

# **EXPLANATORY NOTE**

## **Retail electricity market monitoring of diverse consumers and market offers**

**VEPC Working Paper WP2008  
October 2020**

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**DOI: 10.26196/16ba-pp90**

### **Abstract**

Traditional approaches to retail electricity market monitoring rely on assumptions of the representative customer and the price it pays. Such approaches fail to account for consumer diversity or diversity in the range of competing offers. We develop an approach that prices, at monthly resolution, a large sample of customers' bills on all competing offers available to each customer. This establishes a dataset of around 4 million possible bills each month. We segment these data to provide information on the trends in bills, the effect of discounts, to contrast retailers' pricing strategies and of the savings available to customers if they switch to cheaper offers. Further segmentations could be considered to analyse additional aspects. Establishing a longitudinal sample of customer bills would substantially enhance the approach developed here.

**Acknowledgements:** We acknowledge Amine Gassem without whose PDF parsing, offer pricing and website scraping skills this research would not have been possible. We also gratefully acknowledge the Victorian Government's funding contribution to VEPC.

## 1. Introduction

The retail electricity market in the state of Victoria, Australia, was opened to competition in 2003, and all price controls were withdrawn in 2009. Following an independent review of the market in 2017, see (Thwaites, Faulkner, & Mulder, 2017), the Government of Victoria introduced new regulations affecting retail offers to households and small businesses. Before and since these changes, regulators and policy makers have been particularly interested in the measurement of retail market outcomes.

Measuring outcomes in retail markets is difficult because customers are diverse (they consume different amounts, shipping costs differ considerably by geography, they are supplied on different tariff structures, some have access to rooftop photovoltaics) and also because retailers offer a wide range of different deals.

In Victoria and in retail electricity markets elsewhere in Australia and in other countries, regulators and authorities typically monitor retail electricity markets by measuring prices or bills for what they define to be typical or representative customers. Sometimes they segment consumers into a small number of groups typically differentiated by annual consumption. Sometimes retailers are segmented (for example small versus large). While this approach is easy to implement and the small handful of results are easy to communicate, it fails to provide information on the wide diversity of market outcomes for different customers, and the measures ultimately reflect little more than the authorities' assumptions rather than allowing the data from the market to be objectively expressed.

We have sought to develop a better system of monitoring that involves the use of a large sample of customers' bills to survey the market. While this approach cannot directly measure the actual changes in customers' bills (it is not a longitudinal dataset), it nevertheless can provide substantial additional information on retail market outcomes and how these are changing over time.

The next section describes approaches to retail market monitoring in Australia with brief references to approaches elsewhere. Section 3 describes our data and how we have used it to develop measures that monitor the market. Section 4 provides the results of our approach and a final section discusses the approach and suggests the direction for further development.

## **2. Relevant background**

The retail electricity market in the state of Victoria has allowed households to choose amongst competing retailers, since 2003. There are currently 24 retailers in the market and residential customers typically have a choice of around 200 competing offers. The business of selling electricity is separated from the provision of network services. Five network service providers cover different parts of the state.

Retail offers almost always consist of a cents per day charge and one or more consumption charges (cents per kWh). A little over 8 out of 10 customers are on tariffs whose charges do not vary by time of day (Carbon and Energy Markets, 2017). Most of the remainder have rates that vary between peak and off-peak periods during weekdays. Some customers have access to separately metered “controlled loads” and customers with rooftop PV are compensated for surplus production that is fed back into the grid at rates with a regulated minimum.

Most retail offers also include discounts which often apply to consumption rates, but sometimes also apply to the daily charges. Discounts are almost always conditional on, for example, on-time bill payment or direct debit or in some cases pre-payment. In addition to the commonly used pricing structures, some retailers also offer tariffs with charges for peak demand, or that have fixed monthly charges for consumption up to threshold amounts. Such offers are however, rarely selected.

Standing Offers (which applied to customers who had not chosen their retailer) were regulated until 30 June 2009 and all price controls were withdrawn from that date. The Independent Bipartisan Review (Thwaites et al., 2017) suggested that Victoria’s retail electricity market was failing to deliver outcomes in the interests of consumers. It recommended several changes including the introduction of a default regulated offer. The Victorian Default Offer (VDO) was introduced on 1 July 2019 and revised on 1 January 2020. Consumers can choose the VDO or any other (unregulated) retail offers however the VDO replaced the Standing Offers for customers who have not selected their retailers. In addition, retailers were required to tell customers (on their bill) how much they could save if they switched to their retailers’ cheapest available offers.

## Retail market monitoring

The Essential Services Commission of Victoria monitors retail electricity prices in Victoria for what it defines to be an “average” customer, which it assumes uses 4,000kWh per annum on a tariff with a daily charge and single consumption rate<sup>1</sup>. They apply this consumption to what they determine to be the average price to estimate the average bill. They also distinguish average bills for “unconditional offers” (which includes the VDO, offers with no discount or offers with guaranteed discount) and for “conditional offers” (these are offers with conditional discounts).

In its monitoring of electricity markets in other parts of Australia, the *Australian Energy Regulator* uses its estimate of the median consumption applied to its estimate of the median offer to calculate the median bill. The *Australian Energy Markets Commission* also estimates retail prices<sup>2</sup> based on the consumption of a “representative” customer purchasing electricity on the cheapest commonly available offer.

The *Australian Bureau of Statistics (ABS)* produces an index of electricity prices for capital cities in Australia<sup>3</sup>. The methodology that is used for this is not publicly available but in personal communication we were told that they survey the prices charged on the main plans from a sample of retailers which they select based on market shares. The ABS then estimate electricity bills by applying their estimates of annual usage to the variety of different plans (distinguished by tariff structure, discounts and access to government concessions).

In South Australia, the *Essential Services Commission of South Australia (ESCOSA)*<sup>4</sup> estimates annual residential electricity bills for households on market and standing offers by calculating the average of the price based on all offers available from all authorised energy retailers to

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<sup>1</sup> The reports can be downloaded from <https://www.esc.vic.gov.au/electricity-and-gas/inquiries-studies-and-reviews/electricity-and-gas-retail-markets-review-implementation-2018/assessing-energy-retail-markets-competitiveness-and-efficiency-2019>

<sup>2</sup> The reports can be downloaded from <https://www.aemc.gov.au/market-reviews-advice/residential-electricity-price-trends-2018>

<sup>3</sup> These statistics can be downloaded from <https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/consumer-price-index-australia/jun-2020#data-download>

<sup>4</sup> These reports can be downloaded from <https://www.escosa.sa.gov.au/industry/electricity/regulatory-reporting/energy-retail-offer-prices>

which it applies a fixed annual consumption (5,000 kWh). It also monitors bills assuming the fixed consumption is supplied on the cheapest available offers.

In Great Britain, the *Office of Gas and Electricity Markets* (Ofgem) estimates average annual bills by applying a fixed consumption amount to retailers offers, distinguishing the offers made by the six largest retailers and all other retailers. It also estimates annual bills taking the average of the 10 cheapest offers<sup>5</sup>.

A common limitation of the approach adopted by these authorities is that their analyses rely on their definitions of the average/median/representative customer and then which competing offer(s) should be used in assessing outcomes for the average/median/representative customer. This assumption-driven approach provides limited information on the diversity in the market taking account of their many differences amongst consumers and the available offers.

### **3. Our approach**

We establish data by extracting price and volume information from 18,996 residential bills and use that information, combined with data on the retailers' offers, to develop a suite of analyses that embrace the diversity in the market. This section describes our data and measurement methods.

#### **3.1 Data**

The Government of Victoria provided approximately 26,000 household electricity bills in PDF format to the Victoria Energy Policy Centre.<sup>6</sup> Of these, 18,996 bills had tariffs with consumption charges which did not vary by time of day (these are known as “flat” or “multi-flat” tariffs) and which applied to customers that had a choice of their retailer (and so excluding customers supplied on embedded networks, which do not have freedom to choose their suppliers).

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<sup>5</sup> Ofgem's retail market data panel can be found here: <https://www.ofgem.gov.uk/data-portal/retail-market-indicators>

<sup>6</sup> Households in Victoria voluntarily uploaded their bills to the Government's price comparison website (<https://compare.energy.vic.gov.au>) and these bills covered uploads that occurred from shortly before the VDO was implemented (in May 2019) to the period not long afterwards (to December 2019).

Data on the customer's postcode, usage, distributor, rooftop PV export volumes, rooftop PV feed-in rates, daily rates, consumption rates, discounts, government concessions (if any), and retailer has been extracted from bills using PDF parsing software. Table 1 provides a comparison of our sample to the population of residential electricity consumers in Victoria. The population covers all customers in Victoria, not specifically those only on non-time variant rates or those only supplied in the constable market<sup>7</sup>.

Socio-economic tiers aggregate the postcode level socio-economic deciles obtained from the Australian Bureau of Statistics (2016): "High" = deciles 7 to 10; "Medium" = deciles 4 to 6 and "Low" = deciles 1 to 3. Retailers are also organised into three tiers. Tier 1 retailers (AGL, Energy Australia and Origin Energy) were the incumbent retailers when the market was first deregulated; Tier 2 includes retailers with a minimum of 3% and a maximum of 10% market share (Alinta, Momentum, Simply, Red and Lumo); Tier 3 retailers are those with less than 3% market share (Click, Amaysim, Globird, Tango, Sumo, Powerdirect, Diamond, Dodo and QEnergy).

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<sup>7</sup> Note also that the data on the population has been sourced from a variety of documents and does not cover exactly the same period as the sample. In addition, the population includes customers on all tariff structures, not just on the dominant flat rate structures.

**Table 1. Comparison of sample to population**

		Sample (%)	Population (%)
Distributor <sup>8</sup>	United	28	20
	Ausnet Services	22	25
	Powercor	22	33
	Jemena	15	11
	Citipower	13	11
Retailer <sup>9</sup>	AGL	21	22
	Origin Energy	14	17
	EnergyAustralia	11	16
	Simply Energy	11	10
	Red Energy	7	9
	Alinta Energy	5	6
	Lumo Energy	4	6
	Momentum Energy	4	3
	Powershop	3	2
	Click Energy and Amaysim	4	2
	Sumo	2	2
	Dodo	2	2
	Tango Energy	5	1
	Powerdirect	1	1
	Globird	5	1
	People Energy	-	0.3007
	1st Energy	0.11	0.2333
	Diamond Energy	0.09	0.1376
	QEnergy	0.02	0.0263
	CovaU	0.02	0.0158
	Next Business Energy	-	0.0045
	Energy Locals	0.02	0.0015
	Blue NRG	-	0.0014
	Powerclub	-	0.0011
	Elysian Energy	-	0.0008
	Onsite Energy Solutions	-	0.0002
Rooftop solar - connections <sup>10</sup>	Yes	7	17
Government concession - customers <sup>11</sup>	Yes	9	37
Switched retailer in previous 12 months <sup>12</sup>	Yes	41	26
Socio-economic decile <sup>13</sup>	Low	12	22
	Medium	25	33
	High	63	45

<sup>8</sup> Source of population data: (Carbon and Energy Markets, 2017).

<sup>9</sup> Source of population data: (Essential Services Commission, 2019). Retailers with <=1 residential customer are excluded from this table (WIN Energy, Online Power & Gas, Tas Gas and Sun Retail).

<sup>10</sup> Source of population data: (Clean Energy Council report 2020, 2020) Solar PV installations (household and commercial systems up to 100 kW) 2019. Denominator is total number of residential customers (Essential Services Commission, 2019).

<sup>11</sup> Source of population data: (Colmar Brunton Social Research, 2018).

<sup>12</sup> Source of population data: AEMO National Electricity Market Reports September 2018 to August 2019. Denominator is total number of National Metering Identifiers (NMIs), estimated to be 3,000,000 at March 2019 (the relevant midpoint). There are 562 household bills in our sample where information on whether the consumer switched retailer in the past 12 months could not be determined. There are excluded in the denominator for the purposes of calculating the switching rate for the sample.

<sup>13</sup> Source of population data: (Australian Bureau of Statistics, 2016). Data is based on total number of occupied and unoccupied private dwellings by postcode and SEIFA index of relative socio-economic advantage and disadvantage (2,411,406). There are 204 household bills that could not be mapped to a Victorian postcode. There are excluded from the denominator for the purposes of calculating the proportion of household bills by socio-economic decile tier.

Comparing the sample to the population, it is evident that the sample has a higher proportion of mainly metropolitan consumers (those in the distribution regions of Jemena, Citipower and United); which have a much higher switching rate, are much more likely to be supplied by Tier 3 retailers, much less likely to receive government concessions, and much more likely to be in the highest socio-economic group. The implications of this bias is discussed after the results are set out.

We establish the data of the offers that retailers make, by periodically scraping offer details from the Government of Victoria's price comparison website (<https://compare.energy.vic.gov.au/>). Electricity retailers are required to post all their publicly available offers on the Government's price comparison website.

### 3.2 Methodology

The annual bill for each of the 18, 996 consumers in our sample is calculated once per month for all offers that are available to each consumer. The annual bill on each offer is calculated ("priced") by annualising the bill based on billed consumption and using the prices in each relevant offer<sup>14</sup>. The relevant offers are the publicly available offers of the same tariff type (i.e. excluding time-variant consumption rates). The dataset of priced offers is then segmented to establish relevant information on the market. There are a variety of ways to segment the data. The chosen segmentations provide relevant information on annual bills that reflect different offers, that show the effect of changing discount strategies and that provide comparison of retailers classified in tiers. The specific segmentations chosen are as follows:

1. **Annual bills after conditional discounts using 10<sup>th</sup> / 50<sup>th</sup> / 90<sup>th</sup> percentile offers:**

This is the average annual bill in the sample calculated using the using the 10<sup>th</sup> / 50<sup>th</sup> / 90<sup>th</sup> percentile offers assuming the customer achieves all conditional discounts.

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<sup>14</sup> Mountain and Burns (2020) concluded that annualisation in this way is likely to provide unbiased estimates of annual bills across a large sample.



2. **Annual bills before / after conditional discounts:** This is average annual bill for the sample using median offers assuming all discounts are achieved or the median offer assuming that all conditional discounts are not achieved.
3. **Annual bills after discounts by retailer tier (10<sup>th</sup> / 50<sup>th</sup> / 90<sup>th</sup> percentile offers, segmented by retailer tier):** these series show the average of the 10<sup>th</sup> percentile cheapest offer; the median offer and the 90<sup>th</sup> percentile offer where, in each case, the cohort of offers is defined by the three tiers of retailers.

In addition to analysis of the estimated annual bills, it is possible to assess how much customers would save if they switched to cheaper offers. To do this, we establish the Available Saving which is defined as the estimated annual saving calculated as the difference in the prices in the customers' bills and the price in the chosen competing offers. The chosen offer in this analysis is the 10th percentile cheapest offer. This selection reflects the assumption that customers that switch retailer might be expected to seek cheaper offers but will rarely be successful in finding the cheapest available offer or may not necessarily choose the cheapest offer. The 10<sup>th</sup> percentile cheapest offer is therefore chosen as a proxy for the most likely cheapest offers that customers might reasonably be expected to select.

#### 4. Results

The results of the analysis are presented in the following five charts. Figure 1 shows the trend of the average annual bill in the sample calculated using the 10th, 50th and 90th percentile offers and assuming that all conditional discounts are achieved. This suggests a large reduction in price dispersion after the VDO was introduced.

**Figure 1. Average annual bill calculated using the 10th, 50th and 90th percentile offers**

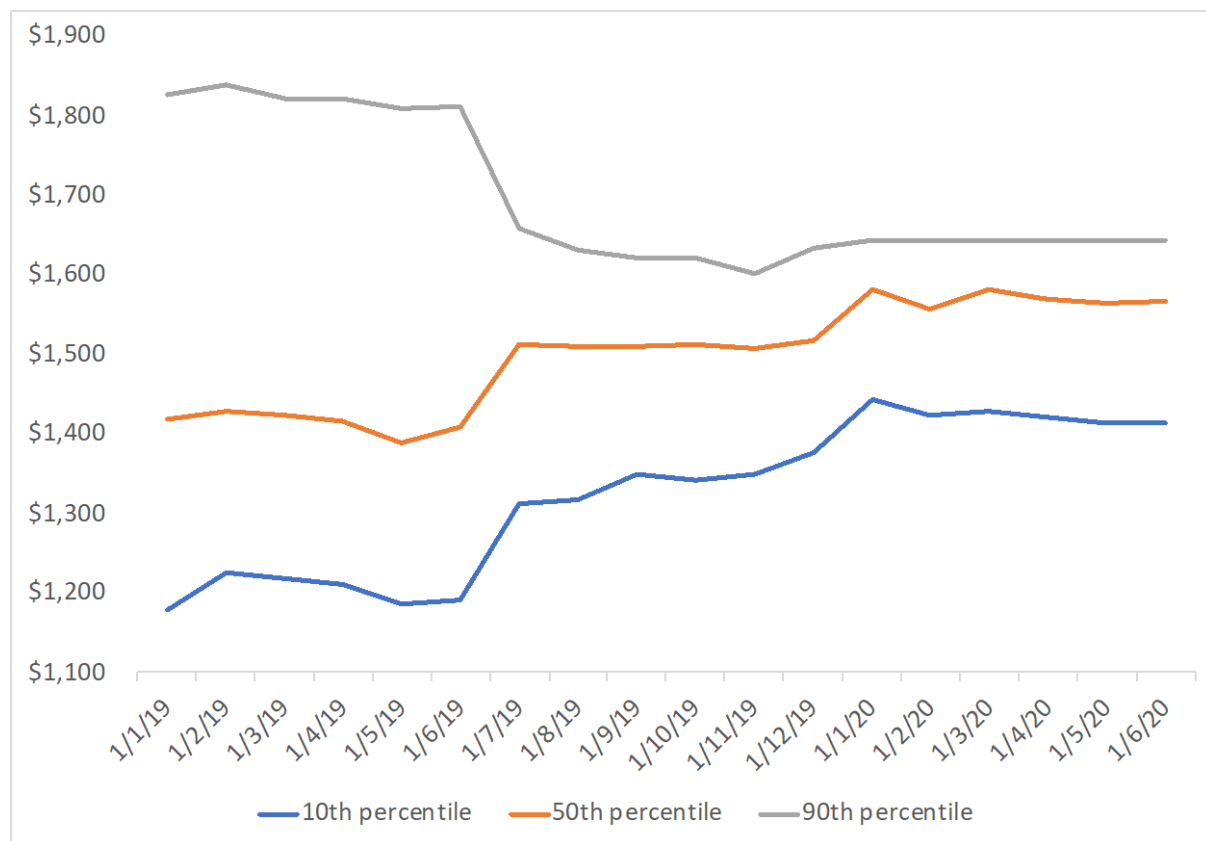


Figure 2 shows the average of the median offers where the median is calculated assuming firstly that conditional discounts are achieved and then that conditional discounts are not achieved. This analysis suggests that outcomes following the introduction of the VDO would have been quite different for customers that selected offers with conditional discounts depending on the extent to which they satisfied the conditions of those discounts. Specifically, those that selected median offers and that satisfied conditions in offers with conditional discounts would have paid higher bills, while those that did not satisfy their conditions in conditional discounts would have paid lower bills.

**Figure 2. Average of median offers with and without conditional discounts**



Table 2 shows (second column) that the proportion of offers with discounts on consumption rates decreased from 1 in 3 in January 2019, to 1 in 20 in June 2020 and the median percentage discount on consumption (third column) roughly halved from 30% to 16%. By contrast, the proportion of offers with discounts on the total bill (fourth column) roughly double from just under 1 in 5 to just under 1 in 3 and the median percentage discount roughly halved from 14% to 6% before rising again to 10%. Taken together, this suggest that discounts are much less significant feature of the retail market following the introduction of the VDO. This is reflected in Figure 2 also in the much smaller gap between annual bills depending on whether conditions in conditional discounts are satisfied.

**Table 1. Analysis of discounts in offers**

	Proportion (%) of offers with discount on consumption	Median percent discount on consumption	Proportion (%) of offers with discount on total bill	Median percent discount on total bill
19-Jan	35	30	17	14
19-Feb	35	30	17	10
19-Mar	34	30	19	10
19-Apr	34	30	19	10
19-May	38	30	18	10
19-Jun	32	30	22	12
19-Jul	8	20	20	6
19-Aug	6	23	20	6
19-Sep	7	22	18	6
19-Oct	6	10	17	6
19-Nov	7	10	24	6
19-Dec	8	10	25	6
20-Jan	9	10	27	6
20-Feb	7	10	29	6
20-Mar	5	15	30	6
20-Apr	4	16	37	10
20-May	4	15	39	10
20-Jun	5	16	30	10

The three charts in Figure 3 show how retail offers compare in the three tiers for the 10th, 50th and 90th percentile offers of the retailers included in each tier. The charts show very different trends across the tiers when slicing offers at these three levels. For example, Tier 3 retailers typically offered the lowest prices when assessed at the 10<sup>th</sup> percentile, but the highest when assessed at the 90<sup>th</sup> percentile, and their 90<sup>th</sup> percentile offers decreased the most over the period.

**Figure 3. Average of median offers segmented by Tier**

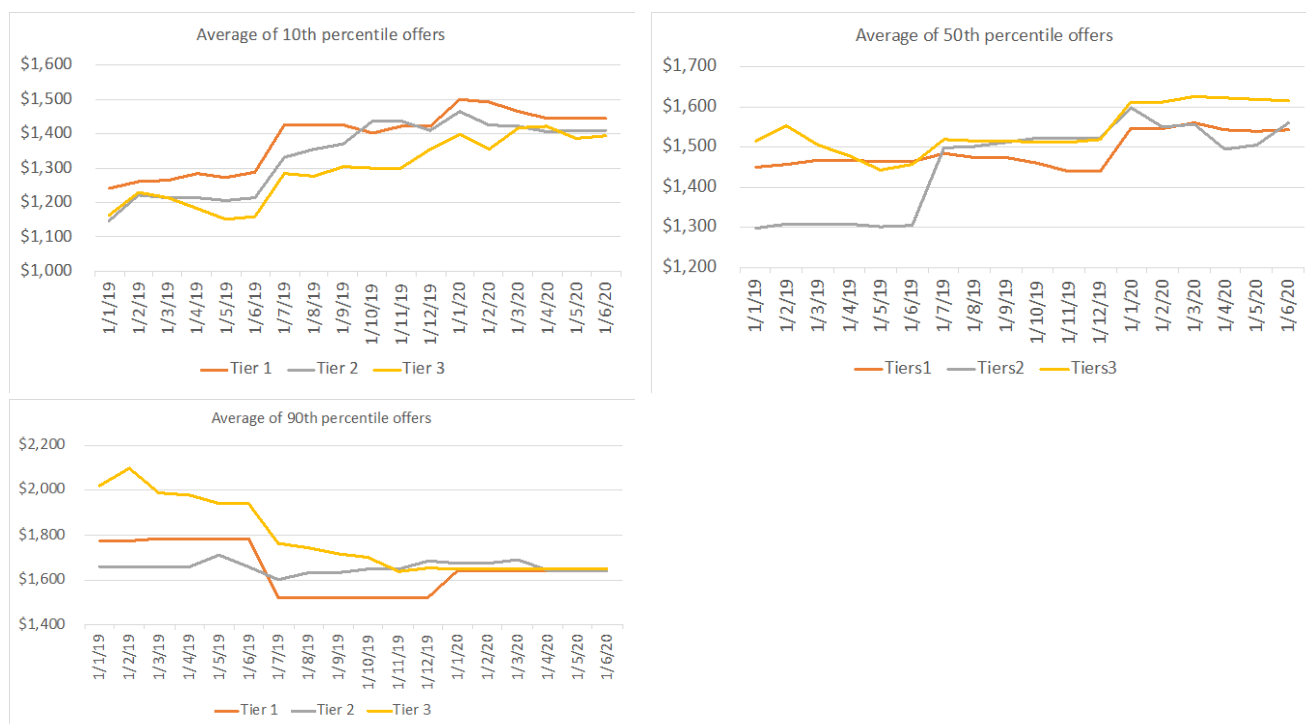
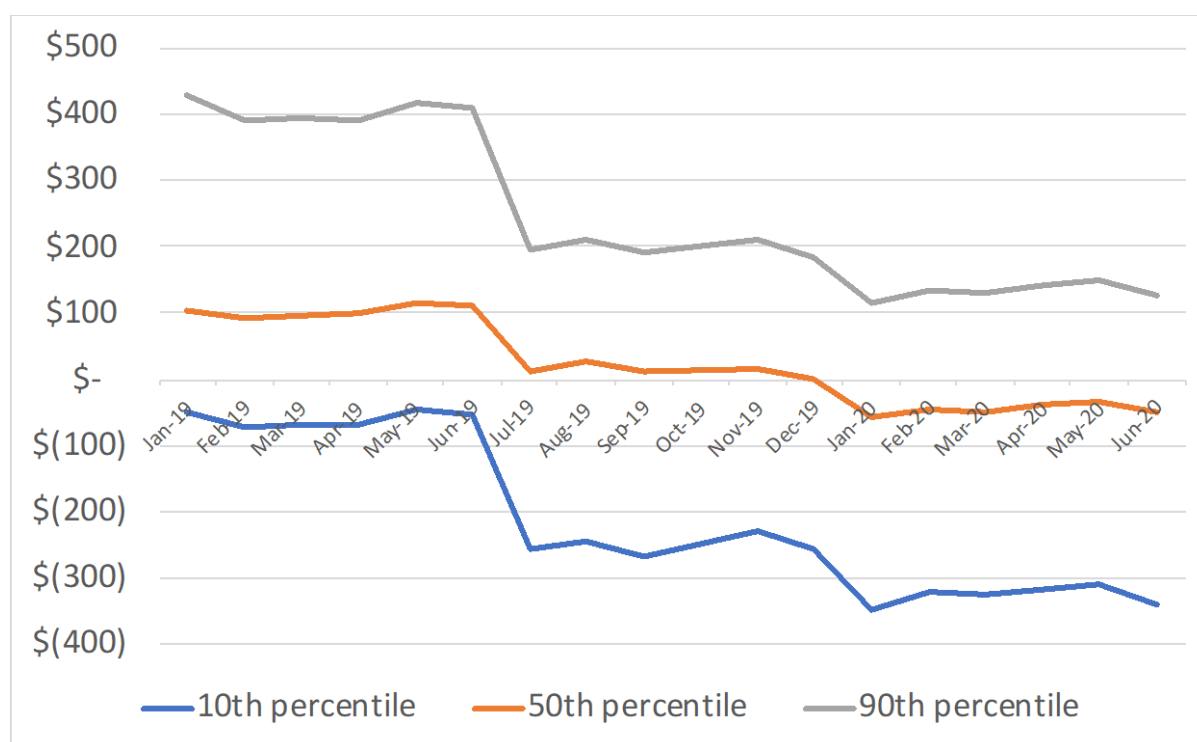


Figure 4 shows the trend in Available Saving calculated as the difference in customers' actual bills and what their bills would be if they were supplied on the 10th percentile best offer (and assuming they satisfied the conditions of any conditional discounts in those offers). The three lines show the trends in the Available Savings measured at the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles in the sample. In all cases, the Available Savings decline over the period. The 10<sup>th</sup> percentile Available Saving was negative<sup>15</sup> over the whole of the period. The charts show large declines in Available Savings as the cheapest offers were withdrawn from the market over the period.

<sup>15</sup> A negative saving means that the bill would rise if the customer switched to the offer.

**Figure 4. Average Available Saving in sample (relative to the 10<sup>th</sup> percentile cheapest offer)**



## 5. Discussion and next steps

This paper presents an approach to the monitoring of retail electricity markets that uses data on the prices and volumes in a large sample of customers' bills, to price the offers that retailers make and from this data to extract relevant information on the market.

The resulting large sample of priced offers – typically around 4 million priced offers each month – provides a data source that can then be used to monitor how bills change over time and can be segmented to reveal relevant trends. We have shown how bills would change if customers selected high, middle or low offers and segmentations have revealed the effect of changes in discount strategies, and how retailers classified in tiers have changed their offers over time in response to recent change in retail market regulation. Using price and volume information in customers' bills, it has also been possible to monitor how much customers could save if they switched to cheaper offers and how this changes over time.

Sample bias affects the results presented here and it is important to be clear on the nature of the bias and its likely effect. Comparing our sample to the population suggest a bias towards

urbanised customers located in wealthier and better educated areas and that are more highly engaged in the retail markets as evident by much higher switching rates and by the proportion of that sample that are supplied by Tier 3 retailers. These differences are likely to mean, *ceteris paribus*, that the sample have lower prices than the population. But we suggest it is unlikely that consumption volumes in the sample will be substantially different to the population. This means that despite the bias in our sample, the trends in annual bills and Available Savings in the sample are likely to be a reasonable estimate of the trends across the population. However, it is likely that the levels of annual bills and Available Savings are lower in the sample than in the population.

There are several possibilities for the extensions of this analysis. For example, segmenting the market by distributor, distinguishing between households with or without rooftop PV, or access to government concessions may reveal additional insights. A higher priority might be to distinguish outcomes for consumers depending on whether they switched retailers in the 12 months before they uploaded their bills (the “switchers”). This is likely to provide valuable information on trend changes in Available Savings for “switchers” and “remainers” that could build on the cross-sectional estimate in (Mountain & Burns, 2020).

Finally, it should also be recognised that while the approach presented in this paper can measure bills and Available Savings at a point in time, it cannot measure how they *actually* change over time since it does not contain data on the offers that consumers actually select (when they switch retailers) or how the prices they pay their existing retailers (if they do not switch retailer) are changing. Periodically, collecting bills from the same customers will establish a longitudinal data set that can be used to directly measure retail market outcomes. This would be a valuable extension to the system of monitoring established here.

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