Evaluation Paper 20/1: An evaluation of our rent-to-own price cap

December 2020

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Acknowledgements

We would like to thank Daniel Christen and Rory Lawless in the Economics Department for their assistance with the data collection, and Sumit Agarwal for his academic peer review.

Contents

Abbreviations used in this document

RTO	Rent to own
CP	Consultation Paper
PS	Policy Statement
DID	Differences-in-differences
MFW	Multi-firm work

Executive summary

This report summarises our evaluation of our 2019 price cap intervention in the rent-to-own market (RTO). Following our commitment at the time of intervention, we have evaluated 2 key aspects of the RTO price cap – the effect on product prices, and the effectiveness of our anti-avoidance measures.

Evaluating the impact of our RTO price cap

Our intervention

We introduced a price cap in the RTO market in April 2019 to address harm from high prices paid by vulnerable consumers. The price cap:

- set a total credit cap of 100% such that consumers do not pay credit costs higher than the cash price of the product, including delivery and installation
- introduced a requirement for firms to benchmark product base prices (including delivery and installation, but excluding other add-on products) against the prices charged by 3 mainstream retailers (also referred to as 'high street' retailers in this report)
- prevented firms from increasing their prices for other goods and services sold in connection to an RTO agreement, including theft and accidental damage insurance, extended warranties and arrears charges, to recoup lost revenue from the price cap ('revenue recovery' in this report)

What we expected

The price cap aimed to bring down prices on RTO agreements where the overall costs to consumers were high compared to other retailers' prices. Prior to intervention we estimated there were approximately 300,000 consumers with outstanding RTO balances. A large fraction of consumers exhibited signs of vulnerability, but we did not put a figure on total harm. We noted that the average cost of acquiring a product through an RTO agreement was roughly 2.7 times higher than purchasing it from other retailers. Total outstanding balances across the sector were below £400m at the time of intervention.

In CP18/35 we estimated that the price cap would deliver net consumer benefits of between £19.6m and £22.7m a year, primarily through lower prices of RTO goods. We estimated RTO prices would stabilise at 10% higher than the mean high street price for identical products after our intervention.

Our evaluation

In PS19/6 we introduced the final rules on the price cap, and committed to reviewing 2 aspects of the intervention from April 2020:

1. The effect of the benchmarking requirement on product prices.
2. The effectiveness of our rules preventing revenue recovery by firms.

To evaluate the effect of product benchmarking, we undertook a price comparison between RTO and high street retailers (see Section 2 for our definition of high street retailers). We collected data on prices from the websites of RTO and high street retailers before (October 2018) and after the intervention (March-May 2020). We compare the ratio of RTO to high street prices before and after the intervention and provide an estimate of the causal effect of our intervention using a differences-in-differences approach.

To evaluate the effectiveness of our rules on preventing revenue recovery, we draw on supervisory information as well as interviews with RTO firms.

Our evaluation is purposefully slightly narrower in scope than our previous ex-post impact evaluations. Due to the coronavirus situation, requesting data from firms would have placed a larger than usual burden on them. We have therefore primarily used publicly available information, as well as previous work by the FCA, to review the aspects of the price cap we committed to evaluating. Due to this, we are not able to quantify the full ex post costs and benefits, but we are able to assess the impact on RTO prices, which is a key indicator of the effectiveness of the intervention. We judge our approach is proportionate to the scale of the market and the harm we identified.

Results

Our results show that the ratios of RTO prices to high street prices are sizeably lower in the period after the intervention. While the average base price plus delivery and installation at the 2 largest firms in the market at the time of intervention (accounting for approximately 90% of the market) was 37% higher than the average high street price in 2018, it was only 16% higher in 2020.

A large part of this decrease was due to a reduction in the highest price ratios observed. While the highest RTO price plus delivery and insurance was 1.8 times the high street price in 2018, the highest ratio we observed in 2020 was 1.5. These movements in the distribution of price ratios are illustrated in Figure 1. Because of small samples, these figures do not control for changes in product mix between 2018 and 2020, but the products used to compute these ratios were randomly selected, hence we believe that the price reduction in the sample is representative of the overall movements in the market. Subsequent analysis in this paper also attempts to address potential composition effects.

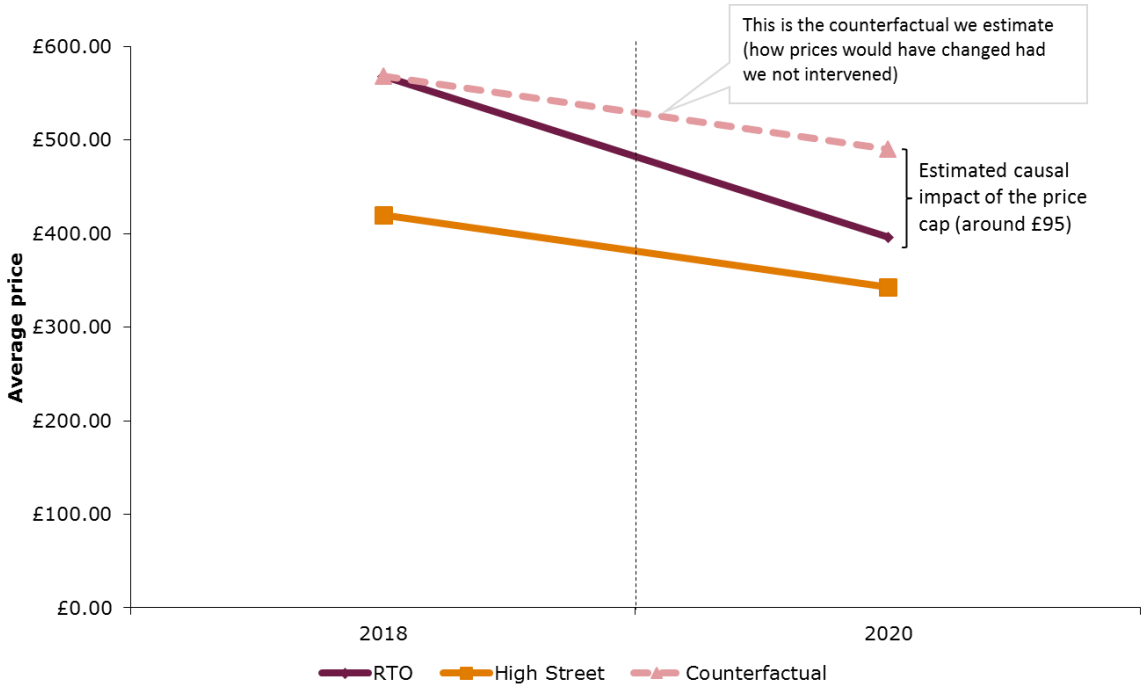
Figure 1: Plot of RTO to high street price ratios (base price plus delivery and installation)

Source: FCA analysis of online data, 2018 and 2020

We find similar reductions in the ratios of the total financing price at RTO firms to high street prices. The average ratio of the total cost of the longest RTO financing term, plus delivery, installation and insurance, to the high street price plus delivery and installation was 2.89 in 2018 and 2.41 in 2020.

We also attempt to account for the fact that other factors may have affected prices over the period. We use a difference-in-difference method, which under certain assumptions isolates the effect of the intervention. We find that RTO prices in the 2 largest firms in the market at the time of intervention fell on average by 19%. This is consistent with our expectations before intervention. Figure 2 illustrates these findings.

Figure 2: Estimated effect of the price cap on RTO prices



Source: FCA analysis of online data, 2020

The quantitative results are subject to some caveats and assumptions. For instance, key assumptions for the difference-in-difference approach are that high street and RTO prices are subject to the same drivers and therefore would otherwise have followed the same trend over time (the 'parallel trends' assumption), and that our data consistently matches comparable products and firms. We discuss these and other conditions, as well as statistical significance, in further detail within the report.

Finally, the qualitative evidence we have reviewed suggests the price cap's anti-avoidance measures appear to be working as expected. We have not seen any evidence to suggest that firms have used the prices of add-ons and connected goods or services to recoup revenue lost during the price cap.

Lessons learned

Given the scope of the evaluation, ie that we have not conducted a full ex post cost benefit analysis, our results are not able to inform us on whether the price cap achieved all of the costs and benefits estimated at the time of intervention. This may limit the wider applicability of the learning from the evaluation.

Nevertheless, based on our conclusions of the price cap's benchmarking and anti-avoidance measures, if the FCA were to consider introducing price caps in other markets in the future some lessons can be drawn.

While our estimates indicate that our benchmarking requirements have been successful in bringing down RTO prices, in most financial services markets there is no comparable external market so benchmarks for price caps or other outcome controls may be harder

to define. Hence the lessons learned from the RTO price cap benchmarking can be limited unless the conditions for a credible counterfactual exist.

By contrast, any future policy consideration may benefit from the experience with the RTO price cap's anti-avoidance measures. It is important for control remedies like price caps to carefully consider anti-avoidance measures, and on the evidence of this evaluation the RTO price cap's measures may be a model which future interventions can learn from. The exact design features, however will always need to be sector-specific.

Structure

The rest of this paper is structured as follows:

- Section 1 sets out the background to our 2019 RTO price cap, the harm it aimed to address, why we are evaluating aspects of this intervention now, and the evaluation's scope.
- Section 2 sets out how we expected the price cap to reduce harm and describes the methodology we use to evaluate it.
- Section 3 provides our evaluation results on the effect of the benchmarking requirement on RTO product prices.
- Section 4 outlines our qualitative results on the effectiveness of our rules preventing revenue recovery through connected goods and services.
- Section 5 details the wider lessons learned from the evaluation, both for the RTO and other markets.
- Annex 1 provides further details on our econometric approach.

1 Why we are evaluating our rent-to-own price cap

This section summarises our 2019 rent-to-own (RTO) price cap and the reasons we chose to evaluate it.

What is RTO?

RTO agreements tend to be hire-purchase agreements which allow consumers to hire goods for an initial period, and then take ownership once they have made all the payments. RTO providers typically offer household items including appliances, household electronics and furniture, either online or in stores. Goods may be new or refurbished. The hire-purchase agreement period typically ranges from 1 to 3 years.

Over the course of an RTO agreement, consumers usually pay weekly instalments that cover:

- the retail price of the product
- the cost of credit, which depends on the interest rate and length of agreement
- the cost of any add-on products such as insurance or extended warranties

Some consumers may also pay supplementary arrears charges or fees in the event that they miss payments, although not all firms charge these.

RTO is a relatively small market. In CP18/35 we estimated that as of November 2017 there were approximately 300,000 consumers with outstanding balances. Total outstanding balances across the sector were below £400m at the time of our intervention.

At the time of intervention 2 firms accounted for over 90% of outstanding balances on RTO agreements. The largest 3 firms accounted for over 95% of outstanding balances. The market was estimated to consist of around 20 firms.

There have been changes in the market since. See 'Market changes in 2020' below.

The harm our intervention aimed to address

Our concern at the time of intervention was that RTO consumers were paying very high prices for household goods. Moreover, evidence showed that most RTO consumers were vulnerable – most had very low levels of income and were in precarious financial situations, and only a third were in work. These concerns had been raised in our High-cost Credit Review (CP18/12) in May 2018.

We were also concerned that many consumers were buying RTO products inappropriately without using the information available on the total costs of the products. And that some consumers bought RTO products despite the availability of lower cost ways to acquire a similar product.

Our findings in CP18/35 and CP18/12 demonstrated this harm. We estimated that the total cost of a typical RTO agreement, including commonly purchased add-ons, was around 3 times the average mainstream retail price. When insurance and extended warranties were added, prices could reach 4 or 5 times the average retail price.

We set out the following drivers for these harms:

- Consumer research showed that consumers focused on the weekly cost of their credit agreements, and not the total cost. This reflected myopia in their decision-making, a type of behavioural bias. This reduced the competitive pressure on the pricing of RTO firms.
- Consumers perceived they faced a lack of options for obtaining the product they were seeking to purchase through RTO. Credit reference agency data suggested most consumers would have struggled to find credit from alternative sources, but that a small proportion of consumers could have accessed products using less expensive forms of credit.
- Many consumers lacked the financial literacy to understand important features of their agreements, particularly how low weekly payments could lead to very high total borrowing costs.

Our intervention aimed to address harm from high prices

We introduced a price cap in the RTO market in April 2019 to address harm from high prices paid by vulnerable consumers.

The price cap contains several features:

- Sets a total credit cap of 100%. This aimed to ensure consumers do not pay credit costs higher than the cash price of the product, including delivery and installation.
- Introduces a requirement that firms must set their product base prices (including delivery and installation, but excluding any add-on products like warranties) at or below a level calculated by reference to up to 3 other UK (non-RTO) retailers' prices.
- Anti-avoidance measures, such as preventing firms from increasing their prices for other goods and services provided in connection with an RTO agreement to recoup revenue lost due to compliance with the price cap. This includes insurance products, such as theft and accidental damage cover, and extended warranties. The rules also remind RTO firms that charges on customers in default or arrears should be no higher than necessary to cover reasonable costs to the firm.

The price cap rules came into force on 1 April 2019. For products that RTO firms were already offering, the price cap applied at the soonest of either the point the RTO firm raises the price on those products, or 1 July 2019. Micro-enterprises had until 1 October 2019 to implement the same changes.

Separate to the price cap, in November 2018 we introduced final rules to ban RTO firms from concluding extended warranty arrangements at the point of sale of an RTO agreement.

Why we are evaluating this intervention

Evaluation is part of our Mission's decision-making framework. Testing the effectiveness of our remedies helps us make better decisions. We published a framework outlining the way we measure the causal impact of our interventions in April 2018.

We committed to evaluating the impact of our price cap rules to protect vulnerable consumers when we announced our RTO intervention in March 2019. The findings of this evaluation will help us judge if our intervention worked as expected.

Though affecting a relatively small market, we committed to an evaluation of the RTO price cap as it potentially allows us to draw lessons for interventions in high-cost credit markets, and lessons specific to price cap interventions. High-cost credit markets have been a priority for our work in recent years, and in May 2018 we consulted on a range of measures designed to address consumer harm from several high-cost credit products. We believe it is important to evaluate aspects of this package of work where appropriate. This evaluation also allows us to develop new evidence on the effectiveness of price control remedies, and identify where they may work well or less well.

Our evaluation is purposefully slightly narrower in scope than our previous ex-post impact evaluations. Because we started our evaluation at the height of the coronavirus situation, we judged that a full evaluation of costs and benefits of the intervention, requiring transactional data from firms, would be disproportionate given the scale of the harm identified. As a result, we decided to focus this evaluation on the 2 topics we previously committed to evaluating:

1. The effect of the benchmarking requirements on product prices.
2. The effectiveness of our rules preventing revenue recovery through insurance, arrears and other charges.

Market changes in 2020

Two market developments in 2020 are important to mention.

Firstly, on 30 March 2020 the largest RTO provider in the market, Caversham Finance Limited (trading as BrightHouse in the UK), entered administration.

Given this evaluation focuses on the effect of benchmarking on RTO product prices, and anti-avoidance measures, the circumstances surrounding the administration of the firm are not of direct relevance. Our analysis in CP18/35 outlined that firm exit could occur under the baseline or counterfactual (ie in absence of our intervention) and hence affect the impact of the price cap, but that it would not have a disproportionate impact on the costs over the benefits. We considered in this evaluation that any attempt to estimate the contribution of the price cap on subsequent firm exit and the impact on its consumers, relative to a counterfactual, would have imposed a disproportionate burden on firms.

Our understanding of the reasons for the firm's exit, however, is that other circumstances played a significant role. For instance, the firm had reported significant annual losses before the price cap's introduction in 2019.

Our financial analysis in CP18/35 estimated that price caps between 90% and 110% of the product price, would cause firms to stop offering less than 5% of agreements. We concluded that 'most agreements will remain profitable for RTO firms, and so, as long as firms continue to trade, we do not expect a price cap of between 90% – 110% to have a significant impact on consumers being able to access RTO.'

Evidence presented in CP18/35 suggests that the effect on the nature or intensity of competition of the exit of the previous largest RTO provider may be somewhat mitigated. Our CBA showed that relatively few consumers refer to other RTO firms as an alternative source of their product – 1% of RTO consumers in a consumer survey considered using an alternative RTO provider and 5% of declined consumers bought from a different RTO provider. Therefore, our CBA concluded that we would not expect a substantial lessening of competition or increase in prices in the event of firm exit. In addition, the imposition of the price cap acts as a constraint on remaining firms from increasing prices. Moreover, the most common methods of payment for those consumers declined for RTO that bought the product elsewhere were cash or debit card, savings and gifts (collectively 70% of consumers), whereas around 9% reported paying by alternative forms of credit. These figures suggest that any detrimental effect on competition in other credit markets as a result of the exit of the largest RTO provider may also be mitigated.

To draw comparisons with 2018, our price comparison results include data collected from the BrightHouse website in March 2020, even though it subsequently stopped selling products. We comment below on possible challenges to the comparability of the firm's product range with that gathered for CP18/35.

Secondly, the timing of our evaluation coincides with the coronavirus pandemic and its associated economic impacts. We collected online pricing data between March and May 2020. We comment below on the possible impacts of the coronavirus situation on our findings.

2 Our evaluation approach

This section sets out how we approach the evaluation of our 2019 rent-to-own (RTO) intervention, and what the approach allows us to conclude about our intervention.

How we expected our intervention to work

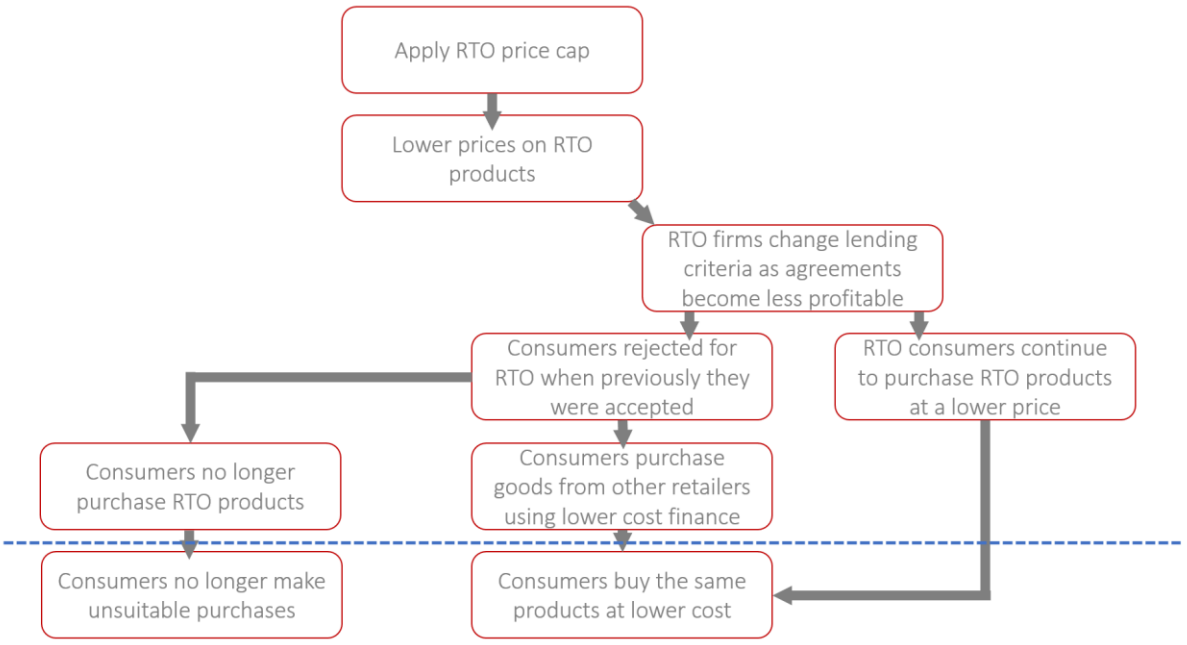
The price cap aimed to bring down prices on RTO agreements where the overall costs to consumers were high compared to mainstream retailers' prices.

In CP18/35 our cost benefit analysis estimated that our proposed price cap would deliver net consumer benefits between £19.6m and £22.7m a year (without weighting for low consumer incomes). We expected these benefits to materialise as a result of:

- RTO sales that happen at a lower price than they would have without the cap
- consumers who lose access to RTO goods as firms change lending criteria to avoid agreements becoming unprofitable at the cap, but are able to find cheaper alternatives
- consumers forgoing the purchase of unsuitable products

This is illustrated in the causal chain of how we expected our intervention to reduce harm (Figure 3).

Figure 3: Causal chain of our RTO price cap



Source: Adapted from CP18/35

The most important channel through which we expected benefits to materialise was lower RTO prices on transactions that continue to be made after the intervention. We estimated that the total amount paid by consumers on these transactions would reduce by £17.9m. We expected that the remaining £4.8m in consumer benefits would result from purchases from other retailers at lower prices (£4.6m), or forgoing unsuitable purchases altogether (£0 - £0.5m).

We estimated consumers would face additional search costs of £0.12m per year, and costs arising from a lack of access to products of £0 - £2.8m per year. The latter estimate was based on financial modelling that 5% of transactions in the market would become unprofitable under a price cap and would therefore not take place after implementation, leading to a loss of utility for consumers. The largest estimated cost for RTO firms was lost revenue resulting from the price cap, but this was a transfer to consumers.

Our intervention recognised that RTO firms could attempt to offset the impact of the price cap by increasing the prices of goods and services associated with an RTO agreement. Services such as theft and accidental damage cover and charges such as arrears charges are not included in the total credit cap. Instead our intervention prevented firms from increasing the prices of insurance charges to recoup lost revenue, and required that firms be able to prove that any price increases are a legitimate business need (eg reflecting insurance claims). Similarly, our intervention prevented firms from increasing arrears charges to offset the effects of the price cap.

Testing our intervention against our expectations

In PS19/6 we said that we would start an impact evaluation of the RTO price cap in April 2020, and aim to complete it by the end of 2020. We said the evaluation would focus on firms' benchmarking but would also look at the effectiveness of our rules on other charges – theft and accidental damage insurance, extended warranties and arrears.

Regarding the first aspect, our intervention requires firms to benchmark their base prices (ie the price of buying the product outright), including delivery and installation charges, against the prices of three non-RTO retailers. The rationale for this requirement is that high base prices lead to high interest charges, and that the total credit price of products would reduce if the base price of RTO products fell closer in line with other retailers.

In CP18/35 we assumed that RTO prices would fall from approximately 37% to 10% above average high street prices as a result of the policy. This estimate was based on the fact that the highest mainstream retailer prices were 10% above the average mainstream price, and the assumption that RTO firms would benchmark closer to the upper range of these comparator prices. We estimated that the reduction in RTO prices would result in £17.9m savings for consumers, forming the bulk of consumer benefits. (Note that this assumption was outlined in paragraph 4.16 of CP18/35 which refers to prices falling to 10% above the median retail price. This was a typographic error – we expected prices to fall to 10% above the mean retail price.)

Concerning our rules preventing firms from increasing insurance, warranty and arrears charges to offset the effects of the price cap and recoup revenue, we expected firms would comply with the rules and there would be no offsetting price increases in these services.

Our evaluation approach

We use a mixture of quantitative and qualitative techniques to evaluate the 2 aspects of our evaluation on product prices and add-on charges.

The effect of benchmarking requirements on product prices

In this Evaluation Paper, we directly test the expectation that the policy would reduce prices to 10% above the mean high street price. Our approach to evaluating the effect on prices consists of 2 stages:

a. replicating the results of the price comparison exercise we undertook in CP18/35
b. employing a difference-in-difference approach to isolate the change in prices due to the price cap

In the first stage, we replicate Table 3.1 of CP18/35. This replication shows us how prices of RTO firms compare to high street retailers in the period after the intervention. Looking at how RTO prices compare to high street prices today can tell us about the potential for consumer harm in the post-intervention period. It also allows us to evaluate our assumption that RTO prices would fall to a level 10% higher than the average high street price.

However, changes in ratios of RTO prices to high street retailers' prices before and after the intervention may result from factors other than the policy, as discussed later. To correct for this, we use a differences-in-differences (DID) approach that, under certain assumptions, can isolate the effect of the price cap. DID estimates are presented in Section 3. The technical details of the method are presented in Annex 1.

We look at the results of these 2 approaches together to build a view of the effects of our intervention on product base prices.

While the price comparison exercise can tell us whether prices moved in line with our expectations, it does not tell us about the change in the number of transactions in the RTO market. In CP18/35 we estimated that the price cap may cause around 5% of agreements offered by RTO firms to become unprofitable. Subsequent regulatory data show a decline in new RTO lending in the periods immediately following the introduction of the price cap, but since we have not collected detailed transactional data it is not possible to say what proportion of this was a result of the intervention. For the same reason we do not analyse any effects of the price cap on factors such as relending (ie whether the price cap caused any changes to repeat borrowing by consumers). Regulatory data also show that the number of RTO agreements fell significantly following the exit of the largest firm at the end of March 2020, but if, as we believe, the exit of the largest firm was primarily driven by external factors then this decline would have occurred in the baseline. The future path of RTO lending following recent market changes is very uncertain.

Comparing price ratios before and after

In CP18/35 we compared product prices and total costs of a sample of products offered by RTO firms to high street prices for the same products.

For each product selected, we attempted in 2018 to find an identical product on the websites of mainstream retailers (Argos, Appliances Direct, AO or Currys PC World) and

recorded the item price, delivery and installation costs. Where a given product was not found on the mainstream retailer's sites, we looked at alternative retailers who advertised the product on their website. (We constructed comparisons entirely from alternative high street providers in around 8% of cases in 2018, and around 18% of cases when we replicate the analysis in 2020. To test for any risk of systematic bias, in our analysis for this evaluation we compared a sample of products at the largest and alternative high street retailers and found no systematic price differences.)

Table 1 below summarises the findings of the review in 2018 for the 2 largest firms who accounted for around 90% of the market share at the time. The main findings were that cash prices for product categories, including delivery and installation were up to 60% higher than the average high street price. When looking at the finance price for the longest term available at the 2 largest RTO firms, the total amount payable including delivery and installation was between 2 and 3.1 times the high street cash prices. When insurance and extended warranties were included (which 90% and 70% of RTO consumers had purchased respectively in 2017), the total amount payable was between 2.6 and 4.4 times the average price at high street retailers.

Table 1: Extract of analysis of RTO pricing (October 2018)

Firm	Product Category		Base Price Multiple (includes delivery and installation) Relative to High Street	Term (weeks)	Relative to High Street		
					Total Relative Financing Multiple	Plus Insurance	Plus Extended Warranties and Insurance
Firm 1	Appliances	**Mean**	**1.6**	156	**3.1**	**3.7**	**4.4**
		Highest	1.8		3.6	4.2	5.3
	Technology	**Mean**	**1.4**	80	**2.3**	**2.8**	**2.9**
		Highest	1.5		2.4	3.0	3.1
	TV & Audio	**Mean**	**1.6**	156	**3.1**	**3.6**	**3.9**
		Highest	1.7		3.3	3.8	4.2
Firm 2	Appliances	**Mean**	**1.1**	156	**2.2**	**2.5**	**3.1**
		Highest	1.4		2.8	3.2	4.0
	Technology	**Mean**	**1.3**	78	**2.0**	**2.4**	**2.8**
		Highest	1.7		2.7	3.1	3.6
	TV & Audio	**Mean**	**1.0**	156	**2.0**	**2.3**	**2.6**
		Highest	1.1		2.1	2.4	2.7

Source: FCA analysis, PS19/6

Our first objective was to replicate this price comparison exercise, and compare the results against the 2018 figures. For this purpose, we gathered information from the websites of the 3 largest RTO firms in the market between March and May 2020. We manually collected price data on a random sample of products, in line with the methodology we applied in 2018. We used the data from the third firm to supplement our estimate of the causal impact of the cap (see Section 3).

Section 3 of the report presents our replication of Table 1 with the 2020 data. Further detail on our data gathering approach can be found in Annex 1.

Differences in differences (DID) analysis

While comparing the ratio of RTO to non-RTO prices is a useful starting point, any changes over time do not necessarily reflect a direct result of the intervention. For example, changes in time-varying factors that affect the ratios such as exchange rate or introduction of new goods may also affect the ratios over the period considered. As a result, a reduction in price ratios may not necessarily be caused by the policy itself.

To correct for this, we undertook a DID analysis. Under certain assumptions, this approach can isolate the change in RTO prices due to the intervention. We present the methodology in the next section.

Implementing a DID method

To illustrate how the DID methodology works, we consider the following hypothetical example for a basket of goods sold at 2 different points in time by RTO firms and by high street retailers (Table 2).

Table 2: DID example (illustrative only)

	Time 1	Time 2	*Difference*
RTO prices	£200	£190	-10
High street prices	£100	£110	+10
	***Difference in differences*:**		**-20**

In this hypothetical example, there is no price cap in time period 1. In time period 2 RTO prices are subject to a cap. High street prices are not subject to our cap in either time period.

The average base price of goods sold by RTO firms decreases from £200 to £190 between the 2 periods. This is a reduction of £10, reflecting both the effect of the price cap, as well as time-varying factors such as inflation, exchange rates and seasonal demand for products.

The cost of the basket sold by high street retailers increases from £100 to £110. This is an increase of £10, reflecting only time-varying factors (as the price cap does not affect high street retailers and the production cost is the same as for the RTO firms).

If the time-varying factors are common to both RTO firms and high street retailers, then we know that the RTO price would have risen by £10 due to time-varying factors. Instead, we (hypothetically) observe that RTO prices have decreased by £10 on average. This means that the total effect of the policy was to reduce prices by £20.

We calculate this number by subtracting the difference of the price change between 2020 and 2018 for RTO prices from the difference for high street prices for the same period, hence the name differences-in-differences.

Assumptions

The crucial assumptions that we make in applying this approach are:

- the time-varying factors determining RTO base prices and high street prices are the same for the 2 groups (known as the parallel trends assumption), and
- our rules have not affected high street prices indirectly, for instance by making RTO products cheaper and diverting demand from high street retailers to RTO firms

One possible challenge to our assumptions is that time-varying factors determining RTO prices may be different to the time-varying factors affecting the high street prices. In CP18/12 we summarised the factors that drive the difference between RTO and high street prices, ie the RTO mark-up. These were:

- low purchasing power due to smaller sales volumes
- lack of supplier trade credit insurance meaning purchases being made by advance payment
- increased operating costs from maintaining a high-street presence and complex retail operation, eg servicing goods, debt collection, and devaluation of goods
- costs associated with the flexibility provided to consumers, ie the ability to hand back goods at any time

If any of these factors vary over time, the parallel trends assumption would be violated, as they would not be reflected in high street prices. Our DID estimate would, therefore, be biased upwards or downwards depending on whether the RTO mark-up already had a trend to decrease or increase, respectively.

We note that we do not have time series data of RTO and high street prices to check this assumption. The causal interpretation of our results is therefore contingent on the RTO mark-up being constant over time. The set of RTO and high street products we compare are identical, which means that other time-varying factors such as wholesale prices are common to the two groups. We therefore expect that our results are indicative of the effect of the policy.

Another reason that the parallel trends assumption may be violated is that RTO consumers' incomes may have reacted more strongly to lockdown compared to the incomes of the average high street consumer. If this is the case, we may expect RTO demand, and respectively prices to contract by more than high street prices. This would cause us to overestimate the impact of the evaluation.

While there is a risk that demand for RTO has responded differently to lockdown measures, we believe that any bias this introduces is likely small. The Office for National Statistics (ONS) reported that retail sales of household goods stores had fallen by 45.4% between March and April 2020 when the data was collected. This indicates that demand for mainstream retailer's products is likely to have decreased significantly too, meaning that we can reasonably expect RTO and mainstream retail firms to have experienced a similar reduction in demand. Furthermore, we conducted our data collection at the start

of the lockdown measures, which means that prices may not have yet fully adjusted to the shock.

We apply this method and present the results in Section 3. We are reasonably confident in the assumptions above as:

- we compare the exact same RTO and high street products, so factors like consumer tastes, availability of substitutes, purchasing power, production cost, etc should be very similar for both RTO and high street firms
- while credit and financing costs are an important differentiating element between RTO and high street markets, we conduct our DID analysis only on base prices, where systematic time-varying differences may be less likely
- the RTO market is very small compared to major mainstream retailers. Hence, if lower RTO prices have managed to divert demand from mainstream retailers such as to affect mainstream prices, we would see explosive growth of the RTO sector. We have no evidence of that and are therefore confident that mainstream prices did not respond to lower RTO prices.

Qualitative analysis on the pricing of other services

For the second element of our evaluation, the effectiveness of the rule preventing firms from increasing the prices of connected goods and services to recover revenue from the price cap, we have undertaken a qualitative assessment based on information gathered by our supervisors in 2019, and have held interviews with 2 RTO firms.

Starting in July 2019, we undertook multi-firm work (MFW) across a sample of RTO firms to determine compliance with our total cost of credit price cap and associated rules. The review examined whether firms had implemented the rules clearly and fairly, and gathered information on pricing in relation to goods or services connected to RTO agreements.

To ensure that evidence was still up-to-date, in September 2020 we conducted semi-structured interviews with 2 large RTO firms that participated in the MFW, to explore any subsequent changes they might have made to the prices or structure of connected goods and services and, if applicable, the reasoning behind those changes.

Section 4 provides further details of the information we reviewed and our findings.

3 Results on the effect of the benchmarking requirement

This chapter sets out the results of our evaluation of the benchmarking requirement of our 2019 rent-to-own (RTO) price cap.

Before and after comparison of price ratios with alternative suppliers

Replicating the 2018 Analysis

The first set of results we present here is a reproduction of Table 1 with the data collected during March-May 2020. Table gives a snapshot of RTO pricing among our sample today. Price ratio changes in percentage terms are given in Table 4 further below.

Table 3: Extract of our analysis of 2020 RTO pricing

Firm	Product Category		Base Price Multiple (includes delivery and installation) Relative to High Street	Term (weeks)	Relative to High Street		
					Total Relative Financing Multiple	Plus Insurance	Plus Add-Ons and Insurance
Firm 1	Appliances	**Mean**	**1.1**	102	**2.2**	**2.6**	**2.6**
		Highest	1.3		2.6	3.0	3.0
	Technology	**Mean**	**1.2**	104	**2.4**	**2.9**	**2.9**
		Highest	1.4		2.7	3.5	3.5
	TV & Audio	**Mean**	**1.2**	101	**2.2**	**2.5**	**2.5**
		Highest	1.4		2.8	3.2	3.2
Firm 2	Appliances	**Mean**	**1.2**	82	**1.7**	**1.9**	**2.2**
		Highest	1.4		2.1	2.3	2.8
	Technology	**Mean**	**1.1**	78	**1.5**	**1.8**	**2.1**
		Highest	1.5		1.6	2.0	2.3
	TV & Audio	**Mean**	**1.1**	104	**1.7**	**1.9**	**2.3**
		Highest	1.1		1.8	2.0	2.4

Source: FCA analysis of online data

According to our analysis, base prices charged by RTO firms are between 10 and 20% higher compared to high street counterparts. Across the whole sample for Firm 1 and Firm 2, the average ratio of RTO to retail prices is 1.16, meaning that RTO prices are 16% above high street prices. RTO prices are 15% higher than high street prices if we include the third largest firm.

As explained above, in our CBA we had estimated £17.9m annual consumer benefits from lower prices, based on an assumption that RTO base prices with delivery and installation would stabilise at 10% above average high street prices. In 2018, RTO base prices were on average 37% above high street prices. In 2020 we observe that RTO prices are actually 16% higher than the average high street price (rather than the expected 10%). This means that around 80% of the expected decrease in price ratios has materialised.

It is important to note that the result that RTO base prices plus delivery and installation are 16% higher than high street prices may be biased upwards. Our price data collection exercise in 2020 was conducted during the height of coronavirus lockdown, which affected the availability of installation services of some firms. Most high street retailers in our sample that would have advertised installation services in 2018, had suspended those at the time of the data collection. The installation price was recorded as zero when the website did not specify installation charges for consistency with our approach in 2018. In contrast, the 2 RTO firms in our sample were advertising the same delivery and installation charges in 2020 as in 2018. This could therefore bias the ratios up as the denominator becomes artificially smaller.

If this were the case, we would expect actual ratios to be closer to our expectation of 1.1. Nonetheless, installation charges only apply to the appliances category, yet we do not see a greater decrease in high street prices plus installation in the appliances category compared to TV & Audio and Technology. This means that the bias is likely negligible.

RTO base prices are important as they determine the total interest paid when the item is taken on finance. We observe that the **total financing price** ranges between 1.5 and 2.4 times the average high street price. In CP18/35 we observed that the financing price was between 2 and 3.1 times the average high street price. Hence, there is some indication that the policy has affected not only base prices, but the total financing price as well. Nonetheless, it should be noted that the longest financing term was 119 weeks on average in 2018, but only 97 weeks in 2020, indicating that firms may have responded to the total cost of credit price cap by shortening the financing term. This suggests that the weekly payments may not have gone down at the same rate as the base price. Nonetheless, we expect the positive effects of lower total cost to dominate.

Another important ratio to look at is the **total financing price plus insurance** to high street prices. Data analysed by the FCA in CP18/35 showed that as of October 2017, 90% of consumers purchased theft and accidental damage cover, which means that the ratios that include insurance may reflect better the cost of the typical RTO agreement. We see that in 2020 RTO financing prices including insurance were between 1.8 and 2.9 times the average high street price of the item. In contrast, in 2018, the ratio was between 2.3 and 3.7.

Finally, in 2018, our CBA compared the **RTO financing price plus insurance and extended warranties**. PS19/6, however, banned concluding the sale of extended warranties at the point of sale of an RTO agreement. Nonetheless, firms can still offer other add-ons such as repair, so the final column of Table 3 includes the prices for other add-ons. In the post-intervention period only Firm 2 offered add-ons at the point of sale in the form of a repair service. The analysis shows that with repair, the price ratio of Firm

2 to the high street price is between 2.1 and 2.3 times the high street price. This compares to between 2.6 and 3.1 in 2018.

Changes in price ratios since 2018

The movements in these key ratios between 2018 and 2020 are expressed in percentage terms in the Table 4 below.

Table 4: Changes in price ratios and term lengths from 2018 to 2020

Firm	Product Category		Base Price Multiple (includes delivery and installation) Relative to High Street	Term (weeks)	Relative to High Street		
					Total Relative Financing Multiple	Plus Insurance	Plus Add-Ons and Insurance
Firm 1	Appliances	**Mean**	**-27%**	-35%	**-29%**	**-31%**	**-41%**
		Highest	-19%		-20%	-22%	-38%
	Technology	**Mean**	**-18%**	30%	**2%**	**3%**	**-3%**
		Highest	-10%		11%	16%	10%
	TV & Audio	**Mean**	**-26%**	-36%	**-30%**	**-30%**	**-35%**
		Highest	-15%		-16%	-16%	-23%
Firm 2	Appliances	**Mean**	**8%**	-48%	**-24%**	**-25%**	**-29%**
		Highest	-1%		-25%	-27%	-30%
	Technology	**Mean**	**-12%**	0%	**-27%**	**-27%**	**-26%**
		Highest	-12%		-40%	-37%	-36%
	TV & Audio	**Mean**	**6%**	-33%	**-15%**	**-15%**	**-11%**
		Highest	3%		-16%	-16%	-11%

Source: CP18/35 and FCA analysis of online data

We expected our price cap intervention to reduce the ratios of RTO prices relative to the high street. Hence, all else equal, negative values in Table 4 are consistent with the desired effect of the policy.

The changes in the ratios for base prices are not all in the direction we would have expected. In particular, the average of the cash price for the Appliances and TV & Audio categories for Firm 2 have increased slightly.

Nonetheless, we see that financing multiple ratios have decreased in most cases. The only exception is the Technology category for Firm 1 where the relative prices have increased.

As we noted above, these differences are not a measure of the causal effect of the cap – they may be influenced by time-varying factors. For example, if the price for technology items increased over the 2 periods, this may cause the ratios to move even if the change

is equal across the 2 types of the retailer. Other factors might be at play such as the effect of coronavirus on delivery prices. It is also possible for these ratio changes to be due to statistical error. Such movements can outweigh the effect of the policy and result in the positive movements we see in Table 4. We also note that our data does not include furniture, refurbished products or products sold exclusively in store (see Annex 1), for which the change in prices relative to high street retailers could be different.

Overall, the movements in the ratios are consistent with our expectations. The average prices of RTO products have generally gone down in line with expectations, and so have the financing multiples. In the next section, we examine whether this movement was due to the policy, rather than other time-varying factors, and relate it to the benefits estimate we calculated in CP18/35.

Difference-in-differences

Here we present the results of the differences-in-differences analysis (DID) we described in Section 2 (for more detail see Annex 1).

Table 5: DID results

Sector	Average price of a basket of goods 2018	Average price of a basket of goods in 2020	Difference
RTO	£567.91	£396.00	-£171.91
High Street	£420.07	£342.68	-£77.39
		Difference in differences	**-£94.52**

Source: FCA analysis of online data

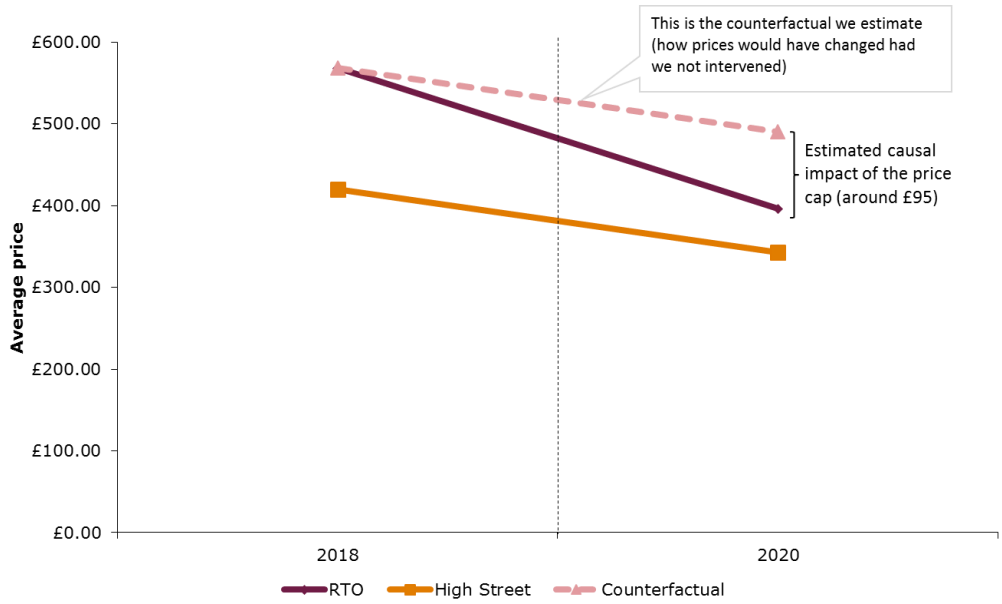
Table 5 shows that the basket of a sample of goods sold by the 2 largest RTO firms in 2018 had an average base price plus delivery and installation of £567.91. In 2020, the average price was £396.00.

We see that in both years, the average price plus delivery and installation of an identical basket at high street retailers was lower (£420.07 in 2018 and £342.68 in 2020).

The price of the basket at the high street retailers fell by £77.39 while the decrease was £171.91 at the 2 RTO firms on average.

This gives us a DID estimate of negative £94.52. This implies that without our intervention, the cost of the basket sold at the RTO firms would have been £490.52. This means that the policy has reduced prices by an estimated 19%. The causal effect we estimate via DID is illustrated in Figure 4.

Figure 4: Estimated effect of the price cap on RTO prices



Source: FCA analysis of online data, 2020

In CP18/35 we assumed that prices would fall to 10% above the average high street price. That would have required RTO base prices to fall on average by 19.5%. The 19% reduction is therefore in line with our expectations at the time of intervention.

The results demonstrate that there has been a reduction in RTO base prices. One caveat is that these results are practically significant, but not statistically significant (see Annex 1). However, we think that the lack of statistical significance is due to a small sample size and large variation in the type and price of goods included rather than spuriousness. The results also refer to RTO goods sold online – we are not able to say if they hold for furniture, refurbished products or products sold only in store.

DID analysis using a panel of products

In addition, the fact that we are unable to observe the same products over time in the results in Table 5 makes the results sensitive to the type of product we include in the basket.

As a robustness check, we repeat the calculations with identical products that we can observe in both years. We can observe 17 such products, all sold by a third RTO firm. The results are presented in Table 6.

Table 6: DID results using only products observed in both years

Sector	2018	2020	Difference
RTO	£435.87	£366.34	-£69.53
High Street	£343.81	£317.91	-£25.90
		Difference in differences	**-£43.63**

Source: FCA analysis of online data

With these data, for an identical basket of goods in each year, the price had dropped by £69.53 at the RTO firm, while it had only decreased by £25.90 at high street retailers. As the goods are identical across the 2 years and between the 2 groups, it is reasonable to assume that the difference is due to the price cap. That is, we estimate that the policy caused prices to decrease by £43.63 on average at the third largest RTO firm. This is 10.6% lower than what prices would have otherwise been.

These results are consistent with the results in Table 5 for Firm 1 and Firm 2 in terms of the direction of the policy effect, albeit smaller in magnitude. However, the third firm had lower initial base prices. While we expected Firm 1 and Firm 2 to decrease their prices on average by 18% to comply with the price cap, Firm 3 would have had to decrease its prices by only 10% to comply. The causal effect of the policy we calculate for Firm 3 (see Table 6) is therefore consistent with our expectations.

In summary, the DID analysis shows that the policy acted to decrease prices by 18% of what they otherwise would have been at the 2 largest firms. We also estimate that the effect for another RTO firm was a reduction of prices by 10%. In both cases these effects were consistent with our expectations set out in CP18/35.

4 Results on the effectiveness of our rules on other charges

This chapter sets out our findings of our review of the rule preventing firms from recovering revenue from goods or services provided in connection with rent-to-own (RTO) agreements.

Information we reviewed

We conducted multi-firm work in the RTO sector from July to December 2019. The work targeted a sample of 4 RTO firms, covering the majority of the market at the time. As part of a request for information, firms were asked to provide:

- schedules of the prices of all other goods and services the firm provided in connection with RTO agreements as of 1 July 2019 and over the previous 12 months
- the tariffs of default, arrears and collections-related fees and charges in operation in the 12 months previous to 1 July 2019, and the period during which each tariff was in place

To establish whether the information we held was up to date for the purposes of this evaluation, we held semi-structured interviews with 2 large RTO firms in September 2020. Our questions covered:

- Have you made any changes since the information gathered during the MFW in the pricing of goods and services provided in connection with RTO agreements, or related charges?
- Have there been any changes since the announcement of the price cap in the way goods and services provided in connection with RTO agreements are applied (eg the range of goods they are applied to/offered on or customers affected)?
- Have there been any changes since the introduction of the price cap to the terms and conditions of insurance, extended warranties or other connected goods/services?
- Have there been any changes since the announcement of the price cap to the pricing or application of delivery and installation charges?
- Have you introduced any new goods or services, or related charges, connected with RTO agreements?
- Do you cross-sell between RTO market and other financial or other goods, and if so has this changed to any degree since the introduction of the price cap?

If the firms had responded yes to any of the above, we planned to ask for the reasons behind the changes and, if necessary, ask the firm to provide supporting material on the changes, including any documentation or board minutes covering their implementation.

Findings

We reviewed the data collected from the MFW and the responses to our interviews. We did not find any evidence to suggest that firms had increased prices of connected goods

and services since the announcement of the price cap. Similarly, there was no evidence to suggest any changes in the way connected goods and services or other charges are applied since the announcement of the price cap.

We are unable to provide any further detailed information in this paper given the small number of firms in the RTO market may lead to disclosure of confidential information.

5 Lessons learned

Here we set out the main lessons we can draw from our evaluation. Some of the learnings below are specific to this intervention and market, but they may nevertheless provide some useful considerations for future interventions in other markets.

Lessons learned on price caps

The results of our evaluation suggest rent-to-own (RTO) base prices have fallen as a result of the price cap's benchmarking requirement, contributing to lower costs of financing for consumers. RTO base prices remain higher than other firms, but have converged with the prices of other non-RTO firms. There is limited evidence of systematic gaming or avoidance to the detriment of consumers.

If the FCA were to consider introducing price caps in other markets in the future, there may be limited lessons that can be drawn from the design of the RTO benchmarking requirements. In the case of the RTO market, there was a comparable retail sector that our rules could require firms to benchmark prices against. This is not the case for most financial services products, where benchmarks for price caps or other outcome controls may be harder to define. So the lessons that can be drawn from the RTO price cap design are likely to be limited unless such conditions exist.

By contrast, any future policy consideration may benefit from the experience with the RTO price cap's anti-avoidance measures. It is important for control remedies like price caps to carefully consider anti-avoidance measures, and on the evidence of this evaluation the RTO price cap's measures may be a model future interventions can learn from. The exact design features, however, will always need to be sector-specific.

Other conclusions

Given the scope of the evaluation we are not able to draw stronger conclusions on the overall effect of the intervention on consumers. We have not conducted an ex-post cost benefit analysis. Nevertheless, our results show that RTO prices have fallen broadly in line with our expectations at the time of intervention. Therefore, if realised costs were in line with those estimated in our CBA (including the costs of compliance estimated by firms in a survey), it would suggest the price cap could have delivered net consumer benefits relative to the counterfactual scenario. On the basis of the results we have reported on product prices and anti-avoidance, there is currently no reason to suggest the cap should be removed or changed.

The exit from the RTO market of the previous largest firm, primarily, we believe, for reasons unrelated to our price cap, means the number of RTO agreements has subsequently fallen, though the long-term effects of economic turbulence and market changes in 2020 is uncertain. Even though we estimate RTO prices have fallen as a result

of the price cap, subsequent market changes create some uncertainty as to how consumers of RTO have reacted and the overall benefits they have experienced.

Annex 1: Further detail on our quantitative evaluation approach

In this annex we explain our approach to data collection, as well as the detail behind the differences-in-differences (DID) methodology and the assumptions we make in interpreting our results.

Data and caveats

To produce Table 2 and calculate the DID estimates, we gathered information from the websites of the 3 largest RTO firms in the market between March and May 2020. We manually collected price data on a random sample of up to 50 products per firm across the 3 product categories, in line with the methodology we applied in 2018.

We did not include furniture items in our data as they are typically bespoke and it is harder to find the exact same or comparable furniture item sold by another retailer. Furniture, however, is not exempt from the benchmarking rules. Similarly, we also excluded refurbished items from the review as it is hard to ensure like-for-like comparisons with a refurbished item.

Our online data collection and exclusion of furniture and refurbished goods provides a caveat to our analysis and conclusions. The range of products offered online may not be fully representative of those offered in-store, and we are aware that furniture and refurbished goods play an important role in this market. Nevertheless, the data used in this evaluation provides consistency with the price comparison baseline from CP18/35.

The largest firm during this period, had a limited selection of products available at the time of data collection. The firm had 26 products available on their website, out of which 17 were also available at high street retailers. This has implications for the analysis – the fact that we were able to match a relatively small number of products sold by this firm to products sold by high street providers could mean the product mix reflected the firms' financial situation at the time of data collection, and means there could have been a change in the product mix sold by the firm since 2018. However, we chose this approach for consistency and comparability to 2018 results.

Our final sample used to construct Table 5 consisted of a total of 63 products. For each of the 63 products, we collected price data from the websites of major high street retailers. We aimed to collect data from 3 high street retailers. We first looked for the same products on the websites of Argos, AO, Appliances Direct or Curry's PC world. Where this wasn't available, we collected price data from other retailers. In some cases, we were able to find price data from only 1 or 2 competitors. This was rare, however, with 45 of the 63 products having comparable data from 3 high street retailers and 11 having 2 comparisons.

We also did a second DID analysis, which was carried out only with products that were sold in both periods. We were able to identify 17 products that were in our sample in 2018 that were still sold by RTO firms in 2020 and used these data to construct Table 6.

We collected data on the base price, which we define to be the price of the product advertised on the website less any delivery or installation charges. We recorded delivery and installation separately. It is important to note that the data collection was carried out between March and May 2020 – the period with the strictest lockdown rules. This had caused many firms to suspend their installation services and remove the installation prices from their website. In such cases we recorded installation charges as zero for consistency with the 2018 methodology.

The DID Estimator

We begin with the following equation for the price of product i sold at time t.

$$Price_{it} = \gamma_i + \beta RTO_i + \lambda_t + \delta I(RTO = 1 \; and \; t = 2) + \epsilon_{it} \quad (1)$$

Where $Price_{it}$ is the price of product i at time t.

γ_i is the intercept, which can be interpreted as the 'intrinsic' price of the product – the price less the mark-up charged by the RTO firm, the effect of time-varying factors, and the effect of the price cap.

RTO_i is a dummy variable taking the value 1 if item i is sold by an RTO firm and 0 otherwise. As described in Section 2, RTO firms have explained that their base prices are higher than those of high street retailers due to several factors, eg higher wholesale prices. The beta therefore captures the mark-up charged by RTO firms.

λ_t is the time-varying component of price. It captures all factors that vary across time such as the sterling exchange rate, seasonal demand or availability of substitutes at the time. Time takes values $t = \{1,2\}$ where 1 denotes the pre-intervention period and 2 denotes the post-intervention period. In the context of this exercise, 2 represents 2020 prices and 1 represents 2018 prices.

Finally, I is a dummy variable taking the value 1 if the statement in parenthesis is true. In this case if $RTO = 1$ AND $t = 2$, I takes the value 1 and 0 otherwise. That means that I takes the value 1 only in the second period, and only for RTO firms, ie I indicates whether a product was subject to the price cap. Since the model already includes the effect of the item being sold by an RTO firm, and the effect of time, δ is the effect of the price cap on prices.

ϵ_{it} is an error term – it captures all other factors omitted from the model. It is assumed that ϵ_{it} is 0 in expectation and that it is not correlated with any of the explanatory variables. This assumption would be breached if the common trends assumption is violated. We argued above that this assumption is reasonable on the basis that we look at identical products between RTO and high street firms.

Our goal is to estimate δ. Below we give a definition of the DID estimator and explain under what assumptions it can be interpreted as the treatment effect.

We define an estimator $\hat{\delta}$ as:

$$\hat{\delta} = (\overline{Price}_{RTO\,2} - \overline{Price}_{RTO\,1}) - (\overline{Price}_{Retail\,2} - \overline{Price}_{Retail\,1}) \quad (2)$$

Where:

$$\overline{Price}_{RTO\ 2} = \frac{1}{n_{RTO,2}} \sum_{i=1}^{N} Price_{i2}\, I(s(i) = RTO, t = 2)$$

$$\overline{Price}_{RTO\ 1} = \frac{1}{n_{RTO,1}} \sum_{i=1}^{N} Price_{i1}\, I(s(i) = RTO, t = 1)$$

$$\overline{Price}_{Retail\ 2} = \frac{1}{n_{Retail,2}} \sum_{i=1}^{N} Price_{i2}\, I(s(i) = Retail, t = 2)$$

$$\overline{Price}_{Retail\ 1} = \frac{1}{n_{Retail,1}} \sum_{i=1}^{N} Price_{i1}\, I(s(i) = Retail, t = 1)$$

In the above s(i) denotes the group to which the observation belongs – RTO or Retail. $n_{RTO,t}$ is the number of observations in the RTO group at time t and $n_{Retail,t}$ is the number of observations in the Retail group at time t.

Plugging in equation 1 for Price, we get:

$$\overline{Price}_{RTO\ 2} = \frac{1}{n_{RTO,2}} \sum_{i=1}^{N} (\gamma_i + \beta + \lambda_2 + \delta + \epsilon_{i2})\, I(s(i) = RTO, t = 2)$$

$$\overline{Price}_{RTO\ 1} = \frac{1}{n_{RTO,1}} \sum_{i=1}^{N} (\gamma_i + \beta + \lambda_1 + \epsilon_{i1})\, I(s(i) = RTO, t = 1)$$

$$\overline{Price}_{Retail\ 2} = \frac{1}{n_{Retail,2}} \sum_{i=1}^{N} (\gamma_i + \lambda_2 + \epsilon_{i2}) I(s(i) = Retail, t = 2)$$

$$\overline{Price}_{Retail\ 1} = \frac{1}{n_{Retail,1}} \sum_{i=1}^{N} (\gamma_i + \lambda_1 + \epsilon_{i1}) I(s(i) = Retail, t = 1)$$

We can use these definitions to plug back into equation (2). We get:

$$\begin{aligned} \hat{\delta} = \Bigg\{ & \frac{1}{n_{RTO,2}} \sum_{i=1}^{N} (\gamma_i + \beta + \lambda_2 + \delta + \epsilon_{i2})\, I(s(i) = RTO, t = 2) \\ & - \frac{1}{n_{RTO,1}} \sum_{i=1}^{N} (\gamma_i + \beta + \lambda_1 + \epsilon_{i1})\, I(s(i) = RTO, t = 1) \Bigg\} \\ & - \Bigg\{ \frac{1}{n_{Retail,2}} \sum_{i=1}^{N} (\gamma_i + \lambda_2 + \epsilon_{i2}) I(s(i) = Retail, t = 2) \\ & - \frac{1}{n_{Retail,1}} \sum_{i=1}^{N} (\gamma_i + \lambda_1 + \epsilon_{i1}) I(s(i) = Retail, t = 1) \Bigg\} \end{aligned} \tag{3}$$

We perform some simplification of the above. First, we assume that:

$$\frac{1}{n_{RTO,2}}\sum_{i=1}^{N}\gamma_i\, I(s(i)=RTO, t=2) = \frac{1}{n_{Retail,2}}\sum_{i=1}^{N}\gamma_i\, I(s(i)=Retail, t=2)$$

And:

$$\frac{1}{n_{RTO,1}}\sum_{i=1}^{N}\gamma_i\, I(s(i)=RTO, t=1) = \frac{1}{n_{Retail,1}}\sum_{i=1}^{N}\gamma_i\, I(s(i)=Retail, t=1)$$

That is, we assume that the average 'intrinsic' price of the products sold by RTO firms and those sold by high street retailers is the same across the 2 periods. We are confident that this is the case as we have matched the products in the 2 groups on their manufacturer code, making sure that products in the RTO and Retail group are the same.

The other assumption we make along the way is that the time-varying component is the same for RTO and Retail products (ie we assume that λ_t is not indexed by $s(i)$). Since we have chosen the control group to consist of exactly the same products as the RTO sample in each period, we are confident that this is the case. This assumption would be violated if there were other time-varying factors that determine the RTO price, but not the high street retail price.

This allows us to simplify equation 3 to:

$$\hat{\delta} = \delta + \frac{1}{n_{RTO,2}}\sum_{n=1}^{N}\epsilon_{i2} - \frac{1}{n_{RTO,1}}\sum_{n=1}^{N}\epsilon_{i1} - \frac{1}{n_{Retail,2}}\sum_{n=1}^{N}\epsilon_{i2} + \frac{1}{n_{Retail,1}}\sum_{n=1}^{N}\epsilon_{i1}$$

Under standard assumptions about the error term, the sum of the errors converges to 0 as the number of observations in each group becomes large. The $\hat{\delta}$ estimator above therefore converges to the causal effect of the policy δ.

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