

Market review into the  
supply of card-acquiring  
services: Interim report

## **Annex 2**

# Pass-through analysis

September 2020

# Contents

Introduction	3
Methodology	5
Data and sampling	11
Descriptive statistics	21
Econometric analysis	35
New versus longstanding merchants	45
Pass-through of scheme fees	51
Summary	53
Additional tables for reference	55

Note: The places in this document where confidential material has been redacted are marked with a [X].

# Introduction

- 1.1** This annex describes the analysis we conducted on whether acquirers passed through the cost savings they made from the Interchange Fee Regulation (IFR) caps ('IFR savings') to merchants between 2014 and 2018. The main findings of this analysis are set out in Chapter 5 of the interim report. This annex provides further details on the methodology, data, and sensitivity analysis conducted to test the robustness of the findings. This annex supplements Chapter 5 of the interim report but can be read as a standalone document. It is aimed at a reader who wants to understand the technical detail of our analysis.
- 1.2** Pass-through is an economic concept, that, in general, measures the change in the price of a good or service in response to a change in input costs of this good or service. Economic theory predicts that, in a competitive market, in the long run, changes in input costs will be reflected in the price. So, by studying the extent of pass-through, we can learn something about the competitive conditions in a market. For example, limited or slow pass-through can indicate that competition is weak.<sup>1</sup>
- 1.3** In the context of our market review, we look at the relationship between the merchant service charge (MSC), and one of its input costs, interchange fees. As explained in Chapter 2 of the interim report, the MSC is the total amount that merchants served by acquirers pay for card-acquiring services. It comprises:
- interchange fees, which the acquirer pays to the issuer
  - scheme fees, which the acquirer pays to the operator of the card payment system (see Annex 4 for more on scheme fees)<sup>2</sup>
  - acquirer net revenue, to cover the other costs of providing card-acquiring services (such as regulatory, staff and technology costs) plus the acquirer's margin
- 1.4** Specifically, we look at whether acquirers passed through IFR savings to merchants in the form of lower MSCs. As explained in Annex 1, the IFR capped interchange fees on consumer debit and credit card transactions where the acquirer and issuer are in the EEA ('capped transactions'). The IFR caps came into force on 9 December 2015 and aimed to reduce the costs of card payments for merchants and consumers.
- 1.5** The IFR did not cap the MSCs paid by merchants. Instead, the IFR relied on competition between acquirers to ensure that the IFR savings were passed through to merchants. The extent to which these IFR savings were passed through is an indicator of the strength of competition in the supply of card-acquiring services: acquirers can hold on to savings if they don't feel under pressure to keep their prices down. We used the introduction of the IFR caps as an indicator for how well the supply of card-acquiring services is working.

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1 The degree of long-term pass-through depends on several demand and supply factors. For more information see RBB Economics. (February 2014). 'Cost pass-through: theory, measurement, and potential policy implications'

2 We use the term 'scheme fees' to refer to all fees acquirers pay to operators of card payment systems including fees for scheme services and fees for processing services.

- 1.6** Using data obtained from the five largest<sup>3</sup> acquirers, covering the period 2014 to 2018, we investigated whether:
- these five acquirers made savings following the IFR caps coming into force
  - where acquirers did make IFR savings, whether they passed these through to merchants in the form of lower MSCs
  - the pass-through rate varied between merchants in different groups defined by annual card turnover (our grouping follows the segmentation introduced in Chapter 4 of the interim report, but with additional detail to allow us to examine any differences between levels of annual card turnover – see paragraph 1.26 to 1.32 of this annex)
- 1.7** We also considered the possibility that acquirers may compete more intensively for new customers<sup>4</sup> by charging them lower prices, while charging existing customers higher prices. This would indicate that merchants may be able to get a better deal by switching. We also consider the possibility that this may have further intensified after the IFR caps came into force. We investigate whether:
- acquirers' new customers pay less than longstanding customers (see paragraph 1.20 of this annex)
  - merchants who signed up with an acquirer after the IFR caps came into force pay less than those who joined before
- 1.8** The rest of this annex:
- details our methodology and explains how we responded to our consultation on the pass-through methodology
  - describes the data and sampling process
  - presents descriptive statistics
  - presents the econometric analysis
  - summarises the results
  - presents additional tables for reference

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3 The five largest acquirers accounted for nearly 90% of transactions by number and value at UK merchants in 2018. See Annex 1 for a description of the five largest acquirers.

4 New customers could include merchants that switched from other acquirers, as well as those who are new to accepting card payments.

# Methodology

- 1.9** We consulted on our proposed approach to the pass-through analysis in February 2019. Since then, our approach has evolved, including to take account of responses to the consultation (see Box 1)<sup>5</sup> This section describes the methodology we adopted to answer the questions set out in paragraphs 1.6 and 1.7 above.

## Baseline model

- 1.10** In order to understand whether, where acquirers made IFR savings, they passed these through to merchants, it is important to understand the general relationship between the MSC and its components:

- If interchange fees fall following IFR caps coming into force, and acquirers pass these savings through to merchants, we would expect to see the MSC falling in line with interchange fees.
- This picture will be complicated if scheme fees simultaneously increased and acquirers also passed these increases on to merchants, causing MSCs to rise.
- If cost decreases and increases are being fully reflected in the MSC (and there is no change in acquirers' other costs), acquirer net revenue will remain flat.

- 1.11** It follows that there are several ways to analyse the question of whether acquirers passed through IFR savings to merchants:

- 1. Average MSC (as a percentage of monthly card turnover) as the dependent variable:** We can examine whether average MSC fell in line with interchange fees following the IFR caps coming into force. In this model, we need to control for other factors that may impact the MSC. Table 1 below summarises these factors.
- 2. Interchange fee margin as the dependent variable:** We define the interchange fee margin as average MSC minus average interchange fees. The remainder is the component of the MSC that is not related to interchange fees, including scheme fees. If acquirers are passing IFR savings through to merchants, we would expect to see the interchange fee margin remaining flat. In this model, we need to control for other variables that may impact the interchange fee margin, including scheme fees.
- 3. Acquirer net revenue as the dependent variable:** We can examine whether acquirer net revenue, defined as MSC minus interchange fees minus scheme fees, remained flat. In this model, we need to control for other variables that may impact acquirer net revenue.

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5 PSR, *Market review into the supply of card-acquiring services: Pass-through methodology consultation* (2019).

**1.12** The three approaches are nested. Mathematically, the three models can be described as:

$$MSC_{it} = \alpha_i + \beta_1 IFR_t + \beta_2 IF_{it} + \beta_3 SF_{it} + \sum_k \gamma_k x_{kit} + \varepsilon_{it} \quad (1)$$

$$MSC_{it} - IF_{it} = \alpha_i + \beta_1 IFR_t + \beta_3 SF_{it} + \sum_k \gamma_k x_{kit} + \varepsilon_{it} \quad (2)$$

$$MSC_{it} - IF_{it} - SF_{it} = \alpha_i + \beta_1 IFR_t + \sum_k \gamma_k x_{kit} + \varepsilon_{it} \quad (3)$$

where

- $MSC_{it}$  is the MSC (as a percentage of monthly card turnover) for merchant  $i$  in month  $t$
- $IF_{it}$  are interchange fees (as a percentage of monthly card turnover) for merchant  $i$  in month  $t$
- $SF_{it}$  are scheme fees (as a percentage of monthly card turnover) for merchant  $i$  in month  $t$
- $\alpha_i$  capture merchant-specific time-invariant characteristics ('fixed effects')
- $IFR_t$  is a dummy variable, which is equal to 1 in the months after the IFR caps came into force on 9<sup>th</sup> December 2015, and 0 before
- $x_{kit}$  is a matrix of control variables; these are outlined in Table 1
- $\varepsilon_{it}$  is an error term which captures random noise

**1.13** Moving from model (1) to model (2) imposes the restriction that the coefficient on interchange fees is equal to one. This would hold under full pass-through of interchange fees. Moving from model (2) to model (3) imposes the additional restriction that the coefficient on scheme fees is equal to one. This would hold under full pass-through of interchange and scheme fees.

**1.14** Because we are using the IFR caps coming into force to investigate pass-through, we focus on model (2) with interchange fee margin as the dependent variable. This specification puts the focus directly on the impact of the IFR caps and the variable of interest, namely the gap between MSC and interchange fees. However, we also conduct analysis using acquirer net revenue – model (3) – and average MSC as a percentage of monthly card turnover – model (1) – as dependent variables to test alternative approaches.

**1.15** We estimate all models using a fixed effects panel model.<sup>6</sup>

<sup>6</sup> In our consultation on our proposed approach to the pass-through analysis, we suggested using a difference-in-difference model, where we compare merchants on standard and IC++ pricing before and after the IFR caps came into force. We focus on the reduced form model presented in paragraph 1.12. We enhance the reduced form model with a dummy variable which equals 1 after the IFR caps came into force and 0 otherwise. We then assess the impact of the IFR caps based on the coefficient on this dummy variable.

**Table 1: Other factors that may impact average MSC as a percentage of monthly card turnover (control variables)**

Control variable	How this impacts average MSC as a percentage of monthly card turnover
Scheme fees	Scheme fees are a component of the MSC. If increases in average scheme fees are passed through in full, this will lead to increases in average MSC.
Value of transactions	The effect of an increase in the value of transactions on average MSC (as a percentage of the monthly card turnover) depends on the structure of pricing. If, for example, the merchant pays an ad valorem fee for card-acquiring services, average MSC would remain unchanged as a percentage of monthly card turnover. If there are economies of scale – for example, if higher total transaction value is associated with a lower per transaction fee – average MSC as a percentage of monthly card turnover could decrease as the total value of transactions increases. And vice versa, if there were diseconomies of scale.
Volume of transactions	As with value of transactions (see above), the effect of an increase in the volume of transactions (that is, an increase in the number of card transactions) on average MSC as a percentage of monthly card turnover depends on the structure of pricing.
Share of capped credit and debit card transactions	Capped credit and debit card transaction incur lower interchange fees than other transactions. Share of capped credit and debit card transactions may affect the relationship between the MSC and the interchange fees.
Share of face-to-face, e-commerce and other transaction types	Different types of transactions attract different levels of interchange and scheme fees. Share of face-to-face (that is card-present), e-commerce and other transaction types may affect the relationship between the MSC and the interchange fees.
Risk (proportion of chargebacks out of value of all transactions)	Proportion of chargebacks serves as a proxy for a merchant's riskiness: a high proportion of chargebacks can indicate that a merchant poses a higher credit risk to the acquirer. (For more information on credit risk, see Annex 1.) However, it should be noted that in some cases a merchant may show no or few chargebacks until it is insolvent, and proportion of chargebacks is therefore an imperfect proxy.
Merchant fixed effects	Merchant fixed effects capture merchant-specific time-invariant characteristics.

- 1.16** Another important determinant of MSC is merchant size. We split merchants into size groups based on annual card turnover and estimate the models set out in paragraph 1.12 separately for each group (see section on ‘merchant grouping’).
- 1.17** Finally, an important determinant of MSC is the pricing option a merchant has. We distinguish merchants on ‘interchange plus plus’ (IC++) pricing from those on ‘standard’ pricing (see the sub-section entitled ‘data issues’ for a more detailed discussion of pricing options). Our data tracks merchants who switch from one pricing option to another while remaining with the same acquirer.<sup>7</sup> As explained in Annex 1, under IC++ pricing, acquirers automatically pass on at cost the interchange fees and scheme fees applicable to that transaction. We estimate the models set out in paragraph 1.12 separately for merchants on IC++ pricing, which we treat as a single, separate category to serve as a benchmark against which to compare merchants of different sizes on standard pricing. We would not expect merchants on standard pricing to show the same degree of pass-through as merchants on IC++ pricing. Nevertheless, this group serves as a useful comparison.
- 1.18** We do not control for acquirers’ other costs, such as regulatory, staff and technology costs. As explained in paragraph 1.3, acquirer net revenue includes the costs of providing card-acquiring services other than interchange fees and scheme fees, plus the acquirer’s margin.<sup>8</sup>

## New versus longstanding customers

- 1.19** Our core analysis focuses on the question of whether acquirers passed IFR savings through to merchants. In addition, we consider the questions of (1) whether acquirers’ new customers pay less than longstanding customers; and (2) whether merchants who signed up with an acquirer after the IFR caps came into force pay less than those who joined before.
- 1.20** In order to examine whether acquirers’ new customers pay less than longstanding customers, we define an indicator variable ‘age’, which equals 0 if an observation was recorded within a year of the merchant signing up with its acquirer; 1 if the observation is recorded between one and two years of it signing up with its acquirer; 2 if the observation is recorded between two and three years of it signing up with its acquirer; and 3 if the observation is recorded more than three years of it signing up with its acquirer.
- 1.21** To examine whether merchants who signed up with an acquirer after the IFR caps came into force pay less than those who joined before, we define a dummy that equals one if a merchant signed up with their acquirer after 9 December 2015.

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7 One of the five acquirers ([X]) could not provide historic tariff data for its merchants, therefore we cannot tell whether its merchants switched tariffs during the period.

8 We aimed to collect information on other costs as part of our financial review. However, acquirers were unable to provide the data requested (see Annex 3)



### Box 1: How we responded to feedback on our consultation on the proposed pass-through methodology

This box summarises the key points stakeholders raised in response to our consultation on the proposed approach to the pass-through analysis, and how we took account of these.

1. Stakeholders told us we have not explained how we intend to interpret the pass-through evidence; and that there is no straightforward mapping between the degree of cost pass-through and the intensity of competition in a market.

*Our response: We explain in Chapter 5 of the interim report and in paragraph 1.5 of this annex that we used the introduction of the IFR caps as an indicator for how well the supply of card-acquiring services is working. The pass-through analysis was one piece of evidence we considered in coming to our provisional findings on whether the supply of these services is working well.*

2. Stakeholders told us we have not explained how they will be allowed to engage with the analysis. Some expressed a desire to engage prior to publication of the interim report; and some called for a data room exercise.

*Our response: We intend to disclose our analysis to interested parties in a confidentiality ring after publishing our interim report. Further details will be available on our website.*

3. Our sampling strategy could give rise to bias and could result in too pessimistic an estimate of pass-through. This is because the sampling approach could introduce a 'survivorship bias', meaning that the analysis puts too little weight on the most price-sensitive merchants.

*Our response: To address this concern, we introduce a secondary analysis which compares the outcomes for merchants who joined their acquirer after the IFR caps came into force with those who joined before. This allows us to capture (although imperfectly) the effect on more price-sensitive merchants who may have switched – see the section on 'new and longstanding customers'. We expanded our sampling process to include a fourth sample to capture more merchants joining their acquirer after the IFR caps came into force (see Box 2).*

4. Looking at the MSC in isolation risks understating the degree of pass-through. By looking only at the MSC, we would not take account of any pass-through that occurs in the form of reduced prices of point-of-sale (POS) terminals (for example) or higher quality of service.

*Our response: We test the possibility that acquirers passed through IFR savings by lowering the price of other products and services rather than the price of card-acquiring services using the data acquirers were able to provide. However, the data acquirers were able to provide us was limited (see 'problems with data on card acceptance products and certain value-added services' in the section sub-section on 'data issues'). Chapter 5 of the interim report sets out the argument relating to quality of service.*

5. Limited data could introduce omitted variables problems.

*Our response: We acknowledge that there are limitations to the data we were able to obtain (see the subsection on 'data issues'). However, we requested sufficient data to allow us to do robust analysis. We sought to balance our need to collect data appropriate for robust analysis against the burden of data collection for the acquirers included in our information request.*

6. Monthly data may not give a correct view of prices.

*Our response: After analysing the data, we found that this was a particular issue for merchants in group 1. Box 3 explains how we address this issue by calculating alternative descriptive statistics.*

7. The proposed methodology does not control for demand shifts.

*Our response: Shifts in demand are captured by transaction volume – see Table 1. Shifts between different types of demand are captured by changes in share of transaction type (as outlined in Table 1).*

8. It is not clear how the methodology would deal with refunds or chargebacks.

*Our response: We address this in the subsection on 'data issues'.*

9. The categorisations of tariff types may be too wide.

*Our response: We address this in the subsection on 'data issues'.*

# Data and sampling

- 1.22** To perform the analysis, we requested data from the five largest acquirers. The choice of which acquirers to include in the analysis was driven by a desire to achieve high market coverage, while at the same time minimising the burden of an information request on the industry.
- 1.23** In June 2019, we issued an information request to the five largest acquirers, asking them to provide data at the merchant level. Box 2 outlines how merchants were sampled.

## Box 2: Our approach to sampling

For each acquirer, we collected four random samples of 2000 merchants each. The four samples cover different, but overlapping, time periods (see Figure 1).

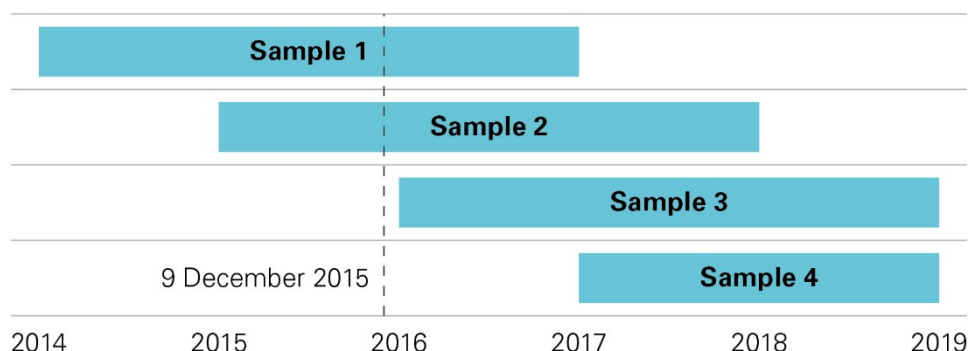
Each sample consists of a random selection of the merchants that buy card-acquiring services from a given acquirer at a given point in time (that is, the sample start date), and tracks those merchants for up to 36 months (or 24 months in the case of the fourth sample). Merchants drop out of the sample when they switch acquirer or stop accepting cards. This approach allows us to both capture changes in the merchant population over time. The fourth sample allows us to capture additional merchants joining after the IFR caps came into force beyond those captured by the third sample.

As we collected samples of equal size from each of the five largest acquirers, each sub-sample consists of a random selection of merchants at a certain point in time. Therefore, equal weight is given to each merchant in the sample, regardless of their annual card turnover or their acquirer.

Our core analysis uses this unweighted sample, as we examine the supply of card-acquiring services from the merchant's perspective. However, we test the robustness of the findings by re-running the baseline model and weighting merchant observations according to the number of merchants their acquirer served in 2016 (see section on 'sensitivity checks').

Finally, we note that because samples 3 and 4 fall entirely within the post-IFR caps period, they do not contribute to the estimation of the IFR dummy. However, they contribute to the estimation of the effects of the control variables. Moreover, they feature in the analysis of new versus longstanding customers.

**Figure 1: Illustration of our approach to sampling**



**1.24** We requested monthly data for the period 2014 to 2018 to provide sufficient coverage of the periods before and after the IFR caps came into force on 9 December 2015: the 'pre-IFR period' (January 2014 to November 2015) and the 'post-IFR period' (December 2015 to December 2018). Our sample consists of over one million observations. Our sample consists of over one million observations.

**1.25** The data we requested falls into three categories:

- 1 MSC** – the total amount the merchant paid to the acquirer for card-acquiring services
- 2 Fees** that the acquirer pays for the merchant's transactional activity, broken down by transaction type<sup>9</sup>, comprising:
  - **interchange fees** paid by the acquirer to the issuer for the merchant's transactional activity
  - **scheme fees** paid by the acquirer to Visa and Mastercard for the merchant's transactional activity<sup>10</sup>
- 3 Merchant characteristics**, including:
  - volume of transactions, broken down by transaction type
  - value of transactions, broken down by transaction type
  - time since the merchant signed up with current acquirer
  - how the merchant was signed up (for example, via internal sales team, independent sales organisation)
  - the pricing option the merchant has (standard, IC+, IC++, fixed, other or unknown)<sup>11</sup>
  - merchant category code (MCC) (a four-digit code used to classify the merchant by the type of goods or services it provides)
  - fees for card acceptance products and certain value-added services (CAP)<sup>12</sup>

<sup>9</sup> We requested the data to be split out according to the transaction characteristics that determine the interchange fees and scheme fees transactions attract: card type, location (domestic UK, other domestic, intra-EEA, other) and channel (face-to-face, e-commerce, etc.).

<sup>10</sup> Acquirers also pay scheme fees that are not directly attributable to transactions. We did not request fees that are not directly attributable to transactions, as they are immaterial. All references to scheme fees are to fees paid by acquirers to Mastercard and Visa.

<sup>11</sup> In the consultation and information request, we referred to 'tariff type' and to 'blended' rather than 'standard'.

<sup>12</sup> We asked acquirers to provide data on how much merchants paid for hiring point-of-sale (POS) terminals and card readers, purchase of card readers, payment gateways, DCC and services to help them comply with the Payment Card Industry Data Security Standard ('PCI DSS').

## Merchant grouping

- 1.26** Stakeholders were particularly concerned that acquirers had not passed through IFR savings to smaller merchants.<sup>13</sup> This prompted us to investigate whether there are significant differences between merchants in different size groups.
- 1.27** We split merchants into size groups based on annual card turnover: up to £15,000, £15,000 to £180,000, £180,000 to £380,000, £380,000 to £1 million, £1 million to £10 million, £10 million to £50 million, more than >£50 million. This grouping follows the segmentation introduced in Chapter 4 of the interim report but with additional detail to allow us to examine any differences between merchants with varying levels of annual card turnover.
- 1.28** In addition, we distinguish merchants on IC++ pricing from those on standard pricing. As explained in paragraph 1.17 and Annex 1, under IC++ pricing, acquirers automatically pass on at cost the interchange fees and scheme fees applicable to that transaction. We treat merchants on IC++ pricing as a single, separate category to serve as a benchmark against which to compare merchants of different sizes on standard pricing. We would not expect merchants on standard pricing to show the same degree of pass-through as merchants on IC++ pricing. Nevertheless, this group serves as a useful comparison. Merchants on IC++ pricing are predominantly large merchants with annual card turnover above £10 million.

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<sup>13</sup> Our assessment identifies two broad segments: large merchants, and small and medium-sized merchants. The term 'smaller merchants' was used by stakeholders.

**1.29** Table 2 provides an overview of the merchant groups as represented in our sample.

**Table 2: Overview of merchant groups**

Group	Turnover band	Number of merchants in sample group	Number of merchants in group as percentage of total	Group card turnover in 2018	Group card turnover in 2018 as percentage of total
<b>1</b>	£0 – £15,000	5,669	15.35%	8,255,530	0.04%
<b>2</b>	£15,000 – £180,000	20,824	56.38%	456,000,000	2.17%
<b>3</b>	£180,000 – £380,000	5,051	13.67%	451,000,000	2.15%
<b>4</b>	£380,000 – 1,000,000	3,200	8.66%	666,000,000	3.17%
<b>5</b>	£1,000,000 – £10,000,000	1,709	4.63%	1,730,000,000	8.25%
<b>6</b>	£10,000,000 – £50,000,000	188	0.51%	1,540,000,000	7.34%
<b>7</b>	>£50,000,000	52	0.14%	1,620,000,000	7.72%
<b>IC++</b>	Any	201	0.54%	14,200,000,000	67.68%
<b>Other</b>	Any	43	0.12%	310,000,000	1.48%
<b>Total</b>	All	36,937	100%	22,195,600,000	100%

Source: PSR analysis using data provided by the five largest acquirers.

**1.30** The sample is randomly drawn and sufficiently large that it approximates the true distribution of the underlying population of the merchants at each of the top five acquirers. Table 2 shows that the small minority of IC++ merchants (0.54%) accounted for the large majority of annual card turnover (67.68%) in 2018 in our sample.

- 1.31** Table 3 provides an overview of the number of merchants who joined before and after the IFR caps came into force.

**Table 3: Overview of merchant groups by joining date**

Group	Joined pre-IFR caps	Joined post-IFR caps	Total
1	5,250	419	5,669
2	19,642	1,182	20,824
3	4,803	248	5,051
4	3,070	130	3,200
5	1,664	45	1,709
6	183	5	188
7	52	0	52
8 (IC++)	197	4	201
Other	40	3	43
<b>Total</b>	<b>34,901</b>	<b>2,036</b>	<b>36,937</b>

Source: PSR analysis using data provided by the five largest acquirers.

**Box 3: A spotlight on group 1**

- Group 1, that is merchants with annual card turnover of less than £15,000, accounts for 15.35% of merchants, but only 0.04% of 2018 transaction value in our sample (see Table 2).
- Throughout our analysis, the findings for this group are less stable. This is because the group comprises merchants whose monthly card turnover can vary significantly from month to month. Merchants in this group may have months with positive card turnover, followed by months of no card turnover. This impacts the descriptive statistics we calculate. If a merchant pays fees for card-acquiring services even if it does not accept any card transactions, average MSC as a percentage of monthly card turnover:
  - cannot be calculated in months with zero turnover
  - will be very high in months with lower turnover
  - will be low in months of higher turnover
- As a result, this group contains observations for average MSC as a percentage of monthly card turnover that appear to be outliers, but are legitimate observations. We find that the distribution for this group has a long right tail of high average MSC. There is no correct way to treat these observations. Including them biases the group mean upward and skews the econometric analysis. Excluding them excludes legitimate observations and biases the group mean downward.
- We observe similar patterns for average interchange fees as a percentage of monthly card turnover.
- For consistency with other merchant groups, and as explained in the section on data issues, we truncate the data at the 99th percentile.

- Because merchants in group 1 have monthly card turnover that can vary significantly from month to month, we need to be careful about making inferences for this group. In the section on descriptive analysis, we will present two sets of statistics, one which underpins the econometric analysis for the other merchant groups, and one which smooths the month-on-month fluctuations for group 1 and allows us to make sensible inferences for that group. In the section on econometric analysis, we include the results for group 1 for completeness, but we do not place weight on the results.
- The issue described above only arises for merchants in group 1, because merchants with higher annual card turnover are very unlikely to have very large month-to-month fluctuations in MSC and interchange fees as a percentage of monthly card turnover.

## Data issues

- 1.32** This section provides an overview of the most important issues we found with the data the acquirers provided, how these issues are likely to impact the analysis, and steps we took to mitigate them.

### Concerns regarding data on scheme fees

<b>Issue</b>	Acquirers told us they had difficulty providing data on scheme fees at the desired level of disaggregation. In particular, they told us that they did not record data on scheme fees at the merchant level and so had to allocate and apportion data to individual merchants. There may also be discrepancies between acquirers in how they allocated and apportioned the data to individual merchants.
<b>Potential impact</b>	The difficulties the acquirers faced proving data on scheme fees, as well as potential discrepancies between acquirers in how they allocated and apportioned the scheme fees to individual merchants, make this data less reliable. As a percentage of total MSC, scheme fees are small, so we do not think this issue significantly impacts on our ability to examine pass-through of IFR savings.
<b>Mitigation</b>	While this does not impact the validity of our findings regarding pass-through of IFR savings, we note that the evidence regarding pass-through of scheme fees is less strong.



## Missing data for one of the five largest acquirers (X)

<b>Issue</b>	<p>One of the five acquirers included in our sample was not able to provide data on some variables for the years 2014 and 2015. The variables affected are:</p> <ul style="list-style-type: none"> <li>• scheme fees</li> <li>• interchange fees – data could not be broken out by channel and location</li> <li>• value of card transactions – data could not be broken out by channel and location</li> </ul>
<b>Potential impact</b>	<p><b>Scheme fees:</b> Scheme fees are a component of the MSC, which we include as a control in our econometric models. Missing values for 2014 and 2015 mean that all observations for this acquirer in the pre-IFR caps period would not be included in our regressions. As we are interested in the differences in outcomes before and after the IFR caps came into force, missing one-fifth of the data in the pre-IFR caps period would mean the results would not be representative of all five acquirers, but of the other four only.</p> <p><b>Value of card transactions splits:</b> the split by location is required to calculate transaction mix, which we include as control variables in our econometric models. Missing values for 2014 and 2015 mean that all observations for this acquirer in the pre-IFR caps period would not be included in our regressions. Therefore, the results from these models in the pre-IFR caps period would not be representative of all five acquirers, but of the other four only.</p> <p><b>Interchange fees splits:</b> Only interchange fees on transactions where the acquirer and issuer are in the EEA were capped by the IFR. Interchange fees split by location are therefore required to calculate IFR savings. We are not able to do this calculation for this acquirer.</p>
<b>Mitigation</b>	<p><b>Econometric analysis:</b> Scheme fees and value of card transactions splits are required to estimate our econometric models. We impute the missing data using the multiple imputation by chained equations (MICE) technique. MICE uses the distribution of the observed data to estimate a set of likely values of the data that are missing. MICE estimates these values <math>m</math> times, each time incorporating a random component to reflect the uncertainty about the missing values. The purpose of MICE is not to fill the gaps with the data that is most similar to the true data, rather it is to reproduce the proper variance/covariance matrix for estimation to reduce bias.</p> <p>To be able to use MICE, we assume data is ‘missing at random’ (MAR). Under this assumption, the probability of a data point missing does not depend on the true values after controlling for the observed variables.</p> <p><b>Descriptive statistics:</b> When calculating certain descriptive statistics, we opt to exclude this acquirer’s data for the years 2014 and 2015. We specify where we take this approach in the footnotes to the relevant graphs and tables.</p>

## Comparability of refund and chargeback transaction data across acquirers

<b>Issue</b>	We found differences in how acquirers record the number and value of refund and chargeback transactions.
<b>Potential impact</b>	Difficulty in making like-for-like comparisons across acquirers.
<b>Mitigation</b>	Our analysis focuses on purchase transactions and excludes refund and chargeback transactions. We do not consider this impacts on our analysis because refund and chargeback transactions comprise only 1.47% and 0.04% of transactions, respectively, in our dataset.

## Consistency of acquirers' allocation of merchants to pricing options

<b>Issue</b>	We encountered some discrepancies in how acquirers allocated merchants to the pricing options we set out in the information request. We requested information on whether merchants were on 'IC++', 'IC+', 'blended', or 'other' pricing.
<b>Potential impact</b>	To conduct our analysis, we need to be able to separate merchants who automatically receive pass-through at cost of interchange fees (and scheme fees) from those that do not.
<b>Mitigation</b>	<p>We had follow-up conversations with some acquirers to clarify our understanding of the pricing options and whether under these options for a given transaction the acquirer automatically pass through at cost interchange fees and scheme fees applicable to that transaction. Based on this engagement we allocated all merchants to one of the following pricing options<sup>14</sup>:</p> <ul style="list-style-type: none"><li>• IC++ pricing, whereby for a given transaction the acquirer automatically passes on at cost the interchange fee and scheme fees applicable to that transaction.</li><li>• Standard pricing, whereby for any given transaction the acquirer does not automatically pass through at cost the interchange fee applicable to the transaction and the pricing option does not satisfy the criteria for IC+, IC++ or fixed pricing.<sup>15</sup></li><li>• Other, if a merchant has IC+ pricing<sup>16</sup>, as well as merchants for which the pricing option was unknown. We merged the IC+ and other group because there were very few of them (43 merchants or 0.12% of observations) and they are not the focus of our analysis.</li></ul>

14 We amended our definitions of the pricing options based on engagement with acquirers.

15 For the purposes of the pass-through analysis we also allocated fixed pricing, whereby the merchant pays a fixed, periodic fee for card-acquiring services (the amount of which does not depend on the volume or value of transactions it accepts or the characteristics of these transactions, within specified limits) to standard pricing.

16 Interchange fee plus (IC+) pricing, whereby for any given transaction the acquirer automatically passes on at cost the interchange fee applicable to that transaction.

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We focus our analysis on merchants allocated to the IC++ and standard pricing. Merchants on 'other' pricing are included in the analysis on the whole sample, but excluded from the analysis by merchant group.

We acknowledge that in making these allocations we have abstracted from some of the nuance in acquirers' pricing options.

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## Data outliers

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### Issue

The data on MSCs, interchange fees and scheme fees contain significant outlying observations. This includes the following:

- Unusually high values for average MSC as a percentage of monthly card turnover (either the result of data entry errors or because of months in which fixed costs are high and turnover is low – the latter is predominantly an issue for group 1 merchants with annual card turnover >£15,000, as explained in Box 3).
- Negative values (either the result of data entry errors or relatively rare circumstances of interchange fees being refunded to the acquirer)

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### Potential impact

Outliers can significantly skew the results. However, we need to exercise care in how we treat them, as they often represent legitimate observations (as opposed to errors in the data).

The treatment of outliers is particularly important for group 1 merchants with annual card turnover of less than £15,000 (see Box 3).

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### Mitigation

We truncate the data within merchant groups upward at the 99th percentile and downward at 0 for the following variables:

- MSC (as a percentage of monthly card turnover)
  - interchange fees (as a percentage of monthly card turnover)
  - scheme fees (as a percentage of monthly card turnover)
  - interchange fees on capped credit card transactions (as a percentage of monthly card turnover)
  - interchange fees on capped debit card transactions (as a percentage of monthly card turnover)
  - interchange fees on other non-capped card transactions (as a percentage of monthly card turnover)
-

## Issues with data on card acceptance products and certain value-added services (CAP)

<b>Issue</b>	Acquirers told us they had difficulty providing data on the total value of CAP for a given merchant in each month: only three acquirers were able to provide a complete dataset; one acquirer was not able to provide historic data due to problems with their database; another acquirer could not provide data for the years 2014 and 2015; [36].
<b>Potential impact</b>	We are not able to comprehensively test for the possibility that acquirers passed through IFR savings by lowering the price of other goods and services rather than the price of card-acquiring services (see section on additional robustness checks).
<b>Mitigation</b>	We test the hypotheses using data from three acquirers only. We present this analysis as a sensitivity check.

# Descriptive statistics

- 1.33** This section describes how the MSC and its components (interchange fees and scheme fees and acquirer net revenue) evolved over the period 2014 to 2018. We consider these variables at an aggregate level, as well as by merchant group.

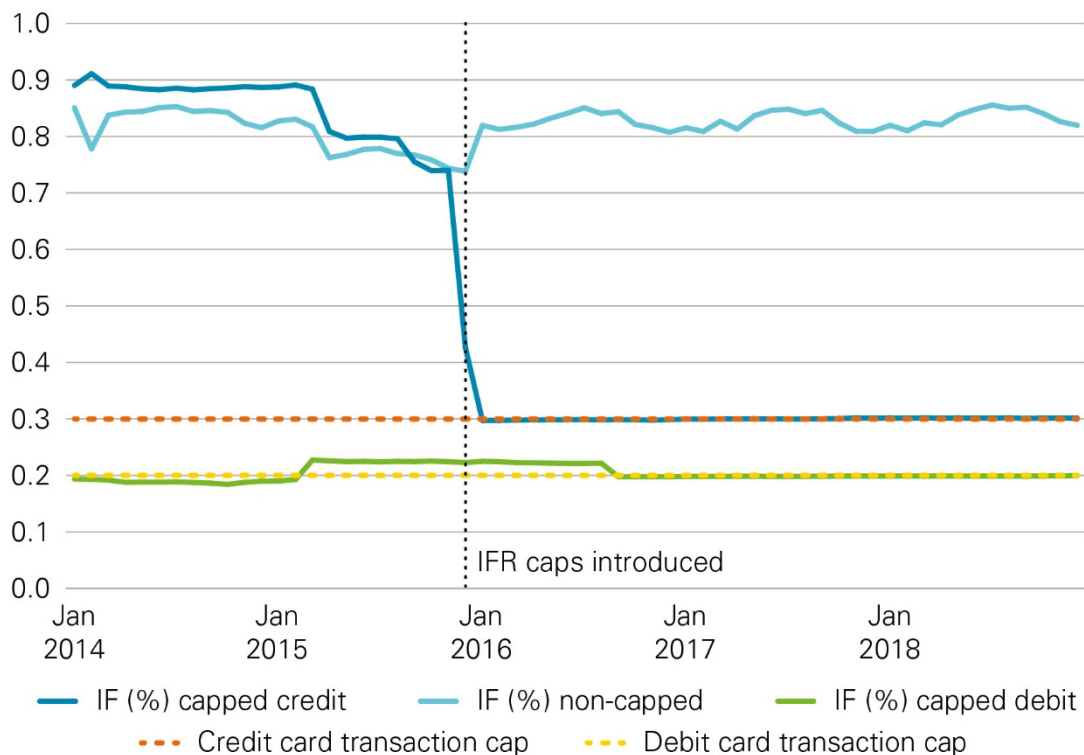
## Interchange fees – aggregate view

- 1.34** We first describe interchange fees, which on average represent the largest component of the MSC. We examine how average interchange fees, calculated as total interchange fees paid in a month over total card turnover in a month evolved over the period 2014 to 2018 at an aggregate level. We separate interchange fees incurred on domestic and intra-EEA consumer credit card transactions (capped at 0.3% by the IFR), domestic and intra-EEA consumer debit card transactions (capped at 0.2% by the IFR<sup>17</sup>), and all other transactions (not capped). Figure 2 shows this evolution. The majority of debit card transactions at UK merchants involve Visa cards, while the majority of credit card transactions involve Mastercard cards.

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<sup>17</sup> As set out in Annex 1, the Treasury permitted operators of card payment systems to apply a weighted average interchange fee to UK consumer debit card transactions. The weighted average cap was set at 0.2% of the average value of all domestic debit card transactions made within a card payment system in the previous year. It meant that interchange fees could be more than or less than 0.2% of the value of an individual transaction.

**Figure 2: Monthly average interchange fees as a percentage of card turnover**



Source: PSR analysis using data submitted by the five largest acquirers<sup>18</sup>

- 1.35** The vertical line in Figure 2 marks the IFR caps coming into force in December 2015. The dotted horizontal lines mark the level of the caps for credit (0.3%) and debit (0.2%) cards.
- 1.36** Overall, Figure 2 shows that average interchange fees for domestic and intra-EEA consumer credit and debit card transactions fell to the levels of the caps in the period after December 2015.
- 1.37** Figure 2 shows that average interchange fees incurred on capped credit card transactions fell sharply upon the IFR caps coming into force in December 2015 – from 0.75% immediately before, to the level of the cap immediately after, where they stayed for the remaining period.
- 1.38** Figure 2 also shows that average interchange fees on capped credit card transactions fell slightly (by 0.1 percentage points) nine months before the IFR caps came into force, around March 2015. This is mainly driven by Mastercard lowering their interchange fee rates on consumer credit cards issued in the UK over the course of 2015 in the lead up to the IFR caps coming into force.

<sup>18</sup> One of the acquirers from which we requested data could not separate out the interchange fees by location of transaction for the years 2014 and 2015. 2014 and 2015 figures in this chart are based on data from the other four acquirers.

**1.39** Figure 2 shows average interchange fees on capped debit card transactions. We observe that:

- prior to the IFR caps coming into force in December 2015, average interchange fees on debit card transactions that were subsequently capped by the IFR were already at a level close to that of the IFR caps (0.23%)
- average interchange fees on capped debit card transactions didn't drop to the level of the IFR cap until September 2016

**1.40** The evolution from 2014 to 2016 of average interchange fees on debit card transactions subsequently capped by the IFR is explained by changes Visa made to its interchange fee rates during this period:

- Prior to March 2015, the weighted average of interchange fees for Visa UK domestic debit card transactions was already close to 0.2%. For example, in 2014, the weighted average for all UK domestic debit card transactions was 0.21%.
- In March 2015, prior to the IFR coming into force, Visa introduced a weighted average interchange fee for UK domestic consumer debit card transactions set as follows: £0.01 plus 0.2% (capped at £0.50) for secure transactions and £0.11 plus 0.2% (capped at £1) for non-secure transactions. We observe a small change in average interchange fees for debit card transactions that were subsequently capped by the IFR in March 2015 when Visa introduced a weighted average interchange fee. Visa continued to apply a weighted average interchange fee until September 2016.
- As set out in Annex 1, the IFR caps interchange fees on domestic and intra-EEA consumer debit card transactions at 0.2% of the value of the transaction. However, the IFR permitted Member States to apply a weighted average interchange fee on domestic consumer debit card transactions for five years after the caps came into force. In the UK, the Treasury exercised this Member State discretion in the Payment Card Interchange Fee Regulations 2015. The weighted average cap was set at 0.2% of the average value of all domestic debit card transactions made within a card payment system in the previous year. It meant that interchange fees could be more than or less than 0.2% of the value of an individual transaction. Visa was the only operator of a card payment system operating in the UK to apply a weighted average interchange fee.<sup>19</sup>
- In September 2016, Visa replaced the weighted average interchange fee with a flat rate of 0.2% for nearly all UK domestic debit card transactions. We observe the impact of this change in Figure 2 as the average interchange fees for capped debit card transactions falls to 0.2%.

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<sup>19</sup> While Figure 2 does not show average interchange fees on domestic debit card transactions falling to 0.2% from December 2015 (when the IFR caps came into force), our dataset does not include all domestic debit card transactions made within the Visa card payment system and does not show the overall weighted average interchange fee for that system.

- Other changes were made to the interchange fees that apply to capped debit card transactions in 2015 and 2016 (in addition to Visa introducing and later replacing the weighted average interchange fee in March 2015 and September 2016 respectively). For example, in January 2015, Visa introduced the Cross-Border Domestic Interchange Programme (CBDIP) following commitments given in the context of competition law investigations carried out by the European Commission. The CBDIP enabled cross-acquirers to elect between either the domestic debit or credit interchange fee rate applicable to a transaction or an interchange fee rate of 0.2% or 0.3% – for debit and credit cards respectively – provided certain conditions were met. The CBDIP meant that acquirers were able to lower the interchange fees they paid for certain transactions in countries that had higher domestic debit or credit interchange fee rates. In practice, the applicable conditions meant that the CBDIP was most likely to apply to transactions involving a small number of large merchants that met specific criteria, for example because only transactions involving merchants with IC++ pricing could qualify. We do not observe the impact of CBDIP in Figure 2, likely because none of the merchants eligible for the programme are included in our dataset.

**1.41** In Figure 2, the outcomes from large merchants dominate the averages and so the averages largely represent outcomes for large merchants. As we will see in the next section which looks at interchange fees by merchant group, prior to the IFR caps coming into force, average interchange fees on capped debit card transactions varied across merchant groups.

## Interchange fees – by merchant group

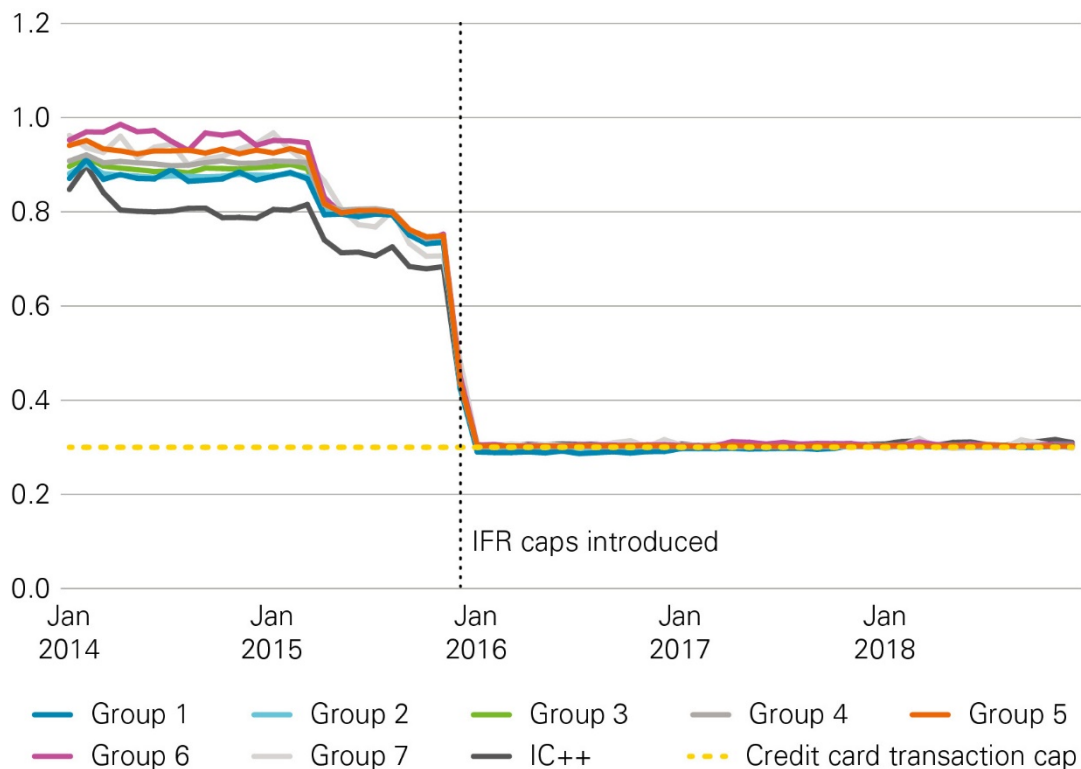
**1.42** We examine how average interchange fees as a percentage of monthly card turnover evolved over the period 2014 to 2018 for each merchant group. We consider average interchange fees incurred on capped credit card transactions and average interchange fees incurred on capped debit card transactions in turn.

### Average interchange fees incurred on capped credit card transactions

**1.43** Figure 3 shows the evolution of average interchange fees incurred on capped credit card transactions by merchant group. It shows all merchant groups following a similar trend to that observed at the aggregate level.



**Figure 3: Monthly average interchange fees on capped credit cards as a percentage of card turnover, by merchant group**



Source: PSR analysis using data submitted by the five largest acquirers<sup>20</sup>

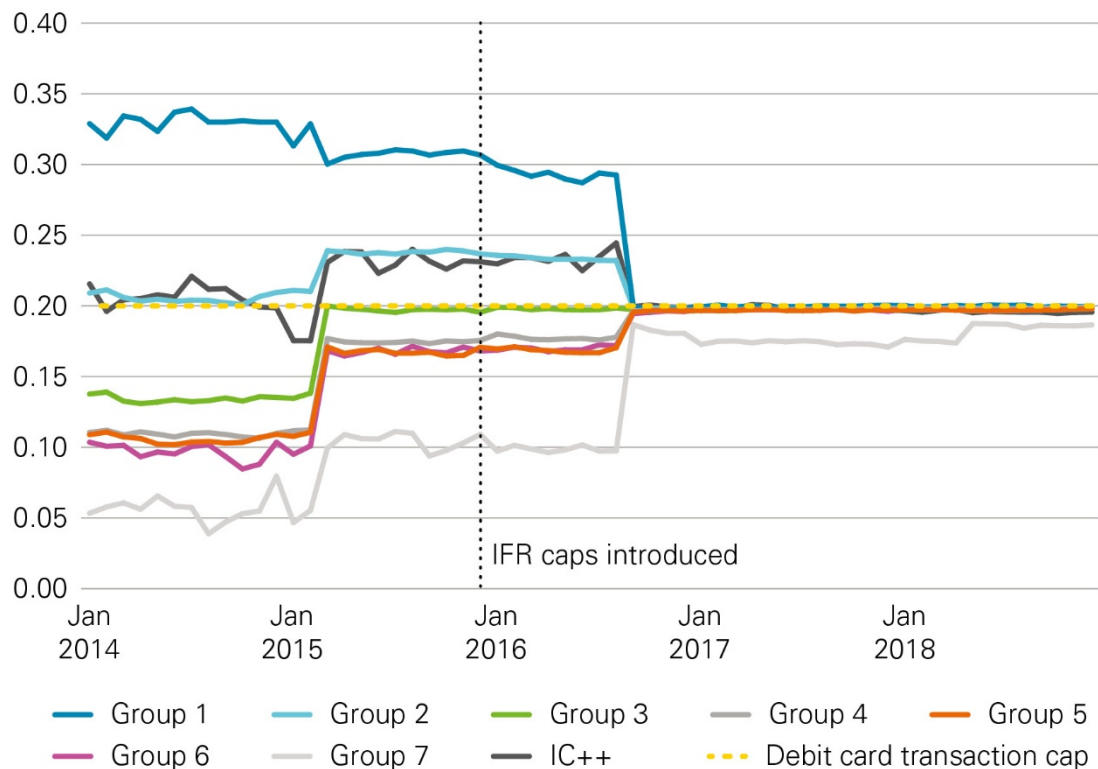
### Average interchange fees incurred on capped debit card transactions

**1.44** Figure 4 shows the evolution of average interchange fees incurred on capped debit card transactions by merchant group. It shows significant differences across merchant groups over the period January 2014 to September 2016, after which average interchange fees for all merchant groups converged to the level of the cap. As explained in paragraph 1.40, this is explained by changes Visa made to its interchange fees during this period.

**1.45** We note that average interchange fees for group 7, that is the largest merchants with standard pricing that have annual card turnover greater than £50 million, increased significantly after September 2016. This appears to be because group 7 merchants have a high proportion of high-value debit card transactions. After Visa replaced the weighted average interchange fee on UK domestic debit card transactions, secure transactions with a value of around £250 and non-secure transactions with a value of around £500 incurred a higher interchange fee than previously.

<sup>20</sup> One of the acquirers from which we requested data could not separate out the interchange fee by location of transactions for the years 2014 and 2015. 2014 and 2015 figures in this chart are based on data from the other four acquirers.

**Figure 4: Monthly average interchange fees on capped debit cards, by merchant group**



Source: PSR analysis using data submitted by the five largest acquirers<sup>21</sup>

## Difference in average interchange fees – by merchant group

**1.46** We calculate the difference in average interchange fees by merchant group following the IFR caps coming into force. As indicated in Box 3, we calculate two sets of descriptive statistics. We explain how these are calculated below. The first set follows on from the analysis presented above, and underpins the econometric analysis in the next section. The second set aims to smooth the month-on-month fluctuations in group 1, and is the basis for the summary statistics in Table 2 in Chapter 5 of the interim report.

**1.47** The first set of descriptive statistics, presented in Table 4, is calculated by dividing interchange fees for a given merchant in each month by card turnover for the same merchant in the same month. We then average these observations across the pre-IFR caps period and the post-IFR caps period, and subtract the latter from the former. We call this the ‘merchant-period-average’.

<sup>21</sup> One of the acquirers from which we requested data could not separate out the interchange fee by location of transactions for the years 2014 and 2015, therefore the data underlying this chart shows interchange fees for the other four acquirers only for years 2014 and 2015.

- 1.48** The second set of descriptive statistics, presented in Table 5, is calculated by
- adding all observations relevant to the calculation being made (all merchants and all months for a particular group) for interchange fees that fall into the pre-IFR caps period
  - adding all relevant observations (all merchants and all months) for transactions values that fall into the pre-IFR caps period
  - dividing the former by the latter
  - doing the same calculation for the post-IFR caps period
  - subtracting pre-IFR caps period from the post-IFR caps period. We call this the ‘aggregate-group-ratios’

**1.49** Note that this calculation produces averages that weight merchants by turnover. As explained in paragraph 1.46, the primary reason for calculating this alternative set of descriptive statistics is to smooth the month-on-month fluctuations in group 1 and hence produce sensible results for this group.

**1.50** Table 4 and Table 5 confirm that average interchange fees did – broadly – fall after the IFR caps came into force. The exception is group 7 – merchants with annual card turnover greater than £50 million. Table 4 shows that this group saw almost no change in average interchange fees. As explained in paragraphs 1.40 and 1.45, because of the change in Visa’s interchange fee rates, the merchants in group 7 – who have a high proportion of high value debit card transactions – saw an increase in interchange fees on debit card transactions following the IFR caps coming into force.<sup>22</sup>

**Table 4: Merchant-period-average for interchange fees before and after the IFR caps came into force, by merchant group**

	1	2	3	4	5	6	7	IC++	All
<b>Pre-IFR</b>	0.57	0.47	0.43	0.44	0.45	0.43	0.26	0.49	0.47
<b>Post-IFR</b>	0.40	0.32	0.29	0.29	0.32	0.33	0.21	0.36	0.32
<b>Difference</b>	0.17	0.14	0.14	0.14	0.13	0.11	0.05	0.13	0.15

Source: PSR analysis using data submitted by the five largest acquirers. Note that figures are rounded and may lead to minor discrepancies between the pre-IFR period minus the post-IFR period and what we report under ‘difference’.

<sup>22</sup> The two set of descriptive statistics produce different results for group 7. As explained in paragraphs 1.48 and 1.49, the calculation of aggregate-group-ratios (presented in table 5) weights merchants by card turnover, whereas the calculation of merchant-period-averages (presented in table 4) weights merchants equally. Group 7 includes merchants with turnover greater than £50 million, but merchants in this group are not uniformly distributed, as this groups has no upper limit (see Box 4). Hence, calculations with and without weights will produce different results.

**Table 5: Aggregate-group-ratios for interchange fees before and after the IFR caps came into force, by merchant group**

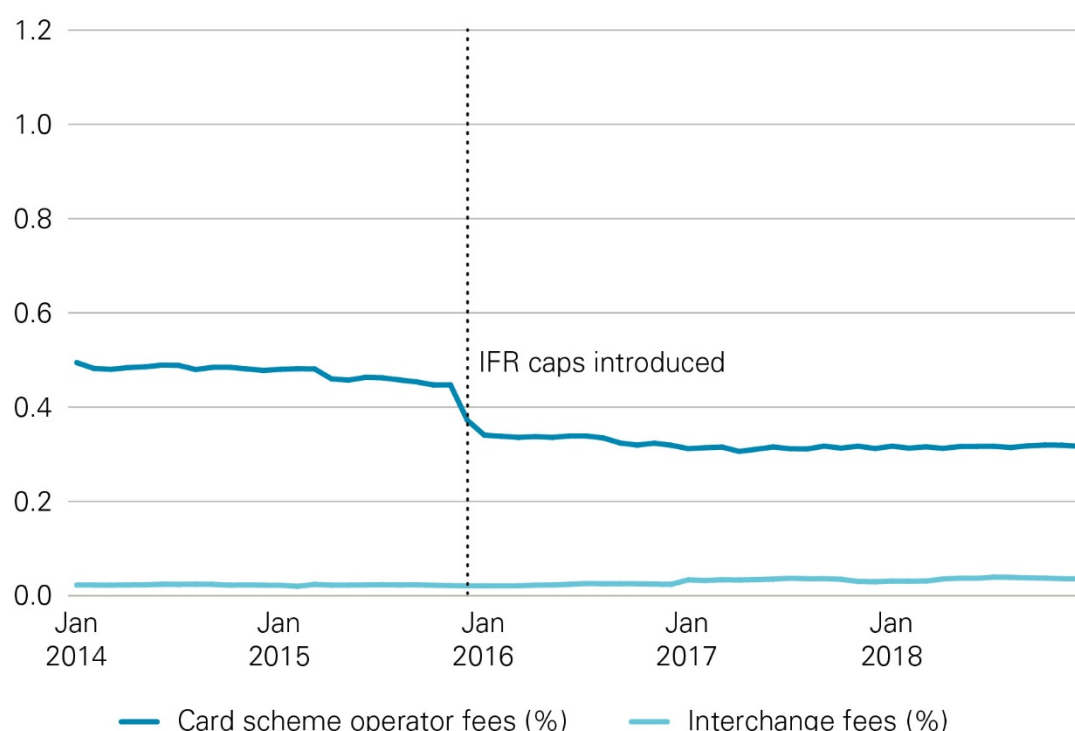
	1	2	3	4	5	6	7	IC++	All
<b>Pre-IFR</b>	0.58	0.46	0.43	0.44	0.45	0.46	0.12	0.37	0.26
<b>Post-IFR</b>	0.42	0.31	0.29	0.29	0.32	0.33	0.18	0.26	0.26
<b>Difference</b>	-0.16	-0.15	-0.14	-0.15	-0.14	-0.13	0.06	-0.12	0.00

Source: PSR analysis using data submitted by the five largest acquirers. Note that figures are rounded and may lead to minor discrepancies between the pre-IFR period minus the post-IFR period and what we report under 'difference'.

## Scheme fees

- 1.51** We have described interchange fees, which on average represent the largest component of the MSC. We now briefly describe scheme fees, which on average represent the second largest component of the MSC. We look at scheme fees in more detail in Annex 4.
- 1.52** Scheme fees made up a significantly smaller proportion of the MSC than interchange fees, over the period between 2014 and 2018. However, during that period, the share of the MSC relating to scheme fees rose, whereas the share relating to interchange fees reduced (see Chapter 5 of the interim report and Annex 3).
- 1.53** We examine how average scheme fees, calculated as total scheme fees paid in a month over total card turnover in a month, evolved over the period 2014 to 2018 at an aggregate level.
- 1.54** Figure 5 shows that average scheme fees increased by 0.012 percentage points in the post-IFR period came into force. We look at the evolution of scheme fees over the period 2014 to 2018 in more detail in Annex 4.

**Figure 5: Monthly average interchange fees and scheme fees as a percentage of card turnover**



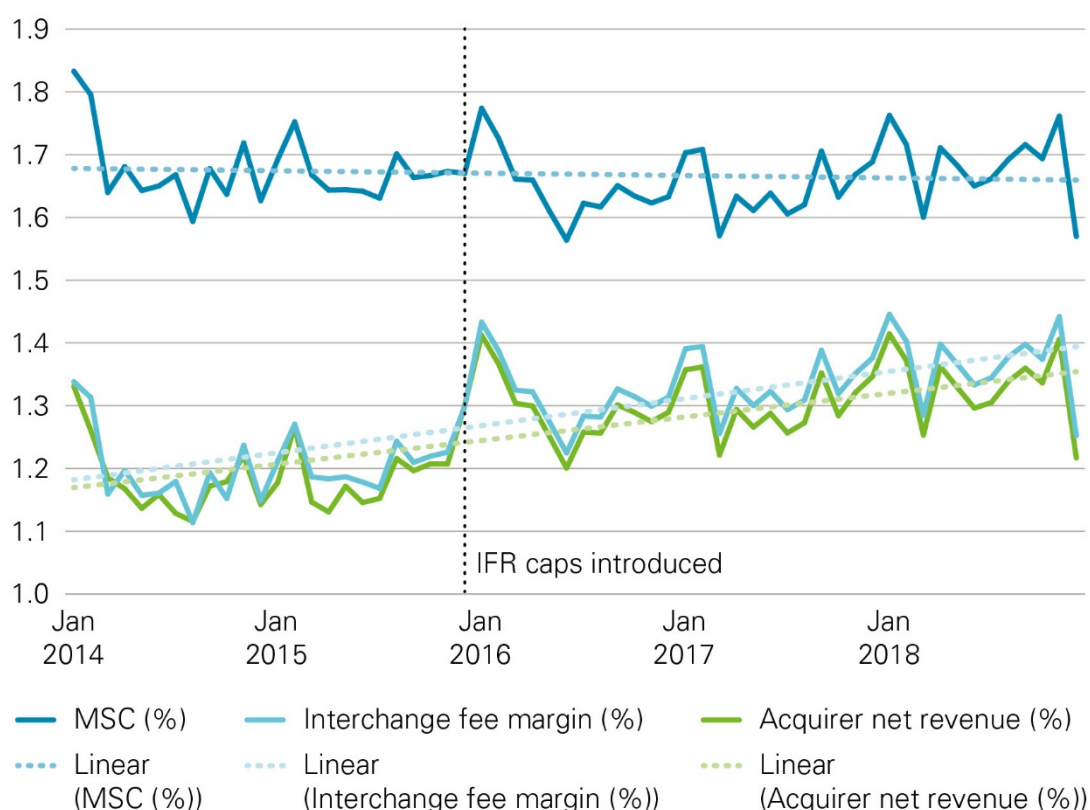
Source: PSR analysis using data submitted by the five largest acquirers.<sup>23</sup>

## MSC, acquirer net revenue and interchange fee margin

- 1.55** We have described how interchange fees and scheme fees evolved over the period 2014 to 2018. We now look at how the MSC itself, as well as acquirer net revenue (calculated as MSC minus interchange fees minus scheme fees) and the interchange fee margin (calculated as MSC minus interchange fees) evolved over this period. As explained in paragraph 1.11, these three variables capture different ways of measuring pass-through.
- 1.56** Figure 6 shows the evolution of average MSC as a percentage of monthly card turnover over the period 2014–2018 at an aggregate level. The vertical line in Figure 6 marks the IFR caps coming into force in December 2015.
- 1.57** Figure 6 shows that MSC remained relatively flat over the period 2014 to 2018. On the other hand, acquirer net revenue and interchange fee margin increased following the IFR caps coming into force.

<sup>23</sup> One of the acquirers from which we requested data could not provide data for monthly scheme fees paid by its merchants in the years 2014 and 2015, therefore the data underlying this chart shows average scheme fees for the other four acquirers only for years 2014 and 2015.

**Figure 6: Monthly average MSC, acquirer net revenue and interchange fee margin as a percentage of card turnover**



Source: PSR analysis using data submitted by the five largest acquirers.<sup>24</sup>

**1.58** We calculate average MSC, average acquirer net revenue, and average interchange fee margin for the entire pre-IFR caps period and the entire post-IFR caps period, and the differences between the periods, for each merchant group according to the two approaches described in paragraphs 1.47 and 1.48. Table 6 and Table 7 summarise the results:

- Merchants on IC++ pricing saw their average MSC decrease by 0.12 to 0.13 percentage points, and the interchange fee margin remain flat, indicating pass-through.
- Average MSC for merchants with annual card turnover between £15,000 and £10 million (groups 1 to 6) remained flat, changing between 0.02 and 0.06 percentage points. The interchange fee margin, on the other hand, increased by 0.14 to 0.2 percentage points, indicating no pass-through.
- For the smallest merchants with annual card turnover below £15,000 (group 1), the results vary substantially depending on how we calculate the descriptive statistics. As explained in Box 3, the reason we calculate two sets of descriptive statistics is because of the volatility in this group. The second calculation (of aggregate-group-ratios) smooths this volatility, and for group 1, we place more weight on this set of descriptive statistics. Table 7 shows that average MSC for merchants with annual

<sup>24</sup> One of the acquirers from which we requested data could not provide data for monthly card scheme operator fees paid by its merchants in the years 2014 and 2015, therefore the data on acquirer net revenue underlying this chart shows scheme fees for the other four acquirers only for years 2014 and 2015.

card turnover below £15,000 remained flat, changing by 0.02 percentage points. The interchange fee margin, on the other hand, increased by 0.18 percentage points, indicating no pass-through.

- Finally, Table 6 shows that, for the largest merchants with annual card turnover over £50 million (group 7), the change in average MSC was close to zero, but interchange fee margin remained flat too. This is because this group did not see a fall in interchange fees following the IFR caps coming into force and there were no IFR savings to be passed through (see Table 4).

**1.59** Overall, these results indicate that, on average, merchants with annual card turnover between £15,000 and £50 million receive little or no pass-through of IFR savings. This is indicated both by the MSC remaining flat and the interchange fee margin increasing. The aggregate-group-ratios for group 1 tell a similar story. However, the average MSCs may also have been affected by other variables over the period 2014 to 2018 (see Table 1), including the characteristics of merchants within each size group, changes in scheme fees, volume of transactions and the mix of transactions, or proportion of chargebacks. To draw conclusions about whether IFR savings have been passed through or not, we need to rule out these alternative explanations. To do this, we used econometric analysis, which we present below.

**Table 6: Merchant-period-average for MSC, interchange fee margin and acquirer net revenue before and after the IFR caps came into force by merchant group**

		1	2	3	4	5	6	7	IC++	All
<b>MSC (%)</b>	Pre-IFR	5.42	1.36	0.95	0.87	0.81	0.66	0.39	0.73	1.67
	Post-IFR	5.63	1.42	0.99	0.90	0.83	0.70	0.34	0.60	1.66
	Difference	0.21	0.06	0.04	0.03	0.02	0.04	-0.05	-0.13	-0.02
<b>Interchange fee margin (%)</b>	Pre-IFR	4.85	0.89	0.52	0.43	0.36	0.22	0.13	0.24	1.20
	Post-IFR	5.23	1.09	0.70	0.60	0.51	0.37	0.13	0.24	1.33
	Difference	0.38	0.20	0.18	0.17	0.15	0.15	0.00	-0.00	0.13
<b>Acquirer net revenue (%)</b>	Pre-IFR	5.19	0.91	0.50	0.43	0.35	0.21	0.10	0.20	1.18
	Post-IFR	5.20	1.06	0.67	0.58	0.48	0.33	0.11	0.20	1.30
	Difference	0.01	0.16	0.17	0.15	0.13	0.13	0.01	0.00	0.12

Source: PSR analysis using data submitted by the five largest acquirers.<sup>25</sup>

<sup>25</sup> One of the acquirers from which we requested data could not provide data for monthly scheme fees paid by its merchants in the years 2014 and 2015, therefore the data on acquirer net revenue underlying this table shows the acquirer net revenue for the other four acquirers only for years 2014 and 2015.

**Table 7: Aggregate-group-ratios for MSC, interchange fee margin and acquirer net revenue before and after the IFR caps came into force by merchant group**

		1	2	3	4	5	6	7	IC++	All
<b>MSC (%)</b>	Pre-IFR	2.76	1.18	0.93	0.87	0.79	0.65	0.16	0.45	0.37
	Post-IFR	2.78	1.22	0.97	0.88	0.79	0.68	0.26	0.32	0.43
	Difference	0.02	0.04	0.03	0.02	0.00	0.03	0.09	-0.12	0.06
<b>Interchange fee margin (%)</b>	Pre-IFR	2.18	0.72	0.50	0.43	0.34	0.19	0.04	0.07	0.12
	Post-IFR	2.36	0.91	0.68	0.59	0.48	0.35	0.08	0.07	0.18
	Difference	0.18	0.19	0.18	0.16	0.14	0.16	0.04	0.00	0.06
<b>Acquirer net revenue (%)</b>	Pre-IFR	2.16	0.70	0.49	0.41	0.32	0.17	0.03	0.05	0.10
	Post-IFR	2.32	0.88	0.65	0.56	0.44	0.31	0.06	0.03	0.15
	Difference	0.17	0.17	0.17	0.15	0.13	0.14	0.03	-0.02	0.04

Source: PSR analysis using data submitted by the five largest acquirers.<sup>26</sup>

#### Box 4: A spotlight on the largest merchants

As explained in paragraph 1.48, the aggregate-group-ratios in Table 5 and Table 7 are calculated from the aggregates in each group of interchange fees, scheme fees, MSC and transactions. However, they do not add up to an aggregate that is representative of the sector as a whole. The 'All' columns in these tables are therefore not comparable with the accounting figures in Figure 11 of Chapter 5 of the interim report and are included here only for completeness.

The reason for this is that Table 5 and Table 7 are compiled from data sampled from the population of merchants of the five largest acquirers for the purpose of conducting the pass-through analysis. The approach to sampling detailed in Box 2 above was designed to result in a random sample in which each merchant has an equal probability of being entered into the sample so that the statistics illustrate the experience of typical merchants.

The sample is therefore not representative of the transactions distributed across the sector as a whole. The size distribution of merchants is skewed, with many more merchants towards the lower end of each group than towards the upper end. This effect is particularly strong in groups 7 and 8 which have no upper limits, so that the descriptive statistics for these groups will be quite sensitive to which particular large merchants are picked up in the random sample. The five largest merchants among the customers of the

<sup>26</sup> One of the acquirers from which we requested data could not provide data for monthly scheme fees paid by its merchants in the years 2014 and 2015, therefore the data on acquirer net revenue underlying this table shows the acquirer net revenue for the other four acquirers only for years 2014 and 2015.



five largest acquirers accounted in 2018 for over £100 billion of transactions, that is 14% of total transactions, and none of these merchants are in our sample. The largest merchant in our sample had just under £6 billion of card transactions in 2018.

In addition, we sampled the same number of merchants from each of the five largest acquirers even though the acquirers have unequal shares of supply; and the elimination of a small proportion of outliers from the data set may not have had the same impact in each size group in our sample. But these effects will be small compared with the effect of the sample not including any merchants with annual card turnover above £6 billion.

Finally, merchants with very high levels of annual card turnover (above £6 billion) will be on IC++ pricing. Separately, we find full pass-through of IFR savings to IC++ merchants and make no adverse finding about the supply of card-acquiring services to the largest merchants, so the fact that our sample does not include any of the merchants with very high levels of annual card turnover has no implications for our conclusions.

## Direct impact of the IFR caps

- 1.60** Before we turn to the econometric analysis, we calculate cost savings directly attributable to the IFR caps ('IFR savings') that will help us interpret the econometric results.
- 1.61** The changes in interchange fees shown in Tables 4 and 5 are not entirely the result of the IFR caps. They may be partly explained by changes in interchange fees on uncapped transactions, or by shifts in the mix of transactions between uncapped transactions, capped credit card transaction, and capped debit card transactions. To isolate the effect of the IFR caps, we calculate the change in the interchange fee for each merchant group that is accounted for by capped transactions, holding transaction shares constant (at their post-IFR caps levels).
- 1.62** Specifically, we do an alternative calculation of the difference in average interchange fees before and after the IFR caps came into force only on the transactions that were capped by the IFR (that is, domestic and intra-EEA consumer debit and credit card transactions). The differences between average interchange fees on capped transactions before and after the IFR caps came into force are then weighted by the post-IFR caps shares of domestic and intra-EEA consumer debit and credit card transactions. Table 8 and Table 9 summarise the results (for the two sets of descriptive statistics explained in paragraphs 1.48 and 1.49, respectively). (Table 17 in the additional tables for reference section of this annex presents the difference in interchange fees per transaction type.)
- 1.63** Table 8 and Table 9 confirm that the IFR caps did – broadly – result in savings for the acquirers. Again, the exception is group 7 with merchants with annual card turnover greater than £50 million, which saw no savings or a slight increase in interchange fees. Merchants with lower annual card turnover saw a bigger impact from the IFR caps coming into force (for example, a fall of 0.17 and 0.16 percentage points for merchants with annual card turnover less than £15,000, compared with a fall of 0.10 percentage points for large merchants with annual card turnover between £10 million and £50 million). Finally, merchants on IC++ pricing saw a smaller fall of 0.09 and 0.06 percentage points.

**Table 8: Merchant-month-average IFR savings, by merchant group**

	1	2	3	4	5	6	7	IC++	All
<b>IFR savings</b>	0.17	0.13	0.11	0.12	0.11	0.10	0.00	0.09	0.10

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 9: Aggregate-group-ratios IFR savings, by merchant group**

	1	2	3	4	5	6	7	IC++	All
<b>IFR savings</b>	0.16	0.13	0.12	0.12	0.11	0.10	-0.01	0.06	0.03

Source: PSR analysis using data submitted by the five largest acquirers.

# Econometric analysis

**1.64** One interpretation of the descriptive statistics presented in the previous section is that (except for the largest merchants who did not see a fall in average interchange fees following the IFR caps coming into force) acquirers did not pass through IFR savings to merchants with standard pricing. This is indicated both by the MSC remaining flat and the interchange fee margin increasing. However, the average MSCs may also have been affected by other variables over the period 2014 to 2018, including the characteristics of merchants within each size group, changes in scheme fees, volume of transactions, changes in the mix of transactions, or proportion of chargebacks. To draw conclusions about whether IFR savings have been passed through or not, we need to rule out these alternative explanations. To do this, we used econometric analysis. (For group 1, we rely on the aggregate-group-ratios only, because the volatility in the merchant-period-averages, which underpin the econometrics, doesn't give sensible econometrics results.)

## Baseline model – interchange fee margin as dependent variable

**1.65** Our baseline model uses the interchange fee margin, calculated by subtracting average interchange fees (as a percentage of monthly card turnover) in each month from average MSC (as a percentage of monthly card turnover) in each month, as the dependent variable. Further below, we also discuss alternative analyses using different definitions of the dependent variable.

**1.66** We regress the interchange fee margin on the IFR dummy and other control variables.

**1.67** The IFR dummy is our main variable of interest. It equals 1 in the post-IFR period, and zero in the pre-IFR period. This breaks the data into two periods, a pre- and post-IFR caps period. The coefficient on this dummy gives us the impact of the IFR caps on the interchange fee margin. The value of the coefficient is the estimated shift (in percentage points) of the interchange fee margin because of the IFR caps. A coefficient close to zero indicates that the interchange fee margin remained flat following the IFR caps coming into force because average MSC fell in line with average interchange fees, which in turn indicates that IFR savings were passed through. On the other hand, a positive coefficient would indicate that the margin increased, which is to say average MSC did not fall in line with interchange fees and there was not full pass-through of IFR savings.

**1.68** We control for merchant fixed effects, average scheme fees, the number of purchase transactions (measured in logarithms to smooth the variance), the share of e-commerce transactions, the share of capped debit card transactions, the share of capped credit card transactions, and the proportion of chargebacks transactions (see Table 1 for a description of the control variables). Table 10 presents the results for the analysis by merchant group and for the whole sample.

**Table 10: Regression results, interchange fee margin as dependent variable, by merchant group**

	1	2	3	4	5	6	7	IC++	All sample
<b>IFR dummy<sup>27</sup></b>	0.3261 ***	0.1742 ***	0.1390 ***	0.1367 ***	0.1141 ***	0.1218 ***	0.0459 ***	-0.0225 ***	0.1864 ***
<b>Scheme fees</b>	14.8239 ***	1.1142 ***	0.8776 ***	0.8732 ***	0.6786 ***	0.7045 ***	0.43 ***	1.4424 ***	5.0233 ***
<b>Log of transaction volume</b>	-5.2414 ***	-0.3868 ***	-0.0642 ***	-0.0493 ***	-0.0425 ***	-0.0194 ***	-0.0135 ***	-0.0290 ***	-1.1673 ***
<b>Proportion of chargebacks</b>	0.1016 ***	0.0200 ***	0.0106 ***	0.0071 ***	0.0163 ***	0.0350 ***	0.0090 ***	-0.0006 ***	0.0402 ***
<b>Share of face-to-face transactions</b>	0.0074 ***	0.0007 ***	0.0003* **	0.0004 ***	0.0005 ***	0.0003 ***	0.0004 ***	0.0006 **	0.0017 ***
<b>Share of capped credit</b>	0.0184 ***	0.0034 ***	0.0033 ***	0.0031 ***	0.0020 ***	0.0045 ***	0.0025 *	0.004 ***	0.0083 ***
<b>Share of capped debit</b>	0.0357 ***	-0.0012 ***	-0.0031 ***	-0.0028 ***	-0.0031 ***	-0.0016 ***	0.0013 ***	0.0041 ***	0.1077 ***
<b>Constant</b>	13.1298 ***	2.4520 ***	0.9538 ***	0.7752 ***	0.7488 ***	0.3710 ***	0.0647 ***	0.0832 ***	5.3863 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139

Source: PSR analysis using data submitted by the 5 largest acquirers.

#### 1.69 Table 10 shows that:

- For merchants on IC++ pricing, which are typically the largest merchants, the value of the IFR dummy is close to zero (-0.0225). It indicates that for this group of merchants, the interchange fee margin remained flat, and that there was full pass-through of IFR savings. The result for this group is consistent with the IC++ pricing structure, under which acquirers automatically pass through at cost interchange fees (and scheme fees). For this reason, and as explained in paragraph 1.17, this group serves as a comparator for merchants of different sizes on standard pricing.
- For the largest merchants on standard pricing with annual card turnover greater than £50 million, the value of the IFR dummy is also close to zero (0.0459). As with merchants on IC++ pricing, the interchange fee margin for this group remains flat. However, as shown in Table 8 and explained in paragraph 1.50, these merchants did not see a reduction in their average interchange fees following the IFR caps coming into force, so there were no IFR savings to be passed through. Our analysis also reveals a significant reduction in the number of largest merchants on standard pricing after the IFR caps came into force, and a corresponding increase in merchants on IC++ pricing, suggesting many of these could have benefited from the IFR caps by moving pricing option.

<sup>27</sup> In chapter 5, the IFR dummy is referred to as the IFR effect.

- For merchants with annual card turnover between £15,000 and £50 million, the IFR dummy is between 0.12 (group 6) and 0.17 (group 2), and higher than or not significantly different from the average reduction in their interchange fees, between 0.10 (group 6) and 0.13 (group 2), indicating that, on average, these merchants received little or no pass-through of the IFR savings.
- For completeness, we include the results for merchants with annual card turnover up to £15,000. However, for the reasons explained in Box 3, we do not place weight on the econometric results for this group and rely on the evidence of the descriptive statistics.

**1.70** Overall, these results indicate that, on average, merchants with turnover between £15,000 and £50 million received little or no pass-through of IFR savings and that the supply of card-acquiring services is not working well for this group.

### Box 5: Calculating the annual benefit of the IFR caps

Our analysis shows that merchants on IC++ pricing received full pass-through of IFR savings, while merchants on standard pricing did not. Our statistics on interchange fees show that average interchange fees on capped consumer credit card transactions fell significantly following the IFR coming into force, while average interchange fees on consumer debit card transactions were already at a level close to the of the IFR caps.

We therefore calculate the annual benefit of the IFR by estimating the value (in 2018) of the IFR savings on capped consumer credit card transactions that were passed through to merchants on IC++ pricing.

We did this calculation in three steps:

1. The customer lists obtained from the five largest acquirers for the merchant survey gave us total card turnover in 2018 in each of the merchant groups we used for the pass-through analysis (see paragraph 1.6). The samples supplied by the five largest acquirers for the pass-through analysis gave us an estimate of the proportion of merchants on IC++ pricing in each of the merchant size segments. As we have set out in Box 4, the pass-through samples did not include merchants with very high levels of annual card turnover (above £6 billion), so we have assumed that all merchants with annual card turnover over £500m have IC++ pricing (or would have had full pass-through in any event). Putting these two sets of estimates together gives us an estimate of £508 billion as the 2018 card turnover of IC++ merchants (77% of the total £659 billion turnover in 2018 of all merchants listed on the customers lists).
2. Data provided by acquirers and payment facilitators showed that 22% of card turnover arose from capped consumer credit cards, so we therefore estimate that the value of capped consumer credit card transactions accepted by IC++ merchants in 2018 was £111 billion.
3. The samples supplied by the five largest acquirers for the pass-through analysis allowed us to estimate the average reduction in interchange fees on capped consumer credit card transactions involving IC++ merchants between 2014 and 2017 as 0.54%. If this reduction was passed through to these merchants in full in 2018 (on the turnover of £111 billion) gives us our estimate of the annual value of the IFR savings as **£603 million**.

We recognised that the underrepresentation of merchants with very high levels of annual card turnover in our sample could have affected the third step of this calculation so we compared our 0.54% estimate of the interchange fee reduction with the 0.40% estimate in European Commission's report on the application of the IFR. The European Commission's estimate was based on data from Mastercard and Visa so it has the strength of being based on virtually the whole market rather than a sample. It was for all merchants and all credit cards and for the period 2015-2016. Applying our methodology to all merchants in the sample and to all credit cards for 2015-2016 gave us an estimate of the interchange fee reduction of 0.40% which gave us confidence in the reliability of our methodology.

We considered two alternative estimates.

Our estimate of the IFR savings of 0.54% was for IC++ merchants only, while for all merchants in the sample the estimate was 0.61%. Merchants with very high levels of annual card turnover were not included in either sample and using the larger estimate of the IFR reduction raises our estimate of the value to **£679 million**.

Our data comes from the five largest acquirers who accounted for nearly 90% of transactions by number and value at UK merchants in 2018. If all other acquirers had the same share of merchants on IC++ pricing, our estimate of the total value of the IFR reduction would rise by 12% to **£683 million**.

Both adjustments together would give a still larger estimate of **£768 million**.

These sensitivity checks, together with the fact that we include no gains for debit card transactions, show that our main estimate is conservative.

## Alternative specifications

- 1.71** As explained in the section on methodology, there are several ways to approach the question of whether acquirers passed through IFR savings to merchants. In the previous section, we presented in more detail the results presented in Chapter 5 of the interim report, based on econometric analysis in which the interchange fee margin is the dependent variable. To check the sensitivity of our results, we now present alternative analyses using acquirer net revenue and average MSC as dependent variables.

### Acquirer net revenue as the dependent variable

- 1.72** We explain above that if acquirers are passing IFR savings through to merchants, we would expect to see the interchange fee margin remaining flat. In this model, we need to control for other variables that may impact the interchange fee margin, including scheme fees.

- 1.73** To check the sensitivity of the findings from our baseline model, we conduct analysis using acquirer net revenue, defined as MSC minus interchange fees minus scheme fees, as the dependent variable. If cost decreases and increases are being fully reflected in the MSC (and there is no change in acquirers' other costs), acquirer net revenue will remain flat.
- 1.74** Table 19 in the additional tables for reference section summarises the findings from this analysis. The results are consistent with the findings from the analysis using the interchange fee margin as a dependent variable. This specification implies an assumption that the coefficient in front of the scheme fees is equal to 1. As for most groups, the coefficient in front of the scheme fees variable is close to 1, the IFR dummy is close to the dummy in the baseline model.

### Average MSC as a percentage of turnover as the dependent variable

- 1.75** Because we are using the introduction of the IFR caps to investigate pass-through, our baseline model focuses on interchange fee margin as the dependent variable (see paragraph 1.14). Using average MSC as a percentage of turnover as the dependent variable instead has the advantage that we can examine the relationship between average MSC and interchange fees and the relationship between average MSC and scheme fees separately. This allows us to examine whether there has been asymmetric pass-through, where cost *increases* (in scheme fees) are passed through, while cost *decreases* (in interchange fees) are not.
- 1.76** We regress average MSC as a percentage of turnover on average interchange fees, average scheme fees, the IFR dummy and other control variables. The findings are presented in Table 20 in the additional tables for reference section. This specification allows for the coefficient in front of the interchange fees and scheme fees to vary. As for most groups, the coefficients in front of the interchange fee and scheme fees variable are close to 1.
- 1.77** The IFR dummy is close to the dummy in the baseline model. The impact of the IFR caps on MSC is calculated by adding the coefficient on the IFR dummy and the interchange fee variable and multiplying this with IFR savings (presented in Table 8). The results do not contradict the findings from the analysis using the interchange fee margin as a dependent variable and, on average, merchants with turnover between £15,000 and £50 million received little or no pass-through.
- 1.78** In addition, we find that increases in scheme fees appear to be passed through in full for all merchant groups. This points to asymmetric pass-through. We look at pass-through of scheme fees in more detail in the section entitled 'pass-through of scheme fees'.

## Additional sensitivity checks

**1.79** This section describes the sensitivity checks we conducted to test the robustness of our findings.

### Weighted regression

<b>Issue</b>	<p>As explained in Box 2, we draw samples of equal number of merchants from each of the five largest acquirers.</p> <p>Because we draw samples of equal size from each of the five largest acquirers, each sub-sample consists of a random selection of merchants at a certain point in time. Therefore, equal weight is given to each merchant in the sample, regardless of their annual card turnover or acquirer.</p>
<b>Alternative approach</b>	<p>We re-run our baseline model and weight the observations according to the acquirers' share in the total merchant population in 2016 based on data collected by the PSR.</p>
<b>Findings</b>	<p>Table 22 in the additional tables for reference section summarises the results.</p> <p>We find that the IFR dummy becomes insignificant for group 1 merchants. However, as described in Box 3, do not place weight on the econometric results for group 1.</p> <p>Looking across groups 2 to 8, we find that the IFR dummy drops slightly. However, these changes are not material, indicating that our baseline correctly identifies the impact of the IFR caps.</p>

### Seasonality

<b>Issue</b>	<p>Our regressions may be affected by seasonality. Seasonal effects can be correlated with both the dependent and independent variables and may make it more difficult to identify the impact of the IFR caps.</p>
<b>Alternative approach</b>	<p>To account for seasonality, we re-run our baseline model and include three quarterly dummies (quarter 1 is the baseline).</p>
<b>Findings</b>	<p>Table 23 in the additional tables for reference section summarises the results.</p> <p>The three quarterly dummies are significant in the regressions for groups 2 to 5, and start to lose significance from group 6 onwards. This indicates seasonality impacts merchants with lower annual card turnover only.</p> <p>Moreover, we find that the coefficient on the IFR dummy does not change materially, indicating that our baseline correctly identifies the impact of the IFR caps.</p>



## Delayed pass-through – quarterly lags

<b>Issue</b>	<p>We find that acquirers did not pass IFR savings through to merchants on standard pricing. However, it may be that merchants may not receive pass-through immediately, but with a delay.</p> <p>If it is true that pass-through did occur with a delay, we may see the interchange fee margin increasing initially, then decreasing back to its original level as delayed pass-through takes effect. Alternatively, we may see MSC remaining flat initially, then decreasing.</p> <p>In addition, it is possible that acquirers started lowering the MSC in anticipation of the IFR caps. Assuming these decreases were not passed through, we may see interchange fees increasing before the IFR caps came into force.</p>
<b>Alternative approach</b>	<p>We enhance our baseline model with two dummies that signify the two quarters immediately prior to December 2015 (to capture lead effects), and four dummies that signify the four quarters after December 2015 (to capture lag effects).</p> <p>Note that in a regression with, for example, one post-IFR caps quarterly dummy, the IFR dummy gives us the difference in the interchange fee margin when comparing the entire pre-IFR caps period with the entire post-IFR caps period, except the quarter after the IFR caps came into force. The difference in the interchange fee margin in the first quarter after the IFR caps came into force is obtained by adding the coefficient on that dummy to the coefficient on the IFR dummy. A negative coefficient indicates that the IFR margin increased over time.</p> <p>In a regression with, for example, one pre-IFR caps quarterly dummy, IFR dummy gives us the difference in the interchange fee margin when comparing the entire pre-IFR caps period, except the first quarter prior to the IFR caps coming into force with the entire post-IFR caps period. The difference in the interchange fee margin in the first quarter before the IFR caps came into force is given by the coefficient on that dummy. We do not need to add it to the coefficient on the IFR dummy because in the pre-period the IFR dummy equals 0. A positive coefficient indicates that the IFR margin started increasing before the IFR caps came into force.</p> <p>Generally, the more quarterly dummies we include around the IFR caps, the more the IFR dummy will be picking things up that happened at the beginning and end of our overall period.</p>

<b>Findings</b>	<p>Table 24 in the additional tables for reference section summarises the results with quarterly dummies.</p> <p>The coefficients on the four lag quarterly dummies are negative. This indicates that the interchange fee margin increased over time. The coefficients on the two lead quarterly dummies are small and positive, indicating that the interchange fee margin started increasing slightly before the IFR caps came into force.</p> <p>Overall, these results suggest that interchange fee margin started increasing immediately before the IFR caps came into force, then saw a step change around the time the IFR caps came into force, and then, some quarters later, increased further by a little. A potential explanation is that interchange fees fell in anticipation of the IFR caps, but that this decrease was not passed through; and that the margin increased further over time for reasons we haven't controlled for.</p> <p>Overall, the findings do not indicate that pass-through was delayed. However, we only consider a period of up to one year after the IFR caps came into force. In the next sensitivity check, we consider a longer adjustment period.</p>
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## Delayed pass-through – annual lags

<b>Issue</b>	<p>We examined whether pass-through of IFR savings might be delayed by up to four quarters – a year. We find that this is not the case. However, it is possible that pass-through was delayed by more than a year.</p>
<b>Alternative approach</b>	<p>To allow for a longer adjustment period, we enhance our baseline model with four annual dummies that capture year-specific effects. Annual dummies give the maximum time possible to see any slow adjustment.</p> <p>Note that in a model with year dummies, we do not include the IFR dummy. The coefficient on each year dummy tells us the percentage point increase in the interchange fee margin in that year relative to the base year, 2014, that cannot be attributed to other explanatory variables. A positive coefficient indicates that the IFR margin increased between that year and the base year, so a delayed pass-through would show as the coefficients for subsequent years declining.</p>
<b>Findings</b>	<p>Table 25 in the additional tables for reference section summarises the results with year dummies. The coefficients on the year dummies are positive and statistically significant for all merchant groups on standard pricing. Moreover, the size of the coefficients increases over the years. This indicates that relative to 2014, the interchange fee margin increases further with each passing year. We do not see evidence of delayed pass-through. On the contrary, we see the interchange fee margin increasing over time.</p> <p>Merchants on an IC++ pricing did not see an increase in margin in any year, which is consistent with our findings.</p>

## Robust standard errors

<b>Issue</b>	Our model may be affected by heteroscedasticity and serial correlation, which affects the variance of the ordinary least squares estimator, which is no longer the best linear unbiased estimator (BLUE).
<b>Alternative approach</b>	We re-run our baseline model with robust standard errors that correct for heteroscedasticity and serial correlation.
<b>Findings</b>	<p>Table 26 in the additional tables for reference section presents the results for the full sample.</p> <p>We find that the results do not change, as our findings are significant after applying the robust standard error fix. Our key finding of no pass-through for merchants on standard pricing still holds.</p> <p>We also run the model by merchant group, and find that the results do not change.</p>

## Alternative analysis to address missing data from one acquirer ([X])

<b>Issue</b>	As highlighted in the section 'data issues', one of the acquirers in the sample ([X]) was unable to provide some data at the level of granularity we requested, so there is missing data for several variables in the pre-IFR caps period, 2014 and 2015.
<b>Alternative approach</b>	<p>We address the problem of missing data in our baseline model using the MICE technique (see section on 'data issues').</p> <p>We also do two additional sensitivity checks:</p> <ul style="list-style-type: none"> <li>• We re-run our models excluding these variables.</li> <li>• We re-run our baseline model on the four acquirers for which we have complete data, excluding the acquirer with missing data ([X]).</li> </ul>
<b>Findings</b>	<p>Table 27 – Table 29 in the additional tables for reference section summarises the results excluding the variables with missing data.</p> <p>We find that the results do not change materially for merchants on standard pricing. Our key finding of no pass-through for merchants on standard pricing still holds.</p> <p>Table 30 in the additional tables for reference section summarises the results excluding the acquirer with missing data.</p> <p>We find that the IFR dummy variable for group 1 increases substantially; however, as discussed in Box 3, we do not place weight on the econometric results for group 1. Looking across groups 2 to 8, we find that the results do not change, indicating that our baseline correctly identifies the impact of the IFR caps.</p>

## Including card acceptance products and certain value-added services

<b>Issue</b>	We find that acquirers did not pass IFR savings through to merchants on standard pricing. However, in response to our consultation on the pass-through methodology, stakeholders raised the possibility that acquirers passed through IFR savings by lowering the price of other goods and services rather than the MSC.
<b>Alternative approach</b>	<p>We enhance our baseline model by including total fees paid for various CAP (in logs).</p> <p>We only have complete data on total fees paid for CAP for three acquirers and we restrict our analysis to these three.</p>
<b>Findings</b>	<p>Table 31 in the additional tables for reference section summarises the results.</p> <p>The IFR dummy drops by around 0.01 percentage points when we introduce the CAP variables. This may indicate that merchants who purchase card acceptance products from acquirers might have seen a lower increase in their interchange fee margin. However, any pass-through is small and does not change the conclusion that, on average, merchants on standard pricing get little or no pass-through.</p>

# New versus longstanding merchants

- 1.80** We examined whether acquirers passed through IFR savings, and found that for merchants with turnover up to £50 million they did not. This finding indicates that the supply of card-acquiring services may not be working well for these merchants.
- 1.81** We now consider the possibility that acquirers may compete more intensively for new customers<sup>28</sup> by charging them lower prices, while charging longstanding customers higher prices. We also consider the possibility that this may be further intensified after the IFR caps came into force. If this is true, merchants may be able to get a better deal by switching.
- 1.82** To understand whether new customers have a lower MSC than longstanding customers, we compare average MSC as a percentage of monthly card turnover across merchants who have been with their acquirers for different lengths of time.
- 1.83** To understand whether competition for new customers intensified after the IFR caps came into force, we compare average MSC as a percentage of monthly card turnover across merchants who signed up before and after the IFR caps came into force.<sup>29</sup>

## Length of time with acquirer

- 1.84** As explained in the section ‘data and sampling’, we requested data on the month and year in which the acquirer first acquired a card transaction for the merchant, that is the month and year the merchant signed up with its current acquirer. We use this information to define an indicator variable, ‘customer age’, which equals:
- 0 if an observation was recorded within a year of the merchant signing up with its current acquirer
  - 1 if the observation is recorded between one and two years of the merchant signing up with its current acquirer
  - 2 if the observation is recorded between two and three years of the merchant signing up with its current acquirer
  - 3 if the observation is recorded more than three years of the merchant signing up with its current acquirer

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28 New customers could include merchants that switched from other acquirers, as well as those who are new to card payments.

29 For merchants who had left, but later re-joined the acquirer, one of the five largest acquirers ([3X]) records the date they first contracted with the merchant rather than the date when they contracted with the merchant on their return.

- 1.85** Table 11 presents the distribution of the customer age. Approximately 70% of merchants in our sample have been with their current acquirer for more than three years.

**Table 11: Distribution of age variable**

Age indicator	Frequency	%	Cumulative %
0	30,821	3.72	3.72
1	89,845	10.85	14.57
2	126,072	15.22	29.79
3	581,401	70.21	100
<b>Total</b>	<b>828,139</b>	<b>100</b>	

Source: PSR analysis using data submitted by the five largest acquirers.

- 1.86** To understand whether new customers have a lower MSC than longstanding customers, we regress average MSC as a percentage of monthly card turnover on customer age. We include the full set of control variables. As we are primarily interested in the effect of customer age, we do not include the IFR dummy but we introduce this in a second regression as a sensitivity check.
- 1.87** Table 12 summarises the findings for the whole sample and by merchant group, respectively.
- 1.88** The coefficients on the customer age indicator variables are positive and significant. Moreover, the size of the coefficients increases with customer age. It indicates that the longer a merchant has been with its provider, the higher the MSC they pay. Merchants who have been with their acquirer between one and two years paid 0.21 percentage points more than merchants who have been with their acquirer for less than a year. This increases to 0.34 and 0.47 percentage points for merchants who have been with their acquirers two to three years, and more than three years, respectively.
- 1.89** Age has a stronger impact on merchants with lower annual card turnover, indicating that the small and medium-sized merchants may have the most to gain from switching provider. For merchants on IC++ pricing age was not statistically significant.

**Table 12: Regressions with age indicator variable, average MSC as dependent variable, by merchant group**

	1	2	3	4	5	6	7	IC++	All sample
<b>Interchange fees</b>	0.7957 ***	0.8289 ***	0.7882 ***	0.7163 ***	0.6256 ***	0.5248 ***	0.7053 ***	1.0208 ***	0.5968 ***
<b>Scheme fees</b>	15.0006 ***	1.2944 ***	1.1545 ***	1.3084 ***	1.1910 ***	1.1888 ***	1.0709 ***	1.4376 ***	5.4402 ***
<b>Log of transaction volume</b>	-5.2433 ***	-0.3899 ***	-0.0668 ***	-0.0527 ***	-0.0467 ***	-0.0241 ***	-0.0186 ***	-0.0285 ***	-1.1706 ***
<b>Proportion of chargebacks</b>	0.1009 ***	0.0199 ***	0.0107 ***	0.0073 ***	0.0157 ***	0.0318 ***	0.0087 ***	-0.0006 ***	0.0401 ***
<b>Share of face-to-face transactions</b>	0.0073 ***	0.0007 ***	0.0003 ***	0.0005 ***	0.0005 ***	0.0002 ***	0.0003 ***	0.0005 *	0.0017 ***
<b>Share of capped credit</b>	0.0171 ***	0.0031 ***	0.0034 ***	0.0031 ***	0.0015 ***	0.0029 ***	0.0014 *	0.0040 ***	0.0068 ***
<b>Share of capped debit</b>	0.0341 ***	-0.0018 ***	-0.0035 ***	-0.0032 ***	-0.0040 ***	-0.0045 ***	0.0000 ***	0.0042 ***	0.0085 ***
<b>Age indicator</b>									
<b>1</b>	0.6394 ***	0.1021 ***	0.0534 ***	0.0266 ***	0.0343 ***	-0.0025 ***	0.0055 ***	-0.0057 ***	0.2140 ***
<b>2</b>	0.9861 ***	0.1898 ***	0.1051 ***	0.0806 ***	0.0906 ***	0.0378 **	0.0306 *	-0.0610 *	0.3385 ***
<b>3</b>	1.3326 ***	0.2982 ***	0.1681 ***	0.1385 ***	0.1187 ***	0.0729 ***	0.0512 ***	-0.0603 *	0.4712 ***
<b>Constant</b>	12.4894 ***	2.4518 ***	1.0109 ***	0.8803 ***	0.9382 ***	0.8043 ***	0.2689 ***	0.1093 ***	5.4371 ***
<b>Observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

- 1.90** The above results suggest that acquirers compete more intensively for new customers. However, there is a possibility that this finding is driven by merchants who signed up with their current acquirer after the IFR caps came into force. To test the sensitivity of the finding, we add in the IFR dummy. Table 13 summarises the findings for the whole sample and by merchant group.
- 1.91** Adding in the IFR dummy does not change the finding. The coefficients on the customer age indicator variables remain positive and significant, indicating that the longer a merchant has been with its provider, the higher the MSC they pay. Customer age continues to have a stronger impact on merchants with lower annual card turnover, indicating that the small and medium-sized merchants may have the most to gain from switching provider. For merchants on an IC++ pricing, age was not statistically significant.

**1.92** Compared with the model without the customer age variable presented as part of our core econometric analysis, the coefficient of the IFR dummy has decreased significantly. This indicates that the lack of pass-through can to some extent (but not completely) be explained by the length of time a merchant has been with their provider and points to a problem of merchant inertia.

**Table 13: Regressions with age indicator variable, interchange fee margin as dependent variable, by merchant group**

Variable	1	2	3	4	5	6	7	IC++	All sample
<b>IFR DUMMY</b>	0.0540	0.1362 ***	0.1260 ***	0.1251 ***	0.1056 ***	0.1167 ***	0.0451 ***	-0.0160 *	0.1172 ***
<b>Scheme fees</b>	14.7345 ***	1.0141 ***	0.8172 ***	0.8128 ***	0.6286 ***	0.6246 ***	0.2493	1.4891 ***	4.8651 ***
<b>Log of transaction volume</b>	-5.2456 ***	-0.3897 ***	-0.0656 ***	-0.0503 ***	-0.0438 ***	-0.0201 ***	-0.0129 ***	-0.0282 ***	-1.1725 ***
<b>Proportion of chargebacks</b>	0.1009 ***	0.0199 ***	0.0105 ***	0.0070 ***	0.0161 ***	0.0337 ***	0.0093 ***	-0.0006	0.0401 ***
<b>Share of face-to-face transactions</b>	0.0074 ***	0.0007 ***	0.0003 ***	0.0004 ***	0.0005 ***	0.0003 *	0.0004	0.0005 *	0.0017 ***
<b>Share of capped credit</b>	0.0183 ***	0.0034 ***	0.0033 ***	0.0030 ***	0.0020 ***	0.0044 ***	0.0022 **	0.0041 ***	0.0083 ***
<b>Share of capped debit</b>	0.0356 ***	-0.0012 ***	-0.0031 ***	-0.0028 ***	-0.0030 ***	-0.0018 ***	0.0010	0.0041 ***	0.0107 ***
<b>Age indicator</b>									
<b>1</b>	0.6369 ***	0.0838 ***	0.0371 ***	0.0117 **	0.0268 ***	-0.0065	-0.0017	-0.0030	0.2067 ***
<b>2</b>	0.9783 ***	0.1471 ***	0.0698 ***	0.0497 ***	0.0737 ***	0.0248	0.0126	-0.0549 *	0.3196 ***
<b>3</b>	1.3181 ***	0.2073 ***	0.0870 ***	0.0676 ***	0.0752 ***	0.0384 *	0.0099	-0.0499	0.4269 ***
<b>Constant</b>	12.2690 ***	2.3199 ***	0.8961 ***	0.7319 ***	0.6926 ***	0.3644 ***	0.0814	0.1170	5.0968 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>R2</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.



## Merchants joining after the IFR caps

- 1.93** Finally, we examine whether merchants who signed up with their acquirers after the IFR caps came into force get a better deal by regressing average MSC on the usual explanatory variables, plus a dummy that equals 1 if a merchant signed up with their acquirer after December 2015. For this analysis, we only use the two samples starting at January 2016 and January 2017.
- 1.94** Table 14 summarises the findings for the whole sample and by merchant group. The coefficient on the dummy is negative, indicating that merchants who signed up with their provider after the IFR caps came into force pay 0.18 percentage points less. This is true across all merchant groups, though smaller merchants on standard pricing benefited more. Finally, our sample does not contain any group 7 merchants who joined after December 2015. This suggests that many of the largest merchants with annual card turnover of above £50 million were able to benefit from the IFR caps by moving to IC++ pricing.
- 1.95** We also find that merchants who were on IC++ pricing and joined after the IFR caps came into force did not pay a lower MSC (%) than those who joined before, which is in line with the finding that all merchants on IC++ pricing received full pass-through of the IFR savings.

**Table 14: Regressions with dummy for merchants who joined after the IFR caps came into force, average MSC as dependent variable, by merchant group**

Variable	1	2	3	4	5	6	7	IC++	All sample
<b>Joined after IFR Dummy</b>	-0.9110 ***	-0.1969 ***	-0.1156 ***	-0.0823 ***	-0.0619 ***	-0.0560 *	no merchants joined post-IFR	-0.0295	-0.1827 ***
<b>Interchange fee (%)</b>	-0.2264	0.8487 ***	0.8755 ***	1.1218 ***	0.9234 ***	1.0245 ***	1.1368 ***	0.7026 ***	0.8889 ***
<b>Scheme fee (%)</b>	28.6013 ***	5.9990 ***	3.1337 ***	2.8881 ***	2.2579 ***	0.7494 ***	-0.1286	2.9060 ***	15.2068 ***
<b>Log of transaction volume</b>	-2.6196 ***	-0.1010 ***	0.0753 ***	0.0461 ***	0.0367 ***	0.0352 ***	0.0110 ***	-0.0137 ***	-0.5287 ***
<b>Proportion of chargebacks (%)</b>	0.0650 *	0.0137 ***	0.0150 ***	0.0064 **	0.0291 ***	-0.0236	0.3650 **	0.0097 *	0.0267 ***
<b>Share of value of face-to-face transactions</b>	0.0087 ***	-0.0004 ***	-0.0019 ***	-0.0021 ***	-0.0016 ***	-0.0014 ***	-0.0007 ***	-0.0007 ***	-0.0009 ***
<b>Share of capped credit transactions</b>	0.0160 ***	-0.0003 *	-0.0000	0.0017 ***	0.0010 ***	0.0044 ***	0.0032 ***	0.0029 ***	0.0043 ***
<b>Share of capped debit transactions</b>	0.0388 ***	-0.0022 ***	-0.0053 ***	-0.0027 ***	-0.0040 ***	-0.0006 *	0.0003	-0.0004	0.0099 ***
<b>Constant</b>	7.2442 ***	1.5752 ***	0.7233 ***	0.4755 ***	0.5053 ***	0.0026	-0.0730	0.3093 ***	2.6839 ***
<b>Number of observations</b>	37,761	206,913	57,562	38,390	20,269	2,320	496	2,519	366,877

Source: PSR analysis using data submitted by the five largest acquirers.

# Pass-through of scheme fees

- 1.96** Our core analysis focuses on pass-through of IFR savings, i.e. decreases in interchange fees specifically related to the coming into force of the IFR caps in December 2015. Stakeholders also told us that scheme fees have increased significantly in recent years. This represents an increase in acquirer's costs. If acquirers passed these increases on to merchants, while at the same time holding on to IFR savings – that is, they passed through cost increases and decreases through *asymmetrically* – this could constitute further evidence that the supply of card-acquiring services is not working well for merchants because it would suggest that acquirers did not face competitive pressures to absorb cost increases or to pass through cost decreases.
- 1.97** Annex 4 assesses whether scheme fees have increased and finds that fees for scheme services approximately doubled. In this section of this annex, we consider whether increases in scheme fees were passed through to merchants.
- 1.98** We re-run the regression using average MSC as the dependent variable, but do not include the IFR dummy. A positive, significant coefficient on scheme fees would indicate they were passed through to merchants.
- 1.99** Table 15 summarises the results for the whole sample and by merchant group, respectively. It shows acquirers passed through increases in scheme fees in full to merchants in all groups.
- 1.100** However, as noted in the section on 'data issues', we have some concerns around the data on scheme fees, and the evidence is therefore less strong.

**Table 15: Regressions without IFR dummy, average MSC as dependent variable, by merchant group (pass-through of scheme fees)**

Variable	1	2	3	4	5	6	7	IC++	All sample
<b>Interchange fees</b>	0.6700 ***	0.7630 ***	0.7149 ***	0.6491 ***	0.5716 ***	0.4809 ***	0.7083 ***	1.0417 ***	0.5059 ***
<b>Scheme fees</b>	15.3946 ***	1.5964 ***	1.4232 ***	1.5635 ***	1.3822 ***	1.4118 ***	1.1792 ***	1.3289 ***	5.8249 ***
<b>Log of transaction volume</b>	-5.2438 ***	-0.3853 ***	-0.0640 ***	-0.0512 ***	-0.0452 ***	-0.0226 ***	-0.0199 ***	-0.0297 ***	-1.1647 ***
<b>Proportion of chargebacks</b>	0.1019 ***	0.0200 ***	0.0108 ***	0.0075 ***	0.0163 ***	0.0308 ***	0.0082 ***	-0.0007 ***	0.0404 ***
<b>Share of face-to-face transactions</b>	0.0074 ***	0.0007 ***	0.0003 ***	0.0005 ***	0.0005 ***	0.0002 ***	0.0003 ***	0.0005 *	0.0017 ***
<b>Share of capped credit</b>	0.0169 ***	0.0031 ***	0.0034 ***	0.0031 ***	0.0013 ***	0.0028 ***	0.0015 *	0.0040 ***	0.0067 ***
<b>Share of capped debit</b>	0.0336 ***	-0.0020 ***	-0.0036 ***	-0.0033 ***	-0.0042 ***	-0.0046 ***	0.0001 ***	0.0043 ***	0.0083 ***
<b>Constant</b>	13.6451 ***	2.7073 ***	1.1679 ***	1.0106 ***	1.0615 ***	0.8697 ***	0.3215 ***	0.0537 ***	5.8584 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

# Summary

## 1.101 We investigated whether

- the five largest acquirers made savings following the IFR caps coming into force
- where acquirers did make IFR savings, whether they passed these through to merchants in the form of lower MSCs
- the pass-through rate varied between different merchant groups

**1.102** We find that merchants on IC++ pricing received full pass-through of the IFR savings. They are very few in number but account for 77% of transaction value. We estimate the annual benefit to these merchants was around £600 million. Our analysis also reveals a significant reduction in the number of largest merchants on standard pricing after the IFR caps came into force, and a corresponding increase in merchants on IC++ pricing, suggesting that some of the largest merchants may also have benefitted from switching to IC++ pricing after the IFR caps came into force.

**1.103** The statistical evidence indicates that, on average, merchants with annual card turnover up to £50 million got little or no pass-through of the IFR savings.

**1.104** Moreover, the econometric analysis allows us to control for changes in the characteristics of merchants within each size group, changes in the mix of transactions, and changes in scheme fees. It confirms that, on average, merchants with annual card turnover between £15,000 and £50 million got little or no pass-through of the IFR savings. We do not place weight on the econometric results for merchants with annual card turnover below £15,000 and therefore rely on the evidence of the descriptive statistics.

**1.105** Taken together, the statistical and econometric analysis provide robust evidence that, on average, merchants with annual card turnover up to £50 million got little or no pass-through—indicating that the supply of card-acquiring services is not working well for these merchants. The evidence is slightly less clear for merchants with annual card turnover less than £15,000, as we rely only on the evidence of the descriptive statistics for this group.

**1.106** We find that the results hold even after we test the sensitivity of our findings by:

- estimating alternative models with MSC and acquirer net revenue as the dependent variable
- weighting the data by acquirers
- testing for seasonal effects
- checking for delayed pass-through
- re-running the baseline model using robust standard errors
- addressing the issue of missing data for one acquirer

- 1.107** Our analysis also shows that small and medium-sized merchants with annual card turnover up to £10 million and large merchants with annual card turnover between £10 million and £50 million secured better deals in the form of lower MSCs by switching their acquirer – we find that, on average, new customers pay less.
- 1.108** While our core analysis focuses on pass through of IFR savings, we also considered whether increases in scheme fees were passed through to merchants. For merchants in all groups, scheme fees are passed through by acquirers in full. However, we have some concerns around the data on scheme fees, and the evidence is therefore less strong.

# Additional tables for reference

## Descriptive statistics

**Table 16: Total MSC, interchange fees, scheme fees and value of purchase transactions before and after the IFR caps came into force (in £ '000)**

		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All
<b>Total MSC</b>	<b>Pre-IFR</b>	580	9,675	7,124	9,677	22,600	16,200	32,400	44,400	146,000
	<b>Post-IFR</b>	1,248	26,500	20,500	28,400	64,300	45,700	36,600	184,000	415,000
	<b>Difference</b>	668	16,825	13,376	18,723	41,700	29,500	4,200	139,600	269,000
<b>Total interchange fees</b>	<b>Pre-IFR</b>	122	3,790	3,298	4,915	12,900	11,400	24,700	37,300	101,000
	<b>Post-IFR</b>	189	6,842	6,097	9,436	25,600	22,000	25,600	146,000	246,000
	<b>Difference</b>	67	3,052	2,799	4,521	12,700	10,600	900	108,700	145,000
<b>Total scheme fees</b>	<b>Pre-IFR</b>	5	146	117	173	577	494	1,805	2,223	5,673
	<b>Post-IFR</b>	16	645	569	856	2,656	2,539	2,616	19,800	30,100
	<b>Difference</b>	11	499	452	683	2,079	2,045	811	17,577	24,427
<b>Total value of purchase transactions</b>	<b>Pre-IFR</b>	21	818	763	1,120	2,860	2,490	19,900	9,970	39,000,000
	<b>Post-IFR</b>	45	2,170	2,120	32,200	8,120	6,750	14,300	57,200	95,700,000
	<b>Difference</b>	24	1,352	1,357	31,080	5,260	4,260	-5,600	47,230	56,700,000

Source: PSR analysis using data submitted by the five largest acquirers.<sup>30</sup>

<sup>30</sup> One of the acquirers from which we requested data could not provide scheme fees incurred for the years 2014 and 2015. 2014 and 2015 figures in this table are based on data from the other four acquirers.

**Table 17: Average interchange fees on capped and non-capped transaction before and after the IFR caps came into force**

	Time	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	Total
<b>Fees on capped debit card transactions</b>	Pre-IFR	0.32	0.22	0.17	0.15	0.14	0.14	0.08	0.22	0.21
	Post-IFR	0.23	0.21	0.20	0.19	0.19	0.19	0.15	0.21	0.21
	Difference	0.09	0.02	-0.03	-0.04	-0.05	-0.05	-0.07	0.01	0.00
<b>Fees on capped credit card transactions</b>	Pre-IFR	0.83	0.83	0.84	0.84	0.86	0.87	0.86	0.75	0.83
	Post-IFR	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.30
	Difference	0.53	0.53	0.53	0.54	0.55	0.56	0.55	0.44	0.53
<b>Fees on non-capped card transactions</b>	Pre-IFR	0.93	0.80	0.75	0.77	0.77	0.77	0.64	1.02	0.80
	Post-IFR	0.93	0.82	0.80	0.83	0.84	0.88	0.68	0.98	0.83
	Difference	0.00	-0.02	-0.05	-0.06	-0.07	-0.11	-0.04	0.05	-0.03

Source: PSR analysis using data submitted by the five largest acquirers.<sup>31</sup>

31 One of the acquirers from which we requested data could not separate out the interchange fee for domestic, intra-EEA and international transactions for the years 2014 and 2015. 2014 and 2015 figures in this table are based on data from the other four acquirers.



**Table 18: Shares of value of card transactions before and after the IFR caps came into force (as %)**

	Time	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	Total
<b>Scheme fees</b>	Pre-IFR	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.02
	Post-IFR	0.04	0.03	0.03	0.03	0.03	0.04	0.02	0.05	0.03
	Difference	0.01	0.01	0.01	0.01	0.01	0.02	0.00	0.01	0.01
<b>Volume of transactions</b>	Pre-IFR	22	145	373	620	2,695	18,042	295,983	228,877	2,431
	Post-IFR	23	181	491	822	3,459	24,042	124,669	532,910	4,597
	Difference	0	37	117	202	765	6,000	-171,314	304,033	2,167
<b>Share of face-to-face transactions</b>	Pre-IFR	53.78	68.60	68.53	61.95	52.06	40.89	39.63	46.46	64.86
	Post-IFR	50.87	66.99	68.94	63.10	50.78	38.92	36.73	44.92	63.89
	Difference	-2.91	-1.61	0.41	1.14	-1.27	-1.97	-2.90	-1.54	-0.97
<b>Share of chargebacks</b>	Pre-IFR	0.06	0.03	0.03	0.03	0.03	0.05	0.33	0.03	0.03
	Post-IFR	0.07	0.03	0.03	0.04	0.04	0.05	0.06	0.08	0.04
	Difference	0.01	0.00	0.00	0.01	0.02	-0.00	-0.28	0.05	0.00
<b>Shares of capped credit card transactions</b>	Pre-IFR	17.90	20.55	24.47	26.44	25.75	22.89	16.04	20.05	21.83
	Post-IFR	21.79	22.12	24.46	26.50	25.14	23.08	15.65	22.99	23.10
	Difference	3.89	1.57	-0.01	0.06	-0.60	0.18	-0.39	2.94	1.27
<b>Shares of capped debit card transactions</b>	Pre-IFR	59.63	61.74	60.25	56.00	53.10	59.58	71.85	61.83	60.16
	Post-IFR	59.22	63.81	63.51	59.13	56.23	58.69	73.48	61.87	62.32
	Difference	-0.41	2.07	3.26	3.14	3.13	-0.88	1.63	0.05	2.17

Source: PSR analysis using data submitted by the five largest acquirers.<sup>32</sup>

32 One of the acquirers from which we requested data could not separate out the interchange fee for domestic, intra-EEA and international transactions, as well as the scheme fees for the years 2014 and 2015. 2014 and 2015 figures in this table are based on data from the other four acquirers.

## Econometric analysis – alternative specifications

**Table 19: Regressions with acquirer net revenue as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR DUMMY</b>	0.6482 ***	0.1880 ***	0.1448 ***	0.1417 ***	0.1140 ***	0.1245 ***	0.0509 ***	-0.0227 **	0.2339 ***
<b>Log of transaction volume</b>	-5.3424 ***	-0.3968 ***	-0.0663 ***	-0.0532 ***	-0.0425 ***	-0.0193 ***	-0.0065 ***	-0.0270 ***	-1.1665 ***
<b>Proportion of chargebacks</b>	0.1192 ***	0.0203 ***	0.0113 ***	0.0066 ***	0.0154 ***	0.0313 ***	0.0001 ***	-0.0000 ***	0.0473 ***
<b>Share of face-to-face transactions</b>	0.0185 ***	0.0012 ***	0.0003 ***	0.0006 ***	0.0006 ***	0.0005 ***	-0.0001 ***	0.0008 ***	0.0093 ***
<b>Share of capped credit</b>	0.0163 ***	0.0041 ***	0.0043 ***	0.0042 ***	0.0031 ***	0.0064 ***	0.0030 ***	0.0026 ***	0.0120 ***
<b>Share of capped debit</b>	0.0341 ***	-0.0011 ***	-0.0038 ***	-0.0036 ***	-0.0041 ***	-0.0019 ***	-0.0022 ***	0.0025 ***	0.0047 ***
<b>Constant</b>	13.2853 ***	2.4556 ***	0.9832 ***	0.7985 ***	0.7700 ***	0.3251 ***	0.2472 ***	0.2068 ***	5.1990 ***
<b>Number of observations</b>	76,249	434,022	122,192	81,553	46,781	5,330	1,397	5,436	774,161
<b>R2</b>	5,327	20,301	4,961	3,172	1,699	188	51	216	35,941

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 20: Regressions with average MSC as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR DUMMY</b>	0.2967 ***	0.1620 ***	0.1370 ***	0.1296 ***	0.0879 ***	0.0989 ***	0.0359 ***	-0.0225 **	0.1417 ***
<b>Interchange fee</b>	0.7635 ***	0.8964 ***	0.9834 ***	0.9454 ***	0.7915 ***	0.7898 ***	0.7689 ***	1.0006 ***	0.6278 ***
<b>Scheme fees</b>	15.1172 ***	1.2533 ***	0.8987 ***	0.9359 ***	0.9042 ***	0.8688 ***	0.7762 **	1.4341 ***	5.5063 ***
<b>Log of transaction volume</b>	-5.2380 ***	-0.3860 ***	-0.0641 ***	-0.0495 ***	-0.0436 ***	-0.0207 ***	-0.0174 ***	-0.0290 ***	-1.1648 ***
<b>Proportion of chargebacks</b>	0.1017 ***	0.0200 ***	0.0105 ***	0.0071 ***	0.0161 ***	0.0323 ***	0.0090 ***	-0.0006	0.0403 ***
<b>Share of face-to-face transactions</b>	0.0074 ***	0.0007 ***	0.0003 ***	0.0004 ***	0.0006 ***	0.0003 *	0.0004	0.0005 *	0.0017 ***
<b>Share of capped credit</b>	0.0170 ***	0.0031 ***	0.0033 ***	0.0030 ***	0.0016 ***	0.0038 ***	0.0016 *	0.0040 ***	0.0068 ***
<b>Share of capped debit</b>	0.0339 ***	-0.0017 ***	-0.0031 ***	-0.0029 ***	-0.0038 ***	-0.0030 ***	0.0001	0.0041 ***	0.0086 ***
<b>Constant</b>	13.3766 ***	2.5354 ***	0.9655 ***	0.8090 ***	0.8938 ***	0.5670 ***	0.2615 ***	0.0853	5.6981 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 21: Regressions using IFR dummy only, average MSC as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++
<b>IFR Dummy</b>	0.8207 ***	0.0454 ***	0.0081 ***	0.0031	-0.0143 ***	0.0180 ***	0.0127 *	-0.1239 ***
<b>Constant</b>	5.0006 ***	1.3679 ***	0.9692 ***	0.8898 ***	0.8349 ***	0.6749 ***	0.3510 ***	0.7247 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216

Source: PSR analysis using data submitted by the five largest acquirers.

## Econometric analysis – additional sensitivity checks

**Table 22: Baseline regressions weighted by share of number of merchants per acquirer, interchange fee margin as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR Dummy</b>	0.1173	0.1698 ***	0.1379 ***	0.1315 ***	0.1104 ***	0.1190 ***	0.0368 ***	-0.0248 **	0.1592 ***
<b>Scheme fees</b>	13.9059 ***	0.1461 *	0.0747	0.2585 ***	0.2927 ***	0.5181 ***	-0.5451	1.3716 ***	4.0168 ***
<b>Log of transaction volume</b>	-4.2030 ***	-0.3247 ***	-0.0519 ***	-0.0347 ***	-0.0332 ***	-0.0122 ***	-0.0078 ***	-0.0346 ***	-0.9931 ***
<b>Proportion of chargebacks</b>	0.0592 ***	0.0161 ***	0.0071 ***	0.0057 ***	0.0109 ***	0.0189 **	0.0254 ***	-0.0009	0.0249 ***
<b>Share of face-to-face transactions</b>	0.0027 *	0.0004 ***	0.0001 **	0.0003 ***	0.0004 ***	0.0002	0.0005 *	0.0004	0.0005 **
<b>Share of capped credit</b>	0.0149 ***	0.0023 ***	0.0018 ***	0.0017 ***	0.0010 ***	0.0033 ***	0.0016 *	0.0052 ***	0.0061 ***
<b>Share of capped debit</b>	0.0270 ***	-0.0023 ***	-0.0031 ***	-0.0025 ***	-0.0026 ***	-0.0018 ***	0.0017 **	0.0057 ***	0.0066 ***
<b>Constant</b>	10.7123 ***	2.2400 ***	0.9269 ***	0.7166 ***	0.6760 ***	0.3373 ***	0.0017	0.0171	4.7806 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 23: Baseline regressions with quarterly seasonal dummies, interchange fee margin as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR DUMMY</b>	0.3271 ***	0.1721 ***	0.1381 ***	0.1358 ***	0.1126 ***	0.1210 ***	0.0462 ***	-0.0232 **	0.1891 ***
<b>Scheme fees</b>	14.6971 ***	1.0925 ***	0.8441 ***	0.8446 ***	0.6556 ***	0.7281 ***	0.2739 ***	1.4725 ***	4.8587 ***
<b>Log of volume transactions</b>	-5.2446 ***	-0.3878 ***	-0.0652 ***	-0.0498 ***	-0.0428 ***	-0.0192 ***	-0.0134 ***	-0.0288 ***	-1.1747 ***
<b>Proportion of chargebacks</b>	0.1015 ***	0.0199 ***	0.0105 ***	0.0071 ***	0.0163 ***	0.0328 ***	0.0096 ***	-0.0005 ***	0.0402 ***
<b>Share of face-to-face transactions</b>	0.0073 ***	0.0007 ***	0.0003 ***	0.0004 ***	0.0005 ***	0.0003 ***	0.0004 ***	0.0005 *	0.0016 ***
<b>Share of capped credit</b>	0.0183 ***	0.0034 ***	0.0034 ***	0.0031 ***	0.0020 ***	0.0044 ***	0.0021 **	0.0040 ***	0.0083 ***
<b>Share of capped debit</b>	0.0356 ***	-0.0011 ***	-0.0030 ***	-0.0027 ***	-0.0030 ***	-0.0018 ***	0.0010 ***	0.0041 ***	0.0108 ***
<b>Quarter 2</b>	-0.2892 ***	-0.0522 ***	-0.0310 ***	-0.0237 ***	-0.0237 ***	-0.0062 ***	0.0071 ***	0.0076 ***	-0.0933 ***
<b>Quarter 3</b>	-0.2195 **	-0.0384 ***	-0.0162 ***	-0.0124 ***	-0.0153 ***	-0.0079 *	-0.0041 ***	0.0004 ***	-0.0107 ***
<b>Quarter 4</b>	0.1124 ***	-0.0239 ***	-0.0129 ***	-0.0110 ***	-0.0132 ***	-0.0099 **	0.0008 ***	-0.0063 ***	0.0353 ***
<b>Constant</b>	13.2593 ***	2.4871 ***	0.9758 ***	0.7898 ***	0.7634 ***	0.3867 ***	0.0960 ***	0.0827 ***	5.4450 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 24: Baseline regressions with quarterly dummies before and after the IFR caps came into force, interchange fee margin as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR DUMMY</b>	0.7682 ***	0.2667 ***	0.1945 ***	0.1777 ***	0.1514 ***	0.1544 ***	0.0550 ***	-0.0479 ***	0.3080 ***
<b>Scheme fees</b>	14.5753 ***	0.8152 ***	0.5981 ***	0.6965 ***	0.5186 ***	0.5720 ***	0.3176 ***	1.5902 ***	4.8000 ***
<b>Log of transaction volume</b>	-5.2365 ***	-0.3859 ***	-0.0640 ***	-0.0483 ***	-0.0424 ***	-0.0206 ***	-0.0131 ***	-0.0293 ***	-1.1699 ***
<b>Proportion of chargebacks</b>	0.1006 ***	0.0199 ***	0.0104 ***	0.0070 ***	0.0161 ***	0.0348 ***	0.0095 ***	-0.0005 ***	0.0402 ***
<b>Share of face-to-face transactions</b>	0.0074 ***	0.0007 ***	0.0003 ***	0.0004 ***	0.0005 ***	0.0003 *	0.0005 *	0.0005 *	0.0017 ***
<b>Share of capped credit</b>	0.0182 ***	0.0034 ***	0.0033 ***	0.0030 ***	0.0020 ***	0.0044 ***	0.0022 **	0.0041 ***	0.0082 ***
<b>Share of capped debit</b>	0.0356 ***	-0.0012 ***	-0.0031 ***	-0.0028 ***	-0.0031 ***	-0.0017 ***	0.0011 ***	0.0042 ***	0.0107 ***
<b>1st Quarter pre-IFR</b>	0.3663 **	0.0585 ***	0.0443 ***	0.0378 ***	0.0420 ***	0.0347 ***	0.0316 ***	-0.0088 ***	0.1468 ***
<b>2nd Quarter pre-IFR</b>	0.6745 ***	0.0889 ***	0.0623 ***	0.0517 ***	0.0493 ***	0.0545 ***	0.0207 **	-0.0123 ***	0.1817 ***
<b>1st Quarter post-IFR</b>	-0.2797 *	-0.0892 ***	-0.0399 ***	-0.0148 ***	-0.0130 ***	-0.0019 ***	0.0158 *	0.0316 **	-0.0995 ***
<b>2nd Quarter post-IFR</b>	-0.4344 ***	-0.1030 ***	-0.0560 ***	-0.0368 ***	-0.0363 ***	-0.0190 **	0.0032 ***	0.0326 ***	-0.0690 ***
<b>3rd Quarter post-IFR</b>	-0.0840 ***	-0.0933 ***	-0.0514 ***	-0.0431 ***	-0.0380 ***	-0.0348 ***	-0.0027 ***	0.0180 ***	-0.0282 *
<b>4th Quarter post-IFR</b>	-0.3987 ***	-0.0443 ***	-0.0273 ***	-0.0222 ***	-0.0077 **	-0.0185 **	-0.0012 ***	0.0282 **	-0.0760 ***
<b>Constant</b>	12.8645 ***	2.4127 ***	0.9316 ***	0.7515 ***	0.7283 ***	0.3700 ***	0.0692 ***	0.0846 ***	5.3259 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 25: Baseline regressions with annual dummies, interchange fee margin as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>Scheme fees</b>	14.5880 ***	0.6953 ***	0.4473 ***	0.5480 ***	0.3368 ***	0.3906 **	0.2133	1.5738 ***	4.6963 ***
<b>Log of transaction volume</b>	-5.2319 ***	-0.3865 ***	-0.0654 ***	-0.0497 ***	-0.0435 ***	-0.0193 ***	-0.0130 ***	-0.0295 ***	-1.1672 ***
<b>Proportion of chargebacks</b>	0.1012 ***	0.0199 ***	0.0104 ***	0.0068 ***	0.0156 ***	0.0352 ***	0.0094 ***	0.0003	0.0402 ***
<b>Share of face-to-face transactions</b>	0.0074 ***	0.0007 ***	0.0003 ***	0.0004 ***	0.0005 ***	0.0004 *	0.0005 *	0.0006 *	0.0017 ***
<b>Share of capped credit</b>	0.0184 ***	0.0034 ***	0.0032 ***	0.0029 ***	0.0019 ***	0.0045 ***	0.0022 **	0.0040 ***	0.0082 ***
<b>Share of capped debit</b>	0.0357 ***	-0.0012 ***	-0.0031 ***	-0.0028 ***	-0.0031 ***	-0.0017 ***	0.0011	0.0042 ***	0.0107 ***
<b>2015</b>	0.3037 **	0.0843 ***	0.0592 ***	0.0546 ***	0.0573 ***	0.0629 ***	0.0204 ***	0.0107	0.1308 ***
<b>2016</b>	0.4653 ***	0.2191 ***	0.1711 ***	0.1686 ***	0.1493 ***	0.1587 ***	0.0626 ***	-0.0056	0.2724 ***
<b>2017</b>	0.6732 ***	0.2904 ***	0.2088 ***	0.1942 ***	0.1709 ***	0.1823 ***	0.0582 ***	-0.0424 **	0.3229 ***
<b>2018</b>	1.1008 ***	0.4066 ***	0.2737 ***	0.2431 ***	0.2116 ***	0.1915 ***	0.0728 ***	-0.0141	0.4650 ***
<b>Constant</b>	12.8295 ***	2.3774 ***	0.9199 ***	0.7413 ***	0.7185 ***	0.3337 ***	0.0712	0.0723	5.2756 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484	828,139
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216	36,937

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 26: Baseline regression with and without robust standard errors, interchange fee margin as dependent variable, by merchant group**

	Standard errors	Robust standard errors
VARIABLES	Margin over IF	Margin over IF
<b>IFR DUMMY</b>	0.1864 ***	0.1864 ***
	(0.0084)	(0.0111)
<b>Scheme fees</b>	5.0233 ***	5.0233 ***
	(0.1680)	(0.4699)
<b>Log of transaction volume</b>	-1.1674 ***	-1.1674 ***
	(0.0061)	(0.0294)
<b>Proportion of chargebacks</b>	0.0403 ***	0.0403 ***
	(0.0031)	(0.0120)
<b>Share of face-to-face transactions</b>	0.0017 ***	0.0017 ***
	(0.0002)	(0.0004)
<b>Share of capped credit</b>	0.0083 ***	0.0083 ***
	(0.0003)	(0.0008)
<b>Share of capped debit</b>	0.0108 ***	0.0108 ***
	(0.0003)	(0.0008)
<b>Constant</b>	5.3864 ***	5.3864 ***
	(0.0367)	(0.1272)
<b>Observations</b>	828,139	828,139
<b>Number of merchants</b>	36,937	36,937

Standard errors in parentheses

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Source: PSR analysis using data submitted by the five largest acquirers.



**Table 27: Baseline regressions excluding transaction mix, interchange fee margin as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++
<b>IFR DUMMY</b>	0.4905 ***	0.1788 ***	0.1375 ***	0.1328 ***	0.1058 ***	0.1173 ***	0.0435 ***	-0.0090
<b>Scheme fees</b>	10.7027 ***	1.1168 ***	0.9806 ***	0.9210 ***	0.8043 ***	0.7388 ***	0.1326 ***	0.9901 ***
<b>Log of transaction volume</b>	-5.2256 ***	-0.3851 ***	-0.0670 ***	-0.0509 ***	-0.0472 ***	-0.0218 ***	-0.0132 ***	-0.0261 ***
<b>Proportion of chargebacks</b>	0.0953 ***	0.0201 ***	0.0107 ***	0.0077 ***	0.0167 ***	0.0332 ***	0.0102 ***	-0.0016
<b>Constant</b>	15.9781 ***	2.4908 ***	0.8775 ***	0.7322 ***	0.6910 ***	0.4161 ***	0.2215 ***	0.4378 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 28: Regressions excluding transaction mix, acquirer net revenue as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++
<b>IFR DUMMY</b>	0.6799 ***	0.1957 ***	0.1461 ***	0.1402 ***	0.1091 ***	0.1202 ***	0.0487 ***	-0.0160 *
<b>Log of transaction volume</b>	-5.3586 ***	-0.3934 ***	-0.0678 ***	-0.0536 ***	-0.0488 ***	-0.0219 ***	-0.0132 ***	-0.0242 ***
<b>Proportion of chargebacks</b>	0.1121 ***	0.0203 ***	0.0113 ***	0.0076 ***	0.0161 ***	0.0316 ***	0.0010 ***	-0.0005
<b>Constant</b>	16.6178 ***	2.5348 ***	0.8790 ***	0.7442 ***	0.6969 ***	0.4077 ***	0.1977 ***	0.4239 ***
<b>Number of observations</b>	76,249	434,022	122,192	81,553	46,781	5,330	1,397	5,436
<b>Number of merchants</b>	5,327	20,301	4,961	3,172	1,699	188	51	216

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 29: Regressions excluding transaction mix, average MSC as dependent variables, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++
<b>IFR DUMMY</b>	0.2029 *	0.1726 ***	0.1572 ***	0.1441 ***	0.0946 ***	0.1051 ***	0.0312 ***	-0.0268 ***
<b>Interchange fee</b>	-0.7532 ***	0.9546 ***	1.1475 ***	1.0816 ***	0.9148 ***	0.8917 ***	0.7731 ***	0.8628 ***
<b>Scheme fee</b>	14.4703 ***	1.1998 ***	0.7713 ***	0.8054 ***	0.9160 ***	0.8724 ***	0.7364 **	1.2510 ***
<b>Log of transaction volume</b>	-5.2020 ***	-0.3850 ***	-0.0665 ***	-0.0505 ***	-0.0481 ***	-0.0233 ***	-0.0184 ***	-0.0266 ***
<b>Proportion of chargebacks</b>	0.0974 ***	0.0201 ***	0.0106 ***	0.0076 ***	0.0166 ***	0.0325 ***	0.0094 ***	-0.0015
<b>Constant</b>	16.7925 ***	2.5091 ***	0.8173 ***	0.6971 ***	0.7322 ***	0.4734 ***	0.3213 ***	0.4984 ***
<b>Number of observations</b>	84,694	466,227	129,109	85,917	48,534	5,406	1,482	5,484
<b>Number of merchants</b>	5,669	20,824	5,051	3,200	1,710	188	52	216

Source: PSR analysis using data submitted by the five largest acquirers.

**Table 30: Baseline regression excluding acquirer with missing data ([X]),  
interchange fee margin as dependent variable, by merchant group**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR Dummy</b>	0.5976 ***	0.1866 ***	0.1436 ***	0.1408 ***	0.1151 ***	0.1260 ***	0.0485 ***	-0.0267 ***	0.2227 ***
<b>Scheme fees</b>	14.5110 ***	1.8400 ***	1.4367 ***	1.1963 ***	0.7762 ***	0.7845 ***	1.5025 ***	1.4208 ***	5.4443 ***
<b>Log of transaction volume</b>	-5.6355 ***	-0.4029 ***	-0.0686 ***	-0.0571 ***	-0.0435 ***	-0.0196 ***	-0.0073 ***	-0.0269 ***	-1.1864 ***
<b>Proportion of chargebacks</b>	0.1178 ***	0.0218 ***	0.0119 ***	0.0066 ***	0.0181 ***	0.0331 ***	-0.0003 ***	0.0010 ***	0.0484 ***
<b>Share of face-to-face transactions</b>	0.0140 ***	0.0013 ***	0.0004 ***	0.0006 ***	0.0006 ***	0.0005 ***	-0.0004 *	0.0008 **	0.0040 ***
<b>Share of capped credit</b>	0.0195 ***	0.0040 ***	0.0044 ***	0.0043 ***	0.0030 ***	0.0062 ***	0.0037 ***	0.0031 ***	0.0095 ***
<b>Share of capped debit</b>	0.0402 ***	-0.0005 ***	-0.0036 ***	-0.0033 ***	-0.0042 ***	-0.0022 ***	-0.0016 ***	0.0030 ***	0.0135 ***
<b>Constant</b>	13.9275 ***	2.4593 ***	0.9766 ***	0.8069 ***	0.7946 ***	0.3525 ***	0.2138 ***	0.1457 **	5.2269 ***
<b>Number of observations</b>	62,852	375,876	108,281	72,159	42,840	5,041	1,292	5,395	674,730
<b>Number of merchants</b>	4,131	16,524	4,157	2,664	1,498	174	45	213	29,422

Source: PSR analysis using data submitted by four out of the five largest acquirers.

**Table 31: Baseline regression with CAP spend, interchange fee margin as dependent variable, by merchant group, three acquirers only**

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	IC++	All sample
<b>IFR DUMMY</b>	0.5146 ***	0.1567 ***	0.1242 ***	0.1377 ***	0.1152 ***	0.1043 ***	0.0401 ***	-0.0083	0.2018 ***
<b>Scheme fee</b>	16.2528 ***	3.4406 ***	3.0076 ***	2.4435 ***	1.5273 ***	1.1036 ***	1.2849 ***	1.5636 ***	7.8565 ***
<b>Log of transaction volume</b>	-8.1299 ***	-0.6058 ***	-0.0984 ***	-0.0794 ***	-0.0636 ***	-0.0478 ***	-0.0117 ***	-0.0129 *	-1.7889 ***
<b>Proportion of chargebacks</b>	0.1581 ***	0.0295 ***	0.0149 ***	0.0104 ***	0.0226 ***	0.0440 ***	-0.0015	0.0021	0.0657 ***
<b>Share of face-to-face transactions</b>	0.0207 ***	0.0010 ***	0.0001	0.0005 ***	0.0004 ***	-0.0010 **	-0.0004 *	-0.0002	0.0042 ***
<b>Share of capped credit</b>	0.0259 ***	0.0063 ***	0.0071 ***	0.0062 ***	0.0045 ***	0.0047 ***	0.0004	0.0021 ***	0.0134 ***
<b>Share of capped debit</b>	0.0560 ***	0.0024 ***	-0.0013 ***	-0.0017 ***	-0.0020 ***	0.0008	-0.0045 ***	0.0011 *	0.0218 ***
<b>Log of spend on card terminals</b>	1.1227 ***	0.0659 ***	0.0207 ***	0.0089 ***	0.0168 ***	0.0138 ***	-0.0074 **	0.0024	0.2355 ***
<b>Log of spend on gateways</b>	-1.0107 *	0.0433	0.0590 ***	0.0730 ***	-0.0040	0.0103	0.0282 ***	0.0068	-0.0618
<b>Log of spend of PCI DSS</b>	1.7559 ***	0.0630 ***	0.0439 ***	0.0123 **	0.0026	0.0333 ***	0.0051	-0.0653 ***	0.2835 ***
<b>Log of spend on other CAP</b>	0.3177 ***	0.0373 ***	0.0113 ***	0.0095 ***	0.0058 ***	0.0011	-0.0018	-0.0010	0.0476 ***
<b>Constant</b>	18.9279 ***	3.0686 ***	0.8774 ***	0.7591 ***	0.7544 ***	0.5362 ***	0.5795 ***	0.2132 ***	7.2471 ***
<b>Number of observations</b>	43,174	266,392	79,088	51,565	29,976	2,798	633	3,797	478,416
<b>Number of merchants</b>	3,034	12,281	3,165	1,975	1,080	102	21	159	21,844

Source: PSR analysis using data submitted by three out of the five largest acquirers.

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