

Understanding Swiss Payment Preferences: Cash, Cards and Other Patterns

A Data-Driven Approach

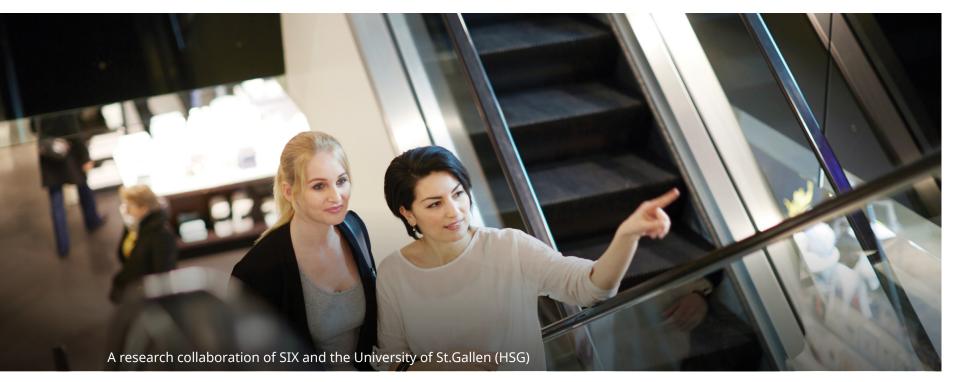




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Executive Summary

In this research paper we present novel and unique insights into the payment behavior of Swiss consumers based on anonymized transaction-level data. As part of this collaboration between SIX and the University of St.Gallen, we leverage a sample of debit card users over a period of 13 months from September 2020 to September 2021. The data covers a large sample of card-issuing banks and is therefore representative for all regions of Switzerland.

The use of debit cards at the POS vs. ATMs differs significantly across cardholders, but surprisingly also for the same cardholder over time. Two-thirds of observed cardholders use their debit cards more for POS payments than for cash withdrawals. While we can clearly assign each cardholder a payer type with respect to his or her preference towards cash or card, we also observe that labelling consumers with static payer types can be misleading as many consumers exhibit changing behavior across individual months.

While we observe clear differences in the preference toward cash across cantons, there is only weak to no variation across agglomeration types or between the German and French language regions. The Italian speaking region shows a slightly higher preference for cash. Our results indicate that there is a widespread demand for all-in-one card products allowing e.g., POS payments, ATM withdrawals, and e-commerce.

Debit POS payments are dominated by everyday consumer purchases. Consumers make on average 16 POS transactions per month. Over the observed months the average cardholder executes transactions at 63 different merchants. Most debit card payments involve purchases at supermarkets and other merchants who consumers visit regularly. The majority of card payments are conducted contactlessly, with transaction sizes below CHF 50. We observe significant differences in transaction sizes across key merchant categories, but no differences across payer types.

During the course of an average month, we observe only a weak payday effect with higher levels of POS transactions toward the end of the month, but card usage is otherwise relatively stable across the month.

ATM withdrawal amounts vary significantly in withdrawal amounts and display a strong payday effect. The average cardholder makes two ATM withdrawals per month. On average 65% of all withdrawals are from ATMs of the cardissuing bank while card-preferring payer types seem more indifferent to the bank affiliation of an ATM as only 60% are at a respective ATM. The average ATM withdrawal by debit card amounts to CHF 350, but 50% of all transactions amount to CHF 200 or less. Demand for ATM withdrawals peaks on Friday and significantly toward the end of the month, signaling a strong payday effect. About 20% of cardholders use ATMs to deposit cash, with an average deposit amount of CH 1,090 and 50% of deposit amounts being CHF 400 or below.



Introduction

The payment industry is constantly affected by numerous trends within society. Digitalization, demographic changes, increased connectivity, urbanization, and security concerns are just some of the examples that cause shifts in payment behavior. Recently, Covid-19 had a great impact on not only what and where consumers bought, but also on how they paid for it. Keeping up with ongoing changes in consumer payment choices is crucial for the financial industry to continue to offer attractive products and services.

Our aim is to understand ongoing developments and consumer payment choices better by researching consumer behavior and potential influencing factors. With our results we seek to:

- Complement existing studies on payment behavior in Switzerland with real data insights
- Advance the overall understanding on consumer debit payment behavior
- Act as a catalyst to enable a data-driven debit product development

The collaboration between SIX and the University of St.Gallen (HSG) combines the access to insightful high-quality debit card payment data, analytics capabilities, and in-depth research. This enables us to find answers to business-relevant questions using sound research methods and data insights.

This white paper seeks to answer three main questions:

- i. What are the overarching characteristics of the payment behavior while using debit cards?
- ii. What describes consumer usage of debit cards at the point of sale (POS)?
- iii. How is consumer demand for cash characterized?

We answer these questions by leveraging anonymized data on consumer transactions with Swiss debit cards. According to the SNB, about one third of all non-recurring payments in Switzerland is conducted with debit cards (SNB, 2021).

The approach of this research paper is unique due to two main reasons. First, it covers a large representative sample of consumers over a significant period of time. We examine 760 million transactions executed by three million cardholders¹ over a period of 13 months. Our data covers a wide sample of cardholders in Switzerland, representing all regions, languages, and bank groups. A study with such a comprehensive scope and in-depth analysis for the Swiss market is a novelty. As a point of reference, the most recent payment diary survey of the Swiss National Bank - which is based on a questionnaire rather than analysis of transactions - records the self-reported payment behavior of about 2,000 consumers over a period of at most seven days (SNB, 2021). Second, for our analysis we sought out an iterative approach, combining thorough data analysis of our largescale data with expertise from subject matter experts from within SIX and the University of St.Gallen.

The limitations of our research approach are twofold: First, the transaction data we examine is anonymized so that we can make only limited statements about how payment choice is related to the socioeconomic characteristics of cardholders. Second, as we observe debit card transactions only, we can examine how much cash consumers withdraw, but not when and where they spend it. We also cannot compare the use of debit cards to that of credit cards or mobile payment services (e.g., TWINT).

¹ As a practical simplification, we consider each card within our sample to have a unique card-holder. More precisely, a cardholder could hold multiple cards, and multiple employees of a business may share one card.

Data Sample

Figure 1: Overview of Included Debit Card Products in Sample



We base our analysis on a constant cardholder sample from September 2020 to September 2021. Only cards that were active throughout the whole sample period are included in the analysis. Active cards are defined as cards showing at least one transaction and a minimum transaction amount of CHF 100 in each month. The minimum transaction amount per month (CHF 100) is purposely set low, in order to cover all debit cards that are regularly used, e.g., also by students to just pay for their lunch.

Our constant cardholder sample brings two main advantages to the analysis: (i) we can analyze shifts in payment behavior for the same consumers within the year and (ii) the data is not distorted through rollouts of new cards and exits of old ones. Within our sample, we consider each card to have a unique cardholder.

Our sample period lasts from September 2020 to September 2021. Starting our analysis in autumn 2020 offers three advantages: First, we can observe payment behavior after the initial impact of the Covid-19 pandemic, which led to a significant shift in the use of cards vs. cash at the point of sale.

Second, transaction data after August 2020 provides a comprehensive analysis of cash withdrawals from ATMs¹. Third, our analysis can complement the most recent official consumer payment survey of the SNB which was conducted in autumn 2020. Our findings must, however, be interpreted considering the ongoing pandemic throughout our observation period (see Figure 31 in the Appendix for an overview of Covid-19 and measures in Switzerland).

The most relevant card products are represented in our sample. The main products under consideration are Maestro and V PAY cards. Figure 1 shows the number of cards and their relative share in our sample. Newly issued Debit Mastercard and Visa Debit cards do not meet our constant cardholder sample requirements. We plan to analyze their impact on the overall consumer behavior and publish obtained results during the next year.

Our sample is geographically balanced and considers all major Swiss banks. The constant cardholder sample comprises debit cards issued by the main types of banks including large universal banks, cantonal banks, mutual savings banks, regional banks, and others. In addition, the geographical distribution of our sample is representative for Switzerland.

Table 1: Geographical Representation of Cardholder Sample²

Region	Share of sample	Share of Swiss population
Lake Geneva	22%	19%
Espace Mittelland	21%	22%
Northwestern Switzerland	17%	14%
Zurich	17%	18%
Eastern Switzerland	10%	14%
Central Switzerland	10%	9%
Ticino	3%	4%

¹ Since September 2020 all ATM transactions of the cards included in the sample have been processed by SIX.

2 89% of the sample cards could be mapped to a location via the issuing Bank Identifier Code (BIC). The remaining 10% could not be geographically mapped, as some banks assign all BICs to their central headquarters. Thus, our location analysis is based on 89% of sample cards.

1 UNDERSTANDING CONSUMER PAYMENT TYPES

Key Insight:

The demand for debit card products offering multiple uses (e.g., POS payments, ATM withdrawals, e-commerce) is extensive, even if all cards are not constantly used for all purposes.



- > Two-thirds of cardholders prefer card over cash payments³.
- → No major change in the share of consumer payer types throughout our observation period.
- → A surprisingly large share of consumers exhibits changing payment behavior from month-to-month.
- → We observe significant variation in payment preferences across cantons, even within the same greater regions.
- → We observe no significant differences in payment behavior between rural and urban areas.
- → On average, cardholders from the German and French speaking regions display similar payment behavior, while cardholders from the Italian-speaking region have a higher preference for cash.

³ More than 50% of transaction sums of 80% of cardholders are POS card payments.

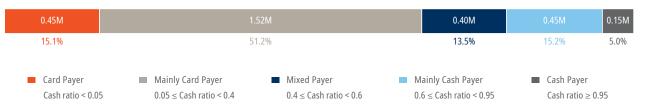
1a. Payment Behavior Consumer Segmentation

Cardholders are grouped into five different categories according to their payment preferences (see Figure 2). The groups are determined by the payer's preference for cash payments, which we measure by calculating the cash ratio, capturing the share of cash transactions relative to the total transaction amount (see box "*Cash Ratio*"). Consumers that show a clear preference for a payment type are defined as (pure) Card Payers or Cash Payers.

Figure 2: Definition of Payer Types according to Payment Preference

	NT PREFERENCE		Cash ratio:
	Card Payer	Pays (almost) exclusively with debit card	0-4%
•	Mainly Card Payer	Pays mostly with debit card	5–39%
•	Mixed Payer	Uses both card and cash to pay	40-59%
•	Mainly Cash Payer	Pays mostly with cash	60-95%
ے ا	Cash Payer	Pays (almost) exclusively with cash	96–100%

Figure 3: Cardholders by Payer Type (# of Cardholders in Millions, % of Sample)



The sample distribution of payer types can be seen in Figure 3. Most consumers prefer to pay with card (66%). However, cash remains relevant as 20% of cardholders make most of their transactions in cash, and 85% of all cardholders use cash from time to time. The largest share of consumers (51%) shows characteristics of a Mainly Card Payer. Mainly Card Payers primarily pay by card, but withdraw up to 40% of total transaction volume as cash at the ATM. Pure Card or Cash Payers are comparatively rare, with pure Cash Payers making up the smallest share of the sample (5%).

Figure 4 depicts hypothetical shares of payer types if their payer type assignments were only based on the respective months. Overall, there is a slight increase in the share of Card Payers from 30% to 34%, whereas the share of the other payer types decreases by 1% each.

CASH RATIO

Cash ratio =

The *cash ratio* is an indicator of consumers' preference for cash payments. It is defined as the total sum of ATM withdrawal amounts divided by the total sum of ATM withdrawals and POS payment amounts over our sample period. We compute the *cash ratio* for each unique card in the sample period. A *cash ratio* of 0 implies that all card transactions within the sample period were made at the point of sale. A *cash ratio* of 1 indicates that the card was exclusively used to make ATM withdrawals.

ATM withdrawal amounts

ATM withdrawal amounts & POS card payment amounts

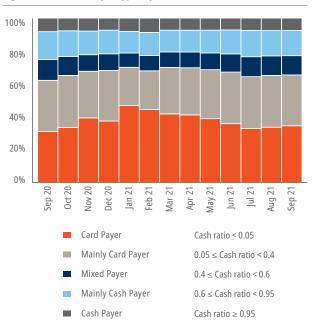
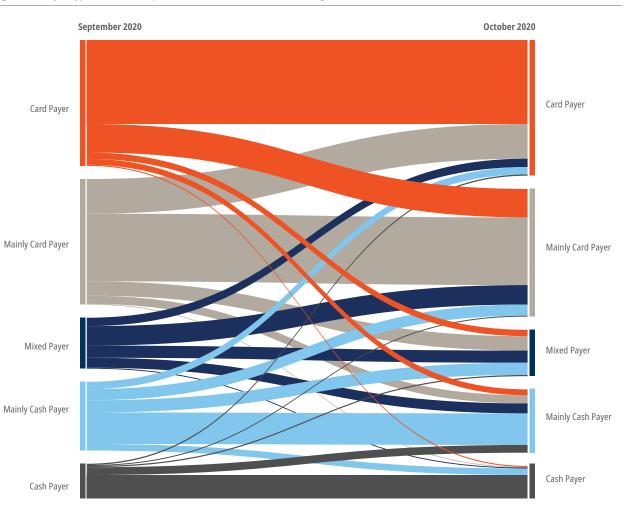


Figure 4: Share of Payer Types by Month

Figure 5: Payer Type Shifts from September 2020 (left) to October 2020 (right)



23% of Card Payers in September 2020 shift to Mainly Card Payers in October 2020, while 28% of Mainly Card Payers in September 2020 show the payment behavior of Card Payers in October 2020.

There is no significant change in the share of payer types during our observation period. Yet, January and February 2021 depict the highest share of pure Card Payers. Additionally, these two months are the ones with the lowest monthly transaction amounts (see Figure 32). We assume that these effects can be attributed to the Covid-19 lockdowns in place in Switzerland during these months (see Figure 31 in the Appendix) as well as shops requesting customers to pay with card instead of cash.

However, at the individual cardholder level, we observe numerous shifts in individual cardholder payment behavior between different months. As an example, Figure 5 shows that only 54% of consumers exhibit the same payer type behavior in September 2020 and October 2020. Cash Payers display the most consistent behavior across time: 94% of Cash Payers in September 2020 were also Cash Payers in October 2020.

The month-to-month variation in payment behavior for many cardholders might be explained by seasonal changes in consumption patterns (e.g., cash withdrawals for holidays, purchase of durables with cards) or other household events (e.g., cash transfers to family members, relocation to another area).

Importantly, our analysis indicates a widespread demand for card products that offer multiple uses, e.g., POS payments, ATM withdrawals (and e-commerce), even if all cards are not constantly used for all purposes.

The higher the cash ratio of a card, the higher the total amount consumers spend per month with the card (see Figure 6). Over the total sample, a cardholder spends on average CHF 1,500 per month. The average card payer spends CHF 950 per month, followed by CHF 1,330 for Mainly Card Payers, CHF 1,600 for Mixed payers and CHF 2,200 for Mainly Cash Payers. Cash Payers spend on average CHF 2,500 per month.

The monthly transaction sums of Cash Payers slightly exceed the average Swiss non-recurring spending of CHF 2,250 (SNB, 2021). Therefore, the data suggests that the monthly spending amount for these payer types contains recurring payments (such as rent, utilities, or insurance) in cash. Supporting this interpretation, we will see in section 3 that ATM withdrawals by Cash Payers are heavily concentrated after payday at the end of the month.



Card Payer

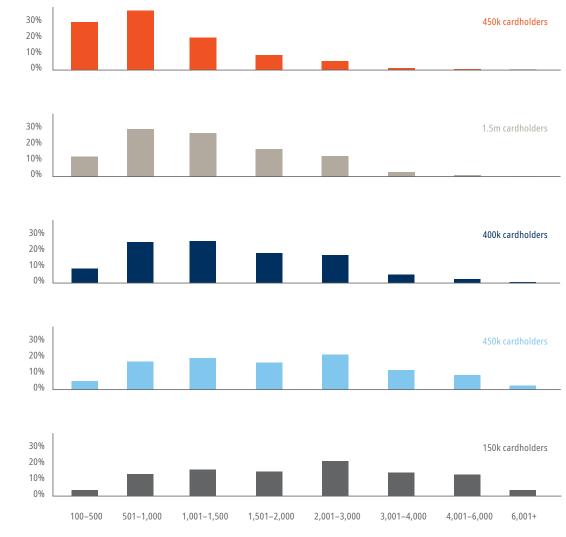
Mainly

Card Payer

Mixed Payer

Mainly Cash

Payer



Monthly spending per cardholder

1b. Distribution of Payer Types across Main Bank Categories

All bank categories show a similar distribution of payer types among their customers. We have examined the differences in payment behavior across three bank groups. The two biggest Swiss banks, UBS and Credit Suisse, are grouped into the "Big banks" category; all 24 cantonal banks make up "Cantonal banks"; and "Other banks" consists of Raiffeisen, Entris banks, as well as other banks. Figure 7 shows the distribution of payer types across the three categories. There are no significant differences in the shares of payer types. Other banks show a slightly higher ratio of consumers preferring to pay with card (68%) compared to Big banks (66%) and Cantonal banks (65%). This could be explained by banking products that especially target young customers. As the cash ratio increases with age (SNB, 2021),

a product portfolio focused on attractive offerings for young consumers increases the overall card usage. In addition, the different debit and credit card product strategies that the respective banks follow might also lead to the observed pattern. Another interesting approach in a future analysis could be to investigate whether the distribution of bank branches affects the preference for cash of a bank's clients.

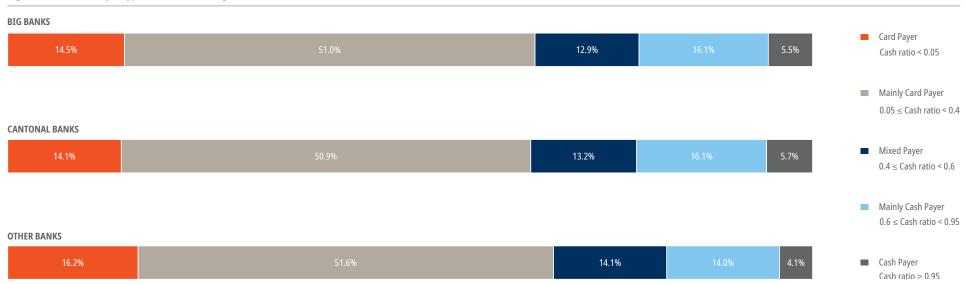


Figure 7: Share of Payer Types across Bank Categories

1c. Impact of Geographical Location and Related Cultural Aspects on Payment Behavior

As our data is anonymized, we do not observe the residence of cardholders in our sample. To allocate cardholders to geographical locations, we therefore rely on the postal code (ZIP) of the card-issuing bank⁴. Hence, we apply a cardissuing bank-based mapping instead of a cardholder-based one. This yields a representative distribution of cardholders, which is roughly in line with the distribution of the Swiss population per Greater Region overall (see also Table 1).

Greater Regions and Cantons

While in Ticino the cash ratio is significantly higher, Zurich shows a higher share of card payments than the Swiss average. We first examine the payment behavior of cardholders by the geographical location of the card-issuing bank. Figure 8 shows the regional distribution of cash ratios for the seven greater regions: Central Switzerland, Eastern Switzerland, Espace Mittelland, Lake Geneva, Northwestern Switzerland, Ticino, and Zurich.

Two regions stand out: Ticino and Zurich. In Ticino, roughly a third of cardholders prefer cash payments. Cash Payers (11%) and Mainly Cash Payers (24%) have significantly higher shares in the southernmost region compared to other regions. Zurich, by contrast, shows a significantly higher card usage in both pure Card Payers (19%) and Mainly Card Payers (53%). Thus, over 70% of consumers in Zurich prefer card payments.

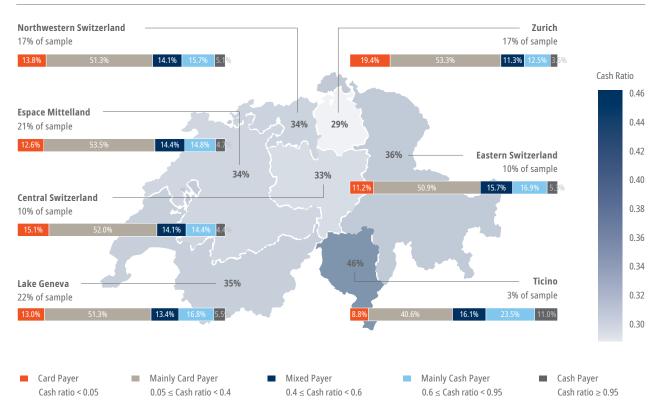


Figure 8: Cash Ratios and Share of Payer Types per Greater Region

4 Note that mapping of BICs to postal codes (ZIP) was not possible in all cases, as some banks assign their BICs to their central headquarters. Roughly 330,000 IDs could not be assigned. Thus, our location analysis is based on 89% of sample IDs.

If we compare the cash ratio in Ticino (46%) to that in Zurich (29%) and multiply it by the average spending by cardholder per month (CHF 1,500) we see that an average consumer in Ticino withdraws CHF 255 more cash per month than an average consumer in Zurich.

We see two possible explanations for the preference for cash in Ticino relative to other regions: age structure, and proximity to Italy. Payment surveys suggest that an older population implies higher cash usage (SNB, 2021). Ticino is the canton with the highest ratio of permanent residents aged 65 and above (Swiss Federal Statistical Office, 2021a). Additionally, a contributing factor can be the proximity to Italy. Italian cross-border commuters who work in Switzerland and have a Swiss bank account may use their debit card to withdraw cash in Switzerland rather than transfer their earnings to an account in Italy.

When comparing the shares of payer types across different cantons of each region, we observe that most cantons share the same consumer preferences as the greater region they are part of. We have included an overview of shares of payer types by cantons in Figure 33 in the appendix. A few notable exceptions are the cantons Geneva, Jura, and Neuchatel, which all show a higher preference toward cash compared to neighboring cantons in their region.

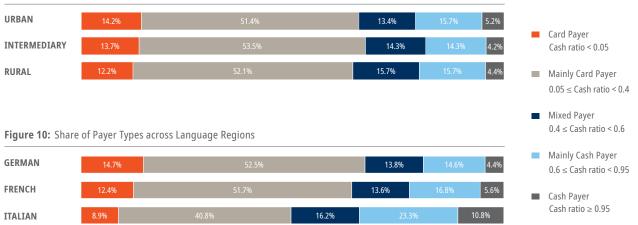
We see no indication that differences in cash preferences across cantons is associated with the card issuing bank, as we see no significant differences in cash usage across bank groups on a regional or cantonal level.

Agglomeration Effects (Urban vs. Rural)

To compare payer types across spatial divisions, we apply the spatial typology of the Federal Statistical Office (2012). Figure 9 shows the distribution of payer types across urban, intermediary, and rural regions. Surprisingly, there are no significant differences in cash preferences. The distribution of payer types in each agglomeration category is similar to the overall Swiss population. Urban municipalities show a higher share of pure Card Payers (14.2%) compared to rural areas (12.2%). However, when taking Mainly Card Payers into account, the share of people who prefer card payments in cities (65.6%) is close to the rural value (64.3%).

The similarity of payer types across urban vs. rural areas is in line with our findings at the cantonal level (see Figure 33). When comparing cantons with a rather urban character (e.g., Basel-Stadt, Geneva) we see no significant difference to more rural cantons (e.g., Nidwalden, Obwalden, Grisons, Appenzell-Innerrhoden). Hence, it is unlikely that agglomeration effects play a significant role in Zurich's low cash ratio. The difference between Zurich and other cantons might be explained by consumers' age structure and spending.





Language Regions

We mapped cardholders according to their bank's affiliation to a language region (Swiss Federal Statistical Office, 2017)⁵. There is no significant difference in cash ratios between the German and French language regions. Figure 10 shows the distribution of payer types by language region. As shown above, cardholders from the Italian-speaking region display a significantly higher preference for cash than in any other region. The lowest average cash ratio of Swiss consumers can be found in German-speaking areas (33%). In the French-speaking Western part of Switzerland, the average cash ratio is only slightly higher (36%).

⁵ The Romansh-speaking regions of Grisons are included in the German-speaking part due to lack of available data.

2 UNDERSTANDING POS PAYMENTS

Key Insight:

For the average cardholder, POS payments are concentrated on few transactions at few merchants.

Summary of main findings:

- → During our observation period of 13 months, the average cardholder makes
 16 POS payments per month and makes payments at only 63 different merchants.
- → Purchases in supermarkets dominate debit card POS payments.
- → The average POS transaction is CHF 40 with 79% of all transactions being below CHF 50.
- → We do not observe significant differences in the amounts of POS transactions across payer types.
- → There are significant differences in POS transaction sizes across key merchant categories.
- → The use of cards for POS payments peaks on Friday and Saturday, however there are significant differences across key merchant categories.
- → We observe only a weak payday effect for POS transactions. The beginning and the end of the month are characterized by only slightly higher card spending compared to the middle of the month.

2a. Frequency of Card Usage at POS and across Different Merchants

Figure 11: Average Number of POS Card Transactions per Month per Cardholder

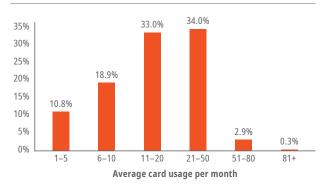
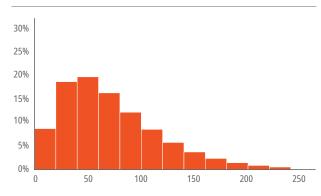


Figure 12: Number of Different Merchants with POS Transactions per Cardholder



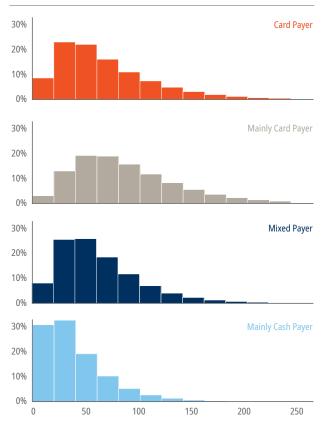
The average cardholder makes 16 POS payments per month (median value). In total, 30% of cardholders have less than 10 transaction per month on average. Only 3% of cardholders in our sample have more than 50 transactions per month.

During our observation period of 13 months, the average cardholder uses their card to make POS transactions at 63 different merchants (median value). Figure 12 depicts the number of merchants a card is used at to make a POS purchase. Hereby we count each distinct merchant establishment as they appear in our issuing data. For instance, each store of a large retailer would be treated as a different merchant.

The data reveals that 13% of all cards are used at less than 25 merchants, while another 24% are used at more than 100 merchants.

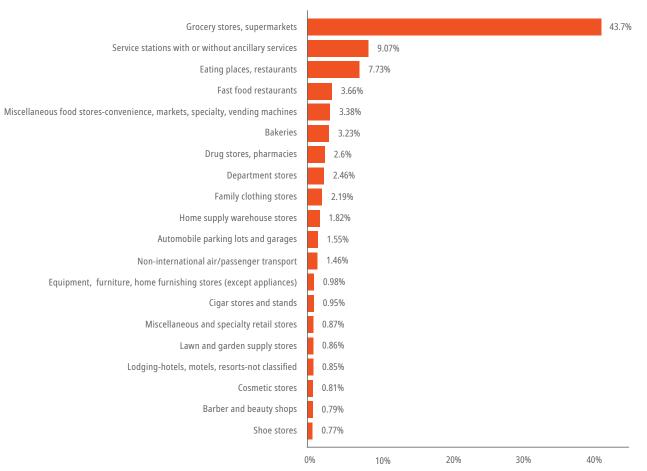
When comparing different payer types (see Figure 13), we observe that Mainly Card Payers tend to use the card at a larger number of different merchants than other groups. Although we might expect Card Payers to be the group that exhibits the largest number of different merchants, they show a similar pattern in the distribution of number of merchants as Mixed Payers. Not surprisingly, we observe Mainly Cash Payers using their cards for POS transactions at the least amount of different merchants.

Figure 13: Number of Different Merchants with POS Transaction per Cardholder, by Payer Type



2b. Card Usage Transaction Sizes

Figure 14: Share of Merchant Categories by Number of Transactions



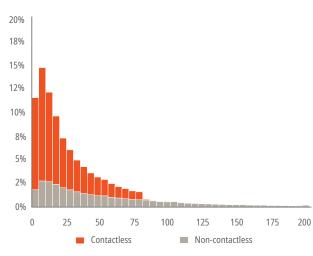
Supermarket purchases dominate debit card transactions at the POS (see Figure 14). During our observation period, merchants in the "Grocery stores and supermarkets" category make up 38% of all POS transactions, and 44% of the POS transaction value. Further significant merchant categories are also related to regular consumer spending items, such as fuel stations, restaurants, clothing, and durables. This pattern is consistent with self-reported out-of-pocket spending of Swiss consumers in 2020 (SNB, 2021) and household budget statistics (Swiss Federal Statistical Office, 2021b).

One notable difference to household statistics is that eating out in restaurants and take-aways accounts for about 10% of spending in our data, compared to 20% for the average Swiss consumer (in pre-covid times). This difference is plausible, given that many consumers prefer paying by cash or credit cards (rather than debit cards) to pay when eating out. Also, the share of spending on eating out was significantly lower during our observation period due to the pandemic and related measures (Swiss Federal Statistical Office, 2021c).

The average transaction amount with a debit card at the POS is CHF 40. More than 55% of all card payments at the POS lie below CHF 25, with 24% between CHF 26 and CHF 50 and only 21% above CHF 50 (see Figure 15). Of the 572 million POS transactions in our sample, 66% of transactions are conducted contactlessly (NFC authentication without PIN entry) and 34% of transactions non-contactlessly. Contactless transactions are possible up to CHF 80, and exhibit an average transaction amount of CHF 22.

For non-contactless transactions, the average transaction amount is CHF 76. Swiss consumers' self-reported median amounts for contactless and non-contactless debit card payments are about CHF 19 and CHF 39 (SNB, 2021), whereas we observe median transaction amounts of CHF 16 for contactless and CHF 41 for non-contactless transactions in our sample. We observe no significant differences in POS transaction amounts across payer types.





The distributions of POS transaction sizes show strong differences across key merchant categories. Figure 16 gives an overview of the distribution of transaction amounts for four selected retail merchant categories. The category "Grocery stores and supermarkets" includes retailers such as *Migros* or *Coop*. "Department stores" includes merchants such as *Manor, Jelmoli*, or *Globus*. *H&M*, *C&A*, or *Zara* are examples for merchants of "Family clothing store", and *Dosenbach* or *Walder* are examples for "Shoe stores". Transaction amounts for grocery stores and supermarkets are significantly lower compared to the other categories, with an average amount

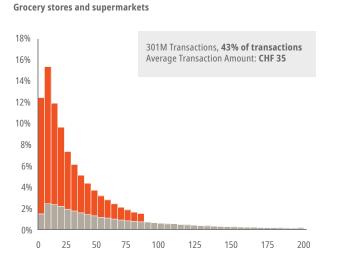
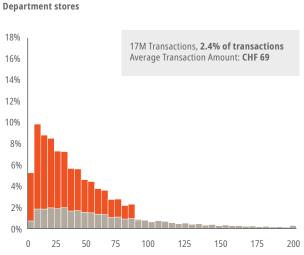
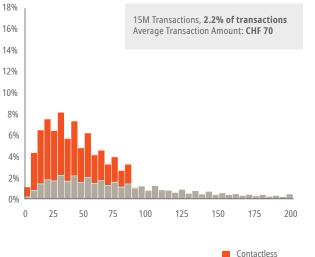


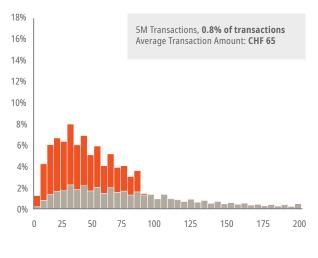
Figure 16: Distribution of POS Transaction Amounts for Selected Retail Merchant Categories



Family clothing stores



Shoe stores



Non-contactless

of CHF 35. The other three categories show similar transaction amount ranges, with average amounts between CHF 65 and CHF 70. For the two clothing merchant categories, we observe a striking pattern of transaction amounts. Here we observe higher shares for transaction amount bins in the upper half of each CHF 10 step (e.g., CHF 46–50) compared to the lower half (e.g., CHF 41–45). This might reflect the specific pricing strategies of merchants in these categories (Anderson & Simester, 2003).

We believe this could partly be due to the fact that it is more common to buy only one item at merchants belonging to either of the two clothing categories, than at grocery or department stores. Furthermore, the higher shares for transaction amount bins in the upper half of each ten CHF step (e.g., CHF 75–80) might indicate the presence of pricing strategies aimed at influencing the perception of prices (e.g., CHF 9.90, CHF 19.90, CHF 99.95).

Figure 17: Distribution of POS Transaction Amounts for Restaurants and Fast-Food Restaurants

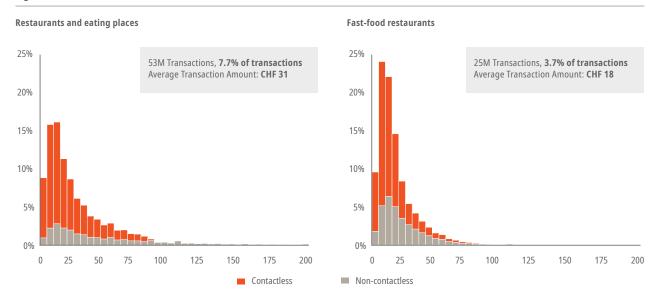


Figure 17 depicts the distribution of POS transaction

amounts for the two categories "Restaurants and eating

places" and "Fast-food restaurants". Examples for the first

category are restaurants such as *Hiltl*, canteens such as

SV Schweiz, or cafes such as Caffe Spettacolo. McDonalds,

Burger King, or Migros Take Away are examples of fast-food

restaurants. Restaurants tend to have almost twice as high

transaction amounts compared to their fast-food equiv-

alents, with average transaction amounts of CHF 31 and

CHF 18 respectively.

2c. Card Usage Daily Pattern during a Month

POS card payments peak toward the weekend. In Figure 18, we compare the number and value of POS card transactions across days of the week. Each day of the week is benchmarked against the average spending per day over our entire observation period. Both card usage frequency and spending value increase over the course of the working week, showing a clear peak in POS activity toward the weekend. Sundays exhibit a significant drop, where volume and value drop to less than 40% of the daily average.

This intra-week pattern of POS transactions differs significantly across merchant categories (see Figure 19). For merchants that also serve customers on Sundays the drop on Sundays is only weak, e.g., for restaurants, or non-existent as in the case of service stations. For durable consumption goods, such as equipment, furniture, or clothing, we observe a much more substantial peak on Saturdays with consumers spending on average twice the amounts as on weekdays.

Figure 18: Number and Sum of POS Transactions by Weekday, Indexed on Average

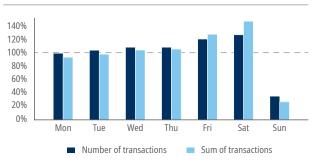
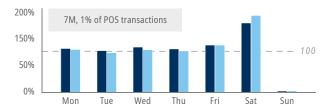


Figure 19: Number and Sum of POS Transactions by Weekday for Selected Merchant Categories, Indexed on Average



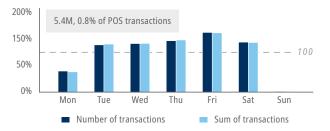
5712 Equipment, furniture, home furnishings







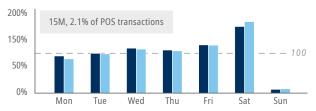




5812 Restaurants and eating places



5651 Family clothing stores



In contrast to the significant within-week pattern, we observe no significant pattern in POS transactions by day of the month (see Figure 20). Again, we benchmark each day of the month against the average daily spending over our entire observation period. We observe a slight decline in the number and value of transactions in the middle of the month. But surprisingly, we do not observe a significant payday effect follow toward the end/beginning of the month. As we will see in chapter 3, the payday effect is much more significant for ATM cash withdrawals.

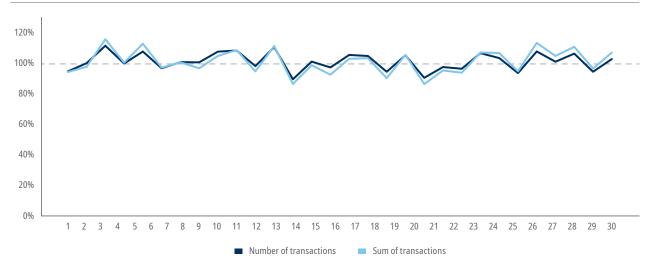


Figure 20: Number and Sum of POS Transactions by Day of the Month, Indexed on Average

2d. Card Usage Seasonality across the Year

Card usage during the year shows signs of seasonality effects, with a peak during the festive season in December and a subsequent drop in January and February (see Figure 34 in the Appendix).

3 UNDERSTANDING THE DEMAND FOR CASH

Key Insight:

A significant share of ATM withdrawals by cash payers is related to large-value transactions around paydays.



- Cardholders make on average two ATM withdrawals per month, with cashpreferring payer types making twice as many withdrawals than card-preferring payer types.
- → Most cash is withdrawn from ATMs of a cardholder's own bank. Cash Payers are more loyal compared to other payer types. Card-preferring payer types seem to be indifferent of the bank affiliation of an ATM and accept potential withdrawal fees or have products that have no fees for ATM withdrawals at third-party ATMs.
- → The average withdrawal amount is CHF 350, with 50% of withdrawals being below CHF 200.
- → ATM withdrawals peak on Friday and toward the end of the month (payday effect).
- → There are significant differences across payer types in withdrawals during the month. Cash and Mainly Cash Payers withdraw most of their cash at the end of the month, while other payer types demand cash on a similar level spread over the whole month.
- → The average ATM deposit is CHF 1,090, with 50% of deposits being below CHF 400.
- → Cardholders who deposit cash tend to prefer to make deposits during the week with a peak on Monday.

3a. ATM Withdrawals from Issuing Bank or Other Banks

Each cardholder makes on average two ATM withdrawals per month, with cash-preferring payer types making more withdrawals than other payer types (see Figure 21). For each withdrawal transaction in our sample, we checked if it was an ATM of the card-issuing bank or an ATM of a different bank. For each card we then computed the ratio of own bank transactions in terms of frequency of transactions. Most cardholders withdraw the majority of their cash from ATMs of their own bank. On average, 65% of withdrawals are made at ATMs of a cardholder's own bank. Some 27% of all cardholders get cash only at ATMs of their own bank, while 9% never withdraw cash from their own bank. Cardholders that withdraw cash from both their own and other banks, tend to withdraw marginally higher amounts from their own bank.

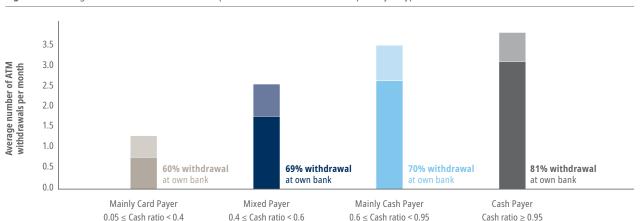


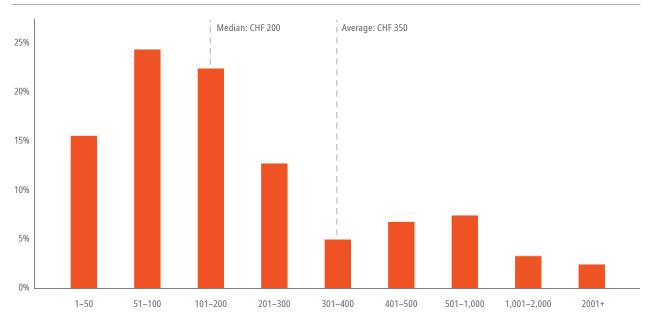
Figure 21: Average Number of ATM Withdrawals per Month and Own Bank Ratio per Payer Type

Cash Payers show a higher loyalty for withdrawals at their own bank, compared to other payer types. Cash Payers conduct 81% of their withdrawals at ATMs of their own bank. In contrast, Mainly Card Payers seem to be more indifferent toward the bank affiliation of an ATM. The lower own bank ratios for card-preferring payer types suggest that they just seek fast access to cash in specific situations, accepting potential fees associated with withdrawals at ATMs of other banks, or have card products that do not include fees at ATMs of other banks.

3b. Distribution of ATM Withdrawal Amounts

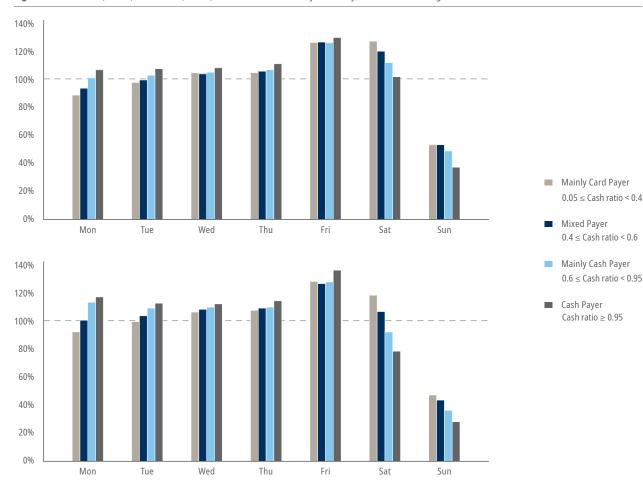
The median ATM withdrawal (value) is CHF 200 (see Figure 22). Among the 70 million ATM withdrawal transactions in our sample, we observe 40% of withdrawals with amounts of CHF 100 or below. Around 9% of transaction amounts are above CHF 1,000. The mean withdrawal value (CHF 350) is thus significantly higher than the size of the average transaction (median). If we assume that the average consumer spends their cash regularly and goes to the ATM when they run out of cash, they would, on average, have an amount of CHF 100 in their wallet. This is very much in line with the CHF 90 (median value) that the average consumer reports keeping in their wallets (SNB, 2020). Assuming that ATM withdrawals usually take place prior to consumption, this number adequately falls in the range of what might be left in the wallet between withdrawals. Furthermore, consumers describe a clear preference for CHF 100 banknotes, followed by CHF 50 and CHF 20 (SNB, 2021). In general, we expect that the average withdrawal amount would be higher if we did not apply our sample inclusion criteria, e.g., excluding bank cards.





3c. ATM Withdrawal Daily Pattern during a Month

Figure 23: Number (above) and Sums (below) of ATM Withdrawals by Weekday, Indexed on Average



ATM withdrawals rise toward the weekend with a peak on Friday. As in the case of POS transactions, we compare the number and value of ATM card withdrawals across days of the week (see Figure 23). Each day of the week is benchmarked against the average spending per day per payer type over our entire observation period. While the overall pattern shows that withdrawals are stable between Monday and Thursday, we observe a clear peak on Friday and continuing elevated demand on Saturday. Moreover, we see a strong drop on Sunday that is comparable but not as high as in the case of POS transactions. Withdrawal amounts exhibit higher deviations during the weekend when compared to changes in ATM withdrawal numbers. Cash Payers stand out among our payer type groups as their cash withdrawals seem to take place mainly during the week, showing as a consequence clearly less-than-average demand for cash on both days of the weekend.

There is a significant payday effect for ATM withdrawals, which is driven mainly by Cash Payers. Looking at the intramonthly pattern of ATM withdrawals evolution, we see a cyclical pattern emerge (see Figure 24). When salaries are paid toward the end of the month, consumers generate a high tide in demand for cash, especially within the (Mainly) Cash Payer type groups. Cash Payers stand out again as they withdraw almost twice their average daily transactions sums around the 25th day of each month. This supports our earlier conjecture that cash payers use a significant share of their cash withdrawals to pay regular invoices.

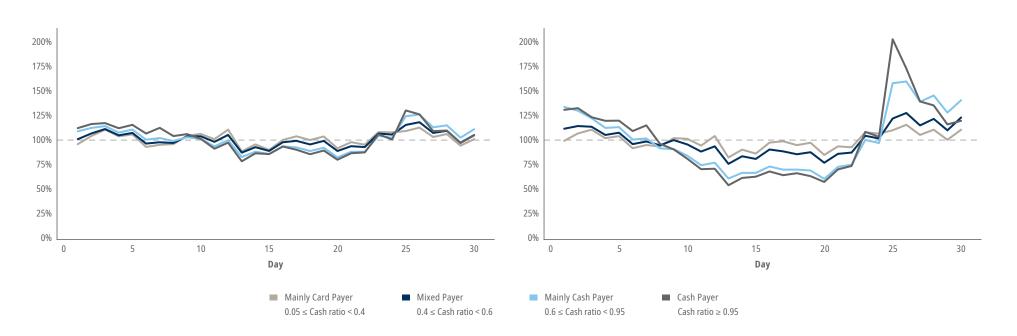


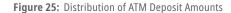
Figure 24: Number (left) and Sums (right) of ATM Withdrawals by Day of the Month, Indexed on Average

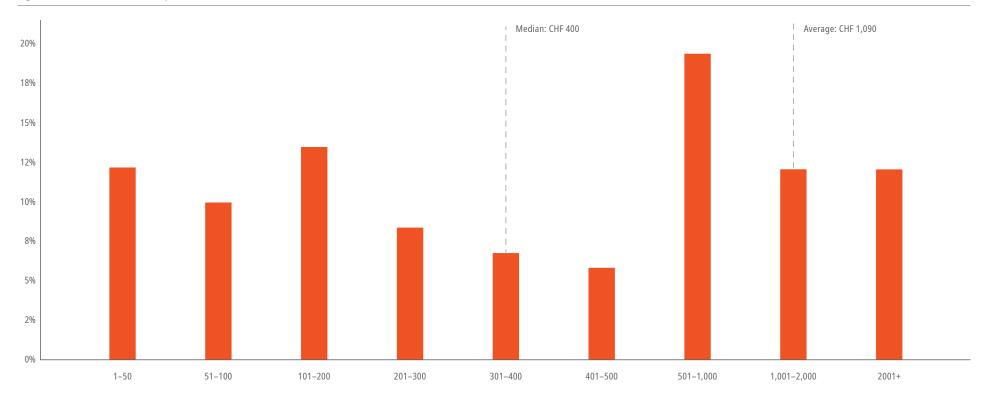
3d. ATM Withdrawal Seasonality across the Year

Similar to card demand for POS transactions, we observe significant seasonality effects during Christmas and summer holidays for ATM withdrawals (see Figure 35 in Appendix).

3e. Distribution of ATM Deposits

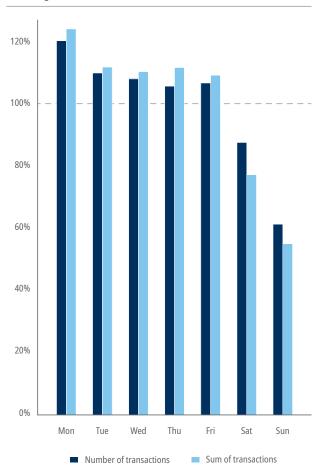
ATM deposit amounts are on average three times larger than withdrawal amounts. During our observation period of 13 months, we observe 3 million ATM deposit transactions. The data reveals that 23% of cardholders made at least one ATM deposit in the observed period. Figure 25 shows that 50% of all ATM deposits are CHF 400 or below while 22% of all deposits are CHF 100 or below. However, on the larger side, deposit amounts between CHF 500 and CHF 2,000 stand out and make up more than 30% of all transactions. An additional 12% of deposits consist of values above CHF 2,000. The mean ATM deposit value is CHF 1,090 and thus just over three times larger than the mean ATM withdrawal amount (CHF 350). This may be a consequence of deposits being made by small businesses rather than private consumers.





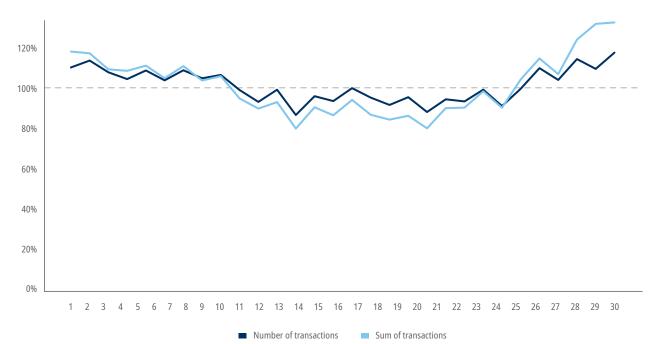
3f. ATM Deposit Daily Pattern during a Month

Figure 26: Number and Sums of ATM Deposits by Weekday, Indexed on Average



ATM deposits peak after the weekend. The weekly pattern of ATM deposits suggests a relation to the weekend earnings of small businesses. These may be deposited on Mondays, potentially as part of their day used for administrative tasks. Deposit volumes show little fluctuation during the working week and a decrease on the weekend, which is less severe in magnitude than in the case of withdrawals. During the course of a month, deposits follow the same seasonality as withdrawals (see Figure 27). Deposit volumes peak toward the end of the month and begin a new month with slightly higher levels that gradually decline mid-month. Regarding both intra-week and intra-month changes, we see no significant differences between payer types.

Figure 27: Number and Sums of ATM Deposits by Day of the Month, Indexed on Average



3g. ATM Withdrawals and Deposit Patterns over the Month

When comparing the distribution of ATM deposits and withdrawals over the course of a week (see Figure 28), we observe significant differences before/after the weekend. ATM withdrawal amounts peak on Friday and decrease over the weekend with the lowest levels of withdrawals on Sunday. In the case of deposits, we observe the peak of transactions on Monday. Note, however, that this is a macroscopic view on the behavior of our sample and not necessarily individuals, as not every cardholder has withdrawals and deposits.

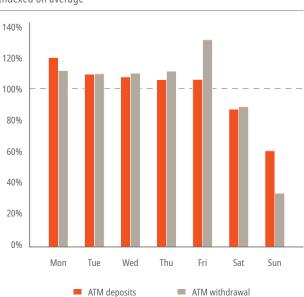


Figure 28: Sums of ATM Deposits and Withdrawals by Weekday, Indexed on average

ATM deposits and withdrawals follow the same intra-month patterns. We observe that ATM withdrawals show stronger fluctuation during the month, with the peak in ATM deposits lagging a few days behind withdrawals. Importantly, Figure 29 reveals that the payday has a significantly stronger impact on ATM withdrawals. Again, this supports our conjecture that a significant share of cash withdrawals is made at the end of the month with the objective of paying regular invoices.

Figure 29: Sums of ATM Deposits and Withdrawals by Day of the Month, Indexed on Average



Conclusion

This research paper offers unique insights into the payment behavior of debit card users in Switzerland.

The close collaboration with the University of St.Gallen, the large and representative sample of anonymized debit cards transactions, and a rigorous data analysis process allowed SIX to derive compelling data-driven observations about actual consumer behavior. We believe that our results provide a significant contribution to the understanding of consumer payment behavior in Switzerland based on an unprecedented transaction-level data basis.

Our results show that the use of debit cards at POS and ATMs by the same cardholder is surprisingly dynamic. We can clearly assign each cardholder to a certain payer type with respect to their cash preference. Nevertheless, our results also indicate that it might be misleading to use static typologies if consumers exhibit changing payment behavior across individual months. Most cardholders prefer card over cash payments. Further, we believe our results corroborate that there still is widespread demand for all-in-one card products, allowing e.g., POS payments, ATM withdrawals, and e-commerce. The average monthly spending per card amounts to CHF 1,500. Within Switzerland, we observe significant differences in cash preferences across cantons, with the canton of Ticino showing the highest usage of cash. Neither the agglomeration structure nor the bank relationship of a cardholder seems to be relevant for the preference of cash over card.

The average cardholder uses their card 16 times per month at the POS at a concentrated number of merchants. POS payments are dominated by purchases in supermarkets and other areas of household spending. The majority of card payments is conducted contactlessly and has a transaction size below CHF 50. We observe significant differences in transaction sizes across key merchant categories, but no differences across payer types. Within the average month we observe a weak payday effect with a higher level of POS transaction toward the end of the month, leaving card usage relatively stable across the rest of the month.

A significant share of ATM withdrawals is focused around paydays, especially for cash payers. ATM withdrawal amounts average CHF 350, while half of all withdrawals amount to CHF 200 or less. An average debit card is used for two ATM withdrawals per month, with cash-preferring payer types making more withdrawals than other payer types. The average number and amounts of ATM withdrawals peak on Friday and more significantly toward the end of the month, signaling a strong payday effect. Most cardholders prefer to withdraw cash from ATMs of their own bank, but cardpreferring payer types seem indifferent to the bank affiliation of an ATM when withdrawing cash, as they just want to satisfy their need for cash in a specific situation. About 20% of cardholders use ATMs to deposit cash. Approximately 50% of deposit amounts are CHF 400 or below, with the average deposit amount being CHF 1,090.

The aim of this research paper was to give an insight into apprehended payment choices of debit card users and highlight potential influencing factors. In addition, we shared our recommendations on potential future development, which should support a more sustainable Swiss financial sector as well as best meet the needs of the debit card consumers. We plan to continue our analyses and publish new data insights in the future. The new generation of debit cards (Mastercard and Visa) were not included in the scope of this study, and we plan to publish related results around the usage of these cards and their impact on the overall payments behavior during the next year.

Our interpretation and recommendations based on the extracted insights:

- Augment your debit offering: The observed data strongly indicates that the debit cards are a key means of payment. Therefore, it is important that card providers continue enhancing their debit offering with additional features (e.g., e-commerce, contactless, mobile pay, added value services) to enable the consumers an easy, fast, as well as comprehensive usage of the debit cards.
- Streamline own ATM network: Overall, most cards are used only infrequently for ATM withdrawals, and most cardholders predominantly use ATMs of their own bank. The high loyalty of consumers toward their own bank, combined with the usage of cards for cash, indicate a potential for banks to reduce the cost of their current ATM operation, i.e., outsourcing of ATM operation being one possible solution. Banks should proactively manage the costs of their cash infrastructure covering ATMs and branch infrastructure to cope with reduced usage.

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Rethink existing cash infrastructure: While cash remains a significant means of payment with 20% of cardholders heavily relying on cash, we observe a clear preference for cash for the Italian-speaking part of Switzerland. However, we did not find a significant difference between urban, intermediary, or rural areas. Additionally, consumers report an overall shift in their cash usage (SNB, 2021). In this context, it is crucial for financial institutions to join their efforts and push forward the vision for an optimized and more sustainable ATM infrastructure in Switzerland, while still meeting the needs for cash.

Appendix

Data and Sample Construction Payment Data

We use transaction data for debit cards issued by Swiss banks and processed by SIX. The transaction data set includes point of sale (POS) and automatic teller machine (ATM) transactions.

The complete data set covers the time period from the 1st of August 2020 until the 30th September 2021. This includes in total 1.2 billion anonymized transactions on 9.3 million unique anonymized cards. The data is available on a transactional level. This means each observation includes the date, amount, location, and card type used in the transaction mapped to a unique randomly generated card identifier.

Sample construction

We use three steps to create a constant cardholder sample that the analysis is based on:

- 1. Full data anonymization to ensure ultimate data privacy.
- Dropping "inactive" cards that do not show at least one transaction within each month from 1st of September 2020 to 30th September 2021 (13 months).
- 3. Dropping "inactive" cards with an average transaction amount smaller than CHF 100 per month.

Variable definition

Active months

The variable active months is defined as the number of subsequent months with at least one transaction starting in September 2020. The sample includes only cards with activities in all 13 months (Sept 2020 – Sept 2021).

Average transaction amount

The average transaction amount is defined as the sum of transaction amounts per unique card ID divided by the number of subsequent active months. The sample includes only cards with an average transaction amount of at least CHF 100 per active month.

Cash Ratio

The cash ratio shows a user's preference for cash payments in percent. It is defined as the total sum of ATM withdrawal amounts divided by the total sum of payment amounts for a unique card in the sample period. A cash ratio of 0% implies that all payments within the sample period were made at the point of sale using cards. A cash ratio of 100% indicates that the card was exclusively used to make ATM withdrawals.

Payer type

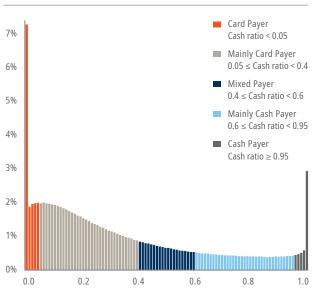
The payer type categorizes card holders into one of five segments according to their overall cash ratio as follows:

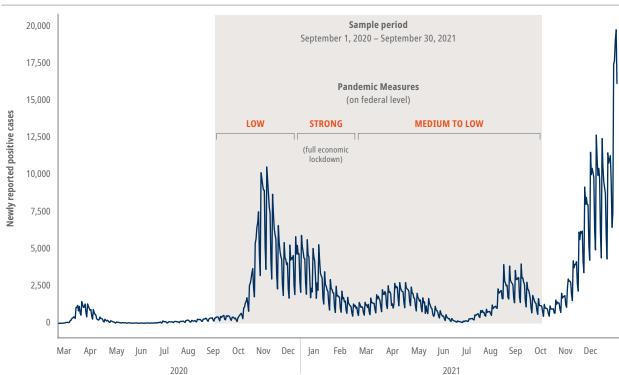
- Card Payer (<5% cash ratio): (Almost) always pays by card, never uses cash, or only to a small extent (at most 5% of total expenses).
- Mainly Card Payer (≥ 5% cash ratio, < 40% cash ratio):
 Prefers to pay with card, but chooses to pay cash occasionally.
- Mixed Payer (≥ 40% cash ration, < 60% cash ratio): Has no clear preference for either payment type, or decides by chance.
- Mainly Cash Payer (≥ 60% cash ratio, < 95% cash ratio):
 Prefers to pay with cash, but chooses to pay by card occasionally.

 Cash Payer (≥ 95% cash ratio): (Almost) always pays with cash, never uses card, or only to a small extent (at most 5% of total expenses).

Our payer type categorization is robust against clusters of cardholders around the cut-off values. Figure 30 shows the distribution of cash ratios and the corresponding payer type categorization. The distribution shows a positive skew with separate peaks at the maximal and minimal cash ratio. There are no irregularities at cutoff values, indicating adequate grouping.

Figure 30: Distribution of Cash Ratios and Payer Type Categorization





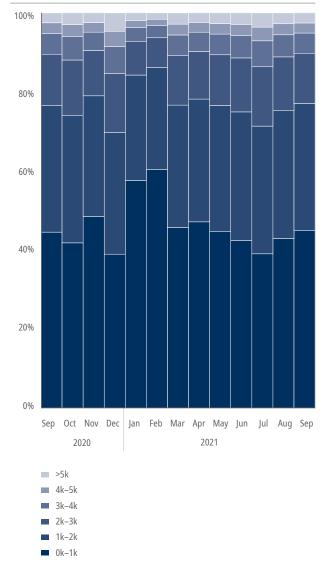
Supplementary Material

Figure 31: Overview of Reported Covid-19 Cases and Federal Pandemic Measures During Sample Period in Switzerland

A look at the trend of POS activity over our sample period reveals distinct seasonality effects without significant differences across payer types (see Figure 34). In all payer types we can verify effects of the winter holiday season with a strong increase in total transaction amounts in December 2020 and a subsequent drop in both POS transactions and amounts for January and February 2021. We believe that the drop in January and February 2021 was increased by the ongoing economic lockdown in Switzerland (see Figure 31). Additionally, we observe well above average transactions and amounts during typical times of summer holidays.

Compared to changes in POS demand, seasonality effects on ATM withdrawals show more pronounced swings of the same underlying dynamics. In particular, the cash amount peak associated with the December holiday season is more distinct, as well as the subsequent drop that lasts until the transition into the summer holiday season.

Figure 32: Distribution of Monthly Transaction Sums by Month



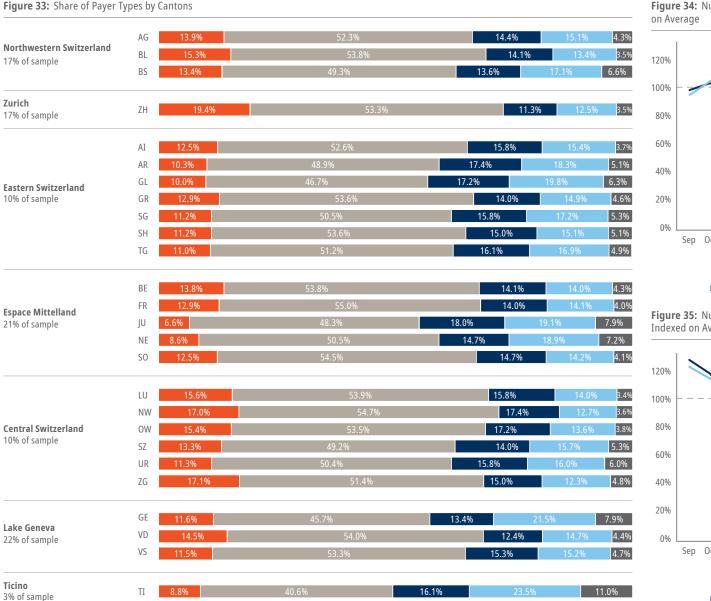


Figure 34: Number and Sums of POS Transactions by Month, Indexed on Average



Figure 35: Number and Sums of ATM Withdrawals by Months, Indexed on Average



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