EXPERT REPORT

THE RETAIL PAYMENT SYSTEM IN NEW ZEALAND:

EFFICIENCY, PRICING AND COMPETITION

BY WILKO BOLT

PROFESSOR OF PAYMENT SYSTEMS
SCHOOL OF BUSINESS AND ECONOMICS
VRIJE UNIVERSITEIT AMSTERDAM

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EXPERT REPORT

Wilko Bolt, Professor of Payment Systems, Department of Finance, School of Business and Economics, Vrije Universiteit Amsterdam, The Netherlands[1]

SHORT BIOGRAPHY

Wilko Bolt is professor of Payment Systems at the Vrije Universiteit (VU) in Amsterdam in the Netherlands. His main research areas are payment systems, platform economics, and money and banking. His research appeared in academic journals such as *Journal of Political Economy (forthcoming), American Economic Review*, *European Economic Review*, *Journal of Money, Credit and Banking*, *Economic Theory*, and *European Journal of Operational Research*.

REQUEST AND AIM

This report was written at the request of the New Zealand Commerce Commission (NZCC, or "Commission") with the aim to summarize the economic literature relating to efficiency, pricing as well as surcharging and competition in the retail payment system.

BACKGROUND AND CONTEXT

The retail payment system performs a critical function for the New Zealand economy and is made up of multiple payment networks offering different instruments and services. These include debit and credit card networks, bank transfer networks, digital wallet networks and "buy now, pay later" networks.

Recently, the Retail Payment System Act 2022 was passed that gives the Commission a range of new functions and powers. The purpose of the Act is to promote competition and efficiency in the retail payment system for the long-term benefit of merchants and consumers in New Zealand.

To this end, this expert report should summarise the publicly available economic literature on payment efficiency, payment pricing and payment competition. It should also draw together key themes and reach conclusions on issues as they relate to the Commission's approach to monitoring the system and surcharging, taking account of the unique characteristics of New Zealand's retail payment system, such as the fact that EFTPOS is free and the broad scope of our regulatory regime.

[1] E-mail address: w.bolt@vu.nl; Bolt is also employed by De Nederlandsche Bank (DNB – Dutch central bank) as a principal economist in the Economic Policy and Research department.

CONTENT

1. INTRODUCTION

Payment systems are essential for the smooth operation of an economy as they facilitate the exchange of goods and services for money. It is important to observe that these payment systems – both retail and wholesale systems – do not come for free but consume considerable resources. In essence, the proper allocation of these resources over time determines overall payment efficiency.

This expert report focuses on the retail payment system in New Zealand. The provision of retail payment services is a complex industry, as many participants are engaged in a series of interrelated bilateral transactions and subject to large economies of scale and scope along with strong adoption and usage externalities. This complex market structure directly affects pricing, competition and innovation, while potential market frictions require thoughtful public policy. Discussed in this expert report, the following main questions come to mind:

- Payment pricing: Is the payment market sufficiently transparent to generate the right price signals and incentives?
- Payment competition: Will competition among payment providers, networks, or instruments improve consumer and merchant welfare?
- Payment innovation: How is innovation best encouraged among competing players in the payments industry?

In this report, a short overview of the literature is presented with a specal focus on payment efficiency, payment pricing, and payment competition. The structure is as follows: section 2 briefly describes the payment landscape in New Zealand, section 3 discusses the underlying economic framework for assessing overall payment efficiency, section 4 delves

deeper into payment pricing and the role of surcharging, and section 5 discusses payment competition in relation to cooperation and innovation as well as the impact of price regulation. Section 6 then concludes.

2. PAYMENT LANDSCAPE IN NEW ZEALAND

2.1. Payment instruments and infrastructure

The retail payment system performs a vital function for the New Zealand economy. It consists of multiple electronic payment networks while the reliance on cash is fading. These electronic networks do not only include payment card and bank transfer networks, but recently also modern digital wallet and Buy Now, Pay Later (BPNL) networks. Although the "incumbent" payment card and bank transfer networks still process the bulk of all electronic retail payments in New Zealand, the entry of new payment players and payment networks may increase the competitive potential of the market and its contestability.

A payment occurs when money is transferred in exchange for goods or services. Most electronic payments are executed using private commercial bank money, i.e. the funds created by commercial banks and issued to transaction accounts. For retail purposes, public money is issued by the government and/or central bank in the form of coins and bank notes. Payment instruments are used to make payments – they enable the transfer of money. In New Zealand, electronic payment instruments can broadly be categorized into bank transfers and payment cards.[2]

First, bank transfers trigger interbank payments that are generally conducted via mobile banking applications or internet banking. Typically, these are (remote) online payments and are not used in-person at the point-of-sale. We may roughly classify bank transfers into "push" credit

[2] E-money – an electronic representation of funds held on a piece of hardware (i.e. prepaid card) or on software (i.e. mobile wallet) – is a third category but still limited in use in New Zealand. There are several e-money/mobile wallet providers, such as GiftPay, Prezzee, Prezzy Card Online, Apple Pay, Google Pay and PayPal.

transfers (i.e., one-off direct credits, (automatic) recurring payments and bill payments) and "pull" direct debits.[3]

As a second category, payment cards allow payments using a physical card by accessing underlying funds. In New Zealand we can distinguish EFTPOS cards and so-called "scheme" cards (such as VISA and MasterCard payment cards). These card instruments can be used at the point-of-sale to make either in-person contact payments (via e.g. PIN and chip) or in-person contactless payments (via e.g. NFC). They can also be used for remote payments in so-called "card not present" (CNP) payment situations.

More specifically, EFTPOS cards – issued by commercial banks or financial institutions – give the users access to their funds in their bank accounts and use the EFTPOS network for payment processing. Relative to scheme cards, EFTPOS is predominantly used for in-person payments and does not offer the contactless option. As well, it has limited use for online payments. Currently, there are 24 EFTPOS issuers in New Zealand, and the rules, laws and procedures to process EFTPOS payments are set by the Consumer Electronic Clearing System (CECS).[4]

Scheme cards are issued by a bank or credit provider and rely on a card network – or card scheme – such as Visa or MasterCard for initiation, authorisation and processing services. Credit cards give the user access to credit issued by its bank or by a third party credit provider (e.g. a three-party card issuer). Debit cards give the user access to its funds held in a bank account, similar to EFTPOS cards. In New Zealand, EFTPOS, VISA and Mastercard debit cards enable retail payments directly between bank accounts whereas credit card payments usually rely in first

[3] Loosely speaking, push and pull payments relate to payment initiation: push payments are initiated by the payer, while pull payments are initiated by the payee.
[4] For a good overview of the New Zealand retail payment landscape see e.g. Dudson et al. (2022) and NZCC (2023).

instance on borrowed funds (from the payer's bank or other credit provider). In 2022, there were 20 card issuers in New Zealand.

Retail payments rely on a wide payment infrastructure that enables a safe, reliable and efficient transfer of money between consumers, merchants, commercial banks and other payment service providers. It also encompasses real-time processing, advanced data-messaging, and the various standards to connect and exchange information. At the "front-end", it connects customers who make payments to merchants that accept payments.

Specifically, in-person acceptance features hardware and software that enables direct customer interaction at bank branches, local ATMs or POS terminals. POS terminals include card readers in stores, parking meters, and on public transport, each handling sensitive and private customer payment data. Before they can be used to handle and process payment instructions, these devices must be approved in order to comply with applicable international security standards. In 2022, there were 138 approved devices from 21 different manufacturers in New Zealand. Further, ATMs allow card holders to withdraw bank deposits as physical cash. ATMs are privately owned and operated by either banks, non-bank payment service providers, or independent ATM operators. Bank-owned ATMs are connected to other banks and are governed by CECS. This allows a customer to use their card issued by one bank at another bank's ATM ("guest use"), while the transaction is "on-us" for a customer of a given bank who uses his own bank's ATM ("home use"), see Dudson et al. (2022).

Regarding online payments, so-called online "payment gateways" enable merchants to accept payments over a website or via a mobile application. These payments include accepting debit, credit or prepaid card payments when the card is not present at the point of sale, or accepting mobile wallet payments. Generally, these gateways provide (technical) payment

services which permit payment instruction and authorisation of a specific payment instrument. To provide these services, online gateways receive, collect and exchange customer payment data on behalf of merchants. This may include storing private payment card information – potentially tokenized – to support e.g. recurring payments. Consequently, the management of processing and retaining (private) payment information is an important part of ensuring the security and validity of online payments, aiming to prevent fraud and criminal transactions. Based on a recent RBNZ report, it is difficult to determine the exact number of online gateways available in New Zealand (Dudson et al., 2022). In the New Zealand "market" for online gateways that process CNP payments, currently one of the largest players is the local payment service provider Windcave.

2.2 First observations and key questions

The retail payment system in New Zealand is made up of multiple electronic payment networks where the "incumbent" payment card (e.g. EFTPOS, scheme debit and credit cards) and bank transfer networks process the bulk of all electronic retail payments. Although some "new kids on the block" have arrived (Klarna, Apple Pay etc.), there are mixed signals about the efficiency and competitive potential of the New Zealand retail payment market.

The usage of the "cheap" EFTPOS network has been declining for some time now in favour of debit and credit card networks. In principle, low EFTPOS payment fees for both consumers and merchants should help to competitively restrain card networks such as VISA and MasterCard in setting higher fees. However, changing consumer preferences and "non-price" attributes also play a key role in choosing payment instruments. Specifically, payments initiated using contactless card technology, are getting more popular than the EFTPOS magnetic swipe

cards due to their ease of use, speed, and ability to avoid physical contact with high touch surfaces – a feature that became more important after the COVID-19 pandemic.

Additionally, credit and debit cards are typically more secure than the "old" magnetic stripe technology used by EFTPOS cards. Moreover, consumers have also fewer incentives to use EFTPOS cards – for instance, they do not earn reward points – and issuing banks face reduced commercial benefits as well, because they have to pay a switch fee rather than earning an interchange fee on scheme cards. Consequently, EFTPOS market share as measured by total value for in-person payments, relative to the share of combined Visa and Mastercard debit cards (contact and contactless), decreased with about 20 percentage points between 2017 and 2022 (NZCC, 2022).

The interbank payment network for bank transfers is widely used for in New Zealand. According to NZCC (2023), the total value of bank transfers settled in 2020 was 1.3 trillion NZD, of which 13 per cent was automatic payment, 24 per cent direct debit, 25 per cent bill payment and 38 per cent direct credit. Although bank transfers settle fast and induce the lowest direct costs for consumers and merchants, this payment instrument does not currently act as an effective competitive restraint at the point of sale in New Zealand. Merchants do not typically make this option available as its usage can be cumbersome. It requires the consumer to input the correct 16-digit account number at the point of sale which can also lead to "mistaken payments". On the merchant side, retailers – unless physically watching the consumer make the actual payment – may be unsure about the incoming payment until the moment the money arrives. That is, they do not have the ability to verify authentication in real time and may face reconciliation costs as well (NZCC, 2022).

To increase the competitive edge of bank transfers at the point of sale, new technologies seem required. For instance, in the Netherlands, the very popular in-person "payback" request via the mobile phone – called "Tikkie"– triggers a so-called "iDEAL" bank transfer payment.[5] These "Tikkies" are mostly used for consumer-to-consumer payments but may also be used at the point-of-sale. Additionally, QR code technologies may enable bank transfer payments at the checkout. This way, bank transfers may effectively start competing with scheme cards for in-person payments at the point of sale.

The question arises how to promote fair pricing, competition and efficiency in the retail payment system for the (long-term) benefit of merchants and consumers in New Zealand. As already mentioned in Section 1, what does the economic literature regarding payment systems say about:

1. Efficiency in the retail payment system (Section 3):

   How do we define "payment efficiency" and how can we gauge it empirically? What are its key drivers? And how can it be improved in the short, medium and long term?

2. Pricing and surcharging (Section 4):

   What drives optimal pricing in payment networks? What role does the "two-sidedness" of the payment market play? Is there an optimal level of surcharging and in which cases might surcharging be appropriate or inappropriate?

3. Competition within and between networks (Section 5):

   Why might a lack of competition arise, what problems would that cause and what does more

[5] iDEAL is a widely used online payment method in the Netherlands that enables consumers to pay online through their own bank; about 70 per cent of all online payments in the Netherlands are done using iDeal. Recently, iDeal was acquired by the EPI (European Payments Initiative) Company. In Sweden, Swish is a comparable mobile payment system that triggers online (instant) credit transfers between bank accounts.

competition look like? What are the effects of surcharges and interchange fee regulation on competition in the payment market? How does competition affect innovation in the payment market?

3. PAYMENT EFFICIENCY AND MARKET FRICTIONS

3.1 Payment systems and efficiency

Payment systems facilitate the exchange of goods and services for money and, as such, enable the economy to function. A payment system defines a set of instruments, laws and rules, procedures, and processes for transferring money. A payment – i.e. the transfer of money – involves sharing information and verifying instructions, in a process referred to as "clearing", and the transfer of funds to discharge the (monetary) obligation or claim, referred to as "settlement". Typically, clearing and settlement mechanisms specify the rights and responsibilities of the participants in the payment network – payers, payees, financial institutions – in combination with laws, rules and operating procedures of the payment system (BIS Glossary, 2003).

In general, consumers and businesses use retail payment systems, while banks and other financial institutions access wholesale – or large-value – payment systems. Retail payment systems support high volumes of lower-value transactions on behalf of consumers and businesses, and may not settle instantly. Instead, wholesale payment systems process much lower volumes but involve much larger-value transactions for financial institutions and government agencies and may use some form of real time or continuous settlement. Whereas most of the policy issues regarding wholesale systems concentrate on liquidity and operational risks, settlement mechanisms and participants' access, the policy focus of retail payment systems – and the focus of this report as well – has more been on cost and pricing, market power and competition, and incentives and innovation.

It is important to observe that payment systems consume substantial resources and therefore impose costs on society. Essentially, payment efficiency means that these scarce

resources are not wasted, and theoretically, it refers to the optimal allocation of resources used in payments systems over time.[6] This optimal allocation is attained when total economic surplus – the difference between total benefits and total resource cost – is maximized. Conceptually, total economic surplus takes into account all the "players" in the payment chain. That is, total economic surplus – often dubbed, total welfare – is equal to the sum of total consumer surplus and total merchants' profit and total profit of financial institutions (i.e. commercial banks, card networks and other payment service providers).

Depending on available market information, "first-best" market outcomes that yield maximum total welfare, are generally difficult to attain in practice. Therefore, in competition policy, "second-best" total user surplus – in this case consumer surplus plus merchants' profit – is frequently taken as an alternative benchmark. This total user surplus benchmark when applied to payment markets, translates to the difference between total (user) benefits and total (payment) prices (Rochet and Tirole, 2011). Interestingly, the "Merchant Indifference Test", or sometimes called "Tourist Test", as currently used by the European Commission (EC) to cap interchange fees on debit and credit cards in the EU is theoretically based on maximizing total user surplus – not on total welfare – and empirically estimated by using payment cost data regarding cash and card payments (EC, 2015).

The constantly evolving retail payment landscape has been largely shaped by increasing digitalization, regulatory changes and changing payment preferences with potentially a large impact on overall efficiency. Empirically, to gauge overall payment efficiency it is useful to look

[6] From an economic viewpoint, efficiency has a static and a dynamic dimension. Broadly, static efficiency encompasses production of goods and services at lowest cost ("productive efficiency") with output prices equal to marginal cost ("allocative efficiency"). Dynamic efficiency involves improving allocative and productive efficiency over time by developing new or better products, applying new technologies and innovations and finding better ways of producing goods and services.

at total social – or resource – costs (and, if measurable, total benefits) of providing retail payment services. In recent years, many countries have surveyed and calculated these retail payment costs (Bolt et al., 2016).

3.2 Payment cost-benefit estimates

As payment instruments differ in resource costs, differences in payment usage and habits lead to differences in cost efficiency of retail payment systems between countries. The total social costs of retail payments refer to the overall resource costs to society of providing payment services, and may be defined as the sum of costs borne by all parties in the payment chain across all payment instruments.[7] There is a wide variety of costs that may be incurred by the parties involved in payment activities.[8] Often, in these cost studies, three different payment instruments are considered – cash, debit cards, and credit cards – and four types of agents: *(i)* consumers, *(ii)* merchants, *(iii)* financial institutions including card networks and other PSPs, and *(iv)* central banks and finance ministries. *De facto*, these total social costs include bank cost, merchant cost and central bank cost. Consumer ("shoe-leather") costs are often ignored because these are typically hard to measure.[9]

[7] Adding up the private costs – that is, the payment cost incurred by each party individually – of all parties in the payment chain may result in measurement errors due to "double-counting" because fees paid by one party may be counted as revenue by another party. For example, interchange fees that card acquirers pay for each card payment they process are transfers to the card-issuing banks and therefore should not be counted as resource cost. In contrast, value of time and cost of maintaining infrastructures are part of the total resource cost (Shy, 2023).
[8] See Kosse et al. (2017) for a list of cost items across various payment activities, including ATM services, cash handling and card services, bank branch and checking account services, overhead and overall costs of staff, premises, information technology, communication, and equipment.
[9] Note, however, that access to cash as a basic means of payment may become a concern for governments now cash usage is in decline. For instance, a maximum distance of 5km to an ATM for (almost) every citizen in the Netherlands is the agreed standard by Dutch payment institutions as recorded in the Cash Covenant of April 2022 (De Nederlandsche Bank, 2022).

Surveying countries for which the overall costs of their retail payment system has been estimated, Hayashi and Keeton (2012) found it to range from 0.5 per cent to 0.9 per cent of GDP annually. Their findings corroborate an initial 2012 ECB study, based on a sample of 13 European countries, showing that the total social costs of retail payment instruments comprised around one per cent of total GDP and the costs of cash was found to represent the largest component (Schmiedel et al., 2012). In a more recent ECB (2012) analysis, based on eight European countries, it is shown that these social cost estimates still vary from 0.3 per cent (Finland) to 1.75 per cent (Hungary) of GDP. Overall, the costs of retail payments as a share of GDP have declined in most European countries for which cost data are available for two different points in time. Comparing the 2012 vis-a-vis 2022 ECB cost study, this holds for Denmark, Italy, Poland and Portugal.

In practice, the use of any payment instrument has trade-offs with other considerations. For example: the availability of payment terminals is a clear pre-condition for the use of cards; consumer cash flow considerations and reward programs influence the use of credit cards; with cash some merchants do not accept high-value notes due to counterfeiting concerns; and some merchants exclude card use for low-value payments to avoid high merchant discounts on those transactions. On the supply side, cost considerations have induced banks to shift consumer cash acquisition away from branch offices to cheaper ATMs, and away from cheques and cash to less expensive debit cards or more profitable credit cards. Large investments in internet connectivity with dense, high-capacity networks are necessary to be able to expand digital payment technologies and online banking applications for providing and processing point-of-sale payments. In addition, banks have outsourced some of the payment services related activities to (high-tech) non-bank third parties (“fintechs”) in order to bring costs down (CPMI, 2014). Due

to their specialized nature, these third parties may enjoy economies of scale and scope by offering their services to several banks. In particular, their recent entry into global payment markets may disrupt current business models and traditional fee structures (Doerr et al., 2023).

Payment costs differ widely, depending not only on payment habits but also on the size of the country– showing the influence of payment scale economies – and partly on the size of the transaction. Generalizing from various studies, it seems safe to say a debit card is less costly than a cheque (in jurisdictions where they still exist), which, in turn, is less costly than a credit card, and that cash costs rise significantly with higher transaction values.[10] Data from the EU ranks the (unit) social costs as: cash (lowest), to debit card, to credit card (highest) which is basically the same as that for the U.S. for transactions less than $50 (ECB, 2022; Garcia-Swartz et al., 2006). However, within the EU there is quite some heterogeneity regarding the social costs of payment instruments. In countries where debit card usage is high, such as in Denmark, the Netherlands, Finland, and Norway, the social costs of debit card payments are lower than cash payments due to payment scale economies (Norges Bank, 2014; Danmarks Nationalbank, 2016; Jonker, 2013; Segendorf and Jansson, 2012; Bank of Finland, 2022). In all, Nordic countries turn out to have the most cost effective retail payments systems where total social costs approximately amount to 0.50 per cent of GDP. Their payment behavior is characterized by low cash usage, high card and credit transfer usage, low or no cheque usage and intermediate usage of direct debits.

Using Bank of Canada data from 2014, Kosse et al. (2017) report that the total resource costs of cash and card payments amounted to 0,8 per cent of GDP. They find debit cards to be

[10] Note that, in general, each payment method triggers transaction-related (variable) costs that fluctuate with the number of transactions and value-related (variable) costs that depend on the transaction size. Usually, the variable cost of a (debit) card payment does not vary much with the transaction size whereas it does for a cash payment. As a result, this means that for small payments cash may be cheaper than a card payment from a social cost point of view. Moreover, observe that in countries where cash usage is still high, the unit social costs of cash can be the lowest across all payment instruments because of this volume component.

the least costly in terms of total resources, followed by credit cards, whereas cash is the most costly. On average, debit cards are also the least costly in terms of resource costs per transaction (volume) as well as resource costs per dollar transacted (value). Credit cards carry the highest resource cost per transaction, while cash is most costly in terms of resource costs per dollar transacted. However, cash is still the least costly payment method with respect to variable resource costs for payments up to $6. With respect to retailers' variable cost, the authors compute $20 as the threshold payment value below which cash is the least costly and above it debit cards are the least costly.

A recent 2021 study of costs and revenues of retail payment services for financial institutions in the Netherlands shows that payment services for banks are loss-making which is partly caused by increased risk and compliance costs. Despite this loss, the Dutch payment systems is highly efficient, with transaction volumes having more than doubled in 15 year time whereas the costs have only risen by around 5 per cent. Bank costs of providing retail payment services amounted to 0.30 per cent of GDP in 2021, which represents the bulk of total resource costs (McKinsey, 2022).

Although some economies of scale exist in cash and paper-based payments, they are much greater for electronic payments because the fixed expenses (building, computer, software, and other overhead expenses) are large relative to their variable costs (labor, telecommunication, and materials expenses). If all costs were variable and none were fixed, then the scale measures would equal 1.00 indicating that a doubling of payment transactions would also double total costs, resulting in constant average cost as transactions expanded. Estimates of payment scale economies in Europe based on bank and processor data are quite large, in the order of 0.30 for electronic instruments so a doubling of output results in only a 30 per cent rise in total costs (Bolt

and Humphrey, 2007; Beijnen and Bolt, 2010). This implies that consolidation of payment processors across countries in Europe could generate substantial reductions in payment costs, similar to those in the U.S. following the Federal Reserve's consolidation of its separate U.S. regional wire transfer operations into a centralized facility (Hancock et al., 1999). Lower payment costs should facilitate the emergence of a more competitive cross-country product market as was also envisioned by the EC and the European System of Central Banks (ESCB) in creating the Single Euro Payments Area (SEPA).

However, even with large economies of scale and rapid technological advances, card payments have remained expensive for merchants in many countries. Apparently, in the payment industry greater cost efficiency does not necessarily go hand in hand with lower user fees. This disparity, further discussed in Section 4, has triggered a great deal of merchant dissatisfaction and led to some spectacular antitrust litigation in e.g. Europe and the United States.

3.3 Complexity, market frictions and regulatory framework

As a point of departure in economics, fierce competition forces producers to deliver products and services at cost. However, market competition is rarely perfect, markets fail, and market power must be kept in check. The essence of regulation is to ensure that "undeserved" market power – often as a result of market frictions – does not translate into high overall prices and low quality (Tirole, 2014).

General policy objectives with respect to payments typically translate to *i)* cheap (low prices of goods and services), *ii)* secure (low fraud risks), *iii)* convenient (wide acceptance) and *iv)* accessible (to any individuals or businesses). If frictions prevent payment markets to attain these objectives "on their own", regulatory action may be needed. Broadly, three types of

regulations are addressed to payments:

- Legislation to lower prices and costs ("raise allocative efficiency"; interchange fee regulation is an example),
- Legislation to support competition and innovation ("lower barriers to entry and exit"; EC's PSD2/3 regulation is an example),
- Legislation to enhance accessibility ("ensure access to basic payment means"; national directives specifying a maximum distance to the nearest ATM is an example).

As noted before, payment markets are complex and they may exhibit a combination of market frictions that require the attention of regulatory authorities (Bolt and Chakravorti, 2012):

First, "two-sided" network effects cause interdependencies that affect the pricing structure of payment instruments, in particular the setting of interchange fees and surcharges in payment card markets. Economic models of two-sided markets suggest that competition among network operators may not yield efficient market outcomes and may even worsen total welfare.

Second, there may be coordination problems among the large number of participants, preventing large capital expenditures or the setting of industry-wide standards, inhibiting long-run growth and development of modern and innovative payment solutions.

Third, overall strong network effects exist in the provision of payment services because of the connectivity required between millions of payees, payers, financial institutions and payment networks, and other payment service providers.

Fourth, considerable economies of scale and scope in retail payment systems may lead to highly concentrated markets with few payment networks because of high barriers to entry for new parties, also raising potential concerns about significant pricing power.

Fifth, consumer and merchant incentives to keep vital payment information secure and investments into fraud mitigation systems by payment providers may not be aligned to achieve the socially desirable level of prudent behavior by market participants. This may require the central bank or another government agency to step in.

Much of the complexity in payment markets derives from its "two-sidedness" which has a fundamental impact on payment pricing and price structure. Two-sided networks – or "platforms" – bring together multiple groups of end-users that want to interact or transact together. Many examples come to the fore: gamers and game developers for videogames; users of operating systems and app developers for operating systems; "eyeballs" and advertisers for search and media platforms; and in our case, cardholders and merchants for payment card transactions. The key challenge for two-sided markets is to find a viable business model – and an appropriate price structure – that gets both sides "on board" (e.g. Rochet and Tirole, 2002; Armstrong, 2006).

In general, two-sided platforms choose to allocate a lower burden to the side – say consumer side – whose presence benefits most users on the other side – say retailer side. As a consequence, platforms charge the retailer side a higher price to exploit its willingness to pay. Like ordinary businesses, two-sided platforms choose a lower burden for the side which has a relatively elastic demand (often the consumer side). In two-sided markets, optimal pricing may often lead to very "skewed" pricing patterns, with one side paying nothing (free search engine, portal or magazine) or even negative prices (cardholders receiving loyalty points), while the other side is heavily charged (e.g. Bolt and Tieman, 2008; Schmalensee, 2011). Importantly, competition in two-sided markets may not always lead to welfare improvements because two-sided competition may "overshoot", in the sense of being too aggressive on the consumer side

tilting the price structure too much against the retailer side even from a social point of view (see Section 5)

The industrial organization (IO) of two-sided markets (viz. skewed pricing and "unexpected" competition effects) has underlined the potential antitrust fallacies that can arise from using conventional wisdom based on "one-sided" economic logic in two-sided market settings (Wright, 2004a; Evans and Schmalensee, 2016). That is, a regulator who does not fully understand the nature of two-sided markets might misleadingly treat the two sides of the market in isolation. Consequently, it may view the low prices on one side as "predation" and judge high prices on the other side as "excessive". Skewed pricing is a typical feature of two-sided markets that are characterized by indirect ("cross-group") network effects and a certain degree of skewness may be necessary to obtain socially optimal outcomes.[11]

Naturally, this does not mean that competition authorities can "sit back and relax". Two-sided markets require careful regulatory attention, particularly when provided platform services are not the only route for a purchase (Tirole, 2014). For instance, VISA provides the cardholder with a payment service, but other payment instruments such as cash, check, or other payment cards may also be available. Similarly, regarding travel bookings, a holiday apartment can either be booked through an online platform, such as AirBnB, or directly via the phone or own website. Usually, two-sided platforms charge a merchant (or seller) fee under the restriction of uniform pricing – also dubbed "price coherence" – meaning that the merchant (or seller) is not allowed to surcharge the "platform user" for a transaction relative to a "platform non-user".[12] While

[11] Filistrucchi (2018) stresses the importance of two-sidedness for competition policy. He notes that the risk of applying a one-sided SSNIP ("Small-but-Significant-Non-Transitory Increase-in-Price") test – which does not incorporate these cross-group feedback effects – is that the two markets may be defined too narrowly.
[12] See Edelman and Wright (2014) for an elegant theoretical framework analyzing price coherence and excessive platform pricing; see Farrell (2006) for an early analysis of price coherence in retail payment systems.

uniform pricing can often be justified on firm economic grounds (e.g. it prevents surcharging "hold-ups" by the merchant, see Section 5), it also creates a negative external effect when high merchant fees are (partly) passed through onto customers (or other third parties) who do not use the platform. This "free-rider" problem puts excessive upward pressure on merchant fees. Hence, the market failure in this case is not the skewed pricing structure but the negative external effect on the "platform non-user".

In case of card payments, to correct this externality the merchant fee should just be equal to the benefit that the merchant derives from a card payment (Rochet and Tirole, 2011). Empirically, this fee would make the merchant cost-indifferent between accepting a card payment and rejecting it in favor of a cash payment (or receiving the payment via another "best alternative" instrument). The consumer, who essentially decides on which payment instrument is used at the point of sale, then exerts no externality on the merchant. This "Pigouvian" principle which is based on "avoided costs" – i.e. avoiding the high direct cost of a card payment by steering to a cash payment – has now been applied since 2015 by the EC for regulating interchange fees for so-called four-party networks such as VISA and MasterCard (EC, 2015).

4. PAYMENT PRICING AND NETWORK STRUCTURE

4.1 Payment network structure

Network structure is important to understand the underlying economics of retail payment systems. Most electronic transactions occur in three- or four-party networks. These networks are composed of consumers and their banks, known as "issuing banks", as well as merchants and their banks, known as "acquiring banks" – the so-called "four-corner model". Issuing and acquiring banks are part of a payment network that sets the rules, practices and standards for the clearing and settlement of payments among its members. These (open) payment networks – sometimes called "schemes" – are often regarded as the fifth player in the four-corner model (e.g. VISA network or scheme). In a (closed) three-party network the issuer and the acquirer are of the same identity (e.g. American Express network or scheme).

Although a similar network structure applies to other types of electronic payment instruments, such as credit transfer and direct debit payments, card payment networks are typically the most complex in terms of market participants, flow of funds, and fee structures. Moreover, mobile payments – point-of-sale payments made through a wireless device such as a mobile phone or tablet – are often also routed as card payments. The network structure for the card payment industry is described below. In Figure 1 (see appendix) the four main players – plus the payment network – are shown along with interactions with one another in the card payment industry.

First, a consumer establishes a relationship with an issuer (usually a bank) and receives a debit card or a credit card or both. Consumers often pay annual card membership fees to their issuers. They generally are not charged a per transaction fee by their banks and some payment

card issuers give their customers a reward for each transaction, such as cash back or airline miles.

Second, a consumer makes a purchase from a merchant. Merchants have often been restricted (by legislation or by contract with the card firm) from charging more for purchases that are made with payment cards. These are called "no-surcharge" rules. However, these practices have been changing over time and whenever it is allowed, merchants may use surcharges or price discounts to recover part of their payment cost or to steer consumers to use payment instruments that are less costly.

Third, if a merchant has established a relationship with an acquirer, it is able to accept payment card transactions. Merchants' costs of card acceptance involve fees that are divided among issuers and acquirers. Broadly speaking, the merchant pays either a fixed per transaction fee (more common for debit cards) or a proportion of the total purchase value (more common for credit cards), but more complicated tariff schemes are possible.[13] These fees, known as merchant discounts or merchant service charges, are paid to the acquiring bank. For credit cards – depending on jurisdictions and regions – the merchant discount can range from half a per cent to five per cent depending on the type of transaction (debit or credit card), the product class sold by the merchant (luxury versus low value items), the type of card (reward or not), and if the card is present for the merchant to physically swipe.

Fourth, the acquirer pays an interchange fee to the issuer, which generally makes up a large portion of the merchant discount. Interchange fees that are set by the card schemes have recently attracted a lot of antitrust scrutiny by competition authorities as real concerns exist over

[13] Shy and Wang (2011) suggest that proportional fees may not only be more profitable for card networks but also socially efficient when card networks and merchants enjoy some market power.

whether the level of these fees reflect the ability of card networks to exercise market power and charge uncompetitive prices.

Fifth, strictly speaking, the card scheme does not receive interchange but collects network fees – e.g. processing and scheme fees – from both issuers and acquirers with every swipe of the payment card.

Generally, credit ("giro") transfer and cheque payment networks are not as complicated.[14] Although two banks are usually involved and there are costs incurred by the parties sending and receiving funds, there is usually no revenue transfer among the banks engaged in the transaction as there is for a card payment. However, direct debit and ATM fee structures may also involve some interchange. With ATM cash withdrawals the bank owning the ATM usually receives a compensation for the use of a customer of another bank. Often, customers are charged differently for "home" and "guest" use, and sometimes a direct fee for using the teller machine is applied on top.

To get some feeling for the magnitude of these payment fees, Wang (2023) calculates the typical flow of fees for a $100 credit card payment in the U.S. Figure 1 illustrates these money flows (in brackets) between the players in the network. When a U.S. consumer uses her credit card to buy $100 of product at a retailer, the merchant pays on average a $2.25 merchant discount fee to her acquiring bank to process the card transaction. The acquirer will use some of that fee to cover its costs but must also forward an interchange fee of $1.75 to the issuing bank. The issuer and the acquirer jointly pay around $0.14 in network (i.e. processing and scheme) fees to the credit card scheme. While some of the $1.75 covers the issuer's costs, a large part is

[14] Paper-based credit transfers and direct debits as well as cheque payments are fading out in most advanced economies. As a result, remote payments in the form of electronic credit transfers or direct debits via online bank solutions are now heavily used.

returned to the consumer as a reward. On average, for a credit card, the rebate is $1.30. Some critical issues arise why merchants pay these high card fees – thereby financing consumer rewards – while consumers that do not have access to credit cards end up paying for other people's rewards through higher goods' prices. These issues directly point to the two-sidedness of the payment market.

4.2 Pricing principles and two-sidedness

A key externality in payments pricing is the ability of the network to convince both consumers and merchants to participate in a payment network. A "chicken-and-egg" problem arises: consumers will not use a payment instrument if merchants do not accept it, and merchants will not accept an instrument when consumers do not see value in using it.

In a seminal paper, Baxter (1983) argued that pricing the consumer and merchant side of the market separately, based on each side's incurred marginal cost, need not yield the socially optimal allocation because the usage externality has not been taken into account. Therefore, an interchange fee that transfers revenues between the issuer and the acquirer may be required to "get the network going". It is debatable whether this arrangement is still necessary given that most consumers and merchants now have and accept cards. If merchants imposed a surcharge on card transactions to share the cost, cards would not disappear even though their growth may be initially reduced. Convenience and habit would, over time, offset the likely negative influence of the surcharge because cash must be acquired to be used and requires record-keeping. Use of a payment card takes less time and record-keeping is "automatically" provided in the monthly statement or available in real time using an online banking application (Bolt and Chakravorti, 2012).

To study the optimal structure of fees between consumers and merchants in payment markets, economists have developed the two-sided market framework.[15] As a commonly used definition, in a two-sided market one or more platforms enable transactions between two different groups of end-users – e.g. consumers and merchants – such that the price structure affects the total volume of transactions. A key friction in two sided markets is uniform pricing, or price coherence, meaning that consumers pay the same price of the good or service irrespective of how they pay. Under uniform pricing, consumers do not internalize the effect of their payment choice on retail prices and total welfare, because they are incentivized to use cards to earn rewards. Consequently, high merchant fees are in part passed through to "third parties", namely consumers who do not use cards. High rewards at the expense of high merchant fees has triggered several antitrust litigations around the world.

Rochet and Tirole (2002) extended Baxter's analysis by considering strategic interactions of consumers and merchants. In their two-sided model, issuers have market power, but acquirers operate in competitive markets. Thus, any increase in interchange fees is passed onto merchants completely. Rochet and Tirole (2002, 2011) found that the profit-maximizing interchange fee for the issuers may be more than or equal to the socially optimal interchange fee (i.e. the interchange fee that maximizes total welfare). Moreover, merchants are willing to pay more than their direct convenience benefit if they can attract or retain customers from their competitors. In this context, Rochet and Tirole (2011) refer to "must-take cards" and "weak merchant resistance". Under uniform pricing, merchants might actually prefer an alternative payment at the point of sale –

[15] In the last two decades, a large body of literature on two-sided market theory has been developed to evaluate payment pricing and card market competition issues, see e.g. Schmalensee (2002), Rochet and Tirole (2002, 2003, 2006, 2011), Gans and King (2003), Wright (2003, 2004b, 2012), Guthrie and Wright (2007), Kahn and Roberds (2009), Prager et al. (2009), Rysman (2009), Verdier (2011), Evans (2011), McAndrews and Wang (2012), Bedre and Calvano (2013), Rysman and Wright (2015), Wang (2016), Mariotto and Verdier (2017), Li and McAndrews (2020) and Wang (2023). For a recent overview of two-sided markets, pricing and network effects, see Julien et al. (2021).

such as cash – to avoid high card fees but they are too "weak" to refuse a card payment.[16] The reason for this is two-fold: a merchant may want to attract and retain (informed) customers by accepting cards and/or he may be afraid that outright card refusal will lead to lost sales – with potentially high margins – from (unaware) customers. Either way, the merchant perceives the card as a "must-take card."[17]

4.3 Ability to surcharge and payment steering

Historically, in many countries and jurisdictions, merchants were often not allowed to surcharge card payments because of legal or contractual restrictions even though the merchant cost of accepting a payment card – especially credit cards – is generally higher than for other payment instruments. However, over the past decade, several countries lifted the no-surcharge rule imposed by card networks. These payment reforms were conceived as a way to reduce the fee-setting power of card networks, as merchants could now pass high card fees directly through to cardholders.

Conventional wisdom holds that if merchants were able to recover the cost of accepting different payment instruments directly from consumers – applying price differentiation according to the payment method – the "two-sided" frictions in payment pricing would be "neutralized" and the fee structure would no longer matter for the total volume of card transactions.[18] Although

[16] In the payment literature, the case of cash versus cards is often taken as the starting point in the analysis, but debit cards (as a best payment alternative) versus credit cards may apply as well for point-of-sale payments. In a recent PSR market review report for the U.K., bank transfers were taken as the best alternative ("comparator") to credit cards for "outbound" card-not-present payments (PSR, 2023; p. 23).

[17] Extending credit to liquidity constrained households, or credit provided by the merchant in the form of store credit, may also increase merchant attractiveness by accepting credit cards (Chakravorti and To, 2007; Rochet and Wright, 2010).

[18] In a consumer-full-information environment, Rochet and Tirole (2002) show that, besides making the interchange fee irrelevant, surcharging leads to an underuse of cards and may increase or decrease welfare; this depends on two opposing distortions: the overuse of cards induced by the platform's exploitation of the "must-take" nature of the card, and the underuse of cards due to issuer market power. Gans and King (2003) prove as

the initial impact on card-based payments would be significant, payments cards would not disappear. Yet, even when it is legally allowed – with some exceptions in some jurisdictions – card surcharging remains infrequent or limited in magnitude in most industries across countries (Stavins, 2018). Rather than imposing surcharges, merchants typically choose to implicitly subsidize consumer card usage by absorbing the fees imposed by the card platform. Moreover, there is not (yet) much empirical evidence that platform fees decreased in reaction to the possibility of card surcharging (Gomes and Tirole, 2018).

The standard modeling of the "must-take" card argument is either based on merchant attractiveness or on missed sales. That is, card acceptance makes the merchant more attractive to consumers by offering an additional payment option ("quality of service") or it reduces missed sales from consumers who come to the store and dislike to pay with cash. These two channels – that crucially differ in their underlying informational assumptions – lower merchant resistance so that payment platforms can charge a merchant fee beyond the socially efficient level.[19]

Whereas Rochet and Tirole (2011) focus on merchant attractiveness and quality of service, Bourguignon et al. (2019) analyze the impact of card surcharging and cash discounting and its potential regulation in a theoretical model of missed sales under imperfect consumer information. A missed sale occurs when the customer is in the shop and eager to buy, but dislikes cash (due to a high inconvenience cost of paying by cash), and is discouraged by either a high card surcharge or an outright rejection of the card. High mark-ups make the merchant particularly wary of missed sales, thereby reducing merchant resistance even further.

well that when surcharges are allowed the impact of the interchange fee on card usage is neutralized. However, excessive surcharges may shy consumers away from using cards and decrease total welfare. See also Wright (2003, 2012).

[19] Note that merchant attractiveness hings on perfect consumer information, while the merchant's concern about missed sales is only relevant under imperfect consumer information.

Bourguignon et al. (2019) conclude that, if given the choice, merchants always opt for a card surcharge (a "rent extraction" device) that brings in additional revenue over a cash discount (a "give-away") that benefits customers.[20] Most importantly, due to consumer "hold-up" at the point of sale, merchants are able to impose high card surcharges. As such, the merchant will always "overshoot" and surcharge card users too much. Consequently, in their model, surcharging will generally yield too few card transactions from the point of view of social efficiency. Only when the merchant fee is excessively high – i.e. higher than some threshold under uniform pricing – allowing card surcharging may increase total welfare.

Moreover, it is theoretically argued that if the no-surcharge rule is lifted, interchange fee regulation is harmful for total welfare. Regulatory attention should in this case shift to merchants, rather than focusing on card networks. If surcharging is to be allowed, the optimal cap is equal to the merchant fee minus the merchant's convenience benefit from card payments. In other words, the merchant should not surcharge more than his own incurred "transaction" cost of a card payment. This result is perfectly in line with the proposed "merchant indifference test" or "tourist test" to optimally cap merchants fees keeping the merchant indifferent between a cash payment vis-à-vis a card payment. Yet, recent cost-based surcharge regulations seem too lenient, as they allow surcharges up to the merchant fee – or even higher (Gomes and Tirole, 2018).

Recent legislation and court settlements allow U.S. merchants to use price discounts to steer customers to pay with means of payment that are less costly to merchants. Briglevics and

[20] In an extensive review article on payment cards, Rysman and Wright (2015) observe (without specifying a model) that card surcharges may play a similar role to that of "add-on" (or "drip") prices for ancillary goods or services (e.g., shipping, assembly, luggage allowances, card payment). Consumer hold-up concerns have led to ancillary good regulations, such as mandated transparency and price caps, but in many retail settings ancillary good prices are set below cost, or even below zero as "give-aways". Similarly, in a "one-sided market" framework, Gomes and Tirole (2018) argue that the seller may absorb partly or fully the ancillary good's cost so as not to miss sales on the basic good, particularly when mark-ups are high; see also Edelman and Wright (2015).

Shy (2014) found that steering consumers to debit and cash via simple price discounts reduces most merchants' card processing cost. However, this reduction is small and may be insufficient to offset the increase in the cost of administering price menus that vary by payment instrument, which may be another reason why such discounts have not been offered more widely in the U.S.

Based on the 2019 Consumer Payment Survey (CPS), Caddy et al. (2020) provide evidence of limited surcharging in Australia. The survey showed that a surcharge was on average paid in 4 per cent of the reported card transactions in 2019. When measured as a percentage of the transaction value, the median surcharge was 1.5 per cent. In value terms, the median surcharge declined from 80c in 2016 to 60c in 2019, which is consistent with increased use of cards for lower-value purchases between 2016 and 2019. In the 2019 CPS, to assess the issue of "merchant attractiveness" and/or "missed sales", participants were also questioned about their typical response when they face a merchant who levies a surcharge on some payment methods. Around 50 per cent of respondents indicated that faced with a surcharge they would instead choose a non-surcharged method to make the payment. A further 20 per cent of respondents replied they would pay a surcharge to use their preferred payment method and around 25 per cent would avoid shopping at that merchant. The possibility of losing business may explain why many merchants choose not to apply a surcharge on card payments.

Finally, the Netherlands offers an interesting case. In 2006, a significant number of Dutch merchants were surcharging debit transactions for purchases below €10. Those surcharges were largely "overshooting" the merchant debit card fee – on average, four times higher than the merchant fee. Once these surcharges were removed, consumers started using their debit cards for smaller payments. They were also encouraged to do so by a nationwide public campaign, that started in 2007. The campaign's aim was to improve the efficiency and safety of the retail

payment system by increasing debit card usage for small amounts at the expense of cash. It stimulated small merchants to accept debit card payments and to remove any surcharges for small debit card payments, and it encouraged consumers to use their debit card more often. The campaign was a joint initiative of commercial banks and retailers. This strategy turned out to be successful. It contributed to the growth in debit card volume by almost 11 percentage points in 2009; more than half of that growth came from payments below €10 (Bolt et al., 2010; Jonker et al., 2015).

4.4 Consumer price incentives and merchant pass-through

There is not much empirical evidence on how strongly consumers respond to price incentives in retail payment markets. Despite the differences in cost among payment methods, there are almost no differences in prices faced by consumers – consumers typically view their transaction as being "free".[21] Therefore, the effect of price incentives on the use of payment methods is an important economic issue.

However, as an early exception, since the mid-nineties Norway has been broadly implementing per-transaction fees for both consumers and businesses. It overcame antitrust concerns by coordinating only the timing of when per-transaction pricing of consumer payments would start – not the level of prices to be charged. The largest banks started by implementing a positive charge while other banks kept them at zero, expecting to gain market share. When this did not generate much of a gain, the zero fees were raised to values charged by other banks. Bolt,

[21] This does not apply to business payments that regularly carry per transaction fees and are not "free" on the margin. The different treatment for business transactions is because payment volumes differ considerably across firms so, unlike the situation for consumers where this variance is much smaller, banks need per transaction fees to recover their costs – not charge all firms the same fee based on the average number of business transactions across all firms.

Humphrey, and Uittenbogaard (2008) analyzed the effect that consumer transaction-based pricing had on the adoption rate of electronic payments in Norway in contrast to the Netherlands, which did not have per transaction pricing for consumers. Controlling for country-specific influences, explicit per-transaction payment pricing (as expected) induced consumers to shift more rapidly to lower-cost electronic payment instruments.

Despite the gradual repeal of no-surcharge rules and laws, U.S. merchants are reluctant to pass on merchant fees to consumers. Based on data of the U.S. Diary of Consumer Payment Choice (DCPC) from 2012, Stavins and Shy (2015) find almost no evidence that merchants either surcharge card payments or provide discounts for cash payments, with the exception of cash discounts given by gas stations and small service providers. Using the 2015 DCPC data, Stavins (2018) analyzes how price discounts and surcharges based on payment method affect payment instrument choice. She reports low incidence of surcharges and discounts as well: only around 1 per cent of card transactions incur a surcharge and circa 2 per cent of cash transactions earn a discount. Although Stavins (2018) finds the occurrence of price incentives to be low, the probability that a cash transaction is conducted by a consumer who prefers other payment methods increases by 19.2 per cent if cash discounts are offered.[22]

In a recent paper, Felt et al. (2021) use novel datasets from different sources to calculate U.S. and Canadian consumers' net pecuniary costs of making payments at the point of sale across income cohorts. These net costs include merchants' cost of accepting payments that is passed to consumers as higher retail prices, payment card rewards, and payment fees (such as ATM fees, annual card fees, monthly checking account fees) paid to financial institutions. In

[22] There exists evidence that reward programs can steer consumers toward greater card use (Ching and Hayashi, 2010). Amromin et al. (2007) utilize data on toll payments on the Illinois Tollway and find that consumers switched fast to electronic toll payments when toll fees doubled for cash payers. See also e.g. Agarwal et al. (2010), Arango et al. (2015), and Shy (2023).

their analysis, merchants pass through their cost of accepting payments to consumers by raising retail prices by a fixed percentage. In other words, it is assumed that merchants neither surcharge credit card users nor offer discounts for cash and debit card users, which is *grosso modo* in line with observed merchant behavior in the U.S. and Canada (Stavins, 2018).

In their baseline scenario, it is assumed that merchants pass through 90 per cent of their cost to consumers through all goods and services they sell.[23] They find that credit card transactions are cross-subsidized by cheaper debit and cash payments. Consequently, consumers in the lowest-income cohort pay the highest net pecuniary cost as a percentage of transaction value, while consumers in the highest-income cohort pay the lowest. These regressive effects remain robust under (almost) all the assumptions, both in the U.S. and Canada. One way to mitigate regressive distributional effects would be to reduce (credit) card rewards along with (credit) card interchange fees to the level where issuers' net interchange fee revenues remain the same.

Using Spanish sectoral data to estimate a two-sided card payment model, Shabgard and Asensio (2023) find that a 1 per cent reduction in the level of the interchange fee leads to a (long run) 0.17 per cent reduction in the retail price index. This "overall" pass-through rate of 17 per cent is derived from an estimated "acquiring" pass-through rate of 39 per cent (i.e. the pass-through from interchange fee to merchant fee) and "merchant" pass-through rate of 44 per cent (i.e. the pass-through from merchant fee to retail price) – note that $0.17=0.39\times0.44$. Interestingly, the estimated merchant pass-through rate of 44 per cent compares well with the 66 per cent

[23] Felt et al. (2021) select 90 percent as pass-through rate, as it is approximately the midpoint of long-run pass-through rates onto retail prices resulting from industry-wide cost changes estimated in previous empirical studies of U.S. industries. They vary the pass-through rate in a robustness test. Wang (2023) estimates a two-sided structural model of payment competition where merchants fully pass on merchant fees into higher prices because of an assumed CES demand structure.

obtained by the European Commission from a variety of sectors in different European countries (EC, 2020). Yet, the estimated acquiring pass-through rate of 39 per cent is substantially higher than the rate of 17 per cent estimated by Ardizzi and Zangrandi (2018) for Italy using payment data between the 2015–2017, or the rate of 21 per cent found by Chang et al. (2005) for Australia using VISA card payment data between 1993-2005. Other things equal, these results seem to suggest a higher intensity of competition in the Spanish acquiring market relative to Italy (or Australia at that time).[24]

[24] Shabgard and Asensio (2023) find limited pass-through effects via the issuing side of the market. Lower interchange fees did hardly affect card usage on the consumer side.

5. PAYMENT COMPETITION AND PRICE REGULATION

5.1 Payment competition, cooperation and innovation

Due to its two-sidedness, competition in the payments market is different from competition in most other markets. On the one hand, payment service providers (mostly banks) that either act as issuer or acquirer of a specific payment instrument within a payment network need to agree on certain rules and standards in order to ensure an efficient and secure processing of the transactions initiated by payers and accepted by payees. This requires close cooperation between issuers and acquirers within a network. On the other hand, issuers need to compete with each other in order to attract payers and acquirers need to compete with each other in order to attract payees. They can do so by competing on fee levels or by offering additional benefits for end-users in the form of new services next to the core services offered by all service providers within the network (Bolt, 2013).

Competition authorities examine whether the extent to which service providers cooperate within a network is necessary for its secure and efficient functioning or whether it tends to reduce competition without leading to sufficient benefits for end-users. In that respect, recent regulatory, legal, and legislative actions in e.g. the U.S., Europe, and Australia have targeted payment fees and practices deemed inefficient, unfair, or uncompetitive. Unfortunately, the effects of competition in payment markets are hard to determine since available (granular) data on bank payment costs are still limited.

Standard economic theory has shown that competition among suppliers of goods and services generally reduces prices, increases output, and improves welfare. However, “two-sided” payment competition may yield an inefficient price structure. In particular, payment competition may result in low or negative consumer fees (i.e. offer a reward) if issuers compete too

vigorously on the consumer side, tilting pricing heavily against merchants (Bolt and Tieman, 2008; Wright, 2012).[25] Moreover, determining the degree of competition (or substitution) between payment instruments – such as cards versus cheques or giro payments at the checkout in retail locations or cash versus cards at online webstores – is limited because not all instruments can easily substitute with others at the point of sale or for online shopping and bill payments.

Payment competition brings additional complexities. Consumers and retailers may participate in different networks at the same time. In particular, many consumers carry cash, debit and credit cards in their wallet, while many merchants accept cash, debit and credit cards in their store. When end-users participate in more than one network, they are said to be "multihoming"; if they connect to only one network, they "singlehome" (Rysman, 2007).[26] As a general finding, competing networks try to attract end-users who tend to singlehome, since – in a two-sided market – attracting them determines which network has the greater volume of business (Guthrie and Wright, 2007). Most of the literature so far has explored the effects of competition between profit-maximizing platforms and finds that, in general, competition results in excessive card usage due to over-subsidization of the consumer side (e.g. Bedre-Defolie and Calvano, 2013).[27]

Recent papers in the IO literature are making progress to better understand the specific impact of competition in payment markets. For instance, Huynh, Nicholls and Shcherbakov

[25] Other papers on (two-sided) payment competition include e.g. Rochet and Tirole (2003), Chakravorti and Roson (2006), Guthrie and Wright (2007), Bedre-Defolie and Calvano (2013), Rysman and Wright (2015), Kay et al. (2018), Huynh et al. (2022), Wang (2023).

[26] Rysman (2007) shows that consumers concentrate their spending on a single payment network (singlehoming), although many maintain unused cards that allow the ability to use multiple networks (multihoming). Put differently, consumers tend to singlehome on usage, but multihome on membership.

[27] In Bedre-Defolie and Calvano (2013) consumers make membership and usage decisions, while merchants only make membership decisions. This asymmetry in decision-making between consumers and merchants generates inefficiently high merchant fees in a competitive setting. See EC (2021) for a report on the impact of multihoming in (online) platform markets.

(2022) estimate a structural model of the equilibrium in the payments market to quantify the network externalities and determinants of consumer adoption and merchant acceptance decisions. Their estimates for the Canadian point-of-sale retail market imply an inefficiently high level of credit card use, while their counterfactuals suggest that the welfare maximizing interchange fee would be lower than the one observed in their sample. Halaburda, Soojin and Shcherbakov (2022) dig further into the specifics of different structures of card payment schemes, such as the four-party scheme (e.g. Visa and MasterCard) and the three-party scheme (e.g. American Express). In this model setting, the authors show that increased competition between card networks results in overuse of cards, while increased competition among merchant acquirers lowers fees for merchants. Empirically, the net effect on total welfare depends on which "force" is more dominant.

In a recent paper, Wang (2023) studies study how regulation, private and public entry of service providers in the payment market affect prices, distribution, and welfare in equilibrium. He models consumer adoption and merchant acceptance of multiple cards, merchant pricing, and network competition, and estimates the model by matching U.S. data on consumers' card holdings, merchant acceptance, network fees, and effects of debit rewards reductions.[28] The estimated model matches external evidence on networks' costs, merchants' margins, and the effects of recent cuts in merchant fees by Amex in 2016-2019. Crucially, in Wang's analysis, uniform pricing is assumed. Under uniform pricing, card payment networks compete by raising merchant fees to fund rewards. As such, cardholders benefit from the full increase in rewards but only bear part of the cost of higher retail prices. When merchants pass on merchant fees into

[28] For competition effects in theoretical models of two-sided markets with multihoming on both sides, see Belleflamme and Peitz (2019) and Halaburda and Bakos (2020).

higher retail prices, cash and debit card users are paying for credit card users rewards (see also Felt et al., 2021).

As a result, in Wang's (2023) model, uniform pricing generates excess credit card adoption: too many consumers use credit cards because they do not internalize the effect of their credit card use on retail prices. The estimated model allows a comparison of the effects of capping credit card merchant fees, increasing entry of private payment service providers, and introducing a low-fee public option like FedNow. Capping credit card merchant fees at 1 per cent increases annual total welfare – in money terms, by 29 billion USD – by reducing rewards, lowering retail prices paid by cash and debit consumers, and declining credit card use. In contrast, since in his model the estimated consumers' reward sensitivity is ten times higher than merchants' fee-sensitivity, competing payment card networks respond by raising merchant fees to fund card rewards. A low-fee public option will therefore struggle to gain consumer adoption without rewards, limiting welfare gains.[29]

Over the past decade, a tsunami of retail payment innovations has occurred: contactless instruments, mobile payments, Apple Pay, BNPL, etc. Contactless, mobile and faster payments as well as digital wallets and (central bank) digital currencies are currently mentioned as the future payment media of a "cashless society". These innovations will certainly affect the retail payment market in terms of consumer behavior and merchant acceptance and by reshaping payment processes (Rysman and Schuh, 2017). Key drivers for payment innovation are

[29] In particular, Wang (2023) predicts that a low-cost, government-run payment network, like FedNow, would only create 2 billion USD of benefits. These gains are smaller than the estimated gains from reversing the Durbin Amendment regarding debit card interchange fees. In response to entry, incumbent credit card networks would raise merchant fees to fund more rewards to tempt consumers to use their cards. In equilibrium, the low-cost payment network steals market share mostly from debit cards, with muted effects on aggregate retail prices and welfare.

technological advancements, changing end-user preferences, increasing market entry from non-bank "fintech" companies offering payment services and changing regulations.

Since funds have to flow from A to B in an efficient, safe and sound way, payment innovation requires cooperation between competing players. This may cause adverse incentives and lock-in effects. Therefore, regulatory clarity on where cooperation ends and competition starts, is needed. An important question arises who captures the rents from innovation. This will largely depend on the market structure of the payment industry determining the incentives to invest in innovation. Pure cost-based approaches to payment pricing may limit incentives to innovate and payment providers may require years to recoup investments in new payment products. In the end, they may not introduce new products but just upgrade existing "rails". In this context, Bourreau and Verdier (2019) argue that interchange fees may still be necessary for providing the right incentives to innovate.[30]

A network good can provide large benefits to providers and users, but network economies can also make replacing old technologies difficult. Adoption is often slow, habits are sticky. An innovation will be preferred to the existing technology only if sufficient numbers of providers and end-users adopt it. In such cases, regulation or market intervention may be necessary to facilitate a transition and provide legal transparency and level playing field. However, imposing regulations mandating the use of new technology usually imposes high costs on some market participants, but alternatively, if the intervention is too "light" and open-ended, the transition may be delayed or even postponed indefinitely, forgoing its benefits (Bauer and Gerdes, 2012).

[30] See also e.g. Verdier (2012) and Chakravorti (2016) about the relation between interchange fees, offered quality and innovations in payment systems.

5.2 Price regulation and the Tourist Test

The payment industry has been under regulatory scrutiny for decades. Specifically, regulators and policy-makers have observed that consumers are highly subsidized by payment card networks, which leads to them using their cards excessively. Merchants, on the other hand, face high fees that are then passed through onto consumers in the form of higher retail prices. Competition between payment networks may only fuel this "free-rider" problem, exacerbating skewed pricing patterns and reducing total welfare. Moreover, many payment networks have frequently imposed restrictive – and potentially "regressive" rules – on the merchant side, such as no-surcharge rules or honor-all-cards rules.[31] Effectively, this implies that payment cards that are more expensive for merchants to accept, such as credit cards, will be cross-subsidized by cheaper means of payments such as debit and cash. As high-income consumers are the ones most likely to hold and use cards with higher reward schemes that are more expensive for merchants to accept, the cross-subsidies between the payment methods are regressive transfers from low-income consumers to high-income consumers (Felt et al., 2021; Wang, 2023).

Merchants have long complained that their inability to pass-through high merchant fees to consumers hindered the proper working of a free market. Over the last decade, several regulators in different countries have lifted these uniform pricing rules imposed by card systems, only to discover a few years later that substantial surcharges were charged to unhappy consumers when they were applied (see e.g. Bolt et al., 2010). In response to abusive surcharging, most regulators proposed variations on the idea that surcharges should be limited to some notion of

[31] Payment card networks usually offer both debit and credit card services and may engage in a "tie-in" on the merchant side through the so-called honor-all-cards (HAC) rule, requiring merchants that accept one of its payment products to accept all of its products, see Rochet and Tirole (2008) for a welfare analysis.

"cost of acceptance".[32] Most competition authorities and regulators in many jurisdictions, including the U.S., Canada, the European Union and Australia, have taken legal action and now capped the fees that card systems can levy on merchants – in the form of interchange fee regulation.[33] Although sharing similar objectives of reducing interchange fees, different jurisdictions followed different legal and theoretical approaches.

For example, the European Commission adopted as its benchmark for the regulation of merchant fees charged by (open) four-party systems (such as Visa and MasterCard) the "Tourist Test" or " Merchant Indifference Test", according to which the merchant fee should not exceed the merchant's convenience benefit of a card payment (EC, 2015).[34] Indeed, if a retailer's customer is viewed to be temporary, some merchants may at the point of sale choose to decline payment cards even when they signed an acquiring contract to accept them. Specifically, the tourist test defines the interchange fee level that leaves a merchant indifferent between different means of payment, say between a payment card and cash, when an incidental customer (the "tourist") enters the store and pays (an "average" transaction amount) at the counter. Theoretically, the tourist test induces the cardholder to internalize the merchant's welfare when choosing the payment method. As such, this principle can be regarded as the "Pigouvian prescription" in the payment context (Tirole, 2014). In a theoretical model of two-sided payment

[32] For the case of Australia, see the Competition and Consumer Amendment (Payment Surcharges) Act of 2016 (RBA, 2016; Box B, p. 40).

[33] For instance, Carbo-Valverde et al. (2016) look at the impact of interchange fee reductions in Spain that occurred during 1999-2005. They found that merchant acceptance, credit card adoption and overall transaction volume have increase following the reduction of the interchange fees. However, they do not look at retail prices. Regarding the U.S. Kay et al. (2018) analyze the impact of the Durbin Amendment that capped debit card interchange fees for banks with over $10 billion in assets. Using a "difference-in-differences" identification strategy, they quantify the resulting decline in interchange income for "treated" banks. Further, they find evidence that these affected banks offset more than 90 per cent of the lost interchange income through increases in deposit fees for account holders.

[34] The Regulation on Interchange Fees for Card-Based Payment Transactions (the "IFR") is now part of the EC's Payment Services Directive 2 (PSD2) that was first adopted on 25 November 2015 and went into full effect on 14 September 2019.

markets, it can further be shown that the tourist test corresponds to maximizing total user surplus (Rochet and Tirole, 2011; Zenger, 2011).

Concretely, by calculating the (average) merchant indifference level based on detailed cost information regarding different payment instruments, interchange fees for debit card payments in the EU are capped at 0.2 per cent of the transaction value while for credit card payments capped at 0.3 per cent of the transaction value.[35] Note that this EC interchange fee regulation only applies to four-party card networks, under the condition that merchants do not surcharge these card transactions. Three-party card networks (such as American Express) are exempted from this regulation as they do not apply an interchange fee. Consequently, merchants in the EU have been allowed to surcharge card transactions that are routed through three-party networks, but these surcharges may not be "abused", i.e. not larger than the difference between the merchant fee and his convenience benefit. This requirement would then again be perfectly in line with the optimality of the tourist test, in the sense that the consumer does not exert a negative externality on the merchant in his choice of payment instrument.

Naturally, caution is required: well-intended regulations often have unintended consequences. The U.S. Durbin Amendment presents an interesting example. Although the U.S. cap on debit card interchange fees that took effect in October 2011, was intended to lower merchant card acceptance costs, some merchants find that their fees have risen instead. In order to recoup lost revenues, debit card networks raised the interchange fee on small value transactions that previously cost merchants much less as they were effectively cross-subsidized by other merchants where the fees were considerably higher (Wang, 2016).

[35] Note that with cash usage declining and the (relative) cost of cash going up, the indifference condition between cash and cards may effectively imply that the "tourist test" interchange fee is rising over time (Bolt et al., 2013).

6. CONCLUDING REMARKS

Payment systems are essential for the smooth operation of an economy as they facilitate the exchange of goods and services for money. It is important to observe that payment systems consume substantial resources and therefore impose costs on society. In essence, the proper allocation of these resources over time determines overall payment efficiency. This issue of efficiency in relation to payment pricing and competitiveness has attracted a lot controversy around the globe.

The provision of retail payment services is complex as many participants with potentially conflicting interests are involved. Strong adoption and usage externalities are at play in payment markets, causing possible divergence of social and private incentives. Modern "two-sided" economic reasoning is needed to better understand these complexities regarding efficiency, pricing and competition. Thoughtful market intervention and regulation may restore competitive potential and raise total economic surplus but can also trigger unexpected negative effects.

This expert report delves deeper into the retail payment system in New Zealand with a special focus on efficiency, pricing and surcharging, and competitiveness. Some main conclusions based on the economic literature are:

1. Retail payment systems consume considerable resources and, therefore, the proper allocation of these resources becomes important. A useful way to gauge payment efficiency is to calculate the total resource costs of the retail payment system and the corresponding unit social cost of different payment instruments. These cost calculations may then also underpin effective policies with respect to payment pricing (e.g. deriving "tourist levels" for merchant fees) and payment steering (e.g. incentivizing the usage of cost-efficient payment instruments).

2. Optimal pricing is complex due to strong “two-sided” network effects in payment markets. In two-sided markets, platforms choose to allocate a lower burden to the side (“consumers”) whose presence benefits most users on the other side (“merchants”). This merchants’ willingness to interact with consumers is fully exploited by the platform in setting high merchant fees. This often results in “skewed” payment prices and, consequently, in high interchange fees. Economic theory has shown that, depending on issuers’ profit margins and cardholder surplus, the profit-maximizing interchange fee is generally set higher than the socially optimal interchange fee.

3. In many jurisdictions and regions, card networks usually charge a merchant fee and demand “uniform pricing” (i.e. the merchant is not allowed to surcharge a card transaction relative to a transaction that does not run through the network). Uniform pricing causes that high merchant fees are partly passed through to consumers who do not use the card network. This may result in excessive merchant fees. In this case however the market failure is not the skewed pricing pattern (which is typical of two-sided markets), but the negative externality on consumers who do not use the card network.

4. Economic theory reveals that the merchant fee should follow a “Pigouvian recipe”. In the case of card payments, the merchant fee should be set at the “tourist level”, implying that the merchant fee should be equal to the (convenience) benefit that the merchant derives from a card payment. The consumer, who ultimately decides on the payment method, then exerts no externality on the merchant. This theoretical principle forms the basis for the “Merchant Indifference Test” (or Tourist Test) to cap interchange fees on debit and credit cards in practice.

5. If interchange fees are optimally regulated according to the Tourist Test, allowing card surcharging (and its potential regulation) becomes effectively redundant. This type of reasoning underlies why transactions using four-party card schemes – which are regulated on the basis of the Tourist Test – are not surcharged in the EU. Allowing surcharges generally generates too few card transactions, both from the point of view of the card network, which therefore prefers a no-surcharge rule, and from the point of view of the social planner. This underusage of cards results from "overshooting" the surcharge by merchants (where in practice surcharges can reach 5 to 10 times the merchant fee). As a response, the card network should optimally choose merchant and cardholder fees in a way that surcharges do not occur. Consequently, payment policy regulations that allow card surcharging need not generate that much actual surcharging. If the no-surcharge rule is to be lifted, regulation should shift its focus to merchants' behavior rather than to the card network's behavior.

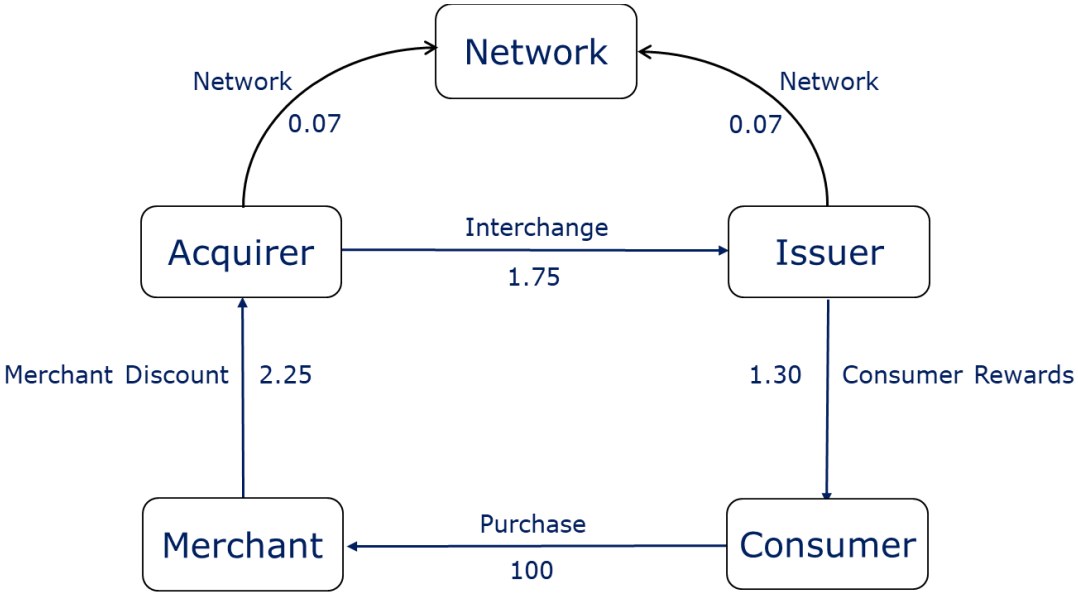
6. The effects of competition in payment markets may be ambiguous and payment competition can even yield inefficient pricing structures. A key aspect of two-sided competition is the ability of end-users to single- or multihome. As a general finding, competing networks try to attract end-users who tend to singlehome, since attracting them determines which network has the greater volume of business. In particular, payment competition may result in low or negative consumer fees if payment cards networks (or card issuers) compete too vigorously on the consumer side, tilting the pricing structure fully against merchants and thereby reducing total welfare. Effectively, payment card networks compete by raising merchant fees to fund consumer card rewards. As a result, a "low-fee" public payment option could therefore struggle to gain

consumer adoption without offering rewards, limiting welfare gains of new entry and competition.

7. Note that skewed pricing is a typical outcome in a two-sided payment market. Competition authorities that fail to understand the nature of two-sided markets might draw incorrect conclusions about predation on the low-price side or even excessive pricing on the high-price side. Regulators should be wary of "mechanically" applying standard ("one-sided") antitrust ideas where they do no longer fit. Moreover, since money has to flow from A to B in a safe and sound way, the payment business relies on strong cooperation between competing players. Regulatory clarity on where cooperation ends and competition starts, is however needed. Finally, caution is required: well-intended regulations often have unintended consequences – also in payments.

FIGURES

Figure 1: Main players in a card payment network



Source: Wang (2023).

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