Uncovering the digital payment divide: understanding the importance of cash for groups at risk

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EUROSYSTEEM

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June 2023

Abstract

The ongoing digital transition in the payment landscape offers countless advantages to many people. However, certain segments of the population encounter difficulties navigating this digital world, particularly individuals within groups at risk. Little is known about the payment behaviour and preferences of these groups. Our research focuses on people with low digital literacy, disabilities or financial difficulties. Using rich payment diary data of Dutch consumers, our study reveals that cash is an important means of payment to many. 7% of the respondents in our study say they always use cash at points of sale and 28% indicate they cannot do without cash. Furthermore, we find that cash is especially important for people with low digital literacy, people who are blind or visually impaired, people with limited or no hand function, people with a mild intellectual disability and people who find it difficult to make ends meet on their income.

Keywords: payment behaviour, groups at risk, payment diaries, consumer survey, cash, cards

JEL classifications: D12; D14; E42; E58

1. Introduction

Over the past few years, there has been a significant uptake of non-cash payments at points of sale (POS). As technology advances and the use of smartphones increases, consumers are looking for more convenient and secure payment options. This trend has been particularly evident in developed countries, where the adoption of contactless payment methods has surged. Whereas the digitalisation of the payment system is a solution for some, it is a challenge for others (Access to Cash Review, 2019; Broekhoff et al., 2023). For central bankers and banks is important to know the extent to which cash plays an important role in society and which groups in particular cannot do without cash.

There is a large body of research on consumer payment choice. Many studies examine the way payment behaviour is related to standard personal characteristics, such as age and income (e.g. Bagnall et al., 2016; Arango-Arango et al., 2018). To date, however, little is known about how payment choices and preferences differ for those who find the digitalisation of payments very challenging. Many people who struggle with the digital payment world belong to groups at risk. These groups include consumers with a low digital literacy, consumers with a physical disability (such as an auditory or visual impairment) and consumers facing financial difficulties.

In this study, we aim to learn more about the importance of cash, especially for groups at risk, by using a rich dataset of 19,136 observations based on payment diary data collected in the Netherlands in 2022. Prior research has shown that payment diaries are a valuable and reliable method to gain insight in consumer payment behaviour and how this behaviour relates to demographics and transaction characteristics (Bagnall et al., 2016; European Central Bank (ECB), 2022; Jonker et al., 2022; Shy, 2021). In addition to the richness of the data, the Netherlands is an ideal context for studying payment behaviour and preferences, given the widespread acceptance of both cash and electronic payments at the POS and the near-universal possession of a debit card and access to cash. This allows us to concentrate on analysing consumer choices.

Our research focuses on people with low digital skills, disabilities or financial difficulties. Our 2022 payment diary data for the Netherlands includes data on these individual characteristics, next to standard demographics. Moreover, the data not only cover payment choice and preferences, but also cash dependence. We learn more about the importance of cash for an individual by looking at: (1) the individual's share of cash transactions at the POS on the registration date, (2) whether the individual only uses cash, (3) whether the individual cannot do without cash, and (4) whether the individual prefers to use cash.

Foreshadowing our main results, we find that cash still plays an essential role in the Dutch society. 7% of the respondents in our study say they always use cash at the POS and 28% indicate they cannot do without cash. Cash is especially important for groups at risk: people with low digital literacy, people with a certain type of disability (for example, people with a visual impairment), and people who find it difficult to make ends meet on their income. Our results underline that it is essential that cash remains accessible and available to all, but especially for these groups of people.

The remainder of the paper is organised as follows. Section 2 offers the theoretical background and hypotheses. The data used to test our hypotheses are described in Section 3. Section 4 outlines the models and the variables used in the data analysis. Section 5 offers the results, and the 6th and final section presents a discussion and our conclusions.

2. Theoretical background and hypotheses

2.1 Literature review and our contribution

There is a large body of research available on the topic of payments. Many of these studies examine the adoption of payment methods and consumers' payment choice at the POS. For instance, research has found that transaction details such as the purchase price and transaction costs affect payment behaviour. Specifically, cash usage tends to be lower for more expensive purchases, and consumers are less likely to use a payment method with high transaction costs (Jonker, 2007; Klee, 2008; ECB, 2022; DNB and DPA, 2023). Furthermore, POS characteristics such as venue and card acceptance affect payment choice (Bagnall et al., 2016). Additionally, socioeconomic factors play a crucial role in consumer payment behaviour. For example, lower-income, older, and less-educated consumers tend to use cash more frequently (Arango-Arango et al., 2018; Bagnall et al., 2016; van der Cruijsen and Plooij, 2018). As low literacy is particularly common among people with a low level of education (Buisman et al., 2013), this suggests that the use of cash is also relatively high among people with low literacy. The literature shows mixed results for financial literacy. For example, Świecka et al. (2021) show that Polish people with high financial knowledge make cashless payments more often than Poles with low financial knowledge, whereas Marcotty-Dehm and Trütsch (2021) show that financial literacy exerts no effect on payment choices of Swiss consumers. Payment behaviour also differs among first-generation migrants, with individuals from cash-oriented countries being more likely to use cash in the Netherlands (Kosse and Jansen, 2013). Also, socio-psychological influences such as social norms and the payment behaviour of peers have been found to affect payment choices (van der Cruijsen and van der Horst, 2019; van der Cruijsen and Knoben, 2021). The characteristics of the

region one lives in matter as well (Wang and Wolman, 2016; Ardizzi et al., 2018). Finally, external shocks such as the COVID-19 pandemic can trigger shifts in payment behaviour (Auer et al. 2022; Jonker et al. 2022).

The digitalisation of the economy has increased the availability of digital financial services. In recent years, this has led to a sharp rise in the use of digital payment methods such as debit cards and mobile contactless payments (ECB, 2022; DNB and DPA, 2023). Studies have examined how digital financial services such as digital payment solutions promote financial inclusion, particularly in developing countries (Dos Santos and Kvangraven, 2017; Demirgüç-Kunt et al., 2022; Hasan et al., 2022). Financial inclusion refers to the extent to which individuals have access to financial services such as bank accounts that can be used to make and receive payments and store or save money (Demirgüç-Kunt and Singer, 2017). Most studies in this field have suggested that digitalisation can contribute to financial inclusion by providing access to financial services to individuals who are excluded from traditional financial services. These studies also emphasise the importance of adapting to digital payment methods.

Even though the digitalisation of the payment system offers countless advantages for many people, certain groups in society are not able to or willing to adapt to digital payment methods for a variety of reasons. These groups are at risk in a society where financial service providers increasingly offer their customers digital solutions, while traditional forms of service are withdrawn. The digitalisation of the economy therefore poses a risk of breaching Article 9 of the United Nations (UN) Convention on the Rights of Persons with Disabilities (CRPD), as many digital financial services may not be fully accessible or usable for individuals with disabilities. According to Spaanderman (2020), the tangible form and clear design makes cash a payment method that is easy to use and accessible to all. The tangible aspect helps people that have a disability or those who have limited access to the non-cash payment system to make payments independently. These groups at risk include, for example, consumers with a low digital literacy, consumers with a disability (such as an auditory or visual impairment) or economically disadvantaged consumers. Studying the payment behaviour and preferences of these groups is crucial to ensure their continued ability to participate autonomously in society.

2.2 Groups at risks and their payment preferences and behaviour
Although little is known about groups at risk and their payment behaviour and preferences, a study has revealed that the level of satisfaction with payment systems has decreased in recent years among these groups in the Netherlands (National Forum on the Payment System (NFPS), 2021). This trend

has increased the interest in topics such as accessibility and inclusivity of the payment system. Accordingly, Broekhoff et al. (2023) studied the impact of the digitalisation of the payment system. The authors find that different groups experience different levels of accessibility due to the ongoing digitalisation, and indicate that this potentially opens up a divide in society. Over 1 in 6 Dutch adults do not manage their digital payments and other banking affairs independently. Studies conducted beyond the national borders of the Netherlands have revealed comparable findings. For instance, in the United Kingdom a majority of the population acknowledges the advantages of digital payments; however, according to Access to Cash Review (2019), 17% of UK residents would face difficulties adapting to a cashless society. Similarly, in Sweden, where cash usage is historically low (as in the Netherlands), experts are concerned about the potential exclusion of individuals who rely on cash due to the rapid digitalisation of the payment landscape (Riskbank, 2022). In the United States, where on a federal level there is no obligation for retailers to accept cash, several states have accepted bills since 2019 to prohibit cashless stores (NPR, 2020). All these developments fit into a trend in which society is (expected to be) more inclusive for everyone.

First and foremost, the rapid digital transition has revealed critical gaps in digital literacy (Lyons and Kass-Hanna, 2021). Since not all consumers have access to the internet, and some consumers have low digital skills, not everyone can reap the benefits that digitalisation has to offer. Individuals who are more digitally inclined, demonstrated by their possession of innovative payment instruments and frequent utilization of digital devices, are associated with a higher probability of using cards (Di Iorio and Rocco, 2022). Other studies show results that align in the same direction: a higher level of digital literacy is associated with a higher use of digital means of payments (Kajdi, 2022; Prete, 2022). It is argued that the complexity of electronic payment solutions prevents consumers with low digital literacy from using such means of payment. This is in line with other research about the relationship between perceived user-friendliness and the use of digital means of payments (Jonker, 2007; van der Cruijsen and Plooij, 2018): the usage intensity of a payment method is positively related to perceived user-friendliness. Perceived safety is also an important driver behind peoples' payment choice. Following this reasoning, consumers who do not know how to make digital payments (or lack the necessary means to do so) do not consider this a user-friendly or safe payment method and are therefore less likely to use it. This sentiment was also revealed in Broekhoff et al. (2023). All in all, we expect that the importance of cash is negatively related to individuals' level of digital literacy. Our first hypothesis therefore reads:

H1: Cash is more important for people with low digital literacy than for people with high digital literacy

Second, research is scarce on the topic of the importance of cash for individuals with a disability. Using data from the Dutch 2021 Availability Monitor (NFPS, 2021), Broekhoff et al. (2023) show that the share of people who do not carry out all banking independently is largest for those with mild intellectual disabilities or people who are blind. In both cases the share is 55%. Next are people with a limited hand function (42%), people who have difficulty walking (37%), and people who are wheelchair-bound (37%). For visually impaired people the share is 31% and for hearing impaired people 29%. Clearly, the share of dependence is much higher among people with a disability than among people who do not fall in a particular focus group. For the latter group the dependence is 8%. Based on over 200 in dept-interviews among people in 27 different focus groups, Broekhoff et al. (2023) find that a lot of people struggle with the digital payment world. This holds especially for people without internet access, people with low literacy, people with a non-Western migration background, but also for people who are blind or severely visually impaired, people who are deaf or severely hearing impaired, people with a limited hand function and people with a mild intellectual disability. The research revealed several obstacles, for example challenges with operating devices such as POS terminals and smartphones, understanding texts and instructions, remembering codes and meeting time limits. Research in the US shows that households where the head of the household has a disability are more likely to be unbanked or underbanked than those without a disability, more likely to rely on bank tellers to access their banking account, and less likely to have a credit card and to use online or mobile options (Goodman and Morris, 2019). Taking into account the factors mentioned above, it appears that people with a disability experience greater difficulties in the digital payment world than others. This is why we suggest the following second hypothesis:

H2: Cash is more important for people with disabilities than for people without disabilities

Third and last, we discuss the existing research about payment behaviour of individuals who have difficulties making ends meet on their income. Greater consumer use of cash is associated with a variety of factors, including low income, low education levels, and low (financial) literacy. These consumer groups are disproportionately represented in the population as having financial difficulties. Studies show that individuals with low incomes and those who experience financial constraints are more likely to rely on cash to exercise greater control over their expenditures and manage their budgets (Hernandez et al., 2017). With cash, they can easily keep track of their expenses and manage their finances accordingly. This is because when using cash, people are more likely to

feel the "pain of paying" – the emotional discomfort associated with spending money – which can help to prevent overspending (Broekhoff and van der Cruijsen, 2022). Paying in the blink of an eye with digital payment methods hurts less, but you spend more. In line with this, research in the United Kingdom and Germany highlights the importance of cash for low-income people in avoiding impulse purchases, making it easier to make ends meet on one's income and reduce debt (Access to Cash Review, 2019; Von Kalckreuth et al., 2014). Many studies find that consumers spend more when they use credit cards than when they use cash (e.g., Feinberg, 1986). Based on the foregoing factors, we propose the following third and last hypothesis:

> *H3: The more difficult it is to make ends meet on one's income, the more important cash is as a payment instrument*

3. Data and measurement

3.1 Survey on Consumers' Payments

To map out the relationship between groups at risk and payment preferences and payment behaviour, we use rich 2022 payment survey data collected from Dutch consumers. The data collection by research agency Ipsos was commissioned by De Nederlandsche Bank (DNB) and the Dutch Payments Association (DPA). The main goal of the DNB/DPA Survey on Consumers' Payments (SCP), which has existed since 2010, is to measure payment behaviour (Jonker et al., 2018). The data that we use spans the period from January 1 2022 to December 31 2022. The survey is filled in by a sample of the members of the Ipsos market research panel aged 12 years and over and is representative for the Dutch population. The sample is drawn monthly and evenly distributed over the days of the month.

The SCP has two parts: a one-day payment diary and an additional questionnaire. In the first component of the survey, consumers register all the payments they make during the day. They report the amount paid, the payment instrument used and the POS. The additional questionnaire entails questions about payment preferences and personal characteristics.

The 2022 data we use contains 23,451 observations from 19,185 unique respondents. Respondents partake in the SCP at most once every quarter. On average respondents in the 2022 sample participated 1.2 times with 82% participating only once, 14% participating twice, 3% three times and 1% four times. In our baseline regression, we include every respondent only once. We take the first 2022 observation from each respondent. For 19,136 respondents we have all the background information we need to run our regression models. 98% of these respondents answered

the survey online and 2% by phone. The regression model with the share of cash transactions as dependent variable is based on fewer observations (12,313), as it is only possible to construct this variable for those respondents who made payments during the registration day. Not all respondents made payments on this day.

3.2 The situation in the Netherlands

In 2022, Dutch consumers made around 6.6 billion POS transactions with a total value of €165 billion (DNB and DPA, 2023). Out of these transactions, 20% were paid using cash. Most transactions were paid contactless with a debit card, making up for almost half of the POS transactions (49%). Contactless payment using a smartphone or wearable is becoming increasingly popular in the Netherlands: 21% of all transactions were made with this payment method. The remaining transactions (10%) were paid with a debit card in the traditional way, where the card was inserted into the payment terminal.

The number of cash payments has been decreasing in the Netherlands for over a decade. This decline was accelerated by the COVID-19 pandemic (Jonker et al, 2022). However, numbers on cash usage in 2022 show a small increase compared to 2021, presumably caused by the absence of measures to prevent the spread of COVID-19. Nevertheless, between 2012 and 2022 the number of POS cash payments decreased by 65%.

The Netherlands is a well-suited country to study payment behaviour. First of all, most retailers facilitate multiple payment methods, resulting in both high debit card and cash acceptance at POS locations in the Netherlands. In 2020, 92% of all retailers accepted a debit card as a means of payment (DNB, 2020). These retailers generally also allow for contactless payments, both contactless with a debit card as well as with a smartphone or wearable. The acceptance of cash is high, with 96% of all retailers accepting this payment method (DNB, 2023). Overall, virtually all Dutch consumers indicated in the SCP they could choose their preferred payment instrument at the POS.

Second, most of the Dutch population have all the means needed to be able to choose the payment method they prefer. 97% of the Dutch population aged 12 years and over had internet access in 2022, and 90% used it on a daily basis. Furthermore, when looking at banking services, it appears that 86% of Dutch consumers use internet banking or mobile banking (Statistics Netherlands, 2022). Also, the use of mobile devices is relatively high in the Netherlands, with 89% of all consumers using a smartphone or other mobile device to access the internet (Eurostat, 2019). Moreover, the share of consumers with access to a payment account (98%) and the share of consumers with a payment card (95%) are amongst the highest in the euro area (ECB, 2022). In the

Netherlands, virtually all payment cards contain Near Field Communication (NFC) chips that allow for contactless payments.

In sum, almost no Dutch consumer faces any restrictions in terms of acceptance of a payment method at the POS or the possession of the necessary equipment to pick a payment instrument of their choice. Therefore, they can individually and independently choose how they would like to pay. This allows us to focus solely on differences in consumer behaviour, potentially influenced by personal barriers that consumers experience due to the fact that they are part of one or more of the groups at risk.

4. Methodology

4.1 Dependent variables and models

As one of the goals of this study is to test whether there are differences in cash usage amongst different groups, we first analyse a dependent variable *share of cash$_i$* that denotes the share of transactions paid with cash by individual *i* on the registration date. Since the value of this dependent variable ranges between 0 (no cash payments) and 1 (only cash payments), and a large proportion of the observations are at these boundary values, this allows for estimating a tobit model. [1,2] We postulate that:

$$share\ of\ cash_i = \begin{cases} share\ of\ cash_i^* & if\ 0 < share\ of\ cash_i^* < 1 \\ 0 & if\ share\ of\ cash_i^* \leq 0 \\ 1 & if\ share\ of\ cash_i^* \geq 1 \end{cases} \quad (1)$$

where *share of cash$_i^*$* is a latent variable assumed to be generated by the following linear specification:

$$share\ of\ cash_i^* = \alpha + \beta' group\ at\ risk_i + \gamma' X_i + e_i \quad (2)$$

Equation (2) relates the share of cash payments by individual *i* on the registration day to that individual's digital literacy level, disabilities and financial difficulties, which are captures by the vector group at risk. X_i is a vector that captures the demographic and transaction control variables,

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[1] The descriptive statistics for the dependent variables are in Table A.1 of Appendix A.
[2] Wooldridge (2002) argues that the tobit model is an appropriate method to use for this type of dependent variable (Papalia and Di Iorio 2001). Our approach is also in line with van der Cruijsen and Knoben (2021), who use SCP data to model the share of debit card usage with a tobit model.

while e_i is the error term. e_i is assumed to be normally and independently distributed with mean 0 and variance σ^2. In our baseline regressions we use only the first observation from each respondent because almost all variance in the dependent variables is variation between respondents.[3] As sensitivity analyses, we use one random observation per respondent and all observations.

Second, we are interested in individual's dependence on cash. As the SCP includes a question about cash dependence (see Box 1), two binary variables can be constructed: *uses cash only* and *cash-dependent*. *Uses cash only* is 1 for respondents who state they only use cash, which holds for 7% of the respondents in our sample (see Figure 2). The variable takes value 0 otherwise. Similarly, *cash-dependent* is 1 for respondents who indicate that they cannot do without cash and 0 for respondents who are not dependent on cash. 28% of the people in our sample indicate they cannot do without cash. Both binary variables represent an individual's cash dependence and are used as dependent variables in logit models. Similar to the share of cash in equation (2), we also relate our two binary measures of cash dependence to digital literacy, disabilities and financial difficulties using logit specifications.

Box 1: Question to measure cash dependence

What applies to you?

Multiple answers are possible.

- o   I only pay cash at the POS
- o   I cannot do without cash
- o   This both does not apply to me

Third, our last variable of interest is *cash preference*. In the SCP individuals could indicate whether they prefer paying with cash or prefer PIN payments (see Box 2). PIN payments entail paying by debit card but also by using a mobile phone or wearable, where there is a digital version of the debit card present on a user's smartphone or wearable. The variable *cash preference* is 1 for respondents who prefer to use cash at the POS, and 0 for respondents who indicates that they prefer PIN payments or have no clear preference. 14% of the respondents in our sample prefer to use cash, 73% prefer to use the debit card and 13% have no clear preference. The variable *cash preference* is used as a dependent variable in a logit model. Similar to earlier specifications, we relate this preference measure to digital literacy, disabilities and financial difficulties and we include

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[3] We performed variance decomposition analyses using the data of respondents with multiple observations. 99.88% of the variance in *share of cash* is variation between respondents. For the other dependent variables *uses cash only*, *cash-dependent* and *cash preference* respectively 99.93%, 99.95% and 99.99% of the variance is variation between respondents.

demographic control variables. All four dependent variables are significantly positively correlated (see Table A.2 in Appendix A).

Box 2: Question to measure cash preference

Under normal circumstances do you prefer PIN payments or paying with cash?

- o Preference for PIN payments
- o Preference for cash
- o No preference/I cannot say

4.2 Key explanatory variables

We include various variables that indicate whether respondents belong to specific groups at risk. The descriptive statistics for these key explanatory variables are presented in Table A.3 of Appendix A.

4.2.1   Digital literacy

First, we construct a variable that captures respondents' digital literacy. We asked respondents to grade their own digital skills (see Box 3). Self-reported levels of digital literacy are on average graded a 7.9 and are plotted in Figure 1. Using these answers, a binary variable *digital literacy: low* is constructed, that takes value 1 for respondents who grade their digital skills to be 6 or lower and 0 for respondents who give themselves a 7 or higher. 4.5% of the respondents in the sample of our baseline regressions grade their own digital skills as low.

Figure 1. Self-reported digital literacy
Share of respondents
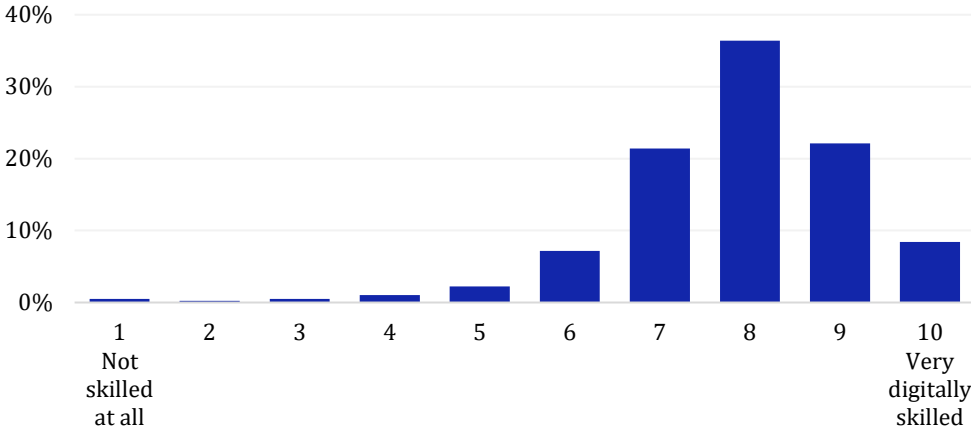
Source: SCP 2022.
Note: 19,136 observations.

4.2.2   Disabilities

The second set of key explanatory variables capture respondents' disabilities. In the 2022 SCP a question was included to gain information on respondents' physical and intellectual disabilities (see Box 4). We use the answers to this question and group these based on the type of disability. Five binary dummy variables are constructed: *difficulty walking or wheelchair-bound*, *deaf or hearing impaired*, *blind or visually impaired*, *limited or no hand function*, and *mild intellectual disability*. These variables are 1 for respondents with the disability mentioned and 0 otherwise. In our baseline sample, 5% of the respondents have difficulty walking or are wheelchair-bound, 5% are deaf or hearing impaired, 2% are blind or visually impaired, 2% have a limited or no hand function and 0.5% have a mild intellectual disability.

4.2.3   Financial difficulties

The third group of key explanatory variables captures the difficulty of making ends meet financially. The SCP includes a question about the difficulty of making ends meet on one's income (see Box 5). We use the answers to this question to construct the following binary dummy variables: *making ends*

meet: very easy, *making ends meet: easy*, *making ends meet: neither hard nor easy*, *making ends meet: hard,* and *making ends meet: very hard*. For example, *making ends meet: very easy* is 1 for respondents who find it very easy to make ends meet on their income and 0 for other respondents. The other dummies are constructed along similar lines. The reference category is *making ends meet: neither hard nor easy*. 39% of the respondents in our baseline sample fall in this category. Somewhat less than 1 in 10 respondents experience financial difficulties; 2% find it very hard to make ends meet and 7% find it hard. A much larger group finds it easy (40% of respondents) or very easy (13% of respondents) to make ends meet. Roughly 60% of all respondents who find it *very hard* to make ends meet have a low income. Additionally, 39% of all respondents who find it *hard* to make ends meet have a low income. So not only low-income respondents struggle to make ends meet, but also individuals with a middle income or (albeit to a lesser extent) high income.

Box 5: Question to financial difficulties

How hard or easy is it for you to make ends meet on your income?

- o   Very hard
- o   Hard
- o   Neither hard nor easy
- o   Easy
- o   Very easy

4.2.4   Characteristics of respondents in groups at risk

21% of the respondents fall in at least one of these groups at risk. On average, these respondents fall in 1.3 groups at risk. The likelihood of falling in at least one of the groups at risk increases with the respondent's age, decreases with their level of education and income and is relatively high for respondents who are female, who do not live together with a partner, or have a non-Western migration background.[4]

4.3 Control variables

We apply a wide range of commonly used demographic control variables in all regression models. The descriptive statistics for the control variables are presented in Table A.4 of Appendix A. In all regressions, we include the following individual-specific binary dummy variables to control for personal characteristics: *male, between 12 and 24, between 35 and 44, between 45 and 54, between 55 and 64, between 65 and 74, 75 and over, income: middle, income: high, income: unknown, education:*

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[4] The regression results are available upon request.

middle, *education: high*, *partner*, *children*, *migration background: Western first generation*, *migration background: Western second generation*, *migration background: non-Western first generation*, and *migration background: non-Western second generation*. *Male* is 1 for male respondents and 0 for female respondents. *Between 12 and 24* is 1 for respondents younger than 25 and 0 for respondents aged 25 or older. We constructed the other age dummies along the same lines. The income dummies control for differences in the gross annual household income. The education dummies capture the various levels of education. *Partner* is 1 for respondents who are married or living together with a partner, and 0 for other respondents. *Children* is 1 when a child or multiple children are part of the respondent's household and 0 for other respondents. The migration background dummies are constructed to control for the migration background. The reference person is a woman who does not live together with a partner and is not married, between 25 and 34 years old, without children living at home, with a gross annual household income of less than €23,400, a low level of education and no migration background.

In the share of cash regressions, we also apply transaction controls. We include *average transaction size in €100* to control for the average value of the transactions of the respondent on the registration day and *number of transactions* to control for the number of POS payments made. On average, the transaction size was €28, and people with POS transactions on the registration day made on average 2.2 POS payments. Finally, we apply controls for the payment diary registration date.[5] Three sets of dummy variables capture this day: (1) month dummies (reference month: January), (2) day of the month dummies (reference day: first day of the month), and (3) day of the week dummies (reference day: Sunday).

5. Results: cash usage, dependence and preference of groups at risk

5.1 There is a need for cash

There is a need for cash, especially among people in groups at risk. Figure 2 presents all dependent variables used in this study. On average, respondents' share of cash at the POS is 23%. Cash is used relatively often by groups at risk. The cash share is 42% for respondents with low digital literacy, 30% for respondents with a disability and 31% for respondent who find it hard or very hard to make ends meet on their household income. In general, 7% of the respondents indicate that they only pay cash at the POS. This figure is higher for respondents in groups at risk. For example, 18% of the

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[5] In the Netherlands, up until 25 February 2022, opening hours of most POS locations were restricted as a measure to prevent the spread of the coronavirus. By controlling for payment diary registration date, we isolate the impact of these coronavirus measures in our regressions.

respondents with low digital literacy indicate that they only use cash. In line with this, we find that 45% of this group states that they cannot do without cash, whereas this holds for 28% of the total group of respondents, 36% of the respondents with a disability and 35% of the respondents with financial difficulties. The need for cash is also reflected by cash preferences. Overall, 14% prefer cash. About 1 in 3 respondents with low digital literacy prefer to use cash at the POS. This figure is 20% for respondents with a disability and 27% for respondents who find it hard or very hard to make ends meet on their income.

Figure 2. There is a need for cash, especially among groups at risk
Share of respondents
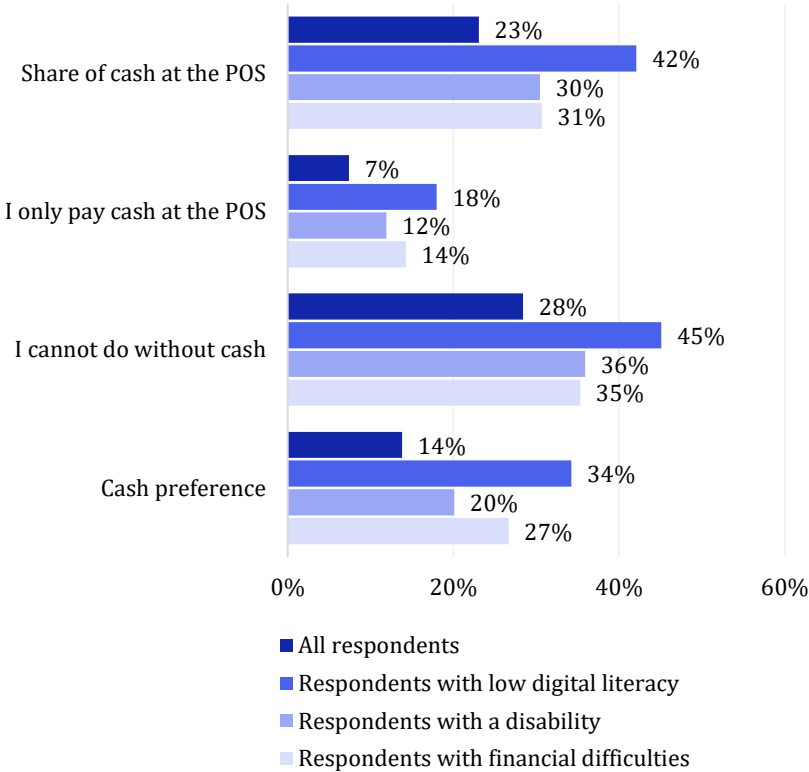
Source: SCP 2022.
Note: 19,136 observations, POS = points of sale.

5.2 Baseline regression results

Our baseline regression results are shown in Table 1.

Table 1. The importance of cash: baseline regression results
Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash-dependent	(4) Cash preference
1 Digital literacy				
Digital literacy: low	0.09***	0.05***	0.09***	0.10***
	(0.02)	(0.01)	(0.01)	(0.01)
2 Disabilities				
Difficulty walking or wheelchair-bound	-0.01	0.01	-0.01	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Deaf or hearing impaired	-0.00	-0.00	-0.03*	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Blind or visually impaired	0.03	0.02**	0.08***	0.05***
	(0.02)	(0.01)	(0.02)	(0.01)
Limited or no hand function	0.04*	0.02**	-0.00	0.05***
	(0.02)	(0.01)	(0.02)	(0.01)
Mild intellectual disability	0.08*	0.02	-0.01	0.06**
	(0.05)	(0.02)	(0.05)	(0.03)
3 Financial difficulties				
Making ends meet: very easy	-0.01	-0.00	-0.06***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: easy	-0.03***	-0.02***	-0.04***	-0.04***
	(0.01)	(0.00)	(0.01)	(0.01)
Making ends meet: hard	0.02*	0.02***	0.02	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: very hard	0.02	0.05***	0.04	0.06***
	(0.03)	(0.01)	(0.02)	(0.02)
4 Demographic controls				
Male	-0.00	0.01*	-0.03***	-0.01
	(0.01)	(0.00)	(0.01)	(0.01)
Between 12 and 24	0.01	0.00	-0.11***	-0.01
	(0.02)	(0.01)	(0.02)	(0.01)
Between 35 and 44	0.02	0.00	0.04***	0.02
	(0.01)	(0.01)	(0.02)	(0.01)
Between 45 and 54	0.07***	-0.00	0.10***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Between 55 and 64	0.08***	0.01	0.15***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)
Between 65 and 74	0.11***	0.00	0.17***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
75 and over	0.13***	0.02	0.16***	0.04***
	(0.02)	(0.01)	(0.02)	(0.01)
Education: middle	-0.03***	-0.02***	0.01*	-0.03***
	(0.01)	(0.00)	(0.01)	(0.01)
Education: high	-0.06***	-0.04***	-0.02**	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Income: middle	-0.05***	-0.02***	-0.03**	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Income: high	-0.09***	-0.05***	-0.08***	-0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Income: unknown	-0.03***	-0.01	-0.03***	-0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
Partner	-0.03***	-0.01**	-0.01*	-0.02***
	(0.01)	(0.00)	(0.01)	(0.01)
Children	0.00	0.01*	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)

This table continues on the next page.

Table 1. The importance of cash: baseline regression results (continued)
Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash- dependent	(4) Cash preference
Migration background: Western first generation	-0.01	-0.00	-0.05**	-0.02
	(0.02)	(0.01)	(0.02)	(0.02)
Migration background: Western second generation	-0.01	-0.02***	0.00	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)
Migration background: non-Western first generation	0.04**	0.04***	-0.03	0.00
	(0.02)	(0.01)	(0.02)	(0.02)
Migration background: non-Western second generation	0.00	0.02**	-0.03	0.01
	(0.02)	(0.01)	(0.02)	(0.01)
5 Transaction controls				
Average transaction size in EUR 100	-0.11***			
	(0.02)			
Number of transactions	0.02***			
	(0.00)			
Registration date controls	yes			
Number of observations	12,313	19,136	19,136	19,136
-Uncensored observations	1,759			
-Left-censored observations (*share of cash* = 0)	8,488			
-Right-censored observations (*share of cash* = 1)	2,066			
Pseudo R-squared	0.04	0.05	0.05	0.06
Log pseudolikelihood	-9819.6	-4782.7	-10887.0	-7184.5
Model significance^	8.5***	559.9***	948.5***	951.8***
Model	Tobit	Logit	Logit	Logit

Note: The table reports average marginal effects of a tobit model (column 1) and logit models (column 2-4). Heteroscedasticity-robust standard errors are in parentheses. ^ F-statistic for the tobit model and Wald Chi-squared for the logit models. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

5.2.1. Cash is a more important payment instrument for people with low digital literacy than for people with high digital literacy

We find support for H1: compared to people with high digital literacy, people with low digital literacy are more dependent on cash. The first section of Table 1 displays the impact of digital literacy on cash importance, with the separate indicators of cash importance presented in the four columns. The share of POS transactions paid with cash is 9 percentage points higher for people with low digital literacy than for people with high digital literacy (Table 1, column 1). Note that 69% of the respondents in our sample did not use cash at all, whereas 17% only used cash. People with low digital literacy are 5 percentage points more likely to state that they only use cash (column 2) and 9 percentage points more likely to indicate that they cannot do without cash (column 3). They are also 10 percentage points more likely to have a preference for cash than people with a high digital literacy (column 4). A plausible explanation for these findings is that individuals with a low level of digital literacy lack the knowledge and skills to use digital payment methods. Consequently, they rely on cash as a default payment method due to their reluctance towards the alternative digital payment methods.

5.2.2 The importance of cash as a payment instrument varies across disability groups

The importance of cash as a payment instrument varies across disability groups. That is, we find support for H2 only for some groups (see the second section of Table 1). Compared to people without visual issues, people who are blind or visually impaired are 2 percentage points more likely to state that they only use cash at the POS, 8 percentage points more likely to indicate that they cannot do without cash and 5 percentage points more likely to prefer cash. People with a limited or no hand function are also 5 percentage points more likely to prefer cash than other people. This stronger preference for cash is reflected in their actual payment behaviour. The share of POS transactions paid with cash is 4 percentage points higher for these people than for people with well-functioning hands. People with a limited or no hand function are 2 percentage more likely to answer that they always use cash. A possible explanation for these findings is that it is more difficult for people with this disability than for others to operate devices such as POS terminals, especially when they need to enter their PIN. Compared to other people, people with a mild intellectual disability are 6 percentage points more likely to prefer cash. This is reflected in their actual payment behaviour at the POS. The share of POS transactions paid with cash is 8 percentage points higher for people with a mild intellectual disability than for people who do not indicate having such a disability. A possible explanation for these findings is that people with a mild intellectual disability find cash payments easier than online payments, for example because they do not need to remember a code or because it is easier to keep track of how much they spend. The various factors of cash importance, i.e. cash usage, dependence and preferences are not associated with having difficulty walking or being wheelchair-bound. We find similar results for people with an auditory disability: most factors of cash importance do not differ significantly for this group from people no auditory impairment. One exception is that people who are deaf or hearing impaired are 3 percentage points less likely than other people to state that they cannot do without cash.

5.2.3 The importance of cash as a payment instrument increases with the difficulty of making ends meet on one's income

We find support for H3: the more difficult it is to make ends meet on one's income, the more important cash is as a payment instrument (see the third section of Table 1). For example, someone who finds it very hard to make ends meet on their income is 10 percentage points more likely to prefer cash than someone who finds it very easy to make ends meet. Someone who finds it very hard to make ends meet is 5 percentage points more likely to indicate using cash exclusively. This finding is in line with studies showing that cash makes it easier for people to track expenses and prevent

overspending. Monitoring expenses and preventing overspending is of particular importance for those who have financial difficulties.

5.2.4. The importance of cash is related to demographics

The importance of cash as a payment instrument is related to numerous demographic variables, as shown in section 4 of Table 1. Age is an especially relevant factor. Older people are more dependent on cash than younger people. For example, compared to people aged between 25 and 34, people aged 75 or above are 16 percentage points more likely to be cash-dependent. They are also 4 percentage points more likely to have a preference for cash. Their cash dependence and preference are confirmed by their payment behaviour on the payment diary registration day. The share of POS transactions paid with cash is 13 percentage points higher for people aged 75 and over than for people between 25 and 34. People between 12 and 24 – the youngest generation in our sample – are the least likely to state that they cannot do without cash. For example, they are 11 percentage points less likely to be cash-dependent than people aged between 25 and 34, the reference group.

In addition, all four variables representing cash importance are negatively related to the level of education and income. For example, someone with a gross annual income of less than €23,400 (a low income) is 10 percentage points more likely to prefer cash than someone with a gross annual household income of €65,000 or more (a high income). This is also reflected in actual behaviour: the share of POS transactions paid with cash is 9 percentage points higher for people with a low income than for people with a high income. And someone with a low level of education is 5 percentage points more likely to prefer cash than someone with a high level of education. The share of POS transactions paid with cash is 6 percentage points higher. Similar results are found for people who live together with a partner: they score lower on the cash importance variables than singles, albeit only slightly. For example, the share of POS transactions paid with cash is 3 percentage points lower for people with a partner.

Finally, for other demographic variables we do not find clear patterns. For example, first generation non-Western migrants pay a larger share of their POS transactions with cash than people without a migration background. However, we do not find conclusive results for this group's cash dependency and preferences. Also, there is no clear gender pattern. Males are somewhat less likely to indicate that they cannot do without cash, but a bit more likely to indicate that they only use cash at the POS. The effects are small. We do not find differences with respect to preferences. The effect of *children* is only significant in the regression with *uses only cash* as dependent variable. Compared to

other individuals, individuals who live together with their children are slightly more likely to report that they only use cash at the POS.

5.3 Sensitivity analyses

This subsection extends the previous analysis by examining whether the reported results are robust to changes in the specified models. First, we show that our findings remain intact when we use different samples. Our baseline regressions are based on respondents' first observations in 2022. As a robustness check, we rerun our regressions with all observations from 2022[6] and with a sample that includes one random observation from 2022 per respondent. The findings are very similar to our baseline results. These findings also convincingly support H1 and H3. Similar to our baseline regressions, we find support for H2 in the alternative regressions only for some groups. The results of these alternative regressions are presented in Table B.1 and B.2 of Appendix B.[7]

Second, we use alternative digital literacy measures and find further support for our hypotheses H1 and H3, and again mixed results for H2. In Table B.3 of Appendix B, we show the results of regressions with *participated by phone* as a measure of digital literacy that is not self-reported.[8] This binary variable takes the value 1 for respondents that answered the SCP by phone because of lack of internet access and 0 for respondents in the online group. 2% of the respondents in our sample answered the SCP by phone. The share of cash used at the POS is 12 percentage points higher for these respondents than for the respondents in the online group. The offline group is 6 percentage points more likely to only use cash at the POS and 5 percentage points more likely to say they cannot do without cash. They are also 15 percentage points more likely to have a preference for cash. Additionally, we run regressions with the variable *does not use internet or mobile banking* as a proxy for having a low level of digital literacy (Table B.4 of Appendix B). 5% of the respondents in our sample indicated that they do not use internet banking or mobile banking.[9] Compared to other people, they are 14 percentage points more likely to use cash at the POS and are 8 percentage points

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[6] In this scenario we cluster the standard errors at the individual level to take into account that errors are possibly correlated across the same respondent.

[7] Additionally, we restrict the sample to observations in which respondents made at least one POS payment on the registration day, and then we only use the first observation for each respondent. We rerun the cash share regression and find very similar results as in our baseline regression. The results are available upon request.

[8] It is often argued that self-reported measures of (digital) literacy can be inaccurate and subjective due to (among other reasons) respondents' overestimation and misunderstanding. This is why, as a robustness check, we include a measure of digital literacy that is not self-reported. *Participated by phone* and *digital literacy: low* are positively correlated (0.15, p-value<0.001).

[9] *Does not use internet or mobile banking* and *digital literacy: low* are positively correlated (0.19, p-value<0.001).

more likely to use cash exclusively. They are also 6 percentage points more likely to say they are cash-dependent and 14 percentage points more likely to indicate that they prefer to use cash.

Lastly, our findings are robust to the use of an alternative measure of financial difficulties. As a sensitivity analysis, we use the variable *debt restructuring* instead of the making-ends-meet variables. This binary variable is 1 for respondents who have a personal debt restructuring arrangement and 0 otherwise. 1% of the respondents in our sample have a personal debt restructuring arrangement. These individuals are 4 percentage points more likely to say they only use cash and also 4 percentage points more likely to prefer cash than other people (Table B.5). This finding further strengthens our support for H3: the more difficult it is to make ends meet on one's income, the more important cash is as a payment instrument.

6. Discussion and conclusions

The transition to digital payments is an ongoing trend, yet there remains a substantial and diverse group of individuals who cannot do without cash. 7% of the respondents in our study say they always use cash at the POS and 28% indicate they cannot do without cash. Specifically, cash is particularly important for people with low digital literacy, people with a certain type of disability (people who are blind or visually impaired, with limited or no hand function, or a mild intellectual disability) and people who find it difficult to make ends meet on their income. Naturally, the need for cash is especially strong for people who fall into more than one of these groups. As previous research has shown, one of the reasons for people to use cash is that they struggle with the world of digital payments (Broekhoff et al., 2023). Even though many parties involved in the payment industry are continuously developing their payment solutions to enhance accessibility for a broader audience, there will always be people for whom the use of digital payments poses significant challenges. This is why we anticipate that the importance of cash will endure in the foreseeable future.

There are several reasons why people prefer cash over digital payments, and some of these reasons are likely to persist. The SCP includes a question to shed more light on the reasons why people prefer cash over debit cards, the results of which are presented in Figure 3. 77% of the respondents who prefer cash find cash easier to use than debit cards, confirming the difficulty many individuals encounter in adapting to digital payment methods. The most frequently mentioned reason to prefer cash is that it enables people to monitor their spending better. Additionally, more than 7 in 10 respondents who prefer cash over debit cards indicate that cash helps them to prevent overspending and that cash feels more real. The use of cash also restricts spending, as individuals cannot spend more cash than they carry. Furthermore, 2 in 3 respondents use cash out of habit.

Clearly, payment habits can change over time, although it often takes a while (van der Cruijsen et al., 2017). The same holds for perceptions of payment instrument characteristics, such as the perceived safety of cash. For about half of the respondents who prefer cash, the perception that banknotes and coins are safer than debit cards is an important consideration for them to use cash. Perceived social norms may also shift over time. 1 in 5 respondents with a preference for cash think retailers prefer cash payments. In addition, the share of people who mention having a lot of cash income as a reason to prefer cash may decline over time as more and more salaries will be paid electronically. Last, we anticipate that privacy will remain a relevant reason to prefer cash over debit cards. For about half of the respondents who prefer cash, the fact that others cannot see what they spend their money on is a reason to prefer cash.

Figure 3. Respondents' reasons for preferring cash to debit cards
Share of respondents

Reason	Share
It allows me to better monitor spending	88%
I think paying with cash is easier	77%
I spend less when using cash	74%
Cash feels more "real"	72%
Out of habit	66%
Others cannot see what I spend my money on	50%
I think cash is safer	49%
More personal contact	44%
It is faster	35%
I have a lot of cash income and therefore cash in my pockets	31%
I have no good alternatives	29%
Maybe the retailer finds a debit card payment less desirable	20%

Source: SCP 2022.
Note: 2,640 observations.

The most frequently mentioned reasons to prefer cash are more or less similar across the different groups at risk. However, there are some noteworthy and significant differences between

cash preferring individuals who belong to a particular group at risk and cash preferring individuals who are not part of this particular group. We describe these here and include the results of one-sided t-tests. People with a low level of digital literacy find safety 12 percentage points more often a reason to prefer cash than people with a high level of digital literacy (p-value < 0.01). People who are blind or visually impaired are 18 percentage points more likely to find personal contact a reason to prefer cash than people without a visual impairment (p < 0.01). People with limited or no hand function are 19 percentage points more likely to mention personal contact as a reason to prefer cash than people with well-functioning hands (p < 0.01). It is possible that these individuals prefer having more personal contact because it allows them to ask for help. People with a mild intellectual disability are 19 percentage points more likely to indicate that having cash income is a reason why they prefer cash (p-value = 0.02) than people without an intellectual disability. The fact that cash helps prevent overspending is relatively important for people who face financial difficulties. 85% of people with a preference for cash that have financial difficulties indicate this is an important reason, whereas 71% of people with a preference for cash without financial difficulties find this important (p-value < 0.01).

In short, our results underline that cash still plays a key role in society. It is therefore essential that cash remains accessible and available. Our results therefore support policies that contribute to a well-functioning cash payment system.

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Appendix A. Description of variables

Table A.1. Description of dependent variables

Variable	Description	Mean	Sd	Min	Max	N
Share of cash	Share of POS transactions paid with cash	0.231	0.382	0	1	12,313
Uses cash only	Binary dummy (1 = uses only cash at the POS, 0 = else).	0.074	0.262	0	1	19,136
Cash-dependent	Binary dummy (1 = cash-dependent, 0 = else).	0.284	0.451	0	1	19,136
Cash preference	Binary dummy (1 = preference for cash, 0 = else).	0.138	0.345	0	1	19,136

Note: This table describes the dependent variables used in the regressions of which the results are reported in Table 1. The mean, standard deviation (sd), minimum (min), maximum (max) and number of observations (N) are reported for the sample included in these regressions.

Table A.2. Correlation of dependent variables

	Share of cash	Uses cash only	Cash-dependent	Cash preference
Share of cash	1.00			
Uses cash only	0.33	1.00		
Cash-dependent	0.21	0.10	1.00	
Cash preference	0.47	0.48	0.22	1.00

Note: This table shows Pearson's corelation coefficients. In all cases, the p-values of two-sided t-tests are smaller than 0.001.

Table A.3. Description of key explanatory variables

Variable	Description	Mean	Sd	Min	Max	N
Digital literacy						
Digital literacy: low	Binary dummy (1 = grade is lower than 6, 0 = else).	0.045	0.207	0	1	19,136
Disabilities						
Difficulty walking or wheelchair-bound	Binary dummy (1 = difficulty walking or wheelchair, 0 = else).	0.050	0.218	0	1	19,136
Deaf or hearing impaired	Binary dummy (1 = deaf or hearing impaired, 0 = else).	0.051	0.220	0	1	19,136
Blind or visually impaired	Binary dummy (1 = blind or visually impaired, 0 = else).	0.021	0.143	0	1	19,136
Limited or no hand function	Binary dummy (1 = limited or no hand function, 0 = else).	0.021	0.142	0	1	19,136
Mild intellectual disability	Binary dummy (1 = mild intellectual disability, 0 = else).	0.005	0.069	0	1	19,136
Financial difficulties						
Making ends meet: very easy	Binary dummy (1 = making ends meet on income is very easy, 0 = else).	0.129	0.335	0	1	19,136
Making ends meet: easy	Binary dummy (1 = making ends meet on income is easy, 0 = else).	0.395	0.489	0	1	19,136
Making ends meet: neither hard nor easy	Binary dummy (1 = making ends meet on income is neither hard nor easy, 0 = else).	0.386	0.487	0	1	19,136
Making ends meet: hard	Binary dummy (1 = making ends meet on income is hard, 0 = else).	0.073	0.260	0	1	19,136
Making ends meet: very hard	Binary dummy (1 = making ends meet on income is very hard, 0 = else).	0.017	0.128	0	1	19,136

Note: This table describes the key explanatory variables used in the regressions of which the results are reported in Table 1. The mean, standard deviation (sd), minimum (min), maximum (max) and number of observations (N) are reported for the sample included in these regressions.

Table A.4 Description of control variables

Variable	Description	Mean	Sd	Min	Max	N
Demographic controls						
Male	Binary dummy (1 = male, 0 = female).	0.467	0.499	0	1	19,136
Between 12 and 24	Binary dummy (1 = between 12 and 24, 0 = else).	0.124	0.329	0	1	19,136
Between 25 and 34	Binary dummy (1 = between 25 and 34, 0 = else). Reference category.	0.092	0.289	0	1	19,136
Between 35 and 44	Binary dummy (1 = between 35 and 44, 0 = else).	0.135	0.342	0	1	19,136
Between 45 and 54	Binary dummy (1 = between 45 and 54, 0 = else).	0.187	0.390	0	1	19,136
Between 55 and 64	Binary dummy (1 = between 55 and 64, 0 = else).	0.214	0.410	0	1	19,136
Between 65 and 74	Binary dummy (1 = between 65 and 74, 0 = else).	0.153	0.360	0	1	19,136
75 and over	Binary dummy (1 = 75 and over, 0 = else).	0.094	0.292	0	1	19,136
Education: low	Binary dummy (1 = no education/primary school/courses/LBO/VBO/VMBO/MBO 1/ MAVO/HAVO/VWO (first 3 years)/ULO/MULO/VSO, 0 = else). Reference category.	0.279	0.449	0	1	19,136
Education: middle	Binary dummy (1 = MBO 2, 3, 4/MBO old or HAVO/VWO(more than three years) /HBS/MMS/HBO first year or WO first year, 0 = else).	0.317	0.465	0	1	19,136
Education: high	Binary dummy (1 = HBO/WO bachelor, WO/HBO or PhD, 0 = else).	0.404	0.491	0	1	19,136
Income: low	Binary dummy (1 = gross annual household income is less than EUR 23,400, 0 = else or unknown). Reference category.	0.136	0.343	0	1	19,136
Income: middle	Binary dummy (1 = gross annual household income ≥ EUR 23,400 and < EUR 65,000, 0 = else or unknown).	0.402	0.490	0	1	19,136
Income: high	Binary dummy (1 = gross annual household income ≥ EUR 65,000, 0 = else or unknown).	0.195	0.396	0	1	19,136
Income: unknown	Binary dummy (1 = gross annual household income is unknown, 0 = income is known).	0.268	0.443	0	1	19,136
Partner	Binary dummy (1 = living together or married, 0 = else).	0.626	0.484	0	1	19,136
Children	Binary dummy (1 = household with kids living at home, 0 = else).	0.288	0.453	0	1	19,136
Migration background: Western first generation	Binary dummy (1 = Western first generation migration background, 0 = else).	0.025	0.156	0	1	19,136
Migration background: Western second generation	Binary dummy (1 = Western second generation migration background, 0 = else).	0.073	0.261	0	1	19,136
Migration background: non-Western first generation	Binary dummy (1 = non-Western first generation migration background, 0 = else).	0.026	0.158	0	1	19,136
Migration background: non-Western second generation	Binary dummy (1 = non-Western second generation migration background, 0 = else).	0.031	0.174	0	1	19,136
Transaction controls						
Average transaction size in EUR 100	Average transaction size (in EUR 100).	0.277	0.402	0.001	11.390	12,313
Number of transactions	Number of payments at the POS during the registration day.	2.224	1.692	1	18	12,313

Note: This table describes the control variables used in the regressions of which the results are reported in Table 1. The mean, standard deviation (sd), minimum (min), maximum (max) and number of observations (N) are reported for the sample included in these regressions.

Appendix B. Robustness analyses

Table B.1. Regression results based on all observations
Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash-dependent	(4) Cash preference
Digital literacy				
Digital literacy: low	0.09***	0.05***	0.08***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Disabilities				
Difficulty walking or wheelchair-bound	-0.01	0.02**	-0.01	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Deaf or hearing impaired	-0.01	0.00	-0.03**	-0.02
	(0.02)	(0.01)	(0.01)	(0.01)
Blind or visually impaired	0.02	0.02*	0.07***	0.04***
	(0.02)	(0.01)	(0.02)	(0.01)
Limited or no hand function	0.05**	0.02**	-0.01	0.05***
	(0.02)	(0.01)	(0.02)	(0.01)
Mild intellectual disability	0.09*	0.02	0.03	0.05
	(0.04)	(0.02)	(0.05)	(0.03)
Financial difficulties				
Making ends meet: very easy	-0.02	-0.01	-0.07***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: easy	-0.03***	-0.02***	-0.04***	-0.04***
	(0.01)	(0.00)	(0.01)	(0.01)
Making ends meet: hard	0.01	0.02***	0.02*	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: very hard	0.04	0.05***	0.05**	0.06***
	(0.03)	(0.01)	(0.02)	(0.01)
Demographic controls	yes	yes	yes	yes
Transaction controls	yes			
Registration date controls	yes			
Number of observations	14,899	23,399	23,399	23,399
Pseudo R-squared	0.04	0.05	0.05	0.07
Log pseudolikelihood	-1,1840.7	-5,929.1	-13,312.2	-8,905.8
Model significance^	9.5***	590.1***	994.2***	930.2***
Model	Tobit	Logit	Logit	Logit

Note: The table reports average marginal effects of a tobit model (column 1) and logit models (column 2-4). Heteroscedasticity-robust standard errors are in parentheses and clustered at the individual level. ^ F-statistic for the tobit model and Wald Chi-squared for the logit models. * $p<0.1$, **$p<0.05$, *** $p<0.01$

Table B.2. Regression results based on one random observation per respondent
Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash-dependent	(4) Cash preference
Digital literacy				
Digital literacy: low	0.09***	0.05***	0.08***	0.10***
	(0.02)	(0.01)	(0.01)	(0.01)
Disabilities				
Difficulty walking or wheelchair-bound	-0.00	0.01	-0.00	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Deaf or hearing impaired	-0.01	0.00	-0.03*	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Blind or visually impaired	0.02	0.02*	0.09***	0.04***
	(0.02)	(0.01)	(0.02)	(0.02)
Limited or no hand function	0.05*	0.03**	-0.00	0.05***
	(0.02)	(0.01)	(0.02)	(0.01)
Mild intellectual disability	0.08*	0.02	0.00	0.06**
	(0.05)	(0.02)	(0.05)	(0.03)
Financial difficulties				
Making ends meet: very easy	-0.01	-0.00	-0.06***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: easy	-0.03***	-0.02***	-0.04***	-0.04***
	(0.01)	(0.00)	(0.01)	(0.01)
Making ends meet: hard	0.02	0.02***	0.02	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: very hard	0.04	0.05***	0.04*	0.07***
	(0.03)	(0.01)	(0.02)	(0.01)
Demographic controls	yes	yes	yes	yes
Transaction controls	yes			
Registration date controls	yes			
Number of observations	12,314	19,139	19,139	19,139
Pseudo R-squared	0.04	0.05	0.05	0.07
Log pseudolikelihood	-9,803.6	-4,820.0	-10,904.0	-7,189.3
Model significance^	8.2***	549.3***	939.7***	963.4***
Model	Tobit	Logit	Logit	Logit

Note: The table reports average marginal effects of a tobit model (column 1) and logit models (column 2-4). Heteroscedasticity-robust standard errors are in parentheses. ^F-statistic for the tobit model and Wald Chi-squared for the logit models. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table B.3. Results of regressions with *participated by phone* as a measure of digital literacy
Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash-dependent	(4) Cash preference
Digital literacy				
Participated via phone	0.12***	0.06***	0.05**	0.15***
	(0.02)	(0.01)	(0.02)	(0.01)
Disabilities				
Difficulty walking or wheelchair-bound	-0.01	0.01	-0.01	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Deaf or hearing impaired	-0.01	-0.00	-0.03*	-0.02
	(0.02)	(0.01)	(0.01)	(0.01)
Blind or visually impaired	0.01	0.02	0.08***	0.03*
	(0.02)	(0.01)	(0.02)	(0.02)
Limited or no hand function	0.04*	0.02**	-0.00	0.05***
	(0.02)	(0.01)	(0.02)	(0.01)
Mild intellectual disability	0.09*	0.03	-0.00	0.06**
	(0.05)	(0.02)	(0.05)	(0.03)
Financial difficulties				
Making ends meet: very easy	-0.01	-0.01	-0.06***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: easy	-0.03***	-0.02***	-0.04***	-0.05***
	(0.01)	(0.00)	(0.01)	(0.01)
Making ends meet: hard	0.03**	0.02***	0.02	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: very hard	0.02	0.05***	0.04	0.07***
	(0.03)	(0.01)	(0.02)	(0.02)
Demographic controls	yes	yes	yes	yes
Transaction controls	yes			
Registration date controls	yes			
Number of observations	12,313	19,136	19,136	19,136
Pseudo R-squared	0.04	0.05	0.05	0.07
Log pseudolikelihood	-9,821.6	-4,787.2	-10,902.3	-7,178.6
Model significance^	8.5***	559.3***	922.9***	977.6***
Model	Tobit	Logit	Logit	Logit

Note: The table reports average marginal effects of a tobit model (column 1) and logit models (column 2-4). Heteroscedasticity-robust standard errors are in parentheses. ^F-statistic for the tobit model and Wald Chi-squared for the logit models. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table B.4. Results of regressions with *does not use Internet or mobile banking* as a measure of digital literacy

Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash-dependent	(4) Cash preference
Digital literacy				
Does not use Internet or mobile banking	0.14***	0.08***	0.06***	0.14***
	(0.02)	(0.01)	(0.02)	(0.01)
Disabilities				
Difficulty walking or wheelchair-bound	-0.01	0.01	-0.01	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Deaf or hearing impaired	-0.00	-0.00	-0.03*	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Blind or visually impaired	0.02	0.02**	0.08***	0.04***
	(0.02)	(0.01)	(0.02)	(0.01)
Limited or no hand function	0.04*	0.02**	-0.00	0.06***
	(0.02)	(0.01)	(0.02)	(0.01)
Mild intellectual disability	0.08*	0.02	-0.00	0.05*
	(0.05)	(0.02)	(0.05)	(0.03)
Financial difficulties				
Making ends meet: very easy	-0.01	-0.00	-0.06***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: easy	-0.03***	-0.02***	-0.04***	-0.04***
	(0.01)	(0.00)	(0.01)	(0.01)
Making ends meet: hard	0.03**	0.03***	0.02	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
Making ends meet: very hard	0.02	0.05***	0.04	0.06***
	(0.03)	(0.01)	(0.02)	(0.02)
Demographic controls	yes	yes	yes	yes
Transaction controls	yes			
Registration date controls	yes			
Number of observations	12,313	19,136	19,136	19,136
Pseudo R-squared	0.04	0.06	0.05	0.07
Log pseudolikelihood	-9,803.3	-4,717.8	-10,898.8	-7,128.7
Model significance^	8.8***	711.4***	927.8***	1048.4***
Model	Tobit	Logit	Logit	Logit

Note: The table reports average marginal effects of a tobit model (column 1) and logit models (column 2-4). Heteroscedasticity-robust standard errors are in parentheses. ^F-statistic for the tobit model and Wald Chi-squared for the logit models. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table B.5. Results of regressions with *debt restructuring* as a measure of financial difficulties
Average marginal effects

	(1) Share of cash	(2) Uses cash only	(3) Cash-dependent	(4) Cash preference
Digital literacy				
Digital literacy: low	0.10***	0.05***	0.09***	0.10***
	(0.02)	(0.01)	(0.01)	(0.01)
Disabilities				
Difficulty walking or wheelchair-bound	-0.01	0.01*	-0.00	-0.00
	(0.02)	(0.01)	(0.01)	(0.01)
Deaf or hearing impaired	-0.00	-0.00	-0.03*	-0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Blind or visually impaired	0.03	0.03**	0.08***	0.05***
	(0.02)	(0.01)	(0.02)	(0.01)
Limited or no hand function	0.04*	0.03**	-0.00	0.06***
	(0.02)	(0.01)	(0.02)	(0.01)
Mild intellectual disability	0.08*	0.03	-0.00	0.06**
	(0.05)	(0.02)	(0.05)	(0.03)
Financial difficulties				
Debt restructuring	0.01	0.04***	0.03	0.04**
	(0.03)	(0.01)	(0.03)	(0.02)
Demographic controls	yes	yes	yes	yes
Transaction controls	yes			
Registration date controls	yes			
Number of observations	12,313	19,136	19,136	19,136
Pseudo R-squared	0.04	0.05	0.04	0.06
Log pseudolikelihood	-9,830.1	-4,806.4	-10,912.2	-7,242.6
Model significance^	8.7***	503.7***	900.6***	833.4***
Model	Tobit	Logit	Logit	Logit

Note: The table reports average marginal effects of a tobit model (column 1) and logit models (column 2-4). Heteroscedasticity-robust standard errors are in parentheses. ^F-statistic for the tobit model and Wald Chi-squared for the logit models. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

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