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Auto-Switch

An ex-post evaluation of the impact of the introduction of the Auto-Switch reforms

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Welsh overview available

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1. Overview

We believe that customers should get a fair deal for their mobile communication services. We want people to be able to shop around with confidence, make informed choices and switch mobile providers easily. Therefore, in December 2017[1] we announced a package of reforms, collectively referred to as the Auto-Switch Reforms ("the Reforms"). The objective of these reforms was to reduce the difficulties and costs consumers encountered when switching mobile providers, which could potentially harm consumers by deterring them from switching to better deals. By making switching easier, we sought to encourage consumers to engage with the different options available to them in the market and to find better deals with their existing or other mobile providers.

The Reforms, which came into effect in July 2019, had three main elements. First, we introduced a simplified way to switch via enabling customers to request and automatically receive a unique code by text or through their online account ("Auto-Switch"). The customer could give this code to their new provider to facilitate switching and porting their number without having to speak to their losing provider. Second, we ensured that customers do not have to pay for their old service after switching by banning post-switch notice periods. Finally, we required mobile providers to give their customers better information about the financial implications of switching .

The assessment in this report focuses on the implementation and impact of these reforms on the outcomes faced by mobile customers. We have reviewed how well these reforms were implemented by mobile providers and, alongside this, the adoption of the new switching processes by consumers. Using econometric techniques, we assessed the impact of these reforms on customer switching and re-contracting behaviour. We have also considered whether these reforms had any wider impact on the mobile market.

What we found

- The implementation of the Reforms was successfully managed by the industry and the Auto-Switch process was in place by the initial deadline.
- Allowing industry to independently manage the implementation process, with Ofcom assuming a monitoring role was effective.
- The take-up of the new switching routes has been high, which means a large number of consumers have benefited from an easier switching process and a reduction in double paying beyond the switch date.
- Switching and re-contracting have increased following the Reforms. The evidence we have reviewed suggests that the Reforms may have contributed to this increase.
- We have also considered whether the Reforms had an impact on pricing, but we have not been able to establish a link.

[1] Ofcom, 2017. Consumer Switching: Decision on reforming the switching of mobile communication services (2017 Statement)

Conclusion

Overall, our analysis shows that the Reforms have been successful in achieving our goal of improving switching for consumers. The Reforms were implemented on time and had a greater take-up than we had expected in the 2017 Statement. As a result, they generated greater direct benefits for consumers than we had previously estimated. Additionally, we have found evidence of increased consumer engagement, suggesting that following these reforms customers were better able to exercise choice.

2. Introduction and background

2.1 The ability to switch easily between mobile providers ensures better outcomes for consumers and means they can best exercise choice and take advantage of the benefits of competition. It is also a key enabler of effective competition, which in turn underpins the provision of good value, high-quality products, and drives innovation.

2.2 To this end, in December 2017 we published our *Decision on reforming the switching of mobile communication services* ('2017 Statement'), introducing a package of reforms that aimed to remove unnecessary difficulties, costs or deterrents consumers encountered when switching mobile providers.[2]

2.3 This report is an ex-post evaluation of the measures included in the 2017 Statement, which comprise of the introduction of Auto-Switch, the prohibition of notice period charges beyond the switch date, and transparency requirements reforms. In the 2017 Statement, we collectively referred to all of these reforms as the Auto-Switch reforms (we now refer to these as 'the Reforms'). This publication is part of Ofcom's ex-post evaluation programme, which seeks to understand the impact of our regulation on consumer outcomes, an important aspect of ensuring that we are delivering for people and businesses in the UK.

Overview of the Reforms

2.4 In the 2017 Statement, we presented evidence that some consumers – including small businesses – could experience difficulties, service interruptions, or incur unnecessary costs when switching mobile providers. Importantly, we found that these difficulties could deter some consumers from switching.[3] To help address this problem, we introduced a package of reforms aiming to simplify the switching process by reducing any difficulties, costs or deterrents encountered by consumers when switching mobile providers.

Motivations for the introduction of the Reforms

2.5 In the 2017 Statement, we identified three main sources of concern associated with the process of switching mobile providers:[4]

- **Unnecessary time and difficulties progressing the switch**[5] – This occurred as a result of consumers needing to contact their existing provider to request a Porting Authorisation

[2] Ofcom, 2017. Consumer Switching: Decision on reforming the switching of mobile communication services ('2017 Statement')
[3] We noted that 15% of those who had not switched or considered switching (equivalent to around 5.9 million consumers) said that process concerns were the main reason they didn't switch or consider switching. Ofcom, 2017. 2017 Statement, paragraph 3.39
[4] Ofcom, 2017. 2017 Statement, paragraph 2.2
[5] Ofcom, 2017. 2017 Statement, paragraph 3.4

Code (PAC) [6] (to undertake a PAC switch)[7] and/or cancel their contracts, which often resulted in being exposed to unwanted persuasion to remain from their current mobile provider.[8]

- '**Double paying' while switching provider**[9] – This occurred because many mobile providers required consumers to pay for notice periods even when their old service had been deactivated.
- **Loss of service while switching provider**[10] – Some consumers suffered harm due to breaks in service during the switch.[11] We considered this occurred largely among 'Cease & Re-provide' ('C&R') switchers.[12]

Obligations regarding residential consumers

2.6 Mobile providers were required[13] to make the following changes relating to the switching process for residential consumers:

- **Ability to request PAC via text[14] or an online account (Auto-Switch routes)** – The Reforms obliged mobile providers to ensure their customers could request a PAC via text or through their online account.
- **Introduction of the STAC process**[15] – Mobile providers were obliged to provide customers who intended to switch but did not wish to retain their number, with a code enabling them to cancel their contract. This service became known as Service Termination Authorisation Codes (STACs).
- An obligation to provide information on the financial implications of a decision to switch away from their current provider ('Switching Information')[16] – Mobile providers

[6] Under the previous switching process, consumers wishing to transfer (port) their number when switching to a new mobile provider would need to request a PAC from their current provider. Most providers required that consumers call and speak to a service agent to request this.
[7] A 'PAC switch' or porting switch is when a customer transfers (ports) their mobile number when switching mobile providers.
[8] The general switching process, which applied before the 2019 Reforms, is set out at paragraphs 2.6-2.8 of the 2017 Statement. The current switching process, and the role of the Central Porting System (also known as the Central Switching System), is set out in more detail in a 2020 document from the MNPOSG. 'UK mobile switching and service termination process manual', page 19, Figure 2: Consumer Switching & Service Termination process flow.
[9] Ofcom, 2017. 2017 Statement, paragraph 3.7.
[10] Ofcom, 2017. 2017 Statement, paragraph 3.9.
[11] The industry made commitments to develop and implement measures to address loss of service on a voluntary basis, which we considered sufficient to adequately address our concerns. As such, we no longer felt it was proportionate to impose regulation regarding loss of service. Ofcom, 2017. 2017 Statement, paragraph 2.21
[12] Before the Reforms, there was no formal process available for consumers who wished to switch mobile provider without transferring their mobile number to their new mobile provider.
[13] The obligations were imposed by making changes to the General Conditions of Entitlement ('General Conditions'), which are regulatory conditions that apply to all communications providers, or to all providers of a particular description. Ofcom website [accessed 29 March 2023], General Conditions of Entitlement.
[14] By 'text' we refer to SMS text throughout this document
[15] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Conditions C7.30 to C7.37. Ofcom, 2017. 2017 Statement, paragraphs 4.35 to 4.110. Previously referred to as the N-PAC process, mobile providers later re-named this the 'STAC process' prior to implementation. 2017 Statement, paragraphs 4.41 to 4.44.
[16] How and when Switching Information must be provided to residential customers is set out in the General Conditions in Conditions C7.30 to C7.37

were obliged to ensure this information accurately captures the major financial implications of switching.[17]

- **Prohibition of notice period charges beyond the switch date**[18] - To prevent double payment, mobile providers were obliged to stop imposing notice charges beyond the switch date to customers using the PAC or STAC process to switch.[19]
- **Transparency to consumers**[20] – Mobile providers were obliged to provide consumers with clear information about the switching and number porting process on, for example, their websites.
- **Provision of PACs/STACs within one minute**[21] – Mobile providers were obliged to provide switching codes requested by residential consumers by each of the required routes within one minute from receipt of the request.[22]

Obligations regarding business consumers

2.7 Mobile providers were also required to implement the changes in relation to business consumers.[23] However, some alterations were made to these obligations, in particular regarding the time required for providing PACs, STACs and other relevant information to business consumers.[24] Specifically:

- Provision of PACs/STACs requested by phone immediately and when this is not possible, within two hours by text[25]
- Provision of PACs/STACs requested by text or online within two working days by the means requested, as well as by text[26]
- Mobile providers had two working days to provide Switching Information to business customers after a request[27] [28]

[17] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Conditions C7.30 to C7.31.
[18] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.8
[19] Losing mobile providers were required to calculate final bills on a pro-rata basis. This means that the customer's final bill would be for the period between day one of switching consumers' monthly billing cycle to the day of the switch, rather than based on a consumer's usage of their inclusive monthly bundle at that point of the billing cycle. 2017 Statement, paragraph 4.120.
[20] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.46
[21] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.46. Ofcom, 2017. 2017 Statement, paragraphs 2.5 to 2.8. 2017 Statement Annexes, paragraph A10.26.
[22] An exception to this is where the request is made, and the response is given by phone – where a text must also be sent to the customer containing the code. When a request is made by phone, the PAC or STAC and the Switching Information must be sent either during the call or up to one minute from the end of it. The 2017 Statement Annexes , Annex 11. Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.36
[23] While these reforms also cover business consumers, they only apply when customers switch fewer than 25 mobile numbers (i.e., exclude "bulk ports"). Ofcom, 2017. 2017 Statement, footnote 22.
[24] 2017 Statement, paragraph 5.15.
[25] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.38
[26] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.38 to C7.39. For requests in relation to more than one mobile number, the PAC or STAC is to be provided within two hours if requested via a phone call or within two working days if requested via an online account.
[27] Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.41
[28] Ofcom, 2017. 2017 Statement, paragraph 4.80 to 4.81

Our approach to assessing the Reforms

2.8 We first examine whether the package of reforms was implemented as intended by the mobile providers. We rely on evidence obtained from stakeholders in meetings held in March 2022. We focus on whether there were any significant difficulties when implementing the Reforms and whether the implementation costs providers incurred were materially different from our initial estimates.

2.9 Using information provided by stakeholders, we next assess the take-up of processes introduced by the Reforms by consumers. We have revisited the cost benefit analysis undertaken in the 2017 Statement using these actual take-up numbers and have re-evaluated the direct benefits accruing to consumers switching mobile provider from avoiding double payment, unnecessary time spent and unwanted contact with their mobile provider.

2.10 Though the Reforms were primarily intended to address the harm consumers often experienced when switching mobile providers, rather than increasing engagement per se, we recognised in the 2017 Statement that simplifying the switching process could lead to increased switching or re-contacting. We have therefore also investigated the impact of the Reforms on these behaviours by performing an econometric analysis using detailed data on customers' contract histories.

This document

2.11 The rest of this document is set out as follows:

- Section 3 summarises mobile providers' experience of implementing the Reforms.
- Section 4 assesses the take-up of the Reforms and updates the 2017 Statement's estimates of direct benefits to accruing to consumers.
- Section 5 examines whether the Reforms had an impact on consumer engagement.
- Annex 1 outlines a review of the cost benefit analysis originally undertaken in the 2017 Statement, updating it with new information.
- Annex 2 sets out the econometric analysis of engagement in more detail.
- Annex 3 summarises developments in average prices and data allowances for new mobile contracts in 2019.

3. Implementation of the Reforms by mobile providers

3.1 This section focuses on the implementation of the Reforms. We examine whether:

- the Reforms were implemented as intended,
- mobile providers encountered any unforeseen problems or difficulties during the implementation process,
- whether the actual implementation costs mobile providers incurred were materially different from our initial estimates as set out in the 2017 Statement.

Costs and difficulties associated with the implementation of the Reforms

3.2 There was an 18-month implementation period, meaning mobile providers were obliged to implement changes by no later than 1 July 2019 for both business and residential consumers. While the PAC process already existed, it was recognised that mobile providers would need to undertake development work, including investment in set-up costs[29] and the training of staff, in order to implement the Reforms by this date.[30]

3.3 In general, mobile providers did not report encountering any major difficulties during the implementation process, as the Reforms largely built on a pre-existing porting infrastructure. In addition, mobile providers already had some experience collaborating to address porting issues through the UK Mobile Number Portability Operator Steering Group (MNPOSG).[31]

The Reforms were implemented by the 1 July 2019 deadline

3.4 During discussions with stakeholders in 2022,[32] no mobile provider mentioned encountering any major challenges in implementing the Reforms by the deadline given. The largest mobile providers[33] confirmed that the Reforms were implemented by the 1 July 2019 deadline. In fact, several mobile providers noted that the testing phase was

[29] For example, this would include development of new systems, implementing the changes and subsequent testing. Ofcom, 2017. 2017 Statement Annexes, paragraphs A3.31 to A3.39

[30] Our expectation of the kind of work required in order to implement the Reforms, as well as our estimate of the likely costs, were set out in Annex 3 of the 2017 Statement Annexes.

[31] MNP OSG website [website accessed 22 March 2023] The UK Mobile Number Portability Operator Steering Group ('MNP OSG')

[32] Discussions were held with BT/EE, Sky Mobile, Tesco Mobile, Three, Virgin Media/O2 and Vodafone in March and April 2022.

[33] These are Three, EE, Vodafone, O2, Virgin Media, Sky Mobile and Tesco Mobile.

completed by June 2019 and they were able to issue PACs requested via text or via an online account ahead of the deadline.[34]

3.5 While some providers remarked that the 18-month implementation period was appropriate [✂], several others [✂] did highlight that significant resources were required to deliver the Reforms by the deadline.

A few providers encountered difficulties when implementing certain aspects of the Reforms

Some providers found it challenging to ensure that PACs were provided within 60 seconds to residential consumers

3.6 Two providers [✂] remarked that it was challenging to provide the PAC to consumers within 60 seconds of being requested, with one [✂] noting the difficulty involved in pulling information from different sources in real time.

Providers had mixed views on whether the introduction of the STAC process imposed substantial additional costs or difficulties

3.7 One mobile provider [✂] told us that it developed the Auto-Switch routes for the PAC and the STAC processes together and therefore the STAC process did not require a lot of extra time or cost in addition to what was being done for the automated provision of PACs. On the other hand, another mobile provider [✂] told us that the implementation of the STAC process was very cumbersome as it required significant changes in infrastructure.

3.8 Several mobile providers [✂] highlighted consumers' limited use of the STAC process (compared to the PAC process)[35] to argue that the introduction of the switching functionality for non-porting switchers was not justified.

Some providers remarked on the strain the implementation process placed on resources and its associated costs

3.9 Overall, most mobile providers we spoke to made limited comments on the direct monetary costs associated with delivering the Reforms. [✂] and [✂] indicated that the implementation costs were in line with their expectations. However, two other mobile providers [✂] remarked that the costs were significantly higher than expected – commenting that the costs were roughly double what they had anticipated, although without providing any further details as to why this was the case.[36] Several mobile

[34] [✂] explained that while it went live officially on 1 July 2019, internally it went live on 1 June 2019, as part of a pilot test run, where mainly internal requests were generated. [✂] also were in a position to process requests for PACs via online accounts and text before the official deadline.

[35] As we note below in Section 4, use of the STAC process has indeed been limited and less than what we had anticipated in the 2017 Statement.

[36] We note that the final cost estimate in the 2017 Statement, reflected input from industry stakeholders through several consultations. Cost estimates, along with accompanying workbooks with calculations and subsequent comments on costs by stakeholders were published on the Ofcom website. Ofcom, 2017. 2017 Statement, Annex 3.

providers also commented that the implementation of the Reforms had the consequence of stretching internal resources, which impeded the progress of other projects [✂].

3.10 We reflect on the extent to which the implementation costs incurred by providers were proportionate to the benefits the Reforms delivered in Section 4, as well as in Annex 1.

Co-ordination among providers during implementation of the Reforms and Ofcom's role

3.11 In the 2017 Statement, we acknowledged that although we expected mobile providers could undertake most of the implementation activity independently, some aspects of the Reforms would require agreement and co-ordination across industry. As the Reforms required amendments to wholesale arrangements,[37] coordination was also required between mobile network operators (MNOs)[38] and mobile virtual network operators (MVNOs).[39]

The implementation of the Reforms was managed successfully by the industry

3.12 There was positive engagement and cooperation between all stakeholders leading to the timely implementation of the Reforms. Two providers [✂] told us that the implementation of the Reforms was a great example of co-ordination across the industry.

3.13 However, some mentioned that initially there were some significant disagreements between mobile providers on how to implement the Reforms [✂]. The same stakeholders also noted that the co-ordination of the implementation process became much smoother once consultants from Cenerva[40] were hired to help with project management and assist with decision making through the MNPOSG.

Ofcom assumed a monitoring role in the implementation process

3.14 Our view in the 2017 Statement was that requirements on providers were sufficiently clear and therefore the industry was best placed to manage the implementation process, with Ofcom assuming a monitoring role.[41] We also sought to provide clarifications and/or guidance on issues brought to our attention.

[37] Ofcom, 2017. 2017 Statement, paragraph 5.61 .
[38] An MNO refers to a provider which owns a cellular mobile network. There are four MNOs in the UK – Three, EE (owned by BT), VMO2 and Vodafone.
[39] An MVNO provides mobile communication services using the infrastructure of an MNO.
[40] Cenerva website [accessed: 13 January 2023] (published 18th December 2019), 'Cenerva helps implement UK mobile switching changes'.
[41] Ofcom, 2017. 2017 Statement, paragraph 5.60.

Some providers told us that greater involvement from Ofcom could have helped the industry reach consensus faster

3.15 Two mobile providers [✂] remarked that it would have been useful if Ofcom had been more actively involved during the implementation process. In particular, mobile providers mentioned initially struggling to reach an agreement on how to implement certain aspects of the Reforms that required close co-operation across the industry.

3.16 However, we note that Ofcom was engaged with the industry throughout the implementation period. There were quarterly roundtable meetings between Ofcom and the industry from March 2018 to March 2019. Ofcom also attended several UK MNPOSG meetings during the early stages of the implementation period. In light of queries raised by providers, we published clarification on customer authentication (we expand on this below), as well as published two further updates on 4 January 2019 on the Ofcom mobile switching page.[42]

Some providers told us that Ofcom should have engaged more with concerns raised by the industry, particularly the issues surrounding customer verification and fraud

3.17 Two mobile providers [✂] commented that Ofcom should have engaged more with the industry in relation to the concerns that were raised during the consultation process on the high risk of fraud posed by the ability to obtain PAC using Auto-Switch.

3.18 Furthermore, there were comments that lack of engagement and clear guidance from Ofcom led providers to implement the customer verification aspects of Auto-Switch differently. We observe that while some mobile providers do not require customers to provide any additional information to verify their identity when requesting a PAC via text, others require additional details from customers. For example, Three customers requesting a PAC via Auto-Switch are asked to provide their date of birth[43], while Vodafone previously required customers to provide a PIN associated with their account.

3.19 We note that in the 18 months leading up to implementation, Ofcom was both aware of these concerns and engaged with the industry to address them and provide clarity. This consisted of meetings with the industry as well as correspondence and discussions with individual providers, in addition to liaising with relevant external bodies such as the Information Commissioner's Office (ICO). We emphasised that each mobile provider had flexibility on how it verified customers' identity, provided that the preferred verification approach did not introducing additional barriers to switching. We also provided clarifications to individual mobile providers, on the extent to which certain proposed verification methods were acceptable or not.

3.20 In October 2018, we provided further clarifications in an open letter to mobile providers in response to queries on how customer authentication could be managed given concerns

[42] Ofcom website [accessed: 25 January 2023], Statement: Decision on reforming the switching of mobile communication services - Ofcom

[43] See Three's website [accessed 22 March 2023] 'How to get a PAC or STAC code when leaving Three'.

about the risk of fraud.[44] Furthermore, as part of our 2022 statement on changes to the General Conditions related to the switching process,[45] we set out formal guidance on our position on customer verification (including multi-factor authentication) in one of the statement's annexes.[46]

Conclusions on the implementation of the Reforms

3.21 Overall, the implementation process was successfully managed by the industry and the Reforms were completed by the initial deadline, with Ofcom maintaining a monitoring role. Although some providers reported challenges associated with certain aspects of the Reforms (such as the provision of switching codes within 60 seconds), we understand that the implementation process ran smoothly for the most part, without major issues arising for providers.

3.22 Further to comments from two mobile providers that the cost of implementation was higher than anticipated, we consider the proportionality to the benefits of the Reforms in greater detail in Section 4 and Annex 1.

[44] Ofcom, 2018. Open Letter titled 'RE: Mobile Switching Reforms – authentication on the text Auto-Switch route' (dated 29 October 2018).
[45] Ofcom, 2022. Quick, easy and reliable switching: Statement on changes to the General Conditions.
[46] Ofcom, 2022. Quick, easy and reliable switching: Statement on changes to the General Conditions, Annex 5: Guidance on multi-factor authentication relating to Auto-Switch.

4. The take-up of the Reforms and direct benefits to consumers

4.1 In this section we assess whether the package of measures that were introduced with the Reforms were used by consumers. Furthermore, we consider the extent to which the Reforms benefitted consumers by improving their switching experience. We then evaluate the immediate benefits to consumers associated with the take-up of the Reforms by updating the cost benefit analysis undertaken in the 2017 Statement.

Use of the Reforms by consumers

4.2 To assess the take-up of the Reforms, we issued a formal request for information (RFI) to obtain data from Syniverse[47] on the number of PACs and STACs requested by consumers and used to complete a switch.[48] The data excludes bulk requests[49] and was provided at a monthly frequency covering the period between January 2017 and December 2021.

4.3 Furthermore, we sent RFIs to the largest mobile operators[50] asking for monthly data[51] on the number of PACs and STACs requested by their customers, broken down by channel (i.e., text, online account, call with provider or in-person). We also made use of survey evidence from the Ofcom Switching Tracker.

More consumers than we had anticipated in the 2017 Statement request PACs using Auto-Switch routes

The number of switches completed via the PAC process increased following the Reforms

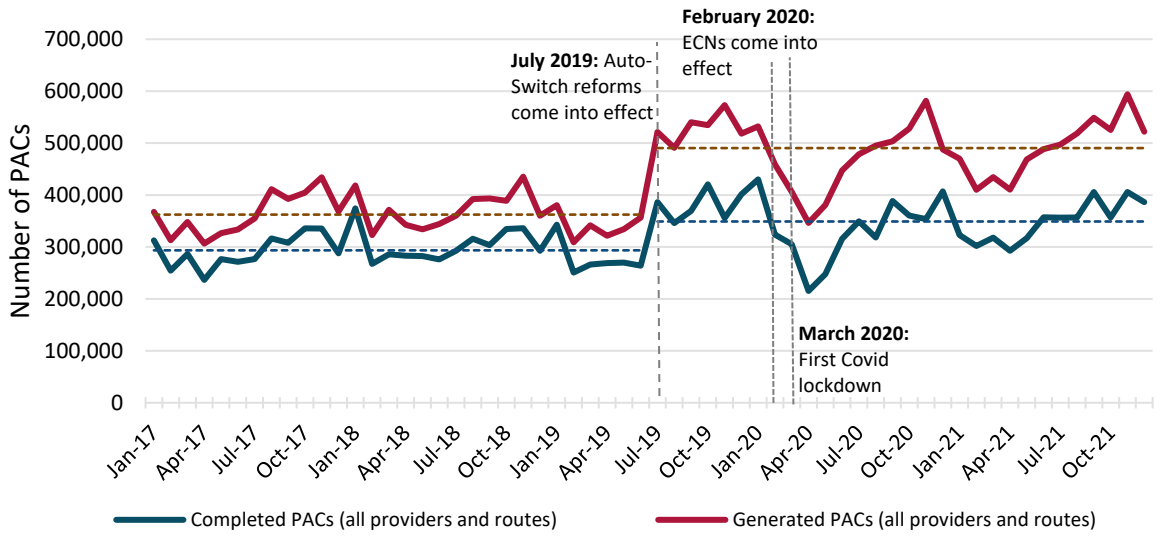
4.4 Figure 4.1 below summarises how the use of the PAC process has evolved over time. More specifically, it provides information on:

a) the number of PACs (besides bulk requests) requested across all routes (i.e., text, online account, call with provider or in-person); and

b) the number of PACs (besides bulk requests) requested across all routes that were subsequently used to port a number to a different mobile provider (i.e., where consumers shared the PAC with their new provider when switching).

[47] Syniverse currently manages the Central Porting System (CPS) that supports mobile number portability in the UK.
[48] Syniverse response to our RFI (dated 1 June 2022), provided on 5 August 2022.
[49] A bulk request is a request to obtain a switching code (either PAC or STAC) relating to 25 (or more) numbers at one time.
[50] We sent the RFI on 1 June 2022 to the following providers: Tesco Mobile, EE, BT mobile, Plusnet, Three, Smarty, Virgin Mobile, Vodafone, VOXI, Sky and giffgaff. These providers serve over 90% UK residential mobile customers, according to the 2022 Ofcom Technology Tracker ("QM4. Which mobile network do you use most often?"). Responses provided on 22 June 2022 (Three, giffgaff, Vodafone, Tesco Mobile), 29 June 2022 (BT/EE, VMO2) and 6 July 2022 (Sky Mobile).
[51] We requested mobile providers to provide the relevant data from 2019 to 2021. However, not all of the mobile providers were able to provide the data for each month of this period. We only have data on how PACs and STACs were requested from all of the mobile providers from June 2021 onwards.

Figure 4.1: Number of unique porting codes (PACs) requested and completed



Source: Syniverse's response to an RFI (request dated 1 June 2022, response dated August 2022). Information excludes bulk requests.

4.5 There were in total 4.4 million PACs requested in the 12 months prior to 1 July 2019 (the deadline for the implementation of the 2019 Reforms) of which, 3.5 million resulted in completed PAC switches. The number of requested PACs increased to almost 5.8 million in the 12 months following the 1 July 2019 deadline, of which 4.1 million resulted in completed PAC switches.

4.6 The observed 0.6 million increase in the number of completed PAC switches in the 12 months following the implementation of the Reforms is approximately the same as what we had anticipated in the 2017 Statement.[52] The number of switches completed via the PAC process further increased to 4.2 million in the year 2021.

The number of requested PACs not subsequently used to complete a switch also increased

4.7 In Figure 4.1, we also observe that the gap between requested PACs and completed PACs has increased since the introduction of the Reforms. This may indicate that consumers have taken advantage of the increased ease of requesting a PAC via Auto-Switch for reasons besides porting their number. For example, consumers may have been testing if the PAC process works or using the PAC process to find out if they are out-of-contract.[53] Consumers may have also requested PACs and not subsequently used them in order to assist with the negotiation of a new contract with their current provider (we expand more on this in Section 5).

[52] Ofcom, 2017 Statement Annexes, Annex 7. In Figure A7.4 ('Number of switchers who would use Auto-Switch'), it was noted that 0.62m switchers who were previously C&R switchers would undertake PAC switches following the Reforms.
[53] The PAC code received by operators' customers is accompanied by Switching Information, i.e., information which sets out the total charge payable by customers (and, where relevant, charges for more than one mobile number must be aggregated) and any credit balances, where the switch relates to prepaid mobile communication services. 2017 Statement Annexes, Annex 10, paragraph A10.7.

Most residential consumers use Auto-Switch to request a PAC

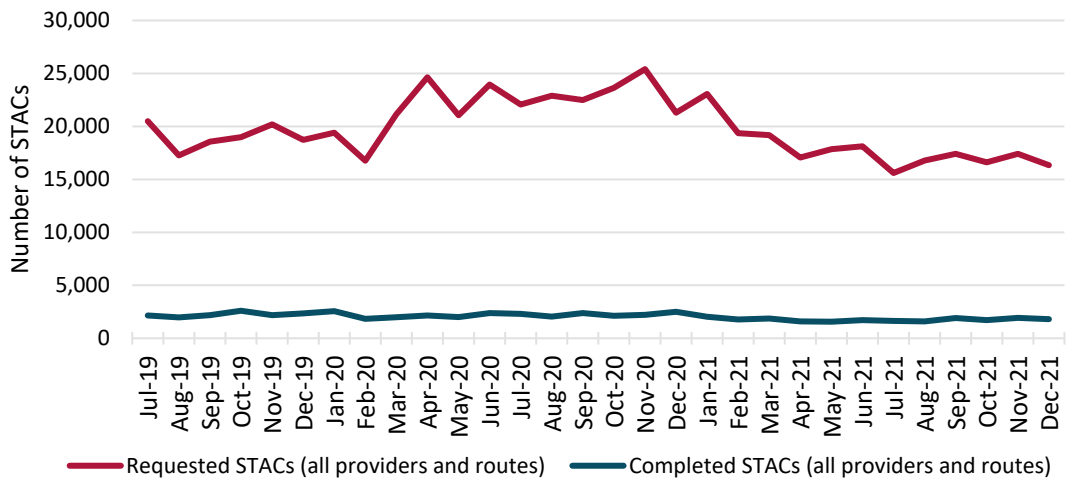
4.8 The Ofcom Switching Experience Tracker survey indicates that following the implementation of the Reforms, the majority of consumers request PACs via the Auto-Switch routes i.e., text or online. In 2020, 51% of PAC requests were submitted via text and 26% through an online account.[54] The prevalence of Auto-Switch's use is further supported by information obtained directly from the largest mobile providers – which indicates that in July 2021, 61% of all PAC requests[55] were submitted via text and 10% through an online account.[56]

4.9 The take-up of Auto-Switch is higher compared to what we had anticipated in the 2017 Statement.[57] The high take-up of Auto-Switch suggests that consumers have welcomed the increased speed and ease of access of the automated routes, as well as being able to control the amount of communication with their losing provider.

On the other hand, the use of the STAC process has been limited

4.10 Figure 4.2 summarises the number of STACs requested by consumers and the number of STACs used to complete a non-porting switch since 1 July 2019.

Figure 4.2: Number of STACs requested and completed



[54] Ofcom, 2020. 2020 Switching Experience Tracker. Q4a "How did you request it" (base: those who either said they kept their number or requested a PAC).
Ofcom, 2021. 2021 Switching Tracker, Q.32F "How did you request the Port Authorisation Code (PAC)".
[55] These numbers include all PAC requests, which would therefore include instances when a PAC was requested, but not subsequently used to switch and port a customer's number to their new provider. However, we consider this to be a reasonable estimate of the proportion of customers who used Auto-Switch to request a PAC when switching.
[56] Based on information received in response to the RFI sent on 1 June 2022 to the following providers: Tesco Mobile, EE, BT mobile, Plusnet, Three, Smarty, Virgin Mobile, Vodafone, VOXI, Sky and giffgaff.
[57] In the 2017 Statement, we expected 42% of those who already switched using the PAC system would use Auto-Switch (1.35 million out of 3.23 million) following the Reforms. In addition, we expected that 0.62 million of those who were previously C&R switchers, following the implementation of the Reforms, would use Auto-Switch. Therefore, we implicitly expected that around 51% (1.97 million out of 3.85 million) of future PAC switchers would use Auto-Switch. 2017 Statement Annexes, Figure A7.4: Number of switchers who would use Auto-Switch

Source: Response to formal information request to Syniverse

4.11 In the 12 months following the Reforms, just over 241,000 STACs were requested (across all providers and routes), with only 11% (26,000) leading to a completed non-porting switch. In 2021, the number of requested STACs had further declined to fewer than 215,000, 10% (21,000) of which resulted in completed non-porting switches. This is less than 1% of the number of competed PACs over the same period. The use of STACs was around a fifth of the amount we anticipated in the 2017 Statement, where we expected approximately 100,000 consumers to make use of the STAC process each year.[58]

Consumers took advantage of the ability to request Switching Information via text

4.12 We collected data on the number of "INFO" texts sent to 85075. In the last seven months of 2021, customers of the largest mobile providers[59] used this functionality to inquire about their contract and obtain switching information on approximately 900,000 occasions.[60] For comparison, over the same seven-month period consumers requested 3.7m PACs (2.6m of which were completed and used to port numbers while switching).

4.13 During conversations with stakeholders, some mobile providers commented that the ability for customers to request switching information via texting "INFO" could sometimes be helpful when talking to customers (of other providers) about switching.

Business consumers also made use of the Reforms

4.14 Around 5% of all the PAC requests in July 2021 were submitted by consumers on business tariffs.[61] This partly reflects the fact that those on business tariffs make up a relatively small proportion of the mobile customer base.[62] Of all the PACs requested by business consumers in July 2021, 76% were requested via phone, while 18% were requested via text and 5% were requested via an online account.

4.15 In addition, very few business consumers requested a STAC (less than 200 STACs were requested by business consumers in July 2021). The majority of these STACs were either via text or online.[63] Furthermore, information received from certain mobile providers

[58] Ofcom, 2017. 2017 Statement. Figure A7.4 'Number of switchers who would use Auto-Switch'

[59] We requested information on the number of residential and business consumers who requested Switching Information via text from Tesco Mobile, EE, BT Mobile, Plusnet, Three, Smarty, Virgin Mobile, Vodafone, VOXI, Sky and giffgaff. This information was provided in response to the RFIs submitted to these mobile providers on 1 June 2022.

[60] We only have data for the largest mobile providers (BTEE, VMO2, Sky Mobile, Tesco Mobile, Vodafone and Three) for the period June 2021 until December 2021. Furthermore, this is data for both business and residential consumers, as not all mobile providers were able to provide information on which type different types of consumers requested the Switching Information.

[61] This has been calculated using the information on how PACs were requested, as obtained from Tesco Mobile, EE, BT Mobile, Plusnet, Three, Smarty, Virgin Mobile, Vodafone, VOXI, Sky and giffgaff, in response to our formal information request, requested on 1 June 2022

[62] Information from quarterly data, which is regularly provided to Ofcom by mobile providers, indicates that in Q4 2021, around 15% of all mobile tariffs were business tariffs (as opposed to residential tariffs).

[63] In July 2021, 27% of all the STAC requests made by business consumers were via phone, 42% were via text and 31% were requested via an online account.

indicates that around 5% of switching information requested by texting "INFO" to 85075, were requested by business consumers.[64]

Evaluation of the direct benefits to consumers due to the Reforms

4.16 In the 2017 Statement, we quantified some[65] of the benefits accruing to consumers as a result of the Reforms and compared them with the estimated cost to industry of implementing the Reforms. As discussed above, there is greater use of PAC and the Auto-Switch routes than we anticipated in the 2017 Statement. The high take-up of Auto-Switch implies that switching is now faster, easier and less costly for the majority of consumers who switch using the PAC process.

4.17 The Ofcom Switching Experience Tracker (SET) however, indicates that more consumers reported having difficulties with the switching process in the years following the Reforms.[66] It is difficult to know the reason for the reported increase as the SET does not provide sufficient context for us to understand whether the reported increase in difficulty relates to the changes in the switching process introduced by the Reforms. Importantly, the increased difficulty may at least to some extent, reflect the impact that the Covid-19 lockdowns had on mobile providers' capacity to handle inquiries from customers.[67]

Direct benefits to consumers were slightly higher than expected, reflecting the higher than anticipated take-up of Auto-Switch

In the 2017 Statement we estimated that the Reforms would generate direct benefits of £115.3m for consumers

4.18 In the 2017 Statement, we estimated that the Reforms would lead to direct benefits of £115.3m (NPV over a 10-year horizon) for existing switchers.[68] These benefits related to the savings realised by consumers following the prohibition of notice period charges past the switch date, as well as the reduction in time and effort spent to complete the switch.[69]

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[64] Based on the data from the mobile providers that were able to provide the residential/business consumer split, 5% of the Switching Information requested by texting "INFO" to 85075 in 2021 were requested by business consumers.
[65] In the cost benefit analysis, we only sought to quantify the benefits that would accrue to those who were already switching, while ignoring the benefit to new switchers (i.e., those who might begin to switch as a result of the Reforms). Ofcom, 2017 Statement. Paragraph 5.36. Moreover, we only sought to quantify benefits pertaining to the reduction in the time spent, the difficulties switchers experienced and, savings from double paying amongst switchers. Ofcom, 2017 Statement. Paragraph 5.27
[66] Based on responses to 'Q19A/B/C. EXPERIENCED MAJOR OR MINOR DIFFICULTY WHEN CHANGING [SERVICE/S] PROVIDER' in the 2018 Ofcom Switching Experience Tracker; 2020 Ofcom Switching Experience Tracker and; 2022 Ofcom Switching Experience Tracker. For example, 64% mentioned experiencing some (either minor or major) difficulties when switching in 2022, compared to 60% in 2020 and 46% in 2018.
[67] We have found that the various Covid-19 lockdowns from 2020 to 2021 had a significant effect on customer service. Information received from mobile providers indicated the customer contact waiting time increased for most of the largest mobile providers. This is likely to have affected those seeking information on switching or those continuing to request PACs via phone. Ofcom, 2021. 'Comparing customer service: mobile, home broadband and landline', pages 5-6, and 11-12.
[68] Ofcom, 2017 Statement. Paragraph 5.35.
[69] Ofcom, 2017 Statement. Paragraphs 5.27 to 5.36, Annex 4, 5 and 6.

4.19 It should be noted that these calculations do not capture the total benefit to consumers from the Reforms. As acknowledged in the 2017 Statement,[70] we believe that consumers who have been encouraged to switch (or re-contract) due to the Reforms are likely to also benefit from better deals. Furthermore, if the Reforms contribute to the mobile market becoming more competitive, all consumers (including non-switchers) are likely to benefit from better deals.

Even higher benefits for consumers, when the 2017 calculations are updated using information on the actual take-up of Auto-Switch

4.20 Following the same methodology as in the 2017 Statement, [71] we have updated our calculations of the direct benefits for consumers using information on the actual level of take-up of the Reforms (as opposed to the estimates of the expected take-up of the Reforms used in the 2017 Statement). We set out the methodology and calculations underpinning our updated estimates in Annex 1.

4.21 Our updated calculations yield a benefit of £130m in NPV over a 10-year horizon, i.e., 13% higher than our estimate in the 2017 Statement. This reflects the fact that the actual take-up of Auto-Switch was higher than what we had expected in the 2017 Statement (around 71%[72] compared to 51%).[73]

There was an overall benefit from the Reforms

2017 Statement found a net benefit from the Reforms

4.22 In the 2017 Statement, we estimated the implementation costs of the Reforms to be £76 million (this included set-up costs, ongoing costs and training costs).[74] However, we also took account of the savings that mobile providers would make from the Auto-Switch process, as a result of fewer call and in-store enquiries from customers who want to switch. We estimated that mobile providers would save £17.7 million (NPV with a 10-year horizon). Therefore, the overall cost to the industry was estimated at around £58 million.

[70] Ofcom, 2017 Statement Annexes, paragraphs A8.11 to A8.23
[71] The cost benefit analysis is set out in paragraphs 5.23 to 5.47 of the 2017 Statement, with more detail on the methodology set out in Annexes 3, 4, 6, 7 and 8 of the 2017 Statement Annexes.
[72] As noted above, 61% of all PAC requests were submitted via text and 10% through an online account. This is based to the RFIs submitted to mobile providers (Tesco Mobile, EE, BT mobile, Plusnet, Three, Virgin Mobile, Vodafone, Sky Mobile and giffgaff) on 1 June 2022.
[73] As noted above, from the figures in the 2017 Statement we can infer it was anticipated around 51% (1.97 million out of 3.85 million) of future PAC switchers would use Auto-Switch. 2017 Statement Annexes, Figure A7.4: Number of switchers who would use Auto-Switch
[74] These costs include £66.1 million for Auto-Switch, £9.0 million for Prohibition on charging notice after switch date and £0.9 million for the transparency requirements. Ofcom, 2017 Statement, paragraph 5.24, footnote 198

Higher take-up of Auto-Switch implies higher than expected cost savings by mobile providers

4.23 In our revised cost benefit analysis, we have updated our estimate of the cost savings based on the take-up of the Reforms. We find the cost savings from the Reforms to be £25 million.[75]

There would a net benefit, if the estimated implementation costs were doubled

4.24 For the purpose of estimating the overall cost to the industry, we have retained our original estimate of the implementation costs (£76m) as set out in the 2017 Statement. This is because most of the mobile providers we spoke to, did not have any comments on implementation costs. Following our quantification of the costs and benefits, we find that the Reforms generated a net benefit of nearly £80 million.[76]

4.25 As mentioned in Section 3, two mobile providers commented that implementation costs were roughly double what they had anticipated. As a conservative scenario, we have repeated the cost benefit analysis assuming that implementation costs for all mobile providers were twice as high compared to what we have estimated in the 2017 Statement (£152m). We still find a net direct benefit of £3.5 million.

Conclusion on the take-up of the Reforms and direct benefits accruing to consumers

4.26 Following the Reforms, there was an overall increase in the number of PAC switches, alongside a higher-than-expected take-up of Auto-Switch by customers (compared to the 2017 Statement). As a result, our updated estimates of the direct quantifiable benefits to consumers due to the Reforms are also higher than what we set out in the 2017 Statement.

[75] For the cost savings calculations, we assume that any increase in PAC usage is due to those who previously undertook C&R switches beginning to switch using PACs, facilitated by Auto-Switch. It is possible that some of the higher PAC usage is due to an overall increase in switching caused by the introduction of the Reforms. As these switches would not have otherwise occurred, costs would not have been incurred without these reforms. However, we have included all of the cost savings from an increase in PAC as a benefit here due to the difficulty in disentangling the cause of the increase in PAC usage.

[76] Resulting from £130m in consumer benefits and £25m in costs savings, set against £76m in implementation costs

5. Impact of the Reforms on consumer engagement

5.1 In this section, we examine whether the Reforms led to greater consumer engagement and whether, as a result, consumers benefited from improved outcomes. Using data from mobile providers, we seek to assess empirically whether the Reforms led to more switching and re-contracting among the customers of these providers. We further consider the impact of the Reforms on prices and data allowances for new contracts and re-contracts.

We observe an increase in consumer engagement in the years following the Reforms

5.2 In the 2017 Statement, we had recognised that simplifying the switching process could lead to increased switching[77] or encourage some consumers who were previously unengaged to contact their mobile providers and negotiate better deals. The evidence we have reviewed indicates there was indeed an increase in consumer engagement, in line with our expectations.

5.3 Besides the increased use of the PAC system discussed in Section 4, survey evidence from the Ofcom Switching Tracker points to an increase in the switching rate from 12% in 2019 to 16% in 2020.[78] Re-contracting rates also increased following the implementation of the Reforms, with the proportion of customer who report making changes as a result of contact with their provider rising from 7% in 2019 to 15% in 2020.[79]

Assessing the impact of the Reforms on consumer engagement

Our analytical approach

5.4 The observed positive trends in consumer engagement cannot, however, be categorically attributed to the Reforms. Developments in the mobile communications market (e.g., the introduction of End of Contract Notifications in February 2020) and other factors (e.g., the Covid-19 lockdowns) may have driven these trends, at least to some extent.

[77] Ofcom, 2017. 2017 Statement Annexes, paragraph A4.63

[78] The switching rate was 12% in 2019 (surveyed in July/August 2019), 16% in 2020 (surveyed in June and November 2020), 16% in 2021 (surveyed in July/August 2021), and 15% in 2022 (surveyed in July/August 2022). This is based on responses to "Q28. Have you or your household ever changed the company that provides your mobile phone service? IF YES – When did you most recently change provider for your mobile phone service?" – counting those who switched in the previous 12 months. There was a methodology change after the 2019 Switching Tracker, as from the 2020 Switching Tracker onwards, the survey was conducted by online/telephone/post, as opposed to face to face (due to Covid-19)- Ofcom, 2019 to 2023. 2019 Ofcom Switching Tracker. 2020 Ofcom Switching Tracker. 2021 Ofcom Switching Tracker. 2022 Ofcom Switching Tracker.

[79] This is based on responses to"Q24/Q25/Q26. SUMMARY OF CHANGES IN THE LAST TWELVE MONTHS AS A RESULT OF MAKING CONTACT WITH PROVIDER". Ofcom, 2019 to 2020. 2019 Ofcom Switching Tracker. 2020 Ofcom Switching Tracker.

5.5 For the purposes of this ex-post evaluation, we went one step further and examined whether we could empirically establish a causal link between the Reforms and consumer engagement (i.e., switching and re-contracting) by using data obtained from mobile providers in response to the 2022 Mobile Strategy Review data request.[80] More specifically, we used data provided by four mobile providers (Sky Mobile, Tesco, O2 and Three) in order to perform an econometric analysis seeking to identify the impact of the Reforms on consumer engagement. For reasons explained in greater detail in Annex 2, we have not been able to include in our analysis data from other mobile providers.[81] Hence, while providing useful insights, our results cannot be safely interpreted as reflecting the impact the Reforms had on consumer engagement for the entire UK mobile communications market.

5.6 The Reforms were implemented by all mobile providers across the UK at the same time (1 July 2019). Our assessment of the effect the Reforms had on consumer engagement, therefore comes down to a temporal comparison - i.e., comparing customer switching and re-contracting behaviour before and after the date on which the Reforms came into effect.

5.7 To strengthen the validity of our comparison and identify the effects of the Reforms, our proposed empirical approach draws on Regression Discontinuity Design in Time (RDDiT), a technique that allows us to account for external factors and compare customers' behaviour shortly before and after the implementation of the Reforms.[82] The idea behind an RDDiT approach is that customers close to before and after the introduction of the Reforms are similar[83] and therefore comparable. We discuss our econometric approach in greater detail in Annex 2.

[80] Formal information requests were submitted to VMO2, BT/EE, Three, Vodafone, Tesco Mobile and Sky Mobile on 25 July 2022, in the context of Ofcom's ongoing strategic review of its approach to markets that deliver mobile communication services.

[81] BT/EE (including Plusnet and BT Mobile), VMO2 (including Virgin Mobile) and Vodafone (including VOXI) also responded to the Mobile Strategy Review data request. We have not, however, included data for EE, Plusnet, BT Mobile, Virgin Mobile, Vodafone and VOXI in our core analysis as issues with the data provided does not allow us to accurately identify the date when a customer leaves their provider (only the month a customer leaves). Furthermore, although Three also provided information on SMARTY as part of the Mobile Strategy Review data request, their customers have been excluded from the analysis due to being pre-pay/pay-as-you-go customers.

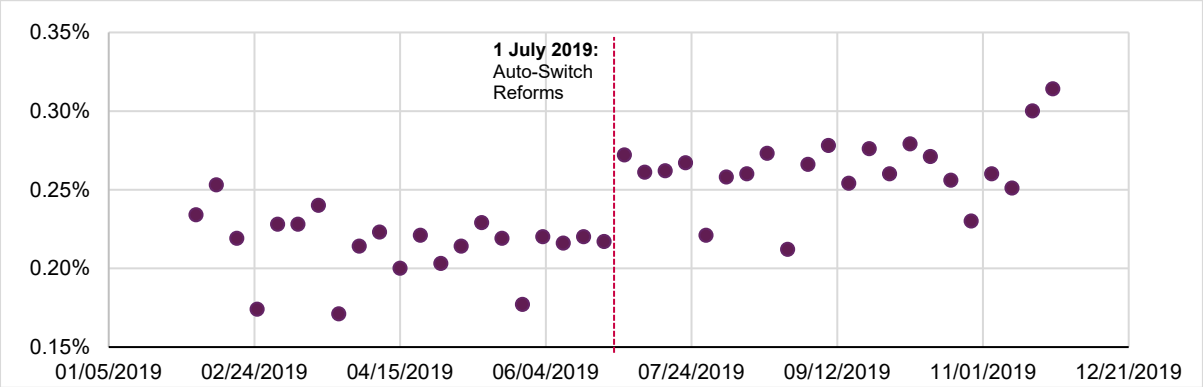
[82] As explained in greater detail in the Annex 2, in its application, our proposed approach departs from the traditional RDDiT method but draws on its underlying logic.

[83] We test this assumption in the Annex 2 with continuity checks.

Econometric analysis of customers' switching behaviour

5.8 Using data for out-of-contract customers[84] of Sky Mobile, Tesco, O2 and Three[85], who are on individual[86] pay monthly[87] residential tariff[88] contracts, Figure 5.1 plots the proportion of customers leaving their mobile provider each week in 2019. We expect this is a reasonable proxy of how many customers switch to another mobile provider.[89] This graph therefore helps to illustrate the effect the Reforms may have had on switching.[90] We observe a jump in switching on the week the Reforms came into effect and, on average, there appears to be an increase in the rate at which customers leave their providers in the second half of 2019 (i.e. after the Reforms were introduced).

Figure 5.1: Switching Rate, per week (Sky, Tesco, Three, O2) from Feb 2019 to Nov 2019



5.9 Note: Average weekly share of out-of-contract customers, on contracts only relating to a single number, that are with Tesco Mobile, Sky Mobile, Three or O2 – that switch provider.

5.10 Our econometric results confirm the graphical analysis in Figure 5.1. We find that the Reforms had a positive and statistically significant (albeit relatively small in magnitude) effect on consumers' switching behaviour. The analysis suggests that the Reforms increased the switching rate of the customers in our working sample (i.e., out-of-contract customers of Sky Mobile, Tesco, O2 and Three who are on individual, pay monthly,

[84] Auto-Switch became available to all mobile customer on 1 July 2019. However, as customers who are well within their minimum contract period would be subject to cancellation/notice period charges and therefore are unlikely to switch, we restrict attention to out-of-contract customers.
[85] We have limited our analysis to these four mobile providers for which we can accurately identify the precise date customers end their contract with their providers.
[86] The Reforms only obliged mobile providers to enable customers to request PACs and STACs via text, for requests relating to a single mobile number. Ofcom, 2023. General Conditions (Unofficial Consolidated Version), Condition C7.32
[87] We excluded PAYG (also known as 'pre-pay') customers, is that since they typically pay for a 30-day contract upfront, the contract end date is always 30-days from the initial payment. We therefore cannot ascertain the precise day such PAYG customers switched to a new mobile provider.
[88] We do not include any mobile customers that are on business tariffs, given that (as outlined in Section 2) the Reforms apply differently to business tariffs, compared to residential tariffs.
[89] We can only observe a customer's contract history with a given mobile provider as each customer is linked to a unique anonymized identifier. However, we cannot link the contract histories a given customer has with different mobile providers. We acknowledge that a customer may terminate their contract with their mobile provider for reasons unrelated to switching. However, we believe that the majority of contract terminations relate to switching mobile providers.
[90] The graph also helps Regression Discontinuity Design (RDD) is an appropriate way to estimate these effects, as if a jump isn't clear in the graphical analysis, RDD is unlikely to show a strong effect.

residential tariffs) by 0.06 percentage points.[91] This is equivalent to around 4,500 additional customers switching in the first week following the introduction of the Reforms.[92]

5.11 However, further checks we have undertaken to test the validity of the assumptions underpinning our preferred econometric approach (i.e., that customers close to before and after the introduction of the Reforms are similar) produced mixed results. This suggest that we cannot confidently establish a causal link between the Reforms and switching behaviour.[93] In other words, in some instances our analysis cannot isolate the effect the Reforms had on consumers' switching behaviour from other factors.

5.12 Our main methodological concern is that consumers who may have been more likely to switch provider (even in the absence of the Reforms), may have simply deferred their switching decision to a later date (i.e., after 1 July 2019) in order to take advantage of the Reforms. This could be for example, due promotional campaigns by mobile providers or news reports alerting consumers of the upcoming changes in the switching process just before the Reforms came into effect.[94] We discuss this in greater detail in the Annex 2.

Econometric analysis of re-contracting behaviour

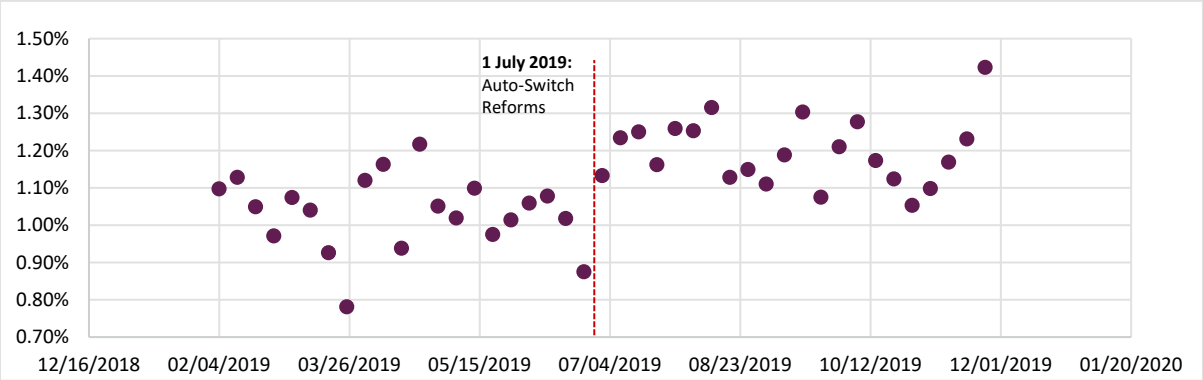
5.13 To assess whether a causal link can be established between the Reforms and customers' re-contracting rate, we used the same dataset[95] and followed the same empirical approach as for our switching analysis.

5.14 In Figure 5.2 we plot customer re-contracting rates[96] over time to illustrate the effect the Reforms may have had on re-contracting.[97] We observe that there was a jump in re-

[91] This is using our baseline sharp RDD model, using a weekly panel and examines the period two-weeks prior to and after the introduction of the Reforms.
[92] We have calculated this figure by first finding the size of the subset relevant to the sample we examined in the regression analysis. Using data obtained from mobile providers as part of Ofcom's regular industry data collection programme, we calculated the number of residential subscriptions for these mobile providers at the end of June 2019. Then, we used the sample data provided for the Mobile Strategy Review to determine the number of customers on residential tariffs that were out-of-contract in July 2019 (c. 40%) and the proportion of these contracts that only related to a single mobile number (c. 80%). This equated to over seven million customers. We then multiplied this number by the relevant coefficient (0.0006 in the case of the baseline Sharp RDD model) to give an estimate of around 4,500 customers.
[93] In particular, when we conduct continuity tests on the customers in our dataset, we find that for one (of the two econometric models we use) there is a statistically significant difference between some of the contract characteristics of the customers before the implementation of the Reforms, compared to afterwards. This opens the possibility that other factors may explain the increase in engagement.
[94] In theory, consumers could have known that the Reforms would come into effect on 1 July 2019 since December 2017 i.e., when the Statement was published. We expect however, that consumer awareness was mainly driven by press coverage and advertising by mobile providers closer to the implementation date. Our own desk research suggests that several related news articles appeared on 1 July 2019 (e.g., Daily Express, Sky News website, ITV news website). Moreover, Ofcom's initial press release and an ISPreview (a telecoms trade journal website) article appeared on 28 June 2019. We also understand that Sky Mobile had an advertising campaign focused on Auto-Switch close to the introduction the Reforms (and Sky Mobile went on to have further high-profile Auto-Switch centred advertising campaigns in 2021), although we could not identify if any campaigns preceded the introduction of these reforms.
[95] Therefore, also for our re-contracting analysis we focus out-of-contract customers of on Tesco Mobile, Sky Mobile, O2 and Three, who are on individual, pay monthly, residential tariff contracts.
[96] That is the proportion of customers who, in a given week, begin a new contract with their existing mobile provider.
[97] It is also important to graph the data to confirm Regression Discontinuity Design (RDD) is an appropriate way to estimate these effects, as if a jump is not clear in the graphical analysis, RDD is unlikely to show a strong effect.

contracting at the cut-off date among customers of the four mobile providers we include in our analysis. We also observe an increase in the average re-contracting rate in the second half of 2019, even though not as pronounced as the increase in switching over the same period that we observe in Figure 5.1.

Figure 5.2: Re-contracting Rate, per week (Sky, Tesco, Three, O2) from Feb 2019 to Nov 2019



5.15 Note: Average weekly share of out-of-contract customers, on contracts only relating to a single number, that are with Tesco Mobile, Sky Mobile, Three or O2, who re-contract with their provider.

5.16 Our econometric analysis finds that the Reforms increased the re-contracting rate of consumers in our working sample (i.e. residential, out-of-contract, individual, pay monthly customers of Sky, O2, Three and Tesco) by 0.29 percentage points. When considering the subset[98] of mobile customers we are examining, this translates into approximately an additional 21,000[99] customers re-contracting in the first week following the introduction of the Reforms.

5.17 Given that this analysis made use of the same dataset as the switching analysis, there is the same concern regarding the validity of the assumptions underpinning our econometric approach. Therefore, we cannot confidently establish a causal impact of the Reforms on re-contracting behaviour.

Impact of improved engagement on consumer outcomes

5.18 We have also considered whether by simplifying the switching process thus helping consumers better exercise choice in the market for mobile communications and increasing competitive pressures on mobile providers, the Reforms could have also led to a downward pressure on prices.[100]

[98] As for the switching analysis, this is the subset of mobile customers who are with Tesco, O2, Three or Sky, who are on pay monthly (post-pay) contracts that relate to only one mobile phone number and who are out-of-contract.
[99] As already explained in relation to switching, we first find the subset relevant to the working sample, which is over seven million customers. This is then multiplied by the relevant coefficient, which in the case of the baseline Sharp RDD analysis on a two-week bandwidth, is 0.0029 – resulting in around 21,000 extra customers switching in the first week following the Reforms.
[100] In the 2017 Statement, we identified this downward pressure on prices as a possible secondary benefit of the Reforms. Ofcom, 2017. 2017 Statement, paragraph 5.26 and Annex 8

5.19 Specifically, we looked at contract prices and data allowances both for new customers[101] and re-contracting[102] customers using data from the seven largest mobile providers (EE, Vodafone, O2, Three, Sky, Tesco, Virgin Media). However, we do not observe any discernible trend in the prices in the months following the implementation of the Reforms.[103] We summarise this evidence in Annex 3.

Conclusions on the impact of the Reforms on consumer engagement

5.20 The evidence we have reviewed suggests that following the implementation of the Reforms, consumer engagement increased, suggesting that residential customers were better able to exercise choice. Our econometric analysis implies that an extra 4,500 customers in our working sample (i.e., a subset of Sky, O2, Three and Tesco customers) switched provider in the first week following the introduction of the Reforms. Furthermore, an additional 21,000 previously unengaged customers re-contracted with their providers in the first week following the implementation of the Reforms.

5.21 However, though our results are indicative, they only hold for the subset on which we have performed our analysis and for the narrow bandwidth just before and just after the implementation date that we have studied, and our working sample excludes several major mobile providers. Hence, our results cannot be safely extrapolated to the whole market.

5.22 As discussed, we are not able to establish that the Reforms had a causal impact on consumer engagement. Moreover, subsequent developments in the market for mobile communications (e.g., the introduction of end-of-contract notifications) may have also contributed to increasing engagement among consumers. Therefore, it is challenging to identify the precise impact that the Reforms had on customer behaviour over a longer period.

5.23 However, when this econometric analysis is considered together with other evidence we have reviewed,[104] we conclude that the Reforms may have contributed at least to some extent to the observed increase in engagement.

[101] New contracts would capture whether by facilitating switching the Reforms may have helped customers move to better deals. At the same time, they would reflect whether in response to increased consumer engagement, mobile providers offered more attractive contracts to attract new customers.
[102] The characteristics of re-contracts would capture whether by facilitating switching, the Reforms might have an indirect effect on customers' ability to negotiate better deals from their mobile provider. This could be the case, if the increased ease of consumer switching resulted in mobile providers making greater efforts to retain customers, by offering better re-contracting deals.
[103] We do, however, observe a slight trend towards consumers purchasing contracts with larger data allowances (particularly unlimited data packages) in the second half of 2019.
[104] In particular, the findings from Ofcom's Switching Tracker in Section 5 indicate the increase in switching from 2019 to 2020. Moreover, Figure 4.1 shows that there was a sharp increase in PAC switches from June 2019 to July 2019.

6. Conclusion

6.1 The main objective of the Reforms was to remove unnecessary difficulties, costs or deterrents consumers encountered when switching mobile providers. By improving the switching process, we sought to enable consumers to better exercise choice and take advantage of the benefits of competition in the mobile communications market.

6.2 We have performed an ex-post evaluation of this policy intervention as part of our ongoing ex-post evaluation programme, which assesses the impact of our interventions on consumers and helps us identify important lessons for our future policies.

6.3 Our review of mobile providers' experience of implementing the Reforms, as set out in Section 3, suggests that the Reforms were successfully implemented as intended by the 1 July 2019 deadline.

6.4 The overall take-up of the automated routes for requesting PACs was greater than we had expected in our 2017 Statement. As we discussed in Section 4, the increased take-up of Auto-Switch among consumers implies that our revised estimate of the net direct benefit of the Reforms is also higher than our forecast in the 2017 Statement.

6.5 After the Reforms were implemented, there was an increase in switching and re-contracting rates among consumers. As discussed in greater detail in Section 5, we cannot go as far as saying that the Reforms had a causal impact on consumer engagement. However, when considering our econometric analysis alongside the evidence we have reviewed, we conclude that the Reforms may at least to some extent have contributed to the observed increase in engagement.

A1. Calculations for cost benefit analysis

A1.1 This annex details the calculations underpinning our assessment of the costs and benefits that accrued to mobile providers and consumers, as a result of the Reforms. As explained in Section 4, in the 2017 Statement we only sought to quantify some of the likely benefits resulting from the Reforms, which were expected to accrue to consumers who were already switching.[105] In this updated cost benefit analysis, we again focus on the benefits to existing switchers, which are more easily quantified.

A1.2 We closely follow the methodology we employed in the 2017 Statement[106], but use updated information on the actual take-up of the Reforms (provided directly from the largest mobile providers and Syniverse),[107] as opposed to the expected take-up figures (based on consumer surveys) we used in the 2017 Statement.

Overview of the 2017 Statement cost benefit analysis

A1.3 In our 2017 Statement, our cost and benefit estimates result from quantifying (in monetary terms) the following components:

a) Costs to industry associated with implementing the Reforms.

b) Cost savings to mobile providers from reduced interaction with customers during the switching process.

c) Benefits to consumers from the reduction in unnecessary time spent and difficulties encountered when switching.

d) Benefits to consumers from a reduction in charges incurred due to double paying for overlapping contracts during the notice period.

A1.4 We found that the expected benefits associated with our package of reforms would be £115 million whereas the overall costs to the industry (after taking into account the cost savings to operators)[108] were estimated to be £58 million over a 10-year period in NPV[109] terms.

Take-Up of Auto-Switch

A1.5 Our estimates of the anticipated costs and benefits associated with the Reforms, as set out in our 2017 Statement, depended on the extent to which we expected consumers would

[105] While we recognised the potential benefits of consumers switching to better deals and there being a more competitive mobile market as a result of the Reforms, these were not part of the benefits that were quantified.
[106] Ofcom, 2017. 2017 Statement, paragraphs 5.23 to 5.38.
[107] i.e., information on the actual proportion of consumers that used Auto-Switch (sourced from mobile providers) and the amount of PAC switches that occurred (sourced from Syniverse, the company that operates the central porting system for mobile providers in the UK).
[108] In particular, mobile providers were expected to save money following the Reforms, as consumer would be able to switch using Auto-Switch, as opposed having to always call a mobile or visit a phone shop to switch and/or obtain a PAC.
[109] 10-year Net Present Value (NPV), which represents the benefits derived over the period of 10 years in terms of "current value" of the pound (to reflect a general economic principle that a pound today is worth more than a pound in the future)

use the automated channels for requesting PACs and STACs that became available with our package of reforms (i.e. the take-up of Auto-Switch).[110] In the 2017 Statement, we used a mixture of survey evidence[111] and evidence obtained from formal information requests to stakeholders (mobile providers and Syniverse) to estimate the expected take-up of Auto-Switch.

2017 Statement estimates of Auto-Switch take-up

A1.6 In the 2017 Statement we assumed that switching numbers would stay the same before and after the Reforms. In the 2017 Statement quantified cost benefit analysis, we therefore used switching numbers from October 2015 to September 2016.

A1.7 In the 2017 Statement, we estimated that following the implementation of the Reforms, each year 2.1 million consumers would complete a PAC switch (i.e. port their number when switching) by using the Auto-Switch process (requesting a PAC via text or an online account).[112] This consisted of 1.35 million switchers who switched using the PAC process before the Reforms ('Former PAC Switchers') and 0.72 million switchers who switched using the C&R process before the Reforms ('Former C&R Switchers').

A1.8 In order to estimate the number of Former PAC Switchers who would use Auto-Switch, we multiplied the number of consumers who switched using the PAC process from October 2015 to September 2016[113], by the anticipated the take-up rate of Auto-Switch by Former PAC Switchers (42%).[114]

A1.9 In order to estimate the number of Former C&R Switchers that would use Auto-Switch, we multiplied the number of those who switched using the C&R process from October 2015 to September 2016, by the anticipated take-up rate of Auto-Switch by Former C&R Switchers (38%).[115] Specifically, we estimated that 0.62 million[116] Former C&R Switchers would use Auto-Switch to request PACs, while 0.1 million[117] Former C&R Switchers would use Auto-Switch to request STACs.

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[110] Set against this, we consider that the package of reforms would deliver significant benefits to: switchers; would-be switchers (those consumers who might switch in the future); and consumers more generally, through increasing rivalry between providers. Ofcom, 2017. 2017 Statement, paragraph 5.25

[111] In particular, we made use of a survey carried out by BDRC Continental (commissioned by Ofcom). Ofcom, 2017. 2017 BDRC Survey

[112] 2017 PAC switchers who will use Auto-Switch (1,354,597) + the number of 2017 C&R switchers who would become PAC switchers using auto-switch (618,722) + Number of C&R switchers who would change their number using Auto-Switch (100,000)=2.1million. The survey data that was used was from BDRC 2017 survey (slide 9). Figure A7.4 sets out how switchers were anticipated to behave following the Reforms. Ofcom, 2017. 2017 statement Annexes, Annex 7 Figure A7.4

[113] The number of PAC switches that occurred from October 2015 to September 2016 was originally obtained from an RFI to Syniverse.

[114] Ofcom, 2017. 2017 BDRC Survey, slide 9

[115] Ofcom, 2017. 2017 BDRC Survey, slide 9

[116] This is the proportion of 0.72m Former C&R switchers who said they would definitely or probably use Auto-Switch said they would also keep their number (86%). Ofcom, 2017. Mobile switching online survey tables, Table 161. QF3F If this method was available, and you used it to switch do you think you would change or keep your phone number?

[117] This is the proportion of 0.72m Former C&R switchers who said they would definitely or probably use Auto-Switch said they would not keep their number when switching (14%). Ofcom, 2017. Mobile switching online survey tables, Table 161, "QF3F: If this method was available and you used it to switch do you think you would change or keep your phone number?"

A1.10 It is worth noting that while the anticipated take-up of the Reforms was based on survey evidence, the expected take-up rate numbers were adjusted down to account for surveys' tendency to overstate future behaviour.[118] Implicitly, it was expected that 51% of all those undertaking PAC switches following the Reforms, would use Auto-Switch.[119]

Updated calculations for the take-up of Auto-Switch

A1.11 Our updated cost benefit analysis uses information requested from Syniverse to assess the increase in the number of PAC switches (comparing the number of PAC switches in the 12 months preceding and following the Reforms). We also use information requested from mobile providers on the proportion of PACs requested using Auto-Switch.

2.9 million PAC switches were completed using Auto-Switch

A1.12 In the 12 months following the Reforms, there were c. 4.1 million PAC switches.[120] Furthermore, we know that 71% of customers requested PACs using Auto-Switch (i.e. via text or an online account).[121] Assuming that the same proportion of completed PACs were requested via automated routes[122], we estimate that in the 12 months following the Reforms, c. 2.9 million PAC switches were completed using Auto-Switch.[123]

…of which, 0.6 million were Former C&R switchers, who, following the Reforms, used Auto-Switch

A1.13 In the 12 months following the introduction of the Reforms (i.e. between July 2019 and the end of June 2020) there was a 0.6 million increase in the number of completed PAC switches compared to the 12 months before the reforms (i.e. July 2018 to the end of June 2019).

A1.14 We assume that this observed 0.6 million increase in PAC switches was entirely due to the Reforms and in particular, due to Former C&R Switchers starting to use Auto-Switch to request a PAC when switching providers.[124] Assuming this, it follows that the remaining 2.3 million[125] PAC switches completed using Auto-Switch, were undertaken by Former PAC Switchers (consumers that used the PAC process before the Reforms).

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[118] The respective take-up rates from the survey were re-weighted to account for the fact that consumers tend to overstate future behaviour in survey responses. Ofcom, 2017. 2017 Statement Annexes, Annex 4, paragraph A4.41.
[119] In the 2017 Statement, we expected 42% of those who already switched using PACs would use Auto-Switch (1.35 million out of 3.23 million), while 0.62 million of those who were previously C&R switchers would start to switch using PACs requested using Auto-Switch. Therefore, around 51% (1.97 million out of 3.85 million) future PAC switchers would use Auto-Switch. 2017 Statement Annexes, Figure A7.4: Number of switchers who would use Auto-Switch
[120] The number of yearly PAC Switchers is from an information request via Syniverse switching numbers from July 2018 to June 2019.
[121] As already noted in Section 4, this is obtained from RFIs to the UK largest mobile providers on how their residential customers are requesting PACs.
[122] The 2021 Switching Tracker indicates 75% people use Auto-Switch. This makes us more confident using 71%.
[123] This is the amount of PAC numbers from July 2019-June 2020, multiplied by the percentage of PAC users that used Auto-Switch to request a PAC: (4,117,425)*(71%)=2,923,371
[124] This is the number of PAC switches following the Reforms, minus by amount of PAC switches before the reforms: 4,117,425 – 3,538,120 = 579,305
[125] We calculate the Former PAC Switchers using Auto-Switch by subtracting the total PAC Switchers using Auto-Switch by the Former C&R Switchers using Auto-Switch: 2,923,371 - 579,305 = 2,344,066.

The updated take-up rate of Auto-Switch channels among C&R and PAC switchers

A1.15 We find that 28% of Former C&R Switchers used Auto-Switch when undertaking a PAC switch[126] and that 66% of Former PAC Switchers used Auto-Switch undertaking a PAC switch.[127]

The use of STAC has been limited

A1.16 Due to the limited use of STAC, these switchers have not been considered in our revised cost benefit analysis. As noted in Section 4 the calculated number of STAC switchers is less than 1% of the number of PAC switches in the same time period. Due to the small number of STAC switches, the benefit derived would have been negligible relative to the benefits derived from extensive use of Auto-Switch to complete PAC switches.

The take-up of Auto-Switch was higher than we had anticipated in the 2017 Statement

A1.17 Overall, we estimate that a higher proportion of PAC Switchers use Auto-Switch than we originally expected (71%, compared to the 51% we implicitly expected in the 2017 Statement). We estimate that the take up of Auto-Switch by Former PAC Switchers was more than expected in the 2017 Statement, while we also see a less-than-expected take up of Auto-Switch by Former C&R Switchers.[128]

Cost to industry of implementing the 2019 package of reforms

A1.18 In the 2017 Statement, we estimated the implementation costs to be £76 million (this included set-up costs, ongoing costs, and training costs).[129] We estimated the cost savings due to fewer calls (as well as fewer chats and in-store visits) made by customers to be £17.7 million .[130] As a result, once we took account of the cost savings, the overall cost to industry was found to be £58 million.

We have not updated our 2017 estimates of the costs of implementing the reforms

A1.19 In meetings with stakeholders in early 2022 (as summarised in Section 3), two providers, [✂] commented that the implementation costs they incurred in order to deliver the Reforms significantly exceeded their expectations. However, neither provider went into detail on what components drove this discrepancy. All other providers consider costs to be

[126] Number of Former C&R Switchers that now use Auto-Switch (579,305)/ Former C&R users (2,077,943) = 27.9%
[127] This is the number of Former PAC Switchers who now use Auto-Switch (2,344,066), divided by the total amount of Auto-Switch users following the reforms (3,538,120) = 66%
[128] The anticipated take-up of Auto-Switch by PAC and C&R switchers can be found in Figure A7.4: Number of switchers who would use Auto-Switch. Ofcom, 2017. 2017 Statement Annexes, Annex 7
[129] These costs are £66.1 million for Auto-Switch, £9.0 million for Prohibition on charging notice after switch date and requirements for transparency of £0.9 million. Ofcom, 2017.2017 Statement Paragraph 5.24, footnote 198
[130] The exact number for cost savings estimated in 2017 was £17,711,795. Ofcom 2017. Supporting calculations to Statement: Benefits model

in line with expectations or did not comment on costs. We therefore consider that it is appropriate to continue using our estimate from the 2017 Statement, which amounts to £76 million (NPV calculated over a ten-year horizon).[131]

A1.20 Furthermore, as set out below, by way of a sensitivity check, we have also considered the implication of the costs being double what was expected in the 2017 Statement, when evaluating the net benefit .

We have updated our estimates of cost savings to mobile providers to reflect customers' actual take-up of Auto-Switch

A1.21 When calculating cost savings to the industry due to Auto-Switch, we follow our previous approach (as set out in the 2017 Statement) but update our calculations using the actual take-up of Auto-Switch as calculated earlier in this Annex. Our updated cost savings estimates are higher than the 2017 Statement estimates, reflecting the fact that the take-up of automated routes was higher than anticipated.

2017 Statement estimates of cost savings

A1.22 The staff cost savings were calculated as losing providers' average staff cost per customer interaction (call/webchat/store visit), multiplied by the reduction in the number of calls/webchats due to customers making use of Auto-Switch. Average staff costs per call were calculated as the average CSA (Customer Service Agents) hourly wage, multiplied by the average call/webchat/store visit duration (expressed in hours).[132]

A1.23 The reduction in the number of calls/webchats and in-store visits to the losing provider was estimated to be the result of (a) c. 1.1 million fewer yearly calls made by Former PAC Switchers[133] (who we expected would use Auto-Switch following the Reforms); and (b) c. 413,000 fewer calls made by Former C&R Switchers[134] (who we expected to use Auto-Switch to undertake PAC or STAC switches after the Reforms).[135]

[131] The breakdown of these costs for the different measures introduced under our package of reforms are as follows: £66.1 million (implementation of Auto Switch for residential and business customers); £9 million (implementation of prohibition of notice period charges past the switching date); £0.9 million (to deliver the requirements for transparency).
[132] Hourly staff costs of £10.98 per hour, 7.3 minutes time saved for PAC request and 7 minutes time saved for termination (C&R). These estimates were based on operator data obtained via RFIs. Ofcom, 2017. 2017 Statement Annexes, Annex 3, Paragraph A3.55
[133] Prior to the Reforms, PAC Switchers would have requested PAC via webchat, by telephone or in-store. This was calculated as the number of PAC switchers (3,277,241) multiplied by the proportion of PAC switchers using core process (phone, webchat, in-store) (81%) multiplied by the proportion of PAC switchers using new process (43.8%) = 1,146,006
[134] Prior to the Reforms, these Former C&R Switchers would have terminated their old contract with their losing provider and negotiate/start their contract with the new provider via webchat, by telephone or in store.
[135] This was calculated as the number of C&R switchers multiplied by the proportion of C&R switchers using core process (phone, webchat, in-store)], multiplied by the proportion of C&R switchers using new process (phone, webchat, in-store): 1,895,364*(51%)*(42.8%)= 413,237. 2017 Statement Annexes, Annex 3, paragraph A3.55

A1.24 Following this approach, we estimated cost savings to be £2.1 million per year (or a NPV of £17.7 million with a 10-year horizon).[136]

Updated estimates of cost savings

A1.25 We have not made any changes to the 2017 Statement's estimates of the average staff costs per call, and only updated Auto-Switch take-up figures. The update therefore increases our estimated reduction in the number of calls/webchats and in-store visits, due to the customers making use of Auto-Switch having been higher than expected.

A1.26 Our updated estimate of the cost savings accruing to mobile providers due to the Reforms is £2.9 million per year (or a NPV of £25 million with a 10-year horizon), comprising of:

- **Former PAC Switchers** who now use Auto-Switch for requesting PACs, result in yearly cost savings of £2.5 million (or an NPV of £21.8 million over a 10-year horizon).[137] This equals the updated estimate of the reduction in calls/webchats/store visits (c. 1.9 million) multiplied by the respective staff cost savings (£1.34).[138]
- **Former C&R Switchers** who now use Auto-Switch following the Reforms to undertake a PAC switch, result in yearly cost savings of £0.3 million (or a NPV of £3.2 million with a 10-year horizon).[139] We calculated this as the reduction in the number of calls/webchats/store visits (c. 295 k) multiplied by the respective staff cost savings (£1.27).[140]

A1.27 Our updated estimate of £25.1 million in cost savings is around 42% higher compared to the cost savings we had calculated in the 2017 Statement (£17.7 million NPV, with a 10-year horizon), reflecting the fact that the actual take-up of Auto-Switch was higher than we had previously anticipated.

Our updated estimates of implementation costs net of cost savings

A1.28 We have estimated the overall cost of the Reforms to the industry to be **£51 million** (over 10-years in NPV terms). We assume the implementation costs to still be £76 million

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[136] Exact numbers being cost savings yearly of £2,057,678 and cost savings 10-year NPV being £17,711,795. Ofcom, 2017. 2017 Statement Annexes, Annex 3, Paragraph A3.56 and Figure A3.5.
PAC yearly cost savings: [After reforms number of PAC calls/webchat/in-store avoided] (1,146,006) * [Time per switch saved, PAC, min] ((7.3)/60)*[Average staff costs, £/hr.](10.98) = £1,531,307
PAC 10yr NPV: [Yearly PAC cost savings] (1,531,307) * [NPV value] (8.61)/1000000= 13,200,000
C&R yearly cost savings: [After reforms number of C&R calls/webchat/in-store avoided](413,237)* [Time per switch saved, C&R, min]((6.96)/60) * [Average staff costs, £/hr] (10.98)= 526,365
C&R 10 Year NPV: [Yearly cost savings] (526,365) * [NPV value] (8.61)/1000000= 4,500,000
[137] Yearly cost savings PAC: [After reforms number of PAC calls/webchat/in-store avoided] (1,898,694) * [Time per switch saved, PAC, min] ((7.3)/60)*[Average staff costs, £/hr.](10.98) = 2,536,465
10 Year NPV PAC: [Yearly PAC cost savings] (2,536,465) * [NPV value] (8.61)/1000000= 21,833,099
[138] More specifically, this is equal to the staff time per switch (7.3 minutes) expressed in hours (7.3/60 = 0.12 hour) multiplied by average hourly staff costs (£10.98).
[139] Yearly cost savings C&R: [After reforms number of C&R calls/webchat/in-store avoided](295,445)* [Time per switch saved, C&R, min]((6.96) /60)) * [Average staff costs, £/hr] (10.98)= 376,303
10 Year NPV C&R: [Yearly cost savings] (376,303) * [NPV value] (8.61)/1000000= 3,239,099
[140] More specifically, this is equal to the staff time per switch for C&R (6.96 minutes) expressed in hours (6.96/60 = 0.116 hour) multiplied by average hourly staff costs (£10.98).

(including set-up costs, ongoing costs, and relevant training costs), while we estimate the cost savings to be £25.1 million. This is 13% lower compared to the **£58 million** (over ten years in NPV terms) we had estimated in the 2017 Statement, reflecting the higher cost savings arising to providers as a result of the higher-than-expected take-up of Auto-Switch.

Direct benefits of the Reforms to consumers

A1.29 In the 2017 Statement, we considered that many existing switchers[141] would immediately benefit from (i) a reduction in time and effort spent to complete a switch; and (ii) savings realised by consumers following the prohibition of notice period charges past the switching date. However, we did not attempt to quantify the benefit to consumers who would be encouraged to switch or would be able to obtain mobile contracts at more competitive prices due to the Reforms.[142]

A1.30 We estimated in our 2017 Statement that these benefits would amount to **£115.3m** (NPV over a 10-year horizon). We set out below how we calculated these benefits in our 2017 cost benefit analysis and detail how we update these estimates with actual Auto-Switch take-up figures for the purpose of our ex-post evaluation.

Benefits from a reduction in unnecessary time spent and difficulties consumers encountered when switching, experienced prior to the Reforms

A1.31 In the 2017 Statement, we identified that Auto-Switch would help customers who wish to switch provider save time and effort by (i) allowing them to control their contact with their losing provider and (ii) avoiding the difficulties experienced when contacting their existing provider to transfer (port) their number or cancel their old service (e.g. being exposed to unwanted attempts by their provider to persuade them to stay).[143]

Our 2017 Statement estimate of the benefits to consumers switching providers from saving time and hassle when switching

A1.32 In the 2017 Statement, we used a Willingness to Pay (WTP) analysis to estimate the amount of money consumers would pay to switch using the Auto-Switch process (and thus avoid the time and hassle associated with switching). The average WTP was calculated using survey data on the maximum price respondents would in theory be willing to pay in order to use Auto-Switch (and thus take advantage of a simpler switching process).[144] The WTP estimates were then reduced to adjusted for a hypothetical bias consumers may have to overstate their WTP.[145]

[141] By existing switchers, we mean both Former PAC Switchers and Former C&R Switchers.
[142] Ofcom, 2017. 2017 Statement, paragraph 5.27
[143] For more information on the difficulties, see 2017 Statement, paragraph 2.2
[144] Those surveyed who said they were unlikely to make use of Auto-Switch, were assigned a WTP of zero. Ofcom, 2017. 2017 Statement Annexes, Annex 7, paragraphs A7.12-A7.14
[145] The survey evidenced used was from the BDRC 2017 slide pack, slide 13. Referenced in the 2017 Statement Annexes, Annex 7, paragraph A7.32.

A1.33 The average WTP was estimated to be c. 66 pence for Former PAC Switchers and c. 59 pence for Former C&R Switchers. The respective yearly benefit was then calculated by multiplying the average WTP by the total number of consumers who switched using either the PAC or C&R processes prior to the Reforms.

A1.34 More specifically, the estimated benefit comprised of:[146]

- A yearly benefit of £2.1 million for Former PAC Switchers (£18.3 million in 10-year NPV) – this being c. 3.23 million Former PAC switchers with an estimated average willingness to pay of c. 66 pence.
- A yearly benefit of £1.1 million for Former C&R Switchers (£9.7million in the 10-year NPV) – this being c. 1.9 million Former C&R Switchers with an estimated average willingness to pay of c. 59 pence.

Updated estimate of the benefits to consumers switching providers from saving time and hassle when switching

A1.35 We have kept the same methodology as in the 2017 Statement and have scaled up the respective benefits in proportion to the amount that the actual take-up of Auto-Switch was greater that the take-up anticipated in the 2017 Statement.

A1.36 Our updated calculation of the benefit accruing to switchers through time saving and less hassle from Auto-Switch is **£4.6 million per year** (or a NPV of £39.5 million with a 10-year horizon) consisting of:

- **£3.7 million yearly benefit** (or an NPV of 31.7 million over a 10-year horizon[147]) for PAC switchers. This reflects how 2.34 million Former PAC Switchers made use of Auto-Switch, which is 73% more than the 1.35 million Former PAC Switchers we expected would use Auto-Switch. Therefore, the amount is 73% higher than the previously estimated yearly benefit of £2.1 million.
- **£0.9 million yearly benefit** (or a NPV of £7.8 million with a 10-year horizon) for Former C&R Switchers. This reflects how 0.58 million Former C&R Switchers made use of Auto-Switch, which is 19% less than the 0.72 million Former C&R Switchers we expected would use Auto-Switch. Therefore, the amount is 19% less than the previously estimated yearly benefit of £1.1 million.

A1.37 Our updated estimate is 41% higher compared to the 2017 Statement, which reflects how the overall take-up of Auto-Switch was higher than we had previously anticipated.

[146] These early figures can be seen in Ofcom 2017. 2017 Statement Annexes, Annex 7, Figure A7.8.
[147] Yearly Benefit for Former PAC Switchers (based on WTP): [Yearly WTP £m for PAC that is in our 2017 Statement] (2,127,566)*[Percentage difference in take-up](1.73)= £3,681,113
10 Year NPV PAC: [WTP PAC Switchers Yearly Benefit](3,681,113)*[NPV value]*(8.61) = £31,685,869

Reduction in double paying

A1.38 The Reforms prohibited notice period charges (beyond the switching date), which eliminated double paying for all consumers who used the PAC or STAC process when switching.

Our 2017 Statement estimate of the savings accruing to consumers switching providers from a reduction in double payment charges

A1.39 In the 2017 Statement, we calculated the yearly savings to consumers from banning notice period charges beyond the switching date by multiplying the average savings per switcher[148] by the number of consumers who would switch using the PAC or STAC process following the Reforms.[149]

A1.40 To determine the benefit to Former PAC Switchers, we identified the amount of PAC switchers who were being charged beyond the switching date and who would no longer be charged following the Reforms. Using information from the BDRC 2016 omnibus survey, we estimated that 66.9% of PAC switchers were switching away from providers who imposed notice period charges[150] and the 66.4% of customers switched outside their minimum contract period. Furthermore, the reduction in double payment would only apply to 85% of PAC customers, who were on post-paid contracts.[151] It was therefore estimated that 1.22 million (of the 3.23 million Former PAC Switchers) would on average save £6.61[152], which would result in an aggregate benefit of c. £8.0 million per year.

A1.41 Similarly, we identified the amount of Former C&R Switchers who would benefit from a reduction in double payment. As 63% of C&R switchers switched outside their minimum contract period and 71% of them were post-paid contracts, we estimated that of 0.72 million Former C&R Switchers who we expected to start using Auto-Switch (and therefore the PAC or STAC process) following the Reforms,[153] 0.32 million would no longer double pay when switching.[154] We also assumed that each of these Former C&R Switchers would on average save £6.61, which would provide an aggregate benefit of c. £2.1 million per year.

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[148] Ofcom, 2017. 2017 Statement Annexes, Annex 6, paragraphs A6.6 to figure A6.1: 'Calculations of reduction in double-paying for existing PAC switchers'.
[149] This is the pre-existing PAC switchers and C&R switchers who would become PAC Switchers.
[150] We understood that Vodafone, O2 and TalkTalk did not charge notice beyond the port-out date for PAC switchers if a customer is outside the minimum contract period. As a result, such customers would not gain any additional benefit from probation in notice period charges introduced by the Reforms. Ofcom, 2017. 2017 Statement Annexes, Annex 6, paragraph A6.6 and footnote 239.
[151] Ofcom, 2017. 2017 Statement Annexes, Annex 6, Figure A6.1 'Calculations of reduction in double-paying for existing PAC switchers' and paragraphs A6.4 to A6.9.
[152] This is based on the average number of days consumers were expected to double pay for being 20 days, with the average daily spend on mobile communication services being 33p. 2017 Statement Annexes, Annex 6, paragraph A6.7.2
[153] The estimated take-up of Auto-Switch by C&R switchers was 38%, from the BDRC 2017 Survey. Ofcom, 2017. 2017 Statement Annexes, Annex 6, paragraph A6.11.
[154] Ofcom, 2017. 2017 Statement Annexes, Annex 6, paragraph A6.15.

Updated estimate of the savings accruing to consumers switching providers from a reduction in double payment charges

A1.42 Our updated calculations build on the approach used in the 2017 Statement, although we use revised estimates of the number of Former PAC Switchers that continue to use the PAC process[155] and the number of Former C&R Switchers who now use Auto-Switch (and therefore, use either the PAC or STAC process).[156]

A1.43 Using the same survey evidence as used in the 2017 Statement, we estimate the amount of Former PAC Switchers who are with a provider who would have imposed notice period charges and who are outside of their minimum contract period and on a post-pay contract. Our estimate is that this accounts for 1.3 million of the 3.5 million PAC Switchers (who we expect still undertake PAC switches, following the Reforms). Assuming each would save £6.61, we calculate an aggregate annual benefit of £8.8 million (or an NPV of £76.0 million over a 10-year horizon) for Former PAC Switchers.

A1.44 Similarly, we use the same survey evidence that was used in the 2017 Statement to estimate the proportion of Former C&R Switchers who are outside of their minimum contract period and on a post-pay contract. We estimate that c. 0.26 million of the 0.58 million Former C&R Switchers who use Auto-Switch following the Reforms, benefit from a reduction in double-payment. Assuming each would save £6.61, we calculate an aggregate annual benefit of £1.7 million (or an NPV of £14.9 million over a 10-year horizon) for Former C&R Switchers.

A1.45 We calculate that the total benefit to switchers from Double-Payment is c. £10.6 million per year (or a NPV of £90.9 million with a 10-year horizon). Our updated estimate is 4% higher compared to the benefit we calculated in the 2017 Statement (£10.1 million per year, £87.3 million NPV with a 10-year horizon). This reflects the fact that there has been a higher amount of PAC switchers following the Reforms, compared to what was expected in the 2017 Statement.

Summary of direct benefits to consumers

A1.46 We have estimated the net benefits of the Reforms to consumers to be **£130 million** in 10-year NPV terms, which is 13% higher than the **£115 million** we had estimated in the 2017 Statement, reflecting the higher-than-expected take-up of the Auto-Switch.

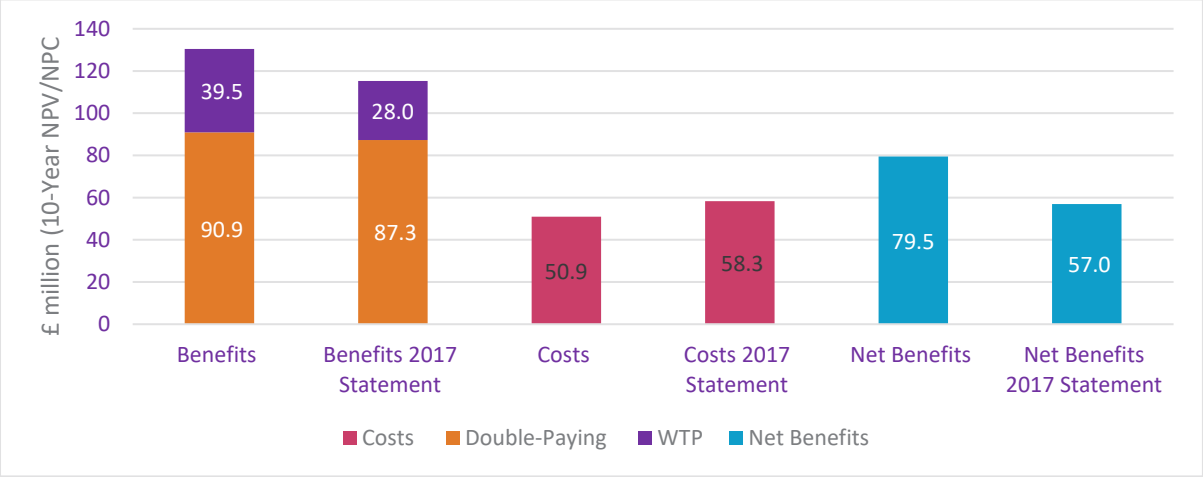
Summary of cost benefit analysis

A1.47 As the take-up of Auto-Switch was higher than we anticipated in the 2017 Statement (71% compared to 51%) our updated estimates of direct net monetary benefits to consumers

[155] In our 2017 Statement, we calculated the number of Former PAC Switchers, as being the number of PAC switched completed between October 2015 and September 2016 (3.23 million). We calculated the number of Former Switchers as the number of PAC switches completed between July 2018 and June 2019 (3.5 million).
[156] [After the reforms, the proportion of Former C&R Switchers who now use Auto-Switch to undertake a PAC switch](27.88%)*[Number of Former C&R Switchers](2,077,943)= 579,305

are also higher. The benefit is found to be £130 million in NPV (over a 10-year horizon), 13% higher than what we anticipated in the 2017 Statement.

Figure A1.1 - Quantified benefits and costs of Auto-Switch, transparency requirements, and notice period reform



A1.48 As noted above, we estimate the cost as £50.9 million (in NPV over a 10-year horizon), 13% less than anticipated in the 2017 Statement. This is due to larger cost savings as take-up was more than expected in the 2017 Statement (71% compared to 51%). We subtract the costs from the benefits, in order to find a net benefit of £78.7 million (in NPV over a 10-year horizon), 38% higher than the £57 million[157] in net benefit anticipated in the 2017 Statement.

A1.49 In light of some providers [✂] remarking that the costs of implementation were around double what was initially expected, we have carried out a sensitivity check on our findings. Specifically, we have examined how the net benefit would change if we doubled the costs of implementation. Even with this adjustment, we still find that given the scale of the direct consumer benefits from the Reforms, there would still be a positive net benefit of £3.5 million.[158]

[157] Ofcom, 2017. 2017 Statement, paragraph 5.35.
[158] Doubling the costs of implementation would be £152 million. Total costs are implementation costs (£152,000,000) minus Cost savings (£25,072,1098) equals £126,927,802. The net being total benefits (£130,432,153) minus total costs (£126,927,802) equals £3,504,351.

A2. Engagement analysis: Data, methodology and detailed results

A2.1 This is a technical annex, which:

- provides a detailed description of the data we used to perform our econometric analysis assessing the impact of the Reforms on consumer engagement;
- discusses the methodology of our econometric analysis and the identifying assumptions underpinning the validity of our approach;
- presents in more detail our results and further analysis we have undertaken to ensure the robustness of our results; and
- discusses the interpretation of our results and the limitations of our analysis.

Overview of the data

The Mobile Strategy Review data

A2.2 For our engagement analysis we have used data we obtained in 2022 from mobile operators in the context of the Mobile Strategy Review.[159] More specifically, for each calendar year from 2019 to 2021 and each MNO/MVNO brand that each mobile provider operates, a 5% random sample of domestic (residential) customers as identified by individual SIMs was selected.[160]

A2.3 For each customer in the sample described above, we requested information for each contract[161] the customer had during the period from 2019 to 2021 (i.e., not only for the year in which the customer was sampled but rather the entire period). This information covered contract characteristics such as, start and end dates, the minimum contract period, the name of the tariff or mobile plan, data allowance etc.[162]

Our analysis focuses on information provided by O2, Three, Tesco and Sky

A2.4 The Mobile Strategy Review data contained information on the contract histories of customers of BT/EE (including BT Mobile and Plusnet), Three (including SMARTY), O2, Vodafone (including VOXI), Tesco Mobile, Sky Mobile and Virgin Mobile. For the purposes of our analysis, we have only used data on pay monthly customers we obtained from

[159] Formal information requests were submitted to VMO2, BT/EE, Three, Vodafone, Tesco Mobile and Sky Mobile on 25 July 2022, in the context of Ofcom's ongoing strategic review of its approach to markets that deliver mobile communication services. Subsequently in November 2022, permission was obtained from the aforementioned mobile providers to use their for the purpose of this ex-post evaluation.
[160] In order to ensure that individual customers cannot be identified, we requested mobile providers for anonymised versions of person-specific variables (e.g. for the SIM, account, or contract number).
[161] These contracts included pay-as-you-go (PAYG), rolling and SIM only contracts, among others.
[162] The Mobile Strategy Review data request was wider in scope compared to what we describe here. We focus on the information we used for the purposes of this ex-post evaluation. For example, we have also obtained information on customers' demographic characteristics (e.g. calendar year of birth, an indicator for vulnerable customers, the location of a customer's home or, their billing address).

Three, O2, Tesco and Sky. The reason for focusing our analysis on these four mobile providers is that contract termination dates are not consistently and accurately recorded in the data provided for EE, Vodafone, Virgin Mobile, BT Mobile and Plusnet.[163] As explained in greater detail below, accurate contract termination dates are crucial for our analysis, as we rely on this information in order to identify switching customers in the dataset.

A2.5 That being said, we acknowledge that systematically excluding the customers of several major mobile providers from our analysis, comes at the cost of limiting the relevance of our findings to the subset of the customers we study. It therefore limits our ability to draw conclusions about how the Reforms impacted customers' engagement in the UK mobile communications services market as a whole.

Our analysis focuses on out-of-contract customers

A2.6 Our engagement analysis focuses on out-of-contract customers, that is customers who are past their minimum contract period (e.g. a customer with a contract start date on 1 February 2018 and a minimum contract period of 12 months is identified as an out-of-contract customer in July 2019).

A2.7 We have decided to focus on assessing the impact of the Reforms on the engagement of out-of-contract customers for two reasons. First, while in theory, Auto-Switch became available to everyone after 1 July 2019, in-contract customers would not benefit from it to the full extent as they would be subject to cancellation/notice period charges, which could have deterred them from switching.

A2.8 In addition, we considered that out-of-contract customers are more disengaged as they have not actively sought to move to a new contract (either with their existing provider or a different provider) that would better suit their current needs. We expected that this group of customers would benefit the most from the Reforms and therefore focused on their behaviour.

Identifying switching customers in the data

A2.9 Our switching analysis sought to assess the impact of the Reforms on customers' decisions to switch provider. We therefore needed to identify when customers switch providers.

A2.10 In the data, for each mobile provider every customer is linked to a unique anonymized identifier, allowing us to observe a customer's contract history with a given mobile provider. However, we could not link the contract histories a given customer has with different mobile providers.[164] While we could not accurately establish whether a customer

[163] As discussed below, SMARTY and VOXI are excluded from the analysis because they are PAYG (i.e., pre-pay) providers for which we cannot accurately identify when a customer leaves these providers.
[164] Each provider has submitted the data using a unique identifier for every customer thus allowing us to observe a customer's contract history with that provider. However, when that customer switches to a different provider we cannot trace where she switches to.

had switched to a new mobile provider, we considered that the date a customer terminates their contract provides an adequate proxy for when a customer switches.[165]

Identifying re-contracting customers in the data

A2.11 As with switching, our re-contracting analysis sought to assess the impact of the Reforms on customers' decision to re-contract with their provider. We defined a re-contracting event where a customer's unique ID is linked to multiple contracts, which have different start dates. In our analysis, we specified the day the re-contracting event occurs as the day before the new contract begins.

Additional data assumptions

We have removed customers with accounts linked to multiple mobile numbers

A2.12 As the Reforms only obliged mobile providers to enable customers to request PACs and STACs via text for requests relating to a single mobile number, we excluded contracts that relate to multiple customers (e.g. joint family contracts).[166]

We have focused on pay-monthly customers

A2.13 We only used data on pay monthly customers (also known as post-pay customers), excluding customers that are on a pre-pay ('PAYG') contract.[167] The reason for excluding PAYG customers, is that since they typically pay for a 30-day contract upfront, the contract end date is always 30-days from the initial payment. We therefore could not identify the precise day PAYG customers switched to a new mobile provider.

Removal of duplicate contracts

A2.14 As noted above, we defined re-contracting customers as having multiple contracts with different contract start dates. Given that our working sample excluded customers that have more than one contract with their provider, no customer in the data should have two or more active contracts with their provider at the same time. Therefore, as part of the data cleaning, we removed instances where a customer had two (or more) contracts that had the same start date (removing multiple entries at random).

Our data is organised as a balanced weekly panel

A2.15 Our baseline engagement has been conducted on a balanced weekly panel observing customers (and their contracts) over time (weeks). The main reason why we have opted for

[165] We acknowledge that a customer may terminate their contract with their mobile provider for reasons unrelated to switching, for example because they move to a different country. However, we believe that the majority of contract terminations relate to switching mobile providers.
[166] Around 80% of post-pay contracts in the Mobile Strategy Review dataset relate to only a single mobile number. We also exclude contracts which are inexplicably listed as relating to zero customers, which we assume is either a mistake or relates to pay-as-you-go customers.
[167] Using data we obtain from mobile providers on a quarterly basis (which are used for the Telecommunications Market Data Updates), we calculate that around 70% of residential tariffs are post-pay contracts.

a weekly rather than daily frequency is because we observe in the data that fewer contract terminations occur during weekends while there is a spike on Mondays and Tuesdays. This likely reflects how operators' systems process contract termination requests.

A2.16 We have also performed the analysis using daily data and including dummies controlling for certain days of the week. Due to issues with collinearity, it was preferable to do the analysis on a weekly level for our baseline analysis.

A2.17 Moreover, we ran our analysis on a balanced panel where we retained contracts in the dataset after they have been terminated (i.e., the contract is present in the periods following its termination even though it is inactive). The reason for this, was to the address the risk that any increase in switching and re-contracting rates did not simply reflect a reduction in the number of contracts we are examining.[168] On the other hand, retaining inactive contracts may have understated the effect of the Reforms on engagement. We believe this more conservative approach is appropriate.

Methodology for assessing the impact of the Reforms on engagement and our assumptions

Overview of our econometric approach

A2.18 The Reforms were implemented by all mobile providers across the UK at the same time (1 July 2019). Our assessment of the effect the Reforms had on consumer engagement, therefore comes down to a temporal comparison - i.e., comparing customer switching and re-contracting behaviour before and after the date the Reforms came into effect.

A2.19 Where a policy applies to all customers, as after the introduction of the Reforms, there is no control group of customers that did not receive the treatment to act as a valid comparison allowing for the identification of the causal impact of the Reforms on consumer engagement.

A2.20 Our preferred empirical approach, Regression Discontinuity Design in time (RDDiT) allows us to overcome this limitation. This approach utilises the fact that there is a temporal discontinuity in the switching process for mobile customers. After 1 July 2019 (i.e. the cut-off date), all UK customers who were eligible to switch (i.e. customers no longer within the minimum term of their contract) had access to a new, simplified process for switching provider, were not exposed to notice period charges beyond the switch date and had access to detailed information about their contract without having to contact their provider.

A2.21 Provided that customers could not precisely manipulate whether they were exposed to the treatment, we can consider that customers are quasi-randomly assigned into two groups: "untreated" and "treated", or customers before and after the cut-off. Moreover, by limiting comparisons between customers' behaviour close to the cut-off date (i.e. 1 July

[168] In that case the switching and re-contracting rates would increase even if switching and re-contracting levels remained unaffected.

2019), external factors[169] affecting customer behaviour can be considered constant. Furthermore, customer characteristics determining willingness to switch (or re-contract) of customers who switch (or recontract) mobile providers just before and just after the introduction of the Reforms can also be considered almost identical, given that the profile of customers (and their contracts) are unlikely to change in a short period of time. As a result, we can claim to obtain reliable estimates of the local average treatment effect of Reforms.

Limitations of our methodology

A2.22 A key assumption for the RDD approach is that individuals are not able to influence whether they receive the treatment or not. Although customers in reality, could not have manipulated whether they would be bound by their minimum contract period by the time the Reforms came into effect,[170] eligible customers could have postponed their decision to switch until after the policy becomes available (e.g. to take advantage of the improved switching process).

A2.23 If many customers deferred their decision to switch/re-contract until after 1 July 2019, and if these customers would have been more likely to switch/re-contract in the first place (i.e. regardless of the Reforms), this would undermine the causal interpretation of our results.

A2.24 As we explain in greater detail below, in a standard RDD set-up where treatment assignment is solely determined by the running variable (here defined as time from the cut-off date) it is sufficient to appropriately control for the impact of the running variable on switching (or re-contracting). In other words, one does not need to include additional controls to obtain an unbiased estimate of the impact the Reforms had on consumer engagement.

A2.25 Given our concerns, we departed from the standard RDD application and additionally controlled for other factors potentially affecting customers' decision to terminate their contract with their current provider, or re-contract. Further to that, we undertook several continuity checks, which examined whether there are abrupt changes (sudden increases or decreases) at the cut-off date with respect to other factors that should not be affected by the Reforms.

A2.26 Another limitation is that the RDD is local and therefore only evaluates the effect of the Reforms in early July. As the effect we measured is specific to the time period under examination, we cannot determine the overall impact of the Reforms in the following months. For example, if the switching rate is lower in July than other months, the effect of the Reforms could also be much larger in other months.

[169] Such as new phone model releases and promotional offers in a given month, as well as seasonality.
[170] The end of their minimum contract period would have been determined at the start of their contract, which typically would be at least six months in advance.

The baseline econometric models

Regression Discontinuity Design

A2.27 In the engagement analysis, every customer has access to the improved process for switching after the cut-off date (i.e. 1 July 2019 when the Reforms come into effect). We therefore used a sharp RDD with a two-week bandwidth on either side of the cut-off. We defined the switching (re-contracting) variable of customer i as y_{it}, where the variable takes the value 0 if a customer has not switched (re-contracted) and 1 otherwise. Let $d_i(\text{date}_i \geq 1\text{Jul}2019)$ denote whether individual i has access to Auto-Switch. The specification we estimated was:

$$y_{it} = \beta_1 d_i(\text{date}_i \geq 1\text{Jul}2019) + f(x_i) + \mu_i + \varepsilon_{it}$$

A2.28 The identification assumption is that the error ε_{it} is uncorrelated with the Auto-Switch indicator, conditional on controlling for the running variable x_i (through $f(x_i)$) and customer fixed effects μ_i.[171] In our case, the running variable is the number of weeks from the introduction of the Reforms. In the standard RDD application, treatment assignment is solely determined by the running variable.

A2.29 To the extent that the impact of the running variable on switching (or, re-contracting) is appropriately captured by the function $f(x_i)$, there is no need to control for additional factors. However, for reasons already discussed in the limitations section, here we departed from the standard RDD application and further controlled for customer fixed effects.[172] Following Imbens and Lemieux (2008), we used a quadratic term to approximate the impact of the running variable.[173] We also controlled for the changes in trends in switching (re-contracting) on either side of the cut-off.

Simple regression analysis around the cut-off date

A2.30 We also estimated a simple linear regression model of an individual customer's decision to switch (or re-contract) focusing on contract terminations (or re-contracting) that occurred within two weeks on either side of the cut-off date (i.e. within the period of two weeks before and after the Reforms came into effect).[174] The specification we estimated was:

[171] Customer fixed effects would capture all time invariant customer characteristics (e.g. gender), or characteristics that can be considered to be constant over the two weeks we study (e.g. income). Customer fixed effects in this specification would also capture region fixed effects and brand and product fixed effects.

[172] Though we do have information about some customer and contract characteristics (such as age, whether the customer contracted online, by phone or in store, the customers' billing address, the tariff the customer is on etc) these are either inconsistently provided in the data or, do not vary over the period studied. We therefore decided to move to an individual fixed effects specification to account for all customer-specific observable and unobservable time invariant characteristics. In addition, customer fixed effects in this specification would also capture region fixed effects and brand and product fixed effects.

[173] Imbens, G & Lemieux, T 2008. 'Regression discontinuity designs: A guide to practice', Journal of Econometrics Volume 142, Issue 2, pp. 615-635.

[174] This model draws on the RDDiT approach but departs from its standard application, as there is no running variable. A similar approach is followed in Busse, M. et al (2006). Busse, M. et al. 2006. '$1,000 Cash Back: The Pass-through of Auto Manufacturer Promotions', American Economic Review 96(4), NO. 4, pp. 1253-1270

$$y_{it} = \beta_1 d_i(\text{date}_\text{i} \geq 1\text{Jul}2019) + \beta_2\big(\tau_T \times d_i(date_i \geq 1Jul2019)\big) + \beta_3\tau_T + \mu_i + \varepsilon_{it}$$

A2.31 Where y_{it} is a binary variable that takes the value of one if a customer terminates their contract with their provider in week t (for the switching analysis) or re-contracts with their provider in week t (for the re-contracting analysis) and $d_i(\text{date}_\text{i} \geq 1\text{Jul}2019)$ is the Reforms indicator, that takes the value of one after 1 July 2019 (i.e. the date the Reforms came into effect). The identification assumption is that the error ε_{it} is uncorrelated with the Reforms indicator, conditional on controlling for differential time trends τ_T[175] and customer fixed effects μ_i.[176]

Regression analysis results and validity checks

A2.32 We present below our detailed results and discuss some potential limitations of our analysis.

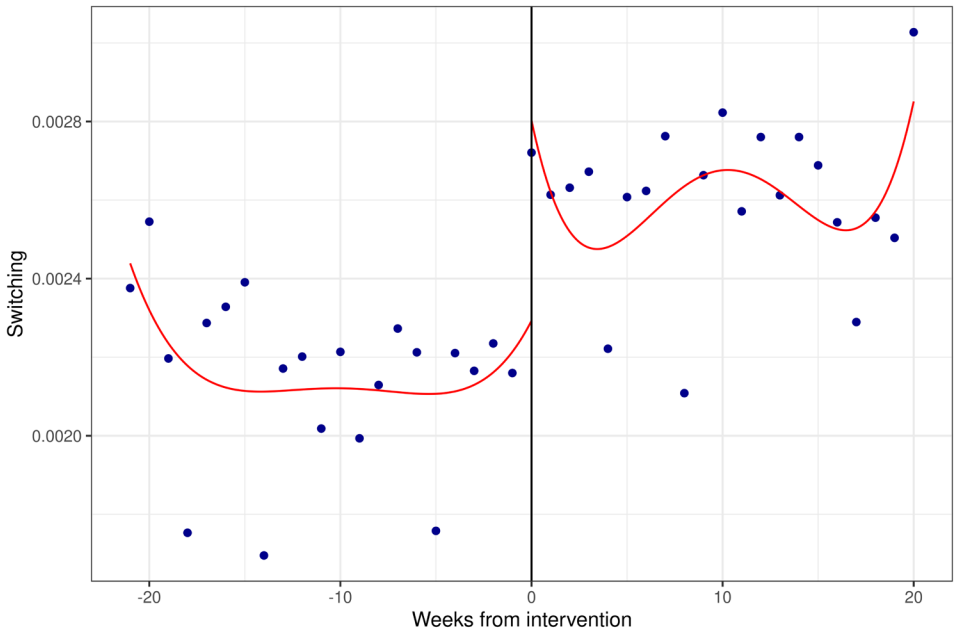
Switching analysis

A2.33 In Figure A2.1, we plot customer switching rates over time to illustrate the effect the Reforms may have had on customer switching. The horizontal axis shows the number of weeks from the date the Reforms came into effect. A negative number of weeks refers to the period before the implementation date. The vertical axis shows the switching rate, and each point on the graph is the weekly switching rate. We also fit a line through the points to help visualise potential changes in switching over time. We observe a jump in the switching rate at the cut-off date, as well as an increase that continues well into the second half of 2019, which suggests that the Reforms had a positive effect on customer switching.

[175] We allow our time trends, τ_T, to vary before and after the introduction of the Reforms by interacting them with the Auto-Switch Reforms indicator, $d_i(\text{date}_\text{i} \geq 1\text{Jul}2019)$.

[176] Customer fixed effects would capture all time invariant customer characteristics (e.g. gender), or characteristics that can be considered to be constant over the two weeks we study (e.g. income). Customer fixed effects in this specification would also capture region fixed effects and brand and product fixed effects.

Figure A2.1: Graphical analysis of switching rates before and after the implementation of the Reforms. [177]



Source: Ofcom analysis of mobile providers' data (Tesco, Sky Mobile, Three, O2)

A2.34 Table A2.2 summarises our regression results for the switching analysis. For all specifications, the effect is highly statistically significant (either at the 1% or 5% level of statistical significance).

A2.35 Column (1) presents our baseline specification for the RDD model, which focuses on switches occurring within two weeks on either side of the cut-off. According to our reported results, the Reforms increased the probability of switching for out-of-contract customers in our working sample [178] by 0.06 percentage points in the first week after the Reforms came into effect. The coefficient for the Reforms treatment reduced to 0.05 percentage point when we extended the bandwidth for our RDD model to four weeks on either side of the cut-off date in Column (2).

A2.36 Column (3) presents our baseline specification for the simple regression model, which focused on switches occurring within two weeks on either side of the cut-off. For this specification, the Reforms increased the probability of switching for out-of-contract customers in our working sample by 0.06 [179] percentage points in the first week after the

[177] Unlike our baseline analysis, Figure A2.1 only contains customers who are active, meaning that we exclude any contracts that have been terminated in prior periods.
[178] Our working sample only relates to a subset of the market. Specifically, residential customers of O2, Tesco, Three and Sky, who are out-of-contract and only on contract that relate to a single mobile number (meaning we exclude multi-contract customers).
[179] Unlike the Sharp-RDD, in order to estimate the effect of the Reforms we need to measure both the coefficient of the Auto-Switch Reforms treatment dummy (0.0012) and the coefficient of the Auto-Switch Reforms x Time trend interaction (-0.0002). The latter needs to be multiplied by the value of the time-trend for the time-period we are considering. The time

reforms came into effect. Columns (4) present results for the simple regression model focusing on switches occurring four weeks either side of the cut-off date.

A2.37 Although the increase in the probability of switching was relatively modest for all the models we have estimated, it was not negligible. Only for the subset that we examined, the estimated coefficients would imply that between 3,500[180] and 4,500[181] additional customers switched providers in the first week, following the introduction of the Reforms.[182]

trend variable starts at 1 in the first period of the bandwidth we examine and increases sequentially – therefore when we consider a 2-week bandwidth (which has 4 time-periods), the first week following the implementation of the Reforms is third time-period, making 3 the relevant value. For the simple regression using a two-week bandwidth, the effect calculated as (0.0012) + 3*(-0.0002) = 0.0006.

[180] This is calculated assuming there is an 0.05 percentage point increase in switching in the first week following the introduction of the Reforms, as implied by the output of the Sharp-RDD model using a 4-week bandwidth, as set out in the column (2) of Table A2.2

[181] This calculated assuming there is an 0.06 percentage point increase in switching in the first week following the introduction of the Reforms, as implied by the output of the Sharp-RDD model using a 2-week bandwidth, as set out in the column (1) of Table A2.2

[182] We have calculated this figure by first finding the size of the subset relevant to the sample we examined in the regression analysis (i.e. out-of-contract customers whose contract only related to a single mobile number and who were with either O2, Sky Mobile, Tesco Mobile or Three). Using data obtained from mobile providers as part of Ofcom's regular industry data collection programme, we calculated the number of residential subscriptions the four relevant mobile providers had at the end of June 2019. Then, we used the sample data provided for the Mobile Strategy Review to determine the number of customers on residential tariffs that were out-of-contract in July 2019 (c. 40%) and the proportion of these contracts that only related to a single mobile number (c. 80%). This equated to over seven million customers. This was then multiplied by the relevant coefficient (0.0006 in the case of the baseline Sharp RDD model) to give an estimate of around 4,500 for the number of additional customers that switched in that first week following the introduction of the Reforms.

Table A2.2: Switching analysis – regression results

Switching analysis – RDD	(1) RDD Baseline	(2) RDD	(3) Simple regression Baseline	(4) Simple regression
	(2-weeks)	(4-weeks)	(2-weeks)	(4-weeks)
Auto-Switch Reforms	0.0006*** (0.0002)	0.0005** (0.0002)	0.0012** (0.0005)	0.0009*** (0.0002)
Auto-Switch Reforms x Time trend interaction			-0.0002 (0.0002)	-0.00007 (0.00005)
Time	-0.0003*** (9.4×10^{-5})	-8.87×10^{-5} (0.0002^{5})		
Time squared	-5.26×10^{-5} (4.1×10^{-5})	1.71×10^{-6} (3.93×10^{-5})		
Time interaction		-0.0001 (0.0002)		
Time squared interaction		9.37×10^{-6} (5.66×10^{-5})		
Customer fixed effects	Yes	Yes	Yes	Yes
Time trends			Yes	Yes
Observations	1,382,419	2,848,013	1,382,419	2,848,013
Within R-Squared	1.36×10^{-5}	1.24×10^{-5}	1.36×10^{-5}	1.23×10^{-5}

*Notes: Standard errors in parenthesis. *** represents statistical significance at the 1% level, ** represents statistical significance at the 5% level, * represents statistical significance at the 10% level. Standard errors are clustered at the customer level. Our sample consists of a balanced weekly panel of OOC customers.*

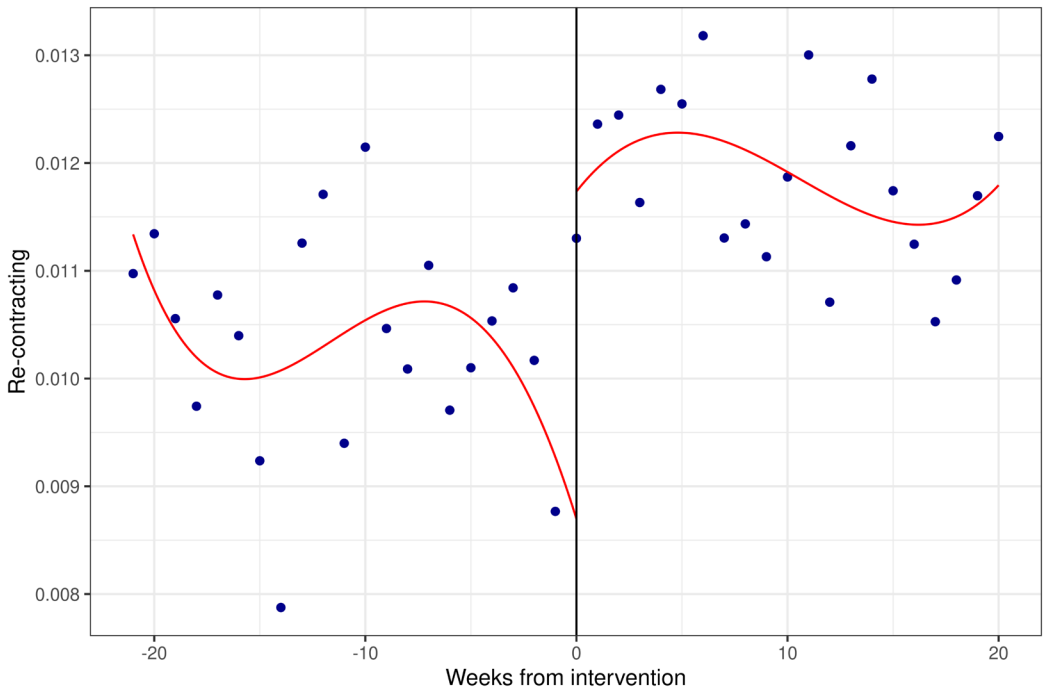
A2.38 We have further tested the sensitivity of our results by examining a few additional specifications. For example, across our sharp RDD and simple regression models, rather than accounting for customer fixed effects, we controlled for various contract characteristics that could influence a customer's decision to switch, such as the minimum contract period, data allowance, price, and contract type. Our results did not qualitatively change across these specifications.

A2.39 We have done further sensitivity checks – undertaking the same analysis using daily panel data and models using a 1-week bandwidth, as well as performing the analysis on an unbalanced panel (therefore removing inactive contracts from the dataset). None of these alternative approaches materially altered our findings.

Re-contracting analysis

A2.40 In Figure A2.3 we plot customer re-contracting rates. We observe a jump in the re-contracting rate at the cut-off date, which suggests that the Reforms had a positive effect on customer re-contracting.

Figure A2.3 – Graphical analysis of re-contracting rates before and after the implementation of the Reforms. [183]



Source: Ofcom analysis of mobile providers' data (Tesco, Sky Mobile, Three, O2)

A2.41 Table A2.4, summarises our regression results for the re-contracting analysis. For all specifications, the effect is highly statistically significant (i.e. at the 1% level of statistical significance).

A2.42 Column (1) presents our baseline specification for the RDD model, which focuses on re-contracting within two weeks on either side of the cut-off. According to our reported results, the Reforms increased the weekly re-contracting rate for out-of-contract customers in our working sample [184] by 0.29 percentage points in the first week after the Reforms came into effect. The estimated effect was higher when we extended the bandwidth for our RDD model to four weeks on either side of the cut-off date in Column (2).

[183] The graphical analysis of re-contracting presented in Figure A2.3 only includes customers who are active, meaning that we exclude any contracts that have been terminated in prior periods (which included in the baseline simple regression analysis and baseline RDD analysis).
[184] Similar to the switching analysis, our working sample relates to residential mobile customers who are with Tesco, O2, Three or Sky, who are on pay monthly (post-pay) contracts that relate to only one mobile phone number, and who are out-of-contract.

A2.43 Column (3) presents our baseline specification for the simple regression model, which focused on re-contracting events occurring within two weeks on either side of the cut-off. For this specification, the Reforms increased the weekly re-contracting rate for out-of-contract customers in our working sample by 0.36[185] percentage points in the first week after the Reforms came into effect. Column (4), presents the results for the simple regression model when we extended the bandwidth for our RDD model to four weeks on either side of the cut-off date.

A2.44 For the subset that we examined, the econometric analysis implies that between 21,000[186] and 32,500[187] additional customers re-contracted in the first week following the introduction of the Reforms.

[185] As with the simple regression model for switching, to find the estimated effect of the Reforms, we need to consider both the Auto-Switch Reforms treatment coefficient (-0.0006) and the Auto-Switch Reforms x time trend interaction, with the relevant multiplier (0.0014*3)

[186] This calculated assuming there is an 0.29 percentage point increase in re-contract following the introduction of the Reforms, as implied by the output of the sharp RDD regression using a 2-week bandwidth, as set out in the column (1) of Table A2.4

[187] This calculated assuming there is an 0.45 percentage point increase in re-contracting following the introduction of the Reforms, as implied by the output of the sharp RDD model using a 4-week bandwidth, as set out in the column (2) of Table A2.4

Table A2.4: Re-contracting analysis - regression results

Re-contracting analysis - RDD	(1) RDD Baseline	(2) RDD	(3) Simple regression Baseline	(4) Simple regression
	(2-weeks)	(4-weeks)	(2-weeks)	(4-weeks)
Auto-Switch Reforms	0.0029*** (0.0004)	0.0045*** (0.0005)	-0.0006 (0.0009)	0.0025*** (0.0005)
Auto-Switch Reforms x Time trend interaction			0.0014*** (0.0004)	0.0001 (0.0001)
Time	-0.0013*** (0.0002)	-0.0031*** (0.0004)		
Time squared	0.0003*** (8.74×10^{-5})	-0.0004*** ($8.5 \times 10^{--5}$)		
Time interaction		0.0037*** (0.0005)		
Time squared interaction		-0.0002 (0.0001)		
Customer fixed effects	Yes	Yes	Yes	Yes
Time trends			Yes	Yes
Observations	1,382,419	2,848,013	1,382,419	2,848,013
Within R-Squared	0.00010	0.00026	1.045×10^{-4}	0.0002

*Notes: Standard errors in parenthesis. *** represents statistical significance at the 1% level, ** represents statistical significance at the 5% level, * represents statistical significance at the 10% level. Standard errors are clustered at the customer level. Our sample consists of a balanced weekly panel of OOC customers.*

A2.45 Similar to the switching analysis, we further tested the sensitivity of our results by examining alternative specifications which control for various contract characteristics, as well as using a daily panel. We have further repeated the analysis using a 1-week bandwidth and using an unbalanced panel excluding inactive customers. These alternative approaches did not materially alter our findings.

Continuity checks

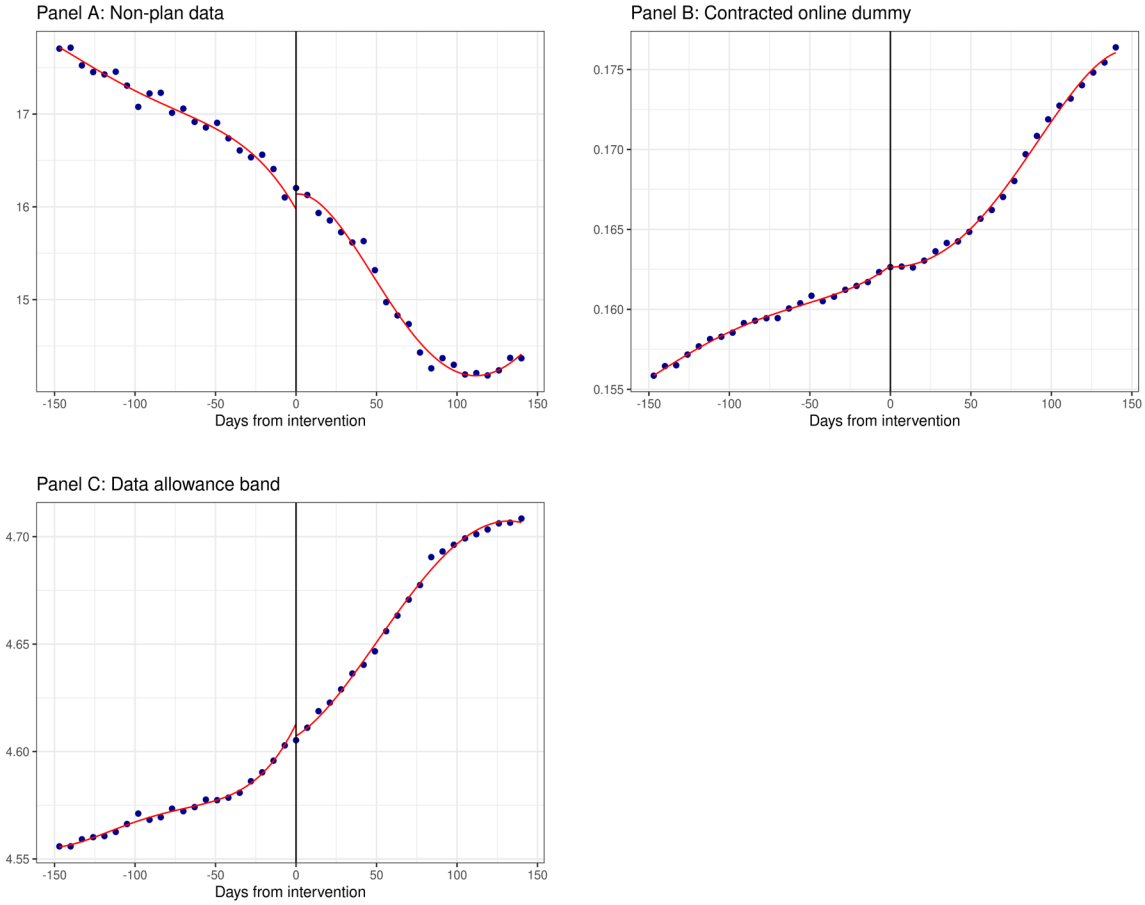
A2.46 We have considered differences in contract characteristics two weeks before and after the introduction of the Reforms. In particular, we have looked at non-plan data rate[188],

[188] This is the rate that customers are charged for data, once they exceed their monthly data allowance.

contract data allowances[189] and whether the customer contracted online[190] (as opposed to by phone or in the store). In theory, these contract features should not be affected by the introduction of the Reforms as they had been determined at the start of the contract (i.e. at least six months in advance). Discontinuities around the cut-off date, with respect to these characteristics would therefore raise concerns that customers may have sorted themselves around the cut-off (e.g. by deferring their switching or re-contracting decisions).

A2.47 Figure A2.5: summarises these checks plotting the weekly average values of the aforementioned variables between February 2019and November 2019. We observe that each variable has a reasonably smooth trend throughout the year, with limited signs of a discontinuity at the cut-out.

Figure A2.5: Continuity checks



A2.48 However, when we undertook the regression analysis using the same models we used for the engagement analysis, the results are mixed. For the sharp RDD model, there were no signs of any significant discontinuity at the cut-off point for any of the three variables

[189] Customers are recorded as falling into certain bands, dependant on the size of their data allowance. For example, those with less than 1 GB are recorded as having a value of "1", while those with between 1GB and 3GBs are recorded as having a value of "2". Those with an unlimited data allowance are recorded as having a value of "8".
[190] If a customer purchased their mobile contract online (i.e. through a website), they are recorded as "1". Otherwise, they are recorded as "0".

tested, which gives us greater confidence in our findings from this model. On the other hand, when we undertook the same checks using the simple regression model, there were significant discontinuities[191] when we examined the contract data allowance and online contracting variables. This means the continuity assumption cannot be established for the simple regression model and as a result, we cannot confidently establish a causal interpretation for our findings for this model.

Conclusions

A2.49 Overall, at least for the working sample on which we conduct our analysis (i.e. out-of-contract PAYM customers of O2, Three, Sky and Tesco), engagement increased following the Reforms. More specifically, we have found that in the first week following the introduction of the Reforms:

a) between 3,500 and 4,500 additional previously unengaged customers switched provider and,

b) between 21,000 and 32,500 additional previously unengaged customers have re-contracted.

A2.50 While our econometric results indicate that immediately following the Reforms switching and re-contracting increased, given the mixed results of the continuity tests we cannot conclude that this increase can be interpreted as the causal impact of the Reforms.

A2.51 Another limitation we face when interpreting our results is that our methodology (RDDiT) does not allow us to extrapolate our findings for periods outside the choice of bandwidth. Finally, our analysis and interpretation of our findings are constrained by limitations in our dataset. Most notably, we have conducted our analysis on a potentially non-representative subset of the UK customer base, as customers of several major mobile providers have been systematically excluded from the analysis due to shortcomings in the submitted data. As a result, we cannot use the econometric analysis alone to draw general conclusions about the impact of the Reforms on the UK market as a whole.

A2.52 However, when this econometric analysis is considered together with other evidence we have reviewed,[192] we do conclude that the Reforms may have contributed to the increase in engagement. The graphical analysis of Figures A2.1 and A2.3 also indicates that an increase in engagement persists into the second half of 2019, suggesting an ongoing effect on engagement. When this is taken with the finding that the continuity assumption holds for the sharp RDD model, it seems reasonable to determine that the increase in engagement may at least partially be driven by the Reforms.

[191] When using the simple regression model, we found there were statistically significant differences (at a 1% level) in customer contract data allowance, when using the 2-week and 4-week bandwidths. Furthermore, there was a statistically significant difference (at a 1% level) only when using a 4-week bandwidth.
[192] In particular, the findings from Ofcom Switching Tracker in Section 5 indicates the increase in switching from 2019 to 2020 and the change in PAC numbers in Figure 4.1 where there is a sudden increase in PAC switches from June 2019 to July 2019.

A3. A summary of contract prices and data allowances in 2019

A3.1 In this annex, we set out our examination of the mobile prices and data allowances in 2019.

A3.2 In Section 5, we presented the evidence we have reviewed which suggests that following the implementation of the Reforms, consumer engagement increased. We have further considered whether by simplifying the switching process and thus helping consumers better exercise choice in the market for mobile communications the introduction of the Reforms also intensified competitive pressures on mobile providers leading to better outcomes for consumers.

A3.3 Specifically, we have reviewed the average monthly prices and data allowances of new contracts in 2019. As for our engagement analysis, we use the data mobile providers submitted in the context of the Mobile Strategy Review (set out in Section 5 and Annex 3). We continue to focus on residential, pay monthly customers with a single mobile number. However, unlike what we did in the engagement analysis, we include data from Vodafone, EE and Virgin Mobile, as this analysis does not require accurate information on contract end dates.[193]

New contracts

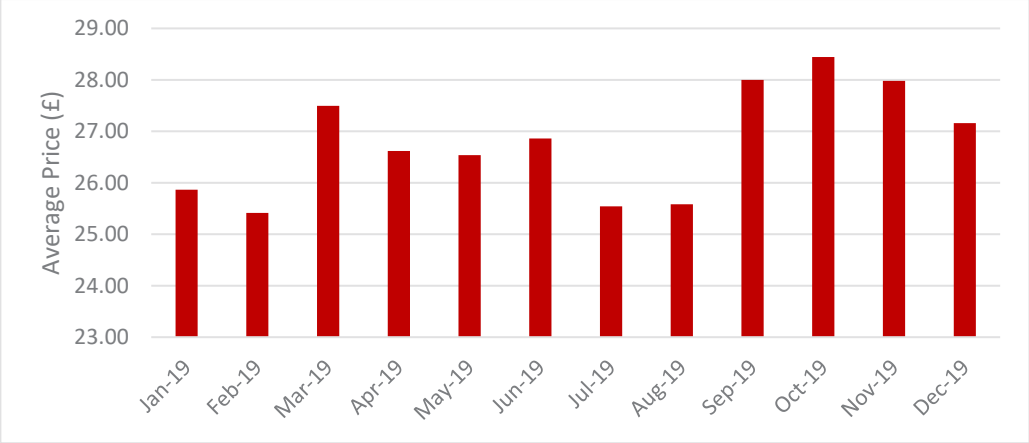
A3.4 As we recognised in the 2017 Statement, [194] by helping consumers better exercise choice, the introduction of the Reforms could lead to better outcomes for customers starting new contracts. Mobile providers may have started offering better deals after the Reforms came into effect (e.g., offer lower prices or higher data allowances for new contracts) to attract new customers, as well as retain customers in the long term.

A3.5 We have therefore explored whether (i) there has been a noticeable reduction in the average prices of new contracts or (ii) there has been a noticeable increase in the average data allowances for new contracts, in the months following the implementation of the Reforms.

A3.6 Figure A3.1 below, summarises average prices for new contracts for each month of 2019. While we observe a slight reduction in the average prices of new contracts following the implementation of the Reforms, average prices increased during the latter half of 2019.

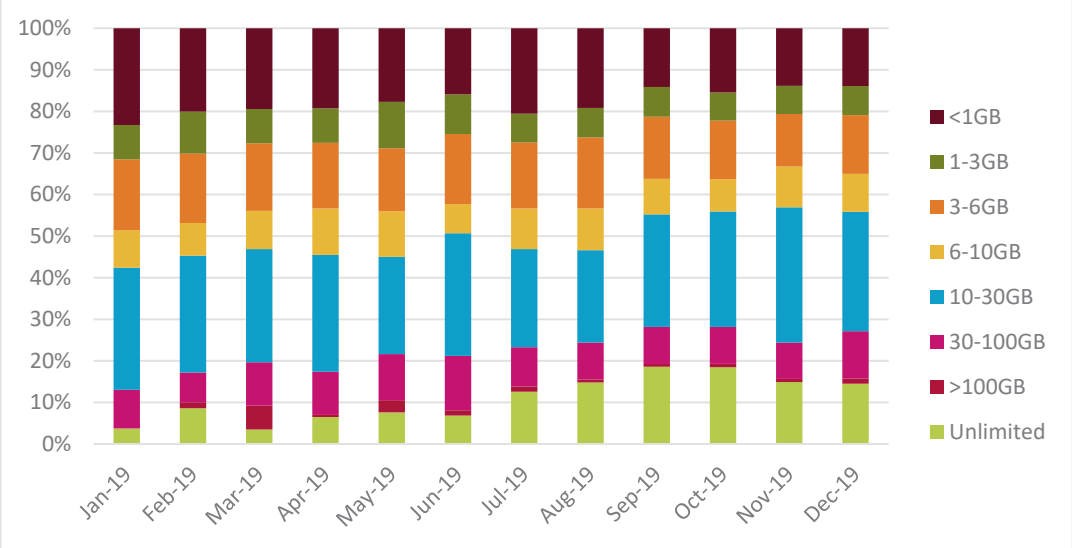
[193] These mobile providers were not included in our engagement analysis as we could not accurately identify switching due to inconsistencies and inaccuracies regarding contract end dates in the submitted data.
[194] As we explained in 2017 Statement, prior to the introduction of Auto-Switch, mobile providers could effectively price discriminate between customer who are likely to switch and those who normally do not switch, by making more generous contracts offers to customers when they call their mobile provider to switch. Once customers could switch using Auto-Switch (and no longer had to speak with their provider to port their number or cancel their contract), the ability of mobile providers to price discriminate would reduce, which could lead to mobile providers reducing general prices. Ofcom, 2017. 2017 Statement, paragraphs A8.4 to A8.10

Figure A3.1: Average price of new pay monthly contracts in 2019



A3.7 Figure A3.2 summarises average data allowances for new contracts for each month of 2019. From July 2019 onwards, we observe an increase in the proportion of customers purchasing unlimited data allowances. However, it is difficult to determine the extent to which this is a result of the Reforms, given that other factors in 2019 could also explain the increase in data allowances, such as new offers from mobile providers[195] or new phone[196] releases.

Figure A3.2: Distribution of data allowances for new pay monthly contracts in 2019



[195] We observe that around the middle of 2019 more mobile providers launched unlimited data allowance offers, such as Vodafone's launch of new unlimited data packages on 3 July 2019, to coincide with the launch of its 5G network. Vodafone website [accessed 11 April 2023], 'Vodafone to offer unlimited data and bring 5G to more places than any other network' (published 3 July 2019).

[196] We observe that there is a jump in the average price and the size of customers' data allowances in September, which is the month when a new iPhone was released. EE website [accessed 11 April 2023], 'EE TO OFFER THE LATEST PRODUCTS FROM APPLE' (published 10 September 2019).

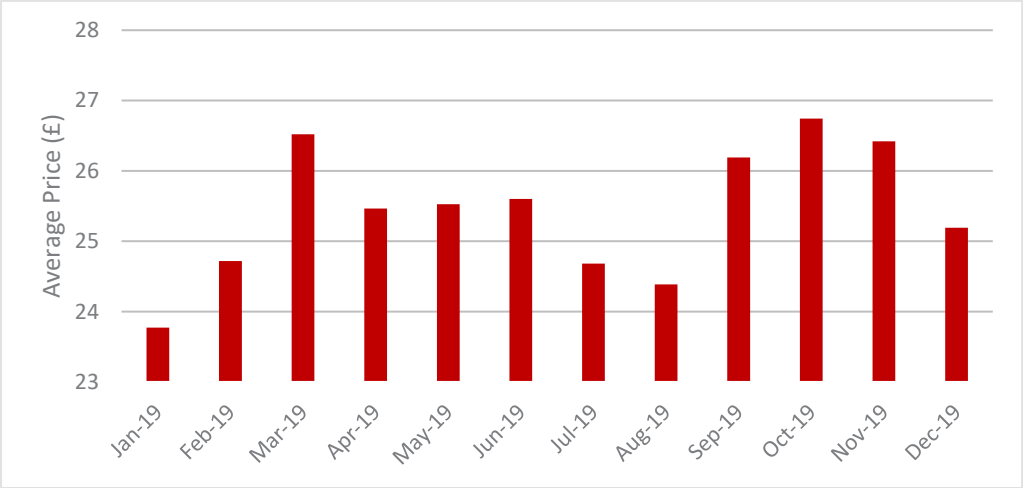
Re-contracts

A3.8 In Section 5, we concluded that the Reforms may at least to some extent have contributed to an increase in re-contracting among consumers in the sample on which we performed our econometric analysis. To the extent that the Reforms may have contributed to improving consumers' ability to negotiate better deals with their existing mobile providers, they may have also led to improved outcomes for consumers.

A3.9 We have therefore also sought to explore whether (i) there has been a noticeable reduction in the average prices of renewed contracts or (ii) there has been a noticeable increase in the average data allowances for renewed contracts, in the months following the implementation of the Reforms.

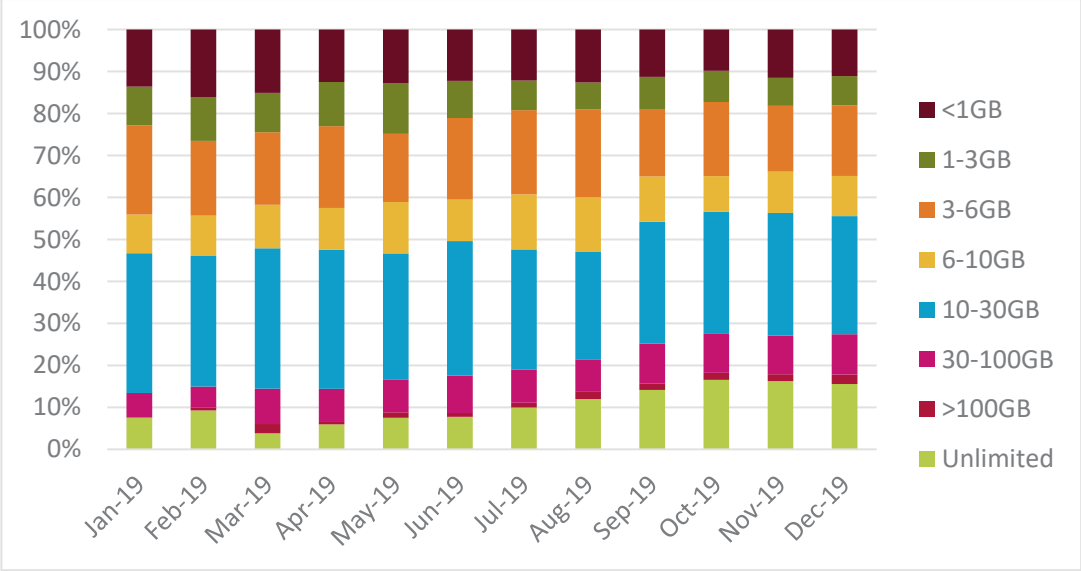
A3.10 Figure A3.3 below, summarises average prices for contracts that customers sign with their existing mobile provider, following the renewal of their contract in each month of 2019. While there is a slight reduction in average prices following the implementation of the Reforms, prices subsequently increased between September 2019 and December 2019. Therefore, overall, there is no discernible trend in prices throughout the latter half of 2019.

Figure A3.3: Average price of pay monthly re-contracts in 2019



A3.11 Figure A3.4 summarises average data allowances for recontracts for each month of 2019. We observe a slight increase in data allowances from September 2019, driven by an increase in unlimited data allowances. However, as with data allowances for new contracts, a simple graphical analysis does not allow us to isolate any effect the Reforms may have had from the influence of other factors.

Figure A3.4: Distribution of data allowances for pay monthly recontracts in 2019



A3.12 We have not undertaken any further empirical analysis (neither for new contracts or for re-contracts) seeking to identify the precise effect of the Reforms on prices and data allowances due to data and methodological constraints.