



University of St.Gallen

Center for Financial Services Innovation

The costs of point-of-sale payments in Switzerland

Tobias Trütsch, Johannes Huber, Nemanja Bralovic

JEL classification: D12, D23, D24, E41, E42, G21, L2

Keywords: cash, debit card, credit card, means of payment, costs



Acknowledgements

This study was made possible thanks to the help of numerous stakeholders. Many thanks go to the numerous financial institutions and infrastructure providers (i.e. banks, issuers and acquirers) as well as retailers in Switzerland who responded to our extensive surveys and provided us with further information. This also includes the Swiss Payment Association, whose support is gratefully acknowledged. We could not have conducted this study without the support of all stakeholders. Many thanks to Mastercard Europe SA for its financial assistance. I would also like to thank the Deutsche Bundesbank and Norges Bank, who provided valuable advice on the survey design and facilitated an inspiring exchange. Finally, I would like to thank the student assistants at ZHAW for their support in carrying out the time duration study at the point-of-sale and my colleagues Johannes Huber and Nemanja Bralovic for their valuable assistance in conducting the study.

Dr Tobias Trütsch
Managing Director FSI-HSG

Imprint

Published by

Center for Financial Services Innovation (FSI-HSG)
University of St.Gallen | Müller-Friedberg-Strasse 8 | 9000 St.Gallen

Contact

Dr Tobias Trütsch | tobias.truetsch@unisg.ch | +41 71 224 71 55

Publication date

January 2024

Availability

www.fsi.unisg.ch | www.alexandria.unisg.ch

Suggested citation

Trütsch, T., Huber, J., Bralovic, N. (2024). The cost of point-of-sale payments in Switzerland. University of St.Gallen.

Summary

This study analyses the costs of stationary point-of-sale (POS) payments in Switzerland in 2022. It focuses on the most important means of payment: cash, debit cards and credit cards provided by Swiss issuers. It examines both the private and resource costs of financial institutions and infrastructure providers, the Swiss National Bank (SNB) and Swissmint, retailers and consumers. Private costs are a stakeholder's total costs and are important to understand stakeholder perspectives. Resource costs result from the private costs minus the fee transfers between the analysed stakeholders and represent expenses in the form of internal processes or resources. They are important for assessing the cost efficiency of payment methods from an overall economic perspective.

Comprehensive data were collected using extensive surveys of financial institutions, infrastructure providers and retailers in Switzerland. In addition to external sources, the analysis also includes data from the first-ever time measurements of POS payments in Switzerland. This study is the first to provide comprehensive, objective information on the costs of POS payments in Switzerland. The results are comparable with other international studies, although the methodologies of those studies and country-specific characteristics differ.

The overall economic costs associated with POS payments in Switzerland are by no means negligible. In 2022, resource costs amounted to approximately CHF 7.3 billion. This corresponded to 0.95 per cent of the country's gross domestic product (GDP). The level of costs varies greatly depending on the stakeholder and means of payment. At 0.60 per cent of GDP, retailers had the highest private costs due to transaction fees, while the financial sector had the highest resource costs at 0.53 per cent of GDP. This is followed by consumers and the SNB (the latter's costs, at ca. 0.03 per cent of GDP for private and resource costs, were negligible).

Cash incurred the highest resource costs in 2022 (CHF 5.2 billion), followed by credit cards (CHF 1.1 billion). Debit cards had the lowest resource costs (CHF 1.0 billion). Cash also accounted for the highest private costs (CHF 6.4 billion), followed by debit and credit cards (CHF 3.2 billion and CHF 2.5 billion, respectively). On average, debit card payments were cheapest, both in terms of resource costs per transaction (CHF 0.70) and per franc transacted (1.6%). Cash incurred the highest resource costs per transaction (CHF 3.72) and per franc transacted (14.6%). The resource costs of credit cards amounted to CHF 3.21 per transaction (volume) and 5.2 per cent per franc transacted (value).

In 2022, cash was the most expensive payment method in terms of total variable resource costs (i.e. per additional transaction and per additional franc transacted), regardless of the transaction value, followed by credit and debit cards. For example, a cash payment of CHF 20 cost society CHF 2.10, while credit and debit card payments cost CHF 0.80 and CHF 0.50, respectively – assuming the underlying payment infrastructure is already in place. Regarding stakeholders (i.e. if their decisions on payment methods are based solely on private costs), consumers preferred credit cards, while retailers, financial institutions and infrastructure providers preferred debit cards.

Table of Contents

Summary	II
List of Abbreviations	V
List of Figures	VI
List of Tables	VII
1 Introduction	1
2 Background	4
2.1 Prevalence of payment cards	4
2.2 Evolution of payment behaviour	4
2.3 Main actors in payment transactions in Switzerland	5
3 Theoretical foundations	7
3.1 Types of costs	7
3.1.1 Direct and indirect costs	7
3.1.2 Average, fixed and variable costs	7
3.1.3 Private costs and resource costs	8
3.2 Activity-based costing analysis	9
4 Methodology	10
4.1 Preliminary remarks	10
4.2 Retailers	11
4.2.1 Sample	11
4.2.2 Survey	12
4.3 Financial institutions and infrastructure providers	12
4.3.1 Sample	12
4.3.2 Survey	13
4.4 Swiss National Bank and Swissmint	14
4.5 Consumers	15
4.6 Time measurements at the POS	16
4.7 Number and value of POS transactions	18
5 Results	20
5.1 Preliminary remarks	20
5.2 Total costs	20
5.2.1 Total private and resource costs	20
5.2.2 Total private and resource costs per stakeholder	22
5.3 Total costs per payment instrument	24

5.3.1	Cash payments	24
5.3.2	Credit card payments	25
5.3.3	Debit card payments	26
5.4	Average costs	26
5.5	Fixed and variable costs	28
5.5.1	Total resource costs	28
5.5.2	Private costs per stakeholder	30
6	Closing remarks	32
	References	33
	Appendix	35
	Figures	35
	Tables	39
	A: Assumptions	42
	B: Concept of private and resource costs	44
	C: Survey of financial institutions and infrastructure providers	46

List of Abbreviations

ABC	Activity-Based Costing
B2B	Business-to-Business
B2C	Business-to-Consumer
BfS	Federal Statistical Office
GDP	Gross Domestic Product
FDF	Federal Department of Finance
EST	Federal Tax Administration
FC	Fixed costs
FSI	Center for Financial Services Innovation
FTE	Full-Time Equivalent
HSG	University of St.Gallen
IT	Information Technology
NOGA	General Classification of Economic Activities
P2P	Peer-to-Peer
PIN	Personal Identification Number
POS	Point-of-Sale
PP	Percentage Points
QR	Quick Response
SARON	Swiss Average Rate Overnight
SNB	Swiss National Bank
TV	Transaction value
TVC	Transaction-linked variable costs
VC	Total variable costs
VVC	Value-linked variable costs
ZHAW	Zurich University of Applied Sciences

List of Figures

Figure 1: Average payment duration of a transaction by payment method _____	18
Figure 2: Total private and resource costs of credit card, debit card and cash payments _____	21
Figure 3: Total private and resource costs of credit card, debit card and cash payments by stakeholder _____	23
Figure 4: Average resource costs per transaction _____	27
Figure 5: Percentage breakdown of total resource costs into fixed and variable costs per means of payment _____	29
Figure 6: Total variable resource costs by transaction value _____	30
Figure 7: Costs, benefits and externalities of the means of payment _____	35
Figure 8: Number of time measurements by type of business _____	35
Figure 9: Distribution of the measured duration by interval _____	36
Figure 10: Total private and resource costs of credit card, debit card and cash payments by stakeholder (in per cent) _____	36
Figure 11: Percentage breakdown of private retailer costs by cost elements _____	37
Figure 12: Variable private costs of financial institutions and infrastructure providers by transaction value _____	37
Figure 13: Variable private costs of retailers by transaction value _____	38
Figure 14: Variable private costs of consumers by transaction value _____	38
Figure 15: Overview of the stakeholders analysed and their fee transfers _____	44
Figure 16: Relationship between private and resource costs _____	45

List of Tables

Table 1: Number and value of POS payments in Switzerland in 2022	19
Table 2: Private costs of credit card, debit card and cash payments (in CHF million)	22
Table 3: Resource costs of credit card, debit card and cash payments (in CHF million)	22
Table 4: Private and resource costs of cash payments (in CHF million)	24
Table 5: Private and resource costs of credit card payments (in CHF million)	25
Table 6: Private and resource costs of debit card payments (in CHF million)	26
Table 7: Average costs per transaction	28
Table 8: Distribution of the sample by NOGA classes	39
Table 9: Distribution of the sample by turnover	39
Table 10: Distribution of the sample by number of employees	40
Table 11: Breakdown of resource costs into fixed and variable costs (in CHF million)	41
Table 12: Key assumptions and potential associated biases	43
Table 13: Direct cost elements of financial institutions and infrastructure providers	47
Table 14: Indirect cost elements of financial institutions and infrastructure providers	48

1 Introduction

Every day, millions of payments are made at points-of-sale in Switzerland. Various payment methods are available and the parties to a transaction incur costs in connection with a payment. In the case of cash payments, for example, the Swiss National Bank (SNB) and banks domiciled in Switzerland incur costs for the production, provision and distribution of banknotes; consumers incur costs for withdrawing cash; and retailers incur costs for accepting and counting cash, as well as for processing and depositing it at the end of the day.

The overall economic costs of guaranteeing POS payments are by no means negligible. In a comparison of European countries, these costs are estimated between 0.4 and 1.75 per cent of GDP (see Junius et al., 2022). A similar study was last carried out in Switzerland in 2007, using data from 2006 (see Minsch et al., 2007). Its authors estimated the total economic cost of cash payments at around 0.4 per cent of GDP.

The payment behaviour of the Swiss population has changed fundamentally since 2006. Innovations such as contactless payment with payment cards and mobile phones are now standard (Graf et al., 2023). Since Minsch et al. (2007), cash use has declined steadily. In 2006, cash accounted for around 67 per cent of sales at the POS; by the end of 2022, this share had fallen to around 25 per cent (Trütsch, 2023). At the same time, the share of credit card sales more than doubled from around 12 per cent to 25 per cent, while the share of debit card sales rose from 17 per cent to 43 per cent (Trütsch, 2023). It is therefore necessary to conduct an updated and more comprehensive study on the costs of POS payments in Switzerland.

This study analyses the costs of stationary POS payments in Switzerland in 2022. It focuses on the most important payment methods in Switzerland in 2022 (see Graf et al., 2023): cash, debit, and credit cards (including prepaid credit cards) provided by Swiss issuers. This approach simplifies the international comparison of results, as other cost studies also focus mainly on cash, debit and credit card payments. Costs associated with transactions between individuals and businesses, payment method costs in e-commerce and costs incurred outside of Switzerland are not examined in this study. We focus on the (overall) costs for financial institutions and infrastructure providers, the SNB and Swissmint, as well as retailers and consumers.

It is important to assess the costs of POS payments in Switzerland for three reasons (see Kosse et al., 2017). First, our study establishes cost transparency between payment methods and provides a basis for discussing where costs could be reduced overall. Second, it enables market participants to make better-informed decisions about the choice, supply, and acceptance of their means of payment. Third, it provides guidance on how to improve the overall economic efficiency of the Swiss payment system.

This study is the first to provide comprehensive information on the costs of POS payments in Switzerland. On the one hand, it analyses the total costs of POS payments in terms of the overall use of resources by Swiss society for each payment method, which is relevant for assessing the cost efficiency of payments from a societal perspective. On the other hand, it examines the total private costs of financial institutions and infrastructure providers, the SNB and Swissmint, retailers and consumers per payment method to understand stakeholders perspectives. We focus exclusively on the payment function of the means of payment; that is, we do not take into account

the costs related to other functions such as credit granting (e.g. credit card) or possible authentication (e.g. debit card).

Methodologically, we follow Kosse et al. (2017) and contribute to the literature on the overall economic costs of POS payments. This literature was produced mainly by central banks. For an overview of recently published cost studies of countries in the eurozone, see Junius et al. (2022) and Schmiedel et al. (2013). Other recently published studies include those for Norway (Norges Bank, 2022), Sweden (Engström et al., 2023), Finland (Sintonen and Takala, 2022), Poland (Przenajkowska et al., 2019) and Canada (Kosse et al., 2017). The level of costs depends not only on country-specific characteristics, but also on a study's methodology and scope (including the year in which data were collected).¹ Therefore, country comparisons should be made with caution. This also explains why a separate study on Switzerland is needed to determine the costs of POS payments in Switzerland.

Besides data collected by extensively surveying financial institutions, infrastructure providers and retailers in Switzerland, this study also includes data from the first-ever time measurements of POS payments. We take into account the most important stakeholders in the payment system for POS payments — financial institutions and infrastructure providers, the SNB and Swissmint, retailers and consumers — and thus provide a holistic picture of the costs of POS payments.² Other studies focus exclusively on the costs for retailers.

When interpreting the results, a number of caveats are warranted. First, shifts in the payments market might change the results. Second, we analyse the gross costs. However, holistically assessing the efficiency of payment methods requires considering a broader spectrum, i.e. the income and benefits of those methods for other stakeholders, as well as the indirect effects on society in the form of externalities (see Kosse et al., 2017).³ However, as the latter are difficult to quantify, we follow other publications and only analyse directly measurable costs in the form of internal costs and fee transfers (see Kosse et al., 2017; Schmiedel et al., 2013).

Third, the estimated costs of cash include all production and distribution costs, regardless of the intended use. As cash can also be used for purposes other than POS payments, e.g. for payments between individuals or as a reserve for unforeseen expenses, the cash costs of POS payments may be overestimated. However, according to the SNB (2021), holding cash to preserve its value in the short and long term plays a subordinate role compared to other categories of financial assets.⁴

Fourth, although our retailer survey may not be entirely representative of Switzerland, it adequately reflects the basic population of retailers in terms of sector, number of employees and turnover. Compared to previous surveys on the costs of POS payments for Swiss retailers, our sample includes the most data points. Fifth, our estimates may be influenced by other assumptions (see Appendix A).

¹ The costs of bank transfers, direct debits and payment apps, as well as costs associated with online payments and payments to individuals, are also analysed in some cases (see Norges Bank, 2022). The total costs tend to increase the more payment methods, stakeholders and transaction types are included.

² In rare cases, government agencies are also taken into account (cf. Engström et al., 2023).

³ With cash, for example, this includes financial inclusion, anonymity, budget control, role in monetary policy and, with credit cards, the credit function, bonus programmes and insurance benefits.

⁴ The proportion of financial assets held in cash is in the single-digit percentage range (see SNB, 2021). Around 70 per cent of the Swiss population keeps cash at home or in a safe deposit box (in addition to their wallet). In this population group, the cash reserves of individuals amount to less than CHF 1,000 in more than three quarters of cases (see SNB, 2021).

The structure of this study is as follows. Chapter 2 provides background information on the development of payment behaviour and the main actors in payment transactions in Switzerland. Chapter 3 discusses the theoretical foundations of our study, while Chapter 4 covers its methodological aspects. Chapter 5 discusses the results. Chapter 6 summarises the main findings.

2 Background

2.1 Prevalence of payment cards

Debit cards are the most popular payment instrument in Switzerland (see chapter 2.2), as reflected in the high number of (contactless) debit cards in circulation compared to (contactless) credit cards.⁵ With a share of 28.5 per cent (approx. 3.9 million cards), the Maestro card is the most common debit card (as at November 2022), followed by the Debit Mastercard (23.1%), the Visa Debit (19.9%), the PostFinance Card (18.1%) and the V Pay card (10.0%).⁶

Since May 2021, the share of the Maestro card (38.5%) has decreased by 10.0 percentage points (pp) – mainly in favour of the Visa Debit (11.3%; +8.6 PP) and the Debit Mastercard (17.9%; +5.1 PP). The share of the PostFinance Card (20.5%; -2.4 PP) and the V Pay card (11.8%; -1.8 PP) has also declined, although the PostFinance Card, newly issued since the beginning of 2022, is co-badged with Debit Mastercard.⁷

A similar trend can also be observed regarding the market penetration of credit cards. Around 52 per cent (approx. 4.3 million cards) of all credit cards issued in Switzerland are issued by Mastercard, followed by Visa (35.9%), American Express (9.4%) and Diners Club (2.9%) (as at November 2022).⁸ Thus, in about one and a half years, market shares have changed to the detriment of Mastercard (59.3%; -7.6 PP) and to the benefit of other licensors, in particular Visa (7.3%; +3.2 PP).

In terms of quantity, the importance of debit cards within the two payment cards has decreased slightly. According to the SNB (2023c), the proportion of debit cards in relation to the number of debit and credit cards has tended to fall since 2005 and amounted to roughly 62 per cent at the end of 2022 (January 2005: 64%).

2.2 Evolution of payment behaviour

The payment behaviour of the Swiss population has changed fundamentally in recent years. It is, however, important to distinguish payments occurring at regular and irregular intervals. The former mainly include rental, telephone and insurance costs (and pocket money!), which are made with varying frequency (weekly, monthly, annually). The latter mainly include everyday expenses. Irregular transactions are mainly relevant to the cost of POS payments.

Over the long term, the emergence of electronic means of payment has led to the decline of cash as a means of payment. Since 1990, fewer and fewer cash payments have been in Switzerland (Trütsch, 2023). In 2022, cash payments amounted to an estimated CHF 40 billion, corresponding to around 25 per cent of sales. In 1990, this share was still 90 per cent. The share of credit card sales

⁵ At the end of 2022, around 13.7 million debit cards, 8.4 million credit cards and 3.3 million prepaid (credit) cards were in circulation in Switzerland. Almost all debit and credit cards are now equipped with the contactless function (99.0% and 98.6%, respectively). The figure for prepaid (credit) cards is 86.5 per cent (see SNB, 2023c).

⁶ Authors' calculations based on data from the Swiss Payment Monitor (see Graf et al., 2023).

⁷ Due to co-badging, PostFinance cards and Mastercard debit cards may be counted double in the data.

⁸ Authors' calculations based on data from the Swiss Payment Monitor (see Graf et al., 2023).

has risen from around 6 per cent in 1990 to 25 per cent in 2022, while the share of debit card sales has virtually exploded from 0.4 per cent to 43 per cent (Trütsch, 2023).

In the short term, payment behaviour can be analysed in more detail using consumer surveys in which respondents record all their irregular payments in a diary (cf. Graf et al., 2023; SNB, 2023a). At the end of May 2023, credit cards (mobile and non-mobile use) accounted for the highest turnover among payment methods, with debit cards being the most frequently used payment method and billing product in Switzerland. Compared to November 2020, their relative shares of credit and debit cards have increased both in terms of turnover (to 29.7 per cent) and in terms of the number of transactions (to 32.4 per cent) (Graf et al., 2023).

Debit cards (mobile and non-mobile use) ranked second with a 27.9 per cent share of sales at the end of May 2023, followed by bank accounts (15.7%)⁹ and cash (14.6%). With an increase in the share of sales from 7.7 PP to 9.6 PP since November 2020, mobile payments (in the true sense) have grown strongly.¹⁰ This puts mobile payments in fifth place among all payment methods in terms of turnover, just behind cash (14.6%) (Graf et al., 2023).

Since our survey in November 2020, cash has ranked second behind debit cards in terms of the number of transactions. After stabilising at just under 30 per cent since the end of 2020, following the sharp decline triggered by the coronavirus pandemic, the proportion of cash payments has again been falling for the first time since May 2023 (Graf et al., 2023). Cash is now mainly used for smaller amounts (less than CHF 20) and tends to be used by older, less educated people with lower incomes.

Contactless payments with payment cards and mobile phones are now the payment standard at the POS. Around 80 per cent of debit and credit card transactions are processed contactless at the POS (see SNB, 2023c).

2.3 Main actors in payment transactions in Switzerland

The most important actors in the Swiss payments market who are involved in POS payments are the SNB and Swissmint, a number of financial institutions and infrastructure providers including cash-in-transit companies, as well as retailers and consumers. For each of these actors, participation in payment transactions incurs costs for the facilitation, utilisation and acceptance of POS payments. Chapter 4 (Methodology) explains in detail which costs are included in this study.

The Swiss National Bank (SNB) primarily bears the costs associated with the production, administration, verification and transportation of cash (Przenajkowska et al., 2019). Banks domiciled in Switzerland, which belong to the group of financial institutions, play an equally important role. They bear the costs of accepting and processing cash, of issuing payment cards and of operating their branches and ATMs. They also offer bank accounts and in some cases process payment card transactions. Financial institutions also include payment card issuers.

Infrastructure providers – including acquirers such as Worldline and Nexi – are responsible for the smooth processing of card payments. Infrastructure providers also include companies that are

⁹ As a billing product, a “bank account” corresponds to an “invoice” as a payment method.

¹⁰ Mobile payment here refers to payment with payment apps on mobile devices such as Twint, Alipay or WechatPay, which are directly linked to bank accounts (mobile payment in the true sense).

responsible for transporting cash. The costs incurred by infrastructure providers mainly include processing, technology, security and transport costs. There are also other payment service providers, particularly in e-commerce (so-called payment service providers).

Finally, retailers and consumers represent the endpoints of the payment process. Costs for retailers include the fees for accepting card payments, the costs for renting or amortising card terminals and the time required to process transactions. Another costs element also includes the costs associated with cash management.

Consumers bear the costs of using payment instruments, such as the fees for bank accounts, credit and debit cards or cash withdrawals. Another cost factor for consumers is time, as reflected in the opportunity cost of going to an ATM, waiting at checkouts and ATMs, or for the payment process to be effected.

Infrastructure providers provide the framework for the processing of payments at the POS and serve as interfaces between consumers, retailers and financial institutions. Among infrastructure providers, issuers, acquirers and cash-in-transit companies play a crucial role.

3 Theoretical foundations

3.1 Types of costs

In principle, costs reflect consumption as measured in Swiss francs, and as usually resulting for a company from input factors (labour and capital). In the context of a payment, costs can be divided into directly allocable costs (direct costs) and non-directly allocable costs (indirect costs). The former include transaction fees, while the latter include costs for office buildings and marketing.

Costs can also be divided into fixed costs (FC) and variable costs, where the latter depend on the quantity produced. Ideally, variable costs can be further subdivided into transaction-linked variable costs (TVC) and value-linked variable costs (VVC). One example is interchange fees for payment cards, which are composed individually or by combining TVC (costs per transaction) and VVC (costs per franc transacted).

Adding up the costs of the analysed stakeholders to calculate the total costs of POS payments produces two cost concepts: “private costs” and “resource costs”. The former represent the sum of all stakeholder costs. The latter reflect the actual costs of the resources needed to operate the payment system and are relevant for assessing the cost efficiency of payments from a overall (i.e. societal) perspective. The resource costs are exclusively the internal costs of the analysed stakeholders (i.e. all fees paid between the analysed stakeholders are deducted from the private costs).

3.1.1 Direct and indirect costs

Direct costs are costs that are based on the number of units delivered by the product or service (cf. Norges Bank, 2022). Therefore, these costs arise from using resources exclusively for a single means of payment. For example, the cost of transporting cash is only incurred for cash payments, while the cost of processing credit cards is only incurred for credit card payments.

Indirect costs are costs that cannot be directly associated with the product or service but must be allocated according to an allocation formula. In contrast to direct costs, indirect costs therefore result from the discrete use of resources in making a payment (Lammer et al., 2015). Indirect costs are incurred simultaneously for several payment methods and can also include costs that are not directly related to POS payments if stakeholders are active in other business areas.

Indirect costs include account management costs. They are linked to a variety of transaction types and payment methods, whether for debit card payments, credit card bill payments or electronic transfers. This makes it difficult to accurately allocate the account management costs incurred in connection with POS payments to a single payment method.

3.1.2 Average, fixed and variable costs

As the total costs of a payment method depend heavily on its frequency of use, the average costs per transaction are an important parameter for comparing the costs of different payment methods. The average cost per transaction is the total cost of a payment method divided by the number of transactions carried out with it.

Another comparative metric is the average cost per franc of sales. For each individual payment, these costs show how much of the transaction value is actually spent on enabling, executing and accepting a payment. Both average metrics are influenced by economies of scale and scope, which makes them difficult to compare. We therefore also calculate the marginal costs of payments, which are derived from the variable costs.

Fixed costs remain unchanged for a payment instrument, regardless of the amount or purpose of the payment (Lammer et al., 2015). Fixed costs can include the costs of machinery, buildings and software.

Variable costs, on the other hand, vary depending on the use of a means of payment. Compared to classical cost theory, variable costs are defined more broadly in the context of payment methods. On the one hand, there are transaction-linked variable costs, which vary with the number of payments made; on the other hand, there are value-linked variable costs, which vary with the value of the transaction. Variable costs reveal the additional costs that arise for an additional transaction at a certain value (so-called marginal costs). This concept is based on the assumption that all fixed costs have already been paid.

The allocation of fixed costs, and thus the marginal costs, depend on the time horizon under consideration. With a longer time horizon, a smaller proportion of the costs is fixed and a larger proportion is variable (and vice versa). In other words, in the long term and for a large number of transactions, all costs will be variable, while in the short term a larger proportion of costs will be fixed. The variable costs can be used to determine the transaction amount for which one means of payment is cheaper or more expensive than another.

3.1.3 Private costs and resource costs

The two main payment-related types of costs are private costs and resource costs (which are a subset of private costs).¹¹ Private costs are a stakeholder's total costs and important for analysing stakeholder behaviour. Resource costs are informative for assessing the cost efficiency of payment methods from an overall perspective. They indicate the total use of resources in a company with regard to POS payments and are the sum of each stakeholder's resource costs.

Resource costs are private costs minus the fee transfers between the analysed stakeholders. Fees paid to parties other than the analysed stakeholders are part of resource costs. We assume that the fees paid to these parties correspond to their resource costs and are therefore included in the analysed stakeholders' resource costs. However, if external parties achieve a profit margin, the total resource costs might be overestimated (Lammer et al., 2015).

For retailers and consumers, resource costs mainly include the time costs incurred, for example, for paying, withdrawing and counting cash. They also include capital and technology costs (e.g. hardware and software costs as well as terminal maintenance). These activities represent expenses in the form of internal processes or resources. If individual parts of these internal processes are outsourced to an infrastructure provider (e.g. a cash logistics company), these expenses are considered transfer costs.

¹¹ In other studies, resource costs are also referred to as social costs (cf. Schmiedel et al., 2013).

The previous comments highlight the importance of distinguishing resource, transfer and private costs. A retailer's transfer costs are also an infrastructure provider's income. These revenues reduce the infrastructure provider's net costs. These costs (which include those of the infrastructure providers) form the basis for calculating the overall economic costs of a means of payment (i.e. the resource costs).

It is important to distinguish resource and transfer costs and the resulting net costs to avoid erroneously overestimating the total economic costs of a means of payment. This is because some elements are counted twice based on the total private costs. The fictitious example in Figure 16 in Appendix B illustrates why only the net costs instead of the private costs are added together to calculate the total economic costs of POS payments. Appendix B also contains a graphical summary of all transfer costs between the stakeholders analysed in this study.

3.2 Activity-based costing analysis

The main challenge in analysing the costs associated with POS payments is allocating indirect costs to individual payment methods. In this study, this is particularly the case for financial institutions and infrastructure providers. To ensure comparability between actors, we follow other studies (see Kosse et al., 2007; Norges Bank, 2022) in using a survey based on activity-based costing analysis.

Activity-based costing (ABC) analysis is well-suited to allocating indirect costs. It is particularly suitable in cases where the share of support functions in a company's total costs is high and/or where major differences exist between products, customers and production processes. The production of payment services by financial institutions and infrastructure providers is characterised both by costly support functions and by major differences in service provision, and hence also by cost differences between services (cf. Gresvik and Øwre, 2002).

ABC analysis enables directly allocating direct costs to products. Indirect costs, on the other hand, are allocated to individual services using an allocation formula. The allocation key is based on the company's activities. Indirect costs are allocated from the company's activities to payment methods via cost drivers. In turn, activity costs are allocated to individual services according to the number of activities performed (cf. Gresvik and Øwre, 2002).

The good provided by the financial institution is referred to as a product or service. One example is ATM cash withdrawals. An activity is an action or process for producing a product or service. Activities can usually also be subdivided into ancillary activities. Associated costs are the amount of input factors involved in the activity, which are a combination of labour and machinery. So-called cost drivers are used to allocate the consumption of labour and capital to a product or service and to activities. One example is the number of times an activity is carried out, the duration of that activity or the use of labour and capital whenever an activity is performed. Examples include the number of transactions and the number of bank accounts (cf. Norges Bank, 2022).

4 Methodology

4.1 Preliminary remarks

We used primary and secondary sources to estimate POS payments in Switzerland. On the one hand, we conducted extensive surveys among retailers, financial institutions and infrastructure providers with different survey structures. On the other hand, we performed time measurements of POS payments in a separate study – as an important reference point for calculating the time and opportunity costs of a payment.¹² In addition, we used internal and external data sources to estimate the costs of payments for consumers, the SNB and Swissmint, as well as individual infrastructure providers (e.g. cash-in-transit companies). Our evaluation of the value and number of POS payments made in Switzerland in 2022 is also based on those sources.

Our methodology follows Kosse et al. (2017), who conducted their study (on Canada) on behalf of the Bank of Canada. Our approach simplifies the international comparison of results. We therefore focus on the three most important payment methods used by the Swiss population at stationary POS in 2022 (cf. Graf et al., 2023): cash, debit cards and credit cards provided by Swiss issuers, with the latter including regular and prepaid credit cards. We only analysed the costs of stationary POS payments by Swiss consumers in Switzerland in 2022.

We do not analyse the following payments: peer-to-peer (P2P), e-commerce, bank transfers, B2B payments and transactions outside Switzerland. For each payment method, we assess the total costs in relation to the social use of resources, which is relevant for understanding the cost efficiency of payment methods from an overall economic perspective (Kosse et al., 2017). The total costs tend to increase the more payment methods, stakeholders and transaction types (e.g. P2P, B2B, cross-border, etc.) are included.

To better understand the decisions of payment market actors, we also analyse the total private costs incurred by consumers, retailers, financial institutions and infrastructure providers, as well as the SNB and Swissmint. To ensure anonymity, the costs for financial institutions, cash-in-transit companies and other infrastructure providers are shown in aggregated form. The same applies to the data for retailers.

We only analyse the gross costs. Thus, we do not take into account the income and benefits of a means of payment for other stakeholders, nor the indirect impact on society in the form of externalities (see Appendix, Figure 7). With cash, for example, externalities are financial inclusion, anonymity, store of value, seigniorage and the role of cash in monetary policy and the shadow economy. With credit cards, possible benefits and externalities include the credit function, bonus schemes, insurance benefits and the risk of debt and overindebtedness. We only analyse directly measurable costs in the form of internal costs and fee transfers (see Appendix, Figure 7).

Like Kosse et al. (2017), we only examine the payment function of payment methods to enable fair comparison. We do not consider costs associated with the credit function of credit cards (e.g. credit defaults and the cost of outstanding credit amounts). Similarly, in addition to their payment

¹² The time measurements at the POS were carried out in collaboration with ZHAW.

function, debit cards can also be used as a means of authentication for online banking and cash withdrawals. However, this study only examines the POS payment function of a debit card. Further, it considers the costs of cash withdrawals associated with debit, credit or prepaid cards to be cash costs (cf. Kosse et al., 2017).

We calculated the average costs of a transaction for each payment method and stakeholder to extrapolate those costs to the overall economy using the total number and total value of POS payments in Switzerland. This implies that all retailers, financial institutions and infrastructure providers have the same cost structure as those in the respective samples.

4.2 Retailers

4.2.1 Sample

We conducted a comprehensive survey among Swiss retailers on the costs of POS payments. Our survey is based on a retailer survey conducted by the Deutsche Bundesbank in 2023 (see section 4.2.2 and chapter 4.6).¹³ The population of retailers corresponds to those companies in Switzerland that are active in B2C business and have a stationary POS, in particular retail shops, accommodation and catering businesses, personal service providers and transport companies (see NOGA-classification).

Large companies (measured in terms of the number of employees and turnover) were given more weight in the survey because the majority of the population consists of very small companies. In total, more than 700 companies, distributed according to the NOGA classification and the number of employees, were contacted several times by email and telephone and were invited to participate in the online survey.

In the end, 44 companies agreed to take part in the survey, representing a net participation rate of around 6 per cent. In the end, however, only 22 companies completed the survey (completion rate of around 3 per cent; one company's responses were unusable). The completion rate therefore lies within the range of voluntary company surveys.

In addition to the number of transactions and turnover, our survey collected data on all relevant costs regarding the acceptance of cash, debit and credit card payments at POS in Switzerland. The large scope of the survey (and the considerable time required to complete it) meant that information on fixed and variable costs was not collected directly from retailers. Instead, the breakdown of retailer costs into fixed and variable costs is based on other similar studies and external information (e.g. EC, 2015).

The final sample of retailers consists of 21 companies of different size and turnover from different NOGA classes and geographical regions in Switzerland. Overall, it represents a good coverage of the defined population of retailers (see Appendix, Table 8, Table 9 and Table 10). In addition to local retailers, the sample also includes companies operating throughout Switzerland. Compared to the defined population, retailers are overrepresented, with the retail sector accounting for the

¹³ The study on retailer costs and the associated survey have not yet been published by the Deutsche Bundesbank.

largest share of POS turnover. The share of sales between sectors in the population corresponds largely to frequency distribution in the sample.

4.2.2 Survey

Our retailer survey on the costs of POS payments is structured according to the 2023 Deutsche Bundesbank survey. With cash payments, it distinguishes four cost blocks: total back-office costs, total front-office costs, cash management costs and opportunity costs. The total cost of a cash payment is the sum of all four cost components.

Total back-office costs are the average time spent on cash accounting, either directly or based on the number of transactions, multiplied by the average hourly rate of the retailer's back-office labour costs. Total front-office costs are the measured time required per cash transaction, multiplied by the average hourly rate of the retailer's front-office labour costs.

Cash management costs are the sum of annual cash processing equipment costs, bank charges, cash and valuables service provider costs, insurance costs and adverse cash balances. Opportunity costs are the average cash balance in the cash registers, multiplied by the SARON interest rate.

The costs of debit and credit card payments are calculated using the following five cost blocks for each payment method: total back-office costs, total front-office costs, transaction fees, terminal costs and costs for insurance and losses. The total costs of a debit or credit card payment are the sum of all five cost components.

The total back-office costs are the average time spent on processing debit and credit card payments, which can be allocated directly or based on the number of transactions, multiplied by the average hourly rate of the retailer's back-office labour costs. The total front office costs are the measured time per debit and credit card payment, multiplied by the average hourly rate of the retailer's labour costs in the front office.

Transaction fees correspond to the costs charged directly by the acquirers for cashless payments. Terminal costs are allocated to debit and credit cards based on actual use (i.e. the number of cashless transactions). These costs include depreciation as well as leasing, maintenance and service fees and costs for data transmission and telecommunications. Installation and cabling costs were not included in this study. The costs for insurance contracts and losses are calculated from the average insurance costs and cash deficits, which can be allocated directly or based on the number of transactions.

4.3 Financial institutions and infrastructure providers

4.3.1 Sample

We conducted a separate survey with financial institutions and infrastructure providers to measure their costs for POS payments. A total of nine organizations completed the survey, including the largest banks, issuers and acquirers in Switzerland. All were invited to participate directly through personal contacts. They are involved in the majority of POS payments in Switzerland: The financial institutions' data set covers more than two thirds of debit and (prepaid) credit card

payments at POSs in Switzerland in 2022.¹⁴ With regard to data from cash-in-transit companies and infrastructure providers, this study is based on a quasi-complete survey, as these two markets are dominated by individual providers.

Our survey covered all costs related to cash services as well as debit and (prepaid) credit card payments in 2022. It also provides information on the breakdown of fixed and variable costs as well as on fee transfers to other parties. The average costs were computed based on the total number and total value of cash withdrawals and card payments in the sample and subsequently scaled to the national level based on the total number and total value of cash and card payments in Switzerland.

Financial institutions primarily include banks, which serve as account providers, card issuers and cash suppliers in payment transactions. Credit card issuers are grouped with payment processors (acquirers) as infrastructure providers.

Cash-in-transit companies are also subsumed under “Financial institutions and infrastructure providers”. Information on their costs was taken from public sources and estimated where necessary. The focus was exclusively on costs related to Swiss banknotes and coins. Costs related to foreign currencies, checks and other (cashless) services were not taken into account.

To ensure anonymity, we combined (and presented in total) the results for the financial institutions with those for cash-in-transit companies and infrastructure providers. The costs for these three actors are included in full (i.e. 100 per cent) in the overall total, with the average cost per actor weighted by the individual number of transactions processed by the companies surveyed.

4.3.2 Survey

The greatest challenge in analysing costs is the allocation of indirect costs (e.g. personnel, buildings, marketing) to payment methods. The ABC analysis used here represents standard practice in studies on the costs of payment methods (see Kosse et al., 2007; Norges Bank, 2022). This approach involves calculating the costs of the individual means of payment as the sum of the costs of all activities needed to provide the service (i.e. means of payment).¹⁵ We designed our survey based on our ABC analysis and following the example of the Norges Bank (2022). This twofold approach facilitated comparison among the participating actors and with international studies.

The ABC analysis and data collection were carried out as follows: First, the participating companies allocated the relevant costs to the three payment methods (i.e. debit cards, credit cards and cash). On the one hand, costs were determined as direct and indirect cost items and, on the other, as percentage shares with regard to fixed costs, transaction-linked and value-linked variable costs. For a list of cost items, see Appendix C, Table 13 and Table 14.

Second, survey participants collected data on their cost drivers (i.e. number of transactions, transaction turnover, number of deposits and withdrawals, number of exchanges, number of accounts and number of products). Third, they provided information on the number of full-time

¹⁴ Some financial institutions were not able to evaluate the costs exclusively with regard to their domestic POS transactions, so their data also cover online and international payments. For this reason, market coverage is slightly overestimated.

¹⁵ Examples of activities providing means of payment by financial institutions include issuing payment cards or processing cash withdrawals.

equivalents (FTEs) used to perform activities relating to the three payment methods. Fourth, they allocated their direct costs to the products and services associated with the three payment methods.

Fifth, indirect costs were broken down by FTEs. Sixth, these costs were allocated to the different products and services of the payment methods by the company's activities and relative to its cost drivers. In such cases, an activity might have several cost drivers. Finally, the total direct and indirect costs for various products and services regarding the analysed means of payment were calculated for each participating company. The fixed, transaction- and value-linked variable costs and the average costs per payment method and company were also calculated. For a detailed description of the ABC analysis, see Appendix C.

Some financial institutions were unable to assess the costs associated exclusively with their domestic POS transactions, so their data also includes online and international payments. Therefore, this study assumes similar average costs for both online and POS payments as well as for domestic and international payments.¹⁶

4.4 Swiss National Bank and Swissmint

The SNB's income statement for 2022 provides the basis for calculating the total cash costs incurred by the SNB with respect to cash transactions involving Swiss banknotes (cf. SNB, 2023b). The income statement provides information on banknote expenses (direct costs) on the one hand and on personnel and material expenses as well as on the depreciation of fixed assets (indirect costs) on the other. While banknote expenses (e.g. raw materials, production) are fully included in the costs of cash transactions, only a fraction of the remaining expenses are related to the SNB's cash transactions (e.g. employees, equipment and premises for the production, processing and distribution of banknotes, as well as for all other banknote-related activities such as research, policy and communication). According to Wettstein and Lieb (2000), roughly half of the SNB's annual costs are attributable to cash transactions.¹⁷ These figures can be used to derive the SNB's overheads for cash transactions.

The amount of fee transfers – particularly with respect to cash transport – and the SNB's fixed and variable costs are based on Kosse et al.'s (2017) percentage distribution of costs. The production and transport costs of banknotes are mostly variable and depend on an economy's demand for cash, while the distribution costs mainly comprise fixed and variable components. The costs of other banknote-related activities and overheads are essentially fixed over a medium-term horizon of three to five years.

Swissmint's costs for producing and issuing circulating coins in Swiss francs are taken from its 2022 income statement (see FDF, 2023). The analysis focuses on circulating coins, which are used for everyday purposes, although Swissmint also produces numismatic products. However, Swissmint's income statement does not differ between the two product groups. Given the minor importance of numismatic products compared to circulating coins, we assume that the effect on

¹⁶ According to Kosse et al. (2017), assuming equal average costs has a minimal impact on the final results.

¹⁷ We assumed that the share of the costs of cash transactions in relation to the total costs at the SNB is the same as in 1999. The SNB does not have any current information on cash-related costs.

Swissmint's total costs is small.¹⁸ We therefore estimate the breakdown into fixed and variable costs and aggregate the cash costs of the SNB and Swissmint.

4.5 Consumers

We use various internal and public sources to calculate the costs of POS payments for consumers. Typical costs for consumers include time and opportunity costs, fees and interest losses. The first category, the time and opportunity costs of POS payments, was recorded with the help of specially conducted time measurements at the POS (see Chapter 4.6). Our estimate of the opportunity costs of checking bank statements and withdrawing cash, which includes the time spent travelling to an ATM or a bank counter and the time needed to withdraw cash, is based on external sources.¹⁹ We also take into account the travel costs of cash withdrawals (the average travel distance and kilometre costs by car to the nearest ATM and bank branch are relevant here; see Trütsch, 2022). Due a lack of data, we do not consider the time spent queuing or waiting and paying credit card bills.²⁰

In line with Engström et al. (2023) and Goldszmidt et al. (2020), we value consumers' time at three quarters of the average net hourly wage.²¹ Other studies value consumers' time at the full wage, even if individuals are unlikely to work all the time they spend on paying bills.

The second category of consumer costs consists of various fees. These include account management fees, fees for cash withdrawals and annual fees for payment cards. We determined the average costs for account management using "Moneyland" (a Swiss price comparison site and service), and based on the data of an average Swiss person over a ten-year period (including account balance and age).²² The calculated costs correspond to the average of all quotes.

The costs of cash withdrawals are based on specially collected data on the origin of the payment card (own bank/foreign bank), the currency (Swiss franc/euro) and the transaction fees (incl. processing surcharge and exchange rate fees). Due a lack of data, cash withdrawals at bank counters and by bank card are not considered.²³

The (free) annual fees for debit and credit cards are based on data that we collected on the market share of licence issuers (e.g. Visa, Mastercard, PostFinance), on the type of credit card (free card, standard, gold, platinum), and on the annual and top-up fees per card type. Due to a lack of data, the costs of invoice copies, invoicing, reminders, replacement cards and call centres – particularly in connection with credit cards – are not included. This also includes the time costs for paying credit card bills and the costs of dealing with misuse, especially as a result of theft, (banknote) counterfeiting and payment card fraud. In view of the low counterfeiting and theft rates in

¹⁸ In 2022, around 17 per cent of all coins produced by Swissmint were numismatic (cf. FDF, 2023).

¹⁹ For the time taken to check bank statements, see Engström et al. (2023); for travelling time, see Trütsch (2022); for withdrawal time, see Norges Bank (2022).

²⁰ These time costs are considered negligible on average thanks to in-store self-scanning and self-checkout solutions, as well as eBill and direct debit when paying credit card bills.

²¹ The average median wage per hour in 2022 net of social insurance is used, which was calculated based on the gender- and age-weighted monthly inflation-adjusted gross wages provided by the BfS (2022).

²² According to Moneyland (2023), account management costs include costs for opening, balancing and closing the banking relationship, account management costs, monthly account statements and payment transactions (excluding costs for debit cards).

²³ These are normally free of charge at a customer's own bank.

Switzerland, and the fact that card fraud losses are often covered (by the card issuer), the costs of misuse in Switzerland are likely to be low overall.²⁴ Likewise, the interest costs for outstanding credit card balances (revolving credit) were not included in the cost calculation based on Lammer et al. (2015) and Kosse et al. (2017), because our study explicitly focuses on the payment function of credit cards.

The third category of consumer costs is interest losses. These are mainly incurred for bank accounts, prepaid credit cards and cash. As the overall interest rate level and interest on payment accounts in particular were nonpositive in 2022, our cost calculation does not include interest costs.

All fees (categories 2 and 3), except the costs for cash withdrawals, were weighted according to the number of POS payments in Switzerland. Bank accounts are also used for other purposes such as transfers and payment cards for online and international payments. Cash withdrawals are also made for P2P payments or to build up a cash reserve (in the wallet). However, there is a lack of information to only consider the costs of POS cash withdrawals.

Consumers' resource costs correspond exclusively to the time and opportunity costs of POS payments. The remaining costs are fee transfers to other parties. The distribution of fixed and variable costs is based on external sources and our own observations (cf. Engström et al., 2023). We assume that periodic fees are fixed and that time costs vary more with the number of transactions and less with the transaction value. This also applies to the costs of cash withdrawals.

4.6 Time measurements at the POS

The time spent on the payment process generates labour costs for retailers and opportunity costs for consumers. These are the largest cost components of POS payments (Kosse et al., 2017). To measure the duration and ultimately the costs of payments, we carried out the first-ever time measurements in the retail sector in Switzerland.²⁵ To avoid distortions, we took a total of 1082 time measurements at 14 different retailers, in different regions of Switzerland and at different times of the day. Measurements took place in February and March 2023.

Retail outlets were selected based on the structure of the Swiss retail sector, i.e. the size and type of shops also varied. Measurements were carried out at supermarkets, department stores, furniture stores, restaurants, kiosks and ticket machines. Most measurements were carried out in supermarkets and restaurants (see Appendix, Figure 8). Data were also collected on different weekdays and at different times of day (morning, afternoon and evening). Retail outlets were located mainly in Zurich, Winterthur and St.Gallen.

Common payment methods (cash, credit and debit cards, and mobile phones) and both checkout types (attended and self-service) were considered. We followed Kosse et al. (2017) and Deutsche Bundesbank (2023) in defining transaction duration (in seconds) in terms of the start and end times listed below:

²⁴ The proportion of counterfeit Swiss franc banknotes compared to the total number of banknotes in circulation in 2022 was merely 0.09 per mille.

²⁵ Time measurements were conducted with the support of ZHAW.

Operated cash register: Payment time measurement started with the mention of the purchase amount and ended when 1) the receipt was printed and removed from the register or 2) the cash drawer was closed.

Self-service checkout: Payment time measurement started when the “Pay now” button was pressed on the screen and ended 1) when the receipt was printed and removed from the register or 2) with the on-screen confirmation that no receipt should be printed.

Time spent on social and productive activities that were not directly related to payment – such as scanning and packing goods – was only recorded if these activities fell within the customer’s waiting time when authorising and approving a transaction. Time measurements were taken using a smartphone app, which enabled precise recording based on the start and end time of the transaction. In addition to the time taken, observers documented other potential influences on transaction duration: the means of payment, the type of payment, the transaction amount, the location, the checkout type, the customer’s and the cashier’s gender and estimated age, as well as irregularities such as technical problems, matching payment or the presentation of a customer card.

Observers positioned themselves near checkouts to record the payment methods and the transaction amount. Sufficient distance was maintained to ensure that customers did not feel observed. In some cases, it was difficult to distinguish debit and credit cards, so cashiers were asked for advice.

Figure 1 shows the average transaction duration of the analysed payment methods, weighted by payment method, as contactless payments are made in two ways with payment cards (with and without entering a PIN code).²⁶ On average, transactions took 13.3 seconds (median 13.0 seconds), with most payments taking between 7.5 and 12 seconds (see Appendix, Figure 9).

Contactless credit and debit card payments (with/without PIN) were the fastest payment methods, with an average transaction time of 12.7 seconds, followed by NFC payments with smartphones and other wearables (13.2 seconds) and mobile payments via QR-code (17.4 seconds) (cf. Figure 1). In fourth place were cash payments at 18.3 seconds, followed by debit and credit card payments via an inserted card at 23.9 seconds (cf. Figure 1).

The values measured for Switzerland are in line with those for Germany (see Bundesbank, 2023). All figures in Figure 1 refer to attended checkouts and self-service checkouts. Both types of checkout are relevant for calculating consumers’ time costs, while the time costs at the attended checkouts only reflect retailers’ opportunity costs. In 2022, Swiss residents over the age of 15 spent an average of around two hours paying at a POS.²⁷

²⁶ In Switzerland, PIN entry is required for contactless payments with debit and credit cards for amounts over CHF 80, whereby the amount for the PostFinance Card is CHF 100.

²⁷ A detailed study on the duration of POS payments and their influencing factors in Switzerland is currently being planned.

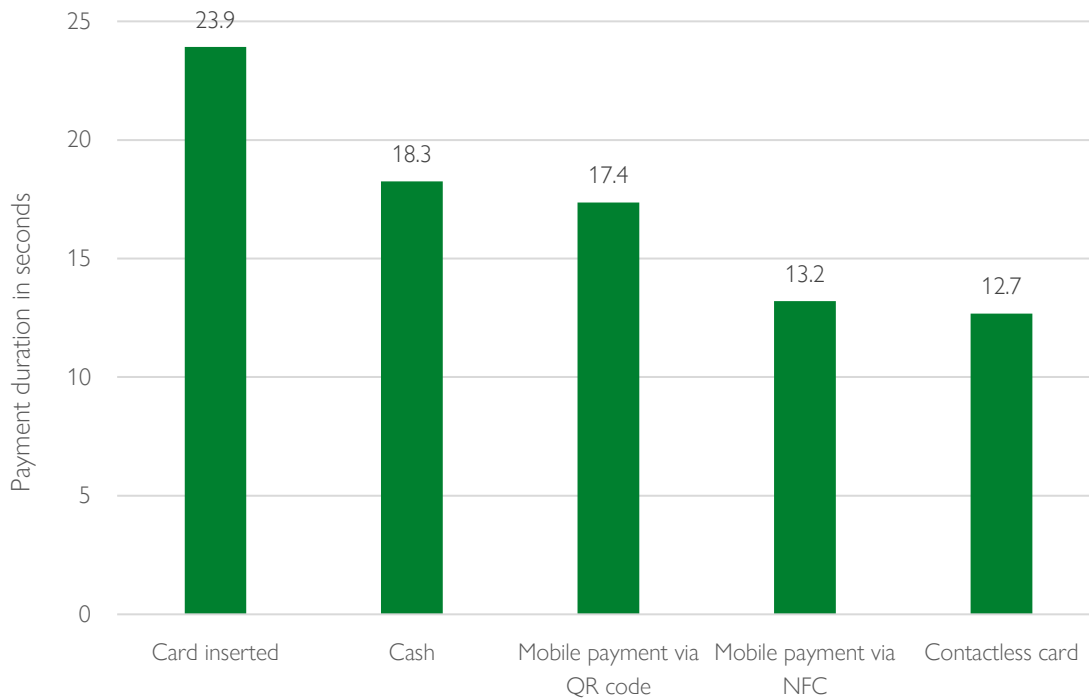


Figure 1: Average payment duration of a transaction by payment method

Note: n = 82 card inserted, of which n = 70 debit card and n = 10 credit card; n = 306 cash; n = 65 mobile payment via QR code; n = 85 mobile payment via NFC; n = 528 contactless card, of which n = 420 debit card and n = 108 credit card; weighted average for contactless payments (without/with PIN).

4.7 Number and value of POS transactions

Precise information on the total number of transactions and the turnover of POS payments in Switzerland in 2022 is essential to evaluate the total costs of POS payments, be it the average transaction costs or the overall economic costs. Statistics on cashless payment methods and cash withdrawals at ATMs are available from the SNB (2023c), while cash use at the POS must be estimated due to its anonymous nature. We applied and tested various methods, and found that consumer surveys provide the most plausible results because they best reflect the relative shares of payment methods at the POS.²⁸

Based on data from Graf et al. (2023), we extrapolated the average number of cash transactions per person per day at the POS to the year 2022 and the Swiss population.²⁹ Next, the number of transactions was multiplied by the average amount of a cash payment, resulting in the total turnover of cash payments at the POS. The number of cash withdrawals, which for the SNB (2023c) only includes those at ATMs and points-of-sales, was corrected for the number of withdrawals at bank counters using the data from Graf et al. (2023). Information on cash changes and exchanges is provided by data collected by the financial institutions themselves (cf. chapter 4.3.2).

²⁸ Other methods are based on the statistics on cash withdrawals and the macroeconomic accounts (see Trütsch, 2017). The total number and total turnover of cash payments based on the consumer survey method are the lowest compared to the other methods.

²⁹ According to the permanent resident population over the age of 15 on 31 December 2022 (see SNB, 2023a).

In 2022, an estimated 1.4 billion cash payments were processed at POSs with a turnover of around CHF 36 billion (cf. Table 1). In addition, around 199 million cash withdrawals and cash exchanges took place, corresponding to a total turnover of around CHF 62 billion. The total number of POS payments with debit and credit cards in Switzerland totalled around 1.4 billion and 340 million, respectively. This corresponds to a turnover of 63 billion CHF (debit card) and CHF 21 billion (credit card) (cf. Table 1).

Table 1: Number and value of POS payments in Switzerland in 2022

	Credit cards	Debit cards	Cash
Total number of POS transactions (in millions)	338	1'420	1'408
Total value of POS transactions (in CHF million)	CHF 20'717	CHF 62'645	CHF 35'901
Average transaction amount (in CHF)	CHF 61.26	CHF 44.13	CHF 25.50
Total number of withdrawals and exchanges (in millions)			199
Total sales of withdrawals and exchanges (in CHF million)			CHF 61'981

Note: The number and value of POS payments as well as cash withdrawals and exchanges only include transactions at stationary points-of-sale or cash withdrawal points in Switzerland. Debit and (prepaid) credit card payments as well as cash withdrawals and exchanges include payment cards issued in Switzerland. Data on payment cards and cash withdrawals are based on SNB statistics (2023c). The estimates of POS cash payments and exchanges are based on data from the Swiss Payment Monitor (cf. Graf et al., 2023) and on our own surveys of financial institutions.

5 Results

5.1 Preliminary remarks

When interpreting the results, a number of caveats are warranted. First, the results are based on current data from 2022, which is why future shifts in the payments market might change the results. Second, we have analysed the gross costs. However, holistically evaluating the efficiency of payment methods requires considering other factors: their income and benefits for other stakeholders, as well as their indirect impact on society in the form of externalities (see Kosse et al., 2017). Our study focuses on directly measurable costs (i.e. internal costs and fee transfers).

Third, the estimated costs of cash include all production and distribution costs, regardless of the intended use. As cash can also be used for purposes other than POS payments (e.g. for payments between individuals or as a reserve for unforeseen expenses), the cash costs of POS payments might be overestimated. However, according to the SNB (2021), cash holdings for short-term and long-term value preservation play a subordinate role compared to other financial assets.³⁰

Fourth, while our sample might not be fully representative of Switzerland's retailer population in all respects, it adequately reflects that population in terms of sector, number of employees and turnover. Fifth, our estimates might be influenced by other assumptions (see Appendix A).

5.2 Total costs

5.2.1 Total private and resource costs

Finding 1: In 2022, the total economic costs (i.e. resource costs) of cash and payment card transactions at the POS amounted to around CHF 7.3 billion. This corresponded to 0.95 per cent of GDP.

Figure 2, which is based on data from Table 2 and Table 3, shows the total private and resource costs broken down by payment method. Cash accounted for the largest share of costs: 71.5 per cent (CHF 5.2 billion) of resource costs were incurred by cash payments, while credit and debit card payments accounted for 14.9 per cent (CHF 1.1 billion) and 13.6 per cent (CHF 1 billion) of total economic costs. Compared to private costs, fees totalled around CHF 4.8 billion (0.62% of the total economy). CHF 4.8 billion (0.62% of GDP) flowed between the analysed stakeholders, primarily due to debit and credit card payments amounting to CHF 2.2 billion (0.28% of GDP) and CHF 1.4 billion (0.18% of GDP), respectively. Cash fees totalled CHF 1.2 billion (0.16% of GDP). In 2022, Switzerland's POS payment system cost every inhabitant CHF 847 per year, of which CHF 605 were for using cash, CHF 126 for credit cards and CHF 115 for debit cards (resource costs).

Overall, the total resource costs of cash, debit and credit card payments were similar to those in other countries (see Junius et al., 2022), although a direct country comparison is difficult as the

³⁰ The proportion of financial assets held in cash is in the single-digit percentage range (see SNB, 2021). Around 70 per cent of the Swiss population keeps cash at home or in a safe deposit box (in addition to their wallet). In this population group, the cash reserves of individuals amount to less than CHF 1,000 in more than three quarters of cases (see SNB, 2021).

results depend on the underlying transaction shares, the methodology and the survey year. Analogous to the methodology used in this study, Kosse et al. (2017) estimated the resource costs for Canada in 2014 at 0.78 per cent of GDP, while in Poland they amounted to 1.21 per cent of GDP in 2018 (cf. Junius et al., 2022).

With transaction shares similar to those in Switzerland, the cost of cash payments accounted for 0.45 per cent of GDP in Canada and 0.78 per cent of GDP in Poland. In this respect, Switzerland ranked mid-table, with 0.68 per cent of GDP (cf. Table 3). At 0.13 and 0.14 per cent of GDP, the total resource costs of debit and credit card payments in Switzerland are only partially comparable with Canada (0.14% and 0.29%, respectively) and Poland (0.26% and 0.04%, respectively), with costs driven mainly by the respective (low) usage shares.

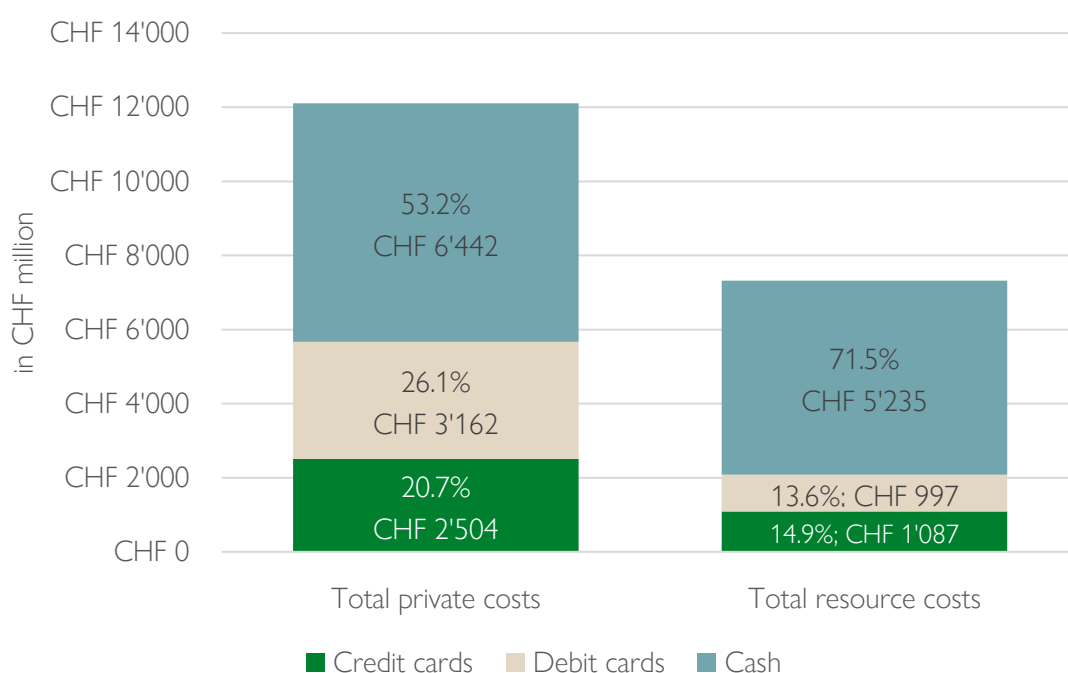


Figure 2: Total private and resource costs of credit card, debit card and cash payments
 Note: Data based on Table 2 and Table 3

Compared to Minsch et al. (2007), who estimated the overall economic costs of cash payments in Switzerland at around 0.4 per cent of GDP for the first time in 2006, these costs rose by 0.2 percentage points to 0.6 per cent of GDP by 2022; this figure is corrected for “consumer” stakeholders, which Minsch et al. (2007) did not include. Today, the “cash” payment system costs the Swiss population twice as much compared to 2006 – given that the estimated total cash transactions at the POS fell by around half between 2006 and 2022, and that the number of transactions is a key driver of total costs.³¹

Therefore, the decline in cash payments might have significantly increased the average cost of cash (for individual actors), in particular due to a relatively high fixed cost component of cash

³¹ Per capita, the total economic costs of cash payments excluding the “consumer” stakeholder rose from CHF 300 in 2006 to CHF 546 in 2022 (+82%).

payments. It is not possible to compare the development of the costs of debit and credit card payments, as Minsch et al. (2007) only analysed the Maestro debit card system.

Table 2: Private costs of credit card, debit card and cash payments (in CHF million)

	Credit cards	Debit cards	Cash	Total	Share of GDP
Financial institutions and infrastructure providers	CHF 1'075	CHF 373	CHF 3'064	CHF 4'512	0.585%
SNB and Swissmint	CHF 0	CHF 0	CHF 214	CHF 214	0.028%
Retailers	CHF 781	CHF 1'829	CHF 2'049	CHF 4'660	0.604%
Consumers	CHF 648	CHF 960	CHF 1'114	CHF 2'722	0.353%
Total	CHF 2'504	CHF 3'162	CHF 6'442	CHF 12'108	1.570%
Share of total costs	20.7%	26.1%	53.2%	100.0%	
Share of GDP	0.325%	0.410%	0.835%	1.570%	

Table 3: Resource costs of credit card, debit card and cash payments (in CHF million)

	Credit cards	Debit cards	Cash	Total	Share of GDP
Financial institutions and infrastructure providers	CHF 903	CHF 345	CHF 2'822	CHF 4'070	0.528%
SNB and Swissmint	CHF 0	CHF 0	CHF 200	CHF 200	0.026%
Retailers	CHF 136	CHF 459	CHF 1'699	CHF 2'294	0.298%
Consumers	CHF 48	CHF 192	CHF 514	CHF 755	0.098%
Total	CHF 1'087	CHF 997	CHF 5'235	CHF 7'319	0.949%
Share of total costs	14.9%	13.6%	71.5%	100.0%	
Share of GDP	0.141%	0.129%	0.679%	0.949%	

5.2.2 Total private and resource costs per stakeholder

Finding 2: In 2022, the level of costs varied greatly by stakeholder and payment method.

At 0.60 per cent of GDP, retailers paid the highest private costs due to transaction fees, followed by the financial sector at 0.59 per cent of GDP. In contrast, the financial sector had the highest resource costs at 0.53 per cent of GDP, followed by retailers at 0.3 per cent of GDP (cf. Table 2 and Table 3). Retailers were followed by consumers and the SNB (at around 0.03 per cent of GDP, the latter's costs are negligible). These results are in line with international studies (see Junius et al., 2022).

Figure 3 shows the total private and resource costs broken down by stakeholder and payment method, while Figure 10 (cf. Appendix) shows the corresponding relative shares. In terms of private costs, the financial sector had the largest share of cash and credit card costs with a share of 48 per cent and 43 per cent (CHF 3.1 billion and CHF 1.1 billion, respectively). With a share of 58 per cent (CHF 1.8 billion), retailers paid the highest private costs for debit cards. Retailers had

almost equal shares of the private costs of credit cards (31%; CHF 781 million) and cash (32%; CHF 2.1 billion), while consumers had similarly high private cost shares for credit and debit cards (26%; CHF 648 million and 30%; CHF 960 million).

If only the resource costs are considered, the largest share was borne by the financial sector and retailers. For example, financial institutions and infrastructure providers paid 83 per cent and 54 per cent (CHF 903 million and CHF 2.8 billion, respectively) of credit card and cash costs, while retailers incurred 46 per cent and 32 per cent (CHF 459 million and CHF 1.7 billion, respectively) of debit card and cash costs (see Appendix, Figure 3 and Figure 10). Consumers paid least for credit cards overall with a share of around 5 per cent (CHF 48 million), followed by cash (10 per cent; CHF 514 million) and debit cards (19%; CHF 192 million). The share of resource costs attributable to the SNB and Swissmint for cash was limited at 4 per cent (CHF 200 million). The breakdown of costs by stakeholder is roughly similar to that in other countries (see Kosse et al., 2017).

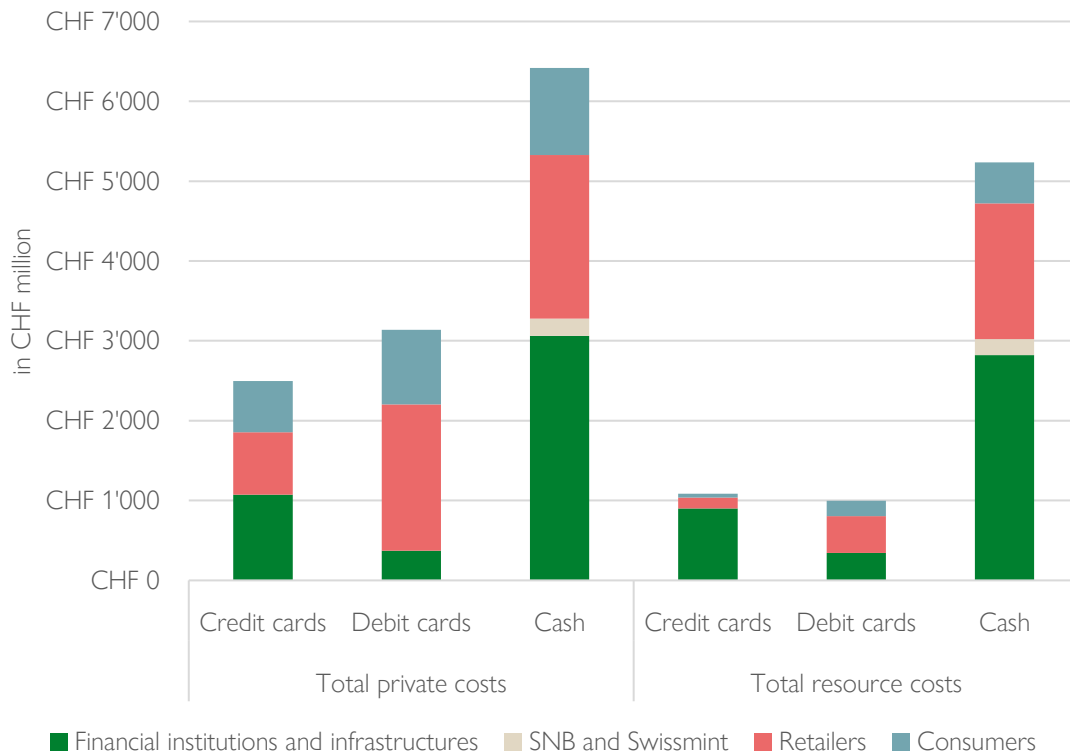


Figure 3: Total private and resource costs of credit card, debit card and cash payments by stakeholder
 Note: Data based on Table 2 and Table 3

5.3 Total costs per payment instrument

5.3.1 Cash payments

Finding 3: In 2022, cash generated the highest resource costs, followed by credit cards. Debit cards had the lowest resource costs. Cash also caused the highest private costs, followed by debit and credit cards.

All stakeholders incurred total private costs of around CHF 6.4 billion for providing and using cash in 2022 (cf. Table 4). Financial institutions and infrastructure providers bore the largest share at CHF 3.1 billion (48%). The most important direct cost factors concerned the provision of ATMs and the transport of cash. Retailers incurred around CHF 2.1 billion in cash costs (32%), most of which (46%) related to cash management (equipment costs, transport costs, insurance) and back-office costs (44%) (see Appendix, Figure 11). Just under a fifth (17%; CHF 1.1 billion) of private cash costs were borne by consumers, and were caused mainly by bank account and withdrawal fees, followed by the time required to obtain cash and use it at a POS. The lowest cash costs, totalling CHF 214 million, were incurred by the SNB and Swissmint, most of which are attributable to the production of banknotes and coins (cf. Table 4).

The largest share (49.7%; CHF 600 million) of fees related to cash payments was incurred by consumers, followed by retailers (29.1%; CHF 351 million), the financial sector (20.0%; CHF 242 million) and the SNB incl. Swissmint (1.2%; CHF 14 million) (cf. Table 4). For consumers, fees mainly comprised bank account and withdrawal fees to financial institutions, for retailers equipment costs, transport costs and insurance, and for the financial sector and the SNB transport and distribution costs for cash to cash-in-transit companies.

Table 4: Private and resource costs of cash payments (in CHF million)

	Private costs	Share of total private costs	Fees	Resource costs	Share of total resource costs
Financial institutions and infrastructure providers	CHF 3'064	47.6%	CHF 242	CHF 2'822	53.9%
SNB and Swissmint	CHF 214	3.3%	CHF 14	CHF 200	3.8%
Retailers	CHF 2'049	31.8%	CHF 351	CHF 1'699	32.4%
Consumers	CHF 1'114	17.3%	CHF 600	CHF 514	9.8%
Total	CHF 6'442	100.0%	CHF 1'207	CHF 5'235	100.0%

Analysing private costs enables understanding stakeholder behaviour, while examining resource costs helps determine overall economic cost efficiency. In 2022, the resources used by society for cash payments cost around CHF 5.2 billion, of which the SNB and Swissmint incurred the lowest costs at CHF 200 million (3.8%) (cf. Table 4). Consumers also used few resources (CHF 514 million; 9.8%), which only include time and opportunity costs. Most resources were consumed by financial institutions and infrastructure providers (CHF 2.8 billion; 53.9%), followed by retailers with CHF 1.7 billion (32.4%). The resources used by the financial sector mainly served to provide counter

and ATM services, while the retail sector primarily spent time on receiving cash payments (front-office activities) and carrying out back-office activities.

5.3.2 Credit card payments

In 2022, the total private costs of credit card payments (including prepaid credit cards) amounted to around CHF 2.5 billion, of which the financial sector accounted for the largest share at just under 43 per cent (CHF 1.1 billion) (cf. Table 5).³² The costs for loyalty programmes and data centres were the largest cost elements for financial institutions, while interchange fees were a large cost block for infrastructure providers (acquirers). In 2022, retailers bore around 31 per cent (CHF 781 million) of the total private costs of credit card payments, followed by consumers with 26 per cent (CHF 648 million). For retailers, the transaction fees paid to acquirers were by far the most significant cost factor of credit cards, accounting for just under 80 per cent of costs (see Appendix, Figure 11). The largest cost elements for consumers were annual credit card fees and account management fees. The SNB and Swissmint bore no costs for credit cards.

Table 5 shows that in 2022 credit card fees accounted for a considerable share of costs, particularly for retailers and consumers: 45.5 per cent (CHF 645 million) for retailers and 42.3 per cent (CHF 600 million) for consumers. Retailers mainly paid acquirer fees, but also fees for renting or owning card terminals and for insurance services (see Appendix, Figure 11). While consumers paid no transaction fees for credit card payments, they paid annual fees for owning credit cards. The fees paid by the financial sector related mainly to billing costs and amounted to around CHF 172 million (12.1%) in 2022.

Table 5: Private and resource costs of credit card payments (in CHF million)

	Private costs	Share of total private costs	Fees	Resource costs	Share of total resource costs
Financial institutions and infrastructure providers	CHF 1'075	42.9%	CHF 172	CHF 903	83.0%
SNB and Swissmint	CHF 0	0.0%	CHF 0	CHF 0	0.0%
Retailers	CHF 781	31.2%	CHF 645	CHF 136	12.5%
Consumers	CHF 648	25.9%	CHF 600	CHF 48	4.5%
Total	CHF 2'504	100.0%	CHF 1'417	CHF 1'087	100.0%

In 2022, the resources used for credit card payments amounted to just under CHF 1.1 billion (cf. Table 5). The majority of those resources can be attributed to the financial sector (83.0%; CHF 903 million), whose largest cost factors included operating processing centres and loyalty programmes. This is followed by retailers (12.5%; CHF 136 million), and by consumers (4.5%; with CHF 48 million), and mainly includes transaction times at checkouts.

³² Cost data do not enable distinguishing prepaid credit cards. However, these only account for around 1.3 per cent of all POS payments examined here. For this reason, it is assumed that the cost contribution to credit card costs is negligible.

5.3.3 Debit card payments

In 2022, the total private costs of debit card payments for all stakeholders amounted to just under CHF 3.2 billion in 2022 (cf. Table 6). More than half of these costs (57.8% ; CHF 1.8 billion) were borne by retailers in the form of transaction fees (52.0%), terminal costs (12.1%) and insurance costs (26.1%) (see Appendix, Figure 11). Consumers paid just under a third of the total private costs (30.4%; CHF 960 million), most of which were for annual and account management fees. CHF 373 million (11.8%) of private costs are attributable to financial institutions and infrastructure providers. These costs arose mainly from providing and processing payments and interbank fees. The SNB and Swissmint did not bear any costs for debit cards.

In 2022, retailers (63.3%; CHF 1.4 billion) and consumers (35.4%; CHF 768 million) incurred the majority of fees. In addition to transaction fees (acquiring fees), retailer fees also include rental fees and depreciation costs for terminals. The largest block of consumer fees was the annual and account management fees for debit cards. Fees for the financial sector were negligible (1.3%; CHF 28 million).

The total economic costs (resource costs) of debit card payments corresponded to just under CHF 1 billion, i.e. only a third of the total private costs (cf. Table 6). Consumers had the lowest share of the total resource costs (ca. 19%; CHF 192 million), which mainly comprises the time spent on payments at a POS. In contrast, retailers bore the highest resource costs (ca. 46%; CHF 459 million), mainly due to the time spent on receiving payments (front-office) and carrying out back-office activities. The financial sector accounted for just over a third (34.6%; CHF 345 million) of the resource costs for the provision of debit card services.

Table 6: Private and resource costs of debit card payments (in CHF million)

	Private costs	Share of total private costs	Fees	Resource costs	Share of total resource costs
Financial institutions and infrastructure providers	CHF 373	11.8%	CHF 28	CHF 345	34.6%
SNB and Swissmint	CHF 0	0.0%	CHF 0	CHF 0	0.0%
Retailers	CHF 1'829	57.8%	CHF 1'370	CHF 459	46.1%
Consumers	CHF 960	30.4%	CHF 768	CHF 192	19.3%
Total	CHF 3'162	100.0%	CHF 2'165	CHF 997	100.0%

5.4 Average costs

Finding 4: On average, in 2022 debit card payments were the cheapest payment method, both in terms of resource costs per transaction and per sales transacted. Cash incurred the highest resource costs per transaction and per franc transacted. The resource costs of credit cards were close to those of cash per transaction and close to those of debit cards per franc transacted.

The level of total costs – both in terms of private and resource costs – is strongly influenced by the total number of transactions. For this reason, it makes sense from an overall economic cost

efficiency perspective to compare the average resource costs per transaction (cf. Figure 4 and Table 7). Overall, debit card transactions generated the lowest average resource costs per transaction (CHF 0.70), followed by credit cards (CHF 3.21) and cash (CHF 3.72). In 2022, a debit card transaction was therefore around 4.6 and 5.3 times cheaper for the economy than credit card and cash transactions, respectively.

In 2022, financial institutions and infrastructure providers incurred the highest average resource costs per transaction for credit cards (CHF 2.67) and cash (CHF 2.00), while this was the case for debit cards at retailers (CHF 0.32) (cf. Figure 4). On average, retailers spent around 3 times and 3.7 times more resources on cash payments than on credit and debit card payments. On average, consumers spent more than twice as much on cash payments than on payment card transactions (cf. Figure 4).

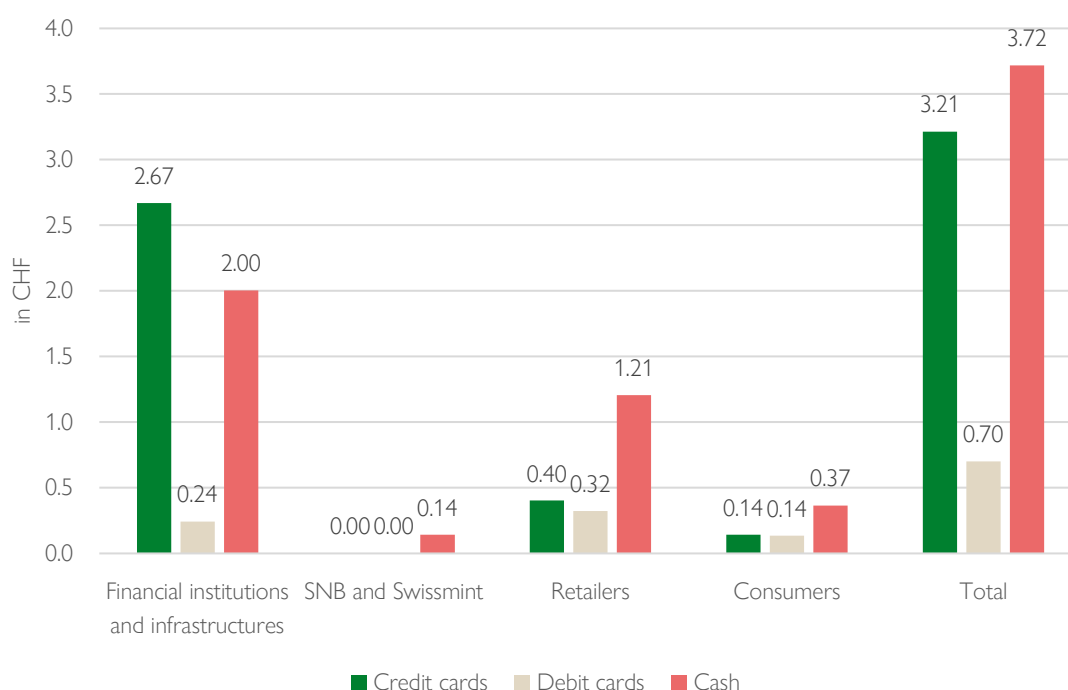


Figure 4: Average resource costs per transaction
 Note: Data based on Table 7

Recent studies show the same ranking of the average resource costs for POS payments: Debit cards were the cheapest payment method, followed by credit cards and cash (cf. Norges Bank, 2022; Engström et al., 2023; Sintonen and Takala, 2022). This is partly due to the fact that an increasing number of card payments leads to significantly lower average costs, as their (fixed) costs are spread over an increasing number of transactions. In contrast, a decreasing number of cash payments means that their (fixed) costs are spread over a decreasing number of transactions, which leads to higher average costs. The development of payment behaviour in Switzerland points in this direction (see chapter 2.2).

Comparing resource costs with total sales or transaction value reveals a similar, albeit more accentuated, picture. Table 7 (last row) shows the total resource costs as a percentage of the total transaction value of the individual means of payment. For each cash transaction, a total of 14.6 per

cent of the transaction value were spent in 2022 on resources to enable, execute and accept payments. For credit cards, resource costs amounted to 5.2 per cent of the transaction value, while they were lowest for debit cards (1.6%).

Table 7: Average costs per transaction

	Credit cards	Debit cards	Cash
Private costs			
Financial institutions and infrastructure providers	CHF 3.178	CHF 0.263	CHF 2.176
SNB and Swissmint	CHF 0	CHF 0	CHF 0.152
Retailers	CHF 2.310	CHF 1.288	CHF 1.456
Consumers	CHF 1.916	CHF 0.676	CHF 0.791
Average private costs per transaction	CHF 7.403	CHF 2.228	CHF 4.575
Private costs as % of total transaction value	12.1%	5.0%	17.9%
Resource costs			
Financial institutions and infrastructure providers	CHF 2.669	CHF 0.243	CHF 2.004
SNB and Swissmint	CHF 0	CHF 0	CHF 0.142
Retailers	CHF 0.403	CHF 0.324	CHF 1.207
Consumers	CHF 0.143	CHF 0.136	CHF 0.365
Average resource costs per transaction	CHF 3.214	CHF 0.702	CHF 3.718
Resource costs as % of total transaction value	5.2%	1.6%	14.6%

Note: Resource costs (private costs) as a percentage of total transaction value are the costs (private costs) of each means of payment divided by the total value of its transactions. The share of resource costs shows how much of a transaction was spent by the economy or society to enable, execute and accept this payment, regardless of its transaction value.

5.5 Fixed and variable costs

5.5.1 Total resource costs

Finding 5: In 2022, cash was the most expensive payment method in terms of total variable resource costs (i.e. per additional transaction and per additional franc transacted), regardless of the transaction value, followed by credit and debit cards.

Generally, the costs of payment methods are influenced by economies of scale and scope. In other words, the costs of an additional transaction for a payment method as a rule decreases as the number of transactions increases (decreasing marginal costs), resulting in so-called positive economies of scale. Payment methods also benefit from economies of scope: For example, card terminals are used with various payment methods, thus reducing the costs of each method. It is therefore helpful to analyse the variable costs or, derived from this, the marginal costs of a means of payment. The variable costs also depend on the transacted amount (i.e. its value).

Table 11 (see Appendix) lists the (total) resource costs by fixed and variable costs per means of payment. The composition of fixed and variable costs varies greatly depending on the means of payment. Figure 5 (based on Table 11 in the Appendix) shows the percentage distribution of total resource costs into fixed and variable costs per means of payment.

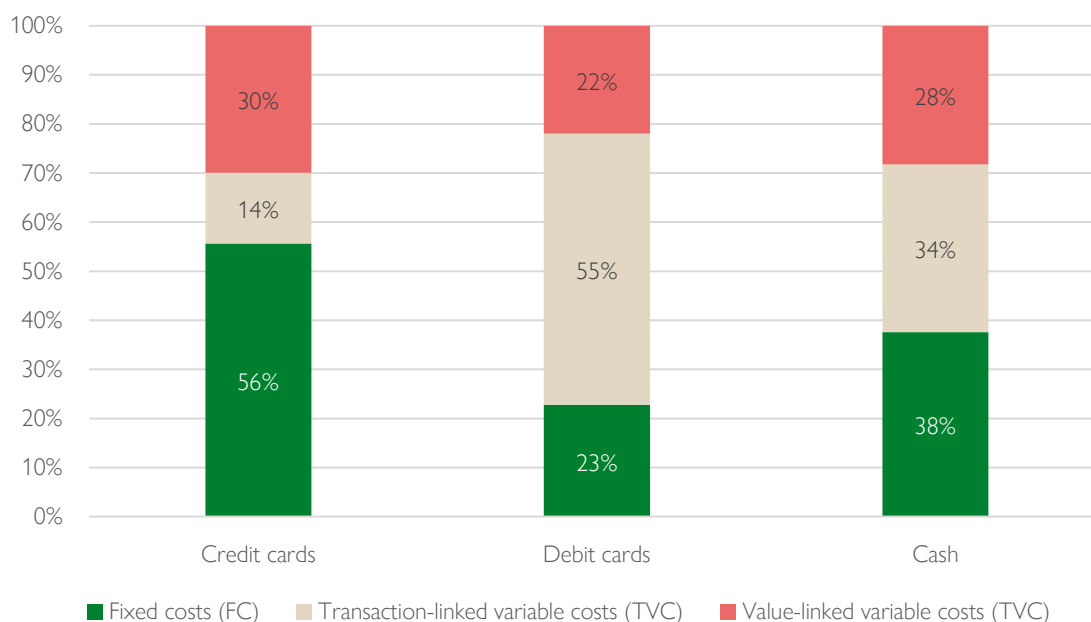


Figure 5: Percentage breakdown of total resource costs into fixed and variable costs per means of payment

In 2022, the largest share of cash costs was fixed costs (38%), followed by transaction- and value-linked variable costs (34% and 28%, respectively; cf. Figure 5). Fixed costs were mainly borne by the financial sector in connection with cash handling and the provision of ATMs and counter services. The variable costs primarily include the time costs for cash withdrawals (for consumers) and cash payments (for retailers).

Of the total resource costs of debit cards, a smaller proportion was fixed (23%) and dependent on turnover (22%), while the majority varies with the number of transactions (57%). Transaction-linked variable costs mainly comprise the time spent by consumers and retailers on making and accepting payments.

More than half of the resource costs of credit cards were fixed (56%), with 30 per cent depending on the payment value and 14 per cent on the number of transactions (cf. Figure 5). In the financial sector, fixed costs are incurred in particular for activities relating to processing centres and personnel. These costs, which vary by payment turnover, primarily include the costs of combating fraud and losses, which are mainly borne by the financial sector and retailers.

The breakdown of cost types enables analysing the variable resource costs per transaction for every possible transaction value (cf. Brits and Winder, 2005). This value indicates how much an additional transaction costs for every transaction value if the underlying infrastructure is already in place (i.e. if the fixed costs have been paid). According to Figure 6, cash is the most expensive means of payment for an economy or society per transaction value, followed by credit and debit cards. The variable resource costs of debit cards barely increase with the transaction value,

whereas they increase sharply with the payment value, in particular with credit cards and cash. In 2022, for example, a cash payment of CHF 20 cost society CHF 2.10, while a credit and debit card payment cost CHF 0.80 and CHF 0.50, respectively. For a transaction value of CHF 100, the total economic costs increased to CHF 5.40 for cash, to CHF 2 for credit cards, and to CHF 0.70 for debit cards.

The amount of variable costs depend on the allocation of fixed, transaction and value-linked costs. However, cost allocation is not always clear. For example, it is not proven which share of indirect costs (e.g. personnel costs, costs for office space) increases with the number of transactions and which share depends on sales. In addition, the level of fixed costs depends heavily on the time horizon under consideration (see section 3.1.2). Therefore, our results are rather indicative. No comparison with current international studies is possible because variable costs are rarely reported and because methodologies of costs studies differ greatly.

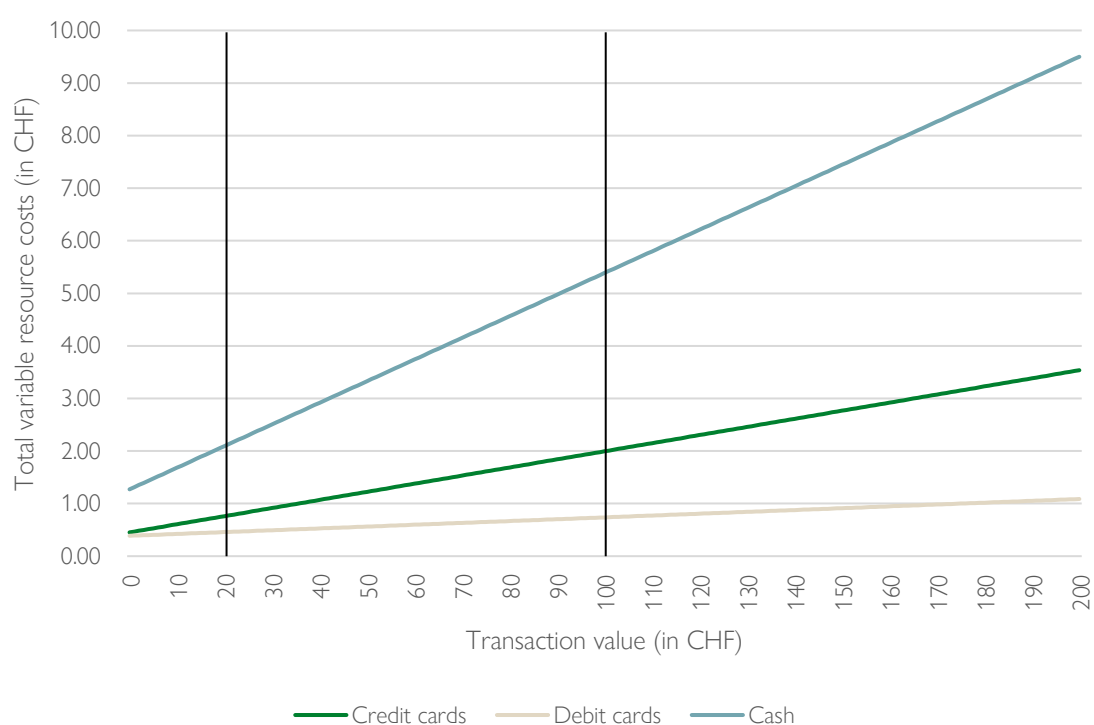


Figure 6: Total variable resource costs by transaction value

Note: Total variable resource costs (VCT) are calculated based on data in Table 11 (see Appendix) as follows:

$VCT = a + (b \times TV)$. VCT correspond to the costs of one additional transaction and one additional franc transacted for each transaction value (so-called marginal costs). VCT indicate how much an additional transaction costs for each transaction value if the underlying infrastructure is already in place.

5.5.2 Private costs per stakeholder

Finding 6: From a stakeholder perspective (i.e. if their choice of payment method is based solely on private costs), in 2022 consumers favoured credit cards, while retailers partly preferred debit cards, as did financial institutions and infrastructure providers.

Private costs are decisive for stakeholders' choice of payment method. For this reason, the most cost-effective payment methods from an overall economic perspective are not necessarily favoured from a private perspective. The discrepancy between a stakeholder's private costs and the

total resource costs (of all stakeholders) can therefore lead to an excessive use of payment methods incurring higher resource costs. Conversely, the discrepancy can also lead to payment methods with low resource costs being underused if stakeholders' choices are determined exclusively by private costs (cf. Kosse et al., 2007).

Figure 12, Figure 13 and Figure 14 (see Appendix) show the variable costs per stakeholder (except the SNB) and the means of payment as a function of the transaction value. In 2022, debit cards were the most favourable payment method in the financial sector regardless of the transaction amount, followed by credit cards and cash (cf. Figure 12). For example, for a transaction of CHF 100, financial institutions and infrastructure providers incurred private costs of CHF 0.16 for debit cards, CHF 1.97 for credit cards and CHF 2.59 for cash. The fact that in 2022 cash was the most expensive payment method for the financial sector is supported by the fact that cash services and access to cash are continuously being reduced and the number of cash-in-transit companies consolidated. In other words, the number of ATMs and bank branches has been steadily declining for years (see Trütsch, 2022). In many cases, cash can no longer be withdrawn from bank counters, but only from ATMs.

In 2022, debit cards were also the cheapest payment method for retailers, but only above a transaction value of CHF 18.95. Below this, credit cards were cheapest, followed by cash up to an amount of CHF 18.74 (cf. Figure 13). For example, for a transaction of CHF 100 (CHF 10), retailers incurred private costs of CHF 1.70 (CHF 0.91) for debit cards, CHF 2.75 (CHF 0.74) for credit cards and CHF 3.25 (CHF 0.80) for cash. Although credit and debit cards were cheaper than cash, regardless of the transaction amount, payment cards are less accepted than cash by face-to-face businesses (e.g. hospitality, retail, public administration) (see SNB, 2023d).

This finding could indicate that not only the variable costs of payment methods are decisive for retailers, but also the fixed costs (e.g. card terminals). The average fixed costs tend to be significantly higher for small retailers with few transactions than for large retailers with many transactions, which is why small retailers tend to refrain from accepting payment cards. In addition, there are more important reasons for retailers to accept payment methods than costs: customer needs are by far the most important reason, followed by reliability and low susceptibility to malfunctions or crisis resistance – both for the acceptance of payment cards and for cash (SNB, 2023d). In the case of cash, settlement speed also plays an even more important role than the overall costs (SNB, 2023d). This might obscure the fact that the time and opportunity costs of POS payments are often not considered by individual retailers when comparing costs. This might apply more to small retailers than large ones, as opportunity costs are less significant for the latter.

In 2022, credit cards were the cheapest payment method for consumers, regardless of the transaction value, followed by debit cards and cash. For consumers, a transaction of CHF 100 incurred private costs of CHF 0.17 for credit cards, CHF 0.18 for debit cards and CHF 0.96 for cash (cf. Figure 14). Although factors other than pure costs also play a role in payment decisions, in 2022 consumers mainly favoured credit and debit cards according to their private costs. This finding is consistent with the observation that debit cards are the most popular means of payment at stationary POS in Switzerland (measured by value and number of transactions) (cf. chapter 2.2).

6 Closing remarks

This study has analysed the costs of stationary POS payments in Switzerland in 2022. We have focused on the most important means of payment: cash, debit cards and credit cards (including prepaid credit cards) provided by Swiss issuers. Besides collecting extensive survey-based data on financial institutions, infrastructure providers and retailers in Switzerland, our study also includes data from the first-ever time measurements of POS payments. We have considered the most important stakeholders in the payment system for POS payments: financial institutions and infrastructure providers, the SNB and Swissmint, retailers and consumers. Our study is the first to provide comprehensive information on the costs of POS payments in Switzerland.

The overall economic costs associated with POS payments in Switzerland are by no means negligible. In 2022, the resource costs amounted to around CHF 7.3 billion. This corresponded to 0.95 per cent of GDP. Debit cards were the most cost-effective means of payment for the Swiss economy and society, respectively, followed by credit cards and cash. The level of costs varies greatly by stakeholder and payment method. The results are comparable with other international studies, although the methodologies and country-specific characteristics differ.

While total resource costs are most important from a societal cost efficiency perspective, private costs are more informative for understanding stakeholder behaviour. If stakeholders make their payment choices based solely on their private costs, in 2022, consumers favoured credit cards, while retailers partly favoured debit cards, as did financial institutions and infrastructure providers.

When interpreting the results, it should be noted that they are based on data from 2022, which is why potential shifts in the environment of the payment methods market might change the results. For example, the importance of mobile payments, the new generation of online-enabled debit cards and cash withdrawal options at the POS is increasing significantly. The number of ATMs and bank branches is steadily declining. Thanks to innovations in cash handling, the automation of cash processes is increasing, making cash payments more efficient and cost-effective. In contrast, the opportunity costs of holding cash have risen since 2022, as a result of the positive interest rate level.

In addition, we have focused exclusively on gross costs, which are directly measurable. However, a comprehensive assessment of the efficiency of payment methods would require including their revenues and benefits for other stakeholders, as well as their indirect societal impacts in the form of externalities. For example, despite high costs, many retailers arguably accept cash, because it meets customer need, as well as payment cards, because they tend to generate higher sales. The provision of cash services might also allow banks to attract and retain customers, in turn offering financial institutions the opportunity to sell customers additional banking products and services.

Our study provides objective indications of where the costs of POS payments could be reduced overall, and of how expensive POS payments are by international comparison. The potential introduction of a digital Swiss franc, which would, among other things, enable fully automated (micro) payments around the clock, might contribute to making payment transactions more efficient.

References

- FSO, Federal Statistical Office (2022). Swiss Wage Structure Survey 2020 [online] <https://www.bfs.admin.ch/news/de/2022-0666> [accessed on 20 July 2023].
- Brits, H., Winder, C. (2005). Payments are No Free Lunch. DNB Occasional Studies 302, Netherlands Central Bank, Research Department.
- Deutsche Bundesbank (2023). Schnelles Bezahlen mit Bargeld und kontaktlosen Zahlungsmitteln möglich. Press release from 10.01.2023.
- EC, European Commission, Directorate-General for Competition; Pavel, F., Kornowski, A., Knuth, L. (2020). Study on the application of the Interchange Fee Regulation: Final Report, Publications Office. [online] <https://data.europa.eu/doi/10.2763/137970> [accessed 20 July 2022].
- FDf, Federal Department of Finance (2023). Federal budget 2022 – Swissmint. [online] [Federal budget \(admin.ch\)](https://www.admin.ch/gov/de/section/02/01/000000000/20230630/42411) [accessed on 30.6.2023].
- Engström, N., Reslow, A., Pedersen, A., Linton, F., Tosteby, C. (2023). Cost of payments in Sweden. Riksbank Studies No. 1, Sveriges Riksbank.
- FTA, Federal Tax Administration (2023). Statistics on value added tax – Value added tax in Switzerland 2021 [online] [Statistics on value added tax | FTA \(admin.ch\)](https://www.esta.admin.ch/esta/02/01/000000000/20230901/42411) [accessed 1 October 2023].
- Goldszmidt, A., List, J. A., Metcalfe, R. D., Muir, I., Smith, V. K., Wang, J. (2020). The Value of Time in the United States: Estimates from Nationwide Natural Field Experiments, National Bureau of Economic Research No. w28208.
- Graf, S., Heim, N., Stadelmann, M., Trütsch, T. (2023). Swiss Payment Monitor 2023 – How does Switzerland pay?, Issue 2/2023 – Survey May 2023, University of St.Gallen/Zurich University of Applied Sciences. [online] www.swisspaymentmonitor.ch [accessed on 30 August 2023].
- Gresvik, O., Øwre, G. (2002). Banks' costs and income in the payment system in 2001. Economic Bulletin Q4, Norges Bank.
- Junius, K., Devigne, L., Honkkila, J., Jonker N., Kajdi, L., Kimmerl, J., Korella, L., Matos, R., Menzl, N., Przenajkowska, K., Reijerink, J., Rocco, G., Rusu, C. (2022). Costs of retail payments – an overview of recent national studies in Europe. ECB Occasional Paper Series No 294. doi:10.2866/3482.
- Kosse, A., Chen, H., Felt, M-H., Jiongo, V., Nield, K., Welte, A. (2017). The Costs of Point-of-Sale Payments in Canada. Bank of Canada Staff Discussion Paper 2017-4. Ottawa: Bank of Canada Currency Department.
- Lammer, T., Banka, H., Kostova, G. (2015). Retail Payments: A Practical Guide for Measuring Retail Payment Costs. Washington, D.C.: World Bank Group.
- Minsch, R., Fauceglia, D., Bernegger, U. (2007). Die Kosten des Bargelds: Empirischer Kostenvergleich der Zahlungsverkehrsmittel Maestro und Bargeld in der Schweiz. University of St.Gallen.

- Moneyland (2023). Private account comparison. [online] <https://www.moneyland.ch/de/privateaccount/index> [accessed 26/05/2023].
- Norges Bank (2022). Costs in the Norwegian payment system 2020. Norges Bank Papers No. 3 2022. Oslo: Norges Bank.
- Przenajkowska, K., Polasik, M., Maciejewski, K., Koźliński, T. (2019). Costs of payment instruments on the Polish market. Warsaw: Narodowy Bank Polski Payment Systems Department.
- Schmiedel, H., Kostova, G., Ruttenberg, W. (2013). The Social and Private Costs of Retail Payment Instruments: A European Perspective. *Journal of Financial Market Infrastructures* 2(1): 37-75.
- Sintonen, M., Takala, K. (2022). Costs of retail payments in Finland: What paying costs? *Expository Studies A: 129*, Bank of Finland, Helsinki.
- SNB, Swiss National Bank (2021). Survey on payment methods 2020. Zurich/Bern 2021.
- SNB, Swiss National Bank (2023a). Survey on payment methods among private individuals in Switzerland 2022. Zurich/Bern 2023.
- SNB, Swiss National Bank (2023b). 115th Annual Report of the Swiss National Bank. Zurich/Bern 2023.
- SNB, Swiss National Bank (2023c). Data portal: Payment transactions – Payments and cash withdrawals. [online] <https://data.snb.ch> [accessed 30 June 2023].
- SNB, Swiss National Bank (2023d). Survey on payment methods among companies in Switzerland 2023: Selected results. Zurich/Bern 2023.
- Trütsch, T. (2017). Bankkarten verdrängen Bargeld. *Die Volkswirtschaft*, 8-9, p. 10–13.
- Trütsch, T. (2022). Swiss Money Map 2022. A spatial analysis of cash access points in Switzerland, University of St.Gallen. [online] www.moneymap.ch [accessed 20.07.2023].
- Trütsch, T. (2023). Turnover shares of payment methods at stationary points of sale in Switzerland [Graphic]. Swiss Payment Behaviour Lab. [online] <https://www.swisspaymentbehaviour.ch/allgemein> [accessed on 30.8.2023].
- Wettstein, F., Lieb, H. (2000). Lebenszyklus der Schweizer Banknoten. *Quartalsheft der Schweizerischen Nationalbank*, 3/2000.

Appendix

Figures

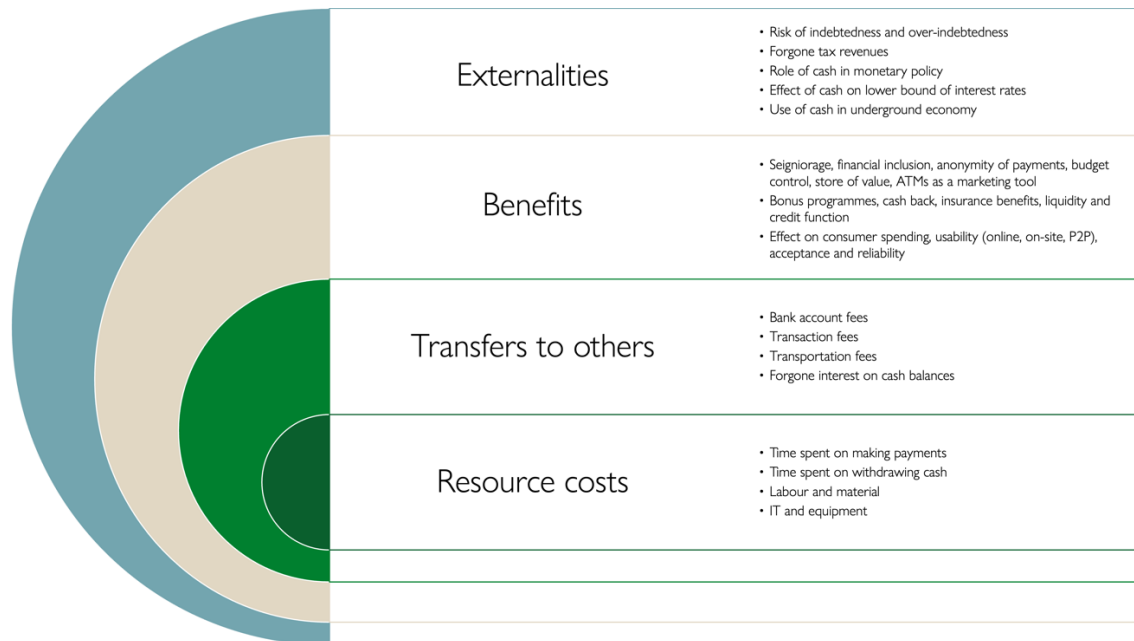


Figure 7: Costs, benefits and externalities of the means of payment
 Source: Authors' illustration based on Kosse et al. (2017)
 Note: Non-exhaustive list

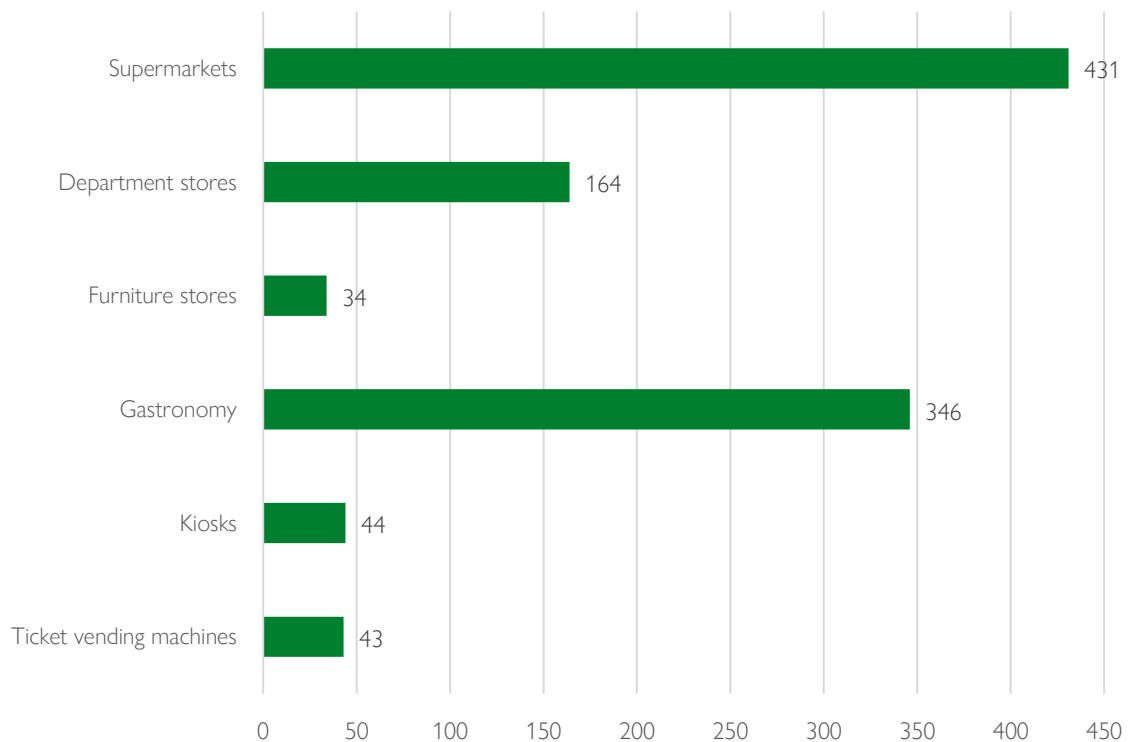


Figure 8: Number of time measurements by type of business

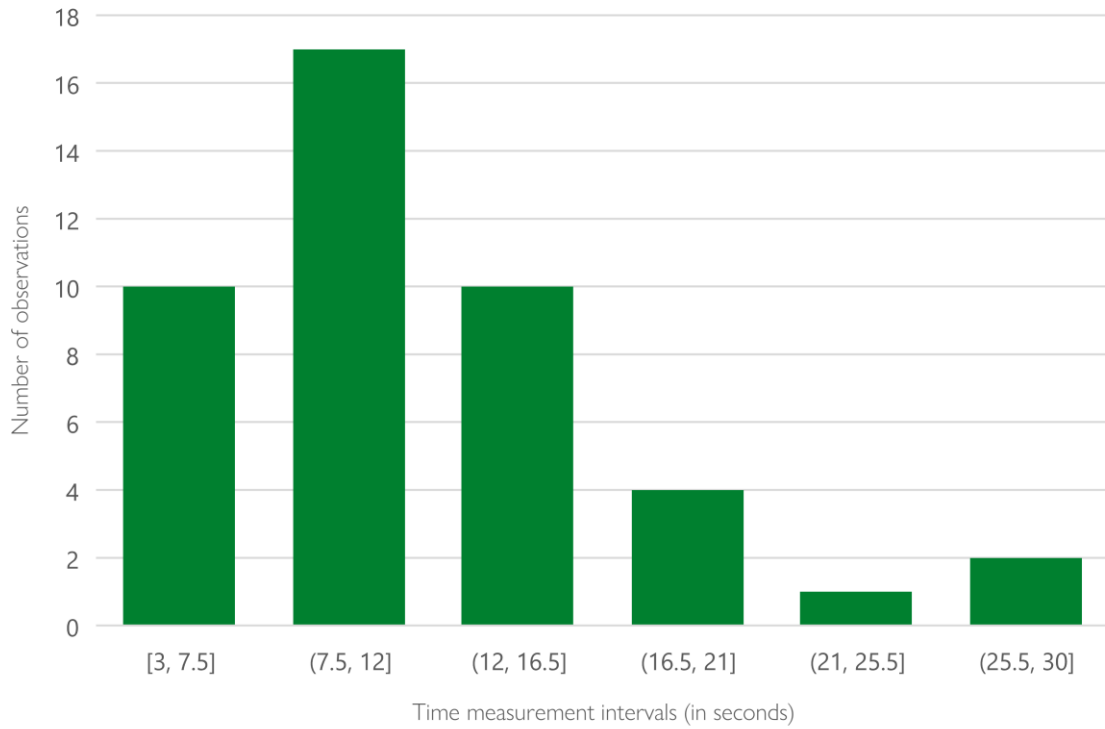


Figure 9: Distribution of the measured duration by interval

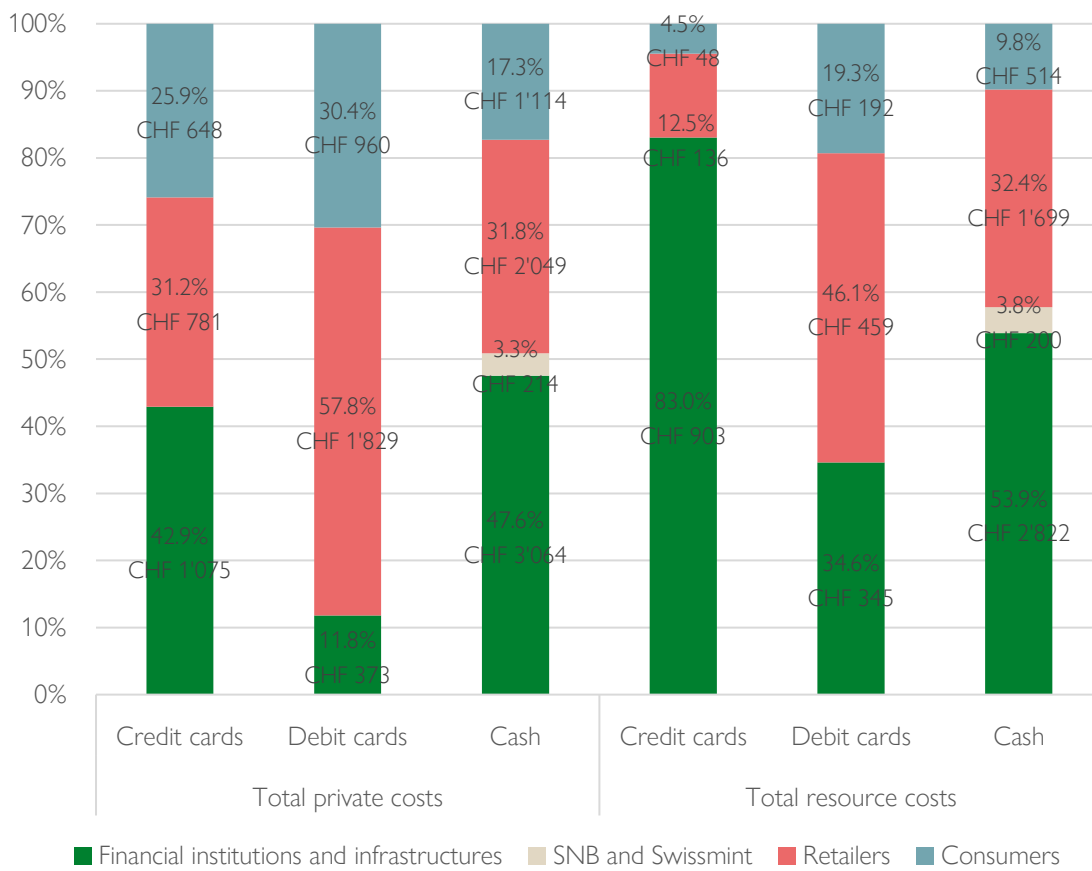


Figure 10: Total private and resource costs of credit card, debit card and cash payments by stakeholder (in per cent)

Note: Relative shares are based on data in Figure 3 as well as Table 2 and Table 3, respectively

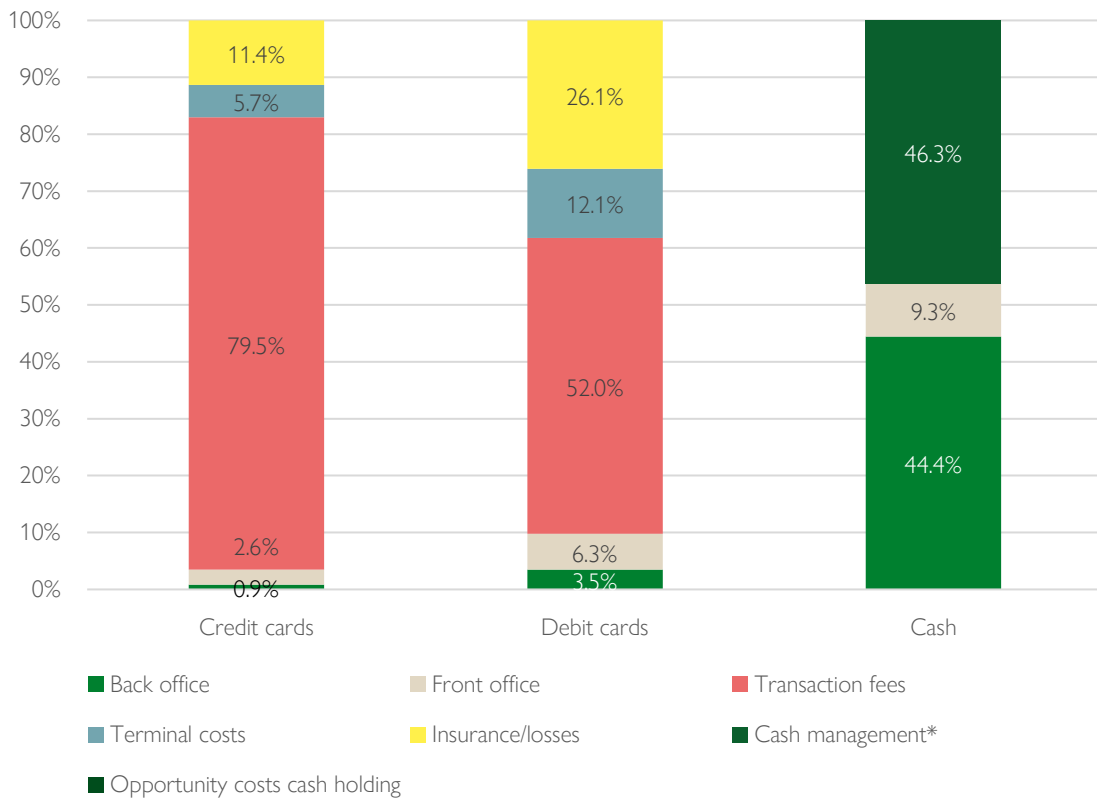


Figure 11: Percentage breakdown of private retailer costs by cost elements

Note: *Cash management costs include costs for equipment, transport and insurance. The opportunity costs of holding cash were zero in 2022 due to negative and low interest rates.

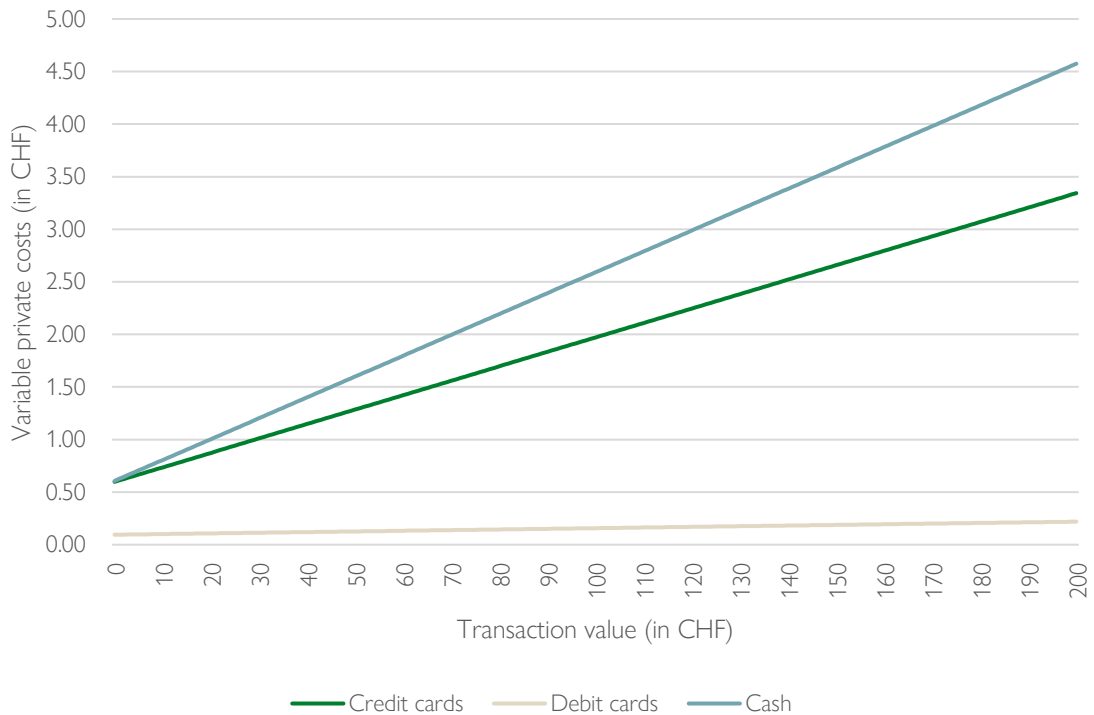


Figure 12: Variable private costs of financial institutions and infrastructure providers by transaction value

Note: Variable private costs are based on data in Table 11. They correspond to the costs of an additional transaction and an additional franc transacted for each transaction value (so-called marginal costs).

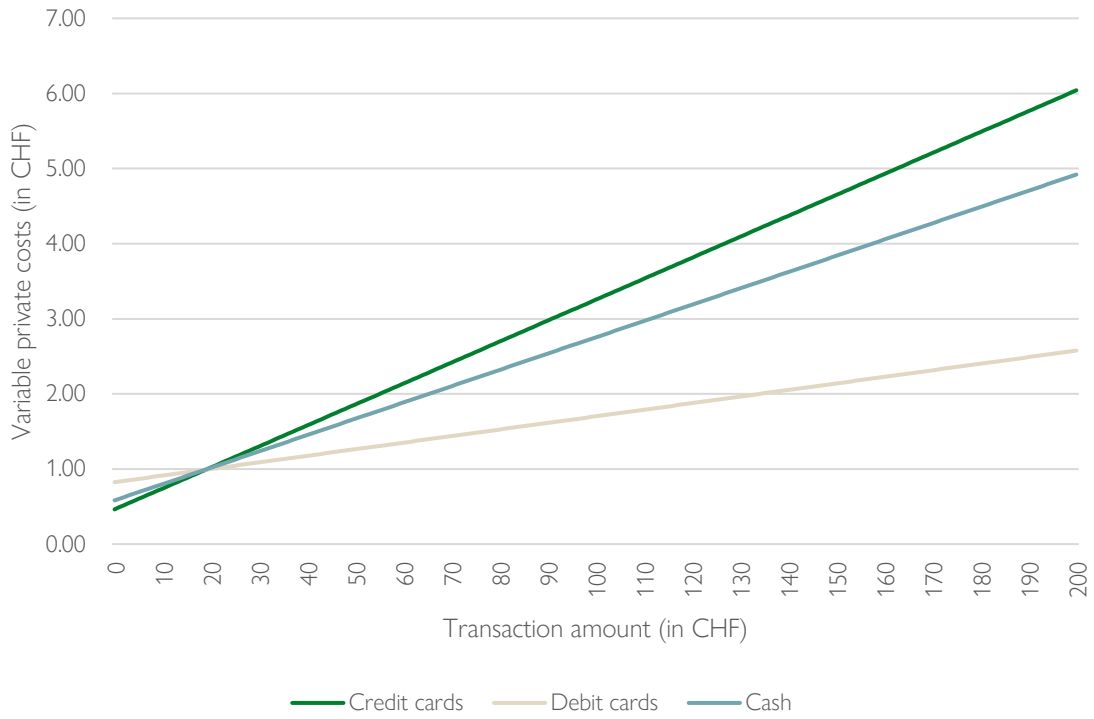


Figure 13: Variable private costs of retailers by transaction value
 Note: Variable private costs are based on data in Table 11. They correspond to the costs of one additional transaction and one additional franc transacted for each transaction value (so-called marginal costs).

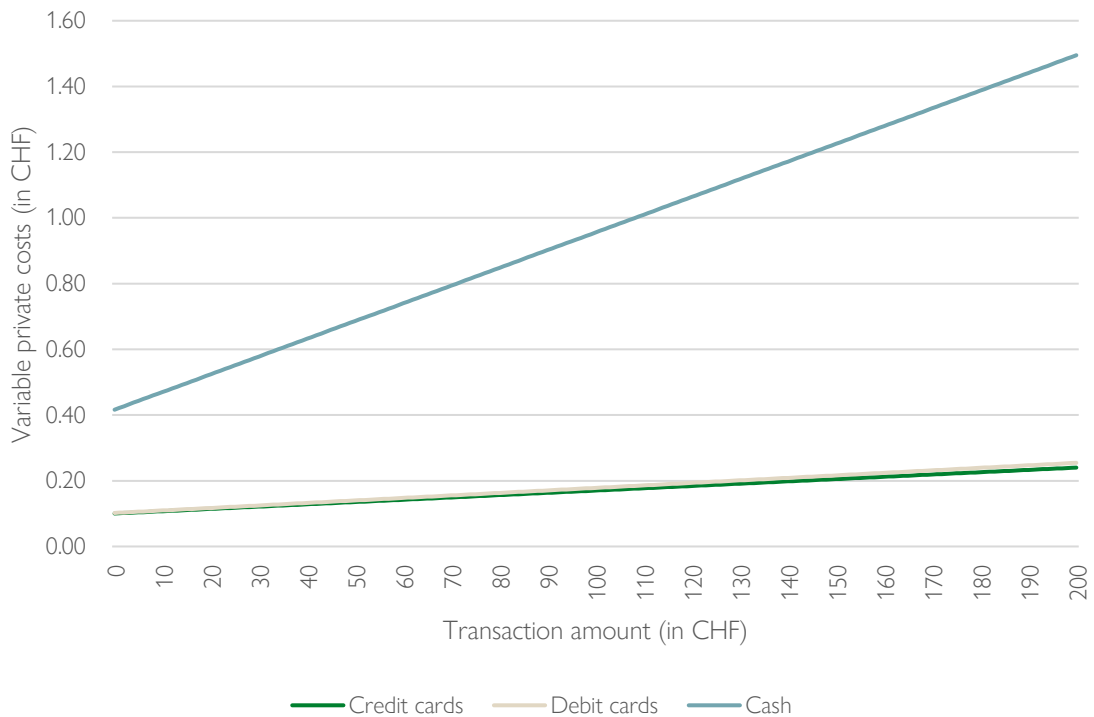


Figure 14: Variable private costs of consumers by transaction value
 Note: Variable private costs are based on data in Table 11. They correspond to the costs of one additional transaction and one additional franc transacted for each transaction value (so-called marginal costs).

Tables

Table 8: Distribution of the sample by NOGA classes

Economic sectors with POS	NOGA code	Number of tax-payers with POS	Share	Number in sample	Share	Difference
Retail trade	47	29'850	46.7%	12	57.1%	+10.5 PP
Land traffic transport	49	1'964	3.1%	2	9.5%	+6.5 PP
Gastronomy	56	20'247	31.7%	3	14.3%	-17.4 PP
Libraries, archives, museums and other cultural activities	91	201	0.3%	0	0.0%	+0.3 PP
Sports, amusement and recreation activities	93	5'143	8.0%	2	9.5%	+1.5 PP
Other personal services activities	96	6'566	10.3%	2	9.5%	-0.7 PP

Note: The defined population of retailers corresponds to those companies in Switzerland that are active in the B2C business and have a potential stationary POS. Population data according to VAT statistics (FTA, 2023). Comparison with the population based on VAT statistics data is limited in that companies are only subject to VAT above a turnover of CHF 100,000 and could also include companies that do not process POS payments. The percentages calculated may deviate slightly from 100 per cent due to rounding differences.

Table 9: Distribution of the sample by turnover

Turnover	Frequency in sample	Share
CHF 50 - CHF 99	0	0.0%
CHF 100 - CHF 199	0	0.0%
CHF 200 - CHF 499	2	9.5%
CHF 500 - CHF 1'999	0	0.0%
CHF 2'000 - CHF 9'999	6	28.6%
CHF 10'000 - CHF 49'999	5	23.8%
CHF 50'000 - CHF 249'999	1	4.8%
CHF 250,000 or more	7	33.3%
Total	21	100%

Note: Turnover in thousands

Table 10: Distribution of the sample by number of employees

Number of employees	Frequency in sample	Share
1 - 9 employees	3	14.3%
10 - 49 employees	4	19.0%
50 - 249 employees	8	38.1%
250 - 2499 employees	4	19.0%
2500 or more employees	2	9.5%
Total	21	100%

Table 11: Breakdown of resource costs into fixed and variable costs (in CHF million)

	Credit cards	Debit cards	Cash
Financial institutions and infrastructure providers			
Fixed costs	CHF 585	CHF 199	CHF 1'489
Transaction-linked variable costs	CHF 92	CHF 112	CHF 636
Value-linked variable costs	CHF 204	CHF 34	CHF 697
SNB and Swissmint			
Fixed costs	CHF 0	CHF 0	CHF 105
Transaction-linked variable costs	CHF 0	CHF 0	CHF 58
Value-linked variable costs	CHF 0	CHF 0	CHF 37
Retailers			
Fixed costs	CHF 8	CHF 28	CHF 374
Transaction-linked variable costs	CHF 27	CHF 294	CHF 679
Value-linked variable costs	CHF 101	CHF 138	CHF 645
Consumers			
Fixed costs	CHF 0	CHF 0	CHF 0
Transaction-linked variable costs	CHF 34	CHF 145	CHF 416
Value-linked variable costs	CHF 14	CHF 48	CHF 98
Total			
Fixed costs (FC)	CHF 593	CHF 227	CHF 1'968
Transaction-linked variable costs (TVC)	CHF 153	CHF 551	CHF 1'791
Value-linked variable costs (VVC)	CHF 319	CHF 219	CHF 1'477
Costs of an additional transaction (in CHF) (a)	CHF 0.453	CHF 0.388	CHF 1.272
Costs for 1 CHF of additional sales (in CHF) (b)	CHF 0.015	CHF 0.003	CHF 0.041

Note: Cost components were calculated assuming a short- to medium-term time horizon (0 to 5 years). The costs of an additional transaction (a) are the total transaction-linked variable costs (TVC) divided by the total number of transactions. The costs for one franc of additional sales (b) are the total value-linked variable costs (VVC) divided by the total value of the transactions. The total variable costs as VCT = a + (b × TV) correspond to the costs of an additional transaction for each transaction value (so-called marginal cost) – provided that all fixed costs are paid. In other words, this value shows how much an additional transaction costs for each transaction value if the underlying infrastructure is already in place.

A: Assumptions

Table 12 summarises the key assumptions of this study and shows how they might influence the results (see Kosse et al., 2017). The total cost of cash is likely overestimated as it includes all cash-related costs of the SNB, Swissmint as well as financial institutions and infrastructure providers, regardless of how cash is ultimately used by the public. As cash can also be used for purposes other than POS payments (e.g. for peer-to-peer payments), it is likely that the total cost of cash reported in this study exceeds that of POS-only costs.

When determining the costs of stakeholders not analysed in this study (e.g. credit card licence issuers, ATM providers), we assume that their profit margins are zero. If these companies are profitable (which is likely), the actual resource costs of cash, debit and credit cards may be overestimated. The total costs for debit and credit cards published in this study therefore represent an upper limit.

We also assume that all costs and transactions are related to consumer payments. B2B transactions between companies are therefore ignored and assumed to be zero. Given this assumption, the results may overestimate the actual costs of consumer payments. This applies to cash, debit and credit card payments.

Other assumptions (see Table 12) may have influenced the results both upwards (+) and downwards (-).

Table 12: Key assumptions and potential associated biases

Assumption	Cash	Debit card	Credit card	Threshold value
All cash-related costs incurred by the SNB and Swissmint as well as by financial institutions and infrastructure providers are entirely attributable to POS cash transactions.	+			
All POS payments are made by consumers. It is therefore assumed that the number of POS payments between companies (B2B) is zero.	+	+	+	
Fees paid to stakeholders not analysed in this study correspond to the resource costs of those stakeholders and do not include a profit margin.	+	+	+	
The allocation of direct and indirect costs to payment methods is based on the information collected from the companies surveyed, as well as from similar studies and external sources.	+ / -	+ / -	+ / -	
The sample of retailers is representative of the total population of retailers in Switzerland where POS payments can be made.	+ / -	+ / -	+ / -	
The sample of financial institutions and infrastructure providers is representative of Switzerland.	+ / -	+ / -	+ / -	
The share of cash transaction costs in relation to total costs at the SNB is the same as in 1999.	+ / -			
The breakdown of fixed and variable costs is based on the information collected from the companies surveyed, as well as from similar studies and external sources.				+ / -

Source: Authors' information based on Kosse et al. (2017)

B: Concept of private and resource costs

Figure 15 illustrates the concept of private and resource costs. The coloured (stakeholder) rectangles represent the resource costs, while the arrows show the fee transfers between the investigated stakeholders. The resource costs also include products and service fees that flow to actors outside the analysed ecosystem.

The total resource costs for the overall economy or society are the sum of each stakeholder's resource costs. The sum of each stakeholder's private costs (resource costs plus fee transfers) would count those resource costs double that flow to the other stakeholders via fee transfers.

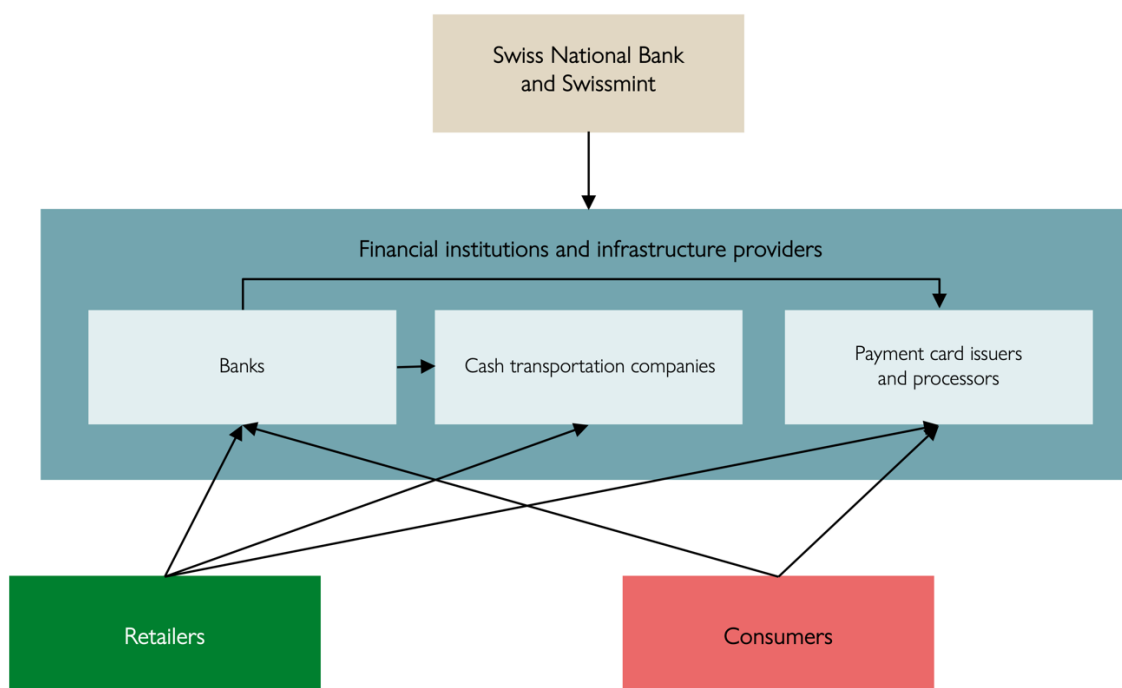


Figure 15: Overview of the stakeholders analysed and their fee transfers

The fictitious example in

Figure 16 illustrates why only the net costs rather than the private costs are added up to calculate the overall economic costs of POS payments. To simplify matters, the example assumes that the total economic costs of POS payments are the sum of the actors' net costs. In reality, the total costs of the payment methods comprise resource costs, transfer costs and economic externalities (Lammer et al., 2015).

In our example, retailers need CHF 400 in resources in the form of time to accept and process POS payments (cf.

Figure 16). They pay transaction fees of CHF 300 to infrastructure providers. They need internal resources of CHF 300, which include personnel costs, data centres and processing payments. At the same time, they receive CHF 300 in fees from retailers. The private costs of both stakeholders are CHF 700 plus CHF 300 (i.e. a total of CHF 1000). From an overall economic perspective, the total net resource costs are therefore overestimated, as infrastructure providers receive CHF 300 in income in the form of fees. The net resource costs result if CHF 300 transfer fees are deducted from the total private costs, resulting in CHF 700. This amount corresponds exactly to the sum of the resource costs for retailers and infrastructure providers.

Retailers			Infrastructure providers			Society as a whole	
Consumed resources	400		Consumed resources	300		Consumed resources	700
Fees paid	300	Fee	Fees paid	0		Fees paid	300
Private costs	700		Private costs	300		Private costs	1000
- Fees received	0		- Fees received	300		- Fees received	300
Net costs	700		Net costs	0		Net costs	700

Figure 16: Relationship between private and resource costs

Source: Kosse et al. (2017)

Note: Fictitious example

C: Survey of financial institutions and infrastructure providers

The financial data on the financial institutions and infrastructure providers required for the ABC analysis were extracted and/or derived mainly from the respective accounts by the responsible members of those institutions. See Table 13 and Table 14 for the retrieved cost components. To establish a complete picture, the parties were asked to obtain further information from specific receipts and invoices. In addition, some accounting items had to be replaced by imputed costs. This is important in order to present the development costs and investments in a standardised manner. The figures stated in the accounts were adjusted for certain cost items.

Direct costs were allocated to payment methods at the discretion of the surveyed companies or depending on the cost drivers. The breakdown and allocation of indirect costs are based on information provided by the financial institutions and infrastructure providers by recording the time spent by employees on carrying out transactions and processes for the respective means of payment (measured in FTEs).

The ABC analysis assumes that the financial institutions and providers produce everything they can produce. In practice, however, this is not the case for all payment transaction and cash services. For example, there is usually unused capacity at bank counters. The resulting costs of idle time must be fully factored into the costs of payments and allocated. To simplify the analysis, we therefore assumed that the number of transactions corresponds to full capacity utilisation. Indirect costs are allocated to the various means of payment in proportion to the activities and cost drivers (cf. Norges Bank, 2022).

Production costs increase depending on the number of units produced. These can be a cost driver. With payment transactions, however, the number of units produced is not the driver, but rather the number of transactions, deposits, withdrawals and exchanges. Drivers record the increase in costs depending on the units produced. The number of customer accounts was also used as a driver. Costs for institutions tend to rise if many customers use means of payment.

Other drivers include the number of products and transaction turnover: a larger number of products leads to higher costs. The costs of cash processing are influenced by the amount. This also affects the costs of payment cards due to transaction fees. The above drivers therefore serve as an important distribution key for allocating indirect costs to payment methods.

Table 13: Direct cost elements of financial institutions and infrastructure providers

Direct costs	
1	Authorisation and processing of transactions (data processing centres)
2	Authorisation and processing of transactions (payment card systems)
3	Authorisation and processing of transactions (other costs)
4	Intelligence and reporting service data processing centres
5	Fees to providers of mobile payment services
6	Fees to providers of cash services
7	Fees incurred in connection with banknotes and coins
8	Insurance of cash holdings, machinery and equipment
9	Cash transports by the institution
10	Cash differences (e.g. loss)
11	Costs of ATMs and other cash dispensers
12	Twint fees
13	Fees paid to other banks for ATM services
14	Interbank and interchange fees
15	Purchase of produced equipment (e.g. cards)
16	Outsourced counter services
17	Processing costs
18	Clearing costs
19	Security for cash services
20	Losses due to fraud, misuse and forgery
21	Credit costs
22	Postage and forms
23	Loyalty and insurance programmes
24	Development costs
25	Other direct costs

Table 14: Indirect cost elements of financial institutions and infrastructure providers

Indirect costs	
1	Personnel costs
2	Education
3	Travel expenses
4	IT
5	Property/real estate
6	External audits
7	Marketing
8	Machinery/facilities/banking technology
9	Costs of capital and investment management
10	Capital tied up in cash holdings
11	Security
12	Office supplies
13	Telephone
14	Postal charges
15	Other indirect costs