WHO PAYS IN DEREGULATED ELECTRICITY MARKETS?: QUASI-EXPERIMENTAL EVIDENCE OF INTER-CLASS SUBSIDIZATION FROM OHIO COMPLETE BILL DATA

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Overview

Like many other "coal states," Ohio has undergone tremendous regulatory regime change in the past decade. It has introduced competition into both its wholesale and retail electricity markets, making it an exemplary case for evaluating the economic effects of regulatory change and resource transition. Empirical support for the purported benefits of retail electric deregulation is mixed at best. Prior studies that refer to states as simply "retail deregulated" overlook the fact that efforts in many states to introduce retail competition have been muddied by various degrees of regulatory intervention. Those studies are often based upon Energy Information Administration (EIA) 826 data that does not account for large costs that end-customers incur from regulatory intervention—which amount to more than 50 percent of the total bill in states like Ohio. Using robust time series bill survey data from the Public Utilities Commission of Ohio (PUCO), this paper provides a quasi-experimental analysis of the price impacts of retail electric restructuring in Ohio on all customer classes—residential, commercial, and industrial. It provides measures of the effect of regulatory change on inter-class subsidization (i.e., subsidies from residential customers to commercial and industrial customers). We also provide welfare impact estimates for each utility service territory.

Methods

We employ a data source that has not yet been used in academic literature (with the exception of Dormady, Jiang and Hoyt, 2017). While the majority of 'deregulation' research has used EIA data, that data is flawed in that it only captures the costs that utilities report from transactions at a wholesale market level, and does not reflect costs associated with riders and surcharges that customers incur at a retail level from utilities' efforts to subsidize the assets of utility-owned, non-regulated subsidiary businesses. Riders and surcharges amount to more than half of customer total bills (i.e., what customers actually write checks for each month). This means that there are likely measurement errors in prior studies that have evaluated the effects of deregulation.

Using this retail survey data from the PUCO, this paper provides a quasi-experimental analysis of the effects of deregulation on residential, commercial, and industrial customers. The PUCO data provides a robust complete monthly bill survey for customers from all classes from before and after the implementation of retail deregulation. Advanced univariate and panel regression techniques are employed to measure both the change in rates due to deregulation as well as the change in inter-class subsidization. Inter-class subsidization is measured as the temporal change in the ratio of rates between classes (i.e., $P_{retail(t)}/P_{industrial(t)} - P_{retail(t-1)}/P_{industrial(t-1)}$). By using this approach, relative prices can be obtained. From this, we provide comprehensive panel regression explanatory controls—including wholesale electricity prices, retail auction prices and auction liquidity, retail customer switching, standard service offer demand, utility operating costs, and input/generation fuel prices.

The univariate models provide advanced interrupted-time series regression techniques based on the longstanding Box-Jenkins approach (Box & Jenkins, 1970; Box-Steffensmeier, Freeman, Hitt, & Pevehouse, 2014; Enders, 2004; Hamilton, 1994; Shadish, Cook & Campbell, 2002)—these include ARIMA, Seasonal ARIMA (i.e., SARIMA) and Fractionally-integrated ARIMA (i.e., ARFIMA) models. This approach allows us to retain the controlled pre- and post- treatment effect measures while accounting for autocorrelation. Properly correcting for autocorrelation is both theoretically and contextually important with this data, as electricity prices in a given month tend to be highly correlated with prices in prior months. We also provide detailed regime change tests using the approach provided in Enders (2004).

From the panel and univariate regression models, we provide aggregate estimates of welfare effects due to regulatory restructuring with respect to all customer classes—industrial, commercial, and residential. We utilize retail demand, and consumption count data to provide these aggregate measures.

Results

While both emissions and prices declined with the concurrent natural gas boom and the associated shift from coal to gas generation, savings were not proportionately passed through to customers. Our results indicate

that residential customers saw substantial price increases associated with retail deregulation. This occurred in most service territories, with the excpetion of the Cincinnati area (i.e., Duke Energy). We note that Duke Energy is the only utility in the state to have fully divested its generation portfolio (Dormady, Jiang and Hoyt, 2017). We also find that residential customers in the state, overall, incurred a net welfare lost of approximately $1 billion. Figure 1 provides a time series plot of the aggregate residential price data in our panel, indicating a substantial negative effect to households associated with deregulation—a finding that other studies have missed in the absence of such comprehensive data as we utilize.

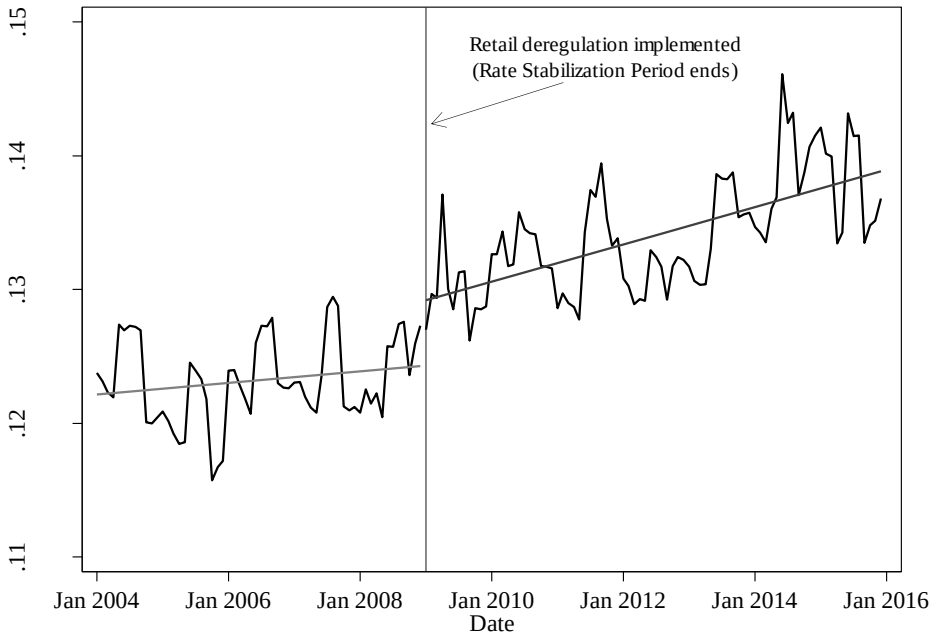

Figure 1. Statewide Aggregate Electricity Price
Mean inflation-adjusted marginal rate for all utility service territories (excludes DP&L)

Conclusions

Under a hybrid form of retail competition, large industrial customers retain both negotiating power with regulatory commissions and utilities as well as gain information and size advantages on the open market. In contrast, disaggregated residential customers are exposed to information asymmetries and collective action problems in facing an altered regulatory process, as well as switching barriers and high transaction costs in contracting with a retail supplier. The swelling of regulatory-approved riders and surcharges made possible by retail restructuring in Ohio may in fact be a complex system of subsidies for underperforming affiliated, arms-length generation. While the restructuring design in Ohio required a 100 percent divestiture of generation, it allowed investor-owned utilities to simply reincorporate that generation into subsidiary corporations (in some cases even retaining the utility's name). The cross subsidization problems and negative welfare effects that we find could have ultimately been averted had regulators and policymakers more thoroughly implemented deregulation as recommended in longstanding academic literature (Hunt, 2002; Joskow & Schmalensee, 1983; Phillips, 1993).

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