WORK IN PROGRESS: Market Power and Vertical Integration in Australia's Eastern Natural Gas Network

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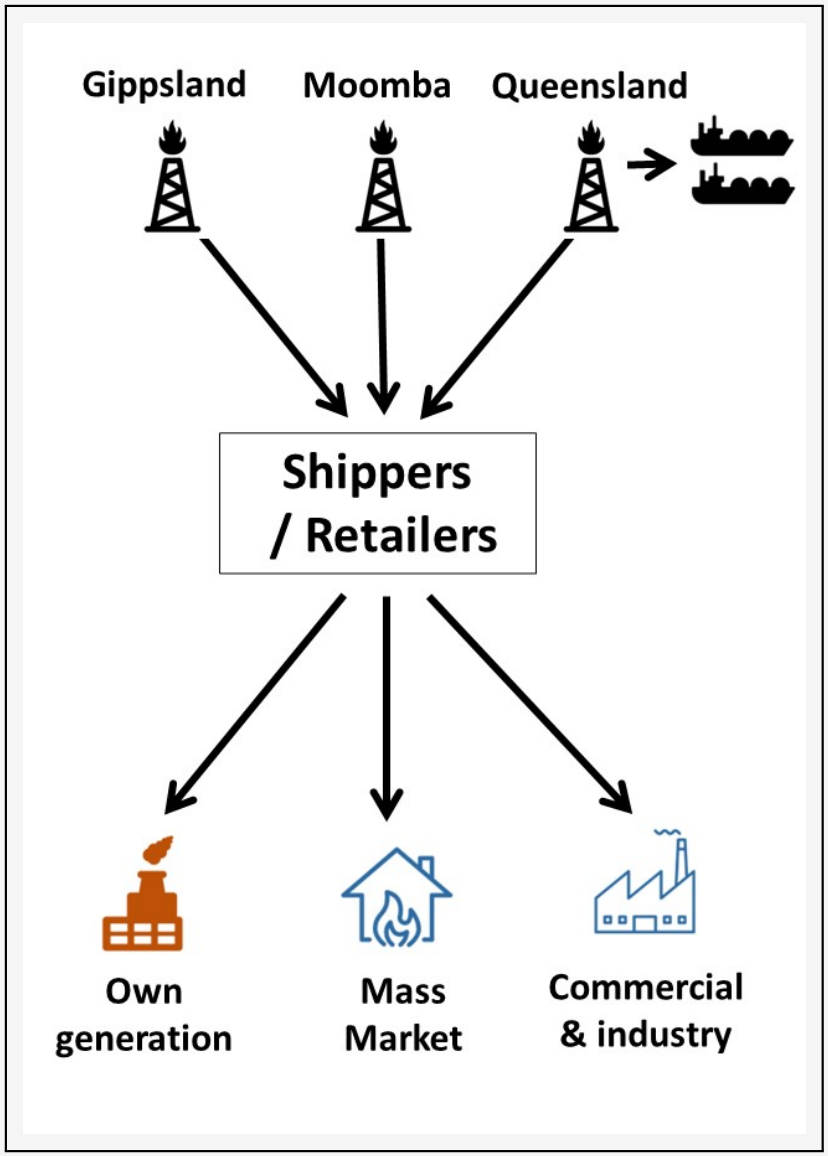
Long term contracts for gas



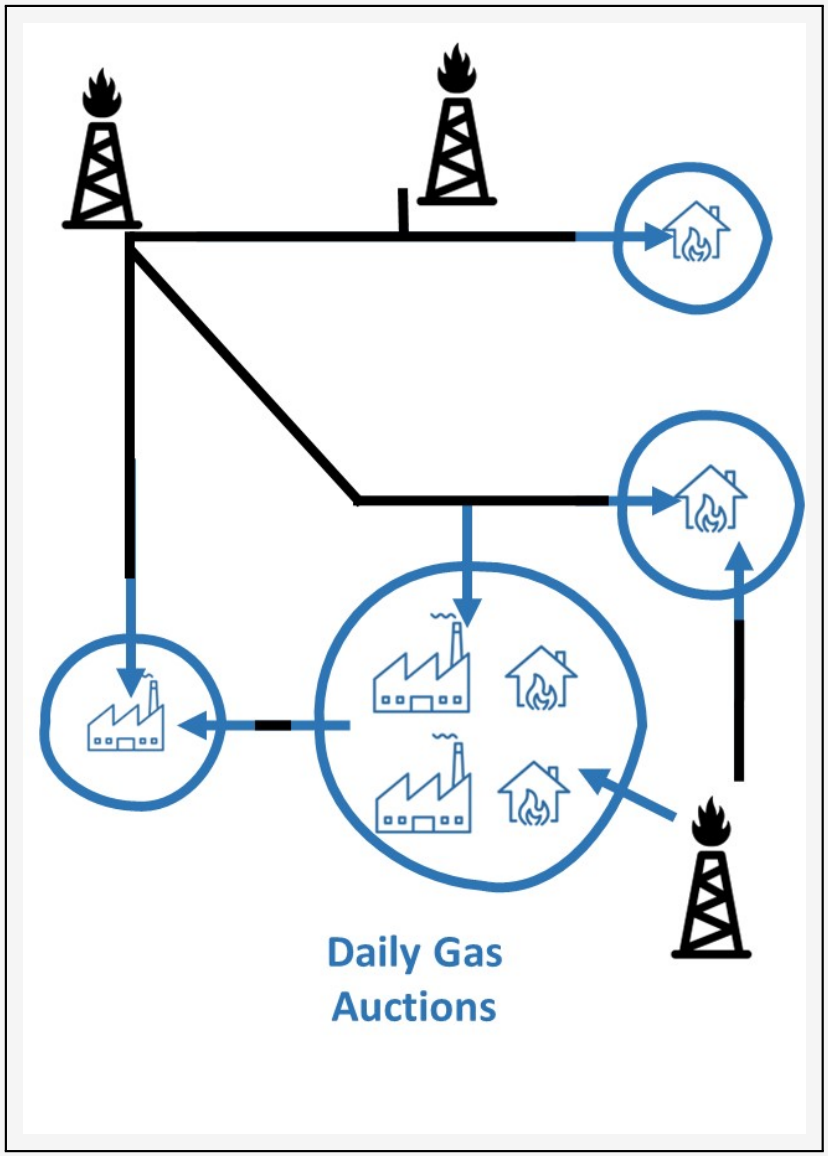
Three large vertically-integrated firms.

Shipping & retail.

In the contract market:

- Buy gas from producers. Linked to international price.
- Transport gas on pipelines.
- Sell gas to retail customers.

Daily auctions for gas



In the spot market:

- Bid to inject gas to the hubs.
- Bids are supply functions.
- Buy gas used by their retail customers at the market price.
- Financial products not widely used

Participation in spot markets has increased

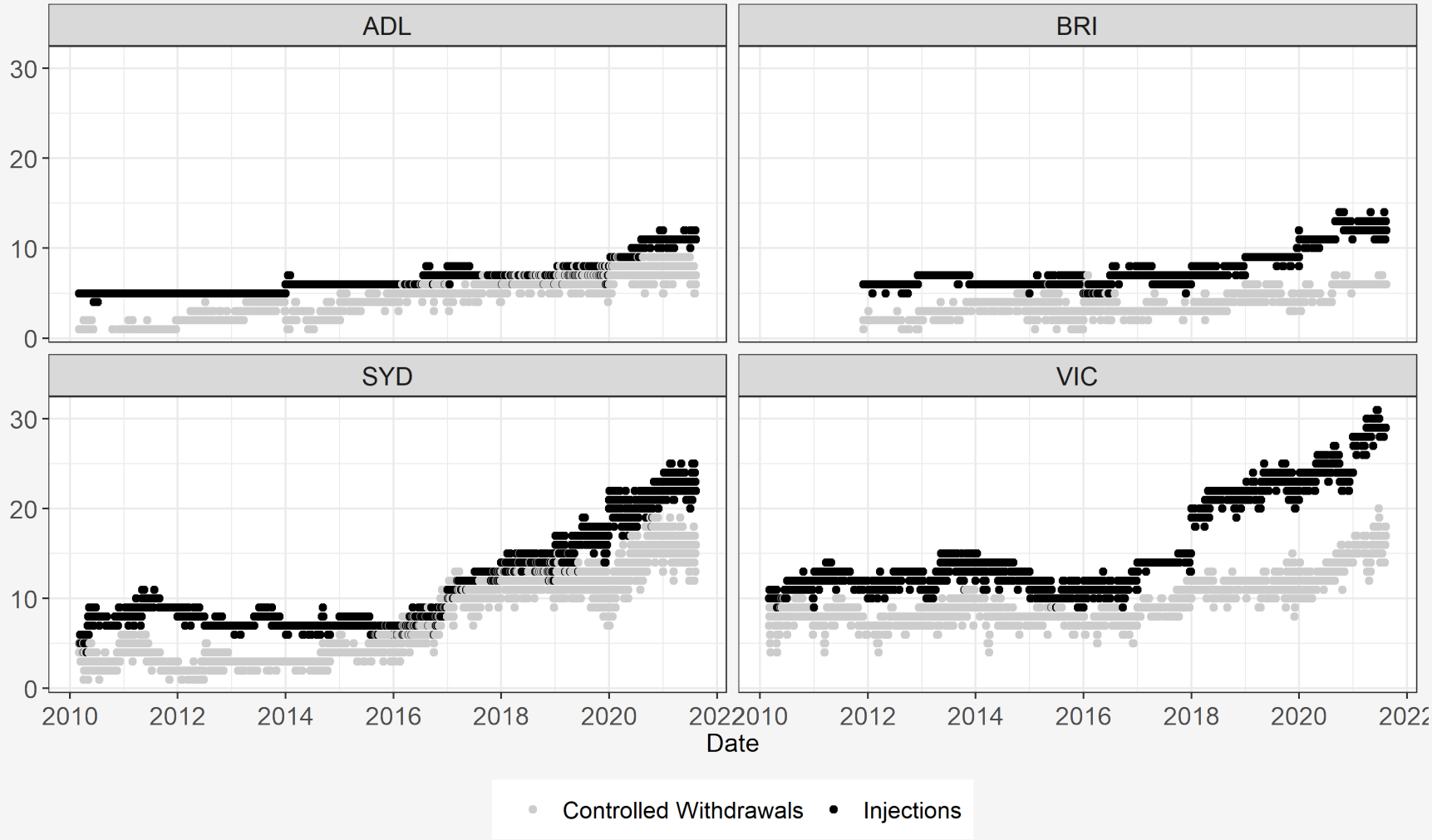


Figure: Number of bidders, daily. Source: AEMO

Outline

Spot prices are close to marginal cost

- Large firms inject just enough gas for their own customers
- Little concern about mark-ups
- Price reveals marginal cost
- Concerned about illiquidity

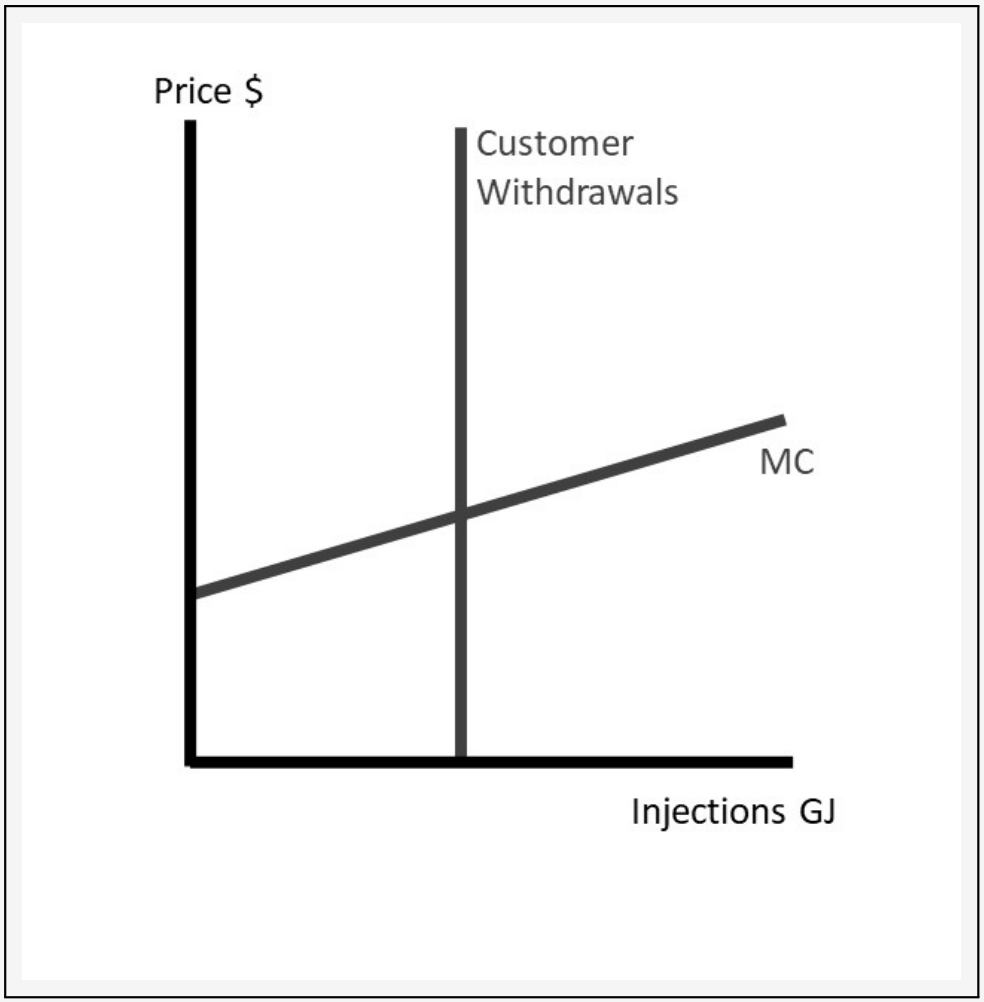
Contract prices are high

- Concerned about lack of competition

How are they related?

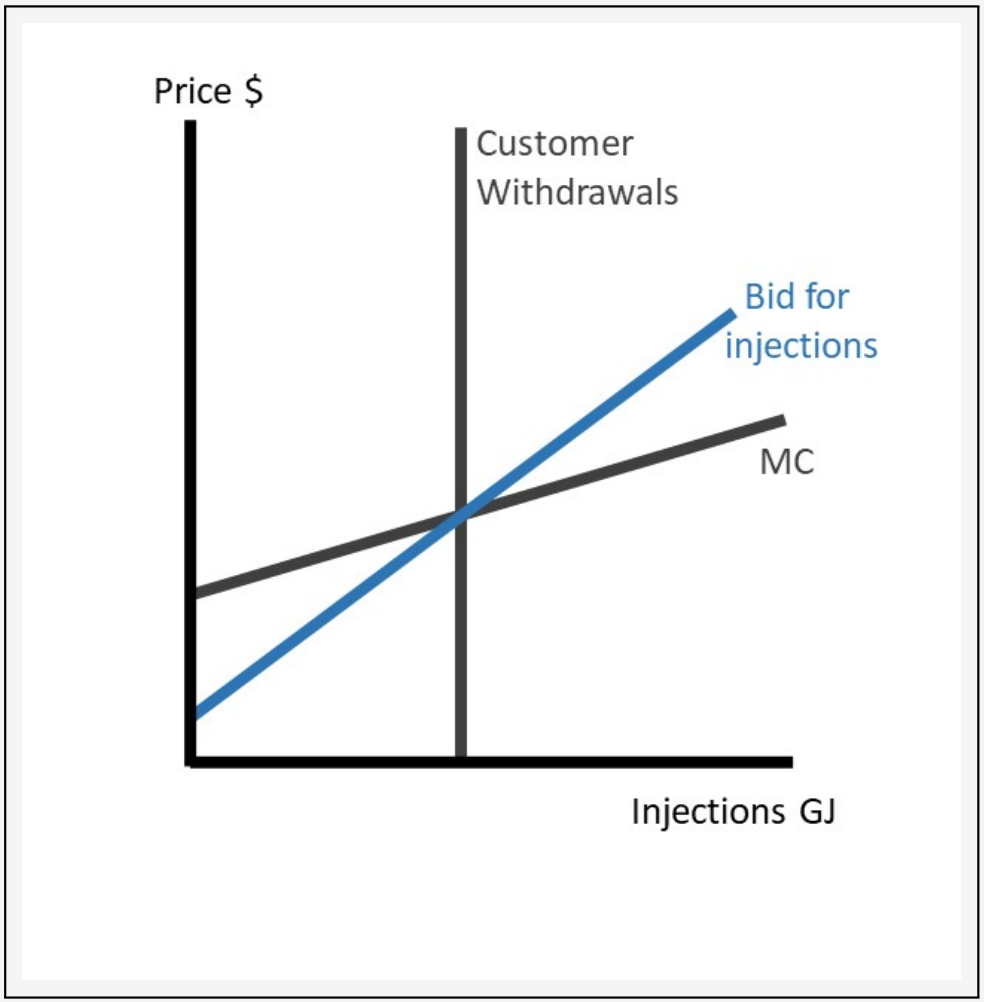
- What does the spot market tell us about the contract market?

Daily bids in gas hubs



- withdrawals set by retail contracts
- marginal cost set by upstream and pipeline contracts
- neither are observed

Daily bids in gas hubs



- optimal bid:
  price above MC when selling,
  below MC when buying
- observed for all four hubs
- participation in electricity
  market makes bids steeper

Estimating daily withdrawals

- If a firm maximizes profit in one hub:

$$\textbf{Marginal Revenue}_h = \textbf{Marginal Gas Cost} + \textbf{Marginal Transport Cost}_h$$

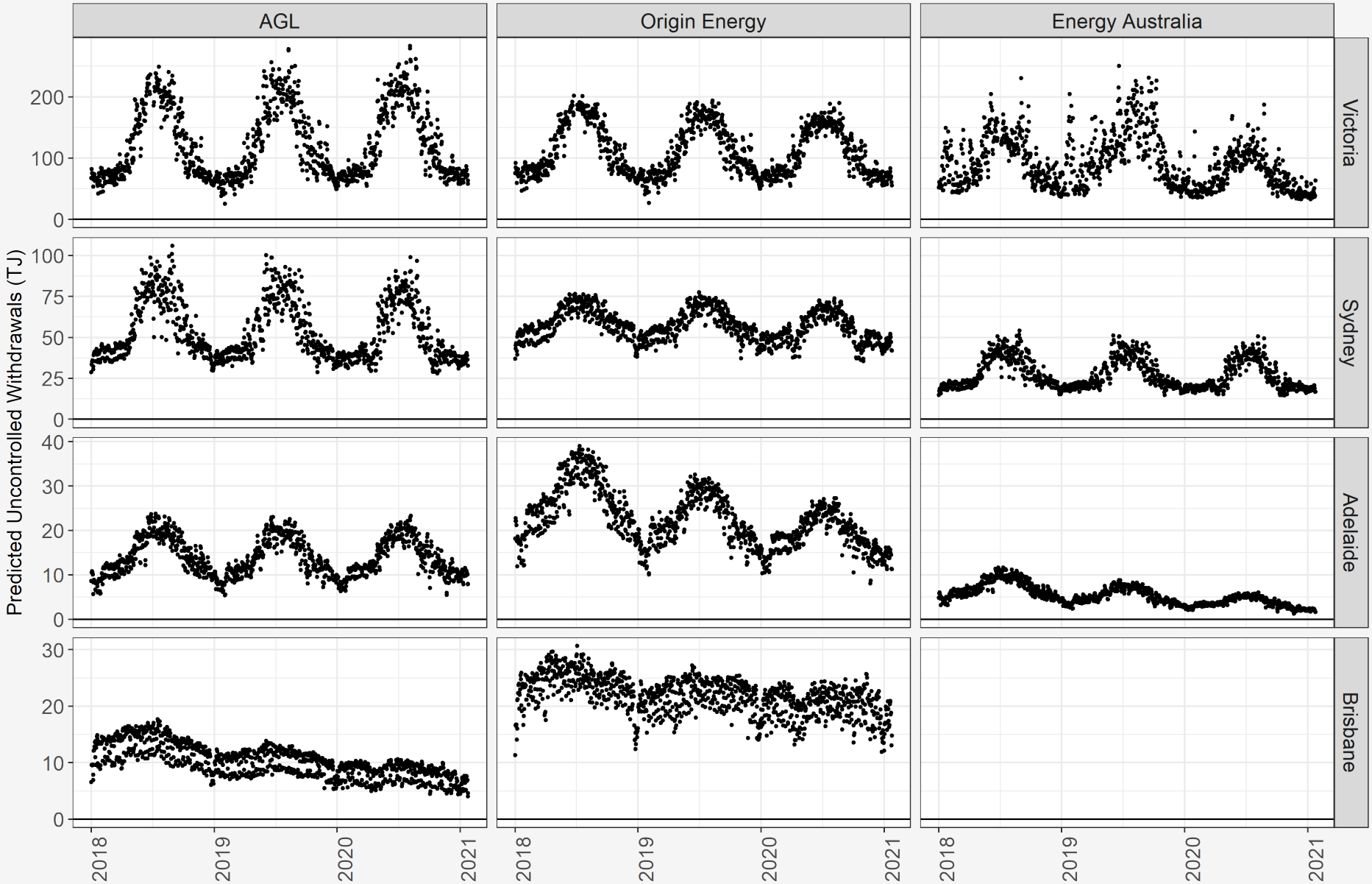
- If a firm maximizes profit across all hubs:

$$\textbf{Marginal Revenue}_h - \textbf{Marginal Transport Cost}_h = \textbf{Marginal Revenue}_g - \textbf{Marginal Transport Cost}_g$$

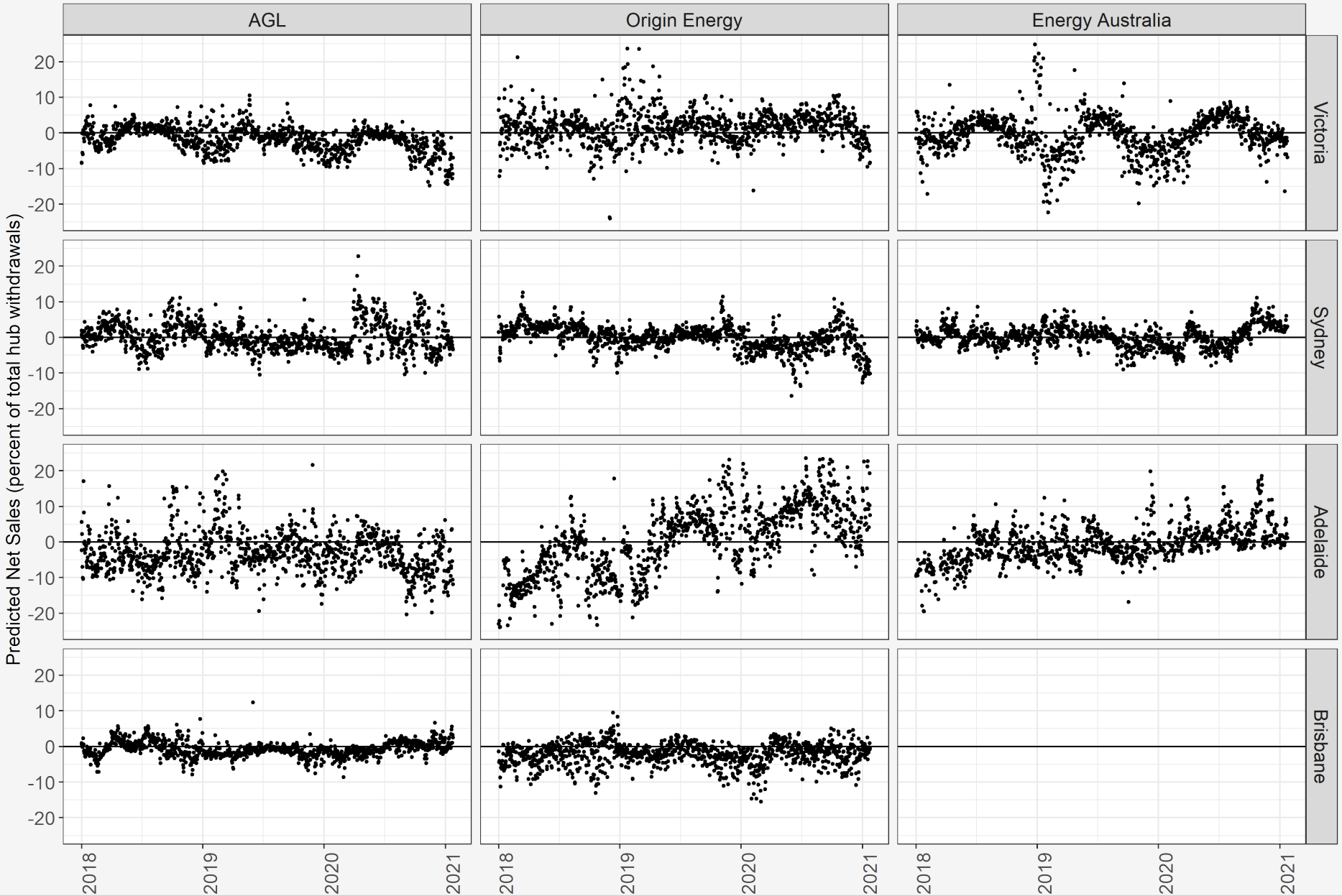
- Use this condition to estimate withdrawals for each firm
- No need to estimate marginal cost of gas

▸ Details

Estimated withdrawals by firm



Estimated net sales by firm



Estimated markups

		± 5%	± 10%
Victoria	AGL	90.1	98.7
	Origin Energy	84.9	95.8
	Energy Australia	77.4	94.6
Sydney	AGL	89.1	96.8
	Origin Energy	94.7	98.9
	Energy Australia	94.5	99.2
Adelaide	AGL	84.3	97.0
	Origin Energy	72.4	90.2
	Energy Australia	91.7	98.1
Brisbane	AGL	93.0	98.0
	Origin Energy	82.6	93.7

Table: Percent of mark-ups between

Mark-ups are only calculated for days when there is no congestion in the network

Take-aways

- Large firms trade little in the hubs
- Inject enough gas for their own customers
- The incentive to mark up (or down) the price is small
- Observed spot market price close to marginal cost
- Firms have arranged their contracts to get this outcome
- Participation in electricity markets reduces trade volumes in gas

- **Work in progress**:
  updating estimation approach to follow Reguant (2014), Ryan (2021)

What do we know about retail markets?

Mass market

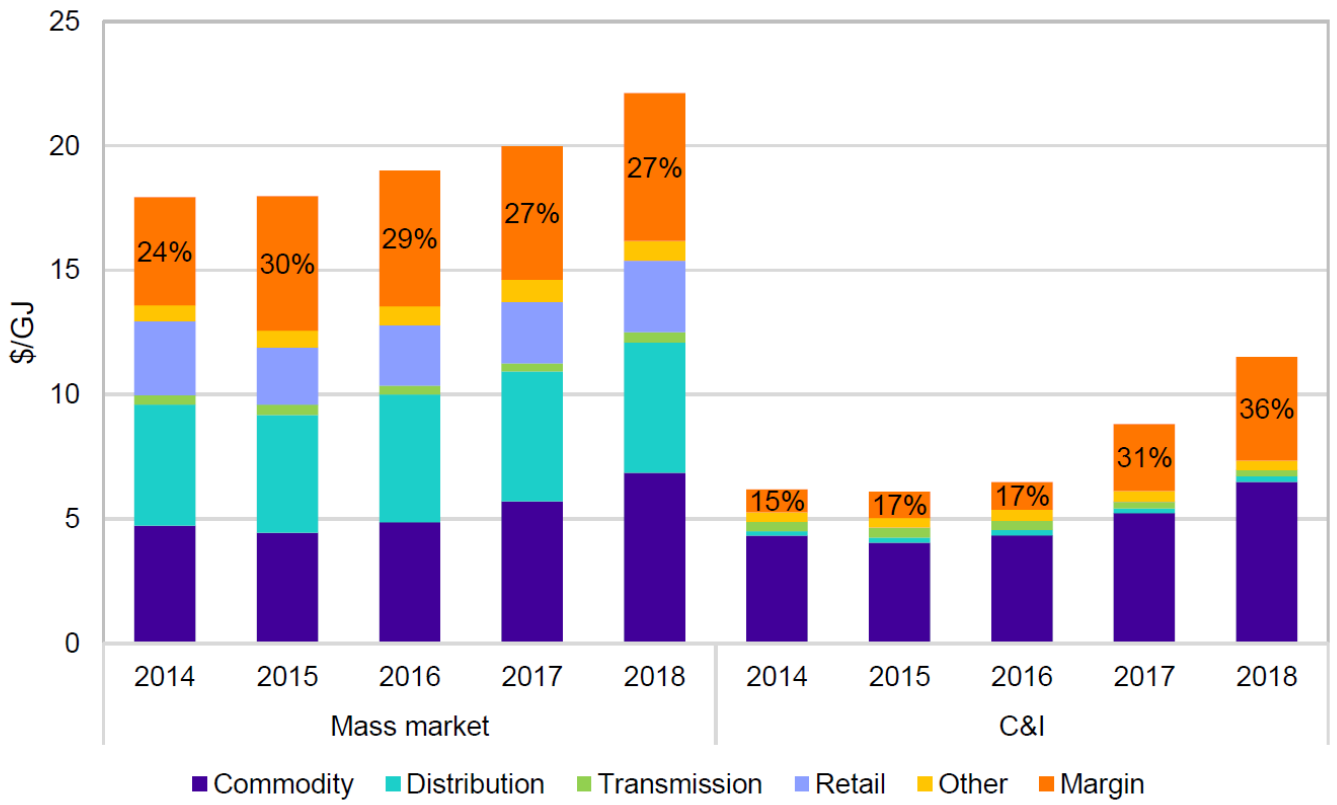
- Consumers appear to be loyal or have search costs
- Concerns about high margins
- ESC, ACCC, AEMC

Large commercial and industry users

- Likely engage in search
- At the margin, compete with export demand
- ACCC

ACCC estimated very high retail margins

Chart 4.5: Cost stacks for Victoria, mass market and C&I



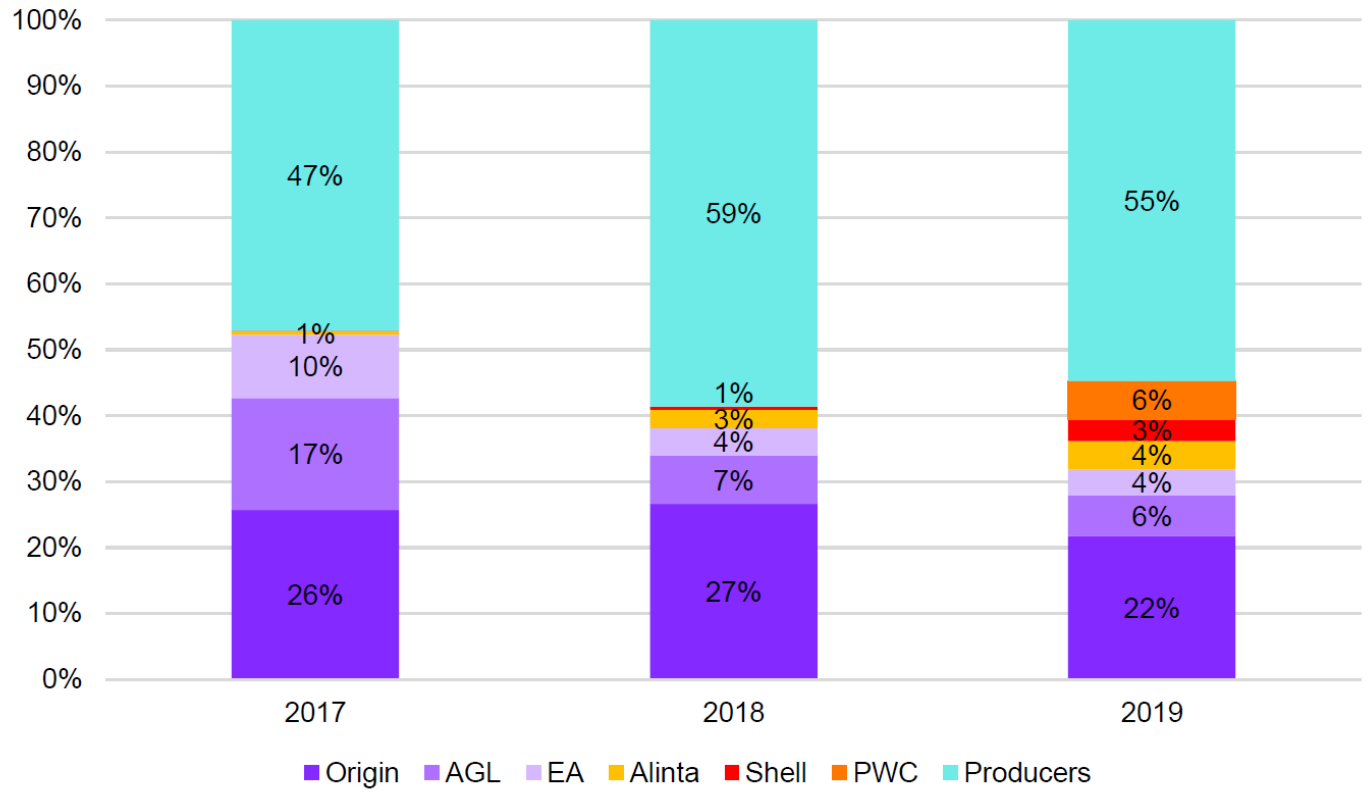
Source: ACCC analysis of information provided by the major retailers

Note: Costs are allocated to the mass market and C&I customer segments, and margins are estimated, based on the methodology outlined in section 4.4.2 above. See section 4.4.3 for caveats in relation to these estimates.

Source: ACCC, Gas inquiry 2017-2020: July 2019, p99

Share of large customer volumes declining

Chart 4.7: C&I market shares of retailers and producers

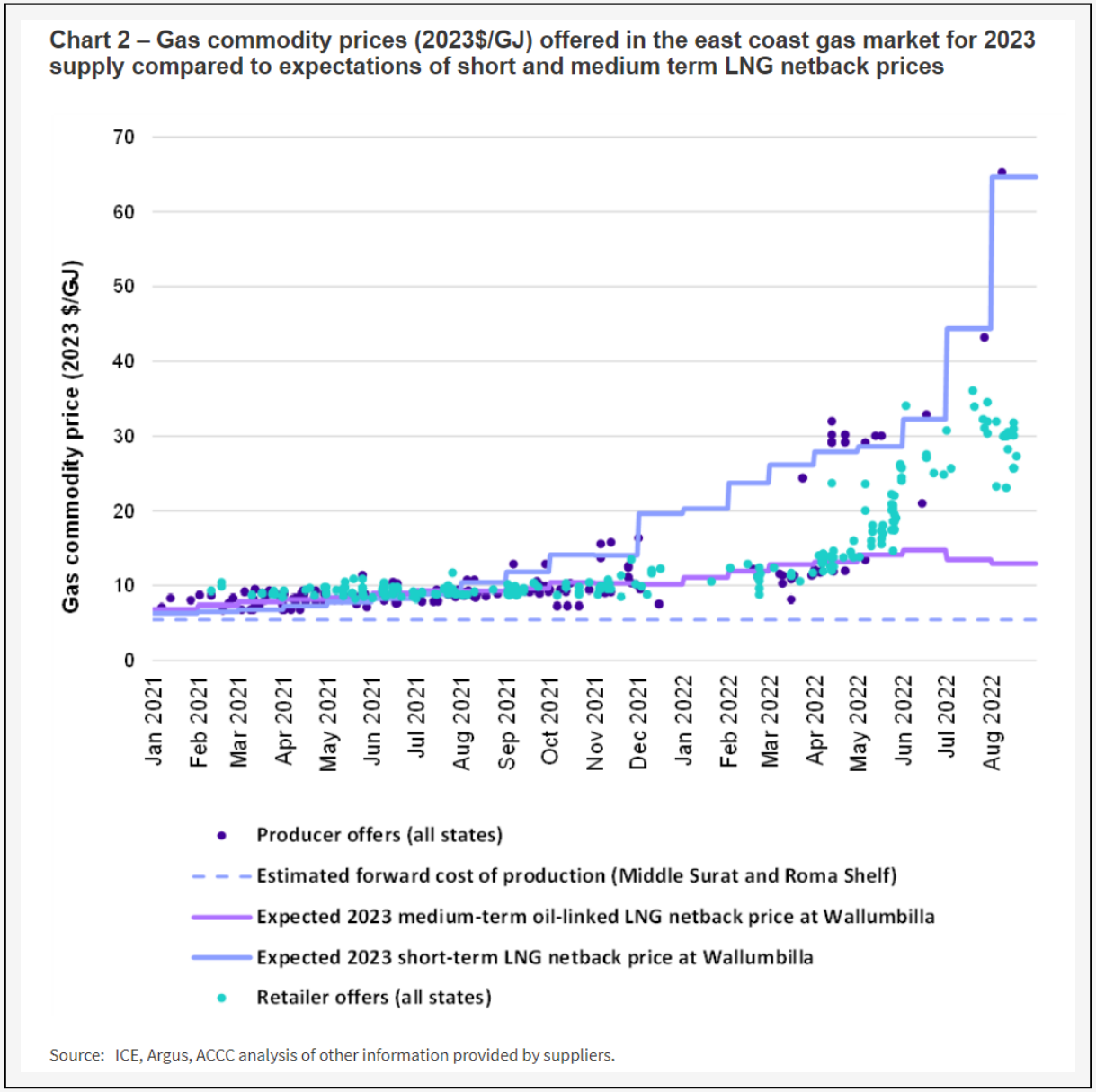


Source: ACCC analysis of information provided by suppliers.

Note: Market shares are relative to the retailers shown in the chart and the producers from which the ACCC has collected information for this report. The chart excludes supply to C&I users by other suppliers. Data for 2019 is based on the quantity of gas contracted with C&I users as at April 2019.

Source: ACCC, Gas inquiry 2017-2020: July 2019, p107

Prices offered to large users for 2023 supply



Source: ACCC, Gas inquiry 2017-2025, LNG Netback Price series, November 2022

How do the two markets influence each other?

Sequential markets for the same good:

- First, firms choose their retail sales and price
- Second, firms decide whether to sell (or buy) more in the spot markets

- Firms anticipate outcomes in the spot market when making retail decisions
- The spot market outcomes depend on the contract markets

Price premium in sequential markets

- Ito and Reguant (2016)
- Day-ahead and real-time electricity markets
- Single dominant firm and competitive fringe
- Limited arbitrage
- Predict price premium in the day-ahead market
- Consistent with observations in the Iberian electricity market

Do the results translate to retail and spot markets for gas?

Price premium in sequential markets

Sequential markets increase quantity supplied by firms with market power

- Sell some quantity in first market, which changes position in second
- Incentive to sell more in second market
- Allaz and Vila (1993)

Firms price discriminate between two markets

- Opportunity cost of selling in first market is price in second market
- Set a higher price in the first market than the second
- Only when arbitrage between two markets is limited

Price premium in sequential markets

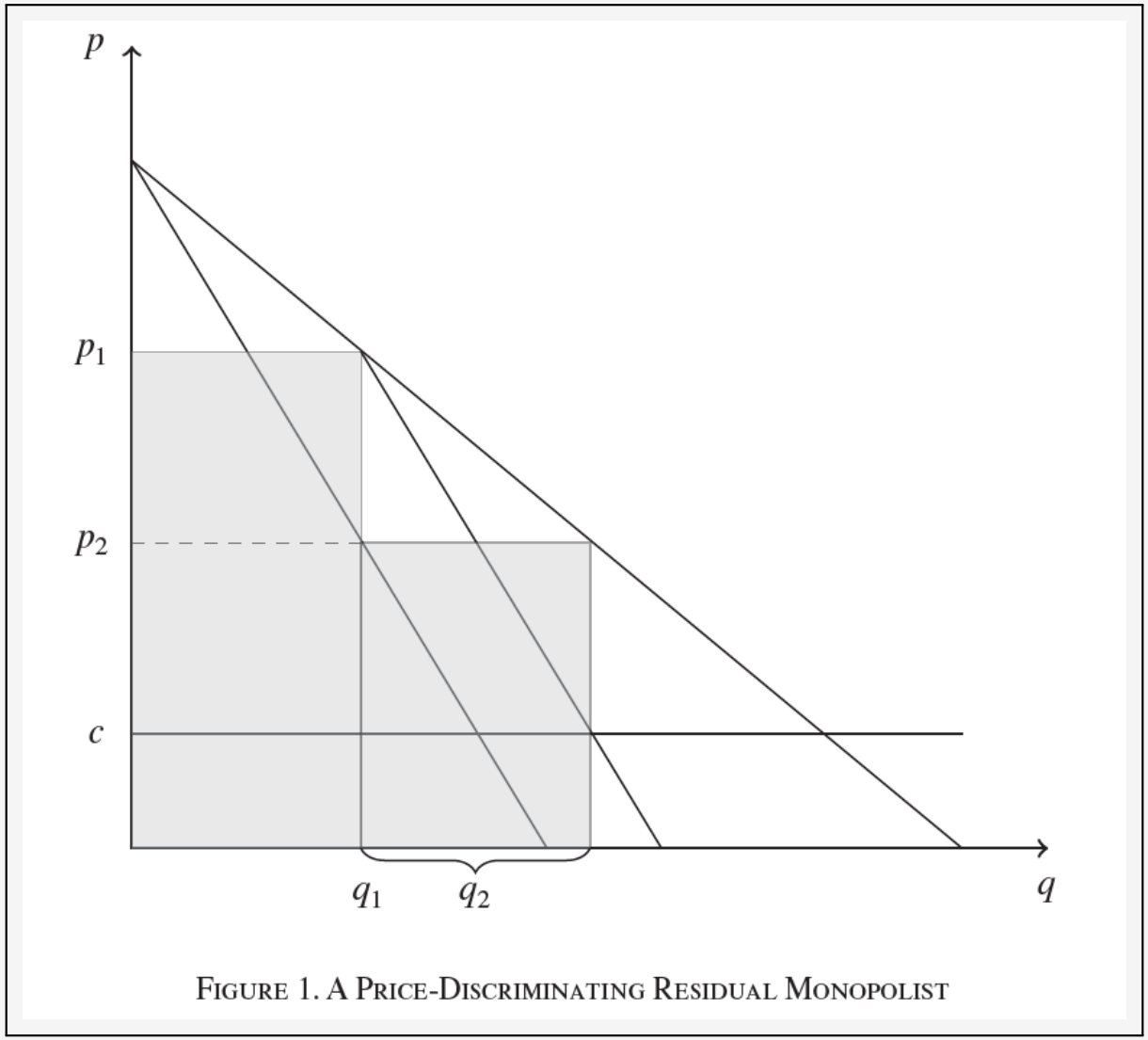


FIGURE 1. A PRICE-DISCRIMINATING RESIDUAL MONOPOLIST

Source: Ito & Reguant (2016), 'Sequential Markets, Market Power, and Arbitrage', *American Economic Review*, 106 (7)

Price premium in sequential markets

Fringe firms have incentive to arbitrage, if they can

- Over-sell in the first market, buy in the second market

Illiquid second markets are a problem

- The inelastic second market, can only arbitrage smaller quantities
- Large firms can raise prices in first market

What about Australian gas markets?

Stylized facts

- Large price premium in retail market
- Large firms trade little in spot market
- Increase in participation in the spot markets over time
- Arbitrage by small firms doesn't seem to appear (risk?)

Revise model assumptions

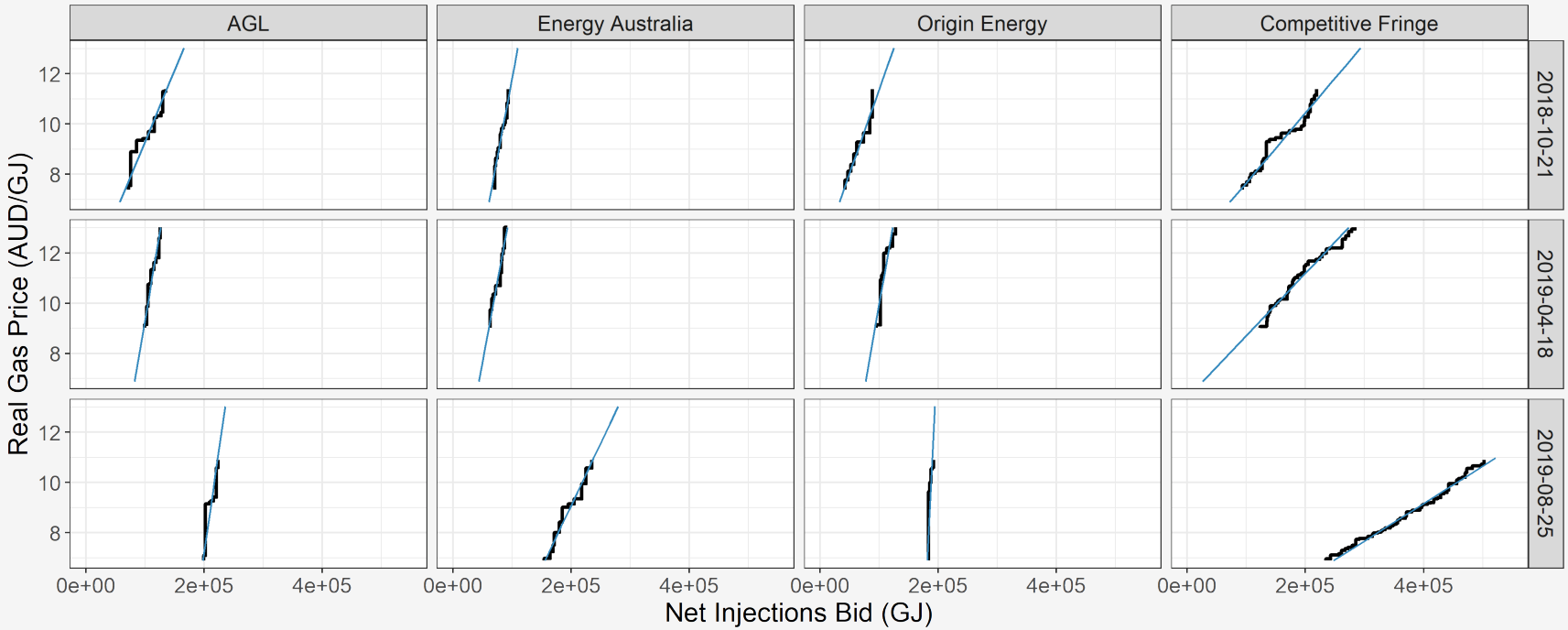
- Total retail sales determine size of demand in spot
- Equilibrium with three large firms (rather than monopolist and fringe)
- Endogenous choice of cost functions

Where to from here?

- Why do large firms arrange their contracts to avoid trade in the spot market?
- Under what circumstances should we expect higher spot market participation to improve retail price competition?
- Has entry in the Victorian market made a difference?

Appendix

Linear approximation for bids



Estimation details

First order condition:

$$p_h - s_{hn}(p_h)[\iota_{hn} - \omega_{hn}] - t_{hn}(\cdot) = p_g - s_{gn}(p_g)[\iota_{gn} - \omega_{gn}] - t_{hn}(\cdot)$$

Model for uncontrolled withdrawals

$$\begin{aligned}\omega_{dhn} &= \left[\beta_{0hn} + \beta_{1hn} d + \beta_{2hn} \text{hdd}_{dh} + \beta_{3hn} \text{wkend}_d\right]\omega_{dh} + \xi_{dhn} \\ &\equiv \omega_{dh} X_{dh} \beta_{hn} + \xi_{dhn}\end{aligned}$$

▸ Estimation