qualifying Facilities'⁷²). This led to high electricity prices. The regulators perceiving this imbalance may move towards restructuring faster to prevent a political debacle. The amount of stranded costs has a positive and significant (at 10 percent) coefficient implying that states with high stranded costs had a faster pace of restructuring.

⁷² Qualifying facilities were small power generators that generated a major portion of their power from renewables and incumbent utilities were mandated to buy this power at "avoided cost".

Last, we use the *average leverage of the utilities* in each state as a dependent variable. It could be argued that a highly leveraged utility would put pressure on the regulators not to restructure since earnings volatility would adversely affect their debt capacity. We find that the coefficient is negative but insignificant, implying that the debt structure of utilities had little influence on the restructuring process.

We then generate the predicted probabilities of legislation enactment (i.e. restructuring index = 3) from this model and use it instead of the actual legislation enactment dummy in the second-stage leverage regression from equation (2) to correct for forward looking expectations and endogeneity issues. We estimate this second stage using the Prais-Winsten methodology and bootstrap the standard errors to account for prediction errors from the first stage. From column (2) in table 9A we find that the predicted probability of restructuring is negative and significant and very similar in magnitude to the restructuring dummy in Table 4, column (3). All other variables are unchanged in sign and relatively similar in magnitude to Table 4. This indicates that endogeneity may not be a significant issue when estimating the effect of restructuring on firm leverage for the US electric utility industry.

As an alternative, we also estimate a more traditional instrumental variables model in a panel data setting in table 9B. We first estimate a panel data probit model with the *Legislation Enactment Dummy* as the dependent variable. The biggest drawback of using the panel model is that we cannot use the average electricity price in the state as an explanatory variable. In the previous ordered probit model, we found a very strong correlation between the level of restructuring and the electricity price in a state. However, once restructuring takes effect, prices are endogenous and cannot be used as a right hand side variable. To solve this problem, we use the *high price state dummy* that is 1 if the average electricity price in the state was greater than the average US electricity price before the state began any investigations into the deregulation process. From column (1) in table 9B, we find that being a high price state has no impact on

whether restructuring legislation is going to be enacted in the state. This could be due to the inclusion of state fixed effects in this model.

We include two similar customer characteristics from the ordered probit model: the *share of industrial customers* in the state and the *share of munis, co-ops and IPPs* in the state. We find that both the variables have coefficients that are negative and significant implying that as the share of industrial customers increases, it has a negative effect on restructuring. We argue that utilities that have a larger share of industrial customers could potentially lose a large part of their customer base after restructuring and may pressure the regulators not to restructure. Similar to the ordered probit model we find that as the share of other types of power generators in the state increase, it is less probable that states will restructure due to reasons explained above⁷³.

We include four state characteristics in column 1 of Table 9B. First, we include the *share of the electricity sector* to measure the importance and power that utilities may have in influencing the restructuring process. This is measured by the share of electricity revenue in total gross state product. We find that the larger the electricity sector, the less likely it is that a state enacts restructuring legislation. We also include the *number of neighboring states with deregulation investigation* to measure how states react to peer effects. We hypothesize that if a large number of neighboring states have begun the process of restructuring then a particular state will be more likely to restructure. This is borne out by the positive and significant coefficient of the variable. Similar to the ordered probit model, the *green state proxy* and the *party in state congress* have no impact on the restructuring process. Last we include the two utility characteristics: a *stranded cost proxy* as measured by the average level of capital expenditure on nuclear plants and the mean leverage ratio of state utilities. As in table 9A, we

⁷³ We also separated this variable into the share of munis and co-ops and the share of IPPs. One can argue that the larger share of IPPs in the state would lead to greater pressure towards restructuring, however, this variable was very imprecisely estimated, hence, we aggregated the munis, co-ops and IPPs into one variable.

find that states with larger stranded costs were more likely to restructure, while the mean leverage ratio had no impact.

In column (2) of Table 9B, we estimate the second stage model with leverage as the dependent variable. In this specification, instead of using the legislation enactment dummy, we use the *predicted legislation enactment dummy* that we obtain from the first stage equation. We estimate this second stage using the Prais-Winsten methodology with bootstrapped standard errors. We find that the predicted legislation enactment dummy has a negative and significant coefficient at the 1 percent level. All other variables are similar to those reported in Table 4, column (3). Thus the results from Table 9A and 9B show that endogeneity and expectations are probably not significant problems in our econometric specification.

Section 5: Conclusion

There has been substantial research investigating the capital structure decisions of firms and some investigation on the financing decisions of regulated ones. However, this is one of the very few papers that document how the financing decisions are altered when a firm transitions from a regulated to a competitive regime, and has to respond to both regulatory and market uncertainties. This study provides a new window into the financial effects of restructuring, and adds to our understanding of firm financing behavior in general. The restructuring of the U.S. electric utilities in the 1990s provides a unique opportunity to study these issues. We find that regulatory risk and market uncertainty variables reduce leverage between 24.6 and 26.7 percent approximately.

We find that any policy that decreased earnings stability, or increased competition and threatened market share, lowered debt levels. First, the introduction of the 1992 Energy Policy Act decreased leverage by 8.7 percent. In a rate-based regulated regime, earnings were stable and firms were insulated, for the most part, from demand and supply-side shocks. Restructuring

forced these firms to assess the risks inherent in their capital structure decisions and optimize accordingly. The uncertainties associated with a market environment, and the absence of the safety-net of regulation limited the amount of debt a firm was willing to undertake. When other restructuring policies are added, we find that the legislation enactment dummy has no influence on leverage. Rather policies on divestiture impact the debt levels of the firm. Utilities in states that encouraged divestiture of generation assets reduced leverage by 6.3 percent. This could either be due to the market undervaluing the assets and reducing a firm's debt capacity, or firms reacting to future earning instability brought about by these policies.

We also show that firms facing higher market uncertainty have lower leverage. As the size of the competitive segment increased, firms reduced their debt ratios by 3.6 percent assuming that on average 60 percent of customers were eligible to switch. Introducing effective competition reduced debt levels by 7.8 percent, one of the larger policy effects. In addition, if the numbers of competitors in neighboring states increases by 1, utilities decrease their leverage by only 0.3 percent. Firms with market power would have the ability to counter such competitive threats to some extent, and were thus willing to take on more debt, increasing leverage by 2.1 percent (although this is not robust across specifications).

In addition, more profitable firms rely less on debt to finance investments suggesting that more profitable firms use internal funds and less debt. In addition, since tangible assets are used as collateral for borrowings, more collateral value translates into higher debt capacities and higher debt levels. The negative coefficient on asset growth, lends support to the hypothesis that firms with high growth opportunities are more likely to forego profitable investments if they are highly levered. Last, firms having greater access to internal capital markets, or ones with a footloose customer segment, used less debt.

We also document that in limited cases firms react differently to restructuring policies depending on their individual attributes. For example, firms with greater levels of stranded costs

leading to the decrease in leverage after restructuring. However, we also find that most of the policies affect utilities across the board and do not depend on firm characteristics. Last, we address the issue of endogeneity between the state level restructuring policies and utility leverage ratios. Based on two alternative instrumental variables models, we show that our results are consistent and endogeneity may not be a significant problem for our empirical specification.

This paper makes two important contributions to the literature. First, it builds on previous capital structure research by adding an important piece about the financing decisions of regulated firms. Second, by studying firms that are transitioning from a regulated to a competitive environment, it provides a unique window into how changing incentive structures influence financial choices of firms. This is a step towards a better understanding of the determinants of capital structure across various types of firms, and may further our knowledge about firm investment and risk-taking behavior.

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APPENDIX TABLES

TABLE 1(A): DEREGULATION /RESTRUCTURING ORDERS

Year	Investigations Ongoing or Order Pending	Order Issued for Retail Access	Legislation Enacted to Implement Retail Access
1994	California		
1995	Connecticut, Louisiana, Vermont, Washington	California	
1996	Alabama, Colorado, Connecticut, Hawaii, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Virginia, Washington	New York, Vermont	California, New Hampshire, Pennsylvania, Rhode Island, Texas
1997	Alabama, Arizona, Arkansas, Colorado, Connecticut, Dc, Georgia, Hawaii, Idaho, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, New Jersey, New Mexico, North Carolina, North Dakota, Oregon, South Carolina, Tennessee, Virginia, Washington, West Virginia, Wisconsin	Illinois, Maryland, New York, Vermont	California, Maine, Massachusetts, Montana, Nevada, New Hampshire, Oklahoma, Pennsylvania, Rhode Island, Texas
1998	Alabama, Alaska, Arkansas, Colorado, Delaware, Hawaii, Idaho, Indiana, Iowa, Kansas, Louisiana, Minnesota, Missouri, New Mexico, North Carolina, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, West Virginia	Arizona, DC, Georgia, Illinois, Maryland, Michigan, Mississippi, New Jersey, Vermont, Washington	California, Connecticut, Maine, Massachusetts, Montana, Nevada, New Hampshire, New York, Oklahoma, Pennsylvania, Rhode Island, Texas, Virginia, Wisconsin
1999	Alabama, Alaska, Colorado, Hawaii, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Missouri, North Carolina, North Dakota, South Carolina, South Dakota, Tennessee	Arkansas, DC, Georgia, Michigan, Minnesota, Mississippi, Vermont, Washington	Arizona, California, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Virginia, West Virginia, Wisconsin

TABLE 1(A) CONTINUED

Year	Investigations Ongoing or Order Pending	Order Issued for Retail Access	Legislation Enacted to Implement Retail Access
2000	Alabama, Alaska, Colorado, Florida, Hawaii, Idaho, Indiana, Kansas, Kentucky, Louisiana, Missouri, North Carolina, North Dakota, South Dakota, Tennessee	Arkansas, Georgia, Minnesota, South Carolina, Vermont, Washington	Arizona, California, Connecticut, Delaware, DC, Illinois, Maine, Maryland, Massachusetts, Michigan, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Virginia, West Virginia, Wisconsin
2001	Alabama, Colorado, Florida, Hawaii, Idaho, Indiana, Kansas, Louisiana, North Carolina, North Dakota, South Dakota, Tennessee	Arkansas, Georgia, Missouri, Minnesota, South Carolina, Vermont	Arizona, California, Connecticut, Delaware, DC, Illinois, Maine, Maryland, Massachusetts, Michigan, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Virginia, West Virginia, Wisconsin

TABLE 1(B): DATES FOR STRANDED COST RECOVERY ACTS

States with No Date (i.e. No Policy)	Alaska, Colorado, DC, Florida, Hawaii, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Missouri, North Carolina, North Dakota, Oregon, South Dakota, Tennessee, Vermont, Washington, West Virginia, Wisconsin
Year	
1996	Alabama, New Hampshire, New York
1997	Arkansas, California, Idaho, Illinois, Maine, Maryland, Massachusetts, Mississippi, Montana, Nevada, New Jersey, Ohio, Oklahoma, Pennsylvania
1998	Arizona, Connecticut, Delaware, Georgia, Rhode Island, South Carolina, Texas
1999	New Mexico, Virginia
2000	Michigan

TABLE 2: SUMMARY STATISTICS FOR REGRESSIONS

Dependent Variables:	Mean	SD	Min	Max
Leverage = Total Debt/Total Assets	0.334	0.109	0.009	0.772
Logit Transformation of (Total Debt/Total Assets)*	-0.749	0.630	-4.744	1.217
Regressors				
<i>Restructuring Characteristics (Dummies)</i>	Percentage of Ones			
Deregulation Investigation Dummy	48.31			
Retail Competition Order Dummy	31.53			
Legislation Enactment Dummy	25.58			
Stranded Cost Recovery Dummy	27.10			
Divestiture Policy Dummy	18.88			
Performance Based Regulation (PBR) Dummy	10.02			
High Price State Dummy	37.59			
Effective Competition Dummy	6.00			
Potential Market Power Dummy	23.08			
<i>Restructuring Characteristics (Continuous Variable)</i>	Mean	SD	Min	Max
Size of the Competitive Segment	13.408	33.387	0	100
No. of Competitors in Neighboring States	5.276	8.872	0	33
<i>Firm Characteristics (Dummies)</i>	Percentage of Ones			
Holding Company Dummy	73.78			
Merger Dummy	3.55			
Generation Company Dummy: Lag (1 Yr.)	48.78			
Mixed Regulation Dummy	18.59			
<i>Firm Characteristics (Continuous Vars.) Lag (1 Yr.)</i>	Mean	SD	Min	Max
Log (Total Assets)	21.039	1.729	15.545	24.015
Return on Assets	0.140	0.042	-0.007	0.278
Tangible Assets / Total Assets	0.674	0.177	0.024	0.958
Asset Growth	0.013	0.139	-0.909	1.848
Holding Company Size [#]	3.216	3.413	0	15
Share of Industrial Sales	0.200	0.138	0	0.954
Input-Cost Volatility Proxy	0.714	0.329	0	1
Wholesale Market Participation	0.260	0.349	0	1
Sh. of Capital Expend. on Nuclear Plts	0.040	0.121	0	1
Share of Purchased Power from IPPs	0.007	0.036	0	0.473

Note: *: All summary statistics are based on the estimation sample. Observation=1724, Range: 1990-2001. # The holding company size variable is not lagged.

TABLE 3A: LEVERAGE COMPARISON

Leverage (Total Debt/Total Assets)		
Sample	US IOUs	US Manufacturing
Obs.	1981	24918
Mean	0.338	0.224
Median	0.329	0.183
Standard Deviation	0.117	0.212
Minimum	0.009	0
Maximum	0.772	1

Note: Leverage statistics is based on all available data. US manufacturing firms are obtained from the COMPUSTAT dataset for SIC 2000-3999 and are corrected for outliers. Range: 1990-2001

TABLE 3B: PRE AND POST RESTRUCTURING LEVERAGE COMPARISON

Leverage (Total Debt/Total Assets)		
	Pre-Restructuring	Post-Restructuring
Obs.	1277	447
Mean	0.345	0.301
Median	0.330	0.304
Standard Deviation	0.104	0.115
Minimum	0.009	0.009
Maximum	0.772	0.772

Note: Leverage statistics is based on the regression sample. The pre-restructuring period covers firms in states (for those years) when the state has not enacted a restructuring legislation, i.e. the legislation enactment dummy equals 0. The post-restructuring period comprises firm-year observations when the legislation enactment dummy equals 1. Kruskal-Wallis equality-of-populations rank test rejects the null hypothesis of equality for the pre and post leverage mean and medians for US IOUs. Range: 1990-2001

TABLE 3C: PRE AND POST RESTRUCTURING COMPARISON OF MEANS OF FIRM CHARACTERISTICS

	Pre-Restructuring		Post-Restructuring	
	Mean	Median	Mean	Median
Log (Total Assets): Lag (1 Yr.)	21.081	21.396	20.918	21.482
Return on Assets: Lag (1 Yr.)	0.141	0.145	0.138	0.141
Tangible Assets / Total Assets: Lag (1 Yr.)	0.703	0.737	0.589	0.648
Asset Growth: Lag(1 Yr.)	0.019	0.002	-0.006	-0.019
Holding Company Size	3.057	2.000	3.677	2.000
Share of Industrial Sales: Lag (1 Yr.)	0.207	0.205	0.180	0.168
Input-Cost Volatility Proxy: Lag (1 Yr.)	0.728	0.854	0.674	0.800
Wholesale Market Participation: Lag (1 Yr.)	0.264	0.103	0.248	0.095
Sh. of Capital Expend. on Nuc. Plts: Lag (1 Yr.)	0.003	0	0.001	0
Sh. of Purchased Power from IPPs: Lag (1 Yr.)	0.001	0	0.026	0

Note: The statistics reported are sample means based on the regression sample. The pre-restructuring period covers firms in states (for those years) when the state has not enacted a restructuring legislation, i.e. the legislation enactment dummy equals 0. The post-restructuring period comprises firm-year observations when the legislation enactment dummy equals 1. There are 1277 observations before restructuring and 447 observations after. Range: 1990-2001

Table 4
Difference in Difference Model
Dependent Variable: Total Debt/Total Assets

	(1)	(2)	(3)
Regulatory Variables			
EPA Act Dummy	-0.028*** (0.005)	-0.028*** (0.005)	-0.028*** (0.005)
FERC Order Dummy	0.0001 (0.0002)	-0.002 (0.007)	-0.006 (0.006)
Deregulation Investigation Dummy	0.002 (0.004)		
Retail Competition Order Dummy		-0.008** (0.004)	
Legislation Enactment Dummy			-0.011** (0.005)
Firm Characteristics			
Log (Total Assets): Lag (1 Yr.)	-0.007 (0.022)	-0.007 (0.022)	-0.008 (0.022)
Return on Assets: Lag (1 Yr.)	-0.244*** (0.083)	-0.240*** (0.083)	-0.240*** (0.083)
Tangible Assets / Total Assets: Lag (1 Yr.)	0.150*** (0.027)	0.151*** (0.027)	0.148*** (0.027)
Asset Growth: Lag(1 Yr.)	-0.037** (0.015)	-0.037** (0.015)	-0.037** (0.015)
Holding Company Dummy	-0.006 (0.008)	-0.005 (0.008)	-0.005 (0.008)
Holding Company Size	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
Merger Dummy	0.007 (0.006)	0.006 (0.006)	0.006 (0.006)
Share of Industrial sales: Lag (1 Yr.)	-0.175*** (0.066)	-0.177*** (0.066)	-0.178*** (0.066)
Generation Company Dummy: Lag (1 Yr.)	-0.001 (0.005)	-0.001 (0.005)	-0.001 (0.005)
Input-Cost Volatility Proxy: Lag (1 Yr.)	-0.012 (0.011)	-0.013 (0.011)	-0.014 (0.011)
Wholesale Market Participation: Lag (1 Yr.)	0.034*** (0.011)	0.034*** (0.011)	0.035*** (0.011)
Sh. of Capital Expend. on Nuclear Plts: Lag (1 Yr.)	-0.030 (0.020)	-0.030 (0.020)	-0.030 (0.021)
Share of Purchased Power from IPPs: Lag (1 Yr.)	-0.085 (0.054)	-0.083 (0.054)	-0.081 (0.054)
Relevant Statistics			
Observations	1724	1724	1724
Number of Firms	183	183	183
R-Square	0.769	0.770	0.770
Rho (AR1)	0.473	0.462	0.464

Note: Prais-Winsten panel model. Standard Errors (in parenthesis) corrected for first-order auto-correlation and panel level heteroscedasticity. All equations contain a constant, year, firm, state and RTO fixed effects. Range: 1990 – 2001. * significant at 10%; ** significant at 5%; *** significant at 1%. ‘Rho(AR1)’ denotes the common autocorrelation coefficient.

Table 5
Extended Model
Dependent Variable: Total Debt / Total Assets

Regulatory Risk	(1)	(2)	(3)	(4)
EPAct Dummy	-0.028(0.005)***	-0.029(0.005)***	-0.029(0.005)***	-0.032(0.005)***
Legislation Enact. Dum	0.008(0.005)	0.008(0.005)	0.008(0.005)	0.007(0.005)
Strand. Cost Reco Dum	0.002(0.005)	0.002(0.005)	0.002(0.005)	0.003(0.005)
Divestiture Pol. Dum.	-0.021(0.009)**	-0.021(0.009)**	-0.021(0.009)**	-0.019(0.009)**
PBR Dummy	0.012(0.011)	0.014(0.011)	0.014(0.011)	0.014(0.011)
High Price State Dum		-0.007(0.008)	-0.007(0.008)	-0.007(0.008)
Market Uncertainty				
Size of Comp. Segment	-0.0002(0.0001)**	-0.0003(0.0001)***	-0.0003(0.0001)***	-0.0003(0.0001)***
Effective Comp. Dum.	-0.026(0.014)*	-0.026(0.014)**	-0.026(0.014)**	-0.026(0.015)*
No. Comp Neigh States	-0.001(0.0003)**	-0.001(0.0003)**	-0.001(0.0003)***	-0.001(0.0003)***
Potential Mkt Pwr Dum	0.007(0.004)*	0.007(0.005)*	0.007(0.005)*	0.007(0.005)
Firm Characteristics: Lag 1 Year[#]				
Log (Total Assets)	-0.012(0.022)	-0.012(0.022)	-0.012(0.022)	0.003(0.019)
Return on Assets	-0.252(0.084)***	-0.248(0.085)***	-0.248(0.085)***	-0.252(0.093)***
Tangible Ast / Tot Ast	0.123(0.026)***	0.124(0.026)***	0.124(0.026)***	0.113(0.026)***
Asset Growth	-0.038(0.015)**	-0.038(0.015)**	-0.038(0.015)**	
Excess Capacity				0.0002(0.0001)***
Holding Co. Dummy	-0.006(0.008)	-0.006(0.008)	-0.006(0.007)	-0.005(0.008)
Holding Company Size	-0.004(0.001)***	-0.004(0.001)***	-0.004(0.001)***	-0.004(0.001)***
Merger Dummy	0.006(0.006)	0.005(0.006)	0.005(0.006)	0.004(0.006)
Sh. of Industrial Sales	-0.162(0.065)**	-0.161(0.066)**	-0.161(0.066)**	-0.161(0.062)***
Generation Co. Dummy	-0.002(0.005)	-0.002(0.005)	-0.002(0.005)	-0.002(0.005)
Input-Cost Volat. Proxy	-0.013(0.011)	-0.013(0.011)	-0.013(0.011)	-0.016(0.011)
Wholesale Mkt Particip	0.034(0.011)***	0.034(0.011)***	0.034(0.011)***	0.033(0.011)***
Sh. of Nuclear Gen.	-0.028(0.022)	-0.028(0.022)	-0.028(0.022)	-0.031(0.022)
Sh. of IPP Supp. Pwr	0.002(0.057)	0.005(0.057)	0.005(0.057)	0.006(0.057)
Mixed Regulation Dum			-0.060(0.082)	0.295(0.447)
Relevant Statistics				
Observations	1724	1724	1724	1724
Number of Firms	183	183	183	183
Rho (AR1)	0.452	0.452	0.452	0.441
R-Square	0.779	0.779	0.779	0.778

Note: Prais-Winsten panel model. Standard errors (in parenthesis) are corrected for first-order autocorrelation and panel level heteroscedasticity. All equations contain a constant, year, firm, state and RTO fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%. 'Rho(AR1)' denotes the common autocorrelation coefficient. # the holding company and merger dummies, and holding company size are not lagged.

Table 6
Robustness Check

	(1) FE	(2) Prais- Winsten	(3) Trunc. Reg	(4) FGLS w/ AR(1)
Dependent Variable	Leverage	Logit Transform.	Leverage	Leverage
Regulatory Risk				
EPA Act Dummy	-0.026***	-0.115*	-0.028***	-0.024***
Legislation Enactment Dummy	0.011	-0.048*	0.011	-0.001
Stranded Cost Recovery Dummy	0.002	0.006	0.002	0.003
Divestiture Policy Dummy	-0.028*	-0.124**	-0.028**	-0.003
PBR Dummy	-0.001	0.073	-0.0004	0.008
Market Risk				
Size of the Competitive Segment	-0.0002*	-0.001**	-0.0002*	-0.000***
Effective Competition Dummy	-0.029*	-0.154**	-0.033*	-0.016
No. of Comp. in Neigh. States	-0.001*	-0.005**	-0.004	-0.001***
Potential Market Power Dummy	0.006	0.039*	0.006	0.004
Firm Characteristics				
Log (Total Assets):Lag(1Yr.)	-0.002	-0.180	-0.001	0.003
Return on Assets:Lag(1 Yr.)	-0.316***	-1.376**	-0.312***	-0.125***
Tang. Asset / Tot. Asset:Lag(1Yr.)	0.187***	0.564***	0.183***	0.114***
Asset Growth:Lag(1Yr.)	-0.050	-0.357***	-0.051	-0.048***
Holding Company Dummy	-0.001	-0.054	-0.001	-0.012**
Holding Company Size	-0.004**	-0.020***	-0.004**	-0.004***
Merger Dummy	0.005	0.045	0.006	0.007*
Sh. of Industrial Sales:Lag(1Yr.)	-0.175*	-0.809**	-0.179*	-0.040
Gen. Com. Dummy:Lag(1Yr.)	-0.005	-0.010	-0.005	-0.002
Input-Cost Volat. Proxy: Lag (1 Yr.)	-0.035*	-0.063	-0.035*	-0.005
Wholesale Mkt Partic.: Lag (1 Yr.)	0.037**	0.180***	0.037**	0.035***
Sh. of Nuc. Gen.: Lag (1 Yr.)	-0.021	-0.290**	-0.021	-0.009
Sh. of IPP Supp. Power: Lag (1 Yr.)	0.038	0.129	0.031	-0.020
State Fixed Effects	No	Yes	Yes	Yes
Observations	1724	1724	1724	1716
R-Square/Log Likelihood/Rho	0.278	0.766	2860.412	0.747

Note: Columns contain coefficients. Standard errors not reported. *, ** and *** significant at 10%, 5% and 1% respectively. Col(1) is estimated by a fixed effects within estimator with robust standard errors and year fixed effects. Mixed regulation dummy is dropped since there is no annual variation. The next two columns correct for truncation. Col (2) performs a logit transformation of the dependent variable and is estimated by Prais Winsten methodology of Table 5. Leverage (the dependent variable) is a proportion and is bounded between 0 and 1 and using traditional OLS based estimation techniques may not yield the correct solution, since the distributional assumptions for this model are based on an unrestricted normal distribution. An usual solution, is to perform a logit transformation of the dependent variable(y): $\ln(y / (1 - y))$. This maps the original variable to the real line. One can now estimate this model using traditional techniques. This specification includes a constant, year, firm and RTO fixed effects. Col(3) is estimated using a truncated regression with year, firm and RTO fixed effects, with robust standard errors clustered by state. Col. (4) is estimated using feasible generalized least squares (FGLS) with AR(1) errors and panel level heteroskedasticity. This specification also includes a constant, year, firm and RTO fixed effects.

Table 7
Pre and Post-Restructuring Effect
Dependent Variable: Total Debt / Total Assets

	(1)		(2)
Regulatory Risk		Market Risk	
EPA Act Dummy	-0.028*** (0.005)	Size of the Competitive Segment	-0.0002* (0.0001)
Legislation Enactment Dummy	0.026* (0.013)	Effective Competition Dummy	-0.029** (0.014)
Stranded Cost Recovery Dummy	0.004 (0.005)	Number of Competitors in Neighboring States	-0.001* (0.0003)
Divestiture Policy Dummy	-0.019** (0.010)	Potential Market Power Dummy	0.005 (0.005)
PBR Dummy	0.009 (0.012)		
Firm Characteristics		Interactions	
Log (Total Assets): Lag (1 Yr.)	-0.010 (0.022)	Legis. Enact. Dum. * Log (Total Assets): Lag (1 Yr.)	-0.001 (0.001)
Return on Assets: Lag (1 Yr.)	-0.341*** (0.103)	Legis. Enact. Dum. * ROA: Lag (1 Yr.)	0.154 (0.126)
Tangible Assets / Total Assets: Lag (1 Yr.)	0.148*** (0.030)	Legis. Enact. Dum. * Tang. Ast / Tot Ast.: Lag (1 Yr.)	-0.047 (0.033)
Asset Growth: Lag(1 Yr.)	-0.022 (0.020)	Legis. Enact. Dum. * Asset Growth: Lag(1 Yr.)	-0.018 (0.026)
Holding Company Dummy	-0.003 (0.008)	Legis. Enact. Dum. * Holding Company Dummy	-0.002 (0.010)
Holding Company Size	-0.004** (0.001)	Legis. Enact. Dum. * Holding Company Size	-0.001 (0.001)
Merger Dummy	0.009 (0.007)	Legis. Enact. Dum. * Merger Dummy	-0.009 (0.010)
Share of Industrial sales: Lag (1 Yr.)	-0.147** (0.061)	Legis. Enact. Dum. * Sh. of Industrial sales: Lag (1 Yr.)	0.080* (0.042)
Generation Company Dummy: Lag (1 Yr.)	-0.003 (0.005)	Legis. Enact. Dum. * Gen. Com. Dum.: Lag (1 Yr.)	0.003 (0.008)
Input-Cost Volatility Proxy: Lag (1 Yr.)	-0.012 (0.013)	Legis. Enact. Dum.* Sh. of Foss.Fuel in Gen:Lag(1 Yr.)	-0.008 (0.013)
Wholesale Market Participation: Lag (1 Yr.)	0.035*** (0.011)	Legis. Enact. Dum. * Whl. Mkt. Part.: Lag (1 Yr.)	-0.007 (0.014)
Sh. of Capital Expend. on Nuclear Plts: Lag (1 Yr.)	-0.011 (0.021)	Legis. Enact. Dum. * Sh. of Capex. Nuc.: Lag (1 Yr.)	-0.983*** (0.162)
Share of IPP Supplied Power: Lag (1 Yr.)	-0.558** (0.272)	Legis. Enact. Dum. * Sh. of IPP Supp. Pwr: Lag (1 Yr.)	0.567** (0.268)
Relevant Statistics			
Observations	1724	Rho (AR1)	0.425
Number of Firms	183	R-Square	0.790

Note: Prais-Winsten panel model. Standard errors (in parenthesis) corrected for first-order autocorrelation and panel level heteroscedasticity. Interactions with the legislation enactment dummy shows if the effect of firm characteristics on leverage is different pre and post restructuring. All equations contain a constant, year, firm, state and RTO fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%. 'Rho(AR1)' denotes the common autocorrelation coefficient.

Table 8
Policy Interactions

Dependent Variable: Total Debt / Total Assets

	(1)		(2)
Regulatory Risk		Market Uncertainties	
EPAct Dummy	-0.028*** (0.005)	Size of the Competitive Segment	-0.0002* (0.0001)
Legislation Enactment Dummy	0.006 (0.005)	Effective Competition Dummy	-0.024* (0.014)
Stranded Cost Recovery Dummy	0.005 (0.005)	Number of Competitors in Neighboring States	-0.008** (0.003)
Divestiture Policy Dummy	-0.021** (0.011)	Potential Market Power Dummy	0.090*** (0.023)
PBR Dummy	0.010 (0.011)		
Firm Characteristics		Interactions	
Log (Total Assets): Lag (1 Yr.)	-0.013 (0.023)	Comp. Neigh. St. * Log (Total Assets): Lag (1 Yr.)	0.0003** (0.0002)
Return on Assets: Lag (1 Yr.)	-0.232*** (0.086)	Pot. Mkt. Pwr. Dum. *	-0.035 (0.091)
Tangible Assets / Total Assets: Lag (1 Yr.)	0.162*** (0.028)	ROA: Lag (1 Yr.)	
Asset Growth: Lag(1 Yr.)	-0.030** (0.015)	Pot. Mkt. Pwr. Dum.* Tang. Ast / Tot Ast.: Lag (1 Yr.)	-0.109*** (0.028)
Holding Company Dummy	-0.008 (0.008)		
Holding Company Size	-0.005*** (0.001)		
Merger Dummy	0.006 (0.005)		
Share of Industrial sales: Lag (1 Yr.)	-0.154** (0.064)	Size of the Comp. Seg. *Sh. of Ind. Sales: Lag (1 Yr.)	0.003 (0.002)
Generation Company Dummy: Lag (1 Yr.)	-0.0004 (0.005)	Dives. Policy Dum. * Gen. Com. Dum.: Lag (1 Yr.)	0.004 (0.011)
Input-Cost Volatility Proxy: Lag (1 Yr.)	-0.016 (0.011)		
Wholesale Market Participation: Lag (1 Yr.)	0.031*** (0.011)	Size of the Comp. Seg. * Whl. Mkt. Part.: Lag (1 Yr.)	0.0001 (0.0001)
Sh. of Capital Expend. on Nuclear Plts: Lag (1 Yr.)	-0.007 (0.020)	Str. Cost. Reco. * Sh. of Capex. Nuc.: Lag (1 Yr.)	-1.027*** (0.136)
Share of IPP Supplied Power: Lag (1 Yr.)	0.181 (0.483)	Str. Cost. Reco. * Sh. of IPP Supp. Pwr: Lag (1 Yr.)	-0.175 (0.490)
Relevant Statistics			
Observations	1724	Rho (AR1)	0.441
Number of Firms	183	R-Square	0.788

Note: Prais-Winsten panel model. Standard Errors (in parenthesis) are corrected for first-order autocorrelation and panel level heteroscedasticity. Interactions with the market and regulatory risk dummies show if the effect of these risk variables is different depending on firm characteristics. All equations contain a constant, year, firm, state and RTO fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%. 'Rho(AR1)' denotes the common autocorrelation coefficient.

Table 9A
Two Stage Model

Stage 1		Stage 2	
Dependent Variable: Status of Restructuring (Legislation Enactment) in 1998		Dependent Variable: Total Debt/Total Assets	
Price Variables		Regulatory Variables	
Price (1993)	5.185*** (1.002)	EPAct Dummy	0.020 (0.060)
“Import” Price Gap (1993)	-6.366*** (1.086)	FERC Order Dummy	-0.006 (0.006)
“Export” Price Gap (1993)	1.673** (0.872)	Probability of Legislation Enactment	-0.021*** (0.006)
Weighted Standard Deviation of Price	0.034 (0.037)	Firm Characteristics	
Customer Characteristics		Log (Total Assets): Lag (1 Yr.)	-0.008 (0.022)
Share of Industrial Customers (1993)	-0.924 (1.266)	Return on Assets: Lag (1 Yr.)	-0.239*** (0.082)
Share of Munis & Co-ops (1992)	-2.320*** (0.827)	Tangible Assets / Total Assets: Lag (1 Yr.)	0.145*** (0.026)
State Characteristics		Asset Growth: Lag(1 Yr.)	-0.037** (0.015)
Green State Proxy	-0.013 (0.010)	Holding Company Dummy	-0.005 (0.008)
Party in State Congress	-0.346 (0.345)	Holding Company Size	-0.004*** (0.001)
Utility Financial Characteristics		Merger Dummy	0.007 (0.006)
Stranded Cost (1995) (billions of dollars)	0.0001*** (0.00004)	Share of Industrial Sales: Lag (1 Yr.)	-0.179*** (0.067)
Mean Leverage (1993)	-0.349 (0.263)	Generation Company Dummy: Lag (1 Yr.)	-0.0004 (0.005)
		Input-Cost Volatility Proxy: Lag (1 Yr.)	-0.014 (0.011)
		Wholesale Market Participation: Lag (1 Yr.)	0.034*** (0.011)
		Sh. of Capital Expend. on Nuclear Plts: Lag (1 Yr.)	-0.030 (0.021)
		Share of IPP Supplied Power: Lag (1 Yr.)	-0.085 (0.054)
Relevant Statistics		Relevant Statistics	
Observations	47	Observations	1717
		Number of Firms	183
		R-Square	0.771
		Rho (AR1)	0.469

Note: First stage is estimated using an Ordered Probit model. The second stage uses a Prais-Winsten panel fixed effects model. Bootstrapped standard errors (in parenthesis) are corrected for first-order autocorrelation and panel level heteroscedasticity. Column 2 contains a constant, year and state fixed effects. Range: 1990 – 2001. * significant at 10%; ** significant at 5%; *** significant at 1%. ‘Rho(AR1)’ denotes the common autocorrelation coefficient.

Table 9B
Instrumental Variables Model

Stage 1		Stage 2	
Dependent Variable: Legislation Enactment Dummy		Dependent Variable: Total Debt/Total Assets	
Price Variables		Regulatory Variables	
High Price State Dummy	-49.818 (321.01)	EPAct Dummy	0.496 (0.500)
Customer Characteristics		FERC Order Dummy	-0.0005 (0.007)
Share of Industrial Customers	-95.741** (38.970)	Predicted Legislation Enactment Dummy	-0.016*** (0.004)
Share of Munis & Co-ops & IPPs	-120.72** (9.261)	Firm Characteristics	
State Characteristics		Log (Total Assets): Lag (1 Yr.)	-0.009 (0.022)
Size of Electricity Sector	-3.992*** (1.213)	Return on Assets: Lag (1 Yr.)	-0.241*** (0.083)
No. of Neighbor. States with Dereg. Investigation	1.183** (0.657)	Tangible Assets / Total Assets: Lag (1 Yr.)	0.147*** (0.027)
Green State Proxy	-0.057 (0.060)	Asset Growth: Lag(1 Yr.)	-0.037** (0.015)
Party in State Congress	6.458 (12.072)	Holding Company Dummy	-0.004 (0.008)
Utility Financial Characteristics		Holding Company Size	-0.004*** (0.001)
Stranded Cost Proxy	0.0000001* (0.00000005)	Merger Dummy	0.006 (0.006)
Mean Leverage	5.838 (9.512)	Share of Industrial Sales: Lag (1 Yr.)	-0.180** (0.066)
		Generation Company Dummy: Lag (1 Yr.)	-0.001 (0.005)
		Input-Cost Volatility Proxy: Lag (1 Yr.)	-0.014 (0.011)
		Wholesale Market Participation: Lag (1 Yr.)	0.035*** (0.011)
		Sh. of Capital Expend. on Nuclear Plts: Lag (1 Yr.)	-0.029 (0.021)
		Share of IPP Supplied Power: Lag (1 Yr.)	-0.075 (0.054)
Relevant Statistics		Relevant Statistics	
Observations	564	Observations	1724
Number of States	47	Number of Firms	183
Log Likelihood	-13.981	R-Square	0.772
		Rho (AR1)	0.463

Note: First stage is estimated using a panel data Probit model with state fixed effects. The second stage uses a Prais-Winsten panel fixed effects model. Bootstrapped standard errors (in parenthesis) are corrected for first-order autocorrelation and panel level heteroscedasticity. Column 1 specification also includes state fixed effects and a constant. Column 2 contain a constant, year, firm, state and RTO fixed effects. Range: 1990 – 2001. * significant at 10%; ** significant at 5%; *** significant at 1%. ‘Rho(AR1)’ denotes the common autocorrelation coefficient.