

# Markets for Power in the United States: An Interim Assessment

# Introduction

- ▶ Mentions FERC 888, 889, 2000
- ▶ The glow that faded from higher MC prices vs AC prices.
- ▶ “Fragments of Evidence”?
  - ▶ Econ on big on making sure we describe causal effects, not just correlations.
  - ▶ We required control, or quasi-control groups for counterfactuals.

# Counterfactual

- ▶ What would have happened in the absence of a treatment.
- ▶ Example:
  - ▶ Randomized Control Trial (RCT)
  - ▶ Quasi-experimental controls
- ▶ Hard to do with 50 states
  - ▶ Need stats that are very similar, one that chose deregulation and one that did not.
  - ▶ Those don't exist.
  - ▶ Or, a very good model (perfect) of why states chose to do what they do.

# Standard Market Design

NOPR in 2002 but withdrawn in 2005. Many good ideas.

Check the reasons for the withdrawal in item 5.

https:

[//www.ferc.gov/CalendarFiles/20050719123006-RM01-12-000.pdf](https://www.ferc.gov/CalendarFiles/20050719123006-RM01-12-000.pdf)

## Discussion of ISO-NE and NYISO

- ▶ This is a nice discussion of how the parts work together.

# Wholesale Market

- ▶ Common to look at difference in Locational marginal price (LMP)
- ▶ He looks at average LMP and compares but
- ▶ Notes that big variations within regions.
- ▶ LMP differences indicates transmission is constrained.
  - ▶ Constraints can give market power to large buyers or sellers.
  - ▶ LMP differences indicate that there could be market power

## The Snake (Fig 2)

- ▶ The diagram shows divergence in prices for part of the year.
- ▶ Not whole year but there are still quasi-rents because of congestion.
- ▶ You frequently check not just average differences but also how the correlations between prices.
  - ▶ High correlation means the markets are well integrated.
  - ▶ Low correlation is evidence that the markets are not integrated.

# The Snake

Figure 2: Day-ahead Year Period Prices (2004) \$/MWH

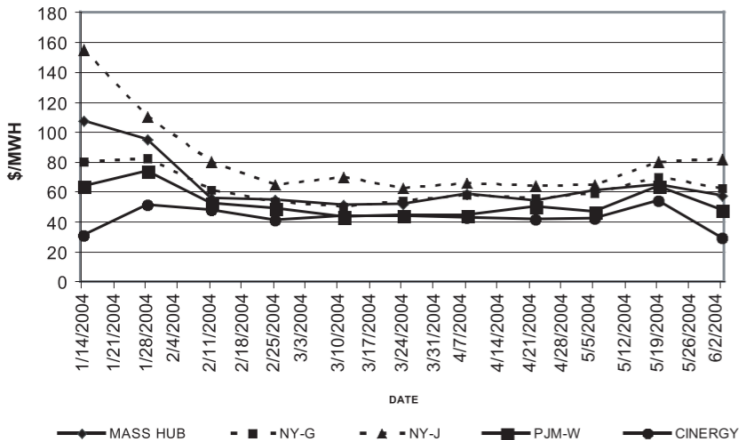


Figure 1:



# Retail Competition

- ▶ There is a regression
- ▶ Retail competition means that you buy electricity from someone else but still pay your LDC for distribution and ISO/RTO, through the LDC, for transmission .
- ▶ Default prices, through the LDC, still include the capital cost of stranded assets.
- ▶ BTW We tend not to switch from defaults.

# Notes on the Regression

- ▶ The author is right up front that this is not a good model.
  - ▶ Think of it as descriptive and not causal.
- ▶ P is average over a state.
- ▶ SIZE is never defined.
- ▶ GLS means they take into account autocorrelation
- ▶ Fixed-effects means they control for the state but equation one looks like random effects.
- ▶ Fixed plus time trend takes into account common year to year differences. Also looks like random effects.

# Specification

$$\begin{aligned} P_{itj} = & \beta_0 + \beta_1 \text{RFC}_{it} + \beta_2 \text{HYDRO}_{it} + \beta_3 \text{NUCLEAR}_{it} + \\ & \beta_4 \text{RYield}_t + \beta_5 \text{SIZE}_{it} + \beta_6 \text{PURPA}_{itg} + \beta_7 \text{EWG}_{it} + \\ & \beta_8 \text{RETAIL}_{it} + \mu_i + \nu_t + \varepsilon_{it} \end{aligned} \quad (1)$$

where:

$i$  indexes states

$t$  indexes years

$j$  is either the residential price (r) or the industrial price (i)

$\mu_i$  is a state specific error

$\nu_t$  is a time specific error

$\varepsilon_{it}$  is an iid random error

Figure 2:

# Variables

and the variables are defined as:

P:	average retail residential or industrial price.
RFC:	average real fossil fuel price per kWh of total electricity supplied in each state over time.
RYield:	Real yield on electric utility debt over time.
HYDRO:	share of total electricity supplied coming from hydroelectric generation in each state over time.
NUCLEAR:	share of total electricity generation coming from nuclear plants in each state over time.
PURPA:	share of total electricity generation coming from PURPA qualifying facilities (QF) in each state beginning with 1985.
EWG:	share of electricity generated by unregulated generators in each state beginning in 1998.
RETAIL:	a dummy variable indicating whether or not a state had introduced retail competition in a particular year — beginning in 1998.

Figure 3:

# Residential

**Table 7. Residential Price Equations 1970-2003**  
(standard errors in parenthesis)

Variable	GLS	Fixed-effects	Fixed-effects plus time trend
RFC	0.51 (0.019)	0.51 (0.019)	0.48 (0.019)
HYDRO	-0.20 (0.077)	-0.16 (0.095)	-0.36 (0.099)
NUCLEAR	0.39 (0.054)	0.38 (0.056)	0.45 (0.056)
YIELD	0.042 (0.002)	0.043 (0.002)	0.047 (0.002)
SIZE	-0.13 (0.0044)	-0.13 (0.0048)	-0.11 (0.0063)
PURPA	0.43 (0.078)	0.42 (0.079)	0.61 (0.084)
EWG	-0.24 (0.058)	-0.23 (0.058)	-0.23 (0.057)
RETAIL	-0.24 (0.042)	-0.25 (0.042)	-0.21 (0.042)
R <sup>2</sup> (corrected)	0.74	0.61	0.62

Source: See text and appendix.

Figure 4:

# Residential

**Table 8. Residential Price Equations 1981-2003**  
(standard errors in parenthesis)

Variable	GLS	Fixed-effects	Fixed-effects plus time trend
RFC	0.24 (0.031)	0.19 (0.032)	0.048 (0.029)
HYDRO	-0.064 (0.11)	0.125 (0.153)	-0.36 (0.137)
NUCLEAR	0.21 (0.071)	0.136 (0.073)	0.082 (0.056)
YIELD	0.06 (0.0046)	0.056 (0.0047)	0.027 (0.004)
SIZE	-0.18 (0.0077)	-0.21 (0.0088)	-0.1 (0.0089)
PURPA	0.22 (0.09)	0.122 (0.092)	0.288 (0.082)
EWG	-0.19 (0.054)	-0.16 (0.054)	-0.16 (0.048)
RETAIL	-0.24 (0.039)	-0.25 (0.038)	-0.126 (0.034)
R <sup>2</sup> (corrected)	0.66	0.73	0.79

Sources: See text and appendix

**Table 9. Industrial Price Equations 1970-2003**  
(standard errors in parenthesis)

Variable	GLS	Fixed-effects	Fixed-effects plus time trend
RFC	0.74 (0.019)	0.73 (0.02)	0.68 (0.019)
HYDRO	-0.264 (0.078)	-0.13 (0.10)	-0.535 (0.10)
NUCLEAR	0.20 (0.071)	0.22 (0.055)	0.42 (0.056)
YIELD	0.034 (0.0054)	0.034 (0.002)	0.043 (0.002)
SIZE	-0.4 (0.034)	-0.4 (0.035)	-0.3 (0.03)
PURPA	0.41 (0.08)	0.38 (0.081)	0.69 (0.083)
EWG	-0.26 (0.059)	-0.24 (0.059)	-0.22 (0.057)
RETAIL	-0.16 (0.043)	-0.17 (0.043)	-0.12 (0.042)
R <sup>2</sup> (corrected)	0.62	0.60	0.64

# Industrial

**Table 10. Industrial Price Equations 1981-2003**  
(standard errors in parenthesis)

Variable	GLS	Fixed-effects	Fixed-effects plus time trend
RFC	0.53 (0.03)	0.48 (0.031)	0.23 (0.026)
HYDRO	-0.40 (0.10)	-0.29 (0.15)	-0.62 (0.12)
NUCLEAR	0.11 (0.071)	0.056 (0.075)	0.029 (0.057)
YIELD	0.078 (0.0045)	0.079 (0.004)	0.029 (0.004)
SIZE	-0.4 (0.04)	-0.4 (0.04)	-0.3 (0.03)
PURPA	0.24 (0.09)	0.10 (0.09)	0.18 (0.072)
EWG	-0.24 (0.054)	-0.23 (0.055)	-0.15 (0.042)
RETAIL	-0.18 (0.039)	-0.20 (0.039)	-0.043 (0.03)
R <sup>2</sup> (corrected)	0.61	0.68	0.82