ELECTRICITY REFORM AND RETAIL PRICING IN TEXAS

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Overview

Electricity market reforms have pursued two goals, both aimed at increasing economic efficiency. The first is to ensure that suppliers minimize costs. The second is to make prices more reflective of marginal costs. We use data from Texas to examine whether post-reform retail prices have better reflected wholesale prices, and whether reform has reduced retailer costs. We find clear evidence of both outcomes in competitive market areas but not in non-competitive areas supplied by municipally-owned utilities or co-operatives.

Methods

We first present a simple theoretical model of a competitive retailer selling electricity to several groups of customers. The firm chooses the amount e_i, $i = 1, 2, \ldots, N$ to supply to each of N customer groups taking the wholesale electricity price p_w in addition to the retail rates r_i, $i = 1, 2, \ldots, N$ as given. Transmission and distribution costs $\tau(e_1, e_2, \ldots, e_N)$ and other costs $w(e_1, e_2, \ldots, e_N)$ are general functions of the supplies to different customer groups. Profit maximization implies that the supply to customer group i will equate the marginal transmission and operating costs, $\partial\tau/\partial e_i + \partial w/\partial e_i$, to the gap between the retail and wholesale prices, $r_i - p_w$.

We next consider a municipally-owned retailer granted a monopoly franchise to supply a local market. The firm can now choose the rate, r_i, for consumers in group i, although it faces a downward sloping demand curve $d_i(r_i)$. We also assume that the municipal government prevents the firm from maximizing profits. Nevertheless, higher profitability π remains important, since any profit returned to the municipality allows other political goals to be pursued. Conversely, losses made by the municipally-owned retailer would have to be financed by other taxes, which would be politically unpopular. The firm also may be pressured to redistribute costs across consuming groups. Specifically, we assume that the political support, or political opposition, of consumer group i depends positively on the consumer surplus C_i that group i obtains from their electricity consumption. Thus, the firm maximizes a "political support" function $V(\pi, C_1, C_2, \ldots, C_N)$ with $\partial V/\partial\pi > 0$ and $\partial V/\partial C_i > 0$ for each i. We show that the gap between the price charged to consumer group i and the marginal cost of serving that group can be written

$$\frac{r_i - p_w - \frac{\partial t}{\partial e_i} - \frac{\partial w}{\partial e_i}}{r_i} = \left(1 - \frac{\frac{\partial V}{\partial C_i}}{\frac{\partial V}{\partial p}}\right)\frac{1}{e_i}$$

Thus, if the consumer surplus of group i is more (less) important in the political support function than the overall profitability of the firm, the price charged to group i will be less (greater) than the marginal cost. The proportionate amount of the subsidy (or implicit tax) for consumer group i will also depend inversely on the elasticity of demand.

A cooperative will fall between the competitive profit-maximizing firm and the municipally-owned utility. While it may be the dominant firm in its local market and be pressured to subsidize households, it also must compete with private firms. This would raise ε_i and reduce the amount of cross-subsidization the cooperative can implement.

Next, we obtained monthly residential electricity bill data from the Public Utility Commission of Texas and wholesale electricity prices from the Electricity Reliability Council of Texas for the period since deregulation, 2002-2016. To measure labor cost in the utility industry we used the average weekly wage in the trade, transportation and utilities sector by county from the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages. We then calculated the average across counties in each utility distribution area. All price and cost data was converted to real terms using the consumer price index from the Federal Reserve. The retail price data covered competitive retail market areas, areas with municipally-owned monopoly retailers and areas with dominant cooperative suppliers that nevertheless faced some competition.

We then estimated a set of regression equations using the seemingly-unrelated regression model. We included a set of monthly dummy variables to allow for seasonal influences on the pricing relationship. To avoid outlier observations, which might otherwise bias parameter estimates, we also included dummies to account for infrequent periods of extremely low rates in several areas dominated by electricity cooperatives. It appears that these periods reflected rate promotions or other marketing initiatives. Finally, we also included dummy variables and two different time trends before and after January 2007 to allow for the "price-to-beat" program that lasted from 2002-2005. The time trends also allow for competition to reduce costs over time, where we expect competition to have been more severe after the interim "price-to-beat" measures expired.

Results

We found estimates of the effects of wholesale price, labor costs, the price to beat mechanism (including the two time trends) and the adjustment speed (reflected in the coefficient on the lagged dependent variable) to be very uniform across competitive areas. Moreover, the seasonal effects were largely insignificant in all these areas. By contrast, residential prices in the non-competitive areas behave differently from each other and also very differently from residential prices in the competitive areas. The estimated contemporaneous covariance matrix (not reported) reinforced the finding of similarly behaved residential prices in competitive areas only.

In particular, wholesale prices p_w were found to have a statistically significant positive effect on residential rates in all competitive regions, consistent with the model of a profit-maximizing price-taking retailer. The effect of p_w was positive and statistically significant in only three non-competitive regions, statistically significant but negative in a region with a municipally-owned monopoly and not statistically significant in the remaining non-competitive regions.

Real wages also had a positive and statistically significant effect in all of the competitive regions. However, the coefficient was positive and significant only in one non-competitive region.

The other coefficient estimates are less relevant for the theory, but generally supported the notion that retail rates in the less competitive areas departed more from the implications of the theory of competitive market behavior.

We next examined a set of data on commercial electricity rates from several large commercial electricity users in Texas with facilities in both non-competitive and competitive areas. We found less separation between commercial rates in competitive versus non-competitive areas than we saw for residential rates. This is consistent with the theoretical model that commercial customers are called upon to cross-subsidize retail customers in the non-competitive areas. Further, as with the residential rates, the commercial rates in competitive market areas followed wholesale rates more closely. As a result, commercial rates in competitive market areas have fallen relative to rates in non-competitive market areas, and are now generally lower.

Conclusions

Since major changes to the Texas electricity market began in 2002, increased competition appears to have had a discernible and significant effect in accord with economic theory. Specifically, we found strong evidence that residential price movements more accurately reflected corresponding movements in wholesale prices in competitive market areas. Moreover, the difference between residential and wholesale prices declined on average over the period in the competitive market regions. These results are consistent with the hypotheses that competition drives prices to reflect marginal costs and drives firms to achieve efficiency gains and cost reductions. We also found that commercial rates better track wholesale prices in competitive than in non-competitive market areas. There is also evidence of more cross-subsidization of residential by commercial customers in non-competitive areas. More generally, our results are consistent with the hypothesis that greater political control and reduced competition allow more deviations between prices and marginal costs. The theoretical model we presented suggests that these deviations, or cross subsides between groups, will reflect differing political influence and elasticities of demand. While cross-subsidies of this sort may be politically optimal, they will lead to inefficient electricity use.

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