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(Occasional Papers)

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THE IMPACT OF THE INTERCHANGE FEE REGULATION ON MERCHANTS: EVIDENCE FROM ITALY

by Guerino Ardizzi* and Michele Savini Zangrandi*

Abstract

Interchange fees (IF) are fees that a cardholder's bank (issuer) receives from the merchant's bank (acquirer) when a card payment is executed. Interchange fees are an important part of the fees charged to merchants by acquirers. Because of their level and fragmentation, interchange fees can restrict competition and have thus been regulated in the EU. The Interchange Fee Regulation (IFR) came into effect for all EU member states in 2015 and sets maximum limits on interchange fees. By using a panel of Italian banks we assess the impact of introducing the IF regulation on the fees that acquiring banks charge to merchants (merchant fees), and on the merchants' acceptance of card-based payments. We find that, in line with the regulatory intent, the ceiling imposed on interchange fees has led to a sizeable drop in merchant fees and to an increase in the acceptance of card payments, measured as transactions per terminal.

JEL Classification: E41, G14, G21, G38, L14, L42, L51.
Keywords: interchange fee, payment card, acquiring, point of sale, banking panel data.

Contents

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* Banca d'Italia, Market and Payment System Oversight.

1. Introduction[1]

In December 2015, Regulation (EU) 2015/751 on interchange fees for card-based payment transaction (known as the Interchange Fee Regulation, henceforth the 'IFR') came into force.[2] Interchange fees (IF) in card-based payment transactions are a mechanism to balance costs and revenues between banks and/or other payment service providers for the joint provision of card payment services. The IFR harmonizes interchange fees across the EU and reduces their level through a price cap. As a general rule, the regulation caps interchange fees at 0.2 per cent of the transaction value for consumer debit cards and at 0.3 per cent for consumer credit cards.

The rationale of the IFR is to combine lower interchange fees with increased transparency and competition in the market[3] to encourage a reduction in the final merchant fees. Lower merchant fees in turn should increase the acceptance of payment cards at the point of sale, facilitating the diffusion of electronic payments.

Research on the impact of regulating interchange fees remains limited and mostly theoretical; empirical evidence on the impact of the IFR in the EU is not yet available. This paper provides a first empirical assessment of the impact of the IFR in Italy. The econometric analysis will focus on two specific policy questions:

1) Did the cap on interchange fees result in lower merchant fees?
2) Is there a positive impact on card acceptance at the point of sale?

The remainder of this paper is structured as follows. In Section 2 we introduce the functioning of interchange fees in the payment card market and present an overview of the

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[2] Regulation (EU) 2015/751 was approved by the European Council and the European Parliament under the Italian Presidency of the European Union.

[3] Regulation (EU) 2015/751 also lays down business rules and other technical requirements for card-based payment transactions with the aim of enhancing the internal market for payments and supporting the establishment of a Single Euro Payments Area. The new rules should reduce market fragmentation and further develop a level playing field in the card payments market. They will foster competition and facilitate new entrants joining the market, leading to broader availability of payment instruments, increased efficiency and lower costs for payment card users.

Italian payments market. In Section 3 we review the empirical literature related to the regulation of interchange fees. Sections 4 and 5 illustrate the data and the empirical strategy. Section 6 discusses the results of the empirical estimates and Section 7 presents the main conclusions and policy indications.
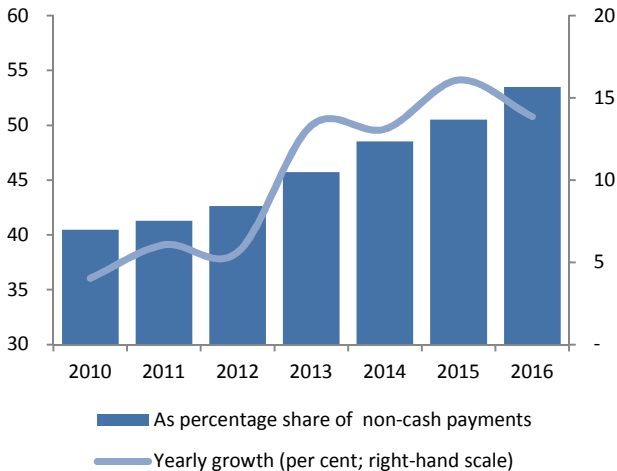
2. Card payments

Card-based payments have displayed remarkable growth in Italy, a still very cash-intensive market, in recent years. At 95 non-cash payments per capita, the use of non-cash instruments in Italy remains below the Eurozone average of 231 (see Figure 1). The diffusion of card payments, however, has increased substantially, and the number of card-based transactions has displayed double-digit growth since 2013. More than half of the total number of non-cash payments are now made by card (see Figure 2). In 2016 the combined number of debit, credit and prepaid card payments exceeded 3 billion transactions, for a total of EUR 198bn.

Figure 1: EU per capita non-cash transactions in 2016
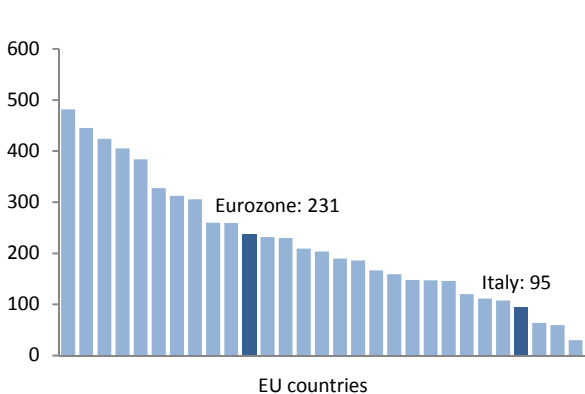
Source: ECB Statistical Data Warehouse, Payment Statistics.

Figure 2: Card payments in Italy

Source: ECB Statistical Data Warehouse, Payment Statistics.

While a cash-based transaction is settled with the physical exchange of cash between the buyer and the seller (merchant), processing a card-based transaction involves a number of additional actors. The process can be thought of as follows: the payment instruction is

sent to the cardholder's bank – known as the issuing bank – which processes the payment to the merchant's bank – known as the acquiring bank – in favor of the merchant (see Figure 3).

The fee structure follows the flow of funds in reverse. Merchants must generally pay two types of fees to the acquiring bank: a percentage fee – the merchant fee – and a fixed fee, related to the cost of rental and maintenance of the POS terminals. The acquiring bank is charged a percentage fee – the interchange fee – by the issuing bank. Merchant fees tend to be directly related to interchange fees, and are often specified in acquiring contracts as the interchange fee plus a markup. Lastly, the issuing bank also generates revenue from the cardholder in the form of cardholder fees. Cardholder fees are generally annual fixed charges that in the case of debit cards tend to be bundled with checking account charges.

Figure 3: The mechanics of a card-based payment
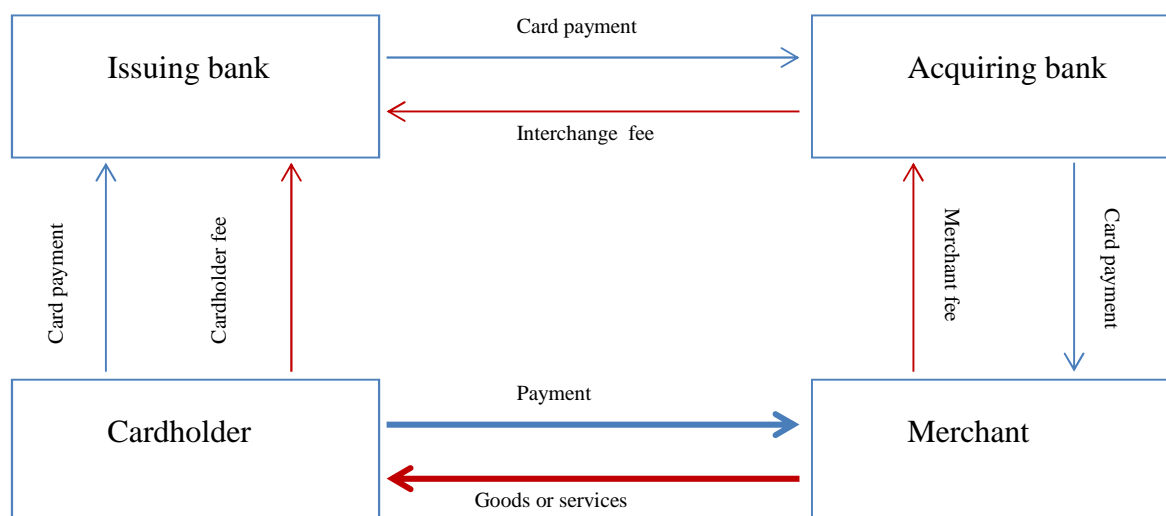
Interchange fees have been found to be problematic from a competition standpoint because of their opaque price-setting mechanism (European Commission, 2015). Card schemes compete on the size of their network by offering interchange fee revenue to issuing banks. Therefore, competition between card schemes generates an increase in interchange fees that acquiring banks pass on to merchants who are generally unable to negotiate

acquiring contracts. The fact that card schemes employ reward schemes to incentivize card usage further increases the cost of card acceptance to merchants.

Because of their perverse effect on competition, interchange fees are regulated at EU level.[4] The Interchange Fee Regulation came into effect for all EU Member States over the course of 2015 with the aim of reducing the level of fragmentation and the costs of acceptance for card-based payments in the internal market.[5] Among other measures,[6] the IFR caps interchange fees at 0.2 per cent of the transaction for debit and prepaid cards and at 0.3 per cent for credit cards.[7]

The effect of the regulation on the market depends on the level of competition among acquiring banks. In a reasonably competitive market lower interchange fees should be passed on to merchants in the form of lower merchant fees, which might in turn encourage merchants' acceptance of card-based payments, thus facilitating an economy-wide shift away from cash.

The literature (reviewed below) documents some attempts at regulating interchange fees in Australia, the United States and Spain. The Reserve Bank of Australia reported declining merchant fees following IF-capping (Reserve Bank of Australia, 2004). Evidence from the US appears more mixed, with survey data showing little perceived change by merchants (Wang et al., 2014). The data from Spain appear to indicate an increase in merchants' acceptance of card-based transactions (Carbó Valverde et al., 2016).

Using detailed Bank of Italy retail payment data, we are able to calculate interchange and merchant fees at the financial institution level. Figure 4 reports average merchant and

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[4] See Regulation (EU) 2015/751 ('IFR'), Recital 10: 'Competition between payment card schemes to convince payment service providers to issue their cards leads to higher rather than lower interchange fees on the market, in contrast with the usual price-disciplining effect of competition in a market economy. In addition to a consistent application of the competition rules to interchange fees, regulating such fees would improve the functioning of the internal market and contribute to reducing transaction costs for consumers'.

[5] Regulation (EU) 2015/751 of 8 April 2015 entered into force on 9 June 2015. IF caps became binding on 9 December 2015.

[6] The IFR also lays down business rules enhancing competition and transparency on the acquiring side of the payment card market.

[7] Caps do not however apply to all types of transactions. For example, corporate cards are excluded.

interchange fees.[8] Prior to the introduction of the IFR, we estimate that interchange fees hovered around 0.5 per cent and merchant fees around 0.8 per cent. Following the introduction of the IFR, we observe a remarkable shift. In 2016 interchange fees dropped by approximately 37 per cent (or 0.2 percentage points) compared with 2015,[9] and this was accompanied by a 19 per cent (or 0.15 percentage point) drop in merchant fees. While interchange fees appear to have stabilized in 2017, merchant fees fell by a further 3 per cent (or 0.02 percentage points), implying a cumulative 22 per cent (or 0.17 percentage point) reduction over the post-IFR period.

Moreover, we are able to estimate the number of transactions per POS terminal at the financial institution level, which is a proxy for merchants' willingness to accept card-based transactions. Merchant acceptance[10] increased by just over 5 per cent (from 875 to 924 transactions per terminal) per year between 2013 and 2015 (Figure 5); following the introduction of the IFR, it jumped by 16 per cent to about 1,070 transactions per terminal. It then increased by an additional 10 per cent in 2017, implying a cumulative 28 per cent increase between 2015 and 2017. There are now 1120 transactions per terminal on average.

However, visual inspection can hardly be taken as conclusive evidence of policy impact. Our empirical strategy relies essentially on a differences-in-differences specification, where in absence of an obvious control group we rely on fixed effects to control for institution-specific idiosyncrasies, and on market and economy wide variables to control for factors that might influence all institutions simultaneously. Our objective is to investigate (a) the degree to which, if at all, the mandated reduction in interchange fees was

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[8] The acquiring market has a relatively high degree of concentration in Italy. Fees are therefore reported in POS-weighted terms to give a larger weight to banks that have a larger presence in the market. This measure better reflects the merchant fee (and related interchange fee) a merchant is likely to pay.

[9] It is important to note here that interchange fee estimates reflect the average interchange fee in the market for all transactions, and not only for capped transactions (see footnote 7), which we are unable to distinguish in the data. Level-estimates should thus not be read in conjunction with the regulatory caps.

[10] As noted in footnote 8, due to the high degree of concentration in the Italian acquiring market, merchant acceptance is better represented by attaching a larger weight to intermediaries with a greater market presence. The measure is thus reported in POS-weighted terms.

passed on to merchants,[11] and (b) whether the IFR contributed to the increase in merchant acceptance.

Figure 4: Merchant and interchange fees
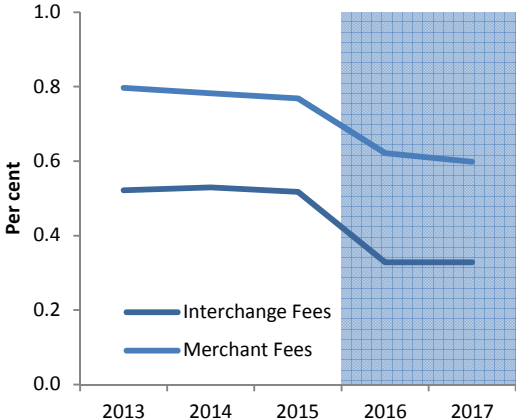
Source: Based on credit and financial institutions' supervisory reports.

Figure 5: Merchant acceptance

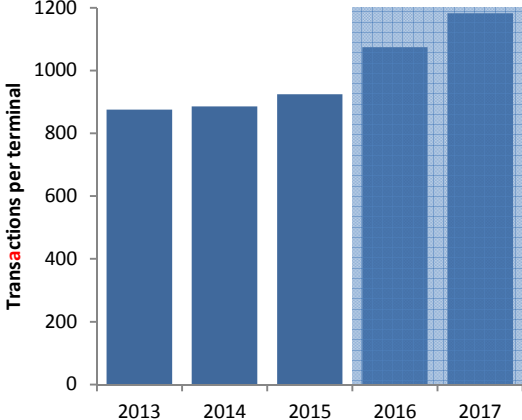Source: Based on credit and financial institutions' supervisory reports.

3. Literature review

The rationale for interchange fees has been justified in the literature through a number of theoretical frameworks in the last twenty years. The general consensus rested around the fact that interchange fees may help to internalize network effects and thus to optimize card usage (Börestam and Schmiedel, 2011).

However, due to a lack of specific data, empirical testing of theoretical frameworks remains rare. Theoretical frameworks also tend to clash with competitive practice. Interchange fees have been found problematic from a competition standpoint in a number of jurisdictions. In the EU, interchange fees came under the scrutiny of the antitrust authority prior to the introduction of the Interchange Fee Regulation. The European Commission's Directorate-General for Competition found that interchange fees undermine competition and inflate final prices. In a series of landmark antitrust decisions, it therefore introduced

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[11] In line with the scope of application of the IFR, we limit our focus to the impact of the new rules on the acquiring side of the payment card network. Investigating spillover effects on other 'sides' of the market remains an important topic for future research.

limitations to card schemes in order to reduce cross-border (intra-EU) interchange fees over time.[12]

In 2003, the Reserve Bank of Australia (RBA) mandated, amongst other measures,[13] a reduction in interchange fees on credit cards from approximately 0.95 per cent of the transaction value to a maximum of 0.55 per cent, subsequently reduced to 0.50 per cent. The immediate impact of the interchange fee reduction was a drop in average merchant fees from 1.41 per cent to 0.99 per cent (Reserve Bank of Australia, 2005). In 2006 the RBA expanded the scope of the regulation to include debit cards. In a broad market consultation the Australian Payment System Board concluded that 'the reforms introduced delivered significant benefits, improving the efficiency of Australia's payment system' (Reserve Bank of Australia, 2008). The interchange fee cap was maintained following a subsequent market consultation in 2015 (Reserve Bank of Australia, 2016).

Acting on the 2010 Durbin Amendment to the Dodd-Frank Act, the US Federal Reserve System set a cap for debit card interchange fees at USD 0.21 plus 0.05 per cent of the transaction value for banks with consolidated assets above USD 10bn. Kay et al. (2014) estimate that, following the introduction of the Durbin Amendment, interchange income fell by approximately 34 per cent relative to what it would have otherwise been. Banks were partially able to offset the losses by increasing deposit fees (Kay et al., 2014). Evidence of the impact on merchants is mixed. Survey results indicate that approximately two thirds of merchants perceive no change in their acceptance costs (Wang et al., 2014) following the introduction of the Durbin Amendment. However, this finding hides substantial heterogeneity in the data as merchant fees in the US can vary by sector and transaction size.

The combination of four measures taken by the Spanish government between 1997 and 2007 led to a steep decline in debit and credit card interchange fees. Using bank-level data, Carbó Valverde et al. (2016) find that merchant acceptance of card payments increased

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[12] See for instance European Commission (2010), 'Decision relating to proceedings under Article 101 of the Treaty on the Functioning of the European Union and Article 53 of the EEA Agreement' (Case COMP/39.398 - Visa MIF).

[13] Other measures included restrictions on the honor-all-cards and no-surcharge rule.

as an effect of the decline in interchange fees, and so did card-based transactions and, consequently, bank payment revenues.

Carbó Valverde et al. (2016) constitutes a useful benchmark in assessing the impact of the introduction of the IFR on merchant acceptance. In the paper merchant acceptance is defined as a function of the interaction of merchant adoption (the percentage of merchants accepting card-based payments) and the number of cards in the network. Merchant adoption is defined in turn as a function of interchange fees. Merchant acceptance is thus affected by interchange fees through the effect of merchant adoption: a lower interchange fee encourages merchants to install a POS terminal, which in conjunction with the number of cards in the network defines merchant acceptance. The combined effect is negative, implying that the mandated reduction in interchange fees in Spain increased acceptance through increased adoption.

Finally, a related study using a panel of Italian banks over the 2009-10 period shows a close connection between the level of interchange fees and the cash-card ratio (Ardizzi, 2013), that is, the ratio of cash withdrawals to POS payments. Specifically, the paper finds that lower interchange fees favor the use of cards over cash, with a 1 per cent drop in interchange fees leading to a 0.1 to 0.3 times decrease in the value of cash withdrawals relative to card payments.

As far as we are aware, this paper constitutes the first attempt to provide an econometric assessment of the impact of the IFR in an EU country.

4. The data

The analysis relies on extensive retail payment data reported to the Bank of Italy by all Italian financial institutions, i.e. both banks and non-banks in the acquiring market. The data are half-yearly and cover a panel of approximately 400 institutions over the period 2009-17.

The institution-level data cover acquired retail transactions, related fees collected from merchants, interchange fees paid to issuers, and the number of payment instruments (cards and POS terminals). Transactions and fees are considered in aggregate for debit, credit and prepaid cards. The data are cleaned to correct for reporting issues and misalignments (caused for example by mergers[14] or service level agreements between banks).

Since transaction level data, including applicable fees, are not available, percentage fees are calculated at the financial institution level as the ratio of fee income to acquired flows. This can be interpreted as the average fee. Therefore, the (percentage) merchant fee equals the ratio of commission income from merchants to the value of acquired transactions, and the (percentage) interchange fee equals the ratio of interchange commission charges to the value of acquired transactions.[15]

Fees and card-acceptance can be a function of the size of the payment network. We measure network size with a composite indicator calculated as the Euclidean distance between the total number of cards and POS terminals reported by a given financial institutions.

Tables 1 and 2 below report the definition and summary statistics of all relevant variables.

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[14] In order to check whether changes in the structures of banking groups affect the results, the analysis is carried out at group level reconstructing the present groups backwards. This includes de facto groups created by servicing agreements in the payments sector. The results are broadly unchanged.

[15] The data structure inevitably hides some degree of merchant-level heterogeneity which prevents the investigation of differential impacts across economic sectors or merchants of differing size.

Table 1 – Variable definitions

Variable	Unit	Definition
Merchant Fees	Per cent	$\dfrac{\text{Merchant Fee Income}_{it}}{\text{Value of Acquired Transactions}_{it}}$
Merchant Acceptance	Number	$\dfrac{Number\ of\ Acquired\ Transactions_{it}}{Number\ of\ POS\ Terminals_{it}}$
Interchange Fee	Per cent	$\dfrac{\text{Interchange Fee Income}_{it}}{\text{Value of Acquired Transactions}_{it}}$
Herfindahl-Hirschman Index (HHI) of POS terminals	Index	$\displaystyle\sum_i \left(\frac{Number\ of\ POS\ terminals_{it}}{\sum_i Number\ of\ POS\ terminals_{it}}\right)^2$
Acquiring Share	Per cent	$\dfrac{Value\ of\ Acquired\ Transactions_{it}}{\sum_i Value\ of\ Acquired\ Transactions_{it}}$
Network Size	Number	$\left[\left(\displaystyle\sum_i Number\ of\ Cards_{it}\right)^2 + \left(\displaystyle\sum_i Number\ of\ POS\ terminals_{it}\right)^2\right]^{1/2}$
Real GDP Growth	Per cent	Real Half-Yearly Seasonally Adjusted GDP Growth

Table 2: Summary information

Variable		Mean	Std. Dev.	Min	Max	Observations	
Merchant Fees	Overall	0.49	0.42	0.00	4.36	N	5,043
	Between		0.41	0.00	2.97	n	467
	Within		0.24	-1.35	3.05	T-bar	11
Ln(Merchant Acceptance)	Overall	5.73	0.77	1.61	7.59	N	6,285
	Between		0.75	1.72	7.48	n	558
	Within		0.48	1.68	8.74	T-bar	11
Acquiring Share	Overall	0.26	1.82	0.00	33.47	N	6,950
	Between		1.54	0.00	28.44	n	596
	Within		0.68	-8.99	19.76	T-bar	12
HHI POS	Overall	0.06	0.01	0.03	0.09	N	11,783
	Between		0.01	0.03	0.09	n	825
	Within		0.01	0.03	0.09	T-bar	14
Ln(Network Size)	Overall	18.31	0.12	18.03	18.47	N	11,783
	Between		0.06	18.03	18.47	n	825
	Within		0.11	18.03	18.48	T-bar	14
Ln(POS)	Overall	6.17	1.77	0.00	13.13	N	7,463
	Between		1.76	0.00	11.82	n	605
	Within		0.51	-0.33	8.67	T-bar	12

5. Empirical strategy

In the logic of impact evaluation, the impact of the policy change can be identified by comparing merchant outcomes before and after the change introduced by the IFR (treatment) and across a 'treated' and a 'non-treated' set of financial institutions. The presence of a control group in the impact evaluation literature is necessary to 'difference out' potential trends in the data that might influence the before-after outcome.

However, as the regulation is applicable to all financial institutions, it is difficult to find a suitable control group. In the absence of a control group, the canonical differences-in-differences specification boils down to a simple before-after difference. This section first discusses the identification problem in general terms and then lays out the two econometric specifications of interest.

Defining Y_{it} as the outcome variable for institution i in semester t, and the dichotomous $D_t^{IFR} = 1(year > 2015)$ variable which takes the value of 1 in year 2016 and 2017 and 0 otherwise,[16] the difference in mean outcome before and after the introduction of the regulation can be estimated as $Y_{it} = \beta D_t^{IFR} + U_{it}$. This rather crude estimate of policy impact, however, will be vulnerable to the effects of unobserved trends that might have shifted outcomes regardless of the break introduced by the IFR. The bias can be mitigated by controlling for trends and for macro or market factors that might be influencing all institutions alike.

In order to control for potential trends in the data, we introduce (i) a quadratic trend term and (ii) a set of macro and market variables denoted by Z_t^v, that are likely to affect outcomes for all institutions. These additional controls are discussed in detail along with the individual specifications. As competitive conditions in the acquiring market might lead to co-determination of interchange fees and merchant outcomes, the introduction of the interchange fee variable in the specification might cause issues of simultaneity. It is therefore discarded.

$$Y_{it} = \alpha + \beta D_t^{IFR} + \sum_{j=1}^{2} \gamma^j t^j + \sum_v \theta^v Z_t^v + U_{it} \ (1)$$

Equation (1) is estimated through a fixed effects specification (FE) in order to control for the presence of a time-invariant component of the institution-specific error. However, a number of identification issues remain unsolved. First, although control variables are available, the presence of omitted-variable bias can never be fully excluded.[17] Second, the presence of acquiring contracts that are not immediately renegotiable might introduce lags in the pass-through effect of the IFR on merchants.

In a robustness check we include a number of lags of the dependent variable in the specification. The inclusion of the lagged dependent variable introduces a mechanical violation of OLS assumptions and requires the use of instrumental variables.

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[16] As noted in footnote 5, the IFR entered into force over the course of 2015, with the caps only becoming legally binding late in the year.

[17] Inability to correctly capture the dynamic of the outcome variable might also lead to the presence of residual serial correlation in the error. This hypothesis was tested and rejected.

$$Y_{it} = \alpha + \beta D_t^{IFR} + \sum_{j=1}^{2} \gamma^j t^j + \sum_v \theta^v Z_t^v + \sum_j \delta Y_{it-j} + U_{it} \quad (2)$$

As external instruments are difficult to come by, we rely on dynamic panel data models which exploit the panel dimension of the data to generate internal instruments (Bond, 2002). Internal GMM instruments are particularly well suited to our problem as they solve both the issue generated by the inclusion of the lagged dependent variable and the potential problems of omitted-variable bias described above.

We lay out two separate specifications to capture the impact of the introduction of the IFR on merchant fees and on merchant marginal acceptance. The equations follow the structure laid out by Equations (1) and (2).

In the case of merchant fees, we include time-varying market characteristics that might influence all institutions simultaneously as well as time-varying factors that might distinguish the market position of certain institutions beyond what is netted out by the presence of the fixed effects. Specifically, the level of competition in the market is measured by the Herfindahl-Hirschman index of concentration of POS terminals, while a given institution's market position is measured by the share of total transactions acquired and the number of POS terminals.

In the case of merchant marginal acceptance, we concern with the economy-wide factors that might influence both consumer and merchant behavior. An increase in transactions per POS terminal could in fact be a function of the broader economic cycle and its effect on consumption. This is controlled by the presence of real GDP growth. A given institution's market position, on the other hand, is measured by the share of total transactions acquired and is corroborated by a measure of network size.

6. Main results

The results of the econometric analysis of the impact of the IFR on merchant fees and merchant acceptance are reported in Table 3 and Table 4 respectively.

6.1. Merchant fees

The merchant fee specification is reported in Table 3, where the first column follows the structure laid out in Equation 1 and the second column that laid out in Equation 2. In the specification, institution-specific market position is controlled for by the share of acquired transactions and the number of POS terminals, while market-wide dynamics are controlled for by the concentration index of POS terminals. In addition, all specifications include a quadratic time trend to control for non-linear market-wide trends. Column (1) reports the fixed-effects estimation (FE) and column (2) the two-step system GMM results which add two lags of the dependent variable.

The GMM specification includes lagged merchant fees as GMM-style instruments in addition to the lags of institution-specific independent variables, assuming that they are pre-determined. As the degree of endogeneity of the variables is high, deeper lags are preferred. GMM-style instruments are collapsed in order to avoid 'too-many-instruments' type problems (Roodman, 2008). Variables measuring overall market trends, conversely, are considered exogenous as no financial institution is sufficiently large to affect market-wide outcomes. The validity of the 18 instruments is confirmed by the Hansen and Sargan tests.

Across all specifications, the coefficient of the IFR dummy is statistically significant with a negative sign. The coefficient becomes more negative – implying a stronger impact of the regulation – when two lags of the dependent variable are included in the GMM specification. This implies the likely presence of some degree of stickiness in acquiring contracts (European Commission, 2006). The IFR dummy coefficient ranges from -0.05 to -0.07 – implying that the introduction of the IFR resulted in a 0.05 to 0.07 percentage point drop in merchant fees. The introduction of the IF cap, in other words, appears to have contributed somewhere between 30 and 40 per cent to the cumulative reduction of 0.17 percentage points in merchant fees observed over the two years following its introduction.

Institution-specific market power as proxied by the share of acquired transactions and the number of POS terminals show positive and significant coefficients in the GMM specification, indicating that acquirers with a greater market power are able to demand higher merchant fees. Conversely, the level of market concentration shows a negative and significant coefficient. Two separate factors might be at play: on the one hand, economies

from technology convergence can reduce costs to acquirers; on the other hand, a higher degree of market concentration means a higher share of 'on-us' transaction for the acquirer,[18] which in turn lowers acquiring costs and merchant fees (European Commission, 2006).

Robustness checks include introducing other fixed charges per POS terminal as a control variable to ensure that the pass-through effects from acquiring banks to merchants take place via merchant fees and not via other charges. The (unreported) coefficient is not statistically significant and does not alter the results appreciably.

6.2. Merchant acceptance

The merchant acceptance specification is reported in Table 4, where the first column follows the structure laid out in Equation 1 and the second column that laid out in Equation 2. The specification controls for economy-wide factors include real GDP growth and the size of the payment network. The institution-specific position is measured as a given institution's share of acquired transactions. In addition, all specifications include a quadratic time trend to control for non-linear market-wide trends. Column (1) reports the fixed-effects estimation (FE) and columns (2) the two-step system GMM results, which add two lags of the dependent variable.

The GMM specification includes lagged merchant acceptance as GMM-style instruments in addition to lags of institution-specific independent variables, assuming that they are pre-determined. As the degree of endogeneity of the variables is higher, deeper lags are preferred. GMM-style instruments are again collapsed in order to avoid 'too-many-instruments' type problems (Roodman, 2008). Variables measuring overall market trends, conversely, are considered exogenous as no financial institution is sufficiently large to affect market-wide outcomes. The validity of the 16 instruments is confirmed by the Hansen test and narrowly fails the less robust Sargan test. As the number of instruments is small, we consider the first test to be more reliable and thus view the instruments as valid.

Across both specifications, the coefficient of the IFR dummy is significant with a positive sign. The coefficient increases and becomes more significant – implying a stronger

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[18] 'On-us' transactions occur where the issuing bank and the acquiring bank are the same entity.

impact of the regulation – when two lags of the dependent variable are included in the GMM specification. This implies the likely presence of some degree of stickiness in merchant behavior. The IFR dummy coefficient ranges from 0.08 to 0.11. As the dependent variable is expressed as a natural logarithm, the coefficient can be interpreted as a semi-elasticity, implying that the introduction of the IFR resulted in an increase of approximately 8 to 11 per cent in merchant acceptance. In other words, the introduction of the IFR appears to have contributed somewhere between 30 to 40 per cent to the cumulative 28 per cent increase in merchant acceptance observed over the two years following the introduction of the IFR. The result is consistent with the findings of Carbó Valverde (2016) for Spain.

Real GDP growth shows a significant coefficient in all specifications. Institution-specific market power, proxied by the share of acquired transactions, has a positive and significant coefficient in the fixed effects specification, indicating that POS terminals of larger acquirers tend to have higher acceptance. This makes sense because large merchants tend to rely on large acquirers. Finally and as expected, network size has a positive impact (albeit only in the GMM specification) on merchant acceptance: the more cards and terminals the higher the likelihood that a card-based transaction will be accepted.

Table 3 – Merchant fees, results

	(1) FE	(2) GMM
D(Y>2015)	-0.05**	-0.07**
	(0.01)	(0.01)
Acquiring Share	-0.03	0.04*
	(0.56)	(0.05)
HHI POS	-2.65***	-1.77**
	(0.00)	(0.02)
Ln(POS)	-0.07	0.09***
	(0.26)	(0.00)
L(Dependent)		0.08
		(0.69)
L2(Dependent)		0.37**
		(0.03)
Trend	Quadratic	Quadratic
Constant	Yes	Yes
N. Obs	4754	3910
Adj R-sq	0.043	
T-avg	10.49	9.56
Cross section	453.00	409.00
Sargan(1)		0.13
Hansen(1)		0.76
AR(1)(1)		0.35
AR(2)(1)		0.17
N. Instruments		18.00
VCE type	Robust	Corrected

p-values in parentheses

* p<0.1 ** p<0.05 *** p<0.01

(1) p-values

Table 4 – Merchant acceptance, results

	(1) FE	(2) GMM
D(Y>2015)	0.08**	0.11***
	(0.03)	(0.00)
Acquiring Share	0.07***	0.14
	(0.00)	(0.13)
Real GDP Growth	0.03***	0.03**
	(0.00)	(0.03)
Ln(Network Size)	-0.34	1.85*
	(0.30)	(0.07)
L(Dependent)		-0.04
		(0.60)
L2(Dependent)		0.18
		(0.12)
Trend	Quadratic	Quadratic
Constant	Yes	Yes
N. Obs	6104	4870
Adj R-sq	0.140	
T-avg	10.98	9.42
Cross section	556.00	517.00
Sargan(1)		0.02
Hansen(1)		0.54
AR(1)(1)		0.04
AR(2)(1)		0.56
N. Instruments		16.00
VCE type	Robust	Corrected
p-values in parentheses		

* p<0.1 ** p<0.05 *** p<0.01

(1) p-values

7. Conclusion

The Interchange Fee Regulation (IFR) came into effect for all EU member states in late 2015. The IFR sets binding caps for the (interchange) fees that acquiring banks pay to issuing banks when a card-based payment takes place. Caps are set at 0.2 per cent of the transaction value for debit and prepaid cards and at 0.3 per cent for credit cards. As the IFR deals with the acquiring side of the payment card market, we do not investigate spillover effects on the other 'sides' of the market, which remain a topic for future research. This paper constitutes the first attempt to provide an econometric assessment of the impact of the IFR in an EU country.

Using institution-level data from financial institutions in the acquiring market we are able to estimate institution-specific interchange and merchant fees, as well as institution-specific merchant acceptance.

We find that between 2015 and 2017, interchange fees dropped by 37 per cent while merchant fees, which include the acquirer's margin, dropped by 22 per cent. Taking into account market characteristics and observable and unobservable financial institution-specific factors, the mandated reduction in interchange fees appears to account for 30 to 40 per cent of the drop in merchant fees.

Furthermore, we find that the IFR had a significant impact beyond the merchant-acquirer network. The introduction of IF caps, and the related decline in interchange fees, led to an increase in merchant acceptance (the number of card transactions per POS terminal) of approximately 8 to 11 per cent and explained 30 to 40 per cent of the increase in merchant acceptance observed between 2015 and 2017.

In sum, in line with the regulatory intent, IF capping led to a sizable drop in merchant fees and to an increase in merchant acceptance as measured by terminal transactions. The shift in resources from the issuing to the acquiring side of the card payment market, in conjunction with other measures introduced by the IFR to foster competition is expected to support the market in adopting point-of-sale innovation to promote non-cash payment instruments.

For a more thorough understanding of the way the market is adjusting, the agenda for future research includes assessing the spillovers of the IFR on the issuing side of the market

and its differential impact on different categories of merchants and consumers. In this sense, the IFR contains a review clause which mandates the European Commission to provide a comprehensive evaluation of the regulation by mid-2019.

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