



**NEW ZEALAND INSTITUTE FOR THE STUDY  
OF COMPETITION AND REGULATION INC.**

# **Approaches to Assessing Market Power in Electricity Markets**

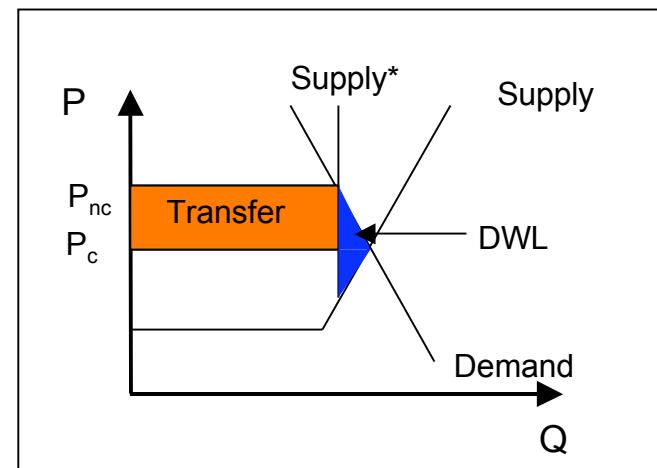
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# What is market power?

- “Market power to a seller is the ability profitably to maintain prices above competitive levels for a significant period of time.” (DOJ, 1997)
- Why is it a problem?
  - Economics: Deadweight loss.
  - Policy/Social: Transfer of wealth.



- It is important to be able to detect the abuse of, or potential for, market power.

# Is it proof of market power?

- High Prices?
  - High prices are a recognized symptom of market power, yet their mere existence doesn't prove that market power is being exercised.
  - High prices may be indicative of a well performing competitive market.
- High Profits?
  - High profits of an individual generator could in fact be due to a number of other factors.



# Methods for assessing the actual abuse of market power

- Simulation Analysis
- Bidding/Supply Analysis



# Simulation analysis

- Wolfram (1999) “Measuring Duopoly Power in the British Electricity Spot Market”, *American Economic Review*.
- Borenstein, Bushnell and Wolak (2002) “Measuring Market Inefficiencies in California’s Restructured Wholesale Electricity Market”, *American Economic Review*.
- Joskow and Kahn (2002), “A Quantitative Analysis of Pricing Behavior in California’s Wholesale Electricity Market During Summer 2000” *The Energy Journal*.

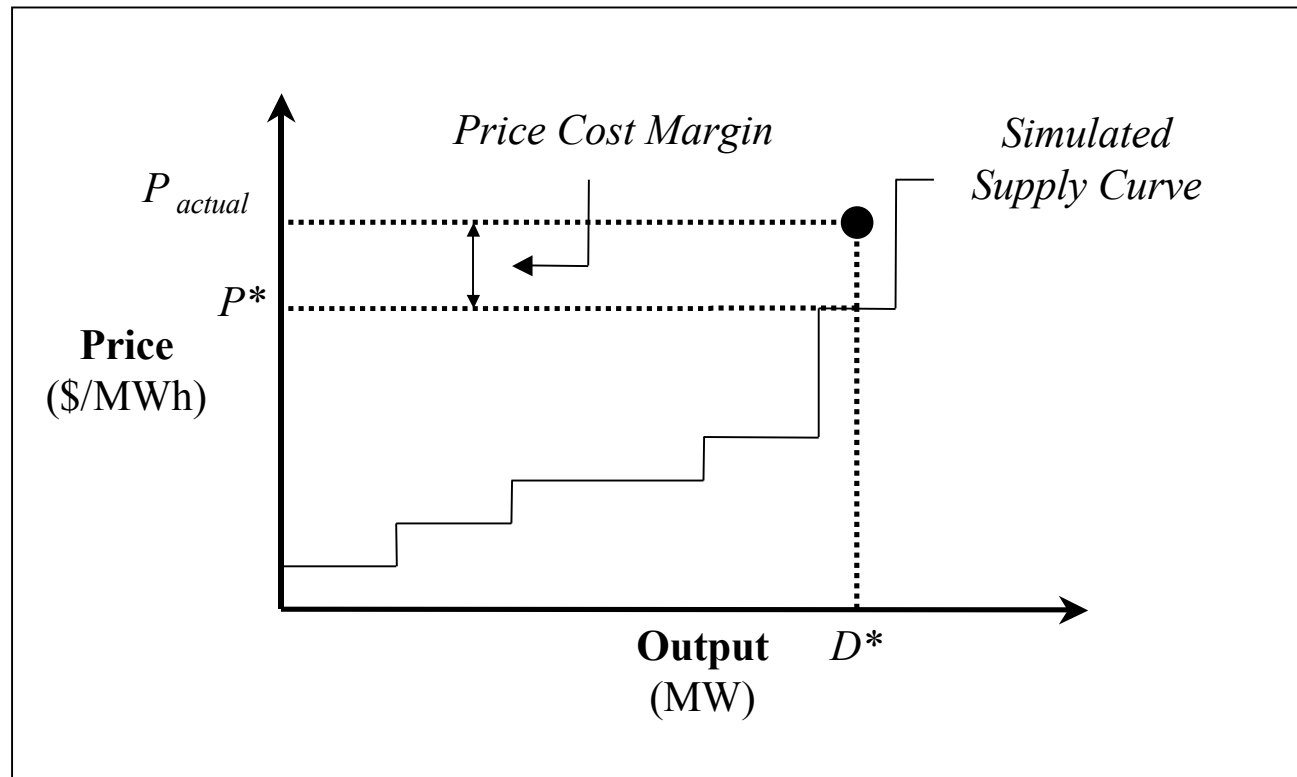


# Simulation analysis cont.

- This approach attempts to find the marginal cost of production of the marginal generator by building a hypothetical competitive market.
- This is done by collecting data on the generation technologies that are present in the market and then estimating a supply curve for each trading period by stacking generators from least expensive to most expensive.



# Simulation analysis cont.



# Simulation analysis (cont.)

- Major simplifications must be made.
- Examples of these simplifications include modeling in a static setting, not incorporating start up costs or minimum load effects, and condensing the market into a single location with a single price.
- The real danger is that these simplifications may in fact underestimate marginal cost by not correctly incorporating the complexities of the real electricity market.





# Simulation analysis in the NZEM

- **Static setting** – Hydroelectric
- What is the MC of hydro (or gas when reserves are low)?
  - MC of hydro not just the direct cost of converting fuel into electricity.
  - Option value of water.
  - This is very challenging to calculate in a dynamic setting using real option analysis, and in a static model it is all but impossible.
- Borenstein et al (2002) deals with this problem by assuming that hydroelectric generators are pricing competitively.



# Simulation analysis in the NZEM

- **Condense the market into a single location.**
  - Ignore inter-nodal constraints and transmission losses, which may impact on the estimate of MC.
  - As constraints limit the availability of generators, a single location simulation, which ignores these constraints, may underestimate marginal cost.



# Simulation analysis conclusion

- “One simply cannot tell from these simulations. The error is larger than the effect being estimated” Scott Harvey and William Hogan (2002).
- Indeed they seem particularly unsuitable for New Zealand’s sometimes constrained, hydroelectric dominated market.



# Bidding/Supply analysis

- Wolfram (1999) Strategic Bidding in a Multiunit Auction: An Empirical Analysis of Bids to Supply Electricity in England and Wales” *RAND Journal of Economics*.
- Joskow and Kahn (2002), A Quantitative Analysis of Pricing Behavior in California’s Wholesale Electricity Market During Summer 2000” *The Energy Journal*.



# Bidding/Supply analysis (cont.)

- It focuses on analyzing the bidding and supply decisions of individual generators to see if they are offering at marginal cost (Wolfram), or equivalently, if they do not offer in all electricity which they could profitably generate (Joskow and Kahn).
- It compares the actual offer curve of individual generator with an estimate of the generator's marginal cost.
- Indeed even if one does uncover a large price-cost margin, it is very difficult to say conclusively whether this is due to abuse of market power or estimation error.
- While this approach may be suitable in the UK where setting where fuel costs (e.g. oil and coal), and hence marginal cost, are relatively easy to determine, in the NZEM the difficulty the measuring marginal cost of hydroelectric power is again the major stumbling block.



# What's next?

- We will now examine the suitability of other techniques to achieve a slightly lesser goal, the ability to measure the potential for such abuses to occur in the NZEM.



# Concentration measures

- This approach was originally built on the simple premise that fewer competitors (i.e. the more concentrated) usually equate to less competition and more scope for market power.
- Example of a concentration index is the HHI which is the sum of the squares of the market shares of firms.
  - Federal Energy Regulatory Commission (FERC) noting that such measures impart only limited information with respect to analyzing market power.
  - Yet some authors argue that they are still useful as high concentration cannot be better than low concentration.
- Determining the relevant geographical market is a very important decision.



# Market definition

- Determining the relevant market is a very important decision, as the market size and composition, can have major impacts on the concentration.
- Is the NZEM one market, or are the North Island and the South Island separate, or alternatively is each one of the 240+ nodes in their own distinct market?
- The two definitions that receive that most attention in the literature are the classical economic market definition and the SSNIP test (small yet significant and non-transitory increase in price).
- As we will see, both of these definitions have some serious drawbacks and the subsequent lack of a universally accepted approach to delineate antitrust markets is a major problem.





# Economic markets

- “Law of one price”
- This definition leads to relatively easy empirical methods to determine the relevant geographic (and product) market.
  - Correlations (Stigler (1985))
- While this is easy to implement in electricity markets due to the vast amounts of price data available, its use for antitrust purposes has been met with criticism (Werden and Froeb (1993), Scheffman and Spiller (1987)).
  - No correlation benchmark.
  - Economic markets are not antitrust markets.

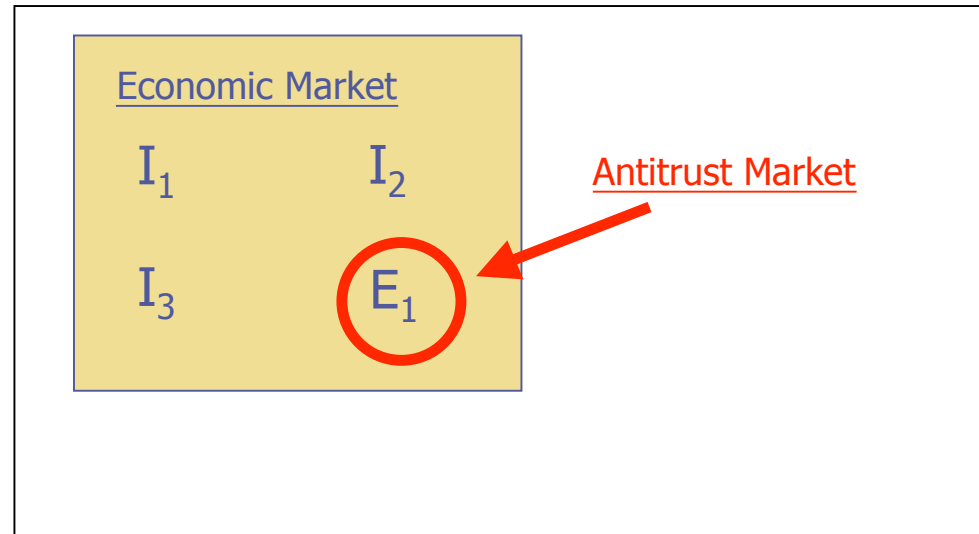


# Antitrust markets (SSNIP test)

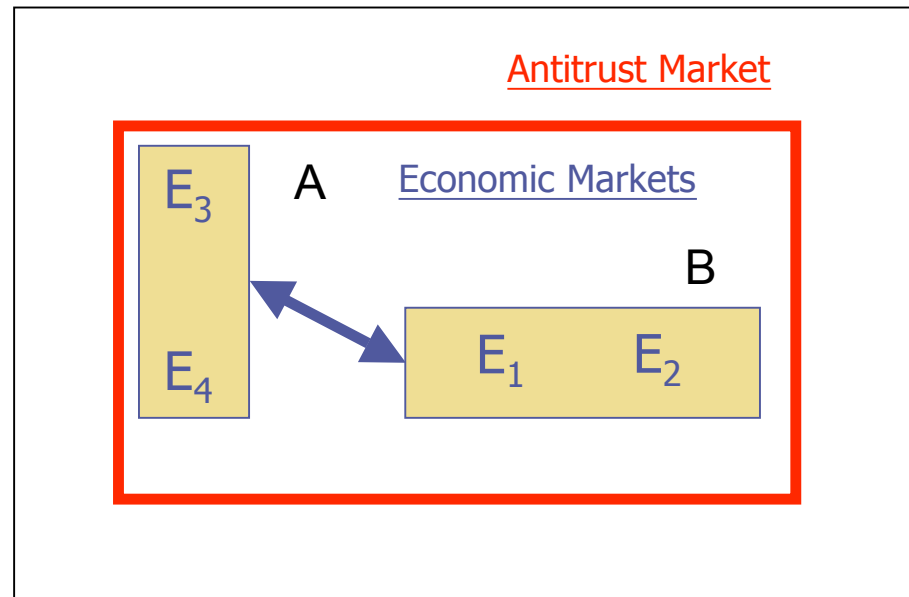
- New Zealand Commerce Commission's approach: "For the purposes of competition analysis, a relevant market is the smallest space within which a hypothetical, profit-maximizing, sole supplier of a good or service, not constrained by the threat of entry, would impose at least a small yet significant and non-transitory increase in price, assuming all other terms of sale remain constant (the SSNIP test)."



# Antitrust smaller than economic



# Antitrust larger than economic



# Which is better?

- Indeed in general the literature suggests that in, theory at least, the Department of Justice's guidelines approach to market definition (sometimes called the SNNIP test or hypothetical monopolist) is superior to the 'economic markets' definition.



# How to SSNIP?

- “If all the generators in a particular geographical location combined into a single firm, would the price in that region rise by a significant amount, say 5%?”
- Residual demand and critical loss analysis.



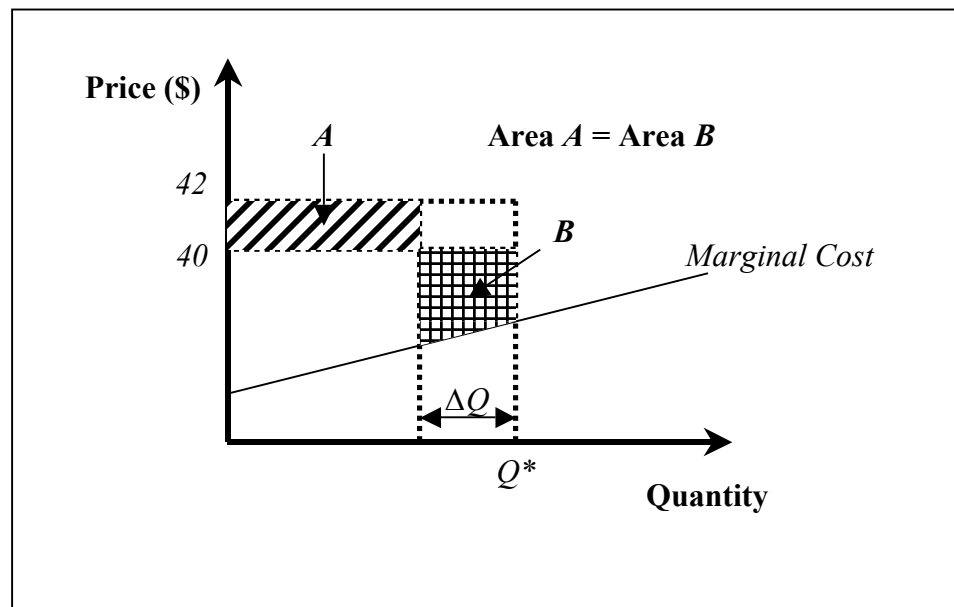
# Residual demand

- Residual demand describes the level of sales a group of generators will make as a function of the price they charge.
- This is relatively easy to estimate.



# Critical loss analysis

- The hypothetical monopolist's critical loss is the proportion of the region's current sales which can be lost if a given price increase is to leave the generators' profits unchanged.





# Conclusion

- The techniques to detect the abuse of, or potential for market power have major problems in the NZEM.
- Particular attention needs to be given to designing a market which is not conducive to market power.
- Such market power mitigating strategies may include reducing transmission constraints, the introduction of a day-ahead market, the encouragement of the entry of new suppliers, and the implementation of real time pricing for larger customers.





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