The impacts of price regulation on price dispersion in Australia's retail electricity markets

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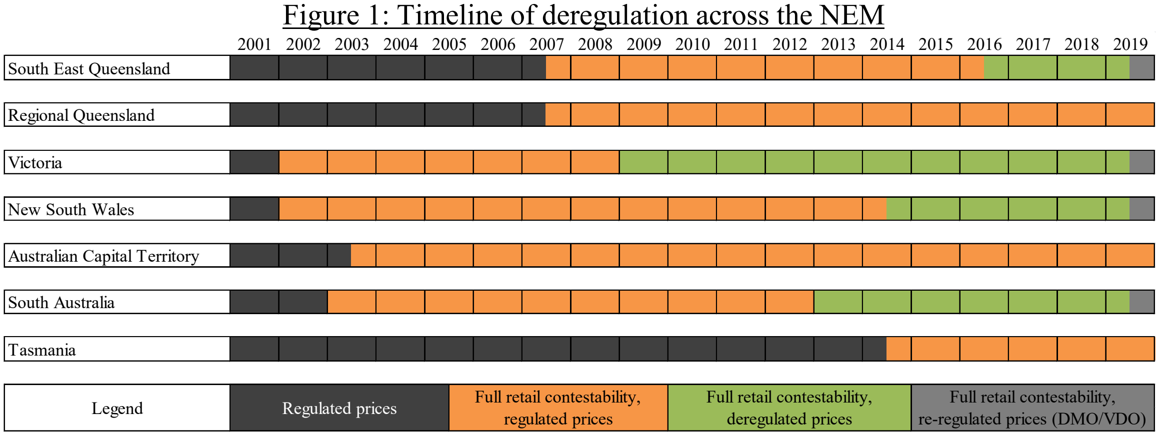
Price deregulation in Australia's National Electricity Market has led to increased competition and greater price dispersion in retail electricity markets. However, increases in electricity prices have led policy makers to impose a 'default offer' to cap retail electricity prices. In this article, we develop a model that demonstrates the mechanism through which a price cap leads to the withdrawal of the lowest priced offers from the market, in effect reducing the benefits available to customers that 'shop around'. We calculate a measure of price dispersion showing a compression of offers since the price cap was imposed has reduced the returns from search by 2.3 per cent, or $37 per year on average. We argue that the important issue of vulnerable, disengaged customers on high priced offers is best addressed through non-price regulation policy options, such as an auction for the right to serve vulnerable, disengaged customers.

Keywords: electricity markets; price discrimination; energy policy
JEL Codes: D40; D20; D22; L11

1. Introduction

Over the decade to July 2016, retail electricity prices were progressively deregulated across most of the jurisdictions that together constitute Australia's National Electricity Market (NEM)[1]. Victoria was the first jurisdiction to have deregulated prices followed by South Australia, New South Wales and most recently South East Queensland as seen in Figure 1.

Figure 1: Timeline of deregulation across the NEM



Initially, electricity retailers were government-owned monopolies. As each jurisdiction opened up to competition, the state government had in place a regulated tariff known as a 'standing offer'

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[1] The National Electricity Market is the interconnected system extending from Queensland around the east coast to South Australia, i.e. excluding Western Australia and the Northern Territory.

which protected disengaged consumers from high prices. [2] This led to entrant retailers making 'discounted' offers from the standing offer. Gradually, state governments removed the regulated standing offer once the market was deemed to be 'workably competitive' (Simshauser, 2018). Retailers were still required to provide standing offers, but they were free to set the price of the offer at a level of their own choosing.

Deregulation of retail prices has led to increased entry in the retail market and high levels of customer engagement, as measured by switching rates. However, in the past few years, there have been calls by various commentators and policy makers for retail prices to be reregulated (Ben-David, 2015). The 'reregulation thematic' gained momentum following the sharp increase in retail prices between 2016 and 2018. The culmination of such activity was the publication of a landmark report by Australia's competition regulator in relation to the operation of Australia's electricity markets. The Australian Competition and Consumer Commission (ACCC, 2018) argued for regulated retail pricing via the introduction of retail price caps. It described the retail offer at the price cap as the 'default' offer, which effectively replaces retailer standing offers. The Default Market Offer (DMO) came into effect July 1, 2019 at a price level set by the Australian Energy Regulator (AER). In Victoria, the Essential Services Commission (ESC) has similarly developed a default offer called the Victorian Default Offer (VDO) which came into effect at the same time as the DMO.[3] A similar price cap has been in effect in Great Britain since January 1, 2019.[4]

The different methodologies adopted by the AER and ESC in setting the DMO and VDO price cap level reflected their different policy objectives. In the case of the AER, the objective was to provide a 'fall-back' price that would preserve incentives for customers to remain engaged in the market (AER, 2019). The DMO was set at the midpoint between the median market offer and the median standing offer, providing headroom for retailers to differentiate their products and compete for customers.

In Victoria, the ESC was tasked with developing a default offer based on the efficient costs of running a retail business. Reflecting this, the VDO was set using a bottom-up 'cost-stack' approach. Each of the cost inputs faced by retailers was estimated by the ESC to build up an 'efficient bill' including a retail margin. The terms of reference for the ESC explicitly stated that the VDO should not include headroom (ESC, 2019). This resulted in the price cap being set at a level that was significantly lower than under the DMO, relative to retailer input costs.

The ACCC (2018) argues that retail price caps are needed as deregulated prices have led to large numbers of consumers being inactive or disengaged with the market. The 'Big 3' retailers benefit from the majority of these inactive customers because in most cases they purchased the customer bases of government owned retailers during privatisation.[5] Over time, increased price dispersion between offers has meant that many of the disengaged customers are on high priced offers:

> *The gap between the best and worst offers in the market has been widening, effectively acting as a tax on disengaged customers, whether a customer is disengaged by choice or because of the unnecessary complexity.* (ACCC, 2018: p. xi)

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[2] There are two types of retail electricity offers available to residential customers across the NEM: market and standing offers. Standing offers are typically higher priced contracts providing a basic service for consumers who have not engaged with the market.

[3] There are important differences in the methodology used for calculating the DMO and VDO. The DMO was set halfway between the median market and median standing offer for a representative consumer in each distribution area. The VDO was set using a traditional 'cost-stack' approach.

[4] See Ofgem's website for more information: https://www.ofgem.gov.uk/gas/retail-market/market-review-and-reform/default-tariff-cap

[5] The 'Big 3' refers to the three largest electricity retailers in the NEM: AGL, EnergyAustralia and Origin.

Another review focused on the Victorian retail market found price dispersion is excessive relative to the variation in retailers' costs to serve (Thwaites et al., 2017). Furthermore, customers on the highest-priced offers include financially vulnerable, low-ability-to-pay customers, with implications for economic efficiency (Simshauser and Whish-Wilson, 2017). In the context of high and rising retail prices, this 'misallocation issue' poses affordability issues for low-income customers which, proponents argue, can be resolved via price caps.

The contribution of our article is to show a mechanism through which imposing a price cap in the retail market leads to retailers withdrawing their lowest priced offers from the market. Secondly, we present data showing that deregulated retail markets in Australia were developing with large numbers of competing retailers and high customer engagement, as evidenced by switching rates. Research from Great Britain and the United States suggests that the move to reregulating prices threatens to reverse these developments.

The withdrawal of low-priced offers, and associated reduction in price dispersion, does not automatically mean efficiency is undermined. To the extent that retail price discrimination was not efficient prior to the imposition of the price caps – that is, consumers are on offers that do not match their willingness to pay – then imposing price caps could promote efficiency. The question of retail market efficiency, pre- and post-cap, is an issue outside the scope of our paper, though we note the rationale for price caps reflects concerns about deregulated prices yielding inefficient outcomes. Therefore, our analysis is silent on whether reduced price dispersion promotes or detracts from efficiency, a question that is left for future research to consider.

Furthermore, even where deregulated prices yield inefficient outcomes, our contention is that price caps are a blunt tool for addressing concerns for financially vulnerable and disengaged consumers being on high-priced offers, since price caps harm other consumers in the market including vulnerable, *engaged* consumers. A preferable approach is to develop a targeted intervention aimed at helping vulnerable, disengaged consumers while minimising the impact on the rest of the market.

This article is structured as follows. Section 2 provides a review of the relevant literature. Section 3 presents our stylised partial-equilibrium model which we use to assess the potential impacts of imposing price caps. Section 4 presents data on the development of Australian retail electricity markets. Section 5 presents our main empirical results on the effect of the DMO on price dispersion. Section 6 provides concluding remarks, alternative policy recommendations, including our main recommendation for an auction for the right to serve vulnerable, disengaged consumers, and areas for future research.

2. A review of the literature

This review provides an overview of the literature on the relationship between price dispersion and efficiency, the interaction between competition in electricity retail markets and price regulation, the drivers of switching behaviour and the relationship between competition and price dispersion.

2.1 Price dispersion and efficiency in the retail electricity market

In this article we will adopt the framework of Robinson (1933) who frames price discrimination as requiring firms to be able to segment customers effectively, with two basic segmentations being *strong* (i.e. low elasticity, higher price) and *weak* (i.e. high elasticity, lower price).

There has been a long debate around the relationship between price discrimination and economic efficiency. While perfectly competitive markets under standard assumptions find that efficiency implies price equal to marginal cost, there are a number of circumstances under which markets may be efficient with differential pricing, for example markets with significant fixed costs (Varian, 1996). It is a well-established result that a necessary condition that price discrimination is welfare enhancing is that total output is increasing (Schmalensee, 1981; Varian, 1985). Baumol and Swanson (2003) show that price dispersion can be the outcome of a competitive process, rather than monopoly power, and that if entry barriers are low, returns will be driven down to the competitive level.

Retailers in the Australian retail electricity market generally use a combination of first-, second- or third-degree price discrimination when setting prices (Simshauser, 2018; Nelson et al., 2018; Byrne et al., 2019).[6] Broadly, this may involve retailers raising prices in strong segments and lowering prices in weak segments, or may involve retailers engaging in negotiation with individual customers. This is possible in retail electricity markets because consumers are unable to exploit arbitrage (by purchasing electricity in the weak segment and selling in the strong segment), imperfect information on the part of consumers and the presence of search and switching costs.

Where assumptions deviate from those underpinning perfect competition, price discrimination is not necessarily detrimental to consumer welfare. In retail electricity markets where there are substantial fixed costs, it has been well established that price discrimination can be welfare enhancing (Littlechild, 2014; Simshauser and Whish-Wilson, 2017).

Much of the literature utilises the *strong* and *weak* segmentation theory discussed earlier. The theoretical *uniform* price is positioned between a higher price for the *strong* segment and a lower price for the *weak* segment (Holmes, 1989). With such pricing in place, and assuming that firms have the capability to segment customers (see Corts, 1998), there is an ability for firms to price in such a way as to compete for new elastic customers while recovering fixed costs through existing inelastic customers on higher priced offers.

Corts (1998) showed that if price discriminating firms are regulated to maintain margins between weak and strong segments they will retreat to the market where they make the greatest profit. This prediction was borne out in Great Britain following the imposition of a non-discrimination clause on retailers requiring them to maintain constant margins between different regions. The result was reduced competition, an overall increase in margins and reduced consumer switching by half (Hviid and Waddams Price, 2012; Waddams Price and Zhu, 2016a; Littlechild, 2019).

The key to price discrimination delivering efficient outcomes is the ability to segment customers on their willingness to pay. If customers are segmented on factors other than their willingness to pay, then price discrimination may lead to inefficient outcomes (Simshauser and Whish-Wilson, 2017). In the context of Australia's retail electricity markets, Nelson and Reid (2013) note that, if price discrimination is based on exploiting informational asymmetries and search costs, then price discrimination may be inefficient.

[6] As defined by Pigou (1920), first-degree price discrimination is where the firm charges each unit equal to the consumer's willingness to pay. Second-degree price discrimination is where the firm sets non-linear pricing such that the price depends upon the quantity consumed. Third-degree price discrimination is where the firm will segment customers and charge them based on their willingness to pay, for example student discounts at the cinema.

Among regulators, there is no consensus on whether the practice of price discrimination in Australia's retail electricity market is efficient. The Australian Competition and Consumer Commission (ACCC, 2018) argues it is not, with the Australian Energy Market Commission (AEMC, 2018a) holding a similar view. In contrast, academic literature finds that price discrimination in the Australian market is largely efficient, with the exception of vulnerable, disengaged consumers on high-priced offers (Simshauser and Whish-Wilson, 2017; Simshauser, 2018; Nelson et al., 2018).

The AEMC (2017, 2018a) notes that the main form of competition in Australia's retail energy markets is via price discounting. Product differentiation does not account for much of the observed price dispersion. Instead, price dispersion is driven largely by variations in the size of price discounts. Furthermore, there are far more offers than segmentation categories used by retailers – and certainly more than the classic two types of *strong* and *weak* customers described in the theoretical literature. While AEMC (2018a) concludes that the observed price dispersion is unlikely to be efficient, it does not compare this outcome relative to the previous price regulated market, and its recommendation for minimising this inefficiency is *not* to impose a price cap. Therefore, despite some agreement between ACCC (2018) and AEMC (2018a) on the inefficiency associated with the observed price dispersion, the policy prescriptions differ. These policy prescriptions are discussed in Section 6.

2.2 Competition and regulation

The United States experience provides informative examples of how competition and regulation interact. During the late 1990s 14 states opened up their retail electricity markets to competition. Of these, 13 have kept in place regulated pricing through a Standing Service (equivalent to a standing offer). In 2007, Texas became the only state to remove their price cap providing a point of comparison for how competition interacts with price regulation. Within Texas, some utilities owned by local authorities and electricity cooperatives, were given the choice of opting in to competition, providing a further point of comparison.

Overall across Texas, Kang and Zarnikau (2009) found that retail electricity prices declined following the expiry of the price cap and that this reduction could not be explained by input prices. Borenstein and Bushnell (2015) similarly found that retail electricity prices more closely follow gas prices in restructured states (including Texas), a sign of increasing competition. Within Texas, Hartley at al. (2019) found that residential retail electricity prices in the competitive areas reflect wholesale electricity prices with a declining gap between them over time. While retail prices in non-competitive areas do not reflect wholesale prices and the gap has not decreased.

In Connecticut where price regulation has been maintained, retail prices were more reflective of changes to the Standard Service than wholesale prices (Tsai and Tsai, 2018). Littlechild (2018) made a similar observation, in relation to Great Britain, that a price cap for prepayment meter tariffs led to a 'clustering' of offers at the price cap.

2.3 Switching and customer engagement

Customer engagement and switching is considered to be necessary, albeit not always sufficient, for a well-functioning retail market. Research from Great Britain suggests that the perception of gains from switching increases switching behaviour (He and Reiner, 2018; Flores and Waddams Price, 2018). This is consistent with results from Waddams Price and Zhu (2016a) and Littlechild (2019) who found that switching rates fell significantly following the imposition of a non-discrimination clause which reduced price dispersion.

Researchers have identified several drivers of switching behaviour in retail markets. Giulietti et al. (2014) explain switching rates as resulting from the costs to consumers of finding and comparing offers. In a laboratory setting, Sitzia et al. (2015) find that a lack of switching is due to inattention to the task of comparing offers and the complexity of choosing between them. Hortaçsu et al. (2017) attribute low levels of switching to consumer inertia and brand loyalty.

Flores and Waddams Price (2018) undertook a survey of searching and switching behaviour in Great Britain which revealed a more nuanced picture. They identified three groups of consumers: 'Shoppers' who are engaged; 'Time-poor' who are semi-engaged and; 'Loyal' who are not engaged. The authors found that the drivers of switching varied between these groups. For example, internet use is only correlated with switching for 'Shoppers' and while education is positively associated with switching for all groups, the association is weaker for 'Loyal' consumers.

There is a risk that by reducing the returns (real or perceived) to switching, price caps may lead to a dampening of consumer engagement in the market. An understanding of what drives switching should inform the development of policy alternatives to price regulation. We outline alternative policy options in Section 6.1.

2.4 Price dispersion increases as markets become more competitive

Stole (2007) shows that under third-degree price discrimination, the effect of competition on the level of price dispersion depends upon the cross price elasticities in the market. In a situation where the consumers in the weak segment of the market consider the goods to be close substitutes while consumers in the strong segment exhibit strong brand loyalty, then firms will choose competitive prices in the weak segment and near-monopoly prices in the strong segment (Stole, 2007: p 2235-6). In these circumstances it can be expected that greater competition leads to greater price dispersion.

Evidence from Australian retail electricity markets is consistent with the theory. There has been an increase in price dispersion in retail electricity markets as competition has increased. This is apparent across states, for example Victoria exhibits the greatest degree of price dispersion and has had the longest experience of price deregulation and has the highest residential switching rates in the NEM (AEMC, 2018a). It is also apparent over time, as shown later in this article in Figure 7 which shows price dispersion since deregulation in four deregulated regions of the NEM.

The imposition of a price cap in the retail market reflects a degree of reregulation of electricity prices. Under a price cap we would expect to see a reversal of the dispersion observed since retail price deregulation across the NEM. Some early indications are that there has been a compression of offers in the UK since the announcement of reregulation (KPMG, 2017; AEMC 2018a). We present some further evidence of this in Section 4.4.

Waddams Price (2018) argues that price caps are likely to raise the prices on the lowest priced offers and harm those that are most active in the market. The author does not specify a mechanism through which this occurs. In Section 3 we suggest a mechanism through which a price cap results in higher prices among the lowest priced retail offers.

We note again that while price caps can reduce price dispersion via the withdrawal of low-priced offers, this does not automatically imply that efficiency is undermined. If price discrimination under deregulated prices were to yield inefficient outcomes, imposing price caps could promote efficiency. The question of retail market efficiency, pre- and post-cap, is an issue outside the scope of our paper, though we note the rationale for price caps reflects concerns about deregulated prices yielding inefficient outcomes (ACCC, 2018; Thwaites et al., 2017).

For example, ACCC (2018)….[also cite Thwaites et al.,; Byrne, Martin, and Nah…]

3. A stylised model to investigate the impacts of a price cap

An important feature of the Australian retail market is that tariff offerings are often heavily discounted from a headline rate (either on the usage component or on the total bill). This discount typically only applies for the 'benefit period', usually the first 12 months from when a customer signs up to the offer. After the benefit period ends the discount ceases and the customer often begins paying a higher rate. This has led to retailers offering aggressive discounts with the aim of gaining market share in the expectation that some customers will remain beyond the benefit period. We show that this behaviour provides a channel through which a price cap may lead to an increase in price among the lowest market offers.

Following the work of Robinson (1933), we segment customers into two groups, strong and weak, with low and high elasticity of demand, respectively. We consider a two-period model where there is a probability $0 < d < 1$ that a customer in the weak segment (on a competitive discounted offer) in period 1 becomes a customer in the strong segment in period 2 (after their benefit period expires). We will refer to these customers as 'staying customers'. We assume an interest rate of $\theta \geq 0$ to account for the time value of money.[7] The retailer attempts to maximise the sum of profit in each market segment.

Assume the demands the retailer faces in the strong (Q_s^d) and weak (Q_w^d) segments are given as:

$$Q_s^d = a_s - b_s P_s \tag{1}$$
$$Q_w^d = a_w - b_w P_w \tag{2}$$

where $a_s > a_w > 0$ and $b_w > b_s > 0$.

To simplify the model we assume that fixed costs are zero and that marginal costs, $c > 0$, are constant and equal across both markets.[8] The profit in each segment in the first period can be written as:

$$\pi_s = a_s P_s - b_s P_s^2 - c Q_s^d \tag{3}$$
$$\pi_w = a_w P_w - b_w P_w^2 - c Q_w^d + \frac{\mathrm{d} Q_w^d (P_s - c)}{(1+\theta)} \tag{4}$$

From (3) we get the standard result under monopolistic competition where the profit in the strong segment, π_s, depends only on the price in that segment, P_s (or equivalently, the quantity Q_s^d).

By contrast, from (4) it is seen that profit in the weak segment, π_w, involves a tradeoff between restricting output to increase price, and expanding output to increase the number of staying customers, dQ_w^d, that become strong segment customers in the following period.

It follows from (3) and (1) that the profit maximising price in the strong segment is given by the following condition:

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[7] We use the term 'interest rate' rather than 'discount rate' to avoid confusion with discounted tariffs during the benefit period.

[8] Assuming zero fixed costs does not affect the pricing decision for the retailer; however it may have implications for retailer entry/exit decisions in the long run. In particular, our model shows that the imposition of a price cap will reduce profit (or increase losses) which may lead to some retailers exiting the market thereby reducing competition.

$$\frac{\partial \pi_s}{\partial P_s} = a_s - 2b_sP_s + b_s\text{c} = 0 \tag{5}$$

Resulting in the following optimal price function:

$$P_s^* = \frac{a_s + b_s\text{c}}{2b_s} \tag{6}$$

In the weak segment, the retailer takes into consideration the strong segment price, P_s^*, that will be paid by the staying customers in the next period. From (4) and (2), the condition for profit maximisation in the weak segment is given by:

$$\frac{\partial \pi_w}{\partial P_w} = a_w - 2b_wP_w + \frac{db_w(c - P_s^*)}{(1+\theta)} = 0 \tag{7}$$

Resulting in the following optimal price in the weak segment:

$$P_w^* = \frac{a_w}{2b_w} + \frac{d(c - P_s^*)}{(2+2\theta)} \tag{8}$$

so that the optimal price in the weak segment depends:

i. negatively on the price set in the strong segment;
ii. negatively on the proportion of staying customers (because $P_s^* > c$); and
iii. positively on the interest rate.

The retailer will lower the price in the weak segment to the extent that the reduction in profit in the first period is less than the (discounted) increase in profit from staying customers in the next period.

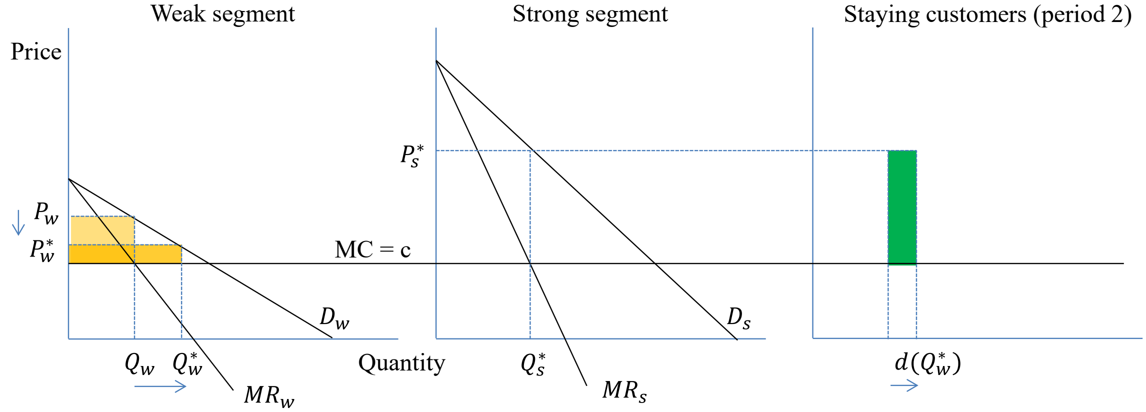
A larger proportion of staying customers (i.e. a higher d) would mean that the retailer is willing to lower the price further in the weak segment as each additional customer is more likely to become a strong segment customer in the following period. On the other hand, a higher interest rate will decrease the present value of profits from staying customers leading to the retailer preferring to raise the price in the weak segment.

The trade off (i) is illustrated in Figure 2, assuming an interest rate $\theta = 0$ for ease of demonstration.

Under an assumption that no customers stay beyond the benefit period (i.e. $d = 0$), the optimal quantity set in each segment would be where marginal revenue equals marginal cost, $MR_s = MR_w = c$, giving optimal prices in Figure 2 of P_w and P_s^* in the weak and strong segments respectively.

However, because we are assuming that some proportion, $d > 0$, of weak segment customers stay beyond their benefit period and become strong segment customers in the following period, the retailer is willing to reduce the price in the weak segment to gain market share. This means that the optimal price in the weak segment is set at P_w^* which is the point at which the marginal loss in profit in the weak segment is equal to the marginal increase in profit from those staying customers in period 2. We can think of this as being the price at which the reduction in area from the light to dark orange rectangle is equal to the size of the green rectangle representing the increase in profit from expanding market share in period 2.

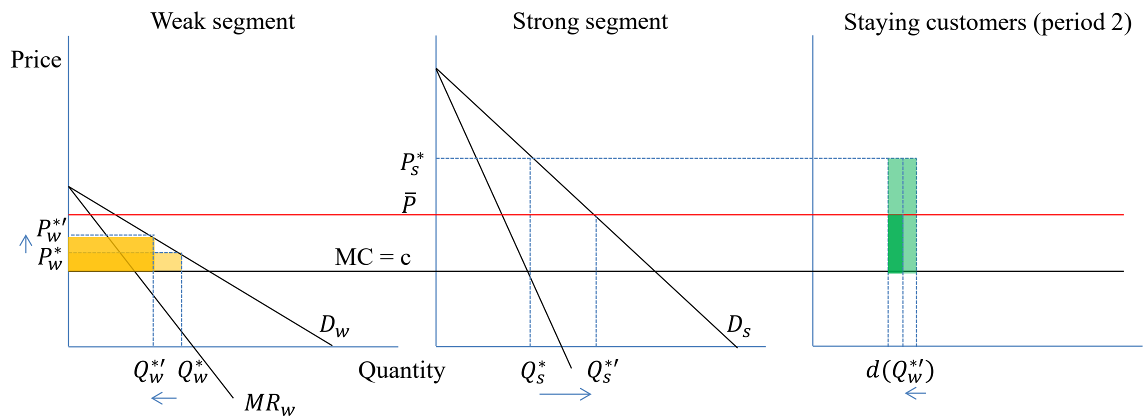
Figure 2: Profit trade-off between weak and strong segments



3.1 *Price cap*

Consider the effect of a price cap, $\bar{P}$, set below the current optimal price in the strong segment, $\bar{P} < P_s^*$. From (8) we can see that this will result in a higher optimal price in the weak segment, $P_w^{*\prime} > P_w^*$. The price cap binding in the strong segment reduces the marginal profit earned on a staying customer so that P_w^* no longer maximises the profit for the retailer. The retailer responds by restricting output in the weak segment until the increase in profit is equal to the reduction in discounted profit from staying customers. The new trade off is demonstrated in Figure 3.

Figure 3: Profit maximisation under a price cap



In Figure 3, the retailer forgoes some market share to increase the profit in the weak segment in period 1. The new optimal output, $Q_w^{*\prime}$, maximises the sum of the area of the dark orange and green rectangles. In the strong segment, the price cap reduces the price to $\bar{P}$, expanding output to $Q_s^{*\prime}$.

This partial equilibrium analysis illustrates a mechanism through which a price cap can lead to retailers increasing prices on their lowest offers in the market. While a price cap set below high priced offers will benefit customers on these offers, it will also reduce the profit earned by retailers on ‘staying customers’. A price cap therefore changes the optimal trade-off between expanding the number of staying customers and increasing the profit earned on strong segment customers in the short term. At the margin, a retailer will seek to increase prices among lowest priced offers, thereby harming those that are most active in the market.

3.2 A final point

It is worth noting our model is silent on whether reduced price dispersion promotes or detracts from efficiency. For example, to the extent that price caps reduce the prices paid by low-willingness-to-pay consumers and increase the prices paid by high-willingness-to-pay consumers, price caps can be efficiency-enhancing. Ultimately, the question of whether price caps promotes or undermines efficiency is an empirical one, requiring information on the retail offers that different willingness-to-pay consumers are on, and the prices these customers pay (inclusive of any discounts received).

Addressing the efficiency aspects of retail price caps is therefore an issue outside the scope of our paper, and is an important issue that is left for future research to consider. Section 5 provides some Australian-based evidence of the extent to which deregulated prices are likely to be yielding efficient outcomes, this discussion does not seek to provide a comprehensive overview of the related literature, given our paper’s scope and different research area.

4. Empirical observations of competition and price dispersion

While there are no historical cases of reregulating retail electricity prices in Australia, there is significant empirical evidence on the impacts of deregulating retail electricity prices. This evidence is useful to draw conclusions about what price dispersion outcomes may be if price regulation was reimposed. There are also a few limited international examples where reregulation has occurred. This section explores these empirical observations.

4.1 Increased customer engagement and competition

Retailers in Australian electricity markets must publish on their websites a standard retail contract (standard contract) for all distribution zones in NEM regions that they operate in. Retailers’ standard retail contracts must adopt the model terms and conditions in the National Energy Retail Rules (NERR). Each consumer has a designated retailer (known as the Financially Responsible Market Participant or FRMP) that is required to offer to supply them under the retailer’s standard retail contract. When full retail contestability was introduced, retailers could also offer retail market contracts (market contracts) which allow them to determine most of the terms and conditions in the contract, including price. The first form of price dispersion displayed post deregulation was the introduction of market offers, typically at discounts from standing offers. Figure 4 displays electricity bills for the *average* market and *average* standing offers over time. Notably, on average, market offers are significantly cheaper than standing offers following deregulation, and the differential increases with time.

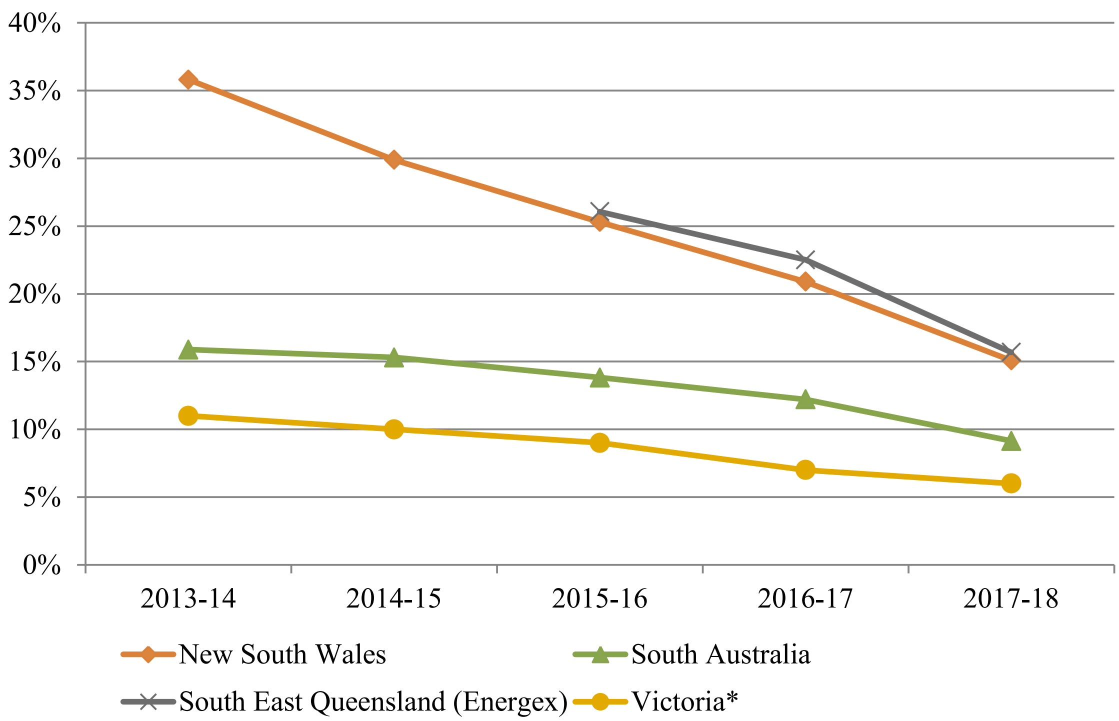
Figure 4 shows that price dispersion, reflected through total average bills for market and standing offer customers, increased in each jurisdiction following price deregulation. Victoria was the first state to deregulate electricity prices in January 2009, followed by South Australia in January 2013, New South Wales in July 2014 and South East Queensland in July 2016.

In a sign that consumer engagement in the market is increasing, the proportion of customers on standing offers has progressively decreased over time in all four jurisdictions where prices are deregulated. This is demonstrated in Figure 5.

Figure 4: Comparison of average standing and market offers

Source: Analysis of data provided by St Vincent de Paul and Alvis Consulting

Figure 5: Percentage of residential customers on standing offers

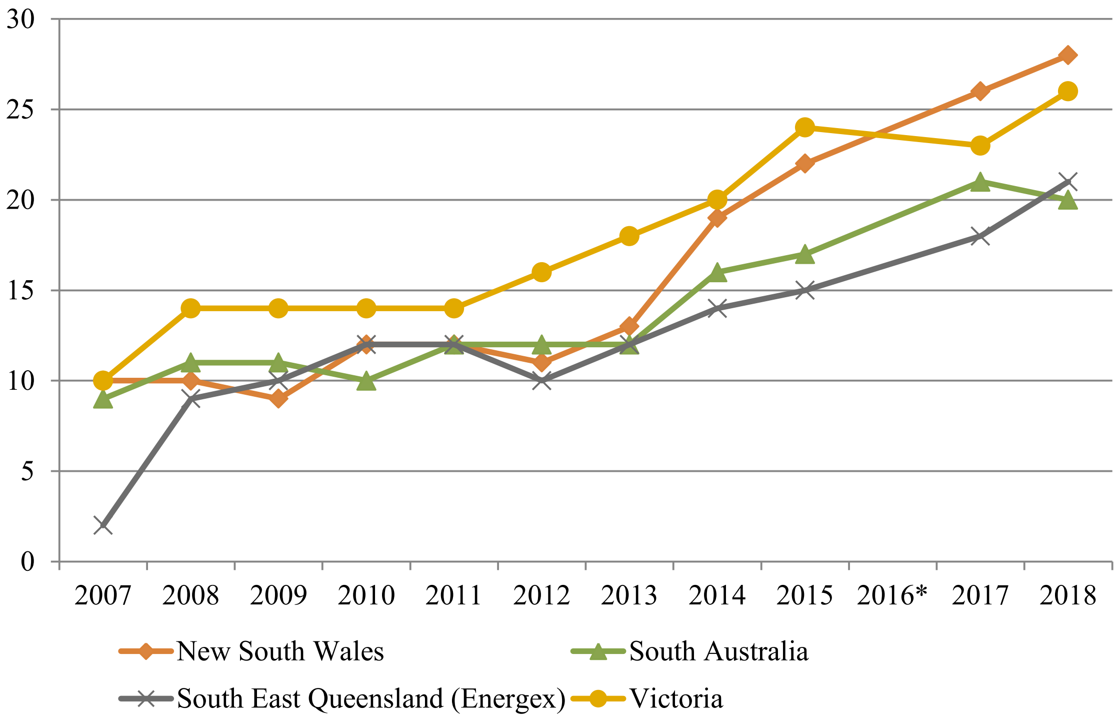


Source: Data from AEMC (2018a), AER (2019) and ESC (2018).
**Victorian data estimated from AEMC (2018a) analysis and the ESC (2018) report.*

Meanwhile, jurisdictions with full retail contestability but regulated prices have a much higher proportion of customers remaining on standing offers. In the Australian Capital Territory, over 50% of customers remain on standing offers, and in Tasmania, over 90% of customers are on standing offers.

Since deregulation there has been significant retailer entry and increasing competition in retail markets. There are now around 30 retailers offering products across the NEM, and at least 20 in each deregulated region in the NEM, as seen in Figure 6.

Figure 6: Number of active retailers for small customers



Source: Data from AER 2007-18.
*The AER did not publish data on active retailers for 2016.

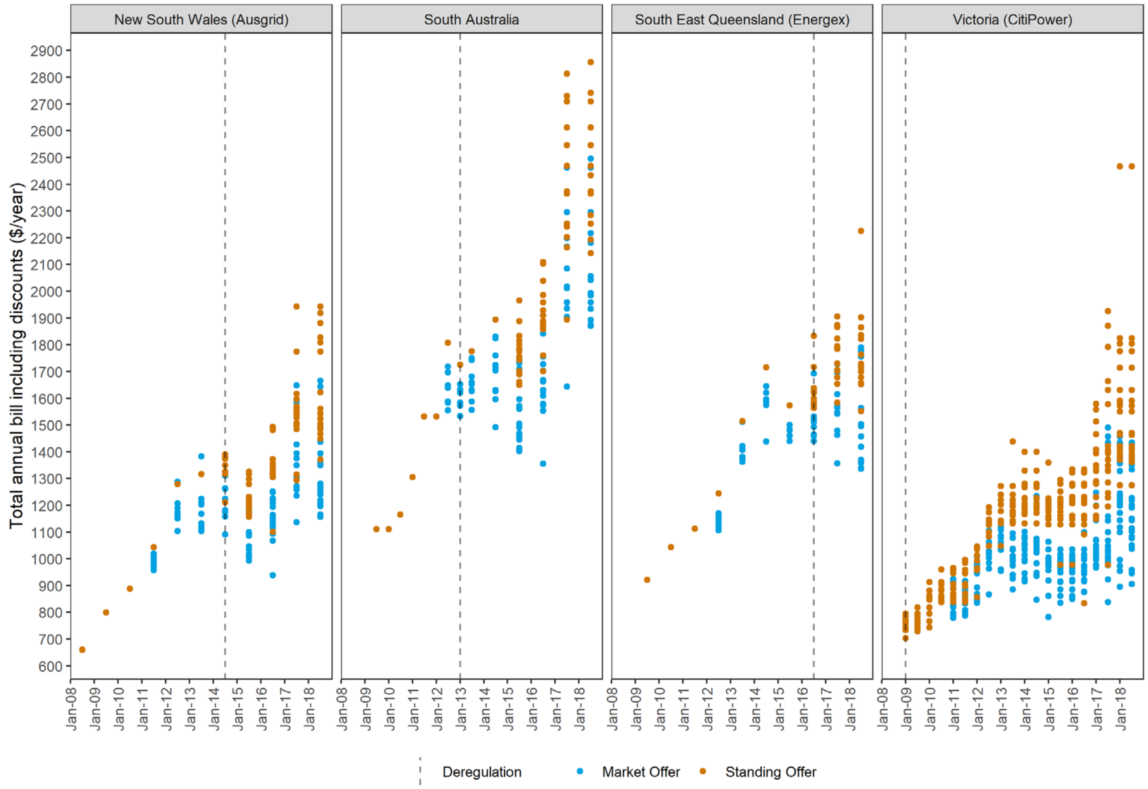
4.2 Price dispersion

Many retailers utilise first-, second- and third-degree price discrimination to provide unique and tailored product offerings (Hviid and Waddams Price, 2012; Nelson et al., 2018; Byrne et al., 2019). These include price discounts targeted at higher consuming customers, lower pricing for customers that utilise particular payment channels (e.g. direct debit) and negotiated pricing for customers. Figure 7 shows that since the removal of price regulation in Australian retail electricity markets there has been a strong and consistent trend of increasing price dispersion.[9]

Figure 7 shows that since prices have been deregulated there has been a significant widening of price dispersion. This is consistent with the economic literature and the earlier findings specific to the Australian context (Simshauser and Whish-Wilson, 2017; Nelson et al., 2018 and Simshauser, 2018). It follows that if the reverse were to occur through reregulation, then the price dispersion would be likely to reduce with a compression of offers (Waddams Price and Zhu, 2016a). The imposition of a default offer may result in retailers changing their strategies in a manner consistent with that proposed by our partial equilibrium model in Section 3.

[9] While the figure only displays dispersion in one DNSP area in each state, this trend is evident across all distribution areas. For more details, see AEMC (2018a).

Figure 7: Price dispersion in selected Australian capital cities[10]



Source: Analysis based on data provided by St Vincent de Paul and Alvis Consulting

4.3 Customer switching behaviour

Another concern with imposing a default offer is the impact that it may have upon customer switching between retailer offers. As the benefit period for competitive offers is often only 12 months, customers benefit most by regularly comparing offers and regulators have made efforts to encourage customers to actively engage in the retail market.[11]

Switching rates in the deregulated regions of the NEM are high, in the range of 20 – 30 per cent per year, as seen in Figure 8.

There is a risk that under a price cap, customers may perceive that the returns from 'shopping around' are reduced and the level of active engagement in the market may be reduced (He and Reiner, 2018).[12] Retailers have an incentive to endorse the perception of protection of a price cap to their existing consumers as it may encourage them not to switch.[13]

The empirical observations presented in this section reveal an increasingly competitive market with benefits for engaged consumers. However, the move towards reregulating electricity prices threatens to throw these developments in reverse.

[10] See Figure 4.16 in AEMC (2018a). A shortcoming of this analysis is that we do not have information on the number of customers on each of the offers. One of our key policy recommendations presented in the subsequent section of this article is for retailers to be required to annually disclose the number of customers (and potentially the average consumption of these customer cohorts) on each offer.

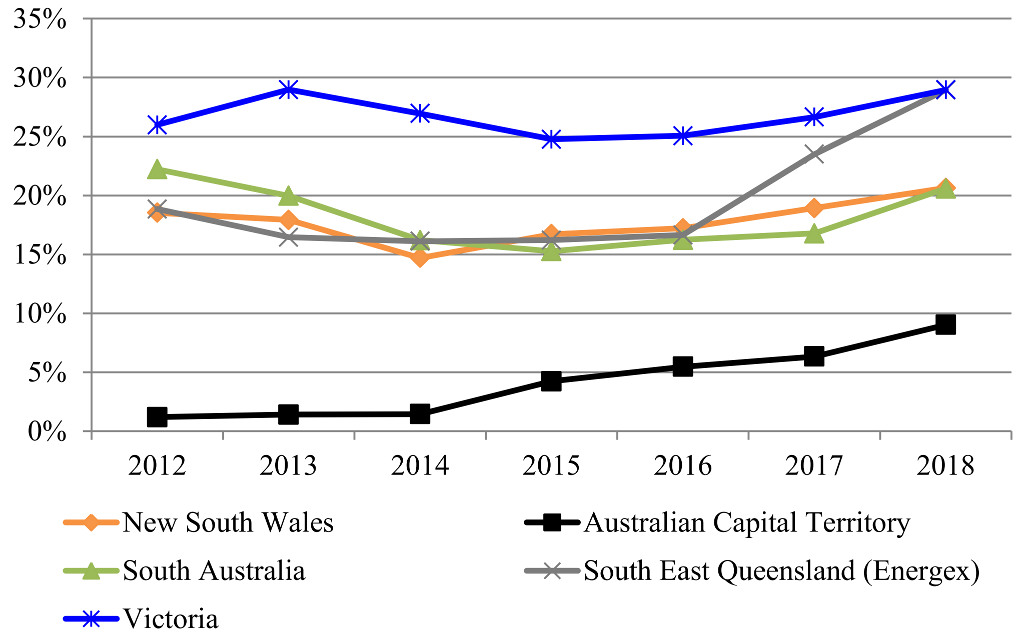
[11] For example, the Victorian Government offers a $50 incentive for residential customers that compare offers through their comparator website *Victorian Energy Compare*.

[12] Survey research from 2015 found that Australian households would require, on average, minimum savings of between $194 and $234 per year to switch to another offer (Newgate Research, 2015).

[13] In the lead up to the DMO, one retailer sent an email to their customers including the following quote: "The Federal Government has introduced a Default Market Offer which they've deemed is a *fair* price for energy consumers to pay per year." (emphasis added).

A systematic reduction in switching behaviour would have negative implications for the level of competition in the market, could possibly re-establish the dominance of the Big 3, and reduce the incentive for innovation in the sector.[14]

Figure 8: Residential switching rates across NEM jurisdictions



Source: Data from AEMC (2019a).

4.4 International observations

The preceding analysis is largely theoretical in that there is no observed history of reregulation in Australian electricity markets. But other jurisdictions have undergone processes of reregulation which allow us to draw conclusions about the robustness of our hypothesis. Great Britain has recently reintroduced price regulation through a temporary 'default tariff cap'.

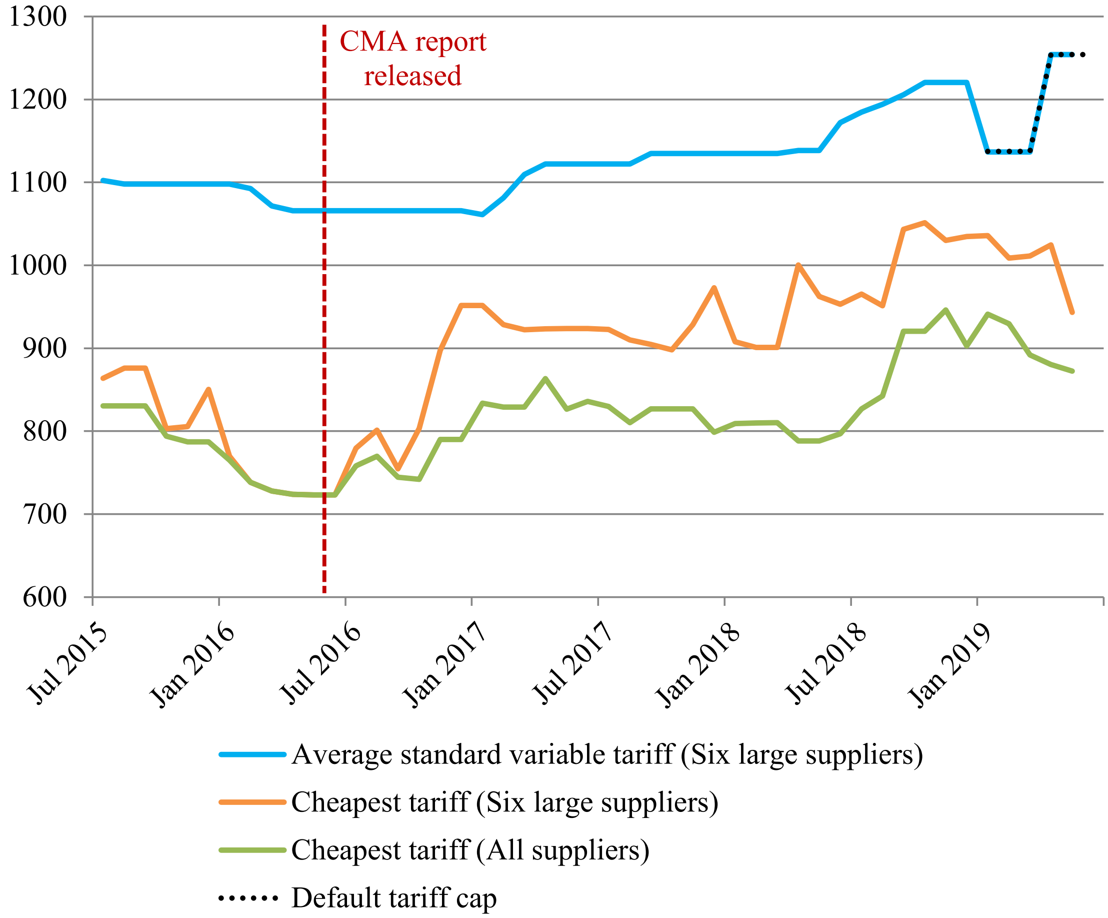
Following the announcement of the default tariff cap in June 2016, there was an increase in the price of the cheapest offers in the market. The increase was larger for the six largest retailers (known colloquially as 'the Big Six") than for the market as a whole (KPMG, 2017). Figure 9 shows the increase in the price of the cheapest offers following the announcement of the default tariff cap in June 2016 (CMA, 2016). This was followed by a further sharp increase in the cheapest tariffs in the months leading up to the start of the tariff cap on January 1, 2019.

Shortly after the start of the tariff cap, Ofgem announced that the cap would be increased from April 1 citing high wholesale costs.[15] Despite this increase in costs, the cheapest offers in the market *decreased* both across the Big 6 and overall, consistent with our theory that the optimal price in the weak segment of the market depends negatively on the price set in the strong segment.

[14] As noted in AEMC (2019a), there has been an increase in innovation in the retail electricity sector. For example, aided in part by the rollout of interval meters, Amber Electric has recently entered the New South Wales and South Australian retail markets offering a dynamic pricing plan that passes through 30-minute wholesale spot prices to end consumers and provides them with real-time electricity price forecasts for consumers to manage their usage.

[15] For the Ofgem announcement see: https://www.ofgem.gov.uk/publications-and-updates/higher-wholesale-costs-push-default-and-pre-payment-price-caps-april

Figure 9: Great Britain tariffs over time (£/year)



Source: Ofgem retail market indicators

4.5 Customer segment composition

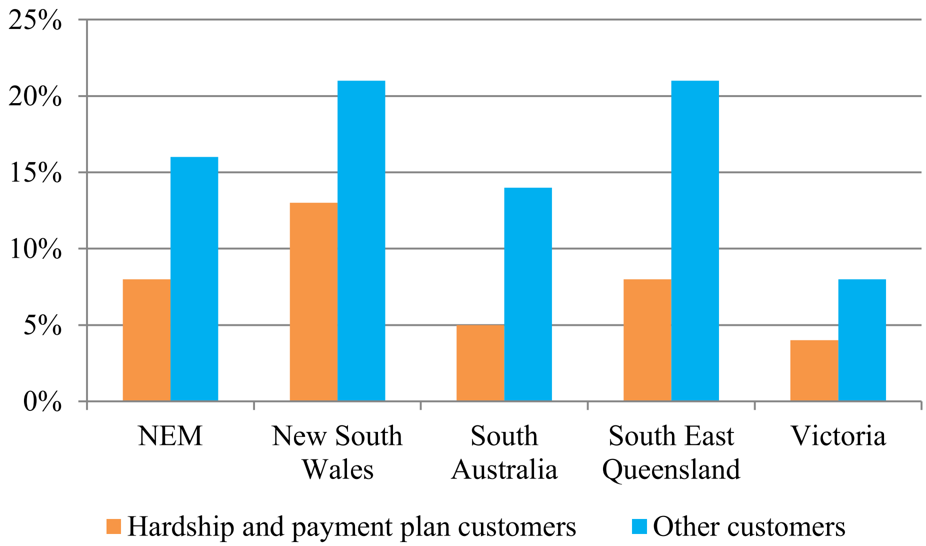
The most cited policy rationale for introducing a default offer relates to the protection of customers prone to energy-related financial hardship. Simshauser and Whish-Wilson (2017) noted that there are issues of inter-consumer misallocation due to relatively high standing offers. They expressed concern that there may be some customers who are vulnerable to financial hardship that remain on higher priced standing offers. This sub-section seeks to explore the types of customers who are on both standing offers and high discount products.

Nelson et al. (2018) found 'that customers on 'standing offer' tariffs use 18% less electricity than customers on 'high discount' products, indicating the presence of market segmentation and implicit second-degree price discrimination.' Simshauser and Nelson (2014) have concluded that the family formation demographic is most at risk of financial hardship due to higher than average consumption and lower per person household income. It can therefore be inferred that price dispersion is facilitating savings for those customers most in need (due to financial vulnerability) as higher discount products are generally targeted at customers with higher consumption. Nelson et al. (2019, p. 262) established that, 'energy related financial hardship is likely to be related to a combination of the following: family formation demographics; low-income (often reliant upon government income support); higher household size; and higher than average consumption.' The study also noted that 'shopping around' was a key way in which households could minimise energy bills due to the opportunities available through second degree price discrimination.

Australian regulators have made similar claims in relation to this issue. The ACCC (2018) and AEMC (2018a) have considered the heterogeneity of household consumption and the incidence of customers on 'standing offers'. The AEMC (2018b) demonstrated there is a correlation between a postcode having a higher proportion of standing offers if the customers: have a lower proficiency in English; occupy a property rent-free (such as being a home-owner); have the property as an unoccupied private dwelling and are in rural areas.

The ACCC (2018) found that there was a particularly strong relationship between customers selecting market offers and them being part of a hardship program or payment plan. Figure 10 presents the findings of the ACCC (2018). Customers on hardship plans are far less likely to remain on a standing offer because they have the greatest incentive to find better offers. AEMC (2018b), without drawing conclusions on the efficiency of price discrimination within the overall market, noted that the lower presence of hardship and payment plan customers on standing offers would likely mean a reduction in price dispersion in the market and would therefore result in the greatest detriment to these customers. This reinforces the findings of Nelson et al. (2019) around hardship and financially vulnerable customers having up to 40% higher than average consumption and thus a disproportionately high incentive to be on the best available market offer.

Figure 10: Percentage of standing offer customers in hardship



Source: ACCC (2018, p. 245)

This summary of customer segmentation demonstrates that introducing a default offer is likely to be counterproductive if the policy rationale is to improve overall outcomes for the consumer segments most at risk of financial hardship: those on hardship programs and those in the family formation demographic. As consumers with higher than average consumption, they have a stronger incentive to be on heavily discounted products, due to the higher marginal benefit to them of 'shopping around'. The introduction of a price cap is likely to result in a compression of offers and reduce the potential savings available to such households through engagement with the market.

5. Impact of price regulation on price dispersion

To compare retailer offers before and after the imposition of the DMO on July 1 2019, we have collected offers from the AER's *Energy Made Easy* comparator website from March 2019, September 2019 and January 2020. This provides a comprehensive overview of the retail market at these points in time as retailers are required under the AER's Retail Pricing Information

Guidelines to submit all generally available offers to *Energy Made Easy*. However, as the requirement is limited to generally available offers, retailers are not required to submit negotiated offers. As discussed in Byrne et al. (2019), negotiated offers play a role in the marketing strategies of some retailers, particularly large and small retailers.[16] Our analysis is unable to capture these dynamics.

Using the snapshot of offers, we calculate bills for each distribution area based on the DMO consumption levels (kWh per year). These levels are presented in Table 1 along with the price cap level for the corresponding consumption.

Table 1: DMO consumption and price level

Distribution area	**Consumption per year (kWh)**	**DMO price (ex-GST)**
Ausgrid (Metro NSW)	3,900	$1,334
Endeavour (Regional NSW)	4,900	$1,564
Essential (Rural NSW)	4,600	$1,779
Energex* (South East Queensland)	6,300	$1,752
SA Power Networks (South Australia)	4,000	$1,765

**Energex includes a controlled load tariff as this is the typical connection in South East Queensland.*

To give a fair representation of the market we have only included offers that are available to all households in each area. For example, we have excluded offers that require the customer to be part of a club or that require the customer to own an electric vehicle.

Likewise, we have only included flat offers, that is offers with a daily supply charge ($/day) and a single volumetric charge ($/kWh). This is because for the first year the DMO only applies to flat offers, and these offers still cover the vast majority of customers in the areas covered.

Where a retailer has multiple offers that result in the same total annual cost (including discounts), we have included only one offer. This is to avoid weighting retailers with different marketing strategies differently.

5.1 Distribution of bills before and after the DMO

Below we present the distribution of bills at each of the three periods for which we have offers: March 2019, September 2019 and January 2020. We have presented bills from the Ausgrid distribution which covers a large part of Sydney in New South Wales (NSW) which has the largest customer numbers of the distribution areas covered. We have also presented bills from the Essential area which covers rural NSW. Retailers in the Essential area face similar input costs to Ausgrid, apart from the network costs.

For this analysis we have classified retailers as ‘Tier 1’ if their market share in the state is greater than 10 per cent, and ‘Tier 2’ otherwise. In each of the distributions we have coloured the Tier 1 retailer offers separately and grouped Tier 2 retailer offers together.

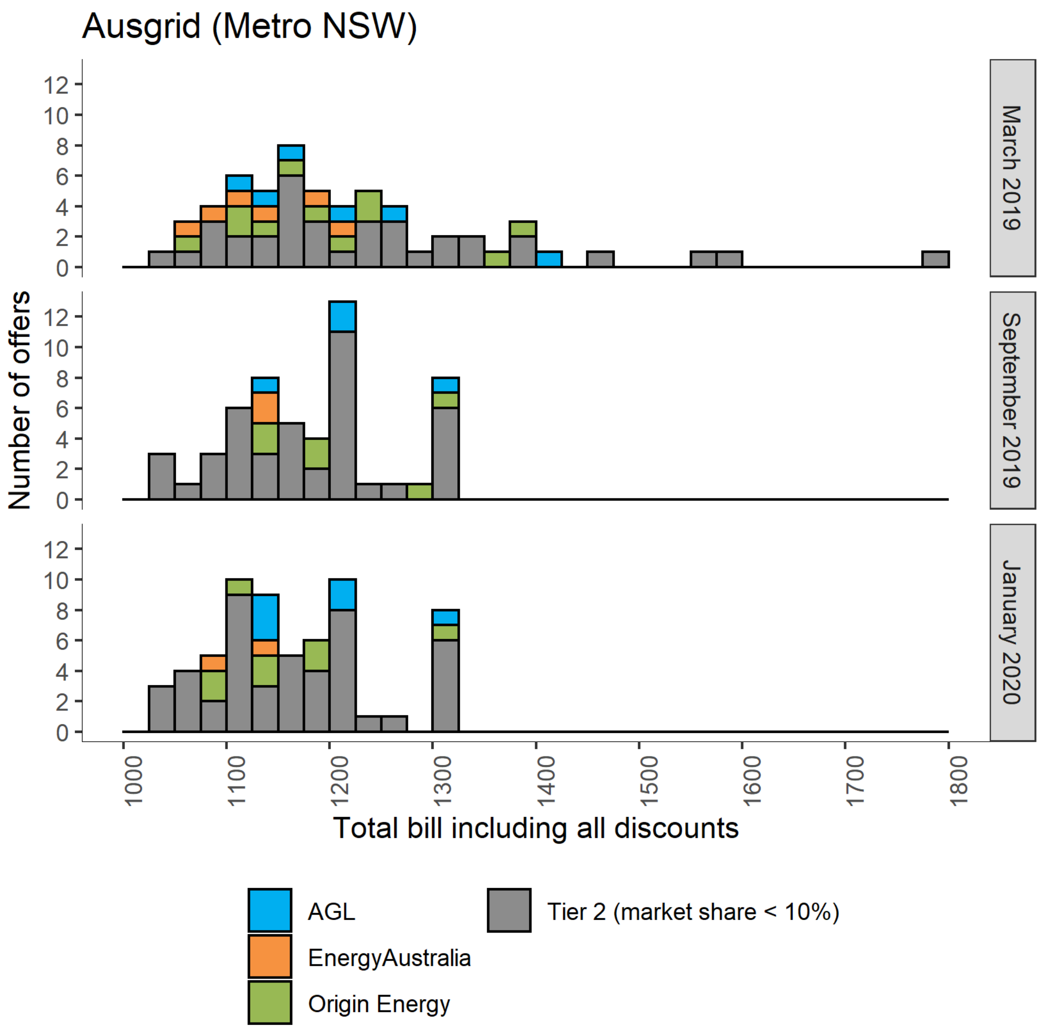
Figure 11 shows the distribution of bills in the Ausgrid area covering Sydney in NSW. It is clear to see the effect of the DMO on the right-hand side of the distribution. After July 1, high priced offers have disappeared from the market and there is a concentration of offers at the DMO price

[16] Byrne et al. (2019) found that large and small retailers are willing to negotiate lower prices with customers in Victoria. Mid-sized firms tended not to negotiate from posted prices.

level. It also appears that the weight of the distribution has shifted to the right, with a greater number of offers in the range of $1,100-$1,200/year. Following the DMO, Tier 1 retailer offers have become more concentrated in the middle of the bill distribution.

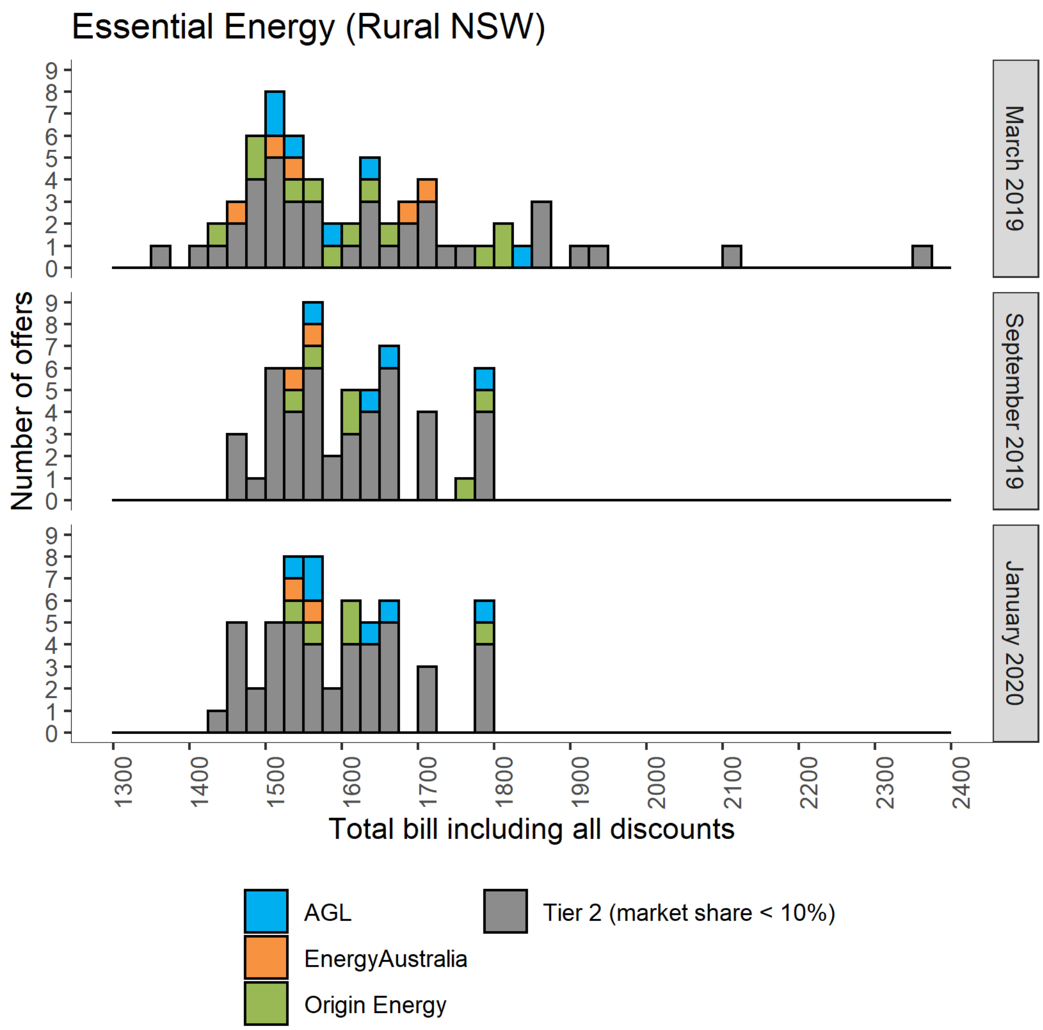
However, there are still cheap offers from Tier 2 retailers in the market. In January 2020 there were more offers under $1,100/year than in March 2019, before the DMO. This may reflect changes in input costs from July 1, 2019 (AEMC, 2019b).

Figure 11: Comparison of bill distributions in the Ausgrid area



In rural NSW there is similar evidence of compression of offers following the DMO. Figure 12 presents the distribution of bills for the Essential distribution area. There appears to be a concentration of bills in the range of $1,500-$1,700/year, particularly for Tier 1 retailer offers.

Figure 12: Comparison of bill distributions in the Essential area

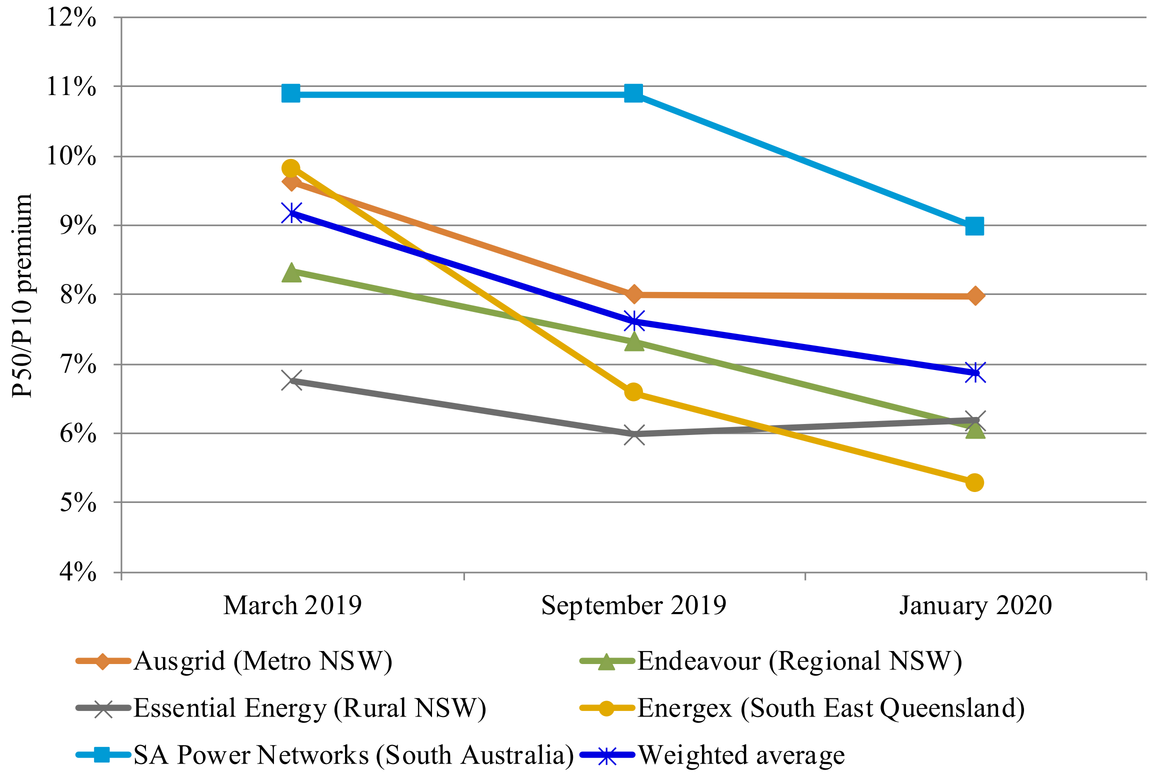


5.2 *Price dispersion measure*

Comparing distributions of bills before and after the DMO is an imperfect method of assessing changes in price dispersion as it does not take account of changing retailer input costs. To better examine the effect of the DMO on price dispersion in the market we have calculated a dispersion metric which is calculated as the premium of the median market offer over the 10th percentile market offer in each distribution area, expressed in percentage terms. This premium can be thought of as the 'returns to search' for a customer finding an offer at the 10th percentile in the market rather than accepting the median market offer. For example, if the P50/P10 premium was 10%, this means that a customer in this area could expect to save 10% off their annual bill by finding an offer at the 10th percentile of the market relative to the median market offer.

We calculate this premium for the available offers for which we have data: March 2019, September 2019 and January 2020. This allows us to compare the level of dispersion before and after the imposition of the DMO on July 1, 2019. Figure 13 shows that price dispersion has reduced across all distribution areas between March 2019 and January 2020.

Figure 13: P50/P10 premium before and after the DMO



Weighting the results by customer numbers, there has been a 2.3% reduction in the premium of median market offers over offers at the 10th percentile. The reduction in premiums varied across distribution areas, as seen in Table 2. The largest fall was in South East Queensland which saw the returns for search fall from 9.8% to 5.3% while the smallest fall was in rural NSW from 6.8% to 6.2%.

Table 2: Change in the P50/P10 premium (including GST)

Distribution area	Change in P50/P10 premium (%)	Change in P50/P10 premium ($)
Ausgrid (Metro NSW)	-1.6%	-$21.62
Endeavour (Regional NSW)	-2.3%	-$32.41
Essential (Rural NSW)	-0.6%	-$8.86
Energex* (South East Queensland)	-4.5%	-$80.02
SA Power Networks (South Australia)	-1.9%	-$28.99
Weighted average	-2.3%	-$36.58

On average, the savings for searching for a P10 above settling for a P50 (median) market offer reduced by $36.58 from $136.12 per year to $99.54 per year. The reduction in dispersion varied substantially across the distribution areas. In the rural NSW the reduction in dispersion was only $9/year while in South East Queensland the reduction was $80/year meaning that the returns for searching for a better offer in South East Queensland effectively halved between March 2019 and January 2020, from $167/year to $87/year.

These savings are based on the DMO consumption levels from Table 1 and are for a 'typical' household. Those with higher energy consumption, for example households with children, have seen a greater reduction in their incentive to shop around for a better offer. This may be of concern in the longer term as these households may face other constraints (such as lack of time) that mean they experience higher search costs and so need a larger incentive to engage in the market.

The magnitude of the observed reductions in the P50/P10 premia are in line with the findings of Byrne et al. (2019) which found that customers received discounts of 1.5% for calling retailers for a price quote and 4% if they further negotiated their offer. This suggests that while the reduction in savings from search are small, some customers are willing to exert extra search (or bargaining) effort to obtain savings of this magnitude.

Table 3 shows the reduction in premium by retailer tier. As in Section 5.1, we have defined Tier 1 retailers as those that have at least 10% market share in the state. These results show that in New South Wales the reduction in dispersion among Tier 1 retailer offers is greater than Tier 2. In South East Queensland the results are the opposite with the reduction in dispersion being driven largely by Tier 2 retailers.

Table 3: Change in the P50/P10 premium by retailer tier

Distribution area	**Change in P50/P10 premium (%)**	
	Tier 1	**Tier 2**
Ausgrid (Metro NSW)	-2.2%	-1.2%
Endeavour (Regional NSW)	-6.1%	-2.6%
Essential (Rural NSW)	-4.8%	-0.1%
Energex* (South East Queensland)	-0.5%	-8.1%
SA Power Networks (South Australia)	-1.4%	-1.5%

Caution should be taken when interpreting these results. While the price dispersion measure we have calculated is intended to overcome limitations of comparing distributions of bills, it does not control for changing dynamics in the market that are independent of price re-regulation. For example, in recent years competition in South East Queensland has increased sharply, driven by the entry of Alinta Energy in 2017. Alinta Energy has aggressively competed for market share from the incumbent retailers with low-priced offers.

6. Conclusion and policy implications

This article has outlined a mechanism through which a retail price cap may lead to retailers withdrawing the cheapest offers from the market. If some customers are 'sticky' and stay beyond the discounted benefit period, then profit maximising retailers have an incentive to aggressively compete by offering generous discounts for new customers. A price cap set below the profit maximising price for staying customers reduces the profitability these customers and so changes the trade-off faced by retailers. This results in a higher optimal price (smaller discount) for new customers. Overall, this results in a redistribution of consumer surplus from more active to less active customers in the market.

Our theoretical model in Section 3 demonstrates that the lowest prices in the market are likely to rise due to the introduction of a default offer. In Section 5, we have tested this prediction by analysing offers in the market in the 6 months following the imposition of a price cap in July 2019. We find a reduction in the premium of the median market offer over an offer at the 10th percentile of 2.3 per cent or $37 per year, on average. This reduction in the premium can be thought of as a reduction in the returns to search for a better offer which reduces the incentive for households to be engaged in the market.

Our analysis suggests price regulation leaves customers on heavily discounted plans worse off. Whether this outcome promotes or detracts from economic efficiency is an open question; if heavily-discounted plans attract mostly low-willingness-to-pay customers, then price reregulation leaves these customers worse off and efficiency is undermined. In contrast, if the high-priced offers attracted mostly low-willingness-to-pay customers, then price caps can be efficiency-enhancing as prices for these customers fall.

6.1 Policy recommendations

We do not contend that the retail electricity market in Australia is operating as efficiently as it could. Instead, we are of the view that there are better ways to enhance welfare than reregulating prices. The introduction of a default offer could, therefore, be counterproductive vis-à-vis other policies.

One policy recommendation relates to resolving the *discount off what?* problem for consumers. We agree with ACCC (2018) that a common price benchmark such as the default offer can reduce consumer confusion, since price dispersion in the NEM occurs I practice through the application of different price discounts to reference prices that vary across retailers. This has created customer confusion about the actual prices charged for different offers, leading to inefficient price discrimination, with some vulnerable customers remaining on high-priced offers.

A second policy recommendation relates to direct measures to help vulnerable consumers. The challenge is to develop interventions that protect vulnerable and disengaged consumers over both the short *and* long-term, whilst preserving the benefits to consumers of remaining active and engaged in the market. Therefore, as an alternative to a default offer, we recommend policy makers create an auction for the right to serve vulnerable, disengaged consumers.

In Figure 14 we provide a schematic to help think about optimal policy development in deregulated retail electricity markets. Broadly we can think of there being four groups of consumers, represented in quadrants *a*, *b*, *c* and *d*. Those in the first row (*a* and *b*) are actively engaged in the market and regularly 'shop around' for better offers, while those in the second row are disengaged either by rational choice (quadrant *c*), or due to some inability to exercise choice (quadrant *d*). Consumers in the first column are financially well-off while those in the second column are financially vulnerable.

In a competitive retail market, quadrant *a* and *b* consumers will tend to be on low-priced offers, while quadrant *c* and *d* consumers tend to be on high-priced market or standing offers. As shown by Simshauser and Whish-Wilson (2017), the outcomes for *a*, *b* and *c* are efficient. The allocation of quadrant *d* consumers to high-priced offers however is a potential source of inefficiency.

<u>Figure 14: Consumer engagement and vulnerability quadrants</u>

Financial situation	
Comfortable	Vulnerable

Engagement with market	Engaged	*a*	*b*
	Disengaged	*c*	*d*

In developing policy to protect vulnerable disengaged consumers we need to be careful to preserve incentives for consumers to be engaged in the market (Waddams Price and Zhu 2016b; Walker, 2017). The central difficulty facing policy makers is that measures intended to benefit consumers in quadrant *d*, such as a price cap, tend to do so at the expense of consumers in *a* and *b*. Instead, policy-makers should focus on developing interventions to target quadrant *d* consumers while minimising the impacts on consumers in quadrants *a*, *b* and *c*.

Our main policy recommendation is that policy makers should determine an appropriate length of time for consumers to be on standing (or high market) offers. After this period of time, say two years, vulnerable consumers (for example, pensioners, those receiving government benefits or low-income cardholders) would be automatically transitioned to a basic retailer offer that is determined through an auction in each distribution area.[17] The auction could be conducted annually and would involve retailers competing within each distribution area to supply these inactive customers. The auction would be decided by the lowest proposed offer to supply these customers and the winning retailer would pay for the cost of administering the auction.

This approach would have the benefit of not reducing the incentive for active customers to be engaged in the market, while protecting vulnerable, disengaged consumers who would otherwise be sitting on high priced offers. In the schematic of Figure 14, the auction would protect quadrant *d* consumers from high prices, while not impacting upon the incentives for quadrant *a* and *c* consumers (because they are not eligible) and would limit the disincentive for *b* to remain engaged (because of the two year waiting period). This would lead to a preferred outcome to a price cap which is a blunt redistribution from quadrant *c* and *d* to quadrant *a* and *b* consumers.

The auction may also provide a way for entrant retailers to establish themselves in the market.

In addition to our main policy recommendation, we believe there are some straightforward policies that may stimulate engagement among vulnerable, disengaged consumers.

Firstly, policy makers could require that retailers contact their longstanding customers on high priced offers annually, directing them to the government-run price comparison website *Energy Made Easy* and informing them that they could make substantial savings from switching.[18] In Great Britain, Ofgem conducted a similar trial which involved sending a 'Cheaper Market Offer Letter' to disengaged consumers on the equivalent of standing offers. The trial resulted in a tripling of switching rates among these consumers from 1 per cent to 3.4 per cent (Tyers et al.

[17] The authors note that switching consumers between offers would require a change to the National Electricity Retail Law, in particular the provisions for Explicit Informed Consent.

[18] The authors note that there is a pending rule change at the AEMC making a similar recommendation.

2019). Other research from the US has likewise suggested that low-cost interventions such sending a flyer to households providing them with information on how to switch may help them to overcome their inertia (Hortaçsu et al., 2017).

Secondly, an expansion of existing state-level concession schemes would assist vulnerable, disengaged consumers and may be warranted given the rapid increase in electricity prices, driven by wholesale and network costs, over the past few years. These schemes could be indexed to average retail electricity prices as published by the Australian Bureau of Statistics.

While we contend that the ACCC (2018) default offer policy recommendation is likely to be counterproductive, it is important to note that many of the other recommendations made by the ACCC (2018) could be prioritised by policy makers to improve consumer outcomes. In our view, the most important of these is the reference bill component of the DMO. This overcomes the *discounts off what?* problem by requiring retailers to advertise discounts from the DMO.

Other welcome measures from ACCC (2018) include: accelerating the take-up of cost-reflective network pricing[19]; increasing the uptake of digital meters to facilitate more efficient pricing; development of a mandatory code of conduct for third party intermediaries offering comparison advice; commitments to ongoing funding of government-run comparator sites; and funding for community organisations to improve energy literacy.

6.2 Further research

Our main policy recommendation outlined above is an auction for the right to serve vulnerable, disengaged consumers. An area of future research would be to consider the optimal amount of time that vulnerable consumers should be left on standing (and high market) offers before they are switched. The key trade-off is how to protect vulnerable, disengaged consumers while preserving the incentive for other consumers to engage actively in the market.

The implementation of the Default Market Offer and the Victorian Default Offer will provide opportunities for empirical testing of the theory presented in Section 3 of this article. Price dispersion and switching rates in the states impacted by the regulation can be compared with those of the other jurisdictions before and after the regulation comes into effect.

[19] To protect against bill shock, there should be a compulsory data sampling period for customers, a requirement for retailers to provide a flat rate tariff offer, and additional targeted protections for vulnerable consumers.

References

Australian Competition and Consumer Commission (ACCC). (2018), *Restoring electricity affordability and Australia's competitive advantage*, Retail Electricity Pricing Inquiry—Final Report, Available online at https://www.accc.gov.au/regulated-infrastructure/energy/electricity-supply-prices-inquiry/final-report

Australian Energy Market Commission (AEMC). (2017), *2017 AEMC Retail Energy Competition Review,* Final report, Available online at https://www.aemc.gov.au/markets-reviews-advice/2017-retail-energy-competition-review

Australian Energy Market Commission (AEMC). (2018a), *2018 AEMC Retail Energy Competition Review,* Final report, Available online at https://www.aemc.gov.au/sites/default/files/2018-06/Final%20Report.pdf

Australian Energy Market Commission (AEMC). (2018b), *Advice to COAG Energy Council: customer and competition impacts of a default offer,* Final report, Available online at https://www.aemc.gov.au/market-reviews-advice/advice-coag-energy-council-default-offer

Australian Energy Market Commission (AEMC). (2019a), *2019 AEMC Retail Energy Competition Review*. Final report, Available online at https://www.aemc.gov.au/market-reviews-advice/residential-electricity-price-trends-2019

Australian Energy Market Commission (AEMC). (2019b), *Residential Electricity Price Trends 2019*. Final report, Available online at https://www.aemc.gov.au/markets-reviews-advice/2017-retail-energy-competition-review

Australian Energy Regulator (AER). (2018), *State of the Energy Market 2018*, Available online at https://www.aer.gov.au/publications/state-of-the-energy-market-reports/state-of-the-energy-market-2018

Australian Energy Regulator (AER). (2019), *Retail energy market performance update for Quarter 1 2018-19,* Retail Performance Data Workbook, Available online at https://www.aer.gov.au/retail-markets/performance-reporting/retail-energy-market-performance-update-for-quarter-1-2018-19

Baumol, WJ and Swanson, DG. (2003). The new economy and ubiquitous competitive price discrimination: Identifying defensible criteria of market power. Antitrust Law Journal. 70. 661-685.

Ben-David, R. (2015), 'If the retail energy market is competitive then is Lara Bingle a Russian cosmonaut?', Available online at https://www.esc.vic.gov.au/sites/default/files/documents/If-The-Retail-Energy-Market-Is-Competitive-Then-Is-Lara-Bingle-A-Russian-Cosmonaut.pdf

Borenstein, S. and Bushnell, J. (2015). "The US Electricity Industry After 20 Years of Restructuring," Annual Review of Economics, Annual Reviews, vol. 7(1), pages 437-463.

Byrne, D., Martin, L., and Nah, J. S. (2019). Price Discrimination, Search, and Negotiation in an Oligopoly: A Field Experiment in Retail Electricity (December 19, 2019). Available at SSRN: https://ssrn.com/abstract=3352209 or http://dx.doi.org/10.2139/ssrn.3352209

Competition and Markets Authority (CMA). (2016), *Energy market investigation*, Final report, Available online at https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf

Corts, K. (1998), 'Third-degree price discrimination in oligopoly: all-out competition and strategic commitment', *RAND Journal of Economics*, Vol. 29, No. 2, pp. 306–323.

Essential Services Commission (ESC). (2018), *Victorian Energy Market Update January to March 2018,* Available online at https://www.esc.vic.gov.au/sites/default/files/documents/victorian-energy-market-report-vemr-update-january-march-2018pdf.pdf

Flores, M., and Waddams Price, C. (2018). The Role of Attitudes and Marketing in Consumer Behaviours in the British Retail Electricity Market. The Energy Journal, 39(4), 153–179.

Giulietti, M., Waterson, M., and Wildenbeest, M. (2014). Estimation of Search Frictions in the British Electricity Market. Journal of Industrial Economics, 62(4), pp. 555–590.

Hartley, P., Medlock, K., and Jankovska, O. (2019). Electricity reform and retail pricing in Texas. Energy Economics, 80, pp. 1–11.

He, X. and Reiner, D. (2018), *Consumer engagement in energy markets: the role of information and knowledge*, Cambridge Working Papers in Economics 1867, Faculty of Economics, University of Cambridge.

Holmes, T. (1989), 'The effects of third-degree price discrimination in oligopoly', *American Economic Review*, Vol. 79, pp. 244–250.

Hortaçsu, A., Madanizadeh, S., and Puller, S. (2017). Power to Choose? An Analysis of Consumer Inertia in the Residential Electricity Market. American Economic Journal: Economic Policy, 9(4), pp. 192–226.

Hviid, M., and Waddams Price, C. (2012). Non-Discrimination Clauses in the Retail Energy Sector*. Economic Journal, 122(562), F236–F252.

Kang, L., and Zarnikau, J. (2009). Did the expiration of retail price caps affect prices in the restructured Texas electricity market? Energy Policy, 37(5), 1713–1717.

KPMG (2017), *What would a price cap mean for the energy market?*, Available online at https://assets.kpmg/content/dam/kpmg/uk/pdf/2017/07/what-would-a-price-cap-mean-for-the-energy-market.pdf

Littlechild, S. (2014). Promoting or restricting competition?: Regulation of the UK retail residential energy market since 2008. IDEAS Working Paper Series from RePEc. Retrieved from http://search.proquest.com/docview/1698012088/

Littlechild, S. (2018). Is there competition below the PPM tariff cap? What are the implications for policy?, Energy Policy Research Group, University of Cambridge. Available online at https://www.eprg.group.cam.ac.uk/wp-content/uploads/2018/10/S.-Littlechild_16-Oct-2018.pdf

Littlechild, S. (2019). Promoting competition and protecting customers? Regulation of the GB retail energy market 2008–2016. Journal of Regulatory Economics, 55(2), 107–139.

Nelson, T., McCracken-Hewson, E., Sundstrom, G. and Hawthorne, M. (2019), 'The drivers of energy-related financial hardship in Australia - understanding the role of income, consumption and housing', *Energy Policy*, Vol. 124, pp. 262-271.

Nelson, T., McCracken-Hewson, E., Whish-Wilson, P., and Bashir, S. (2018), 'Price dispersion in Australian retail electricity markets', *Energy Economics*, Vol. 70, No. 1, pp.158-169.

Nelson, T. and Reid, C. (2013), 'Reconciling energy prices and social policy', *The Electricity Journal*, Vol. 27, No. 1, pp. 104-114.

Newgate Research (2015), 'Consumer Research for 2015 Nationwide Review of Competition in Retail Energy Markets', Research report. Available online at https://www.aemc.gov.au/sites/default/files/content/a2bcda47-18c6-4721-9532-086e2f77a782/Consumer-Research-for-2015-Nationwide-Review-of-Competition-in-Retail-Energy-Markets-Newgate-Research.PDF.

Office of Gas and Electricity Markets (Ofgem). (2018), *Decision – Default tariff cap – Overview document*, Available online at https://www.ofgem.gov.uk/system/files/docs/2018/11/decision_-_default_tariff_cap_-_overview_document_0.pdf

Office of Gas and Electricity Markets (Ofgem). (2018), *Retail market indicators*, Available online at https://www.ofgem.gov.uk/data-portal/retail-market-indicators

Pigou, A.C. (1920), *The Economics of Welfare*, Macmillan, London.

Robinson, J. (1933). *The Economics of Imperfect Competition*, Macmillan, London.

Schmalensee, R. (1981) 'Output and welfare implications of monopolistic third-degree price discrimination', American Economic Review, Vol 71, pp. 242-247.

Simshauser, P. (2018), 'Price discrimination and the modes of failure in deregulated retail electricity markets', *Energy Economics,* Vol. 75, No. 1, pp. 54-70.

Simshauser, P. and Nelson, T. (2014), 'The Consequences of Retail Electricity Price Rises: Rethinking Customer Hardship', *The Australian Economic Review*, Vol. 47, No. 1, pp. 13-43.

Simshauser, P. and Whish-Wilson, P. (2017), 'Price discrimination in Australia's retail electricity markets: An analysis of Victoria & Southeast Queensland', *Energy Economics,* Vol. 62, No. 1, pp. 92-103.

Sitzia, S., Zheng, J., and Zizzo, D. (2015). Inattentive consumers in markets for services.(Report). Theory and Decision, 79(2), pp. 307–332.

Stole, L. (2007), 'Price discrimination and competition', In: Armstrong, M. Porter, R. (Eds.), *Handbook of Industrial Economics vol. III,* Elsevier, Amsterdam.

Thwaites, J., Faulkner, P., and Mulder, T. (2017), 'Independent review into electricity and gas retail markets in Victoria', Available online at https://www.energy.vic.gov.au/__data/assets/pdf_file/0030/79266/Retail-Energy-Review-Final-Report.pdf

Tsai, C., and Tsai, Y. (2018). Competitive retail electricity market under continuous price regulation. Energy Policy, Vol 114, pp. 274-287.

Tyers, R., Sweeney, M., and Moon, B. (2019). Harnessing behavioural insights to encourage consumer engagement in the British energy market: Results from a field trial. Journal of Behavioral and Experimental Economics, 80, pp. 162–176.

Varian, H. (1985), Price Discrimination and Social Welfare, American Economic Review, Vol 75, issue 4, pp. 870-875.

Varian, H. (1996), 'Differential pricing and efficiency', *First Monday*, Vol. 1, No. 2, pp. 1–13.

Waddams Price, C. (2018), 'Back to the Future? Regulating Residential Energy Markets', *International Journal of the Economics of Business*, Vol. 25, No. 1, pp. 147-155.

Waddams Price, C., and Zhu, M. (2016a). Non-discrimination clauses: their effect on British retail energy prices. The Energy Journal, 37(2), 1.

Waddams Price, C., and Zhu, M. (2016b). Empirical evidence of consumer response in regulated markets. Journal of Competition Law & Economics, 12(1), pp. 113–149.

Walker, M. (2017), 'Behavioural economics: the lessons for regulators', *European Competition Journal*, 13:1, pp. 1-27.