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The ACCC's Caltex-Mobil Decision: A Network View

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Abstract

On December 2nd 2009, the Australian Competition and Consumer Commission (ACCC) announced its intention to oppose the acquisition of Mobil's retail assets by Caltex, based in part on an assessment of adverse competition effects in some local markets. Their assessment was based upon the proportion of sites within each local market that would become controlled by Caltex post-merger. This paper suggests an alternative method for analysing competitive effects, which formalises local market structure into a network and assesses the position of each outlet in that network.

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The ACCC's Caltex-Mobil Decision: A Network View

Introduction

On December 2nd, the ACCC announced its intention to oppose the acquisition of Mobil's retail network by Caltex, based at least in part on its considerations concerning competitive effects in local markets. The ACCC deemed such effects likely if the post-merger share of Caltex-controlled outlets in the local market around each Mobil outlet was greater than one half, and possible if it was greater than 40 percent.

We suggest a different approach to assessing competitive effects, based upon representing market structure via a network, and looking at the position of each outlet in that network. We compare the ACCC's approach with ours in a case study of the Perth market which, although not part of the ACCC's investigation, contains excellent data.[1]

Section Two of this paper outlines the ACCC decision in more detail. Section Three provides some background to the Perth market. Section Four shows how a network summarising competition can be constructed and provides an overview of the measures which one can use to highlight structural advantage in that network. Section Five compares our methodology with the ACCC's in the Perth retail petroleum market. Section Six concludes.

[1] Our approach could be easily replicated for any of the cities which the ACCC does analyse by someone with the Informed Sources datasets that the ACCC used in its analysis. We do not have access to this data, so instead use the more readily available *FuelWatch* data from Perth.

The ACCC Decision

On December 2nd 2009. the ACCC released a statement outlining its intention to oppose the acquisition of Mobil's retail assets by Caltex.[2] The proposed takeover eventuated following a corporate decision by Mobil to divest much of its downstream business in Australia, part of which involved selling its roughly 300 retail outlets. It still intends to undertake this divestment, although it will not now seek to sell its retail outlets to Caltex.

The ACCC's investigation found that the acquisition of 53 by Caltex would be likely to have the effect of substantially reducing competition in the relevant local markets. The sites were in Brisbane, Sydney, Melbourne and Adelaide; the cities where it focussed its analysis. The ACCC was also concerned that the takeover would exacerbate co-ordination in retail petroleum markets, most particularly because Caltex is frequently a price leader when prices cycle upwards, and Mobil has, on average, lower prices than Caltex. In its press release, the ACCC expressed a preference that the retail outlets be taken over by a 'maverick' or aggressive discounter more likely to inject competition into the marketplace.

In undertaking its analysis, the ACCC looked at overall price levels in each of the cities analysed, determining which brands had the lowest prices. It also examined local market effects. It defined a local market as all the outlets within five kilometres of the outlet being analysed. It looked at idiosyncratic features of each local market, such as local geography and the number and nature of independent operators in each market, but its

[2] Available at http://www.accc.gov.au/content/index.phtml/itemId/904296, which also contains links to the various background papers underpinning the ACCC's decision.

main focus was the number of outlets controlled by Caltex before and after the merger. Post merger, if this proportion was greater than 50 percent, the ACCC suggested this would be likely to result in competition concerns in that local marketplace, whilst for proportions between 40 and 50 percent it suggested that the takeover may raise competition concerns. It was on the basis of this assessment that the ACCC made its decision.

Perth was not included in the ACCC's decision. However, it has excellent data which we have used (see Bloch & Wills-Johnson, 2010a, b, c, d) to explore market structure and its effects on pricing. Thus, in this paper, we compare and contrast the ACCC's methodology with our own. Before doing so, we describe the Perth market and our methodology for determining market structure in more detail.

Background to the Perth Market

Retail petroleum outlets in Western Australia are governed the *FuelWatch* scheme whereby each outlet must advise the regulator (who publicises that price) of its next-day price and keep that price for 24 hours. The regime is described in detail in ACCC (2007) and the controversies surrounding analysis of its impacts in Davidson (2008).

The data used in this study cover the period from January 1st 2003 to March 14th 2004. The start-date is chosen as data on wholesale or terminal gate prices (the proxy for the marginal cost of retailers) are unavailable before this date, and the end-date is chosen because the following day marked the conversion of some 40 Shell outlets into Coles Express outlets through a joint venture between Coles and Shell. The data do not cover all outlets in Perth, omitting some on the outskirts of the city, those for which the data series are incomplete (usually because they are new, or were closed for long periods during the sample period owing to a change in ownership) and those for which the retailing of fuel is not a core business (such as taxi depots and marinas). Data on demand come from the ABS *Census* (ABS, 2006) whilst the remaining data come from *FuelWatch*, or are based on data in the *FuelWatch* database.[3]

Table One provides information on branding, ownership structures, presence of convenience stores and location of competitors.

Table One: Perth market summary

Branding			**Ownership**		**Competitors Within 5km**		**Distance to Nearest Competitor**	
	Total	*With Convenience Store*			*Number of competitors*	*Frequency*	*Distance (km)*	*Frequency*
BP	52	16	Branded Independent	23	up to 2	10	up to 0.4	38
Caltex	57	29	Company Controlled	99	3 or 4	16	0.41 to 0.8	38
Woolworths	4		Distributor Controlled	2	5 or 6	31	0.81 to 1.2	41
Gull	27		Independent	2	7 or 8	35	1.21 to 1.6	35
Independent	2		Larger Independent	37	9 or 10	43	1.61 to 2	39
Liberty	5		Price Supported	42	11 or 12	37	2.01 to 2.4	8
Mobil	13	11	Supermarket	4	13 or 14	13	2.41 to 2.8	5
Peak	13				15 or 16	17	2.81 to 3.2	2
Shell	35	8			> 16	7	> 3.2	3
Wesco	1							

Caltex has the largest market share, followed by BP and Shell. Independent chains (Gull, Liberty and Peak) make up roughly a quarter of the sample, making them collectively more important than either Shell or Mobil and slightly smaller than BP. Supermarkets

[3] The authors would like to thank the *FuelWatch* regulator for making this dataset available.

are more prevalent today than in the dataset, which precedes the entry of Coles, and is from a time when only small numbers of Woolworths outlets existed. Today, the two comprise almost half of overall Fuel sales in Australia (ACCC, 2007).

Company controlled outlets comprise roughly half of those in Table Two, according to *FuelWatch*, which defines outlets owned directly by the Majors and outlets owned by their multi-site franchisees as being company controlled. In WA as a whole, Shell owns eight sites, BP owns five and Mobil none. Thus, most of the outlets listed as company controlled in Table One are owned by one of the multi-site franchisees of these brands. Caltex has no multi-site franchises due to the terms of its 1995 merger with Ampol (see Walker & Woodward, 1996). Instead, it uses single site franchises and a price-support scheme described in detail in Wang (2009).

Convenience stores attached to retail petroleum outlets are often an important source of profits for the brands which own them. Caltex has two convenience store brands, whilst Shell, Mobil and BP have one apiece. Most Mobil outlets have a convenience store attached, as do around two-thirds of Caltex outlets. The shares for BP and Shell are each less than one-third. None of the independent brands has a convenience store brand, though some (Gull in particular) sell convenience store items in many of its outlets.

Although Perth is a relatively low-density city, retail petroleum outlets tend to be located along highways or at the major shopping centres which exist in some suburbs. This is in part due to zoning laws and in part due to a desire to be located at nodes of demand. For this reason, distances to the nearest rival tends to be low (on average just over one km) and the number of competitors within five kilometres is nine.

The Perth Market as a Network

An important aspect of this paper is the way in which we model market structure. Rather than use indirect measure such as seller density or the penetration of independents, we develop a simple theoretical model of bilateral interaction and use this to test who competes with whom. We collect these bilateral links to form a network which summarises the structure of competition in the marketplaces as a whole and use simple graph-cutting tools to delineate local sub-markets. We then use a number of measures of network structure from the mathematical sociology literature to summarise the position of each retail gasoline outlet in the overall structure of the global market and local sub-markets. We describe the process of network formation and division briefly below, and in more detail in Bloch and Wills-Johnson (2010c).

The simple theoretical model is based upon that of Hoover (1937) and MacBride (1983), who study how spatial differentiation can give rise to local market power. Our point of departure is an assumption that consumers come to the retailer rather than having goods delivered to them, and this requires the retailer to set a single price for all consumers without knowing from whence each has come.

In a duopoly where each firm sells one unit of an homogenous good to an homogenous set of consumers whose travel plans take them past one retail petroleum outlet during but who must deviate to frequent the other (meaning purchase from the former is costless but that from the latter is not), each firm has two choices; set a higher price than its rival and collect rents from those customers for whom deviation to its rival is more costly or set a price lower than its rival and endeavour to steal market share. The advantages of each choice change depending upon overall price levels, and it is relatively simple to show the situations whereby this will give rise to an Edgeworth Cycle (see Bloch & Wills-Johnson, 2010a). It is also relatively simple to show that the minima of such price cycles will be related in a consistent fashion if firms compete (ibid). Moreover, if marginal costs and the proportion passing each outlet first are equal, one can easily show that the minimum of each price cycle for each outlet in the duopoly will be the same (see Bloch & Wills-Johnson, 2010c, for an illustration of these results).

This gives rise to a simple test of connection. We first form the series of price cycle minima for each gasoline station by taking the lowest price in the three days prior to each price increase of greater than five percent.[4] We then undertake a simple statistical test of the difference between the means for each pair of outlets within five kilometres of one another.[5] Where there is no statistically significant difference between the means, we deem the two outlets to be connected. By collecting these connected pairs, we are able to construct a network which summarises the patterns of connection in the overall market.

[4] Looking four days prior and using different price increases made little difference to results; the increasing phase of each price cycle is quite clear in the data.

[5] The ACCC adopted this local market definition in a recent merger decision (see http://www.accc.gov.au/content/index.phtml/itemId/904296), and a similar distance has been used to define local markets in the US literature (see Hastings, 2004 or USSPSICGA, 2002). We use it as a provisional measure of local markets, to avoid having to test every possible bilateral pair in a collection of 208 gasoline stations.

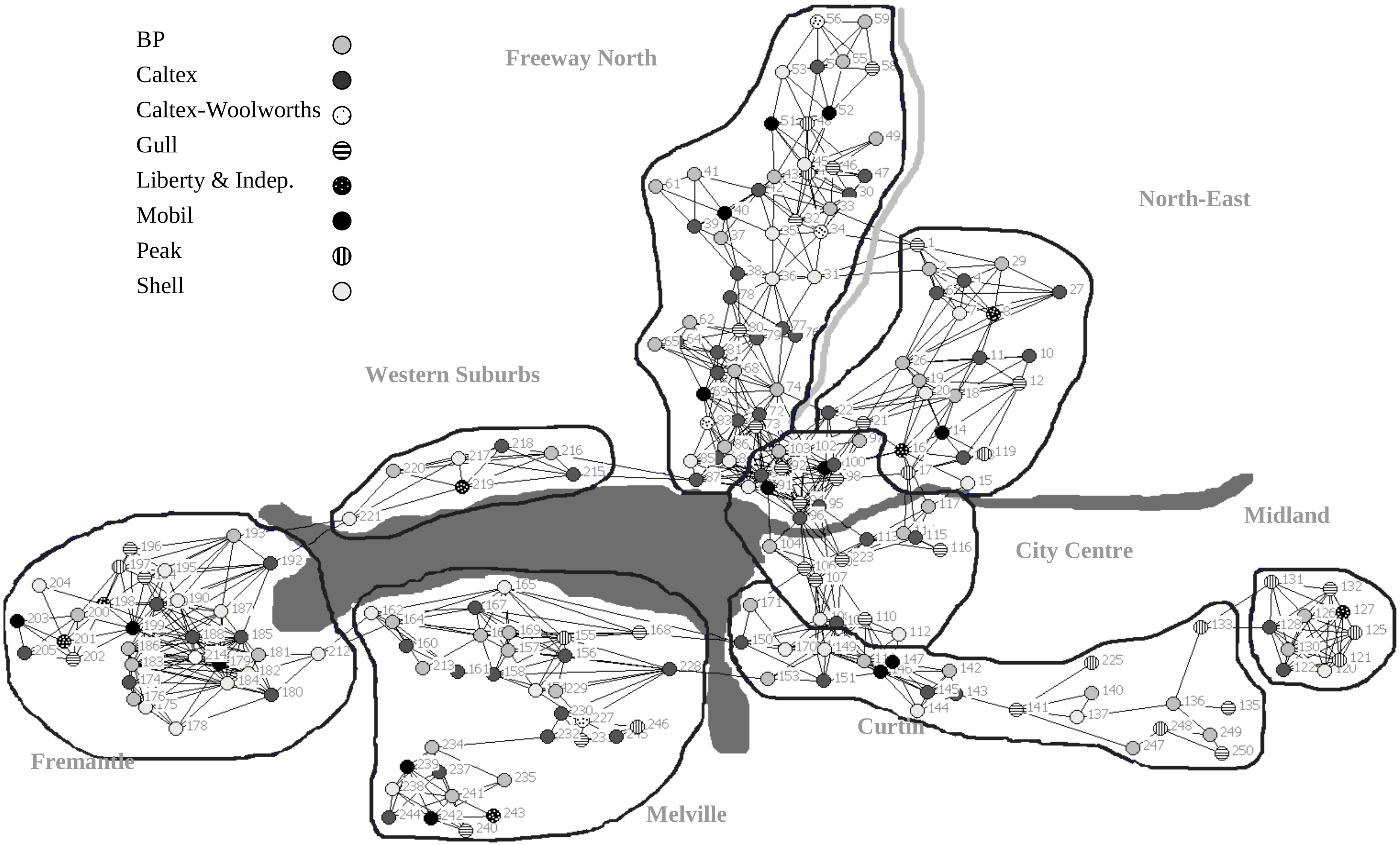
We then divide this network in to a series of submarkets, using an approach pioneered by Gould (1967), and subsequently widely used in geography (see, for example, Cliff, Haggett & Ord, 1979, Boots, 1985, O'hUallachain, 1985 and Straffin, 1980).

The network is first converted into an adjacency matrix; a symmetric, zero-one matrix where a zero in the ij^{th} position indicates that nodes i and j are not connected, and a one indicates that they are. We then take the eigenvectors of this adjacency matrix. The first (that is, the eigenvector associated with the largest eigenvalue) has all positive entries. In order to be orthogonal to the first, the remaining eigenvectors must contain positive and negative elements. Gould (1967) suggests that clusters of positive and negative eigenvector elements indicate sub-groups within the network. The approach is somewhat judgemental, but subsequent testing of the submarkets (see Bloch & Wills-Johnson, 2010c) suggests they are reasonably robust, and indeed give a better characterisation of groups of like-priced outlets than branding does.

The results of following Gould's (1967) approach using the second to sixth eigenvectors (after which the signal to noise ratio makes it impossible to uncover further structure) divides the market into eight distinct sub-markets. Figure One, overleaf, shows the overall market with the eight sub-markets superimposed. The dark-grey area represents the Swan River, which divides the city North from South, and the light grey line represents the main north-south freeway, which divides East from West. Placement of each station is approximate, but roughly correlates to the physical shape of the Perth market.[6] The different shaded dots represent different brands.

[6] The software used to construct the networks and calculate their structural characteristics (Borgatti, Everett, & Freeman, 2002) has only limited capabilities in terms of spatial mapping.

Figure One: Sub-markets in market network



Having constructed the network and divided it up into sub-markets, one can then calculate a number of summary statistics for the network as a whole and for each sub-market in isolation. Of particular use are Burt's (1992) measures of redundancy, efficiency and constraint, which he uses to capture the notion of a structural hole; a part of the network where there are few connections between densely intra-connected sub-groups. Burt's (1992) measures have been widely used in the literature, and Burt (2000, 2002, 2005) contain reviews of empirical applications of his measures.

What Burt (1992) terms the redundant portion of one node's relationship with another node is the extent to which their relationship is through other nodes connected to both of them; the more indirect connections the two nodes have, the more redundant are these connections, as there are many paths down which information can flow. The effective size of the network for a given node is the sum of the non-redundant portions of its relationships with all other nodes in the network, and ranges from one to N, the total number of nodes in the network. The efficiency of the network for a given node is its effective size divided by N. A more efficient network is one where structural holes are better situated from the perspective of the node for which efficiency is being calculated.

Constraint is the absence of structural holes, meaning that, even if a node severs its direct connection with another node, indirect connections mean that it is still restricted by that node. Burt (1992) defines constraint as the sum of the proportion of network time spent on connections with a given node and across all other nodes which that node and the node for which constraint is being calculated are connected to.

We make use here of Burt's (1992) measures of efficiency and constraint. Elsewhere (Bloch & Wills-Johnson, 2010d) we regress these measures, along with a number of other independent variables, against price, using Hansen's (1996, 1999, 2000) Threshold Regression Model to differentiate between effects which dominate in the upwards phase of the price cycle and those which dominate in the downwards phase.

We find that global constraint (that is, Burt's constraint score for each node in the network as a whole) has a negative coefficient during the downswing of the cycle, indicating that those outlets which are the bridges between sub-markets and are hence least constrained also exhibit the highest prices. Potentially, they are acting to slow the flow of price information between sub-markets. We also find that local efficiency and constraint (that is, within each sub-market) have a positive coefficient during the downswing.[7] The former is consistent with the negative global constraint results, and suggests that those outlets for which the relevant local market is favourable are able to leverage their superior structural position into higher prices. The latter, however, does not fit this same picture. We suspect that what is happening is that the peripheral outlets with access to customers outside the network in Figure One, pay less attention to the pricing of their peers in each local market and concentrate instead upon reaping monopoly profits from these external customers for which they face limited competition.[8]

[7] None of the market structure effects are significant during the upswing, confirming Wang's (2009) suspicion that it is only in the downswing that local market competitive effects are important.
[8] Eckert & West (2005) show that outlets on the peripheries of cities in Canada were less likely to close during the 1990s, pointing to similar effects as noted here.

From the perspective of an assessment of local market competition, therefore, we can now make a number of suggestions. The first is that the ACCC should look closely at globally unconstrained outlets, which sit at the bridges between sub-markets. If one player can capture many of these in a given market, it may be able to restrict the flow of price information between sub-markets, even without owning a majority of outlets in any sub-market. The second is that the ACCC should also look at the acquisition of outlets with high local efficiency scores, as possession of sufficient of these in a given local market may provide the relevant owner with sufficient leverage to extract rents from that sub-market without owning a majority of outlets within it. The third is that the ACCC should show less concern for the acquisition of outlets on the market fringe. These are likely to have high prices regardless of their ownership and thus, even if an acquisition of them results in a local market share of greater than one-half, overall competition within that local market is unlikely to be affected much.

Using these lessons, we now compare and contrast an application of the ACCC's methodology in Perth's retail petroleum market with an assessment based upon constraint and efficiency.

Comparing the Network Approach with the ACCC's Approach

In Figure One, there are 13 Mobil outlets.[9] If we define a local market in the same way that the ACCC does (all outlets within five kilometres of the relevant Mobil outlet) and examine the post-acquisition share of Caltex in each local market, then there are few competition concerns likely to arise. In only one case (Outlet 69) would the ACCC's

[9] There are actually more Mobil stations in Perth, but only these 13 were considered in the analysis of Bloch & Wills-Johnson (2010b, c, d). Others were on the periphery of the city, or contained insufficient data to undertake econometric analysis.

threshold of 50 percent be breached and in only three further cases (Outlets 99, 146 and 147 – with the latter two being essentially the same market) would its threshold of 40 percent be breached. Elsewhere, the ACCC's approach suggests no competition concerns.

However, Figure One casts a somewhat different light on these findings. Turning first to global constraint, Outlets 91, 199, 99, 69 and 179 all lie in the lower quartile of global constraint results. This suggests they may be able to use their position vis-a-vis the market as a whole to strategically control the flow of information between sub-markets. For example, Outlet 91 appears to be one of the conduits for pricing information between the North and South of the Swan River. Its owner may thus have scope to restrict the flow of pricing information from South to North. Moreover, post-merger, Caltex would control more than a third of these lower-quartile outlets; as much as BP and Shell Combined. There may thus be wisdom in excising these outlets from the sale, and requiring that the they be purchased by independents, who might have less interest in controlling the flow of pricing information between sub-markets.

As noted above, local constraint is not an issue, but local efficiency is. To explore this further, we calculate the local efficiency scores for each of the outlets in the 13 local markets created by following the ACCC's market definition, and allowing every outlet within five kilometres to be connected.[10] The results are shown in Table Two, where existing Mobil outlets are highlighted light-grey, and Caltex are coloured dark-gray.

[10] The result is local markets which are a little more densely connected than a radius of five kilometres around each Mobil outlet in Figure One would suggest.

Table Two: Local efficiency in the ACCC's markets

Station 14		Station 40		Station 51		Station 52		Station 203		Station 242	
Stn N°	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*
15	1	40	0.625	48	0.388	52	0.625	204	1	241	0.556
16	0.592	42	0.556	51	0.388	54	0.625	201	0.52	242	0.556
12	0.5	39	0.5	52	0.36	55	0.556	200	0.25	235	0.5
14	0.469	37	0.375	53	0.333	48	0.5	202	0.25	243	0.5
17	0.44	41	0.375	44	0.278	53	0.5	203	0.25	238	0.25
118	0.44	35	0.333	45	0.278	58	0.5	205	0.25	239	0.25
18	0.389	38	0.333	43	0.2	51	0.36			240	0.25
119	0.375	43	0.333	46	0.2	44	0.25				
19	0.28	61	0.333			45	0.25				
20	0.28										

Station 69		Station 91		Station 99		Station 146		Station 147		Station 179		Station 199	
Stn N°	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*	*Stn N°*	*Eff Score*
69	0.44	91	0.511	97	0.5	146	0.528	147	0.521	179	0.361	199	8.857
67	0.407	97	0.5	102	0.396	147	0.48	146	0.48	183	0.361	198	5.6
68	0.407	104	0.5	21	0.389	145	0.333	111	0.375	184	0.322	188	4.111
83	0.36	90	0.449	99	0.385	111	0.313	145	0.333	185	0.292	194	2.75
86	0.36	92	0.404	100	0.375	109	0.281	109	0.265	214	0.273	195	2.714
71	0.313	89	0.347	98	0.372	148	0.281	110	0.265	188	0.256	197	2.333
81	0.28	102	0.347	16	0.333	149	0.281	112	0.25	178	0.25	214	2.333
72	0.265	103	0.333	22	0.278	151	0.25	142	0.2	180	0.25	189	2.143
73	0.265	73	0.309	92	0.24	142	0.2	143	0.2	186	0.22	190	2.143
74	0.265	98	0.309	103	0.24	143	0.2	144	0.2	187	0.188	200	1.8
64	0.25	96	0.306	94	0.16	144	0.2	148	0.167	182	0.185	196	1.4
		87	0.281	95	0.16	110	0.184	149	0.167	181	0.156	181	1
		86	0.265	96	0.16	108	0.167			189	0.156	182	1
		82	0.25	91	0.156					190	0.156	201	1
		84	0.224	90	0.136							202	1
		94	0.18										
		95	0.18										
		99	0.16										

We do not present any definitive demarcation points, such as possessing more than half the total efficiency, as this would be arbitrary, much as the ACCC's benchmark of half the market share is. However, in the case of the markets around outlets 14, 203 and 199, there would appear to be few concerns, as Caltex is not acquiring any of the outlets with the top three efficiency scores. The markets around outlets 242 and 179 are also unlikely to pose much concern as, even though Caltex is acquiring outlets with high efficiency scores, there is not much difference between the largest and smallest scores. The same might be said of Outlet 91. For the remainder, however, Caltex is acquiring the most or (often and) the second most efficient outlet. In particular, in the case of Outlet 199, it is much more efficient that others in its local market, and thus its acquisition may raise concerns, even though Caltex would only have two outlets in that market.

Conclusions

In its recent decision on the proposed takeover of Mobil's retail sites around Australia by Caltex, the ACCC paid particular attention to the local market effects, examining whether the takeover would put Caltex in a position of having a greater than 50 percent market share in any local market. This is appropriate if all outlets in a given local market are equal. However, clearly they are not. The ACCC endeavoured to account for this in a rather ad-hoc fashion by considering idiosyncrasies of each local market, such as the presence or absence of independents or particular geographic features (main roads, for example) which might influence competition.

Here, we present an alterative approach to account for the inequalities between outlets by modelling market structure more directly through the use of networks, and considering market power to be related to positioning that network. We establish the link between network position and higher prices in a separate paper (Bloch & Wills-Johnson, 2010d) and use those findings here to give policy recommendations.

We compare and contrast our methodology with the ACCC's own approach, using the retail petroleum market in Perth as a case study. It allows us to highlight two salient points. The first of these is that, were the Perth Mobil outlets included in the ACCC's assessment, it methods would have missed a number of key outlets which sit at junction points between sub-markets and are thus potentially able to restrict the flow of price information between those sub-markets. The second is that, at the level of each local market, one can uncover elements of local market power deriving from the structure of the relevant local market which are missed by the ACCC's approach.

The methodology presented here does not aim to present an infallible or complete picture of market dynamics. However, it does provide a way of capturing market structure in a formal manner, and bringing this information to bear in market power and merger analyses. Although we use a retail petroleum market as a case study here, the methodology has wide application whenever markets have a spatial nature.

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