Electricity Markets and Lessons from Prior Deregulation Experiences

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A Summary View of Progress

“Even the Cato Institute has lost patience with competitive reforms in electricity and appears to see merit in returning to the good old days of regulated vertically integrated utilities.” -Joskow (2006)
Outline of Talk

1. Brief History of U.S. (de-)Regulation of Electricity
2. Impact on Productive Efficiency
3. Impact on Allocative Efficiency
4. Impact on Consumer Prices
5. Implications for Future Initiatives
Outline

1. **Brief History of U.S. (de-)Regulation of Electricity**
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5. **Implications for Future Initiatives**
A Brief History of the Electricity Sector

- Was long believed to be a natural monopoly.
- Grew up as a balkanized patchwork of regulated, vertically integrated utilities.
- Rates were set by State (Not Federal!) Public Utility Commissions.
- “Prudent” cost recovery ensured regulation of investments and operations.
- Units dispatched based on engineering estimates of cost within ~ 100 Power Control Areas.
Rate Regulation of Electricity: IOUs
Electricity Restructuring

Generators

Generation

Market

Transmission

Retailers

Distribution
General Narrative of Restructuring

• Implemented by state legislation, starting in mid-1990s.
• Ends local monopoly in distribution.
• Requires vertically-integrated IOUs sell off (divest) all generating assets.
• Ends rate hearings.
• Market-based dispatch.
• Deregulatory momentum up to 2000.
• No states restructured since CA crisis.
“Deregulation” Might Refer to:

- No guaranteed cost recovery: Public Utility Regulatory Policies Act (1978)
- Market-based dispatch (1997-present, occurs in rate-regulated areas)
- Consumer Choice on Retail side No states restructured since CA crisis.
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Productive Efficiency: Plant Divestiture

Does a given plant reduce its operational costs?

- Labor Costs: Yes (Fabrizio, Rose, and Wolfram (AER, 2007))
- Heat Rates: No (Bushnell and Wolfram (2005))
- Maintenance: Yes (Davis and Wolfram (AEJ, 2012))
- Fuel Costs: Yes, for coal (Cicala (AER, 2015))
Challenges Answering the Fuel Cost Question

- Deregulated plants subject to different data disclosure rules
- Deregulation not randomly assigned
  - Difficult to say what prices *would have been* if not for deregulation
Legend
- Divested Plants
- IOU/Gov/Muni/Coop
- Coal Fields

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Impact on Productive Efficiency
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Matched U.S. Coal-Fired Power Plants

Legend
- Divested Plants
- IOU/Gov/Muni/Coop
Pre-Trend Test: Matched Delivered Coal Price, 1990-1997

![Graph showing the cost of delivered coal over time with shaded areas indicating 95% confidence intervals for both divested and not divested facilities. The graph includes a line for divested facilities and a dashed line for not divested facilities.]
Matching by Year from Divestiture: $\log(Price)$, Distance $\leq 100$ mi.
Why Do Fuel Prices Fall?

- Transparency: No price drop for natural gas
- Capital Bias: Use low-sulfur coal rather than install abatement equipment
- Regulatory Capture
Capture by Coal
In-State Coal Matches by Year from Divestiture: Fraction from In-State, $m = 10$
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Allocative Efficiency: Market Dispatch
Do Wholesale Electricity Markets Reduce over-all Production Costs?

• Substantial Literature on Market Power:

• Less on Gains from Trade:
  • Mansur and White (2012)
Power Control Areas in 1997

NERC Regions and Control Areas

As of July 1, 1997

Source: NERC

Dynamically Controlled Generation
Percent of Generation Capacity Dispatched by Markets

![Graph showing the share of national capacity dispatched by markets from 1998 to 2012. The share increases from 1998 to 2006 and then remains relatively stable until 2012.](image-url)
Losses from Out-of-Merit Generation
Local Gains from Imports
Local Gains from Exports

$ / MWh

Demand

Local Supply Curve

Exports

Quantity

Impact on Allocative Efficiency

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Trade Across Areas: $\log(\text{MWh Traded})$

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Impact on Allocative Efficiency

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Trade Across Areas: $\log(Gains \text{ from Trade})$
Out of Merit Generation: $\log(\text{MWh Out of Merit})$

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Impact on Allocative Efficiency
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Out of Merit Generation: $\text{Log}(\text{Out of Merit Costs})$
Summary of Causal Estimates

- Short run estimates show substantial net improvements in allocative efficiency:
  - Gains from trade in market areas: $\uparrow 30 - 50\% \ (\$1.25 - \$2B/year)$
  - Traded Quantities: $\uparrow 10 - 15\%$
  - Out of Merit Quantities: $\downarrow \sim 10\%$
  - Out of Merit Costs: $\downarrow 15 - 20\% \ (\$1.5B - \$2B/year)$

- Increased availability has swamped withholding.
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Consumer Prices: Which Deregulation?

- Consumer Choice: Limited benefits
  - Joskow (Energy Journal, 2006), Kwoka (Rev IO, 2008)
- Problem: Market Areas without Consumer Choice are in “control group”
Electricity Prices by Consumer Choice

Deregulation

Excludes AK, HI. Data Source: EIA–826
Electricity Prices by Market Dispatch

Excludes AK, HI. Data Source: EIA-826
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Which Deregulation, Whose Evaluation?

- Rules Matter: California
  - Political deals may wreak mayhem in market setting
- Well-defined/constructed counterfactual needed for evaluation
- Evaluation impossible without high-quality data