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1. Introduction

I never owned a car as a student. If I had to go somewhere, I walked or took public transport. I paid little attention to petrol prices because they did not affect my weekly budget. However, if you talk to someone who owns a car or drives to work, you will likely find they pay attention to prices at the pump. They may tell you which are the cheap petrol stations in their market, what the cheap day of the week for buying petrol is, or express concern that petrol prices rise around weekends and holidays.

Consumers' interest in petrol prices is likely driven by three facts: (1) petrol prices are displayed on large signs, making them highly visible; (2) in the short-run, consumers are unable to substitute from petrol to other fuels or modes of transportation when petrol prices rise; and (3) consumers spend a large share of their income on petrol. In 2009, the average Australian spent $51.02 per week on petrol, or 4.1% of their total weekly expenditures (ACCC 2011). Moreover, petrol is a relatively homogeneous good, which leaves consumers questioning why its price varies so much over time and across stations.

Given the impact petrol costs have on consumers' budgets, the Australian Competition and Consumer Commission (ACCC) monitors competition in Australian petrol markets. In fact, the ACCC has an entire branch solely dedicated to petrol markets! A striking finding the ACCC has documented for at least the past five years is that *petrol price cycles* exist in Australian cities. Figure 1, taken from an ACCC (2010) monitoring report, illustrates petrol price cycles for Adelaide, Brisbane, Melbourne, Perth, and Sydney. In these cities, the average daily petrol price drastically increases once a week ("*price restorations*"), followed by a sequence of daily price decreases (the "*undercutting phase*"), until the next price restoration occurs.[1] To the extent that drivers purchase petrol from different stations at different parts of the cycle, petrol price cycles may explain why consumers form opinions about cheaper stations, cheap days for buying petrol, and petrol price hikes around weekends and holidays.

This article provides an overview of the burgeoning academic literature on petrol price dynamics and cycles. I first discuss the empirical literature on price cycles in petrol markets. In light of the empirics, I then present theories of competition and consumer demand in petrol markets that help us understand the many facets of petrol price cycles. Developing such an understanding is important for antitrust policy. Policymakers require benchmark economic models that predict how prices should behave if stations set prices competitively, given market and supply conditions. With such a model in hand, authorities can effectively monitor the conduct of petrol stations, identify collusive behaviour, and design policies that help to ensure consumers pay fair prices. It is my hope that this article sheds light on the economics behind petrol price cycles, informs the development of such benchmark models, and piques readers' interest in petrol industry research.

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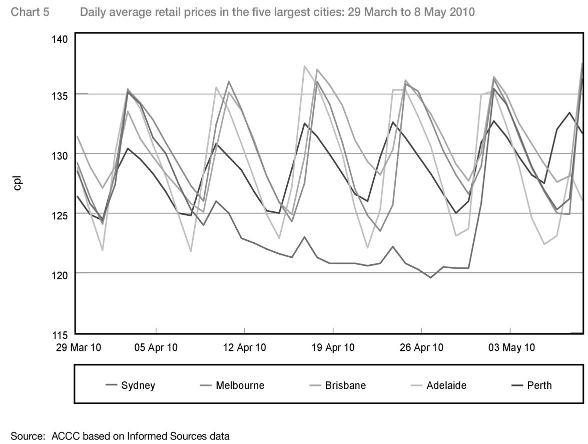

Figure 1: Petrol Price Cycles in Australian Cities
Source: ACCC (2010)

2. Empirical Evidence on Petrol Price Cycles

Petrol price cycles are not a recent phenomenon, nor are they unique to Australian cities. The earliest evidence comes from Allvine and Patterson (1974), who document petrol price cycles in the 1960s and 1970s across various U.S. cities. Castanias and Johnson (1993) investigate petrol price cycles using weekly average petrol price data from 1968-1972 for Los Angeles, and propose theoretical explanations for the existence of price cycles (discussed below). To my knowledge, this is the first *single-market study* in economics that uses data for an individual market to examine petrol price cycles.

A second generation of empirical research on petrol price cycles emerges from two papers by Eckert (2003) and Noel (2007a). The key novelty of these papers is that they are *multi-market studies*. They examine weekly average petrol price data for a cross-section of 19 Canadian cities and formally attempt to relate the presence of price cycles to local market characteristics. Noel (2007a) documents the existence of three types of petrol pricing equilibria in these data: (1) price cycles; (2) cost-based pricing; and (3) sticky pricing. These equilibria are depicted in Figure 2, which contains daily plots of the average petrol price and "rack" price (i.e, the daily wholesale price of fuel) for the three Canadian markets: St. Thomas (price cycles), Goderich (sticky pricing) and Ajax (cost-based pricing). A key distinction in these studies is made between *branded* and *independent* petrol retailers. Branded stations operate under the name of major petrol companies that own refineries. Independents are all other types of stations.[2]

Various multi-market studies have recently surfaced with the availability of richer datasets that entail: (1) larger cross-sections of markets (≈ 100); (2) higher frequency reporting (daily not weekly); and (3) more disaggregation (station-level prices, not city-level averages). Lewis (2009) examines a panel of daily city-level average price data for U.S. cities, and discovers petrol price cycles exist in Midwestern U.S. cities. He finds markets with a large share of stations concentrated amongst a few firms (regardless of whether they are independents or brands) are more likely to have price cycles. Doyle et. al (2010) similarly find petrol price cycles mainly exist in the Midwestern U.S., particularly in markets with larger shares of independent stations with convenience stores. Lewis (2011) investigates price leadership and coordination using a panel of station-level petrol price data from U.S. cities. He shows retailers that operate large chains/networks of stations initiate price restorations in cycling markets, while independently owned non-chain stations are aggressive in undercutting prices during the undercutting phase of

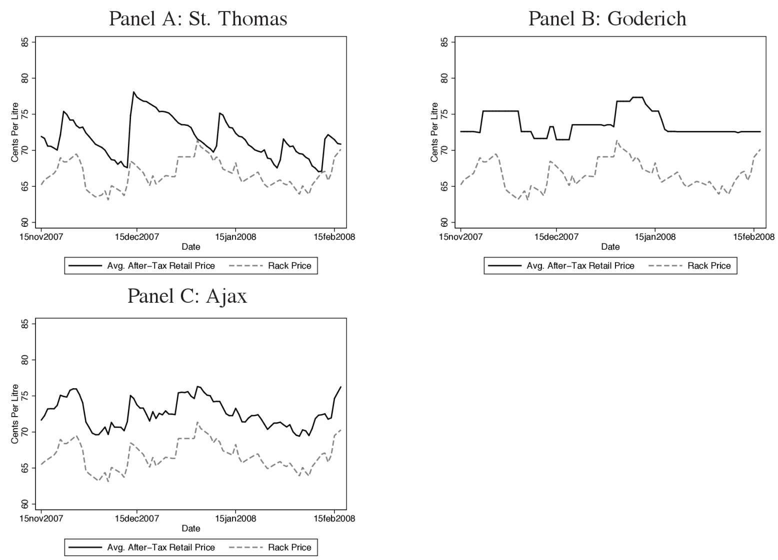

Figure 2: Price Cycling, Sticky-Pricing, and Cost-based Pricing
Source: Byrne and Ware (2011)

the cycle. Byrne and Ware (2011) examine a station-level panel from Canada, and similarly find brands who operate large retail chains of stations in cycling markets lead price restorations, while independent stations lead in price undercutting. They further revisit price cycles, cost-based pricing, and sticky pricing in Canadian markets, and argue that the ability of brands to act as leaders and coordinate price restorations are key to maintaining stable price cycles.

To summarise the findings from the multi-market studies, petrol price cycles are most likely to exist in cities where there are:

1. dominant retailers with large networks of stations relative to market size who can signal price restorations and coordinate market prices
2. many independent stations, possibly with convenience stores, who have a large incentive to undercut dominant retailers' prices to steal away business.

Markets where (1) and (2) hold are characterised by a large degree of firm-size asymmetry in terms of the number of stations operated by petrol companies. Such market structures give rise to interesting leader-follower dynamics in price setting over the cycle. Dominant retailers are leaders and independents are followers during price restorations; independents are aggressive in undercutting and driving down prices during the undercutting phase while dominant retailers are non-aggressive in price undercutting. Figure 3 depicts these respective roles of dominant and independent retailers over a price cycle.

In contrast, cost-based pricing markets tend to be cities where there are no firms with sufficiently large networks of stations relative to market size who can coordinate price restorations, and thereby maintain stable price cycles. In such markets, coordinating price restorations is infeasible, and a competitive cost-based pricing equilibrium prevails. Sticky-pricing markets tend to be rural towns with less frequent petrol inventory shipments (i.e., bi-weekly as opposed to daily), and few firms with little or no asymmetry in firm size.[3]

There are numerous single-market studies on petrol price cycles that complement the cross-market analyses. These include Noel (2007b) (Toronto, Canada), Eckert and West (2004b), Eckert and West

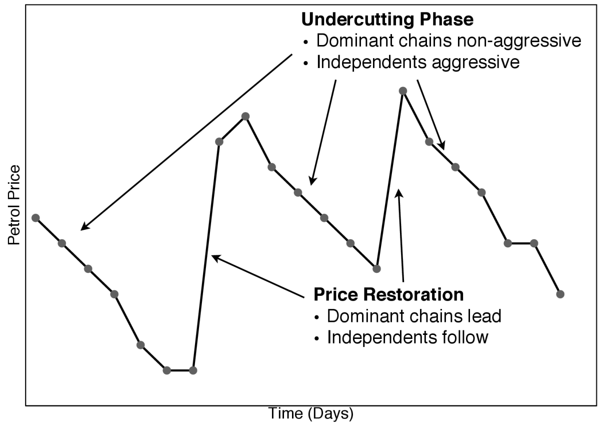

Figure 3: The Roles of Dominant and Independent Retailers

(2004a), Eckert and West (2005) (Vancouver and Ottawa, Canada), Atkinson (2008) (Guelph, Canada), Wang (2009), De Roos and Katayama (2010) (Perth, Australia). These studies yield a number of insights into competition in individual petrol markets, many of which re-affirm that dominant chains lead the market in initiating price restorations, while independent stations are aggressive in undercutting prices. Multiple studies find price restorations are synchronised across all parts of cities.

Wang's (2009) study of a market experiment in Perth, Australia is particularly important for understanding petrol price cycles. In January 2001, Perth introduced a law that required all stations to report their next day prices to the government by 2:00 pm each day so they could be published on the website http://www.fuelwatch.wa.gov.au. He shows Perth's petrol price cycle completely disappears following the law's introduction, and then re-emerges in May 2001. He further shows that prior to the law, BP is the clear market leader in initiating price restorations, while BP, Caltex, and Shell share the leadership role in the post-law period. Intuitively, the law increased the "cost" of being the price leader. Before the law, if a firm attempted a price restoration but found no other firms followed, they could retreat from the restoration price back to a lower price within minutes with little harm done. Under the law, price leaders are committed to relatively high prices and low market shares for a 24-hour period if they initiate a price restoration alone. The law caused the mixed strategy equilibrium that governs *who* initiates price restorations to shift from a BP-only equilibrium, to an equilibrium where BP, Caltex, and Shell shared the more costly leadership role. That price restoration events can be characterised by a mixed strategy equilibrium is an important result for developing theories of price cycles.

Before discussing theories that help us understand petrol price cycles, I will briefly note key data sources for potential researchers. Data for the U.S. studies mainly come from Oil Price Information Service (OPIS, www.opisnet.com). Data for Canada largely come from two online petrol price reporting websites GasTips (www.gastips.com) and GasBuddy (www.gasbuddy.com). For Australia, data mainly come from MotorMouth (www.motormouth.com.au) or FuelWatch for Perth (http://www.fuelwatch.wa.gov.au/). Yet another alternative is to collect data by hand like Atkinson (2008) did. As a PhD student, he drove around Guelph, Ontario every day from 8:00 am to 10:00 pm for three months straight to observe and record individual stations' price postings every 45 minutes!

3. Why do Petrol Price Cycles Exist?

Developing a theoretical model of petrol markets is a challenging task that requires researchers to confront multiple demand- and supply-side factors that play a role in determining prices. On the demand-side, consumers' purchasing decisions are likely affected by various factors beyond petrol prices, including: (1) firm-specific branding effects (for example, customer loyalty programs); (2) consumers' daily travel routines for work, school, and so on (which affects the stations they see); (3) consumers' management of petrol fuel tank inventories (do consumers just fill up when empty, or strategically time purchases?); and (4) consumers' informativeness over the petrol price distribution and "search costs" in obtaining information on multiple stations' prices. On the supply-side, it is generally assumed that stations set prices to maximise profits, taking as given their wholesale cost of petrol, and rival stations' prices. That is, firms are strategic Bertrand price competitors with an incentive to undercut their rivals' prices to steal away business. The optimal pricing strategies of stations ultimately depend on their wholesale costs, and the various primitive demand-side factors that govern consumers' purchasing decisions.[4] The Bertrand price equilibrium could be in *pure* strategies where each firm sets a single price with certainty, or *mixed* strategies where firms randomly choose prices.

While these demand- and supply-side factors in petrol markets are individually well-understood, there is no consensus over what is the "right" theory for interpreting petrol price cycles. Castanias and Johnson's (1993) seminal paper concludes that Maskin and Tirole' s(1988) dynamic oligopoly model is best suited for interpreting petrol price cycles. In its simplest form, this model is a discrete-time, infinite horizon price-setting game between two firms who sell a homogeneous good, have identical marginal costs, and no fixed costs nor capacity constraints. The firms alternate in choosing prices each period from an exogenous grid of prices. In any period, all consumers purchase from the firm with the lowest price; the firms split the market if they charge the same price. It is assumed firms play Markov strategies where they condition their current pricing decisions only on their rival's last period price. The authors show this model has an *Edgeworth cycle equilibrium* where firms sequentially undercut each others' prices each period until prices equal marginal cost. At this point, firms enter a "war of attrition," where with some probability α, one of the firms relents and restores their price to a price above marginal cost. In the next period, the rival just undercuts this higher price, and the cycle repeats. Figure 4 plots an example of an Edgeworth cycle equilibrium price path. The resemblance of this figure to the petrol price cycles in Figures 1 and 2 is striking. This resemblance lead Castanias and Johnson (1993) to be the first to conclude that petrol price cycles should be interpreted as Edgeworth cycles.

The recent wave of multi and single-market studies discussed above have largely adopted the Edgeworth cycle interpretation of petrol price cycles. Variants on the Maskin and Tirole (1988) model have yielded theoretical predictions that have subsequently been verified empirically. Eckert (2003) allows for a "large" and "small" firm in the model, and shows that: (1) in the Edgeworth cycle equilibrium, the large firm matches the small firm's prices period-by-period during the undercutting phase of the cycle; and (2) if the asymmetry in firm size grows, the focal price equilibrium of the model where the two firms set fixed prices each period cannot exist (i.e., only Edgeworth cycle equilibria can exist). The first prediction is empirically verified in the U.S. and Canada by Lewis (2011) and Byrne and Ware (2011) who find independent non-chain stations are relatively more aggressive in undercutting prices. The second prediction is consistent with the empirical result from Eckert (2003) and Noel (2007a) that markets with large shares of small non-chain firms are more likely to exhibit price cycles.

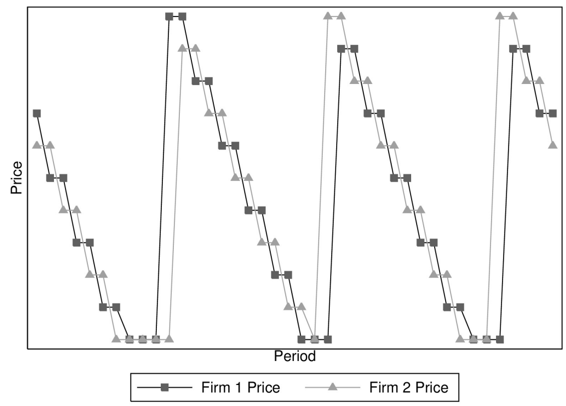

Figure 4: Example Edgeworth cycle Equilibrium Price Path

Noel (2008) introduces various extensions into the Maskin and Tirole (1988) framework, including cost shocks, capacity constraints, product differentiation, and triopoly. He finds Edgeworth cycles equilibria exist under many parameterisations of the model. A key finding under triopoly is that "false starts" can occur where one firm sets a restoration price, but the other two firms fail to follow. Empirically, the findings from Atkinson (2008), Wang (2009), Lewis (2011), and Byrne and Ware (2011) suggest that in practice, firms with large networks of stations leverage their networks to signal to small non-chain stations the start of price restorations. Doing so helps dominant firms avoid "false starts" and restoration coordination failure that Noel' (2008) model predicts. Finally, that firms enter a war of attrition at the bottom of price cycles in Maskin and Tirole (1988) lines up with Wang's (2009) empirical finding that price restorations are outcomes of a mixed-strategy game played by branded firms.

Recently, a number of papers have pointed out shortcomings of Maskin and Tirole (1988) in examining petrol price dynamics. One issue is the lack of tractability in extending the model to allow for many firms (i.e., beyond triopoly) with different sizes, as we see in many petrol markets. This lack of tractability makes it difficult to extend the model to interpret the findings from Byrne and Ware (2011) that sticky pricing exists in rural markets, price cycles exist in intermediate-sized markets, and cost-based pricing exists in large urban markets.

A recent paper documents that firms follow simple coordination strategies over the timing of price restorations. Specifically, Foros and Steen (2008) find that in Norwegian cities price restorations systematically occur on Mondays at noon. Such simple coordination on the timing of restorations described in this paper lies outside of the Maskin and Tirole (1988) framework. De Roos and Katayama (2010) show Wang's (2009) finding that BP, Caltex, and Shell play mixed strategies in coordinating price restorations in Perth during the post-law period is not robust beyond the sample period considered in Wang (2009). De Roos (2010) also exploits the Perth pricing law to test the assumption from Maskin and Tirole (1988) that firms play Markov strategies. His findings reject this fundamental assumption of the model for the Perth.

An alternative theory of petrol price competition is Varian's (1980) model of sales. Castanias and Johnson (1993) originally proposed this model as a rival theory to Maskin and Tirole (1988) for explaining petrol price cycles. In this model, n firms with homogenous marginal costs sell a homogenous-good, and compete by simultaneously setting prices. Each consumer has the same valuation for the good; however, a fraction $\lambda \in (0, 1)$ of consumers are "shoppers" with zero search costs who observe all prices in the market. The remaining "non-shopper" consumers have positive and different search costs that they must pay before observing all the prices in a market. A non-shopper buys from a random store if they do not pay their individual search cost. Varian (1980) shows that given a proportion of $\mu \in [\lambda, 1]$ informed shoppers, this model has a unique symmetric mixed strategy Nash equilibrium where firms randomise in setting prices to discriminate amongst informed and uninformed consumers.

Varian's (1980) environment characterises petrol markets quite well. It importantly captures the notion that some petrol consumers are informed in making purchasing decisions, while some consistently make uninformed choices (i.e., only fill the tank when it is empty). Price cycles could be interpreted as random pricing strategies with sales; firms discriminate against non-shoppers during price restorations, and offer sales to shoppers during the undercutting phase. Chandra and Tappata (2011) find that various predictions from this model of relationships between petrol price dispersion, and the number of firms in a market, production costs, and consumer search costs are consistent with empirical patterns found in the data. This suggests that Varian (1980)'s model is also a useful theory for understanding competition and consumer demand in petrol markets, particularly in explaining price dispersion across space and over time. Key limiting factors in using this model alone for interpreting petrol price cycles is it does not explain: (1) the regularity of the price cycle; (2) coordination in price setting during restorations; and (3) the alternating leader-follower roles of dominant chains and independents in price setting over the cycle (Lewis (2011) and Byrne and Ware (2011)).

Yet another explanation of petrol price cycles questions the notion of competition in petrol markets altogether. Two recent papers by Robert Clark and J.F. Houde (Clark and Houde (2011a) and (2011b)) examine the collapse of a petrol pricing cartel in Quebec. Canada's competition authority, the Competition Bureau, discovered the cartel through use of wire-taps. Various stations in markets with price cycles were found to be explicitly colluding in setting prices. The authors provide a cooperative interpretation of petrol price cycles, and find that a central goal of the cartel was to reduce stations' aggressiveness in price undercutting. Wang (2008a) examines a price fixing case in Ballarat, Australia, and documents that stations phoned each other to coordinate on the timing of price restorations to resolve the war of attrition at the bottom of price cycles.

4. Concluding Remarks

Petrol price cycles are a remarkable economic phenomenon that continue to puzzle applied econometricians and theorists alike. With improving data availability, particularly with the emergence of petrol price reporting websites, empirical research on petrol price dynamics and cycles should continue to flourish. New empirical results help shed on light on the relevant theories that help us understand the existence and many nuances of petrol price cycles. Going forward, economists should not be quick to discount past research based on "weaker" datasets. Castanias and Johnson (1993)'s seminal paper identified various mechanisms that potentially generate price cycles (Edgeworth cycles, models of sales, collusion) which are the foundation of current empirical research.

This article largely emphasises studies of firms' behaviour, and the supply-side of petrol markets. An open area for research on petrol markets lies on the demand-side. There are few estimates of the price elasticity of demand for petrol in the literature. Those that we have are largely based on aggregate (i.e., state or national-level), low frequency (quarterly or annual) data (see Small and Van Dender (2007) and Hughes et. al (2008)). Houde (2011) shows spatial considerations and consumers' commuting behaviour play an important role in petrol demand. Chandra and Tappata (2011) emphasise that consumer search costs limit the degree to which consumers shop around for petrol. Little is known about demand in petrol markets with price cycles, largely because high frequency data on petrol prices and quantities sold have been unavailable to researchers. Wang's (2008b) study of petrol demand for a small sample of eight stations in Perth, Australia is a notable exception. Using daily station-level price *and* quantity data, he finds petrol demand can be very elastic, with price elasticities of demand reaching an extraordinarily high -20.38 for neighbouring stations. Beyond Wang (2008b), however, there are virtually no empirical studies that inform important questions such as: Do consumers realise price cycles exist? To what extent do consumers strategically time their purchases of petrol to exploit the cycles' undercutting phase and avoid price restorations? How do consumers substitute across stations over the price cycle? Future research that sheds light on these questions is invaluable for anti-trust policy, and will potentially help explain why petrol price cycles exist.

May 2012

References

ACCC. 2007, 'Petrol Prices and Australian Consumers', Report of the Australian Competition and Consumer Commission (ACCC) Inquiry into the Price of Unleaded Petrol.

ACCC. 2010, 'Monitoring of the Australian Petroleum Industry', Report of the ACCC into the Prices, Costs and Profits of Unleaded Petrol in Australia.

ACCC. 2011, 'Monitoring of the Australian Petroleum Industry – Summary 2011'.

Allvine, F. C., and J. Patterson. 1974 'Highway Robbery, An Analysis of Gasoline Crisis', Bloomington: Indiana University Press.

Atkinson, B. 2008, 'Retail Gasoline Price Cycles: Evidence from Guelph, Ontario Using Bi-Hourly, Station-Specific Retail Price Data', *The Energy Journal*, vol. 30, pp. 85–109.

Byrne, D. P., and R. Ware. 2011, 'Pricing and Market Structure in Urban and Rural Gasoline Markets', mimeo, University of Melbourne.

Castanias, R., And H. Johnson. 1993, 'Gas Wars: Retail Gasoline Price Fluctuations', *Review of Economics and Statistics*, vol. 75, pp. 171–174.

Chandra, A., And M. Tappata. 2011, 'Consumer Search and Dynamic Price Dispersion: An Application to Gasoline Markets', *Rand Journal of Economics*, vol. 42, pp. 681–704.

Clark, R., and J. F. Houde. 2011a, 'Collusion Between Asymmetric Retailers: Evidence from a Price Fixing Case in Canada', mimeo, University of Wisconsin, Madison.

Clark, R., and J. F. Houde. 2011b, 'The Effect of Explicit Communication on Pricing: Evidence from the Collapse of a Gasoline Cartel', mimeo, University of Wisconsin, Madison.

De Roos, N. 2010, 'Do Firms Play Markov Strategies? Evidence from a Gasoline Policy Intervention', mimeo, University of Sydney.

De Roos, N., and H. Katayama. 2010, 'Retail Petrol Price Cycles in Western Australia', mimeo, University of Sydney.

Doyle, J., E. Muehlegger, And K. Samphantharak. 2010, 'Edgeworth Cycles Revisited', *Energy Economics*, vol. 32, pp. 651–660.

Eckert, A. 2003, 'Retail Price Cycles and the Presence of Small Firms', *International Journal of Industrial Organization*, vol. 21, pp. 151–170.

Eckert, A., and D. West. 2004a, 'Retail Gasoline Price Cycles Across Spatially Dispersed Gasoline Stations', *Journal of Law and Economics*, vol. 47, pp. 245–273.

Eckert, A., and D. West. 2004b, 'A Tale of two Cities: Price Uniformity and Price Volatility in Gasoline Retailing', *The Annals of Regional Science*, vol. 38, pp. 25–46.

Eckert, A., and D. West. 2005, ‘Price Uniformity and Competition in a Retail Gasoline Market’, *Journal of Economic Behavior and Organization*, vol. 56, pp. 219–237.
Foros, O., and F. Steen. 2008, ‘Gasoline Price Jump Up on Mondays: An Outcome of Aggressive Competition?’, CEPR Working Paper DP6783.
Houde, J.F. 2011, ‘Spatial Differentiation and Vertical Mergers in Retail Markets for Gasoline’, *American Economic Review*, forthcoming.
Hughes, J.E., Knittel. C., and D. Sperling. 2008, ‘Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand,’ *The Energy Journal*, vol. 29, pp. 93–114.
Lewis, M. S. 2009, ‘Temporary Wholesale Gasoline Price Spikes have Long Lasting Retail Effects: The Aftermath of Hurrican Rita’, *Journal of Law and Economics*, vol. 52, pp. 581–606.
Lewis, M. S. 2011, ‘Price Leadership and Coordination in Retail Gasoline Markets with Price Cycles’, *International Journal of Industrial Organization*, forthcoming.
Maskin, E., And J. Tirole. 1988, ‘A Theory of Dynamic Oligopoly II: Price Competition, Kinked Demand Curves and Edgeworth Cycles’, *Econometrica*, vol. 56, pp. 571–599.
Noel, M. D. 2007a, ‘Edgeworth Price Cycles, Cost-Based Pricing and Sticky Pricing in Retail Gasoline Markets’, *Review of Economics and Statistics*, vol. 89, pp. 324–334.
Noel, M. D. 2007b, ‘Edgeworth Price Cycles: Evidence from the Toronto Retail Gasoline Market’, *Journal of Industrial Economics*, vol. 55, pp. 69–92.
Noel, M. D. 2008, ‘Edgeworth Cycles and Focal Prices: Computational Dynamic Markov Equilibria’, *Journal of Economics and Management Strategy*, vol. 17, pp. 345–377.
Noel, M. D. 2011, ‘Edgeworth Price Cycles and Intertemporal Price Discrimination’, *Energy Economics*, forthcoming.
Small, K. A., And K. Van Dender. 2007, ‘Fuel Efficiency and Motor Vehicle Travel: The Declining Rebound Effect’, *The Energy Journal*, vol. 28, pp. 25–51.
Varian, H. R. 1980, ‘A Model of Sales’, *American Economic Review*, vol. 70, pp. 651–659.
Wang, Z. 2008a, ‘Collusive Communication and Pricing Coordination in a Retail Gasoline Market’, *Review of Industrial Organization*, vol. 32, pp. 35–52.
Wang, Z. 2008b, ‘Station Level Gasoline Demand in an Australian Market with Regular Price Cycles’, *Australian Journal of Agriculture and Resource Economics*, vol. 53, pp. 467–483.
Wang, Z. 2009, ‘(Mixed) Strategies in Oligopoly Pricing: Evidence from Gasoline Price Cycles before and under a Timing Regulation’, *Journal of Political Economy*, vol. 117, pp. 987–1030.

Endnotes

1 Perth’s price cycle seems quite different from the other cities’ cycles from in Figure 1. This may in part be due to a unique petrol price-setting law in Perth. I will discuss this later in the article.

2 In Australia, the branded retailers are BP, Caltex, Mobil and Shell.

3 These U.S. and Canadian studies are relevant for understanding why petrol price cycles might exist in Australian cities. The Canadian cities that Byrne and Ware (2011) examine, such as Toronto or Hamilton, are similar in terms of size and density to Australian cities, yet they exhibit cost-based pricing. Canadian retailers do not operate nearly as large a network of stations relative to the size of these markets as do the branded retailers in Australian cities. For example, the four largest brands (BP, Caltex, Mobil, Shell) operate up to 75% of all stations in Melbourne and Sydney. That price cycles exist in Australian cities but not similar Canadian cities speaks to the result from multi-market studies that price cycles exist in markets with high concentration amongst a few firms who act as market leaders to coordinate price restorations. Moreover, ACCC (2007) reports that sticky pricing exists in rural Australian markets, which is similar to what Byrne and Ware (2011) find in rural Canada. The ACCC suggests that differences in petrol inventory delivery schedules between rural but urban markets partly explains why sticky pricing persists in rural markets but not cities. These conclusions mirror those of Byrne and Ware (2011) for Canada.

4 Stations’ number of pumps, their petrol inventory capacity, and whether they have a convenience store may also affect their pricing decisions.