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Glossary

Annex A: Description of data and spreads analysis

1. In this annex we set out the price and cost data we have obtained and describe the methodology used to calculate refining and retail spreads.

Price data

2. In this section we outline two sets of pricing data we have obtained: average retail petrol and diesel prices across the UK, and retail petrol and diesel prices at each pump in the UK.

Average UK petrol and diesel prices

3. BEIS[1] publishes road fuel price statistics containing weekly UK retail 'pump' prices for petrol and diesel.[2] Petrol and diesel retail prices are collected on a weekly basis (for each Monday). The retail prices are calculated from weekly data submitted by six companies (four oil companies and two supermarkets)[3] which jointly cover around 65% of the market. The BEIS petrol and diesel retail prices are weighted averages of the average prices submitted by the six companies, with weights determined by annual sales. BEIS data is available for the period 9 June 2003 to 12 June 2023 (inclusive).

Petrol and diesel prices at each pump

4. In addition to the retail prices published by BEIS, we also acquired retail price data from Experian. Experian stated there are around 8,350 open sites in the UK currently. On average, 85% of these sites reported price each week, which represents around 97% of the fuel volume in the market. A total number of 7,649[4] sites reported petrol and diesel prices in the Experian price dataset. The CMA acquired Experian's price data on a twice-weekly basis (for each Wednesday and Saturday) over a five-year period between 3 June 2017 and 14 May 2023 (inclusive).

5. Experian pricing data is collected from transaction data made on Allstar Fuel cards. A price is reported when at least one Allstar Fuel card is used to purchase fuel at a particular site on a particular day. Experian use the most frequently reported price for that site for each day in the dataset.

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[1] BEIS existed until 2023 when it was split to form new departments, including the Department for Business and Trade (DBT), and the Department for Energy Security and Net Zero (DESNZ). References in the report to data supplied by BEIS cover data subsequently supplied by DESNZ when BEIS ceased to exist.
[2] Weekly road fuel prices.
[3] BEIS collects the average price across sites from each of the six companies (site-level data is not collected).
[4] Note, Experian price data contains 7,649 sites. We removed 5 sites as price was not reported on Wednesday or Saturday. We removed an additional 14 sites which were in the Isle of Man.

6. We also obtained data from Experian on site characteristics, covering: site location information, location type,[5] brand, ownership type,[6] company owner, availability of shop, availability of carwash, and estimated average annual volumes. Experian's site characteristics data was provided on a quarterly basis, covering a five-year period between Q2 2017 and Q1 2023 (inclusive).[7] Experian collect and maintain data on all open sites in the UK.

Data on cost components

7. One of the principal factors driving the pump prices for petrol and diesel is the wholesale fuel price, which in turn, is dependent on:

   (a) the global price of crude oil, which is driven by supply and demand for crude oil;

   (b) oil refinery production and capacity;

   (c) the pound to dollar exchange rate, as crude oil and refined fuel is sold in US dollars;

   (d) biofuel prices and costs related to the Renewable Transport Fuel Obligation;

   (e) distribution costs; and

   (f) the margins that refiners and wholesalers make.

8. In addition to the wholesale price, the level of, and changes in, pump prices are dependent on:

   (a) The fuel duty charged by the Government, currently 52.95p a litre;

   (b) VAT charged at the end of every forecourt fuel transaction, currently at 20%; and

   (c) the margins that fuel retailers make.

9. We have sought data on the underlying cost components for petrol and diesel in order to analyse and explain changes in prices at the pump. While we have obtained data on several input costs, it has not been possible to collect data

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[5] Experian site data includes the following location types: industry/office, motorway, residential, rural, and urban transient.
[6] Experian site data uses the following ownership types: oil company, dealer, and supermarkets. Experian defined supermarkets to include Asda, Morrisons, Sainsbury's, Tesco, Co-op, and Food Store. The CMA reallocated Co-op and Food Store sites to a separate "not applicable" category to focus on the top four supermarkets in our analysis.
[7] We note the site data excludes the following period: Q2 2021 to Q4 2021.

for all of the components. We outline below the data which we have obtained, as well as cost components for which we don't have data and how these missing cost components may impact our calculations.

Crude oil

10. Petrol and diesel are made from crude oil. A high percentage of the global extraction of crude oil comes from USA, Saudi Arabia and Russia. It is an internationally traded commodity and thus has a global price.

11. We use the Brent 1-month daily price series from Bloomberg as a proxy for the cost of crude oil.[8] Brent crude is a sweet light crude oil that is extracted from the North Sea. It is used as an international benchmark for pricing crude. The 1-month refers to a crude contract that is bought to be delivered in a month's time, and this crude contract tends to be the most widely quoted price for crude.

12. We do a simple average of the daily prices to obtain the average weekly price of Brent crude, which is then converted from USD per barrel to pence per litre.[9]

Exchange rates

13. As some of the data we have obtained is priced in a different currency (for example, Brent crude oil is priced in USD), we have obtained daily spot exchange rates for USD into GBP and EUR into GBP from the Bank of England.[10]

14. Exchange rate data is available for weekdays only, excluding Bank holidays. We have calculated simple averages of the daily exchange rates to obtain the average weekly exchange rates which can then be applied to the weekly input prices.

CIF petrol and CIF diesel

15. Several fuel retailers have told us that their wholesale cost of goods for petrol and diesel are based on Platts benchmark prices. We have obtained the

[8] The Bloomberg series code is CO1 Comdty. Data is available for weekdays only, including for Bank holidays where these fall on a weekday.
[9] We first convert from USD per barrel to £ per barrel using exchange rates published by the Bank of England (see paragraphs 13–14 for more details on the exchange rates used), and then from £ per barrel to pence per litre by multiplying the £ per barrel figure by 100/159.
[10] Exchange rates - Bank of England.

following data from Platts, as these benchmarks are most commonly used in contracts between wholesale suppliers and retailers:

(a) For petrol we have obtained Gasoline 10ppmS CIF NWE Cargo ("CIF petrol"), and

(b) For diesel we have obtained ULSD 10ppmS CIF NWE Basis UK Cargo ("CIF diesel").

For both series, we have the daily[11] 'close' amounts in USD per tonne, over the period 2 January 2015 to 2 June 2023.

16. We convert the Platts 'close' prices for both petrol and diesel from USD per tonne to pence per litre using Bank of England exchange rates and conversion factors provided by Platts.[12] We do a simple average of the daily CIF 'close' prices to obtain the average weekly CIF prices of petrol and diesel.

Biofuel and Renewable Transport Fuel Obligation

17. As described further in Annex E on biofuels,[13] road fuel suppliers face a number of constraints arising from the desire to incentivise the use of renewable fuels in order to reduce greenhouse gas emissions while maintaining a basic quality of fuel to consumers and ensuring that older vehicles can continue to function. The most important constraint is from the Renewable Transport Fuel Obligation (RTFO).[14]

18. In order to meet the RTFO, biofuels are blended into petrol and diesel. As described further in Annex E, the main biofuel prices that enter into the contractual pricing of road fuel to UK retailers are ethanol, which enters into the pricing of petrol contracts; and Fatty Acid Methyl Esters (FAME) which enters into the pricing of diesel contracts.[15]

19. We have obtained weekly price indices for ethanol and FAME from Bloomberg.[16] The ethanol index is provided in EUR per cubic metre and the FAME index is provided in USD per tonne. Both indices are available weekly for the period: week of 29 December 2014 until week of 29 May 2023. We have converted the indices i) from their original currencies to GBP using the

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[11] Working days only.
[12] The conversion factors are: 1 tonne = 1,324 litres for petrol and 1 tonne = 1,184 litres for diesel.
[13] Biofuels are made from crops (such as corn) or biowaste (such as used cooking oil). Ethanol has about half the energy per mass of petrol, which means it takes twice as much ethanol to get the same energy.
[14] See Annex E, paragraphs 3 and 4.
[15] As described further below, the FAME price also enters into petrol contracts.
[16] The ethanol index is Ethanol T2 Anhydrous 99.3-99.8% in Euros per cubic metre, Free On Board Rotterdam. The FAME index is for FAME zero conforming to EN14214 specifications with a guarantee of 0C Cold Flow Plugging Point (CFPP) in US dollars per Metric Tonne, Free on Board Antwerp/Rotterdam/Amsterdam.

Bank of England exchange rates described above and ii) from their original units to litres.[17]

20. For diesel, reflecting our understanding of pricing in motor fuel supply contracts, the cost of the biofuel component is calculated by multiplying the proportion of renewables in blended fuel required under the RTFO (11.45% for 2023)[18] by the price of FAME and adding the cost of the development fuel obligation based on its buy-out price.

21. For petrol, reflecting our understanding of pricing in motor fuel supply contracts, the cost of the biofuel component is calculated by multiplying the maximum proportion of ethanol in blended petrol (10% from September 2021) by the ethanol price, adding any additional cost of meeting the RTFO based on the FAME price,[19] and also adding the cost of the development fuel obligation based on its buy-out price.[20]

Calculation of spreads

22. Using data on average retail prices from BEIS and data on the cost components outlined above, we have calculated the spread between the CIF benchmark prices and the price of crude oil[21] (referred to as 'refining spread') as well as the spread between the net price (ie price at pump excluding VAT and fuel duty) and wholesale price (referred to as 'retail spread'). These are described in more detail below.

Refining spread

23. The refining spread is the spread between the CIF benchmark price and the price of crude oil, calculated for the amount of crude oil contained in 1 litre of petrol/diesel sold at the pump:

(CIF benchmark price[22] – Price of crude oil[23]) x Proportion of ex-refinery product in 1L of end-product sold at the pump[24].

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[17] 1 tonne of FAME is assumed equivalent to 1,130 litres.
[18] Table 1 in Annex E shows that under the RTFO the 2023 main obligation is 13.08% and the 2023 development fuel obligation is 1.14%, both as percentages of fossil fuel. Given the development fuel obligation is generally bought out, the required proportion of biofuel in blended diesel is 0.1308/(1+0.1308+0.0114)=0.1145.
[19] The pricing of biofuels in petrol contracts is discussed further in paragraphs 16-18 and 29-32 of Annex E.
[20] Prior to 2020, for both diesel and petrol, allowance is also made for the cost of meeting the Motor Fuel Greenhouse Gas Emissions Reporting Regulations.
[21] Including the effect of exchange rate fluctuations.
[22] We use CIF petrol and CIF diesel prices provided by Platts.
[23] We use the Brent 1-month price provided by Bloomberg.
[24] This proportion is less than 1, and has been reducing over time from 0.9525 for both petrol and diesel pre-April 2018 to 0.9 for petrol and 0.8855 for diesel from January 2023 due to the addition of biofuels to petrol and diesel sold at the pump.

24. This is not a measure of refining margins for two principal reasons:

(a) firstly, refining is a co-production system where a single input is used to create multiple outputs. Although it is possible to make small changes in the output mix produced by a refinery, it is not possible to only produce petrol or diesel from crude oil, and as such, a number of other products are always produced. These other products are also internationally traded commodities, some of which are worth substantially less than petrol or diesel; and

(b) secondly, the refinery spread does not account for any operating costs that refineries face.

Retail spread

25. The retail spread is the difference between average fuel prices at the pump net of fuel duty and VAT, and an estimated wholesale price,[25] which is comprised of the benchmarked cost of diesel and petrol imported into the UK, and the cost of biofuel:

(Price at pump – Fuel duty – VAT) – (CIF benchmark cost[26, 27] + Cost of biofuel)

Estimated wholesale price

26. The retail spread broadly reflects retail and transportation costs as well as retailer profit and some costs that may be borne by wholesale suppliers (such as branding costs, see Section 7), and as such is not a measure of retail margins.

[25] The actual wholesale price paid will vary by retailer due to differences between purchase contracts, including differences in lags between purchase and delivery.
[26] We use CIF petrol and CIF diesel prices provided by Platts.
[27] The CIF benchmark price is multiplied by the proportion of ex-refinery product in 1L of end-product sold at the pump to get the CIF benchmark cost.

Annex B: Local Case Studies

1. We studied 21 local areas in the UK. These areas were defined based on a drivetime isochrone around a relatively expensive site (the “centroid”) in each local authority we looked at. The prices of competing sites in the 52 weeks up to w/c 8 May 2023 were analysed.

2. The local areas were selected as follows:

   a. First, we chose 21 local authorities, by selecting 1-2 from each region or country in GB. This ensured a geographic spread around GB;

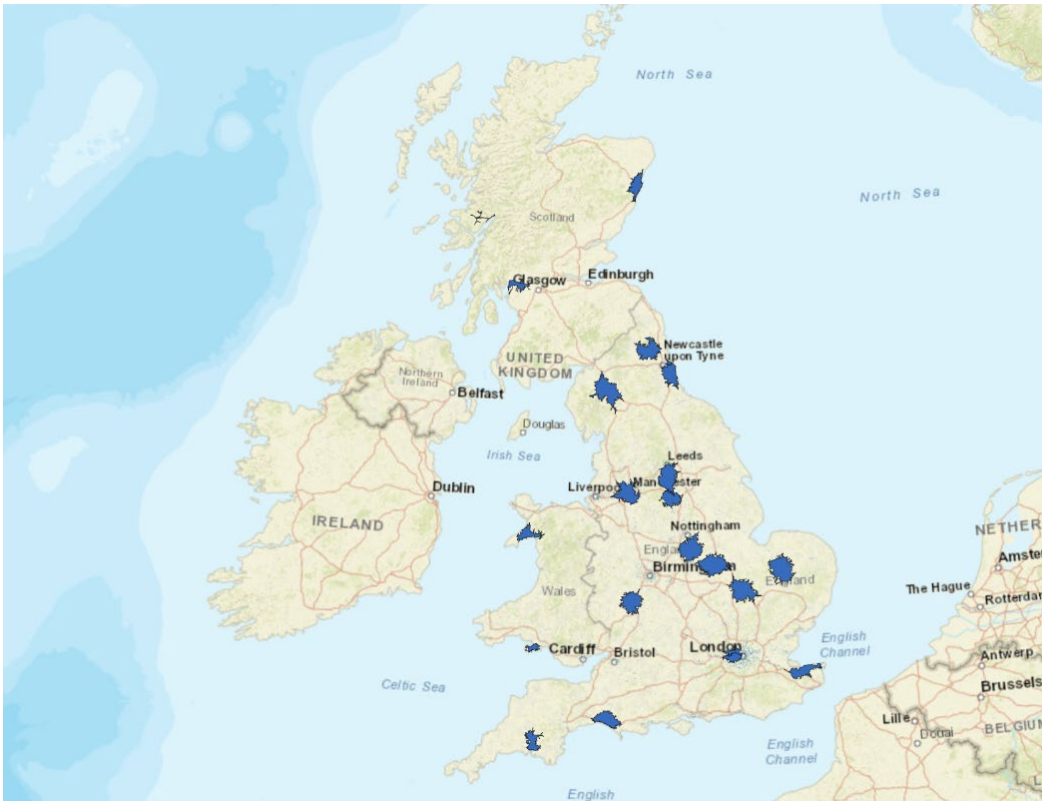
   b. From each local authority, we chose the most expensive non-motorway PFS site, based on average diesel prices in the first half of 2022 referred to as “H1 2022”.[1]

   c. We then computed 5-, 10- and 20-minute drivetime isochrones around the centroid. Within these isochrones, all driving distances from the centroid to the competing sites were calculated.

3. The geographic spread of the 21 local areas based on 20-minute drivetime isochrones is shown in the map below.

[1] H1 2022 was the latest period for which we had pricing data when we started our analysis. Diesel prices were chosen because petrol data was more sparse.

Map of the 21 chosen local areas based on 20-minute isochrones



Source: CMA analysis of Experian Data.

Key findings

4. As outlined above, the 21 local areas were selected by searching for more expensive sites in each chosen local authority. Therefore, average centroid prices in the chosen local areas were higher than the national average price in H1 2022 for both diesel and petrol. Further:

    a. in 14 local areas centroid prices were higher than the national average price across the whole, or most, of the period June 2017 – April 2023; and

    b. in the remaining 6 local areas the centroid price was below the national average price in a significant number of months in the period June 2017 – April 2023.

5. In 17 of the 21 local areas the cheapest PFS within a 20-minute drive from the centroid is consistently at or below the national average price for both diesel and petrol. In the remaining 4 areas:

    a. In the Highlands, the centroid is in a remote area and there are no competitors within 20-minutes drive;

b. Northumberland and Gwynedd results are affected by missing data which affects the choice of cheapest PFS;[2] and

c. In Swansea the cheapest site is below the national average in most periods, though there are periods where it exceeds the national average price.

Possible savings in local areas

6. In each local area, we looked at the savings that consumers could make within 5-, 10- and 20-minute drive times from the centroid site. In 9 of the 21 local areas, consumers could save at least 2ppl on diesel within a 5-minute drive. Within these areas, consumers can save at least 5ppl in 5 of the areas and at least 8ppl in 1 of the areas.

7. When we considered a longer drivetime, there is greater potential for savings, consumers could save at least 8ppl on diesel in 5 local areas, with savings of 5-8ppl on diesel in another 6 of the 21 local areas within a 20-minute drive. This is shown in Table 1 below.

8. The corresponding figures for petrol are similar, with the savings being possible on a slightly smaller number of isochrones, as shown in Table 2 below.

Table 1: Number of local areas where a consumer can achieve a saving of x pence per litre (diesel)

	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Saving of 2ppl+	9	14	18
Saving of 5ppl+	5	7	11
Saving of 8ppl+	1	1	5

Source: CMA analysis of Experian Data
Note: To calculate the savings, only data points for 52 weeks up to w/c 8 May 2023 where data was available for the centroid PFS was considered. Prices were pairwise compared with competing PFS on the dates that contained prices for both, and the PFS that yielded the highest average saving compared to the centroid was chosen as the "cheapest", as long as there were at least 4 observations.

[2] In particular, in a scenario where site A is cheapest in period t, but there is no data for site A in period t+1, then another site is chosen for the minimum price which may be more expensive than site A in that period. If data is then available for site A in period t+2 (and site A is the cheapest site), then site A would again be chosen for the minimum price in period t+2 which can make the minimum price series quite spiky.

Table 2: Number of sites a consumer can achieve a saving of x pence per litre (petrol)

	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Saving of 2ppl+	8	13	17
Saving of 5ppl+	5	8	12
Saving of 8ppl+	2	2	5

Source: CMA analysis of Experian Data
Note: To calculate the savings, only data points for 52 weeks up to w/c 8 May 2023 where data was available for the centroid PFS was considered. Prices were pairwise compared with competing PFS on the dates that contained prices for both, and the PFS that yielded the highest average saving compared to the centroid was chosen as the "cheapest", as long as there were at least 4 observations.

Price Dispersion

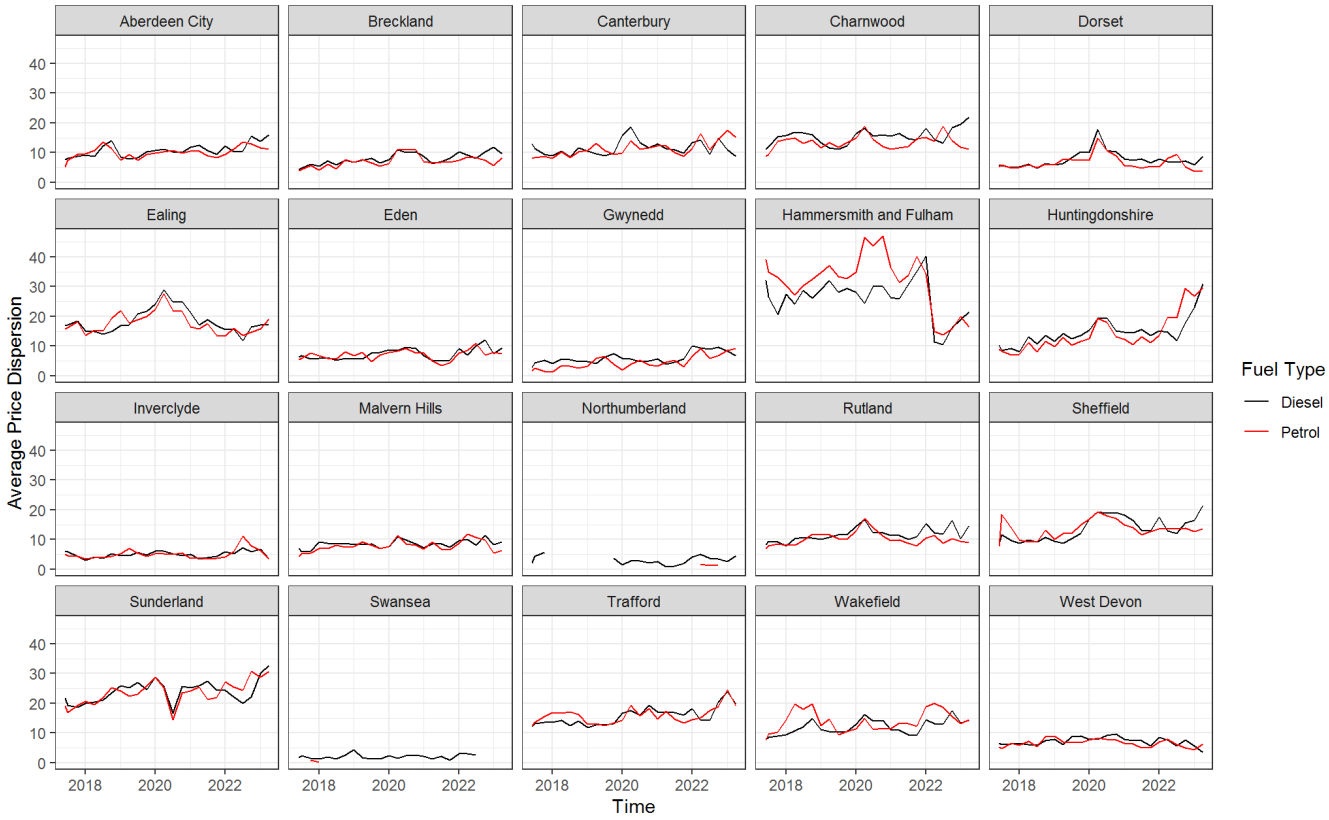
9. Price dispersion is computed as the difference between the maximum and minimum price in each week in each local area.[3] As shown in Figure 1 the pattern of price dispersion remained fairly steady over time within each area, with some areas showing an upward drift in price dispersion. If we compare some of the areas where price dispersion is low to those where it is high we note:

    a. In two local areas price dispersion is below 7ppl for diesel and petrol in each quarter. In both of these areas there are no competitors within a 5-minute drive, no supermarkets within a 20-minute drive time, and the average price within the area is higher than the national average; and

    b. In three local areas the price dispersion is higher at 15-40ppl.[4] All three of these areas are in or near large cities and therefore capture over 50 PFSs within a 20-minute drive. Price dispersion in these local areas is lower (between 4-20ppl) when we consider a 10-minute drive-time. Two of these local areas[5] have a higher average price for petrol and diesel than the national average (between 1-3ppl more expensive for diesel and 1-2ppl more expensive for petrol), while the third has average prices below the national average.

[3] Local area is the area within a 20-minute drive time from the centroid. Price dispersion is averaged for each quarter in the period of 52 weeks up to w/c 8 May 2023.
[4] These are Hammersmith & Fulham, Ealing and Sunderland.
[5] These are Hammersmith & Fulham and Ealing.

Figure 1: Price dispersion around centroid in 20 local areas, Q2 2017 – Q2 2023



Source: CMA analysis of Experian data.
Note: Price dispersion is calculated as the average quarterly difference between the maximum and minimum prices within a 20-minute drive time of each centroid. Complete price dispersion lines are not available for Northumberland and Swansea due to missing data.

Aberdeen City

10. Aberdeen City is a local authority (council area) located in Scotland with an area of 186 sq km and an estimated population of 227,430.[6] There are 22 petrol filling stations (PFSs) in the local authority. Six out of these 22 PFSs (27.3%) are owned and operated by supermarkets.

11. Table 3 below shows the average price of diesel and petrol in Aberdeen City local authority alongside the national average prices for 52 weeks up to w/c 8 May 2023 in pence per litre (ppl). Based on the data available, both petrol and diesel were less expensive (around 3ppl) in the local authority compared to the national average.

Table 3: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Aberdeen City (ppl)*	*Price gap (ppl)*
Diesel	179.1	176.2	-2.9
Petrol	162.4	159.4	-3.0

Source: CMA's analysis of Experian data.

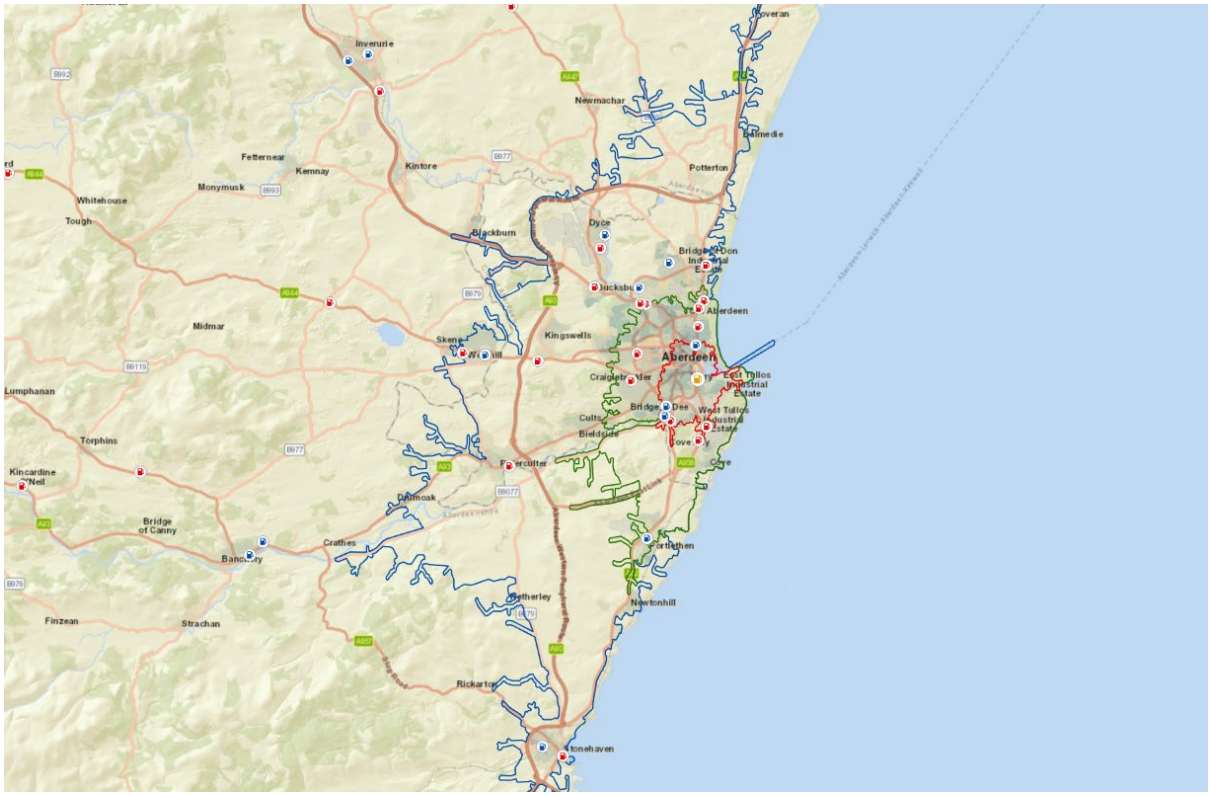
Centroid site in Aberdeen City

12. The centroid site is a branded PFS. At 178.43ppl, the site had a lower price for diesel than the national average in the 52 weeks up to 8 May 2023.[7] The closest competitor is a company PFS within a 5-minute driving distance.

13. The centroid is located in a densely populated area in Aberdeen City. In a 5-minute drive from the centroid, there are 5 competing PFSs, 2 of which are supermarkets. Within a 10-minute drive from the centroid, there are 14 competing PFSs, 4 of which are supermarkets. Finally, within a 20-minute drive from the centroid, there are 26 competing PFSs, 8 of which are supermarkets. This is illustrated on the map in Figure 1.

[6] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[7] The centroid was selected because it was the most expensive site in H1 2022.

Figure 2: Map of PFSs within 5-, 10- and 20-minute drive time of centroid site

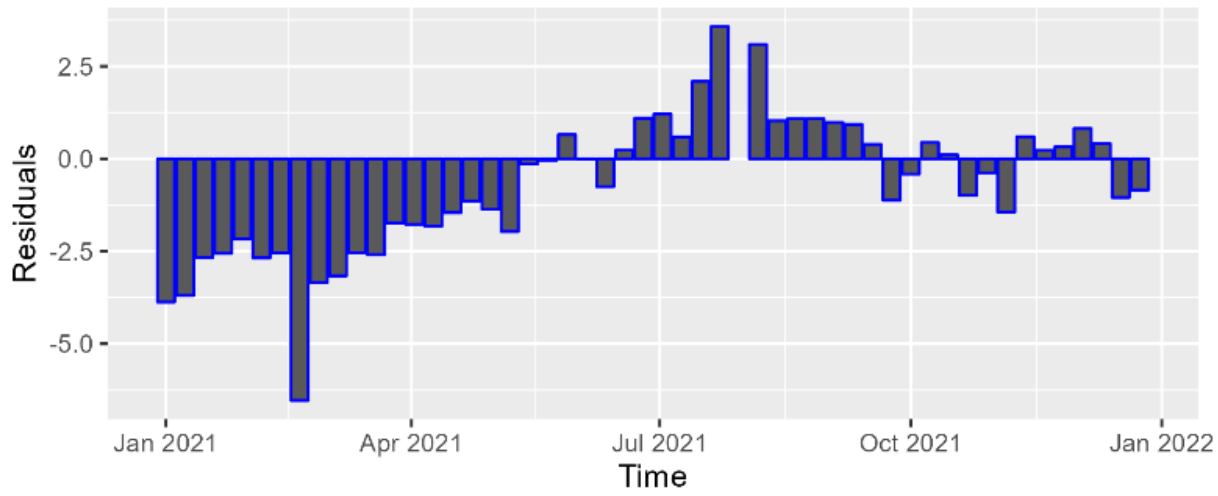


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

14. In the initial update, the CMA published the results of a cross-sectional price concentration analysis (PCA), which is an econometric model that uses factors such as local concentration to explain prices.[8] The factors included in the PCA explain in excess of 90% of the variation in prices across areas, but for any given PFS may under or overpredict prices. In Figure 3 we plot the residuals from the PCA for the centroid site from January to December 2021.[9] The residual is the difference between the model's predicted prices for that site and the actual prices. As such, it can be interpreted as the unexplained element of price variation for a given PFS. Figure 3 shows that until around June 2021 the PCA model tended to over-predict the centroid site's diesel prices.

[8] See Initial update report Annex C
[9] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 3: Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA analysis of Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

15. Figure 4 and Figure 5 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[10] The centroid diesel price was slightly lower or on par with the national average price until mid-2021. In the second half of 2021 and the whole of 2022 the centroid price was higher than the national average, and then in the first few months of 2023, it fell below the national average. The centroid petrol price shows a similar trend. The minimum price for both petrol and diesel in the 20-minute isochrone was always systemically lower than the national average and the gap between the centroid price and the minimum price seems to have grown somewhat over the period.

[10] The national average price on each week is subtracted from the petrol and diesel prices to enable comparison of the prices relative to the national average.

Figure 4: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Figure 5: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

16. Table 4 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). The cheapest competitor for diesel (highlighted grey), was a supermarket with a 5-minute drive time, based on average prices for 52 weeks up to 8 May 2023. The cheapest competitor for petrol (highlighted green) was also a supermarket which is located within an 18-minute drive time from the centroid.

Table 4: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.20	51	162.73	50
[redacted]	[redacted]	Company	0	178.43	51	161.15	50
[redacted]	[redacted]	Company	5	181.26	46	162.76	46
[redacted]	[redacted]	Dealer	5	179.74	50	162.14	48
[redacted]	[redacted]	Supermarket	5	172.63	51	156.66	50
[redacted]	[redacted]	Company	5	179.07	50	161.51	50
[redacted]	[redacted]	Supermarket	5	172.41	51	157.28	48
[redacted]	[redacted]	Supermarket	6	172.77	51	156.27	50
[redacted]	[redacted]	Company	7	175.4	51	159.39	49
[redacted]	[redacted]	Other	8	NA	NA	NA	NA
[redacted]	[redacted]	Company	9	177.85	47	161.85	44
[redacted]	[redacted]	Dealer	9	177.54	50	162.81	35
[redacted]	[redacted]	Supermarket	9	173.97	51	158.01	50
[redacted]	[redacted]	Dealer	10	177.7	42	159.72	23
[redacted]	[redacted]	Dealer	10	178.29	51	161.84	43
[redacted]	[redacted]	Dealer	10	177.97	49	162.33	35
[redacted]	[redacted]	Supermarket	13	173.23	51	156.16	50
[redacted]	[redacted]	Company	14	178.17	47	160.94	40
[redacted]	[redacted]	Dealer	14	176.94	51	163.63	37
[redacted]	[redacted]	Company	14	179.01	51	161.72	49
[redacted]	[redacted]	Dealer	14	172.55	50	158.59	47
[redacted]	[redacted]	Supermarket	15	172.95	51	156.15	49
[redacted]	[redacted]	Other	18	180.07	50	164.91	48
[redacted]	[redacted]	Dealer	18	179.87	47	160.47	35
[redacted]	[redacted]	Dealer	18	179.45	46	162.66	36
[redacted]	[redacted]	Supermarket	18	172.78	51	155.62	50
[redacted]	[redacted]	Supermarket	19	173.24	51	159.06	39
[redacted]	[redacted]	Dealer	19	172.81	48	158.17	39

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]Cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS is included for reference as the first entry (highlighted in orange).

17. Table 5 below shows the estimated population, number and type of PFSs, and highest saving (based on average prices for 52 weeks up to w/c 8 May 2023) within a drive time of 5- , 10- and 20-minutes of the centroid PFS.

Table 5: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

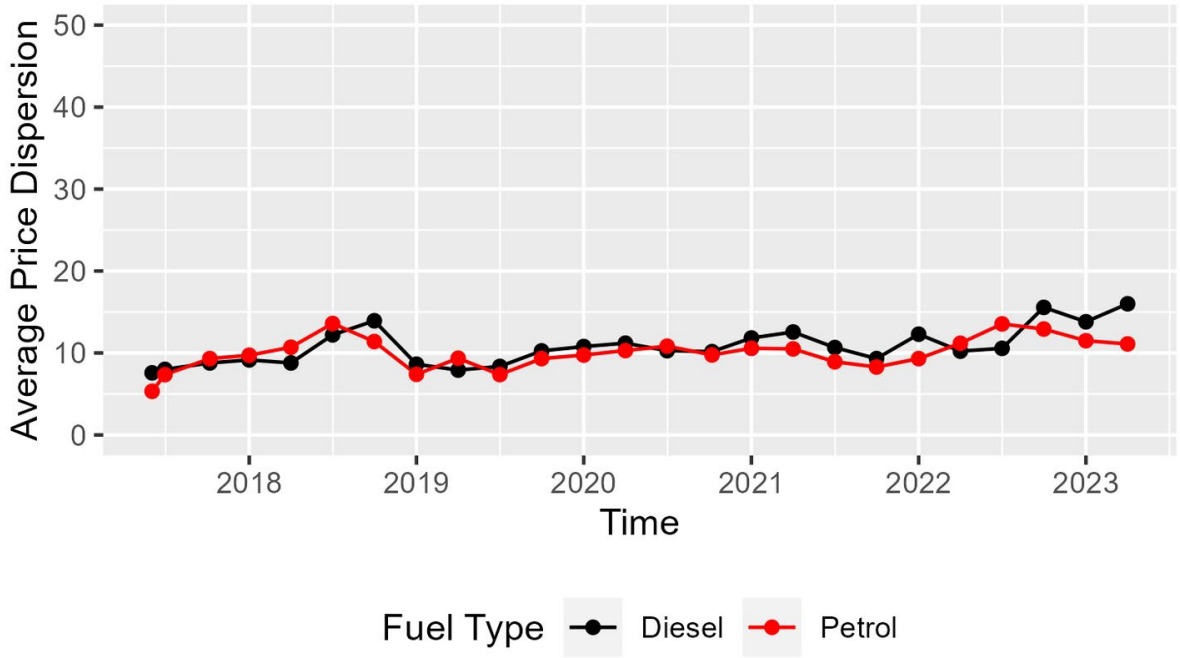
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	50,530	150,402	260,754
Number of competing sites[1]	5	14	26
Number of supermarket sites	2	4	9
Highest ppl saving in the 52 weeks up to w/c 8 May 2023 (diesel)	6.02	6.02	6.02
Highest ppl saving in the 52 weeks up to w/c 8 May 2023 (petrol)	4.49	4.89	5.53

Source: CMA analysis of Experian Data and National Records of Scotland.
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

18. Figure 7 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone for the 52 weeks up to w/c 8 May 2023. It can be observed that the average price dispersion varied from around 5ppl to above 14ppl for both petrol and diesel, with the highest variation of prices in 2018 for petrol and late 2022 and 2023 for diesel. Price dispersion is increasing over the period, starting at around 7.5ppl for diesel and 5ppl for petrol in Q2 2017, and reaching over 15ppl for diesel and over 10ppl for petrol in Q2 2023.

Figure 7: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes: The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaging over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.

Breckland

19. Breckland is a local authority (non-metropolitan district) located in the East of England with an area of 1,305 sq km and an estimated population of 142,164.[11] There are 28 petrol filling stations (PFSs) in the local authority. Five out of these 28 PFSs (17.9%) are owned and operated by supermarkets.

20. Table 6 below shows the average price of diesel and petrol in Breckland for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were almost 4 ppl more expensive in the local authority compared to the national average.

Table 6: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Breckland (ppl)*	*Price gap (ppl)*
Diesel	179.1	182.9	3.8
Petrol	162.4	166.0	3.6

Source: CMA Analysis of Experian Data.

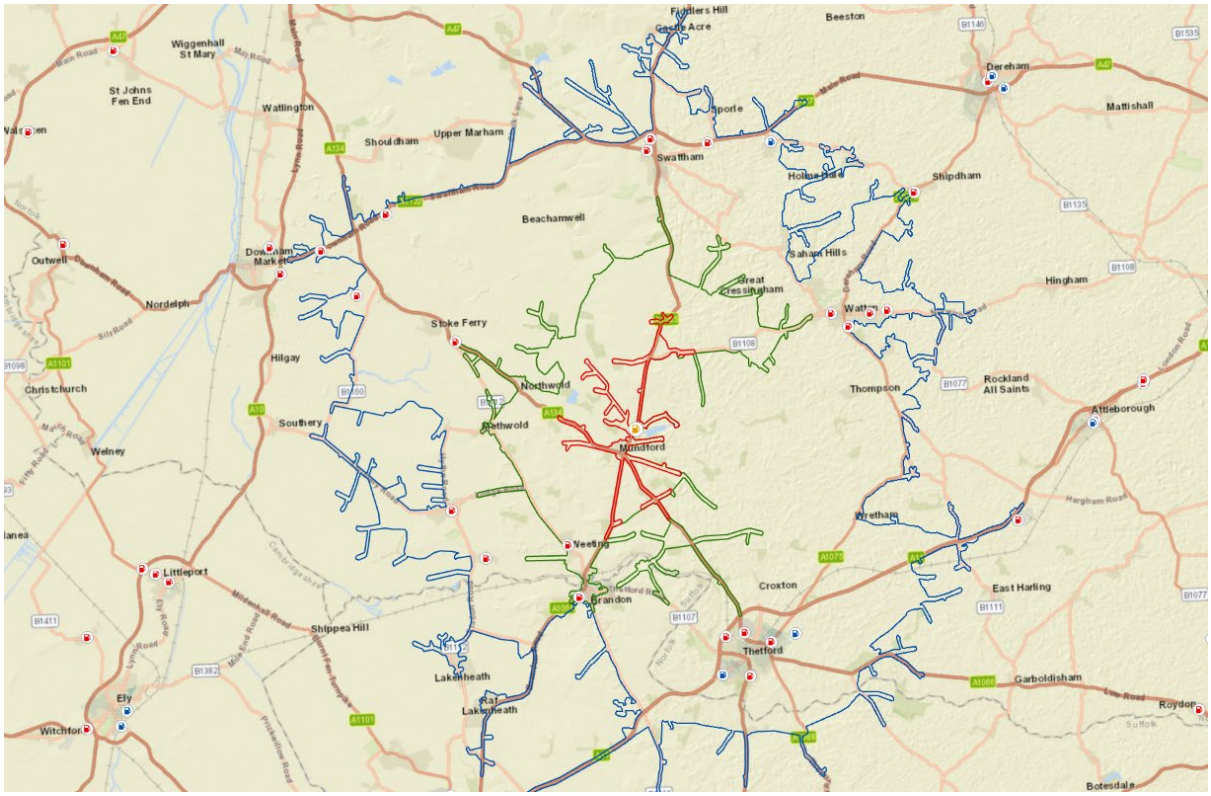
Centroid site in Breckland

21. The centroid site is a dealer. At 183.19ppl, the site had a higher price for diesel than the national average during the 52 weeks up to w/c 8 May 2023.[12] The closest competitor is a dealer PFS within around 8-minute driving distance.

22. The centroid is located on A1065, on the village of Ickburgh. There are no competing sites within a 5-minute drive from the centroid, but there are 3 competing sites within a 10-minute drive, none of which are supermarkets. These are illustrated in Figure 8.

[11] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[12] The centroid was selected because it was the most expensive site in H1 2022.

Figure 8: Map of PFSs within 5-, 10- and 20-minute drive time of centroid site

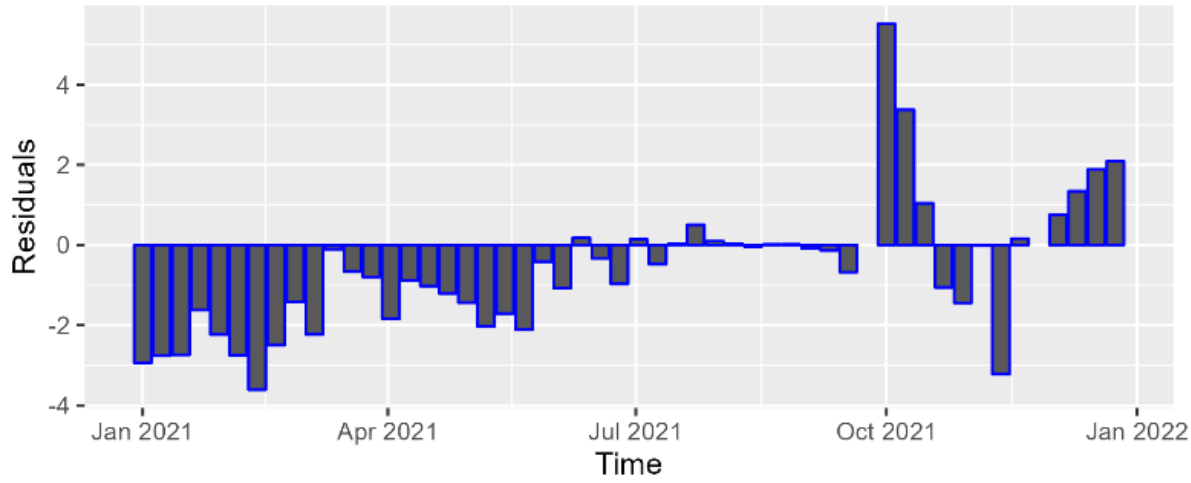


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone and green line denotes the boundary of a 10-minute isochrone.

23. Figure 9 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[13] It can be observed that up until October 2021 the PCA model tended to over-predict the centroid site's diesel prices.

[13] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 9: Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

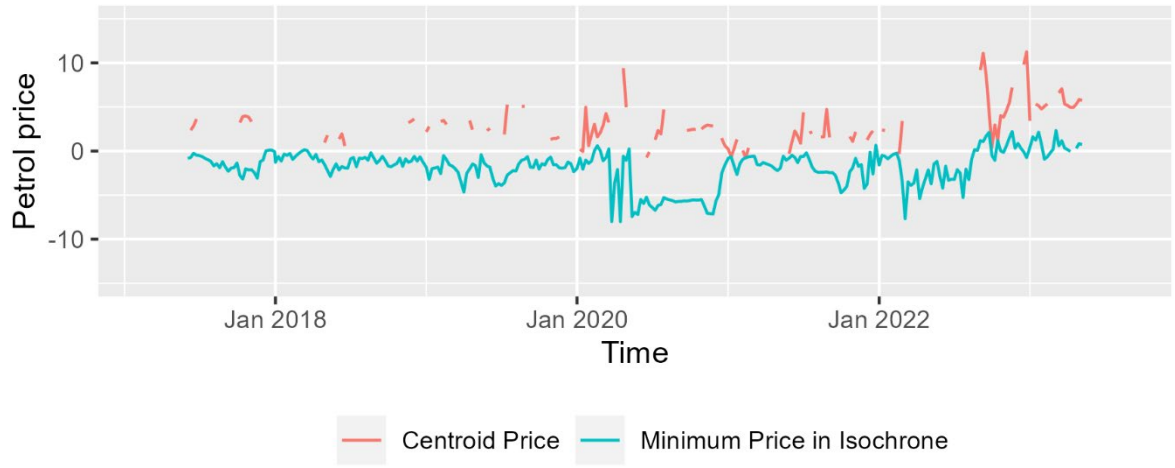
24. Figure 10 and Figure 11 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[14] Based on the data that we have, the centroid price for both diesel and petrol has been higher or on par with the national average, while the minimum price in the isochrone has usually been lower than the national average.

Figure 10: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[14] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 11: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

25. Table 7 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on the average prices for 52 weeks up to w/c 8 May 2023, the cheapest competitor for diesel (highlighted grey) was a dealer, located in a 12-minute drive time from the centroid, and the cheapest competitor for petrol (highlighted green) was a dealer, located 15 minutes away.

Table 7: PFSs within 20-minute drive time of centroid store

PFS Brand	***Company***	***Business Model[1]***	***Drive Time (Minutes)***	***Diesel Price (ppl), 52 weeks up to w/c 8 May 2023***		***Petrol Price (ppl), 52 weeks up to w/c 8 May 2023***	
				Average[2]	*Cardinality[3]*	*Average[2]*	*Cardinality[3]*
National Average Price				178.68	49	158.75	36
[✂]	[✂]	Dealer	0	183.19	49	164.41	36
[✂]	[✂]	Dealer	8	183.8	44	158.83	21
[✂]	[✂]	Dealer	10	183.71	47	160.5	29
[✂]	[✂]	Dealer	10	182.46	49	163.75	27
[✂]	[✂]	Dealer	11	184.71	45	158.67	22
[✂]	[✂]	Dealer	11	185.04	46	163.37	30
[✂]	[✂]	Dealer	12	177.6	49	161.71	36
[✂]	[✂]	Dealer	12	181.04	49	161.89	36
[✂]	[✂]	Dealer	12	NA	NA	NA	NA
[✂]	[✂]	Dealer	13	NA	NA	NA	NA
[✂]	[✂]	Supermarket	14	179.84	48	161.59	32
[✂]	[✂]	Dealer	14	184.07	43	166.51	22
[✂]	[✂]	Supermarket	14	179.5	49	160.52	36
[✂]	[✂]	Dealer	15	NA	NA	NA	NA

[✂]	[✂]	Company	15	182.4	48	162.74	30
[✂]	[✂]	Dealer	15	181.87	41	156.5	21
[✂]	[✂]	Dealer	16	183.23	47	161.82	27
[✂]	[✂]	Company	16	185.6	45	164.54	31
[✂]	[✂]	Dealer	17	179.41	49	162.14	29
[✂]	[✂]	Dealer	17	NA	NA	NA	NA
[✂]	[✂]	Other	18	182	48	163.16	34
[✂]	[✂]	Dealer	19	182.04	48	161.51	23
[✂]	[✂]	Dealer	19	180.28	28	163.45	13

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

26. Table 8 below shows the estimated population, number and type of PFSs, and highest saving (based on average prices for 52 weeks up to w/c 8 May 2023) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 8: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

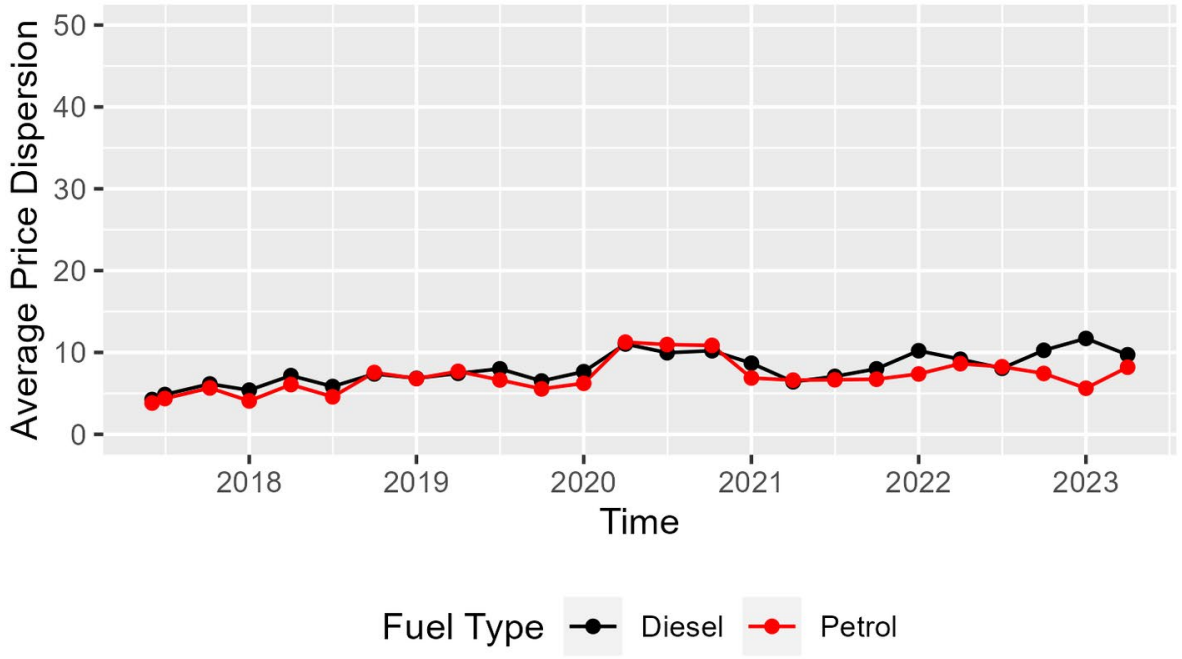
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	214	6,799	76,919
Number of competing sites[1]	0	3	22
Number of supermarket sites	0	0	3
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	0.73	5.59
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	4.14	4.14

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

27. Figure 12 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone during the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 4 ppl to around 11 ppl for both diesel and petrol. The graph also shows an upward trend over the period.

Figure 12: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Canterbury

28. Canterbury is a local authority (non-metropolitan district) located in the South East with an area of 309 sq km and an estimated population of 156,554.[15] There are 15 petrol filling stations (PFSs) in the local authority. Five out of these 15 PFSs (33.3%) are owned and operated by supermarkets.

29. Table 9 below shows the average price of diesel and petrol in Canterbury for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was on average around 1ppl more expensive in the local authority compared to the national average; petrol was on average 2ppl more expensive.

Table 9: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Canterbury (ppl)*	*Price gap (ppl)*
Diesel	179.1	180.5	1.4
Petrol	162.4	164.7	2.2

Source: CMA's compilation from Experian data.

Centroid site in Canterbury

30. The centroid site is a dealer PFS. At 181.49ppl the centroid diesel price was slightly higher than the national average diesel price in the 52 weeks up to 8 May 2023.[16] The closest competitor is a supermarket PFS within a 5-minute driving distance.

31. In a 5-minute drive from the centroid, there are 3 competing PFSs, of which 1 is a supermarket. Within a 10-minute drive from the centroid, there are 7 competing PFSs, of which 3 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 25 competing PFSs, of which 7 are supermarkets. This is illustrated in the map in Figure 13.

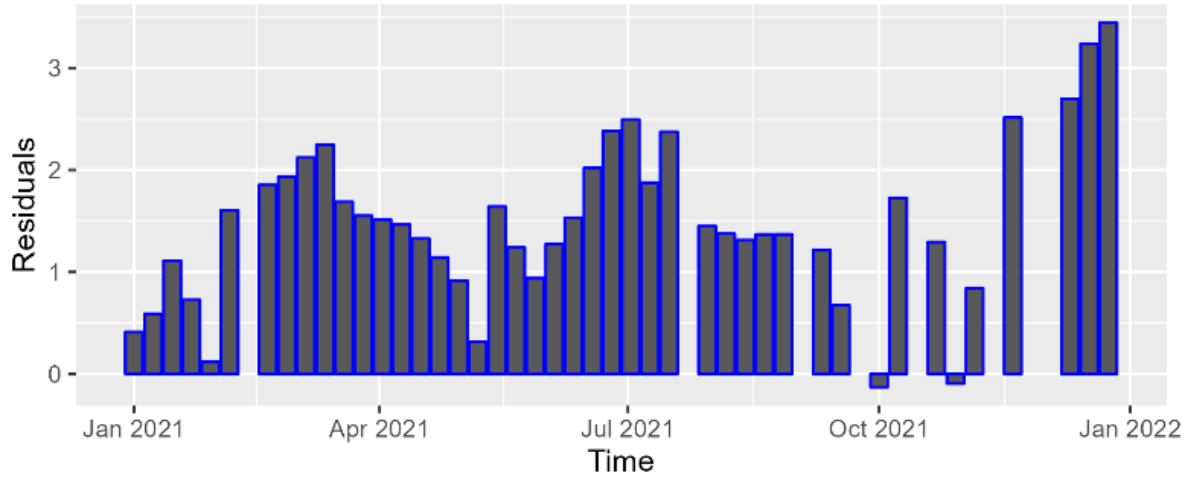
[15] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[16]The centroid was selected because it was the most expensive site in H1 2022.

Figure 13: Map of PFSs within 20-minute drive time of centroid site

Source: CMA analysis of Experian Data.
Note: a red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

32. Figure 14 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[17] It can be observed that the PCA model generally under-predicted the centroid PFS's diesel price (excluding 2 weeks in Q4 2021). However, the extent to which prices were underpredicted appears larger than usual around December 2021.

Figure 14. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

[17] Only 2021 is shown as it is the only year used in the PCA regression model.

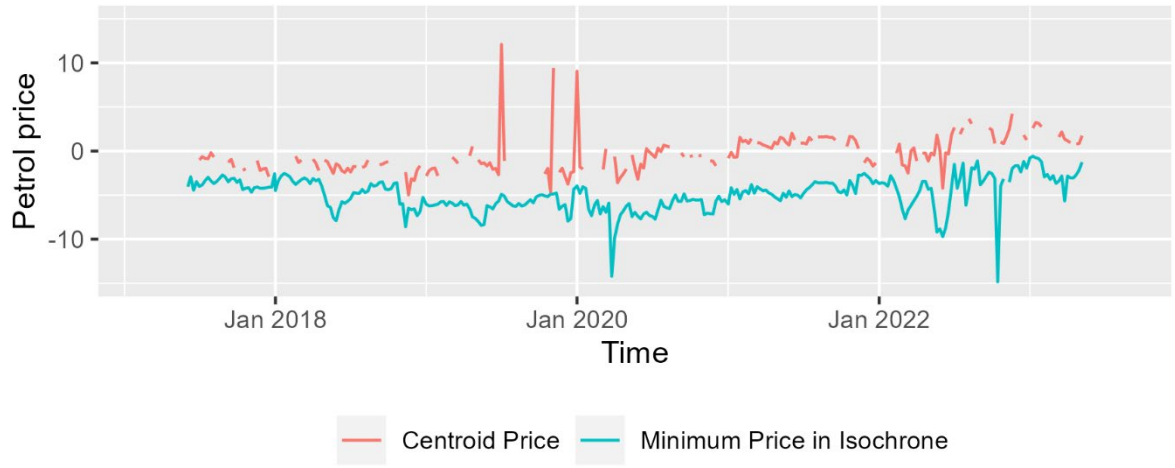
33. Figure 15 and Figure 16 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[18] Based on the data that we have, the centroid diesel prices were generally below the national average until 2021, after which the prices were higher. Petrol prices in the centroid followed a similar trend except for some short-term peaks in 2019. The minimum prices in the isochrone for both petrol and diesel has generally been lower than the national average.

Figure 15: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[18] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 16: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

34. Table 10 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for diesel (highlighted grey) was supermarket, located 17-minute drive time from the centroid, and the cheapest competitor for petrol (highlighted green) was a dealer, located 12 minutes away.

Table 10: PFSs within 20-minute drive time of centroid store

PFS Brand	***Company***	***Business Model[1]***	***Drive Time (Minutes)***	***Diesel Price (ppl), 52 weeks up to w/c 8 May 2023***		***Petrol Price (ppl), 52 weeks up to w/c 8 May 2023***	
				Average[2]	*Cardinality[3]*	*Average[2]*	*Cardinality[3]*
National Average Price				180.33	39	162.91	37
[✂]	[✂]	Dealer	0	181.49	39	164.67	37
[✂]	[✂]	Supermarket	5	180.57	39	163.98	36
[✂]	[✂]	Company	5	186.05	39	169.64	31
[✂]	[✂]	Dealer	5	186.26	37	166.21	32
[✂]	[✂]	Dealer	6	181.78	39	166.28	29
[✂]	[✂]	Supermarket	7	180.11	35	162.91	34
[✂]	[✂]	Supermarket	9	180.62	38	163.39	37
[✂]	[✂]	Dealer	9	184.11	28	167.57	27
[✂]	[✂]	Dealer	11	NA	NA	NA	NA
[✂]	[✂]	Dealer	11	181.8	31	163.98	25
[✂]	[✂]	Company	11	182.5	39	163.9	37
[✂]	[✂]	Supermarket	12	178.96	39	160.57	37
[✂]	[✂]	Dealer	13	188.8	34	173.23	32
[✂]	[✂]	Dealer	14	185.65	38	167.78	30
[✂]	[✂]	Dealer	15	179.56	28	162.48	26

[✂]	[✂]	Dealer	15	181.77	34	164.87	37
[✂]	[✂]	Supermarket	15	NA	NA	NA	NA
[✂]	[✂]	Dealer	15	180.74	37	165.54	35
[✂]	[✂]	Dealer	16	179.9	38	162.2	34
[✂]	[✂]	Dealer	16	181.57	39	165.62	30
[✂]	[✂]	Supermarket	16	179.66	39	163.42	37
[✂]	[✂]	Other	16	182.04	39	165.43	37
[✂]	[✂]	Dealer	17	NA	NA	NA	NA
[✂]	[✂]	Dealer	17	180.32	35	164.23	36
[✂]	[✂]	Supermarket	17	178.65	39	162.76	36
[✂]	[✂]	Dealer	20	182.82	32	157.73	24

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

35. Table 11 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5- , 10- and 20-minutes of the centroid PFS.

Table 11: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

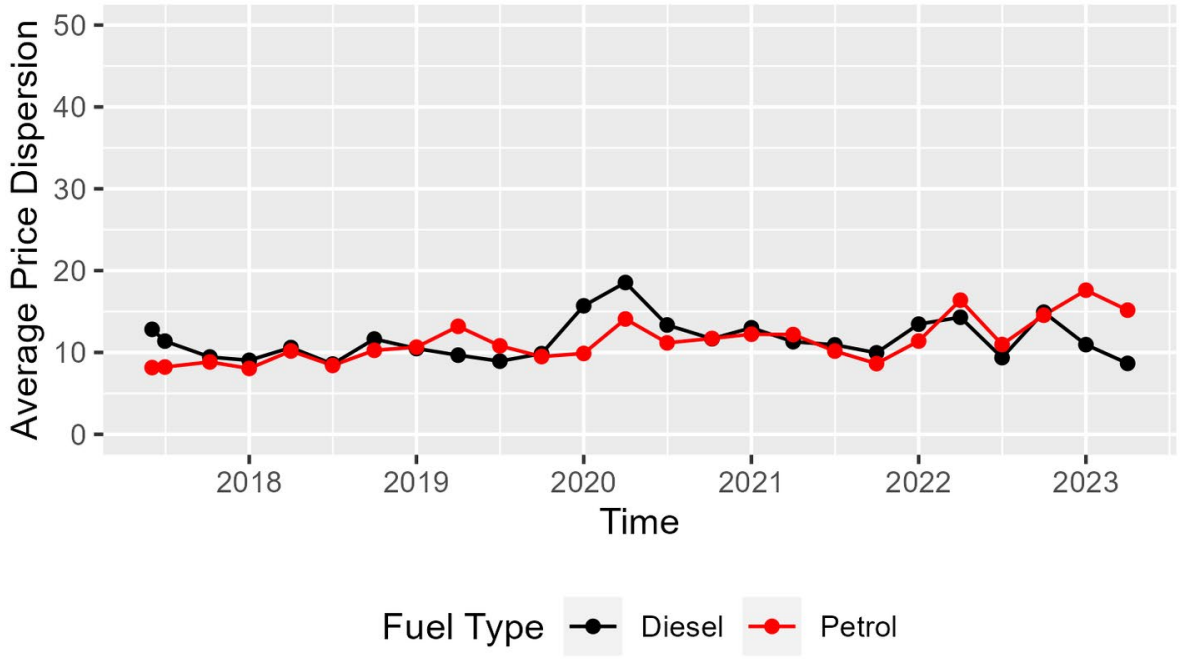
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	17,378	58,455	195,971
Number of competing sites[1]	3	7	25
Number of supermarket sites	1	3	7
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	0.92	1.67	2.84
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	0.62	1.28	4.10

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

36. Figure 17 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone from 52 weeks up to w/c 8 May 2023. It can be observed that the average price dispersion varied from around 8 ppl to 20 ppl for diesel and from around 8 ppl to 17 ppl for petrol. The graph also shows a slight upward trend over the period.

Figure 17: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Charnwood

37. Charnwood is a local authority (non-metropolitan district) located in the East Midlands with an area of 279 sq km and an estimated population of 182,817.[19] There are 23 petrol filling stations (PFSs) in the local authority. Five out of these 23 PFSs (21.7%) are owned and operated by supermarkets.

38. Table 12 below shows the average price of diesel and petrol in Charnwood for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was on average 1ppl more expensive in the local authority compared to the national average and petrol was almost 2ppl more expensive than the national average.

Table 12: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Charnwood (ppl)*	*Price gap (ppl)*
Diesel	179.1	180.5	1.4
Petrol	162.4	163.9	1.5

Source: CMA's compilation from Experian data.

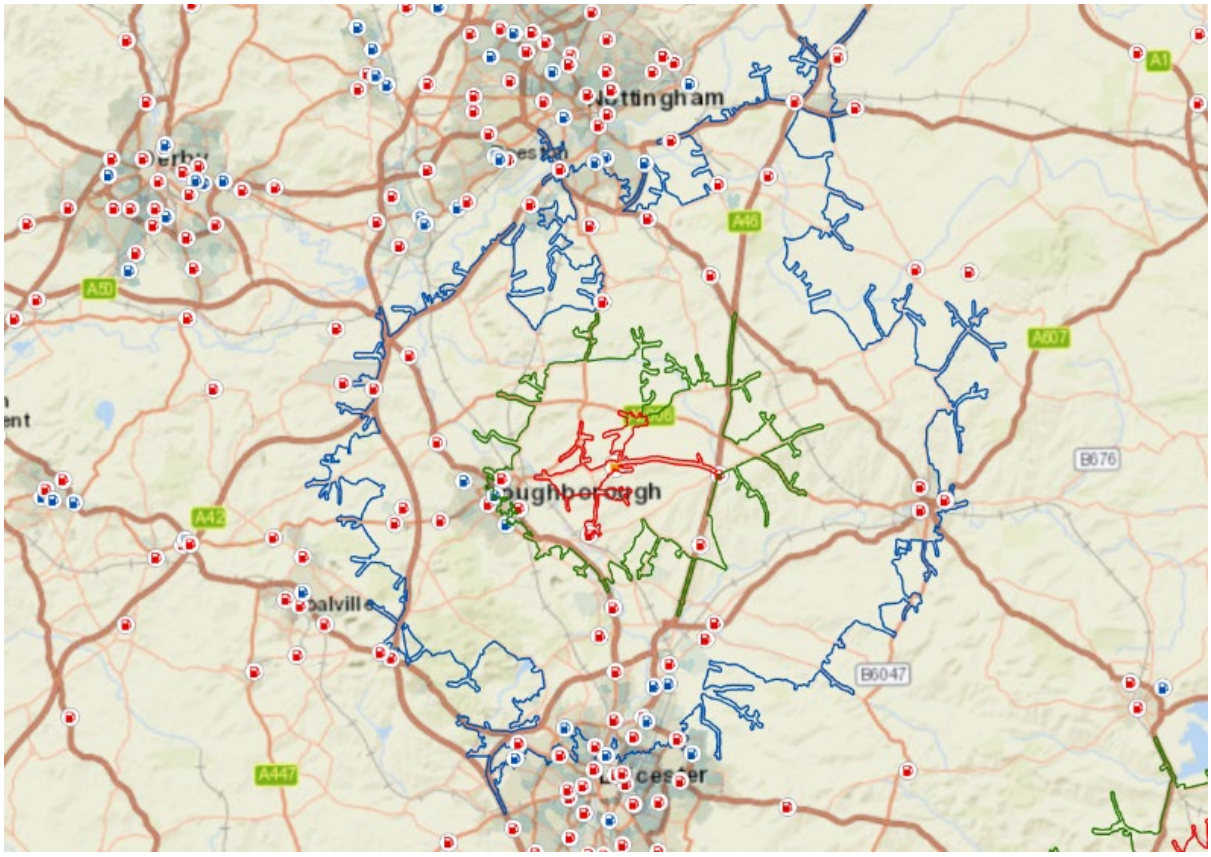
Centroid site in Charnwood

39. The centroid site is an unbranded dealer PFS. At 181.58ppl, the site had a higher price for diesel than the national average price in the 52 weeks up to w/c 8 May 2023.[20] The closest competitor is a dealer PFS within a 5-minute driving distance.

40. In a 5-minute drive from the centroid, there is 1 competing PFS, and it is not a supermarket. Within a 10-minute drive from the centroid, there are 6 competing PFSs, of which 1 is a supermarket. Finally, within a 20-minute drive from the centroid, there are 52 competing PFSs, of which 10 are supermarkets. This is illustrated on the map in Figure 18.

[19] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[20] The centroid was selected because it was the most expensive site in H1 2022.

Figure 18: Map of PFSs within 20-minute drive time of centroid site

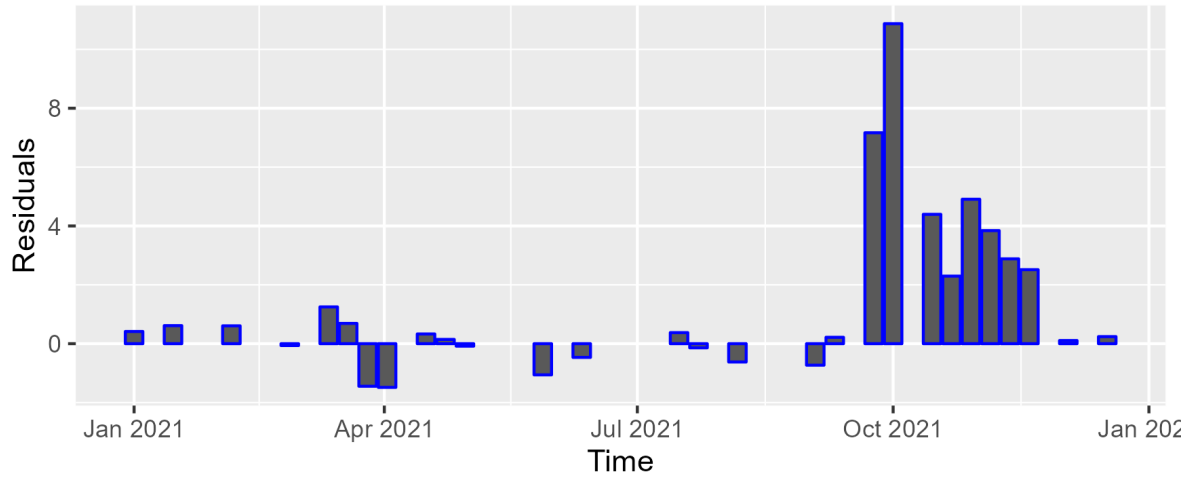


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

41. Figure 19 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[21] It can be observed that up until around September 2021 the PCA model predicted the centroid's diesel prices relatively well (i.e. no pattern in residuals). Thereafter, the PCA model tended to under-predict the centroid's prices systematically for several weeks.

[21] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 19. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

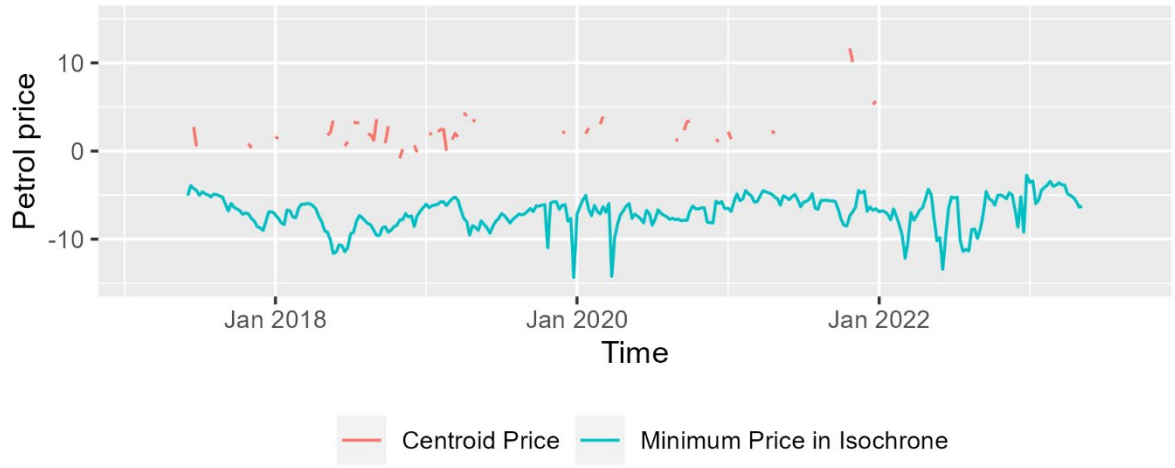
42. Figure 20 and Figure 21 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[22] Based on the data that we have available, both diesel and petrol prices in the centroid have generally been on par or higher than the national average, while the minimum price in the isochrone has consistently been lower.

Figure 20: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[22] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 21: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

43. Table 13 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for diesel (highlighted grey) was a supermarket, located 20-minutes away from the centroid. Not enough data was available to find the cheapest competitor for petrol.

Table 13: PFSs within 20-minute drive time of centroid store

PFS Brand	***Company***	***Business Model[1]***	***Drive Time (Minutes)***	***Diesel Price (ppl), 52 weeks up to w/c 8 May 2023***		***Petrol Price (ppl), 52 weeks up to w/c 8 May 2023***	
				Average[2]	*Cardinality[3]*	*Average[2]*	*Cardinality[3]*
National Average Price				178.6	34	N/A	N/A
[✂]	[✂]	Dealer	0	181.58	34	NA	NA
[✂]	[✂]	Dealer	5	189.29	17	NA	NA
[✂]	[✂]	Dealer	6	183.83	32	NA	NA
[✂]	[✂]	Company	8	180.96	32	NA	NA
[✂]	[✂]	Company	9	181.36	34	NA	NA
[✂]	[✂]	Dealer	9	178.87	34	NA	NA
[✂]	[✂]	Supermarket	10	175.92	30	NA	NA
[✂]	[✂]	Dealer	11	183.05	30	NA	NA
[✂]	[✂]	Dealer	11	176.67	30	NA	NA
[✂]	[✂]	Supermarket	11	177.59	34	NA	NA
[✂]	[✂]	Dealer	12	NA	NA	NA	NA
[✂]	[✂]	Supermarket	12	178.21	34	NA	NA
[✂]	[✂]	Dealer	13	179.14	34	NA	NA
[✂]	[✂]	Company	13	183.93	34	NA	NA
[✂]	[✂]	Dealer	13	NA	NA	NA	NA

[✂]	[✂]	Dealer	13	178.72	34	NA	NA
[✂]	[✂]	Dealer	14	NA	NA	NA	NA
[✂]	[✂]	Other	14	NA	NA	NA	NA
[✂]	[✂]	Company	14	179.24	32	NA	NA
[✂]	[✂]	Supermarket	14	175.38	34	NA	NA
[✂]	[✂]	Dealer	15	179.69	34	NA	NA
[✂]	[✂]	Dealer	15	179.96	33	NA	NA
[✂]	[✂]	Dealer	15	178.46	33	NA	NA
[✂]	[✂]	Dealer	15	177.52	34	NA	NA
[✂]	[✂]	Company	16	178.58	34	NA	NA
[✂]	[✂]	Dealer	16	178.35	31	NA	NA
[✂]	[✂]	Dealer	17	172.88	34	NA	NA
[✂]	[✂]	Dealer	17	179.26	21	NA	NA
[✂]	[✂]	Company	17	180.08	34	NA	NA
[✂]	[✂]	Dealer	17	180.17	24	NA	NA
[✂]	[✂]	Company	18	180.38	34	NA	NA
[✂]	[✂]	Dealer	18	182	21	NA	NA
[✂]	[✂]	Company	18	178.09	34	NA	NA
[✂]	[✂]	Supermarket	18	175.46	34	NA	NA
[✂]	[✂]	Company	18	178.4	34	NA	NA
[✂]	[✂]	Dealer	18	176.97	33	NA	NA
[✂]	[✂]	Company	18	180.84	33	NA	NA
[✂]	[✂]	Supermarket	19	176.12	34	NA	NA
[✂]	[✂]	Dealer	19	179.4	28	NA	NA
[✂]	[✂]	Supermarket	19	177.36	34	NA	NA
[✂]	[✂]	Dealer	19	177.53	28	NA	NA
[✂]	[✂]	Other	19	176.41	34	NA	NA
[✂]	[✂]	Dealer	19	178.44	28	NA	NA
[✂]	[✂]	Dealer	19	176.31	22	NA	NA
[✂]	[✂]	Dealer	20	177.83	28	NA	NA
[✂]	[✂]	Supermarket	20	175.04	34	NA	NA
[✂]	[✂]	Supermarket	20	172.2	34	NA	NA
[✂]	[✂]	Dealer	20	197.4	34	NA	NA
[✂]	[✂]	Dealer	20	177.9	32	NA	NA
[✂]	[✂]	Dealer	20	178	34	NA	NA
[✂]	[✂]	Dealer	20	186.77	26	NA	NA
[✂]	[✂]	Dealer	20	185.39	34	NA	NA
[✂]	[✂]	Supermarket	20	171.71	34	NA	NA

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

44. Table 14 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 14: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

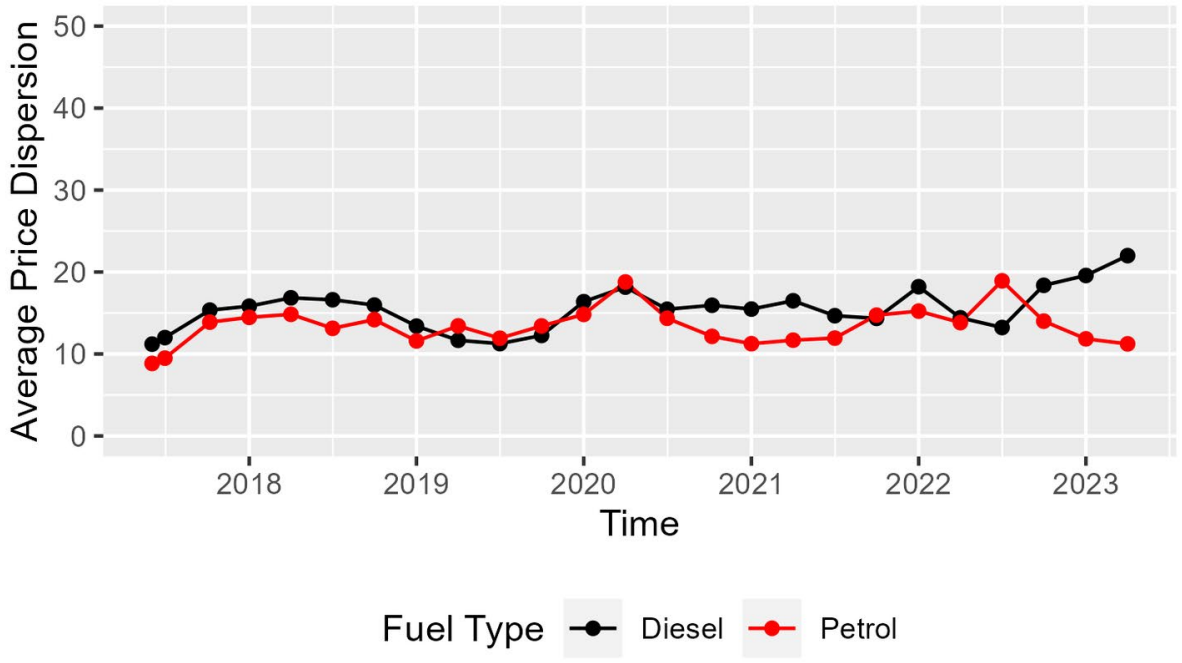
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	1,734	38,697	347,372
Number of competing sites[1]	1	6	52
Number of supermarket sites	0	1	12
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	0.44	4.28	9.86
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	N/A	N/A

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

45. Figure 22 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 10 ppl to 22 ppl for diesel and from around 8 ppl to 19 ppl for petrol. The graph also shows a slight upward trend over the period.

Figure 22: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:

1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Dorset

46. Dorset is a local authority (unitary authority) located in the South West with an area of 2,491 sq km and an estimated population of 381,292.[23] There are 56 petrol filling stations (PFSs) in the local authority. Nine out of these 56 PFSs (16.1%) are owned and operated by supermarkets.

47. This area was chosen due to multiple complaints received from the general public regarding high prices in PFSs in Bridport relative to other areas.[24]

48. Table 15 below shows the average price of diesel and petrol in Dorset for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel and petrol were on average around 2ppl more expensive in the local authority compared to the national average.

Table 15: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Dorset (ppl)*	*Price gap (ppl)*
Diesel	179.1	180.8	1.6
Petrol	162.4	164.5	2.1

Source: CMA analysis of Experian data.

Centroid site in Dorset

49. The centroid site is a dealer PFS. In the 52 weeks up to w/c 8 May 2023, the average price of diesel in the PFS was 180.27ppl, slightly higher than the national average.[25] The closest competitor is a supermarket PFS within around 2-minute driving distance.

50. In a 5-minute drive from the centroid, there is 1 competing PFS, which is a supermarket. Within a 10-minute drive from the centroid, there are 3 competing PFSs, of which 1 is a supermarket. Finally, within a 20-minute drive from the centroid, there are 10 competing PFSs, of which 2 are supermarkets. This is illustrated on the map in Figure 23.

[23] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[24] The centroid is the highest priced in Bridport as per average diesel prices in 52 weeks up to w/c 8 May 2023.
[25] The centroid was selected because it was the most expensive site in H1 2022.

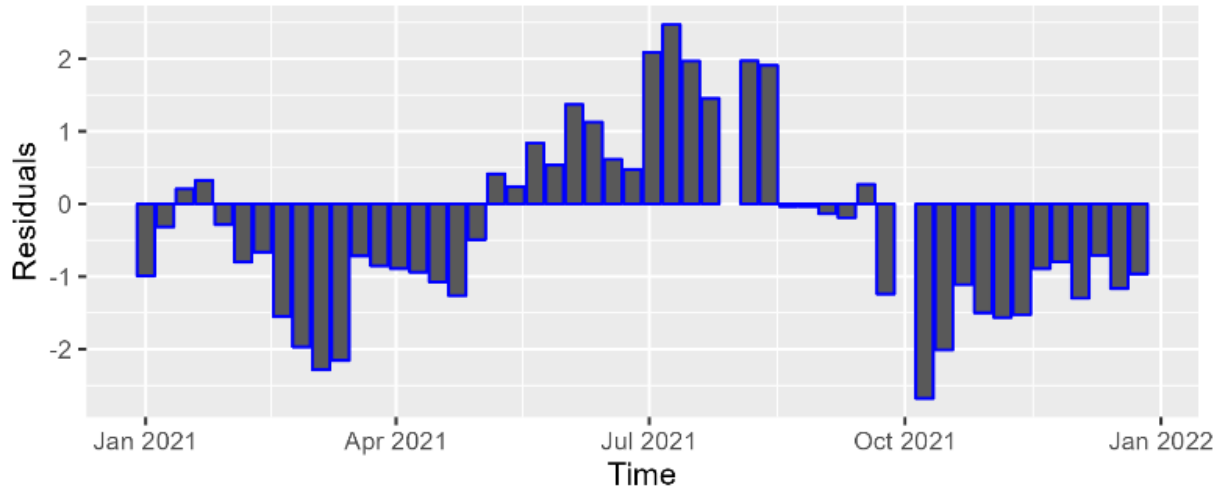
Figure 23: Map of PFSs within 20-minute drive time of centroid site

Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

51. Figure 24 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[26] It can be observed that the PCA model did not consistently over- or underpredict the centroid PFS's diesel price. However, there is a degree of persistence: up until around May 2021 and again from around October 2021 the model tended to predict higher prices than observed.

[26] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 24. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

52. Figure 25 and Figure 26 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[27] Based on the data that we have available, the price for diesel at the centroid was either on par or higher than the national average. The price for petrol at the centroid followed a similar trend, with some peaks in 2019. The minimum price in the isochrone was generally lower or on par with the national average for both diesel and petrol.

Figure 25: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[27] The national average price on each week is subtracted from the diesel and petrol prices to enable comparison of the prices relative to the national average.

Figure 26: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

53. Table 16 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, two competitors were jointly the cheapest for diesel (highlighted grey and green), one was a dealer and the other a supermarket, located within a 20-minute drive time from the centroid. The cheapest competitor for petrol (highlighted green) was a supermarket 20 minutes away from the centroid.

Table 16: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.2	51	161.98	43
[✂]	[✂]	Dealer	0	180.27	51	164.98	43
[✂]	[✂]	Supermarket	2	179.36	51	164.41	42
[✂]	[✂]	Dealer	6	NA	NA	NA	NA
[✂]	[✂]	Dealer	7	182.17	42	166.15	16
[✂]	[✂]	Dealer	12	180.4	44	164.42	23
[✂]	[✂]	Dealer	15	NA	NA	NA	NA
[✂]	[✂]	Dealer	17	181.41	50	166.86	32
[✂]	[✂]	Dealer	19	NA	NA	NA	NA
[✂]	[✂]	Dealer	19	178.49	40	166.2	19
[✂]	[✂]	Supermarket	20	178.49	51	162.33	43
[✂]	[✂]	Dealer	20	179.7	45	166.09	31

Source: CMA analysis of Experian and ArcGIS data.
Notes:

[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

54. Table 17 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5- , 10- and 20-minutes of the centroid PFS.

Table 17: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

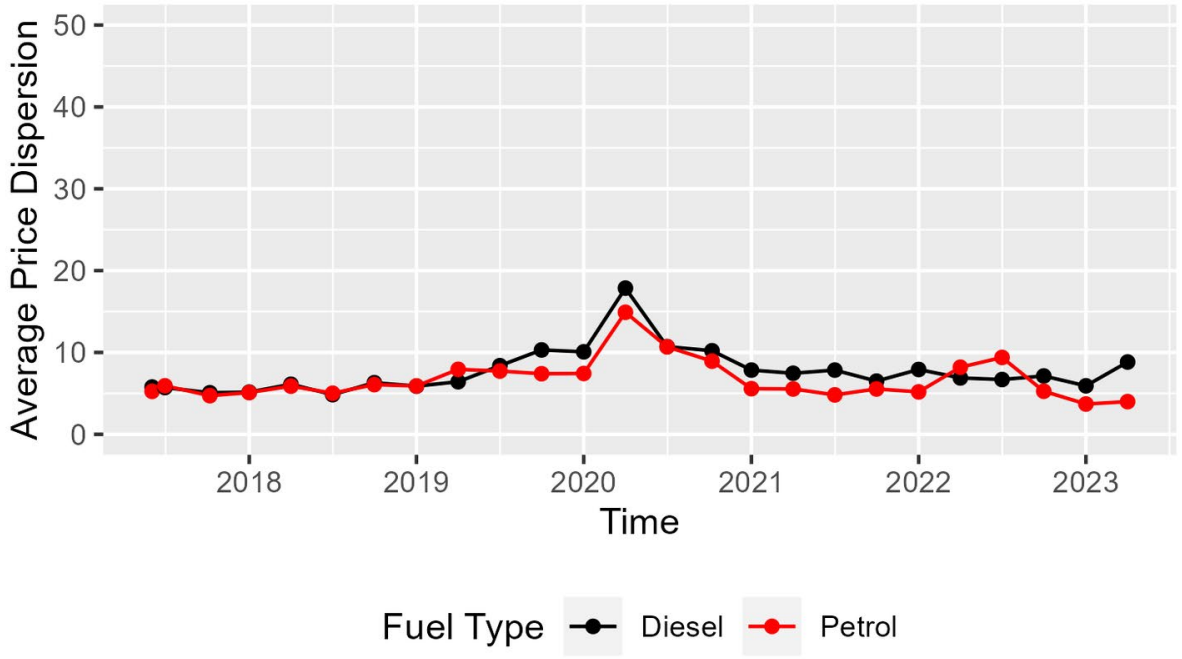
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	10,438	16,490	44,167
Number of competing sites[1]	1	3	10
Number of supermarket sites	1	1	2
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	0.91	0.91	2.01
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	0.90	0.90	5.65

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

55. Figure 27 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone during the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 5 ppl to 18 ppl for diesel and from around 4 ppl to 15 ppl for petrol. There was a sharp peak during the early stages of the pandemic in 2020.

Figure 27: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Ealing

56. Ealing is a local authority (London borough) located in London with an area of 56 sq km and an estimated population of 366,127.[28] There are 26 petrol filling stations (PFSs) in the local authority. Three out of these 26 PFSs (11.5%) are owned and operated by supermarkets.

57. Table 18 below shows the average price of diesel and petrol in Ealing for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was 2.5ppl more expensive and petrol was 1.5ppl more expensive in the local authority than the national average.

Table 18: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Ealing (ppl)*	*Price gap (ppl)*
Diesel	179.1	181.6	2.5
Petrol	162.4	163.9	1.5

Source: CMA's compilation from Experian data.

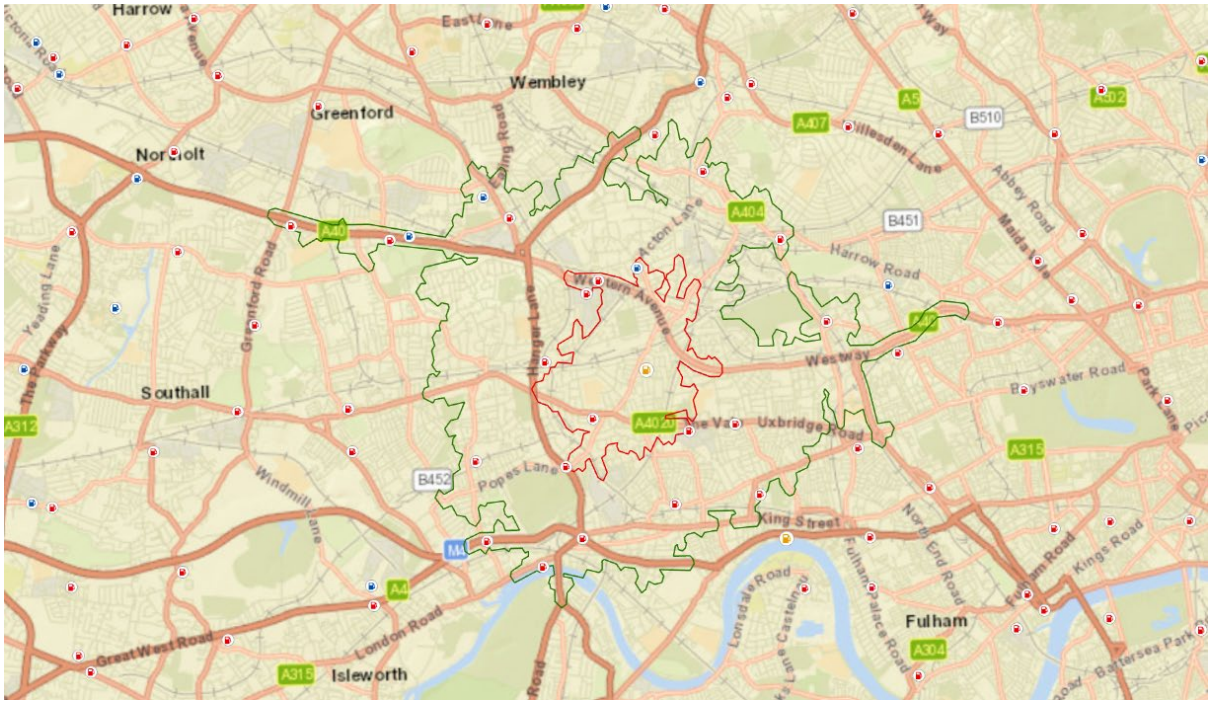
Centroid site in Ealing

58. The centroid site is a dealer. At 182.12ppl, the site had a higher price for diesel than the national average in the 52 weeks up to w/c 8 May 2023.[29] The closest competitor is a company within around 3-minute driving distance.

59. In a 5-minute drive from the centroid, there are 4 competing PFSs, of which 1 is a supermarket. Within a 10-minute drive from the centroid, there are 18 competing PFSs, of which 2 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 102 competing PFSs, of which 17 are supermarkets. This is illustrated in the map in Figure 208.

[28] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[29] The centroid was selected because it was the most expensive site in H1 2022.

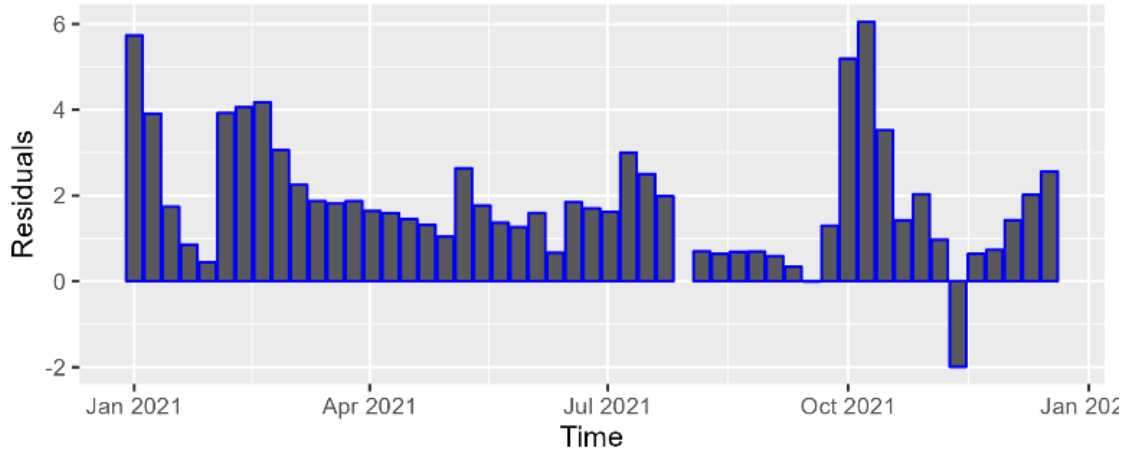
Figure 28: Map of PFSs within 10-minute drive time of centroid site



Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

60. Figure 29 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[30] It can be observed that, with the exception of one week in late 2021, the PCA model generally under-predicted the PFS's diesel price.

Figure 29. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

[30] Only 2021 is shown as it is the only year used in the PCA regression model.

61. Figure 30 and Figure 31 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 10-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price. [31] Based on the data that we have available, the diesel and petrol prices at the centroid were always higher than the national average, while the minimum price within the 10-minute isochrone was consistently and significantly lower.

Figure 30: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Figure 31: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.

[31] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

62. Table 19 below shows the PFSs in a 10-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor within a ten-minute drive time for both diesel and petrol (highlighted blue) was a supermarket, located 5-minutes away from the centroid.

Table 19: PFSs within 10-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				178.58	44	161.34	45
[✂]	[✂]	Dealer	0	182.12	44	167.3	45
[✂]	[✂]	Company	3	178.43	44	160.8	42
[✂]	[✂]	Company	4	184.61	43	166.55	43
[✂]	[✂]	Supermarket	5	174.84	44	158.04	44
[✂]	[✂]	Company	5	184.79	44	166.6	45
[✂]	[✂]	Company	6	180.2	43	161.75	44
[✂]	[✂]	Company	6	179.78	44	161.19	45
[✂]	[✂]	Dealer	6	179.36	44	160.94	41
[✂]	[✂]	Dealer	7	179.28	44	162.03	43
[✂]	[✂]	Dealer	7	180.3	44	162.4	41
[✂]	[✂]	Dealer	8	177.58	44	160.66	43
[✂]	[✂]	Dealer	9	177.91	44	160.62	41
[✂]	[✂]	Dealer	9	178.88	43	160.61	39
[✂]	[✂]	Supermarket	9	175.16	44	158.35	43
[✂]	[✂]	Dealer	10	177.82	44	159.85	42
[✂]	[✂]	Dealer	10	180.56	37	162.21	44
[✂]	[✂]	Company	10	184.61	44	166.91	44
[✂]	[✂]	Dealer	10	179.84	43	161.84	44
[✂]	[✂]	Company	10	180.91	44	162.7	45

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

63. Table 20 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 20: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

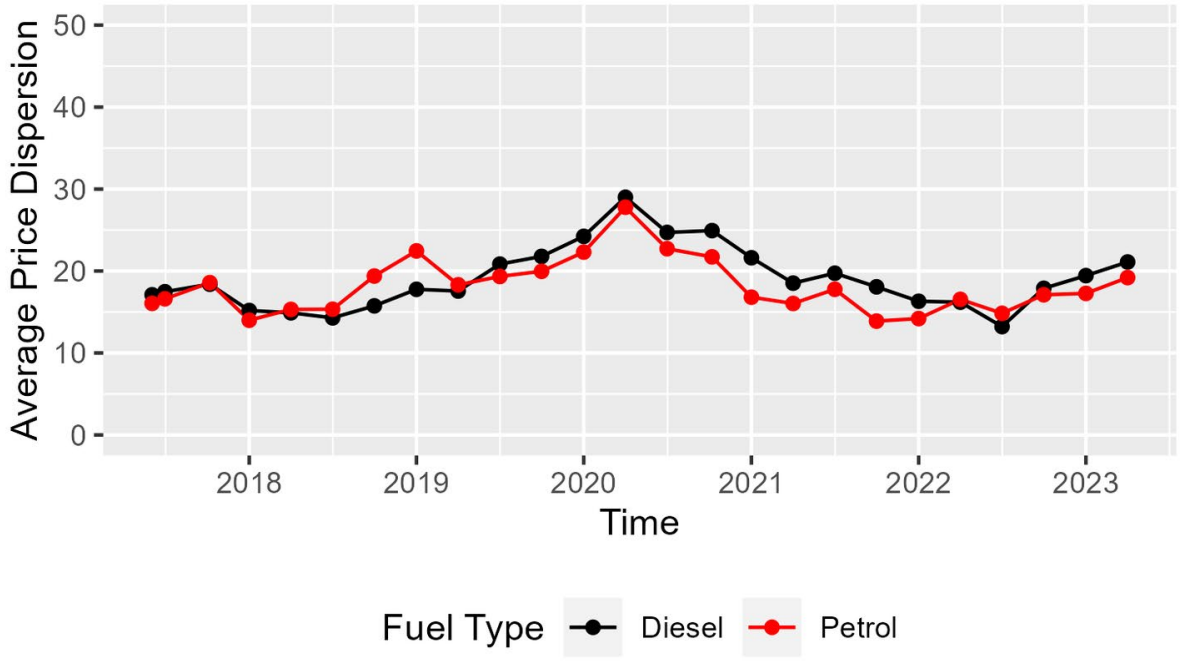
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	37,319	231,312	1,596,534
Number of competing sites[1]	4	18	102
Number of supermarket sites	1	2	17
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	7.28	7.28	7.28
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	9.48	9.48	9.55

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

64. Figure 32 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 15 ppl to 30 ppl for both diesel and petrol. The price dispersion has been mostly steady but saw a sharp peak during the early stages of the pandemic in 2020 and has started to increase from mid-2022 onwards.

Figure 32: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Eden

65. Eden is a local authority (non-metropolitan district) located in the North West with an area of 2,142 sq km and an estimated population of 54,955.[32] There are 26 petrol filling stations (PFSs) in the local authority. One out of these 26 PFSs (3.8%) are owned and operated by supermarkets.

66. Table 21 below shows the average price of diesel and petrol in Eden for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were on average around 5ppl more expensive in the local authority compared to the national average.

Table 21: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Eden (ppl)*	*Price gap (ppl)*
Diesel	179.1	184.0	4.9
Petrol	162.4	167.6	5.2

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

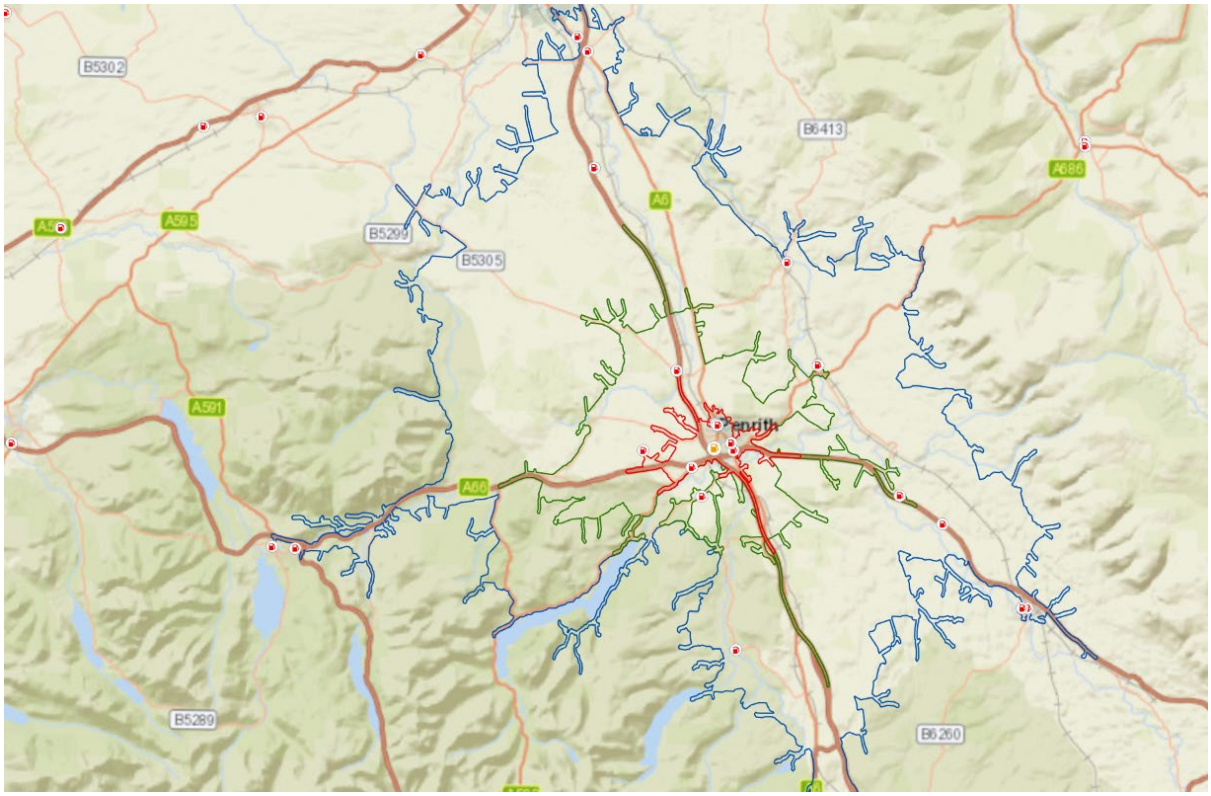
Centroid site in Eden

67. The centroid site is a dealer. At 182.19ppl, the site had a higher average price of diesel than the national average.[33] The closest competitor is a dealer PFS within around 3-minute driving distance.

68. In a 5-minute drive from the centroid, there are 7 competing PFSs, none of which is a supermarket. Within a 10-minute drive from the centroid, there are 10 competing PFSs, of which none are supermarkets. Finally, within a 20-minute drive from the centroid, there are 20 competing PFSs, of which only 1 is a supermarket. This is illustrated in the map in Figure 33.

[32] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[33] The centroid was selected because it was the most expensive site in H1 2022.

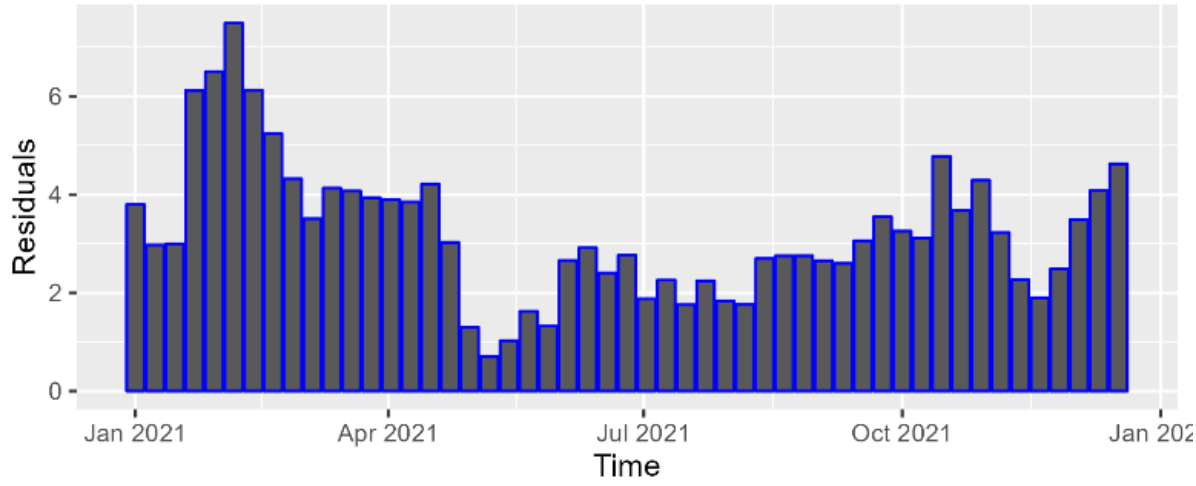
Figure 33: Map of PFSs within 20-minute drive time of centroid site



Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

69. Figure 34 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[34] It can be observed that the PCA model consistently under-predicted the centroid PFS's diesel prices.

Figure 34. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.

[34] Only 2021 is shown as it is the only year used in the PCA regression model.

Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

70. Figure 35 and Figure 36 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price. [35] Based on the data that we have available, the centroid price for both petrol and diesel was generally higher than the national average, while minimum prices in the 20-minute isochrone was always lower than the national average prices.

Figure 35: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Figure 36: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[35] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Competitors

71. Table 22 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a supermarket, located 20-minute drive time from the centroid.

Table 22: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.11	52	161.85	49
[redacted]	[redacted]	Dealer	0	182.19	52	162.91	49
[redacted]	[redacted]	Dealer	3	182.01	52	162.41	48
[redacted]	[redacted]	Company	3	181.62	48	163.08	41
[redacted]	[redacted]	Dealer	4	178.55	52	159.78	39
[redacted]	[redacted]	Dealer	4	179.31	52	159.93	49
[redacted]	[redacted]	Dealer	4	178.33	47	158.83	37
[redacted]	[redacted]	Dealer	5	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	5	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	7	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	10	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	10	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	12	181.38	50	164.38	42
[redacted]	[redacted]	Dealer	16	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	17	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	17	178.98	49	159.15	45
[redacted]	[redacted]	Dealer	17	178.5	50	158.4	45
[redacted]	[redacted]	Dealer	19	179.72	50	159.5	41
[redacted]	[redacted]	Dealer	19	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	20	NA	NA	NA	NA
[redacted]	[redacted]	Dealer	20	178.7	52	159.61	42
[redacted]	[redacted]	Supermarket	20	174.24	52	156.36	49

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

72. Table 23 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 23: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

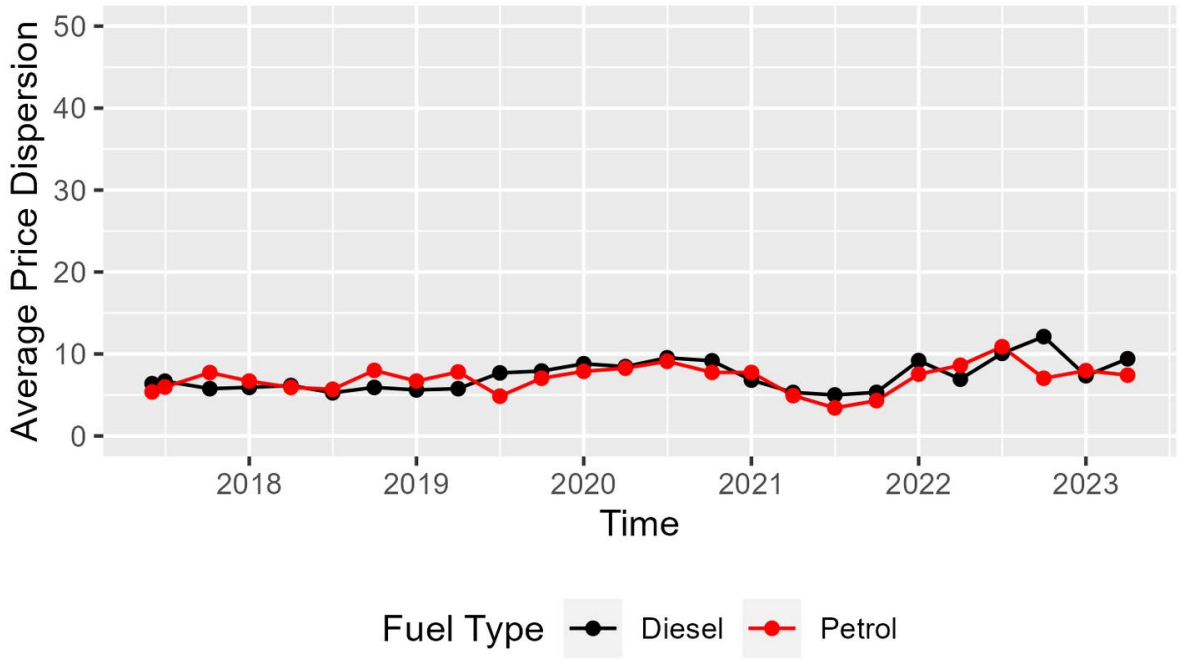
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	12,035	19,013	39,669
Number of competing sites[1]	7	10	20
Number of supermarket sites	0	0	1
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	3.73	3.73	7.95
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	4.72	4.72	6.55

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

73. Figure 37 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 4 ppl to 10 ppl for diesel and from around 5 ppl to 10 ppl for petrol. The graph also shows a slight upward trend over the period.

Figure 37: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Gwynedd

74. Gwynedd is a local authority (unitary authority) located in Wales with an area of 2,535 sq km and an estimated population of 117,072.[36] There are 40 petrol filling stations (PFSs) in the local authority. Four out of these 40 PFSs (10.0%) are owned and operated by supermarkets.

75. Table 24 below shows the average price of diesel and petrol in Gwynedd for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was on average 3.5ppl less expensive and petrol was 2ppl less expensive in the local authority compared to the national average.

Table 24: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Gwynedd (ppl)*	*Price gap (ppl)*
Diesel	179.1	175.6	-3.5
Petrol	162.4	160.4	-2.0

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

Centroid site in Gwynedd

76. The centroid site is a dealer. At 178.22ppl, the site had a slightly lower price for diesel than the national average in the 52 weeks up to w/c 8 May 2023.[37] The closest competitor is a dealer within around 9-minute driving distance.

77. In a 5-minute drive from the centroid, there are no competing PFSs. Within a 10-minute drive from the centroid, there are 2 competing PFSs, of which 1 is a supermarket. Finally, within a 20-minute drive from the centroid, there are 10 competing PFSs, of which only 1 is supermarket. This is illustrated on the map in Figure 38.

[36] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[37] The centroid was selected because it was the most expensive site in H1 2022.

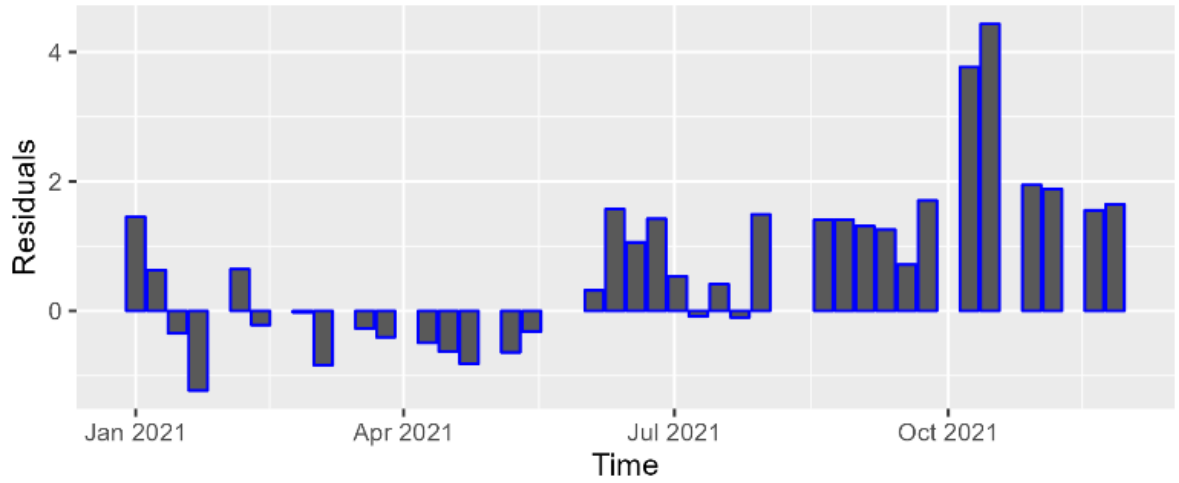
Figure 38: Map of PFSs within 20-minute drive time of centroid site

Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

78. Figure 39 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[38] It can be observed that up until around June 2021 the PCA model marginally over-predicted the centroid's diesel prices in certain weeks. Since then, the PCA model has more systematically under-predicted the centroid's diesel prices.

[38] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 39. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

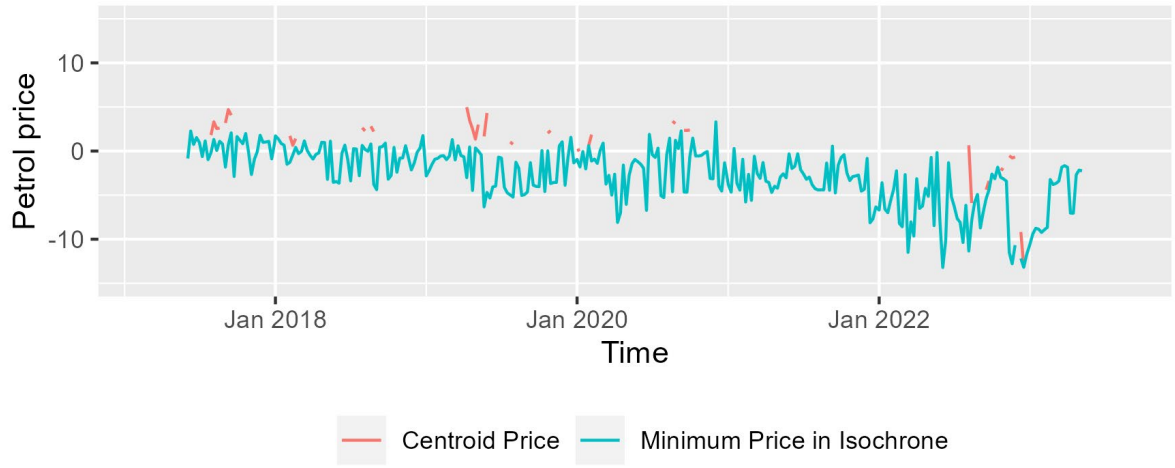
79. Figure 41 and Figure 42 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[39] Based on the data that we have available, the centroid's diesel price was generally higher or on par with the national average price until late-2022, while the minimum price in the 20-minute isochrone was generally lower than the national average price. Petrol data is more sparse, but seems to follow a similar trend.

Figure 40: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[39] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 41: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

80. Table 25 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a dealer located 9 minutes away from the centroid.

Table 25: PFSs within 20-minute drive time of centroid store

PFS Brand	***Company***	***Business Model[1]***	***Drive Time (Minutes)***	***Diesel Price (ppl), 52 weeks up to w/c 8 May 2023***		***Petrol Price (ppl), 52 weeks up to w/c 8 May 2023***	
				Average[2]	*Cardinality[3]*	*Average[2]*	*Cardinality[3]*
National Average Price				180.32	34	165.20	21
[✂]	[✂]	Dealer	0	178.22	34	163.47	21
[✂]	[✂]	Dealer	9	174.23	34	158.4	17
[✂]	[✂]	Supermarket	9	175.18	31	158.76	14
[✂]	[✂]	Dealer	11	177.15	34	159.8	14
[✂]	[✂]	Dealer	11	178.71	34	163.52	16
[✂]	[✂]	Dealer	12	179.96	33	167.75	13
[✂]	[✂]	Dealer	12	NA	NA	NA	NA
[✂]	[✂]	Dealer	13	NA	NA	NA	NA
[✂]	[✂]	Dealer	14	177.93	34	163.55	20
[✂]	[✂]	Dealer	14	178.81	34	163.83	19
[✂]	[✂]	Dealer	19	177.65	26	170.7	10

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

81. Table 26 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 26: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

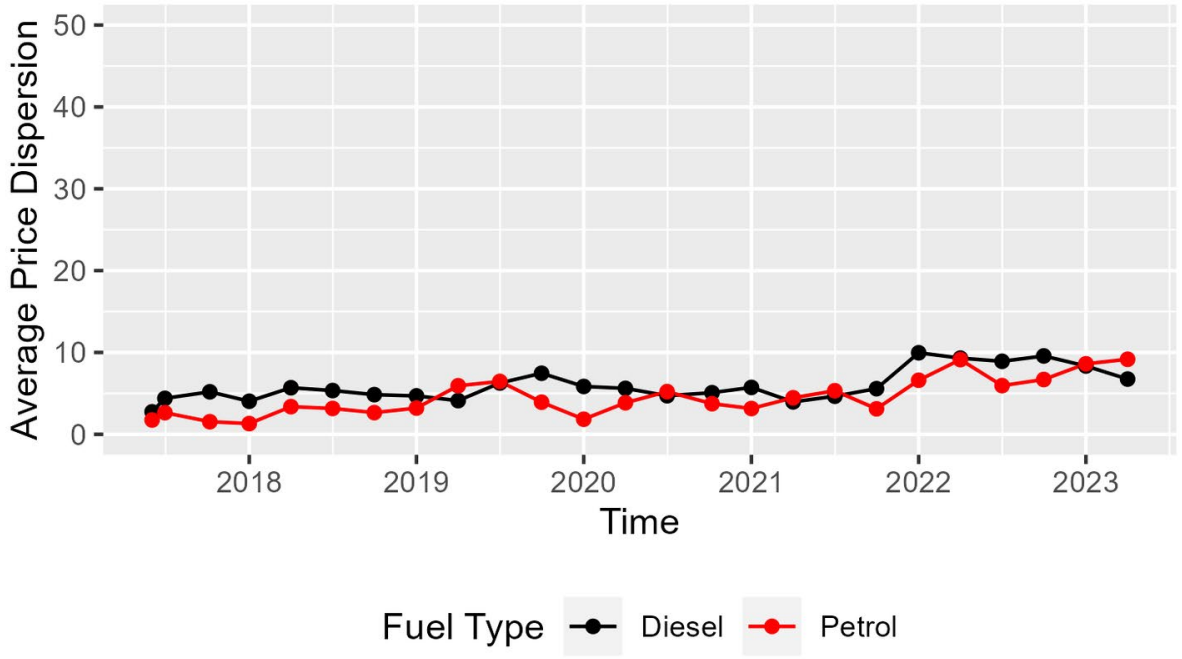
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	575	2,939	16,173
Number of competing sites[1]	0	2	10
Number of supermarket sites	0	1	1
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	4.43	4.43
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	4.56	4.56

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

82. Figure 42 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 2 ppl to 10 ppl for both diesel and petrol. The graph also shows a slight upward trend over the period.

Figure 42: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Hammersmith and Fulham

83. Hammersmith and Fulham is a local authority (London borough) located in London with an area of 16 sq km and an estimated population of 183,295.[40] There are 8 petrol filling stations (PFSs) in the local authority. None out of these 8 PFSs (0.0%) are owned and operated by supermarkets.

84. Table 27 below shows the average price of diesel and petrol in Hammersmith and Fulham for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were on average around 1ppl more expensive in the local authority compared to the national average.

Table 27: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Hammersmith and Fulham (ppl)*	*Price gap (ppl)*
Diesel	179.1	180.5	1.4
Petrol	162.4	162.9	0.5

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

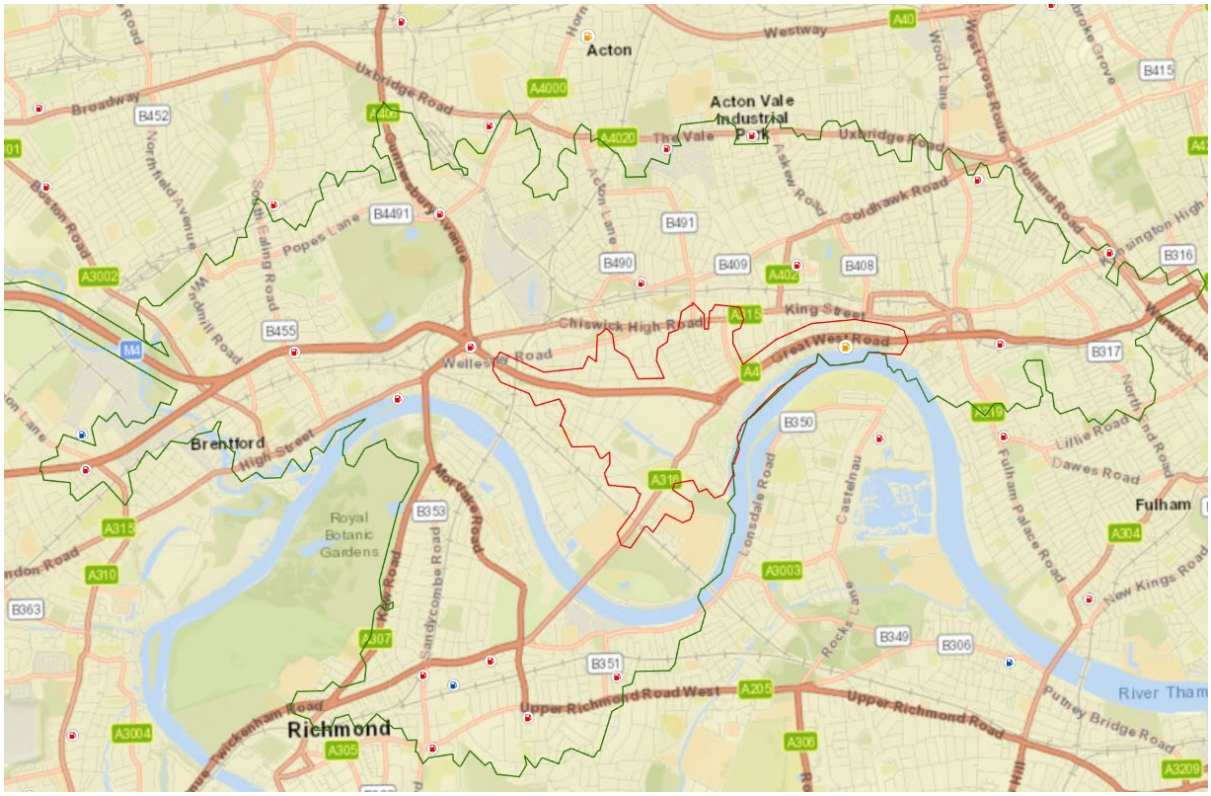
Centroid site in Hammersmith and Fulham

85. The centroid site is owned by a company. At 181.16ppl for diesel, the site was more expensive than the local authority average price across the 52 weeks up to w/c 8 May 2023.[41] The closest competitor is a dealer PFS.

86. In a 5-minute drive from the centroid, there are 2 competing PFSs, of which none are supermarkets. Within a 10-minute drive from the centroid, there are 18 competing PFSs, of which 2 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 81 competing PFSs, of which 13 are supermarkets. This is illustrated in the map in Figure 43.

[40] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[41] The centroid was selected because it was the most expensive site in H1 2022.

Figure 43: Map of PFSs within 10-minute drive time of centroid site

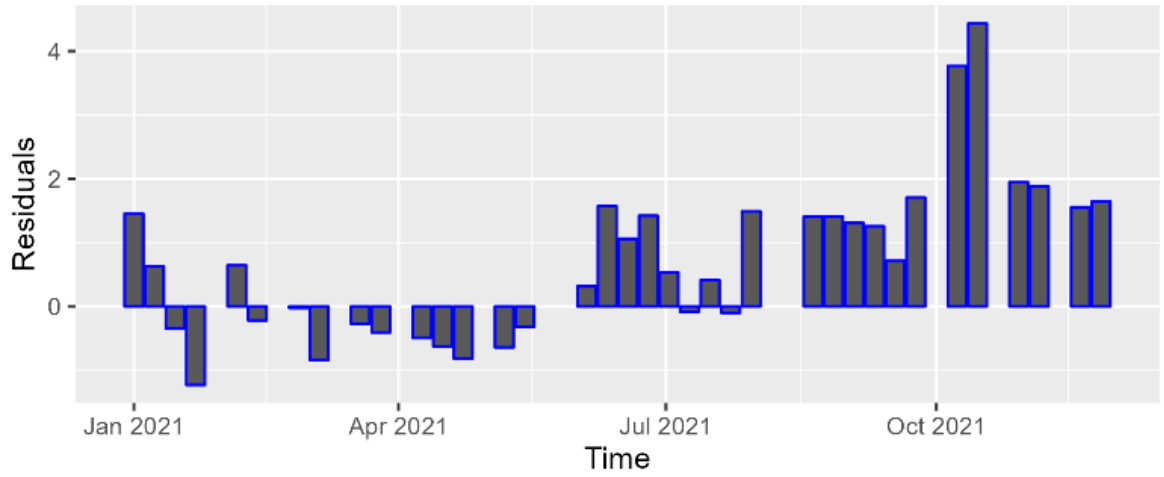


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

87. Figure 44 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[42] It can be observed that up until around June 2021 the PCA model marginally over-predicted the centroid's diesel prices in certain weeks. Since then, the PCA model has more systematically under-predicted the centroid's diesel prices.

[42] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 44. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

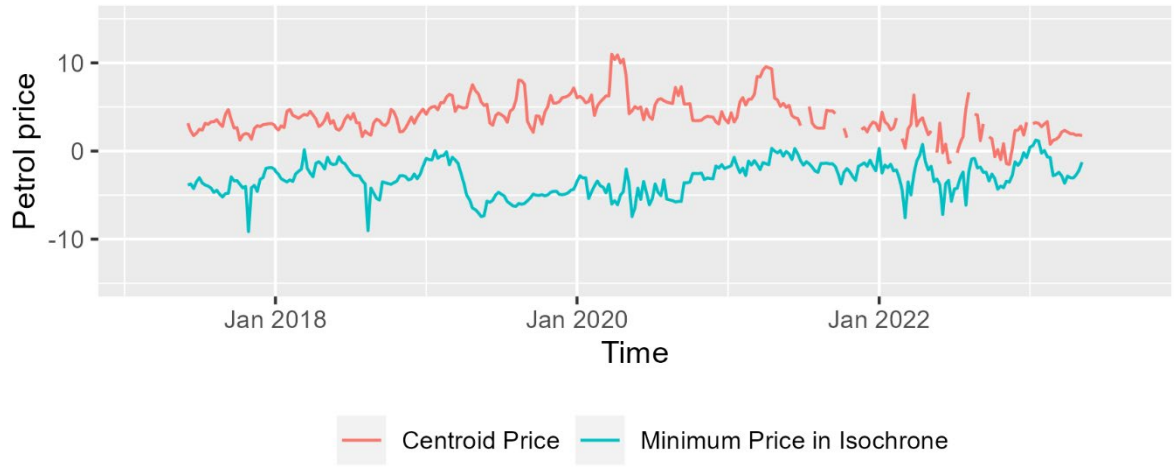
88. Figure 45 and Figure 46 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 10-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[43] Based on the data that we have available, the centroid prices for both petrol and diesel have been higher than the national average, while the minimum price in the 10-minute isochrone was generally lower.

Figure 45: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[43] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 46: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

89. Table 28 below shows the PFSs in a 10-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023, the cheapest competitor for diesel (highlighted grey) was a dealer, located with a 10-minute drive time from the centroid. The cheapest competitor for petrol (highlighted green) was a supermarket, located 9 minutes away from the centroid.

Table 28: PFSs within 10-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.47	46	161.69	47
[✂]	[✂]	Company	0	181.16	46	162.24	47
[✂]	[✂]	Dealer	0	182.3	47	163.38	47
[✂]	[✂]	Dealer	5	180.69	46	161.97	47
[✂]	[✂]	Dealer	7	179.3	45	160.51	40
[✂]	[✂]	Dealer	7	181.14	47	162.8	45
[✂]	[✂]	Dealer	7	181.44	40	162.54	46
[✂]	[✂]	Company	7	181.74	47	163.03	47
[✂]	[✂]	Company	7	181.29	46	161.73	43
[✂]	[✂]	Company	8	181.01	45	161.89	47
[✂]	[✂]	Dealer	8	180.34	35	161.09	43
[✂]	[✂]	Supermarket	9	178.39	47	159.14	44
[✂]	[✂]	Dealer	9	179.03	15	159.26	20
[✂]	[✂]	Company	9	182.03	47	163.51	47
[✂]	[✂]	Company	10	180.58	45	162.03	46

[✂]	[✂]	Company	10	180.17	46	162.16	47
[✂]	[✂]	Dealer	10	177.69	32	161.77	38
[✂]	[✂]	Dealer	10	NA	NA	NA	NA
[✂]	[✂]	Supermarket	10	179.55	47	161.21	47
[✂]	[✂]	Dealer	10	179.65	46	162.41	45

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

90. Table 29 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 29: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

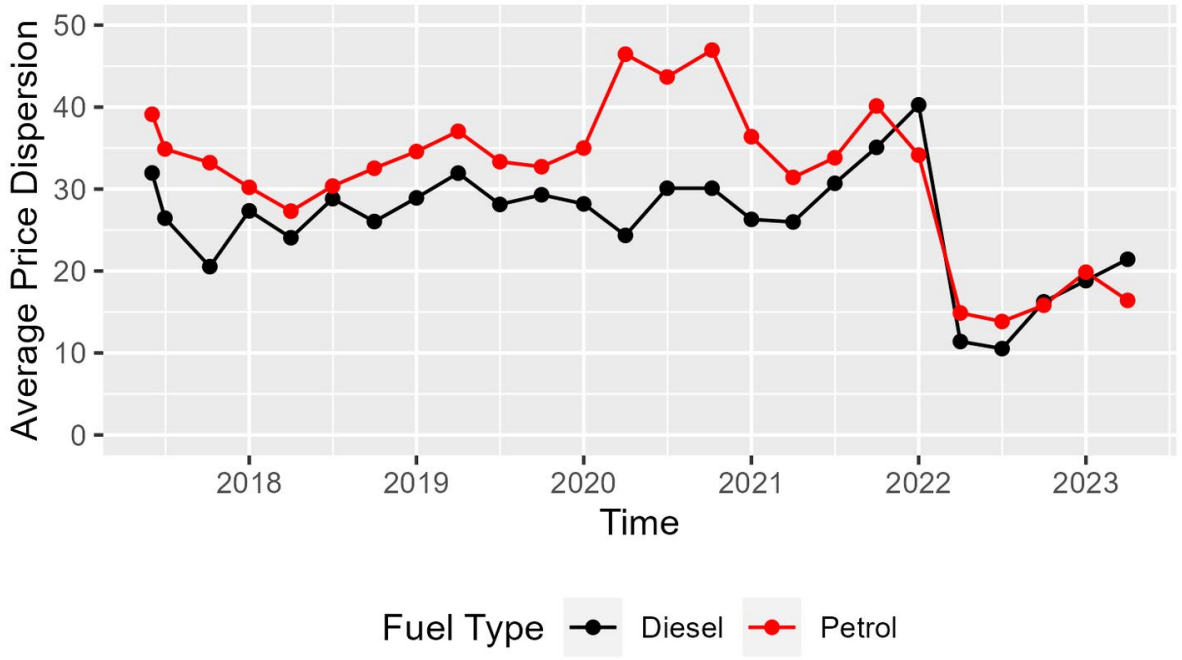
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	15,957	194,137	1,199,010
Number of competing sites[1]	2	18	81
Number of supermarket sites	0	2	13
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	1.45	3.91	6.49
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	1.40	3.77	5.46

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

91. Figure 47 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. The price dispersion in this area have been particularly high, and more so for petrol than for diesel. The dispersion varied from around 20 ppl to 40 ppl for diesel and from 30 ppl to around 45 ppl for petrol until early 2022, and since then there was a significant drop to around 10-20 ppl for both products.

Figure 47: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Highland

92. Highland is a local authority (council area) located in Scotland with an area of 25,653 sq km and an estimated population of 238,060.[44] There are 85 petrol filling stations (PFSs) in the local authority. 12 out of these 85 PFSs (14.1%) are owned and operated by supermarkets.

93. Table 30 below shows the average price of diesel and petrol in Highland for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were marginally less expensive (<1ppl) in the local authority compared to the national average.

Table 30: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Highland (ppl)*	*Price gap (ppl)*
Diesel	179.1	178.9	-0.2
Petrol	162.4	162.4	-0.1

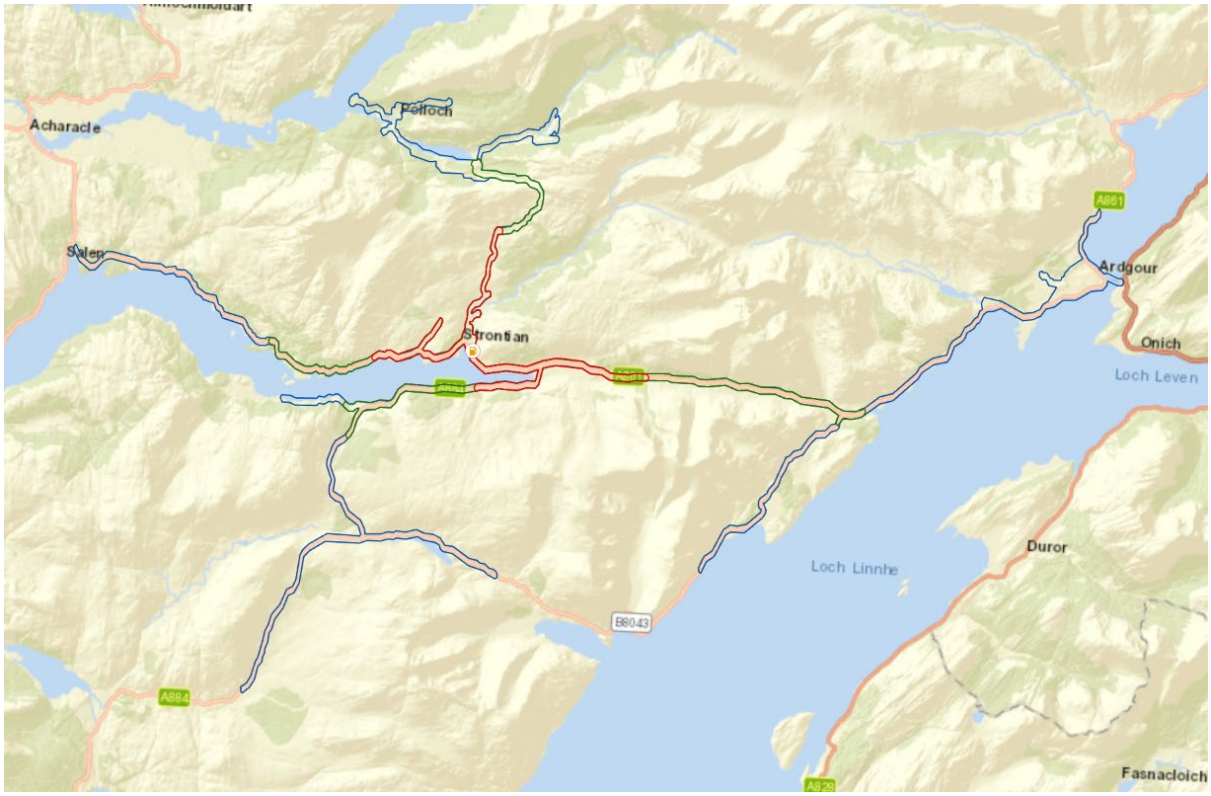
Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

Centroid site in Highland

94. The centroid site is a company PFS. At 200.00ppl, the site had the highest average price of diesel in the local authority in the 52 weeks up to 8 May 2023.[45] The closest competitor is located more than 20-minute drive time from the centroid.

[44] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[45] The centroid was selected because it was the most expensive site in H1 2022.

Figure 48: Map of PFSs within 20-minute drive time of centroid site

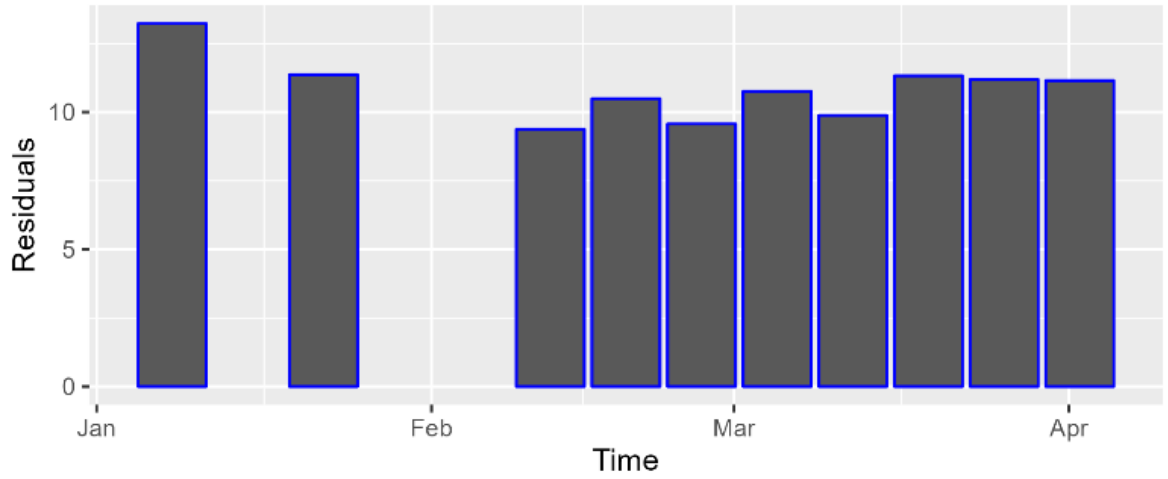


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone.

95. Figure 49 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[46] It can be observed that, for the weeks for which data is available, the PCA model systematically significantly under-predicted the centroid's diesel prices.

[46] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 49. Residuals from cross-sectional PCA for centroid site, January – April 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

Competitors

96. Table 31 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange).

Table 31: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				183.99	3	158.18	2
[✂]	[✂]	Company	0	200.0	3	171.0	2

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

97. Table 32 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 32: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	5	11	28
Number of competing sites[1]	0	0	0
Number of supermarket sites	0	0	0
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	N/A	N/A
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	N/A	N/A

Source: CMA analysis of Experian Data and National Records of Scotland
Notes:
1. Excludes the centroid PFS; does not account for common ownership.
2. The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger.
3. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.

Huntingdonshire

98. Huntingdonshire is a local authority (non-metropolitan district) located in the East of England with an area of 906 sq km and an estimated population of 181,804.[47] There are 30 petrol filling stations (PFSs) in the local authority. Five out of these 30 PFSs (16.7%) are owned and operated by supermarkets.

99. Table 33 below shows the average price of diesel and petrol in Huntingdonshire for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were around 2ppl more expensive in the local authority compared to the national average.

Table 33: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Huntingdonshire (ppl)*	*Price gap (ppl)*
Diesel	179.1	181.3	2.2
Petrol	162.4	164.1	1.6

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

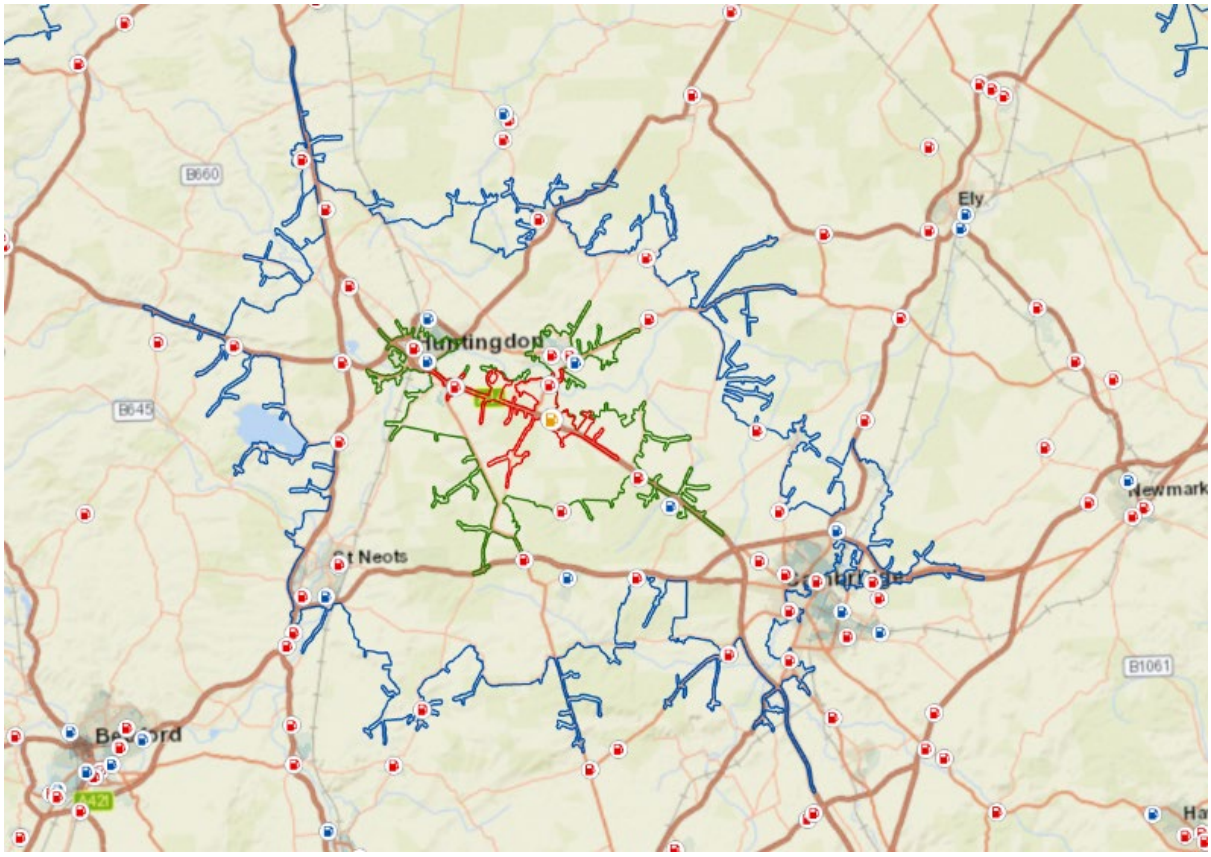
Centroid site in Huntingdonshire

100. The centroid site is a company PFS. At 186.61ppl, the site had a higher average price of diesel than the national average.[48] The closest competitor is dealer PFS within around 4-minute driving distance.

101. In a 5-minute drive from the centroid, there are 2 competing PFSs, of which none are supermarkets. Within a 10-minute drive from the centroid, there are 10 competing PFSs, of which 2 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 35 competing PFSs, of which 7 are supermarkets. This is illustrated on the map in Figure 50.

[47] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[48] The centroid was selected because it was the most expensive site in H1 2022.

Figure 50: Map of PFSs within 20-minute drive time of centroid site

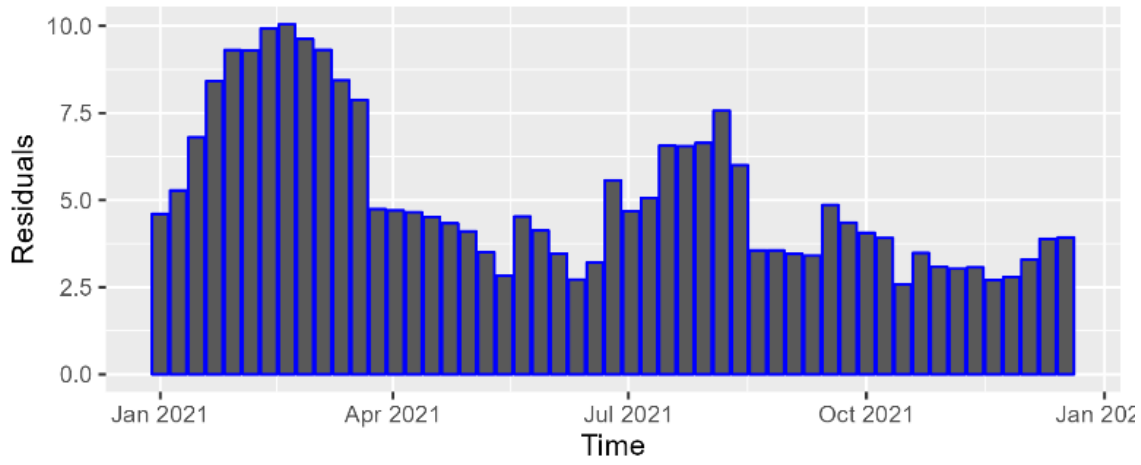


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

102. Figure 51 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[49] It can be observed that the PCA model systematically under-predicted the centroid's diesel prices over this time period.

[49] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 51. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

103. Figure 52 and 53 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price. [50] Based on the data that we have available, the centroid prices for both petrol and diesel have been consistently higher than the national average, while the minimum price in the 20-minute isochrone was usually lower.

Figure 52: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[50] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 53: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

104. Table 34 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a dealer, located in a 17-minute drive time from the centroid.

Table 34: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.11	52	162.18	45
[✂]	[✂]	Company	0	186.61	52	169.05	45
[✂]	[✂]	Dealer	4	182.77	42	164.81	41
[✂]	[✂]	Company	4	183.81	52	166.51	45
[✂]	[✂]	Supermarket	7	181.69	52	164.44	45
[✂]	[✂]	Company	7	184.79	50	169.4	39
[✂]	[✂]	Company	8	185.86	45	168.14	35
[✂]	[✂]	Company	8	183.73	52	166.33	45
[✂]	[✂]	Company	8	191.87	52	179.15	45
[✂]	[✂]	Supermarket	9	178.97	50	163.81	38
[✂]	[✂]	Company	10	185.51	52	169.92	45
[✂]	[✂]	Dealer	10	NA	NA	NA	NA
[✂]	[✂]	Supermarket	11	180.45	52	164.43	45
[✂]	[✂]	Dealer	11	181.95	46	159.32	28
[✂]	[✂]	Supermarket	12	178.93	52	162.41	45
[✂]	[✂]	Dealer	12	NA	NA	NA	NA
[✂]	[✂]	Company	12	184.09	51	165.51	44

[✂]	[✂]	Dealer	13	181.81	49	162.86	38
[✂]	[✂]	Supermarket	14	182.82	52	167.16	45
[✂]	[✂]	Company	14	184.31	52	165.57	44
[✂]	[✂]	Dealer	15	183.31	48	164.3	34
[✂]	[✂]	Dealer	15	182.81	51	165.06	44
[✂]	[✂]	Dealer	15	180.5	40	NA	NA
[✂]	[✂]	Supermarket	16	179.44	52	162.51	45
[✂]	[✂]	Company	16	177.74	42	160.81	27
[✂]	[✂]	Dealer	16	184.23	49	169.35	11
[✂]	[✂]	Dealer	17	180.07	35	164.28	36
[✂]	[✂]	Company	17	180.55	52	163.48	45
[✂]	[✂]	Dealer	17	175.71	51	155.65	41
[✂]	[✂]	Company	18	183.91	51	165.76	43
[✂]	[✂]	Dealer	18	176.83	52	157.79	45
[✂]	[✂]	Supermarket	18	176.02	52	155.59	45
[✂]	[✂]	Dealer	18	NA	NA	NA	NA
[✂]	[✂]	Company	19	183.02	52	164.65	44
[✂]	[✂]	Dealer	19	179.86	39	164.65	26
[✂]	[✂]	Dealer	19	NA	NA	NA	NA
[✂]	[✂]	Dealer	20	182.49	28	165.59	21

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

105. Table 35 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 35: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

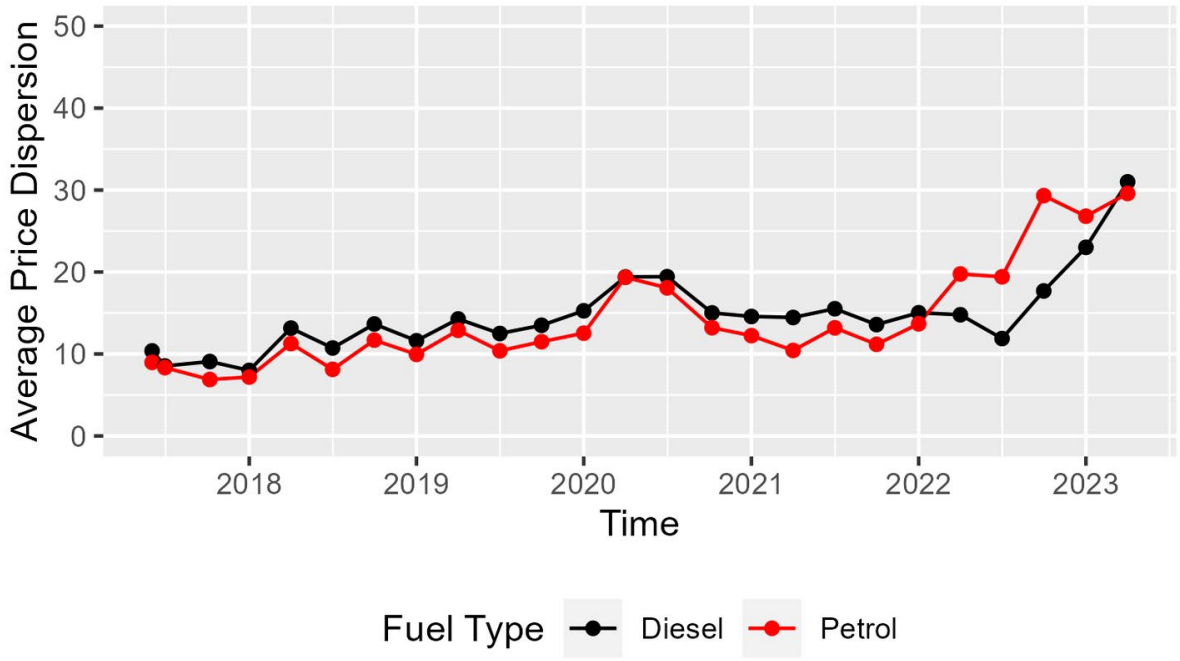
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	3,637	45,533	260,871
Number of competing sites[1]	2	10	35
Number of supermarket sites	0	2	7
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	3.56	7.37	10.80
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	3.72	5.95	13.53

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

106. Figure 54 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the price dispersion varied from around 8 ppl to 30 ppl for both diesel and petrol. The graph also shows a significant increase in price dispersion for both diesel and petrol from mid-2022 onwards.

Figure 54: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Inverclyde

107. Inverclyde is a local authority (council area) located in Scotland with an area of 160 sq km and an estimated population of 76,700.[51] There are six petrol filling stations (PFSs) located in the local authority. Three out of these 6 PFSs (50.0%) are owned and operated by supermarkets.

108. This area was chosen due to multiple complaints received from the general public regarding high prices in PFSs relative to other areas.

109. Table 36 below shows the average price of diesel and petrol in Inverclyde for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was around 1ppl more expensive in the local authority compared to the national average and petrol was 2ppl more expensive in the local authority compared to the national average.

Table 36: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Inverclyde (ppl)*	*Price gap (ppl)*
Diesel	179.1	180.5	1.3
Petrol	162.4	164.7	2.3

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

Centroid site in Inverclyde

110. The centroid site is a dealer. At 181.20ppl for diesel, the site was more expensive than the average price of diesel in the local authority in 52 weeks up to w/c 8 May 2023.[52] The closest competitor is a supermarket PFS within around 1-minute driving distance.

111. In a 5-minute drive from the centroid, there are 2 competing PFSs, both of which are supermarkets. Within a 10-minute drive from the centroid, there are 4 competing PFSs, of which 3 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 7 competing PFSs, of which 3 are supermarkets. This is illustrated on the map in Figure 55.

[51] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[52] The centroid was selected because it was the most expensive site in H1 2022.

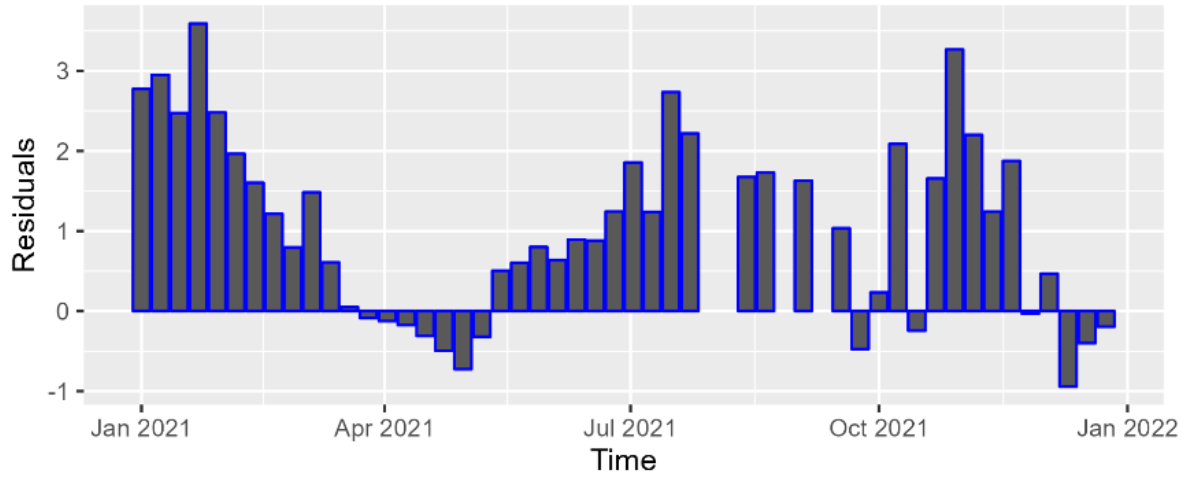
Figure 55: Map of PFSs within 20-minute drive time of centroid site

Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

112. Figure 56 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[53] It can be observed that the PCA model tended to under-predict the centroid site's diesel prices (the exceptions being around April 2021 and December 2021).

[53] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 56. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

113. Figure 57 and Figure 58 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[54] Based on the data that we have available, both diesel and petrol prices at the centroid store were either on par or higher than the national average, while the minimum price in the isochrone was generally lower.

Figure 57: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[54] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 58: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

114. Table 37 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on average prices across 52 weeks up to w/c 8 May 2023, the cheapest competitor for both diesel and petrol (highlighted blue) was a dealer, located in a 20-minute drivetime from the centroid.

Table 37: PFSs within 20-minute drive time of centroid store

PFS Brand	***Company***	***Business Model[1]***	***Drive Time (Minutes)***	***Diesel Price (ppl), 52 weeks up to w/c 8 May 2023***		***Petrol Price (ppl), 52 weeks up to w/c 8 May 2023***	
				Average[2]	*Cardinality[3]*	*Average[2]*	*Cardinality[3]*
National Average Price				178.96	43	163.04	22
[✂]	[✂]	Dealer	0	181.2	43	166.47	22
[✂]	[✂]	Supermarket	1	179.88	43	165.22	22
[✂]	[✂]	Supermarket	3	179.61	43	165.06	22
[✂]	[✂]	Supermarket	6	179.61	43	164.81	22
[✂]	[✂]	Company	6	181.67	42	169.23	20
[✂]	[✂]	Company	15	179.32	37	162.63	21
[✂]	[✂]	Dealer	18	NA	NA	NA	NA
[✂]	[✂]	Company	20	177.54	43	161.58	22

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

115. Table 38 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 38: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

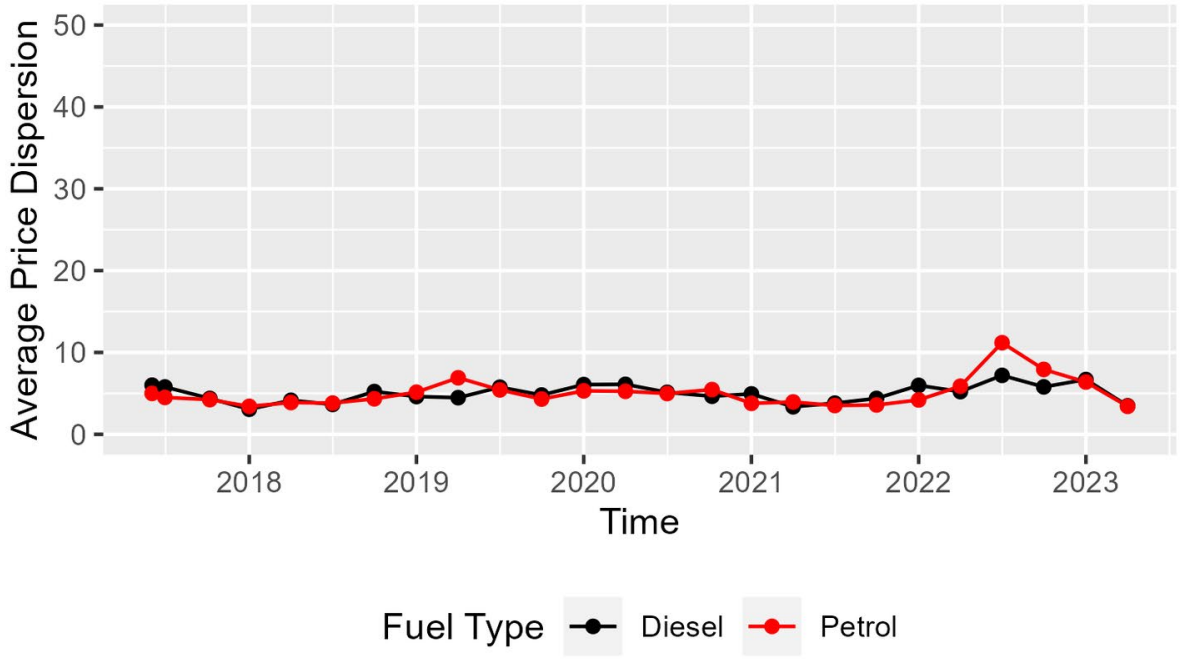
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	27,887	57,052	102,347
Number of competing sites[1]	2	4	7
Number of supermarket sites	2	3	3
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	1.59	1.59	3.66
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	1,41	1.66	4.89

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

116. Figure 59 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 3ppl to 6ppl for diesel and from 3ppl to 11ppl for petrol.

Figure 59: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Malvern Hills

117. Malvern Hills is a local authority (non-metropolitan district) located in the West Midlands with an area of 577 sq km and an estimated population of 79,973.[55] There are 14 petrol filling stations (PFSs) in the local authority. One out of these 14 PFSs (7.1%) is owned and operated by supermarkets.

118. Table 39 below shows the average price of diesel and petrol in Malvern Hills for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was around 4ppl more expensive, and petrol was 3ppl more expensive in the local authority compared to the national average.

Table 39: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Malvern Hills (ppl)*	*Price gap (ppl)*
Diesel	179.1	182.8	3.7
Petrol	162.4	165.2	2.7

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

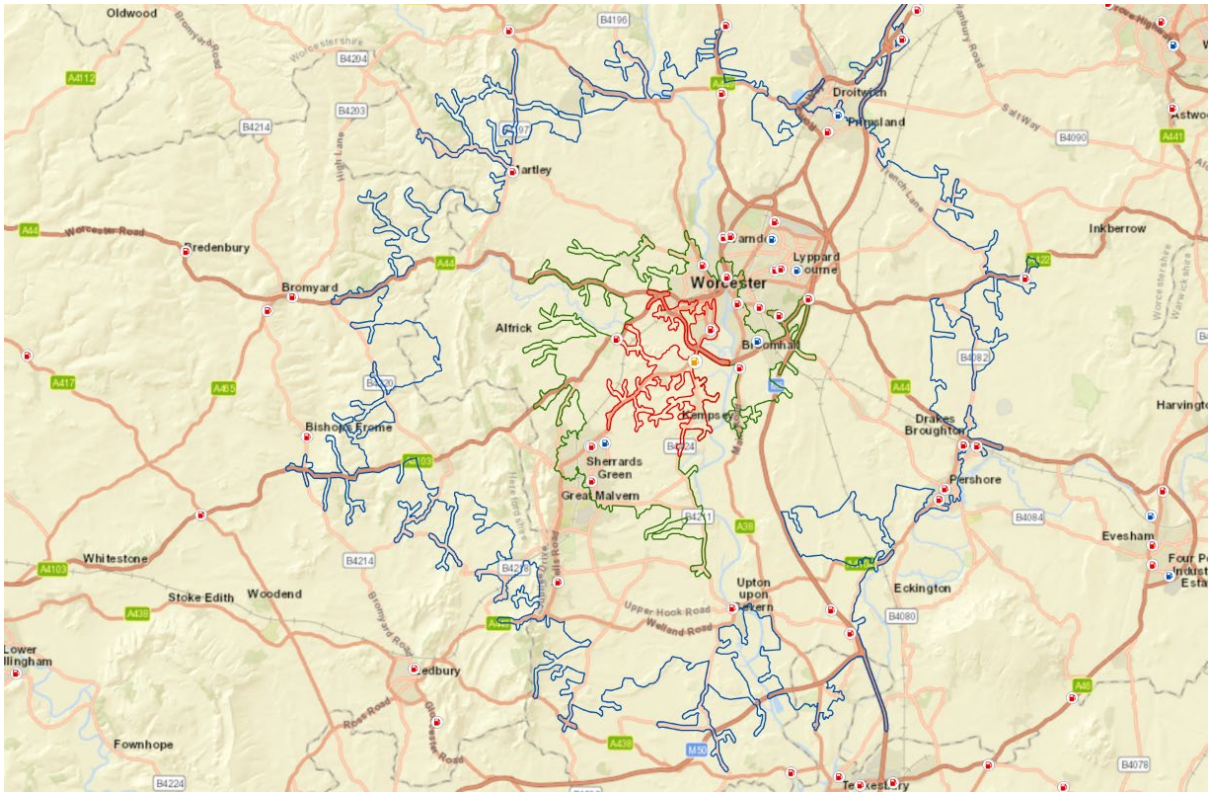
Centroid site in Malvern Hills

119. The centroid site is a dealer.[56] At 177.30ppl, the site had the highest average price of diesel in the local authority in H1 2022. The closest competitor is a company PFS within around 3-minute driving distance.

120. In a 5-minute drive from the centroid, there are 2 competing PFSs, of which 0 are supermarkets. Within a 10-minute drive from the centroid, there are 12 competing PFSs, of which 2 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 34 competing PFSs, of which only 5 are supermarkets. This is illustrated on the map in Figure 60.

[55] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[56] The centroid was selected because it was the most expensive site in H1 2022.

Figure 60: Map of PFSs within 20-minute drive time of centroid site

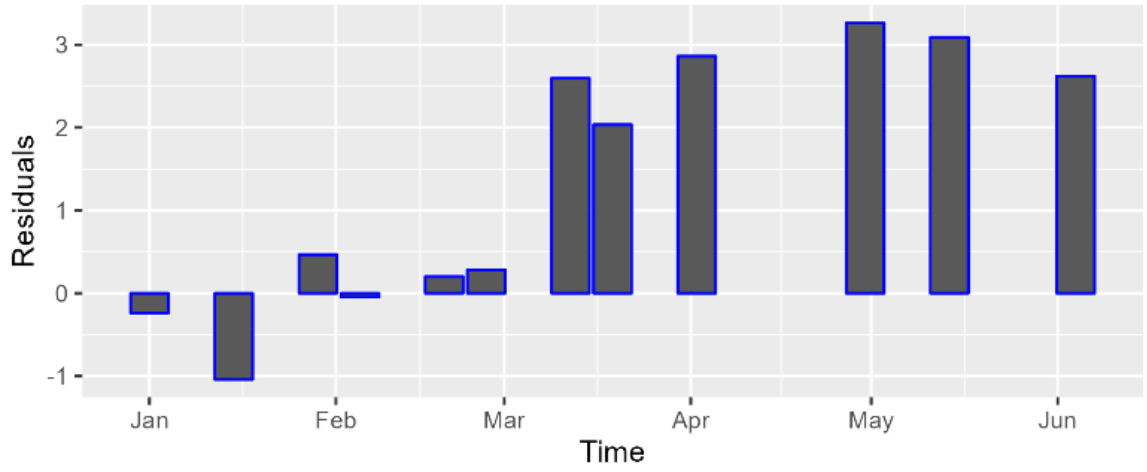


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

121. Figure 61 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[57] It can be observed that the PCA model under-predicted the centroid site's diesel prices significantly from around March 2021 onwards, based on the few weeks for which data was available.

[57] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 61. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

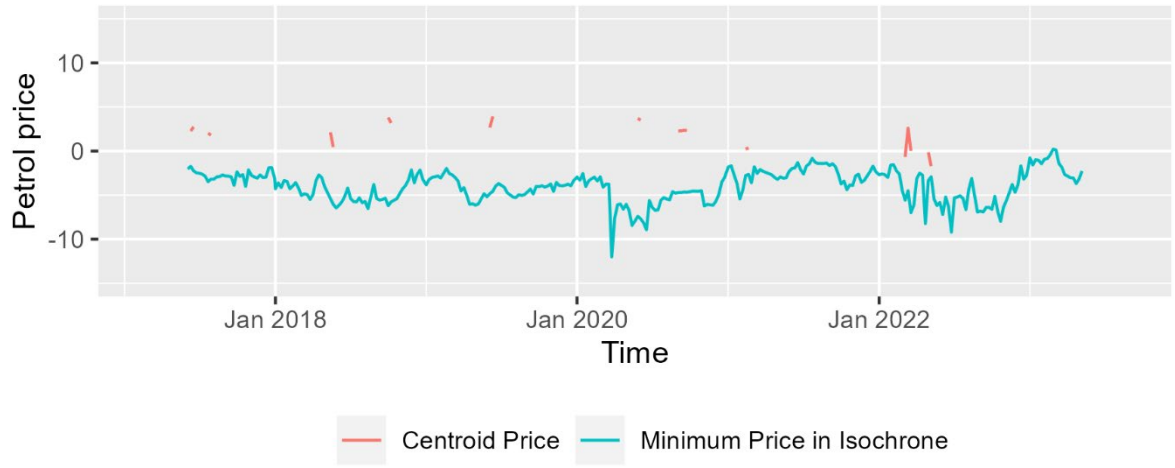
122. Figure 62 and Figure 63 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price. [58] Based on the data that we have available, the centroid price for diesel has been higher than the national average, while the minimum price in the 20-minute isochrone was usually always lower. Petrol data was quite irregular to make any conclusion.

Figure 62: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[58] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 63: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

123. Table 40 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). In this area we have used data from H1 2022, as 2023 data was too patchy for the centroid. In H1 2022, the cheapest competitor for diesel (highlighted grey) was a supermarket, located with a 9-minute drivetime from the centroid, and the cheapest competitor for petrol (highlighted green) was a dealer, located 5 minutes away.

Table 40: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), H1 2022*		*Petrol Price (ppl), H1 2022*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				175.04	5	163.27	5
[✂]	[✂]	Dealer	0	177.3	5	163.32	5
[✂]	[✂]	Company	3	175.2	5	163.6	5
[✂]	[✂]	Dealer	5	172.1	5	158.7	3
[✂]	[✂]	Dealer	7	174.78	4	162.28	4
[✂]	[✂]	Dealer	7	176.8	5	165.02	4
[✂]	[✂]	Dealer	7	176	5	163.8	5
[✂]	[✂]	Dealer	8	172.4	5	161.04	5
[✂]	[✂]	Supermarket	8	172.8	5	162.4	5
[✂]	[✂]	Supermarket	9	167.5	5	160.9	5
[✂]	[✂]	Dealer	9	172.07	3	164.57	3
[✂]	[✂]	Dealer	9	178.8	5	165.4	3
[✂]	[✂]	Dealer	10	173.3	5	163.73	3
[✂]	[✂]	Dealer	10	173.1	5	162.9	5
[✂]	[✂]	Company	11	173.3	5	163.7	5
[✂]	[✂]	Dealer	12	175.5	5	166.1	5

[✂]	[✂]	Dealer	12	N/A	N/A	N/A	N/A
[✂]	[✂]	Dealer	12	173.3	5	162.5	5
[✂]	[✂]	Dealer	12	177.9	5	163.2	5
[✂]	[✂]	Dealer	12	172.52	4	162.4	4
[✂]	[✂]	Dealer	13	182.9	1	N/A	N/A
[✂]	[✂]	Supermarket	13	168	5	161	5
[✂]	[✂]	Dealer	13	178.9	5	166.15	4
[✂]	[✂]	Dealer	14	N/A	N/A	N/A	N/A
[✂]	[✂]	Dealer	15	173.6	5	162.9	5
[✂]	[✂]	Dealer	16	178.4	3	161.9	4
[✂]	[✂]	Supermarket	17	168.05	5	160.05	5
[✂]	[✂]	Company	18	176.3	5	166.9	5
[✂]	[✂]	Dealer	18	178.4	5	167.6	5
[✂]	[✂]	Dealer	19	N/A	N/A	N/A	N/A
[✂]	[✂]	Company	19	186.6	5	176.4	5
[✂]	[✂]	Dealer	19	175.5	5	161.5	5
[✂]	[✂]	Dealer	19	178	5	166.7	5
[✂]	[✂]	Dealer	20	180.4	3	166.9	2
[✂]	[✂]	Dealer	20	179.65	4	166.1	5
[✂]	[✂]	Supermarket	20	171.35	5	162.65	5

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

124. Table 41 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 41: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

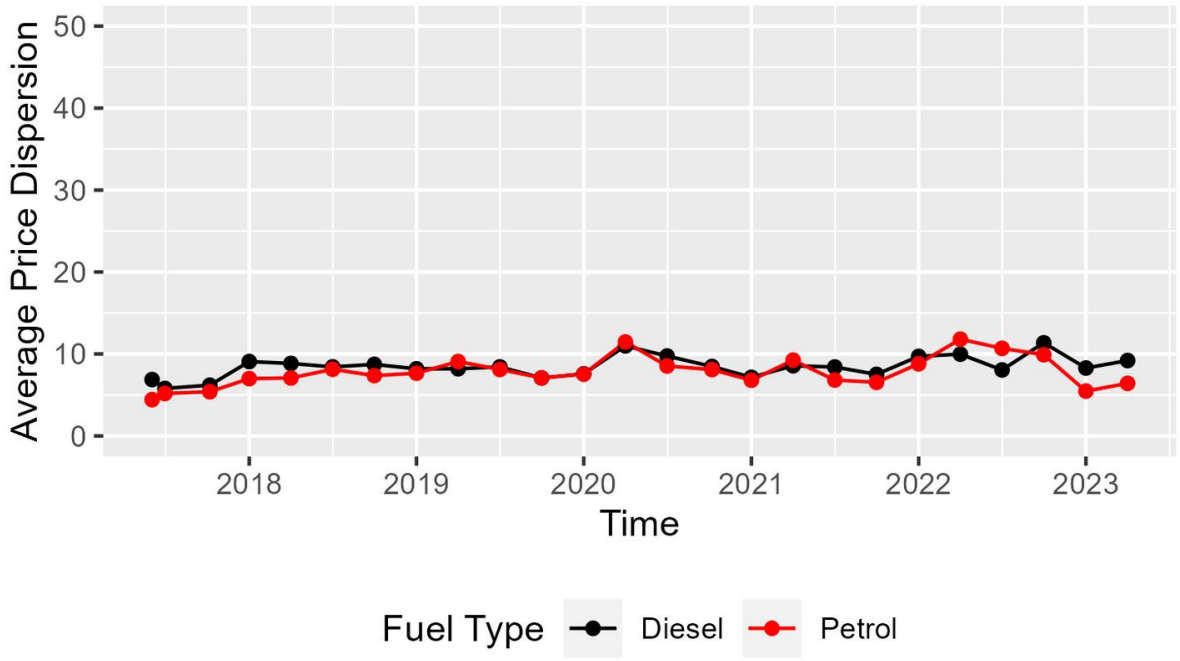
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	5,192	63,276	202,155
Number of competing sites[1]	2	12	34
Number of supermarket sites	0	2	5
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	N/A	N/A
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	N/A	N/A

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

125. Figure 64 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 5 ppl to 11 ppl for both diesel and petrol. The graph also shows an upward trend over the period.

Figure 64: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Northumberland

126. Northumberland is a local authority (unitary authority) located in the North East with an area of 5,020 sq km and an estimated population of 321,558.[59] There are 54 petrol filling stations (PFSs) in the local authority. Eight out of these 54 PFSs (14.8%) are owned and operated by supermarkets.

127. Table 42 below shows the average price of diesel and petrol in Northumberland for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were marginally less expensive (around 1ppl) in the local authority compared to the national average.

Table 42: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Northumberland (ppl)*	*Price gap (ppl)*
Diesel	179.1	178.4	-0.7
Petrol	162.4	161.5	-0.9

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

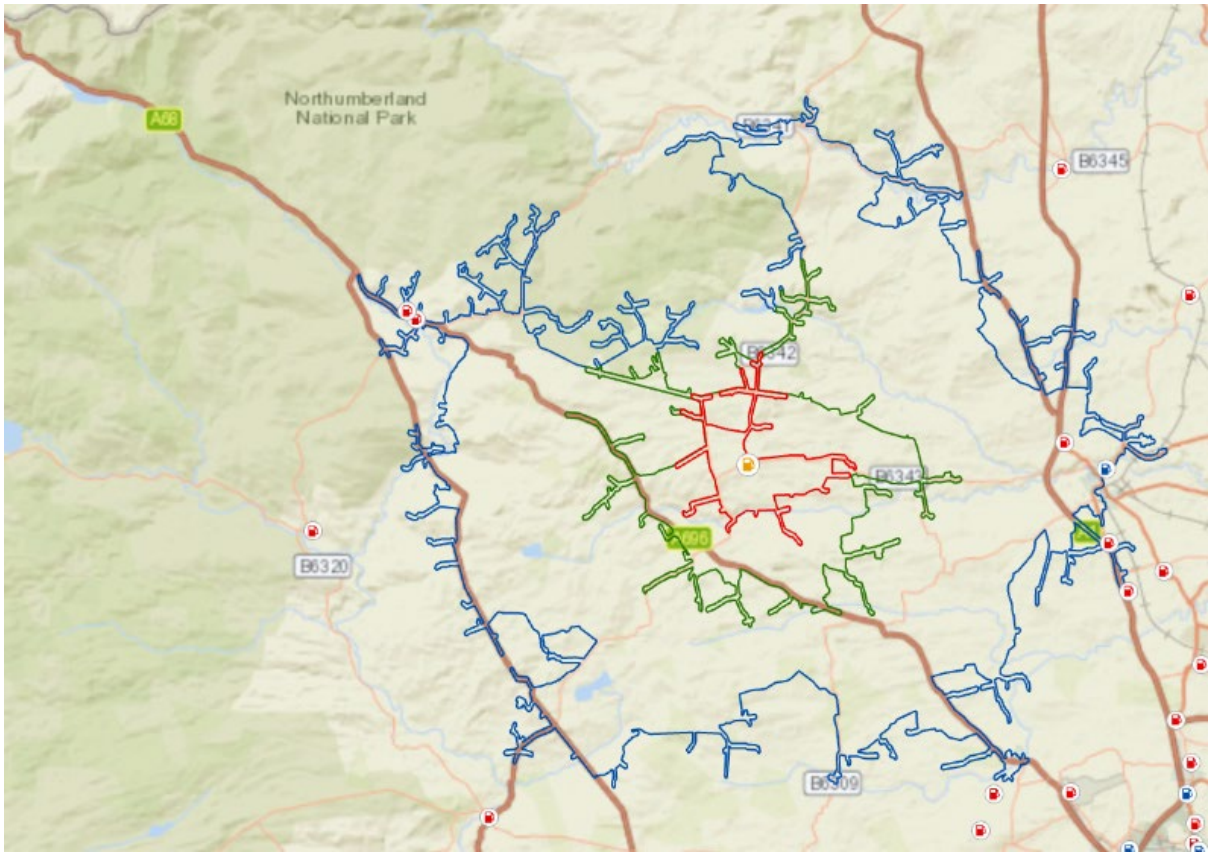
Centroid site in Northumberland

128. The centroid site is a dealer. At 184.68ppl, the site had a higher average price of diesel than the local authority average in the 52 weeks up to 8 May 2023.[60] The closest competitor is a dealer PFS within around 16-minute driving distance.

129. In a 10-minute drive from the centroid, there are no competing PFSs. Within a 20-minute drive from the centroid, there are 3 competing PFSs, of which none are supermarkets. This is illustrated on the map in Figure 65.

[59] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[60] The centroid was selected because it was the most expensive site in H1 2022.

Figure 65: Map of PFSs within 20-minute drive time of centroid site

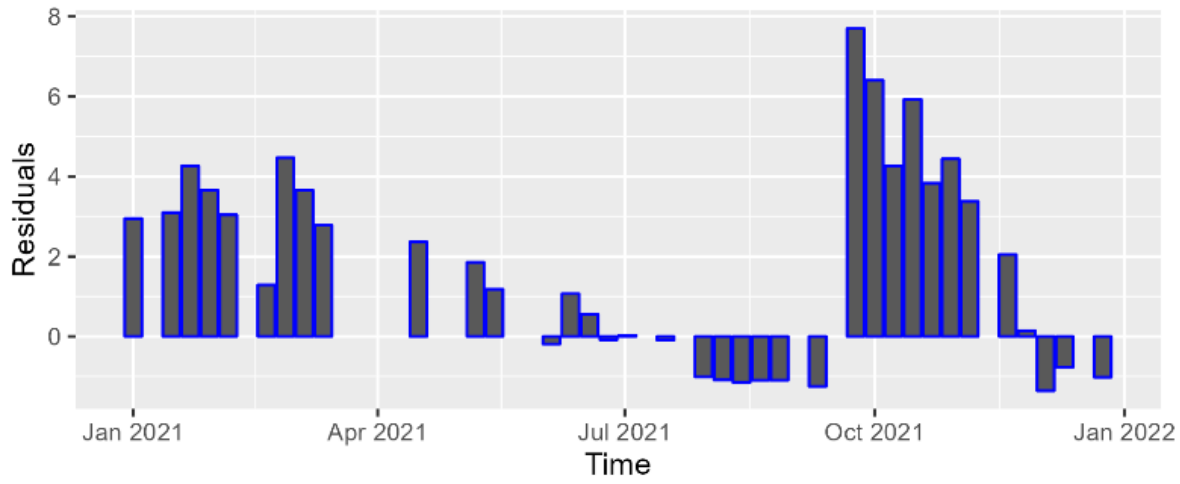


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

130. Figure 66 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[61] It can be observed that up until around July 2021 the PCA model under-predicted the centroid's diesel prices. From around October 2021 the model again significantly under-predicted prices for a few weeks.

[61] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 66. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

131. Figure 67 and Figure 68 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price. [62] The centroid price for diesel was generally higher than the national average, while the minimum price in the 20-minute isochrone (in this case there was only one competitor with available data) was on par or above the national average. Petrol data was too irregular to make any conclusion.

Figure 67: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[62] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 68: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

132. Table 43 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a dealer, located in a 16-minute drive time from the centroid.

Table 43: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				180.50	40	169.44	10
[✂]	[✂]	Dealer	0	184.68	40	176.5	10
[✂]	[✂]	Dealer	16	180.81	40	169.9	10
[✂]	[✂]	Dealer	17	NA	NA	NA	NA
[✂]	[✂]	Dealer	18	NA	NA	NA	NA

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

133. Table 44 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 44: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

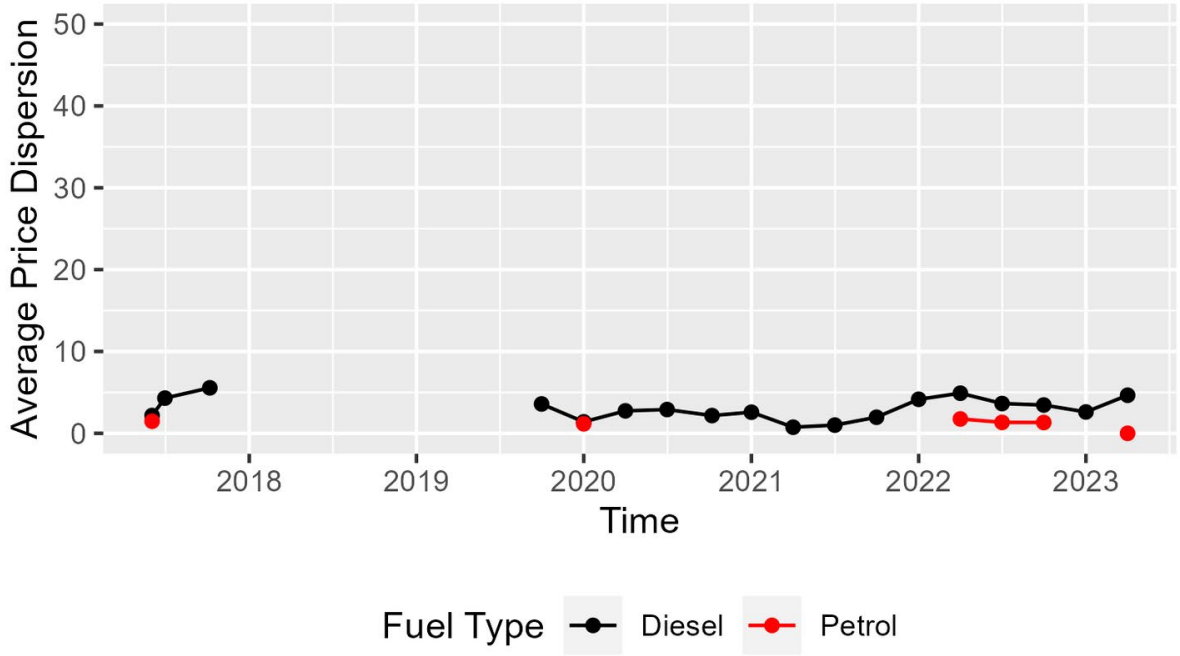
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	177	917	19,875
Number of competing sites[1]	0	0	3
Number of supermarket sites	0	0	0
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	N/A	3.86
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	N/A	6.60

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

134. Figure 69 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion always stayed below 10ppl for diesel, while petrol data is very patchy.

Figure 69: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Rutland

135. Rutland is a local authority (unitary authority) located in the East Midlands with an area of 382 sq km and an estimated population of 41,381.[63] There are 10 petrol filling stations (PFSs) in the local authority. None out of these 10 PFSs (0.0%) are owned and operated by supermarkets.

136. Table 45 below shows the average price of diesel and petrol in Rutland for 52 weeks up to w/c 8 May 2023 in ppl. Based on the data available, diesel was marginally more expensive (<0.5ppl) in the local authority, however, petrol was at most marginally less expensive (<0.1ppl) compared to the national average.

Table 45: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Rutland (ppl)*	*Price gap (ppl)*
Diesel	179.1	179.4	0.3
Petrol	162.4	162.4	0.0

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

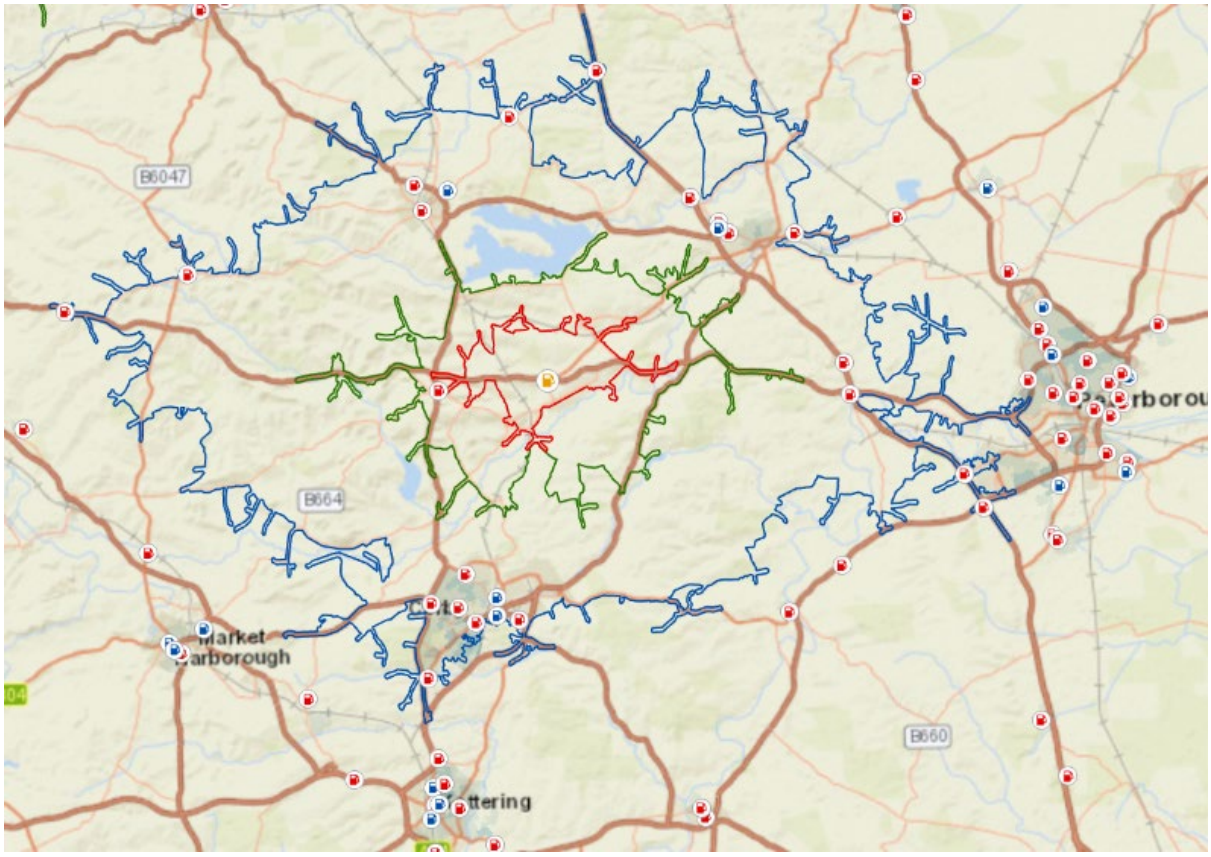
Centroid site in Rutland

137. The centroid site is a company. At 171.11ppl, the site had a slightly higher price for diesel than the national average in the weeks for which data was available (as shown in Table 46 below).[64] The closest competitor is a dealer PFS within around 0-minute driving distance.

138. In a 5-minute drive from the centroid, there are 2 competing PFSs, of which none are supermarkets. Within a 10-minute drive from the centroid, there are 2 competing PFSs, of which none are supermarkets. Finally, within a 20-minute drive from the centroid, there are 25 competing PFSs, of which 3 are supermarkets. This is illustrated on the map in Figure 70.

[63] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[64] The centroid was selected because it was the most expensive site in H1 2022.

Figure 70: Map of PFSs within 20-minute drive time of centroid site

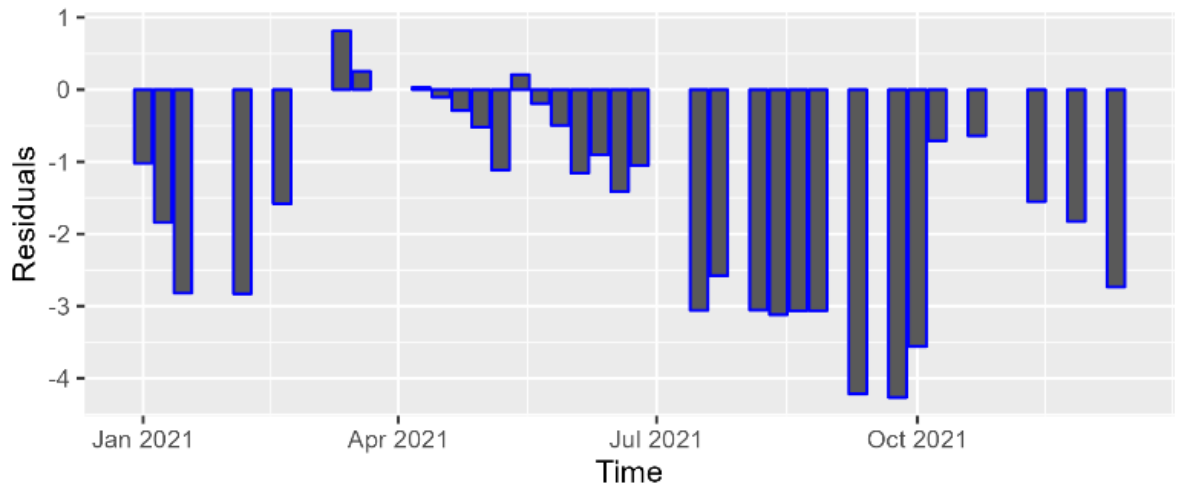


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

139. Figure 71 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[65] It can be observed that the PCA model tended to consistently over-predict the centroid PFS's diesel price.

[65] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 71. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

140. Figure 72 and Figure 73 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[66] Based on the data that we have, for both petrol and diesel, the centroid prices were generally lower than the national average. The diesel prices of the centroid slightly increased to be higher than the national average at the start of 2022. The minimum price in the isochrone usually remained below the national average throughout the period.

Figure 72: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[66] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 73: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

141. Table 46 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for diesel (highlighted grey) was a supermarket, located in an 18-minute drive time from the centroid and the cheapest for petrol (highlighted green) was a dealer located in a 16-minute drive time.

Table 46: PFSs within 20-minute drive time of centroid store

PFS Brand	***Company***	***Business Model[1]***	***Drive Time (Minutes)***	***Diesel Price (ppl), 52 weeks up to w/c 8 May 2023***		***Petrol Price (ppl), 52 weeks up to w/c 8 May 2023***	
				Average[2]	*Cardinality[3]*	*Average[2]*	*Cardinality[3]*
National Average Price				170.51	12	159.62	10
[✂]	[✂]	Company	0	171.11	12	157.06	10
[✂]	[✂]	Dealer	0	170.36	12	158.07	11
[✂]	[✂]	Dealer	5	173.67	9	167.51	9
[✂]	[✂]	Dealer	13	173.9	11	163.61	7
[✂]	[✂]	Dealer	13	170.63	11	159.23	9
[✂]	[✂]	Supermarket	13	169.48	12	158.63	11
[✂]	[✂]	Dealer	13	176.04	7	164.9	9
[✂]	[✂]	Other	13	169.9	11	156.54	11
[✂]	[✂]	Dealer	13	170.94	11	160.13	9
[✂]	[✂]	Dealer	14	172.32	12	160.67	11
[✂]	[✂]	Dealer	14	171.02	12	160.95	11
[✂]	[✂]	Company	14	171.65	12	160.49	11
[✂]	[✂]	Dealer	16	171.44	12	151.15	8
[✂]	[✂]	Dealer	17	176.86	12	165.57	9

[✂]	[✂]	Dealer	17	168.57	12	160.15	10
[✂]	[✂]	Company	17	172.63	11	160.65	10
[✂]	[✂]	Dealer	18	175.63	12	158.18	9
[✂]	[✂]	Dealer	18	NA	NA	NA	NA
[✂]	[✂]	Dealer	18	NA	NA	NA	NA
[✂]	[✂]	Supermarket	18	167.24	12	155.84	11
[✂]	[✂]	Dealer	19	173.9	12	161.62	11
[✂]	[✂]	Dealer	19	172.57	9	163.07	9
[✂]	[✂]	Supermarket	20	168.9	12	157.26	11
[✂]	[✂]	Dealer	20	168.5	10	NA	NA
[✂]	[✂]	Dealer	20	170.23	12	158.49	11
[✂]	[✂]	Dealer	20	173.73	12	163.65	8

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

142. Table 47 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 47: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

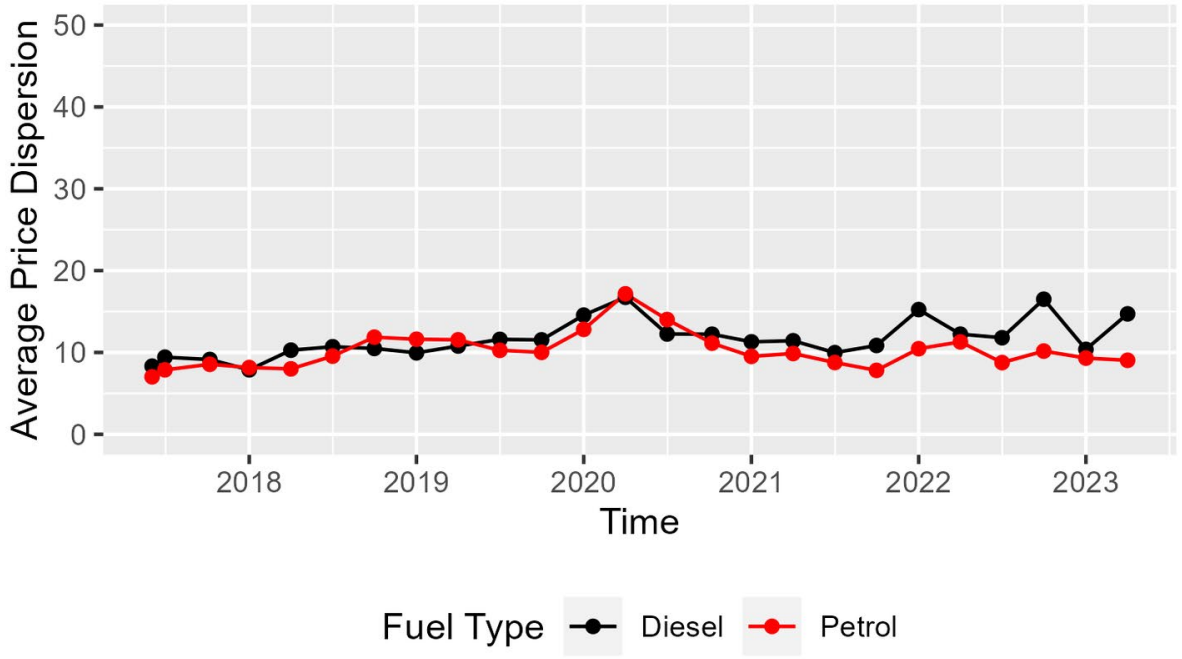
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	2,002	10,262	134,893
Number of competing sites[1]	2	2	25
Number of supermarket sites	0	0	4
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	-0.66	-0.66	3.12
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	-0.77	-0.77	2.24

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

143. Figure 74 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 7 ppl to 17 ppl for both diesel and petrol, with a peak for both products in early 2020. Price dispersion for diesel increased slightly from 2022 onwards.

Figure 74: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Sheffield

144. Sheffield is a local authority (metropolitan district) located in the Yorkshire and the Humber with an area of 368 sq km and an estimated population of 554,401.[67] There are 48 petrol filling stations (PFSs) in the local authority. 14 out of these 48 PFSs (29.2%) are owned and operated by supermarkets.

145. Table 48 below shows the average price of diesel and petrol in Sheffield for 52 weeks up to w/c 8 May 2023. Based on the data available, petrol was marginally less expensive (<0.5ppl) in the local authority, however, diesel was marginally more expensive (<0.2ppl) in the local authority compared to the national average.

Table 48: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Sheffield (ppl)*	*Price gap (ppl)*
Diesel	179.1	179.3	0.2
Petrol	162.4	162.1	-0.4

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

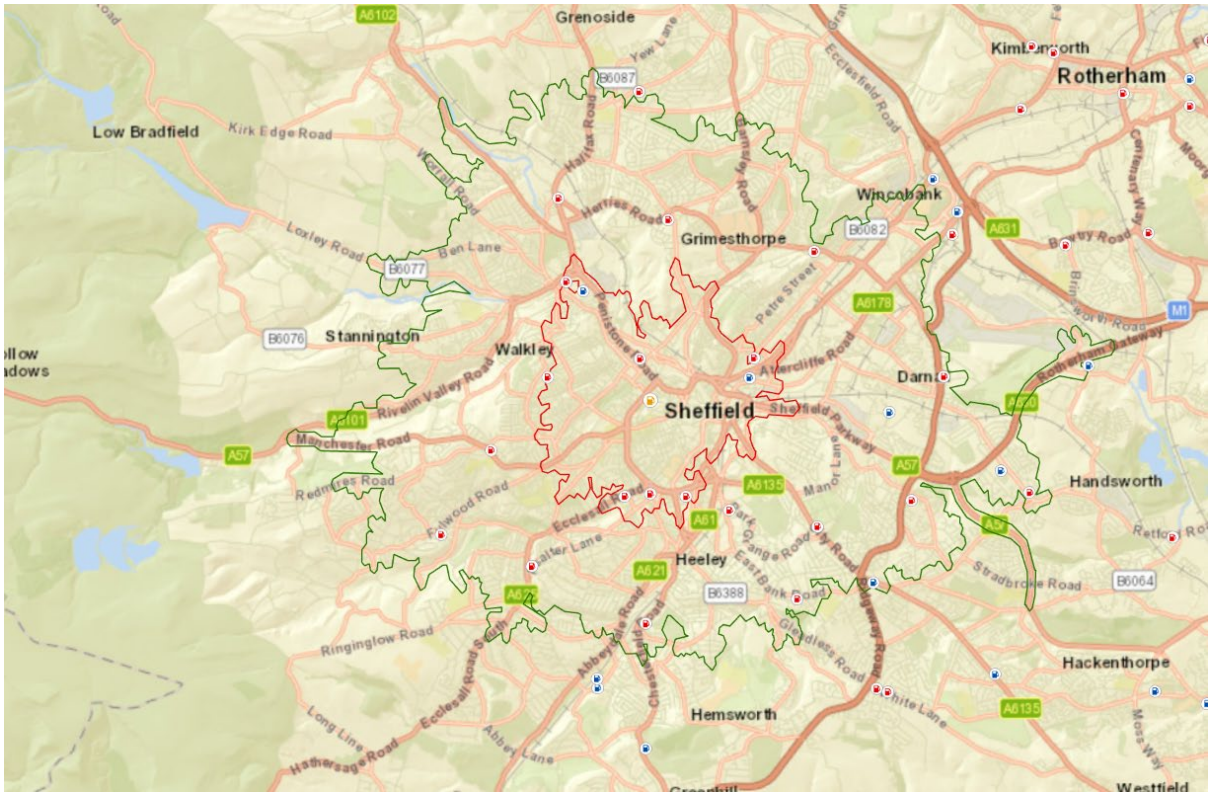
Centroid site in Sheffield

146. The centroid site is a dealer PFS. At 183.27ppl, the site had a higher price for diesel than the national average in the 52 weeks up to w/c 8 May 2023.[68] The closest competitor is a dealer PFS within around 3-minute driving distance.

147. In a 5-minute drive from the centroid, there are 7 competing PFSs, of which 1 is a supermarket. Within a 10-minute drive from the centroid, there are 26 competing PFSs, of which 5 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 76 competing PFSs, of which 15 are supermarkets. This is illustrated on the map in Figure 75.

[67] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[68] The centroid was selected because it was the most expensive site in H1 2022.

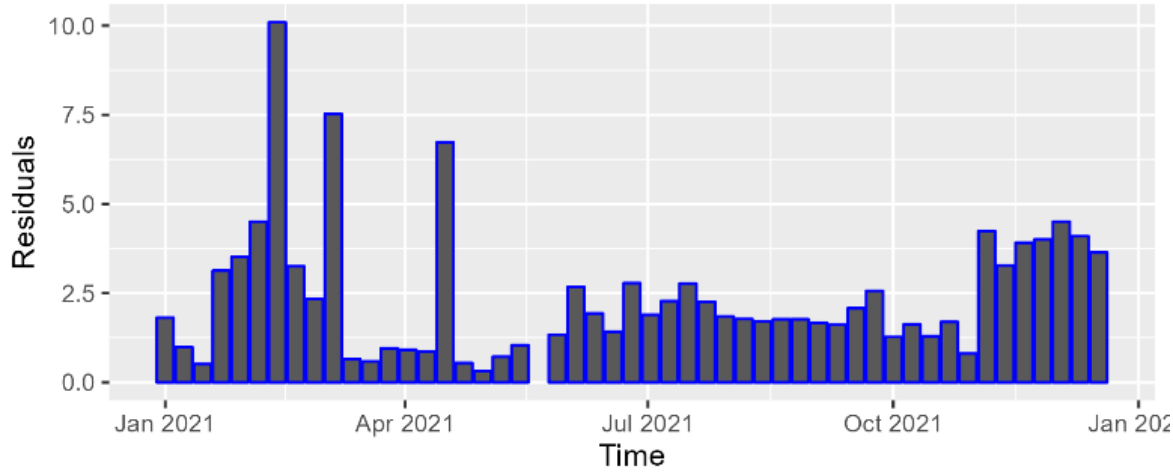
Figure 75: Map of PFSs within 10-minute drive time of centroid site



Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

148. Figure 76 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[69] It can be observed that the PCA model consistently under-predicted the centroid PFS's diesel price.

Figure 76. Residuals from cross-sectional PCA for centroid site, January – December 2021

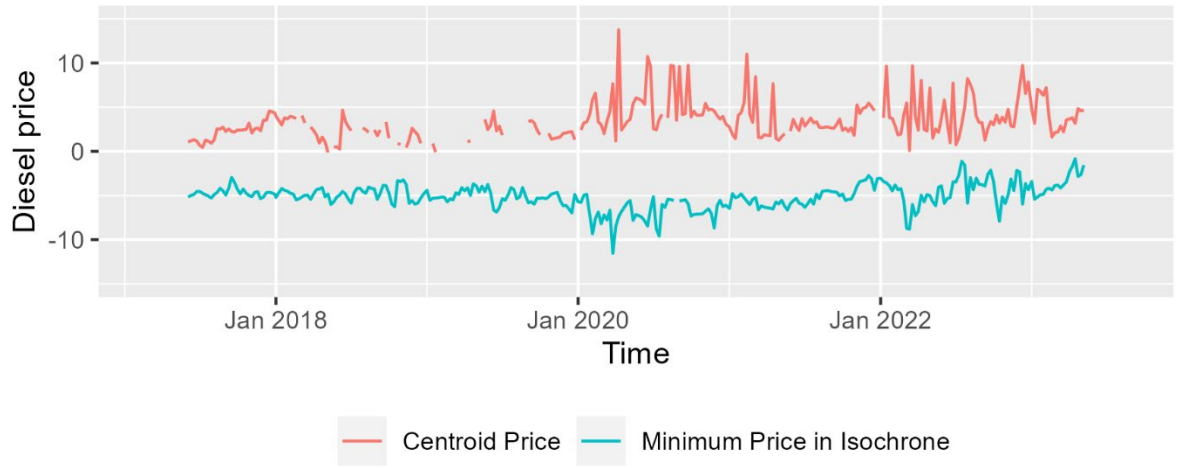


Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

[69] Only 2021 is shown as it is the only year used in the PCA regression model.

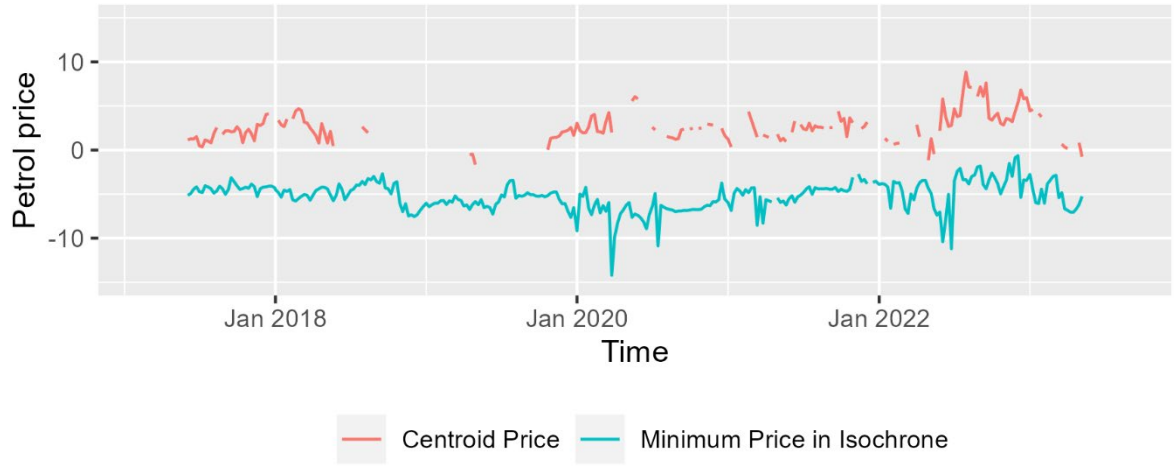
149. Figure 77 and Figure 78 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 10-minute drive time from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[70] Based on the data that we have available, the centroid prices for both petrol and diesel have generally been higher than the national average, while the minimum price in the 10-minute isochrone was always lower.

Figure 77: Centroid and minimum diesel price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Figure 78: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[70] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Competitors

150. Table 49 below shows the PFSs in a 10-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a supermarket, located with a 10-minute drive time from the centroid.

Table 49: PFSs within 10-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.11	52	164.79	42
[✂]	[✂]	Dealer	0	183.27	52	168.76	42
[✂]	[✂]	Dealer	3	185.6	5	176.57	3
[✂]	[✂]	Dealer	4	184.57	51	168.48	33
[✂]	[✂]	Supermarket	5	178.16	52	163.17	42
[✂]	[✂]	Dealer	5	181.11	49	165.42	37
[✂]	[✂]	Dealer	5	180.54	35	162.7	28
[✂]	[✂]	Company	5	180.75	46	166.6	30
[✂]	[✂]	Company	5	184.72	52	168.46	41
[✂]	[✂]	Supermarket	6	178.63	52	163.88	42
[✂]	[✂]	Dealer	6	179	51	163.89	35
[✂]	[✂]	Dealer	6	182.06	51	168.58	32
[✂]	[✂]	Dealer	6	NA	NA	NA	NA
[✂]	[✂]	Other	7	NA	NA	NA	NA
[✂]	[✂]	Dealer	7	185.9	3	NA	NA
[✂]	[✂]	Dealer	7	180.73	51	164.96	36
[✂]	[✂]	Dealer	8	180.94	39	167.02	28
[✂]	[✂]	Company	8	176.68	48	164.03	29
[✂]	[✂]	Dealer	8	183.02	51	167.29	41
[✂]	[✂]	Dealer	8	184.81	52	167.22	27
[✂]	[✂]	Supermarket	9	176.54	52	162.36	42
[✂]	[✂]	Dealer	9	176.36	13	NA	NA
[✂]	[✂]	Company	9	177.99	52	163.15	41
[✂]	[✂]	Dealer	9	177.5	22	NA	NA
[✂]	[✂]	Dealer	9	183.33	52	168.33	31
[✂]	[✂]	Dealer	10	181.73	50	166	42
[✂]	[✂]	Supermarket	10	176.27	52	161.83	34
[✂]	[✂]	Supermarket	10	177.32	52	163.12	42

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).

[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

151. Table 50 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5- , 10- and 20-minutes of the centroid PFS.

Table 50: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

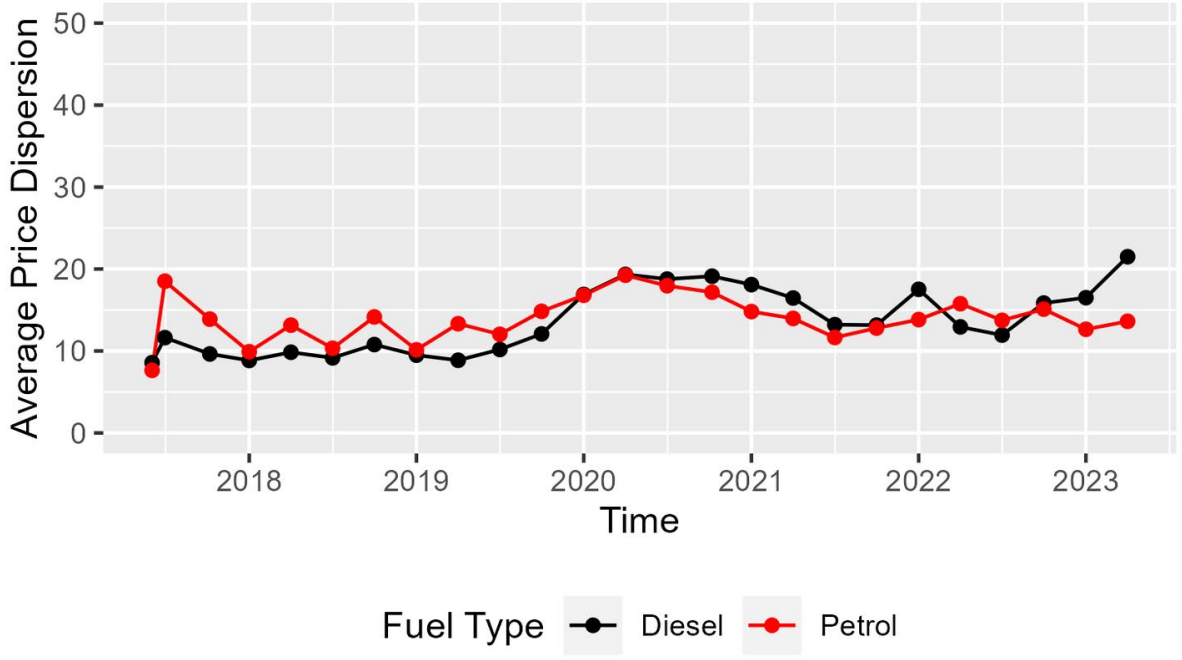
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	83,931	317,176	707,456
Number of competing sites[1]	7	26	76
Number of supermarket sites	1	6	17
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	5.11	7.02	9.56
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	5.59	6.41	8.69

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

152. Figure 79 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion varied from around 8 ppl to 20 ppl for diesel and petrol. The graph also shows an upward trend over the period.

Figure 79: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:

1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Sunderland

153. Sunderland is a local authority (metropolitan district) located in the Yorkshire and the Humber with an area of 137 sq km and an estimated population of 274,211.[71] There are 24 petrol filling stations (PFSs) in the local authority. Seven out of these 24 PFSs (29.2%) are owned and operated by supermarkets.

154. Table 51 below shows the average price of diesel and petrol in Sunderland for 52 weeks up to w/c 8 May 2023 in ppl. Based on the data available, both petrol and diesel were around 2ppl less expensive in the local authority compared to the national average.

Table 51: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Sunderland (ppl)*	*Price gap (ppl)*
Diesel	179.1	177.0	-2.1
Petrol	162.4	160.2	-2.2

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

Centroid site in Sunderland

155. The centroid site is a dealer PFS. At 179.75ppl, the site's price for diesel was only slightly higher than the national average in the 52 weeks up to w/c 8 May 2023.[72] The closest competitor is a dealer PFS within around 0-minute driving distance.

156. Within a 5-minute drive from the centroid, there are 5 competing PFSs, of which none are supermarkets. Within a 10-minute drive from the centroid, there are 18 competing PFSs, of which 5 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 77 competing PFSs, of which 12 are supermarkets. This is illustrated on the map in Figure 80.

[71] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[72] The centroid was selected because it was the most expensive site in H1 2022.

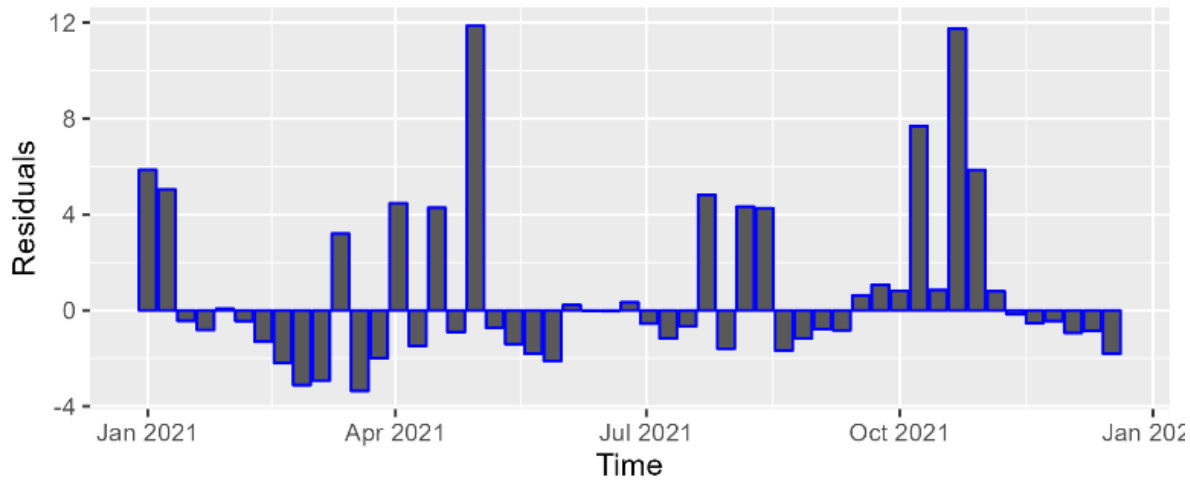
Figure 80: Map of PFSs within 10-minute drive time of centroid site

Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

157. Figure 81 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[73] It can be observed that the PCA model did not consistently under- or over-predict the centroid PFS's diesel price. However, the under-predictions tended to be more significant than over-predictions (i.e., the positive residuals are larger in magnitude).

[73] Only 2021 is shown as it is the only year used in the PCA regression model.

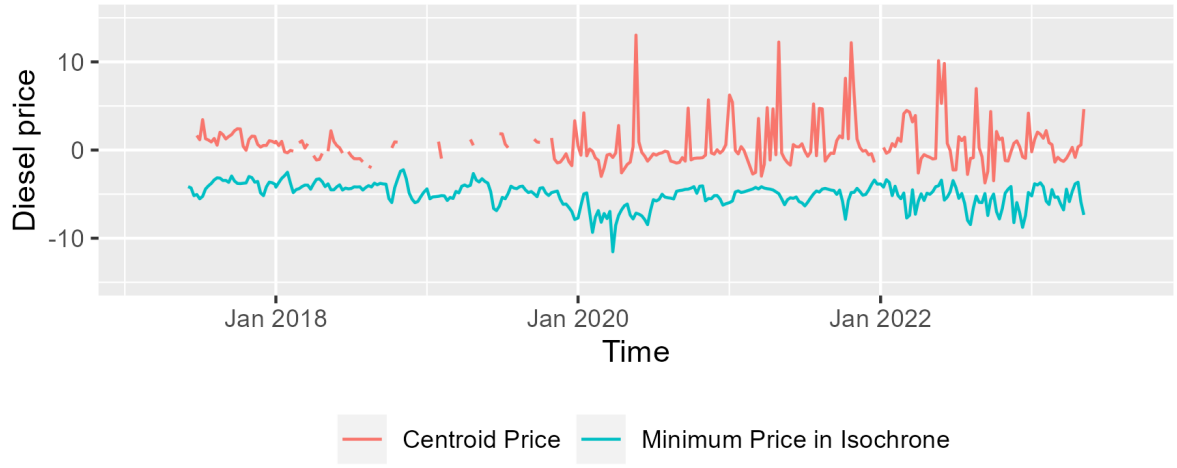
Figure 81. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

158. Figure 82 and Figure 83 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 10-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[74] Based on the data that we have available, the centroid's diesel price was generally higher than the national average price, with peaks seen in 2020 to mid-2022. The minimum price in the 10-minute isochrone was lower than the national average price. Petrol data was quite irregular to make any conclusion until 2022, after which the centroid price fluctuated around the national average.

Figure 82: Centroid and minimum diesel price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[74] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 83: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

159. Table 52 below shows the PFSs in a 10-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for diesel (highlighted grey) was a dealer, located in a 9-minute drive time from the centroid. The cheapest competitor for petrol (highlighted green) was a dealer with a drive time of 5 minutes.

Table 52: PFSs within 10-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.11	52	161.03	41
[✂]	[✂]	Dealer	0	179.75	52	160.44	41
[✂]	[✂]	Dealer	0	178.49	46	159.72	34
[✂]	[✂]	Dealer	4	176.13	43	163.18	13
[✂]	[✂]	Dealer	4	178.57	52	159.72	32
[✂]	[✂]	Dealer	5	177.88	41	160	32
[✂]	[✂]	Dealer	5	177.33	50	154.17	30
[✂]	[✂]	Supermarket	6	176.17	51	157.16	39
[✂]	[✂]	Company	6	177.05	52	158.04	38
[✂]	[✂]	Supermarket	6	176.86	51	157.46	38
[✂]	[✂]	Dealer	7	178.42	51	160.17	41
[✂]	[✂]	Dealer	7	176.9	52	159.73	31
[✂]	[✂]	Supermarket	8	175.91	52	157.97	41
[✂]	[✂]	Dealer	8	NA	NA	NA	NA
[✂]	[✂]	Supermarket	8	175.44	52	156.92	32
[✂]	[✂]	Dealer	9	174.61	48	159.63	13

[✂]	[✂]	Dealer	10	176.52	48	157.11	34
[✂]	[✂]	Supermarket	10	175.59	52	157.88	41
[✂]	[✂]	Company	10	176.36	51	155	28
[✂]	[✂]	Dealer	10	179.05	50	162.27	23

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

160. Table 53 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 53: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

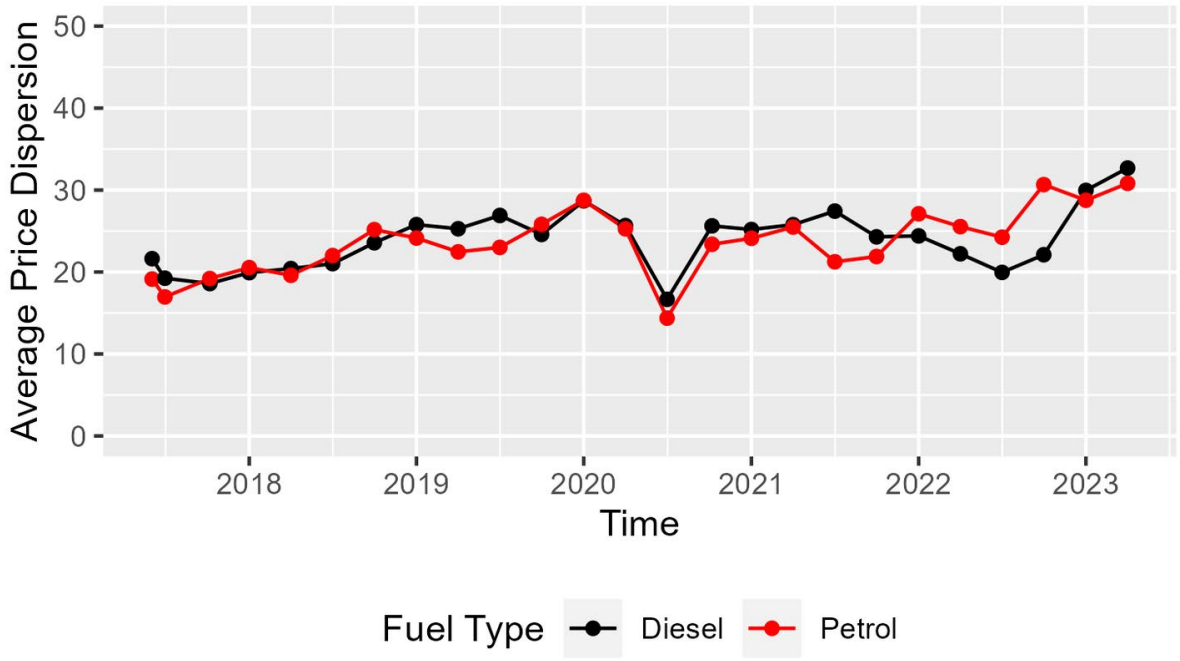
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	54,139	193,066	753,212
Number of competing sites[1]	5	18	77
Number of supermarket sites	0	5	13
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	4.43	5.56	6.12
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	3.49	4.08	4.43

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

161. Figure 84 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks to 8 May 2023. It can be observed that the average price dispersion varied from around 15 ppl to 30 ppl for both diesel and petrol. The graph also shows an upward trend over the period, with a temporary drop in mid-2020.

Figure 84: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Swansea

162. Swansea is a local authority (unitary authority) located in Wales with an area of 378 sq km and an estimated population of 237,834.[75] There are 31 petrol filling stations (PFSs) in the local authority. Seven out of these 31 PFSs (22.6%) are owned and operated by supermarkets.

163. Table 54 below shows the average price of diesel and petrol in Swansea for 52 weeks up to w/c 8 May 2023. Based on the data available, diesel was around 2ppl less expensive in the local authority, and petrol was around 3ppl less expensive compared to the national average.

Table 54: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Swansea (ppl)*	*Price gap (ppl)*
Diesel	179.1	177.6	-1.6
Petrol	162.4	159.9	-2.6

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

Centroid site in Swansea

164. The centroid site is an unbranded dealer PFS. At 180.16ppl, the site had a higher average price for diesel than the national average.[76] The closest competitor is an unbranded dealer PFS within around 7-minute driving distance.

165. Within a 5-minute drive from the centroid, there are no competing PFSs. Within a 10-minute drive from the centroid, there are 2 competing PFSs, of which none are supermarkets. Finally, within a 20-minute drive from the centroid, there are 5 competing PFSs, of which none are supermarkets. This is illustrated on the map in Figure 85.

[75] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[76] The centroid was selected because it was the most expensive site in H1 2022.

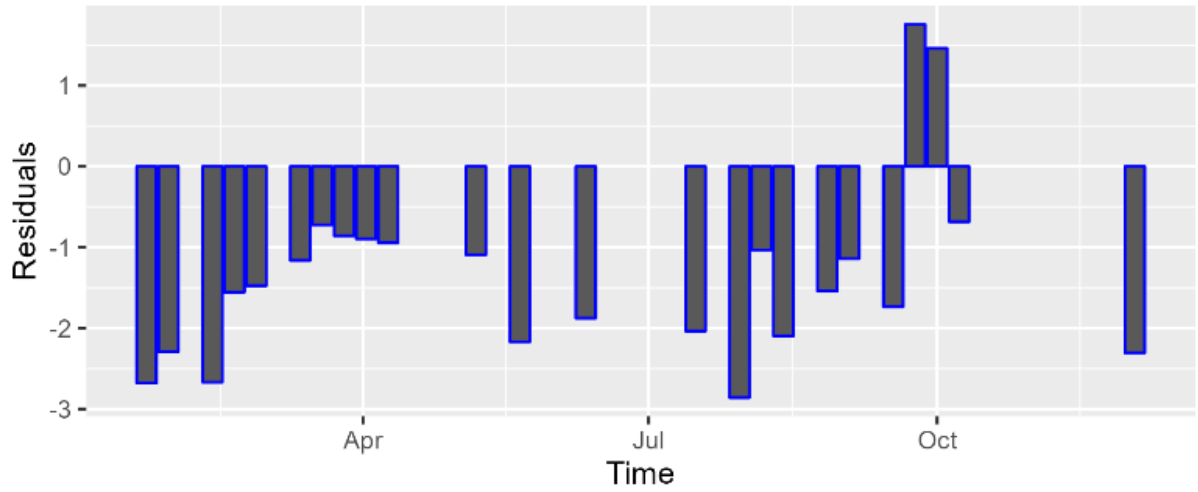
Figure 85: Map of PFSs within 20-minute drive time of centroid site

Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone.

166. Figure 86 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[77] It can be observed that, with the exception of October 2021, the PCA model over-predicted the centroid PFS's diesel price.

[77] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 86. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

167. Figure 87 and Figure 88 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[78]

Figure 87: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[78] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 88: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

168. Table 55 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a dealer, located in a 19-minute drive time from the centroid.

Table 55: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.95	28	176.42	4
[✂]	[✂]	Dealer	0	180.16	28	177.85	4
[✂]	[✂]	Dealer	7	NA	NA	NA	NA
[✂]	[✂]	Dealer	9	181.98	13	NA	NA
[✂]	[✂]	Dealer	16	NA	NA	NA	NA
[✂]	[✂]	Dealer	19	179.98	13	NA	NA
[✂]	[✂]	Dealer	19	177.65	20	176.9	3

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

169. Table 56 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 56: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

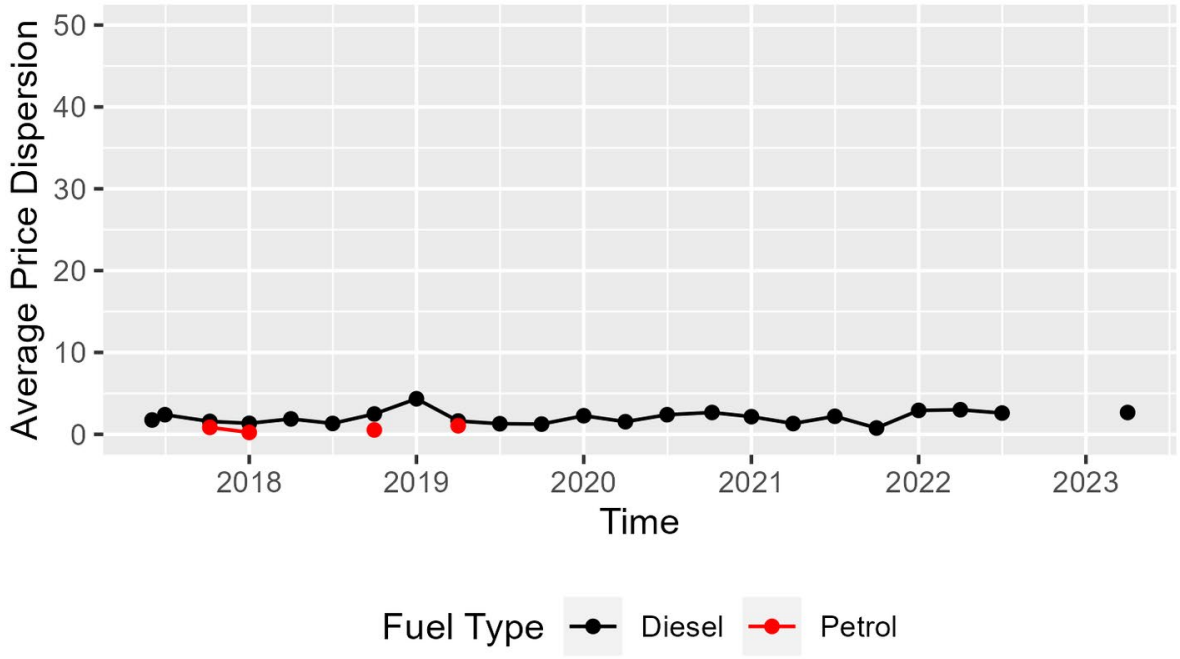
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	237	953	15,097
Number of competing sites[1]	0	2	5
Number of supermarket sites	0	0	0
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	-0.24	1.32
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	N/A	N/A

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

170. Figure 89 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. It can be observed that the average price dispersion was steady at below 5ppl for diesel. Petrol data is insufficient to provide a conclusion.

Figure 89: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Trafford

171. Trafford is a local authority (metropolitan district) located in the North West with an area of 106 sq km and an estimated population of 235,546.[79] There are 25 petrol filling stations (PFSs) in the local authority. Six out of these 25 PFSs (24.0%) are owned and operated by supermarkets.

172. Table 57 below shows the average price of diesel and petrol in Trafford for 52 weeks up to w/c 8 May 2023. Based on the data available, petrol was marginally more expensive (0.1ppl) in the local authority compared to the national average; diesel was only marginally less expensive (0.1ppl).

Table 57: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Trafford (ppl)*	*Price gap (ppl)*
Diesel	179.1	179.1	-0.1
Petrol	162.4	162.5	0.1

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

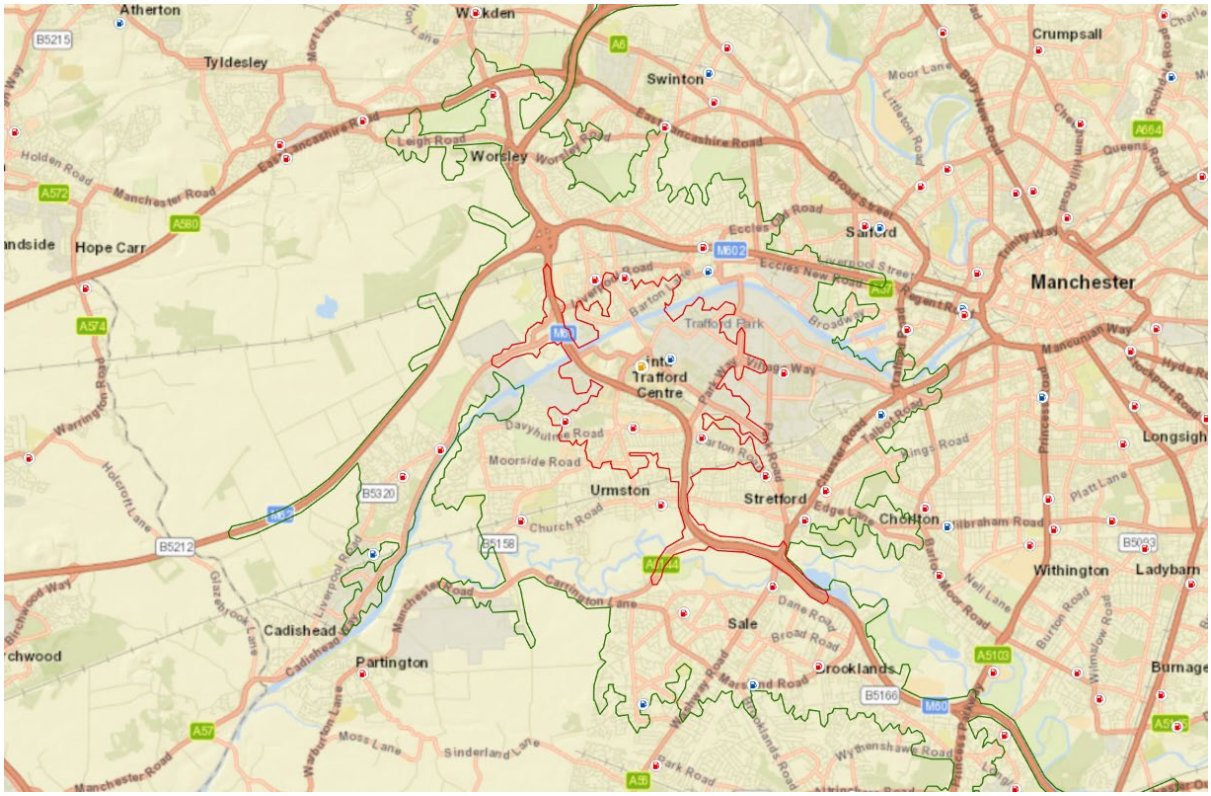
Centroid site in Trafford

173. The centroid site is a dealer PFS. At 183.03ppl, the site had the highest average price of diesel in the local authority in the 52 weeks up to w/c 8 May 2023.[80] The closest competitor is another dealer PFS, as well as a supermarket, an 'other' PFS and two other dealers PFSs within around 4-minute driving distance.

174. Within a 5-minute drive from the centroid, there are 7 competing PFSs, of which 1 is a supermarket. Within a 10-minute drive from the centroid, there are 26 competing PFSs, of which 6 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 164 competing PFSs, of which 35 are supermarkets. This is illustrated in the map in Figure 90.

[79] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[80] The centroid was selected because it was the most expensive site in H1 2022.

Figure 90: Map of PFSs within 10-minute drive time of centroid site

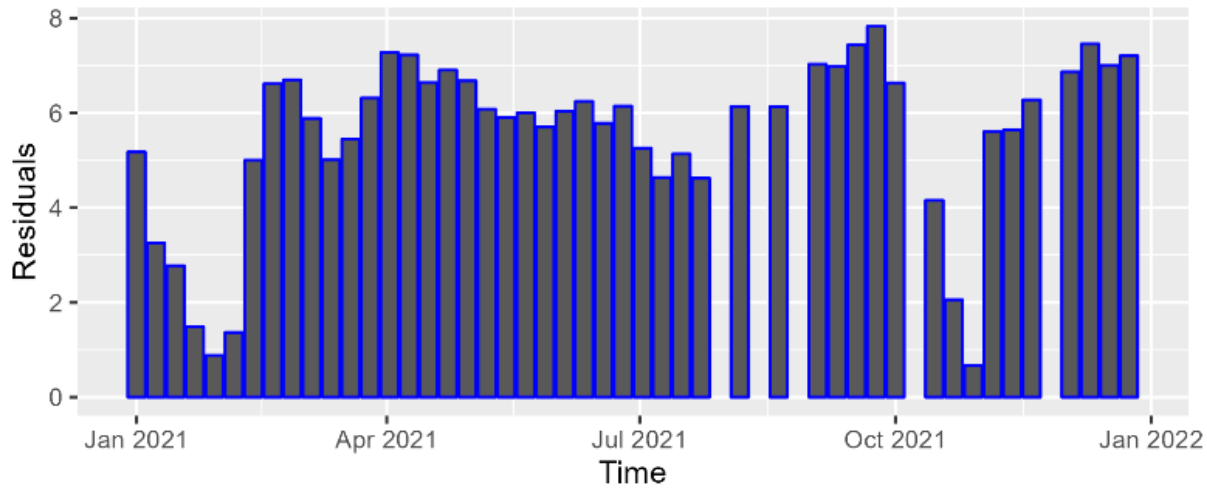


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

175. Figure 91 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[81] It can be observed that the PCA model generally significantly over-predicted the centroid PFS's diesel price.

[81] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 91. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

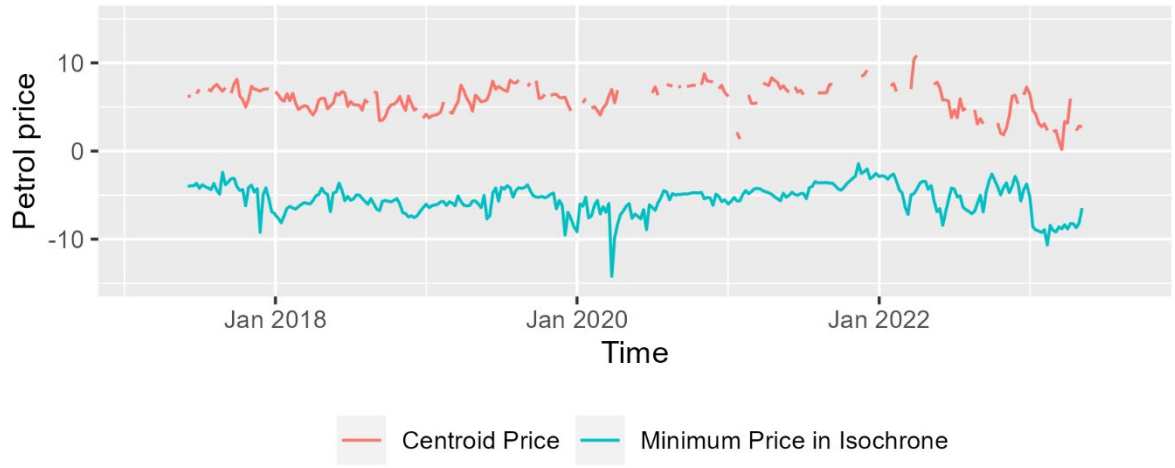
176. Figure 92 and Figure 93 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 10-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[82] Based on the data that we have available, the centroid prices for both petrol and diesel have been consistently higher than the national average, while the minimum price in the 10-minute isochrone was always lower.

Figure 92: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[82] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 93: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

177. Table 58 below shows the PFSs in a 10-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for both diesel and petrol (highlighted blue) was a supermarket, located 4-minute drive time from the centroid.

Table 58: PFSs within 10-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.47	46	162.61	44
[✂]	[✂]	Dealer	0	183.03	46	166.78	44
[✂]	[✂]	Dealer	4	178.86	45	163.34	34
[✂]	[✂]	Supermarket	4	173.88	46	157.34	44
[✂]	[✂]	Other	4	NA	NA	NA	NA
[✂]	[✂]	Dealer	4	178.93	45	161.09	42
[✂]	[✂]	Dealer	4	178.71	40	161.77	31
[✂]	[✂]	Dealer	5	180.88	46	163.79	40
[✂]	[✂]	Company	5	180.13	46	163.03	44
[✂]	[✂]	Company	6	176.19	45	159.96	43
[✂]	[✂]	Dealer	6	179.96	45	162.6	44
[✂]	[✂]	Company	6	179.16	45	162.05	36
[✂]	[✂]	Supermarket	6	174.16	46	157.4	43
[✂]	[✂]	Dealer	7	178.6	40	163.82	31
[✂]	[✂]	Dealer	7	180.13	39	164.19	27
[✂]	[✂]	Dealer	7	177.66	46	159.43	44
[✂]	[✂]	Dealer	8	175.94	45	157.87	35

[✂]	[✂]	Dealer	8	178.58	46	161.78	43
[✂]	[✂]	Dealer	8	177.84	45	159.16	30
[✂]	[✂]	Dealer	9	NA	NA	NA	NA
[✂]	[✂]	Dealer	9	182.84	45	165.11	44
[✂]	[✂]	Dealer	9	181.57	32	161.28	41
[✂]	[✂]	Dealer	9	NA	NA	NA	NA
[✂]	[✂]	Supermarket	9	174.76	46	158.16	44
[✂]	[✂]	Supermarket	10	175.3	46	159.36	44
[✂]	[✂]	Supermarket	10	174.13	46	157.78	44
[✂]	[✂]	Supermarket	10	176.27	46	160.45	42
[✂]	[✂]	Company	10	179.98	46	162.3	42

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

178. Table 59 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 59: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

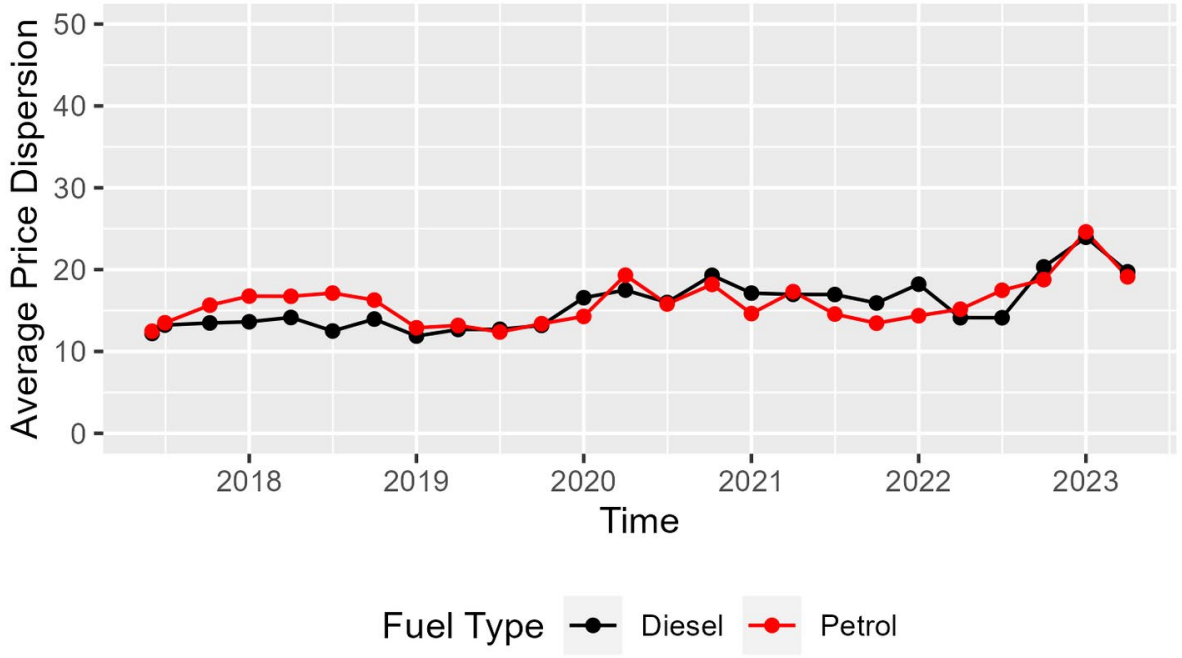
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	23,424	195,755	1,516,661
Number of competing sites[1]	7	26	164
Number of supermarket sites	1	6	35
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	9.16	9.16	12.16
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	9.43	9.43	12.68

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

179. Figure 94 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks to 8 May 2023. It can be observed that the average price dispersion varied from 10 ppl to around 25 ppl for both diesel and petrol. The graph also shows a slight upward trend over the period.

Figure 94: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Wakefield

180. Wakefield is a local authority (metropolitan district) located in the Yorkshire and the Humber with an area of 339 sq km and an estimated population of 353,802.[83] There are 51 petrol filling stations (PFSs) in the local authority. Six out of these 51 PFSs (11.8%) are owned and operated by supermarkets.

181. Table 60 below shows the average price of diesel and petrol in Wakefield for 52 weeks up to w/c 8 May 2023. Based on the data available, petrol was marginally more expensive (0.2ppl) in the local authority, and diesel was 1ppl more expensive in the local authority compared to the national average.

Table 60: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*Wakefield (ppl)*	*Price gap (ppl)*
Diesel	179.1	180.1	1.0
Petrol	162.4	162.6	0.2

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

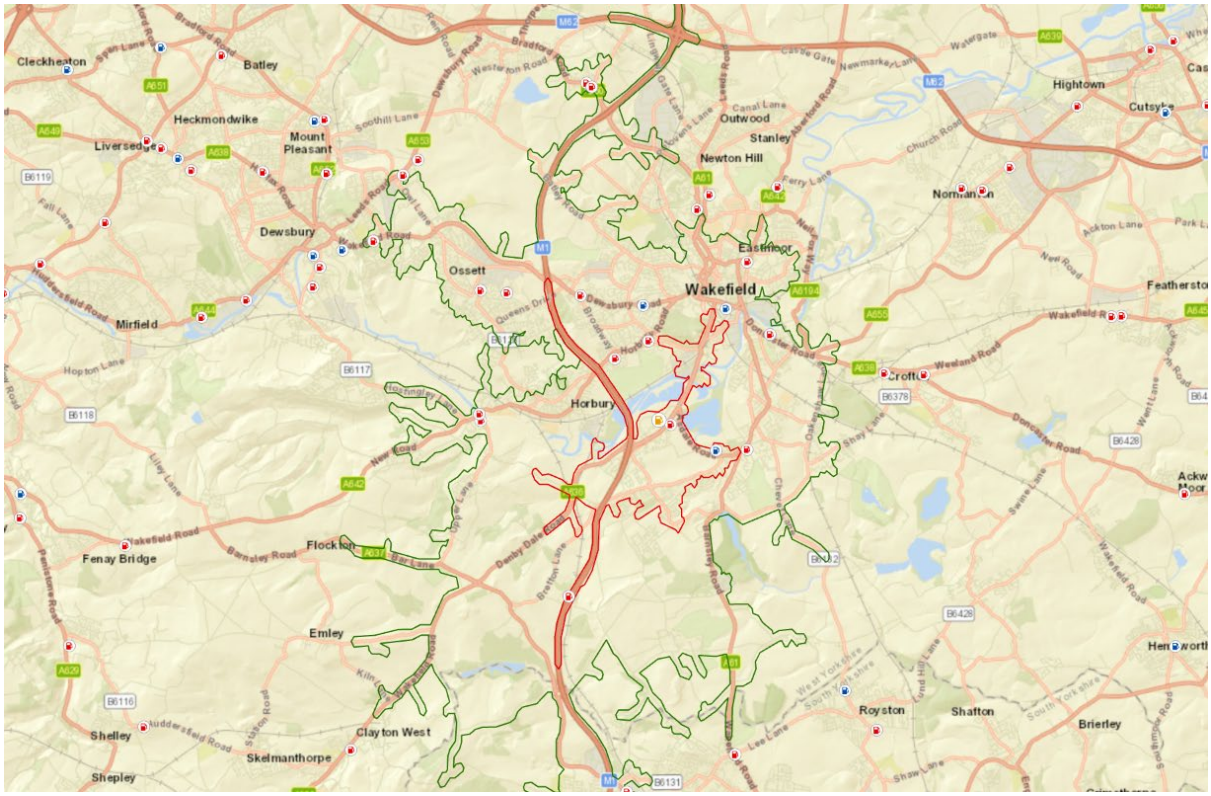
Centroid site in Wakefield

182. The centroid site is a dealer. At 181.27ppl, the site had a higher average price for diesel than the national average in the 52 weeks up to w/c 8 May 2023.[84] The closest competitor is a dealer PFS within around 3-minute driving distance.

183. In a 5-minute drive from the centroid, there are 2 competing PFSs, of which 1 is supermarket. Within a 10-minute drive from the centroid, there are 22 competing PFSs, of which 3 are supermarkets. Finally, within a 20-minute drive from the centroid, there are 103 competing PFSs, of which 19 are supermarkets. This is illustrated on the map in Figure 95.

[83] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[84] The centroid was selected because it was the most expensive site in H1 2022.

Figure 95: Map of PFSs within 10-minute drive time of centroid site

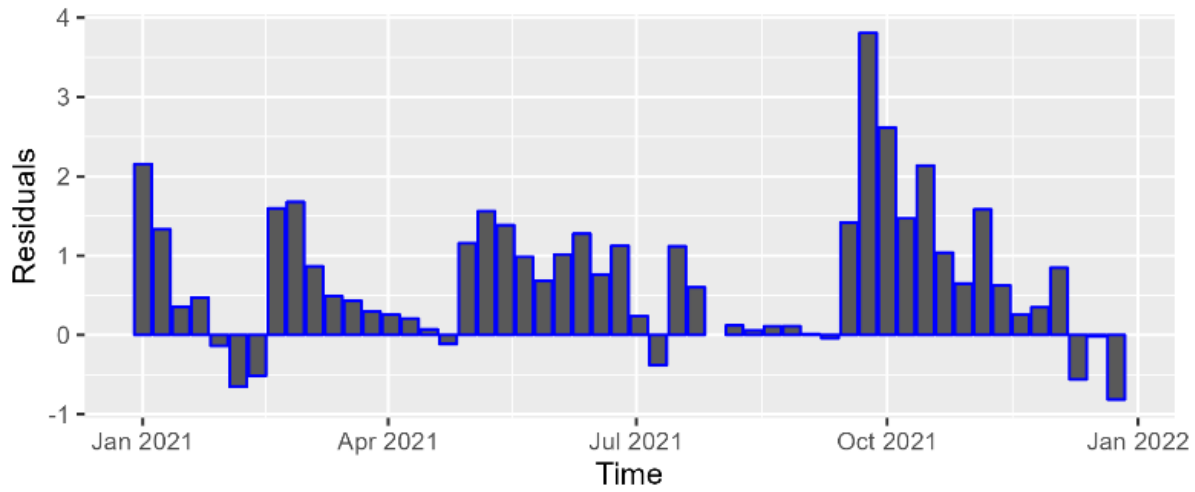


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

184. Figure 96 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[85] It can be observed that the PCA model mostly under-predicted the centroid PFS's diesel price with a significantly worse fit (i.e., larger residuals) around October 2021.

[85] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 96. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

185. Figure 97 and Figure 98 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 10-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[86] Based on the data that we have available, the centroid prices for both petrol and diesel have usually been slightly higher than the national average. Prices dropped slightly below the national average during 2022 before rising again to above the national average towards the end of 2022. The minimum price in the 10-minute isochrone has always been lower than the national average.

Figure 97: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[86] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 98: Centroid and minimum petrol price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

186. Table 61 below shows the PFSs in a 10-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for diesel (highlighted grey) was a supermarket, located 7 minutes away from the centroid, and the cheapest competitor for petrol (highlighted green) was a supermarket located 4 minutes away.

Table 61: PFSs within 10-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.20	51	161.90	47
[✂]	[✂]	Dealer	0	181.27	51	163	47
[✂]	[✂]	Dealer	3	176.52	51	157.47	46
[✂]	[✂]	Supermarket	4	174.73	51	156.75	47
[✂]	[✂]	Dealer	6	177.14	27	159.62	37
[✂]	[✂]	Dealer	6	177.16	38	161.53	38
[✂]	[✂]	Supermarket	7	174.72	51	157.17	47
[✂]	[✂]	Company	7	180.13	51	161.55	47
[✂]	[✂]	Dealer	7	179.71	51	161.56	47
[✂]	[✂]	Dealer	7	NA	NA	NA	NA
[✂]	[✂]	Dealer	7	197.91	50	183.76	46
[✂]	[✂]	Dealer	7	196.71	47	182.56	36
[✂]	[✂]	Other	7	178.15	51	160.58	42
[✂]	[✂]	Supermarket	8	175.29	51	157.55	47
[✂]	[✂]	Dealer	8	184.23	29	168.65	16

[✂]	[✂]	Dealer	9	177.43	49	159.86	43
[✂]	[✂]	Dealer	9	181.09	35	163.83	15
[✂]	[✂]	Company	9	177.7	51	159.9	47
[✂]	[✂]	Dealer	9	179.1	23	NA	NA
[✂]	[✂]	Dealer	9	179.11	50	160.38	43
[✂]	[✂]	Dealer	9	178.91	48	160.56	43
[✂]	[✂]	Dealer	9	181.64	51	167.62	47
[✂]	[✂]	Company	10	177.72	51	159.13	46
[✂]	[✂]	Dealer	10	179.46	51	162.01	47

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

187. Table 62 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5-, 10- and 20-minutes of the centroid PFS.

Table 62: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

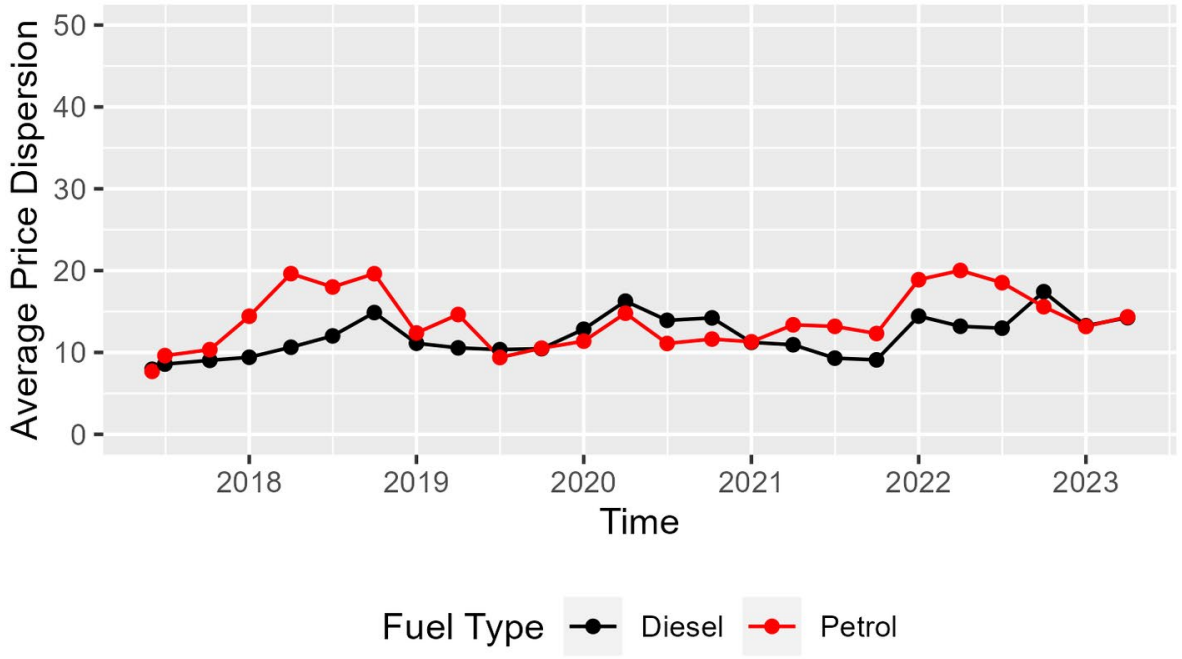
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	10,415	112,225	771,282
Number of competing sites[1]	2	22	103
Number of supermarket sites	1	3	21
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	6.54	6.55	6.55
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	6.25	6.25	9.00

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

188. Figure 99 shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone in the 52 weeks up to 8 May 2023. The price dispersion for petrol was generally higher than that of diesel and had short-term peaks in 2018 and 2022.

Figure 99: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

West Devon

189. West Devon is a local authority (non-metropolitan district) located in the South West with an area of 1,086 sq km and an estimated population of 99,435.[87] There are 13 petrol filling stations (PFSs) in the local authority. One out of these 13 PFSs (7.7%) are owned and operated by supermarkets.

190. Table 63 below shows the average price of diesel and petrol in West Devon for 52 weeks up to w/c 8 May 2023. Based on the data available, both petrol and diesel were just under 1ppl more expensive in the local authority compared to the national average.

Table 63: Average retail price by fuel type, 52 weeks up to w/c 8 May 2023

Fuel	*National (ppl)*	*West Devon (ppl)*	*Price gap (ppl)*
Diesel	179.1	179.8	0.7
Petrol	162.4	162.9	0.5

Source: CMA's compilation from Experian data.
Note: The national average excludes Northern Ireland.

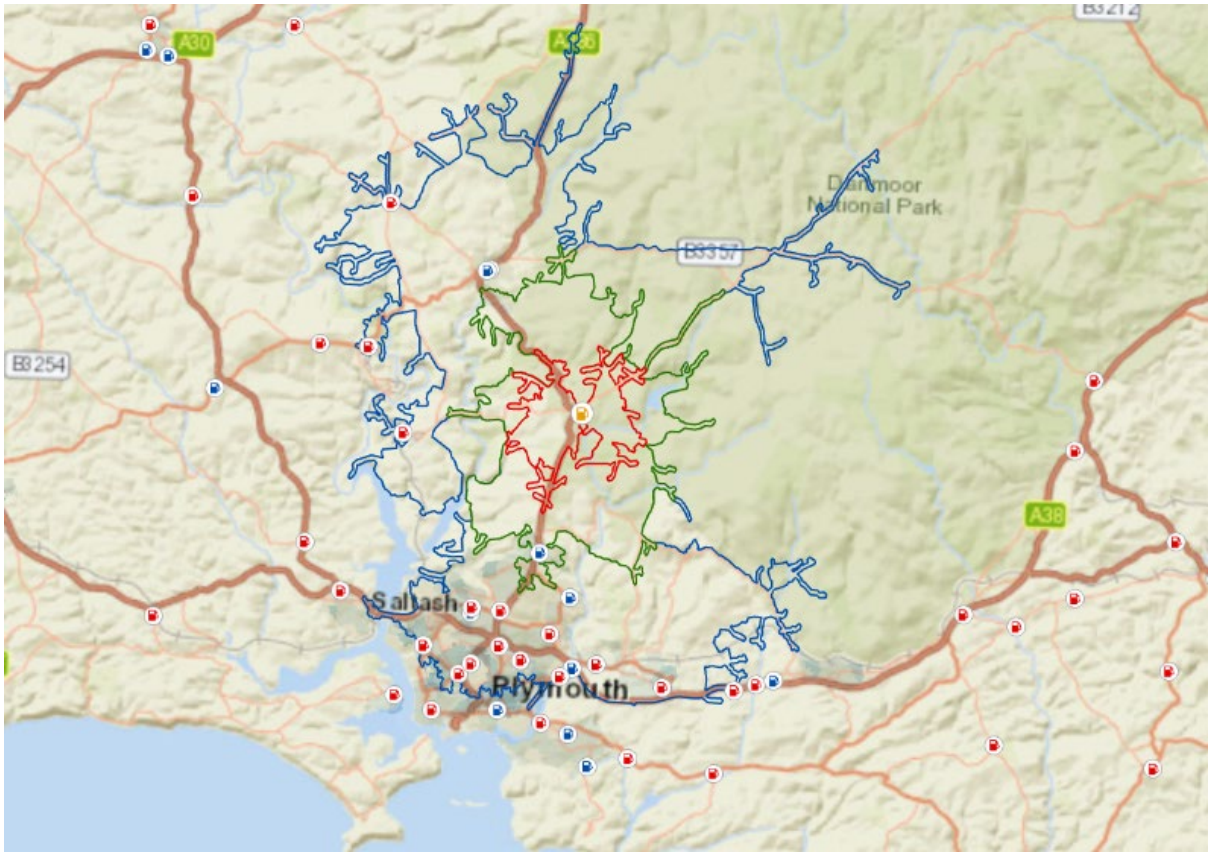
Centroid site in West Devon

191. The centroid site is a dealer. At 179.93ppl, the site was only slightly higher than the national average price of diesel in the 52 weeks up to w/c 8 May 2023.[88] The closest competitor is a supermarket PFS within around 8-minute driving distance.

192. In a 5-minute drive from the centroid, there are no competing PFSs. Within a 10-minute drive from the centroid, there is 1 supermarket PFS. Finally, within a 20-minute drive from the centroid, there are 19 competing PFSs, of which 4 are supermarkets. This is illustrated on the map in Figure 100.

[87] Source: Mid-2021 dataset, tab MYE 5, of Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland - Office for National Statistics.
[88] The centroid was selected because it was the most expensive site in H1 2022.

Figure 100: Map of PFSs within 20-minute drive time of centroid site

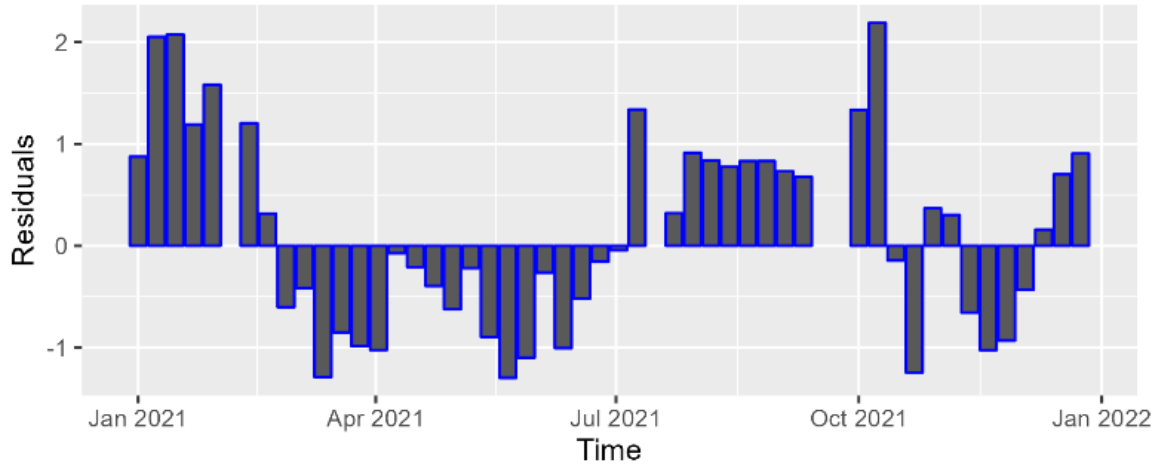


Source: CMA analysis of Experian Data.
Note: A red symbol denotes a non-supermarket PFS; a blue symbol denotes a supermarket PFS. The centroid is denoted in yellow. Blue line indicates the boundary of a 20-minute isochrone, green line denotes the boundary of a 10-minute isochrone and red line denotes the boundary of the 5-minute isochrone.

193. Figure 101 plots the residuals of the CMA's cross-sectional PCA for the centroid site from January to December 2021.[89] It can be observed that the PCA model did not consistently over- or underpredict the centroid PFS's diesel price; in particular, for Q1 and Q3 2021 the model tended to predict lower prices than observed whilst for Q2 and Q4 2021 the model tended to predict higher prices than actually observed.

[89] Only 2021 is shown as it is the only year used in the PCA regression model.

Figure 101. Residuals from cross-sectional PCA for centroid site, January – December 2021



Source: CMA's compilation from Experian Data.
Note: Negative residuals imply over-prediction of diesel prices; positive residuals imply under-prediction.

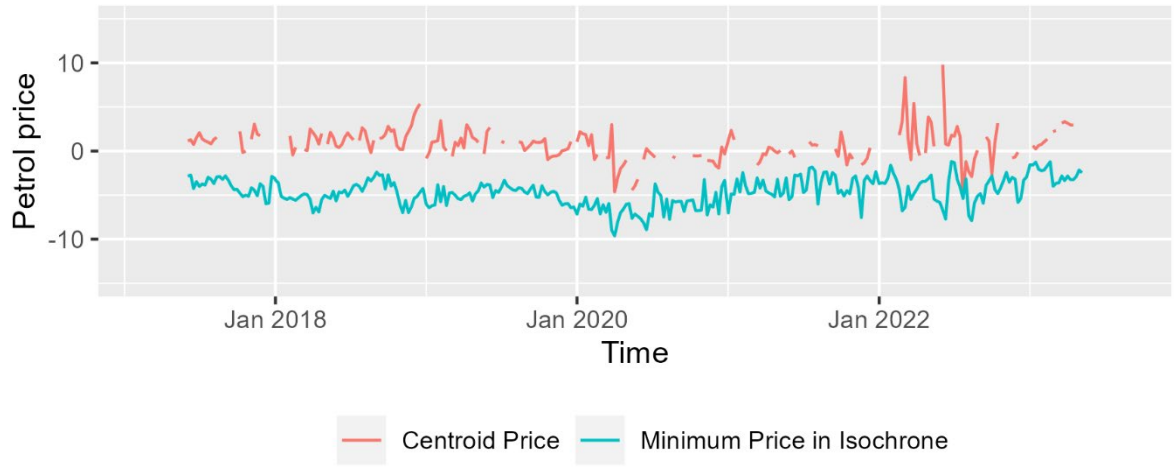
194. Figure 102 and Figure 103 show the diesel and petrol prices, respectively, for the centroid PFS, along with the minimum priced PFS within a 20-minute drive from the centroid. Both the centroid and minimum prices are shown relative to the national average price.[90] Based on the data that we have available, the centroid prices for both petrol and diesel have generally been higher than the national average, while the minimum price in the 20-minute isochrone was always lower. In 2022, we see a sharp rise in the centroid's prices for both petrol and diesel compared to the national average, with prices eventually falling towards the end of 2022 but remaining above the national average in 2023.

Figure 102: Centroid and minimum diesel price (ppl), adjusted for national average

Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

[90] The national average price on each week is subtracted from the diesel prices to enable comparison of the prices relative to the national average.

Figure 103: Centroid and minimum petrol price (ppl), adjusted for national average



Source: CMA analysis of Experian Data.
Note: The minimum price and the national average price are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.

Competitors

195. Table 64 below shows the PFSs in a 20-minute drive time from the centroid (highlighted in orange). Based on 52 weeks up to w/c 8 May 2023 average prices, the cheapest competitor for diesel (highlighted grey) was a company, located in an 8-minute drive time from the centroid and the cheapest competitor for petrol (highlighted green) was a dealer, within a drive time of 16 minutes.

Table 64: PFSs within 20-minute drive time of centroid store

PFS Brand	*Company*	*Business Model*[1]	*Drive Time (Minutes)*	*Diesel Price (ppl), 52 weeks up to w/c 8 May 2023*		*Petrol Price (ppl), 52 weeks up to w/c 8 May 2023*	
				Average[2]	*Cardinality*[3]	*Average*[2]	*Cardinality*[3]
National Average Price				179.09	50	163.98	36
[✂]	[✂]	Dealer	0	179.93	50	165.12	36
[✂]	[✂]	Supermarket	8	176.55	50	161.25	36
[✂]	[✂]	Supermarket	11	175.77	50	162.44	23
[✂]	[✂]	Supermarket	13	180.17	50	164.65	36
[✂]	[✂]	Dealer	13	179.98	50	165.26	34
[✂]	[✂]	Dealer	14	NA	NA	NA	NA
[✂]	[✂]	Dealer	14	178.8	49	161.65	32
[✂]	[✂]	Dealer	15	178.06	48	162.81	33
[✂]	[✂]	Dealer	15	175.33	28	NA	NA
[✂]	[✂]	Dealer	16	177.44	46	161.15	30
[✂]	[✂]	Supermarket	17	176.54	50	161.23	36
[✂]	[✂]	Dealer	18	NA	NA	NA	NA
[✂]	[✂]	Company	18	174.01	36	163	31
[✂]	[✂]	Dealer	18	178.81	48	162.92	31

[✂]	[✂]	Dealer	18	177.92	47	164.99	32
[✂]	[✂]	Dealer	18	177.66	45	164.25	26
[✂]	[✂]	Dealer	18	178.28	50	163.01	31
[✂]	[✂]	Other	19	178.68	50	163.37	36
[✂]	[✂]	Dealer	20	179.41	48	167.08	22
[✂]	[✂]	Dealer	20	178.78	48	163.05	33

Source: CMA analysis of Experian and ArcGIS data.
Notes:
[1]Company – these are owned by an oil company which brands the PFS; Dealer – these PFSs are owned and operated by dealers which can be branded or unbranded; Supermarket – these are owned and operated by grocery retailers and are generally located adjacent to their supermarket.
[2]The average for the LA and the national average are calculated over different numbers of PFSs in each week as there is missing data for different PFSs across weeks.
[3]The cardinality refers to the number of data points (equivalently, weeks) that have been used for the computation of the average price. Only those weeks that coincide with the data availability of the centroid is taken into consideration. The average price may be less accurate where there is missing data, particularly where data is missing disproportionately in weeks where prices were high (or conversely low).
[4]Centroid PFS (highlighted in orange) is included for reference as the first entry.

196. Table 65 below shows the estimated population, number and type of PFSs, and highest saving (based on average 52 weeks up to w/c 8 May 2023 prices) within a drive time of 5- , 10- and 20-minutes of the centroid PFS.

Table 65: Potential savings from 'shopping around' within 5-, 10- or 20-minute drive time

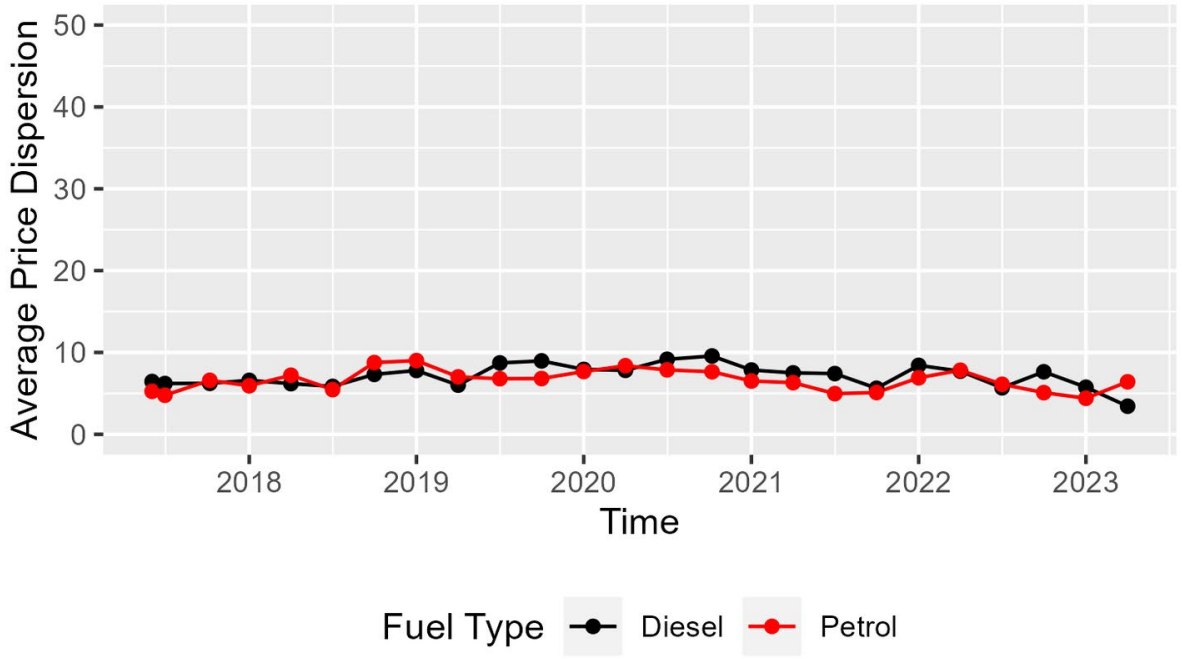
	Drive time		
	5-minutes	*10-minutes*	*20-minutes*
Estimated population	2,034	15,298	196,127
Number of competing sites[1]	0	1	19
Number of supermarket sites	0	1	4
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (diesel)	N/A	3.38	4.15
Highest ppl saving in 52 weeks up to w/c 8 May 2023 (petrol)	N/A	3.87	4.34

Source: CMA analysis of Experian Data and Office for National Statistics
Notes: The saving is calculated relative to the centroid PFS; hence, the price dispersion within the isochrone can be larger. Given the lack of pricing data for some PFSs, the calculated ppl saving is a "lower bound". The actual saving could be higher.
[1]Excludes the centroid PFS; does not account for common ownership.

Price dispersion in isochrone

197. Figure shows the quarterly average price dispersion of diesel and petrol prices in the 20-minute isochrone for 52 weeks up to w/c 8 May 2023. It can be observed that the average price dispersion remained steady and varied from around 5 ppl to 10 ppl for both diesel and petrol.

Figure 104: Average price dispersion in the 20-minute isochrone, 52 weeks up to w/c 8 May 2023



Source: CMA analysis of Experian Data.
Notes:
1. The average price dispersion is calculated by subtracting the minimum price from the maximum price in each week, and then averaged over the quarter. The possibility of missing data implies that the maximum and minimum prices may not constitute the true highest-priced and cheapest stores, respectively.
2. The price dispersion excludes motorway sites.

Annex C: Asda price announcements: econometric detail

1. The CMA estimated the following probit model using data on Asda's price announcements and Platts CIF prices for each weekday for the period between 2017 and 2020 (inclusive):

$$\Pr(a_t = 1 \mid \mathrm{p}) = \Phi(\alpha_0 + \sum_{v=0}^{v=15} \beta_v p_{t-v} + \varepsilon_t),$$

where a_t is a dummy variable equal to 1 if Asda made a price announcement on day t and 0 otherwise, α_0 is a constant, p_{t-v} is the daily Platts CIF price change on day $t - v$, ε_t is the error term (assumed to be normally distributed) and Φ is the standard normal cumulative distribution. The probit model was estimated separately for diesel and petrol.

2. Table C1 below shows the probit model regression results. The results show that lag 10 (weekdays) are negative statistically significant at the 99% level for diesel and 95% level for petrol. For diesel, lag 8, 11, and 12 are also negative and statistically significant at the 95% level. This suggests that decreases in wholesale price which occur approximately 2 weeks ago (8 to 12 weekdays) are associated with a higher likelihood of Asda making a price announcement.

Table C1 Price announcement probit model results for diesel and petrol (2017 to 2020 inclusive)

Dependent variable: Price announcement dummy	Diesel		Petrol	
Independent variable: daily wholesale price change	Coefficient	Standard Error	Coefficient	Standard Error
Lag 0	0.1709	0.1400	0.0460	0.1135
Lag 1	-0.1773	0.1313	-0.1940	0.1118
Lag 2	-0.2186	0.1337	-0.1247	0.1093
Lag 3	-0.1885	0.1334	-0.1873	0.1083
Lag 4	-0.0924	0.1332	-0.0170	0.1109
Lag 5	-0.0949	0.1404	-0.0858	0.1093
Lag 6	-0.0645	0.1435	-0.0198	0.1110
Lag 7	-0.1829	0.1425	-0.1328	0.1156
Lag 8	-0.3463*	0.1429	-0.2046	0.1134
Lag 9	-0.0696	0.1302	-0.1747	0.1101
Lag 10	-0.3863**	0.1426	-0.2532*	0.1128
Lag 11	-0.2972*	0.1407	-0.1668	0.1212
Lag 12	-0.3462*	0.1475	-0.1858	0.1131
Lag 13	-0.0354	0.1459	0.0458	0.1139
Lag 14	0.1008	0.1439	0.0974	0.1176
Lag 15	0.0972	0.1441	0.0149	0.1180
Constant	-2.3093***	0.1299	-2.1435***	0.1065
Number of observations	1010		1010	
Pseudo R2	0.2028		0.1631	

CMA analysis of Platts and Asda's price announcement data. Note: *, **, *** means the results are statistically significant at the 95 per cent, 99 per cent and 99.9 per cent levels respectively

Annex D: Asda price announcements: modelling detail

1. In order to test whether Asda has reduced the competitive pressure that it imposes on the market, we have analysed data on the frequency of Asda's national price cut announcements.

2. We have analysed the frequency of price cut announcements since 2017, as well as modelling the probabilities of Asda making a price cut announcement, based on changes in the wholesale price. This analysis includes a period before the Asda/Bellis merger, as well as a period following the merger, which was cleared by the CMA in June 2021.

3. In response to a request for information, Asda provided us with dates for all of their price cut announcements for petrol and for diesel between 1 January 2017 and 16 March 2023. We have looked at the number of price cut announcements (ie frequency) alongside the average amount by which estimated wholesale prices[1] reduced in the weeks in which there were price cut announcements for each calendar year in the period 2017 to March 2023, as shown in Table D1. The data shows that there were between 6 and 9 price cut announcements per year in the years 2017-2020, with none in 2021, and then 2 for each type of fuel in 2022. Further, wholesale price reductions for petrol and diesel in the weeks when there were price cut announcements appear to be higher for more recent price cut announcements than for price cuts in 2017-19.

Table D1: Number of Asda price cut announcements and average wholesale price announcement by year, 2017-2022

	Number of Asda price announcements		*Average wholesale price reduction in week of price announcement*	
	Petrol	*Diesel*	*Petrol*	*Diesel*
2017	7	6	-0.85	-0.55
2018	9	7	-0.72	-0.52
2019	7	6	-0.79	-0.13
2020	6	6	-2.91	-1.99
2021	0	0	n/a	n/a
2022	2	2	-2.85	-3.87
Q1 2023*	**0**	**0**	**n/a**	**n/a**

Source: Asda RFI response and CMA analysis
Note: *Covers the period 1 January – 16 March 2023.

[1] Estimated wholesale prices include the CIF benchmark cost and the cost of biofuel.

4. We have also plotted Asda's price cut announcements against the Platts CIF price (which is by far the largest component in the wholesale price) – Figures D1 and D2 show the days in which Asda announced price cuts for petrol and/or diesel, alongside the daily Platts CIF price of petrol and diesel respectively. Each dark blue vertical line on the charts is a day during which one price cut announcement took place. In some periods there were price cut announcements in two or more consecutive weeks.

5. As Figures D1 and D2 show, the frequency of price cut announcements has reduced significantly in the period since April 2020. In total, there were 28 price cut announcements for petrol, and 24 for diesel in the period January 2017 – March 2020, and only 3 price cut announcements for petrol and for diesel in the period from April 2020 – February 2023. Further, the two price announcements in 2022 occurred in periods when there was government/regulatory pressure:

   (a) In March 2022 there was a fuel duty cut of 5ppl and in July 2022 the CMA published its Urgent Review findings - Asda made a price cut announcement on 29 July 2022; and

   (b) The CMA published its Initial Update Report on 6 December 2022 – Asda made a price cut announcement on 8 December 2022.

Figure D1: Asda price announcements and Platts CIF price of petrol

Source: CMA analysis of Platts and Asda's price announcement data

Figure D2: Asda price announcements and Platts CIF price of diesel

Source: CMA analysis of Platts and Asda's price announcement data

6. The wholesale price has not moved in a consistent way over time, with a dramatic decline in the Platts CIF in early 2020 and a dramatic increase in early 2022. Since one of the main factors likely to drive a price announcement is a change in the underlying wholesale price, the frequency of price announcements cannot be considered independently of changes in underlying costs.

7. The reduction in the frequency of Asda price announcements over the past two years could be explained by changes in the patterns of underlying cost reductions, or alternatively by changes in Asda's approach to pricing (ie how Asda responds to patterns of wholesale price changes) or some combination of the two. To shed more light on those two hypotheses, the CMA has modelled the probability of a price announcement occurring based on changes in the Platts CIF price. We modelled this over the 2017-2020 period,

and then used these results to predict probabilities of price announcements over the 2021-2023 period.[2]

8. This is asking the question 'If Asda had responded to underlying cost changes over 2021-2023 in the same way as it had in 2017-2020, how likely would price announcements have been in that later period?'. We show the period 2017-2020 (inclusive) in Figure D3 and the period 2021-2023 in Figure D4.[3] The charts show that:

   (a) Over the period 2017-2020, price announcements occur on days where the predicted probability of a price cut announcement is between 0.07 and 0.25[4], and when there were only modest reductions in the Platts; while

   (b) Over the period 2021-2023, there are a number of occasions where the Platts CIF price reduced and the daily probabilities of a price announcement predicted were high (reaching or surpassing the range estimated over the period 2017-2020), and we would therefore expect a price cut announcement, but one was not made.

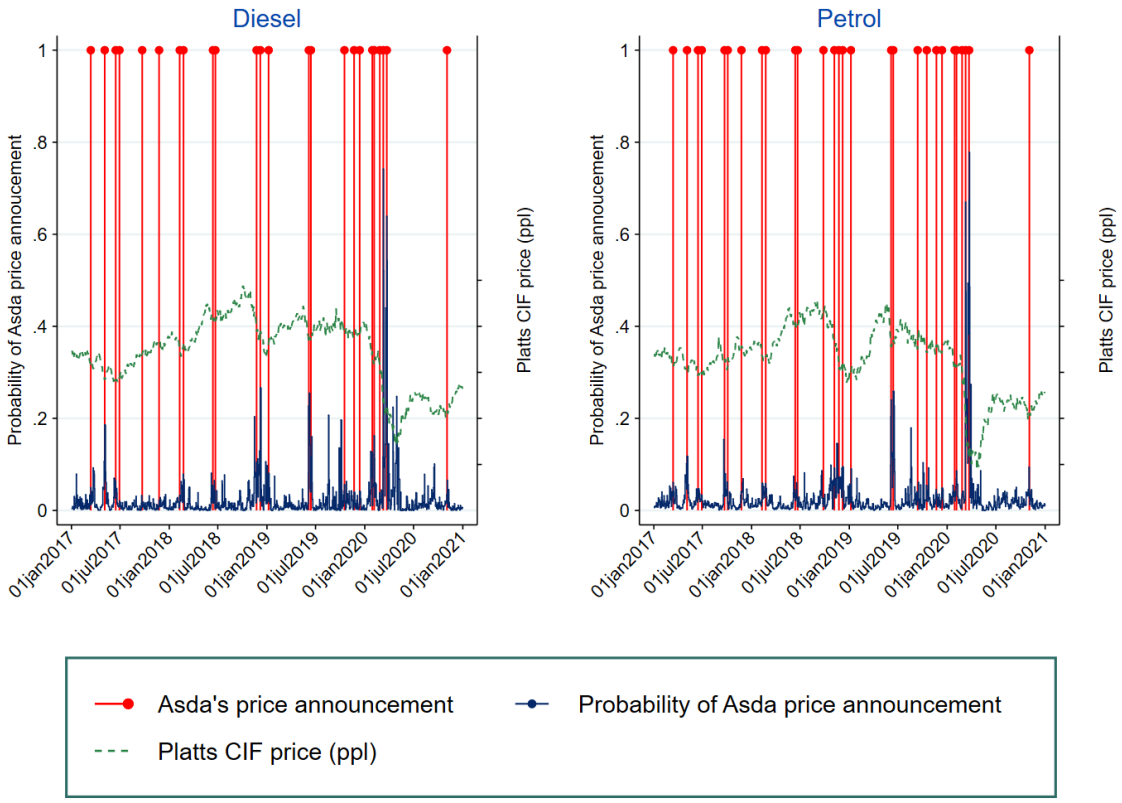
9. This suggests that the observed reduction in the frequency of price cut announcements was due to a change in Asda's approach to pricing rather than a change in patterns of underlying cost changes.

[2] The CMA estimated the following probit model using data on Asda's price announcements and Platts CIF prices for each weekday for the period between 2017 and 2020 (inclusive): $\Pr(a_t = 1 \mid \mathrm{p}) = \Phi(\alpha_0 + \sum_{v=0}^{v=15} \beta_v p_{t-v} + \varepsilon_t)$, where a_t is a dummy variable equal to 1 if Asda made a price announcement on day t and 0 otherwise, α_0 is a constant, p_{t-v} is the daily Platts CIF price change on day $t - v$, ε_t is the error term (assumed to be normally distributed) and Φ is the standard normal cumulative distribution. The probit model was estimated separately for diesel and petrol.

[3] The probit model is used to estimate the probability of a price announcement for each weekday.

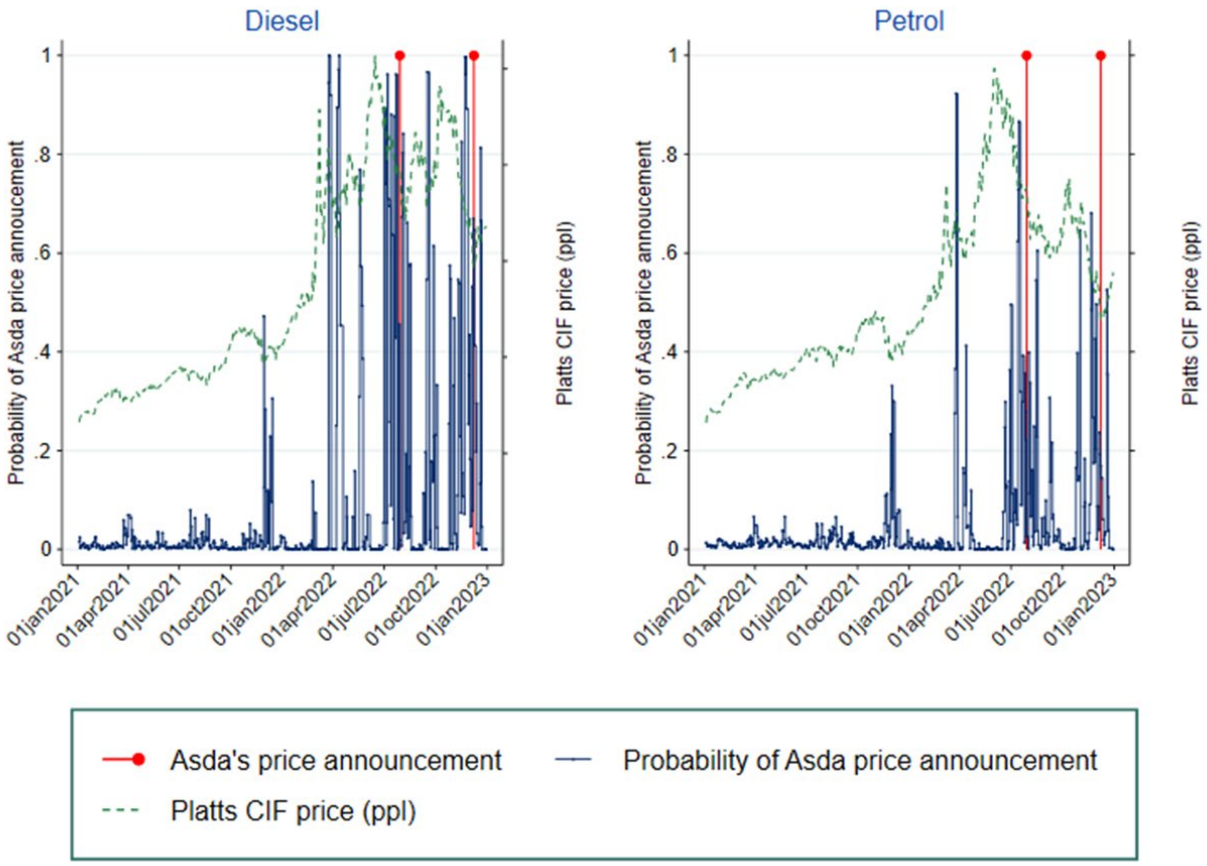
[4] The low predicted probabilities simply reflect the fact that price announcements are fairly rare events.

Figure D3: Asda's price announcements, probability of price announcement, and Platts CIF price, 2017-2020



Source: CMA analysis of Platts and Asda's price announcement data.

Figure D4: Asda's price announcements, probability of price announcements, and Platts CIF price, 2021-2023



Source: CMA analysis of Platts and Asda's price announcement data.

10. One limitation of this model is that it assumes that the probability of a price announcement in a given day is a simple function of observed changes in underlying costs over the previous 3 weeks. Although we would expect observed changes in underlying costs to be an important determinant of price announcements, other factors may also be important. For instance, if Asda takes additional contextual factors into account when deciding whether to implement a price announcement, such as the volatility of underlying costs or the risk of supply disruptions, and these contextual factors have changed in the recent period in a way that is not captured by the analysis, then the probabilities that we estimate may be wrong.

11. We asked Asda what factors they take into account when deciding whether to make a price cut announcement. They told us that:

    (a) Asda triggers a price drop when the following criteria are met:

        (i) [✂];

        (ii) [✂];

(iii) [✂]; and

(iv) [✂].

(b) Asda's decision to announce a drop in the national cap is driven by reductions in wholesale fuel cost. When Asda is considering whether to implement such a price cut, it will take into account two main elements:

(i) [✂];

(ii) [✂].

(c) [✂].

12. Our analysis has shown that Asda has significantly decreased the frequency with which it makes price cut announcements since spring 2020. Asda told us that the decision to make a price cut announcement is driven by reductions in the wholesale cost of fuel, which they buy on a [✂] week lag.[5] Although they also place weight on other factors such as stock levels and how persistent they think a change in the wholesale price will be, this suggests that there should be a relationship between the wholesale price and the probability of Asda making a price cut announcement.

13. Our analysis has shown that there have been numerous occasions in the last 2 years where the probability of a price cut announcement, based on changes in wholesale costs, was at (or above) the level where an announcement was previously made prior to 2020.

14. Taken together this analysis suggests that Asda is no longer making price cut announcements with the frequency it was prior to spring 2020. However, a reduction in price cut announcements does not in and of itself show that Asda has reduced the competitive pressure it places on the market, as a price cut announcement is not necessary in order to cut local prices. Therefore, we have looked for evidence in internal documents to see if Asda has changed its approach to pricing after spring 2020.

[5] Asda told us that "*the cost of fuel that is delivered to Asda in a given week will have been set* [✂] *weeks previously*".

Annex E: Biofuel used in UK road fuel

Introduction

1. In our Initial Update Report, we identified that wholesale contracts set the price of fuel on the basis of international prices for diesel and petrol and for the biofuels which are blended with fossil fuels in the mix supplied to retailers.[1] We also said that we may decide to assess further whether contractual terms reflect the costs that road fuel suppliers incur in supplying biofuel or whether they may be contributing to higher prices.[2]

2. In this Annex, we set out our understanding of the key constraints UK suppliers face regarding blending of renewables (ie biofuels) into road fuel. We then explain how the average price of fuel supplied could be calculated from benchmark prices of fossil and biofuels and compare this with the evidence we have seen on actual contractual terms. Next, we summarise wholesale suppliers' comments on our emerging analysis; give our response and set out our views on how well current biofuel contractual terms are working for consumers.

Renewable constraints on UK suppliers of road fuels

3. Road fuel suppliers face a number of constraints arising from the desire to incentivise the use of renewable fuels in order to reduce greenhouse gas emissions while maintaining a basic quality of fuel to consumers and ensuring that older vehicles can continue to function. The main such constraints are:

    a. The Renewable Transport Fuel Obligation (RTFO), which is described further in the next paragraph;

    b. The standard grade of automotive diesel sold in the UK, known as B7, allows a maximum of 7% biodiesel;[3]

    c. Standard grade petrol (95 or 96 octane), known as E10, must contain a minimum of 5.5% bioethanol and may have up to a maximum of 10% bioethanol;[4]

    d. 'Super' grade petrol (97 or higher octane), known as E5, may contain up to 5% bioethanol. The lower limit on bioethanol is intended for older

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[1] Initial Update report, paragraph 7.21.
[2] Initial Update report, paragraph 7.24.
[3] BS EN 590. The renewable content of diesel may be increased beyond 7% through using 'drop-in' renewable diesel (eg hydrotreated vegetable oil, HVO).
[4] Introducing E10 petrol: outcome and summary of responses.

vehicles that are not warranted to use unleaded petrol with a higher biofuel content.

4. Most PFSs in the UK can sell no more than 4 grades of road fuel (typically, where four grades are sold these are standard and 'super' diesel and standard and 'super' petrol)[5]. Consequently, there is very little ability for PFSs to supply grades of fuel other than B7 diesel,[6] E10 and E5 petrol.

5. The most important provisions of the RTFO[7] are that:

   a. Suppliers are required to have a certain number of Renewable Transport Fuel Certificates (RTFCs), of which there are two types, main and development. Both main and development obligations are expressed as a proportion of fossil fuel and are shown in Table 1.

   b. RTFCs may be obtained through certified use of biofuels (though only certain development fuels can be used to meet the development RTFO, dRTFO)[8], or by purchasing RTFCs from other suppliers (RTFCs are tradeable) or by buying out the obligation. The buy-out price is also shown in Table 1.

   c. Suppliers' fulfilment of their obligation under the RTFO is generally assessed at the point where duty is payable. Suppliers failing to redeem RTFCs or buy out the obligation on time are charged interest at 5% above the Bank of England base rate and may have to pay penalties.

   d. Certain biofuels, primarily those manufactured from waste and residues or produced using only renewable energy of non-biological origin, earn twice as many certificates when working out whether a supplier has met the RTFO (we refer to this as double-certification or double-counting). Thus, the main RTFO could be met in 2023 with a volume of single-counted biofuel equal to about 13.08% of fossil volume (see Table 1) or with a volume of double-counted biofuel equal to 13.08/2 = 6.54% of fossil volume.

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[5] Where PFSs sell fewer than four grades, one or both of 'super' diesel and petrol would not be sold.
[6] 'Super' diesel contains additives to improve performance.
[7] The 2022 guidance is at renewable transport fuel obligation compliance guidance. The 2023 guidance is similar.
[8] Development fuels are hydrogen, aviation fuel, substitute natural gas (renewable methane produced from the product of gasification or pyrolysis) and any fuel that can be blended such that the final blend has a renewable fraction of at least 25% whilst still meeting the relevant standard for petrol/diesel. Additionally, development fuels must be made from sustainable wastes or residues (apart from segregated oils and fats such as used cooking oil and tallow), or a renewable fuel of non-biological origin.

e. If a supplier overachieves against the RTFO, 25% of RTFCs from the previous year can be carried forward to the next year.

f. There is a separate cap on the contribution that crop-derived biofuels, excluding dedicated energy crops, can make towards discharging a supplier's obligation. This is 3.67% for 2022 and 3.5% for 2023.

g. The RTFO only applies to suppliers supplying over 450,000 litres of fossil fuel and, for those supplying between 450,000 litres and 10 million litres, there is no obligation on the first 450,000 litres supplied.

Table 1: RTFO obligation and buy-out price, 2015 to 2023

Year	Obligation as % fossil volume		Buy-out price pence (per certificate)*	
	Main	Development	Main	Development
2015	4.987%		30	
2016	4.987%		30	
2017	4.987%		30	
2018 (to 14 Apr)	4.987%		30	
2018 (from 15 Apr)	7.817%		30	
2019	9.180%	0.109%	30	80
2020	10.637%	0.166%	30	80
2021	10.679%	0.556%	50	80
2022	12.599%	0.908%	50	80
2023	13.078%	1.142%	50	80
2024	13.563%	1.379%		
2025	14.054%	1.619%		
2026	14.552%	1.863%		
2027	15.056%	2.109%		

Source: DfT
*The buy-out price per litre of fuel, assuming no renewable fuels are used, is the obligation multiplied by the buy-out price per certificate.

Reflecting renewable obligations in pricing formulae

6. Wholesale suppliers usually supply their customers on the basis of contracts with terms of 1 to 5 years. These contracts provide for the price per litre to be determined by a formula, which is based among other things on benchmark prices of fossil fuel and biofuels.

7. In this section, we set out our analysis of how biofuels prices can be incorporated in pricing formulae. We consider first diesel and then petrol. Further details are in Appendix 1.

Diesel

8. The main RTFO can be met through blending biodiesel with fossil diesel. The maximum proportion of biodiesel in diesel is 7%, but the 2023 main obligation of 13.078% (see Table 1) can be met, for example, by supplying a blend of

6.138% double-counted biodiesel and (100-6.138) = 93.862% fossil diesel.[9] Agencies such as Argus and Platts publish benchmark prices for a double-counted biodiesel, UCOME.

9. There is some limited potential for use of single-counted biodiesel as well as double-counted biodiesel. For example, instead of using just a double-counted biodiesel such as UCOME, suppliers could use up to 1.6% single-counted biodiesel (together with at least 5.3% double-counted biodiesel) to achieve the 2023 obligation while still having 0.1% tolerance against the 7% biodiesel blendwall. However, there is little evidence that UK suppliers do use single-counted biodiesel, with at least 95% of RTFCs being from double-counted diesel fuels, in recent years see Table 2.[10] Given that there is only limited potential for single-counted biodiesel to meet the RTFO and little evidence that it is actually used in the UK, it seems inappropriate to use a single-counted biodiesel benchmark in a contractual pricing formula.

Table 2: Percentage of RTFCs from double-counted biofuels

	Diesel (Biodiesel, Diesel (origin Bio) & HVO)	**Petrol** (Bioethanol & Biopetrol)
2015/16	99%	32%
2016/17	100%	49%
2017/18	100%	41%
2018 (from 15 Apr)	98%	37%
2019	96%	25%
2020	95%	47%
2021	100%	51%
2022 3rd provisional stats	96%	29%

Source: CMA analysis, based on Tables RF 0105 and RF0111, *Renewable fuel statistics*

10. The RTFO can also be met through purchasing RTFCs and Argus publishes a price assessment for UK RTFCs. Although the use of an RTFC price has some theoretical advantages over using a biodiesel price in contracts,[11] suppliers told us the UK RTFC market tended to lack liquidity and was therefore unsuitable as a basis for contracts. One supplier explained that, as the RTFO main obligation was now very close to the production specification maximum blend rates, all obligated parties needed to consistently achieve very high blend rates at all times. It said this reduced the liquidity in the RTFC market as an obligated party can only be a net supplier of RTFCs if it

[9] This gives (2*6.138/93.862) = 13.078 RTFCs as a % of the fossil fuel supplied.
[10] The bulk of this is from UCOME. For example, in 2021, 87% was from UCOME, 7% from other biodiesel ME (eg waste pressings from production of vegetable oils) and 6% from other renewable diesel, such as HVO, for nearly all of which used cooking oil was the feedstock.
[11] The theoretical advantage is that the RTFC prices would be expected to reflect all relevant factors, including the crop cap and the buy-out price (suppliers will not purchase biodiesel if using it is more costly than buying out the main RTFO), whereas this is not necessarily the case for any individual biodiesel benchmark price. Albeit, trading in RTFCs would be expected to reflect the cost of meeting the RTFO at the margin and would not necessarily reflect cheaper, ie intra-marginal, biofuels that are limited in their application (eg bioethanol which is considered below, see paragraph 17).

overachieved against the main obligation (which is increasingly difficult). It said it was already seeing the impact of this as the same RTFCs were being traded multiple times (an indicator of low liquidity) and this would increase as the main obligation continued to tighten. This issue arises because, even with maximum use of double-counted biodiesel (around 6.9%, ie a tolerance of 0.1% below the 7.0% blendwall), the 2023 obligation enables at most a surplus of 0.762% (6.900% less 6.138% needed to achieve the RTFO, see paragraph 7) to be made available to the market and this is further reduced as the RTFO tightens in future years (see Table 1).[12]

11. The dRTFO can be met through developing relevant fuels or buying out the obligation. However, as there are no benchmark prices for development fuels, a pricing formula needs to be based on the buy-out price of the dRTFO.

12. As set out in Appendix 1: the price of the diesel supplied to customers (over and above the fossil diesel price) can be expressed as a function of:

    a. The biofuel premium (difference between biofuel price and fossil diesel), for which there are benchmarks available; and

    b. The buy-out price of the dRTFO (development fuel buyout price, DFBP), which is specified by DfT, see Table 1.

13. Table 3 sets out the factors to be applied to each of these for a formula using (i) the RTFC price[13] and (ii) a double-counted biodiesel (eg UCOME) premium. Additionally, Table 3 also shows the factors for (iii) a formula using a single-counted biodiesel (eg FAME-10) as such an approach is used by suppliers. However, for the reasons set out above in paragraph 9, we consider that using a single-counted biodiesel benchmark in a contractual pricing formula is inappropriate.

[12] As discussed below, the blendwall for E10 petrol is higher at 10%, potentially allowing for a greater surplus if a double-counted biofuel is used. However, there is less blending of double-counted biofuels with petrol, see Table 2.

[13] We have included formulae using the RTFC price, even though the market appears to lack liquidity (see paragraph 9), as a starting point for considering other formulae.

Table 3: Factors to calculate the price of blended diesel

Year	Formula using RTFC price		Formula using double-counted biodiesel (eg UCOME)		Formula using single-counted biodiesel (eg FAME-10)	
	RTFC price	DFBP	UCOME premium	DFBP	FAME-10 premium	DFBP
2015 to 14 Apr 2018	4.987%		2.433%		4.750%	
From 15 Apr 2018	7.817%		3.761%		7.250%	
2019	9.180%	0.109%	4.389%	0.104%	8.408%	0.100%
2020	10.637%	0.166%	5.050%	0.158%	9.614%	0.150%
2021	10.679%	0.556%	5.069%	0.528%	9.649%	0.502%
2022	12.599%	0.908%	5.926%	0.854%	11.189%	0.806%
2023	13.078%	1.142%	6.138%	1.072%	11.565%	1.010%
Notes	These are just the %s specified in the RTFO (shown inTable 1).		See formula in Appendix 1 paragraph 5		Based on formula in Appendix 1 paragraph 8. For the reasons set out in paragraph 8, a single-counted biodiesel formula is inappropriate	

Source: CMA analysis, see Appendix 1

14. For example, Table 3 shows that a consistent formula in 2023 for the price of blended diesel would add to the fossil diesel price 6.138% of the UCOME premium and 1.072% of the DFBP.

15. The factors in the formula using the RTFC price are equal to the obligation, as set out in Table 1. The factors in the formula using double-counted biodiesel are less than half of the obligation because the obligation is expressed as a percentage of fossil fuel supply and using biodiesel (as opposed to buying RTFCs) reduces the obligation as well as fulfilling it. The factors in the formula using single-counted biodiesel are less than the obligation for the same reason.

Petrol

16. The position for petrol differs from that for diesel because:

    a. Standard grade petrol (E10) is required to have a minimum of 5.5% bioethanol, thus some use of bioethanol is inevitable;

    b. The majority of RTFCs associated with petrol renewables tend to be single-counted, see Table 2.

17. We also note that, based on benchmark prices available to us, the cost of single-counted bioethanol (which from now on we refer to as ethanol) tends to be low compared to the traded RTFC price and biodiesel prices, see Figure 1.[14]

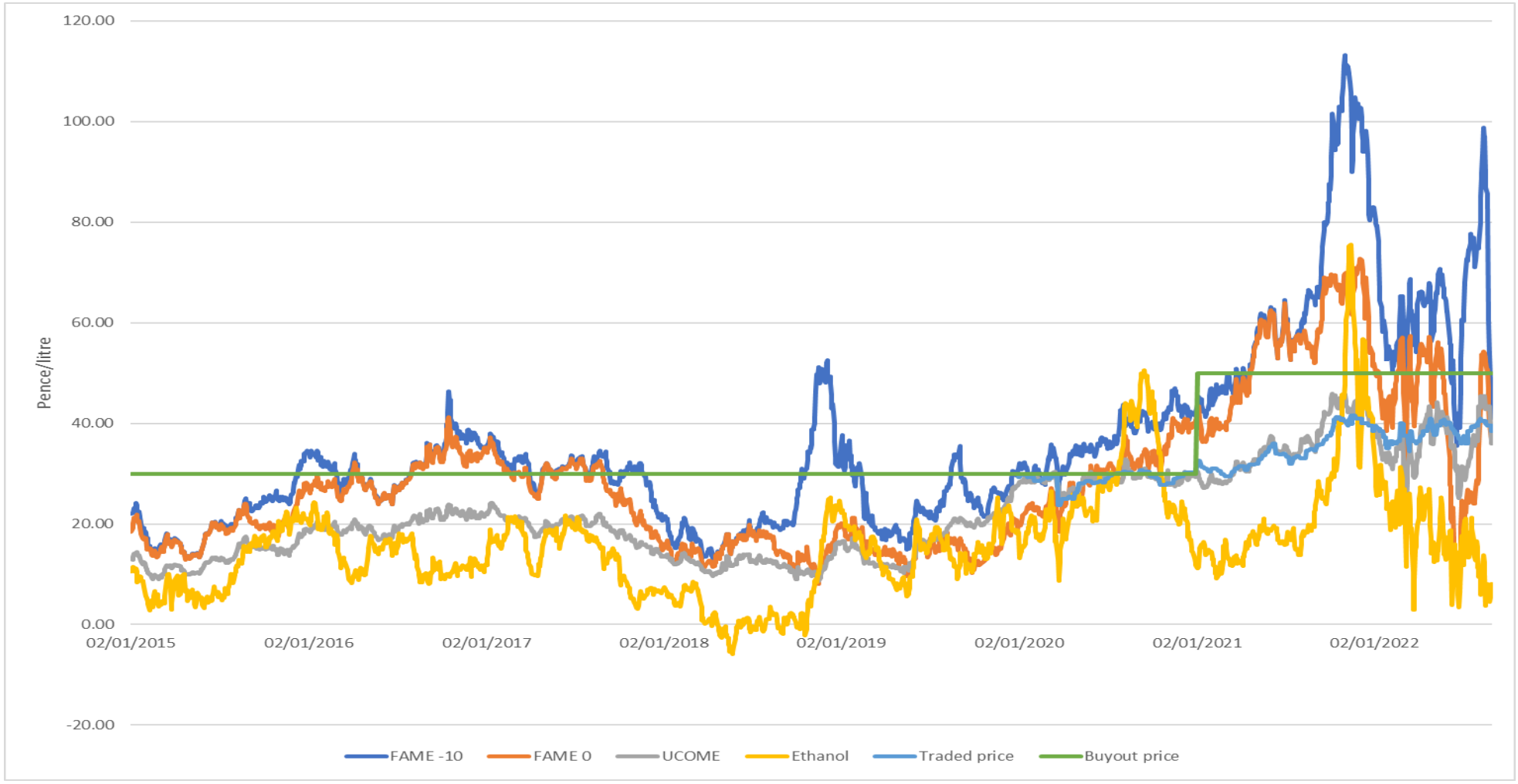
18. Since the price of ethanol tends to be low compared to the traded RTFC price, it seems reasonable for a pricing formula to be based on an ethanol

[14] The calculation of the cost of an RTFC implied by biofuels is set out at Appendix 1 paragraphs 6, 9 and 14. We only have benchmark data available for the fuels shown in Figure 1, see Appendix 3.

proportion close to the maximum (10% for E10 and 5% for E5) rather than the minimum (5.5% for E10 and zero for E5). This is also supported by volume data up to August 2021 which shows the percentage of ethanol in petrol around 4.5% to 4.7%,[15] quite close to the maximum of 5% prior to the introduction of E10 petrol. Even at the maximum, use of crop-based ethanol would not itself lead suppliers to breach the crop cap (which is 3.5% for 2023 and was higher in previous years) given that petrol accounts for about one third of fuel to which the RTFO is applied.[16]

[15] Tables 3.2 and 3.4 of Digest of UK Energy Statistics (DUKES).
[16] Table RF 0101, Renewable fuel statistics. The maximum ethanol percentage for petrol is 10% for E10 and 5% for E5 and hence is below 10% for all petrol. Use of ethanol at the maximum would therefore be below 10%*33% = 3.3% of all fuel covered by the RTFO and therefore below the 2023 crop cap of 3.5%.

Figure 1: Cost of RTFC implied by UCOME, FAME-10, FAME 0 and ethanol price compared with traded and buy-out price of RTFC



Sources: CMA calculations based on data from Argus (for biofuel, RTFC) and Platts (for fossil fuels), see Appendices 1 and 3. The traded price of RTFC is only available from 2020.

19. For most of the period since April 2018, blending of ethanol up to the maximum would not by itself have enabled a supplier to meet the RTFO for its petrol supplies.[17] Suppliers would also have needed to purchase some RTFCs and/or to over-achieve the RTFO on diesel using UCOME and transfer the surplus to petrol or use some double-counted bioethanol.

20. Taking this into account, we have set out in Table 4 factors to calculate the price of blended petrol using a similar approach to that for diesel in Table 3. We have assumed use of ethanol up to the maximum (or to meet the RTFO for petrol if lower) and calculated supplementary factors for meeting the RTFO using the RTFO price and, using transfers from diesel, the price of a double-counted diesel fuel (eg UCOME). As in Table 3, we have also shown factors for a single-counted diesel fuel (eg FAME-10) even though its use in a petrol pricing formula is inappropriate since use of a single-counted diesel fuel cannot achieve the RTFO for diesel, let alone over-achieve and transfer a surplus to petrol.

Table 4: Factors to calculate the price of blended petrol

	All formulae	Formula using RTFC price		Formula using double-counted biodiesel (eg UCOME)		Formula using single-counted biodiesel (eg FAME-10)	
Year	**Ethanol premium**	**RTFC price**	**DFBP**	**UCOME premium**	**DFBP**	**FAME-10 premium**	**DFBP**
Standard petrol (E5 to Aug 2021, E10 from Sep 2021)							
To 14/04/18	4.750%						
From 15/04/18	5.000%	2.426%		1.167%		2.250%	
2019	5.000%	3.721%	0.104%	1.779%	0.102%	3.408%	0.100%
2020	5.000%	5.105%	0.158%	2.424%	0.154%	4.614%	0.150%
Jan-Sep 2021	5.000%	5.145%	0.528%	2.442%	0.515%	4.649%	0.502%
Sep-Dec 2021	9.649%		0.502%		0.502%		0.502%
2022	10.000%	1.339%	0.817%	0.630%	0.811%	1.189%	0.806%
2023	10.000%	1.770%	1.028%	0.831%	1.018%	1.565%	1.010%
Super petrol (E5, from Sep 2021)							
Sep-Dec 2021	5.000%	5.145%	0.528%	2.442%	0.515%	4.649%	0.502%
2022	5.000%	6.969%	0.863%	3.278%	0.833%	6.189%	0.806%
2023	5.000%	7.424%	1.085%	3.484%	1.045%	6.565%	1.010%
Notes	This is the bioethanol % (maximum or to meet the RTFO if lower)	See formula in Appendix 1 paragraph 13		See formula in Appendix 1 paragraph 15		Based on formula in Appendix 1 paragraph 16. For the reasons set out in paragraph 8, a single-counted biodiesel formula is inappropriate	

Source: CMA analysis, see Appendix 1

21. Table 4 does not include a formula based on meeting the RTFO using double-counted bioethanol. This is set out in Appendix 2.

[17] The exception is Sep-Dec 2021 after the introduction of E10 petrol, when an ethanol percentage of 9.649% would have been sufficient to meet the RTFO in regard to supplies of E10 petrol.

Review of pricing terms in suppliers' contracts with retailers

22. Wholesale suppliers provided us with information about their contracts with retailers as part of their responses to our information requests (template contracts, some actual contracts and a summary of contractual terms). The extent of the information provided differed between individual suppliers but typically contracts have a pricing schedule which calculates the price per litre from benchmark prices of fossil fuels and biofuels.[18]

Diesel

23. Based on the information received, it appears that the bulk of volume is supplied on terms linked to a single-counted benchmark (FAME-10) price despite the fact that, as noted above (see paragraph 9), there is only limited potential for single-counted biodiesel to meet the RTFO and little evidence that single-counted biodiesel is actually used in the UK (see Table 2).

24. Very few contracts appear to be linked to UCOME. A few involve the retailer paying the fossil fuel price and, for each litre of biofuel required under the RTFO, providing an RTFC (usually referred to as a 'ticket') to the supplier. We understand the retailer would obtain the required RTFCs on the open market or from an intermediary. Additionally, a few contracts linked to FAME-10 have a cap on the biofuel component linked to the RTFO buy-out price.

25. Additionally, we found a technical issue in relation to how pricing formulae are specified. This is described below in Appendix 1 paragraphs 21 to 26.

26. We have calculated the implication of using different biofuel benchmarks for the blended price, expressed as the premium over the fossil diesel price, which we refer to as the biofuel premium. We have used data on fossil benchmarks from Platts and data on biofuels and RTFCs from Argus for January 2015 to August 2022, see Appendix 3.

27. The results are set out in Figure 2 below and show that over the period January 2015 to August 2022:

    a. The biofuel premium implied by UCOME (and implied by RTFC for the period it is available) increased due to the increased proportion of biofuels required under the RTFO (see Table 1) and because there has

[18] Some suppliers' pricing schedules were clearly expressed via a combination of plain English, short formulae and tables. Other suppliers' pricing schedules were difficult to comprehend as they contained long formulae, which combined the conversion of benchmark prices from $/tonne to pence/litre with the calculation of a blended price based on benchmarks for fossil fuel and biofuels and the addition of a transportation premium for biofuels which are quoted FOB Rotterdam or ARA, and did not always define clearly the terms used in these formulae.

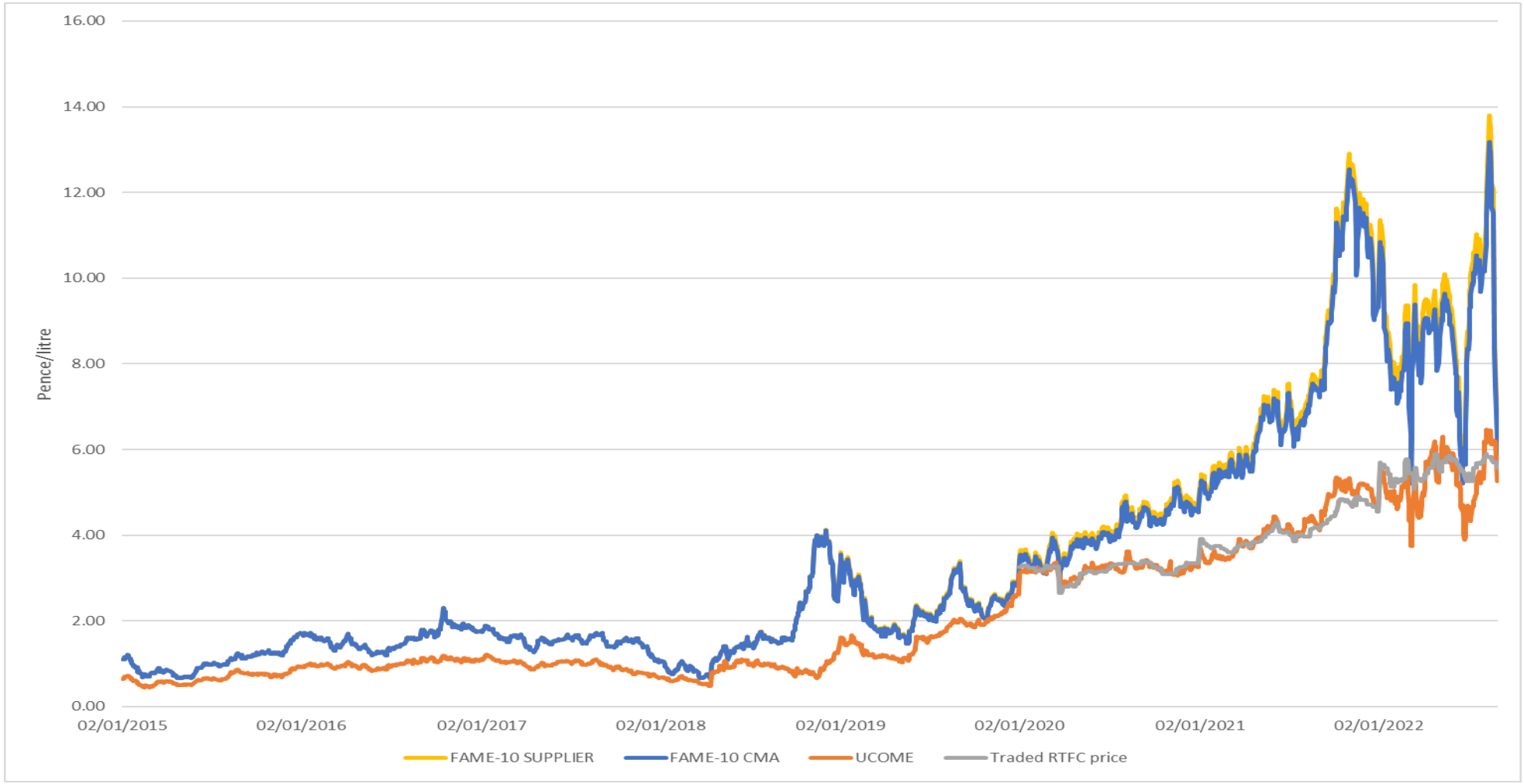
been some tendency for UCOME prices to increase over time (see Figure 1);

b. The biofuel premium based on FAME-10 was higher and more volatile than that based on UCOME or the traded RTFC price. In 2021 and 2022 (to end August) it was on average 3p to 4p per litre higher.

28. Furthermore, as shown in Figure 1, for much of 2021 and 2022 (to end August), the addition to prices implied by the FAME-10 benchmark price was above the level implied by the RTFO buy-out price. The Government has stated this is 'intended to protect consumers from excessive increases in fuel prices'.[19] Therefore, suppliers' use of the FAME-10 benchmark price (without a cap linked to the RTFO buy-out price) also may have frustrated the Government's wish to protect consumers from 'excessive increases in fuel prices'.

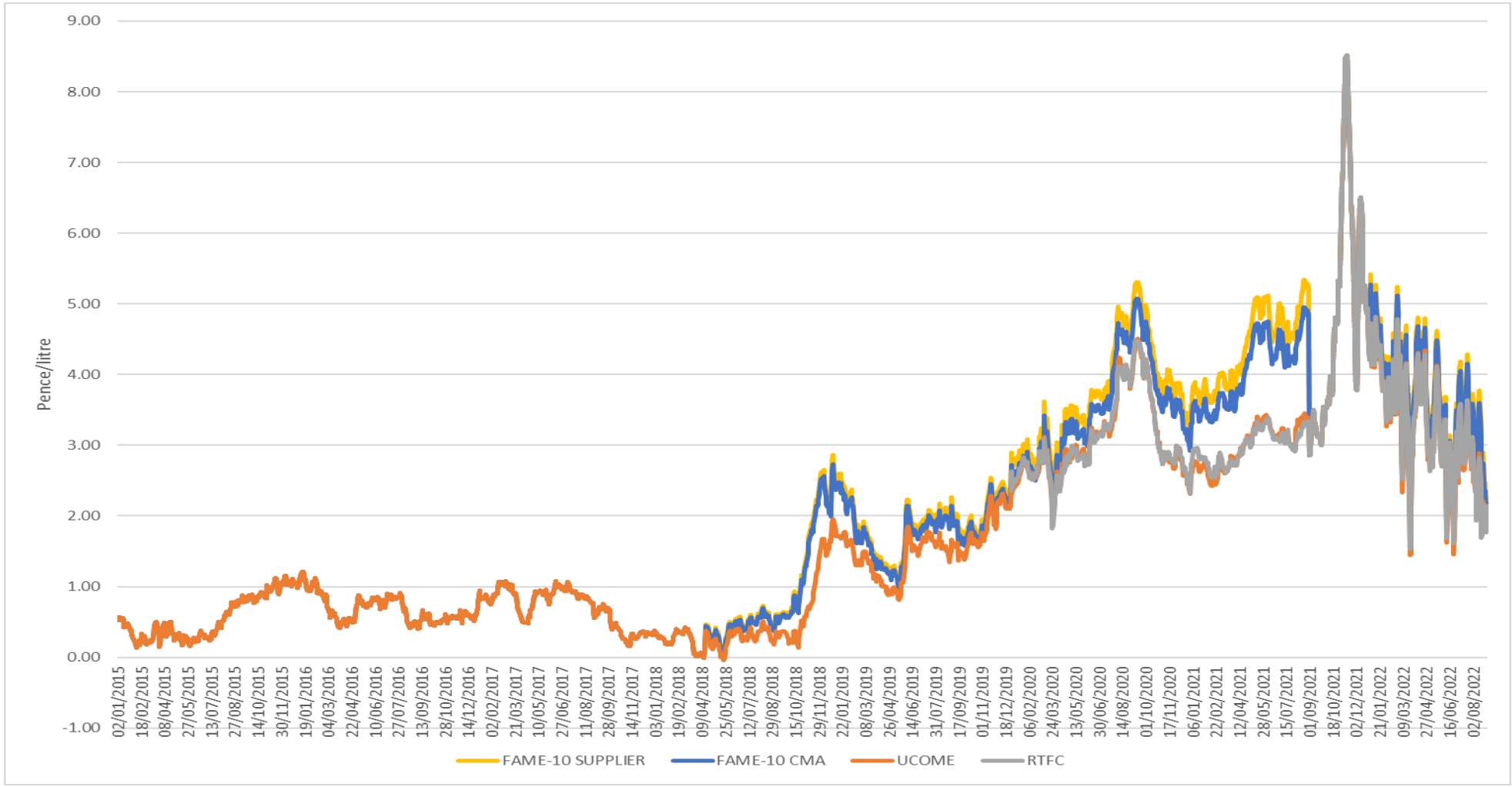
[19] Paragraph 1.11, renewable transport fuel obligation annual report 2020.

Figure 2: Diesel biofuel premium implied by UCOME, FAME-10 and traded RTFC price



Sources: CMA calculations based on data from Argus (for biofuel, RTFC) and Platts (for fossil fuels), see Appendices 1 and 3. The traded price of RTFC is only available from 2020.

Figure 3: Standard petrol biofuel premium implied by ethanol price together with UCOME, FAME-10 or traded RTFC price for remaining obligation



Sources: CMA calculations based on data from Argus (for biofuel, RTFC) and Platts (for fossil fuels), see Appendices 1 and 3. The traded price of RTFC is only available from 2020.

Figure 4: Super petrol biofuel premium implied by ethanol price together with UCOME, FAME-10 or traded RTFC price for remaining obligation

Sources: CMA calculations based on data from Argus (for biofuel, RTFC) and Platts (for fossil fuels), see Appendices 1 and 3. The traded price of RTFC is only available from 2020.

Petrol

29. Based on the information received, it appears that most volume is supplied on terms that link the blended petrol price to an ethanol T2 benchmark price and a FAME-10 benchmark price. The weight on the ethanol T2 benchmark price is the maximum allowed bioethanol percentage (10% for E10 petrol and 5% for E5 petrol) and the weight on the FAME-10 benchmark price is determined by multiplying the obligation by the maximum proportion of fossil petrol in blended petrol (90% for E10 and 95% for E5) and subtracting the weight on the ethanol T2 benchmark price. For example, for E10 petrol in 2022, (90%*12.599%) -10% = 11.34% - 10% = 1.34%.

30. Given that the FAME-10 price enters into the petrol formula, the point we have made above in relation to diesel (that use of a single-counted benchmark biodiesel price such as FAME-10 is inappropriate) also applies to petrol.

31. We have calculated biofuel premia for standard and super grades of petrol similar to for diesel, see Figures 3 and 4 above. The calculated premium for petrol, particularly for standard petrol since the introduction of E10 in September 2021, was lower than for diesel due to ethanol prices being lower than biodiesel prices (see Figure 1). The difference between the biofuel premium based on FAME-10 and UCOME was much smaller for petrol than for diesel, particularly for standard petrol since the introduction of E10 in September 2021, due to the weight on FAME-10 or UCOME being much lower in the petrol formula than the diesel formula.

32. Compliance with the RTFO may be achieved by using double-counted bioethanol rather than transfer from diesel. Indeed, the renewable fuel statistics (see Table 2) suggest there is significant use of double-counted as well as single-counted bioethanol in the UK. However, there do not appear to be any published reference prices specifically for double-counted bioethanol,[20] therefore at present double-counted bioethanol cannot readily be used in a pricing formula.

Suppliers' views on our emerging analysis

33. We shared our emerging analysis with 10 large wholesale suppliers of road fuel and received 8 responses.

[20] Platts and Argus publish reference prices for 'premium' T2 ethanol, but we understand from suppliers that these are not necessarily reflective of the double-counted bioethanol used in the UK.

34. The suppliers did not consider that the use of FAME-10 necessarily increased prices. They said the wholesale market was competitive and the biofuel component of pricing formulae should not be considered in isolation from other components as the additional revenue from linking to FAME-10 rather than UCOME would tend to be offset by a lower 'add-on' premium.[21] Some suppliers provided evidence that they offered customers a choice of different formulae (optionality) with a lower level of 'add-on' premium if the FAME-10 benchmark was used. These suppliers submitted that the difference reflected their expectation of FAME-10 and UCOME prices over the contract period. It was also submitted that the large increase in FAME-10 prices in 2021 and 2022 reflected a series of unanticipated events,[22] and two suppliers indicated that biofuel pricing had increased their profits (compared to the level they would otherwise have been) though one added that this only to a limited extent ameliorated some of the material refining losses it had incurred in the previous decade.[23]

35. We asked suppliers to provide any evidence that higher prices due to the use of single-counted biodiesel benchmark prices, such as FAME-10, was offset by other factors, such as a lower 'add-on' contractual premium over the benchmarks-derived price: for example, evidence from contractual negotiations of a link between the biodiesel benchmark and the 'add-on' contractual premium or evidence that the 'add-on' contractual premium for diesel has declined relative to petrol. The evidence provided in relation to contracts suppliers had with retailers was limited:

    a. One supplier submitted that contract premiums factored into its view of what the compliance cost would be. It submitted an attachment showing a basic RTFO calculation when doing a negotiation with a large supermarket. This showed its forward view of the 2021-23 benefit from FAME-10 was 2.45p/litre which was factored into the terms offered. The attachment also showed that the actual benefit from FAME-10 was more than this in 2021 and 2022 (3.74p/litre in 2021 and 3.27p/litre in 2022).

    b. Another supplier submitted that it had adjusted its pricing model to reflect the expected benefits from FAME-10; and that this had resulted in it reducing the product premium element in FAME -10 contracts by

[21] This is the premium (or discount) to the blended fossil and biofuel price, sometimes referred to as the Platts premium, which is negotiated between suppliers and customers for each contract.
[22] One supplier said that such events included the Russian invasion of Ukraine, Covid-19-related hampering of harvests, poor weather, supply issues for two significant producers of sodium methylate (a key catalyst in the biodiesel production process), uncertainty and changes in regulation.
[23] Two suppliers acknowledged this in their responses to our biofuels analysis, and one did so in an earlier response to an information request.

over 0.8 pence per litre between Q1 2021 and Q1 2022. We noted that this was only about half of the benefit we calculated from linking to FAME-10 rather than UCOME in diesel contracts over the same period (see Figure 2). The supplier said the expected benefit over the life of the contract did not reflect the full extent of the increase in the biofuel premium we had identified, as this was not (and is not) expected to continue in the medium to long term.

c. Another supplier said that it saw additional hydrocarbon premia applied on all UCOME-based pricing contracts, most RTFC-based pricing, and approximately half of non- FAME-10 gasoline contracts. This supplier quoted an example of a recent offer from a major supplier in the UK which allowed for pricing on a UCOME-formulated basis, but with an additional $35/mt hydrocarbon premium, which was equivalent to 2-2.5 pence per litre on the finished grade and directly equal to the difference between UCOME and FAME-10 pricing at the time. We noted that this was one example and related to a contract between suppliers, rather than to a contract between supplier and retailer.

d. Another supplier compared the terms it agreed with a large customer which is itself a wholesale supplier for a 1 year diesel contract starting in June 2022 (which included an option of linking to the RTFC price instead of FAME) to the terms on a broadly similar contract with a supermarket: the 'add-on' premium was lower in the contract without the option of linking to the RTFC price by about $8/tonne or 0.6p/litre. We noted this difference was relatively small compared to the differences shown in Figure 2 during 2021 and 2022.

36. No evidence was provided that the 'add-on' contractual premium for diesel had declined relative to petrol, as would be expected given the greater impact of FAME-10 prices on diesel than petrol (as shown by a comparison of Figure 2 with Figure 3).[24]

37. Another point made by suppliers was that the use of FAME-10 dated back to the early years of the RTFO and had become established industry practice and customer preference. Some suppliers submitted that, as the FAME-10 benchmark continued to be used across the market, this enabled customers to easily compare prices on a 'like-for-like' basis across competitors.

38. Some suppliers also made the point that they bought as well as sold on contracts linking to FAME-10.

[24] Figure 3 relates to standard grade petrol, which accounts for the bulk of UK sales.

39. Some suppliers referred to the better cold weather performance of FAME-10 and said that the higher price of FAME-10 provided some compensation for the more expensive blending components that were required with UCOME.[25] One supplier provided an example of a quote it had received based on the UCOME reference price plus the difference between FAME-10 and Fame 0 and a total premium of $70/tonne on the biofuel element.[26] Again, we noted that this was one example and related to a contract between suppliers, rather than to a contract between supplier and retailer.

40. One supplier said that there was an important distinction between (i) the sustainability documentation that is claimed against the RTFO; and (ii) the physical product which includes the different specifications of the biofuels components that may be selected to be blended into the end road fuel. It submitted that fuel quality, seasonality, tank turnover, time to blend and testing requirements all affected the physical biofuel molecule that needed to be blended. It further submitted that, to enable obligated parties to meet physical fuel specifications, they could deliver FAME-10 molecules to the UK while attaching UCOME documentation, which enabled them to concurrently claim the double-counted certificates against the RTFO. It added that, although we had identified UCOME as the most commonly used product in the UK, this actually related only to the sustainability documentation claimed against the RTFO and not necessarily to the physical product.

Our view on suppliers' responses

41. We have considered carefully the views of suppliers. We consider that the use of different biofuels benchmark prices could, in principle, be offset by differences in 'add-on' premia. However, we note that such 'add-on' premia are in general negotiated at most once a year, so upward movements in the FAME-10 price in the interim would create a windfall for wholesale suppliers paid by retailers, which we would then expect to be passed on in the pump price.

42. Moreover, the evidence we received (see paragraph 35) was limited and did not appear to suggest that the impact of using FAME-10 in contracts was fully offset by lower 'add-on' premia.

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[25] Reference prices for FAME-10 are based on a cold filter plugging point (CFPP) of -10ºC, whereas reference prices for UCOME are based on a CFPP of 0ºC.
[26] This supplier also provided a quote for double-counted biodiesel with a CFPP of -10ºC at 200$/tonne above the FAME-10 price. We were unable to compare it with the contemporaneous UCOME price, but we noted that the double-counted UCOME reference price was frequently more than 200$/tonne above the single-counted FAME-10 reference price (this is consistent with the biofuel premium being lower for UCOME than FAME-10 due to UCOME being double-counted).

43. We do not consider that the continued use of FAME-10 gives rise to significant benefits as a result of retail customers being able to compare prices on a 'like-for-like' basis across competitors. This is because retailers can ask suppliers for a quote on a consistent basis, eg they can ask for quotes based on UCOME rather than FAME-10. We see no reason why a supplier would refuse to quote on the basis retailers request, but even if that were the case, comparisons can still be made using current and future prices for different benchmarks.

44. We note that, where suppliers buy blended fuel, they may do so on contracts linking to FAME-10 in order to limit the risk from divergence between buy and sell prices. Our concern is primarily with the contracts between suppliers and retailers, and we consider these are more likely to be driving suppliers' buy terms than vice versa.

45. In our consultation with suppliers, we stated that use of UCOME may involve some additional costs due to its higher CFPP but that all the additional costs involved in meeting the RTFO would be reflected in the traded RTFC price which showed similar results to the UCOME biofuel premium (see Figure 1); and that it was therefore unlikely that any additional costs associated with UCOME were significant. Although some suppliers referred to the need for additional blending components with UCOME (see paragraph 39), only one provided an example of the scale of the extra costs. Our view therefore remains that it is unlikely that the additional costs associated with UCOME are significant.

46. In relation to the point about the distinction between the RTFO sustainability documentation and the physical product '(see paragraph 40), we do not believe this affects our analysis which is based on comparing biofuel premia and taking into account that UCOME is double-counted under the RTFO, ie that only around half as much double-counted UCOME as single-counted FAME-10 is required to meet the RTFO.[27] If in fact single-counted FAME-10 can be documented as double-counted UCOME, suppliers would still benefit at least as much, and probably more,[28] from contractual terms that assume blending rates for a single-counted fuel.

[27] The ratio between the single-counted and double-counted premium over fossil fuel is not precisely 1 to 2 due to the RTFO being on fossil fuel rather than total fuel supply (see paragraph 15 and Table 3 which shows that for example in 2023 the ratio is 0.06138/0.11565 = 0.53)

[28] The double-counted UCOME price has usually been above the single-counted FAME-10 price. However, as shown in Figure 2, the biofuel premium has nearly always been lower for UCOME than FAME-10 once allowance is made for UCOME being double-counted.

Our views

47. We have found that most wholesale prices are linked to a biodiesel benchmark (FAME-10) that differs significantly from the benchmark for the biodiesel actually being used (UCOME). We consider that this is a problem. In the recent past we believe it has led to higher wholesale, and therefore, retail prices. Broader consequences include distortion of the pricing signals being conveyed to the market; prices being more volatile (due to FAME prices being more volatile than alternatives, see Figure 1); and additional risk being created in the supply chain due to differences between cost and revenue being increased.

48. While there is no perfect way of reflecting costs in pricing formulae, we consider that the current approach of linking to FAME-10 does not work well and could be improved. We would expect wholesale suppliers to offer retailers a more cost-reflective benchmark than FAME when negotiating new contracts.

49. In this context, there currently appear to be three main possible alternatives to the use of FAME-10 reference prices:

    a. UCOME reference prices: we have not heard any disadvantages of this approach;

    b. RTFC reference prices: while this has some theoretical advantages over UCOME, we heard that RTFC reference prices may not represent a robust benchmark because the market for RTFC was illiquid and may become more illiquid due to the progressive tightening of the RTFO (see paragraph 10); and

    c. Provision of RTFC by customer to supplier: this is used in some contracts at present but illiquidity in the RTFC market due to progressive tightening of the RTFO is at least as much of an issue for this approach as for direct linkage to RTFC reference prices. Therefore, we would be concerned that this approach does not scale up well to a larger number of contracts.

50. In light of these points, our view is that the best approach currently is to base the biofuel premium on UCOME reference prices instead of FAME-10 reference prices.

51. Additionally, we remain concerned that high biofuel prices have at times caused the biofuel component of wholesale prices to exceed the level implied by the RTFC buy-out price which is intended to protect consumers, and that this could happen again. We would therefore suggest that market participants

consider including terms in pricing formulae that limit the biofuel premium to a level that is consistent with the RTFC buy-out price. However, we regard this as an addition, not an alternative, to basing the biofuel premium on UCOME instead of FAME-10 reference prices. This is because limiting the biofuel premium to a level based on the RTFC buy-out price only partially addresses the disadvantages of using FAME-10 reference prices.

Appendix 1: Formulae for the price of blended road fuel

Introduction

1. The purpose of this appendix is to set out formulae to calculate the price of blended road fuel using benchmark prices for fossil fuel and renewable fuels, consistent with legislation in particular the RTFO. Contracts for the supply of road fuel commonly include excise duty and a premium or discount over benchmark prices: in the interests of simplicity, these are not included in the formulae below.

2. Since 2019, the RTFO has contained both a main and a development fuel obligation (dRTFO). The main obligation can be met through purchasing RTFCs or using renewable fuels such as biodiesel or bioethanol for which daily benchmark prices are available from agencies such as Argus and Platts. The dRTFO can only be met through specific development fuels, which being relatively new inevitably do not have benchmark prices. The dRTFO is therefore assumed to be bought out at the rate specified in the legislation (this is currently 80p/litre of obligated development fuel).

Diesel

Formula based on RTFC price

3. The simplest approach to a diesel formula is to use the RTFC price.

$$BD = FD + m.RTFC + d.DFBP$$

Where BD is price of blended diesel

FD is price of fossil diesel

m is the main obligation under the RTFO (% of fossil fuel)

RTFC is the price of an RTFC

d is the dRTFO (% of fossil fuel)

DFBP is the buy-out price of the dRTFO

With all prices in pence per litre and m and d expressed as % of fossil fuel use.

Formula based on double-counted biodiesel

4. The main renewable fuel that is blended with fossil diesel is UCOME, which is double-counted under the RTFO. The price of blended diesel can be expressed as a weighted average of the fossil diesel price and the UCOME price together with the buy-out cost of the dRTFO:

$$BD = k.FD + (1-k).UCOME + d.k.DFBP$$

Where k is the volume of fossil diesel as a proportion of the total volume of diesel

UCOME is the price of UCOME

Note: if the main RTFO is met through double counted biodiesel, such as UCOME and the dRTFO is bought out, the volume of biodiesel is equal to VOL_{FD}*m/2 where VOL_{FD} is the volume of fossil diesel. The total volume of diesel (fossil and bio) is then VOL_{FD}*(1+m/2). Then k = {VOL_{FD}/(VOL_{FD}*(1+m/2))} = 1/(1+m/2) = 2/(2+m).

5. The formula for BD in paragraph 4 can therefore be rewritten in terms of the fossil diesel price, the excess of the UCOME price over the fossil diesel price (UCOME premium) and the DFBP.

$$BD = FD + (m/(2+m)).(UCOME-FD) + (2d/(2+m)).DFBP$$

6. Comparison of the formulae in paragraphs 3 and 5 gives the RTFC cost implied by the UCOME premium.

$$RTFC = (1/(2+m)).(UCOME – FD) + (d/(2+m)).DFBP$$

Formula based on single-counted biodiesel

7. Current UK specification diesel (B7) has a maximum biodiesel content of 7%. Consequently the maximum renewable fuel as a percentage of fossil that can be achieved with single-counted biodiesel is 7.527% (7%/93%). Hence single-counted biodiesel cannot achieve the main obligation under the RTFO which was 12.599% for 2022 and is 13.078% for 2023.

8. Therefore, the use of a single-counted biodiesel benchmark, such as FAME-10 is problematic. Nevertheless, it is possible to use some single-counted biodiesel without underachieving against the RTFO[29] and such benchmarks continue to be used. We have therefore used a similar approach to that set

[29] A combination of 4.7% double-counted and 2.3% single-counted biodiesel could achieve the 2022 obligation; while 5.2% double-counted and 1.8% single-counted biodiesel could achieve the 2023 obligation.

out above for UCOME to express the blended diesel price in terms of the fossil diesel price, the excess of the single-counted biodiesel price over the fossil diesel price and the DFBP.

$$BD = FD + (m/(1+m)).(FAME-FD) + (d/(1+m)).DFBP$$

Where FAME is the price of a single-counted biodiesel such as FAME - 10.

9. Comparison of the equations in paragraphs 3 and 8 gives the RTFC cost implied by the excess of the single-counted biodiesel price over the fossil diesel price.

$$RTFC = (1/(1+m)).(FAME – FD) + (d/(1+m)).DFBP$$

Petrol

10. The simplest approach utilising the RTFC price as set out in paragraph 2 is less appropriate for petrol since standard petrol (E10) has a minimum renewable content (5.5%), the main renewable blended with fossil petrol (single-counted bioethanol) tends to be cheaper than other renewables but cannot by itself achieve the main obligation under the RTFO as the maxmum bioethanol content of standard petrol (E10) is 10% and of super petrol (E5) is 5%. This is discussed further in the main paper.

11. In this context, we consider formulae assuming a proportion of single-counted bioethanol with the remainder of the main obligation under the RTFO achieved by one of the following:

    i. Purchase of RTFCs

    ii. Using sufficient double-counted biodiesel to achieve the RTFO across both diesel and petrol

    iii. Using sufficient double-counted bioethanol.

Purchase of RTFCs

12. The formula assuming purchase of RTFCs is comprised of a weighted average of the price of fossil petrol and bioethanol together with the cost of RTFCs and of the development fuel buy-out.

$$BP = (1-e).FP + e.ETH + (m-e/(1-e)).(1-e).RTFC + d.(1-e).DFBP$$

Where BP is price of blended petrol

FP is price of fossil petrol

e is the proportion of bioethanol in blended petrol

ETH is the price of single-counted bioethanol

Note: if the proportion of bioethanol in blended petrol is e, the contribution to achieving the main RTFO is e/(1-e) since the RTFO is expressed as a percentage of fossil fuel. The remainder of the main RTFO to be achieved by purchasing RTFCs is (m-e/(1-e)) but, as RTFCs only need to be purchased on fossil fuel, this is multiplied by the proportion of fossil fuel (1-e) when calculating the cost of purchasing RTFCs. Similarly, as the dRTFO is applied to fossil fuel, the DFBP is multiplied by the proportion of fossil fuel (1-e).

13. This formula for the price of blended petrol can be rewritten in terms of the fossil petrol price, the excess of the single-counted bioethanol price over the fossil petrol price (ETH premium), the RTFC price and the DFBP.

$$BP = FP + e.(ETH-FD) + (m-e.m-e).RTFC + (1-e).d.DFBP$$

14. Comparison of the formulae in paragraphs 3 and 13 gives the RTFC cost implied by the ethanol premium.

$$RTFC = (1/(1+m)).(ETH – FP) + (d/(1+m)).DFBP$$

Biodiesel

15. By substituting the expression for the cost of an RTFC implied by the UCOME price in paragraph 6 into the formula for BP in paragraph 13, the formula for BP can be written in terms of the fossil petrol price, the excess of the single-counted bioethanol price over the fossil petrol price (ETH premium), the excess of the double-counted UCOME price over the fossil diesel price and the DFBP.

$$BP = FP + e.(ETH-FD) + ((m-e.m-e)/(2+m)).(UCOME-FD) + ((2-e)/(2+m)).d.DFBP$$

16. Since use of single-counted biodiesel cannot by itself meet the RTFO for diesel (see paragraph 7), it cannot be used to make up the shortfall against RTFO from single-counted ethanol and does not appear relevant to the price of blended petrol. Nevertheless, for completeness, we similarly express the formula for BP in terms of the fossil petrol price, the excess of the single-counted bioethanol price over the fossil petrol price (ETH premium), the excess of the single-counted biodiesel price (FAME) over the fossil diesel price and the DFBP.

BP = FP + e.(ETH-FD) + ((m-e.m-e)/(1+m)).(FAME-FD) +.(d/(1+m))..DFBP

Double-counted bioethanol

17. Suppliers could also us double-counted bioethanol to meet the RTFO.

18. Using similar logic to above, the formula for BP can be written in terms of the fossil petrol price, the excess of the single-counted bioethanol price over the fossil petrol price (ETH premium), the excess of the double-counted bioethanol price over the fossil petrol price and the DFBP.

    BP = FP + (2e+e.m-m).(ETH-FD) + (m-e.m-e).(DCETH-FD) + d.(1-e)DFBP

    Where DCETH is the double-counted bioethanol price.

19. For E10 petrol, use of double-counted bioethanol can meet the RTFO on petrol. For E5 petrol, use of double-counted bioethanol has not since 2020 by itself met the RTFO; some purchase of RTFCs or transfer from diesel would be required. Assuming maximum use of bioethanol and purchase of RTFCs to make up any shortfall, the equation in the previous paragraph would be amended to:

    If e>=m/(2+m), ie use of double-counted bioethanol can meet the RTFO:

    BP = FP + (2e+e.m-m).(ETH-FD) + (m-e.m-e).(DCETH-FD) + d.(1-e)DFBP

    If e<=m/(2+m)

    BP = FP + e.(DCETH-FD) + (m-e.m-2e).RTFP + d.(1-e)DFBP

    Note: if e=m/(2+m), ie use of double-counted bioethanol just meets the RTFO both expressions reduce to BP = FP + e.(DCETH-FD) + d.(1-e)DFBP

20. By substituting the expression for the cost of an RTFC implied by the UCOME price in paragraph 6 into the second formula for BP in paragraph 19, the formula for BP can alternatively be written in terms of the fossil petrol price, the excess of the double-counted bioethanol price over the fossil petrol price (DCETH premium), the excess of the double-counted UCOME price over the fossil diesel price and the DFBP.

    If e<=m/(2+m)

    BP = FP + e.(DCETH-FP) + (m-e.m-2e)/(2+m)*(UCOME-FD) + d.{(1-e)-(m-e.m-2e)/(2+m)}.DFBP

Illustration

21. Table A1.1 below illustrates for a simple example with a supply volume of 100m litres of double-counted biodiesel (UCOME) that the volumes implied by the CMA formula exactly meet the RTFO.

    i. Using the formula in paragraph 5 and the obligation for 2022 (12.599%), the weight attached to the UCOME premium is (0.12599/2.12599) = 5.926%. Similarly, the weight attached to the DFBP is 0.854%.

    ii. If the total volume of blended diesel is 100m litres, the formula implies a supplier uses 5.926m litres of UCOME, providing 11.852m RTFCs. With buy-out of 0.854m development RTFCs.

    iii. If the total volume of blended diesel is 100m litres and a supplier uses 5.926m litres of UCOME, it is using 94.074m litres of fossil diesel. If the 2022 RTFO percentages are applied to this fossil volume, the required number of main and development RTFCs are 11.852m and 0.854m respectively. This is exactly the same as implied by the formula.

    iv. In other words, the formula would exactly cover the additional costs of purchasing UCOME at the benchmark price to meet the RTFO.

Table A1.1: Illustration of formula for price of blended diesel based on UCOME premium

	CMA formula	Supplier formula
Assumed volume	100	100
Formula factors 2022		
UCOME premium	5.926%	5.859%
DFBP	0.854%	0.844%
UCOME volume and formula RTFCs		
UCOME volume	5.926	5.859
Main RTFO	11.852	11.717
dRTFO	0.854	0.844
Volume & 2022 Obligation		
Fossil volume	94.074	94.141
Main RTFO %	12.599%	12.599%
Main RTFO volume	11.852	11.861
dRTFO %	0.908%	0.908%
dRTFO volume	0.854	0.855
Difference between formula RTFCs and obligation		
Main RTFO	0.000	-0.144
dRTFO	0.000	-0.010

Source: CMA analysis

22. Responses to the CMA's information requests suggest that suppliers are using slightly different formulae to those set out above. In relation to diesel, suppliers appear to have calculated the percentage applied to biodiesel by multiplying the obligation by 93% (the maximum proportion of fossil diesel in

blended diesel). For example, for 2022, 93%*12.599% = 11.717% for single-counted biodiesel and half of this (5.859%) for double-counted biodiesel.

23. Table A1.1 illustrates that the volumes implied by the supplier formula leads to a slight difference with the requirement against the RTFO. For example, in relation to the main obligation in 2022, purchasing 5.859m litres of UCOME would give 11.717m RTFCs but this is less than the obligation on the implied fossil diesel volume. Implied fossil diesel volume is (100-5.859=94.141m litres) and the obligation on this is (12.599%*94.141 = 11.861)m RTFCs. In other words, the supplier formula would not exactly cover the additional costs of purchasing UCOME at the benchmark price to meet the RTFO.

24. The only circumstance where this formulation for UCOME would be correct is if the RTFO was at a level which required exactly 7% of UCOME, ie if the main RTFO was 15.054% assuming, as above, that the dRTFO is bought out. {(15.054%/2)/(1+15.054%/2) = 7%}.

25. In the case of double-counted biodiesel illustrated above, the effect of the supplier formula is to slightly reduce the blended price of fuel compared to the logically coherent formulae set out earlier in this Appendix. However, in the case of single-counted biodiesel, the effect is to increase the blended price of fuel compared to the logically coherent formulae set out earlier in this Appendix. For example, our calculations show that during the period January to August 2022, using the supplier formula increased the additional diesel cost from the FAME-10 rather than UCOME benchmark from 3.39 to 3.80p/litre, an increase of 0.41p/litre.

26. We put these points to suppliers. None disputed our logic, but they considered this was standard market practice.

Appendix 2: Formula for the price of blended petrol using double-counted bioethanol

1. Table A2.1 below extends Table 3 above (in the main text of the Annex) to show factors to calculate the price of blended petrol using double-counted bioethanol. From 2020, the RTFO on E5 petrol supply could not be achieved using double-counted bioethanol, therefore some contribution from purchase of RTFCs or transfer from diesel would be needed. For E5 petrol from 2020, Table A2.1 shows the factors assuming the maximum use of double-counted bioethanol with the remainder of the RTFO achieved by purchase of RTFCs or transfer from diesel, based on the UCOME premium. With the introduction of E10 petrol as standard in September 2021, the RTFO on standard, but not super, petrol could be achieved again with single- and/or double-counted bioethanol without needing a contribution from purchase of RTFCs or transfer from diesel.

Table A2.1: Factors to calculate the price of blended petrol using double-counted bioethanol

Year	Ethanol premium	Double-counted bioethanol premium	RTFC price	DFBP	Formula using double-counted biodiesel instead of RTFC price	
					UCOME premium	DFBP
Standard petrol (E5 to Aug 2021, E10 from Sep 2021)						
To 14/04/18	4.750%					
From 15/04/18	2.574%	2.426%				
2019	1.279%	3.721%		0.104%		
2020		5.000%	0.105%	0.158%	0.050%	0.158%
Jan-Sep 2021		5.000%	0.145%	0.528%	0.069%	0.528%
Sep-Dec 2021	9.649%			0.502%		
2022	8.661%	1.339%		0.817%		
2023	8.230%	1.770%		1.028%		
Super petrol (E5, from Sep 2021)						
Sep-Dec 2021		5.000%	0.145%	0.528%	0.069%	0.528%
2022		5.000%	1.969%	0.863%	0.926%	0.854%
2023		5.000%	2.424%	1.085%	1.138%	1.072%
Notes	This is the maximum single-counted bioethanol % consistent with use of bioethanol to meet main RTFO	See formula in Appendix 1 paragraph 19			Factors for UCOME premium and DFBP if formula using double-counted biodiesel instead of RTFC price. Factors for the ethanol and double-counted bioethanol premium remain the same. See formula in Appendix 1 paragraph 20	

Source: CMA analysis, see Appendix 1

Appendix 3: Data used

1. Table A3.1 below sets out the data used in our analysis. The period covered is January 2015 to August 2022 (with the exception of RTFC prices where we have only used data from January 2020 to August 2022).

Table A3.1: Data used

Fuel	Source	Unit & price point	Conversion	Description
Fossil Diesel	Platts	$/tonne, midpoint	0.845 kg/litre	ULSD 10ppmS CIF NWE Basis UK Cargo
Fossil Petrol	Platts	$/tonne, midpoint	0.755 kg/litre	Gasoline 10ppmS CIF NWE Cargo
UCOME	Argus	$/tonne, midpoint	1132 litres/tonne	Biodiesel UCOME (used cooking oil) RED ARA range barge fob*
FAME 0	Argus	$/tonne, midpoint	1132 litres/tonne	Biodiesel FAME 0C CFPP RED ARA range barge fob†
FAME-10	Argus	$/tonne, midpoint	1132 litres/tonne	Biodiesel FAME -10C CFPP RED ARA range barge‡
Ethanol	Argus	$/tonne, midpoint	0.789 kg/litre	RED (T2) ethanol fob ARA range§
RTFC	Argus	p/RTFC, midpoint	N/A	UK other RTFC reduction 2020-22 obligation prompt#
Exchange rate	Bank of England	$/£	N/A	Code: XUDLUSS

Source: S&P Global (Platts), Argus, Bank of England and CMA analysis; daily data unless stated otherwise. ULSD is ultra low suplhur diesel and ppmS is parts per million sulphur. RED indicates material must be accompanied with Renewable Energy Directive (RED)-compliant certification. CFPP is cold filter plugging point.

* Minimum 87.5pc greenhouse gas (GHG) savings, based on a fossil fuel comparator of 94g CO2 equivalent/MJ; qualified to count double under UK renewable energy for transport laws and regulations

† Minimum 60pc greenhouse gas (GHG) savings, based on a fossil fuel comparator of 94g CO2 equivalent/MJ
‡ Minimum 60pc greenhouse gas (GHG) savings, based on a fossil fuel comparator of 94g CO2 equivalent/MJ
§ Minimum 64pc greenhouse gas (GHG) savings, based on a fossil fuel comparator of 94g CO2 equivalent/MJ
# Prices at each date are for current obligation year and are weekly averages up to October 2021, daily thereafter.

2. The prices for fossil diesel and petrol are quoted on a CIF NWE (cost, insurance and freight to North West Europe) cargo basis while the prices for biofuel are quoted on an FOB ARA (free on board from Amsterdam/Rotterdam/Antwerp). Pricing formulae in contracts usually include a biofuels freight premium to reflect the cost of transport from ARA to UK ports. This has not been included in our analysis but we note that a biofuels freight premium of $15 to $25 per tonne would add about 1.0 to 1.8p/litre to biofuels costs and hence to the comparison with RTFC prices.

Annex F: Road fuels benchmarks

Summary

1. Refined petrol and diesel are traded 'over-the-counter', rather than on a public exchange. Therefore, there is no publicly-available market price for market participants to use in order to price their products. As is common in many commodity markets, market participants use price assessments constructed by price reporting agencies ('**PRAs**') as benchmarks in their contracts. Price assessments are estimates of the market price formed from private transaction information and other data sources collected by PRAs.

2. There are a range of different specifications of petrol and diesel traded in the UK road fuels sector. Market participants have settled on a single specification for petrol and a separate one for diesel to form the basis for their trading, and have separately settled on a specific PRA to provide a price assessment for each specification.

3. UK road fuels sector market participants nearly universally use two fossil fuel price assessments as benchmarks – one for petrol ('Gasoline 10ppmS CIF NWE Cargo'), one for diesel ('USLD 10ppmS CIF NWE Basis UK Cargo') – provided by Platts (U.K.) Limited, part of S&P Global Commodity Insights ('**Platts**)', to write their pricing contracts. The vast majority of pricing contracts between refiners and wholesale suppliers and between wholesale suppliers and retailers (referred to generally, but not exclusively, as 'market participants' below) are specified in the form of 'Platts plus/minus'. Other relevant price assessments are produced by other PRAs, principally Argus Media Ltd ('**Argus**').

4. Due to the importance of price assessments in the functioning of the road fuels sector, we have investigated how they are constructed and the role they play, principally in the adjustment of prices over time along the vertical chain from refining via wholesaling to the retail level. Though we have focused on Platts as the provider of the price assessments used overwhelmingly in the market, we have not assessed the relative strengths and weaknesses of different PRAs' price assessment methodologies.

5. We have gathered information on the number of transactions, bids and offers used to form the Platts price assessments used in the vast majority of contracts in the sector. In the period January 2015 – August 2022:

   (a) The daily petrol Platts price assessment was formed using information from 32 transactions (in total), with a further 66 bids and 83 offers made that did not result in a transaction. On 98% of days there were no

transactions and on 94% of days there were no bids, offers or transactions.

(b) The daily diesel Platts price assessment was formed using information from 79 transactions (in total), with a further 1715 bids and 215 offers made that did not result in a transaction. On 96% of days there were no transactions and on 52% of days there were no bids, offers or transactions.

6. The number of transactions and offers informing the petrol and diesel Platts price assessments has therefore been very low for an extended period of time. For the petrol Platts price assessment there has also only been a small number of bids, while for the diesel Platts price assessment the number of bids has been higher. The evidence available to the CMA suggests that only a small proportion of transactions and other trading activity are being reported to Platts to be used in forming the petrol and diesel Platts price assessments.

7. Whilst we have not compared the liquidity of Platts' price assessments with those of Argus, we have found that there can be sustained and volatile differences between Platts' assessments and the similar price assessments produced by Argus, especially during periods of market volatility such as after the start of Russia-Ukraine in February 2022.

The role of PRAs

8. Many internationally traded commodities, including crude oil and refined petrol and diesel, are sold 'over-the-counter' in private bilateral transactions, rather than on public exchanges. Therefore, information from transactions, bids and offers, including prices, is not publicly available to other market participants by default.

9. The resulting lack of publicly-available information creates a need for market participants to have market information, and so a commercial opportunity for PRAs to collect and analyse market information and data, and then publish it for their customers. This information and data is used by market participants to make better informed business decisions.

10. One type of product which PRAs sell to their customers is commodity price assessments, which are a view of the prevailing market price for a specific commodity.[1] The exact methodology used to produce a commodity price

[1] There are three broad types of commodity price assessment: spot, the price at the top of the supply chain; rack, the price at the point where the commodity is sold wholesale; and retail, the price at the end of the supply chain. For road fuels, these three points represent the refinery gate, the fuel terminal and the petrol filling station

assessment varies by commodity and by PRA. To form their price assessments, PRAs collect information from market participants on a voluntary basis, meaning that market participants can choose if their private trading activity is collected, analysed and published.[2]

The role of price assessments in the UK road fuels sector

11. Although PRAs compete to provide price assessments, usually all market participants use a single price assessment offered by one PRA for each commodity, ie one for petrol and one for diesel.

12. This likely reflects network effects as the benefit of using a certain specification and specific price assessment tends to be greater, the more others use it.

13. We understand that two Platts price assessments – one petrol, one diesel - are nearly universally used as the benchmark in transactions between domestic and international refineries and UK wholesale suppliers, and between UK wholesale suppliers and UK retailers.

    (a) The petrol Platts price assessment refers to Platts' 'Gasoline 10ppmS CIF NWE Cargo' price assessment.[3] It aims to capture the price of imported RON 95 petrol that is yet to have ethanol added to it.[4] It was first published on 1 October 2008.

    (b) The diesel Platts price assessment refers to Platts' 'USLD 10ppmS CIF NWE Basis UK Cargo' price assessment.[5] It aims to capture the price of the type of low sulphur diesel imported into the UK. It was first published on 1 November 2007.

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respectively. Only spot commodity price assessments are used in the UK road fuels sector. Source: CMA's decision of 19 October 2021 in the case of no. ME/6918/20, Anticipated acquisition by S&P Global, Inc of IHS Markit Ltd. (**S&P Global/IHS Market Ltd**), paragraph 67.

[2] Platts told us that it has procedures in place to safeguard against selective and/or false reporting of information, such as the transparency of its 'market-on-close' process.

[3] Identification Code: AAXFQ00. CIF ('Cost, Insurance and Freight') refers to how the price of the petrol/diesel includes haulage costs, as opposed to FOB ('Free on Board') which does not. NWE refers to the geographic region of Northwest Europe. 10ppmS refers to its sulfur content being maximum 10 parts per million. It is evaluated on a 'Thames basis' because of the Thames' role as an important intra-European trade flows hub. Transactions to import locations other than the Thames are normalised to as if they had done so. The specification is set for 'cargoes' (shipments 9,000 – 11,000 metric tonnes in size) with delivery due 10 – 25 days from the date of publication. Shipments of greater than 9,000 – 11,000 metric tonnes and with a delivery timeline different to 10 – 25 days are normalised back to the basis specification. Source: S&P Global Website, *Specifications Guide: Europe and Africa Refined Oil Products*, available at S&P Global Website, Specifications Guide: Europe and Africa Refined Oil Products (last visited 17 February 2023).

[4] Platts submitted to the CMA that their petrol specification is designed to be "aligned with the grade that importers into short locations of the UK typically import, with traditionally ample supply coming from refineries located in Scandinavia." Ethanol is added to meet renewable fuel obligations.

[5] Identification Code: AAVBH00. USLD refers to 'Ultra-low Sulfur Diesel' reflecting the maximum sulfur content of 10ppm, ie '10ppmS'.

14. Prices in contracts are specified on a 'Platts plus/minus' basis.[6] The 'plus/minus' is negotiated by the transacting parties to reflect their own costs and to give them a margin. The exact 'plus/minus' in a contract will depend on the Parties' relative bargaining positions. Market participants benefit from specifying transaction prices in this form because it reduces their exposure to volatility in the ex-refinery price of petrol and diesel. For example, a wholesale supplier who buys at 'Platts + 2' and sells at 'Platts + 7' has a unit spread of 5 protected from changes in the ex-refinery price of petrol/diesel.

15. Without the use of price assessments as benchmarks, market participants would face higher information search costs to identify market prices and would have to use alternative methods to reduce their exposure to volatility in the ex-refinery price of petrol and diesel.

16. Argus, another PRA, produces two price assessments – one for petrol, one for diesel – which the CMA understands have nearly identical product specifications to the two Platts price assessments identified above: a 'Gasoline 10ppm non-oxy NWE cif' for petrol and 'Gasoil diesel UK ultra low sulphur cif' for diesel. Argus told us that their petrol and diesel price assessments are not used in contracts in the UK in the same way as the Platts price assessments.

Price assessment methodologies

Platts

17. Platts uses a 'market-on-close' methodology to produce its commodity price assessments. Platts uses market activity reported throughout the day, but there is a specific focus on activity in the 'window' of the last 30-45 minutes of each day's trading (when the market is typically most active), to assess a commodity's price at the point when the day's trading ends. Since trading is over the counter, rather than on a public exchange, market participants must report their trading activity to the relevant PRA, in this case Platts, for it to be used to form the relevant price assessment.

18. When there is no or limited activity in the window before market close, Platts provides greater weight to market activity across the full day and the market's wider context, including market activity in other related physical and derivatives markets.[7] For the diesel Platts price assessment, these other

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[6] Evidence we have seen in the course of the market study indicates that the 'Platts prices' are nearly universally used to specify prices in contracts between market participants. For example, see PRA response to CMA invitation to comment.

[7] Platts submitted to the CMA that in the event that no transactions, bids or offers are reported on a given day Platts will consider "the fundamental supply/demand analysis for the market in question".

related markets include its linked derivatives markets and the wider Northwest Europe diesel market.[8] For the petrol Platts price assessment, information from the Eurobob[9] market may be factored in alongside UK-continent freight rates for example.[10]

19. Platts told us that the reason for focusing on trades during this 'window' is to ensure that Platts' price assessments more closely reflects the price at a specific point in time, at the end of the trading day. Platts further told us that all trading information is published in real time, including identifying participants by name. This allows Platts to verify price information reported and test it with the market at large in real time. Market participants can draw Platts' attention to trades reported on the Platts platform if they think they are unrepresentative of the market, or make use of Platts' price correction and complaints process. Additionally, Platts told us that it has procedures in place to safeguard against selective and/or false reporting of information.

20. For each daily price assessment, Platts uses pricing data from that day's completed spot transactions, as well as bids and offers for trading in the commodity that matches that price assessment's particular product specification that did not lead to a transaction that day, if there are any.[11] Platts gives the greatest priority to fully verifiable and transparent market information.[12] Platts told us that in the event of limited trading liquidity, a number of other data points, such as market activity in other related physical and derivatives markets in addition to this trading data, may be taken into account for the final price assessment. Platts has told us that it considers this to be sufficient to maintain the price assessment's quality in periods of low liquidity.

Argus

21. Two price assessments produced by Argus are of particular relevance to the UK road fuels sector: one is for petrol and the other is for diesel. Argus uses a

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[8] Platts submitted to the CMA that the diesel Platt price assessment's market is "inherently linked to the broader diesel cargo market in Northwest Europe".
[9] The European petrol 'blendstock' market – known as the 'Eurobob' market – is a barge-based petrol market centred on the Amsterdam, Rotterdam and Antwerp (ARA) trading hub.
[10] Specifically, the information that may be factored in includes the differentials to other petrol markets such as the Eurobob Gasoline Barges FOB AR or Premium Gasoline 10PPM Barges FOB AR price assessments' markets.
[11] As detailed for the petrol Platts price assessment in Footnote 3, market activity that is close to but does not exactly match the specification is 'normalised' to the specification. For example, a transaction with a traded volume smaller or greater than the specification's will be scaled to the specified cargo size.
[12] Source: https://www.spglobal.com/commodityinsights/PlattsContent/_assets/_files/en/our-methodology/methodology-specifications/benchmark-statements/ulsd-10ppms-cif-nwe-cargo.pdf

different methodology for each of them. As with the Platts price assessments, market participants choose whether to report their trading activity to Argus.

22. For petrol, the relevant Argus price assessment is 'Gasoline 10ppm non-oxy NWE cif'.

    (a) Like the petrol Platts price assessment, it aims to capture the price of imported RON 95 petrol. Argus told us that there are slightly different summer and winter versions of the specification. It is assessed and published as a $1/mt high-low range either side of a midpoint.

    (b) Argus typically assesses this grade as a differential to the Eurobob non-oxy barge price assessment it produces.[13] Argus told us it bases this differential on a regular survey of market participants to assess firstly the product quality differences between Gasoline 10ppm non-oxy NWE cif product and Eurobob non-oxy product and secondly the cost of shipping petrol from the ARA hub (which Eurobob price assessments are based on) and the UK. Argus told us it also factors in transactions, bids and offers for petrol cargoes in Northwest Europe when producing its Gasoline 10ppm non-oxy NWE cif.

23. For diesel, the relevant Argus price assessment is 'Gasoil diesel UK ultra low sulphur cif.

    (a) Like the diesel Platts price assessment, it aims to capture the price of the type of low sulphur diesel imported into the UK. It is assessed and published as a $0.50/mt high-low range either side of a midpoint.

    (b) Argus told us that it uses a wide range of input information when constructing its diesel price assessment. Argus told us that it uses transactions, bids and offers for diesel cargoes into a wide range of Northwest Europe ports, which are then normalised to reflect the cost of diesel imported into the UK, specifically the Thames. Additionally, Argus told us that, in the absence of such trading activity, it may use trading activity in 'forward' markets and from related geographic markets, such as the ARA hub.

The Platts price assessments' liquidity

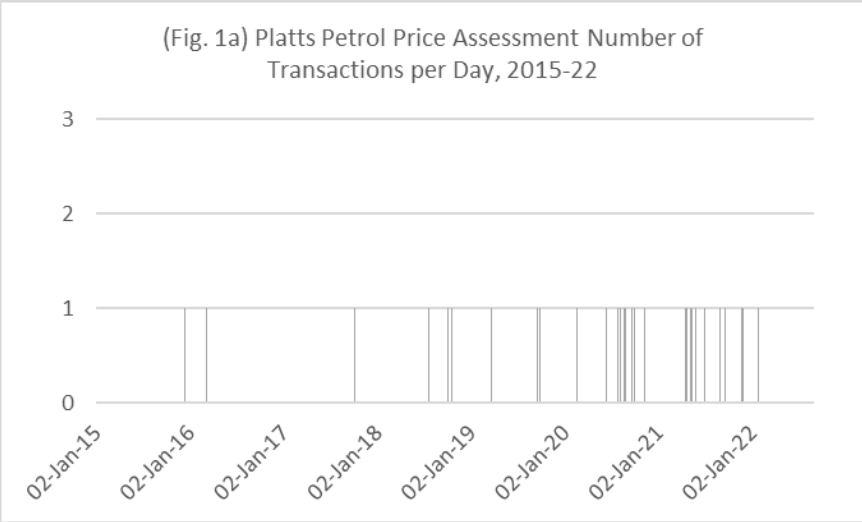
24. As they are the price assessments nearly universally used in the road fuels sector, we have focused our evidence gathering on the Platts price

[13] As also noted in Footnote 9, the European petrol 'blendstock' market – known as the 'Eurobob' market – is a barge-based petrol market centred on the Amsterdam, Rotterdam and Antwerp (ARA) trading hub.

assessments. We obtained data from Platts on the quantity of the transactions, bids and offers input information that has been used by Platts to form the petrol and the diesel Platts daily price assessments published 1935 times in the period between January 2015 and August 2022.

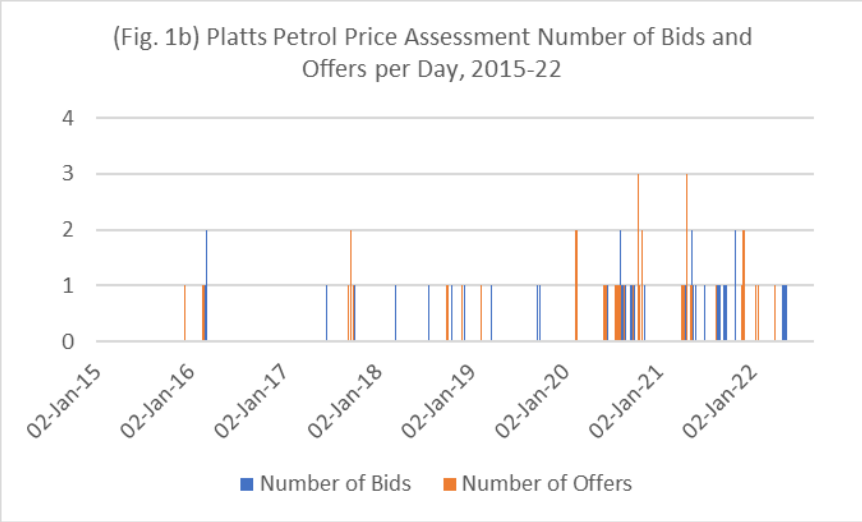
(a) **Petrol** – the petrol Platts price assessment was formed using information from 32 transactions (total) in this period (Fig. 1a), with a further 66 bids and 83 offers made that did not result in a transaction (Fig. 1b). On 98% of days there were no transactions and on 94% of days there were no bids, offers or transactions.

Figure 1a Platts petrol price assessment - number of transactions per day 2015-22



Source: Platts data

Figure 1b Platts petrol price assessment - number of bids and offers per day 2015-22



Source: Platts data

(b) **Diesel** - the diesel Platts price assessment was formed using information from 79 transactions (total) in this period (Fig. 2a), with a further 1715 bids and 215 offers made that did not result in a transaction (Fig. 2b). On 96% of days there were no transactions and on 52% of days there were no bids, offers or transactions.

Figure 2a Platts diesel price assessment - number of transactions per day 2015-22

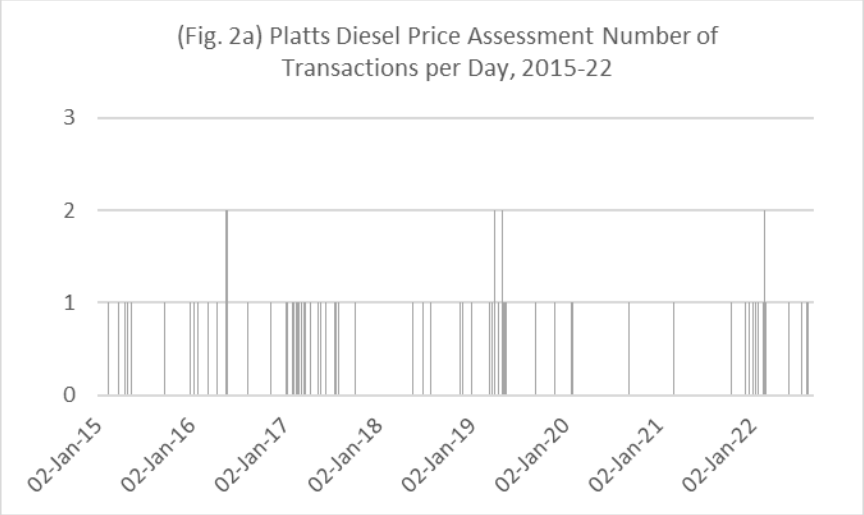
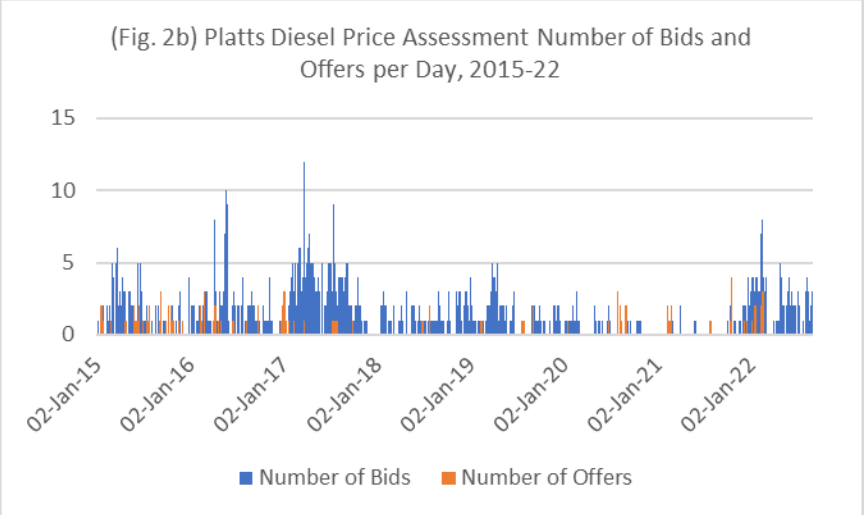


Figure 2b Platts diesel price assessment – number of bids and offers per day 2015-22



Source: Platts data

25. There is therefore a small number of transactions, bids and offers, especially in the case of petrol, where there have been lengthy periods when no transactions, bids or offers were reported.

26. A PRA's price assessment for a particular specification of fuel can be illiquid because either (a) there is a limited amount of trading taking place which

could be reported to and used by the PRA or (b) there is trading in that specification of fuel but it is often not reported to the PRA.

27. The evidence available to the CMA suggests that there is a substantial amount of trading activity occurring.

    (a) **Petrol** – in the period January 2015 to August 2022, the 32 transactions used to form the Platts price assessment represented trade in 306,000 metric tonnes of product. However, significantly greater quantities of petrol matching the price assessment's specification were traded in the UK in this period. For example, from 2015 to 2021 the UK imported 22.6 million metric tonnes of petrol,[14] and one wholesaler alone traded over 10 million metric tonnes in January 2017 to June 2022.

    (b) **Diesel** – in the period January 2015 to August 2022, the 79 transactions used to form the Platts price assessment represented trade in 2,007,000 metric tonnes of product in the same. However, significantly greater quantities of diesel matching the price assessment's specification were traded in the UK in this period. For example, from 2015 to 2021 the UK imported 91.1 million metric tonnes of diesel,[15] and one wholesaler alone traded nearly 15 million metric tonnes in January 2017 to June 2022.

28. Therefore, the low liquidity of the Platts price assessments (which are near universally used in the UK road fuels sector) does not appear to be due to a low level of trading, but rather due to the amount of trading being reported to Platts. The CMA notes that wholesale trading, including importing, may itself be at prices linked to Platts benchmarks, and this may be one of the reasons for the low volume of trading being reported to PRAs.

Implications of the lack of liquidity

29. We have identified very low levels of liquidity in the Platts price assessments predominantly used in the UK road fuels sector. As set out above, we gathered data on the liquidity of Gasoline 10ppmS CIF NWE Cargo and USLD 10ppmS CIF NWE Basis UK Cargo from Platts.

30. We then calculated the difference between the petrol and diesel price assessments produced by Platts and Argus in the periods when they were both published. We have not assessed the relative strengths and weaknesses of the Platts and the Argus price assessment methodologies.

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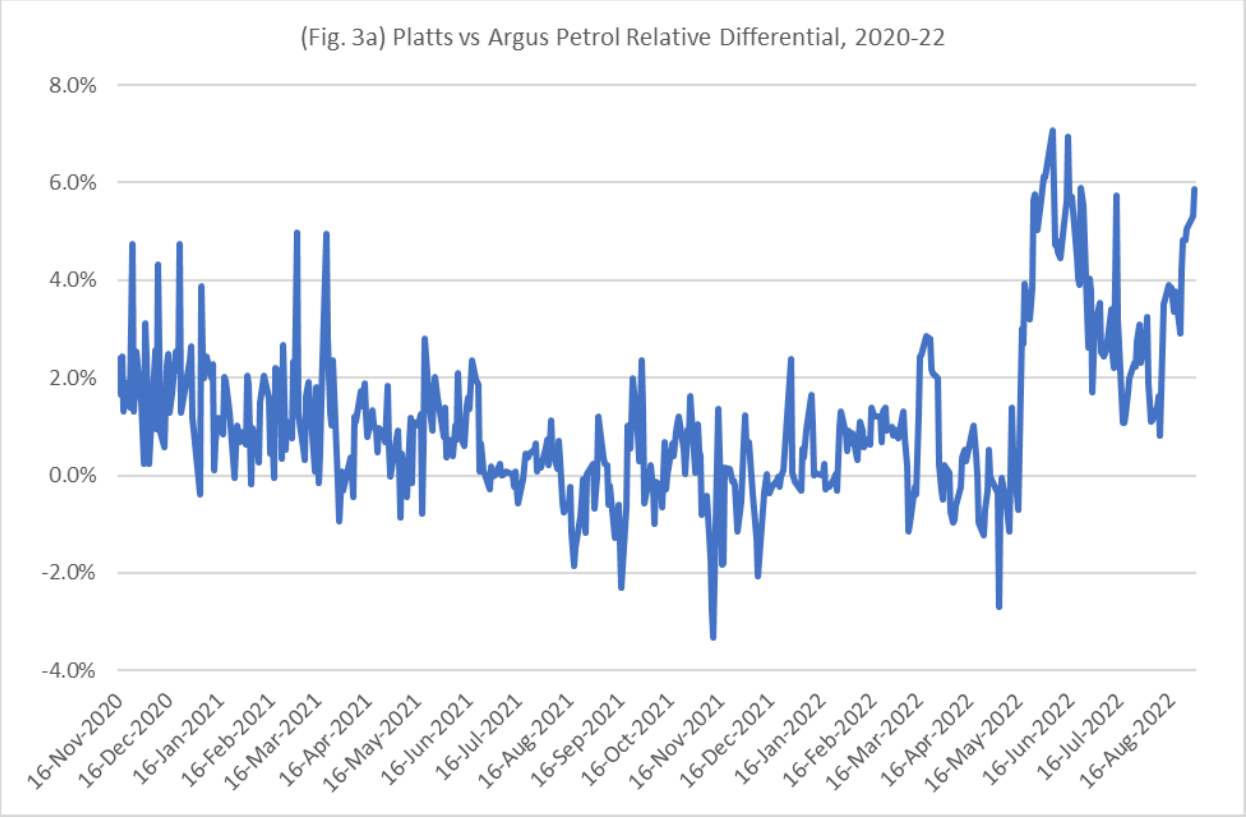
[14] Source: Digest of UK Energy Statistics (DUKES) Table 3.2.
[15] Source: DUKES Table 3.2.

31. Figures 3a and 3b show the difference between the two PRAs' price assessments as a percentage of the Platts price assessment, with a positive difference reflecting that the Platts price assessment is higher than the Argus one.

(a) **Petrol** – in the period November 2020 to August 2022, the Platts price assessment was consistently higher than the Argus price assessment, particularly so in the period of volatility in petrol and diesel markets from February 2022 started by Russia-Ukraine. Looking at the period up to February 2022 (ie before the start of Russia-Ukraine), the average difference was 0.65% of the Platts price assessment's value, approximately0.38ppl, with a standard deviation of 1.19%, approximately 0.76ppl. After February 2022, the average difference was 2.07%, approximately2.45ppl, with a standard deviation of 2.08%, approximately 2.69ppl.

Figure 3a Platts vs Argus petrol relative differential 2020-22

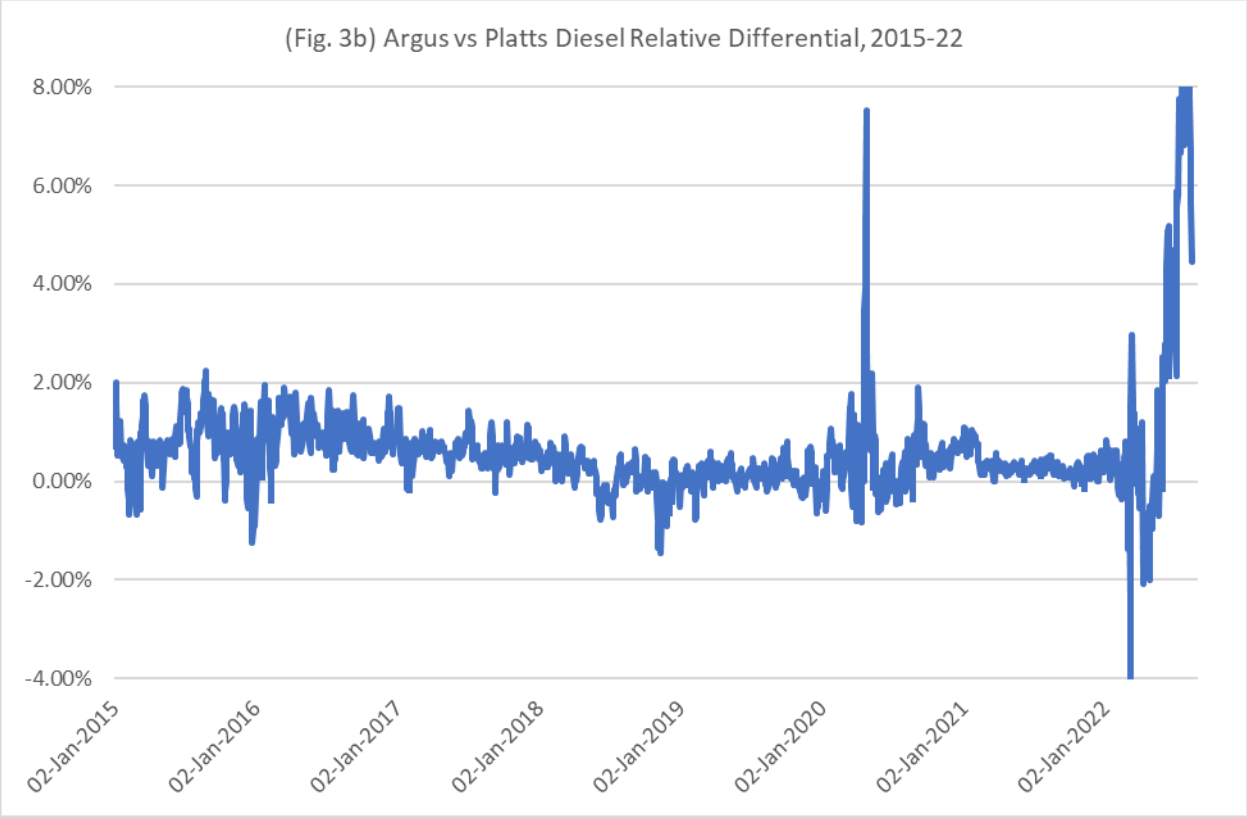


Source: CMA calculations based on Platts and Argus data

(b) **Diesel** – in the period January 2015 to August 2022, the Platts price assessment was consistently higher than the Argus price assessment, particularly in the period from February 2022. Looking at the period up to February 2022 (ie before the start of Russia-Ukraine), the average difference was 0.48% of the Platts price assessment's value,

approximately 0.26ppl with a standard deviation of 0.56%, approximately 0.29ppl. After February 2022, the average difference was 2.01%, approximately2.4ppl, with a standard deviation of 3.40%, approximately4.11ppl.

Figure 3b Argus vs Platts diesel relative differential 2015-22



Source: CMA calculations based on Platts and Argus data. For comparability to Fig. 3a, the scale used excludes values over 8% and under -4% (specifically, one value of -12.89% in March 2022 and four values in July 2022 ranging from 8.34% to 9.13%.

32. Platts told us that it takes into account a number of additional data inputs and factors for both its petrol and diesel price assessments, with a view to addressing any 'gaps' in its analysis due to limited reported trades in a given time period. Platts submitted that these steps are sufficient to mitigate any concerns related to the low levels of trading activity.

33. As can be seen in Figures 3a and 3b, while the differences between the Platts and Argus price assessments have persisted for extended periods, they increased dramatically after February 2022 and the start of the volatility in refined fuels markets caused by Russia-Ukraine. The CMA considers that the low liquidity of price assessments may have particularly pronounced effects during periods of market volatility.

Glossary

Applegreen	Petrogas UK Limited.
Asda	Asda Group Limited.
API	Application Programme Interface, which is software that allows computers or applications to communicate with one another.
Argus	Argus Media Ltd, a price reporting agency.
BEIS	Department for Business, Energy and Industrial Strategy. BEIS existed until 2023 when it was split to form new departments, including the Department for Business and Trade (DBT), and the Department for Energy Security and Net Zero (DESNZ). References in the report to data supplied by BEIS cover data subsequently supplied by DESNZ when BEIS ceased to exist.
Biofuel	Fuel produced from biomass (plant-based materials).
BP	BP Oil UK Limited.
Business Secretary	The Secretary of State for Business, Energy and Industrial Strategy.
Carbon offsets	A reduction or removal of CO2 or other greenhouse gas emission, eg via investment into an environmental project, to offset emissions made elsewhere.
Catchment area	Catchment areas are used to identify the most significant competitive alternatives available to customers at a local level. They are defined as the areas from which most customers of a given shop are drawn.
Centroid PFS (or 'centroid shop')	The PFS taken as a starting point to define a catchment area.
Certas	Certas Energy UK Limited.
COCO	Company Owned, Company Operated.
CODO	Company Owned, Dealer Operated.
Crude oil	Oil, or petroleum, from underground that has not yet been refined into various petrochemicals including petrol, paraffin and diesel.
Diesel	A type of refined oil used as fuel.

DODO	Dealer Owned, Dealer Operated.
EG/EG Group	Euro Garages Limited.
Experian/Experian Catalist	Experian Limited.
Emissions Trading Scheme (ETS)	The UK's carbon emissions trading scheme designed to reduce greenhouse gas emissions.
Essar	Essar Oil (UK) Limited.
Esso	Esso Petroleum Company Limited.
Fuel duty	Fuel duties are taxes levied on purchases of petrol, diesel and a variety of other fuels. In the UK, Fuel Duty is levied per unit of fuel purchased and is included in the price paid for petrol, diesel and other fuels used in vehicles or for heating. The rate depends on the type of fuel. Fuel Duty is levied at the time fuel leaves the refinery or import terminal and is paid before the retailer receives the fuel.
Fuel Card	A fuel card (also known as a fleet card) is used by business customers to pay for petrol, diesel, and other fuels at petrol filling stations. Fuel cards enable fleet owners/managers to receive real time reports and set purchase controls with their cards helping them to stay informed of all business-related expenses.
Fuel margin	The difference in the cost of acquiring fuel and the revenue generated from the sale of fuel as reported in the management accounts divided by the reported fuel revenue.
Greenergy	Greenergy Fuels Holdings Limited and Greenergy Fuels Limited.
Importer	A party that purchases petrol, diesel or any other road fuel overseas and imports it into the UK.
Independent wholesaler	A party who buys refined products in the UK and sells them to retailers.
LCC	LCC Group Limited.
Mabanaft	Mabanaft Limited.
Median	The middle number in a set of values when those values are arranged from smallest to largest.
MFG	Motor Fuel Group.
Moto	Moto Hospitality Limited.

Morrisons	WM Morrisons Supermarkets Limited.
MSA	Motorway Service Area – a place where drivers can refuel, rest, or take refreshments on a motorway.
OFT	Office of Fair Trading, a predecessor of the Competition and Markets Authority.
OPEC	Organisation of the Petroleum Exporting Countries.
Open Data Scheme	An initiative whereby data is freely accessible to developers to use in their own software and services, including for commercial purposes.
Operating margins	These are calculated by dividing reported operating profit by total fuel revenues.
Pass-through	The extent to which cost changes are 'passed through' to prices.
Petrol	A type of refined oil used as fuel.
Petroineos	Petroineos Trading Limited and its subsidiaries and Petroineos Refining Limited and its subsidiaries.
Petroleum products	Petroleum products (also referred to as refined products) are materials derived from crude oil (petroleum) processed in oil refineries and include aviation fuel.
Petroleum	See "Crude Oil".
PFS	Petrol Filling Station – the retailing point for road fuel which may form part of a larger site. (This includes filling stations at supermarkets, as well as large and small independent retailers.)
Platts	Platts (U.K.) Limited, part of S&P Global Commodity Insights, a price reporting agency.
Platts benchmark	A commodity price assessment provided Platts.
Phillips 66	Phillips 66 Limited.
PRA	Petrol Retailers Association.
Prax	State Oil Limited and its subsidiaries, including Prax Lindsey Oil Refinery Limited.
Refinery	An industrial plant which produces fuels and petrochemicals from crude oil.
Refining activity	The process of separating crude oil into its component fractions to create specific petrochemicals and products including petrol and diesel.

Refining spread	The difference between the CIF benchmark price and the price of crude oil, calculated for the amount of crude oil contained in 1 litre of petrol/diesel sold at the pump.
Renewable Blending Products	Additives or fuel products produced from renewable or sustainable sources eg ethanol, methanol.
Renewable Transport Fuel Obligation (RTFO)	An obligation placed on suppliers of relevant transport fuel by the UK Government to show that a percentage of the fuel a company supplies comes from renewable or sustainable sources.
Renewable Transport Fuel Certificates (RTFCs)	Certificates issued to suppliers of sustainable renewable fuels. These certificates can be traded or redeemed to help suppliers meet requirements under the RTFO.
Retail activity	Selling petrol and diesel to motorists.
Retailer	A party selling petrol and diesel to motorists. (This includes supermarkets, as well as large and small independent retailers.)
Retail spread	The difference between fuel prices at the pump net of fuel duty and VAT, and estimated wholesale costs, which are based on the benchmarked cost of diesel and petrol, and the cost of biofuel.
Rocket and Feather pricing	A concept where pump prices increase rapidly when wholesale petrol prices are going up but fall back slowly when wholesale prices decrease.
Rontec	Rontec Roadside Retail Limited.
RFI	Request for Information.
Sainsbury’s	J Sainsbury PLC.
Shell	Shell PLC.
Spot price	The spot price is the current price in the marketplace at which a commodity can be bought or sold.
Supermarket	Tesco, Sainsbury’s, Morrisons or Asda.
Tesco	Tesco PLC.
UKPIA	United Kingdom Petroleum Industry Association.
Valero	Valero Energy Limited.
Welcome Break	Welcome Break Group Limited.
Wholesale supply	Selling petrol, diesel and any other road fuel to retailers.

Wholesale supplier	A party that sells petrol, diesel and any other road fuel to retailers. Wholesale suppliers may be refiners, importers or independent wholesalers.