Harry Leinonen (ed.)

Evolving payment habits

Proceedings of the Bank of Finland
Payment Habits Seminar 2008

EUROJÄRJESTELMÄ
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The views expressed in this study are those of the authors and do not necessarily reflect the views of the Bank of Finland.

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Abstract

This publication consists of seven studies on retail payment issues presented as preliminary versions at the annual Bank of Finland Payment Habits Seminar in 2008. Interest in retail payment services has recently been growing at a fast pace among authorities and the general public. For this, there are several reasons: developments in technology, changes in the competitive framework and globalization. Authorities have become increasingly concerned about the efficiency and standardization issues of retail payments. A key topic of research appears to be the extent to which the payment habits of the general public can and should be switched to options that are more efficient for the society as a whole, as well as the means of achieving this. The current marketing setup seems to bias customers against change and to promote the use of legacy solutions and old habits instead of the modern solutions. However, recent trends for change seem to be pointing in new directions for the evolution of payment habits.

Keywords: payment services, payment costs and pricing, card payments, electronic and mobile payments

JEL classification numbers: G10, G18, F15, H4, L86, 033

Tiivistelmä

Tämä julkaisu koostuu seitsemästä erillisestä tutkimuksesta, jotka koskevat vähittäismaksukysymyksiä. Tutkimusten alustavat versiot on esitelty Suomen Pankin vuosittaisessa Maksutapa-seminaarissa. Viranomaisten ja suuren yleisön kiinnostus vähittäismaksupalveluihin on kasvanut merkittävästi viime aikoina. Tähän on useita syitä, kuten mm. tekniikan kehitys, muutokset kilpailuasetelmissa ja kansainvälistyminen. Viranomaisten kiinnostus maksupalvelujen tehokkuuteen ja standardointiin on lisääntynyt. Keskeinen tutkimuskohde on, kuinka laajasti ja millä tavalla suuren yleisön maksutottumukset voitaisiin muuttaa yhteiskunnan kannalta tehokkaampiin vaihtoehtoihin. Nykyinen markkinatilanne tuntuu vähentävän asiakkaiden muutoshalukkuutta ja tukevan olemassa olevien vanhojen maksutapojen käyttöä modernien ratkaisujen kustannuksella. Nämä uudet kehitystrendit tullevat kuitenkin ajan myötä luomaan uusia kehityssuuntauksia yleisön maksutavoissa.

Asiasanat: maksupalvelu, maksamisen kustannukset ja hinnoittelu, korttimaksaminen, elektronien maksaminen ja maksaminen matkapuhelimella

JEL-luokittelu: G10, G18, F15, H4, L86, 033

Preface

Payment instruments and habits have been evolving throughout history. In most industries we have seen a continuing electronization, and the payment industry is no exception. E-banking and e-payments have seemingly emerged as new service forms, here to stay and set to expand rapidly in the near feature. The current financial turmoil could in fact speed up developments as cost savings and efficiency increasingly take centre stage. In these times of change, it is important to study the new phenomena, their advantages, impacts and risks. The authorities need to have a good understanding of the requirements of the new payment habits and instruments.

The Bank of Finland has a long tradition of economic research and modelling, and modern payment and settlement systems have been one of the focal areas. The anticipated vast changes in retail payments led to the initiation of a research project, Payment Habits 2010+, aimed at assessing technology and business innovations that could have major consequences for payment habits of the general public. The creation of SEPA (Single Euro Payment Area) was also seen as an important generator of change in Europe. It seems that retail payments are worth a greater focus of attention by central banks because, although the transferred transactions are of low value, the number of transactions is very high, and hence the efficiency and reliability of the basic retail payment instruments is crucial for the economy at large.

The Bank of Finland has arranged seven yearly international payment and settlement seminars and workshops over the years 2003 to 2009. Since 2007, these have been accompanied by a payment habits seminar. The primary objectives of the payment habits seminars are to stimulate research on payment habits and to share results and other experiences. The idea of arranging a regular payment habits seminar started with the presentation of findings from the Bank of Finland Payment Habits 2010+ project (BoF publication A111:2008, Payment habits and trends in the changing e-landscape 2010+).

I would like to thank the authors for their contributions to this publication, which enhance our understanding of the payment service market and provide a good basis for future studies as well as for policy discussions concerning retail payments.

For the finalisation of the publication we are indebted to Päivi Nietosvaara for the text editing and Teresa Magi for overseeing the printing. We are also indebted to the editorial board of the publication, consisting of Päivi Heikkinen, Esa Jokivuolle and Harry Leinonen.

I hope the strong interest in retail payment issues will continue and that this publication will stimulate research in the area. It is a great pleasure for me to present, via this publication on Bank of Finland seminar proceedings, the fruits of productive research cooperation between central banks.

Helsinki, August 2009
Kimmo Virolainen
Head of Department
Bank of Finland

Contents

Chapter 1
Introduction

Harry Leinonen

1 Introduction

Payment habits have evolved throughout history; from barter to coins, from coins to cheques and notes, and further to different kinds of fund transfers and card payments. Now the physical paper and plastic instruments are converted to digitalized instruments of different types for use in both traditional markets and e-commerce.

The broad drivers for change in the payment industry seem to be the same as in other transportation industries: lower costs, higher speed, better security and improved comfort (ease of use). However, the payment solutions show a wide variety of regional standards. Global standards have emerged only slowly compared for example to telecommunication developments. International standards have only lately received much attention for example via the SEPA (Single Euro Payment Area)[1] initiative in Europe. Until recently, each national market had its own proprietary payment system solutions, and only the international card payment networks include partial global standards.

There are several reasons for the slower development of payment services. Payments have mostly been local between consumers and nearby service providers. The growth of global travel, export activity and, more recently, Internet-based commerce has increased global payments. Payment services have been governed by local regulations and processing centers, resulting in local development paths. Payments are complementary services directly dependent on overall economic activity, that is, the volume of payments is determined completely by external factors. Payments are only one small integrated part of the overall economic transaction process of quoting, ordering, delivering, invoicing etc. Payment costs have traditionally been charged via hidden and non-transparent price markups, float revenues and/or low interest on payment capital. The hidden differences in payment costs between different instruments have reduced customers' economic incentive for change.

Retail payments are of great importance to the economy, as they form the foundation for all kinds of daily economic transactions ranging in value from a few euro cents to tens of thousands of euros (in EU regulations, a frequent upper limit is 50 000 euros). The number of retail payments in the economy is therefore very large, For example, in the EU-15 area the number of transactions has been

[1] More information can be found on www.sepa.eu and www.europeanpaymentscouncil.eu.

estimated at about 180 bn transactions in year 2006[2], ie some 460 transaction per inhabitant per year, including business-to-business payments. Therefore, the efficiency of retail payments is of great importance. Savings can be made by moving from paper-based payments (cheques, card paper-slips, credit transfers etc) to their e-based versions. Savings can also be made by moving from less efficient instruments to low-cost or high-benefit instruments, for example from cash to cards, for all but very low-value payments[3], increasing the use of direct debits and increasing remittance data for automated reconciling or complete invoicing information in the form of e-invoices. A very moderate average saving of only about 10 cents per transaction would already result in yearly savings of 18 bn euros for the EU-15 area. However, as savings per transaction is rather small and invisible to the users, these potential savings seldom receive enough attention.

However, authorities have recently begun to pay more attention to retail payments and their efficiency. An efficient payment industry and payment service palette can reduce the economy's total payment costs, so that resources can be employed more efficiently in other industries. The interest stems from the recognition of these potential savings, which are due to efficient implementation of new technology and processing patterns.

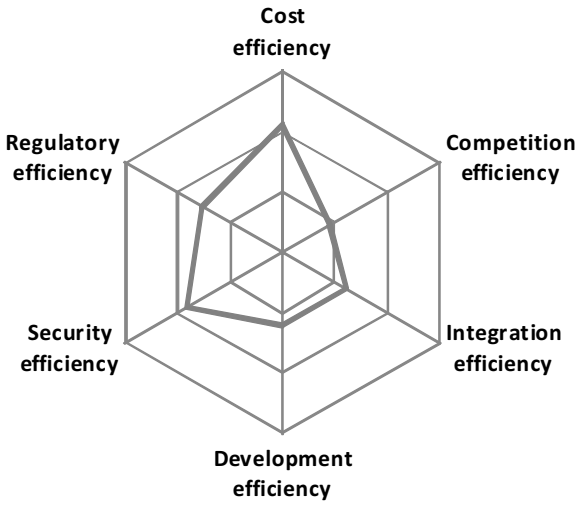
It would seem that there are six major focus areas in payment efficiency:

– cost efficiency
– competition efficiency
– integration efficiency
– development efficiency
– security efficiency
– regulatory efficiency.

[2] According to ECB Blue Book 2006 (www.ecb.int), non-cash transactions in EU-15 amounted to about 70 bn transactions. Assuming the cash transaction share to be 60%, the total transaction volume comes to about 180 bn transactions.

[3] See central banks' payment cost studies in Belgium (Banque National de Belgique, Coûts, avantages et inconvenient des diffrents moyens de paiement, 2005), Holland (Brits, H and Winder, C, Payments are no free lunch, De Nederlandsche Bank, Occasional studies, Vol. 3, Nr. 2, 2005) Portugal (Cavaco, Chapter 3) and Sweden (Bergman, Guibourg and Segendorff, Chapter 2).

Figure 1.1 **Major retail payment efficiency factors**



The major retail payment factors are shown in figure 1.1. In this type of diagram, the efficiency levels for the different factors can be described with a profile like the dark blue polygon. The polygon would typically vary between different local payment environments and over time. (In figure 1.1 the polygon is inserted just for illustrative purposes and is not based on any particular payment service setup.) The larger the polygon, the more efficient the use of payment technology.

Cost efficiency relates to the processing costs of payments in the banks' and other service providers' internal systems, costs in interbank systems and customer processing costs. Solutions supporting electronic straight through processing (STP) have reduced costs considerably during the last few decades, compared to paper-based processing. However, the STP rate varies considerably across economies.

Authorities have realized the benefits of STP and have started to push for improved STP. This can be seen in Europe, for example, in the payment regulation (EU 2560/2001) which required the informing of customers as to international bank codes (BIC) and international bank account numbers (IBAN). The ECB SEPA[4] reports have also called for a greater focus on higher STP rates.

[4] See www.ecb.int.

Competition efficiency seems to have two sub-dimensions: competition among service providers and competition among payment instruments. The payment industry often includes monopoly or oligopoly entities – clearing centers or payment networks – with strict participation rules that hinder potential new entrants. The governance structures of these monopoly entities often protect the legacy systems and traditional and/or larger market participants. The interbank bank processing charges and conventions such as interchange fees can notably curtail price competition in the market. The competition among payment instruments is usually quite limited, due to hidden price signals and subsidies. Cash and most other payment methods are often perceived as free services by their users. However, without cost-based price differences, there cannot be any true price competition among instruments or their service providers. Limitations on competition lead to lower overall efficiency.

Recently, authorities have shown a much greater interest in payment competition issues. Interchange pricing issues are debated widely in the different countries. The Payment Service Directive (2007/64/EC) stipulates a zero interchange fee for credit transfers, and the new EU regulation on cross-border payments (repealing EU 2560/2001) puts a ceiling of 0.088 euros on direct debits, which is be zero as from 1 November 2012. Competition authorities in Europe have also considerably reduced the interchange fees applied to card payments. The Payment Service Directive will also grant non-banks, payment institutions, some limited rights to provide payment services, which might increase competition, especially regarding modern versions of e-payments. The requirement of common information requirements and a maximum delivery time of one day for common payments throughout the euro area will also stimulate competition. Rules requiring transparent pricing and reducing the possibilities for non-transparent pricing such as float will facilitate increased price competition. It seems that authorities in Europe as well as in other countries have realized the benefits of greater competition efficiency in the payment industry.

Integration efficiency refers to customers' (end-users') possibilities of connecting payments to other economic processes in an efficient manner, for example, consolidating receivables, paying salaries or sending invoices. Payments are part of the overall economic billing process of corporate customers, who need to have good possibilities for integrating payments with all other processes. STP in customers' processes is an area of great importance due to the large cost savings. The basic need is for remittance information that can be used automatically. The payment receiver should be able to

recognize automatically each payment in the consolidation process. In recent years, the expansion of remittance information to complete invoices using e-invoicing[5] processing has become a new area of office automation, both between companies and vis-à-vis consumers. Modern e- and m-payments at point-of-sale and in web-based e-commerce have also provided new and better means of payment integration. End-user automation possibilities and user-friendliness in general reduces the costs for paying at the customers. This improves the overall cost benefits of the total payment process often much more than can be achieved in pure banking processes especially due to the large number of affected customers, almost everyone.

E-invoicing in particular seems to be catching the interest of authorities. In most Nordic countries central and local administration support or even require e-invoices in government billing. Various task forces and committees have been set up to find good ways to reap the potential benefits of payments and e-invoicing synergies.

Development efficiency refers to built-in striving to employ modern and more efficient technologies in payment processing. New technologies emerge which generally can be employed by many different industries, as witnessed by the new telecommunication possibilities and low-cost real-time processing. The widely varying levels of development across countries suggest differences in development incentives. The legacy payment system and old widely used standards seem to entail challenging development barriers. These development barriers seem to be continuously on the rise because of the increasing number of affected participants, systems to be changed and details requiring coordination. The costs of change have increased with higher integration, and poor management of the change process can increase costs and postpone benefits. The payment systems' governance structures, which have traditionally been dominated by banks or other payment service providers, put less emphasis on direct customer developments and benefits than on service providers' interests. Low levels of competition and development efficiency seem to strengthen each other.

There have been recent discussions on possible authority actions to improve development efficiency, especially regarding governance structures. In countries where the central bank or other government institutions are involved in payment processing, these institutions can have a big impact in either promoting or delaying developments. In

[5] See eg the European Commission's report on Electronic Invoicing (2007) and e-invoice report of EBA clearing (2008), www.ebaclearing.eu.

case the private sector does not undertake the necessary developments, it may be that the ultimate solution will be efficient public service provision. A major change in a new technology platform might require more authority attention and support to solve the coordination problems of competing standards, architectures etc.

Security efficiency is highly important for payment instruments. No customer will trust insecure instruments. Therefore the service providers generally have a strong incentive to meet at least the minimum standards. However, there are often regulations or recommendations on payment services from the consumer protection perspective, for example, rules on maximum customer loss in case of lost cards. The service level for retail payments must meet customer expectations, because customers are dependent on their means of payments. Because the volumes of retail payments are high, frequently occurring problems will get enough attention and be corrected. However, because the private solution need not result in a socially optimal solution, authority involvement can be beneficial.

E/m-payments will require different electronic security features from those that sufficed for the old physical payment instruments. Some of the government agencies that have provided the old paper-based identity documents have become interested in expanding their services to include e-identity services. The rapidly increasing electronic service forms, such as e-banking, e-commerce, e-government, e-insurance etc, will require good customer identification and payment processing security. This is an area of emerging private and public services.[6] It seems clear that n the long run authorities will need to become more active in the field of e-security for payment services.

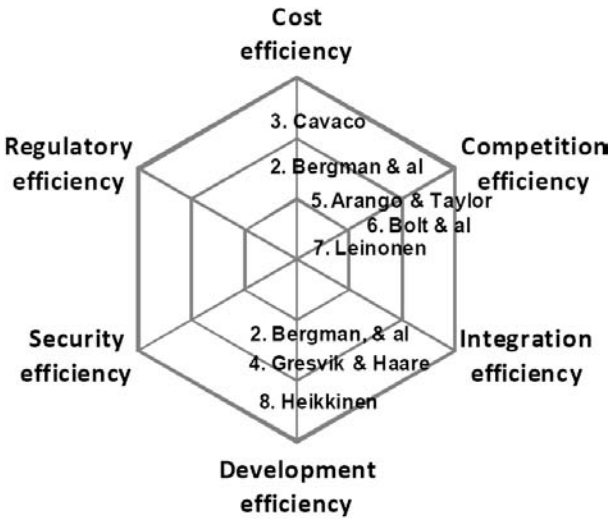
Regulatory efficiency determines the extent of regulatory support or hindrance regarding the efficiency of payment services. Regulations maintaining monopolies without the necessary controls, providing subsidies and/or requiring subsides, distorting competition and/or pricing, prescribing inefficient paper-based or manual processes etc can prevent efficiency advancement. Regulations that promote competition, control of monopolies or level-playing-fields, or implement necessary standards and thereby solve coordination problems, will also promote increased payment efficiency. It is important that regulations are updated from time to time in accord with economic and technology developments.

[6] See eg proceedings of the Porvoo Group www.porvoo12.net.

Especially in the EU, but also in other countries, it seems to be the time for updating payment service regulations. The drafting of payment regulations in EU is generally part of the process of creating a true common market also for payment services.[7] Technology advances, alone with general requirements for open competition, have pressed authorities to review their policy stances.

This publication contains eight articles earlier versions of which were presented at the Bank of Finland Payment Habits seminar of 2008. These have been placed in the retail payment efficiency framework in figure 1.2. From the figure, we can see that the focus of the presentations was on cost, competition and development efficiency.

Figure 1.2 **Main topics of the articles within the efficiency framework**



Chapter 2 (Bergman, Guibourg and Segendorff) looks at card and cash payments from a social perspective. They put the social costs of using these payment instruments at about 0.4% of GDP. Cash is generally more costly and seems to be overused in comparison to card payments in Sweden. A visible cost difference would probably steer consumers to more rational payment instrument choices.

[7] Typical regulations here are the Payment Service directive (2007/64/EC), the Payment regulation EU 2560/2001 and its successor to be published soon, and the earlier Cross-border Credit Transfer Directive 97/5/EC.

Chapter 3 (Cavaco) presents the cost of paying in Portugal, which is found to be about 0.77% of GDP. The direct payment revenues for banks are estimated to be about 0.49% of GDP, resulting in a cost recovery rate of about 63%. Direct debits involve the lowest unit costs in Portugal (0.09 euros), followed by debit cards (0.23 euros) and credit transfers (0.26 euros). Cheques entail clearly higher unit costs (1.45 euros) and credit cards the highest (2.44 euros). Cash withdrawals in branches are expensive (1.85 euros per withdrawal), so that inducing customers to convert to ATM usage would reduce banks' costs.

Chapter 4 (Gresvik and Haare) reviews point-of-sale payment instruments used in Norway, especially cash and card payments, which are the most popular ones. Cards have replaced cheques completely and continue to replace cash gradually. The article presents four different approaches to quantifying cash usage, for which there are seldom reliable statistics or surveys. Today, only about 24% of retail sales in Norway are settled using cash.

Chapter 5 (Arango and Taylor) examines merchants preferences and perceptions of retail payment reliability, risks and costs in Canada, employing a merchant survey. The authors develop models for each means of payment in order to determine how merchant characteristics may influence their responses. They find that the average transaction value, total transaction volume, and/or number of point-of-sale terminals influence merchant perceptions. Although merchants can determine which instruments they will accept, they have little influence over the ultimate payment decisions made by consumers.The authors also calculate the variable costs of accepting different means of payment and find that debit cards are the least costly for a transaction value of $36.50 CAD.

Chapter 6 (Bolt, Jonker and Renselaar) presents an empirical analysis of the effects of debit card surcharges in the Netherlands, where retailers are allowed to surcharge. These make independent decisions on their surcharging conventions; some surcharge a flat fee, at least for low-value purchases, while others do not surcharge. The analysis shows that surcharging steers customer away from debit cards to cash. Removing surcharging could generate considerable social savings of more than 100 million euros in the long run, as debit card usage would grow more rapidly.

Chapter 7 (Leinonen) studies the non-transparent payment charging conventions in Finland. Banks apply merchant charges to all payment instruments, including cash. Merchants seldom surcharge transparently but instead embed their payment costs, including banks' merchant fees, in an average payment mark-up to price in the range of

0.5%. The article evaluates also the possible impact of moving towards transparent pricing based on consumers' price elasticity reported in a consumer survey.

Chapter 8. (Heikkinen) analyses different mobile payment schemes that are available and provides a framework for categorizing these. The new technology and innovations have created a rich diversity of mobile payment systems. Which are the drivers of this diversity and the change to mobile means of payments? Which are the pros and cons compared to current dominant payment instruments?

It is apparent that consumers' payment habits face an evolutionary process. Based on historic experiences, this process will probably take some time. Consumers are slow to change their payment habits and will need clear incentives for change.

The incentive for change will be rather modest if inefficient instruments are cross-subsidised by efficient ones. There is little evidence of forthcoming rapid change to more transparent payment charging. Although the actual cost efficiency differences are increasing as between modern and traditional payment instruments, this is not transmitted to consumers, due to the hidden charging conventions. This will also reduce competition efficiency, as there cannot be price competition in a market that essentially functions without direct charges and where new efficient entrants find it difficult to sell their services, having to rely on cross-subsidisation possibilities.

Users' main benefits will therefore be where integration efficiency is improving, ie mainly in convenience. The new developments will therefore probably be in areas where e- and m-payments have a clear service content benefit compared to traditional retail payments. Service providers are likely to attempt to charge for this convenience, which in turn will probably prolong parallel use of traditional instruments.

Security efficiency will improve with new instruments, but the security of traditional instruments can also be upgraded via modern technology; for example, high-value notes could be equipped with remotely readable chips (RFID chips). Breeches in security features of popular instruments could even lead to a more rapid changeover to more secure instruments. However, the probabilities of such breeches are likely to be nearly the same for all types of instruments. Any instrument can have a concealed Achilles heel.

There has lately been a clear trend towards increased payment regulation in several countries. Authorities have become interested in increasing competition and cost efficiency as regards payment services. Authorities' actions are seldom a rapid means of change in

this industry. However, they could provide a faster means of achieving change than market developments entailing high barriers to change in the private sector. Regulations that increase private incentives for changes in the right direction, ie changes that lower the barriers, are then probably more effective than direct technical regulations.

This publication raises some interesting development factors in retail payments. Central banks' interest in retail payments will probably increase and thereby result in more payment habits seminars and publications based on the studies presented.

Chapter 2

Card and cash payments – the social perspective in Sweden

Mats A Bergman – Gabriela Guibourg – Björn Segendorff

2 Card and cash payments – the social perspective in Sweden

Abstract

The modern market economy depends on the ability to make payments simply and inexpensively. Yet surprisingly little is known about the impact of these payments. In this article, we describe both the fundamental problems and costs in the use of cards and cash in Sweden, from a social perspective. We estimate that the cost to society of the use of cards and cash amounts to 0.4% of GDP. Cash payments tend to be more expensive than card payments, and the results indicate that cash is overused. The choice that the consumer makes between card and cash is largely determined by the size of the payment and the age and education of the consumer. The consumer also appears to be influenced by cost implications. A balanced use of withdrawal fees for cash and transaction fees for cards could therefore result in more efficient use of the payment system in Sweden.

2.1 Introduction

One of the main reasons why money exists is that we need it as a means of payment. After all, the major part of all economic activity in a modern economy requires the buyer to pay the seller. Having inexpensive, simple methods for making payments is important for two reasons. Firstly, lower costs of executing transactions lead to increased exchange of goods and services in the economy because of the lower cost of buying goods and services. In this way, efficient means of payment serve as a lubricant to the economy. Secondly – and this is an oft-neglected point – payment mediation is an economic activity in itself, which requires real resources. On that basis, an efficient means of payment produces direct social benefits that may be substantial.

The physical handling of money, ie distributing and storing notes and coins, is expensive and tends to increase the cost of payment. Electronic payments, in contrast, do not involve physical handling, but they do produce other costs, eg for IT networks. This applies equally to remote payments, where buyer and seller do not meet, and to payments where the parties meet at the point of sale. In the first case,

electronic transfers – such as Internet payments – are the electronic alternative to paper-based giro transfers. For payments at the point of sale, card payments can replace cash.

The fact that the costs involved in producing a payment service are not reflected in a per-payment charge may make it difficult to make the right – most cost-efficient – choice of payment method when we buy something. In other markets, the production cost often determines the price of the product or service concerned, but in the market for payment services, the customer rarely incurs a specific charge for a particular payment; cash withdrawals are often free, and we do not pay the bank a fee every time we use our debit or credit card. It is thus not certain that the customer will choose the lowest-cost method of payment. Therefore, it is not certain either that the payment system as a whole is used in the best way.[1]

Despite the fact that payments occupy such a central place in all economic activity, relatively few studies exist that shed light on social costs of different types of payment, or how efficiently the payment market functions. Within its responsibilities for the security and efficiency of the payment system, the Riksbank has begun to address these issues. In this article, we present some results from the Riksbank's research into the payment system: what is the cost of cash versus card payments from a social perspective? How does the public choose between these two payment instruments? What prevents us from using them efficiently?

2.2 Common causes of welfare loss in the payment system

In the simple world of the textbook, maximum social efficiency obtains when goods and services are priced on the basis of the marginal cost of producing them. However, in reality, a large number of other factors come into play, making it impossible – or undesirable – to apply this simple principle without qualification. Negative externalities (harmful environmental impacts etc) and the need to cover fixed costs implies that the price should be set above the

[1] All-you-can-eat pricing, ie, no variable fees, are used in some other contexts, such as flat-rate telephone plans, monthly commuter passes and amusement parks. Taking transaction costs and the need to cover fixed costs into account, zero-marginal-cost pricing need not be inefficient.

marginal cost.[2] Similarly, in the presence of positive externalities, the price should be set *below* the marginal cost.

One particular type of positive externality is represented by 'network effects'. These arise when the benefit of a product to a user increases as the number of other users of the same product increases. For example, a certain individual's telephone becomes increasingly useful as the number of people it can be used to call increases. In the same way, certain computer applications – such as Word – become more useful as the number of people who can use it to swap files increases. Payment systems are characterised by network effects such as these. In the case of cash, the network effects are in the main direct and so obvious that they are taken for granted: the value of notes and coins lies in the fact that they are used (accepted) by practically all the players in the market. This type of network effect may be referred to as direct or one-sided.

2.2.1 Network effects very important for card use

Another type of network effect arises when two different types of players interact via a *platform* (or platform product) connecting them. This type of network effect is usually referred to as two-sided. In the case of debit and credit cards, network effects are mainly two-sided. Cardholders do not interact with each other and so do not enjoy any direct benefit from an increase in the number of cardholders. On the other hand, cardholders do benefit from an increase in the number of merchants who accept cards. Similarly, the ability to accept card payments becomes more valuable to the merchants if the number of card users increases.

Markets with network effects – both one- and two-sided – may need to pass a critical point (or critical mass) in the number of users before the benefit outweighs the cost. After all, the first person to buy a telephone will have no-one to call, and a single cardholder will not be able to use his card if no shop accepts it. Consequently, in markets with direct network effects, consumers will hesitate to be among the first users to pay for the service or product. To get the market moving, the manufacturer may need to sell the product at a loss initially before the number of users is large enough for the willingness to pay to justify paying a price that exceeds the cost. The need for a critical mass of users in markets with network effects carries the risk of a low

[2] For a discussion on marginal-cost pricing in this context, see Laffont (2000).

degree of innovation, a technology lock-in. This is very much a problem for payment markets that in some cases may become locked into an inefficient technology.

2.2.2 Subsidies can solve the network problem

A further complication of two-sided markets, such as the card market, is that there may also be a need for long-term subsidisation of one side of the market. For example, it could be that consumers' willingness to pay falls short of the production cost but the merchants' willingness to pay is far above it. If, in such case, marginal-cost pricing is applied to both sides separately, the consumers will not buy the card product/card services and the card system will not become established in the market. One possible solution here is to allow the merchant – with high willingness to pay – to subsidize consumers in order to create a demand for cards/card services on both sides of the market. This reasoning can lead to a situation in which payment services exist even though one side does not pay anything for the product, ie the entire cost is borne by the side with the higher willingness to pay. Cards and card payments are frequently cited as examples of payment services of this kind, but the similar arrangements obtain in other markets. For example, Adobe Acrobat software is available in a simple version that only reads PDF files and is free of charge, and in a full version in which the user can create PDF files but must buy it.

Generally speaking, production costs are the basis of efficient pricing of payment services, ie if the price charged for a product accurately reflects its production cost, the price will contain all the information the consumer needs to make a choice that will result in optimal use of society's resources. In certain cases, however, an adjustment for externalities is necessary. Where positive network effects are present, the price should be set below the production cost; with negative externalities, eg negative external environment effects, the price should be set above the production cost. Nevertheless, for the payment system as a whole, it may be reasonable to demand that it should cover its own costs, which in practice means that the 'side' of the market that benefits most from the system should subsidise the other 'side'. Even if such subsidies from one side of the market to the other may be socially optimum, it is very difficult to decide how large these subsidies should be. Incorrect pricing may have the effect that the market does not develop rapidly enough and that a relatively less efficient payment instrument is overused and that a more efficient instrument is underused. In the example of the card market, this may

result in too few payment terminals (if merchants' fees paid to banks are too high) or too few customers with cards (if cardholders' transaction fees are too high). In that scenario, cards will be underused and cash overused.

2.2.3 Agreements on fees between banks

Where externalities exist, it is possible that the market prices will not be socially optimal and that the networks will be too limited. In the card market, the banks have tried to address this problem by entering into multilateral agreements on fees between card-issuing and acquiring banks. These interbank mediation fees (or interchange fees) are often justified by the argument that the payer's bank must be compensated for its efforts and costs connected with the payment.[3] Another way of expressing this is that an optimal balance of network effects is best achieved by having the card acquiring bank – and therefore, ultimately, the merchants – pay these costs, rather than having the cardholders pay them. This argument prevails if difficulties in persuading individuals to become card users justify their being subsidised by the merchants. The European Commission previously accepted this argument but recently changed its policy and decided to prohibit MasterCard from charging what are known as multilateral interchange fees for cross-border payments of private individuals using charge and credit cards – if it cannot demonstrate that the fees promote innovation for the benefit of all users.

2.3 Is the problem of pricing relevant to the cash and card markets in Sweden?

In the case of cash, network-related problems – such as for small-scale networks – are not relevant, as notes and coins issued by the Riksbank are traditionally broadly accepted as a means of payment.

On the other hand, there are examples in the card market of situations where network effects may have hampered the development of innovative products. One such situation arose in 1998 when three of Sweden's major banks jointly issued the *Cash Card*. *Cash Card* was

[3] For a discussion of interchange fees, see, eg, Evans and Schmalensee, 2005, or Bergman, 2003.

Sweden's first electronic cash system and was intended for use as a substitute for physical cash. The system worked by having a prepaid value stored on a microchip in a plastic card. As part of the transaction, a digital value corresponding to the transaction amount was transferred from the microchip to another microchip in a terminal. The launch of the new electronic cash system failed, although the three issuing banks collaborated in building up a common infrastructure and technical standards, as well as in marketing activities. Electronic cash never reached a sufficient critical mass of users, and the system was abandoned in 2004.

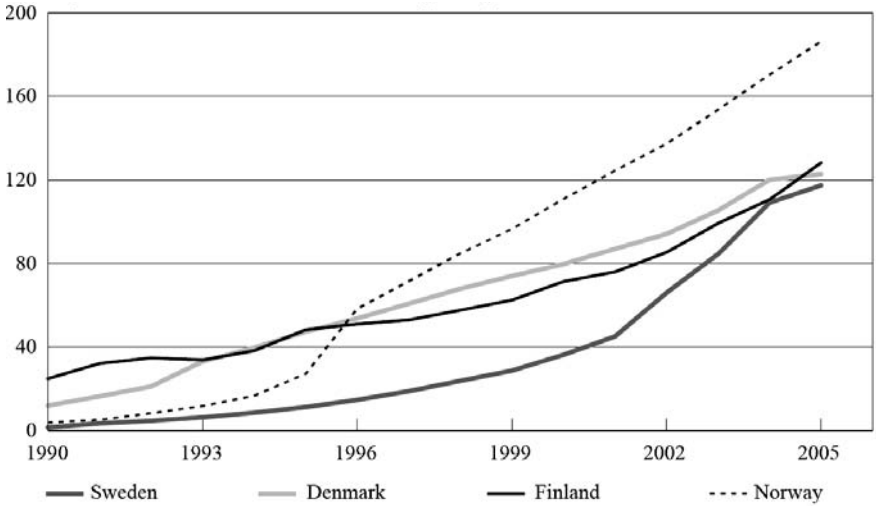
2.3.1 Card payments well established

However, standard debit and credit card payments quickly passed the critical mass threshold in Sweden. Both sides of the market are now well established. Not only density of terminals but also the number of cards per capita in Sweden is high by international standards. In 2006 there were 20,107 payment terminals per million inhabitants in Sweden. The corresponding average for the EU countries was 15,356. The Swedish public holds on average more than 1 card per person. The number of cards issued per capita totalled 1.53 in Sweden, compared to the EU average of 1.38.[4] If anything, these figures indicate as high a level of acceptance of card payments among individuals as well as among merchants.

However, a comparison with the other Nordic countries suggests that far too few card payments are made in Sweden. In terms of both number of terminals and cards per capita, the Nordic countries are very similar. On the other hand, this infrastructure appears to be used less intensively in Sweden than in the rest of the Nordic region, even though the differences – above all, versus Denmark and Finland – have narrowed considerably since 2001. The number of card transactions per capita in Sweden in 2005 – the last year for which it is available for all the Nordic countries – was 117.[5] The corresponding figures for Denmark, Finland and Norway in the same year were 123, 128 and 186, respectively.[6] Figure 2.1 shows the trends of card use in the Nordic countries since the early 1990s.

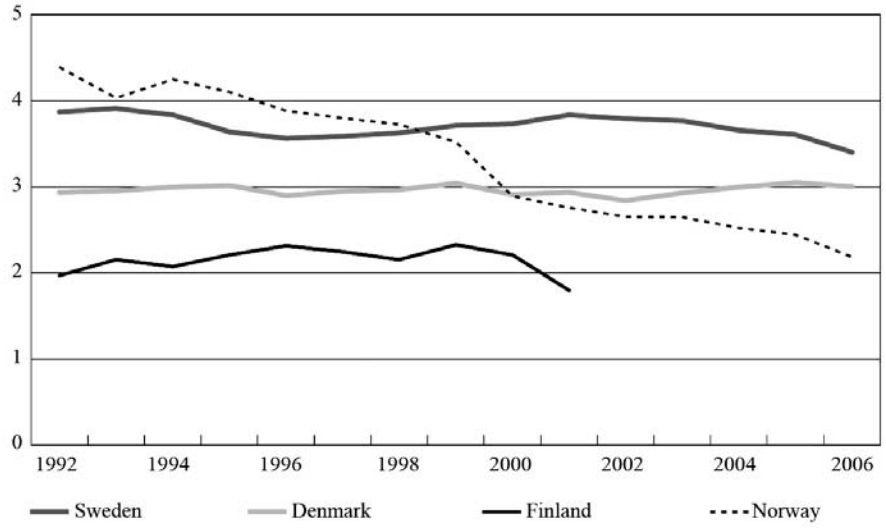
[4] Blue Book (2006), European Central Bank.
[5] Statistics on card transactions refer only to card transaction using bank-issued cards.
[6] Sveriges Riksbank, The Swedish Financial Market in 2007.

Figure 2.1 **Number of card transactions per capita in the Nordic countries**



Sources: ECB and Norges Bank.

Figure 2.2 **Cash use, measured as ratio of cash in circulation to GDP in the Nordic countries Per cent**



Sources: ECB and Norges Bank.

Because card and cash payments are interchangeable, the lower level of card use by Swedes also reflects a more widespread use of cash. In 2001, the last year for which Finland reported its own money supply figure (before joining the euro), its cash use, measured as the ratio of cash in circulation to GDP, was 1.8%. In Denmark and Norway, cash use by this measure was 2.9% and 2.8%, respectively. The corresponding figure in Sweden was 3.8%. The difference versus Denmark has narrowed in recent years but has remained stable or even risen slightly versus Norway. Figure 2.2 illustrates cash use in the Nordic countries since the start of the 1990s.

As we explained in the introduction, handling cash is expensive. The fact that cash is used more in Sweden than in the other Nordic countries could therefore indicate that the Swedish payment system is being used less efficiently. Logically, the next question is: why is cash overused in Sweden? Experience from both Sweden and Norway indicates that the demand for payment services is price-sensitive, ie the fees charged for payments, above all by banks, but also in some cases charged by merchants, considerably influence the consumers' choice of payment method – see Humphrey et al (2001) and Nyberg and Guibourg (2003).[7] In Norway, the number of electronic payments – including card payments – rose sharply when the banks began increasingly to charge cost-based transaction fees. Previously, the Norwegian banks had financed their payment services via cross-subsidisation, net interest and float income.[8] This raises the question as to whether incorrect pricing for card and cash payments may lie behind the less efficient use of the payments instruments in Sweden.[9]

[7] Cash is the most common means of payment in the shadow economy. If Sweden had a larger shadow economy than the other Nordic countries, the demand for cash in Sweden would be higher than in the other Nordic countries. However, there is nothing to suggest that this is the case. On the contrary, the shadow economy appears to be roughly of the same size in each of the Nordic countries. Therefore, the explanation for the different level of demand for cash in the different countries is probably to be found elsewhere. For more information on the correlation between shadow economy and the demand for cash, see Guibourg and Segendorff (2007b).

[8] According to information from Norges Bank, the rapid growth was attributable to a combination of successful pricing and merging of different card systems. 'Net interest' refers to the difference in borrowing and lending interest rates. 'Float income' is the interest income the bank earns on money 'in transit' between accounts. If it takes more than 24 hours from the debiting of the payer's account to the crediting of beneficiary's account, the bank can invest the money and earn interest on it.

[9] Guibourg and Segendorff (2007a).

2.4 How are card and cash payments priced in Sweden?

Guibourg and Segendorff (2007a) analyse the Swedish banks' costs for various payment services and demonstrate that the cost differences are only to a minor extent reflected in the fees paid by businesses and private individuals for various services.[10] In the case of card and cash payments, it appears that the banks almost exclusively charge fees to retailers. With few exceptions, the Swedish public do not pay the banks for cash withdrawals; they only pay an annual fee for their cards. Instead, the banks cover their card and cash payment costs by charging retailers for daily takings (cash takings) and transaction fees for card payments. In some cases, a cardholder will also receive a bonus on the purchase amount, and for charge and credit card transactions consumers regularly benefit from an interest-free credit period of about one month. Both the absence of such charges and the provision of a bonus mean that the bank subsidises the consumer's card transactions. As we explained above, such a subsidy for just one side of the market may be justified if there are (two-sided) network effects.

2.4.1 Cash is more expensive

The costs to Swedish banks – both variable and unit – of cash withdrawals exceed their costs for card payments. If we look at the revenue side, we find that in 2002 an average large Swedish banking enterprise made an annual profit in the card market (SEK 460 million) equal to the loss it incurred on its cash distribution operation (SEK 466 million). It may thus be concluded that cash distribution is being subsidised by profits made in the card market.

So retailers pay fees to the banks for both cash and card payment services, but do not price these services explicitly vis-à-vis their own

[10] Ibid.

customers.[11] The costs that retailers incur are instead passed on to consumers in the form of general mark-ups on the prices of goods. Thus retailers do not signal the costs of one payment method or another to their consumers.

2.4.2 The customer chooses

In the transaction, it is the customer who decides which means of payment he or she will use. Since the customer rarely receives explicit pricing signals, either from the bank or from the merchant, he or she can be expected to decide on the basis of non-monetary costs, such as the time and trouble involved.

It is clear from the above-mentioned studies that the banks would gain from increased use of cards by their customers, at the expense of cash. However, this does not automatically imply that society as a whole would benefit from such a tendency. To ascertain what is good for society, we should instead consider the social costs that arise as a result of card and cash payments.

2.5 Cost to society of card and cash payments

What distinguishes a cash payment from other types of payment is that no intermediaries are involved in the transaction itself. The payment is concluded immediately when notes and coins are handed over. A card payment, on the other hand, is not concluded immediately when the buyer hands his card to the seller. When a card is inserted into a terminal, information is transferred from the buyer's card to the terminal and onward to the shop's (merchant's) bank. This initiates a fairly complex process in which information and payments are transferred in several stages involving several intermediaries. Ultimately, the transfer of information results in money moving from

[11] Agreements that retailers enter into with the card issuer prohibit them from 'discriminating' between different types of card, such as credit card and debit card, or between cards and cash. 'Discrimination' here refers to retailers charging a special fee for card payments or charging customers different prices depending on their choice of means of payment. Nevertheless, there are individual merchants who charge a fee for card payments below a certain amount. Under a decision by the Swedish Competition Authority, 'discrimination' was permitted up to the start of the 2000s, but this option was rarely used and the Authority then changed its decision after the EU Commission declared in 2001 that card issuers were entitled to prohibit 'discrimination'.

payer's bank account to the beneficiary's bank account. The payment is not considered final until the banks have appropriately debited and credited the parties' accounts.

Card payments require an infrastructure of terminals and systems for transferring information on the payment. An infrastructure of this kind generally represents a major fixed cost. On the other hand, the cost directly attributable to an individual card payment is minor and arises when the payment information is processed and transferred in the system.

Cash payments do not require any infrastructure for the payment itself to be executed. On the other hand, handling cash requires an infrastructure for transport of cash between banks, post offices, retailers and users. This, too, involves fixed costs as well as costs attributable to an individual payment that arise before, during and after the actual handing over of the cash. What is common to both cards and cash is that several parties are involved in both types of payment.[12]

An analysis of costs within a particular market should distinguish between private costs for the parties involved and social costs. The latter consist of the total costs to society, and reflect the real use of resources in the production of payment services. When a good or service is produced in a production chain, the social costs cannot be estimated simply by adding up the private costs of the parties involved. This is partly because, at a given stage of production, private costs include fees to cover costs at an earlier stage of the production process.[13] For example, part of the fees paid by the business proprietor for transport of cash covers the transport company's production costs. Simply adding up these costs would result in double counting. The social costs comprise only the real costs of production that arise at each stage of production, ie the value added by that production stage (assuming zero economic profit).

[12] For a more detailed account of the card and cash markets, see Bergman, Guibourg and Segendorff (2007) and The Swedish Financial Market, Sveriges Riksbank (2007).

[13] In the case of cash, the calculation of private financial costs also include seigniorage costs – the interest income that banks, retailers and the public lose via their holdings of cash. However, these costs are deducted in the estimation of social costs, since seigniorage consists only of transfers from banks, retailers and the public to the central bank.

2.5.1 Costs of cash payments

Handling cash demands an extensive infrastructure that entails substantial costs and the involvement of many intermediaries. The Riksbank's costs arise mainly when notes are issued, ie printing costs, storage costs etc. The banks buy the notes and coins they need from the Riksbank. These notes and coins are then handled by various private operators. In the case of the cash deposits – where the cash surpluses of the banks are stored – costs include rent of premises, insurance, security, machinery, personnel and IT systems. Transport companies move and distribute the cash, and their costs include, besides personnel and transport costs, the costs of logistics and security.

Private costs

Cash handling at bank branches includes both the withdrawal and depositing of cash by customers.[14] These transactions involve costs relating to premises and personnel, ie costs that are generally fixed regardless of the number of cash withdrawals. ATMs also involve high fixed costs, but there are also substantial variable costs, in particular for filling the machines and for the interchange fees paid by the banks to each other. Banks also incur costs for cash takings, in terms of foregone interest and administration, as well as for transport of cash between bank branches and cash deposits.

Swedish users do not pay fees for cash withdrawals. The only explicit costs to the public are the fixed annual fees that are charged for cards that can be used for withdrawals from ATMs. Nevertheless, the user incurs implicit costs, namely foregone interest income on his average cash holding, plus the time cost for the withdrawals. Cash users also incur a cost in the form of the time needed to carry out a cash payment (time of queuing at the shop's cash register etc.).

Retailers incur costs, including personnel time costs for cash payments at the cash register, as well as the extra time taken for other administration of cash, such as counting, sorting notes and coins, helping with daily takings and ordering cash. Retailers also pay fees to both banks and transport companies for depositing and transporting daily takings.

[14] Hereinafter, any reference to banks' costs will include those incurred by Svensk Kassaservice (Swedish Cashier Service), no longer in existence.

The total private cost of handling cash is the total cost for all these stages. Bergman, Guibourg and Segendorff (2007) estimated that the total private cost connected with handling cash in 2002 was SEK 10.8 billion, corresponding to 0.5 per cent of GDP in that year. Just over 70 per cent of gross private costs fall on banks and retailers, and are fairly evenly shared by them.[15]

Social costs

The social costs only take account of the value added in each production stage, and are calculated as the total of private costs at each production stage, less the payments to the previous production stage. By this measure, the social costs amounted to SEK 6.6 billion or 0.3 per cent of GDP. Nearly half of the social costs arose on the banking side. Roughly the same proportion was incurred jointly by retailers, transport companies and the public, distributed fairly evenly across the three categories. The respective shares of total social costs accruing to the Riksbank and cash deposits are minor.[16] According to the above-mentioned study, the number of payments made with cash totalled 1.4 billion per year. As a result, it is calculated that a cash payment cost society on average SEK 4.6 in 2002.

2.5.2 Costs of card payments

The costs of card payments vary from user to user and bank to bank, depending on the type of card used. Credit card payments are more expensive to both issuing banks and users.[17] The card issuers have to pay higher costs for credit card payments because they allow the users credit for a period that the banks themselves have to finance.[18] As a result, the banks charge higher fees to the sellers (merchants) for credit card payments. To the cardholders, the picture is more ambiguous. Annual fees for credit cards may be higher than for debit

[15] Bergman, M, Guibourg, G and Segendorff, B (2007).
[16] Bergman, Guibourg and Segendorff (2007).
[17] All cost data are from Bergman, Guibourg and Segendorff (2007).
[18] There are two types of credit card: pure credit cards, where the cardholder pays either the whole amount or part of the debt after 30 days and pays interest on the remaining balance of the debt, and 'charge cards', where the entire debt is paid after 30 days without any interest charge to the cardholder. Charge cards are used most frequently in Sweden. Debit card payments are the most common in Sweden. With these, the transaction amount is deducted immediately from the cardholder's account at the time of the transaction.

cards, but generally fees are not charged per transaction, for debit or credit cards. In addition, those who pay by credit card sometimes receive a bonus on the purchase price and it is fairly common that no fee is charged for at least the first year.

In addition to fees paid to banks, retailers must also bear the costs of terminals and personnel. As for cash payments, personnel costs are a function of the average time for a card payment to be performed. Customers who pay by card also incur a time cost at the cash register. The cost is the same for credit and debit card payments, as they use the same technology. Otherwise, card payments generate costs for the transfer of information on payments between card-issuing bank and merchant's bank, plus costs relating to settlement and clearance of payments between the banks involved.

In the above-mentioned study, the social costs for payments by card were estimated at SEK 1.9 billion, corresponding to 0.1 per cent of GDP in 2002. The gross private costs totalled SEK 4.3 billion, or 0.2 per cent of GDP. Nearly half of the total social costs arose at the banks, while the share accruing to retailers was approximately a third.

Our discussion has so far centred on where the costs arise. If we also take account of payments between operators, such as fees for services, we gain an idea of the proportions in which they ultimately bear these costs. We can then see that retailers bear nearly half of the costs, while the banks' share is less than a quarter. Retailers pay high transaction fees to banks for card payments, fees that depend on fees that the banks involved, in turn, pay to each other, the interchange fees.

In 2002, the number of card payments was 589 million.[19] The cost to society of each card payment was on average SEK 3.0, about 35 per cent less than the corresponding cost of a cash payment. Table 2.1 summarises the social costs, in total and per transaction, for both payment instruments.

[19] The Swedish Financial Market (2007), Sveriges Riksbank.

Table 2.1 **Social costs, total and per transaction, of card and cash in 2002**

	Total social costs SEK million	Wolume million transactions	Unit cost social SEK
Cash	6560	1424	4.6
Cards	1780	589	3.0
– of which			
– Debit cards	1540	509	3.0
– Credit cards	240	80	3.0
Total	**8340**	**1989**	

Source: Bergman, Guibourg and Segendorff, 2007.

2.6 Cost-efficiency in the choice between cards and cash

What does this say about the socially optimal use of cards and cash? At first glance, card payments – with a social unit cost 35% lower than that for cash payments – ought to totally replace cash. But it is not quite so simple, because there are major differences in the production technologies of the two payment instruments. Card payments require an extensive infrastructure of terminals, computers and lines of communication, which involves a high proportion of fixed costs. A cost is also associated with processing payments, but this cost is fixed per payment, irrespective of the transaction amount – meaning that the cost of the payment is the same whether the card is used to pay for a purchase amounting to SEK 50 or 50,000.

In the case of cash payments, the conditions are partly reversed. Cash payments involve a good deal of physical handling – transport, counting, storage of notes etc. The larger the transaction amount, the more expensive the actual cash payment is, as a larger transaction amount will require a larger amount of handling. In payments of small amounts, the 'variable' cost is lower for cash than for card payments. As a result, from the social viewpoint, cash may be preferable for small payments. But what does this mean in practice, from the perspective of the socially optimal use of cash?

Bergman, Guibourg and Segendorff (2007) calculate a 'social breakeven value', which is the transaction amount below which cash payments are the socially most efficient option. The calculation is performed by expressing the cost to society of a cash versus a card payment, each as a function of the transaction amount. In payments of very small amounts, the fixed unit cost dominates. Because this is

higher for card payments than for cash payments, paying by cash is (on average) socially more efficient for small payments. As the transaction amount rises, so does the total unit cost of a cash payment, whereas the cost of a card payment is not affected by the amount. Therefore, the social breakeven value is the transaction size at which the total social unit costs are equal for both payment methods. The result of the calculation indicates a breakeven point of SEK 69.[20] This means that, according to the costs that prevailed in 2002, the socially optimal option typically was to use cash for purchases up to a value of SEK 69. Above that amount, card payments were generally preferable, even though the actual costs for the two payment methods may of course vary considerably from one specific payment to another.

2.7 Costs to consumers of card and cash payments

In Sweden, a high proportion of merchants accept both cash and card payments. It is therefore primarily the consumer who chooses the instrument of payment. Demand for payment instruments is determined in the same way as demand for other goods and services, in other words by the consumers' preferences and their private incentives, ie the costs that arise from the consumer's choice.

Both card payments and ATM cash withdrawals require the customer to have a card, and an annual fee is normally charged to the customer for such cards. However, when transacting, the customer will already have borne the annual card fee. This is thus a sunk cost and so should not affect the choice between cash and card. Otherwise, a Swedish consumer does not incur any explicit variable costs, either from the bank or the merchant. On the other hand, costs arise in the form of queuing time at the cash register and implicitly a cost in time for future ATM cash withdrawals when the person draws on his cash balance.

Bergman, Guibourg and Segendorff (2007) also calculated the private costs to consumers of paying by card and by cash, using the figures for 2002. As for the social costs, private costs are also expressed as functions of the transaction amount. As before, the calculation is based on specific assumptions and therefore may be

[20] For a more detailed description of the method of estimation, see Bergman, Guibourg and Segendorff (2007).

assumed at best to apply to a 'typical' transaction. Depending on the circumstances, the costs and hence the breakeven value, vary over individual payments.

For an average payment, it was calculated that the private breakeven value for consumers was around SEK 125. Below this value, it is in private terms cheaper to use cash; above it, using a card is cheaper. It should be noted that the private breakeven value is nearly double that of its social equivalent. As a result, if consumers chose between card and cash on the basis of private incentives, this would lead to overuse of cash and thus to a welfare loss.

2.8 How do Swedish consumers choose between card and cash payments?

In order to study how consumers choose the method of payment, the Riksbank conducted a questionnaire-based survey *inter alia* of how consumers chose between card and cash in their most recent transaction.[21] As well as being asked about their actual choice of means of payment, individuals were questioned on the size of the purchase. Other background variables taken into account in the survey were age, education, income and gender. By comparing consumers' actual choices with the breakeven values calculated, it is possible to discuss the efficiency of the payment system in Sweden.

Bergman, Guibourg and Segendorff (2007) used data from this survey to estimate the actual breakeven value in the choice between card and cash payments. To be more precise, the transaction amount at which it was equally likely that an individual would choose a card or a cash payment was estimated. The results indicated that a typical consumer does not choose to use a card until the purchase amount exceeds SEK 123.[22] This is very near the private break-even value. Against that background, it appears that a typical consumer makes the choice on the basis of his private incentives and so deviates from the social optimum. This results in overuse of cash. However, certain background variables – such as level of education and, above all, age – considerably affect the outcome. The breakeven value at which a 60-year-old chooses card over cash is as much as SEK 179, while the

[21] Synovate Temo (2006).

[22] The typical consumer is defined as a 41-year-old man with upper secondary education and with an annual household income of SEK 350,000–400,000, living in a two-person household.

corresponding breakeven value for a 20-year-old consumer occurs at transaction amounts as low as SEK 60. The choice of young people thus appears to be very close to the social optimum.

2.9 Private incentives can deliver more cost-efficient payments

The Riksbank's studies of the card and cash markets suggest that there is overuse of cash and underuse of cards, from a social perspective. Welfare losses therefore arise in these markets. Because developments in technology have made card transactions more efficient and because the study is based on conditions in 2002, it is probable that the breakeven value today is lower than the estimated one, which implies even greater welfare losses.

On the other hand, the choice of payment instrument by Swedish consumers appears to follow from their private incentives. The problem is that these incentives are not compatible with the social optimum. However, the behaviour of the consumers could be changed by structuring private incentives so as to coincide with what is socially efficient. This could be achieved eg by introducing fees on cash withdrawals. An illustrative calculation based on 2002 figures indicates that fairly small withdrawal fees – on the order of SEK 0.15 per SEK 100 withdrawn – would be sufficient. In order not to encourage small withdrawals, a fixed fee might be justified, eg SEK 1.5 if a normal withdrawal is for about SEK 1,000.[23]

To prevent this from providing excessive incentive for using cards for small payments, consideration could also be paid to the possibility of introducing a fixed transaction fee of eg SEK 0.25 – 0.50 per card payment. However, higher fees for card payments alter the private breakeven value, and hence such fees must be offset by higher withdrawal fees. On that basis, card fees at the above-mentioned level require withdrawal fees of SEK 5–8.5 per withdrawal for the breakeven point to remain at the optimal level of around SEK 70. For a typical customer, the annual cost would rise by SEK 300–500. If competition is effective, however, higher transaction fees ought to give the consumer offsetting revenues via higher interest on

[23] In 2006, the average withdrawal was just under SEK 900, but a withdrawal fee would probably lead to an increase in this average.

transaction accounts or, alternatively, reduce other fees such as annual card fees, so that the consumer's total costs remain stable.

Of course, it is up to the market operators themselves to decide how to price their services. There may be commercial and other issues to be considered, and so the above-mentioned calculations should only be regarded as illustrative. Transaction-based fees also involve costs in themselves, which speaks against their introduction. In addition, the use of cards as an instrument of payment is age-related, in that the choice of the young generation is very close to the optimum. This may be interpreted as indicating that – all else being equal – time itself may play a part in reducing welfare losses. If, on the other hand, the aim is to create a more efficient payment system quickly, transaction fees may be a means of aligning private incentives to better match the social costs involved in the production of the two payment services.

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Chapter 3

Retail payment instruments in Portugal: a brief description of costs and benefits

Maria Tereza Cavaco

3 Retail payment instruments in Portugal: a brief description of costs and benefits

Abstract

Generally speaking, there is little information on the costs related to payment systems, although these costs, as a percentage of GDP, are not insignificant. The purpose of this study was to assess for the first time the costs and benefits of the Portuguese payment systems. Estimates show that retail payments in Portugal in 2005 generated costs totalling 1,139 million euros and revenues totalling 722 million (around 0.77% of GDP for costs and 0.49% for revenues), representing a 63% cost–revenue recovery rate. This means that part of the costs involved in the use of payment instruments are paid by bank customers as a whole and not necessarily by the customers who use these specific instruments. Direct debits have the lowest unit cost, at just 0.09 euro per transaction. Credit transfers cost 0.28 euro per transfer and debit cards cost 0.23 euro per transaction. Each cheque represent a cost of 1.45 euros and each deposit or withdrawal at a branch costs 1.85 euros. The credit card has the highest unit cost' 2.44 euros per transaction.

3.1 Introduction

There has been a significant increase in recent years, in Portugal, in terms of the choices of payment instruments. Paper-based instruments (such as cheques) are being replaced by electronic payment instruments (eg payment cards). Cheques accounted for 29% of all transactions in 2000 but only for 17% in 2005, while payment cards accounted for 51% in 2000 but 62% in 2005.

This change in the use of payment instruments in Portugal has influenced the development of costs and benefits for the banking industry, consumers and retailers.

Banco de Portugal conducted a study, 'Retail Payment Instruments in Portugal: Costs and Benefits' (July 2007), which was the first to provide essential information for assessing these costs and benefits.

The starting point for the study was the collection of a bibliography of cost estimates in payment systems. This bibliography included a number of studies carried out in other countries by national central banks, such as the ones conducted by the central banks of Norway, Sweden, The Netherlands and Belgium. These studies have different degrees of depth and use different methodologies.[1]

The study published by the national central bank of Norway (Gresvik and Owre, 2002) summarises the method and the findings of a cost analysis developed in 2001. This analysis covered costs to the banks, prices charged and income generated by the Norwegian retail payment system and was carried out by using the ABC framework.

The study conducted by Guibourg and Segendorff (2004) aimed at estimating the costs to the Swedish banking sector for the production of payment services and investigating the extent to which the price structure reflects the estimated cost structure. The authors relied on cost and price data for 2002 provided by the four biggest banks and constructed an 'average bank', using as weights the banks' market share for each payment instrument and channel (in terms of volume of transactions).

The work carried out by the Nederlandsche Bank (Brits and Winder, 2005) aimed mainly at quantifying the social costs inherent in the use of the payment instruments at point of sale. Social costs were broken down into fixed and variable costs, the latter being divided into costs that vary with the number of transactions (transaction-linked) and costs that vary with the size of the transaction (sales-linked). Central bank, commercial banks and retailers supplied the data used for the study by means of a survey.

The study published by the National Central Bank of Belgium in 2005 aimed at: (i) identifying and quantifying the costs inherent in the use of payment instruments at the point of sale; and (ii) putting forward recommendations as to how to reduce these costs. The basis

[1] Banque Nationale de Belgique, 2005, 'Coûts, avantages et inconvénients des différents moyens de paiement', Dec.
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for this study was a similar work carried out in the Netherlands, in terms of aims and scope. The quantitative information used in the study came from surveys of commercial banks, retailers and consumers.

The present article seeks to summarise the main aspects of the study 'Retail Payment Instruments in Portugal: Costs and Benefits', with special emphasis on the methodological model used. The way the conceptual model was conceived and designed and the care taken in obtaining primary data made it possible to obtain good quality information on costs and revenues for the banking sector related to making payment instruments available.

The article is in two parts. Section 3.2 gives a brief presentation of the scope and methodology used in the study, a short description of the data collection and processing procedures, a summary of the main findings, and some views regarding future research. Section 3.3 comprises a summing up of the main findings from surveys covering consumers and retailers in Portugal and estimates of the gains from the use of more efficient payment instruments.

3.2 Analysis of costs and revenues in payment systems

3.2.1 Scope and methodology

The study 'Retail Payment Instruments in Portugal: Costs and Benefits' covers retail payment operations, defined as transactions of less than one hundred thousand euros,[2] whether carried out by individuals or companies.

The payment instruments included were: cash, cheques, payments cards (debit, credit and pre-paid cards), credit transfers, and direct debits.

The model used for the study is based on Activity Based Costing (ABC). Its underlying principles make this a suitable method for analysing the costs incurred by payment systems institutions. This is because these institutions are operating in a highly competitive market, they have a significant proportion of indirect costs and there

[2] According to the Portuguese payment systems framework, the transactions above one hundred thousand euros are considered large value payments. To minimise systemic risk, these are settled individually, via the Real Time Gross Settlement (RTGS) system.

are major differences in the way products and services use the available resources. Using the ABC method means that information can be obtained on the cost of each payment instrument and of each activity inherent in making the instruments available. The ABC framework was also used by the national central bank of Norway (Gresvik and Owre, 2002), which work constituted a reference for the Portuguese study.

The methodological model involved two phases: the conceptual phase, followed by a phase of data collection and analysis.

First phase – Conceptual

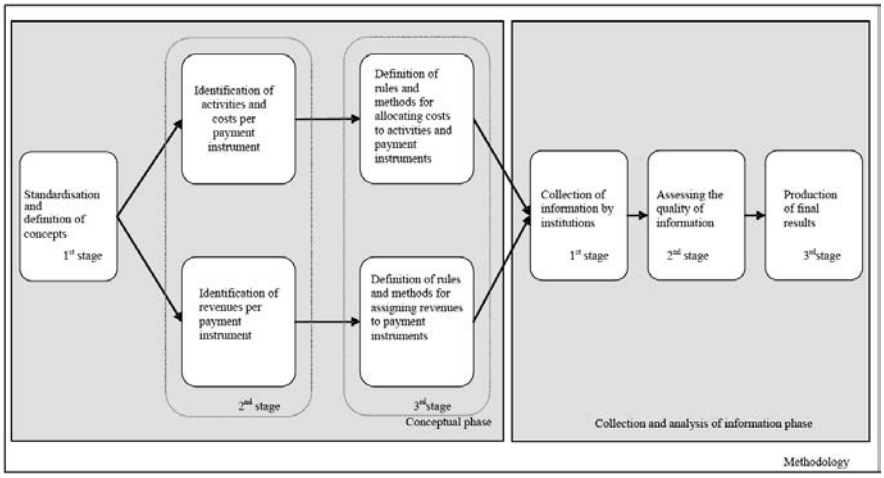
The first phase was broken down into three stages: (i) standardisation and definition of the concepts; (ii) identification of the main activities, costs and revenues related to making payment instruments available; and (iii) definition of rules and calculation methods for allocating costs to activities and to payment instruments, and for assigning revenues to those payment instruments. As indicated in Figure 3.1, costs and revenues were analysed differently in the second and third stages.

The first stage involved standardisation and detailed definitions of the concepts and terminology used in the study. The principles were set out, along with the basic guidelines for participating institutions as regards the collection of information. The aim was to facilitate communication among all those involved.

The second stage aimed at identifying the activities, costs and revenues related to making each payment instrument available.

The third stage included the definition of rules and calculation methods for allocating costs to activities and to payment instruments and for assigning revenues to the same payment instruments.

Figure 3.1 **Methodological model**



Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Regarding stage two, the identification of activities and costs related to payment instruments was based on the ABC method. Activities were classified into three categories: (i) activities directly related to payment instruments; (ii) activities not related to payment instruments; and (iii) supporting activities such as overall management, human resources management, logistics and asset management. With the aim of identifying those activities directly related to payment instruments, each participating institution carried out an in-house survey of the main activities performed. The proposals put forward by the institutions were discussed in depth and the consolidation of these individual proposals resulted in a list of activities by payment instrument, as presented in Table 3.1. This list of activities provides an accurate overview of the banks' operations. Some of the activities were broken down further in sub-activities, by type of channel (branch visit, internal ATM, external ATM, internet, telephone) and by type of back-up support (paper based or electronic).

Table 3.1 **Main activities directly related to payment instruments (ADRPI)**[3]

	Cash	Cheques	Direct debits	Credit transfers	Debit cards	Credit cards	Acquiring
Collection/Transport	X	X					
Withdrawal	X						
Deposit	X	X					
Safe-keeping	X	X					
Cash handling	X						
Treasury management (stocks)	X						
Management and control of activities	X						
Procedures with false notes	X						
Cheque production		X					
Request for cheques		X					
Issue and delivery of cheques		X					
Presentation for payment		X					
Return		X		X			
Handling of post-dated cheques		X					
Cheque imaging		X					
Refund		X		X			
Overdue credit		X					
Connections with central bank (cancellations)		X					
Normalisation of incidents and withdrawal of cancellations		X					
Control and fraud abuse		X		X			
Engaging new customers and analysing credit risk					X	X	
Issuing of cards					X	X	
Transaction processing					X	X	
Issuing statements					X		
Payments processing					X		
Overrunning credit limit and default						X	
Checking fraud					X	X	
Overall management					X	X	
Costs reverting to customers					X	X	
Licences VISA/MasterCard/Amex					X	X	
Service contracts			X	X			
ADC management (Creditor)			X				
ADC management (Debtor)			X				
Filing procedure (archive)			X	X			
Collection procedures			X				
Credit analysis			X				
Accounting and reports			X				
Management of purchases							X
POS management							X
Requests for transfers				X			
Transfer processing				X			
Cancellation (specific item)				X			
Cancellation (DD order)				X			
Transfers received				X			

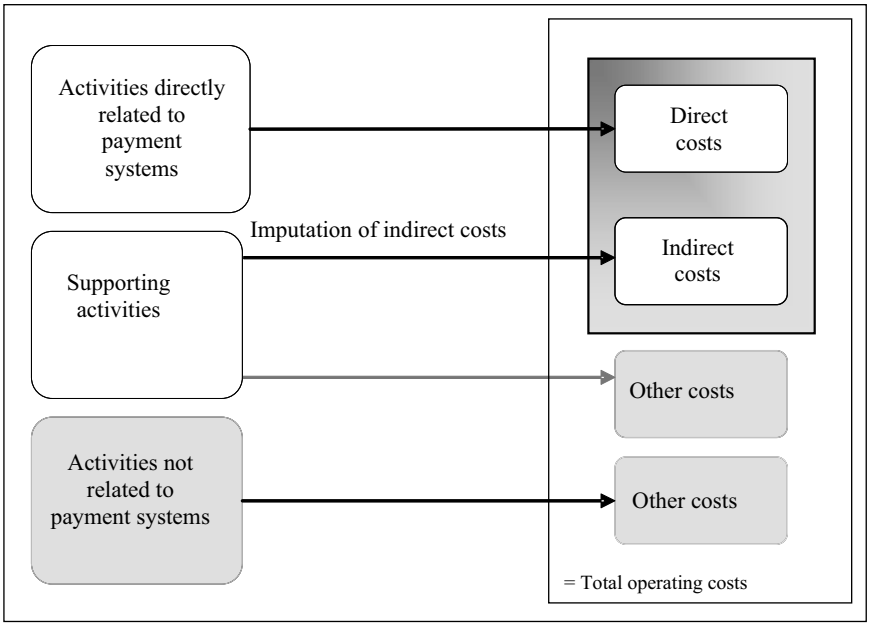
[3] In order to facilitate data collection by participating banks, activities were listed on a matrix relating separately to each instrument. This means that the activities described here in different ways may relate to the same activity but to different instruments. For example, 'overdue credit' for cheques is the same as 'overrunning credit limit and default' for credit cards.

	Cash	Cheques	Direct debits	Credit transfers	Debit cards	Credit cards	Acquiring
Control of money laundering				X			
Customer service	X		X	X	X	X	
Advertising and marketing			X		X	X	
Other activities	X	X	X	X	X	X	X

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Following the ABC framework, costs were broken down into direct costs and indirect costs, according to whether they arise from a direct and exclusive use of resources to make payment products and services available. Based on this assumption, direct and indirect costs were related with the three categories of activities already specified, as outlined in Figure 3.2.

Figure 3.2 **Relationship between activities and costs**



Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Only costs associated with the activities directly related to payment instruments (taken as direct costs) and those associated with the supporting activities for the production of payment instruments (taken as indirect costs) were analysed.

The information on costs associated with the activities not related to payment instruments and to the supporting activities to these activities was not relevant for estimating the costs of the payment instruments themselves, but it was essential for the control of total costs and hence for assessing the quality of the information.

In fact, we also collected data on these 'Other costs' to check that their sum with the direct and indirect costs corresponded to the total operating costs of the participating institutions (disclosed in banks' annual reports). This cross-checking procedure provides an additional guarantee of the quality of the information collected.

The classification in the Revised Accounting Standards was used for identifying the main costs related to making payment instruments available and the respective cost headings, as presented in Table 3.2 (commissions paid, staff costs, specialist and third party services, rentals and depreciations and other costs).

Still at the second stage, the main revenues generated by making each payment instrument available and the respective revenue headings were also identified by using the Revised Accounting Standards, as presented in Table 3.3 (interest and similar income, commissions received relating to amortised costs, other commissions received – interbank rates and other revenues).

Table 3.2 **Cost headings**

68 – Other commissions paid
70 – Staff costs
71 – General administrative expenses
710 – Supplies (consumables)
711 – Services
7110 – Rents and rentals (property and equipment)
7111 – Communications
7112 – Business travel and related expenses
7113 – Advertising and publications
7114 – Maintenance and repairs (property and equipment)
7115 – Transport
7116 – Staff training
7117 – Insurance
7118 – Specialist services
7119 – Other third-party services
72 – Other charges and provisions for imparity
76 – Losses from and provisions for imparity
77 – Depreciations
78 – Provisions
Other costs

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Table 3.3 **Revenue headings**

79 – Interest and similar income
80 – Commissions received relating to cost amortised
81 – Other commissions received (interbank rates)
Other revenues

Source: Banco de Portugal: 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

It was also necessary to define the revenues taken into account for each payment instrument. In terms of cash, the revenues taken into account were the following: revenues from night safe use, commissions on deposits and withdrawals at a branch and commissions on withdrawals for special customers. For cheques, we included revenues from issuing as well as charges levied on the customer or retailer. Revenues from debit cards included the annual charge, application of the price list and the interchange fee paid by the acquirer to the institution issuing the debit or credit card used to carry out POS transactions. Revenues from credit cards comprised the ones mentioned in relation to the debit card, and also those stemming from the collection of interest on amounts due, other interest received and debt recovery. For payment cards, there is also acquiring related revenues, such as monthly fees and the retailers' service rates paid to the acquirer. For credit transfers and direct debits, the revenues relate to interbank charges on the creditor side and commissions on the debtor side.[4]

The work carried out at the third stage turned out to be essential to ensure that the data reported from the participating institutions is comparable, rigorous, coherent and consistent.

Regarding costs, and considering that participating institutions have accounting systems which are not structured in accordance with the ABC method, it was necessary to transpose total costs booked in cost centres to the activities. Costs were transposed from cost centres to activities using cost-drivers. By identifying cost-drivers, the ABC method makes it possible to define cause and effect relationship between costs and payment instruments. The participating institutions were free to use the cost-drivers that best suited their situation. For example, the variable 'time used by employees in carrying out their tasks' was an obvious criterion for the imputation of costs, since staff costs account for a large proportion of costs and there is a close

[4] See also page 55.

relationship between these and the cost items under General Administrative Expenses.

Since each payment instrument corresponds to a specific set of activities, total costs related to a specific payment instrument are the sum of costs imputed to the activities needed to make the instrument available.

The allocation of revenues to payment instruments was carried out on the basis of a direct relationship between them. This relationship was established by identifying the origin of each kind of revenue. Then, total revenues relating to a specific payment instrument were calculated as the sum of all the revenues imputed to that instrument.

Second phase – Data collection and analysis

The second phase corresponds, in overall terms, to the compilation, consolidation, processing and analysis of information collected from participating institutions.

It was made up of three main stages. The first stage was the collecting of information from participating institutions. The second stage aimed at ensuring and assessing its quality and the third stage consisted in detailing the final findings.

3.2.2 Data collection and processing

To facilitate the task of collecting information from participating institutions,[5] activities, costs and revenues were structured on individualised matrixes by payment instrument. Each matrix was linked to a back-up chart, to help with the details for certain costs and revenues, such as costs related to specialist services and to other operational costs and revenues from commissions received.

The collection of information from participating institutions involved filling in these matrixes and the related back-up charts for each payment instrument. On the matrixes, the activities are listed in the first column and the remaining columns relate to the costs and revenues by nature.

Once the matrixes were filled in with the details on costs and revenues, the information was sent to Banco de Portugal. Institutions

[5] A sample of banks, including the five major Portuguese banks, and Unicre.

were advised to use their own quality control models and their knowledge of those used by Banco de Portugal.

Afterwards, in the second stage, the information was subject to Banco de Portugal quality control procedures, ie tests of consistency, validity and dispersion. Some of the tests carried out were:

- comparison of total costs in the matrixes with the figures in operating costs (total costs in the matrixes had to be the same as total costs on the institution's profit and loss account)
- comparison of total cost structures of participating institutions (this involved looking at the activities directly related to payment instruments as a proportion of the total in each cost item and as a proportion of the institution's total costs)
- comparison of unit costs for different payment instruments in participating institutions
- comparison of revenue structures of participating institutions
- comparison of unit revenues from each payment instrument in participating institutions.

For all the calculations, Banco de Portugal used an array of descriptive statistics covering maximum, minimum and average values. With a view to analysing disparities between the values supplied by each institution, the following dispersion indicators were used: the ratio between maximum and average, the ratio between minimum and average, and the ratio between maximum and minimum.

Two situations became apparent at this point: inconsistency in the data supplied by the institutions, and unjustified discrepancies between the structure of costs and revenues across the institutions. When either these occurred, Banco de Portugal requested clarification of inconsistencies or discrepancies and asked bilaterally to the participating institution for the information to be reanalysed or confirmed, in order to ensure confidentiality. For discrepancies between banks' structures, Banco de Portugal put together comparative charts to see the specific institution in terms of the sample, and the information was passed on and discussed multilaterally at the steering committee level. This exercise made it possible to obtain enough good quality information to avoid compromising the aims of the study.

In the final stage, the sample data were consolidated and the final results were produced. These final results included:

(i) the sample total costs and revenues relating to making the payment instruments available, obtained as the sum of the total

costs and revenues for all payment instruments and for all participating institutions

(ii) the sample total costs and revenues relating to each payment instrument, obtained as the sum of the total costs and revenues of each payment instrument for all participating institutions

(iii) the sample unit cost and revenue for each payment instrument, obtained by dividing the total costs and revenues relating to each payment instrument by the total number of transactions made by that instrument.

The following points were taken into account in the final results.

First, to make collection of information easier, acquiring related costs and revenues were detailed in a specific matrix. Because of this, it became necessary to identify a set of imputation criteria for the activity that would reflect the true nature of this business. The criteria vary according to whether the institution acts as an acquirer of debit and credit cards or just of debit cards.

Moreover, for the analysis of commissions paid and received, costs and revenues related to payments between institutions in the banking system were excluded from the analysis and were not considered in the final results. These costs and revenues basically result from the interbank tariff and are recorded as costs for one institution and revenues for another, so in terms of system they cancel out.

In addition, credit cards have specific features and in many cases function as a means of credit rather than payment instrument. Therefore, the revenues that appear under the heading of interest and similar income were set apart and the amounts involved were not considered as revenues from the use of the credit card as a payment instrument.

Finally, costs and revenues for the whole Portuguese banking system were extrapolated from the sample of five banks. The coefficient used for this on the cost side was the representativeness of the sample compared with total costs in the banking system. Costs for the five participating banks accounted for 76.8% of the total costs in the system. The costs of Unicre (the main Acquiring Company) were then added to the extrapolated costs for the whole Portuguese banking system.

The assumption for the present analysis was that unit costs for the whole Portuguese banking system and for each payment instrument were obtained from the respective sample unit costs (five participating banks and Unicre). These sample unit costs are in fact weighted costs. The unit cost of making a specific payment instrument available for

any institution in the system is the same as the average unit cost for the sample. The same method was used for unit revenues.

It was also assumed that the cost/revenue coverage rate in the system is the same as the unit cost/unit revenue coverage rate. Given this, coverage rates for the sample and for each payment instrument were multiplied by the cost to the banking system to obtain total revenue.

3.2.3 Major cost collection findings

The figures in Table 3.4 show how total costs for the banking system are distributed among two groups of activities: activities directly related to payment instruments (ADRPI) and activities not related to payment instruments (ANR).

Table 3.4 **Costs of resources used in activities directly related to payment instruments (ADRPI) and not related activities (ANR) (as a percentage)**

	ANR	ADRPI	Total
Total costs	**84.0**	**16.0**	**100.0**
Staff costs	81.3	18.7	100.0
Commissions paid	62.1	37.9	100.0
Specialist and third-party services	74.9	25.1	100.0
Rentals and depreciations	76.4	23.6	100.0
Other costs(1)	92.7	7.3	100.0

Source: Banko de Portugal: 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.
Note: (1) Other costs include general administrative expenses (except for specialist and third-party services and rentals), other expenses and operating costs, losses due to imparity and provisions for the year.

Portuguese payment system costs accounted for 16.0% of total costs in the banking system.

In addition, the breakdown of total costs among cost items shows that payment instruments are responsible for 18.7% of total staff costs, 37.9% of total commissions paid, 25.1% of costs of specialist and third party services and 23.6% of rentals and depreciation costs.

Total costs borne by the banking sector in making payment instruments available are estimated at 1,138.7 million euros for 2005, representing 0.77% of the country's GDP for the year (Table 3.5).

Table 3.5 **Costs of resources used in activities directly related to payment instruments**

	Value (million of euros)	Structure (%)	% of GDP
Total costs	**1,138.7**	**100.0**	**0.77**
Staff costs	482.2	42.3	0.33
Commissions paid	44.6	3.9	0.03
Specialist and third-party services	283.5	24.9	0.19
Rentals and depreciations	129.2	11.3	0.09
Other costs	199.2	17.5	0.14

Source: Banco de Portugal: 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Expenditure on staff and specialist services accounts for approximately 67% of this figure. Staff costs were 482.2 million euros or 42.3% of total costs. Specialist and third party services are the second biggest item, with an estimated cost of 283.5 million euros, almost 25% of total costs. Costs related to rentals and depreciations are estimated at 129.2 million euros (11.3% of total costs) and commissions come in at 44.6 million euros (almost 4% of total costs). Other costs were estimated at 199.2 million euros and represented 17.5% of total costs.

A detailed analysis of total costs per payment instrument is summarised in Figure 3.3. It shows that payment cards are responsible for 50.5% of total costs, credit cards for 23.4%, and debit cards for 27.1%. Cash and cheques together account for 45.9% of total estimated costs, with cash accounting for 17.2%[6] and cheques for the remaining 28.7%. Direct debits and credit transfers only account for 3.5% of total costs.

For 2005, total revenue from payment instruments was estimated at 722.0 million euros, representing 0.49% of GDP (Figure 3.3).

Payment cards are responsible for 74.5% of total revenue from payment instruments, 538 million euros. This relates in large measure to annuity fees and bank pricing lists.

[6] Compared with 29.4% in Norway. Percentages of total cost of other payment instruments cannot be compared to Portugal, since Norway has practically no cheques and gives values for payment cards in aggregate form. In addition, the costs of payment cards in Norway refer only to use at POS terminals.

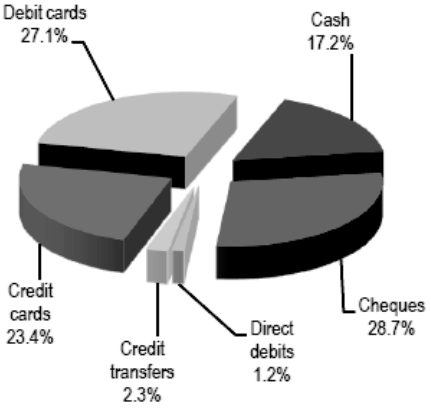
Credit cards account for 286.9 million euros and debit cards for the remainder. It should also be noted that estimation of revenue from payment cards is strongly influenced by the fact that acquiring-related revenues are imputed here.

Revenue from cheques is 129.1 million euros, 17.9% of the total revenue from payment instruments. This figure is related above all to revenue from issuing cheques and fees applied to customers and retailers.

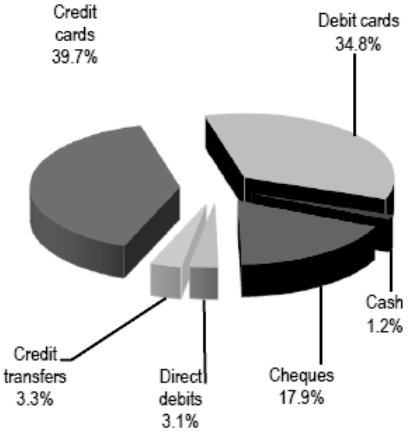
The remaining payment instruments – cash, direct debits and credit transfers – account together for 7.6% of total revenue. The low figure for cash derives from the fact that most revenue is from interbank fees and is therefore not included in the analysis. The revenue from cash comes from fees charged on withdrawals and deposits at bank branches. Most of the revenue from direct debits and credit transfers comes from fees charged respectively to the creditor and to the customer issuing the instruction.

Figure 3.3

Total costs per payment instrument (million of euros and as a percentage)



Total revenues per payment instrument (million of euros and as a percentage)



Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

In terms of the banking system as a whole, making retail payment instruments available costs a net 416.7 million euros (Table 3.6), meaning that revenues generated cover 63.4% of costs. These figures indicate cross subsidisation against other banking products.

Table 3.6 **Total costs and revenues for the banking sector per payment instrument**

	Costs (million of euros)	Revenues (million of euros)	Net costs (million of euros)	Coverage rate (%)
Total	**1,138.7**	**722.0**	**416.7**	**63.4**
Cash	196.3	8.3	188.0	4.3
Direct debits	14.0	22.3	-8.3	159.5
Cheques	327.3	129.1	198.2	39.4
Credit transfers	26.1	24.2	1.9	92.7
Credit cards	266.9	286.9	-20.0	107.5
Debit cards	308.1	251.1	57.0	81.5

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Table 3.7 shows that cash and cheques have the highest net unit costs for the banking system. Cash is the payment instrument which brings in the least unit revenue, 0.08 euro per deposit or withdrawal at a branch. Comparing this with unit costs yields a net unit cost of 1.77 euros for each cash deposit or withdrawal at a branch. The coverage rate for cash is 4.3%.

Every cheque presented carries a total unit cost of 1.45 euros and unit revenue of 0.57 euro; the net unit cost being 0.88 euro per cheque. The coverage rate for cheques is 39.4%.

Credit cards have the highest unit revenue, 2.62 euros per transaction, and the highest net unit negative cost, 0.18 euro per transaction. Revenue from credit cards is 107.5% of costs.

Each transaction with a debit card generates a unit cost of 0.23 euro per transaction and causes the banks a net unit cost of 0.04 euro. The coverage rate for debit cards is 81.5%.

Each direct debit generates a net 0.05 euro gain, with unit cost of 0.09 euro and unit revenue of 0.15 euro. The coverage rate for direct debits is 159.5%.

Each credit transfer, however, generates a 0.02 euro loss for the banking system. The coverage rate for credit transfers is 92.7%.

Credit transfers and payment cards are those payment instruments with the best balance between unit costs and revenue generated by their use.

The only payment instruments where revenues generated from use cover costs are credit cards (together with the acquiring activity) and direct debits.

Table 3.7 **Unit costs and revenues for the banking sector per payment instrument (in euros)**

	Unit	Unit cost	Unit revenue	Net unit cost
Cash	withdrawal/deposit at branch	1.85	0.08	1.77
Direct debits	direct debit instruction	0.09	0.15	-0.05
Cheques	cheque presented	1.45	0.57	0.88
Credit transfers	transfer	0.28	0.26	0.02
Credit cards	transaction	2.44	2.62	-0.18
Debit cards	transaction	0.23	0.18	0.04

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

3.2.4 Experiences

The breadth and detail of this study are unequalled among previous studies in Portugal. This study is the first of its kind, and relates to one year (2005), so it does not provide for the evolution in costs and revenues for the retail payment systems. It does, however, provide a basis for an analysis of the relative efficiency of payment instruments and their contribution to economic and social welfare.

The experience gained in this first effort has laid the groundwork for further studies and it has also created the opportunity for improvements in various areas, among them, methodology and data collection and processing.

Concerning methodology, one of the practical problems encountered is related to the fact that it was necessary to transpose the costs booked in cost centres to the activities directly related to payment instruments and to the respective supporting activities. As already noted, and following the ABC method, this transposition was carried out using cost-driver factors, which the participating institutions were free to choose. If the cost drivers are very different, cost estimates may well have big discrepancies. Hence, in any future work, harmonised cost drivers should be used.

An improved list of the activities directly related to payment instruments is also a possibility. On one side, and because some of

these activities may not have been individually specified, the heading 'Other activities' was used. Since this was considered a residual activity, the participating institutions were asked to make every effort to allocate costs to the specified activities, minimising the possibility of overestimating this item. On the other side, each participating institution carried out an in-house survey to identify the activities that were directly related to payment instruments and the different proposals were consolidated in a list of activities. The level of activity aggregation is not uniform across institutions. A more detailed list of activities would provide a better view of banking operations and such a list is recommended for future studies, with a better description and definition of the content and scope of each activity.

The fourth aspect is related to the revenues. Costs were supplied on the basis of detailed activities, but revenues were broken down by respective natures. As a result, revenues could not be related to specific activities, and it was impossible to reach an economic balance for each activity and each channel.

The differences between the scope of this work and studies carried out in other countries raise interesting considerations for future developments.

Firstly, this study focused on costs and revenues for the banking system while other studies analyse the costs and revenues for the different players in the payment chain – banks, central bank, retailers and consumers. Future work should also include costs and revenues for retailers and consumers.

Secondly, the main aim of most international studies is to analyse the pricing and cost policies involved, with a view to improving the efficiency of retail payment systems. In this study, the prices charged to consumers and retailers did not come into the equation, and so it is difficult to measure how prices for each payment instrument reflect the cost of making it available.

Concerning data collection and processing, and with a view to minimising the dispersion of values supplied by participating institutions, further studies should put more emphasis on:

- analysis of activities and payment channels, in order to obtain information of better quality when broken down
- situations that give rise to dispersion. Errors in collection and reporting should be reduced as much as possible and the true size of economies of scale and gains in efficiency should be measured precisely. There is an important point to be made here. Those dispersion indicators computed during the quality control exercise show some heterogeneity of costs reported by participating

institutions for the different payment instruments and cost and revenue headings. We speculate that scale economies can be a good explanation at least for part of these findings
– on the types of operations that should be considered payment transactions (some institutions include nonfinancial operations such as checking account balances and entries, others consider only operations that affect an account such as purchases and payment of services) and on the definition of payment services (mixed cards or pure debit or pure credit cards).

3.3 Economic and welfare analysis

3.3.1 Findings from consumer and retailer surveys in Portugal

In 2005 Unicre sponsored two surveys in order to collect information on the use of payment cards in Portugal. One involved 1,800 interviews of consumers, the other 1,200 interviews of retailers. The survey of retailers did not cover companies with more than 100 employees, so the Banco de Portugal carried out its own survey of major commercial outlets, thus providing a complement to the Unicre survey.

Using the findings from these surveys,[7] the study 'Retail Payment Instruments in Portugal: Costs and Benefits' also looked at the use of payment instruments in Portugal.

In terms of payment instruments held (also called possession), the survey of consumers showed that:

– most Portuguese have at least two methods of making payments: cash (notes and coins) and at least one debit card
– all Portuguese use notes and coins, and over a third (38%) use cheques
– as regards cards, the debit card is dominant; more than three quarters (77%) have one or more debit cards and 24% of the people have a credit card.

[7] Unicre (2005), 'Survey on payment instruments: households'. Unicre (2005) 'Survey on payment instruments: retailers'.

Information on the payment instruments that people have in their wallet or purse at the point of purchase (also called availability) suggests that:

– 100% carry notes and coins
– about 30% also carry cheques
– 75% have at least one debit card and 22% a credit card; these figures show that there is a very high rate of penetration for debit cards.

As regards payment instruments preferred at point of sale by type of purchase (Table 3.8), the survey of consumers demonstrated that:

– cash is preferred for low value transactions (up to thirty euros) and for goods most frequently purchased, such as newspapers, magazines, coffee, fruit, bread and milk, restaurant meals and day-to-day clothing
– the debit card is preferred for purchases above approximately eighty euros, such as supermarket/hypermarket shopping, household appliances, travel and furniture
– for day-to-day purchases of average value (between thirty and eighty euros), such as day-to-day clothing and super/hypermarket, credit cards are used more than cheques (but both at levels considerably lower than cash or debit card)
– for occasional high-value purchases (above approximately 280 euros), such as household appliances, travel or furniture, cheques are used more than credit cards.

Table 3.8 **Consumers – payment instruments preferences at point of sale by type of purchase**

	Cash (%)	Cheques (%)	Debit card (%)	Credit card (%)	Average purchase (euros)
Newspapers, magazines, coffee	98	0	2	0	2.2
Fruit, bread, milk	91	1	8	0	8.0
Restaurant	79	0	19	2	17.1
Day-to-day clothing	59	0	37	4	30.4
Supermarket/hypermarket	43	2	49	6	81.1
Household appliances	31	15	45	9	279.1
Travel	34	14	41	11	475.4
Furniture	28	25	36	11	537.3

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

The project of Unicre found that the image of payment instruments in Portugal has considerable influence over the use of specific payment instruments at point of sale. Portuguese consumers see certain attributes in debit cards: security, ease of use, acceptance by most retailers and control over expenditure. Cash is associated with acceptability and control over expenditure, but it is also within the reach of everybody and does not cost much to use. Credit cards are valued for certain attributes related to access to credit and prestige. Cheques are similar, though to a lesser extent, but they are also seen as high on security and control of expenditure. These attributes, however, are not seen in the same light by all consumers. Cash tops the point scale valuation at 8.8 (on a scale of 0 to 10). Debit cards come in just above the average, at 6.4. Cheques have an average value of 3.5, higher only than credit cards. Credit cards are the least appreciated, with an average of 2.9.

In terms of payment instruments accepted, the survey of retailers shows that:

– all retailers accept cash as a mean of payment
– cheques are accepted by 66% of retailers and debit cards by 27%, but the rates go up as the average amount of sales increases.
– only 11% of retailers accept credit cards.

These findings suggest that there is a relatively low rate of acceptance for electronic payment instruments.

Table 3.9 **Retailers – use of payment instruments and structure of transactions per sales value bracket**

	Cash	Cheques	Debit card	Credit card	Others	Total
Sales value (in terms of percentage)						
Below 10 euros	94.1	0.6	3.5	0.2	1.7	61.4
Between 10 and 20 euros	84.6	2.4	11.1	0.5	1.4	28.0
Between 20 and 50 euros	65.1	8.6	23.0	2.0	1.3	8.6
Between 50 and 100 euros	44.3	23.7	25.9	4.3	1.9	1.5
Between 100 and 500 euros	22.4	45.1	20.4	11.0	0.8	0.3
Between 500 and 1000 euros	15.1	60.2	14.0	10.8	2.2	0.1
Above 1000 euros	14.8	65.9	9.1	8.0	1.1	0.1
Total	87.9	2.4	7.7	0.5	1.6	100.0

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.

Data on purchase value (Table 3.9) also show that cash is the most frequently used instrument for low-value payments, below 100 euros. Cash is far ahead of the second ranking debit card. Although cheques are third in terms of use, for purchases above 100 euros, cheques are used more than other payment instrument. The credit card is considerably below the other payment instruments in terms of use, with maximum use for purchases between 100 euros and 1000 euros. For large scale retailers, the relative positions of cheques and credit cards are reversed: the cheque is fourth and the credit card is third in large retail outlets and the opposite holds for small retailers. This divergence may be justified by the fact that, on one side, the credit card is less accepted by small scale retailers compared with large retail outlets. On the other side, there are differences in the type of purchases made with a credit card in the two kinds of business.

According to this survey, consumers' knowledge of the costs of holding payment instruments is clearly insufficient for them to opt for the most efficient instrument at point of sale. In fact, consumers have a low awareness of the costs involved in some payment instruments, such as the cost of cheque books, the cost of a cheque at an ATM, the annual charge for debit and credit cards, and the interest rate for credit cards. Also retailers have very little knowledge about the costs involved in accepting various kinds of payment instruments, such as the time spent handling cheques and cash and the costs of managing cheques and cash. This may also lead to less efficient choices of payment instrument.

3.3.2 Estimates of benefits to consumers and banks from the use of more efficient payment systems

The advent of new payment services coming with the technological progress in information and communications has expanded the range of consumers' choice as regards payments for goods and services. Electronic payment instruments provide considerable gains in security, ease of use, convenience, processing time, etc. In many cases, however, the benefits are more of a qualitative nature and are difficult to quantify. ATMs are a good example. They are available 24 hours a day and are more accessible, with a network considerably more widespread than any bank branch network.

Using the information collected on costs and average processing time for the same payment service provided through different channels (at a branch or through an ATM), the benefits from the use

of the most efficient alternative were assessed, both for banks and consumers. The benefits for consumers are in terms of gains in processing time and for the banks in terms of reduced costs (Table 3.10).

A distinction was made between potential benefits and effective benefits. Effective benefits were estimated by applying to the number of transactions carried out through the most efficient channel (ATM) the differential in time and cost for the two alternatives (ATM and branch visit). Potential benefits were assessed by applying the differential in time and cost for the two alternatives to the number of transactions carried out through the channel that consumes most resources (branch visit). In this way, effective benefits quantify the gains actually obtained by those using ATM instead of visiting a branch and potential benefits measure the possible gains if all those visiting branches switch to ATM.

Taking the example of cash deposits, the effective benefit for consumers who currently use ATMs is a saving in transaction processing time of 443 thousand hours. For those who currently make cash deposits at branches, the potential benefit is a saving of 1,523 hours in processing time, simply by replacing the branch visit by the ATM. For the banks, the effective benefits (from deposits currently made at an ATM) and potential benefits (by consumers opting for ATM over branch visit) are estimated at 4.3 million euros and 14.7 million euros in cost savings, respectively.

Regarding cash withdrawals, the benefit for consumers who currently use ATMs instead of branch visits is a saving in transaction processing time of 11.2 million hours. For banks, the benefit is estimated at 289.9 million euros in cost savings.

For credit transfers, the benefits from using ATMs instead of branch visits are estimated at 491 thousand hours of saving in processing time for consumers and at 5.1 million euros of cost savings for banks.

Table 3.10 **Estimated benefits to consumers and banks from replacing branch visits by ATMs**

	Effective benefit	Potential benefit
Cash deposit		
Consumers (in thousands of hours)	443	1,523
Banks (in millions of euros)	4.3[(a)]	14.7
Cash withdrawal		
Consumers (in thousands of hours)	11,207	575
Banks (in millions of euros)	289.9[(b)]	14.9
Credit transfers		
Consumers (in thousands of hours)	491	347
Banks (in millions of euros)	5.1	3.6
Account and entry checking		
Consumers (in thousands of hours)	1,487	n.a.
Banks (in millions of euros)	n.a.	n.a.
Total		
Consumers (in thousands of hours)	13,628	2,445
Banks (in millions of euros)	299.3	33.2

Source: Banco de Portugal, 'Retail Payment Instruments in Portugal: Costs and Benefits', July 2007.
Notes: (a) Corresponding to a reduction in costs on cash deposits of around 0.7% of total costs.
(b) Corresponding to a reduction in costs relating to cash to the order of 46% of total costs.

The gains to society come from replacing an instrument with a higher unit transaction cost by one with a lower unit cost. An estimate of these kinds of benefits was obtained taking into account the replacement of cheques by bank transfers and direct debits and the replacement of cash by debit cards.

The results summarised in Table 3.7 were used for this, specifically those relating to unit costs and revenues for the banking sector from making each payment instrument available.

If one-third of cheques presented in 2005 had been replaced by credit transfers and direct debits, the quantity being the same, a significant improvement would have resulted in the degree of coverage of the costs associated with making payment instruments available.

Replacing cheques by credit transfers and direct debits means a decrease in the use of a payment instrument with a high net unit cost (0.88 euro per cheque) and an increase in one with a unit cost either slightly positive (0.02 euro for credit transfers) or negative (-0.05 euro for direct debits). And the coverage rate climbs from 63.4% to 66.5%.

As for the estimate of gains from the replacement of cash (with a unit cost of 1.85 euros per deposit or withdrawal at a branch) by debit card (with a unit cost of 0.23 euro per transaction), a simulation was carried out involving the replacement of 10 million cash withdrawals

by 80 million debit card payments. In this scenario, the cost coverage rose from 63.4% to 64.7%.

This study also provides some evidence that for transactions with value below 8 euros, the use of cash would be more efficient, while for higher amounts, the use of a debit card leads to gains in terms of the total costs of payment instruments. Payments for newspapers, magazines, fruit, bread, milk and cafés are all under 8 euros and account for 75% of payments at point of sale. Given that around 96% of payment of these goods is in cash, we are close to good practice in the use of this payment instrument. On the other hand, for values above 8 euros, cash accounts for around 65% of payments, far from optimal.

3.4 Conclusion

Generally speaking, there is little information on costs related to payment systems, although these costs are significant as a percentage of GDP. This particular study aimed at assessing the costs and benefits to the Portuguese banking sector of making payment instruments available. It's the first of its kind at this level of comprehensiveness in Portugal.

The model used in the Portuguese study is based on Activity Based Costing. This is considered an appropriate method since it ensures enough good quality information for the purpose of quantifying the costs of payment systems. It makes it possible to obtain the cost of each activity performed by the institution and, in the end, since each payment instrument corresponds to a specific set of activities, total costs related to a specific payment instrument are obtained from the sum of the costs imputed to the activities needed to make the instrument available.

For the Portuguese banking industry, the retail payment system is a cost centre even if there are differences between the net unit costs of the various payment instruments. This means that part of the costs involved in the use of payment instruments are paid by bank customers as a whole and not necessarily by the customers who use these specific instruments. This is a consequence of the 63% cost-revenue coverage rate.

Replication of this study for another year is of great importance, in order to capture the evolution of costs and revenues in the retail payment system. This study relates only to the year 2005, so it does not uncover the evolution in costs and revenues. Furthermore, future

research should go deeper into the issues of economies of scale and gains in efficiency.

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Chapter 4

Payment habits at point of sale in Norway

Methods of calculating use of cards and cash

Olaf Gresvik – Harald Haare

4 Payment habits at point of sale in Norway. Methods of calculating use of cards and cash

Abstract

The most popular payment instruments at point of sale in Norway are cash and cards. Cards have replaced cheques and seem to be gradually replacing the use of cash. However, few studies have been made on the use of cash for payments. This article presents four different approaches to quantify cash use at point of sale: consumption residual estimation, circulation estimation, and household survey-based and merchant survey-based methods. These estimation methods have their drawbacks and difficulties. However, they generate broadly the same results: cash use is decreasing and is modest in Norway, by international standards. In 2007 cash was used to settle about 24% of all payments at point of sale, representing 14–38% of the total value (depending on the metric).

4.1 Introduction

4.1.1 Background

In this paper we employ different methods to estimate the use of cash and other instruments at point of sale[1] in Norway. Statistics for use at point of sale for some payment instruments (cards, cheques) are readily available in Norway. This is not the case for cash, for which only data on the stock of cash are available (not on the number or value of cash payments).

Four empirical methods form the basis for our results, the residual method, the circulation method, and two surveys towards households

[1] Point of sale (POS) is where merchants and consumers meet; where payer and payee make a trade which must be settled using a means of payment. The marketplace may be physical or virtual (including the Internet – at least for transactions where the service or good is immediately delivered against payment). Note that although cards and cash are the most widely used instruments, also giro, e-money or other instruments can be used in point-of-sale payments.

and merchants. The four methods are supplemented with other information, completing the picture in Norway. Estimates of cash use have been made in other countries using the residual and household and merchant survey methods, but we are not aware of papers comparing all four methods. This is thus a first attempt to use the four methods in a combined analysis. To our knowledge, the circulation method has not been used in other publications.

Some of the calculations below depict developments since 1980. Our main data sources are domestic statistics from Norges Bank's *Annual Report on Payment Systems*, Statistics Norway (SSB[2]), and surveys conducted by Norges Bank. In addition, we use some information from surveys conducted by BBS[3] and Sparebankforeningen[4].

The estimations of cash use at point of sale discussed in this article were important inputs to a broader analysis of costs in the Norwegian payment system, published at http://www.norges-bank.no. Information on the use of cash can also be used in the production planning of notes and coins, and it is also of interest to a central bank to track changes in the use of different payment instruments.[5]

4.1.2 The Norwegian payment system

An indication of how popular cash is as a payment instrument is found by calculating the ratio of the value of cash in circulation to GDP[6]. In 2007, banknotes and coins in circulation amounted to 2.9 % of mainland GDP and 2.2 % of GDP (see figure 4.1), after a notable decline from the level of 15 years earlier.

[2] SSB = Statistisk Sentralbyrå (Statistics Norway).

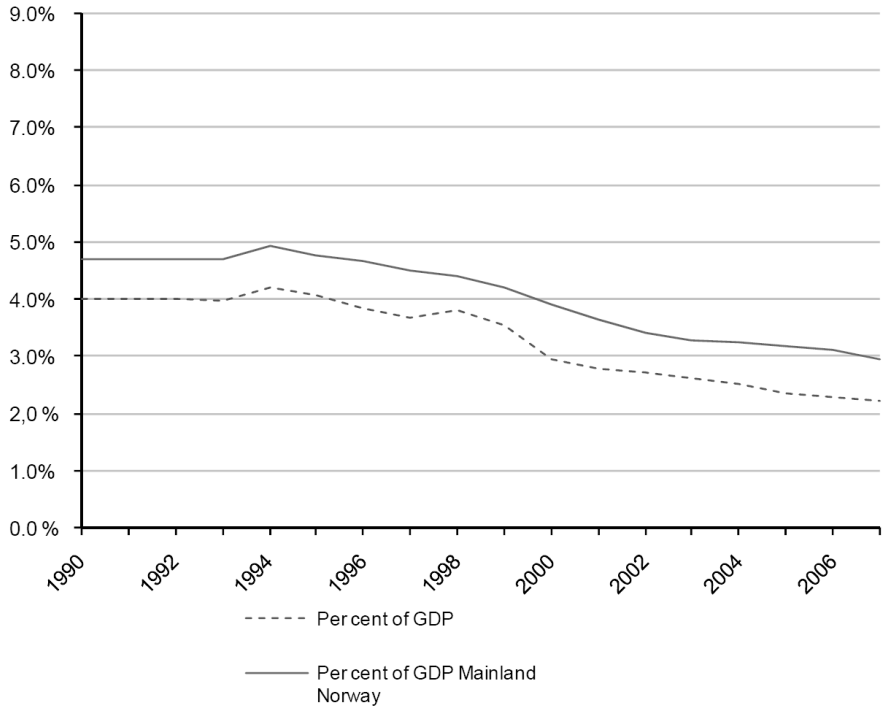
[3] BBS (Banking and Business Solutions) is a supplier of electronic ID services as well as payment and information solutions to shops, restaurants etc.

[4] Sparebankforeningen = The Norwegian Savings Banks Association.

[5] Pricing of payment services have accelerated the pace of the shift from paper-based to electronic services in Norway (Bolt, W – Humphrey, D – Uittenbogaard, R (2008)). Availability of payment terminals and pricing of cash withdrawals are important factors in this process. Pricing of cheques and cards have probably had an important effect on the use of cash since 1980.

[6] In Norway, GDP is quoted both as 'GDP' and 'mainland GDP', where mainland Norway consists of all domestic production activity excluding exploration of crude oil and natural gas, service activities relating to oil and gas, transport via pipelines and ocean transport. The idea here is that offshore activity is not closely related to the mainland economy.

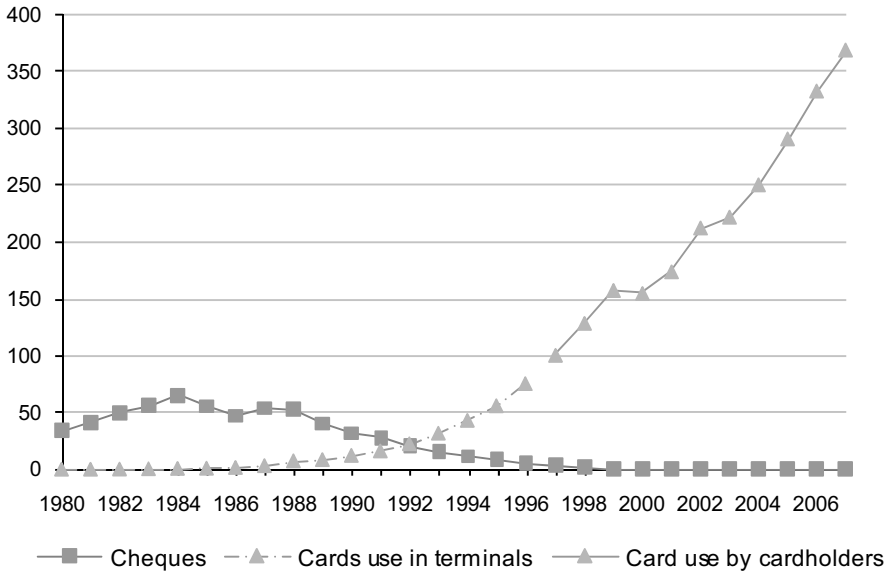
Figure 4.1 **Notes and coins as percentage of GDP and Mainland GDP Norway**



This is a low level compared with other countries, but is similar to the level in other Nordic countries (see section 4.2). A low and falling cash stock ratio indicates that cash use is on the decline. Cash is being replaced by other means of payment, namely transaction deposits and loans, both of which are most often accessed by payment instruments such as payment cards and giros (credit transfers and direct debits). Figure 4.2 shows the rapid increase in use of cards in Norway[7] and how cheques were previously an important point-of-sale payment instrument. Since Norwegians prefer debit cards to credit cards, most of the value spent via cards is drawn directly from deposits. (Cheques are of course drawn on deposits as well, so this has been true since the 1980s.)

[7] Until 1996 statistics on card use was based on use of terminals and from 1997 based on cardholders' payments. These deviate somewhat, cardholders payments are all payments while use of payment terminals are close to all payments.

Figure 4.2 **Use of payment instruments and stock of cash in Norway. Value in NOK billions.**



Transaction deposits as a percentage of GDP is increasing, In 2007 this ratio was 29.8% (39.6% of mainland GDP). The corresponding percentages were 22.8% and 19.4% in 1992.

4.1.3 Outline

The article presents an overview of similar studies in section 4.2, elaborates the residual method in section 4.3, the circulation method in section 4.4, a household survey-based method in section 4.5 and a merchant survey-based method in section 4.6. Comparisons of the results are presented in section 4.7, along with some supporting evidence from other studies in Norway. Section 4.8 concludes.

4.2 Overview of similar studies

Studies on the use of cash and cards at point of sale have been carried out in several Nordic countries.[8] These studies use (slightly different variations of) the residual method for cash estimation.

4.2.1 Methodology, briefly

Briefly explained,[9] using the residual method, one derives the use of different payment instruments from domestic household consumption data.[10] Bill payments are deducted to obtain the household's consumption at point of sale. Use of different point-of-sale instruments, such as payment cards and e-money, are deducted from household consumption at point of sale to obtain a residual value. The residual value largely represents the use of cash at point of sale, but may include the use of other instruments (assumed to be a minor part of the residual).

Estimations of cash use at point of sale have also been made in various studies of payment-system costs in a number of European countries.[11] These estimations are based on information from surveys of household payments habits and merchants' payment receipts. Surveys are conducted by phone or mail or via payment diaries or Internet questionnaires. These surveys[12] have provided daily data on payments by individuals and businesses. Multiplying by the number of inhabitants or appropriate number of businesses and by days of the year yields the annual number or value of payments at point of sale for each instrument (including cash).

[8] Further details on the different analyses can be found in Humphrey, Kaloudis and Øwre (2000), Gresvik and Kaloudis (2001), Andersson and Guibourg (2001), Carlsen and Riishøj (2006) and Paunonen and Jyrkönen (2002).

[9] A more detailed explanation of the Norwegian residual estimation is found in section 4.3.

[10] Household consumption is included in the national accounts.

[11] Norway: Gresvik and Haare (2009), Sweden: Bergman, Guiborg and Segendorff (2007), Portugal: Banco de Portugal (2007), Belgium: Nationale Bank van Belgié (2005), The Netherlands: Brits and Winder (2005).

[12] See sections 4.5 and 4.6 for detailed explanations of the Norwegian surveys of households and merchants.

4.2.2 Cash use in different countries

A useful initial way of comparing cash use in different countries is the cash-to-GDP ratio. The Norwegian cash/GDP ratio has fallen since 1992. Cash use was high in the early 1990s, probably due to the phasing out of cheques for point-of-sale purchases. In the early 1990s, Norwegian banks developed a common debit card system, Bank-Axept, and cash was rapidly replaced by cards. Developments in the other countries are similar, but the levels of the M0/GDP ratios are quite different.

Figure 4.3 shows the relation between cash in circulation and GDP. The ratio is low in Nordic countries compared to most others, except for the Netherlands.

Figure 4.3 **Notes and coins as percentage of GDP. Selected countries.**

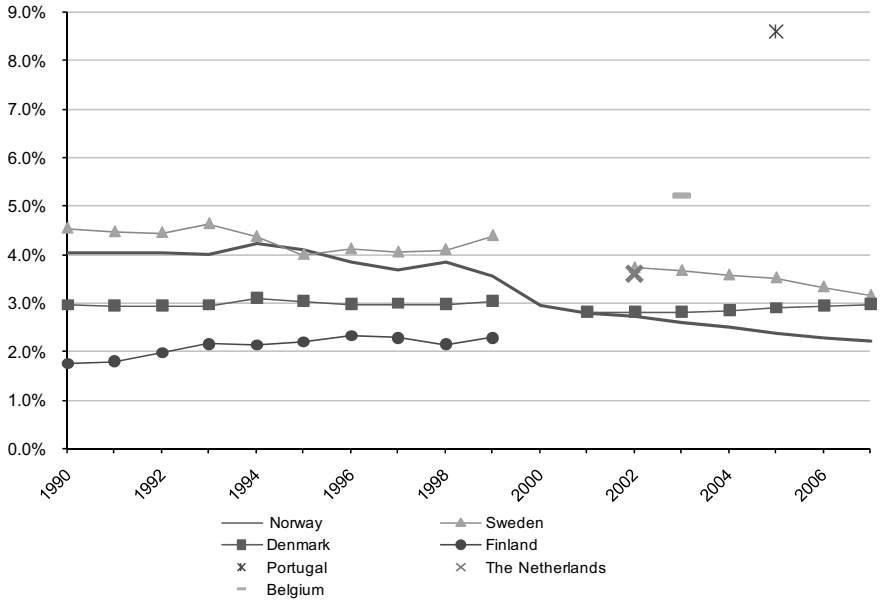
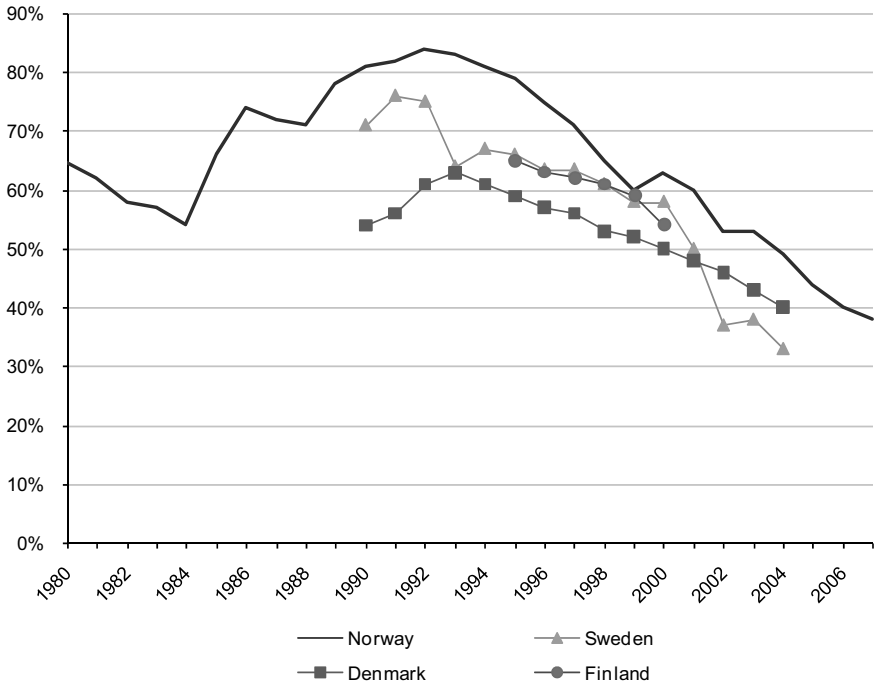


Figure 4.4 shows results from the residual estimation of cash use at point of sale for the Nordic countries. In the early 1990s, the share of cash payments at point of sale was more than 80% in Norway compared with 54% in Denmark (1991). By the end of the 1990s, the shares had fallen to 60% in Norway, 58% in Finland and Sweden and 52% in Denmark. In 2004, the share in Denmark was 40%. Based on

the residual method, the share in Norway is about 38%, whereas survey results indicate 14%.

Figure 4.4 **Cash as share of point of sale value, Nordic countries**



Based on the household surveys in the cost studies, the use of cash seems to vary quite substantially between countries (table 4.1). Note that the survey produces a lower estimate for Norway than the residual estimate, which is explained in section 4.7.

Table 4.1 **Use of cash**

	Year	Ratio of cash transactions to total transactions, %	Ratio of cash to total turnover at point of sale, %
Norway	2007	24	14
Portugal	2005	26	–
Sweden	2002	72	39
Belgium	2003	81	63
The Netherlands	2002	85	56

Note: Portuguese calculation includes only withdrawals and deposits at the counter, hence underestimates.

4.3 Residual estimation method

In this section, we calculate the residual value of payments (mostly cash) at point of sale in Norway, using a method developed by Humphrey et al (2004) and Snellman et al (2001).[13] We present the calculation using revised, updated and new data series.

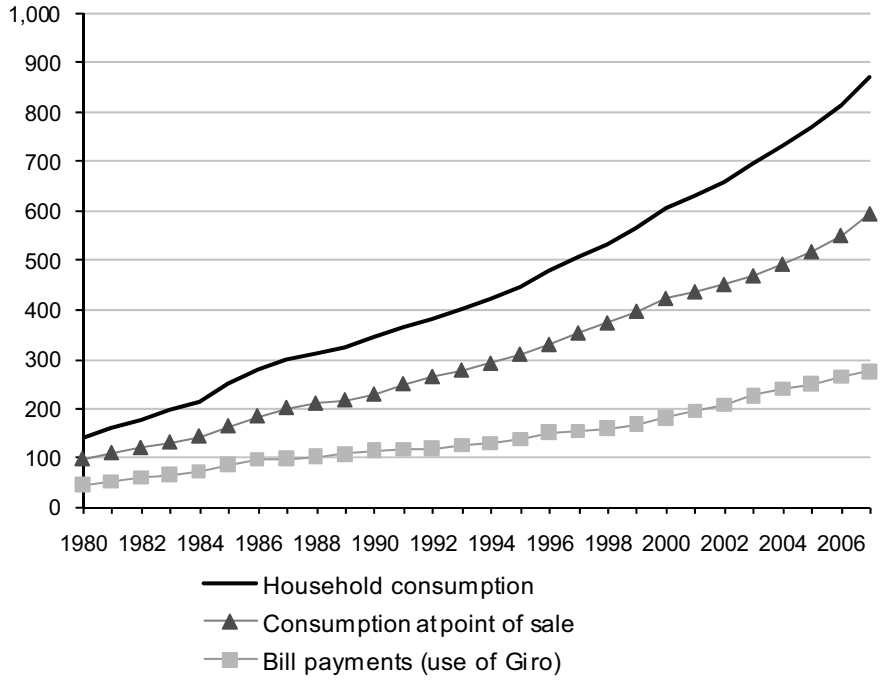
The value of cash used at point of sale can be calculated as a residual, based on a framework using data from public sources. The steps in the calculation are:

Household consumption (from national accounts)
– Consumption paid by giro (bills)[14]
= **Value of consumption at point of sale**
– Value of card payments at point of sale[15]
– Value of cheque payments at point of sale[16]
= **Residual value of payments at point of sale**[17]

Household consumption is the sum of residents' and non-residents'[18] consumption in Norway. Consumption can be paid by giro (credit transfer and direct debits), cheque, payment card and cash. Giros are mostly used for large-value payments and for payments where buyer and seller do not meet, and also in some industries such as healthcare etc. Consumption paid by giro must be separated in order to isolate the portion of household consumption that is consumption at point of sale. Consumption at point of sale is the part of household consumption that is paid for by payment cards, cheques or cash (see figure 4.5).

[13] See Gresvik and Kaloudis (2001). Our numeric results deviate somewhat from the prior analysis due to new information and revisions in the data series.
[14] Direct debits are included in giro. The value of bill payments is not based on payment statistics, but on items in household consumption mostly paid by giro. Company giros are not included.
[15] All card payments in Norway, including company card payments, as these cannot be deducted in the statistics. Chain-specific card systems are not included.
[16] Note that value of cheques only includes cheques considered to be used at point of sale. Interbank payments, bill payments and business-to-business payments are excluded.
[17] Mostly cash payments, but may include e-money and eg local / chain specific payment card systems.
[18] That is: people living in Norway and foreign visitors. Norwegians travelling abroad are not included.

Figure 4.5 **Household consumption by consumption at point of sale and bill payments (use of Giro), NOK billion**



The following goods and services[19] are normally paid for by giro (bills), as they are typically sold and paid for periodically, or are regarded as high-value items that require financing (the list is not complete):

- House rent
- Motor vehicles for personal use[20]
- Insurance
- Electricity and heating
- Postal and telecom services
- Banking, finance and insurance services
- Costs connected with education (study fees etc).

[19] Elements in 'Consumption' as reported by SSB.
[20] Second-hand sales of cars etc are not included.

We consider the value of these goods and services a good estimate of the bills (giro) paid by households.

Data for household consumption was collected from the national accounts, published by Statistics Norway. Domestic household consumption consists of 33 categories, of which 8 were considered to be non-point-of-sale consumption. A total of 25 categories were relevant for point-of-sale consumption. Data on cheques and cards were collected from Norges Banks series of *Annual Report on Payment Systems*. Statistics on cards and cheques are of good quality and depict the use of these instruments at point of sale.[21]

The national accounts show that household consumption in Norway totalled NOK 872.4[22,23] billion in 2007. The calculated value of consumption at point of sale was NOK 595 billion. Payments by cards at point of sale amount to NOK 368 billion, or 61.7% of sales value at point of sale. Use of cheques was negligible in 2007. The residual value of payments at point of sale using cash (and other means of payments) in 2007 was NOK 228 billion or 38.3% of value at point of sale.[24] This value of payments gives a cash turnover ratio of the cash stock (NOK 51.5 billion) of 4.42 times a year.

Figure 4.6, shows the developments since 1980. In 1984 cheques represented 45.8% of sales value at point of sale. Cash usage fell until cheques peaked in 1984. Cash usage then hit a temporary low level of 53.7% of value at point of sale. At that time, banks charged for cheque usage, and their popularity as an instrument fell (see also Bolt, W, Humphrey, D and Uittenbogaard, R, 2008). In the late 1980s and early 1990s, no instrument (payment cards) was able to cover the ground lost by cheques, so that cash usage increased until it peaked in 1992 at 83.7%. Since then, cards have gained increasing popularity, and in

[21] We subtracted the relevant value of bill payments by cheque. Business cheques are deducted, this was however not possible for cards. The calculation thus overvalues the use of cards for household consumption.

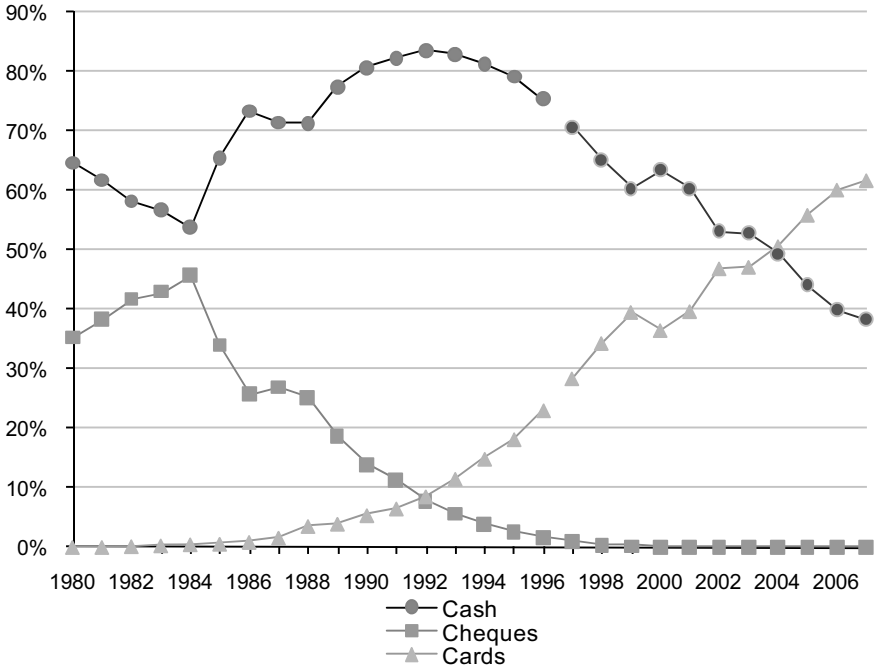
[22] 2007 conversion rates, annual average: 1EUR = 8.0153 NOK, 1 USD = 5.860 NOK.

[23] Household consumption including foreigners' consumption in Norway, excluding Norwegians' consumption abroad and other means of payments (e-money, and possibly giro payments as well)

[24] This is based on data from domestic statistics on use of cheques and cards from Norges Bank's *Annual Report on Payment Systems*, supplemented by data on use of cheques provided by FNH (Norwegian Financial Services Association) and Sparebankforeningen.

2005 the residual value of cash payments was less than the value of card payments in Norway.[25]

Figure 4.6 **Use of different payment instruments and means of payment, value in per cent**



'Consumption at point of sale' is not a simple concept to define. Some limitations apply, for instance:

– Cash can be used for purposes not traceable, both legal and illegal. Thus, using household consumption from national accounts is to ignore the illegal / 'grey' economy (and unregistered legal

[25] Figure 4.6 shows a break in 1996–1997 for cards, which affect cash as well. This is due to a shift in data series: as from 1997, card transactions could be counted on the payer's side of a transaction. Prior to 1997, statistics were only available for card use in terminals (payee's side of the transaction), and the data set was unfortunately not complete. The difference between the values in the two data series is fortunately very small.

payments like person-to-person payments). This will cause our estimate of cash use to be too low.[26]

– Cash can be used at several stages in the value chain. Point of sale is the end of a value chain, where goods and services are finally consumed. However, goods and services can be paid for several times before being consumed – eg an apple may be sold by producer to wholesaler, to a shop, and to a consumer. In theory, cash can be used at every stage of the chain. If this is so, the value of cash use in the society will be higher than the value of cash used at point of sale. Our calculations only focus on point of sale, and so it is likely that the use of cash in the society is greater than our estimate. That said, we do not believe the difference to be very large nor that cash is an important instrument for business-to-business transactions.

– It is very likely that part of the value in the residual is paid using giros, e-money and possibly other means of transferring money from account to account. This will lead to overestimation of cash usage.

These limitations should be taken into consideration when interpreting the results. The residual method gives only the use of cash at point of sale, which is only part of the total use of cash in the society.

4.4 Circulation estimation of cash use

In this section, we calculate cash use based on an estimate of the circulation value of cash used in the society, using new statistics in a way not previously done, as far as we know.

Cash payments in the society include all types of payments: households use of cash at point of sale (of course), but also use of cash by businesses, cash spent in non-point-of-sale activities, or payments that cannot be traced, such as person-to-person payments or illegal payments. Cash payments in the society should exceed the value calculated by the residual method above. New data have made it possible to make a circulation estimation of cash use in society.

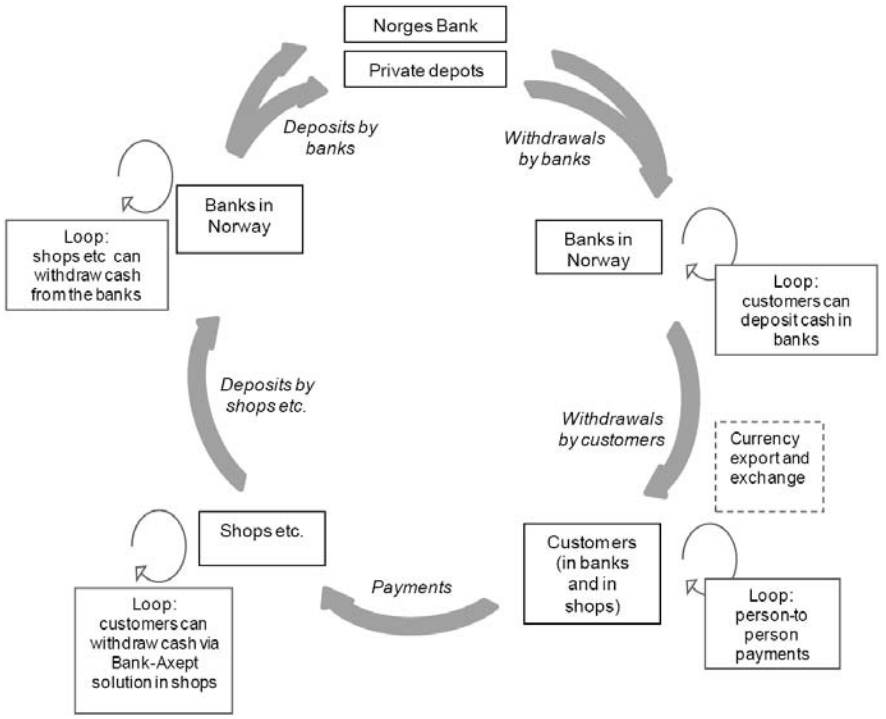
[26] To speculate a bit on this: If the grey economy is 10% of mainland GDP (NOK 1714.6 billion * 0.1), the cash residual will most likely be close to that amount, which would give a cash use at point of sale of 228+171.46 = NOK 399.46 billion.

The system for distributing cash has been thoroughly restructured in Norway in recent years. In contrast to the mid-1990s and before, CIT (cash-in-transit) operations are now handled mostly by CIT companies, and less often in bank branches.[27] Before the restructuring, cash deposits were made by the banks to Norges Bank's branches and main office, and the banks themselves handled parts of the deposits. Statistics on cash deposits made at Norges Bank and at private depots operated by CIT companies have become available as a result of the recent restructuring of cash handling in Norway.

Banks in Norway deposit cash at Norges Bank and in several private cash depots. When a Norwegian krone is deposited, it has reached the end of one full circle of the circulation.[28] It started as an issued note/coin from Norges Bank, was picked up by a bank, withdrawn by a customer, spent in a shop, deposited by the shop to a bank, and then deposited by the bank to a private cash depot or Norges Bank (see figure 4.7). Most likely, the krone has been used for more than one payment at some stage, making one or more 'loops' in the bigger cash circle. One straightforward circulation without loops represents an estimate for the minimum value[29] of payments made by cash in a year in the society.

[27] One consequence is that cash is more often deposited in a depot or Norges Bank over night. The statistics are thus closer to the true minimum use of cash than was previously the case. See Eklund, Veggum and Solberg (2005) for further detail.
[28] Circulation description is simplified.
[29] Based on the assumption that it is unlikely that a bank will return money to the central bank or to a private cash depot before it has circulated at least once. Note that banks can re-circulate cash without using Norges Bank or depots, so the circulation estimation will be a minimum value, not the most likely value of cash payments in the society.

Figure 4.7 **Cash cycle in Norway**



The notes/coins can make 'loops' between customers and stores at several points in the cycle. When cash circulates in the loops, the value generated by notes and coins in circulation will be higher than the estimated circulation value. However, if all withdrawals from Norges Bank and private depots go straight through the cycle without loops, a theoretically minimum value of cash turnover in the economy can be read directly from the deposit statistics.

In 2007, the registered value of deposits made to Norges Bank and private depots was NOK 208 billion (35% of sales at point of sale), which is our circulation estimate of the lowest value of cash used in the Norwegian society. The circulation estimate is thus a full cycle in the graph, without loops. Due to the restructuring of CIT companies, there are no pre-2007 statistics available that are comparable to the NOK 208 billion circulation estimate. The average stock of cash in 2007 was NOK 51.5 billion,[30] which means that, by the circulation

[30] Average, based on quarterly observations.

estimate, every krone in the stock of cash was on average spent at least 4.04 times a year.

Unfortunately, there are some problems with this calculation, eg:

– Notes and coins are Norwegian currency, and can be exchanged in a bank into other currencies. This is a purely financial transaction, which says nothing about payments in society. We have no statistics that show us the relation between currency exchange and deposits at Norges Bank and CIT companies.[31]

– Banks can re-circulate cash without using Norges Bank or the depots for overnight deposits (even though this is not very common because of the incentive structure of interest compensation and security offered by the depots). Cash held in branches which is re-circulated directly to the bank's customers should be included in the circulation estimate. However, no statistics are available for the branches.

– Cash is used both for registered and unregistered/illegal payments. Illegal payments are normally not 'point of sale'. There are also legal payments that are not registered, for instance person-to-person payments. Besides, the cash cycle shown above applies to the whole economy and so includes more than the value of cash used at point of sale.

4.5 Household survey-based estimations

In this section, we calculate an estimate of the cash use by households based on results from a survey conducted by Norges Bank[32] in 2007,[33] and present some results from a similar survey of 1993.

The 2007 survey focused on payment habits. It was of the omnibus type, ie respondents were asked every day during a week to describe their payments of the previous day – how many payments they made, with cash or card, what kind of card etc. The sample was drawn from

[31] CIT companies Nokas and Loomis transport and sort cash on banks' and merchants' behalf. They also operate private cash depots on banks behalf.

[32] The survey was constructed and analysed by the authors of this memo, while NORSTAT, a market analysis agency made the phone interviews on our behalf.

[33] Similar surveys have been done in a number of countries. Our inspiration came from surveys performed in the Netherlands (2005), Belgium (2005), Austria (2005), UK (1997–2007) and Norges Bank's survey of 1993.

Norwegian inhabitants older than 15 years. The survey included eight questions relevant for all respondents and a ninth question on payments. Not all respondents made payments the previous day, so the payment question was answered by 1201 persons (of 2608 respondents in total) .The sample was considered representative for the whole population.[34,35]

Calculation of an estimate of the domestic level of number of transactions for Norway is as follows

$$\frac{\text{Number of payment in the survey}}{\text{Number of respondents in the survey}} \times \text{Norwegian residents older than 15 years} \times 365 \text{ days}$$

The calculated number of card transactions based on survey input corresponded closely to the domestic statistics on card use.

To estimate the number of transactions and the value of cash use, the cash use information from the survey was used, under the assumption that when transactions and value of card use from the survey were representative, data on cash use would also be representative.

The data covered use of cash and payment cards, cash holdings, and withdrawal and deposit frequency and channels. For the analysis of this section, only data on payments are cited.

The main results show that at point of sale in 2007, the value of use of cards and cash by residents was NOK 369.9 billion and NOK 62.1 billion respectively (86% and 14% based on the average value of respondents' payments; table 2). Based on results of the survey, we estimate the total value at point of sale to be NOK 432 billion. According to these figures, the cash stock of NOK 51.5 billion had a turnover of 1.21 in 2007.

Results from the 1993 survey show that the use of cash has decreased from over 8 in 10 payments to only 2 in 10, cheque use has been eliminated, and card use has increased from near 1 in 10 to near 9 in 10 payments. Payment values have moved in the same direction, and these developments show that cash is no longer the most important payment instrument for small-value payments.

[34] Data on card use by residents abroad is not relevant for our calculations.

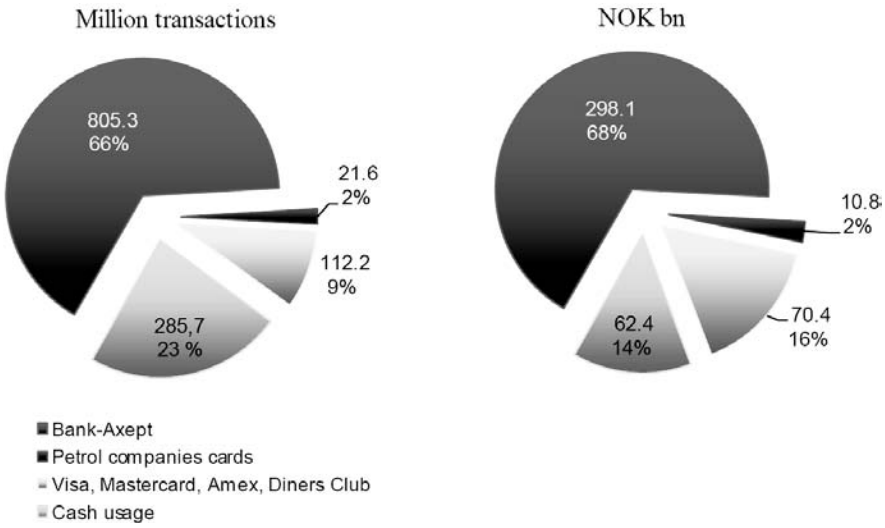
[35] We did not ask how businesses spent their deposits and cash. The survey only focused on private individuals' use of cash and deposits.

Table 4.2 **Household surveys in 1993 and 2007**

	Transactions				Value			
	1993		2007		1993		2007	
	Millions transactions	Per cent	Millions transactions	Per cent	NOK billion	Per cent	NOK billion	Per cent
Cash	1 258.1	84.5	285.0	23.6	231.9	74.6%	62.1	14.4
Cards	191.8	12.9	924.0	76.4	62.6	20.1%	369.9	85.6
Cheques	38.4	2.6	–	–	16.4	5.3%	–	–

The number of transactions is 1 209 million (Table 4.2). Cash accounts for 24% of the transactions and relatively more low-value payments are made by cash than by card.[36]

Figure 4.8 **Payments by cash and cards at point of sale in Norway, 2007**



The calculations indicate that a large stock of cash is necessary for a fairly low sale value (low turnover). On the other hand, for individuals, cash might be a very effective (or possibly the only) relevant payment instrument in certain situations, so that the low turnover does not necessarily indicate inefficiency. Use of cash in

[36] Payment cards in Norway can be divided into debit cards and credit cards, or into Bank-Axept and other brands. Bank-Axept, the dominant scheme, concerns only debit cards. The international card schemes consist of debit, credit and delayed debit cards.

2007 is low, in terms of both value and number of transactions, according to the survey.

This kind of survey has some shortcomings, eg:

– Households are covered, but not small businesses or non-residents (tourists/foreigners tend to be heavier users of cash than residents).

– It is likely that respondents do not remember all payments made on the prior day, and some payments might be purposely omitted (eg illegal payments). Furthermore, it is likely that small-value payments are hard to remember.

– People under 16 years are not included in the survey. These tend to use cash for almost all payments.

The listed shortcomings tend to undervalue the use of cash. However, we believe the results provide important information on the use of payment instruments at point of sale and are useful as a basis for further analysis.

4.6 Merchant survey-based estimations

In this section, we estimate the cash received by merchants based on results from a survey of merchants' costs of handling payments conducted by Norges Bank in 2007–2008. One of the questions focused on how many payments the business received in the course of one month, the value, and how the payments were made (by cash or card). The survey did not cover the business' own use of cash and deposits.

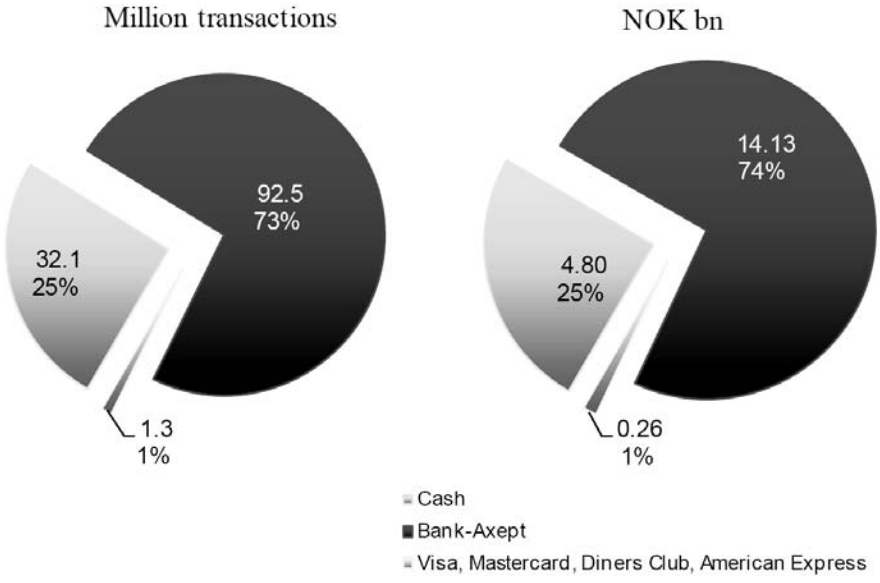
The survey provided a basis for estimating payments at point of sale, but the response rate was very low. We eventually received only 147 responses, covering 696 businesses (of 3000 letters sent). Moreover, the responses to some of the 14 questions were of poor quality.[37] But a few of the questions were answered properly and are useful indicators, in combination with other information.

[37] See the Gresvik and Haare (2008) and Gresvik and Haare (2009) for further details of the survey. Some measures were taken to improve the quality of the survey, which eventually produced satisfactory quality in parts of the data. These data are published in this article and in the Norges Bank Staff Memo Series.

Merchants report that cards dominate cash at point of sale. Payments are generally of rather low average value and heavily weighted towards Bank-Axept payments.

Figure 4.9 displays results from the merchant survey. The volumes/values represent the 696 businesses that did respond (not all merchants in Norway). These merchants received 25% of their payments in cash, 1% by international payment cards, and the majority, 74%, was paid using Bank-Axept cards.

Figure 4.9 **Payments by cash and cards at merchants / point of sale in Norway, 2007**



If the results from the merchant survey were representative, total cash usage could be calculated, in the same manner as explained in the household survey estimation. The results are shown in Table 4.3.

Table 4.3 **Merchant survey, 2007–2008**

	Transactions		Value	
	Million transactions	Per cent	NOK bn	Per cent
Cash	315.6	25.5	123.4	25.0
Cards	924.0	74.5	369.9	75.0
Cheques	–	–	–	–

This survey has obvious weaknesses, eg:

– Low response rate and questions not properly answered.

– The responses from merchants are skewed, weighted too heavily towards grocery chain stores. This skewness leads us to believe that transaction data will be skewed towards small-value payments, and perhaps towards overweighting of Bank-Axept payments compared to other card brands, as some grocery chains do not accept all card brands. In addition, Norwegians usually do not use credit cards or delayed debit cards when buying food.

Note therefore that the merchant survey estimate can only be used as an indicator, as the quality of the survey was not satisfactory for a more detailed analysis.

4.7 Comparing results

Results from the four estimations in sections 3–6 are supported by some results from three surveys by BBS and Sparebankforeningen (section 4.7.2).

4.7.1 Comparing the four estimates

The results from the different methods are only partly comparable. 'Use of cash' is a vague term. The methods generate different results, as they entail different 'use of cash' concepts. Use of cash in the society is by definition higher in value than use of cash at point of sale. The value estimated by the residual method of section 4.3 is comparable to the value estimated by the household survey in section 4.5 and the merchant survey in section 4.6. The estimated value of use of cash in the economy in section 4.4 includes more payments than at point of sale. However; we find that all the methods and the additional information tell essentially the same story: in 2007, cash use was low and declining in Norway compared to previous years and to other countries. Cash is increasingly being replaced by payment cards use at point of sale. The results are shown in table 4.4.

Table 4.4 **Estimates of cash use, 2007**

	Value		Transactions	
	Cash	**Cards**	**Cash**	**Cards**
Residual value estimate (sec 3)	228 bn	368 bn[38]	Unknown	924 m
Per cent at point of sale	38%	62%		
Household survey estimate (sec 5)	62 bn	370 bn	285 m	924 m
Per cent at point of sale	14%	86%	24%	76%
Merchant survey estimate (sec 6)	123 bn	370 bn	316 m	924m
Per cent at point of sale	25%	75%	26%	74%
Circulation value estimate (sec 4)	298 bn	Not covered	Not covered	Not covered

When comparing what happens at point of sale, all three estimates show that the number of cash transactions at point of sale is rather low (24–26%). The values vary much more, reflecting differences in methodology and that the choice of average value of cash payments is crucial to the calculation. Furthermore, the residual value is likely to include some non-cash payments, eg e-money or giro payments. The residual value estimate is a less exact estimate than the survey estimates.

When comparing the circulation estimate to the others, one should keep in mind that the circulation estimate covers both the legal and the illegal economies, while the three others only cover the legal economy at point of sale. As expected, the circulation estimate, which gives a minimum value of cash use in the whole economy, is rather high compared to the others. Yet the value is of a magnitude that is not too different from the others, which gives us some confidence that the true value paid in cash is somewhere in our estimated range for the three point-of-sale estimates.

4.7.2 Information from other Norwegian surveys

In 2007, BBS and Sparebankforeningen conducted surveys that included questions on customers' and merchants' preferences for cash and card use. Their results support our results.

[38] Note that although the card value seems to deviate in the surveys and the residual estimate, this merely reflects technical differences in how the card statistics are treated.

Table 4.5 **Estimates of cash use, 2007**

	Value		Transactions	
	Cash	Cards	Cash	Cards
BBS asking Cardholders	Not covered	Not covered	23% prefer to pay using cash	74% prefer to pay using cards
Sparebankforeningen asking Households	Not covered	Not covered	8% never pay by card	77% pay at least every other time using cards

BBS has conducted two surveys for 2007, one covering their own customers' (merchants) contentment and one covering card holders' card usage.

All merchants in the first survey have a BBS card terminal which accepts Bank-Axept cards. Such terminals can accept other brands as well (Visa, MasterCard etc). Many merchants accept several brands. A number of other companies besides BBS also offer terminals to merchants. The BBS survey is not representative of the country as a whole, as it covers only BBS' customers/merchants. Yet we believe it provides a good indication, as 900 merchants answered the computer-assisted telephone interview on customer contentment.

Of the merchants surveyed, 72% preferred that their customers would use payment cards, an increase from 52% in 1996. Merchants preferring cash has decreased from 19% to just 5%. The indifferent merchants declined in the period, from 28% to 20%.

Of the merchants surveyed, 80% preferred cards when the amount was small and 11% did not prefer customers' use of cards at all.

The sales value paid by cards at BBS's points of sale was 61% in 2007, an increase from the 50% of five years earlier (cash and other means of payments accounted for 39% of the value).

The second BBS survey was a general survey on use of payment cards. A total of 650 persons were interviewed by phone. Of these, nearly 600 had more than one card. Cards were the preferred way of paying for 74%, while 23% preferred cash. Today, every fourth card holder uses cards more than ten times a week.

Each year since 2000, the Norwegian Savings Banks Association has conducted surveys, which originally focused on the general public's attitudes towards Internet banking. A part of the survey also

deals with the use of cards and cash. About 1000 persons over the age of 15 have been interviewed by phone every year.[39]

The use of cards in grocery stores rose over the period 2005–2007. In 2007, 77%[40] used cards in payment operations at least every other time, while 8% never use cards when paying for groceries. In 2005, 72% used cards at least every other time.

The survey shows that in 2007, 95% of the population carried cash on a daily basis. This is interesting and indicates that cash is still for most people a practical payment instrument in some situations.

The largest proportion of people paying solely by cash in grocery stores is found in the age group over 60 at fairly low income and education levels, but even in this group the number of people using cards has shown a sharp rise lately. In 2008, 18% of this group paid solely by cash, whereas 25% used only cash three years ago.

4.8 Summary and conclusions

This article describes different ways of calculating cash use and card use at point of sale. All the methods have weaknesses and are influenced by uncertainties.

Calculations based on Norwegian statistics dating as far back as 1980 show that the ratio of cash stock to GDP has fallen over the years – considerably faster than in other Nordic countries. Also, the residual estimate of cash use has diminished rapidly and faster than in other Nordic countries. In the early 1990s, cash was the dominant payment instrument at point of sale, even more so in Norway than in other countries. This was a result of the rapid disappearance of cheques due to pricing. The introduction of a common interface (Bank-Axept) combined with the pricing strategy followed by the banks encouraged Norwegians to move towards electronic-based point of sale payments. Norwegians embraced payment cards faster than consumers in most other countries. This led to rapid displacement of cash and has resulted in low cash use compared to other countries.

We estimate that the value of payments at point of sale in Norway was at most NOK 595 billion in 2007. Payments at point of sale are usually based on payment cards or cash. The value paid using other

[39] The market analysis company TNS Gallup conducted the survey on behalf of Sparebankforeningen.

[40] The percentage can be decomposed: 42% always use a card and 20% ‘normally’ use a card, and 15% use a card about every other time they shop.

instruments in use at point of sale is considered negligible. Our estimates show that cash accounts for 14–38% of turnover value at point of sale, while the remaining 62–86% of value is paid using payment cards. The value per transaction is lower for cash than for cards; so that, in terms of number of transactions, cash accounts for a bigger share – our estimate is 24%.

We estimated the number of transactions at point of sale to be 1 209 millions in 2007 (section 4.5). 285.7 million payments were performed using cash as the payment instrument. As there were 3.7 million Norwegians older than 15 years in 2007, the average is 72 cash payments per person per year, or 1.48 per week (1 to 2 payments per week using cash).

Furthermore, our calculations show a cash replenishment frequency of 50.7 times a year per person, or slightly less than one withdrawal a week. There are approximately 128 000 businesses in Norway that are likely point-of-sale locations. Not all of these businesses have payment terminals; domestic data show that there are 107 000 payment terminals[41] in Norway. As some businesses have several outlets, there are quite a large number of outlets without terminals.

Even though the importance of cash has diminished, there are a couple of situations every week where an individual can expect to depend on cash to settle a transaction. Therefore it is rational to withdraw cash from time to time and to carry a certain amount of cash for transaction purposes. Most people therefore withdraw cash once a week for their one or two weekly cash transactions. In some situations cash is still a popular and perhaps the only available payment instrument. Cash also has other positive features. The main part of the population therefore still finds it convenient to have some cash in the wallet. There is no reason to believe that cash as a means of payment will disappear in the near future. It is likely, however, that the trend will continue – cash will be used less.

[41] The actual number is somewhat higher, as there are 107 000 that can read Bank-Axept cards and other cards, while there are terminals in operation that cannot read Bank-Axept cards but can read other cards (Visa etc). We do not have statistics on these terminals, but we know they are, among other places, used in parking houses, air/bus/train ticket automats, taxis and in some (tourist) shops. We do not believe that these terminals are so widespread that they would alter our argument.

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Chapter 5

Merchant acceptance, costs, and perceptions of retail payments: a Canadian survey

Carlos Arango – Varya Taylor

5 Merchant acceptance, costs, and perceptions of retail payments: a Canadian survey

Abstract

Using the results of a survey on accepted means of payment, the authors examine merchant preferences and perceptions of retail payment reliability, risk, and costs; the share of each type of payment method over total sales; and the costs involved in accepting payments. Models are developed for each means of payment in order to determine how merchant characteristics may influence their responses. The authors find that the average transaction value, total transaction volume, and/or number of point-of-sale terminals influence merchant perceptions. The authors confirm that merchant preferences are determined by their perceptions and that the intensity of payment use is also important. Furthermore, the authors find that, aside from the initial decision to accept a payment method, merchants have little influence over the payment decisions made by consumers.

As for costs, surveyed merchants pay an average of 12 cents for every debit card transaction and 2 to 4 per cent for every credit card transaction. Based on a transaction value of $36.50, the estimated total variable cost of accepting debit cards is the cheapest at 19 cents, compared to 25 cents for cash and 82 cents for credit cards.

5.1 Introduction

The Bank of Canada is interested in understanding methods of retail payment as they are used by the public and accepted by merchants. These research objectives are motivated by the Bank's mandate to provide Canadians with bank notes as a viable form of payment. Retail payments research, particularly by surveys, provides insight into the underlying aspects of payment demand that is otherwise difficult to obtain. Looking forward, this type of research is increasingly important to understanding how innovations in alternative payment methods affect the use of bank notes. In this regard, the Bank commissioned a survey in 2004 on the perceptions and payment habits of the general public (Taylor, 2006). The survey

revealed that the relative use of payment instruments by consumers is a function of demographics and of consumers' views on risk and convenience (Arango and Taylor, 2007).

However, looking only at the consumer side ignores the intricacies of two-sided markets. In payments, the two sides of the market are merchants and consumers. The demand for a payment service depends on the decisions made by both merchants and consumers. Recognizing that merchants face unique implications when they accept payments and that they may therefore view payments differently from consumers, the Bank commissioned a national survey of merchants on their accepted means of payment (MOP) for point-of-sale (POS) transactions in 2006. The survey focused on how merchants perceive payment methods, the share of each payment method by annual sales, and the associated costs of accepting payments.

Of the merchants who responded to the survey, 89 per cent accept cash, debit, and credit card payments simultaneously. Despite the high acceptance rate, merchants perceive each MOP very differently. For example, while 53 per cent of respondents prefer debit cards the most (followed by cash at 39 per cent), only 5 per cent say they prefer credit cards the most.

In this paper, we analyze the survey results on acceptance, preferences, and perceptions. First, we investigate how merchant characteristics influence their perceptions of reliability, risk, and costs. We find that, as the average transaction value increases, merchants view card payments as less costly and more reliable. Cost perceptions of card payments also decrease by transaction volume, which indicates economies of scale. Second, we find that merchant preferences are shaped by their own perceptions, as well as by relative payment usage. This implies that, as consumers use a payment instrument more intensively, merchants increasingly value their choice. Moreover, models on payment shares reveal that merchants have little influence over the payment method used by consumers, aside from the initial decision to accept the method. Third, our study goes beyond perceptions and addresses the actual costs of accepting payments. We find that a merchant's average transaction value and total transaction volume are significant factors underlying payment card processing fees. Lastly, we calculate the variable cost of each payment method using the survey data and anecdotal information. Given some reasonable assumptions, we find that cash is the cheapest MOP for merchants when the transaction is below $12.

Our study contributes to the literature on retail payments by revealing how merchants in Canada vary by their perceptions of retail payments and by the actual costs they face. Many of our findings give

insight into the nature of two-sided markets and the relationship between consumer use and merchant acceptance of payments. We are not aware of other studies that empirically address merchant acceptance and perceptions of retail payments. An empirical study similar to ours was done in Malaysia, but it concentrates on the probability of credit card acceptance (Loke, 2007). Otherwise, most of the literature on retail payments and merchants focuses on costs (Garcia-Swartz, Hahn, and Layne-Farrar, 2004, Humphrey et al, 2003), or on the theoretical aspects of acceptance (Masters and Rodriguez-Reyes, 2005, Chakravorti and To, 1999, Hayashi, 2006, Guthrie and Wright, 2007).

The paper is organized as follows. Section 5.2 describes retail payments in Canada and Section 5.3 describes the implications of accepting retail payments from the merchant's perspective. Section 5.4 describes the survey methodology and key results. Sections 5.5 and 5.6 report the empirical findings on the factors that underlie merchant perceptions, preferences, and payment instrument shares. Section 5.7 goes beyond merchant perceptions and addresses the actual costs of accepting payments. Section 5.8 offers some conclusions.

5.2 Retail payments in Canada

Of the $425 billion worth of goods and services sold by merchants in 2006,[1] the vast majority were paid for by cash, PIN-based debit cards, and credit cards (mainly Visa and MasterCard, but also American Express). Gift cards and cheques are also used at the POS, but to a lesser extent.

The use of debit and credit cards in Canada is extensive and growing. Based on the number of cards in circulation, the average adult is likely to have at least one debit card and more than two credit cards. Over the past five years, the average growth rate in the value of debit card and credit card transactions has been 9 per cent and 14 per cent, respectively. Table 5.1 reports the annual value and volume of debit and credit card transactions for 2006.

[1] Statistics Canada data include annual sales from restaurant/food services and the retail trade.

Table 5.1 **Annual Debit and Credit Card Transactions in Canada (2006)**

	Value (billions CAD)	Value Per Capita (CAD)	Volume (billions)	Volume Per Capita
Debit Cards	149	5,813	3.3	129
Credit Cards	230	9,120	2.2	85

Note: Data on credit cards include transactions made abroad and non-POS payments and data on debit cards include cashback withdrawals. Per capita refers to adults 18 years and older.
Source: Bank for International Settlements (2008) and Statistics Canada.

The extensive use of card payments by consumers coincides with broad acceptance by merchants. Currently, over 400,000 retail locations accept debit cards and close to 700,000 locations accept credit cards.[2] Growth in merchant acceptance has also been impressive. Debit card acceptance has grown at an annual average of 6 per cent since its national establishment in the mid 1990's and Visa/MasterCard acceptance has grown at annual average of 5 per cent since 1977.

Consumer use and merchant acceptance of debit and credit cards is facilitated by the payment card industry, which includes card issuers, acquirers and card associations or companies. The card issuer, usually a financial institution, provides consumers with card products and services, while the acquirer, either a financial institution or third party, provides merchants with payment processing products and services. To process a card transaction at the POS, the acquirer will send an electronic message via the POS terminal to the card association or company's network.[3] The network will request payment authorization from the card issuer, and if approved, the transaction will be processed.

The payment card industry is often described as a two-sided market, where in this case, the two sides are consumers and merchants. In two-sided markets, sufficient adoption by both sides of

[2] Debit card acceptance by retail trade can be viewed at http://www.interac.org/en_n3_31_idpstats.html#a6. The number of merchants accepting Visa and MasterCard can be viewed at http://www.cba.ca. American Express is also widely accepted by Canadian merchants, but such data are not readily available.

[3] In Canada, there is only one national debit card network, which is run by the Interac Association, a not-for-profit organization of financial institutions and payment-related entities. The credit card companies, such as Visa, MasterCard and American Express, each run their own networks separately. Credit card companies currently do not offer debit card products in Canada, but they will be available in the near future.

the market is critical to the overall success of the product or service. Once the network is established, continued growth is important, because the value of the network increases. Because sensitivity to cost by either side can differ substantially, the industry often subsidizes one side of the market at the expense of the other through differential pricing. The credit card industry, in particular, subsidizes consumers over merchants, because they add the most value to the network and they are viewed as the most price sensitive. The implications of accepting retail payments from the merchant's perspective, including card payments, is discussed in the next section.

5.3 Why merchants accept payments: a review of costs and benefits

From the merchant's perspective, payments are a necessary part of business. Transactions occur only if the merchant and consumer agree on a particular payment method. In a competitive sales environment, merchants must consider what consumers demand and what nearby competitors accept. The extent to which a merchant will accommodate consumer demand, however, is based on the costs and benefits associated with each payment method. Table 5.2 lists some of the implications a merchant may consider when deciding which methods to accept. We describe these implications in this section.

Table 5.2 **Cost-benefit implications for merchants in Canada**

	For all payments	Unique to cash	Unique to cards
Costs	• Bank account fees • Tender time at the POS • Access to funds (float)	• Back-office reconcilation and deposit-preparation time • Deposit/ordering fees • Transportation • Secure storage • Security measures/ insurance • Cash registers	• Transaction fees • Network reliance • Equipment, software, and telecommunications • Chargebacks • Rules and regulations • Payment non-finality
Benefits	• Facilitate transactions • Accommodate consumer choice • Reliability/ convenience • Competitiveness	• Liquidity • No explicit per-transastion fees	• Increased sales • Electronic bookkeeping • Loyalty programs • Cashback service • Funds transfer

Bank account fees: Regardless of payment type, a merchant must hold an account at a financial institution and incur fees for payment-related services. These fees are bundled into service packages that financial institutions usually customize. Merchants pay a monthly package fee in fixed or variable terms, depending on activity levels (such as the number or value of deposits), and are often required to hold a minimum reserve. Standard packages include detailed bank statements, cash deposits, bank note and coin ordering, and electronic payment processing services. Electronic payment processing services are provided by the acquirer, which is either the merchant's financial institution or a third party.

Back-office duties/deposits: Merchants must consider the labour costs involved in back-office duties, such as preparing cash registers, reconciling payments at the end of the day, and preparing for cash deposits. Smaller merchants have employees deliver cash deposits to their bank, while larger merchants often require armoured transportation services to make deposits on their behalf. Smaller merchants may sometimes delay their cash deposits and deposit only once or twice a week. After cash is physically deposited at a bank, merchants typically wait one to two business days to receive credit in their account. This is an opportunity cost known as float.

Tender time: When accepting any payment, a merchant considers the time it takes to process the transaction at the POS and how reliable

it is in terms of its ease and dependability. While merchants can accept cash payments directly, they must rely on their acquirer to process and authorize card payments through designated networks. Consumers must enter their personal identification number (PIN) to initiate debit card payments and provide their signature to finalize credit card payments. Time lost to front-end processing, such as an error in PIN entry, or time lost to back-end processing, such as a network malfunction, can result in longer line-ups and loss of sales.

Transaction fees: Merchants incur a set fee for every debit card transaction and a percentage fee for every credit card transaction. The credit card fee, known as the merchant discount rate, is applied to the total value of the transaction.[4] In addition to the discount rate, some merchants pay a flat transaction fee. Merchants may also face a minimum monthly charge if their credit card fees do not reach a certain threshold.

Equipment costs: Accepting cash requires the set-up cost of cash registers, while electronic payments require the installation of POS terminals. Merchants often rent POS terminals from their acquirer and pay for maintenance and upgrades. Some of the larger retail chains, such as department stores, own POS terminals and customized software. POS equipment also requires the monthly costs of telecommunication lines, whether dial-up, high speed, or satellite.

Risk and finality: Each payment instrument is associated with a certain amount of risk of fraud or loss and varies in the degree of payment finality. Cash is the most final and liquid means of payment, because the funds are settled and received during the transaction. However, to receive funds directly exposes the merchant to the risk of theft (internal or external) and counterfeiting, as well as to the risk of human error during the exchange. Security measures (eg, surveillance cameras and security guards) and secure storage (eg, vaults and cash registers) are required.

The finality and security of accepting debit cards is rarely an issue for merchants. Authorization by personal identification number ensures that sufficient funds are available at the time of sale. The funds are debited from the consumer's account in real time and transferred to the merchant, usually by the next business day. In the

[4] The discount rate is determined by the acquirer who will assess the merchant's monthly sales volumes and potential for risk, including credit risk (the risk of not receiving fees owed by the merchant) and chargeback risk (the risk of transaction reversal due to fraud or discrepancy). Certain industries receive higher rates because of the riskier nature of their business. For example, online or mail-order businesses are considered more risky because transactions are processed without the physical presence of the consumer.

case of fraudulent activity, it is usually the card issuer who will absorb the loss, since the authentication relies solely on the technology and has little to do with the merchant.

In contrast, credit cards represent the least payment finality relative to debit cards and cash, because of the consumer's deferred payment advantage and limited liability against fraud. Though merchants receive funds within one to two business days, consumers have a certain number of days to dispute a credit card transaction, whether it is because of an unresolved dispute with the merchant or because there is a fraudulent claim (ie, the card was used without the cardholder's consent). In these cases, the transaction will be reversed through a chargeback. The chargeback amount is deducted from the merchant's account by the acquirer while the dispute is under review. Merchants have a limited number of days to provide the information in their defence (ie, prove they followed proper procedures). Thus, chargebacks can be costly to merchants, since they are charged for the process and also risk losing the transaction funds.

Card rules: After signing a contract to accept debit or credit cards, the merchant has limited influence over which payment method a consumer can use. As Levitin (2007) puts it, 'Card acceptance is an all-or-none proposition'. The most notable rules for credit cards include:

- *Honour all cards*: merchants must accept all credit card products under the card's brand[5]
- *No surcharging*: merchants are forbidden to impose extra fees for consumer use of cards, though some acquirers apparently allow surcharging on debit cards[6,7]
- *Non-discrimination*: merchants cannot dissuade consumers in any way from using their card of choice

Benefits: Despite the costs and regulations associated with electronic payments, merchants may value their unique benefits. One of the main

[5] A 2003 class action lawsuit in the United States, which settled outside of court, resulted in a modification of Visa USA and MasterCard International's rules to honour all cards, including signature debit cards. This is not necessarily the same issue in Canada, since debit cards are currently PIN-based and not offered by credit card companies.

[6] Anecdotal evidence suggests that, in reality, some smaller merchants may surcharge or set payment minimums for debit or credit card transactions, which may violate their agreements. However, in some cases, debit card surcharging is actually permitted by processors.

[7] See Monnet and Roberds (2007) for a theoretical discussion of the rationale for the no-surcharge rule.

advantages of card acceptance is the opportunity for consumers to spend without necessarily having the funds on their person, allowing for purchases that may not otherwise occur and increased sales.[8] Satisfying consumer demand for payment options and attaching loyalty/reward programs to card payments is especially important if the merchant is operating in a competitive environment: the acceptance of cards by nearby competitors cannot be disregarded.

5.4 The survey

5.4.1 Survey methodology and sample characteristics

Over 500 merchant representatives across Canada were interviewed by telephone over the period March–May 2006.[9] The 20-minute interviews were conducted by an independent research firm that contacted senior-level employees familiar with the payment methods accepted.

The survey sample, though relatively small, was stratified by employee size, region, and subsector, to reflect the diversity of the retail trade sector in Canada.[10] Other dimensions, such as corporate structure (ie, chain versus franchise versus independent stores), were considered.[11] Because most merchants in Canada are small independent businesses, roughly half of the sample consists of small merchants and three-quarters are independently owned and operated.[12] The median retail outlet in the survey consists of only one POS

[8] Untracht (1996) reports that 83 per cent of merchants in an Ernst and Young 1995 survey stated that acceptance of credit cards does lead to increased sales. Most respondents claimed that it led to higher profits, but 24 per cent felt that profits actually lowered because of related expenses.

[9] Prior to the national survey, a pilot study was conducted to gauge the feasibility of proposed questions. After the national survey, 35 respondents participated in follow-up interviews. The interview results are used in section 5.6.

[10] Firms in each stratum (eg, size, region, and subsector) were randomly selected using the sample frame provided by the Info Canada database.

[11] Statistics Canada defines a retail chain as one that operates four or more of the same type of store under common ownership, and a franchise as one that is part of a group of stores that sell the same products and operate similarly but is independently owned. An independent store generally operates less than four locations.

[12] According to Statistics Canada, 72 per cent of merchants have fewer than 10 employees. Independent merchants characterize the industry, representing 56 per cent of retail activity in 2005. However, chain merchants have recently been gaining ground. See http://www.statcan.ca/Daily/English/070327/d070327a.htm.

terminal and eight employees, and processes 53 transactions per day worth $1,667 in gross sales.

Although participants represented a wide variety of subsectors (from gas stations to groceries, restaurants and general merchandise), those without a physical store were excluded, as were businesses that were not hypothetically able to accept all three main payment methods. For that reason, this sample is not necessarily representative of the retail trade industry as a whole.

Lastly, the survey results, though informative, should be interpreted with caution, since the margin of error is relatively high at +/– 4.4 per cent and is even greater if generalizations are made for a particular size, region, or subsector. It should be noted that the refusal rate was 46 per cent, which is high but not unusual for this type of survey.

5.4.2 Survey results

Acceptance: Of the merchants who responded to the survey, 89 per cent accept cash, debit cards, and credit cards simultaneously. All merchants accept cash, followed closely by debit cards at 93 per cent and credit cards at 92 per cent. In addition, 16 per cent of respondents issue their own self-labelled credit card. Cheques and gift cards have lower acceptance levels, at 70 per cent and 55 per cent, respectively. The smallest merchants (measured either in terms of number of employees or sales volume) are the least likely to accept electronic payments. Credit cards are less likely to be accepted at restaurants and food, general merchandise, and personal services stores,[13] but are fully accepted at gas stations and in the furniture, health, and apparel trades. Debit card acceptance is practically uniform across sectors. Cheques are most likely to be accepted at furniture, electronics, building and materials, and health stores.

Of those merchants who do not accept debit cards, 52 per cent said that set-up and processing costs are the main barriers to acceptance. Of those not accepting credit cards, lack of demand (29 per cent) and costs (16 per cent) were the main barriers. Risk was mentioned as a main barrier by 73 per cent of those not accepting cheques.

Merchant preferences: In spite of the overwhelming acceptance of cash, debit cards, and credit cards, merchant acceptance levels do not

[13] Personal services include movie theatres, video rental shops, dry cleaning, personal care, photofinishing, and repair and maintenance services.

necessarily reflect their relative preferences. For example, of those merchants who accept all three payment methods , 60 per cent said they very much prefer debit cards, 52 per cent said they very much prefer cash, and 21 per cent said they very much prefer credit cards. Yet, when merchants were asked which one of the three accepted methods they prefer consumers to use *the most often*, 53 per cent favoured debit cards, 39 per cent favoured cash, and only 5 per cent favoured credit cards.

Merchant perceptions: The survey asked all merchants about the perceived ease and dependability (or reliability) of processing payments at the point of sale, as well as perceived risk and cost.[14] Cash was rated as 'totally reliable' by 67 per cent of respondents, while 56 per cent gave this top rating to debit cards, and 38 per cent to credit cards. Debit cards were viewed as the least risky MOP and 42 per cent rated them as 'not at all risky'. Cash was seen as 'not at all costly' by 63 per cent of respondents, compared with the 19 per cent who gave this rating to debit cards and the 3 per cent who gave the rating to credit cards.

Table 5.3 **Acceptance and perception ratings given by percentage of respondents**

	Cash	Debit Card	Credit Card
Acceptance	100	93	92
Most preferred	53	39	5
Totally reliable	67	56	38
Not at all risky	42	21	15
Not at all costly	63	19	3

Payment shares: According to the survey results, there is no single payment instrument that dominates total transactions. Table 5.4 shows that each major payment instrument represents about a third of the value and volume of total sales for the median merchant in the survey. The table also reports the median transaction value by payment instrument.

[14] Questions on perceptions were asked of all merchants, regardless of acceptance.

Table 5.4 **Payment instrument shares and transaction value by sample median**

Payment instrument	Value (%)	Volume (%)	Trans. value ($)
Cash	25	35	36.50
Debit card	30	34	50.00
Credit card	30	25	62.50
Cheque	5	3	150.00
Self-labelled credit card	5	4	67.50

Note: Shares do not add to 100 per cent, because each cell corresponds to the survey median calculated independently for each MOP. Therefore, the median observation for cash may not be the same as the median observation for other MOP. Median transaction values are estimated based on merchant responses to the following question: *In your store(s), what is the average transaction value for each of the following payment methods?*

Costs: The cost of accepting payment instruments comprises monthly and per-transaction fees charged by payment service providers. More than half of the merchants in the survey receive their electronic payment services from payment processors; the remaining merchants receive them directly from their financial institution.

According to the survey, merchants pay around $45 to $53 a month for their banking and payment processing services, which may include terminal leasing.[15] Although questions about communication costs were not asked, the survey reveals that 56 per cent of the respondents use dial-up lines and 30 per cent use high-speed lines, and the majority of respondents use only one connection.

Merchants were also asked about their per-transaction fees for debit and credit cards. The median per-transaction fee for debit cards in the survey is 12 cents and the median discount rate for credit cards is 2 per cent of the value of the transaction.[16] However, debit card fees may vary from 7 cents in the lower quartile of the distribution to 25 cents in the upper quartile. Similarly, credit card discounts range from 1.75 per cent in the lower quartile to 2.5 per cent in the upper quartile.

[15] Among those who accept credit/debit cards, approximately half said they lease their POS equipment and 24 per cent said they own the equipment; the rest either did not know or did not respond.

[16] This is based on an average credit card discount rate calculated for each merchant judging by the credit cards they accept at their stores.

5.5 Merchant perceptions and preferences

In this section, we examine how merchant characteristics, such as transaction value and volume, can affect merchant perceptions of MOP reliability, risk, and costs. We then examine how much weight perceptions may have on merchant preferences compared with other factors.

Because survey responses are categorical rankings, we use ordered probit models, which are estimated by maximum likelihood (Greene, 2000). The ordered probit model is based on the assumption that there is a latent factor y_i^*, which is considered by individuals in their categorical response. For example, merchants might have a series of measures of transaction failure, risk of loss, or per-transaction costs by MOP. However, due to time constraints or confidentiality issues, merchants may be reluctant to provide these measures, and the surveyor has to rely on an ordered categorical response, $y_i \in \{1,2,...,G\}$.

In general, letting y_i^* be a linear function of a set of regressors x_i

$$y_i^* = \beta' x_i + \varepsilon_i$$

and assuming that the error term ε_i follows a normal distribution, then

$$P(y_i = g) = P(\mu_{g-1} < y^* \leq \mu_g) = \psi_g(\beta' x_i)^{17} \quad (5.1)$$

where μ_i are thresholds to be estimated. Ordered probit models allow us to estimate the parameter vector β.

5.5.1 Merchant perceptions of reliability

The survey asked merchants to rate cash, debit, and credit card payment methods, in terms of the ease and dependability of processing the payments at the POS, using a scale from 1, 'completely unreliable', to 5, 'totally reliable'. We model the score for merchant i for MOP j, E_{ij}, as an ordered probit with the following regressors:

[17] Ψ_g is a functional form that varies with category and derives from the normality assumption of ε_i.

- ATV_i: average transaction value weighted by payment instrument share
- POS_i: number of terminals
- $SALES_i$: total sales volume or, alternatively, total sales value[18]
- $CHAIN_i$: dummy that differentiates chain-owned stores ($CHAIN_i$ =) from independent stores
- $SHARE_{im}$: MOP shares, excluding the j payment instrument share
- $SECTOR_{im}$: m = 1,…,S retail subsector dummies
- $REGION_{im}$: m = 1,…R regions in which the merchant has a presence. Each regional variable is equal to 1 if the merchants respond that they have outlets at least in that province.

Table A5.1 in Appendix A shows that both ATV and transaction volume play a significant role in explaining merchant perceptions of reliability. The lower the ATV, the more merchants find cash reliable to process. The opposite applies for debit and credit cards: they are found to be more reliable by merchants in higher-ATV stores. This is expected, since paying with cash can be more cumbersome in high-value transactions – counting, verification, and change handling would be more time consuming and less dependable for both the cashier and the consumer.

Our results show that merchants with high-volume stores find cash more reliable, controlling for the number of terminals and ATV. This is in part due to the fact that cash has the fastest tender time,[19] followed by PIN debit cards and signature credit cards,[20] which is critical in high-volume stores. However, sales volume has no significant effect on merchant perceptions of debit and credit card reliability.

We also examine *relative* perceptions of reliability between cash and debit, debit and credit, and cash and credit by estimating the ratio of the scores for MOP j and k, $E_{i(j,k)} = E_{ij}/E_{ik}$.[21] Analyzing perceptions in relative terms allows us to identify those characteristics that cause merchants to have more contrasting views of payment instruments.

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[18] We test several measures of merchant overall payment operations: total sales volume, total sales value, and number of employees (which enter in dummies, each for a different size range). We also test the significance of $SALES_i$ entered in squared terms. In some models, transaction volumes for debit and credit cards are also used, since merchants may look at MOP individually.

[19] Tender time is defined as the time elapsed from the moment the total amount is displayed on the cash register to the moment the payment is consummated.

[20] See Working Group on Costs of POS Payment Products (2004).

[21] Each MOP response has five possible categories. Therefore, the ratio of two MOP responses would have 5^2 possible values.

The results in relative terms (Table A5.2) reveal how ATV, total sales, and number of terminals may influence how merchants score each pair of payment instruments. Cash is perceived to be more reliable than credit cards by merchants with a lower ATV, higher transaction volume, and smaller number of terminals. Debit cards are considered more reliable compared with cash as the total value of sales increases. Also, debit cards are more reliable than cash the larger the number of terminals. Only the number of terminals significantly explains relative perceptions between debit and credit cards, with the latter perceived to be less reliable the higher the number of terminals. In summary, debit cards are perceived to be relatively more reliable as ATV and the merchant's overall operation increase.

5.5.2 Merchant perceptions of risk

The survey asked merchants to rate cash, debit cards, and credit cards in terms of the risk of counterfeiting, theft, or fraud. As in section 5.5.1, we estimate ordered probit models both in absolute and relative terms, denoted R_{ij} and $R_{i(j,k)}$, respectively. In this case, the five possible risk scores are on a scale of from 1, 'not at all risky', to 5, 'very risky'. We use the same regressors as specified in section 5.5.1.

Table A5.3 shows the results in absolute terms. For cash, the main drivers of risk perceptions are total transaction volume and province of operation. The bigger the total sales volume, the higher the perception of risk. This result is consistent with the fact that merchants with larger overall cash operations are more exposed to theft, employee error, and counterfeits. In addition, the larger the total value of cash sales, the larger the size of the expected loss. Merchants operating in Ontario perceive cash to be more risky and those operating in Alberta see it as less risky, compared with merchants operating elsewhere in Canada.

Debit cards are perceived to be less risky the bigger the total transaction volume. This result is puzzling, since merchants are, in general, not liable for debit card fraud and, therefore, debit risk should not depend on merchant size.[22] Also, merchants in Ontario and Quebec seem to consider debit and credit cards to be more risky than do merchants operating elsewhere. Finally, the bigger the merchant, in terms of the number of terminals, the higher the perception of risk for

[22] The result may be an indication that merchants use cash as a reference point for their debit risk ratings.

credit cards. Average transaction value is not significant in any of these models.

ATV, however, is significant in explaining *relative* risk perceptions (Table A5.4). Cash is perceived to be less risky compared with debit as the ATV increases, whereas credit cards are perceived to be less risky compared with debit cards as the ATV increases. These results are apparently counterintuitive: expected losses from cash should increase with ATV, debit cards essentially pose no risks to merchants, and credit card risk actually may increase with ATV, since chargebacks are proportional to the value of the transaction.[23] We conjecture that the effect of larger expected losses associated with higher ATV from payments with cash and credit cards is more than offset by the higher security standards that merchants may impose on their high-ATV stores.[24] Yet, transaction volume increases the perceived risk of cash relative to debit cards and credit cards.[25] Also, merchants processing a higher volume of credit card transactions perceive credit cards to be riskier than debit cards. The number of terminals increases the perceived risk of credit cards relative to debit cards.

5.5.3 Merchant perceptions of cost

The survey also asked merchants to rate cash, debit cards, and credit cards in terms of the costs to handle and process payments. In this case, the five possible scores are on a scale of from 1, 'not at all costly', to 5, 'very costly'. For each payment instrument, we estimate ordered probit models of cost responses in absolute and *relative* terms, C_{ij} and $C_{i(j,k)}$, respectively, in the same fashion as in section 5.5.1.

There are, however, two considerations that should be kept in mind as we present the results. First, not all merchants recognize the full cost of accepting payments. For example, some merchants approached in the pilot study prior to the national survey did not recognize cash processing as an incremental cost to their business. They claimed that it is just a part of 'doing business' and is covered in their overall set-up cost. Therefore, these merchants may answer

[23] We try different specifications but the results do not change, and no outlier effects appear, either.

[24] This result could also be consistent with merchants in higher-ATV stores being less risk averse.

[25] The chi-squared test in Table A5.4 shows, however, that the model for relative risk between cash and credit cards has no overall significance.

differently than those who see cash processing as an incremental cost to their operations. This may bias some of the results. For example, the relationship between cost perceptions and payment volume may be weakened, since those merchants who think cash is part of doing business would not associate their cost perceptions with volume. Second, some merchants may think in total costs, whereas others may think in per-transaction costs.

The results in absolute terms (Table A5.5) confirm that merchants responded in per-transaction terms when revealing their cost perceptions of debit and credit cards. This is evident from the negative relationship between transaction volume and debit and credit card cost perceptions, after controlling for the number of terminals. This is not surprising, since the strong fixed-cost component should drive significant economies of scale. We also find a significant negative effect of ATV on debit card cost perceptions, which is consistent with the fact that debit card fees are set independent of the value of the transaction. Yet, it is not clear why credit card cost perceptions decrease with ATV. If credit card discount fees are constant from one merchant to another, credit card per-transaction costs in dollar terms should increase with ATV, since credit card fees are *ad valorem*. One plausible reason, which we examine in section 5.7, is that payment providers may offer lower credit card discount fees to higher-ATV merchants.

Cost perceptions of cash do not appear to vary by transaction volume and ATV. The merchant's overall operation, measured by the number of employees, is also non-significant. Annual sales is the only size measure to be positively and highly correlated with cost perceptions. However, this result is driven by merchants with the highest annual sales. The results again suggest that merchants respond on a per-transaction basis, and may imply that merchants do not perceive any economies of scale in handling cash payments.

Table A5.6 shows cost perceptions in *relative* terms. It shows that merchants in high-ATV stores perceive cash to be more costly than debit cards, compared with merchants in low-ATV stores. Yet, the higher the number of terminals, the more likely that debit is perceived to be more costly than cash. Perhaps this is because leasing costs increase with the number of terminals. All things equal, merchants with large transaction volumes perceive cash to be relatively more costly than debit cards. Furthermore, cost perceptions between debit and credit cards are associated only with the ATV. Merchants in higher-ATV stores perceive debit cards to be less costly than credit cards. Neither the transaction volume nor the number of terminals seems to affect relative cost perceptions between debit and credit

cards. The relative results confirm that ATV, the number of terminals, and the transaction volume tilt perceptions in favour of card payments as cash processing and opportunity costs increase.

5.5.4 Merchant preferences

We estimate ordered probits of merchant responses for preference ratings of payment j, P_{ij}, as a function of $RBLTY_{ij}$, $RISK_{ij}$, $COST_{ij}$, $SHARE_{im}$, $SECTOR_{im}$, and $REGION_{im}$, where $RBLTY_{ij}$, $RISK_{ij}$, and $COST_{ij}$ are the merchant's responses of reliability, risk, and costs for MOP j, respectively, and the other variables are as defined in section 5.5.1.

Table A5.7 shows that reliability and costs are significant factors underlying merchant preferences for all MOP. Risk, on the other hand, only plays a role in the preference for cash, but is non-significant for debit and credit cards. Moreover, as consumers use a payment instrument more intensively, merchants increasingly value their choice. For example, merchants in intensive debit/credit card stores tend to rank cash lower in their preferences, the effect being strongest in debit-intensive stores. Likewise, the more cash-oriented a merchant's business, the lower it will rank debit and credit cards.

We also estimate ordered probits of preferences in *relative* terms between MOP j and k, $PR_{i(j,k)} = P_{ij}/P_{ik}$, as a function of $RL_{i(j,k)}$, $RK_{i(j,k)}$, $RC_{i(j,k)}$, $SHARE_{im}$, $SECTOR_{im}$, and $REGION_{im}$, where $RL_{i(j,k)}$, $RK_{i(j,k)}$, and $RC_{i(j,k)}$ are relative reliability, risk, and cost scores, respectively.

In *relative* terms, Table A5.8 confirms that reliability and costs are significant drivers of merchant preferences among the three instruments. Risk, however, matters only in the relative preference between cash and debit cards.

We also examine how merchant characteristics influence preferences. By doing so, we describe preferences in terms of objective measures of merchant heterogeneity, rather than the more subjective ones based on perceptions as above. We estimate ordered probits of *relative* preferences as a function of all the regressors defined in section 5.5.1.[26]

Table A5.9 shows the results in *relative* terms. Merchants with relatively higher transaction volumes and a higher number of terminals are more likely to prefer electronic payments to cash, except

[26] We also estimate order probits of preference ratings by payment, but we do not find any significant merchant characteristic effects.

for those merchants with the highest transaction volume per terminal. Credit card preference, relative to debit cards, increases with ATV and transaction volume, but decreases with the number of terminals.

There are also strong sector-specific effects. Cash is preferred to debit cards in gas stations, bars and restaurants, and personal service sectors. Credit cards are preferred to debit cards by merchants in the health, apparel, bars and restaurants, and personal service sectors.

In summary, this section shows that debit cards emerge as the more reliable, less risky, and less costly payment instrument as the size of a merchant's operation increases. The ATV at the POS also plays a significant role in explaining perceptions. Merchants in high-ATV stores perceive cash to be more costly and less reliable than electronic payments compared with merchants in low-ATV stores. As expected, merchants in higher ATV stores perceive debit cards to be less costly than credit cards. Merchants with relatively higher transaction volumes and a higher number of terminals are more likely to prefer electronic payments to cash. In addition, preferences are shaped by the MOP most used at the POS, as measured by payment instrument shares.

5.6 Payment instrument shares

In this section, we investigate the hypothesis that, once a merchant decides whether to accept a payment instrument, it has little influence over the consumer's choice of MOP, which determines the outcome at the POS.[27] We test this hypothesis by estimating payment instrument shares as a function of merchant perceptions regarding cost, risk, and reliability. Subsequently, we extend the model by including variables that would reflect consumer MOP behaviour, and test their significance in explaining market shares. The results in this section show that merchants have little influence over payment shares aside from initial acceptance, and that consumer MOP decisions govern payment shares at stores that accept all MOP.[28] In particular, we find evidence suggesting that consumers may choose to use cash more

[27] None of the 35 merchants interviewed in the pilot survey reported any type of practice to dissuade customers from paying with any of the payment instruments surveyed.

[28] Sample selection bias due to acceptance decisions is not a major issue in the Canadian environment, since 89 per cent of survey participants accept cash and debit and credit cards.

intensively relative to cards at stores with low ATV and high transaction volumes.

Table A5.10 shows that costs, reliability, and risk do not have any significant effect in explaining payment shares after controlling for acceptance. Most of the explanatory power in these regressions depends on the merchant's subsector and region. We extend this model by adding total sales, the number of terminals, and ATV as additional factors underlying payment instrument shares.[29] These variables are our proxies for consumer payment behaviour. For example, we expect cash payment shares to decrease with ATV because cash tends to be inconvenient for high-value payments – the risk of loss and opportunity costs increase with transaction value.[30] Also, consumers may find electronic payments more convenient for high-transaction values, not only because such payments avoid the hazards associated with handling large amounts of cash, but also because they enable the consumer to use funds not available at hand.[31] Record keeping provided by electronic MOP would also be more desirable the higher the transaction value, by providing proof of payment and aiding cash-flow management. Total transaction volume, controlling for the number of terminals, proxies for waiting times in line. Consumers in busy stores with long lines may be more impatient and may prefer to use cash. Subsectors proxy for the type of goods being purchased. For example, consumers may be more inclined to pay with credit cards for durable goods (Santomero and Seater, 1996).

Table A5.11 shows that, all things equal, ATV is statistically significant: the higher the ATV, the lower the cash and debit card payment shares and the higher the credit card share. Another observation is that subsectors that are less cash intensive tend to be significantly more credit card intensive. That is the case in the furniture, apparel, hobby, and health care trades. However, there are no particular differences across sectors for debit card shares. Stores that have a higher transaction frequency tend to have significantly higher cash shares, as captured by transactions per terminal.[32]

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[29] ATV in payment share models is an unweighted average of each MOP transaction value, to avoid endogeneity issues.

[30] Transaction value is often a main variable in determining the relative demand for different payment methods (Whitesell, 1989, 1992, Prescott, 1987, Klee, 2004, Bounie and François, 2006).

[31] See Arango and Taylor (2007) for a detailed discussion of the factors involved in consumers' choices between alternative MOP at the POS.

[32] Transactions per terminal are calculated as the total sales volume divided by the number of POS.

Table A5.12 shows the results of *relative* payment shares. Cash is used more intensively than debit cards as total sales increase. Also, consumers use credit cards relatively more than debit cards the larger the number of terminals. Note the orders of magnitude of the ATV coefficient across equations. Relative payment shares between debit and credit, and cash and credit, are much more sensitive to changes in the ATV than are relative payment shares between cash and debit. This may indicate that, in stores that accept all payment instruments, the higher the ATV, the higher the likelihood that people will turn to credit card payments rather than debit cards (due in part to strong incentives given by credit cards in terms of the grace period and rewards). This conjecture deserves further investigation, since the survey studied herein is not best suited to test this type of hypothesis.

Subsector dummies are also significant in explaining relative payment shares. Cash is more intensively used relative to debit in the food, gas, restaurants, and general merchandise subsectors. Credit card shares are particularly higher than debit card shares in sectors associated with durable goods, such as the furniture, apparel, and hobby sectors. One sector that stood out as highly credit card intensive relative to other sectors, all things equal, is gas stations. This may reflect the convenience of using credit cards for payment at the pump. It also may reflect the wide acceptance of credit cards in this trade, where self-labelled credit cards are common.

5.7 Costs of accepting cash, debit cards, and credit cards

In this section, we examine whether payment processor fees are associated with merchant characteristics. We also examine merchants' per-transaction costs of accepting all MOP. In particular, we want to determine whether the finding that cash is perceived as the cheapest payment instrument is consistent with an accounting exercise in which we try to include all variable costs. The results for payment processor fees show significant volume discounts for both debit and credit cards. We also find that debit cards are less costly than cash for the median cash transaction value in the survey.

5.7.1 Per-transaction fees for debit and credit cards

We examine various models of debit and credit card fees as a function of merchant characteristics. Although we test whether different merchant attributes affect fees, only ATV and transaction volume are consistently significant across specifications. Table A5.13 shows conditional median regressions of debit and credit card fees as a function of ATV and transaction volume.[33]

We find that both debit and credit card fees decrease with transaction volume. The fact that larger merchants are able to negotiate lower per-transaction fees is consistent with stronger competition among payment processors in this segment of the market.

We also find that debit card fees increase with ATV, while credit card fees decrease with ATV. Lower debit card fees for merchants with low ATV suggest that payment processors may compensate for the competition between cash and debit cards at low transaction values. Yet, credit card payment processors may give lower rates to high-ATV merchants, to compensate for the competition between debit and credit card fees, which becomes more pronounced as the ATV increases, given the different fee structures.

To determine the order of magnitude of the ATV effect, we compare per-transaction fees of a high-ATV merchant versus those of a low-ATV merchant based on our estimates. For example, a merchant with an ATV of $100 would pay 3 per cent more in debit card per-transaction fees than a merchant with an ATV of $10. In contrast, a merchant with an ATV of $100 would pay credit card discount rates that are about 4 per cent lower than those for a merchant with an ATV of $10. However, in absolute-dollar terms, the credit card fee paid by a merchant with an ATV of $100 is about 9 times the amount paid by a merchant with an ATV of $10. Even though credit card providers seem to decrease their discount rates for higher-ATV merchants, this does not compensate for the increase in the dollar amount that results from applying the discount rates to higher transaction values.

The regressions also suggest that a merchant with large transaction volumes (ie, at 500 transactions per day) pays 7 per cent lower debit card fees and 4.1 per cent lower credit card discount rates than a small merchant (ie, at 100 transactions per day). These may sound like small

[33] We estimate a conditional median model instead of conditional mean, because of the strong weight that outliers have in the mean, and also because of the rather skewed distribution shapes of card fees.

differences in per-transaction fees, but they represent significant savings to the merchant in aggregate costs.

5.7.2 Cash, debit, and credit: a comparison of variable costs

Based on data obtained from follow-up interviews with 35 merchants (a subset of the survey), it is possible to derive some of the back-office costs associated with handling cash. The participants provided more detailed information on the number of transactions by payment method, the number of cash deposits per week, the value and frequency of coin ordering, the reconciliation and deposit preparation time, the average cash deposit value, and deposit fees. This information, together with the information on debit and credit card fees, allows us to compare merchant per-transaction variable costs across payment methods. We account for the following cost items:

- For all payment instruments, the labour cost associated with tender time is included, which is based on the average cashier wage in the national survey ($9.60 per hour). Tender time estimates are taken from the Dutch National Bank as follows: 19 seconds for cash, 26 seconds for debit cards, and 28 seconds for credit cards (Working Group on Costs of POS Payment Products 2004).
- For cash, we calculate the labour cost of the reconciliation and deposit preparation time per transaction.
- We include the value of time spent delivering the cash deposit to the bank, which we assume is 20 minutes per deposit. According to anecdotal information, most merchants still make their deposits during business hours, although after-hours drop-off chutes are available. (We exclude the cost of armoured transportation services due to lack of data.)
- Cash deposit fees and coin-ordering fees are taken from one of the major Canadian commercial bank's public brochures, as published at the time of the survey.
- For debit and credit cards, we take the median per-transaction fees from the survey.
- For cash theft, we use the results of a Retail Loss Prevention Survey conducted by the Retail Council of Canada and the Royal Bank of Canada in 2007, which provides information about the

types of criminal activity faced by merchants.[34] Losses due to counterfeiting are calculated based on the annual average value of counterfeits passed in 2004–06 divided by average total cash sales in the same period.

- The cost of a credit card chargeback is derived from Garcia-Swartz, Hahn, and Layne-Farrar (2004).
- Float is the opportunity cost of funds in transit, based on short-term interest rates. For cash, we not only consider the time it takes for the financial institution to credit the merchant's account, but also the average time that total cash sales remain in the store before being deposited at a financial institution, based on deposit frequency.[35]

Table 5.5 summarizes our calculations. Results are reported for a transaction value of $36.50, which is the median cash transaction value in the survey. The estimations reveal that debit card payments are the least costly at 19 cents, followed by cash at 25 cents and credit cards at 82 cents.

Since many cost items would vary by the value of the transaction, a sensitivity analysis is performed to identify the threshold at which cash may be the cheapest to accept. We calculate the per-transaction costs for different transaction values. For cash, we assume that all cost items increase with transaction value, except tender time, deposit time at the bank, and coin ordering. For debit cards, only the opportunity cost of funds availability would increase with transaction value. For credit cards, all cost items, except tender time, would increase with transaction value. Given these assumptions, the sensitivity analysis suggests that cash would be the least costly payment instrument for transactions below $12.6 among merchants in the lower range of debit card fees (7 cents), the least costly for transactions below $23.4 at

[34] This survey finds that 35 per cent of merchants face theft by an employee within a year, and that 23 per cent face an intrusion (such as break-and-enter or armed robbery). In the first case, the cash loss would be a portion of total sales, whereas in the second it is reasonable to assume a total loss of the transaction proceeds. We calculate the daily probability of a cash-theft event based on a 29 per cent annual frequency, an average of the above frequencies, and a 75 per cent cash-sale loss.

[35] Merchants in the survey differ by how frequently they deposit cash at their financial institution. Only 18 per cent of merchants deposit cash on a daily basis, while approximately half deposit either once per week (27 per cent) or twice per week (22 per cent). We find that merchants of larger operations, either measured by sales or transaction volume, deposit cash more frequently. However, merchants with a higher number of terminals to manage and reconcile tend to deposit cash less frequently.

stores that pay 12 cent debit fees, and the least costly for transactions below $51.3 among merchants in the higher range (25 cents).[36]

Table 5.5 **Merchant variable per-transaction costs**

	Base case for a $36.50 transaction		
Cost item	**Cash**	**Debit**	**Credit**
Tender time	0.051	0.070	0.080
Deposit reconciliation time	0.033		
Deposit preparation time	0.033		
Deposit time at the bank	0.025		
Payment processing fees		0.120	0.730
Cash deposit fees	0.078		
Coin ordering	0.006		
Theft/counterfeit	0.025		
Chargebacks			0.016
Float	0.006	0.001	0.001
Total	$0.25	$0.19	$0.82

Although these are back-of-the-envelope calculations, our estimate of the threshold transaction value between cash and debit cards seems reasonable, since low-ATV stores, such as convenience stores and fast food restaurants, are more likely to not accept electronic payments. Note, however, that we are considering the survey median values in some of our estimates. Our results show that costs may vary among merchants for a variety of reasons, including size, technology used, and geographical location.

Our calculations contrast with the perceived view of merchants that cash is the cheapest payment instrument to accept. This may be a result of the way merchants perceive cash. It is possible that those merchants who perceive cash as part of doing business would not consider some of the costs in Table 5.5, such as deposit reconciliation and deposit preparation, as variable costs of processing cash. Alternatively, as the results in section 5.5.3 suggest, merchants may consider both variable and fixed costs in their cost perceptions; therefore, both ATV and merchant's size will be important in their ranking.

[36] We focus our discussion on comparisons between cash and debit cards, since the marginal cost of credit cards (the merchant discount rate) combines transactional as well as lending costs transferred to the merchant. Since cash and debit cards do not have lending attributes, the comparison with credit cards may not be valid.

5.8 Conclusion

Our empirical results permit a thorough understanding of the merchants' perspective of MOP acceptance that has been only marginally explored in the literature. First, we find that merchant preferences are shaped by both costs and the relative intensity of MOP use at the POS. This implies that, as consumers use a payment instrument more intensively, merchants increasingly value their choice. Second, we find that merchants have little influence, aside from acceptance, in the relative usage of MOP at the POS. Finally, the survey shows that cash, debit, and credit cards compete equally in terms of payment shares at POS that accept all MOP; therefore, the decision to reject a payment instrument may imply significant losses of sales.

As for the costs of acceptance, our rough estimates show that cash is actually more costly than debit cards at the survey's median cash transaction value of $36.50, and may cost less only at transaction values lower than $12. Therefore, a further shift away from cash and towards electronic payments is beneficial for most of the merchants in the survey who have average transaction values above this $12 threshold. The gains are probably larger among merchants with large scales, as our work shows evidence that debit and credit card fees decrease with merchant size, and that merchants profit from economies of scale in electronic payments.

These results are consistent with the two-sided nature of payment services markets. Although merchants might find it costly to adopt a particular payment instrument, they still might find it profitable in that it either enhances the demand for their goods or prevents a loss of customers to their competitors.

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Appendix A

Econometric models

Although all regressors are tested for statistical significance in each set of models, each column in the tables in this appendix should be seen as an independent model. Therefore, different specifications are possible. Robustness checks are performed by testing different measures of merchant size, including number of employees and total sales. However, annual transaction volume is preferred. Variables not included in some of the models are dropped because of their lack of joint significance. Different procedures for outlier effects are performed. The auto parts, accessories, and tires sector is excluded from the estimations. The highest-frequency stores, measured in annual transaction volumes per POS, are taken into account by including a dummy variable in the models. The retail sector of reference, or left-out sector, is food (eg, grocery and convenience stores). The reference group for the set of dummies under the title "Provinces of presence" in the following tables are those merchants that have operations nationwide. One of the payment shares is excluded to avoid singularity. Further details are provided in the notes to each table.

Table A5.1 **Merchants' perceptions of reliability**

	Reliability		
	Cash	**Debit card**	**Credit card**
Weighted avg transaction value[1]	-0.112 **	0.258 **	0.291 ***
High-frequency stores (volume per POS >37,500)	0.324 **	-0.058	
Total number of terminals[2]	-0.002	0.022	-0.011
Total annual transactions	-0.056 [2]	-0.002 [3]	-0.025 [3]
Total annual transactions (sq)		0.046	
Cash share		-0.013	0.027
Credit share	-0.072	0.287	
Debit share	-0.765 **		0.303
Corporate/Franchised	-0.124	-0.026	-0.039
Furniture		0.276	0.732 ***
Electronics		0.270	0.295
Bldg materials		0.367	0.749 ***
Health care		0.279	0.560 **
Gas station		0.122	0.435 *
Apparel		0.263	0.487 *
Hobby		0.274	0.412
General merchandise stores		0.255	0.169
Miscellaneous merchants		0.457 *	0.583 **
Bars and restaurants		-0.052	0.389 *
Personal services		0.005	0.374
Provinces of presence[a]			
Ontario			0.291 **
Manitoba			-0.677 **
Quebec	-0.385 ***		
Observations	456	457	461
Wald chi2(p)	36.990	37.980	72.870
Prob > chi2	0.002	0.150	0.000
Log pseudolikelihood	-471.06	-466.30	-587.50
Pseudo R2	0.028	0.028	0.043

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively.
[1]Measured in logarithms; [2]Per 1,000 terminals; [3]Per 100,000 transactions.
[a] Significant at 10% or less.

Table A5.2 **Merchants' *relative* perceptions of reliability**

	Relative reliability		
	Cash/ Debit	**Debit/ Credit**	**Cash/ Credit**
Weighted average transaction value[1]	-0.076	-0.004	-0.120 **
Total annual transactions[2]			0.024 ***
Total annual sales[3]		0.023	
Annual sales (ln)	-0.069 **		
Annual sales squared		-0.010	
Total number of terminals[1]	-0.021 **	0.029 ***	-0.005
Cash payment share	0.077	0.112	0.167
Credit card payment share	-0.054		
Debit share		0.302	-0.421
Corporate/Franchised	-0.079	0.038	-0.107
Furniture	-0.152	-0.492 *	-0.505 *
Electronics	0.086	-0.195	0.003
Bldg materials	-0.339	-0.511 *	-0.730 ***
Health care	-0.023	-0.407 *	-0.245
Gas station	0.252	-0.316	0.056
Apparel	-0.017	-0.312	-0.202
Hobby	-0.028	-0.321	-0.154
General merchandise stores	-0.077	0.051	-0.027
Miscellaneous merchants	-0.291	-0.266	-0.269
Bars and restaurants	0.289	-0.365 *	-0.023
Personal services	0.150	-0.522	-0.118
Provinces of presence[a]			
Alberta		-0.269 **	
Ontario			-0.314 ***
Manitoba		0.699 ***	0.644 **
Quebec	-0.279 **	0.334 ***	
Observation	457	452	461
Wald chi2(d)	55.45	61.15	60.57
Prob > chi2	0.002	0.000	0.000
Pseudo R2	0.021	0.029	0.023
Log pseudolikelihood	-830.75	-713.76	-915.44

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [1]Per $1,000. [2]Per 1 million transactions. [3]Per $100 million. [a]Significant at 10% or less.

Table A5.3 **Merchants' risk perceptions of counterfeiting, theft, or fraud**

	Risk perceptions		
	Cash	**Debit card**	**Credit card**
Debit transaction value (ln)		-0.034	
Average transaction value[1]	-0.004		0.034
Total number of terminals[2]	0.029	-0.294	0.147 **
Annual transactions	0.050 *	-0.070 [4] **	-0.006 [3]
Credit share	-0.515 *	-0.249	
Cash share		0.268	0.356
Debit share	-0.237		-0.090
Corporate/Franchised	0.094	0.049	0.118
Furniture 0.431	*	-0.007	0.021
Electronics -0.135		-0.669 **	-0.093
Bldg materials	0.154	0.091	-0.341
Health care	-0.100	-0.338	-0.656 ***
Gas station	0.096	0.182	0.111
Apparel 0.447	*	-0.157	-0.074
Hobby	0.298	0.037	0.151
General merchandise stores	-0.027	-0.376	-0.239
Miscellaneous merchants	0.082	-0.505 *	-0.183
Bars and restaurants	0.023	-0.430 *	-0.386 *
Personal services	-0.146	-0.333	-0.319
Provinces of presence[a]			
Alberta	-0.378 **		
Ontario	0.427 ***	0.310 **	
Quebec		0.260 *	0.320 ***
Observations	467	427	465
Wald chi2(p)	38.020	41.280	59.740
Prob>chi2	0.098	0.051	0.000
Pseudo R2	0.026	0.035	0.025
Log pseudolikelihood	-717.444	-590.776	-698.955

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1]Per $1,000. [2]Per 10,000 terminals. [3]Per $1 million. [4]Measured in logarithms. [a]Significant at 10% or less. Both ATV as defined in the text and the transaction value specific to each MOP were alternatively tested, but were not significant.

Table A5.4 **Merchants' *relative* risk perceptions of counterfeiting, theft, or fraud**

	Relative risk		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Weighted average transaction value	-0.024 ***		-0.0001 *
Total annual transactions[1]		0.002 *	
Total annual transactions (in log)	0.087 ***		0.050 **
Total number of terminals[3]	0.001	-0.003 ***	-0.001
Cash payment share	-0.517 **	0.198	-0.193
Debit share	-0.099	-0.221	-0.082
Debit average transaction value [2]		-0.007	
Credit average transaction value [2]		0.007 **	
Credit transaction volume[1]		-0.031 **	
Corporate/Franchised	0.049	-0.061	-0.028
Furniture	0.353	0.018	0.351
Electronics	0.337	-0.337	0.006
Bldg materials	-0.127	0.493 **	0.257
Health care	0.225	0.201	0.388 **
Gas station	-0.224	0.134	-0.095
Apparel	0.349	0.019	0.298
Hobby	0.105	0.044	0.053
General merchandise stores	0.285	-0.170	0.138
Miscellaneous merchants	0.251	-0.056	0.160
Bars and restaurants	0.264	-0.006	0.246
Personal services	0.127	0.120	0.135
Provinces of presence[a]			
British Columbia	0.349 **		
Manitoba		-0.397 *	
Ontario			0.266 ***
Observation	465	463	465
Wald chi2(d)	50.650	77.320	32.180
Prob > chi2	0.006	0.000	0.267
Pseudo R2	0.023	0.018	0.012
Log pseudolikelihood	-1,093.60	-990.108	-1138.576

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [1] Per 100,000 transactions. [2] Per $100. [3] Per 100 terminals. [a] Significant at 10% or less.

Table A5.5 **Merchants' cost perceptions of accepting a payment instrument**

	Cost perceptions		
	Cash	**Debit card**	**Credit card**
Weighted transaction value[1]	0.004	-0.761 [4] ***	-0.132 **
Total number of terminals[2]	-0.014	0.030 ***	0.045 **
Annual sales	0.074 **		
Transaction volume[3]		-0.082 *	-0.200 *
Cash share		0.438	-0.104
Credit share	-0.097	0.150	
Debit share	0.138		-0.261
Corporate/Franchised	0.149	-0.184	-0.159
Furniture	-0.334	0.013	-0.130
Electronics	-0.216	-0.149	0.131
Bldg materials	-0.122	-0.215	-0.178
Health care	-0.302	-0.172	-0.265
Gas station	0.115	0.355 *	0.249
Apparel	-0.025	0.179	0.196
Hobby	-0.143	-0.037	0.217
General merchandise stores	-0.294	-0.522 *	0.228
Miscellaneous merchants	0.085	0.275	-0.165
Bars and restaurants	-0.076	0.347 *	0.214
Personal services	-0.466	0.102	-0.093
Provinces of presence[a]			
Alberta	-0.368 *		-0.328 **
British Columbia	0.383 **		-0.271 *
Ontario	0.360 **		-0.220 *
New Brunswick	0.707 ***		
Nova Scotia		0.436 ***	
Quebec	0.340 **		
PEI		-0.772 ***	
Observations	467	462	460
Wald chi2(p)	63.840	80.210	56.270
Prob >chi2	0.000	0.000	0.001
Pseudo R1	0.047	0.048	0.531
Log pseudolikelihood	-558.218	-659.507	-628.921

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1]Per $10,000. [2]Per 1,000 terminals. [3]Per $1 million. [4]Debit average transaction value. [a]Significant at 10% or less.

Table A5.6 **Merchants' *relative* cost perceptions of accepting a payment instrument**

	Relative cost		
	Cash/ Debit	**Debit/ Credit**	**Cash/ Credit**
Weighted average transaction value (in log)	0.092 **	-0.107 **	0.091 ** [3]
Total annual transactions (in log)	0.068 **		0.047 **
Total annual transactions[1]		0.012	
Annual transactions squared		-0.004	
Total number of terminals[2]	-0.003 **	-0.001	-0.004
Corporate/Franchised 0.	193 *	-0.071	0.190 *
High transaction volume per terminal	-0.173		
Cash payment share	-0.376	0.203	0.031
Credit card payment share	-0.396		
Debit share		-0.092	0.270
Provinces of presence [a]			
British Columbia	0.320 **		0.358 **
Ontario	0.249 **	0.201 *	0.346 ***
New Brunswick	0.527 ***		0.478 **
Newfoundland	-0.487 **		
Nova Scotia		0.315 **	
Observation	462	458	460
Wald chi2(18)	62.230	24.740	56
Prob > chi2	0.000	0.132	0.000
Pseudo R2	0.022	0.009	0.018
Log pseudolikelihood	-1,045.442	-996.291	0.000

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. Sectors of presence were not significant and seem to bring strong collinearity effects. [1]Per 1 million transactions. [2]Per 100 terminals. [3]Per $1,000. [a]Significant at 10% or less.

Table A5.7 **Cash, debit card, and credit card payment preferences**

	Relative cost		
	Cash/ Debit	**Debit/ Credit**	**Cash/ Credit**
Weighted average transaction value (in log)	0.092 **	-0.107 **	0.091 ** [3]
Total annual transactions (in log)	0.068 **		0.047 **
Total annual transactions[1]		0.012	
Annual transactions squared		-0.004	
Total number of terminals[2]	-0.003 **	-0.001	-0.004
Corporate/Franchised 0.	193 *	-0.071	0.190 *
High transaction volume per terminal	-0.173		
Cash payment share	-0.376	0.203	0.031
Credit card payment share	-0.396		
Debit share		-0.092	0.270
Provinces of presence [a]			
British Columbia	0.320 **		0.358 **
Ontario	0.249 **	0.201 *	0.346 ***
New Brunswick	0.527 ***		0.478 **
Newfoundland	-0.487 **		
Nova Scotia		0.315 **	
Observation	462	458	460
Wald chi2(18)	62.230	24.740	56
Prob > chi2	0.000	0.132	0.000
Pseudo R2	0.022	0.009	0.018
Log pseudolikelihood	-1,045.442	-996.291	0.000

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. Sectors of presence were not significant and seem to bring strong collinearity effects. [1]Per 1 million transactions. [2]Per 100 terminals. [3]Per $1,000. [a]Significant at 10% or less.

Table A5.8 **Merchant cash, debit card, and credit card *relative* preferences: merchants' perceptons**

	Relative Preference		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Relative reliability			
Cash/Debit	1.043 ***		
Debit/Credit		0.515 ***	
Cash/Credit			0.527 ***
Relative risk			
Cash/Debit	-0.123 **		
Debit/Credit		0.144	
Cash/Credit			0.007
Relative cost			
Cash/Debit	-0.209 ***		
Debit/Credit		-1.157 ***	
Cash/Credit			-0.386 ***
Cash payment share	1.396 ***	0.536 *	1.153 ***
Credit card payment share	0.170		
Debit share		0.572 *	-0.171
Corporate/Franchised	-0.193 *	-0.085	-0.184 *
Furniture	0.023	-0.063	-0.093
Electronics	0.298	0.030	0.134
Bldg materials	0.464 **	-0.105	0.172
Health care	0.471 ***	-0.452 *	-0.052
Gas station	0.608 ***	-0.261	0.189
Apparel	0.223	-0.577 **	-0.373
Hobby	0.282	-0.091	0.084
General merchandise stores	0.362 *	-0.234	-0.119
Miscellaneous merchants	-0.004	-0.269	-0.307
Bars and restaurants	0.475 **	-0.617 ***	-0.075
Personal services	0.702 ***	-0.568 *	0.020
Provinces of presence[a]			
Alberta		-0.317 **	
Newfoundland	0.532 **		
Territories	-1.141 **		
Quebec		-0.341 ***	-0.306 ***
Observation	434	417	434
Wald chi2(28)	176.940	100.560	100.390
Prob > chi2	0.000	0.000	0.000
Pseudo R2	0.087	0.061	0.056
Log pseudolikelihood	-844.036	-827.367	-1,065.000

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [a]Significant at 10% or less.

Table A5.9 **Merchant cash, debit card, and credit card *relative* preferences: merchants' characteristics**

	Relative preference		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Weighted average transaction value (in log)	-0.082 *		-0.110 **
Weighted average transaction value [1]		-0.015 **	
High transaction volume per terminal	0.270 **	0.039	0.248 *
Total annual transactions	-0.068 **	-0.099 ***	-0.116 ***
Total number of terminals [2]	-0.015 **	0.014 **	-0.004
Corporate/Franchised stores	-0.214 *	0.082	-0.147
Furniture	-0.292	-0.365	-0.472 *
Electronics [1]	0.012	-0.073	-0.123
Bldg materials	0.251	-0.241	-0.130
Health care	0.200	-0.630 ***	-0.350 *
Gas station	0.444 *	-0.417 *	-0.041
Apparel	-0.137	-0.726 ***	-0.628 ***
Hobby	-0.024	-0.322	-0.295
General merchandise stores	0.300	-0.183	-0.062
Miscellaneous merchants	-0.370 *	-0.704 ***	-0.759 ***
Bars and restaurants	0.567 ***	-0.765 ***	-0.106
Personal services	0.495 **	-0.753 **	-0.282
Provinces of presence [a]			
Alberta		-0.335 **	
Newfoundland	0.503 **		
Territories	-1.337 ***		
Quebec		-0.256 *	-0.288 **
Observation	436	419	436
Wald chi2(27)	125.590	71.480	116.990
Prob > chi2	0.000	0.000	0.000
Pseudo R2	0.036	0.032	0.028
Log pseudolikelihood	-896.196	-859.408	-114.500

Notes: Ordered probit regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. Regression with robust standard errors. [1]Per $100. [2]Per 1,000 terminals. [a]Significant at 10% or less.

Table A5.10 **Cash, debit card, and credit card payment shares of total sales value: merchants' perceptions of reliability, risk, and cost**

	Payment share		
	Cash	**Debit card**	**Credit card**
Constant	-1.287 ***	-1.629 ***	-2.102 ***
Relative reliability	0.561	1.003 *	0.785
Relative risk	-0.133	0.187	0.106
Relative cost	0.267	0.094	0.036
Corporate/Franchised	0.048	0.018	-0.028
Furniture -1.489	***	-0.374 **	0.871 ***
Electronics -0.824	***	-0.135	0.355 **
Bldg materials	-0.733 ***	-0.240	0.356 **
Health care	-0.367 ***	-0.046	0.310 **
Gas station	-0.191	0.012	0.608 ***
Apparel -0.973	***	0.086	1.010 ***
Hobby -0.633	***	0.083	0.773 ***
General merchandise stores	-0.153	0.017	-0.068
Miscellaneous merchants	-0.674 ***	0.081	0.752 ***
Bars and restaurants	-0.005	-0.319 ***	0.381 **
Personal services	-0.095	0.241 *	0.099
Accept cash only	0.783 ***		
Accept cash and debit	0.537 ***		
Accept cash and credit	-0.379		
Provinces of presence[a]			
Alberta	-0.336 ***		0.218 **
Ontario		-0.130 *	
Quebec		-0.190 **	
Nova Scotia	0.346 ***		
PEI	0.650 ***		-0.483 ***
Territories	-1.158 ***	0.802 *	
Observations	414	358	417
F(p,q)	11.250	1.790	5.860
Prob > F	0.000	0.011	0.000
R-squared	0.374	0.113	0.214
Root MSE	0.745	0.595	0.715

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [a]Significant at 10% or less.

Table A5.11 **Cash, debit card, and credit card payment shares of total sales value: merchants' characteristics and perceptions**

	Payment share		
	Cash	**Debit card**	**Credit card**
Constant -0.553	**	-0.944 ***	-2.750 ***
Unweighted avg transaction value (ln)	-0.179 ***	-0.131 ***	0.154 ***
Transactions per terminal[1]	0.141 ***		
5–9 employees	-0.190	-0.147	0.004
10–19 employees	-0.187 *	-0.042	-0.032
20–49 employees	-0.238 *	-0.032	0.014
50–99 employees	-0.285 ***	-0.077	0.147
100+ employees	-0.303 *	-0.092	0.216
Relative reliability	0.561	0.683	0.479
Relative risk	-0.132	0.492	0.252
Relative cost	0.424	0.225	-0.069
Corporate/Franchised	0.100	0.042	-0.026
Only accepts cash	0.707 ***		
Accepts only cash or debit	0.497 ***		
Accepts only cash and credit	-0.360		
Furniture -1.069	***	-0.225	0.679 ***
Electronics -0.600	***	-0.058	0.284
Bldg materials	-0.470 **	-0.238	0.330 *
Health care	-0.392 ***	-0.199	0.489 ***
Gas station	-0.242 *	-0.125	0.808 ***
Apparel -0.782	***	0.109	1.019 ***
Hobby -0.568	***	-0.007	0.850 ***
General merchandise stores	-0.151	-0.161	0.043
Miscellaneous merchants	-0.745 ***	-0.093	0.928 ***
Bars and restaurants	0.028	-0.515 ***	0.506 ***
Personal services	-0.192	-0.025	0.326
Provinces of presence[a]			
Alberta	-0.271 **		0.183 *
British Columbia		-0.173 *	
New Brunswick			-0.432 **
Ontario		-0.145 *	
Quebec		-0.190 **	
Nova Scotia	0.253 **		
PEI	0.474 ***		-0.387 *
Territories	-1.113 ***	0.925 **	
Observations	414	342	396
F(p,q)	11.170	2.150	6.390
Prob > F	0.000	0.001	0.000
R-squared	0.423	0.177	0.285
Root MSE	0.722	0.576	0.680

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively.
[1]Per 1 million transactions. [a]Significant at 10% or less. Number of employees, instead of total transaction volumes, is used in these models, to avoid endogeneity due to the fact that market shares are a function of total transaction volumes. Also, unweighted ATV is used, since the payment share weights are the dependent variables in these models.

Table A5.12 ***Relative* payment shares: merchants' characteristics**

	Relative share		
	Cash/Debit	**Debit/Credit**	**Cash/Credit**
Constant	-0.243	1.369 ***	2.003
Unweighted avg transaction value (ln)	-0.102 **	-0.274 ***	-0.360 ***
Total number of terminals[1]		-0.002 **	0.000
5-9 employees		-0.193	-0.078
10-19 employees		-0.087	-0.043
20-49 employees		-0.172	-0.226
50-99 employees		-0.405 *	-0.518 **
100+ employees		-0.628 **	-0.623 **
Total annual sales[2]	0.090 ***		
Relative ease and dependability	0.223 *	0.088	0.126
Relative risk	-0.036	0.141	-0.005
Relative cost	-0.084	0.002	0.085
Corporated/franchised	-0.102	0.108	0.176
gas+bar & rest.+general+food (dummy)	0.622 ***		
Furniture		-0.652 **	-1.741 ***
Electronics		-0.197	-0.796 **
Bldg materials		-0.107	-0.535
Health care		-0.291	-0.825 ***
Gas station		-0.533 **	-1.038 ***
Apparel		-0.499 **	-1.745 ***
Hobby		-0.341	-1.344 ***
General merchandise stores		0.404	-0.109
Miscellaneous merchants		-0.655 ***	-1.601 ***
Bars and restaurants		-0.707 ***	-0.396
Personal services		-0.168	-0.524
Provinces of presences [a]			
Alberta	-0.2714 *		-0.525 ***
British Columbia		-0.313 *	
Nova Scotia	0.42555 ***		
Ontario	0.32221 ***		
Saskatchewan	0.35858 *		
Territories	-1.9581 **		-1.512 **
New Brunswick			0.828 ***
Prince Edward Island			0.658 **
Observations	366	303	303
F(17, 347)	4.700	4.150	4.150
Prob > F	0.000	0.000	0.000
R-squared	0.215	0.281	0.281
Root MSE	0.925	0.854	0.854

Notes: ***, **, * statistically significant at 1%, 5%, and 10% level, respectively.[1] Per 100 terminals. [2] Per $100 million annual sales.

Table A5.13 **Debit and credit card per-transaction fees**

	Fees					
	Debit card			Credit card		
Constant -1.	687		***	-3.664		***
Transaction volume (ln)	-0.055		*	-0.028		***
Average transaction value	0.032	[1]	***	-0.024	[2]	***
Observations	253			312		
Pseudo R2	0.015			0.033		

Notes: Median regression. ***, **, * statistically significant at 1%, 5%, and 10% level, respectively. [1] Per $100. [2] Measured in logarithms.

Chapter 6

An empirical analysis of payment behaviour and debit card surcharges in the Netherlands

Wilko Bolt – Nicole Jonker – Corry van Renselaar

6 An empirical analysis of payment behaviour and debit card surcharges in the Netherlands

Abstract

In contrast to many countries, in the Netherlands retailers are allowed to surcharge consumers for their debit card use. This allows an empirical analysis of the impact of card surcharges on the demand for debit card services, and the effect of removing the 'no-surcharge rule' on card acceptance by retailers and on consumer payment choice. Based on consumer and retailer survey data, our analysis shows that surcharging steers consumers away from debit cards and towards cash. Half of the observed difference in debit card payment shares across retailers can be explained by this surcharge effect. Initial calculations suggest that removing the surcharge on debit card payments in the Netherlands could generate considerable social cost savings of more than EUR 100 million in the long run.

6.1 Introduction

The retail cards payments industry is subject to increasing attention by economists and policymakers. This has led to a surge in the theoretical and empirical literature on the economics of payments. At the centre of this literature is a debate about the pricing of payments based on credit and debit cards. Merchant dissatisfaction with interchange fees and merchant service charges for card payments have triggered antitrust scrutiny and have led to regulatory actions by public authorities eg in Australia and Europe.[1]

According to economic theory, a card network sets optimal prices for consumers and merchants so as to keep both sides on board while making profits overall. However, in a four-party network, achievement of an optimal price structure for consumers and

[1] Interchange fees are fees that banks charge each other for executing card payments. In practice, the level of interchange fee largely determines the level of the merchant's service charge. For a summary of antitrust challenges in various jurisdictions, see Bradford and Hayashi (2008).

merchants may require setting an interchange fee to reallocate the costs of payment transactions between consumer's bank and merchant's bank. By doing so, the card network influences the prices of payment transactions for end-users, which in turn affects consumers' payment behaviour and merchants' decisions on acceptance of payment instruments. Moreover, the costs of card payments are hidden from most consumers because card schemes often do not allow merchants to pass on these charges to consumers by directly surcharging card payments in a transparent way. These contractual agreements between card schemes and merchants are commonly known as the 'no surcharge rule'. This rule has come under pressure by antitrust and competition authorities. Indeed, the Reserve Bank of Australia eliminated the no-surcharge rule in 2003 and, more recently, the European Commission announced that it will explicitly allow the use of surcharges in its so-called Payment Services Directive, which provides the legal foundation for creating a Europe-wide single market for payments.[2]

In the Netherlands, cash and debit card are the most intensively used payment instruments at the point of sale. In contrast to many countries, Dutch retailers are allowed to surcharge consumers for card payments. A large minority of retailers – mostly small shop owners – makes use of this differential pricing mechanism and surcharges consumers for debit card payments.[3] Hence, the Dutch retail payments market enables a useful 'economic experiment' to assess the possible impact of removing the no-surcharge rule on acceptance and surcharge behaviour of retailers and on consumer payment choice. Our paper tries to examine the effects of surcharging card payments and whether surcharging leads to possible under- or overprovision of card services, as well as assessing the impact of surcharging on total costs of point-of-sale (POS) payment system. We also pay attention to what types of retailers choose to surcharge for card payments and what types of consumers react to debit card charges. We use two unique sets of data, especially designed to gain insight into the extent to which Dutch retailers surcharge their customers and its impact on payment behaviour. The first set is from a DNB Household survey

[2] The provisions of the Payment Services Directive will need to be implemented by all Member States by the 1st of November 2009.

[3] Nowadays, surcharging debit card payments is not as self-evident as it used to be, since cash payments are often more costly to businesses than debit card payments (Brits and Winder, 2005). Hence surcharging for cash usage or giving discounts for using debit cards may provide incentive for consumers to enhance cost efficiency of the POS payment system rather than surcharging for debit card payments.

conducted in the autumn of 2006 and covering some 2000 households. The second set is from a NIPO survey done in the same period, covering 1000 Dutch retailers. In this way we are able to confront both sides of the market and identify possible correlations and feedback mechanisms.

This paper is structured as follows. Section 6.2 provides an overview of the theoretical and empirical literature on payment pricing and surcharging card payments. Section 6.3 describes the characteristics of the Dutch POS payment system, its cost structure and the tariffs structure that Dutch banks employ to charge consumers, merchants and business clients for payment transactions. Section 6.4 discusses the set-up of the surveys and the data. Section 6.5 provides some descriptive statistics on consumers' payment behaviour and on retailers' acceptance of payment instruments and surcharging. Attention is also paid to how retailers surcharge and how consumers react to such charges. Section 6.6 compares the payment behaviour of consumers in stores with and without surcharges and provides estimation results on the impact of surcharging on debit card usage. It also discusses what types of consumers react to price signals and surcharges. In addition, an illustration is given of potential cost saving from increased substitution of debit card for cash when retailers remove the debit card surcharge. Section 6.7 summarizes and concludes.

6.2 Payment pricing and the no-surcharge rule

6.2.1 An overview of the theory

Pricing payment instruments is a complex matter because payment networks give rise to large economies of scale and various types of externalities. These factors have led to significant concentration in the retail payment industry. At the core of the industrial organization literature on payment markets is a debate about what economic principles should guide payment pricing, in particular the pricing of card payments. The observation that the payment industry is a two-sided market underlines the fact that in setting payment prices banks need to get both consumers and retailers on board by effective pricing

on both sides of the market.[4] Hence, under two-sidedness, payment providers need not only choose a total price for their payment services, but also an optimal price structure vis-à-vis consumers and retailers. The merchant's ability (or lack thereof) to surcharge card payments affects the price structure and hence the total demand for card payment services.

While there seems to be widespread agreement that electronic payment instruments induce greater efficiency, card-based payments in particular have often remained more expensive for merchants than the paper-based equivalents or cash. The price of cash and card payments is effectively hidden from consumers. Often, banks charge cardholders only fixed periodical fees but no transaction fees, while merchants cannot – or do not – price-differentiate between cash and card payments. It may be the case that merchants would like to surcharge card payment instruments but that contractual agreements between card providers and merchants prohibit them from charging extra for card payments. These contractual agreements are dubbed the 'no-surcharge rule'. Instead, the cost of card payments is reflected in the merchant's service charge (or discount), ie the transaction fee that the merchant pays to the acquiring bank (in a four-party scheme) or card company (in a three-party scheme). It is often argued that lifting the no-surcharge rule – so that merchants can charge differential prices for card and cash payments – is an alternative mechanism for internalizing (participation) externalities between merchants and cardholders in a two-sided market, just as the interchange fee is a mechanism for guaranteeing the participation of all parties to the card payment system.

Rochet and Tirole (2002, 2003) have shown that the price structure (and therefore also the interchange fee) becomes irrelevant if merchants charge different prices for cash and card payments. In a fully-fledged model of an imperfectly competitive payment card industry, taking account of two-sidedness, they compare privately optimal and socially optimal payment prices (and corresponding interchange fees). With respect to Baxter's (1983) initial analysis, two important features of the payment market are added: imperfect competition between issuers and strategic behaviour of sellers.[5] For

[4] See Kahn and Roberds (2009) for a broader discussion on payment economics. The reader is referred to seminal papers by Rochet and Tirole (2002, 2003 and 2006) and Armstrong (2006) for a general introduction to the theory of two-sided markets. See Chakravorti (2003) for a theoretic survey on credit card networks.

[5] Baxter (1983) was the first to recognize that inefficient card use can be corrected by imposing an appropriate interchange fee.

tractability, they assume perfect competition among acquirers, homogeneity of merchants, and an exogenous total payment volume. Under a no-surcharge rule and merchant homogeneity, the model is solved by observing that the merchant service discount is as high as possible, consistent with all merchants (just) accepting. This mechanism, in which merchants are kept indifferent between accepting cards versus refusing and accepting cash instead, determines the profit maximizing interchange fee. In this way, since the issuer's profits are increasing in the interchange fee, the cardholder fee is kept as low as possible, boosting demand for card services. The socially optimal cardholder fee (and interchange fee) follows from equating the fee to the social value of the payment externality imposed by the cardholder on the rest of the economy, ie on the issuers, acquirers, and merchants. This externality can be internalized when merchants are able to fully pass on their payment costs to cardholders through higher retail prices. In general, the socially optimal cardholder fee is higher than the profit-maximizing fee as long as accepting cards provides a competitive edge for merchants over their competitors who only accept cash. Hence, there is generally excessive use of card services. The resulting heavily skewed pricing structure is a general finding in two-sided markets.[6]

When the no-surcharge rule is lifted and sellers can costlessly surcharge, they never benefit from refusing card payments. At the optimum, the merchant charges an additional amount equal to its merchant service discount minus the (incremental) convenience benefit. This extra amount is effectively added to the cardholder fee, and therefore the total price of card services is entirely borne by the consumer.[7] With perfect surcharging (and no transaction costs), total card payment volume depends solely on total prices and not on price structure. Similarly, the issuers' net margin depends solely on total price and total cost, so that the level of the interchange fee ceases to play a role.[8] Moreover, because of imperfect competition, issuers have positive margins, implying underprovision of card services.

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[6] Bolt and Tieman (2008) offer an explanation for extremely skewed pricing in two-sided markets based on the fact that some demand functions that are well-behaved in an ordinary one-sided context yield non-concave profit functions in some two-sided models, thus making corner solutions (eg zero prices) optimal.

[7] See Bolt and Chakravorti (2008) for an analysis that allows for instrument-contingent pricing but where merchants' pass-through need not be complete, affecting card acceptance decisions by merchants and payment fees set by banks.

[8] Gans and King (2003) have established that this neutrality of interchange fees is a general property when costless surcharging is feasible.

Rochet and Tirole (2003) conclude that under costless surcharging, lifting the no-surcharge rule may or may not increase welfare, depending on issuers' market power and merchants' resistance to accepting cards. In particular, when issuers have much market power, banning the no-surcharge rule is likely to be welfare decreasing, due to increased under-usage of card services. On the other hand, when sellers' resistance is strong, so that interchange fees cannot be set too high, banning the no-surcharge rule is likely to be welfare improving, because it can be a countervailing force to the initial overprovision. Wright (2003) extends the analysis of Rochet and Tirole (2002) by looking at alternative specifications of sellers' competitive behaviour. He concludes that if sellers are monopolistic, the no-surcharge rule partially corrects the underprovision which occurs under perfect surcharging. When monopolistic merchants are allowed to surcharge, they extract 'too much' surplus ex post from card customers with higher prices for card purchases, resulting in less welfare than when merchants set a single price. If sellers are perfect competitors, the no-surcharge rule has no impact on card payment volumes or social welfare.

Another approach, by Bolt and Chakravorti (2008), does not assume exogenous (ad hoc) convenience benefits from using a payment card. The premises of their model are 'security' (or any opportunity cost attached to carrying or using cash) and 'income uncertainty' that drives consumers and merchants towards the use and acceptance of cards rather than cash. Given security and income uncertainty, induced merchant acceptance of cards and (fixed) cardholder fees determine whether a consumer will carry a payment card in his wallet. In turn, merchant acceptance is determined by merchants' cost structures, the ability to pass on costs, and the level of merchant discounts. Ultimately, in solving the model, both consumer usage and merchants' acceptance decisions are functions solely of the bank-set merchant fee. Their model predicts that imposing the no-surcharge rule increases bank profits, when merchants are not able to fully pass on payment cost to the consumer.

6.2.2 An empirical overview

There is limited empirical literature on the influence of payment pricing, and surcharging in particular, on the use of payment instruments. In the area of retail payment systems, most studies have focused on the consumer's choice of payment method, with particular emphasis on the shift from paper to electronic payment methods. Due

to a lack of transaction data, most studies on retail payments have tried to infer consumer payment behaviour from household surveys. Studies employing such surveys (Boeschoten and Fase 1989 Boeschoten, 1992, Kennickell and Kwast 1997, Stavins 2001, Hyytinen and Takalo 2004, Loix, Pepermans and Van Hove 2005, Bounie and François 2006, Klee 2006a, Mester 2006, GfK/Currence 2007, Jonker 2007) have established that demographic factors such as age, income, and education strongly influence consumers' payment choices, and have documented the shift towards electronic means of payment in recent years. Zinman (2009) uses data from the Federal Reserve Board's Survey of Consumer Finances to infer that debit card use is more common among consumers who are likely to be credit-constrained.

Another approach in the literature has been to infer consumer choice from aggregate data on payment systems and data from industry sources. Among the papers in this literature are Humphrey, Pulley and Vessala (2000), Humphrey (2004), Garcia-Swartz, Hahn and Layne-Farrar (2006a, b), Jonker and Kettenis (2007) and Bolt, Humphrey and Uittenbogaard (2008). In particular, Bolt et al (2008) use the experience of Norway (which directly prices its payment services to consumers) and the Netherlands (which did not) over the period 1990–2004 to try to determine the incremental effect of transaction pricing on the adoption of card payments and electronic bill payments versus ATM withdrawals and paper-based giros. Overall, they find that payment pricing induces consumers to shift more rapidly to more efficient payment instruments. However, non-price attributes and terminal availability may play an even bigger role than payment pricing for point-of-sale payments.

While these analyses have been informative, their lack of transaction-specific data has limited the researchers' ability to model the microeconomic behaviour of consumers. This shortcoming has been partially addressed in some recent studies that make use of surveys more specifically targeted at consumers' and merchants' perceptions and acceptance of various modes of payment. Hayashi and Klee (2003) use data from a survey by the American Bankers Association to link consumers' use of electronic means of payment with their use of other information technologies. Loix et al (2005) get similar results using data from a Belgian survey. Jonker (2007) analyses data from a survey done in the Netherlands, indicating that consumers appreciate the safety, convenience and transaction speed of the debit card whereas they regard cash as a cheap payment instrument. They find the debit card relatively expensive compared to cash because some merchants surcharge debit card payments. Results

from a survey specifically on the effects of banning the no-surcharging rule in Sweden by IMA Market Development (2000), commissioned by the European Commission, indicate that lifting the no-surcharge rule has had only a marginal effect on merchant acceptance of credit cards. It is likely that the vast majority of merchants connected to Visa and MasterCard would have joined the card payment systems, even if the no-surcharge rule had not been lifted.

Recent papers by Borzekowski and Kiser (2008) and Borzekowski, Kiser and Ahmed (2008) combine the two major approaches in the empirical literature. They are able to estimate demand functions for various methods of payment using data from the Michigan Survey (demographic data plus consumer attitudes to different payment types) and data on the 'average' characteristics of certain payment types (electronic versus paper, time of use, bank fees, etc). Borzekowski et al (2008) examine the consumers' reactions to bank-imposed transaction fees for PIN debit card payments. The banks' motivation for such charges is that they want to encourage consumers to use signature-based debit instead of PIN debit because of the higher interchange fees for signature debit payments. About 15 per cent of US banks charge for PIN debit card transactions. The average fee is 75 cents (US) or 1.8 per cent of the transaction amount. It turns out that bank-imposed PIN debit card charges have led to a 12% reduction in debit card usage. They also find that the frequency of use is not affected by either the imposition of transaction fees or the level of such fees. They expect that, if merchants would surcharge, the magnitude of the effect on debit card usage would be even stronger, since consumers are directly confronted with additional costs when they make purchases rather than being charged later.

Only a few empirical studies of retail payments have been able to use transaction data, some notable examples being Klee (2004, 2006b), Fusaro (2006), and Rysman (2006). Using data provided by a grocery retailer, Klee finds that a major determinant of consumers' payment choice is simply transaction size, with cash being highly favoured for small-value transactions involving just a few items. Analysis of the same dataset indicates a marked transaction-time advantage for debit cards over cheques, helping to explain the recent popularity of the former. Fusaro (2006) applies a sample of bank accounts to examine behavioural explanations for consumers' preference for debit over credit card transactions. Rysman (2006) uses data collected by Visa and finds that, while consumers may hold multiple payment cards, they in fact tend to concentrate card payments on a single card network.

6.3 Point-of-sale payment system in the Netherlands

6.3.1 Payment configuration in the Netherlands

Dutch consumers mainly use cash and debit cards for POS payments. Over the last two decades, the Netherlands has seen a rapid shift from cash and paper-based payment instruments to electronic payment instruments. The driving force behind this 'electronic revolution' is the debit card. The bulk of point-of-sale retail transactions is still effected in cash, with more than 5 billion cash payments (EIM, 2007) against 1.6 billion debit card payments in 2007 (Currence, 2008). The Dutch e-purse (Chipknip) and the credit card follow at a distance with 175 million and 30 million transactions in 2007, respectively. However, looking at the value shares of payment instruments in total POS sales, it turns out that the debit card has surpassed cash from 2004 onwards (see figure 6.1).[9] A debit card is linked to its owner's current account, usually with a credit line.

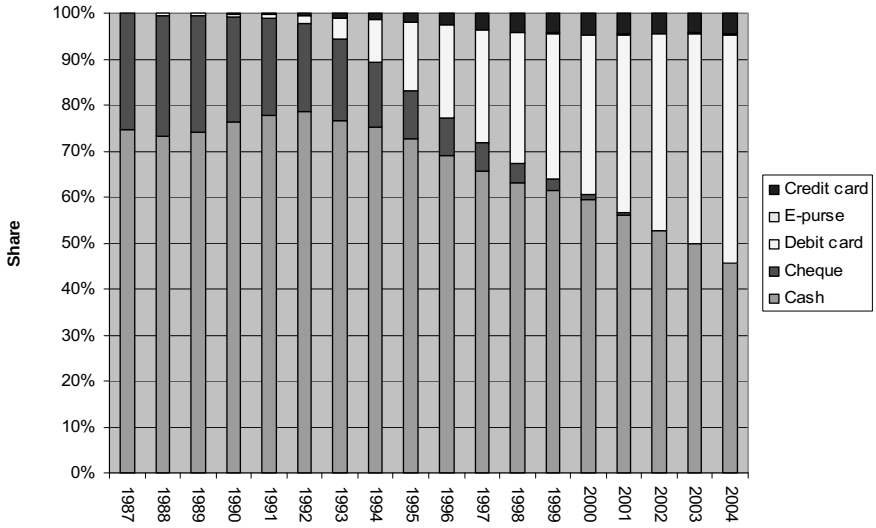
Table 6.1 **Shares of cash and debit card by transaction size, 2006**

Transaction size	Cash	Debit card	Other
< EUR 5	84%	5%	11%
EUR 5–10	82%	16%	1%
EUR 10–15	69%	29%	2%
EUR 15–20	54%	44%	2%
EUR 20–60	36%	62%	4%
> EUR 60	20%	75%	5%

Source: GfK/Currence (2007).

[9] The value of cash transactions has been approximated by subtracting the value of card payments from total sales at POS locations.

Figure 6.1 **Shares of POS payment instruments by value** (in percentages of total value of POS payments)



Source: Jonker and Kettenis (2007)

The Dutch often use cash for small purchases whereas they pay with debit cards when the transaction amount is relatively high, eg at gas stations, clothing stores, home improvement stores and supermarkets (see table 6.1). There are several reasons for this. First, in the past public campaigns promoted the usage of debit cards for larger transaction sizes. Second, in some branches retailers accept only cash payments; and finally, surcharging on debit card payments when transaction sizes are small (below EUR 10–15) is quite common (see also section 6.4).

6.3.2 Debit card payments in the Netherlands

The Netherlands has a national debit system (PIN) that was developed by the Dutch banks in the late 1980s. Consumers use debit cards to withdraw cash form ATMs and to effect debit card payments at point-of-sale. Dutch banks have co-branded their debit cards with Mastercard's international debit card scheme Maestro, to facilitate cross-border usage. Some banks also issue PIN-only debit cards, which can be used only in the Netherlands.

Interpay, the Dutch Automated Clearing House (ACH) was owned by the Dutch banks. Interpay was responsible for acquiring and processing payment transactions and for scheme management. In the past few years the banks have reorganized Interpay. In 2004 the banks took over the acquiring activities, and Interpay has increasingly focused on processing payments. As part of the restructuring, a new organization, Currence, has been set up. Currence is the scheme owner of Dutch electronic payment instruments such as the debit system PIN. In 2006 the Dutch Interpay and German ACH Transaktioninstitut für Zahlungs-verkehrsdienstleistungen merged, resulting in the establishment of Equens, a pan European payment processor.

At end-2006, several Dutch banks made bilateral agreements on interchange fees for debit card payments. Earlier on, Dutch banks attempted to arrange a multilateral interchange fee for debit card payments within the Netherlands but withdrew their request following an informal decision by the Netherlands Competition Authority (NMa). The NMa finds that when there is just a small number of issuers, as in the Netherlands, it is perfectly feasible for banks to reach bilateral agreements on compensation for processing and authorisation costs.

6.3.3 Cost and price structure of Dutch POS payment services

Costs and benefits

The total costs of payment systems and services to society are considerable, and there is much to be gained by designing them efficiently. Brits and Winder (2005) provide an overview of the (social) costs of retail payments in which they include costs of the banking industry, retail sector and central bank. They estimated the cost in 2002 of all POS payments (cash, debit cards, credit cards and stored value cards) at EUR 2.9 billion or 0.65% of Dutch GDP.[10] The costs of retail payments varied in transaction amount and payment instrument. Focusing on the most used payment instruments, cash and

[10] Brits and Winder (2005) focused on total costs of POS payment instruments for banks, the Nederlandsche Bank, merchants, the Dutch payment processor Interpay, and credit card companies. Their study does not include costs incurred by consumers nor any non-monetary benefits of payment instruments. That way they cover a large part of the social costs of the POS system, but not all costs. But herein after, we follow their approach for measuring social costs.

debit card, paying in cash was socially preferable when the transaction amount was lower than EUR 11.63, otherwise paying by debit card was more efficient. This information is essential in assessing the optimality of payment card usage regarding under- or overprovision of card services.

The cost data included expenditures for producing payment instruments, for construction and maintenance of payment infrastructure, and for processing payments. Brits and Winder drew a distinction between fixed and variable costs per additional transaction and per extra euro sales.[11] By doing so, they were able to construct payment instrument-specific cost functions (see figure 6.2), showing the cost of making an additional payment with a particular payment instrument.[12] The variable costs depend on the costs involved in one extra payment transaction (intersection of cost function with y-axis), such as data-communication costs for the authorization of a card payment, and on the costs related to transaction size (slope of the cost function), as for counting banknotes and coins and safety-related expenditures. The cost functions were used to determine which payment instrument is most cost-efficient for which transaction size. A debit card payment turned out to cost about EUR 0.19 and was cheaper than paying in cash if the amount paid was EUR 11.63 or more.[13]

Given recent, rapid technological developments, especially in telecommunications and IT, the costs of making electronic payments have declined considerably since 2002. Therefore, we calculated new cost functions for cash and debit card using new data for 2005 on costs to banks from the McKinsey study (2006) and cost data for 2006 for the retail and catering industry from a study by EIM (2007). They are used in section 6 for assessing the impact of prohibiting debit card

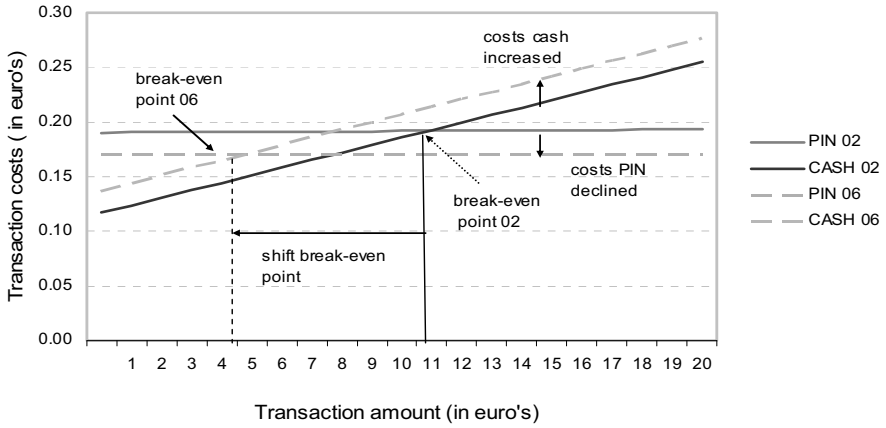
[11] Fixed costs are not affected by a specific transaction or the related sales amount and may relate to investments in payment infrastructure.

[12] Note that the cost structures and relative costs of using the two payments instruments are probably not the same for all parties in the payment chain, and can even differ between businesses within the same part of the chain (eg merchants). As the breakeven point between cash and debit card can differ across parties in the payment chain, these parties may favour different payment instruments and encourage their customers to pay in accordance with their own preferences.

[13] Similarly, a breakeven point for the retail sector in isolation can be calculated. In this case, it is not the underlying bank resource costs, but rather the bank fees and tariffs for cash and debit card services that retailers pay which matter for the calculation. However, poor data availability prevents us from analysing the situation.

surcharging by merchants on the costs in three scenarios.[14] It turns out that the costs of debit card payments have declined during the past few years whereas the costs of cash have increased, shifting the breakeven point of debit card payments versus cash payments to the left. The transaction size beyond which debit card payments are less costly than cash payments has declined by more than 50% in five years. Changes in costs have a large impact on the breakeven point because of the modest slope of the cash cost function. This makes the breakeven point highly sensitive to small changes in costs for either cash or debit card, as can be seen from figure 6.2.

Figure 6.2 **Impact of change in variable costs on breakeven point of cash vs debit card, 2002 and 2006**



Tariff structure POS payments

Consumers and retailers face different tariff structures for payment instruments (see Bolt 2006). Tariffs for retailers are directly linked to the use of payment instruments through a differentiated system of payment packages, explicit fees and charges depending on the number of payment transactions. Generally, bank fees for electronic payments do not depend on transaction value, whereas tariffs associated with cash payments do depend on the value. With respect to PIN debit card

[14] In this study we followed the approach of Brits and Winder (2005) in updating the 2002 cost figures. We used these updated cost data for the scenario-analyses of subsection 6.4. That way we could assess the costs savings for businesses in the payment chain.

payments, acquiring banks impose a transaction fee on retailers of about 4–5 euro cents for each incoming debit card payment, although (very) large retailers usually pay less (see NMa, 2005). Retailers also pay fixed, periodic 'membership' fees for terminal rental and have telecommunication expenses.[15] Dutch consumers are rarely confronted with the costs of their payment behaviour at the counter. For them, the use of payment instruments seems to be 'free'. Banks usually charge them a fixed, periodical fee for the use of a bank account and payment cards. This total fee amounts on average to EUR 35 a year (Capgemini/ING/EFMA, 2005). However, consumers do pay for payment instrument usage indirectly and via (hidden) direct costs, such as not receiving interest on current account balances or value dating.

Dutch retailers recover their payment costs indirectly, by raising consumer prices, or sometimes directly, by charging consumers a "threshold" transaction fee. By law, Dutch retailers are free to decide on: 1) a surcharge; 2) the payment instruments for which they will surcharge; 3) the transaction size, and 4) the level of the surcharge. In practice, retailers who apply surcharges on debit card payments restrict them to values below a certain threshold, on average EUR 10 (see section 6.5 for its incidence).[16] The surcharge itself is fixed and does not depend on transaction size.

6.4 Survey data description

6.4.1 Consumer survey on debit card surcharges

The consumer survey on surcharging debit card payments is part of the DNB Household survey (DHS). The survey was distributed to panel members aged 16 and older for completion on the weekend of 13 October 2006. Of the 2563 panel members qualifying for participation, 1,863 answered the questionnaire in full. The questionnaire included questions related to the payment instrument

[15] Traditionally, because of political and competitive pressures, bank fees for cash handling services and cash deposits charged to retailers have been fairly small.

[16] While retailers are also free to surcharge on credit card payments, only 10 per cent of credit-card-accepting-merchants apply such a surcharge, either as a fixed fee or a proportional fee. Extremely low credit card usage in the Netherlands and specific merchant types accepting credit cards (mainly retailers with high profit margins) may have contributed to this oberved retailer behaviour.

choice of consumers, the impact of surcharging on it, and the respondent's opinion of surcharging.

The DNB Household Survey (formerly known as the CentER Savings Survey) is a panel survey dating from 1993. The panel consists of some 2,000 Dutch households, from which several members may participate. Data are collected via Internet surveys, which may introduce some positive selection bias towards electronic payment instruments in our results. However, we think the results give a clear and fairly accurate indication of the opinion of Dutch consumers on surcharging payments and the effects on their payment behaviour. We feel that the pro-electronic bias in this study is rather small, for two reasons. First, new panel members need not have access to the Internet to enroll in the panel: the selection of new panel members is done by phone. This selection procedure enhances the representativeness of the panel. Second, the usage of Internet is nowadays widespread among the Dutch; more than 80% have access at home.

The sample represents the Dutch population fairly well, although there are slight differences. There are 1,863 respondents, of whom 52% are male and 48% female. Most respondents use both cash and debit card to make POS payments. About 8% use only cash. The average age of the respondents is 49 years, which is somewhat higher than the (conditional) average age of the Dutch population of over-15-year-olds. Almost 80% of the respondents have a partner (married or living together), compared to 60% for the Dutch population. The educational level of the respondents seems to be slightly higher than for the population as a whole.

6.4.2 Retailer survey on debit card surcharge

The retailer survey on surcharging, covering 1000 Dutch retailers, was conducted in September 2006 by a private company, TNS Nipo, based on a questionnaire prepared by DNB. The survey included questions on payment instrument acceptance, payment behaviour of customers, surcharging, reasons for surcharging or not, impact of surcharging on payment behaviour, etc. There were also questions about firm characteristics. Interviewing was done by phone and respondents were mainly store managers. The sample, drawn from the registers of the Dutch Chambre of Commerce, was stratified into eleven retail sectors and six company sizes (measured by number of employees), in order to ensure sufficient variation. Table 6.2 shows the unweighed number of retailers by branch (panel A) and size (panel B) in the sample. In

the remainder of this study, the figures cited are weighted so as to represent the Dutch population of retailers.

Table 6.2 **Retailers by branch and firm size (unweighed data)**

A) Branch	Freq	%	B) Firm size (employees)	Freq	%
Food	118	12	1	92	19
Garden centre, florist, etc	108	11	2–4	278	28
Clothing, shoes	90	9	5–9	210	21
Home improvement stores	100	10	10–19	160	16
Hotel/restaurants	104	10	20–49	108	11
Department stores, furniture	111	11	≥50	53	5
Media (books, DVDs, Cds)	69	7			
Drugstores, perfumery	85	8			
Other retail stores	109	11			
Gas stations/travel agencies	41	4			
Other services	66	7			
Total	1,001	100	Total	1,001	100

6.5 Results on the incidence of debit card surcharge

6.5.1 Acceptance of payment instruments and debit card surcharge

Almost every retailer accepts payments in cash (see table 6.3). Acceptance is not 100% in branches where transaction size tends to be large, as in the hotel & catering industry, or where cash is declined for security reasons (eg at unmanned gas stations). Two-thirds of the retailers accept debit card payments and less than three of ten accept credit cards. Card acceptance varies by industry. It is relatively common in industries where transaction size tends to be large. For instance, debit card acceptance is around 90% in clothes & shoe shops, drugstores & perfumeries, and florists & garden centres, whereas it is relatively low in the catering industry, specialised food stores and other service-providers. Card acceptance is determined not just by the segment of industry but also by company size: consumers can pay by debit card at only 40% of one-man businesses, whereas nearly all businesses with fifty or more employees accept debit cards.

With respect to surcharging on debit card payments, one of five debit-card-accepting retailers surcharges customers for paying with debit card below a certain threshold amount. Three branches stand out: food, media and gas stations/travel agencies. Here, almost one of two debit-card-accepting stores surcharge. At first sight, the high surcharge rate for gas stations seems counterintuitive since transaction size is usually large. However, many people pay separately for fuel, especially if they have a company or lease car, and small purchases (coffee, food, newspaper, etc). Again we see a strong company size effect: retailers with less than ten employees surcharge about ten times as often as those with fifty or more employees.

Table 6.3 **Acceptance of payment instruments and debit card surcharge**
(weighed data, in percentages)

Branch	Cash	Debit card	Credit card	Surcharging[a]
Food	100	65	8	48
Garden centre, florists, etc	100	87	19	35
Clothing, shoes	100	88	54	19
Home improvement stores	100	76	16	29
Hotel & catering	98	41	27	15
Department stores, furniture	99	78	27	14
Media (books, DVDs, Cds)	100	82	32	47
Drugstores, perfumeries	100	87	16	29
Other stores & market	100	88	47	13
Gas stations/travel agencies	96	84	77	48
Other services	95	54	2	6
Company size				
1 employees	96	41	13	28
2–4	100	76	29	22
5–9	100	89	48	20
10–19	100	93	48	11
19–50	99	98	54	11
>50	100	92	67	2
Total	98	67	28	22

[a]percentages refer to the group of debit-card-accepting retailers

6.5.2 First explorations of the impact of surcharging on payment efficiency

Recent cost data suggest, as mentioned above, that the breakeven point fell by more than 50% in 2002–2006. However, cash is still the dominant payment instrument for transaction size below EUR 20 (see table 6.1 in section 6.3). This suggests that from a cost perspective the debit card is underused. The question is whether surcharging has contributed to this under-usage.

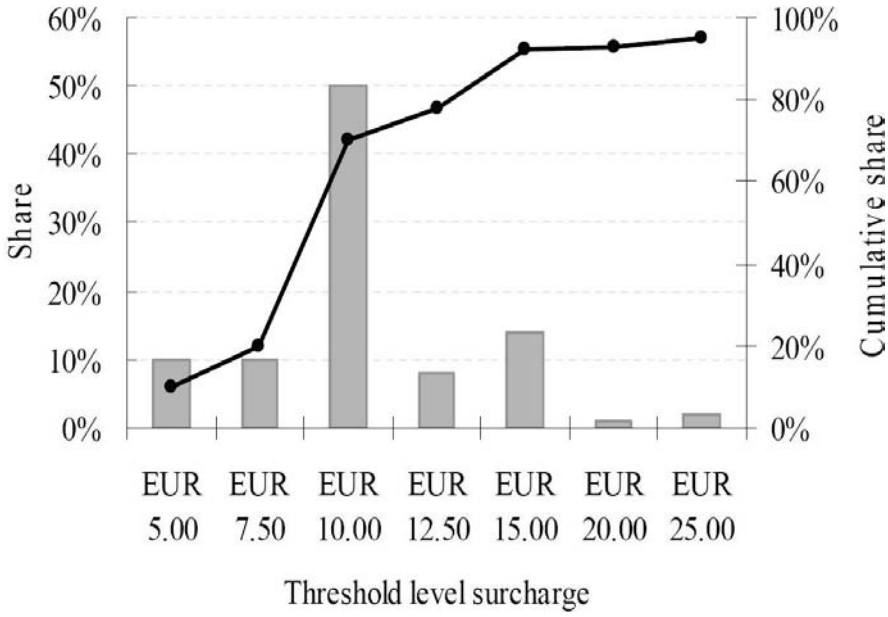
The way in which retailers surcharge can give us a first glance at the possibility of under- or overprovision of debit card services. Underprovision due to surcharging may stem from two sources. The first is the induced incentive structure of the surcharge. If retailers surcharge on debit cards above the socially optimal threshold; consumers, acting in accord with this structure, may use cash more often than desirable from a cost efficiency viewpoint. The second source is the influence of surcharging on consumers' choices. Irrespective of the threshold level, surcharging may give rise to the perception by consumers that debit cards are expensive relative to cash, which is provided 'for free' since ATM fees in the Netherlands are zero (see Jonker, 2007). The average level of surcharge may play a role here. A general feeling that cash is for free may influence consumers' payment behaviour in all payment situations, including those where debit card payments are not surcharged. On the other hand, overprovision arising because cardholders do not face transaction fees for using debit cards can be mitigated if retailers surcharge on debit card payments. However, this surcharge and threshold must be aligned with the social breakeven point. Given that the social breakeven point has fallen substantially, overprovision of debit card services in the Netherlands seems unlikely.

Threshold level

We start by looking at the threshold level for retailers to surcharge, in order to examine whether it may send the wrong signals to consumers (see figure 6.3). One of five surcharging retailers employs a threshold of EUR 7.50 or lower, about three of five use a threshold level of EUR 8–12.50, and the remaining 20% use an even higher threshold. On average, the threshold level is EUR 10. Only a small portion of retailers use a threshold level that is suitable from a business-cost perspective, whereas 80% employ excessively levels. These results

indicate that it is likely that the threshold levels used by surcharging retailers lead to the current under-usage of debit cards. It is striking that the current thresholds match well the social breakeven point of 2002. When asked whether they have changed the threshold or the level of the surcharge, 12% of the retailers stated that they have changed the surcharge and only 1% had adjusted the threshold level. The latter suggests that changes in the breakeven point are only partially translated into adjustments in threshold level. This could indicate an information problem on the retailer's side. The present threshold would have been adequate from the social cost perspective for 2002, but nowadays it could contribute to under-usage of debit cards.

Figure 6.3 **Share of surcharging retailers by threshold (weighed data)** (in percentages, straight line denotes cumulative share)



Level of debit card surcharge

Figure 6.4 depicts the share of retailers by level of surcharge. The average level is about 23 eurocents, which is relatively high compared to the surcharged transaction sizes. This implies a surcharge of 2.3% on a EUR 10 transaction. This may have contributed to the general perception among consumers that the debit card is an expensive

payment instrument (see Jonker, 2007). Therefore, it is likely that surcharging has affected the payment behaviour of consumers, which is formally tested in the next section.

Consumers' reaction

We asked the consumers about their payment choice and whether surcharging influences it. About 25% of debit card payers indicated that transaction size does not affect their payment choice: if possible, they will always use a debit card. The majority, however, states that the surcharge does influence their payment choice (see figure 6.5). Most of them use cash for purchases below EUR 15. This range closely matches the thresholds used by surcharging retailers, which suggests that consumers could be steered toward the use of cash by surcharges. If asked how they would pay if confronted with a surcharge of 10–15 euro cents for purchases below EUR 10, three-quarters of the respondents who use the debit card for paying replied that they would be unwilling to pay such a fee (see figure 6.6). Around two-thirds indicated that, faced with such a surcharge, they would pay cash, 4% would use their e-purse, and 5% would shop elsewhere.[17] To put it differently, consumers react to fees and adapt their payment behaviour accordingly: they try to avoid the extra surcharge and do so by paying in cash.

[17] If we exclude the consumers who stated that they usually use the debit card for transactions above EUR 10 (irrespective of surcharges) and focus on consumers who use their debit card for low transaction sizes, we still find a strong steering effect: more than 60% stated that they would not use their debit card.

Figure 6.4 **Share of retailers by level of surcharge** (weighed data, in eurocents)

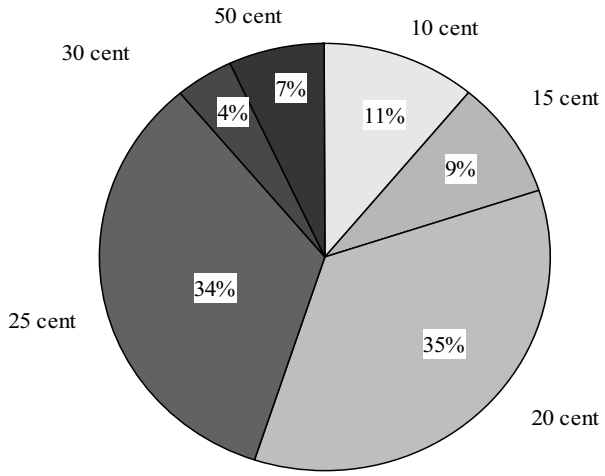
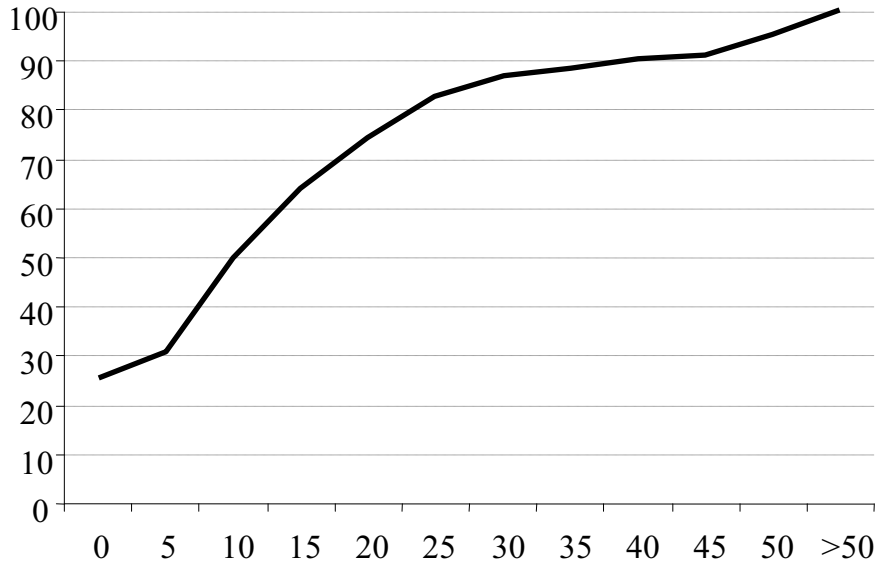


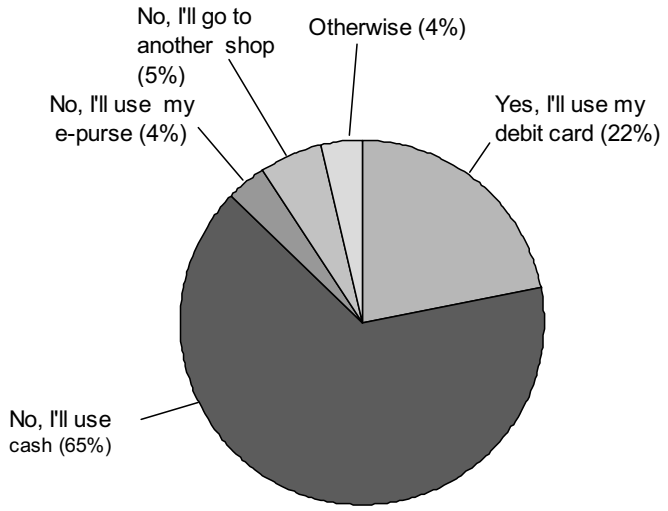
Figure 6.5 **Share of debit card payers using their card by transaction size (in EUR)** (in percentages)



An interesting point here is that surcharging may cost retailers some customers. The retailer survey confirms this finding: 6% of retailers who lifted the debit card surcharge attracted more customers. This indicates that not levying a debit card surcharge may result in higher

sales, which corroborates Rochet and Tirole's (2002) assumption that accepting debit cards is a service to consumers that gives a competitive edge and may increase business. Moreover, as Wright (2003) argues, initial underprovison of debit card services may be corrected if card services are not charged. In effect, merchants cannot use their pricing power to inefficiently extract surplus from card users.

Figure 6.6 **Are you willing to pay a surcharge of 10–15 eurocent for using a debit card to pay an amount less than EUR 10?**

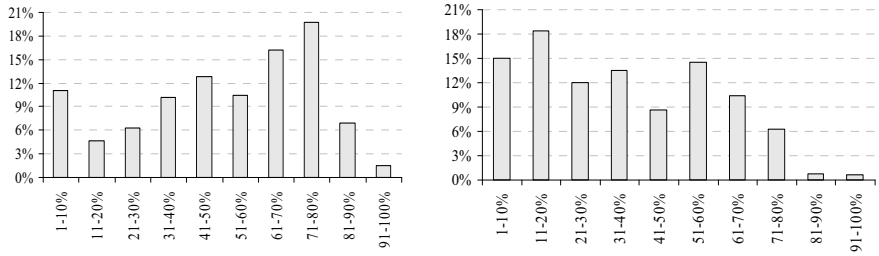


6.6 Impact of surcharge on payment behaviour

In this section the impact of surcharging on debit card payments on the payment behaviour of consumers at the counter is examined. Retailers who accept debit card payments were asked to indicate the share of debit card payments in the total number of incoming payments. Figure 6.7 depicts the results for retailers who do not surcharge (left-hand diagram) and for retailers who do (right-hand diagram). There are ten categories on the x-axis indicating the share of debit card payments in the total number of payments. The y-axis indicates the share of debit-card-accepting retailers in these categories. For example, the first bar on the left in the left-hand diagram indicates that 11% of non-surcharging retailers have 10% or less debit card

payments. The frequency distributions of the two groups of retailers are clearly different.[18] Stores with a debit card surcharge report fewer debit card payments than stores without. On average, 36% of purchases in stores with a debit card surcharge is paid by debit card, as compared to 51% for stores without a surcharge. This is a first raw indication that removing the surcharge could increase consumer debit card usage at point of sale.

Figure 6.7 **Frequency distributions of debit card payments with and without surcharge**



Note: in left panel, share of debit card payment in total number of payments in shops *without* debit card surcharge; in right panel, share of debit card payment in total number of payments in shops *with* debit card surcharge.

6.6.1 Estimating the impact of card surcharges on payment behaviour

To assess the impact of surcharging on the demand for debit card services, measured by[19] share of debit card payments in total (incoming) payments, we applied a linearly ordered probit model. The dependent variable is the retailer's reported share of debit card payments in the total number of payments (ten categories, see Figure 6.7). We selected this type of model because of the discrete and

[18] Several statistical tests reject the null hypothesis of equal distributions at the 5% level.
[19] See Greene (1993) for a good introduction to the econometrics of ordered probit models.

linearly ordered nature of the dependent variable).[20] We added some controls to correct for firm-specific characteristics and other exogenous influences in our model.[21]

We estimated three separate models. In the first model we used data from all debit-card-accepting retailers who indicated the share of debit card payments (n=812) and used a dummy variable indicating whether a retailer surcharged to measure the impact of surcharging, irrespective of fee or threshold level. With the other two models we examined the impact of fee level (model 2) and threshold level of the surcharge (model 3) below which debit card transactions are surcharged. In estimating models 2 and 3, we only used data from surcharging retailers. Their number is rather small (n=169), so that the estimated effects only give some first insights in whether fee level and threshold level influence the payment choice of consumers. The estimated effects are shown in table A6.1 in the appendix, together with tables A6.2 and A6.3, showing the marginal effects of surcharging and changes in fee level.

The results for model 1 show that retailers who surcharge can expect a significantly lower share of debit card payments in the total number of payments than retailers who do not surcharge. This effect still holds when we control for firm size (measured by number of employees or sales), for industry type, for ownership type (shop is independent or part of a holding/chain), and type of location as measured by degree of urbanization and province. The magnitude of the effect seems to be relatively large, indicating that surcharging does affect the payment choice of many customers. The format of the

[20] It is possible that some retailers impose a debit card surcharge because they expect few debit card payments and want to recover some of their costs of accepting debit card payments. In these cases the expected share of debit card payments influences the decision to surcharge. If the expected share of debit card payments plays a role in most retailers' decision to surcharge, a simultaneous equation model would be more appropriate. However, we think it is more likely that retailers who expect few debit card payments and find the investment costs too high decide simply not to accept debit card payments. Therefore we decided to focus on the influence of surcharging on customers' payment behaviour and not on the other possible relation.

[21] The control variables include branch dummies. In the estimation results presented in this paper, all merchants are included, irrespective of branch. However, the inclusion of merchants who are active in branches where transaction sizes tend to be large and debit card usage extensive might have led to an overestimation of the impact of surcharging on payment choice. Estimation results in which merchants who are active in such branches were excluded from the analysis revealed that the impact of surcharging did not differ significantly from the results presented in this paper, so that our results seem to be fairly robust.

surcharge also seems to be important.[22] The estimated effect of the level of the fee is significant at the 10% level, (see model 2) indicating that the higher the charge, the less likely consumers pay with a debit card. However, consumers' payment choices do not seem to be much affected by the cut off point below which debit card transactions are being surcharged. The threshold effect is not significant at the 10% level (see model 3). A possible explanation for this result is that the variation in the threshold amounts is not great enough to yield significant results. Over 70% of the surcharging retailers use a threshold between EUR 10–15. Another possible explanation is that consumers readily recall which merchants surcharge on debit card payments, but do not so often recall the threshold amounts.

We also estimated marginal effects of surcharging on the share of debit card payments in the total number of payments. These estimated effects are significantly different from zero. They show that if a retailer surcharges debit card payments, the probability that its debit card share in the total number of payments lies between 1 and 40% increases whereas the probability that it is higher than 50% decreases, compared with the debit card share of a non-surcharging retailer (see table A6.2, 2nd column). Taking the marginal effects of all ten categories together, our analysis shows that applying a debit card surcharge decreases the share of debit card payments in total payments by 8 percentage points. This is about half of the difference between the average debit card share of surcharging and non-surcharging retailers shown in figure 6.7. At the level of the individual retailer, the impact of surcharging is considerable. Our result is that, if a retailer stops surcharging, the share of debit card payments increases on average from 36% to 44%.

The impact of lowering the surcharge fee is shown in table A6.3. If we increase the average fee of 23 cents by 9 eurocents (one standard deviation), the share in debit card payments declines with almost 3 percentage points. If we decrease the average fee by 23 cents, which more or less boils down to lifting the surcharge, the debit card share increases with almost 7 percentage points. This number is broadly in line with the previously found 8 percentage points for not levying the fee. In subsection 6.4 we will illustrate the economic impact of removing the debit card surcharge on the entire retail payment system.

[22] By format of the surcharge, we refer the combination of threshold level used by the retailer and level of surcharge.

6.6.2 Other firm characteristics affecting the share of debit card payments

Apart from surcharging by merchants, there are additional firm characteristics that influence the demand for debit card services of consumers. A closer look at the estimation results regarding type of industry (reference group: supermarkets) suggests that transaction size influences consumers' payment behaviour. They pay significantly more often in cash when the transaction size is relatively small (specialized food store, catering, florist, etc) and use their debit card significantly more often when the transaction size is relatively large (clothing or shoe store, gas station). These results were derived using only data from debit-card-accepting stores while controlling for surcharging. They support the view that the transaction size is an important factor explaining industry differences in debit card usage.

Firm size as measured by sales revenues has a positive and significant effect on debit card share (reference group: sales ≥ EUR 500K). Another measure of firm size, the number of employees (reference group: less than 5 employees), does not have a significant effect on payment behaviour. However, if we run the same regression without the sales dummies, the number of employees becomes statistically significant, indicating multicollinearity among these variables. The firm size effect seems intuitively plausible. Dutch consumers are used to paying in cash in small stores, since those shops often accept only cash (see section 6.5.1).

The Netherlands is divided into twelve provinces. Eight of eleven province-dummies are statistically significant. Compared to retailers in Noord-Holland (the reference province in which the capital city Amsterdam is located) retailers in other provinces, except for Zeeland and Limburg, have a larger debit card share. Part of the explanation may lie in differences in age distribution (see also table A6.4) between different provinces. For instance, Flevoland is a province with a relatively young population.

6.6.3 Consumer sensitivity to debit card surcharges

The above analysis indicates that many but not all consumers are sensitive to surcharges. We already touched on the influence of age. In this section we try to shed some light on the question of which consumers react to debit card surcharges and which ones are less price sensitive. In the consumer survey we asked respondents to indicate

what they would do if they had to pay a surcharge on a debit card payment below EUR 10 (see also figure 6.6). We now focus on two possible answers, namely '*I'll use cash instead*' and '*I'll use my debit card*', where the first one indicates that a cardholder is sensitive to the pricing of card services and the second that a cardholder's demand for card services does not depend on price. We estimated two probit regressions, one for each of the these possible responses. We excluded respondents who never used a debit card for making payments. As explanatory variables, we included standard demographic characteristics like age, gender, marital status, educational and income levels. We also included explanatory variables indicating the degree of urbanization of the respondent's residence and province in order to account for regional differences. The results are shown in table A6.4.

Age is an important factor. People below 35 years of age significantly more often indicated use the debit card than people aged 65 or higher (reference group). This holds to a lesser extent for people between 35 and 44 years of age. The age effects on the choice of cash are contrary to those we found for the debit card. These findings suggest that age is positively related to price sensitivity for card payment services.

Gender also affects the way people react to surcharges. Men are significantly less likely than women to use cash instead of the debit card when confronted with a surcharge. However, they were not significantly more often than women prepared to use a debit card, surcharge or not. This suggests that they are not so much less sensitive to pricing than women, but that they use other ways to evade the surcharge. The data reveal that men tend to use the e-purse more often than women, or they simply go to another shop.

Income and educational levels are important factors as well. With a surcharge, low and high income respondents shy away from the use of debit cards, and use cash instead (reference group: middle income and intermediate educational level). With respect to educational level, we find a negative relationship between education and willingness to pay a debit card surcharge. Taken together, the results for income and education reveal that highly educated, high-income respondents are among the most price sensitive payers. This result is somewhat striking since, from a budget perspective, one would expect that the less affluent would be more sensitive to price. Controlling for personal characteristics, we found hardly any evidence of regional differences in price sensitivity. Urbanization degree does not seem to matter much.

6.6.4 Cost savings of removing the debit card surcharge

Savings in POS payments can be achieved if consumers substitute ('expensive') cash payments for ('cheap') debit card payments. Retailers could steer consumers towards debit cards if they would stop charging debit card payments. To gauge just how much banks, retailers, the central bank (DNB) and the card processing centre (Equens) together could save in the Netherlands, three ad hoc scenarios were briefly examined (see table 6.4). The cost data used in this scenario analysis are from several different sources, namely EIM (2007) for the costs of retailers and the catering industry, McKinsey and Company (2006) for the costs to the banking community, and Brits and Winder (2005) for the costs borne by DNB. Following the approach of Brits and Winder (see also section 6.3.3), we focused on variable costs in our projections for cost savings. We distinguished between costs that vary with the number of transactions and costs that vary with the size of transaction.[23]

The direct consequences of surcharges will presumably show up first in stores which used to surcharge debit card payments of small transaction size (scenario 1). In this scenario, these stores' share of debit card payments increased by 8 percentage points when the surcharge was eliminated. Assuming substitution for payments in the EUR 10–15 expenditure category, this 'immediate' scenario suggests that the total number of debit card payments could increase by 67 million annually, and its total value by EUR 840 million. It is likely that after some 'reaction' time, this effect will feed through to all POS locations which accept debit cards, and for more purchase amounts. As the debit card surcharge disappears, the perception that debit cards are meant especially for larger transaction sizes will gradually disappear. Survey evidence has shown that consumers tend to consider debit card payments more convenient than cash, but dislike the pricing aspects of debit cards, such as the surcharge on small transaction amounts (Jonker, 2007). Therefore, with the surcharge removed, consumers may adjust their payment habits and start using debit cards for both small and large transactions.

Scenarios 2 and 3 indicate the consequences of a change in payment behaviour in the long term. Scenario 2 shows what happens if the share of debit card payments for purchases of EUR 10–60 in the

[23] Following the approach of Brits and Winder (2005) in updating the 2002 cost figures, we were able to provide assessments of costs savings for businesses in the payment chain. Cost savings of consumers and changes in non-monetary benefits were not included. Incorporating these was beyond the scope of this study.

total number of payments increases by 10 percentage points. Although the amount continues to co-determine the choice of instrument, the preference shifts to the debit card. In scenario 3, it is assumed that the purchase amount no longer matters for the choice of payment instrument. Purchases of EUR 10–60 are then paid just as often by debit card as by cash, as are purchases in excess of EUR 60. In this scenario, the share of debit cards is assumed to rise to 75 percent. As a result, 1.2 billion cash payments are replaced by debit card payments, and the total amount involved in debit card payments increases by EUR 16 billion.

The direct cost savings from lifting the debit card charges in scenario 1 amount to EUR 5 million. This is a modest sum given the total costs of over-the-counter payments. These small cost savings arise because initially only a few cash payments will be replaced, those of a size for which the cost of a cash payment barely differs from that of a debit card payment. If consumers were to use debit cards more often for purchases of EUR 10–60, a savings of some EUR 50 million (scenario 2) to EUR 110 million (scenario 3) could be achieved. This is around 4–8% of the variable costs of cash and debit card payments combined. The bulk of savings is accounted for by retailers and the catering industry.

Table 6.4 **Indication of payment cost savings**

Scenario	Influence on debit card payments		Savings
	Numbers in millions	Value in EUR billion	Value in EUR millions
1: direct effect of abolition debit card surcharge	67	0.8	5
2: 10%-points increase in debit card payments for EUR 10–60 purchases	340	7.7	50
3: share of debit card payments for EUR 10–60 rises to 75%	1180	16.0	110

6.7 Conclusion

In the Netherlands retailers are allowed to surcharge consumers for using payment instruments. One in five debit-card-accepting retailers makes use of this possibility and charges customers for small debit card payments. The retailers who surcharge are often small in size and receive predominantly small payments. They view the low cost of cash and surcharge debit cards as a means of recovering their payment cost. In such cases, most consumers opt for cash. Retailers that charge a fee for debit card payments are thus influencing the way their customers pay for purchases. Moreover, applying a surcharge to card payments can to some extent neutralise the effects of interchange fees on consumers' payment behaviour and retailers' acceptance decisions.

The design of the surcharge rule which Dutch retailers use initially enhanced the efficiency of the POS payment system. In 2002 the most efficient way to pay an amount below EUR 11.63 was by cash. Many retailers geared their surcharge so that debit card payments below EUR 10–15 were charged an extra fee, in line with cost efficiency. However, due to technological developments and increasing payment volumes, the amount below which cash is more cost efficient than a debit card has decreased considerably in a few years time, whereas the threshold level of surcharging retailers has hardly changed. As a consequence, applying a surcharge would now lead to under-usage of debit cards and removing retailers' debit card charges would thus increase cost efficiency. This result shows that both the way in which retailers surcharge, as well as developments in costs and payment instrument usage should be taken into account when assessing whether surcharging supports the efficient usage of payment cards.

Based on our analysis, removing consumers' debit card surcharges would lead to more debit card payments and reduce the use of cash. Estimation results show that the share of debit card payments in the total number of payments in a store would on average increase by 8 percentage points if the retailer were to discontinue the use of a surcharge. The consequences of lifting debit card surcharges altogether for the total costs of the Dutch POS system are modest in the short term. Only a limited number of cash payments would be directly replaced, and the cost savings per transaction would be small. It is likely that the total effect of removing the debit card surcharge would attain its full impact after some time, when consumers stopped viewing the debit card as expensive – as many Dutch currently still do. Scenario analyses indicate that savings up to EUR 110 million may be possible, which represents about 8% of the variable costs of

cash and debit card payments. Although less surcharging debit card payments in the Netherlands would improve the cost efficiency of the Dutch POS system, in general prohibiting surcharges may also have adverse effects on cost efficiency. Depending on competitive forces in the acquiring market, it may effectively reduce the bargaining power of retailers vis-à-vis payment services providers, leading to higher merchant fees for card payments and possibly lower card acceptance by retailers. This efficiency tradeoff begs for more empirical payment research.

The Dutch results are relevant for Europe. The 'no surcharge' rule that some card schemes impose on retailers is currently under pressure by competition authorities. Our analysis shows that consumers' payment-method choices are sensitive to price inducements. When differential pricing is allowed, retailers may start charging or discounting their customers for their payment use. By imposing surcharges or, alternatively, giving discounts, retailers can effectively steer consumers towards payment instruments that retailers prefer. It is therefore important that merchant fees for payment transactions (cash and card payments) reflect the true underlying costs. Transparent payment pricing should help to ensure that payment cost savings are ultimately passed on to consumers and merchants.

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Appendix

Table A6.1 **Ordered probit results on the impact of surcharging on share of debit card payments**

	Model 1		Model 2		Model 3	
	Coef.	Z	Coef.	z	Coef.	z
Usage of surcharging=1	-0.41**	4.28	–	–	–	–
fee level	–	–	-0.02*	1.70	–	–
cut off point	–	–	–	–	-0.01	0.30
City	0.04	0.27	0.01	0.04	0.06	0.16
Town	-0.04	0.31	-0.44	1.31	-0.38	1.13
Village/countryside	-0.16	1.07	-0.33	0.92	-0.25	0.72
Provinces						
Zuid-Holland	0.27**	2.11	-0.14	0.45	-0.15	0.48
Utrecht	0.54**	3.02	1.52**	3.35	1.53**	3.29
Flevoland	0.72*	1.77	1.34**	1.98	1.36**	1.99
Overijssel	0.68**	3.65	0.94**	2.27	0.94**	2.26
Drenthe	0.44*	1.89	-0.32	0.57	-0.38	0.68
Gelderland	0.27*	1.94	0.14	0.43	0.14	0.44
Friesland	0.30	1.46	0.72*	1.72	0.75*	1.81
Groningen	0.58**	2.78	0.95*	1.71	0.89	1.61
Noord Brabant	0.39**	2.91	0.47	1.50	0.41	1.32
Zeeland	-0.16	0.62	-0.075*	0.09	-0.04	-0.08
Limburg	0.04	0.21	0.67	1.60	0.64	1.51
Independent store	-0.03	0.33	-0.49*	1.70	-0.57**	1.99
Firm size 5–19 employees	-0.02	0.18	0.16	0.81	0.14	0.72
20–49 employees	0.06	0.41	0.20	0.41	0.18	0.36
over 49 employees	-0.21	1.15	-1.02	1.29	-0.96	1.21
sales < EUR 25K	-0.64**	2.35	1.55	1.28	1.09	0.92
EUR 25K < sales < EUR 49K	-0.46*	1.67	-0.42	0.78	-0.38	0.71
EUR 49K < sales < EUR 100K	-0.47**	2.23	-0.01	0.01	0.00	0.01
EUR 100K < sales < EUR 200K	-0.47**	2.77	-0.19	0.51	-0.20	0.53
EUR 200K < sales < EUR 500K	-0.20	1.53	-0.15	0.45	-0.23	0.68
Sales unknown	-0.05	0.57	0.15	0.74	0.13	0.63
Branch						
Food	-0.80**	5.09	-1.14**	2.69	-1.12**	2.65
Greenery, florist	-0.54**	3.52	-0.57	1.31	-0.55	1.26
Clothing, shoes	0.63**	3.95	1.19**	2.38	1.20**	2.37
Home improvement stores	-0.07	0.44	0.60	1.26	0.59	1.25
Catering, hotels	-1.24**	6.86	-0.87	1.56	-0.96*	1.71
Media (Books, Cds, Dvds)	-0.42**	2.38	-0.17	0.41	-0.20	0.48
Drugstores/Perfumery	-0.99**	6.08	-0.52	1.12	-0.43	0.93
Other stores	0.42**	2.79	0.85*	1.66	0.78	1.53
Gas stations, travel agencies, etc	0.37*	1.73	1.08*	2.33	1.02*	2.22
Other services	0.39**	2.00	-0.94	1.27	-0.96	1.29
cut1	-1.89		-2.52		-2.26	
cut2	-1.52		-1.86		-1.60	
cut3	-1.09		-1.29		-1.04	
cut4	0.60		0.61		0.36	
cut5	0.15		0.07		0.16	
cut6	0.26		0.60		0.82	
cut7	0.84		1.18		1.40	
cut8	1.74		1.87		2.09	
cut9	266		2.48		2.72	

	Model 1		Model 2		Model 3	
	Coef.	Z	Coef.	z	Coef.	z
log likelihood	1,606.74		-304.93		-306.33	
pseudo R-squared	0.09		0.14		0.14	
no of obs.	812		169		169	

** denotes significance at 5%, * denotes significance at 10% level.

Table A6.2 **Marginal effects (model 1) of surcharging on share of debit card payments at store level**

Share	Pr(share=j| no surcharge)	Marginal effect dPr(Share=j)/ d(surcharge=yes)	P+dP= Pr(Share=j| surcharge=yes)
1–10%	0.052	0.054**	0.109
11–20%	0.052	0.033**	0.085
21–30%	0.100	0.042**	0.141
31–40%	0.164	0.032**	0.196
41–50%	0.178	-0.001	0.177
51–60%	0.153	-0.026**	0.127
61–70%	0.167	-0.056**	0.111
71–80%	0.111	-0.060**	0.051
81–90%	0.021	-0.016**	0.005
91–100%	0.002	-0.002*	0.000

** denotes significance at 5%, * denotes significance at 10% level.

Table A6.3 **Marginal effects (model 2) of surcharge on share of debit card payments at store level**

Share	Pr(Share=j)	Marginal effect dPr(Share=j)/d (Tariff up by 1 cent)	Effect for a 9 cent increase. In fee level	P+dP(9 cents)
1–10%	0.042	0.002*	0.015	0.057
11–20%	0.101	0.003*	0.023	0.124
21–30%	0.165	0.002*	0.021	0.187
31–40%	0.264	0.001	0.007	0.271
41–50%	0.192	-0.001*	-0.014	0.178
51–60%	0.154	-0.003*	-0.016	0.134
61–70%	0.058	-0.002*	-0.016	0.042
71–100%	0.023	-0.001	-0.009	0.014

* denotes significance at 10% level.

Table A6.4 **Impact of surcharging debit card payments at 10–15 eurocents when the transaction size is less than EUR 10**

	Coef.	z	Coef.	z
Male=yes	0.064	0.83	-0.168**	-2.43
Married=yes	-0.008	-0.07	-0.007	-0.08
Children	0.063	0.67	-0.037	-0.44
Wealth	0.000	-0.32	0.000	0.39
Age 15–24	0.516*	1.80	-0.606**	-2.30
25–34	0.478**	2.88	-0.501**	-3.36
35–44	0.163	0.98	-0.225	-1.53
45–54	0.081	0.52	-0.161	-1.18
55–64	0.076	0.55	-0.160	-1.34
Town	0.339**	2.41	-0.170	-1.34
City	0.033	0.29	-0.071	-0.71
Village	0.092	0.81	0.007	0.07
Countryside	0.026	0.21	0.142	1.29
Employed	0.153	1.48	-0.031	-0.34
Stydying	0.034	0.13	-0.055	-0.22
Income very low	-0.020	-0.13	0.011	0.08
low	-0.223**	-2.18	0.198**	2.11
high	-0.323**	-3.51	0.202**	2.44
Primary school	0.225	1.30	-0.085	-0.52
Secondary school	0.165*	1.72	-0.155*	-1.77
Higher vocational education	0.000	0.00	-0.065	-0.73
University	-0.276*	-2.01	0.072	0.62
Provinces				
Groningen	-0.040	-0.20	-0.110	-0.62
Friesland	0.295*	1.68	-0.233	-1.43
Drenthe	0.271	1.31	-0.404**	-2.12
Overijssel	0.205	1.26	-0.154	-1.04
Flevoland	0.184	0.66	-0.170	-0.67
Gelderland	0.119	0.84	-0.198	-1.57
Utrecht	-0.120	-0.65	0.004	0.02
Noord Holland	-0.011	-0.09	-0.042	-0.38
Zeeland	-0.120	-0.48	-0.006	-0.03
Noord Brabant	0.066	0.49	-0.045	-0.38
Limburg	0.024	0.14	0.007	0.05
Constant	-1.176**	-5.98	0.842**	4.82
log likelihood	-790.4		-1,018.5	
pseudo R-squared	0.05		0.03	
no of obs.	1668		1668	

** denotes significance at 5%, * denotes significance at 10% level.

Chapter 7

Hidden payment charges at point of sale and possible impact of increased transparency

Harry Leinonen

7 Hidden payment charges at point of sale and possible impact of increased transparency

Abstract

All payments are essentially transfers of funds from payer's to payee's account provided by mainly by banks or credit card companies. To cover their service costs banks apply today mainly non-transparent charging conventions. Banks also charge merchant-payees for received payments and funds. This results in pass-through charging by merchants, which internalises banks' merchant fees as embedded payment markups to the prices of their goods and services. This study presents the hidden and direct bank charges for payment instruments used at point of sale in Finland. It tries also to evaluate the possible impact of changing the current hidden pricing convention to transparent charges.

7.1 Introduction

Consumers can nowadays select from a fairly wide variety of payment instruments for making daily purchases at point of sale. Cash is still the most widely used payment medium. It is withdrawn from customer accounts mainly using cards at ATMs and deposited back by merchants transporting their cash balance to banks at the end of their business days. However, the popularity of various cards is growing rapidly and in some countries cards have already surpassed cash in popularity. By using cards directly at electronic point-of-sales the physical cash process can be by-passed. Checks are still widely used in some countries, but checks require also physical and paper-based processing.[1] Technology advancement points to completely electronic mobile payments based on next-generation digital cards stored inside mobile phones.[2]

[1] For country data, see the Eurosystem Blue Book and the statistical charts in Leinonen (2008).
[2] See for future development trends, see Leinonen (2008).

The cost differences across payment instruments have increase because of the technology developments. Electronic card payments carry clearly lower production costs than paper-based cheque and cash payments. According to recent studies cash is only a cost efficient alternative under a break-even point of about EUR 5–10. Debit transactions are mostly the most efficient alternative as credit cards carry quite high extra costs for the credit services. E-money schemes have been introduced in some countries, but these have not been able to catch any larger market share. The general cost trends will increase the cost differences between manual and automated processing and thereby lower the break-even point.[3]

However, due to the current charging conventions the cost differences among alternative payment methods are seldom fully visible to customers. Service providers employ effective price hiding and cross-subsidisation techniques. Other services like credits are often bundled with the pure payment service, which makes comparison more difficult. The current distorted price signals thus seem to be nudging consumers into choices that are inefficient in their own terms. They often select costly payment instruments and credit sources because they cannot see the total costs. The distorted volumes will result in increasingly distorted cost figures, as fixed costs are allocated on the basis of these distorted volumes.

The current pricing conventions also hinder the new, more efficient services from entering the market, as their cost-efficiency will not be visible to end-users in an environment with hidden pricing. Customers are reluctant to change their payment behaviour when there are no visible incentives or benefits. This delays the long-term advance to more efficient technologies.

Payment efficiency has become a topical issue. Authorities use direct regulation and other means such as research and information to promote payment efficiency. Academics have focused particularly on the two-sided market.[4] Merchant organisations have opposed rising merchant charges.[5] New entrants have introduced new instruments and

[3] For European cost studies see for example Bergman, Guibourgh and Segendorff (2007), Brits and Winder (2005), Gresvik and Ovre (2003), Leinonen (2008), National Bank of Belgium (2006) and Takala and Viren (2008).

[4] See for example Baxter (1983), Evans and Schmalensee (2005), Farrell (2006) and Rochet and Tirole (2003, 2004 and 2008).

[5] See for example www.eurocommerce.be the position papers on European Commission consultations on SEPA framework for action, Retail Financial Services in the Single Market and the Impact Assessment on the New Legal Framework for Payments in the Internal Market. www.unfaircreditcardfees.com / Merchants Payments Coalition, Inc.

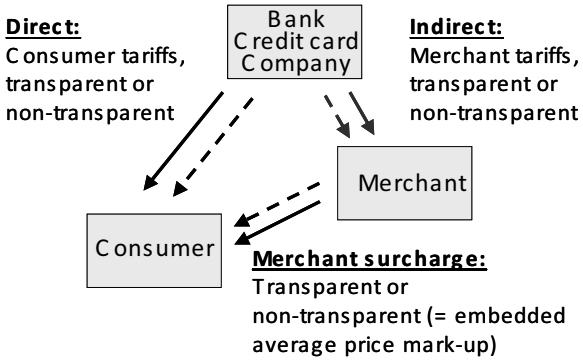
business models. Several trends and new features point to major changes in the current business models.

This article examines especially the hidden payment pricing conventions and tries to quantify these in the case of Finland. The different payment charging conventions are presented in section 7.2. Section 7.3 presents data on the current charging level and their impact on merchant prices in Finland. Section 7.4 presents an evaluation of the potential benefits of moving towards more transparent consumer charges. Section 7.5 contains conclusions and some reflections on future directions.

7.2 Current pricing conventions at point of sale

The saying, 'in the end consumers pay for everything' is also true of payments. Consumers currently cover the cost of paying in either of two ways: directly via service provider charges or indirectly via merchant charges and in both cases part of or all charges can be transparent or non-transparent (see figure 7.1).

Figure 7.1 **Consumer cash and card payment charging routes for point-of-sale transactions**



Both payment service providers and merchants are commercial undertakings which have to cover their costs. They must charge enough for their services and goods to cover all their costs on average over the long term. Both payment service providers and merchants can employ transparent or non-transparent charging. When payment service providers levy charges on merchants they become pass-

through agents for these charges. Merchants have to include these costs somehow in their prices, as is the case for all their other costs.

Typical transparent bank charges are transaction and periodical fixed fees. Typical non-transparent bank charges consist of float, value-dating and lower interest rates on payment funds. Merchants sometimes use transparent surcharging for certain payment instruments in certain countries for example Holland,[6] but the prevailing convention seems to be that merchants embed a non-transparent average payment markup in their prices of services and goods. In Finland all merchants embed their payment costs in their prices on goods and services, because credit card companies and banks include generally a non-surcharge rule in their merchant contracts for credit cards.[7]

The larger the hidden part of the charge, the more difficult it is for consumers to select efficient instruments and the lower the price/efficiency competition will be among instruments and service providers. This raises some concern, especially when there are large efficiency differences among instruments and service providers. Developments in electronic technologies have resulted in major cost differences due to variations in automation levels.

A market with sufficient competition generally operates with low margins and little cross-subsidisation. The extensive cross-subsidisation, wide profit margins and low levels of competition cited in European banking sector reports[8] points to weak incentives for payment efficiency. Transparent cost-based charges would with high probability move us towards increased efficiency based on user choice and assessment.

7.2.1 Banks' direct consumer charging options and their impacts

Banks currently use three major charging options for payment services

- non-transparent charging via lower interest rates, interest-free float and value days

[6] Bolt, Jonker and van Renselaar (2008).
[7] Some Finnish merchants were surcharging debit cards for a short period when debit cards were introduced in the 1980s, but stopped soon this practice when the benefits of debit cards over cash became more obvious.
[8] European Commission (2006 and 2007).

- fixed periodic fees for service bundles
- transaction-based charges.

Payment services have traditionally been priced largely in non-transparent ways using interest margins and float. The interest margins on current accounts and other payment accounts have been wider than those for long-term deposits in order to cover the costs of payment transfers and related liquidity needs.

The hidden consumer charges via wider interest margins (foregone interest earnings) can be calculated as follows

$$\text{Average foregone interest earnings per transactions} = \frac{\text{Interest rate difference} * \text{ave tied-up capital} * \text{ave tied-up time}}{\text{Total number of transactions}}$$

$$= \frac{\text{Interest rate difference} * \dfrac{\text{Total payment value}}{\text{Income payment frequency} * 2}}{\text{Total number of transactions}} \tag{7.1}$$

Consumers generally receive their income as salaries, pensions etc at given frequency and consume evenly over each period using cash withdrawals or debit card payments. They thus hold on average half of their payment or cash withdrawal balance deposited in the bank account plus a minimum reserve for unforeseen needs. The average charge per payment transaction in the form of foregone interest is the average payment balance times the interest rate difference between current (sight) accounts and fixed-term (eg 1–3 months) deposit accounts, divided by the number of transactions. Comparing the current account interest rate to a short fixed-term interest rate is justified by the fact that in both cases the average customer balances for banks to invest will be the same, but the cost difference stems from the payment services provided to customers and their impact on liquidity needs.

The same formula (7.1) can be used to find the hidden charges on both cash and card purchases. Customers make given average purchases each month using cards and need to keep corresponding balances on their debit card accounts. In order to be able to make (ATM) cash withdrawals for cash payments, customer will also keep average balances on their current accounts. From this, one can calculate an average corresponding transaction fee.

Banks have traditionally received float income on payments, consisting of transfer days plus back/future dated bookings (= value days) on the account to the advantage of the banks. A similar formula

(7.2) can quantify the float effect in the form of an average transaction fee

$$\text{Average float charge per transactions} = \frac{\text{Market interest rate} * \text{Total payment value} * \frac{\text{Value days} + \text{Processing days}}{360}}{\text{Total number of transactions}} \quad (7.2)$$

During the float period, the customers forego interest on the payment capital. The number of days involved usually depends on value-day conventions and processing time. Often the processing time varies because the length of the transfer chain for an internal transfer between accounts within the same bank is shorter than that for an interbank transfer. Interest is generally calculated only for banking days; which means that the longer the overall float period, the greater the chance of extra weekend float days. Banks use value days in both ends (consumer and merchants), these are all included in the same formula as the foregone interest of merchants will in the end be passed on to consumers.

The market interest rate is used as the calculation interest rate, because these balances are free for banks to invest without paying the customers any interest. Banks have no extra costs for float days resulting in every extra float day increases revenues in full.

Banks have an incentive to speed up debiting of accounts and to delay crediting in order to maximize float income. This can clearly be seen eg in real-time ATM cash withdrawal bookings, where putting the money back into the account via credit transfer can take days. There is no technical reason why crediting should take longer than debiting.

The Payment Service Directive (2007/64/EC) entering into force in the EU area on 1 November 2009, will substantially reduce float charges. Value days will be prohibited and the delivery time will shrink to one day, with the possibility to agree with the sending customer on a maximum delivery time of three days during an interim period ending 1 January 2112. Transactions initiated with paper forms may require an extra processing day.

Both the charge in the form of foregone interest due to lower rates on current accounts and due to float conventions are unrelated to actual payment processing costs. A more efficient instrument will involve the same charge as a less efficient one. The only exception would be the situation in which an efficient instrument has a shorter float period. With hidden charges the customers will not see any difference in charges for the different products, which would promote the use of more efficient instruments.

Banks nowadays seem to have increased their use of transparent fees in Finland by introducing a fixed periodic fee for a bundle of payment services. Customers often pay a fixed monthly amount for a payment service basket including eg free ATM withdrawals, debit/credit card, direct debits and standing orders. For electronic customers, this basket often includes free use of internet banking. Although the price of such a bundled service package is transparent, it does not reflect the cost differences among parallel services. Customers will not see the actual cost differences.

Transaction-based pricing for consumers seems to be the rare exception, employed when a bank wants to steer customers away from a particular service (eg over-the-counter cheques or other paper instruments). High transaction-based fees are also used for services for where the customer has no low-cost alternative (cash withdrawals abroad or customers of other banks). One of the main objectives of EU regulation 2560/2001 was to reduce the high charges for cross-border transfers by requiring domestic fees to be applied for all intra-euro-area transfers.

The overall structure of Finnish banks' current direct consumer charges includes few or no economic incentives for consumers to move to low-cost payment instruments. The cost components are thus non-visible to the average consumer. Value-based charging, which is the result of interest margin and float-based pricing, over-charges for high-value and under-charges for low-value non-cash transactions because the account booking and administration costs are not related to transaction value but basically to the number of transactions. For cash-based transactions, a totally or partly ad valorum fee is defendable since cash processing employs manual or ATM resources, depending on total value of the transaction. Consumers do not see any cost differences among instruments that would reflect differences in service providers' production costs. The common bundle fee for most of the instruments used by the average consumer provides no increased cost visibility as between different instruments. In the current situation, the only cost-based components of different instruments that are visible to the consumers are their own internal costs.

Merchants' fees are mostly transparent as Finnish banks and credit card companies charge for returned cash based on the deposited balances, for debit card transaction a flat transaction fee and for credit card transactions a merchant discount. In addition to these transparent fees merchants may also pay fixed monthly account fees. Merchant accounts carry also value days, which can be considerably long for

credit card payments. These are without exception embedded in merchants' prices towards.

The sudden and large drop in interest rates we currently experience in the market will decrease significantly banks' hidden interest-based payment income. The new legal requirements will increase this effect. In order to maintain their current income levels European banks need in future to increase their direct and visible charges to customers.

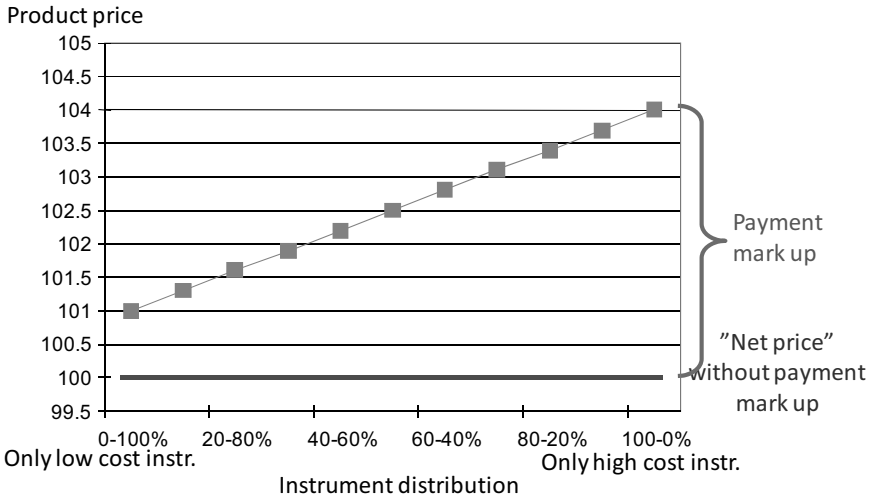
7.2.2 General effects of merchant internalisation and service bundling

For merchants, banks' charges for payment services imply costs that have to be covered like other costs. The merchant can embed the payment costs in general product and service price markups, just as for electricity costs, rents, salaries, equipment costs etc. The other option is to surcharge the payment costs separately, as some merchants do for disposable shopping bags and parking services. Embedding the costs in markups – internalisation – is often necessary for merchant card charges due to the rules/contracts of credit card companies and banks, as these often include a surcharge prohibition rule (including also a discount prohibition rule for competing instruments). Some competition authorities have seen this as a limitation on merchants right to freely decide on pricing models. Payment Service Directive (2007/64/EC) forbids by default non-surcharge rules in the EU area as from 1 November 2009.

The general effect of merchant internalisation is that users of low cost instruments subsidise users of high cost instruments when the merchant applies a single average payment markup on his goods/services. The larger the volume of the high-cost users, the higher the markup must be. Statistics show that the high-cost credit cards are currently gaining market share, which will increase the markups and total costs of paying.[9] The general effect of payment instruments with different merchant fees on markups is described in figure 7.2.

[9] In many countries, debit card volumes have increased rapidly in the last decade but in the last few years credit cards and credit cards with rebates have posted faster growth. Customers find the visible credit benefits and rebates attractive and fail to understand the higher hidden charges. See data in ECB Blue Book and Leinonen (2008).

Figure 7.2 **Relationship between payment markup and merchant charge (1% and 4% merchant charge)**



The simple example of figure 7.2 could describe the relationship between two card payment alternatives (debit and credit cards) on an Internet site. The more expensive the credit cards, the higher the markup must be. A similar graph could be drawn for cash and card payments when banks' charge different merchant fees for these instruments.

The example shows also how service bundling can increase cross-subsidisation. In our example debit card customers merchant charges are 1% and customers do not get any credit (or deferred debit service). Credit card customers get deferred debits and merchants pay the higher charges for credit cards. In our example, a 50–50 distribution of customers implies a markup of 2.50 and that debit card users would subsidise credit card purchases by 1.50.

The cost of credit customers will be partly transferred to non-credit customers. How much is transferred depends on the relationship between credit and non-credit customers. It will also hide the credit costs and keep them external to any interest rate negotiations. A 3% merchant fee difference would, for 36 effective interest days, translate into a 30% pa interest rate, whereas customers would in most cases get a debit card overdraft limit at a much lower interest rate.

According to standard price theory, with sufficient competition in the market, merchants' payment markups mirror their merchant fees. Any change in merchant fees or customer distributions would affect

the merchant markups. It seems there is wide agreement that merchants have to adjust their markups upwards when banks and credit companies increase their fees. However, especially banks argue often that merchants would not adjust the markups downwards for a general merchant fee reduction, due eg to a regulatory intervention.[10] For the merchant, the situation is similar to a general VAT reduction, interest rate cut or electricity cost cut. If there is sufficient competition in the (retail) market, some merchants will adjust their prices accordingly and the others will follow suit. Thus the cost reduction would benefit the end users, the consumers.

If a merchant were in a monopoly situation or in otherwise limited competition (eg oligopolistic) and his costs moved up or down, his reaction would depend on the demand elasticity. He would adjust prices so as to maximise revenues at the new cost level. In an oligopoly or similar limited competition situation the merchant must observe the reactions of the other main merchants. The price elasticity will determine if he over or under-compensates for the change in merchant fee. However, the merchant fee will in any case cause a change in the same direction also in a limited competition situation. For the markup adjustments, the source of the cost change is irrelevant. For merchants, the payment costs are just like other costs and they cannot gain or lose benefits due to changes in bank charges as compared eg to a reduction in telecommunication or electricity charges. This can be clearly seen in the prices all seasonal products and with the current large variations in oil prices we have seen clear changes in both directions in gasoline prices.

Internalisation of payment costs renders merchant fees and merchants' internal costs completely non-transparent to customers, who cannot see the cost differences among payment instruments and thereby select the more efficient instruments.

7.3 Finnish payment charging conventions – an empirical review

The current Finnish payment environment can be described as fairly efficient. Cash usage is quite limited: on average 32% of value and slightly below 60% in volume at point of sale (see table 7.3). Most (over 90%) of the cash for daily purchases is withdrawn for ATMs.

[10] Macfarlane (2005), Worthington (2008).

On average, citizens withdraw cash from ATMs about 37 times a year (2007) and the average withdrawal size is EUR 86.[11] The cash processing is managed in a centralised and consolidated way, mainly through one cash handling company Automatia Oy[12] that services both bank branches and merchant outlets. Currently cash usage decreases at about 2–4% per year.

Internationally, card usage is quite high in Finland, having a 68% market share (cash versus card payments) in value and 31% in volume. On average, citizens make more than 190 card transactions per year (2007).[13] This is at the same level as in USA and Canada; only Norway and Iceland show higher figures. Debit cards are accepted everywhere and credit cards in most places. However, low-margin shops do not accept credit cards. Card usage has grown continuously, at about 12–20% per annum in recent years. Visa and MasterCard operations are managed centrally by a joint credit card company, Luottokunta Oy,[14] owned by both banks and merchants.

The general payment charging structure is such that cardholders/ consumers pay directly to banks and credit card companies have only fixed service package fees while merchants pay volume-based merchant fees. Merchants seldom surcharge, but instead embed a general payment markup in their prices. Credit card companies and banks may currently include surcharge prohibition rules in their agreements in Finland, and this is the case for most merchants' credit card agreements. However, the implementation of the Payment Service Directive EC/64/2007 will change the situation when it is implemented into national legislation in November 2009.

7.3.1 Banks' consumer charges for cash and cards in Finland

Banks do not charge private customers for cash services using visible fees. The costs for cash services (ATM or teller services) are covered through large interest margins on payment/current accounts, float income, and/or general account charges. The interest difference for current accounts and fixed short-term deposits in Finland is about

[11] Finnish banking statistics see www.fkl.fi.
[12] See www.automatia.fi.
[13] For international card statistics see ECB Blue Book and BIS Red Book and Sedlabanki statistics.
[14] See www.luottokunta.fi.

3%.[15] Normal consumers usually receive their salaries monthly and withdraw cash then according to a fairly linear pattern up to the next salary day. Based on this, one can calculate, using formula 2 with some adjustments, that the foregone interest rate difference translates into about EUR 0.14 per ATM cash withdrawal.[16]

In the similar way one can calculate that the foregone interest for debit card transactions corresponds on average to about EUR.0.06 per transaction.[17] The value day and float effect on average for 2 days (one day for processing and one value day) add up, using formula 3, to EUR 0.01 at 5% pa for the average debit card transaction of EUR 35.

These average fees illustrate how high a flat transaction fee should be in order to compensate banks, assuming they were to pay the same interest rate on current accounts as on fixed short-term accounts, ie banks would cover their costs out of visible transaction fees instead of via expanded margins.

In addition to foregoing interest, most Finnish customers pay their bank a periodic fee that covers most of the transaction services (credit transfers, direct debits, ATM withdrawals and debit card purchases). There are no data on average fees paid by customers, but EUR 2 per month is typical of the published price list figures. In Finland, there are about 1.1 billion such bank account transactions, of which some 200 million are in pure business-to-business payments and 0.9 billion in business-to-consumer and consumer-to-consumer transactions. The 4.1million private customers (77.5% of the total population of 15–80 year olds) using the standard payment services thus pay periodic fees amounting to about EUR 98.4 million a year. This yields an average of some EUR 0.11 per transaction. However, there are many preferential customers and customers with joint accounts, which

[15] Finnish credit statistics.

[16] ATM withdrawals totalled 190 million and EUR 16,4 billion in 2007. The average balance needed by the customers would be 1/24, with an add-on of 10% for customers receiving salary payments, often and an increase of 20% for reserve capital, resulting in about EUR 745 million as cardholders' average deposit capital for cash withdrawals. The average interest difference is about 3%, but this should be adjusted somewhat upwards due to some banks providing continuous high interest bearing deposits in this group and some paying interest only on the lowest balance of the month for current accounts. The effective difference is thus about 3.5%. The total foregone interest per year for cash withdrawn from ATMs is thus about EUR 26.1 million, resulting in an average ATM transaction fee of about 0.16% or EUR 0.14 per withdrawal for the average withdrawal of EUR 86.

[17] Debit card transactions totaled 628 million and amounted to EUR 22.5 billion in 2007. The same calculation as for ATM withdrawals yields an average capital to support these transactions of EUR 1 billion. The foregone interest is EUR 35.8 million and the fee EUR 0.057 for the average debit card payment.

lowers the overall average from EUR 2 per month, while some people use several banks, which raises the average charge. One might therefore settle on a monthly fee in the region of EUR 2 for all types of payment transactions.

There are generally no visible credit card charges for high-cost credit cards; the first year is normally charge-free and subsequently the charges are often negotiable although the published price lists contain fees ranging up to EUR 175. For low-cost credit cards (Visa and MasterCard), the yearly fee varies according to the bank and agreed credit limit, but is typically about 2% of the limit per year. This means that, if a customer makes purchases up to the limit and spread evenly over each month, his direct share of the interest costs will be about 4%. The lower his actual use of the limit, the higher the effective interest rate. However, there are no published data from which one can calculate the actual usage levels.

7.3.2 Merchant fees and markups in Finland

In Finland banks charge merchants fairly high fees for all kinds of payment instruments. Merchants generally embed them in their prices of goods and services and rarely surcharge.

Merchant's fees for cash services (handling change), range from 0.6% to 1.0% of their cash turnover. Although these are visible to the merchants, they remain invisible to consumers, as merchants do not pass them onwards transparently but instead include them in overall payment markups. When banks are able to charge merchants high cash handling fees, their cash service income increases and their need to directly charge private customer decreases. Service providers have an interest in increasing their hidden charges, as this reduces price competition. The embedded cash charge of 0.6% to 1.0% corresponds to a direct average cardholder ATM transaction fee of EUR 0.52 to EUR 0.86, as the average cash withdrawal amount is EUR 86.

Table 7.1 **Merchant cash and cardholder account fees converted to ATM transaction fees for an average transaction of EUR 86**

Merchant fee level	Merchant fee per ATM trans (€)	Foregone interst on deposit (€)	Monthly charge as trans fee (€)	Total ATM cash charge (€)
0.6% of turnover	0.52	0.14	0.11	0.77
1.0% of turnover	0.86	0.14	0.11	1.11

Sources: Public tariff information of Finnish banks and author's average calculation of the impact of different service factors.

Debit cards carry a low flat merchant fee in Finland ranging from EUR 0.03 to 0.05 per transaction.

Credit card charges vary considerably across card types and merchants. VISA and Mastercard transactions have an average fee of 1% of value for EFTPOS transactions and 1.2% of value for slip transactions (a minor share of all transactions) for all merchants. Other credit cards, mainly Amex and Diners, apply fees that vary across merchants. Based on merchant sources, these fees vary from 2.7% to 4.0% of transaction value, but there are no reliable data on actual fees.

A merchant credit card charge of 2.7%–4.0% translates (under current Finnish merchant crediting and cardholder debiting rules) to a an average interest rate of 27%–40% pa and a merchant fee of 1% translates to about 10% pa. Customers get an average deferred debit of 45 days, when the pay off their 'free' credit at the end of the next month after purchase. Merchants get value for transactions only about 8 business days later, or (taking into account at least one weekend in between) 10 calendar days later. Thus the efficient credit period granted by the credit card company is currently 35 days on average. At least two major banks have recently announced that they will shorten customers' average deferred debit on MasterCard and Visa credit cards to 35 days, while keeping merchant charges unchanged and merchant booking delays still at 10 days. This will result in a decrease in average credit time to 25 days, and so the hidden interest rate will increase to 14.4%, a 44% increase in the hidden charge.

Table 7.2 **Finnish merchant fees on credit cards converted to transaction fees or yearly credit interest rates for an average transaction of EUR 62**

	Merchant fee %	Merchant fee EUR/trans	Efficient interest pa for 45 days customer credit	Efficient interest pa for 35 days customer credit
MasterCard, and Visa credit card	1.0%	0.62	10%	14%
Amex and Diners cards lower bound	2.7%	1.67	27%	39%
Amex and Diners card upper bound	4.0%	2.48	40%	58%
Customer rebate deducted:				
Amex and Diners cards lower bound -0.7% rebate	2.7–0.7%	1.24	20%	29%
Amex and Diners cards upper bound -0.7% rebate	4.0–0.7%	2.05	33%	48%

Sources: Public tariff information from Luottokunta Oy and merchant inquiry for Amex and Diners fees.

In 2007, customers with good past records or collateral can get consumer credits from their bank at interest rates of 6%–8%, eg as an overdraft limit on their debit card account. Consumer credits without any backing are granted at interest rates of 14% upwards, depending on the credit card company.

Based on data on payment volumes and merchant charges in Finland, the average merchant payment markup[18] is reported in Table 7.3.

[18] The average markup is the sum of merchant fees paid by merchants to payment service providers for services related to merchants' customers' card and cash payments divided by total sales turnover for these instruments. This excludes the smaller payment streams based on credit transfer, direct debits etc, but these are seldom used with ordinary point-of-sale purchases.

Table 7.3 **Estimation of average payment markup[19] in Finnish consumer prices in 2007**

	Bank and credit card tarfiffs	Volume (2007) millions	Market share volume	Value (2007) EURm	Market share value	Merchant fee EURm (lower bound)	Merchant fee EURm (upper bound)	Average purchase EUR
Domestic debit cards	3-5 cent/trans	628	27 %	22 500	44 %	19	31	35
International debit cards	0.33% of turnover	199	9 %	4 000	8 %	13	13	20
Cash	0.6-1.0% of turnover	1 366	59 %	16 400	32 %	98	164	12
MC/Visa credit cards	1.0% of turnover	108	5 %	6 700	13 %	67	67	62
Other credit cards	2.7-4.0% of turnover	15	1 %	1 000	2 %	27	40	63
Totals		2 316	100 %	50 600	100 %	224	316	21
Total average mark-up						0.44%	0.62%	

Sources: Published payment statistics from the Federation for Finnish Financial Services, public tariff information of Finnish banks of Luottokunta Oy, merchant inquiries of tariffs and volumes of other credit cards, cash volumes based on author's calculations based on ATM cash withdrawal statistics, merchant inquiries on average cash payments.

Currently the average payment markup in the Finnish shops is between 0.44%−0.62%. The charges of EURm 224–316 corresponds to 0.15%–0.21% of GDP. The large supermarkets and other large volume merchants probably have lower markups than the smaller shops, as they have greater negotiating power versus banks and credit card companies.

If merchants were to surcharge the current merchant fees transparently to customers, the lowest fee would be on domestic debit cards: a flat fee of EUR 0.03–0.05. All other merchant fees are dependent on transaction size. Based on the average transaction, the fees on cash payments are EUR 0.07–0.12, depending on the fee level paid to the merchant bank. Mastercard and Visa fees would be on

[19] Average payment markup is total merchant bank charges across instruments divided by total payment turnover on these instruments at point-of-sale. The instruments included are cash and cards, whereas credit transfer and direct debit based sales are excluded, as these are seldom used in daily purchases. However, more expensive consumer goods like cars, boats etc credit transfers probably account for a significant share. The charges include only direct instrument-related charges, not any interest margin or float effects on merchant accounts.

average EUR 0.64 for an EFTPOS[20] transaction, as the higher fee relates to slip-based transactions. Other credit cards would be in the range of EUR 1.80–2.67, depending on the merchant agreement.

Based on current merchants fees, different break-even points can be calculated. Due to the flat fee for debit card transactions, there is be a break-even point at EUR 3 to 8, depending on the above merchant fees, beyond which debit card payments will be more advantageous than cash. Because international debit cards only have a value-based fee, which is lower than the cash fee, it is more advantageous than cash for all purchase sizes. Domestic debit cards have a break-even point against international debit cards at about EUR 9 to 15. For credit cards such break-even points are not applicable, as customers can obtain consumer credits from lower-cost sources, which, combined with cash or debit cards, means lower total costs. Credit cards would provide benefits only to customers who cannot get consumer credit directly from their banks.

7.3.3 Average cross-subsidisation among instruments

Based on an estimated average merchant fee for each payment instrument type the average cross-subsidies in merchant prices among payment instruments on the Finnish market are presented in table 7.4. When merchants are not surcharging transparently the embedded average mark-up will result in cross-subsidies on the merchant level.

Table 7.4 **Average cross-subsidisation in merchant prices among Finnish payment instruments**

	Average merchant fee	**Average purchase EUR**	**Average cross-subsidy %[21]**
Domestic debit cards	3.5 cent	35	-0.38%
International debit cards	0.33%	20	-0.15%
Cash	0.65%	12	0.17%
MasterCard/Visa credit cards	1%	62	0.52%
Other credit cards	3.2%	63	2.72%
Totals	**0.48%**	**21**	

Sources: Same as for table 7.3.

[20] EFTPOS Electornic Fund Transfer at Point-Of-Sale, ie a card transaction done electronically using a point-of-sale terminal that reads the card data from the electronic element of the card (a chip, in modern cards).

[21] Difference to the average merchant fee of 0.48%.

Based on the assumed average merchant fees for each instrument stated in column the average merchant fee would be 0.48%. It is assumed that the larger merchants have more favourable contracts than smaller merchants. According to this the debit cards would subsidise the other instruments. The domestic debit card would subsidise the other instruments with on average 0.38% and the international debit cards with 0.15%. Cash users would receive a subsidy of 0.17%. Among credit cards MasterCard and Visa card users would receive a 0.52% subsidy, while Diners and Amex users would receive on average a 2.72% subsidy from the users of other instruments.

7.3.4 Total bank charges for payment instruments at point of sale

Finnish customers' current average hidden and transparent payment charges are presented in table 7.5. The fixed periodical fees and foregone interest (float) is calculated based on current volume distributions and average payment sizes. In order to make credit cards comparable with non-credit based alternatives, a negative float charge is calculated based on a 7% pa consumer credit, which can be seen as the average cost for a debit card overdraft facility. This is too high for customers with a deposit surplus who do not need credits. For them, the correct foregone interest would be 4–5% for a one month fix-term deposit.

Table 7.5 **Estimated consumer fees for average-size transaction per instrument type in Finland**

	Average transaction size (€)	Average merchant transaction fee (€)	Average merchant float	Average consumer foregone interest and float	Average bank direct fee (€)	Tot. corresp. average transparent fee (€)
Domestic debit card	35.00	0.03–0.05	0.00	0.06	0.11	0.20–0.22
International debit card	20.00	0.06	0.03	0.03	0.11	0.23
ATM cash withdrawal	86.00	0.52–0.86	0.03	0.14	0.11	0.80–1.14
Cash payment	12.00	0.07–0.12	0.00	0.02	0.02	0.11–0.16
Other MC/Visa credit cards	62.00	0.62	0.09	-0.46 – -0.54	0.42	0.67–0.75
Other credit cards	63.00	1.80–2.67	0.09	-0.46 – -0.54	0–2.92	1.45–5.14

Sources: Same as for table 7.3.

Because the fee schedules are quite different, the outcome is sensitive to volume shifts and average transaction values. The smaller average transaction for international debit cards results in equal total fee levels for domestic and international debit cards for average transaction sizes. However, the domestic card is more advantageous for larger purchases. Cash withdrawals will be quite costly; each withdrawal would have to be used to cover at least four purchases to be competitive, based on average costs. Credit cards are the most costly alternative, although a negative float for credit is deducted at an interest rate of 7% pa. Other high-fee credit cards provide rebates in the form of bonus points, but there are no data for evaluating the value of the rebates and the extent of usage by customers. The value of these would have to be deducted in order to get fully comparable figures versus other payment instruments.

Note that the previous comparison was based on current average charges. The direct bank charge (for a comprehensive service bundle) and float in the form of foregone interest will be the same irrespective of the instrument. With the current fee schedules, customers could see the fee differences in cash versus card processing only if merchants' were to surcharge. Based on marginal charge calculations, the break-even for debit cards over cash is at purchases of about EUR 5.

7.4 Moving towards more transparent payment fees

7.4.1 General consequences of non-transparent pricing

When most payment charges are hidden and non-transparent

- users do not see differences in actual cost but choose on the basis of other factors, eg tradition or convenience, with little no cost considerations
- users will have no incentives to economise by saving costs and to change possibly inefficient payment habits
- price competition will be limited when most charges are hidden
- new efficient instruments will have difficulty in entering the payment market when their cost advantages are not visible in a freely competitive market
- new service providers without a cross-subsidisation pool have difficulty in entering the market

- cross-subsidisation, rebates and hidden charges increase in order to attract customers to services where service providers margins are wide, but customers' costs are usually higher.

Subsiding in payments, as in other industries, leads to inefficient volume increases for subsidised services. The use of disposable plastic bags is greater when they are provided free of charge. Cheques disappeared rapidly from the Scandinavian countries when they were priced, but remain in countries where they are distributed without cost. Especially when inefficient payment instruments are subsidised more than efficient ones, the result will be an overall inefficient payment structure and slow developments. Hiding prices and costs lead to protection of high costs and inefficiency.

Moving from hidden to transparent pricing will, for most customers, look like a price increase. However, it will be in the customer's interest to see the actual prices due to their competition-enhancing effect. Compared to transparent prices, hidden prices will be higher, as there is no competition mechanism to keep them low. There is no free lunch for consumers in the payment industry.

7.4.2 Barriers to transparent pricing of payments

Most other industries operate with transparent pricing and visible price competition. The very basis for market efficiency is open competition. However, there seem to be considerable barriers against moving to open price competition in payments.

Service providers understandably support hidden pricing and lower level of competition. This also creates a barrier for new entrants, eg non-banks, because operating in a cross-subsidised market requires business lines and charging options that support the cross-subsidised services.

Merchants are often satisfied with the status quo, ie continuous cross-subsidising, as it will not require any changes. Merchants currently pass through their payment charges via a simple average markup. Moving to a more complex surcharge-based solution will mean investments and costs of change. However, they can also see inequalities among customers, as price margins vary considerably due to the payment instrument costs. Merchants thus tend to prefer to have more customers paying with low-fee instruments. If merchants should start to surcharge visibly, they will have to consider that those customers that have previously been cross-subsidised will react negatively when this advantage is taken away. The larger the

merchant charge differences across instruments, the greater the merchants' interest in separating their own prices of goods and services from those of the payment instrument. Visible surcharging will essentially mean that payment costs are redistributed in a new way among customers and will affect the overall costs only if customers change their payment habits.

A large portion of consumers seems to oppose transparent pricing. Credit card users find that their free credit possibilities will be reduced. Cash users find that they need to change their payment habits. Hidden pricing promotes expensive and inefficient payment instruments. Many consumers still view payment services as a free lunch and think that transparent pricing would increase overall charges instead of reducing them due to the open competition. Sticking with traditional charging patterns seems to them to be less risky than moving to new transparent ones requiring more consumer attention. Due to the negative psychological reactions to surcharging, it will probably be easier to move from a non-surcharge environment to a cost differentiated convention by providing instrument discounts for the most efficient payment alternative. The end-result (total sum) will be the same, but a discount convention will be easier to sell to the customers and could even be more effective as an incentive for change.

7.4.3 Moving to increased price transparency in payments

As most market participants are in favour of continued opaque charging conventions, it will be largely up to regulators to require healthier pricing conventions. This will require political support and consumer acceptance. Regulators face a complicated competition situation, which has step-by-step moved towards a less competitive payment market. There are several interdependencies locally and internationally. To accomplish a level playing field would require major long-term policy changes. However, these will be difficult to negotiate and will require consumer support. Authorities in some countries have realised these development trends and have started to analyse the situation and to use regulatory powers to increase competition and price transparency within the payment industry.[22]

[22] See for example Reserve Bank of Australia interchange fee decision of 2006, Poland's competition authority's interchange fee decision 2007, European Commission Mastercard international interchange fee decision 2007.

There are two basic routes to increased price/cost transparency

a) increased surcharging by merchants, ie showing payment instrument differences as discounts and/or surcharges at the teller
b) replacing banks'/card companies' merchant fees by direct customer/consumer charges, ie redeeming payment instruments at par and so reducing the need for through-charging.

Increased surcharging would require abolishment of surcharge-prohibition rules.[23] However, this will probably not be sufficient to set off a process towards general surcharging. It will also require cooperation with consumer and merchant organisation to ensure backing for a fair and strictly cost-based surcharging convention, in which all payment instruments are treated equally. The price tags for goods and services need to be redesigned so that these become the bases for payment instrument discounts or surcharges.

Surcharging for several parallel payment alternatives could concretely mean a price list at the teller stating the costs of alternative payment methods, eg

- cash according to price tags
- debit cards get a 0.x% discount
- credit card X surcharged at 0.y%
- credit card Y surcharged at z.z%
- etc.

This can be compared to supermarket price lists at the tellers stating the costs of different bags: plastic, large plastic, ecology or paper.

Reduced merchants fees could be introduced by forbidding or reducing interchange fees for four-party card schemes (separate issuing and acquiring institutions typically Amex and Diners) applying such fees.[24] The current interchange fees enable issuers to transfer all or some of their costs to acquirers, which then include these in their merchant fees. (The interchange fees can also be over-generous by covering more than issuer costs.) The basis for forbidding interchange fees would be that they are based on price-cooperation among competitors and that they inflate merchants' prices in a non-transparent and anti-competitive way.[25]

[23] The Payment Service Directive 2007/64/EC will accomplish this for the EU area.
[24] European Commission (2007).
[25] European Commission (2007).

However, forbidding interchange fees for four-party schemes will not reduce merchant fees for so-called three party schemes (issuers and acquirers being the same organisation for example Amex and Diners). Nor will it cover merchant fees for cash. A general reduction of merchant fees and increase of direct cardholder (payer) fees can only be achieved by requiring redeemability by original issuers free of charge, ie at par for all instruments. Every service provider would be obliged to accept its own instruments without transferring costs to other parties.[26] This would put the pricing pressure on the payers' service providers. The payer, who selects the instrument, would then be able to see the total costs for his choice via the charges from his own service provider. A general redeemability requirement at par by all acquiring service providers would increase competition among different service providers. New entrants would get interbank network services on equal terms. However, some acquiring service pricing would probably still be necessary to separate the different acquiring service levels to the merchants, eg slip-based transactions compared to EFTPOS and value-added services like cash transporting and accounting services etc.

Of these two alternatives, transferring indirect merchant fees to direct visible payer fees would be more efficient in terms of competition. Customers would be directly charged only by their own service providers and would see the total costs in one go. It would be easier to compare different instruments and service providers. However, it would not cover the internal cost differences for instrument processing within the merchant. However, it these show the same cost relationship among them within the merchants' part of the chain, as within the service providers' part, the customers would probably see price signals that are in line with the overall actual costs.

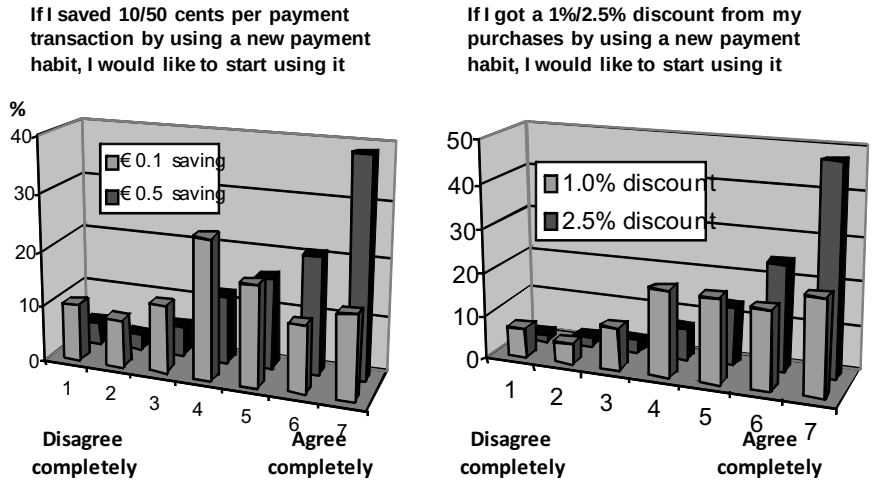
In the surcharging option, merchants that generally use only one bank (or a very limited number of banks) would have difficulties in surcharging separately for the different banks and instrument combinations. In indirect charging via merchants, there will therefore be less room for negotiations and free choice of provider than if consumers negotiate and select the bank directly and can see all charges from one price list.

[26] This was eg the policy view: the Federal Reserve System required cheques to be accepted at par from the start of 2000 in order to establish a level playing field for the different cheque issuers. In those days, merchants were able to deposit cash without cost.

7.4.4 Would transparent consumer charges make a difference?

Based on a consumer inquiry study[27] by the Bank of Finland, consumers are quite price sensitive (see Figure 7.3). Visible cash and card charges, in line with current non-transparent charges, would probably result in marked changes in payment habits and choice of payment instruments towards less costly instruments.

Figure 7.3 **Payment price sensitivity of Finnish consumers**



Sources: Dahlberg and Öörni (2006).

According to this study, customers would clearly reduce the use of credit cards, especially the expensive ones, if they could see the true cost differences. The use of cash would probably also decrease, especially for mid-size and high-value payments. Cash would be mostly used for smaller payments. However, the changes would probably not be so straight-forward, as the service providers would be likely to change their pricing policies if visible price competition were introduced. The changes in volumes would also alter the cost structures and thereby further promote the use of debit card as the most cost-efficient solution. Note also that current variations in

[27] Dahlberg and Öörni (2006).

charges do not necessarily reflect actual production cost differences of banks among instruments.

7.4.5 Estimation of the effects of visible surcharges in the Finnish market

A visible surcharge would imply that merchants would start to surcharge their payment markups transparently and according to costs, ie the bank charges and merchants' own costs would be presented to the customers in a visible way.

There would probably be three types of impact on each other:

1. customers would begin to select payment instruments based also on cost signals and thus select more cost-efficient instruments for some of their current payments, ie change their payment habits
2. service providers would face a new competitive situation and would need to adjust their prices and pricing policies, ie probably reducing charges for over-charged services and increasing charges for under-charged services, which would reduce cross-subsidies
3. volumes would change when payment habits change, which would affect the costs of payment instruments due to economies of scale, which in turn would affect competitive pricing.

The use of cash would probably decrease by about a third. This is based on the fact that 75% of all cash payments representing about 26% of total cash value are for less than EUR 10, because cash is the low-cost option for these or because the difference versus the debit card is marginal. These would probably be affected very little. As regards the others, there would be a clear difference. The consumer inquiry study presented in the previous section (figure 7.5) gives a rough idea of the price elasticity. Assuming a linear probability of 0–100% would produce an average probability change of about 55%–75%, depending on the size of the purchase resulting in an average probability change of 44% for all cash payments. However, caution necessitates an assumption that about 25% of these purchases would be such that the customer prefers cash (for anonymity or other reasons) or cannot pay by any type of card, due to special circumstances (although most customers have cards and most merchants accept cards) resulting in 33%.

The use of credit cards would probably be roughly halved. Debit cards and credit cards are perfect substitutes from the payment

perspective, and most cards in Finland are co-branded with both debit and credit options in the same card. The card customer makes the choice at the terminal by selecting the preferred option. The rough price elasticity distribution in figure 7.5 implies an average probability change under the above assumptions varying from 63% to 82%. Although customers have indicated a clear change preference of this size, caution is necessary because customers will in some situations find the readily available card credit tempting and could even negotiate away the payment charge. Therefore a reduction in the probability to 50% for the impact calculation is reasonable.

Apparently at least some cash and credit card services are overpriced today, and service providers would need to adjust their visible charges to be competitive. It is assumed that the merchant cash fee declines to 0.6% on average, which is the current lower bound. The domestic debit card fee is assumed to be EUR 0.04 per transaction and the international debit card fee is assumed to decrease to 0.015% (ie without MIF add-on). VISA/and MasterCard fees are assumed to decrease by about 10% due to competition and the other credit cards fees by about 50%, so as to become attractive alternatives to direct consumer credits granted via debit cards.

The result of these predicted changes are presented in table 7.6.

Table 7.6 **Redistributed volumes and new merchant fees**

	Bank and credit card tariffs	**Volume (2007) millions**	**Value (2007) EURm**	**Merchant fee EURm**
Domestic debit cards	4 cent/trans	675	30 410	27
International debit cards	0.015% of turnover	214	5 406	8
Cash	0.6 of turnover	1 367	10 933	66
MC/Visa credit cards	0.9% of turnover	54	3 350	30
Other credit cards	1.8% of turnover	7	500	9
Totals		2 316	50 600	140
Total average mark-up				0.28%
Merchant cost difference to current total EURm				85–176

Sources: Same as for table 7.3 plus calculations and assumption made by the author.

Based on these assumptions the merchant average markup (visible surcharges) would decrease to roughly 0.28, resulting in an overall cost saving to consumers of EUR 85–176 million per year. These calculations should be seen as a the author's view and a calculation exercise to find the range of attainable benefits via reduced total merchant markups due to decreasing total bank charges as the use of more efficient payment instruments increases. When cash usage decreases, merchants' internal actual payment costs also decrease, resulting in some additional savings. If the cash and credit card usage should decrease more than assumed, the savings would be higher and of course the opposite will hold for smaller actual changes.

Table 7.7 shows how these pricing modifications would change when the embedded charges are changed to visible surcharges. The title line for each column contains the current price. The first line contains the current prices without markups and the second line the new cash price including a cash charge of 0.6%. Debit cards will be granted discounts, which will lead to prices lower than the benchmark cash price, while the credit card payments will have an add-on fee to cover the credit costs.

Table 7.7 **Possible outcome of transparent surcharging of all payment instruments in Finland for different purchase totals**

Payment instrument	Merchant fee	Purchase size €1	€5	€10	€50	€100	€500
Price w/out markup	-0.57%	0.99	4.97	9.94	49.72	99.43	497.15
New cash price	+0.60%	1.00	5.00	10.00	50.01	100.03	500.13
Dom. debut card add on / cut	-06%+€0.05	+0.04	+0.02	-0.10	-0.25	-0.55	-2.95
Int. debit card cut	-0.45%	0.00	-0.02	-0.05	-0.23	-0.45	-2.25
MasterCard/Visa add-on	+0.3%	0.00	0+0.02	+0.03	+0.15	+0.30	+1.50
Other credit cards add-on	+1.1%	+0.01	+0.06	+0.11	+0.55	+1.10	+5.50

Sources: Same as for table 7.3 plus calculations and assumption made by the author.

Cash would be advantageous compared to domestic debit cards for purchases of less than EUR 8. International debit cards would be favourable compared to cash in all ranges and compared to current domestic cards below about EUR 50. Credit cards would become more costly in all ranges and especially for high-value payments.

The cash charge of 0.6% plays a central role in this calculation. If competition were to drive cash service charges (and costs) below .57%, cash payers would also benefit from increased competition at all

payment sizes. In the current situation, cash payers would see no change for payments up to EUR 10, but because 5 eurocent is the lowest nomination used in Finland the rounding up will only be effective on transaction above EUR 8.

7.5 Conclusions and future directions

The current payment industry services show very large variations in efficiency. Old costly services are maintained in parallel with highly modern and efficient solutions. Parallel infrastructures are common. There are numerous tests and experiments with new payment instruments, but the majority of users often prefer the traditional services. Developments seem to be slow at times and faster at other times. Does this reflect customers preferences based on complete or limited information? Would the development patterns change if customers were presented with more transparent charges and cost information?

The current Finnish payment market is mainly based on non-transparent consumer fees, which hides charge/cost differences from the end-users. The current total charges seem to reflect, at least on the general level, the actual cost differences. Embedding bank charges as non-transparent average markups in the prices of merchant goods and services, results in de facto cross-subsidisation among instruments favouring high-cost instruments at the expense of low-cost instruments. The general outcome of such subsidies is that high-cost instruments (cash and credit cards) are used proportionally more than the cost efficient instruments (debit cards). Moving towards transparent charging would probably reduce substantially the total costs of paying.

More empirical studies on payment costs are necessary in order to establish the actual production costs and transparent and non-transparent customer charges. The current cost structures are based on historic developments and an environment with limited competition among instrument alternatives. It would also be important to try to assess the cost levels in case customers were to at least slightly alter their payment behaviour. The current, seemingly distorted volumes result in biased cost structures and levels.

Based on user inquiries, consumers seem to be sensitive to visible payment charges. Statistics also show that customers moved quite rapidly (in 2–3 years) from cheques to debit cards when banks started to charge for cheques in Scandinavia in the late 1980s. Comparing

cash, debit cards and credit cards which each other is not as straight-forward as cheques versus debit cards and cash. How important are the cost factors and how important are other factors? Experiments with transparent pricing for sampled customers could shed some light on the price elasticity issue and get closer to real situations for the broader public than with inquiry studies.

Cash, debit cards and credit cards are not fully comparable products because of the bundling of exclusive additional services, eg anonymity, credits, revoking possibilities etc. Are the current exclusive bundling conventions efficient? Would it be more efficient to unbundle these features and let them be connected to all instruments on equal transparent terms? Why should the costs of credit be directly consumer-payable for some types of payment instruments while for other types the credit costs are distributed also to those customers who reject the credit option.

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www.sampobank.fi: Sampo bank.
www.UnfairCreditCardsFees.com: Merchants Payments Coalition Inc.

Chapter 8

A framework for evaluating mobile payments

Päivi Heikkinen

8 A framework for evaluating mobile payments

Abstract

A great number of mobile payment schemes exist in the market. This paper suggests a framework, based on payment type and technology, to classify mobile payment schemes. The framework supports a definition of mobile payments as a way to use existing payment instruments. Based on the framework, mobile payments' success factors from the payer and payee viewpoints are discussed. In the mobile payments value chain, both banks and mobile operators are critical players, but their business cases are not self-evident. This paper aims at contributing to central banks' need to better understand the functioning of mobile payment schemes and mobile payment markets.

8.1 Introduction and motivation for the study

There is a large number of mobile payment schemes in the market.[1] Rapid developments in technology and innovation, along with technology convergence, are drivers of this diversity. Use of mobile devices in payments has the potential to change the structure of retail payments, and it enables new entrants to the market. Use of new technology raises questions about its reliability and efficiency. For these reasons authorities, especially central banks in connection with their oversight activities, should be interested in developments in this area. Motivation for this article arose from a need to understand better what mobile payments really are, and how these initiatives might change the retail payment landscape.

The purpose of the article is to create a viable framework to analyse various mobile payment initiatives. The framework is based on a review of existing mobile payment definitions, applications and classifications, as found in public information channels and the related literature. Using the suggested framework, we discuss the potential success factors for various mobile payment initiatives and elaborate

[1] See eg Appendix 2 in Mobey Forum (2008), Karnouskos (2004) and Vaughn,P (2007).

the core market participants' role in the mobile payment value chain. Is it possible that the provision of payment services may change due to mobile payments? The article's perspective is that of a central banker as overseer and analyser of payment market developments.

Related analytical literature can be found in payment economics and in research on technology acceptance and diffusion of innovations. Payment economics considers payment systems as part of financial intermediation. Also developments in payment systems and changes in the payment market via new technology have been studied. The industrial organisation of the payment industry is highlighted in the research on network economics, two-sided markets and card payment fees.[2] Some recent studies have analysed attributes impacting a consumer's choice of payment instrument.[3]

Mobile payments have been studied in past years largely from the technology-acceptance perspective. The Technology Acceptance Model was originally aimed at shedding light on organisations' acceptance of new technology, but it has been adapted to consumer research. Perceived usefulness and ease of use are the main attributes for the acceptance of technology. Research on mobile payment services has also recognised the importance of perceived risk and trust as important factors.[4] Most existing research on mobile payments does not distinguish between different technologies or applications by which the payment service is created. This is in spite of the fact that payment-application characteristics greatly influence the consumer's perception of usefulness, ease of use and trust.

As this article is concerned with payments, Internet banking with a mobile device[5] is beyond its scope. Internet banking services are the same, irrespective of the access device, notwithstanding the fact that combining Internet banking services with mobile alerts, confirmations and especially identification is one of the most promising areas of development for banking services.

This article begins with a short, and hardly exhaustive, presentation of various mobile payment definitions and how existing applications in Finland, Europe and globally have been classified. Based on the previous analyses, we describe a payment type based typology for analysing mobile payment applications. The questions asked are the following. What are we talking about when we talk about mobile payments? How does the environment influence the

[2] Kahn,C – Roberds,W (2009).
[3] Eg Ching, A – Hayashi, F (2008).
[4] Eg Viehland, D – Leong, R (2007) – Mallat, N (2006).
[5] So-called Mobile Financial Services (MoFS).

development of applications, and what are the relative advantages or disadvantages of different mobile payment applications compared to existing payment methods? With a focus on developed countries, a short evaluation is made of the potential success factors of these initiatives and which technologies and payment types are likely to succeed. By describing the value chain of mobile payments the article highlights the different roles of banks and mobile operators in mobile payments. In conclusion, possible implications of the regulatory framework and developments in payment industry structure are discussed. Some abbreviations used in this article can be found in the appendix.

8.2 What are mobile payments?

In every-day language 'mobile payments' refers to any method of paying that involves a mobile handset. The wide definition, by Dewan and Chen, classifies a payment as mobile if the payment is made using mobile devices, including wireless handsets, PDA or RF devices or NFC-based devices.[6] This definition includes the different available technologies and does not limit a mobile payment to mobile phones, but eg the NFC application may be attached to anything a person carries with him, such as an mp3-player, key ring or wrist watch. By this definition, a card payment with an NFC chip embedded in the plastic should be considered a mobile payment. This definition clearly does not support a deeper analysis of market development.

The European Central Bank has defined mobile payments as a sub-group of e-payments, where mobile phones or other wireless communication devices are used to access accounts and to use payment services.[7] This definition recognises the user interface as a significant criterion for mobile payments, though no distinction is made between the different applications. Moreover, payment services are not defined, and any general or proprietary system can be included.

Mallat defines mobile payments as the use of a mobile device, commonly a mobile phone, to make a payment, where funds are transferred from payer to payee, either via a bank or directly, without an intermediary. This functional definition considers mobile payments

[6] Dewan, S G – Chen, L (2005).
[7] ECB (2004).

as a payment instrument comparable to credit transfers, direct debits or card payments.[8]

The above definitions are vague for two reasons: mobility is defined too broadly, and the characteristics of a mobile handset – eg SIM card, display or keypad – are ignored. The definitions also ignore the fact that it is possible to create many differing payment applications for a mobile handset. This article treats mobile payments as a channel for payment services rather than a payment instrument or scheme. A mobile handset can be considered a carrier of various payment instruments; as a technological platform, it adds some elements to the usage and management of the payment instrument in question. As described in the following, the classifications found in existing literature seem to support such an approach.

8.2.1 Mobile technology-based classification

Technological development and convergence have turned modern mobile phones into a bundle of technical options: the same phone can be used in a GSM-network for calls, SMS-messages or WAP-connections, or it can be used to transmit data or as an Internet browser through GPRS, 3G or 4G connections. It can also use WLAN and (in future) WiMAX to connect to the Internet in local networks.[9] Short distance communication technologies like infrared, Bluetooth, RF[10] or NFC[11] are embedded in the phone. A payment application may be used with any of these technologies. Chip technology allows different applications with the phone, whether a plain SIM card is used or the multifunctional UICC chip,[12] which allows the use of a secure element[13] in payment applications. The secure element may also be embedded in the phone itself. Communication between chip and phone is developing rapidly and creating new possibilities. In

[8] Mallat, N (2006).

[9] This paper does not distinguish between 2G, 3G and 4G applications of packet oriented mobile data services such as EDGE or UMTS. The next generation, like WiMAX , is also not discussed separately.

[10] RF radio frequency chip is a chip readable over a short distance, Smart Card Alliance 2007.

[11] Near Field Communication, a chip capable of both being read and reading other NFC-tags, MobeyForum 2008.

[12] Universal Integrated Circuit Card, smart card platform for wider mobile or other service offerings,MobeyForum 2008.

[13] Secure element is a combination of hardware, software interfaces and protocols that enable secure storage and use of credentials. It forms a platform where applications can be installed, personalised and managed, MobeyForum 2008.

addition to these, separate devices may be attached to the phone to facilitate payments.

NFC applications may require contact with an RF reader or may operate contactless. Earlier, the NFC applications used in mobile phones were realised by adding an RF chip to the phone's cover. Today, it is possible to integrate the NFC application with the same multifunctional chip that carries the SIM or with a separate UICC in the phone. There have been trials with dual-chip phones, where the other chip carries the payment application. These trials have, however, not covered long periods.

Table 8.1 **Existing mobile technologies and some examples of payments based on them**[14]

Mobile technology:		Examples of payment applications:
GSM	fixed radio connection	Sms-based payment applications like ringtones or Helsinki public transportation, or mobile-PayPal
GPRS + 3G/4G	packed data transmission	Payment application embedded in chip together with sim, using secure element or not. Sms-based solutions like Banxafe or UICC-based as described by MoneyForum. Browser based Internet-banking.
WLAN + WiMAX	short distance wireless internet connection	Browser based Internet-banking, web-payment.
RF-chip	radio frequency transponder for NFC, either as separate device in mobile handset or embedded in UICC.	I-mode, Visa Contactless, MasterCard, PayPass, public transportation like Octopus, Oyster

The variety of very different technical options for mobility and existing applications renders a definition based simply on the presence of a mobile phone rather fuzzy. From the technology perspective, the mobile phone is more of a channel or a carrier of a payment instrument than a payment instrument per se.

8.2.2 Usage-based classification

Mallat classifies mobile payments according to the environment (remote vs proximity), size of payment, and method of charging: prepaid, real time or post paid, according to table 8.2 below.[15] The

[14] This table is produced by the author and may not be complete in terms of technology or applications.
[15] Mallat, N (2006).

same attributes have been used commonly in articles describing new payment applications.

Table 8.2 **Mobile payment categories and examples**

Environment	Value	Charging / Application examples	Mobile payment system examples					
			pre paid			real time	post paid	
			pre paid account	mobile account	RFID chip	direct debit	credit	billing
Remote Internet, mobile, mail, order, TV, papers	micro	music, pictures, games, parking, public transport	Pre-paid call / sms; PayPal mobile	Mobile money	i-mode FeliCa	Peppercoin; Pay-box Austria	Mobi-pay	HKL mobile ticket; Mo-neta (slo)
	macro	goods, services, subscriptions to contens, ticketing						
Manned POS	micro	newspaper, milk						
	macro	fast food, groceries						
Unmanned POS	micro	vending, ticketing, cigarettes	Pre-paid call / sms				Post-paid call / sms	
	macro	ticketing						
Proximity P2P	micro	lending money	PayPal mobile					
	macro	splitting a restaurant bill						
Remote P2P	micro	lending money						
	macro	weekly allowance to children						

The picture again shows the wide variety of possibilities for initiating a payment using a mobile device. Money remittance applications are not even listed by Mallat. The environment or payment size seems to differentiate poorly between applications; most existing mobile payment schemes could be used in all environments. This classification does not take account of how the applications are used. However, the mode of settlement seems to be an attribute capable of differentiating between existing applications.

This classification reveals the heterogeneity of mobile payment applications, but it does not support the view that the use of a mobile device as such could define a payment instrument.

8.2.3 Payment type-based classification

Paying is about transferring funds irrevocably between payer and payee. When done in any other format than by hand-to-hand exchange of cash, the activity is closely regulated. It also requires a trusted

service provider to guarantee the flow of funds. In traditional terms, the financial industry, banks and payment card companies, have played the role of trusted service providers and settlement agents. When paying with a mobile handset, mobile operators have also assumed this role. In the following, the existing mobile payment schemes are discussed from the payment-transmissions perspective.

Air-time-based mobile payments are typically calls or SMS to toll numbers that trigger a decrease in prepaid balance on SIM-card or an increase in the mobile bill. In other words, they are billing systems. Final settlement of the purchase occurs when the phone bill is paid and the operator transmits the fee to the provider of the service or product, be it ring tones or a can of soda. This type of payment intermediation puts the operator outside of its traditional role, and on a larger scale may require a licence (eg as a payment institution after the implementation of Payment Services Directive in Europe). Air-time-based payments also easily reach the upper limit of the SIM-holder's credit, effectively preventing the wide use of this type of payment.

Account-based payments may be provided by either a financial institution or a separate mobile payment company. Until now these companies have often been seen as electronic money institutions, at least in Europe.[16] In an account-based model, the payer may have a separate account via which he transfers funds for his mobile payments.[17] This creates a proprietary system, where the funds in the mobile account are usable only in the mobile payment scheme in question. The payment is usually initiated with an SMS, where the payment-service provider recognises the payer by his telephone number, or by using a separate application with credentials in the SIM-card. A basic payment often requires several SMS messages: the payee first transmits the purchase information to the payer, who confirms the transfer of funds, after which confirmations are sent to both parties. This type of payment seems lucrative from the mobile operator's perspective, but the payment process itself is both slow and vulnerable, if any of the required SMS-messages is not successful. Examples of account-based mobile payments are the Finnish Digiraha, Belgian Banxafe, PayPal Mobile and the money transfer applications such as M-Pesa in Kenya. In Austria (PayBox), it is also possible to generate one-off direct debits with this type of payment.

[16] The Payment Services Directive could also allow payment institutions to act as service providers at least in some applications.

[17] Account-based model could also be called the credit transfer model, as payments between accounts are executed either in a proprietary system or as normal credit transfers between payer and payee.

The payment card industry has also been interested in developing new ways to make card payments, eg by using the mobile handset. Use of contactless chip technology, with EMV-standard or lighter solutions makes it possible to use almost anything as a carrier. Over the years, several trials have been done with a payment card application embedded in the cover of the mobile phone, with dual-chip phones or multifunctional chips. The transaction itself, however, is executed using the four-corner model of card payments.[18] Basically, the mobile handset carries the payment card application, and communication with the payee occurs with NFC, eg by 'tapping' the terminal with the phone, or by sending the card data to the terminal using the secure element in the multifunctional chip.

Payment type is a natural approach from the central bank perspective. It seems to differentiate between various mobile payment schemes and, combined with the technology choice, it is used to create a framework for mobile payments, as discussed below.

8.2.4 Suggested definition and framework for mobile payments

Based on previous analysis, one might well suggest a new definition for mobile payments, where the use of mobile device is viewed as a channel for payment services. One formulation might be: 'Mobile payments' refers to the use of payment services other than Internet banking, using a mobile handset, its chip, keyboard and display.

As described in Section 8.2.2, mobile technologies provide a rough basis for classifying mobile payments: any type of payment may be done with all available technologies, and these technologies may even converge or be present at the same time. Most existing SMS or phone call-based applications should be classified as billing systems.

The usage-based classification discussed in Section 8.2.3 makes a distinction between proximity and remote payments as well as between prepaid, real-time and post-paid applications. Most existing applications may be used either at the place of purchase or remotely. The main difference is in the usage experience: many of the applications are rather clumsy at the counter, but may be more useful

[18] In the four corner model, the payment is processed separately by acquirer for merchant and by issuer for card holder, the card scheme defining how the transaction and its settlement are carried out between issuer and acquirer. Further information is found in a vast payment card literature, eg Chakravorti, S (2003) and Hunt, R (2003).

in a remote payment situation. RF technology, however, can only be used in proximity payment situations.

Usage-based classification also includes the prepaid, real-time or post-paid alternatives. The point of time when the payer's bank account is debited does not give specific guidance in evaluating the functioning or usability of mobile payment applications. Rather, it seems logical to use the payment type described in Section 8.2.3 as the second criteria for classification of the different mobile payment applications. This approach with the suggested definition of mobile payments, captures the fact that many mobile payment applications are variations of existing payment types (like direct debits, credit transfers or card payments). It also enables comparison of various initiation channels or techniques by keeping the payment transmission process as constant. Based on these elaborations, a classification based on the mobile technology employed and the payment type seems to provide a viable way to analyse mobile payments (Table 8.3).

Table 8.3 **Suggested classification of mobile payments**

	SIM-based applications	UICC based application	NFC-based applications
Operator billing	ringtones, charities, Helsinki public transportation (FI)	No applications yet	RMV-Handy-Ticket für NFC (DE)
Money remittance (cash sent)	M-Pesa (KE), Western Union Mobile Money Transfer Service	No applications yet	not applicable
Credit transfers	Banxafe Pay2Me (BE), PayBox (AT), Rabo Mobile (NL), China rural, Wizzit, First National Bank (ZA)-Mango, GXI (PH)	No applications yet	RMV-Handy-Ticket für NFC, direct debit (DE)
Card payments	Mobipay (ES)	No applications yet	Visa Contactless/payWave, MasterCard PayPass, Payez Mobile
Account-based proprietary systems	Mobile PayPal, Digiraha (FI), Obopay (US), Sendairtime (UG)	No applications yet	Osaifu-Keitai (JP), EZ-Link (SG), Public transportation

The large number of mobile payment applications fit quite well within the suggested framework. Information about the applications was collected from public sources (see footnote 1 and the applications Internet pages) and may not be totally accurate. However, the over-all fit should be reliable. This framework also highlights the preferences of various service providers: card schemes seem to focus on payments using NFC-technology, whereas mobile network operators (MNOs) and money transmitters rely on SMS-messaging.

8.3 Evaluating mobile payment solutions

The starting point for developing mobile payments has been the ubiquity of the mobile handset,[19] and, just as in the early stage of innovation, competing solutions are tested. All analysis of existing applications is bound to be outdated before publishing. We still cannot know which applications will prevail, but there seem to be some indications for the future.

In developed countries, payment business is a highly saturated market. Both consumers and businesses have various ways to make and receive payments. Most of the established ways are provided by financial institutions, including payment card companies, and few people are unbanked, ie lack banking possibilities. Cash provides a universal means of payment in cases where non-cash payments are not viable. New ways to make payments must prove their advantages to consumers, merchants and payment service providers, meaning that they face tough competition in the market.

A different situation is found in developing countries, where financial services are not commonly available, the majority of people are unbanked and no broadband connections for Internet or other services are available. The value of the typical payment is usually very low, a few eurocents. In this environment, however, mobile networks do exist, and the handset manufacturers' investment in low-cost mobile phones may enable the making of payments in areas where no such possibility has existed before.

With the starting points so widely separated, there will hardly be a single way forward for mobile payments. At least in the short run, the development will take separate courses in these two environments.

In developed countries, comparison to existing payment instruments may provide a good framework for evaluating various mobile payment initiatives' potential to success. In the following, initiatives are discussed according to the framework presented in table 8.3.

In order to succeed, a mobile payment method must provide all participants in the payment value chain an incentive to use it. The incentive may be financial – savings or profits – or gains in efficiency

[19] According to public sources, mobile phone penetration in Western Europe is over 100%, in the USA about 80% and globally some 50%. (Reuters 2008a and Reuters 2008b, Digitoday 2008. In developing countries, the penetration is lower but growing rapidly. In Africa the penetration was, however, about 8–9% and in South of Sahara just some 5% in 2005 (Finnfund, 2005). In many Asian countries the penetration level is about 30%.

or ease. The financial incentives are divided into investment cost and usage cost. As gains in efficiency or ease, attributes such as usage experience, speed, availability and security are discussed. According to the chosen framework, the payment processing, the settlement of payments, is kept constant, and each technology is discussed from the payer's and payee's viewpoint in Sections 8.3.1 and 8.3.2. The characteristics of different payment schemes are discussed from the payer's – or mobile phone user's – and from the payee's (usually merchant's) viewpoint in Section 8.3.3.

8.3.1 Mobile payment applications – payer's viewpoint

Table 8.4 **Mobile payment applications – payer's viewpoint**

	SIM	UICC application	NFC
Easy to get	☑	?	?
Easy to use and understand	☑	☑	☑
Safe, reliable	Prone to errors, delays	☑	☑
Widely accepted	☑	Investment required	Card infra can be used
Cheap	☑	?	?

For the consumer, a payment instrument must be easy to get, use and understand. It must also be widely accepted as a payment instrument, as nobody wants to experience disappointment at the counter when an item has been selected but, in spite of means, cannot be paid for. It must also be safe from criminal use or technical disturbances. Both industry's anecdotal information and some studies strongly suggest that price elasticity of consumer demand is high in payments. People do not want to pay for paying.[20]

SIM-based applications are mainly SMS-based. Whether billing, credit transfer or card payment in the settlement, they fulfil many of these prerequisites. SMS-based paying is indifferent to the type and age of mobile device, and no investments are needed. SMS-messaging is also widely used. These are likely the reasons why eg money transfer systems rely greatly on SMS.

[20] The relevance of these attributes has been confirmed in academic research on mobile payments using the technology acceptance model, eg Viehland, D – Leong, R (2007).

The handicaps of SMS-based paying relate to the eventual errors and delays in messages. Moreover, the user interface, which usually involves extensive manual typing, is not optimal for everyone and certainly does not lend itself to the shopping environment.

The security of SMS-based applications may also be questioned. To reach the security level of traditional credit transfers, one needs a secure element and a specific application in the mobile device. The multifunctional UICCs provide a technical platform for this. However, getting a new chip or separate devices and applications for the phone generates an investment cost for the payer – if not as a direct fee, then as the burden of getting the application. Eg according to the Rhein-Main Verkehrsverbund experience, the most problems in their billing-based mobile payment system occurred during the installation of the required software.[21]

So far, there are hardly any known applications based on the multifunctional chip (UICC), other than combined with NFC. However, this platform has the potential to obviate many of the weaknesses of SIM-based payments. Potential success would emphasise the ease of obtaining the chip and applications, ease of use and understanding of the payment procedure, as well as reasonable pricing. Eg the need for typing should be minimised, to create a fluent user experience. Perhaps the amount of manual typing in EMV card payments at POS can be used as a benchmark. Especially the use of the secure module makes it possible to create a method for payments of different sizes and environments. As proprietary payment schemes limit its usage, general schemes, such as credit transfers or card payments with wide interoperability, would provide the best basis for UICC-applications. When creating these applications, special attention should be given to the separation of payment applications from the voice- and data-transmission. Otherwise the use of company phones effectively prohibits the use of personal payment applications.

NFC-based payment applications have so far been card payments, either proprietary and usually pre-paid, such as for public transportation, or general, like international credit cards. The use of NFC is easy: ‘tap and go’. NFC-based payments could be used without payer confirmation (pin or signature) for smaller sums, but larger payments would require more secure separate confirmation, in accordance with the rules of current card payment schemes. When used for card payments, the existing infrastructure and acceptance

[21] Preuss, P (2007) NFC@RMV, a presentation given by Peter Preuss, RMV, in New Payment Channels Conference, London, 2007.

network are available, making the launch of the service relatively uncomplicated.[22]

The main questions about NFC-based applications relate to receiving the payment application, delivery of the NFC-device, possible security of pin at payment terminal and its cost to the user.

As described in Table 8.3, most non-payment card applications are currently based on SMS. UICC-based applications seem to be efficient due to the possibility of enhancing payment safety, easy user-interfaces and the ability to embed a NFC application in the same chip. SMS-applications, either text or voice for illiterate users, seem to provide the best technical environment for money transfers and other payment systems in developing countries, where these systems are mainly run by MNOs. However, in developed countries, payments that make use of existing settlement infrastructure and with easy and reliable payer interface could best be created with UICC.

8.3.2 Mobile payment applications – payee's viewpoint

Table 8.5 **Mobile payment applications - payee's viewpoint**

	SIM	UICC application	NFC
Minimum investment	☑	?	Card infra can be used
Optimise liquidity	?	?	According to card payments
Safe, payment guarantee	?	Secure module allows Enhanced guarantee	☑
Widely accepted	☑	?	☑

There is no direct source of attributes that payees consider important when choosing which payment instruments to accept. According to industry experience, a payment must be secure and preferably guaranteed by the payment service provider. It must be fast for both better customer service and for optimising the liquidity. It must also be easy to install, with minimum investment, and it should have a wide user group. Payees are as unwilling to pay for payments as are payers. From this perspective, NFC-based payments seem to be best positioned to fulfil the requirements.

[22] European mobile payment experience in the framework of the Single Euro Payments Area seems to be going this way.

Most general payment schemes using NFC are card payments where the merchant only needs an NFC-reader. Otherwise the existing payment card terminal and acquiring technology may be used. Operations at the counter may be faster with an NFC than with other cards or cash. Electronic accounts are always easier for the merchant than cash. There is an ongoing debate about merchants' fees for card payments, but compared to alternatives, at least the tariffs, schedules and rules are familiar and most often guaranteed. However, NFC payments can only be used in proximity.

It is possible to build various payment applications based on the UICC, for both proximity (NFC) and remote use. Payee's requirements for fast, secure and investment-free payments can be met with credit transfer, direct debit or e-payment. The UICC seems to provide good possibilities, but unless developed by the payment industry jointly, no general, sufficiently widely accepted payment method can be achieved. Also, the need for no or low investment for payees must be kept in mind.

8.3.3 Comparison of mobile payment services

From the consumer's point of view, MNO billing systems offer a practical way to pay for certain items or services, such as ringtones or display logos for phones. As a matter of fact, it is difficult to imagine that this type of low value mobile content could be paid for with any other payment instrument: credit transfers or card payments are too expensive for small sums like the ones in question and are not always available for the major users of these services. An advantage is that the billing/paying happens in real-time with the delivery. The possibility to bill the customer in real-time is important also when funds are collected for a charity or a public transportation ticket is bought – if there were more time to think about the expenditure, the consumer might have regrets and not buy the service or make the donation after all.

The flip-side of billing system benefits is the willingness to combine various expenditures on the phone bill. MNOs have been forced to provide customers with various services with restricted balances or usage: these have been required by parents with heavy-mobile-usage children or companies wanting to restrict the use of toll-numbers or other fee-based services with company phones. Also, in case of disputes, it may not be self-evident or easy to sort things out between service provider and MNO.

Account-based services, when not linked directly to the payer's current account (ie proprietary), may be clumsy: to transfer funds to a separate mobile account is an extra step in making payments. These funds are typically not credited with interest, so there is no incentive to deposit larger sums 'just in case'. Usually both payer and payee must be participants in the same scheme, which means that these payment instruments are actually not general, that is, widely usable. Due to these handicaps, the general card payments and credit transfers/direct debits are the most promising payment instruments to be applied with the mobile.

Proprietary account-based systems may be useful to payees when no better alternative is available. Critical factors are the investment costs and how fast the payee is able to convert his funds from the proprietary system to general payment systems for interest or other use. A transaction between current accounts would most likely be the fastest and cheapest method (analogy with credit transfer, direct debit or debit card).[23]

From the payee's viewpoint, MNO-based billing systems seem uncomplicated: the payment instrument is widely available and no investment is needed. The payment instrument can be used both remotely and in proximity. The MNO disburses the billed amount the payee according to a bilateral agreement. However, the service provider's negotiating power with the MNO may be unbalanced and there is no explicit knowledge about the fees MNOs charge for billing service or the timing of fee crediting or the credit risk involved. The billing systems seem to be suitable for a limited area of services, as described earlier (mobile content, charities, ad hoc ticketing), but it seems unlikely that this type of paying would expand, in spite of trials with some vending machines.

8.3.4 Conclusion for payer and payee viewpoints

Based on the above analysis, one could say that operator billing and SMS-based payments have played a role in the early stage of mobile payments development. They may also have a prevailing role when no better payment instruments are available: according to experience, such services are low value, ad hoc and remote. Proprietary account-based payment services have filled a gap in the payments market, but by all measures the financial industry (banks) would be far better

[23] These conclusions are supported by eg Mallat, N (2006).

positioned to provide payment services between current accounts in a reliable and safe way: the advantages of a general payment infrastructure for a larger network and better liquidity management are obvious. This, however, will require far more determination by banks to develop these services and applications using the secure module and a multifunctional chip in the phone.

For proximity payments, the NFC provides unique benefits, and NFC-based card payments seem to be commonly acknowledged as the next generation of payment services. Again, the existing payment infrastructure has a huge advantage over any other form of payment.

All this analysis applies to the developed countries' payment landscape. The situation changes dramatically in the absence of financial services and with completely different payment needs. In developing countries SMS-based money transfer services which can be used with any handset and easily redeemed for cash by a wide cooperative network are in a position to make a huge difference in the everyday lives of individuals, both payers and payees. As a matter of fact, they enable the emergence of economies in areas where that has not been possible before, irrespective of the service provider. The impact of this type of payment service may be compared to the impact of micro financing in many developing societies.

8.4 Mobile payment value chain

The introduction of a new way of initiating payments has the potential to change payment systems and the use of payment instruments. From the authorities' viewpoint, it is interesting which payment types – credit transfers, direct debits, card payments or proprietary payments – are growing and which may be declining. New ways to pay also have the potential to change the structure of the payments industry, the roles and participants of the service provision. These potential changes are discussed here based on the value chain concept.[24]

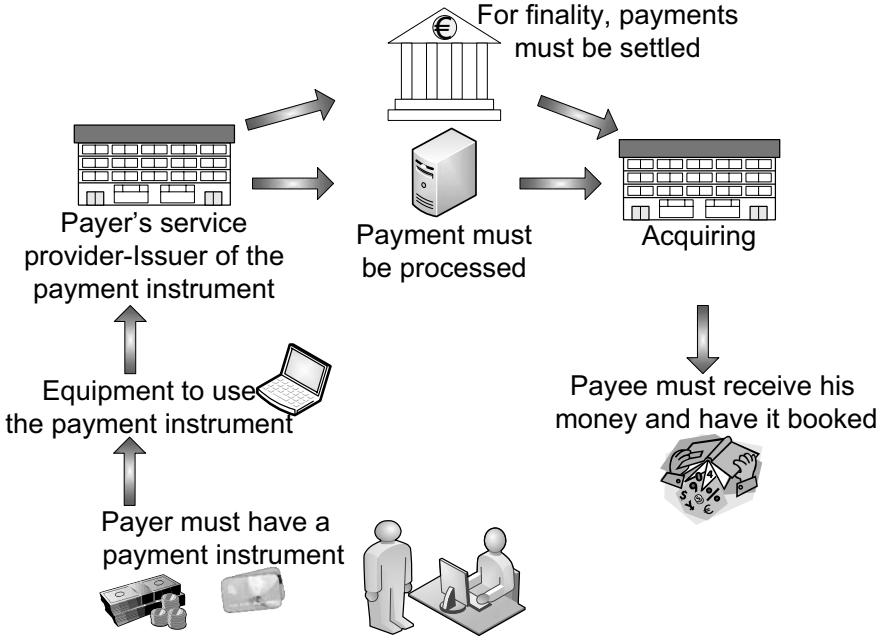
In a basic payment value chain, the participants are the payment service provider, payer and payee and eventual service providers for these participants (Figure 8.1). In the traditional payments environment, the value chain is dominated by the financial industry, banks and payment card companies. When the mobile handset is introduced, new participants emerge at both ends of the value chain (Figure 8.2): mobile device manufacturer, application and terminal

[24] Porter, M (1988).

provider and mobile operator. This is true also for proprietary account systems, where there is a transmission between the general payment system and the proprietary system. These new participants are not dominated by the financial industry, which is a challenge to banks. The concept of mobile payment ecosystem sheds light on the new structure of the payment industry in a mobile world.[25]

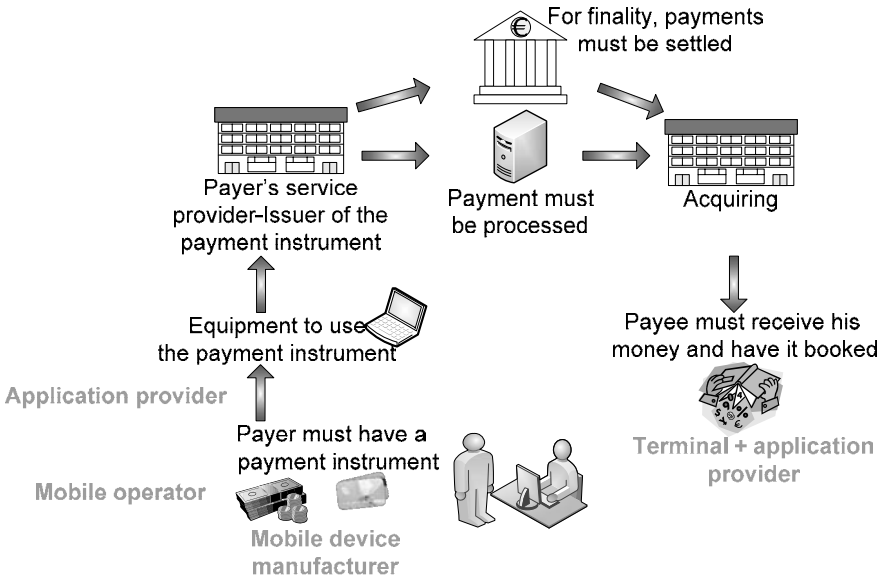
The changed value chain also demonstrates the fact that the use of a mobile device influences mainly both ends of the value chain – the payer and payee environments – while the payment transmission remains constant. This conclusion supports the chosen framework, where mobile payments are considered just a new way to initiate payments. But it also says that the use of the mobile handset in payments does not automatically streamline the payment process but does introduce new participants who need their share of the revenues generated. With end-customers unwilling to pay for paying, the business case for mobile payments may be challenging. This approach may contribute to future research on eg the efficiency of mobile payments.

Figure 8.1 **Traditional payment value chain**



[25] MobeyForum (2008).

Figure 8.2 **Mobile payment value chain**



The main players in the mobile payment value chain are financial institutions and mobile operators. The final success of mobile payment services depends on the cooperation and power-plays between the two entities. Terminal and application service providers will follow the leader, whichever it is. A fruitful outcome might be balanced cooperation between the two. However, based on previous experience from banking and insurance or retailing, cooperation for synergies across business sectors is not always rewarding.

8.4.1 Financial institutions' role

Financial institutions manage the payment systems. However, they do not offer payment services in a vacuum but rather as part of a bundle of financial services: accounts and credit. In many cases, payment services are considered a side product for overall customer profitability. Payments are developed either to increase internal efficiency or to attract customers to the institutions' other services. This may be one reason why banks tend to lag behind mobile operators or even card companies in mobile payments. Financial institutions have been facing a stream of sizable mandatory changes during the last decade: starting with Y2K, the euro in Europe, and new

accounting and prudential requirements. There has not been much space for product development in payments. This is notwithstanding the fact that without payment services banks would lose the tight daily connection with their customers. It is very much in banks' interest to keep the payment industry in its core business and sphere of dominance.

Payment card companies' main product is credit next to payment. Though most of the mandatory requirements described above also apply to them, in times of economic boom they have been in a better position to look at new technologies. Card companies compete fiercely with each other, which creates an incentive to develop new products for customers. This probably explains why the payment card companies have been so active, and why most payment applications for mobile handsets have been launched by card companies.

8.4.2 Mobile operators' role

Mobile operators are the ones in charge of the SIM-card, and in many countries they also dominate the handset markets with their combined product offerings. Their main income source has been fees for calls and data transmission. For these obvious reasons, MNOs have put much effort into finding ways to generate new business. Having the customer base and billing systems in place, payments have been a natural area to explore. Concerning SMS-based payment applications, the revenues are generated in two ways: from payment service fees and from increased SMS traffic.

Comparing the roles of financial institutions and MNOs, there are similarities but also fundamental differences: the financial institutions own the payment transmission channel and the MNOs own the payment initiation tool [SIM, (UICC delivery) handset]. Both have a customer base, but their customer contacts differ greatly: while a normal bank customer uses his web bank 4–5 times a month,[26] checks his balances and uses his payment cards on regular basis, a MNO customer hardly has a single contact with his service provider unless there is something wrong with his invoice or pre-paid top-up. Customers, both consumers and businesses, are accustomed to financial institutions' services regarding payments, they have established ways of using such services, and there is a certain amount

[26] According to informal industry information, this is the average usage of a Finnish web bank customer.

of trust in the industry. MNOs lack these advantages, and they must create the acceptance network from scratch. MNOs also enter new terrains when expanding their credit line per customer: typically MNOs have lots of customers, but the credit risk per customer is relatively low. When entering the payment industry, the per-customer credit may increase, creating pressure for financing and capital.

The regulatory framework also restricts the MNO's possibilities to expand its business: at least in Europe, to act as a general payment service provider, a MNO must become either a credit institution or a payment institution. This requires the fulfilment not only of capital requirements but also of other supervisory and information requirements.

8.4.3 Cooperation of financial institutions and mobile operators

A successful mobile payment application requires the key competences of the two industries, the financial sector and MNOs. According to EPC, there are over 6000 banks that are active in the payment industry in Europe.[27] GSMA represents about 850 MNOs.[28] For a general method of paying with a mobile all, or at least the vast majority, of these market participants should be linked with technical interoperability and common rules. This can be achieved in several ways: the financial industry may expand into the mobile industry (Rabobank + Rabo Mobile), mobile industry may expand into the financial industry (NTT DoCoMo), or they may create alliances, either led by one or through a third party. The Mobey Forum Mobile Business Ecosystem[29] identifies the function of a Trusted Service Manager (TSM) as balancing and bringing together various payment service providers and mobile operators. A TSM structure could ensure interoperability between different mobile networks and payment schemes. It also brings one more participant into the value chain. Currently, there are some companies providing this type of service.[30] However, they can gain a position in the value chain only with the consent of both banks and MNOs.

[27] EPC (2008).
[28] GSMA (2008).
[29] MobeyForum 2008.
[30] We are aware of Venyon, Gemalto and Motorola services.

Non-SMS-based payment applications require a delivery process for bringing the payment application to the payer's handset. This is one of the key factors in the success of a mobile payment application. There, the analogy with existing payment instruments does not provide very good guidance, and new models and processes are needed.

When getting a mobile handset, the MNO provides the phone holder with SIM subscriber identity module, which enables the use of the phone. To make the payment application a natural part of the mobile handset, the platform should be delivered at the same time with the phone and the SIM. Unless banks want to start delivering mobile handsets or UICC chips to their customers, the MNOs have the critical role in the value chain for facilitating the payments platform. Another option is a dual-slot phone, where the SIM and other applications are located in different chips. This requires the phone manufacturers' clear stance in preferring this option. So far, the phone manufacturers have not seen enough demand for such differentiated products, but if the cooperation of the MNOs and payment industry does not prove fruitful, there might be a willingness to reconsider.

The payment application can be readily available in the UICC. It may also be loaded into the chip at a later stage, either by visiting a service provider or over the air (OTA). Management of OTA services is a core competence of TSMs. However, when upgrading the chip with sensitive data, eg e-identifiers or payment application data, the customer must be positively identified. Hence, a stepwise approach is most likely required: the customer verification tools are delivered to the platform in face-to-face contact, whereas payment applications may thereafter be uploaded OTA.

Compared to existing payment schemes, the mobile schemes require participation of at least one or possibly two other players, who both need to get their share of the revenues. If end-customers are not willing to pay more for the mobile alternative, its success is dependent on the service providers' ability to agree on how the available revenues are divided, ie the cake does not grow bigger by introducing the mobile, but it must be divided between more participants than before. Without solving this dilemma no bank-MNO-TSM cooperation model can work.

Industry convergence has proven successful in Japan, where NTT DoCoMo has introduced banking services to support its mobile payments. In Europe, this has not yet happened, but the current financial turmoil may enable MNOs to expand their operations to payments. In the Netherlands, Rabobank has its own MNO, RaboMobiel, which enables SMS-based payments and the linking of

mobile payments to the general payment system. It might be too daring to speculate about the future, but since the previous industry convergence happened between insurance and banking in investment services, the next wave may be between mobile operators and banking in payment services. Such a development would only be logical, considering the great dependency of banking on ICT in general and especially in payments. The main question is, in which terms is such cooperation or convergence happening.

8.5 Conclusions

This article analyses the current supply of payments initiated with a mobile handset from the payments, technology and value chain perspectives, using existing market information and a review of the literature. There seems to be justification for redefining the concept of mobile payments. This article suggests that mobile payments should be defined as the use of payment services other than Internet banking with a mobile handset, its chip, keyboard and display. This definition is very close to the ECB's definition, but it recognises the mobile phone's characteristics as an element in the definition. With this definition, the mobile handset is understood simply as a tool for accessing various payment services.

As a result of this elaborated definition, payments initiated with mobile handset are just payments: card payments, credit transfers or a proprietary system's payments. Hence, no separate regulation should be needed to ensure their reliability: existing regulation on retail payment services should apply. Similar requirements for reliability, contingency, security and anti-money laundering must apply to all payments, irrespective of the way of initialising them or the operator providing these services. Also the institutional requirements should be the same.

When analysing existing mobile payment schemes from the end-users' (payer and payee) perspective, it is clear that schemes that utilise existing payment infrastructure – card payments or credit transfers – are best positioned to evolve into widely accepted payment methods. As security plays an important role in customers' acceptance of new technology, the use of a multifunctional chip (UICC), or development of an in-phone embedded secure element provides the best platform for payment applications. NFC for card payments could be the easiest application to spread through the economy. In developed countries, mobile payments compete with existing payment

methods, and ease of access and use are prerequisites for a successful mobile payment scheme. End-users' price sensitivity creates a challenge to viable business models.

There are good arguments favouring the banking industry as the service provider also for mobile payments. For quick adoption of a new payment method, banks have the trust, the customer relationships and the acceptance network of existing payment instruments as their advantage; banks have a close relationship with end customers, both payers and payees. Their comparative advantage is also in the reliability and familiarity of their payment services – introduction of a new way of initiating payments could be fairly easy.

For reasons like numerous mandatory changes or the role of payments in banks' service portfolio, the banking industry has not been very active in developing mobile payments, and payment card companies and mobile network operators have created most of the existing services and trials. The leading role in retail payments is critical for banks' other businesses, accounts and lending; hence it is important for the banking industry to carefully follow developments in mobile payments and to make use of its comparative advantage in the area.

MNOs are best positioned to deliver the payment application platform to the customer, be it embedded in the phone or in UICC. A separate NFC chip could theoretically be delivered separately, but without a fully standardised phone-NFC interface, it could not make use of the phone's or UICC/SIM-cards' intelligence. That kind of application would undoubtedly be only of rather limited use.

For MNO-centred mobile payments to spread widely across consumers, MNOs should be able to cooperate. For a general payment instrument, MNOs need banks' settlement and payee network. It is difficult to see how any of the two main players could create mobile payments alone. However, eg under European jurisdiction, MNOs have an option to become payment institutions and claim access to sufficient retail payment systems in order to bypass the banking sector. This could lead to banks loosing part of the payment industry to these new institutions. It remains to be seen if any of the Trusted Service Managers can create enough coverage – banks and MNOs – to become an integrating player in the mobile payment market.

In all cases, use of the mobile handset in payment initiation introduces new participants into the payment value chain. All these new participants must see payments as a lucrative business area in order to participate. This, however, creates pressure on fees imposed on end-customers, payers and payees. Traditionally, end-customers are very sensitive to payment instrument pricing, and in developed

countries they have alternative ways to pay and get paid. All mobile payment systems face the challenge of a viable business model in a highly competitive and fee-sensitive environment.

The different environment in developing countries requires a different approach by market players. Currently in many cases the MNO has created a payment system where its own shops or other cooperators act as service points, ie redeeming air-time for cash and vice versa. This has been enabled by the different regulatory environments in these countries – in developed countries such services would require a banking licence. For the benefit of developing countries' mobile payment users, it is important to create sufficient regulation for these payments. The developed countries, however, do not necessarily provide a good example, as the difference in environments must be taken into consideration. The benefits generated by current mobile payment systems certainly exceed their risks, even though they would be unorthodox by developed-country standards. In time, when balance between banks and mobile operators is achieved, there will be no obstacle to this type of scheme becoming viable also in developed countries.

From the central bank viewpoint, the operations of mobile payments and their linkage to payment systems and business models are an interesting area for further research. Mobile payments have the potential to change the payments landscape and also the structure of the payment industry. Oversight of payment systems is focused on the smooth functioning and efficiency of payment systems. Many central banks also have a role as catalyst for further development of payment infrastructure. In these capacities, the central banks need further information and understanding of both the functioning of various mobile payment schemes and the conditions and functioning of mobile payment markets. This article questions the efficiency of mobile payments with a view to the mobile payments value chain. Elements of efficiency, costs and revenues – from both the end-users' and service providers' side – would deserve deeper analysis. Hopefully, the framework presented here will prove useful for that purpose.

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List of abbreviations:

EMV, global standard for credit and debit payment cards based on chip card technology, www.EMVCo.com.

NFC, Near Field Communication, a chip capable of both being read and reading other NFC-tags, MobeyForum 2008.

OTA, over the air service provisioning, a method of distributing new software updates or settings to mobile handsets, GSMA 2007.

RF, radio frequency chip, a chip readable from short distance, Smart Card Alliance 2007.

Secure element, a combination of hardware, software interfaces and protocols that enable secure storage and use of credentials. It forms a platform where applications can be installed, personalised and managed, MobeyForum 2008.

SIM, subscriber identity module in mobile handset, GSMA 2007.

TSM, Trusted Service Manager, securely distributes and manages the Service Providers services to the MNO customer base, GSMA (2007).

UICC, Universal Integrated Circuit Card, smart card platform for wider mobile or other service offerings, MobeyForum 2008.

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