Interpreting Evidence for Market Power

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Puller Study: Pricing and Firm Conduct in California's Deregulated Electricity Market

- Key Assumptions:
  - Uses EPA generation utilization data and PX MCP for April 1998-December 1999
  - Symmetric firms
  - Game where firms Choose Production Quantity
- Reduced form regression to study utilization rates and 2 Structural equations on firm conducts
- Searching for static or dynamic market power
- Found evidence of static market power consistent with Cournot pricing model

Puller's Findings : Reduced form regression

- Found utilization rate by firm negatively correlated with share of profitable capacity
- Not significantly related with projected demand or lagged change in market shares (which would have indicated dynamic market power)

Puller Findings: Structural Equations

$$P(q_{it} + q_{-it}) - c_i(q_{it}) - \lambda_{it} = -\theta_{it} P'_t q_{it} + \mu_t \frac{d\pi^{BR}}{dQ_t}$$

H$_1$: No Market Power:

$$\theta_{it} = 0, \quad \mu_t = 0, \quad \lambda_{it} \geq 0$$

H$_2$: Static Market Power:

$$\theta_{it} = 1, \quad \mu_t = 0, \quad \lambda_{it} \geq 0$$

H$_3$: Dynamic Market Power:

$$\theta_{it} = N, \quad \mu_t \geq 0, \quad \lambda_{it} \geq 0$$

- Supports H$_2$ $(\theta = 1)$; Found no evidence of dynamic market power

- However, full dynamic specification did not support the static results $(\theta < 1)$

Joe Crespo et al:

Bidding Asymmetries in Multi-Unit Auctions: Bid Function Equilibria in the British Market

- Key Assumptions
  - Detailed Bidding Data
  - Asymmetric Firms: Price Setter and Non-Price Setters
  - Game where Firms Choose Bid Prices
- Regression and Simulation Display Fit to the BFE Hypothesis in UK Market

CALIFORNIA ISO
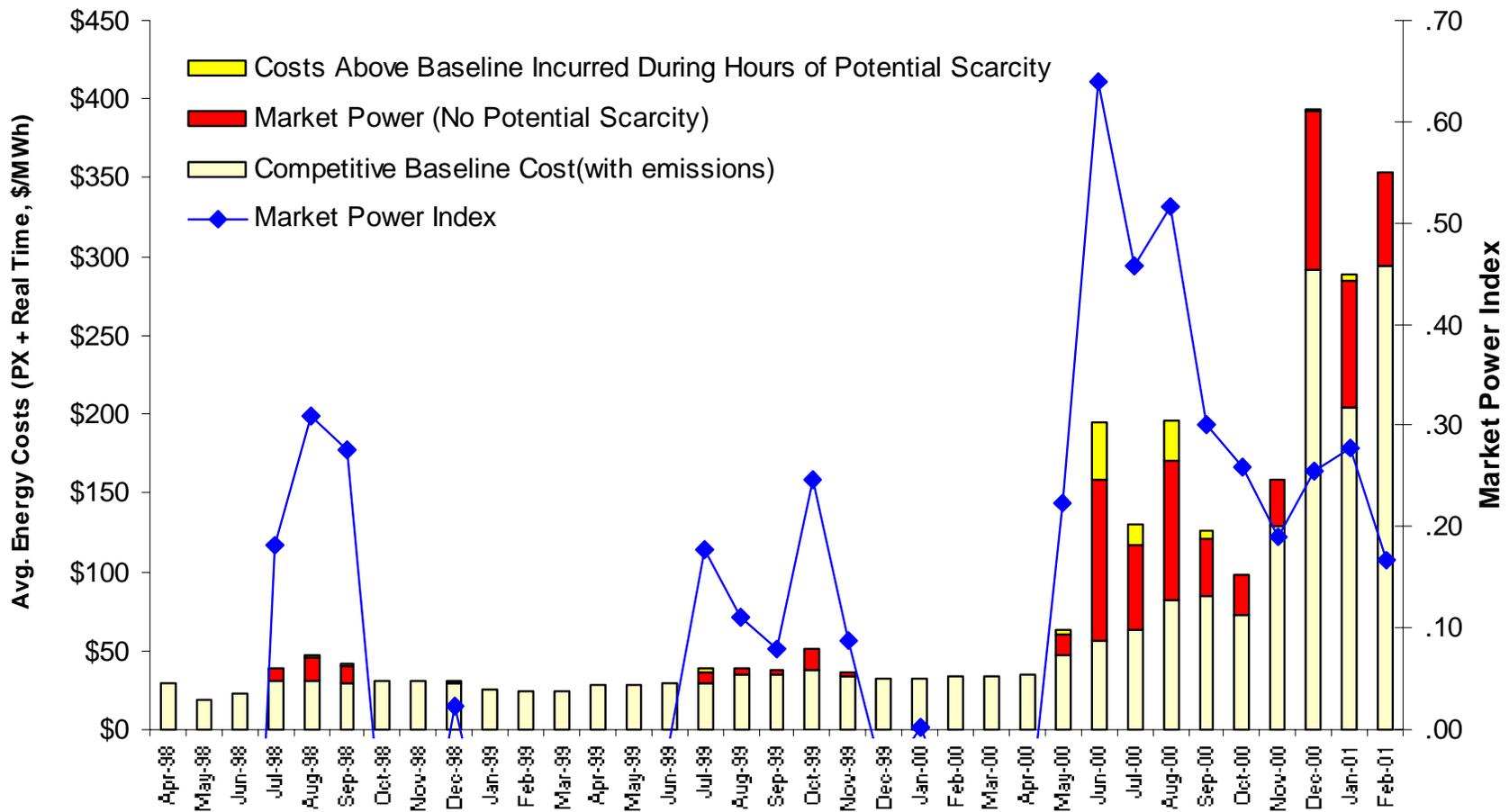
Do These Models Explain the California Experience?

Significant Market Power Experienced in Calif. Electricity Markets Totaling Approx $5.5 Billion* From May 2000 – Feb 2001

(Accounts for emissions and scarcity hours which includes 10% system reserves)
(*later revised to $6.2 billion in final filing to FERC)

Empirical Market Experience: CA ISO Study

- Objective:
  - Identify individual firms engaging in market power activity
  - Analyze how each firms' actions set market clearing prices
- Utilized full bidding data in CA ISO real time for each hour between May and Nov 2000
- Defined and categorized bidding patterns and identified withholding (economic or physical)
- Calculated bid-cost mark-up and monopoly rent
- Preliminary checks against key predictions of supply function equilibrium

CAISO Findings

- Economic withholding is the dominant bidding pattern used by the five large non-UDC generators (two above 80% and two above 70% times).

- Pure physical withholding less than 10% of the time.

- Bid curves were typically increasing step functions. Some very fine steps to approximate upward line segment.

- A few firms bid at or close to the MCP.

- Bid-cost mark-up (Leaner Index) above 50%. (More than $100 on peak, June to Sept.)

- Confirmed key predictions of Supply Function Equilibrium
  - Mark-up positively correlated with output quantity
  - Mark-up negatively correlated with residual demand elasticity

Do We Have the Right Model?

	Puller	BFE	SFE	Empirical Evidence
Symmetry	Yes	No	Both Types	Both Types
Choice Variable	Quantity	Price	Price	Price and quantity
Mark-up	High (Cournot)	Low	Med	Med to High
Other Features	Dynamic Game	Only one price setter, other large firms bid MC (Inconsistent with CA obs)	Not fully tested in terms of econometrics implications	Multi-settlements complicates research