Have Customers Benefited from Electricity Retail Competition?*

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Abstract

Compared to traditional cost-of-service (COS) regulation, electricity retail competition may lead to lower costs but higher markups. Thus, the net policy effect on the average electricity retail price is ambiguous. This paper uses a difference-in-difference approach to estimate the policy impact for U.S. states that restructured their electricity retail markets. The results suggest that in restructured states, only residential customers have benefited from significantly lower prices but not commercial or industrial customers. Furthermore, this benefit is transitory and disappears in the long run. Overall, retail competition does not seem to deliver lower electricity prices to retail customers across the board or over time.

Keywords: Electricity; restructuring; retail choice, retail competition; difference-in-difference.

JEL codes: L52, K23, Q48, D42, D43

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1 Introduction

In the 1990s, a number of U.S. states began restructuring their electricity retail markets and pursued retail competition as an alternative to traditional cost-of-service (COS) regulation. Direct rate regulation was eschewed in favor of access regulation, thereby opening the electricity market to alternative retail service providers (RSPs). These firms procure electricity from power producers and market it to final customers, using existing electricity network infrastructure owned by local utilities. It was hoped that, by restructuring the electricity retail market to allow for competition, electricity prices determined in the marketplace would decrease, and welfare would increase.

However, there is no guarantee that retail competition will ultimately lead to lower retail prices paid by customers. Two potentially opposing effects arise from the same market restructuring process: On the one hand, competitive pressure gives all firms a strong incentive to cut costs. On the other hand, the markup rate determined through competition may exceed the markup rate charged by previously rate-regulated monopolies. In the electricity retail market, even when entry is relatively easy and RSPs possess limited market power, a higher markup rate can nonetheless arise when customers face search frictions. This is especially likely to happen for small customers, where the perceived benefits from identifying the optimal choice among many, and potentially rather complicated, alternatives may be small relative to the associated search costs and switch costs. Furthermore, search costs and switch costs may not diminish over time, even as customers become more familiar with the new regime of retail competition. Thus, unlike the hypothetical benchmark of an unregulated monopoly—where the introduction of competition would reduce both costs and markups—replacing rate regulation with competition may or may not result in lower prices.

This paper empirically investigates the policy impact of retail competition, as currently practiced in the U.S., on average electricity retail prices. Using data obtained from the Energy Information Administration (EIA) covering the period from 1990 through 2011, we examine the effects of a state's decision to implement retail competition on the average prices paid by different segments of customers: residential, commercial, and industrial.[1] To identify the policy impact, we employ a difference-in-differences (DID) approach, exploiting the fact that while some states never pursued restructuring, other states implemented retail competition in different years.

We also allow for potentially different policy effects at different stages of restructuring. Anticipating that it takes time to establish competition, states that pursue market restructuring generally stipulate additional regulatory provisions for a transitional period following the opening of their retail markets. In particular, there are two main provisions. First, during the transitional period, incumbent utilities typically are allowed to recover their "stranded costs," i.e., the difference

[1] Residential customers are mainly regular, single-family households living in houses or apartments. Commercial customers include businesses, offices, restaurants, hotels, etc., and industrial customers are large manufacturing or processing plants.

between the net book value of a generating plant used for setting cost-based regulated prices and the market value of that plant if it were required to sell its output in a competitive market. The recovery of stranded costs tends to increase the retail price than it otherwise would be. Second, during the transitional period, many restructuring states also implemented some form of "rate freeze" or "rate reduction" to ensure price stability while competition was being established. The rate freeze or rate reduction tends to decrease the retail price than it otherwise would be. The net effect on the retail price during the transitional period thus depends on the balance of these two factors. There is no *a priori* reason to believe that the policy impact of restructuring would be the same for the transitional period and the period afterwards.

Our results are illuminating. First, we find different policy impact of restructuring across customer segments. In restructured states, residential customers have benefited from significantly lower prices. The price reduction, on average, ranges from 0.87 to 1.02 ¢/kWh and is significant at the 1% level. Commercial and industrial customers, on the other hand, have not benefited from any significant price reductions associated with restructuring.

Second, the policy impact of restructuring indeed changes over time. For example, we use a five-year window for the transitional period (i.e., the short run) and the period afterwards (i.e., the long run). The price reduction experienced by residential customers is more pronounced in the short run but becomes insignificant in the long run. For residential customers, the short-run price reduction ranges from 1.14 to 1.31 ¢/kWh and is significant at the 1% level, while the long-run price reduction ranges from 0.53 to 0.72 ¢/kWh and is not significant at the 10% level. For commercial customers, the price reduction ranges from 0.46 to 0.52 ¢/kWh and is marginally significant in the short run, but insignificant in the long run. Lastly, for industrial customers, the policy impact is insignificant both in the short run and in the long run.

For electricity retail markets, the transitional period represents a hybrid regime—namely, incipient competition coupled with direct price controls (both stranded costs recovery and rate freeze or rate reduction). The period afterwards represents a relatively pure form of retail competition. The short-run policy effect is a highly significant price reduction for residential customers, suggesting that the impact from rate freeze or rate reduction outweighs the impact from stranded-costs recovery during the transitional period, at least for residential customers. On the other hand, the long-run policy impact is insignificant for all customer segments, so there is insufficient evidence that retail competition, as currently practiced in the U.S., delivers lower prices to retail customers across the board or in the long run.

The rest of the paper is organized as follows. In Section 2 we provide some background concerning electricity market restructuring in the U.S., and link this paper to the existing literature on competition and regulation of electricity markets. We then present our econometric model and discuss our identification strategy in Section 3. Data used for the empirical analysis are described in Section 4, and estimation results are reported in Section 5. We conclude with a discussion of the results in Section 6. All tables are in the Appendix.

2 Background

2.1 Restructuring of the U.S. electricity market

The U.S. electricity industry can be divided into a wholesale sector and a retail sector. The wholesale sector generates bulk power in power plants and transports it through the high-voltage, long-distance transmission grid to load centers. The retail sector purchases bulk power from the wholesale sector and distributes power through low-voltage, local distribution networks to final customers. Wholesale operations typically involve interstate commerce and are thus subject to state and federal regulations. On the other hand, retail operations do not usually involve interstate commerce and are subject to state regulations only.

A traditional electric utility is a vertically integrated local monopoly in both wholesale and retail operations, regulated by both federal and state agencies. The predominant form of regulation of utilities used to be cost-of-service (COS) regulation, i.e., price regulation. However, the mid-1990s saw a paradigm shift in electricity industry regulation in the United States. With the mandate of the 1992 Federal Energy Act, the Federal Energy Regulatory Commission (FERC) issued a series of regulatory orders to promote wholesale competition through access regulation to the transmission grid.[2] The restructuring of the wholesale market replaced traditional COS regulation of wholesale operations with wholesale competition.

Soon after the restructuring of the wholesale market, some states started to experiment with a similar restructuring of their retail markets. Traditional COS regulation of retail operations was replaced with retail competition, enabled by access regulation of distribution networks. Depending on the state, retail restructuring may be implemented through state legislation, regulatory orders, court decisions, or a combination of these actions. By the end of 2011, active retail competition exists for residential customers in 13 states, for commercial customers in 15 states, and for industrial customers in 17 states (excluding the District of Columbia). Figure 1 is a snapshot of restructured states for the year 2011. Table 1 shows the evolution of the restructuring status across states from 1990 to 2011. The policy variation across states and over time will play an important role for the identification of the restructuring policy impact (to be discussed in detail later).

When a state restructures its retail market, competition does not happen overnight: It takes time for firms to enter the newly opened market, and for customers to understand and take advantage of the newly available choices. There is hence a transitional period after restructuring has commenced, but before retail competition is fully established, during which incumbent utilities face relatively little competitive pressure. Thus, additional regulatory measures are needed to ensure a smooth transition to competition. There are two main categories of provisions. The first provision is for stranded-costs recovery. That is, in the transitional period, incumbent utilities are typically allowed to recover some or all of their stranded costs, which represents the

[2] See Federal Energy Regulatory Commission, Orders No. 888, No. 889, and No. 890.

difference between the net book value of a generating plant used for setting cost-based regulated prices and the market value of that plant if it were required to sell its output in a competitive market. In most states, stranded-cost recovery is achieved through some type of non-bypassable stranded cost charge that is assessed to *all customers* as a component of regulated monopoly distribution service (See Joskow 2000). The stranded cost charge tends to increase the retail price than it otherwise would be in the transitional period. The second provision is rate freeze or rate reduction. That is, to ensure price stability, states almost invariably stipulate a rate freeze or a rate reduction for some time after the commencement of their restructuring policies, especially so for *residential customers*.[3] The rate freeze or rate reduction tends to decrease the retail price that it otherwise would be in the transitional period, in particular for residential customers. Overall, the transitional period can be regarded as a hybrid regime of cultivating retail competition with components of direct price controls, whereas the period afterwards can be regarded as a relatively pure form of retail competition replacing traditional COS regulation.

2.2 Effects of restructuring on market outcomes

The policy changes in the electricity industry described above have spawned a growing literature that examines the impact of restructuring on market outcomes in the U.S.[4] Most of this literature focuses on the wholesale sector. It is nonetheless important in our context, as it examines the effects of restructuring on production efficiency and the exercise of market power—channels that are also relevant to the retail sector.

Kleit and Terrell (2001) estimate that gas-fired generation plants could reduce costs by up to 13% by eliminating production inefficiencies. Wholesale restructuring creates competition in the generation segment and gives plant operators an incentive to close this gap. Fabrizio *et al.* (2007) estimate that investor-owned fossil-fueled plants in states that restructured their wholesale markets reduced labor and nonfuel expenses by 3–5% relative to investor-owned plants in other states, and by 6–12% relative to government and cooperatively owned plants that were largely insulated from restructuring incentives. For nuclear-fueled plants, Zhang (2007) finds that restructuring is linked to a 5.5% increase in plant utilization, and to an 11% reduction in operating costs. Barmack *et al.* (2007) use plant level data from New England to simulate the social cost and benefit of

[3]For example, in Illinois, House Bill 362, "The Electric Service Customer Choice and Rate Relief Act of 1997," stipulated a 15 percent rate reduction for residential customers by August 1998, and another 5 percent reduction in May 2002. In Massachusetts, House Bill 5117 required retail access by March 1998, rate cuts of 10 percent by March 1998 and another 5 percent cut 18 months later. In Ohio, Senate Bill 3 was signed into law in July 1999. It allowed retail customers to choose their energy suppliers beginning January 1, 2001. It also required a 5 percent residential rate reduction and a rate freeze for 5 years. In Texas, Senate Bill 7 was enacted in June 1999. The law required retail competition to begin by January 2002, rates to be frozen for 3 years, and then a 6 percent reduction for residential and small commercial consumers.

[4]For the restructuring experiences of other countries, see Green and Newberry (1992), Pollitt (1997), Newberry and Pollitt (1997), Newberry (1999, 2002), Hogan (2002), Al-Sunaidy and Green (2006), Joskow (2006, 2008), and Zhang *et al.* (2008), among others.

restructuring. Compared to the counterfactual of continued direct regulation, restructuring led to a net social benefit of 2% of total wholesale costs.[5]

Whether such cost savings are passed on from the wholesale to the retail sector depends on each firm's market power. The literature finds less positive results on this issue. Borenstein and Bushnell (1999) use historical cost data to simulate California's electricity market after restructuring, and find potential for significant market power during high-demand hours. Using California post-restructuring data, Borenstein *et al.* (2002) find near-competitive pricing during low-demand months, but a significant departure from competitive pricing during high-demand summer months. Similarly, Wolak (2003) finds a significant increase in unilateral market power for each of the California's five large electricity suppliers, following restructuring.[6]

In contrast to what is known about wholesale markets, our understanding of the restructuring impact on electricity retail markets is still rather limited.[7] In states that restructured their electricity retail sectors, Apt (2005) compares the annual rates of change of electricity prices before and after restructuring, and argues that retail competition for industrial customers did not lead to lower industrial electricity prices. However, the before-and-after comparison may be confounded by factors whose changes coincide with the restructuring. Fagan (2006) uses historical price data for 1990–1997 to forecast 2001–2003 prices, and then compares this forecast to actual prices in 2001–2003. He finds that, relative to their predicted values, prices for industrial customers in restructured states increased less than those in non-restructured states, but the difference is not statistically significant.[8]

Our paper fills a gap in this literature. Using a long panel dataset (1990–2011), we are able to exploit differences in electricity retail market restructuring status across states *and* over time, to estimate the impact of retail competition on average prices. We further allow for different policy

[5]Similar efficiency gains have been documented in other industries that have undergone a restructuring or deregulation process (e.g., Bailey 1986, Olley and Pakes 1996, Ng and Seabright 2001). In the context of electricity markets, reductions in production costs may be partly offset by increased environmental costs associated with power generation. Fowlie (2010) finds that deregulated power generation plants in restructured electricity markets are less likely to adopt more capital-intensive environmental compliance options, compared to physically similar plants that are either rate regulated or publicly owned.

[6]A different strand of the literature examines the role of vertical arrangements between the wholesale and retail sectors for price formation in electricity markets. Joskow (1997) and Borenstein (2002) emphasizes the importance of such vertical relationships for the success of electricity market restructuring. Bushnell (2007), Mansur (2007), and Bushnell *et al.* (2008) examine a number restructured electricity markets and demonstrate that the presence of long-term vertical arrangements between the wholesale and the retail sectors are generally important not only for maintaining price stability, but also for preventing anti-competitive practices.

[7]A unique feature of the retail market, as compared to the wholesale market, is that retail customers typically do not see real-time price changes and hence cannot adjust their consumption decisions accordingly. Bushnell and Mansur (2005) find that retail consumers respond more to lagged price increases from their past bills than current price information. Borenstein and Holland (2005) and Joskow and Tirole (2006, 2007) discuss the importance of replacing traditional electric meters with real-time meters to improve efficiency in the electricity retail market.

[8]Fagan (2006) acknowledges that the result is preliminary as "the impact of restructuring on prices was still evolving in the post-restructuring period examined. Most states were (and still are) in the transition period where rates are set by a mix of competitive and regulatory forces."

impacts for residential, commercial, and industrial customers, as well as different policy impacts in the short run and long run. As we will demonstrate, the effect of retail competition on average prices depends crucially on both the customer segment and the time frame under consideration.

3 Empirical Approach

To answer the question of whether retail competition leads to lower electricity prices, compared to traditional COS regulation, we use the difference-in-difference (DID) approach. This method utilizes policy variations across both states and time periods for identification.

3.1 Econometric model

The basic, *uniform impact* model we estimate is the following:

$$y_{st} = \alpha_s + \beta_t + \gamma R_{st} + \theta X_{st} + \varepsilon_{st}. \tag{UI}$$

The dependent variable y_{st} is the average electricity retail price for state s in year t, calculated as the average revenue per unit of energy sales and services (¢/kWh).[9]

On the right hand side, α_s is the state fixed effect and β_t is the year fixed effect, allowing for a linear time trend as a special case. R_{st} is a dummy variable that takes on the value 1 if the retail market in state s has been restructured in year t, and 0 otherwise. X_{st} is a vector of control variables that capture both supply and demand side factors for state s in year t. The residual term is ε_{st}. Our parameter of interest is γ, which measures the policy impact of retail restructuring, that is, the difference between the average electricity retail price under retail competition and that under COS regulation.

In the uniform impact model (UI), the policy effect is assumed to be constant over the entire restructuring period. As outlined previously, this assumption neglects temporary regulatory measures, imposed by restructuring states, that are effective only during the transitional period. To better capture these policy differences between the short run and long run, we divide the policy impact into two parts: A transitional impact over a certain period following restructuring, and a post-transitional impact thereafter. Thus, we also estimate the following *differential impact*

[9] We focus on the average price instead of marginal price of retail electricity for several reasons. First, even if one can find the tariff schedules offered by retails service providers, the choice of the applicable tariff schedule is potentially endogenous and influenced by a customer's forecast of his own future demand, and customer-level data is not publicly available. Second, our analysis is at the state level. While it is easy to construct state-wide average price, it would be very difficult to construct state-wide marginal price even with customer-level data. Three, despite the potential efficiency reasons to install real-time meters, the majority of residential customers and small commercial customers still have conventional meters. Ito (2014) finds strong evidence that household consumers respond to average price rather than marginal price or expected marginal price in their electricity consumption.

model:

$$y_{st} = \alpha_s + \beta_t + \gamma^{SR} R_{st}^{SR} + \gamma^{LR} R_{st}^{LR} + \theta X_{st} + \varepsilon_{st}. \qquad \text{(DI)}$$

In (DI), R_{st}^{SR} is a dummy variable equal to 1 if the retail market in state s has been restructured but remains in the transitional period in year t. R_{st}^{LR} is a dummy variable equal to 1 if the retail market in state s has been restructured and is in the post-transitional period in year t. (The construction of these indicators will be detailed in Section 4.2.) The coefficients γ^{SR} and γ^{LR} capture the short run and long run impacts, respectively, of switching from COS regulation to retail competition.

3.2 Identification

After controlling for observed heterogeneity through X_{st}, identification of γ (and γ^{SR}, γ^{LR}) rests on the following assumptions. First, systematic unobserved heterogeneity across states remains constant over time, so that it can be captured by the state fixed effects (α_s). Second, systematic unobserved heterogeneity over time remains constant across states, so that it can be captured by the year fixed effects (β_t). When these assumptions are satisfied, the patterns of price evolution over time are similar across states, so that γ can be identified through the following difference-in-difference method.

For state s that first implemented restructuring in year t, the observed year-over-year price difference $y(R_{st}=1) - y(R_{s,t-1}=0)$ captures the effect caused by moving from one regulatory regime to another, as well as other (policy-independent) factors that result in price changes between year $t-1$ and year t. The counterfactual benchmark is $y(R_{st}=0) - y(R_{s,t-1}=0)$, that is, the price difference that would obtain if state s had not implemented its restructuring policy. This counterfactual is not directly observable. However, it can be approximated by that of another state u that did not restructure its market in either year $t-1$ or year t. For this state, the observed price difference $y(R_{ut}=0) - y(R_{u,t-1}=0)$ captures only the policy-independent price evolution across the two years, under an unchanged regime of COS regulation. By netting out the difference across the two years, the remaining difference can be solely attributed to the policy change from COS regulation to retail competition in state s. Thus, the parameter γ is identified by the difference in differences

$$\big[y(R_{st}=1) - y(R_{s,t-1}=0)\big] \; - \; \big[y(R_{ut}=0) - y(R_{u,t-1}=0)\big].$$

One may worry about the possibility that restructuring policies are endogenous. That is, a state's decision to adopt retail competition is not random but instead depends on the prevailing electricity prices in that state.Indeed, states that implemented restructuring tend to have had (and continue to have) higher electricity prices than states that decided against restructuring. Selection based on the level of prices does not bias our estimates of the restructuring impact, as level

differences are readily accounted for by the inclusion of state fixed effects.[10] On the other hand, selection based on different price trends would create a problem. For example, if state s adopted restructuring based on the observation that its retail prices had increased and were expected to continue to increase, while state u rejected restructuring based on the observation that its retail price had stayed flat and were expected to remain flat, the time-invariant state fixed effects α_s and α_u would fail to capture this trend difference. The observed price difference for state u would then underestimate the counterfactual price difference for state s, resulting in an upward bias in the estimated parameter γ.

To determine whether such trend differences played an important role in the restructuring decisions across states, we look for both document evidence and empirical evidence. First, on the document side, a careful reading of the EIA reports documenting states' restructuring decisions indeed suggests that the level of electricity retail prices, rather than the trend of price changes, was the primary concern in the decision to adopt retail competition.[11]

Second, on the empirical side, we compare the price patterns from 1990 to 1996—before any restructuring policy was implemented—between the group of states that later pursued retail competition ($g_s = 1$) and the group of states that did not ($g_s = 0$). This comparison can reveal whether systematic differences exist between the two groups of states before the policy change. In particular, we estimate the following *pre-treatment* model:

$$y_{st} = \phi g_s + \beta_t + \delta(t \cdot g_s) + \theta X_{st} + \varepsilon_{st}. \qquad \text{(PRE)}$$

A significant estimate of ϕ would suggest a systematic difference in price level between the two groups, consistent with the document evidence, and this price level difference is readily accounted for in the subsequent DID analysis by the state fixed effects. On the other hand, a significant estimate of δ would indicate a systematic difference in trends between the two groups, thus raising concerns about the suitability of the DID approach.

4 Data

To empirically estimate the regression models, we compiled a state-level panel dataset for the period 1990–2011.

[10] An alternative method to our difference-in-difference approach is to use the instrumental variable approach to deal with the potential self-selection bias. That is, to find excluded variables that arguably affect states' restructuring decisions without directly influencing their retail price levels. For example, one may argue that the political composition of a state's governing bodies has a direct impact on the state's restructuring decision but not its electricity retail prices. However, when these political variables are weak instruments, the IV estimates are biased. See Bound, Jaeger, and Baker (1995), Staiger and Stock (1997), and Stock *et al.* (2002) for more detailed discussions on weak instruments.

[11] See Table 2 for the EIA report excerpts.

4.1 Dependent variable

For the dependent variable, electricity retail sales data are obtained from the EIA website.[12] These are annual, state-aggregate data on electricity sales quantity and revenue. The data are separately reported for the three main customer segments: residential, commercial, and industrial. Our focus is on the average price for all customers within the same segment, as competitive pressure induced by retail competition affects all RSPs. The average price y_{st} is thus calculated by dividing the total sales revenue by the total sales quantity.

Residential customers tend to be small, commercial customers medium-sized, and industrial customers large. Over our 22-year period, the nationwide annual electricity consumption of an average customer in each of these segments is 11, 71, and 1,576 MWh, respectively. These size differences translate into different outside options and, hence, potentially different degrees of bargaining power with RSPs.[13] While industrial and large commercial customers may resort to on-site self generation of electricity, or decide to relocate to a different area when it is economical to do so, smaller commercial and residential customers typically cannot. Outside options place an upper limit on the price a customer is willing to pay for electricity retail services. In our sample, the national average retail prices paid by residential, commercial, and industrial customers were 10.9, 9.5, and 6.9 ¢/kWh, respectively (in 2009 dollars). Given the substantial price differences across customers, we estimate the model separately for the three segments to avoid potential confounding effects due to composition changes.

4.2 Restructuring status

Data on the restructuring status of electricity retail markets by state and year are obtained from EIA state restructuring documents. We record the effective dates of states' restructuring policies as applicable to each of the three customer segments.[14] Five states—Arkansas, Montana, New Mexico, Oklahoma, and West Virginia—pursued restructuring policies but subsequently repealed these policies before they became effective. Four states—Arizona, California, Delaware, and Virginia—suspended their restructuring policies after they had been in effect for some time. In addition to the customer-segment specific restructuring status, we also construct a common status variable called "full retail choice" that indicates whether retail competition applies to all customers in all three segments.[15] As shown in Table 1, the number of states (excluding the

[12] www.eia.gov/electricity/data.cfm.

[13] Besides their relative size, the three segments differ in other characteristics as well. For example, the load profile of residential customers tends to be more variable than that for industrial customers, thus requiring more ancillary services to meet reliability standards.

[14] In the case where retail competition is phased in, the effective date is recorded as that of the first phase. On the other hand, pilot programs are not considered official restructuring policies.

[15] This is a more restrictive measure of restructuring for two reasons. First, if a state implements retail competition for industrial or commercial customers before it does so for residential customers, or introduces retail competition in

District of Columbia) with active retail competition for at least one customer segment gradually increases from zero in 1990–1996 to 20 during 2002–2004, and then decreases to 17 in 2011. The number of states with full retail choice increases from zero in 1990–1997 to 16 in 2004, and then decreases to 13 in 2011.

For each state, we also divide the entire restructuring period into a transitional period and the period afterwards. Recall from Section 2.1 that most restructuring states stipulate some forms of direct price controls—both for stranded-costs recovery and for rate freeze or rate reduction—when transitioning from COS regulation to full retail competition. The actual length of the transitional period varies from state to state (and possibly from region to region within a state), and so does the magnitude of provisional rate reductions mandated during the transition. These stipulations are determined in the legislative and regulatory process associated with restructuring, and are influenced by various parties, including regulators, incumbent utilities, potential competitors, and consumer advocacy groups. As a summary measure, we consider the first 5 years after the introduction of retail competition the transitional period, and the years afterwards the post-transitional period. Table 1 provides a breakdown of the number of observations that fall into the transitional and post-transitional period, respectively.

4.3 Supply and demand controls

Electricity prices also depend on a number of other factors that affect market supply and demand. To control for supply side factors, we consider both the generation capacity and fuel costs. More specifically, we obtain EIA state-level data on electricity generation capacity by primary fuel source (coal, natural gas, oil, nuclear, hydro, and other).[16] For fuel costs, we obtain EIA data on natural gas price at the state level (using citygate price), as well as coal and oil (WTI) prices at the national level. Interaction terms between the generation capacity and the fuel price are aslo included for each of the three fossil fuels, allowing control for a state's exposure to fuel price shocks depending on how heavily this state has invested in the given fuel type because of historic decisions. Together, these variables capture observed heterogeneity in supply conditions across states.

We also want to control for demand side heterogeneity. For residential customers, electricity is used for final consumption, and we obtain state level aggregate personal income data from the Bureau of Labor Statistics (BLS) to control for income effects. For commercial and industrial customers, electricity is an intermediate input used in production of goods and services. Ideally, we would like to obtain state level GDP data to control for derived demand. However, due

multiple phases, the effective date of full retail choice is that of the last phase for retail customers. Second, if a state suspends retail competition for residential customers while maintaining it for non-residential customers, we record this event as an end to full retail choice even though segment-specific restructuring continues.

[16]Other sources for electricity generation include wind, solar thermal, photovoltaic, geothermal, biomass, etc. Over the 22-year period, they account for 5.4% of total capacity.

to changes in GDP reporting criteria during our data period this is problematic.[17] Instead, we use the same state level aggregate personal income data from the BLS as a proxy to control for derived demand, relying on the macroeconomic identity that aggregate production equals aggregate income.

4.4 Summary statistics

Our dataset is a balanced panel of 50 states (excluding the District of Columbia) over the period 1990–2011, resulting in 1,100 observations. Summary statistics are reported in Table 3. All revenue, price, and income figures are in 2009 real dollars.

Average revenue generated from residential customers per state, per year is 2.6 billion dollars. For commercial and industrial customers, average revenue is $2.1 and $1.3 billion dollars, respectively. Similarly, for the three customer segments, the average sales quantity per state, per year are 24, 21, and 20 TWh (million MWh). Dividing revenue by quantity, the average prices for residential, commercial, and industrial customers are 10.9, 9.5, and 6.9 ¢/kWh, respectively.

On the supply side, the average summer generation capacity per state, per year is 17 GW (thousand MW), translating into a national average of 871 GW.[18] Out of the generation portfolio, coal, natural gas, oil, nuclear, hydropower, and all other sources account for 36%, 31%, 7%, 11%, 9%, and 5%, respectively. Over the 22-year span, the average coal price at the national level is 26 dollars per short ton, the average natural gas price at the state-level is 6 dollars per thousand cubic feet, and the average WTI oil price is 45 dollars per barrel.

On the demand side, the aggregate personal income per state, per year is 200 billion dollars, translating into a national average of 10 trillion dollars (in 2009 dollar).

5 Results

As both restructuring status (the policy variable) and average price (the outcome variable) are serially correlated, the difference-in-differences approach overestimates the significance of the policy impact unless the clustered error structure is properly corrected for (Bertrand *et al.* 2004). Here, all reported standard errors are clustered by states.

[17] The Department of Commerce (DOC) switched its GDP reporting criteria from SIC to NAISC code in 1997, and cautioned that reported GDP data under these two codes are not directly comparable. In fact, in 1997, when GDP was reported under both codes, it differs substantially across reporting codes (both in aggregate and broken down by industry). DOC has done extensive work to harmonize reported GDP under the two codes at the national level; however, state level GDP data remain incomparable before and after 1997. Since the year 1997 also corresponds to the beginning of retail competition in the states, using state level GDP data would confound the interpretation of any estimation results (i.e., any discrete jump detected in the data could be attributed either to the change in GDP reporting or to the change of retail regulation).

[18] If all generation capacity were used at 100%, 7,600 TWh of power could be produced in a year. The actual output is 3,300 TWh, implying an average capacity utilization rate of 43%.

5.1 Pre-treatment price patterns

Our first analysis compares pre-treatment price patterns in states that pursued restructuring—regardless of whether the restructuring policy was subsequently repealed, suspended, or carried through as planned—to those in states that never pursued restructuring (see regression (PRE)). This categorization captures states' intent to restructure their retail markets, despite the possibility that eventual restructuring outcomes may be different based on future market developments. Since information about future market developments during the treatment period was not available in the pre-treatment period 1990–1996, it could not have influenced the original policy deliberations.

Table 4 reports the estimation results for all three customer segments. Recall that year fixed effects allow for a linear time trend as a special case. For each customer segment, column (1) allows for different intercepts of the average retail price but requires the same trend, while column (2) allows for both different intercepts and different trends across the two groups of states. The results are revealing. As expected, the two groups of states do exhibit significant differences in their price levels. On average (column 1), residential customers in states that later pursued restructuring paid 1.7 ¢/kWh more than those in states that did not pursue restructuring, commercial customers 1.0 ¢/kWh more, and industrial customers 0.9 ¢/kWh more. The level difference is significant for all customer segments at least at the 10% level. All other control variables, when significant, are of the expected signs, as the average retail price depends positively on a state's aggregate income, negatively on its coal and hydro generation capacity, and positively on its exposure to coal price shocks. Adding a different time trend (column 2) slightly affects the estimates for the level difference —1.6 ¢/kWh for residential, 1.0 ¢/kWh for commercial, and 1.0 ¢/kWh for industrial customers—without affecting their significance levels, while the trend difference itself is insignificant. Furthermore, allowing for different time trends has no impact on the explanatory power of the model, as can be seen in the reported adjusted R^2.

Next, recall that five states—Arkansas, Montana, New Mexico, Oklahoma, and West Virginia—repealed their restructuring policies and, despite their initial intent, never actually implemented retail competition. As a robustness check, we exclude these states from the pre-treatment analysis. The estimation results are reported in column (3). After excluding the five states, the level difference estimates are even larger and more significant for all three customer segments. This is not surprising. States that repealed restructuring tend to have had lower prices than states that followed through. In fact, their low prices (and hence the lack of perceived benefits) were an important reason why these states eventually decided against restructuring. On the other hand, the trend difference estimates remain insignificant for all customer segments. These results offer us some reassurance that restructuring states did not experience a price trend that is significantly different from that of the non-restructuring states.

While our pre-treatment analysis addresses the potential endogeneity of the adoption of restructuring policies, it does not address the potential endogeneity of the suspension of restruc-

turing policies. Recall that four states—Arizona, California, Delaware, and Virginia—suspended retail competition after having implemented it for a period of time, and the decision to suspend restructuring likely depended on the actual policy experiences in these states. For example, if restructuring was accompanied by significant price increases or other market disruptions, a state may have reacted by suspending retail competition. To ensure that our results are not sensitive to events in states that either repealed or suspended their restructuring policies, our subsequent DID regressions are performed both with and without these states.

5.2 Uniform policy impact

We now turn to our difference-in-differences analysis to estimate the policy impact of restructuring on average electricity retail prices. Table 5 reports estimation results for the uniform impact model (UI). For each of the three customer segments, we estimate the model three times by increasingly restricting our sample: Column (1) uses all 50 states; column (2) excludes the five states that repealed their restructuring policies; and column (3) further excludes the additional four states that suspended their restructuring policies after implementation. At the expense of losing observations, the control group and the treated group of states arguably become more homogeneous when moving from column (1) to column (3). State and year fixed effects are included in all estimations but are not reported.

For residential customers, retail competition leads to a price decrease ranging from 0.9 ¢/kWh (column 1) to 1.0 ¢/kWh (column 3). The estimates are highly significant at the 1% level. Given an average price of 10.9 ¢/kWh, these estimates translate into a price reduction of $8-9\%$, which is also economically significant. For commercial and industrial customers, we find no significant policy impact on price at the 10% significance level.

Note that when state and year fixed effects are included, most control variables become insignificant. One prominent exception is natural gas, where the capacity is consistently significantly negative and the price is consistently significantly positive. Thus, one is naturally concerned that natural gas, as a main driver of the electricity retail price, may affect states differently even after we control for states' exposure to natural gas price shocks. In particular, one may be concerned about the "regulatory lag," namely the time lag between when the electricity retail price changes in response to a change in the fuel price in regulated markets. The regulatory lag, and the cost under-recovery associated with it, was indeed a big concern in the 1970s, when fuel costs rose unexpectedly and sharply. To address this problem, many states have adopted "fuel adjustment clauses", which allow regulated utilities to adjust their fuel cost riders charged to customers at more frequent intervals, i.e., monthly or quarterly. However, even with fuel adjustment clauses, if retail prices still move more slowly in regulated markets than in competitive markets, our estimation results could be potentially biased with changing fuel prices. More specifically, consistently rising fuel prices would bias the estimated benefit of restructuring downward, because the impact

of higher fuel costs is reflected as higher retail prices in restructured states before it is reflected in regulated states.

To check whether this is the case, we consider adding an interaction term between the restructuring variable and natural gas price. The results are reported in Table 6. It is reassuring to see that the coefficient on this interaction term is insignificant, suggesting that natural gas price shocks do not affect the electricity retail prices in restructured states differently than those in regulated states. It is also worth noting that adding this interaction term reduces (rather than increasing) the estimated benefit of restructuring, for the price reduction experienced by residential customers is now insignificant. Overall, it appears that regulatory lag does not bias our estimation of the restructuring policy benefit downward.

As a robustness check, we also estimate the uniform impact model (UI) allowing state-specific trends. This approach relies on the assumption that any policy impact of restructuring affects only the levels but not the trends of retail prices in restructured states. The results are reported in Table 7. As can be seen, when state-specific trends are included, the estimated policy impact become stronger. Residential customers now experience a price reduction ranging from 1.2 to 1.6 ¢/kWh and is significant at the 1% level. Commercial customers also benefit from restructuring with a price reduction of 0.6 ¢/kWh, significant at least at the 10% level. Industrial customers enjoy a price reduction ranging from 0.2 to 0.4 ¢/kWh, significant in one of the three model specifications. So our estimation without state-specific trends is a conservative approach, which makes it less likely to find any significant result.

5.3 Differential policy impact

As discussed in Section 2.1, many restructuring states stipulated temporary provisions when transitioning from COS regulation to retail competition. The short run impact of restructuring during the transitional period may very well be different from its long run impact in the period afterwards. The former captures the difference between COS regulation and a hybrid regime consisting of both incipient retail competition and some forms of direct price controls, while the latter represents the difference between COS regulation and a relatively pure form of retail competition.

The estimation results using a five-year window for the transitional period are reported in panel A of Table 8. For residential customers, retail competition leads to a short-run price reduction ranging from 1.1 ¢/kWh (column 1) to 1.3 ¢/kWh (column 3), significant at the 1% level. In contrast, the long run price reduction is much smaller, ranging from 0.5 ¢/kWh to 0.7 ¢/kWh and statistically insignificant after the first five years. Thus, the price benefit of restructuring found in the uniform policy impact model appears to be largely driven by the transitional period. For commercial customers, retail competition leads to a marginally significant price reduction of 0.5 ¢/kWh within the transitional period, while the long run impact is not significantly different

from zero. Finally, for industrial customers, in both the short run and the long run, the policy impact of restructuring is insignificant. For all three customer segments, there is generally an upward price jump (albeit insignificant) from the transitional period to the period afterwards.

One may wonder why restructuring confers a short run benefit to residential (and in some instance, commercial) customers but not industrial customers. There are several possible explanations. One could be that there was cross-subsidization from residential to industrial customers in regulated markets, and restructuring removed such cross-subsidization so residential customers benefited. If this is the case, the benefit of removing cross-subsidization somehow diminished over time. Another possible explanation could be due to the temporary provisions in the transitional period. While stranded cost charges apply to all customers, rate freeze or rate reduction may be restricted to only residential (and small commercial) customers in some states. If this is the case, our results suggest that the impact of rate freeze or reduction outweighs the impact of stranded-costs recovery for residential customers in the short run, while both disappear in the long run with the ending of the transitional provisions.

As a sensitivity test, we consider a linear trend for the policy impact using a "year since restructuring" variable, allowing the average price to change depending on the number of years since a state began retail competition. The estimation results are reported in panel B of Table 8. With this post-restructuring trend, we find that for residential customers, retail competition leads to an immediate price decrease of 1.3–1.5 ¢/kWh, followed by an increasing price trend (albeit insignificant) of 0.07–0.08 ¢/kWh per year. The estimation results for commercial and industrial customers remain largely insignificant.

Next, instead of dividing the restructuring period into only two phases or imposing a linear trend, we consider a more flexibly, year-by-year estimation of the policy impact of restructuring. We include a set of indicator variable for $t = 1, 2, ..., T$ years since restructuring. The results are reported in Table 9. The pattern is interesting. For residential customers, retail competition lower the retail prices significantly up to the 7th year since restructuring, and becomes insignificant afterwards. Within the first seven years of significant results, the restructuring benefit (price reduction) increases in the first several years, peaks in the fifth year, and then decreases afterwards. The early increase in the policy impact is consistent with the gradual phase-in of retail competition for residential customers, and the later decrease is consistent with the ending of the transitional provisions. Commercial customers only experience significant price reductions in the second and third year of restructuring, and no significant impact afterwards. The policy impact for industrial customers is consistently insignificant.

Lastly, we further extend the flexible form of estimation to years before restructuring by including additional indicator variables $t = -1, -2, ...$ To economize on the number of parameters, we estimate the price differences at the biannual level instead of the annual level. The estimation results are reported in Table 10, where the default case is five years or more before restructuring. As expected, the biannual post-restructuring price differences are consistent with those at the an-

nual level. More interestingly, the pre-restructuring price differences are consistently insignificant after controlling for state and year fixed effects, as well as supply and demand control variables. This offers additional reassurance that the pre-treatment price patterns for restructured states are not significantly different from those in states that never pursued restructuring.

5.4 Sensitivity tests

To check the robustness of our main results, we perform the following sensitivity tests. First, instead of using restructuring status that is specific to each customer segment, we use the status of "full retail choice" common to all three customer segments. The estimation results are reported in Table 11. Using this more restrictive measure of restructuring, we find qualitatively similar policy impacts. In the uniform impact model (panel A), both residential and commercial customers experience significant benefits from restructuring, but not industrial customers. Allowing differential policy impacts (panel B), the benefit is front-loaded but disappears for all customers in the long run.

Interestingly, using the full-retail-choice status variable, even industrial customers enjoy significant price reductions in the short run, unlike the previous findings using segment-specific status. To explain this change, recall that the primary reason for regulators to stipulate rate freeze or rate reduction during the transitional period is to protect consumer welfare, i.e., the welfare of residential customers. If retail competition is first introduced for industrial customers only, few safeguards are put in place to control the prices these large customers pay. However, when retail competition is later introduced for residential customers, temporary rate freeze or rate reduction become effective and may spill over to industrial customers.

Next, because states vary substantially by the size of their economies, we estimate the restructuring policy impact using state aggregate income as weights. The results are in Table 12. The overall pattern remains robust. In the uniform policy impact model (panel A), residential customers experience a price reduction of 0.6–0.8 ¢/kWh, significant at the 5% level. Commercial and industrial customers see no significant price changes. Allowing for differential policy impacts (panel B), we again find a more prominent, short-run benefit, while the benefit disappears in the long run.

Finally, we consider a log-linear specification of the model, so that the policy impact is estimated as a percentage change in the average retail price.[19] The results are in Table 13. The results remain robust. In the uniform impact model (panel A), residential customers experience a price reduction of 7%, consistent with the $8-9\%$ estimates we computed in the linear model. Allowing for differential policy impacts (panel B), the benefit for residential customers is front-

[19] For our supply side control variables, a $\ln 0$-problem arises due to the fact that not all states have all six categories of generation capacity installed. To circumvent this problem, we use the logarithm of state total generation capacity, together with the share of individual generation categories in total capacity, as supply side control variables.

loaded. Again we find no evidence that restructuring delivers benefits to any customer segment in the long run.

6 Discussion

It has been over a decade since some states in the U.S. implemented retail competition in their electricity markets. This paper is the first to use state-level panel data to estimate the policy impact of retail competition on electricity retail prices. The results are mixed and, generally, less favorable than what was perhaps hoped for by policy makers in restructured states. Across the three customer segments, only residential customers can be said to have benefited in a significant fashion from retail competition. Even so, the benefit appears front-loaded and mainly driven by the transitional period from COS regulation to competition. We find no evidence of a long-term benefit for either residential, commercial, or industrial customers.

These findings deserve some discussion. Given that our most favorable estimates are short-run policy impacts, one may be tempted to ask whether regulators could prolong the "transitional period" indefinitely, thus extending the short-run policy impact into the long run. In other words, could regulators maintain aggressive price controls in an otherwise open retail market? This approach, unfortunately, may not be sustainable. Regulators cannot force local utilities or RSPs to operate at or below costs. These firms can always exit retail operations if they earn less than a normal profit. They may accept price controls during the transition to open markets as an investment, exchanging lower profits in the short run for the opportunity to earn higher profits in the long run. However, unless the market-wide normal profit level decreases drastically, or technological innovations reduce operational costs significantly, it is unlikely that firms will accept permanently lower price levels and still remain in the electricity retail business.

One may also ask why restructuring and deregulation in other industries (e.g., airlines, telecommunications) have delivered significant price reductions, but not in the electricity retail sector. For residential and small commercial customers, a possible explanation is the presence of search frictions. At the U.S. income level, household expenditure on electricity is only a small fraction of total household budget. Thus, the perceived benefits from identifying the optimal choice may be small relative to the associated search costs and switch costs. It may be a daunting task for small customers to gather information from multiple RSPs, forecast their future load demand, and determine which contract delivers the best cost/risk combination. When these search frictions are sufficiently high, consumers may exhibit a preference for the status quo (i.e., their incumbent utility as the default retailer), as shown in Wilson and Price (2010) and Hortaçsu *et al.* (2012). Waterson (2003) describes this situation, "even in potentially competitive industries, reluctance by consumers to search or to switch suppliers can lead to sub-competitive outcomes."

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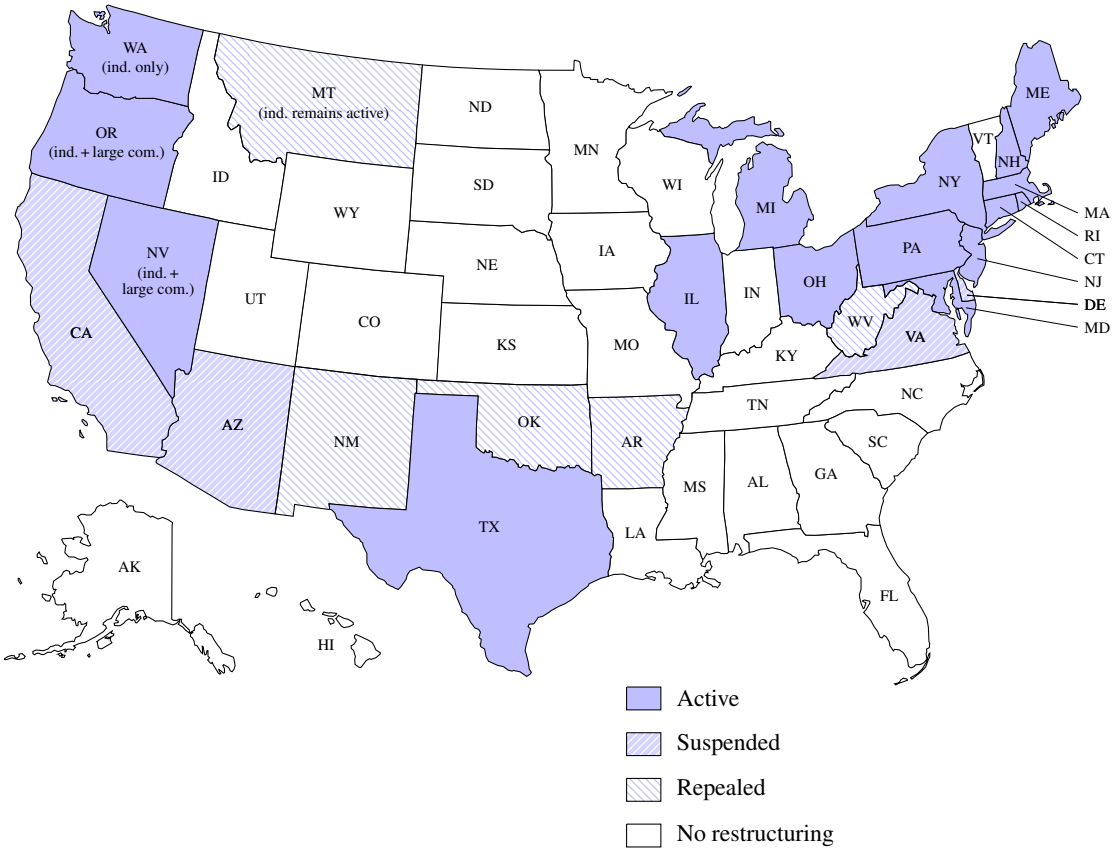
Appendix

Figure 1: State electricity retail market restructuring status, 2011



Source: Energy Information Administration

Table 1: State restructuring status

Year	Residential	Commercial	Industrial	Full retail choice
	Number of restructuring states by year			
1990–1996	0	0	0	0
1997	1	1	1	0
1998	5	5	6	3
1999	7	9	10	4
2000	11	12	13	7
2001	14	16	18	12
2002	16	18	20	15
2003	16	18	20	15
2004	16	18	20	16
2005	15	17	19	15
2006	15	17	19	15
2007	14	16	18	14
2008	13	15	17	13
2009	13	15	17	13
2010	13	15	17	13
2011	13	15	17	13
Observations in transitional/post-transitional period				
First 5 years	84	94	104	82
After first 5 years	98	113	128	86
Total observations	**182**	**207**	**232**	**168**

Table 2: State deliberations and restructuring decisions (EIA excerpts)

Retail competition adopted	Retail competition rejected
"In 1996, the average revenue per kilowatt hour (which is used as a proxy for price) of electricity sold in **California** was 9.48 cents, the tenth highest rate among the 50 States and the District of Columbia. This rate was one factor leading Governor Pete Wilson to sign Assembly Bill 1890 (AB1890) on September 23, 1996. [...] To implement it, **retail competition**, allowing customers to choose their electricity, began on March 31, 1998." [a]	"There is no compelling reason at this time for **Kentucky** to move quickly to restructure. [...] Representatives from other States that have restructured as well as experts in the field of electricity restructuring indicate that Kentucky is in a unique position because of its existing low electricity rates, which currently are the lowest east of the Rocky Mountains. Most of Kentucky's generation is coal-fired and its generators are close to coal fields which are among the cheapest fuel sources." [a]
"On November 27, 1997, HB 5117, the Electric Utility Restructuring Act, was signed by Governor Paul Cellucci to restructure the industry in **Massachusetts**. [...] **Retail access** was required by March 1998. [...] In 1996, Massachusetts had the eighth highest electricity rates in the Nation, which were most certainly a consideration in enacting the legislation the following year." [a]	"The Legislative Council Committee on Electric Utilities Restructuring issued its final report. The report recommended a slow approach to retail competition. **Idaho** was a low cost state for electricity and concerned about prices rising under a competitive market." [b]
"In both years (1996 and 1998), **Pennsylvania** had the eleventh highest average electricity price among the 50 States and the District of Columbia. Like California and Massachusetts, Pennsylvania falls into the camp of relatively high-priced States that have been somewhat aggressive in pursuing restructuring. [...] Governor Tom Ridge signed the Electricity Generation Customer Choice and Competition Act into law on December 3, 1996. [...] The law called for a phase-in of **retail choice** with one-third eligible to choose by January 1998, another third by January 1999, and the remaining third by January 2000." [a]	"In light of the low cost of electricity in **West Virginia** and the price spikes experienced this past summer in other States that have restructured retail markets, lawmakers seem to need to be convinced that restructuring will benefit West Virginia consumers. [...] Most concerns center on protecting small (residential) consumers from price increases." [c]

(a) www.eia.gov/cneaf/electricity/chg_stru_update/chapter8.html

(b) www.eia.gov/cneaf/electricity/page/restructuring/idaho.html

(c) www.eia.gov/cneaf/electricity/page/restructuring/west_virginia.html

Table 3: Summary statistics

Variable			**Mean**	**Std. Dev.**	**Min.**	**Max.**
Total revenue	($mil.)	Residential	2,586	2,834	152	17,199
		Commercial	2,085	2,646	145	16,4971
		Industrial	1,261	1,275	54	9,373
Total sales	(GWh)	Residential	23,818	23,675	1,603	145,654
		Commercial	21,146	22,380	1,450	128,214
		Industrial	20,051	18,912	459	108,300
Average price	(¢/kWh)	Residential	10.93	3.19	6.27	33.61
		Commercial	9.54	2.88	5.18	31.37
		Industrial	6.86	2.67	3.17	27.52
Summer generation capacity	(GW)	Coal	6.26	6.01	0	23.51
		Natural gas	5.42	9.89	0	73.22
		Oil	1.26	2.20	0	14.80
		Nuclear	1.99	2.50	0	12.61
		Hydro	1.56	3.41	0	21.58
		Other	0.93	1.63	0	11.57
		All sources	17.43	16.31	0.56	109.18
Fuel price	($/short ton)	Coal	26.49	4.87	20.49	35.77
	($/1000 cubic feet)	Natural gas	5.95	2.52	0.46	30.60
	($/barrel)	Oil	44.89	23.87	18.27	100.44
Aggregate income	($bil.)		200	240	12	1,623

Note: All revenue, price, and income figures are in 2009 real dollars.

Table 4: Pre-treatment price patterns

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Pursued restructuring	1.734***	1.636***	2.361***	0.967*	0.981*	1.423**	0.863*	1.006*	1.660**
	(0.579)	(0.566)	(0.554)	(0.539)	(0.560)	(0.613)	(0.510)	(0.568)	(0.622)
Trend difference		0.033	0.043		–0.005	–0.026		–0.048	–0.084
		(0.074)	(0.090)		(0.070)	(0.081)		(0.071)	(0.081)
Aggregate income	0.013***	0.013***	0.010**	0.010**	0.010**	0.008*	0.007**	0.007**	0.005
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)
Coal capacity	–0.633***	–0.635***	–0.621***	–0.474***	–0.474***	–0.474***	–0.388***	–0.392***	–0.392***
	(0.121)	(0.119)	(0.132)	(0.111)	(0.113)	(0.128)	(0.102)	(0.106)	(0.115)
Natural gas capacity	–0.047	–0.052	0.116	0.015	0.015	0.136	–0.099	–0.092	0.061
	(0.134)	(0.140)	(0.143)	(0.144)	(0.149)	(0.148)	(0.129)	(0.135)	(0.136)
Oil capacity	0.184	0.170	0.176	0.003	0.005	0.036	0.100	0.114	0.157
	(0.293)	(0.288)	(0.266)	(0.251)	(0.255)	(0.255)	(0.121)	(0.139)	(0.140)
Nuclear capacity	0.156*	0.156*	0.100	0.104	0.104	0.078	0.073	0.073	0.032
	(0.078)	(0.078)	(0.067)	(0.095)	(0.095)	(0.088)	(0.087)	(0.088)	(0.083)
Hydro capacity	–0.326***	–0.325***	–0.281***	–0.262***	–0.262***	–0.236***	–0.290***	–0.291***	–0.296***
	(0.084)	(0.084)	(0.071)	(0.080)	(0.080)	(0.080)	(0.067)	(0.067)	(0.067)
Other capacity	–0.504**	–0.501**	–0.411	–0.232	–0.232	–0.179	–0.134	–0.138	–0.077
	(0.237)	(0.239)	(0.276)	(0.289)	(0.290)	(0.311)	(0.271)	(0.272)	(0.300)
Natural gas price	0.475	0.473	0.485	0.573	0.574	0.625*	0.465	0.469	0.458
	(0.386)	(0.389)	(0.419)	(0.348)	(0.353)	(0.372)	(0.349)	(0.355)	(0.373)
Coal cap * coal price	0.013***	0.013***	0.014***	0.009***	0.009***	0.010***	0.006*	0.006*	0.007*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Natural gas cap * ng price	–0.007	–0.006	–0.042	–0.016	–0.017	–0.043	0.012	0.010	–0.024
	(0.030)	(0.031)	(0.033)	(0.032)	(0.033)	(0.034)	(0.029)	(0.030)	(0.030)
Oil cap * oil price	–0.008	–0.007	–0.006	–0.001	–0.002	–0.002	–0.004	–0.005	–0.006
	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Adj. R-sq	0.603	0.602	0.641	0.516	0.515	0.539	0.466	0.465	0.497
States	50	50	45	50	50	45	50	50	45
Observations	350	350	315	350	350	315	350	350	315

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Year fixed effects are used for estimation but omitted from reporting in the table.

Table 5: Uniform policy impact for the entire restructuring period

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Restructured States	–0.872***	–0.972***	–1.020***	–0.320	–0.405	–0.364	–0.057	–0.203	–0.032
	(0.303)	(0.312)	(0.354)	(0.284)	(0.284)	(0.331)	(0.258)	(0.263)	(0.285)
Aggregate income	–0.001	–0.001	–0.000	0.001	0.001	0.003	0.001	0.001	–0.000
	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)
Coal capacity	–0.293*	–0.337*	–0.259	0.004	–0.042	0.030	–0.022	–0.046	0.024
	(0.166)	(0.180)	(0.180)	(0.146)	(0.156)	(0.155)	(0.139)	(0.151)	(0.151)
Natural gas capacity	–0.079*	–0.077*	–0.080*	–0.087**	–0.081**	–0.078**	–0.096***	–0.092**	–0.074*
	(0.044)	(0.046)	(0.044)	(0.036)	(0.036)	(0.037)	(0.033)	(0.034)	(0.038)
Oil capacity	–0.010	0.007	0.047	–0.003	0.005	0.068	0.094	0.095	0.127
	(0.126)	(0.127)	(0.127)	(0.114)	(0.116)	(0.118)	(0.120)	(0.122)	(0.144)
Nuclear capacity	–0.045	–0.032	–0.017	–0.323	–0.317	–0.301	–0.335	–0.363	–0.289
	(0.451)	(0.449)	(0.469)	(0.234)	(0.233)	(0.252)	(0.234)	(0.231)	(0.254)
Hydro capacity	0.263	0.286	0.201	0.397	0.380	0.276	0.393	0.380	0.438
	(0.257)	(0.226)	(0.268)	(0.296)	(0.279)	(0.276)	(0.284)	(0.277)	(0.265)
Other capacity	0.115	0.112	0.037	0.010	0.010	–0.073	0.040	0.036	0.039
	(0.102)	(0.105)	(0.115)	(0.079)	(0.081)	(0.084)	(0.075)	(0.075)	(0.093)
Natural gas price	0.436**	0.462***	0.483***	0.410**	0.439***	0.460***	0.383**	0.417***	0.434***
	(0.179)	(0.168)	(0.161)	(0.173)	(0.159)	(0.154)	(0.164)	(0.148)	(0.143)
Coal cap * coal price	0.002	0.002	0.003	0.001	0.001	0.002	–0.001	–0.001	–0.001
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Natural gas cap * ng price	0.005	0.006	0.007*	0.004	0.004	0.004	0.006	0.006	0.006
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Oil cap * oil price	0.003	0.002	0.002	0.004**	0.003**	0.002	0.004**	0.003**	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Adj. R-sq	0.911	0.915	0.918	0.908	0.914	0.918	0.901	0.906	0.910
States	50	45	41	50	45	41	50	45	41
Observations	1,100	990	902	1,100	990	902	1,100	990	902

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects are used for estimation but omitted from reporting in the table.

Table 6: Test the hypothesis of regulatory lag

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Restructured States	–0.143	–0.099	0.089	–0.385	–0.345	–0.167	0.134	–0.057	0.255
	(0.658)	(0.652)	(0.828)	(0.639)	(0.636)	(0.787)	(0.573)	(0.551)	(0.650)
Restructured * Natural gas price	–0.098	–0.118	–0.143	0.009	–0.008	–0.026	–0.026	–0.020	–0.038
	(0.095)	(0.094)	(0.110)	(0.094)	(0.094)	(0.107)	(0.082)	(0.080)	(0.090)
Aggregate income	–0.001	–0.001	–0.001	0.001	0.001	0.003	0.001	0.001	–0.000
	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)
Coal capacity	–0.275*	–0.316*	–0.233	0.002	–0.041	0.033	–0.019	–0.043	0.029
	(0.164)	(0.177)	(0.179)	(0.145)	(0.155)	(0.156)	(0.139)	(0.150)	(0.152)
Natural gas capacity	–0.089*	–0.089*	–0.099**	–0.086**	–0.082**	–0.081**	–0.098***	–0.093**	–0.078*
	(0.046)	(0.048)	(0.048)	(0.037)	(0.038)	(0.039)	(0.035)	(0.037)	(0.043)
Oil capacity	–0.024	–0.010	0.024	–0.002	0.004	0.065	0.090	0.093	0.121
	(0.120)	(0.122)	(0.122)	(0.111)	(0.113)	(0.116)	(0.117)	(0.120)	(0.143)
Nuclear capacity	–0.055	–0.044	–0.023	–0.323	–0.316	–0.298	–0.335	–0.362	–0.284
	(0.457)	(0.456)	(0.469)	(0.234)	(0.233)	(0.252)	(0.235)	(0.231)	(0.254)
Hydro capacity	0.259	0.284	0.206	0.398	0.379	0.276	0.386	0.376	0.434
	(0.249)	(0.215)	(0.256)	(0.297)	(0.280)	(0.276)	(0.278)	(0.274)	(0.262)
Other capacity	0.112	0.109	0.039	0.010	0.010	–0.073	0.039	0.035	0.038
	(0.100)	(0.104)	(0.114)	(0.079)	(0.080)	(0.085)	(0.074)	(0.075)	(0.095)
Natural gas price	0.446**	0.474***	0.496***	0.409**	0.440**	0.462***	0.386**	0.419***	0.437***
	(0.176)	(0.162)	(0.153)	(0.179)	(0.164)	(0.156)	(0.167)	(0.151)	(0.145)
Coal cap * coal price	0.002	0.002	0.003	0.001	0.001	0.001	–0.001	–0.001	–0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Natural gas cap * ng price	0.006	0.007	0.009*	0.004	0.004	0.004	0.006	0.006	0.006
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Oil cap * oil price	0.003	0.002	0.002	0.004**	0.003**	0.003	0.004**	0.003**	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Adj. R-sq	0.911	0.916	0.918	0.908	0.914	0.918	0.901	0.906	0.910
States	50	45	41	50	45	41	50	45	41
Observations	1,100	990	902	1,100	990	902	1,100	990	902

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects used for estimation but omitted from reporting in the table.

Table 7: Uniform policy impact with state-specific trends

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Restructured states	–1.223***	–1.218***	–1.638***	–0.632***	–0.641***	–0.610*	–0.317	–0.372*	–0.167
	(0.226)	(0.224)	(0.272)	(0.186)	(0.182)	(0.327)	(0.212)	(0.207)	(0.289)
Aggregate income	–0.005	–0.005	–0.007*	–0.000	0.000	–0.002	–0.003	–0.001	–0.009*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)
Coal capacity	–0.292*	–0.341**	–0.314*	–0.006	–0.068	–0.055	0.002	–0.026	0.009
	(0.148)	(0.149)	(0.158)	(0.164)	(0.166)	(0.185)	(0.163)	(0.166)	(0.191)
Natural gas capacity	–0.029	–0.033	–0.012	–0.032	–0.035	–0.026	–0.073*	–0.072*	–0.082
	(0.039)	(0.039)	(0.041)	(0.038)	(0.039)	(0.047)	(0.041)	(0.042)	(0.049)
Oil capacity	–0.084	–0.089	–0.059	–0.096	–0.098	–0.083	–0.176	–0.166	–0.186
	(0.092)	(0.092)	(0.091)	(0.064)	(0.064)	(0.065)	(0.113)	(0.116)	(0.116)
Nuclear capacity	0.381	0.368	0.430	–0.084	–0.096	–0.047	–0.058	–0.083	–0.120
	(0.306)	(0.306)	(0.319)	(0.279)	(0.281)	(0.288)	(0.269)	(0.267)	(0.275)
Hydro capacity	0.183	0.169	0.142	0.111	0.115	0.079	0.226	0.223	0.283
	(0.130)	(0.132)	(0.133)	(0.137)	(0.139)	(0.141)	(0.270)	(0.274)	(0.314)
Other capacity	–0.141*	–0.156*	–0.135	–0.257***	–0.263***	–0.221***	–0.247**	–0.261**	–0.208**
	(0.080)	(0.082)	(0.093)	(0.082)	(0.082)	(0.079)	(0.105)	(0.105)	(0.102)
Natural gas price	0.204*	0.220*	0.226*	0.223*	0.239**	0.243**	0.202*	0.224**	0.233**
	(0.119)	(0.114)	(0.117)	(0.120)	(0.115)	(0.116)	(0.112)	(0.101)	(0.098)
Coal cap * coal price	0.003*	0.003*	0.003*	0.002	0.002	0.001	–0.000	–0.000	–0.001
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Natural gas cap * ng price	0.006*	0.006*	0.007**	0.004	0.003	0.004	0.006	0.005	0.006
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Oil cap * oil price	0.001	0.001	0.001	0.003*	0.002	0.002	0.004	0.004	0.004
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Adj. R-sq	0.963	0.963	0.964	0.956	0.956	0.958	0.941	0.944	0.946
States	50	45	41	50	45	41	50	45	41
Observations	1,100	990	902	1,100	990	902	1,100	990	902

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State fixed effect, state specific trends, and year fixed effects are used for estimation but omitted from reporting in the table.

Table 8: Differential policy impact for the restructuring period

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
A. Differential policy impact using the 5-year window for the transitional period									
First 5 years of restructuring	–1.142***	–1.213***	–1.308***	–0.461	–0.521*	–0.455	–0.156	–0.284	–0.071
	(0.226)	(0.231)	(0.240)	(0.275)	(0.273)	(0.323)	(0.267)	(0.266)	(0.288)
After first 5 years	–0.530	–0.666	–0.718	–0.155	–0.270	–0.270	0.059	–0.106	0.011
	(0.489)	(0.502)	(0.562)	(0.380)	(0.385)	(0.436)	(0.327)	(0.348)	(0.387)
Difference	0.612	0.548	0.591	0.306	0.251	0.185	0.215	0.178	0.082
	(0.411)	(0.416)	(0.480)	(0.329)	(0.335)	(0.383)	(0.295)	(0.317)	(0.366)
B. Differential policy impact using linear trend for the post-restructuring period									
Restructured states	–1.274***	–1.324***	–1.482***	–0.494	–0.536*	–0.464	–0.169	–0.259	–0.061
	(0.249)	(0.251)	(0.281)	(0.308)	(0.308)	(0.380)	(0.290)	(0.299)	(0.351)
Years since restructuring	0.077	0.068	0.080	0.032	0.024	0.017	0.021	0.011	0.005
	(0.059)	(0.060)	(0.066)	(0.050)	(0.051)	(0.056)	(0.042)	(0.047)	(0.053)

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects, and additional control variables are used for estimation but omitted from reporting in the table.

Table 9: Year-by-year policy impact of the restructuring period

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1st year of restructuring	–0.804***	–0.870***	–0.836***	–0.300	–0.349	–0.276	–0.111	–0.184	–0.066
	(0.196)	(0.194)	(0.191)	(0.298)	(0.295)	(0.322)	(0.259)	(0.279)	(0.303)
2nd year of restructuring	–1.183***	–1.259***	–1.294***	–0.598*	–0.659*	–0.568	–0.098	–0.159	0.015
	(0.231)	(0.230)	(0.240)	(0.336)	(0.330)	(0.389)	(0.286)	(0.301)	(0.339)
3rd year of restructuring	–1.455***	–1.563***	–1.541***	–0.662*	–0.747**	–0.669	–0.150	–0.311	–0.183
	(0.288)	(0.288)	(0.304)	(0.372)	(0.370)	(0.424)	(0.313)	(0.315)	(0.353)
4th year of restructuring	–1.258***	–1.379***	–1.285***	–0.267	–0.374	–0.188	0.243	–0.075	0.115
	(0.318)	(0.328)	(0.357)	(0.342)	(0.344)	(0.374)	(0.366)	(0.287)	(0.307)
5th year of restructuring	–1.531***	–1.679***	–1.850***	–0.460	–0.588	–0.668	–0.070	–0.252	–0.284
	(0.382)	(0.391)	(0.391)	(0.421)	(0.425)	(0.403)	(0.328)	(0.346)	(0.328)
6th year of restructuring	–1.334***	–1.488***	–1.515***	–0.454	–0.590	–0.597	0.040	–0.145	–0.223
	(0.400)	(0.409)	(0.450)	(0.395)	(0.398)	(0.410)	(0.341)	(0.357)	(0.367)
7th year of restructuring	–1.046**	–1.210**	–1.237**	–0.355	–0.493	–0.352	0.080	–0.100	–0.086
	(0.460)	(0.473)	(0.550)	(0.375)	(0.382)	(0.408)	(0.339)	(0.359)	(0.394)
8th year of restructuring	–0.527	–0.714	–0.748	–0.222	–0.381	–0.363	0.419	0.199	0.168
	(0.581)	(0.596)	(0.724)	(0.452)	(0.464)	(0.519)	(0.454)	(0.481)	(0.566)
9 years or more since restructuring	–0.317	–0.489	–0.337	–0.062	–0.210	–0.114	0.284	0.071	0.072
	(0.560)	(0.573)	(0.660)	(0.495)	(0.504)	(0.526)	(0.416)	(0.456)	(0.469)
Adj. R-sq	0.913	0.918	0.920	0.908	0.914	0.918	0.901	0.905	0.909
States	50	45	41	50	45	41	50	45	41
Observations	1,100	990	902	1,100	990	902	1,100	990	902

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects, and additional control variables are used for estimation but omitted from reporting in the table.

Table 10: Biannual price patterns before and after restructuring

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
3-4 years before restructuring	0.052	–0.007	0.103	0.090	0.064	0.136	–0.006	–0.037	0.015
	(0.192)	(0.191)	(0.200)	(0.169)	(0.170)	(0.165)	(0.177)	(0.185)	(0.205)
1-2 years before restructuring	–0.255	–0.336	–0.234	–0.032	–0.067	0.060	–0.047	–0.128	–0.044
	(0.251)	(0.251)	(0.249)	(0.244)	(0.247)	(0.230)	(0.241)	(0.254)	(0.251)
1-2 years since restructuring	–1.057***	–1.171***	–1.110***	–0.435	–0.508	–0.364	–0.119	–0.223	–0.035
	(0.288)	(0.287)	(0.275)	(0.398)	(0.396)	(0.425)	(0.359)	(0.383)	(0.406)
3-4 years since restructuring	–1.414***	–1.567***	–1.450***	–0.452	–0.565	–0.375	0.032	–0.241	–0.045
	(0.354)	(0.360)	(0.344)	(0.418)	(0.420)	(0.439)	(0.402)	(0.379)	(0.395)
5-6 years since restructuring	–1.486***	–1.672***	–1.722***	–0.446	–0.594	–0.587	–0.034	–0.246	–0.267
	(0.439)	(0.446)	(0.432)	(0.458)	(0.462)	(0.437)	(0.395)	(0.416)	(0.408)
7-8 years since restructuring	–0.847	–1.057*	–1.037	–0.282	–0.446	–0.314	0.225	–0.003	0.025
	(0.548)	(0.558)	(0.634)	(0.461)	(0.468)	(0.494)	(0.417)	(0.439)	(0.477)
9 years or more since restructuring	–0.378	–0.586	–0.382	–0.052	–0.216	–0.065	0.260	0.017	0.055
	(0.600)	(0.609)	(0.663)	(0.546)	(0.551)	(0.562)	(0.461)	(0.497)	(0.493)
Adj. R-sq	0.913	0.918	0.920	0.908	0.914	0.918	0.901	0.905	0.909
States	50	45	41	50	45	41	50	45	41
Observations	1,100	990	902	1,100	990	902	1,100	990	902

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects, and additional control variables are used for estimation but omitted from reporting in the table.

Table 11: Policy impact - restructuring measured as full retail choices for all three customer segments

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
A. Uniform policy impact for the entire restructuring period									
Restructured States	–0.880***	–0.983***	–1.008***	–0.506*	–0.592**	–0.592**	–0.297	–0.329	–0.229
	(0.308)	(0.317)	(0.351)	(0.256)	(0.262)	(0.287)	(0.251)	(0.256)	(0.273)
B. Differential policy impact using the 5-year window for the transitional period									
First 5 years since restructuring	–1.183***	–1.258***	–1.329***	–0.712***	–0.779***	–0.773***	–0.518**	–0.529**	–0.455*
	(0.230)	(0.234)	(0.240)	(0.207)	(0.209)	(0.225)	(0.211)	(0.215)	(0.227)
After first 5 years	–0.431	–0.575	–0.649	–0.200	–0.314	–0.389	0.030	–0.033	0.023
	(0.550)	(0.564)	(0.586)	(0.442)	(0.452)	(0.467)	(0.390)	(0.400)	(0.412)
Difference	0.752	0.682	0.680	0.512	0.465	0.384	0.548	0.496	0.478
	(0.485)	(0.492)	(0.519)	(0.398)	(0.403)	(0.428)	(0.334)	(0.340)	(0.356)

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects, and additional control variables are used for estimation but omitted from reporting in the table.

Table 12: Policy impact - using state aggregate income as regression weights

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
A. Uniform policy impact for the entire restructuring period									
Restructured states	–0.649**	–0.690**	–0.812**	–0.381	–0.425	–0.464	–0.285	–0.316	–0.075
	(0.288)	(0.291)	(0.384)	(0.256)	(0.259)	(0.319)	(0.277)	(0.282)	(0.299)
B. Differential policy impact using the 5-year window for the transitional period									
First 5 years since restructuring	–0.858***	–0.884***	–1.050***	–0.551**	–0.582**	–0.535**	–0.459*	–0.479*	–0.175
	(0.215)	(0.220)	(0.290)	(0.235)	(0.239)	(0.246)	(0.272)	(0.276)	(0.255)
After first 5 years	–0.274	–0.339	–0.494	–0.111	–0.174	–0.376	–0.005	–0.047	0.061
	(0.463)	(0.467)	(0.567)	(0.372)	(0.376)	(0.459)	(0.369)	(0.378)	(0.455)
Difference	0.584*	0.545	0.556	0.440	0.408	0.159	0.454	0.432	0.235
	(0.347)	(0.347)	(0.398)	(0.338)	(0.341)	(0.314)	(0.344)	(0.349)	(0.378)

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects, and additional control variables are used for estimation but omitted from reporting in the table.

Table 13: Policy impact - log-linear models

	Residential			Commercial			Industrial		
Average price	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
A. Uniform policy impact for the entire restructuring period									
Restructured States	–0.066**	–0.069***	–0.069**	–0.015	–0.018	–0.002	0.022	0.009	0.044
	(0.025)	(0.025)	(0.032)	(0.028)	(0.027)	(0.030)	(0.036)	(0.036)	(0.039)
B. Differential policy impact using the 5-year window for the transitional period									
First 5 years since restructuring	–0.083***	–0.085***	–0.088***	–0.023	–0.026	–0.011	0.014	0.005	0.042
	(0.022)	(0.022)	(0.029)	(0.027)	(0.027)	(0.031)	(0.039)	(0.040)	(0.045)
After 5 years since restructuring	–0.042	–0.046	–0.042	–0.005	–0.009	0.008	0.031	0.013	0.046
	(0.033)	(0.034)	(0.040)	(0.033)	(0.033)	(0.036)	(0.038)	(0.039)	(0.042)
Difference	0.041*	0.039	0.047*	0.019	0.017	0.019	0.018	0.009	0.003
	(0.024)	(0.024)	(0.027)	(0.024)	(0.025)	(0.028)	(0.030)	(0.032)	(0.038)

Notes: 1. Standard errors are clustered by states and reported in parentheses.
2. Stars denote statistical significance: * significant at 10%; ** significant at 5%; *** significant at 1%.
3. State and year fixed effects, and additional control variables are used for estimation but omitted from reporting in the table.