Easier Said Than Done: Why Italians Pay in Cash While Preferring Cashless*

Alberto Di Iorio and Giorgia Rocco
Bank of Italy, Directorate General for Currency Circulation and Retail Payments

In this study we use data from the 2019 Study on the Payment Attitudes of Consumers in the Euro Area (SPACE) to analyze the main drivers of payment choices at the point of sale (POS) in Italy. We find that transaction-related features are the most important factors affecting the payment choice at the POS, while individual consumer preferences play a minor role. We also document that consumers often pay in cash, even though they would prefer to use a different payment instrument, due to a lack of acceptance of alternative instruments by merchants, especially for low-value transactions. Finally, consumers' digital skills are found to be a relevant factor in payment habits since they affect preferences and reduce the likelihood of cash usage, especially for those groups that tend to use it more, such as women and residents in the South.

JEL Codes: D12, E58, G02.

1. Introduction

Reliability, efficiency, and inclusiveness of retail payment systems are key topics in current central bank policy discussions. Over the last decades, innovations and technologies have affected the market for retail payments, which have become increasingly electronic. Cash alternatives have grown for years: combined with the widespread adoption of more traditional debit and credit cards, the usage of

*We would like to thank the referee, Gabriele Coletti, Massimo Doria, Michele Lanotte, Andrea Nobili, Gabriele Sene, and the participants of the December 15, 2021 EURECA meeting for their helpful comments and suggestions. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Italy. All remaining errors are ours. Author e-mails: Alberto.Diiorio@bancaditalia.it; Giorgia.Rocco@bancaditalia.it.

new payment technologies—such as contactless, mobile, and instant payments—has increased rapidly. At the same time, the transition toward a cashless society can imply restrictions to access to payment services in some social classes and difficulty relying on safe and liquid assets in times of financial distress. For these reasons, central banks, including the European Central Bank (ECB), have been evaluating electronic cash substitutes, namely the design and implementation of a central bank digital currency—CBDC (European Central Bank 2020a).

Investigating what factors affect consumers' payment choices is of primary importance to understand what drives the retail payments market, thus enabling policymakers to address and evaluate their actions. To this end, the analysis of payment diary data is the gold standard in payment habits literature, given the high granularity of the information it provides. This type of collection requires consumers to describe payments made in one (or more than one) day, recording some attributes characterizing the transaction (i.e., payment instrument used, value, acceptance of other instruments, etc.).

Bagnall et al. (2016) analyze consumers' use of cash based on diary surveys from seven countries: Canada, Australia, Austria, France, Germany, the Netherlands, and the United States. Their findings are in line with several national studies showing that the characteristics of a transaction strongly affect the payment choice.

Specifically, the use of cash is (negatively) associated with the transaction value (Bounie and François 2006; Klee 2008; Von Kalckreuth, Schmidt, and Stix 2014; Swiecka, Terefenko, and Paprotny 2021), as well as with the merchants' acceptance of cards, also in small-value transactions (Huynh, Schmidt-Dengler, and Stix 2014; Wakamori and Welte 2017; Bounie, François, and Van Hove 2017). Cash-related variables also influence the payment choice. For example, the fact that change will be received in the form of banknotes and coins discourages the use of cash (Brancatelli 2019; Chen, Huynh, and Shy 2019) and an individual's inclination to use cash, measured by cash in hand at the beginning of the diary, heightens the probability of paying cash (Borzekowski, Kiser, and Shaista 2008; Arango, Hogg, and Lee 2015; Alvarez and Lippi 2017).

A large body of studies emphasizes the role played by incentives, discounts, and surcharges in the payment choice. Ching and Hayashi (2010) and Carbó-Valverde and Liares-Zegarra (2011) show that payment card rewards significantly modify payment choice in favor of cards; Arango, Huynh, and Sabetti (2015) find that participation in a credit card rewards program induces a shift toward credit card usage at the expense of both debit cards and cash. Stavins (2018) highlights that cash discounts increase the probability of using cash also by a consumer who prefers other payment methods. Finally, Arango et al. (2018) provide evidence that the relative cost of cards compared with cash and differences in ATM withdrawal costs are key factors explaining why cash is still used extensively across many developed economies.

More recently, Bounie and Camara (2020), Brown et al. (2020), and Trütsch (2020) studied the convenience of electronic payments especially using contactless technology, showing that it increases the use of cashless instruments, while van der Cruijsen and Knoben (2021) investigate whether payment behavior is influenced by the peer effect, finding that people mirror the payment choices of others.

The present study aims to shed light on Italian consumers' payment habits in an econometric framework, building on and contributing to the existing literature on the topic. For this purpose, we analyzed payment diary data from the Study on the Payment Attitudes of Consumers in the Euro Area (SPACE; European Central Bank 2020b). So far, ECB survey data for Italy have been analyzed only in a descriptive way (Rocco 2019; Coletti et al. 2022). However, their findings lack any control for the simultaneous effect of all potential factors relevant to the payment choice, preventing them from concluding what influences consumers' payment habits and to what extent.

We modeled the probability of using cash or payment cards (as the main cashless instrument) against a set of selected variables. On the one hand are the variables describing the characteristics of the transactions (transaction-related variables); on the other are the characteristics of the respondents (sociodemographic and individual factors, and preferences). The SPACE survey does not present information about costs, incentives, discounts, and surcharges for using cards and this missing information would hardly have allowed us to target the discussion on supply versus demand factors, for example, as in Arango, Huynh, and Sabetti (2015) or Stavins (2017). However, it should be emphasized that among the transaction-related variables, the acceptance of instruments other than cash can be identified as a fundamental supply factor.

In addition, we wanted to investigate the role of digitization in payment behavior. This assessment is essential to contribute to the public debate that often ties a low usage of cashless instruments to a lack of digital skills. Italy is far behind the euro-area average in terms of both yearly cashless transactions per capita (Bank of Italy 2022) and people's digital skills (European Commission 2022). Therefore, we developed an indicator for the subjects' digital attitude. We also enriched the study with an in-depth analysis of the gender gap, the geographical divide, and the role of digitization.

Another topic addressed in the payment habits literature is the relationship between actual usage and stated preferences. In the United States, O'Brien (2014) and Stavins (2018) find that people tend to use their preferred payment instrument. By contrast, a difference between usage and preference is observed for the Netherlands (van der Cruijsen, Hernandez, and Jonker 2017) and SPACE data highlight this discrepancy for many other euro-area countries, including Italy (European Central Bank 2020b). Hence, we explored why Italian consumers fail to express a consistent choice at the point of sale (POS) by using a different payment instrument than the one they prefer.

Overall, the results show that the transaction-related features are among the most important drivers of payment choice at the POS. Specifically, the acceptance of cashless instruments and the value of the transaction are two key factors. This finding is consistent with a large body of the literature, but in the Italian case these two factors also have a pivotal role in the decoupling between use and preferences, with consumers who, due to a supply constraint such as the lack of acceptance of alternative instruments, or based on transaction value, decide (or are forced) to use an instrument other than their preferred one. Considering sociodemographic and individual characteristics, we find a significant gender gap and geographical divide in the usage of cash. More digitally inclined consumers are less likely to use cash, especially for those groups that use it more, such as women and residents in the South. These findings support the idea that increased awareness of digital tools stands as a way to bridge the gaps.

This paper contributes to the economic literature on payment behavior by concurrently analyzing usage and its deviation from preferences. Moreover, this is the first econometric study using Italian payment diary data, thus contributing to enriching the understanding of payment habits in the very heterogeneous landscape of the euro area. Finally, to the best of our knowledge, an extensive assessment of the role of digitization represents a novelty in the payment habits literature.

The remainder of this paper is structured as follows. Section 2 illustrates the SPACE survey and widely describes the data for Italy. Section 3 discusses the factors affecting payment instrument choice and describes the variables used for the analysis. Section 4 presents the payment choice models and discusses the results. Section 5 focuses on the probability of deviating from the stated preferred method and finally, Section 6 concludes and provides some hints on policy implications.

2. Data

In 2019, the ECB conducted the SPACE survey to update the previous consumer payment behavior data (SUCH, Esselink and Hernández 2017)[1], exploring POS and P2P (peer-to-peer), remote, and recurring payments, to allow a deeper understanding of the use of payment instruments.

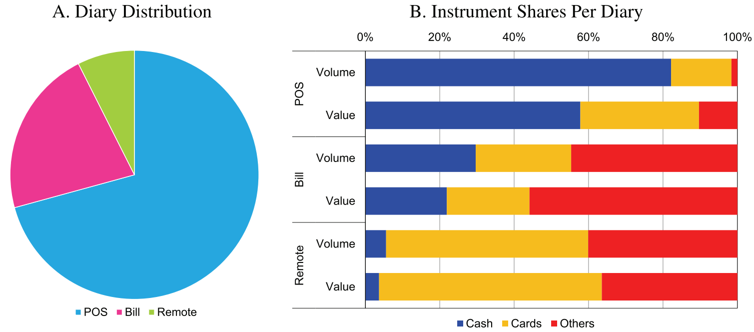
The euro-area results were published in December 2020 in a report (European Central Bank 2020b) which also explains the survey methodology.[2] In the SPACE survey, euro-area residents[3] older than 18 years were asked to fill in three modules covering: (i) POS and P2P payments; (ii) remote payments, including online purchases, telephone and mail orders; and (iii) bill and recurring payments. The first two modules referred to a one-day diary, while

[1] In 2016, the ECB conducted the Study on the Use of Cash by Households (SUCH), the first study analyzing consumers' payment behavior at the POS and P2P for the euro area.

[2] The report also includes results from the IMPACT survey (survey on the impact of the pandemic on cash trends).

[3] SUCH and SPACE samples refer to 17 of all 19 euro-area countries, excluding Germany and the Netherlands, which carried out their own surveys on payment behavior. Where possible, their data were integrated into the ECB reports.

Figure 1. Diary Composition



Note: Unweighted amount of all diary transactions sums to 11,7222. "Others" category includes: credit transfers, direct debits, bank checks, mobile phone payments, online payment methods, gift cards or vouchers, and crypto-assets.

the last reported any bill payments made during the previous seven days. Furthermore, respondents had to answer a questionnaire with questions about their behavior and attitudes toward cash and other payment instruments. Between mid-March and mid-December 2019, three different waves were conducted, and 41,155 respondents were interviewed. In Italy, 4,199 individuals were interviewed for a total amount of 11,722 transactions: 8,293 reported in the POS diary, 2,557 in the bill module, and 872 registered as remote payments (Figure 1.A).[4] Although cash is widely used at the POS, examining other transactions, such as remote and bill payments, reveals that the role of cash is more limited. Cards (both credit and debit) and PayPal are the most used instruments for remote payments, while for bill payments cash, cards or direct debits play an almost equal role (Figure 1.B).

Our analysis, therefore, focused on POS payments, as they represent the bulk of transactions detected through the diaries and are

[4]These figures refer to the original data set. For our purposes, we cleaned the data. First of all, we removed from the sample "absurd" observations, for example observations referring to those subjects who claimed to have less cash than the total amount of cash expenditures made during the day. In addition, to avoid biased estimated probability, we removed "obligated" card transactions, where the subject made a purchase with a value greater than their entire cash holdings or where cash was not accepted for payments.

unique in terms of payment behavior, with extensive use of cash. Our models aim to describe the factors that influence the choice of payment instrument at the POS.

3. Factors Affecting Payment Instrument Choice

Our selection of factors affecting the usage of a payment instrument mainly relied on the literature on payment habits. However, the choice of variables was also constrained by the information available in the SPACE survey, which, for example, does not include information about costs, incentives, discounts, and surcharges for using cards.

Variables in the longitudinal SPACE data set can be broadly classified into two categories: on the one hand are the variables describing the characteristics of the transactions, which are subject to both within- and between-unit variability; on the other are the characteristics of those conducting the transactions, which vary only between units.

For our analysis, we identified three groups of covariates: (i) transaction-related variables; (ii) individual characteristics, which also include sociodemographics; and (iii) the preferences expressed for payment instruments.[5] In Table 1, we provide a list of the variables selected together with a short description.

3.1 Transaction-Related Variables

The characteristics of a transaction strongly affect the choice of payment instruments (Bagnall et al. 2016; Stavins 2017; Wakamori and Welte 2017).

Among the transaction features, we considered the sequential number of payments made by an individual during the reporting day ($PayNr$, Figure 2.A). This variable controls for the potential reduction of cash held by an individual as the number of payments increases, and the resulting heightened likelihood of using an alternative instrument. In addition, we also included a variable indicating

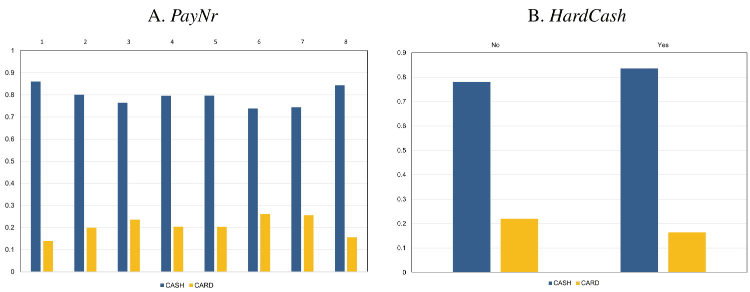
[5] Please note that preferences are also individual characteristics as they vary only between individuals, but due to their importance, we have separated them from other individual characteristics.

Table 1. List of Independent Variables

	Variable	Description
Transaction Features $TRANS_{ij}$	AcceptanceRate	Continuous variable describing the average acceptance rate of cashless instruments per category of purchase location.
	Value	Continuous variable representing the logarithm of the transaction value.
	PayNr	The sequential number of transactions of the day.
	HardCash	Binary variable that takes the value of 1 if the transaction is expected to involve the respondent receiving coins as change.
Individual Characteristics $INDIV_i$	Education	Binary variable taking the value of 1 if the respondent completed post-secondary education.
	Income	3-level categorical variable representing the tertiles of the income distribution.
	Employment	3-level categorical variable describing the employment status of the respondent.
	Age	5-level categorical variable representing different age classes of the respondents.
	Gender	Binary variable indicating the gender of the respondent.
	Cless	Binary variable indicating if the respondent possesses a payment card with contactless function.
	DigitallyInclined	Binary variable taking the value of 1 if the respondent has access to more innovative payment instruments or crypto-assets or makes extensive use of technological devices.
	Urban	Binary variable taking the value of 1 if the area of residence of the subject is urban.
	South	Binary variable indicating if the subject lives in the South (or islands) or other Italian regions.
	InitialAmount	Continuous variable representing the logarithm of the amount of cash held by the respondent at the beginning of the interview day.
	CashAdded	Continuous variable representing the logarithm of the amount of cash added (from different sources) during the interview day.
	IntentionToPayCash	Binary variable that takes the value of 1 if the subject has (potentially) exhausted their initial cash supply and added cash on the day of the interview.
Preferences $PREF_i$	Preference	3-level categorical variable representing the subject's preferred instruments.

Note: Income levels are: <€2,000, €2,000–3,000, €3,000+. Employment status is: not employed/student, self-employed, employed. Age classes are: <25, 25–39, 40–54, 55–64, 65+. Southern regions are defined according to the Italian National Statistics Institute (ISTAT) classification. Preference categories are: cash, cashless instrument, no clear preference.

Figure 2. Transaction Features Other Than Acceptance and Value



Note: Frequency of use of cash versus card for different values of *PayNr* (A) and *HardCash* (B).

whether a transaction might involve coins (*HardCash*, Figure 2.B). *HardCash* is a binary variable indicating if the value of a transaction is not a multiple of five, or, in other words, if a transaction cannot be settled using only banknotes. This variable is inspired by Brancatelli (2019), which itself relies on the consumers' "burden of holding coins" introduced in Chen, Huynh, and Shy (2019) and accounts for the possibility that cash usage may be driven not only by the transaction value as such, but also by the perceived burden of the number of coins needed to conduct a cash payment or obtained back as change.

3.1.1 The Role of the Acceptance of Cashless Payment Instruments

Merchants' acceptance of cards is a key factor to be considered when investigating consumers' payment choices. For example, Huynh, Schmidt-Dengler, and Stix (2014), Arango, Huynh, and Sabetti (2015), and Bagnall et al. (2016) show that the lack of card acceptance at the POS plays a key role in why cash continues to be highly used. Wakamori and Welte (2017) introduced "perceived acceptance," which allows for a nuanced analysis of the supply-side factor. Their simulation, assuming universal card acceptance, shows a limited decline in cash, emphasising demand-driven preferences, especially for small transactions. Bounie, François, and Van Hove

(2017) study the determinants of merchant card acceptance with a special focus on the network externalities that are generated by cardholders. In the SPACE survey, respondents were asked to indicate for each payment reported whether a different payment option would be accepted. Focusing on cash transactions, this represents perceived acceptance of alternative digital payment instruments. Consumers' perception may reflect an objective lack of acceptance, or it may be induced (e.g., by keeping the POS terminal unnoticeable) to lead consumers to choose cash. In both cases, this could be seen as a (supply) constraint, leading consumers to hold more cash or to choose shops where alternative payment instruments are accepted. The latter possibility could introduce endogeneity problems; for this reason, in this work we use the average acceptance rate (*AcceptanceRate*) of cashless instruments per category of place of purchase,[6] following the approach of Huynh, Schmidt-Dengler, and Stix (2014). We assumed that the category of place of purchase is dictated by personal needs and is completely independent of the characteristics of the transaction and those of the individual.

3.2 Individual Characteristics

Respondents reported their sociodemographic characteristics in the questionnaire. These factors are often viewed as determinants of consumers' payment choices.

Alongside sociodemographic factors such as age, gender, income, and employment, we also exploited consumers' geographic characteristics. In particular, we introduced a variable indicating whether the respondent lives in a rural or urban area (*Urban*) and another indicating whether the respondent lives in the macro-region South and Islands (*South*). This allowed us to investigate the geographical divide between the southern regions and the rest of the country in the use of cash (Rocco 2019; Ardizzi et al. 2020; Coletti et al. 2022).

We also considered individual characteristics that could be related to the propensity to use a payment instrument. For example, in the literature, contactless technology seems to have driven greater

[6] We grouped places of purchase into 14 categories: charity, culture and entertainment, durable goods, food, home services, on the street, other, P2P, petrol station, services, supermarket, taxes and public charges, travel, and vending or ticketing machines.

use of payment cards (Bounie and Camara 2020; Brown et al. 2020; Trütsch 2020); therefore, we included an indicator for possession of a card with contactless technology (*Cless*).

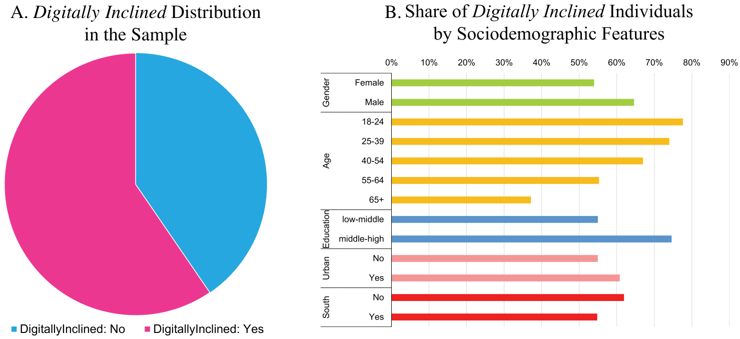
3.2.1 Cash Management

To assess the role of cash behavior in consumers' payment habits at the POS, we considered three variables related to cash management. In particular, several empirical studies (Borzekowski, Kiser, and Shaista 2008; Arango, Hogg, and Lee 2015; Alvarez and Lippi 2017) suggest that higher cash holdings are correlated with higher use of cash in payments. We therefore included the amount of cash available at the start of the day (*InitialAmount*) and the amount of cash added during the day through ATM withdrawals or other sources (*CashAdded*). The latter is used as a measure of the increased availability of cash with respect to that reported at the start of the day. Moreover, to capture the intention to pay in cash, we added a dummy variable that takes the value of 1 if a respondent exhausted his or her cash holdings and added cash during the day of the interview (*IntentionToPayCash*). We assumed that individuals are more likely to withdraw cash when they feel they will need it to pay for upcoming purchases.

3.2.2 Individual Digital Attitude

To investigate the role of digitization and technology in payment instrument choice, we included a binary variable as a measure of consumers' digital attitude, called *DigitallyInclined*, indicating possession of innovative payment instruments or frequent use of digital devices. In detail, we developed a synthetic indicator by running a principal component analysis (PCA) on the polychoric correlation matrix of the questionnaire items related to the frequency of use of computers, tablets, and smartphones. We then identified users who make frequent use of electronic devices as those belonging to the third tertile of the distribution of the synthetic indicator. In the end, the *DigitallyInclined* variable assumes a value of 1 if an individual makes frequent use of electronic devices to access the Internet or possesses crypto-assets or mobile or Internet payment services.

Figure 3. *DigitallyInclined* Descriptives



Note: Percentages are computed on individuals that reported at least one transaction at the POS. Weighted data.

Figure 3.A shows that about 60 percent of respondents belong to this category.

This type of indicator, made feasible by the structure of the SPACE questionnaire, made it possible to assess an individual's digital inclination with a focus on payments. It also pairs a point-in-time assessment, i.e., one related to the possession of crypto-assets, mobile or Internet payment services, with a more stable one related to the respondent's technology use habits.

According to this indicator, younger people are more inclined toward technology compared to older people. The same is also true for those with higher education and living in an urban area rather than a rural one. Males and people living in central and northern regions tend to have a stronger inclination toward digital than females and those living in the South (Figure 3.B).

3.3 Stated Preferences for Payment Instruments

Preferences are a key factor expected to primarily influence the payment instrument choice.

In a dedicated question within the SPACE questionnaire, respondents stated their preference at the POS for cash, cashless means of payment, or no clear preference between these instruments.

Table 2 shows that, for Italy, as of the survey date, almost 50 percent of respondents preferred cashless instruments, while the

Table 2. Overall Respondents' Reported Preferences and Use at POS

	Preference	Use
Cashless	46.9	17.8
Cash	28.1	82.2
No Clear Preference	24.9	

Note: Percentages of preferences are computed counting the expressed preferences one time for each respondent ("wide" format). Percentages of use are computed on the number of transactions. Weighted data.

Table 3. Preferences by Instrument Used at the POS

Preference/Instrument	Cashless	Cash
Cashless	27.8	72.2
Cash	5.4	94.6
No Clear Preference	13.5	86.5

Note: Percentages are computed counting the reported preferences as many times as the number of transactions at the POS ("long" format). Weighted data.

remainder was essentially split in half between those who preferred cash and those who did not have a preference. Despite reporting a greater preference for cashless payment instruments, consumers actually used cash the most.

In addition, Table 3 shows that cash was the most widely used instrument even among those who preferred alternative instruments, although to a lesser extent than those who prefer cash or have no clear preference. This evidence highlights that consumers deviated from their preferred payment instrument and calls for further analysis to understand the underlying reasons for the mismatch.

4. Modeling the Payment Choice at the POS

The data set has the form of repeated measures since each individual reported all the transactions made in a day. Therefore, the data exhibit two sources of variability: one intra-individual (within) and one between individuals (between). Among the former are the transaction-related features, while the latter include the characteristics of those conducting the transactions.

Our variable of interest is the binary variable $CASHUSE_{ij}$, which takes the value of 1 if the j-th transaction at the POS of the i-th individual is settled with cash. We focus mainly on the use of cash because of the close complementarity between cash and payment cards; indeed, the estimates obtained for a binary dependent variable indicating the use of cards are approximately the same as those for cash, but of the opposite sign.

Given the binary nature of the dependent variable, the reference model is logistic regression.[7] However, to account for correlations that may exist among observations related to the same respondent, we cluster standard errors at the individual level.

The complete model is the following:

$$log\left(\frac{\mathbb{P}(CASHUSE_{ij}=1)}{\mathbb{P}(CASHUSE_{ij}=0)}\right) = \alpha + \beta TRANS_{ij} + \gamma INDIV_i + \delta PREF_i + \varepsilon_{ij}, \quad (1)$$

where $TRANS_{ij}$ is a matrix including transaction-related variables, while matrices $INDIV_i$ and $PREF_i$ include individual characteristics and stated preferences, respectively.

To assess the effect of the different groups of variables, we first modeled the probability of paying with cash against only transaction-related variables (model (i) in Table 4). Then, we considered individual attributes in addition to the transaction characteristics (model (ii)). Finally, the last specification (model (iii)) includes the stated preferences.[8]

To measure the goodness of fit of our estimated models, we computed different metrics: the Akaike and Bayesian information

[7]Because we are interested in estimating average effects in the entire population, we avoided the inclusion of individual effects (fixed or random), as this choice also involves an individual-specific interpretation of the effects. We have also challenged the models by using a random effects multilevel linear probability model that confirms our findings.

[8]Issues related to multicollinearity have been explored by looking at the stability of the coefficients across different specifications, the size of the standard errors, and the variance inflation factor (VIF) analysis of the specification for the complete models, where an identity link function has been chosen instead of the logistic one.

Table 4. Transaction-Level Logistic Regressions Estimating the Marginal Probability of Using Cash

	(i)	(ii)	(iii)
AcceptanceRate	–0.2421***	–0.2197***	–0.2128***
	(0.0349)	(0.0320)	(0.0304)
Value	–0.0721***	–0.0958***	–0.0926***
	(0.0056)	(0.0060)	(0.0055)
PayNr	–0.0183***	–0.0251***	–0.0246***
	(0.0037)	(0.0032)	(0.0032)
HardCash: *Yes*	–0.0417***	–0.0386***	–0.0365***
	(0.0112)	(0.0099)	(0.0095)
Education: *Middle–High*		–0.0048	–0.0102
		(0.0106)	(0.0097)
Income: *€2000–3000*		–0.0232*	–0.0116
		(0.0130)	(0.0120)
Income: *€3000+*		–0.0511***	–0.0375***
		(0.0143)	(0.0124)
Employment: *NotEmployed*		0.0182	0.0156
		(0.0177)	(0.0170)
Employment: *Employee*		–0.0049	0.0035
		(0.0152)	(0.0139)
Gender: *Male*		–0.0144	–0.0164*
		(0.0106)	(0.0097)
Age: *18–24*		–0.0124	–0.0434*
		(0.0242)	(0.0233)
Age: *25–39*		0.0384**	0.0343**
		(0.0184)	(0.0172)
Age: *40–54*		0.0277	0.0265
		(0.0195)	(0.0185)
Age: *55–64*		–0.0050	0.0017
		(0.0191)	(0.0175)
Cless: *Yes*		–0.0650***	–0.0433***
		(0.0115)	(0.0106)
DigitallyInclined: *Yes*		–0.0524***	–0.0368***
		(0.0120)	(0.0115)
Urban: *Yes*		–0.0190*	–0.0123
		(0.0114)	(0.0113)
South: *Yes*		0.0207*	0.0180*
		(0.0107)	(0.0100)
InitialAmount		0.0555***	0.0492***
		(0.0073)	(0.0065)
CashAdded: *Yes*		0.0110***	0.0092***
		(0.0035)	(0.0033)
IntentionToPayCash: *Yes*		0.0612***	0.0555**
		(0.0228)	(0.0219)
Preference: *Cash*			0.1365***
			(0.0116)
Preference: *NoPref*			0.0938***
			(0.0114)

Note: The sample size is 6,646, i.e., that of the most comprehensive model. Baseline levels: *HardCash*: "No", *Education*: "Low–Middle", *Income*: "<€2000", *Employment*: "Self-Employed", *Gender*: "Female", *Age*: "65+", *Cless*: "No", *DigitallyInclined*: "No", *South*: "No", *Preference*: "Cashless." Clustered standard errors in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

criteria (AIC and BIC) and the area under the receiver operating characteristic curve (AUROC).

Table 4 shows the results of estimated marginal effects across the different specifications introduced above.

Starting with the transaction-related features, we find that the effects are significant and stable across all specifications. *AcceptanceRate* and *Value* exhibit the strongest marginal effects, respectively. Specifically, each additional 10 percentage points in the acceptance rate of alternative instruments decreases the probability of paying cash by more than 2 percent. In line with the literature, the probability of using cash decreases as the value of the transaction increases: an increase of 1 in the logarithm of the value of the purchase results in a reduction in the probability of paying cash by more than 7 percent. The sequential number of payments made during the day is highly significant and shows that each additional payment throughout the day decreases the likelihood of using cash by about 2 percent on average. As in Chen, Huynh, and Shy (2019) and Brancatelli (2019), the "burden of coins" captured by the variable *HardCash* seems to be confirmed also in the Italian case. On average, it represents a penalty of approximately 4 percent on the probability of using cash.

Marginal effects for model (ii)—which also includes individual characteristics—and for model (iii)—which includes all the variables discussed above—are very similar. Among the individual features, a higher level of income is associated with a lower probability of using cash. Ceteris paribus, the probability of paying with cash at the POS is about 2 percent lower for men than for women, confirming the existence of a gender gap. A similar, even stronger result is found for digitally inclined people versus those who are not (digital divide). Moreover, results also show a geographical divide, since for those who live in the South, the likelihood of using cash is higher than for those who live in other regions, confirming the evidence from the Italian literature (Rocco 2019; Ardizzi et al. 2020; Coletti et al. 2022). These gaps and the role of consumers' digital attitude are further explored in Subsection 4.1. Possession of a contactless payment card significantly decreases the probability of paying with cash, likely confirming that the convenience of electronic payments fosters their use to the detriment of cash (Bounie and Camara 2020; Brown et al. 2020; Trütsch 2020). The cash in hand held by respondents

Table 5. Goodness-of-Fit Measure of the Transaction-Level Logistic Regressions

	(i)	(ii)	(iii)
AIC	3,977.143	3,584.107	3,364.869
BIC	4,011.152	3,733.746	3,528.112
AUROC	0.775	0.805	0.825

Note: The sample size is 6,646, i.e., that of the most comprehensive model (model (iii)). The lower the AIC and BIC, the better is the fit of the model, while for the AUROC, the higher it is the better the fit.

at the beginning of the day is a highly significant variable with the strongest effect after those of transaction variables. In particular, on average, having a large amount of cash in the wallet is an incentive to pay with cash. This is a well-known finding in the payment habits literature (see Eschelbach and Schmidt 2013; Arango, Huynh, and Sabetti 2015). The other variables describing cash management, $CashAdded$ and $IntentionToPayCash$, also have a significant effect on the probability of paying with cash. Age is found to be of little significance, although it has some peculiarities. Younger people use less cash than older people, while surprisingly those between the ages of 25 and 39 are more likely to use cash than those aged over 65. Finally, education level, urbanization, and employment status seem to be minor factors affecting payment choice. Consistent with expectations, preference for cash strongly raises the probability of using cash, while, in absolute values, the marginal effect of unclear preference is higher than that of preference for alternative instruments and less strong than that for cash.

All the goodness-of-fit measures (Table 5) confirm that model (iii) shows the best fit. However, specification (ii), which includes individual and sociodemographic characteristics in addition to transaction features, exhibits comparable goodness of fit. This evidence suggests that preferences approximately convey the same information about consumers' payment behavior as other individual variables.

According to these results, Italians' payment choices at the POS are mainly driven by transaction-related features. Indeed, the fitting metrics of model (i), which accounts only for transaction characteristics, are very similar to those of model (iii), which also includes both individual characteristics and preferences. In other words, the additional information contribution of individual variables and preferences is limited, as there is only a small reduction in goodness of fit when these variables are removed. Taking it a step further, looking at the magnitude of the marginal effects, although not directly comparable, *AcceptanceRate* and *Value* are the characteristics that most affect the payment instrument choice.

4.1 Exploring the Gender Gap and the Digital and Geographical Divide

The comprehensive specification (model (iii)) reveals the presence of significant gender, geographic, and digital gaps in the use of alternative instruments, even when controlling for numerous other factors. To understand whether these gaps are in turn influenced by gender, geography, and digital culture of individuals, we enriched specification (iii) with the three two-way interactions of these variables. The marginal effects of these interactions are reported in Table 6. To facilitate the interpretation of the results, we graphically displayed the probability of using cash predicted by these enriched models for the different levels of interactions (Figure 4).

Figure 4A shows that the gap in the usage of cash widens as you move south. This widening is due to women being more likely than men to use cash when they live in a southern region. This graphical evidence matches the statistical evidence in Table 6A, which shows that the gender gap in other regions is nonsignificant, while it becomes significant in the South. Flipping the perspective, the geographical divide is significant for women but not for men.

The same reasoning just outlined can be applied to the cases of the interaction between gender, geography, and digital attitude (panels B and C of Figure 4, respectively). The gender gap and geographical divide narrow for those who are more inclined toward digital tools. In both cases, the reduction in the gap is primarily attributable to a greater effect of digitization on the disadvantaged category (women/South). In particular, this means that the digital divide affects more women and the inhabitants of southern Italy.

Table 6. Interactions' Effects on Probability of Using Cash

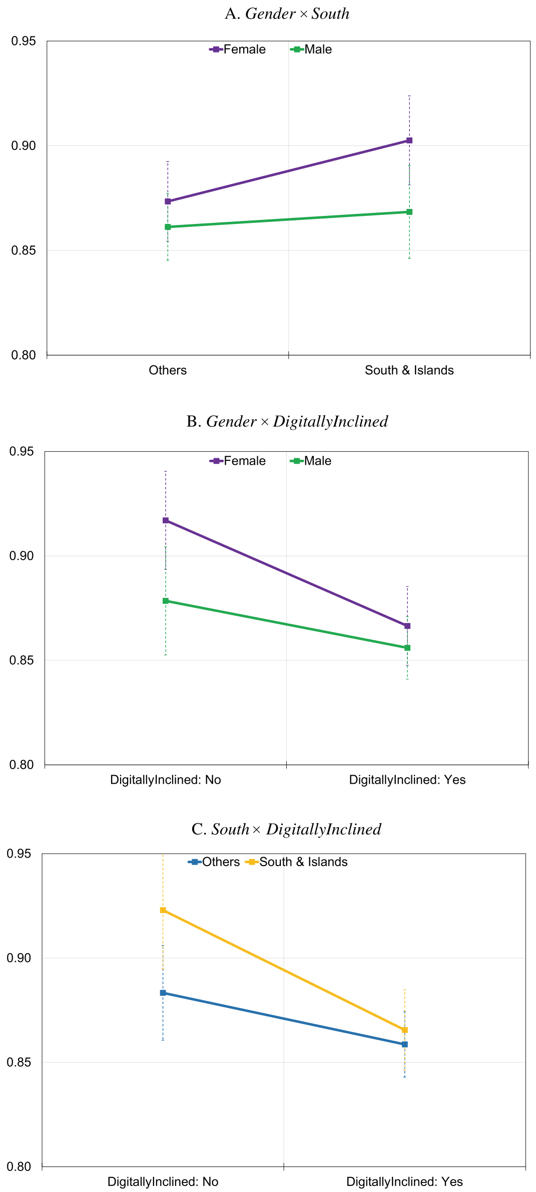
A. Marginal Effects of Gender x South Interaction			
Effect of *Gender* on *South*		Effect of *South* on *Gender*	
South: *No*	South: *Yes*	Gender: *Female*	Gender: *Male*
–0.0122 (0.0126)	–0.0341** (0.0156)	0.0291** (0.0147)	0.0072 (0.0138)
B. Marginal Effects of Gender x DigitallyInclined Interaction			
Effect of *Gender* on *DigitallyInclined*		Effect of *DigitallyInclined* on *Gender*	
DigitallyInclined: *No*	DigitallyInclined: *Yes*	Gender: *Female*	Gender: *Male*
–0.0385** (0.0177)	–0.0105 (0.0118)	–0.0505*** (0.0157)	–0.0225 (0.0153)
C. Marginal Effects of South x DigitallyInclined Interaction			
Effect of *South* on *DigitallyInclined*		Effect of *DigitallyInclined* on *South*	
DigitallyInclined: *No*	DigitallyInclined: *Yes*	South: *No*	South: *Yes*
0.0396** (0.0184)	0.0069 (0.0125)	–0.0247* (0.0144)	–0.0574*** (0.0176)
Note: Clustered standard errors in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.			

Estimated marginal effects in panels B and C of Table 6 show a significant gender and geographical gap for those who are not digitally inclined, which vanishes when they become so. The digital divide is significant for women and residents in the South, while the evidence fades for men and residents in other regions.

5. Exploring the Mismatch between Preferences and Actual Use

In this section, we explore the actual use of payment instruments against stated preferences, investigating why consumers deviate from their preferred method. The first clue regarding the reasons for this mismatch comes from the usage probability curves estimated from

Figure 4. Probability of Using Cash: Gender Gap, Digital and Geographical Divide



Note: Probability of cash usage is predicted by model (iii) extended with the two-way interactions *Gender* × *South*, *Gender* × *DigitallyInclined*, and *South* × *DigitallyInclined*.

model (iii) in Section 4. These curves are reported by stated preference and varying the two main factors affecting usage: the value of the transaction and the acceptance of cashless payment instruments (Figure 5, panels A–C).

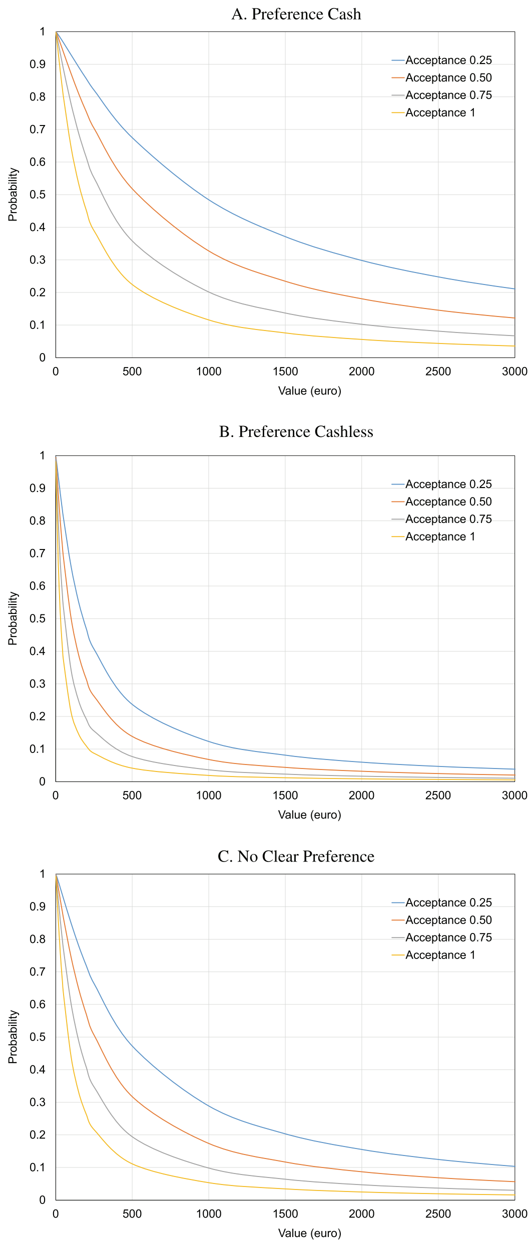
Consistent with the findings in O'Brien (2014) and Stavins (2018), the probability of using cash generally declines as the value of the transaction increases. However, in contrast to their findings, we find that consumers do not always have a higher probability of using their preferred payment method. For example, people preferring cashless instruments have a higher probability of using cash than cashless means of payment for transactions below €30 when alternative payment instruments are always accepted, and for transactions below €150 when the acceptance rate of alternative instruments is at 25 percent. People preferring cash have a higher probability of using cash for transactions up to €1,000 when the acceptance rate of alternative instruments is at 25 percent, and for transactions up to €200 when alternative instruments are always accepted.

Overall, this evidence suggests that consumers' preferences may vary with the value of the purchase. Cash leads the segment of micropayments (under €30) despite stated preference and acceptance of other payment instruments, while it is used less for large transactions. However, a higher level of acceptance of alternative payment instruments discourages the use of cash regardless of stated preferences.

5.1 Why Do Consumers Deviate from Their Preferred Method?

To better understand why consumers fail to express a consistent choice at the POS by using a different payment instrument than the one they prefer, we ran a logistic regression on two mismatch measures taken as dependent variables. The first regression considers the probability of a "cashless mismatch," which is a deviation from the preferred payment method when this is cashless. The dependent variable is binary and takes the value of 1 when a cashless payment instrument was not used—a mismatch in fact—and 0 when there was a match between use and preference. Similarly, the second model considers the probability of a "cash mismatch," which is a

Figure 5. Probability Function of Cash Usage: the Role of Acceptance and Value



Note: Probabilities are predicted by model (iii) in Section 4.

deviation from the preferred method when this is cash. Regressions were performed for the two groups separately. People stating "no clear preference" were not included, since it is assumed that it is impossible to have a mismatch when there is no preference.

The approach outlined above, with stratification by preferences, allows us to disentangle how selected factors affect the mismatch when the use deviates specifically from cash or a cashless instrument as the preferred payment method.

Results in Table 7 show that the acceptance of other instruments and the value of transactions have the strongest effect in terms of deviations from a cashless preference. For example, when alternative payment instruments are always accepted, the probability of using cash when a subject prefers a cashless instrument drops by 38 percent, while doubling the transaction value reduces the probability by 13 percent.

AcceptanceRate has no significant effect on deviation from a cash preference, while $Value$ has a significant but small impact on increasing the probability of deviating.

Among transaction features, the rank order of payments made during the day is also a significant factor in both models, showing that each additional transaction decreases the probability of deviating from using a cashless instrument, while it increases the probability of deviating from using cash.

The $HardCash$ indicator significantly reduces the probability of a usage conflicting with cashless preference, while it has no effect on deviation from the cash preference. In other words, the "burden of coins" seems to affect only those with a cashless preference, while it is not a sufficient deterrent to using cash when cash is preferred.

Among individual characteristics, the strongest effects are from $IntentionToPayCash$ and $InitialAmount$. The probability of a "cashless mismatch" goes up 9 percent when withdrawing due to running out of cash. Likewise, doubling the amount of cash held in the wallet at the beginning of the day increases the probability of this mismatch by about 7 percent. Conversely, increasing the amount of money held in the wallet decreases the probability of a "cash mismatch." This finding supports the hypothesis that "cash burns," i.e., people tend to spend the cash they have before resorting to other instruments (see Alvarez and Lippi (2017) and references therein). $IntentionToPayCash$ has no impact on deviating from cash

Table 7. Transaction-Level Logistic Regression Estimating the Probability of Deviating from Preferred Payment Instrument Stratified for Stated Preferences

	Deviating from a Cashless Preference (iv)	**Deviating from a Cash Preference (v)**
AcceptanceRate	–0.3822***	–0.0250
	(0.0517)	(0.0271)
Value	–0.1327***	0.0214***
	(0.0090)	(0.0069)
PayNr	–0.0306***	0.0069*
	(0.0061)	(0.0038)
HardCash: *Yes*	–0.0666***	0.0017
	(0.0169)	(0.0106)
Education: *Middle–High*	–0.0070	0.0373**
	(0.0163)	(0.0176)
Income: *€2000–3000*	–0.0260	0.0126
	(0.0211)	(0.0142)
Income: *€3000+*	–0.0840***	–0.0103
	(0.0217)	(0.0097)
Employment: *NotEmployed*	0.0056	0.0063
	(0.0296)	(0.0166)
Employment: *Employee*	–0.0206	–0.0223*
	(0.0243)	(0.0128)
Gender: *Male*	–0.0251	0.0004
	(0.0175)	(0.0092)
Age: *18–24*	–0.0659	0.0342**
	(0.0441)	(0.0145)
Age: *25–39*	0.0301	0.0217*
	(0.0315)	(0.0127)
Age: *40–54*	0.0196	0.0354*
	(0.0348)	(0.0185)
Age: *55–64*	–0.0399	0.0004
	(0.0321)	(0.0114)
Cless: *Yes*	–0.0497***	0.0251**
	(0.0183)	(0.0100)
DigitallyInclined: *Yes*	–0.0441**	0.0251**
	(0.0214)	(0.0108)
Urban: *Yes*	–0.0368*	–0.0120
	(0.0211)	(0.0142)
South: *Yes*	0.0288	–0.0048
	(0.0176)	(0.0089)
InitialAmount	0.0693***	–0.0174**
	(0.0109)	(0.0073)
CashAdded	0.0175***	0.0059***
	(0.0064)	(0.0022)
IntentionToPayCash	0.0874**	0.0116
	(0.0386)	(0.0127)
Observations	3,447	1,362
AIC	2,165.291	368.641
BIC	2,300.487	483.409
AUROC	0.8149	0.8485

Note: The case of "no preference" has not been analyzed since it is assumed that it is impossible to have a mismatch in the absence of a preference. *p < 0.10, **p < 0.05, ***p < 0.01.

preference, while *CashAdded* shows an unexpected behavior, as it has a positive but very small effect.

Possession of a contactless payment card reduces the probability of deviating from the preferred method when this is cashless, while it represents an incentive to deviate when the preferred instrument is cash. Similar considerations apply to digitally inclined people.

The probability of a mismatch when preferring cashless instruments is lower for high-income people than for low-income people, but there are no significant differences when considering cash preference. The same is true when considering people living in an urban area, rather than rural.

Younger people are more likely to deviate from the cash preference but not from the cashless preference. Results show no differences related to gender and region of residence.

6. Discussion and Conclusion

This study analyzes payment behavior in Italy using, for the first time, data from payment diaries. By modeling the probability of using cash at the POS against several variables it sheds light on what factors influence consumers' choice of means of payment. Results show that the transaction-related features are the most relevant drivers in payment instrument choice.

Starting from the descriptive pieces of evidence of higher use of cash contrasting with a stated higher preference for cashless instruments, we also investigate this mismatch, finding that it is strongly influenced by the value of a transaction and the acceptance of alternative payment instruments.

This evidence has policy implications, especially concerning the lack of acceptance of cashless payment instruments, which is a supply constraint. At the survey date, cash is perceived as the only accepted means of payment in more than one in three cash-settled transactions, although the legal obligation to accept cards at the POS has been in place since 2012. However, acceptance of cashless instruments is not the one-size-fits-all solution to foster payment digitization. Cash is also extensively used for low-value transactions among people preferring cashless instruments even when alternative payment methods are accepted. Therefore, other catalysts like execution speed and usability could foster cashless micropayments.

In addition, we find that some population groups, such as women and residents in the South, are likely to use cash.

A consumer's digital inclination is a relevant factor in payment habits, decreasing the likelihood of cash usage, especially for cash-intensive groups such as women and residents in the South. Moreover, the possession of a contactless payment card decreases the probability of paying with cash, likely confirming that the convenience of electronic payments fosters their use to the detriment of cash. Our results support the idea that an increased inclination toward digital and easy-to-use means of payment reduces the likelihood of cash usage, especially for those groups that use it more. On the flip side, however, it should be noted that these population groups, such as women and residents in the South, tend to be less digitally inclined, so further efforts to bridge the digital divide may be necessary.

In perspective, the evolution of the payments market toward more innovative and digital instruments, including CBDC, could completely change payment behavior. Take-up at the POS may be fostered by widespread acceptance by merchants tied to handy use for consumers, especially for micropayments. Adoption in Italy could be increased by investing in digital literacy, especially for women and residents in the South.

References

Alvarez, F., and F. Lippi. 2017. "Cash Burns: An Inventory Model with a Cash-Credit Choice." *Journal of Monetary Economics* 90 (October): 99–112.

Arango, C., Y. Bouhdaoui, D. Bounie, M. Eschelbach, and L. Hernandez. 2018. "Cash Remains Top-of-Wallet! International Evidence from Payment Diaries." *Economic Modelling* 69 (January): 38–48.

Arango, C., D. Hogg, and A. Lee. 2015. "Why Is Cash (Still) So Entrenched? Insights from Canadian Shopping Diaries." *Contemporary Economic Policy* 33 (1): 141–58.

Arango, C., K. P. Huynh, and L. Sabetti. 2015. "Consumer Payment Choice: Merchant Card Acceptance Versus Pricing Incentives." *Journal of Banking and Finance* 55 (June): 130–41.

Ardizzi, G., E. Bonifacio, C. Demma, and L. Painelli. 2020. "Regional Differences in Retail Payment Habits in Italy." Bank of Italy Occasional Paper No. 576.

Bagnall, J., D. Bounie, K. P. Huynh, A. Kosse, T. Schmidt, S. Schuh, and H. Stix. 2016. "Consumer Cash Usage: A Cross-Country Comparison with Payment Diary Survey Data." *International Journal of Central Banking* 12 (4): 1–61.

Bank of Italy. 2022. "Annual Report for 2021." Technical Report, May.

Borzekowski, R., E. K. Kiser, and A. Shaista. 2008. "Consumers' Use of Debit Cards: Patterns, Preferences, and Price Response." *Journal of Money, Credit and Banking* 40 (1): 149–72.

Bounie, D., and Y. Camara. 2020. "Card-Sales Response to Merchant Contactless Payment Acceptance." *Journal of Banking and Finance* 119 (October): Article 105938.

Bounie, D., and A. François. 2006. "Cash, Check or Bank Card? The Effects of Transaction Characteristics on the Use of Payment Instruments." Working Paper No. ESS-06-05, Telecom Paris Economics and Social Sciences.

Bounie, D., A. François, and L. Van Hove. 2017. "Consumer Payment Preferences, Network Externalities, and Merchant Card Acceptance: An Empirical Investigation." *Review of Industrial Organization* 51 (3): 257–90.

Brancatelli, C. 2019. "Preferences for Cash vs. Card Payments: An Analysis Using German Household Scanner Data." June.

Brown, M., N. Hentschel, H. Mettler, and H. Stix. 2020. "Financial Innovation, Payment Choice and Cash Demand: Causal Evidence from the Staggered Introduction of Contactless Debit Cards." Research Paper No. 2020/02, University of St. Gallen, School of Finance.

Carbó-Valverde, S., and J. M. Liares-Zegarra. 2011. "How Effective Are Rewards Programs in Promoting Payment Card Usage? Empirical Evidence." *Journal of Banking and Finance* 35 (12): 3275–91.

Chen, H., K. P. Huynh, and O. Shy. 2019. "Cash Versus Card: Payment Discontinuities and the Burden of Holding Coins." *Journal of Banking and Finance* 99 (February): 192–201.

Ching, A. T., and F. Hayashi. 2010. "Payment Card Rewards Programs and Consumer Payment Choice." *Journal of Banking and Finance* 34 (8): 1773–87.

Coletti, G., A. Di Iorio, E. Pimpini, and G. Rocco. 2022. "Report on the Payment Attitudes of Consumers in Italy: Results from ECB Surveys." Markets, Infrastructures, Payment Systems Working Paper No. 21, Bank of Italy.

Eschelbach, M., and T. Schmidt. 2013. "Precautionary Motives in Short-Term Cash Management: Evidence from German POS Transactions." Discussion Paper No. 38/2013, Deutsche Bundesbank.

Esselink, H., and L. Hernández. 2017. "The Use of Cash by Households in the Euro Area." ECB Occasional Paper No. 201.

European Central Bank. 2020a. "Report on a Digital Euro." (October).

———. 2020b. "Report on the Study on the Payment Attitudes of Consumers in the Euro Area (SPACE)." (December).

European Commission. 2022. "Digital Economy and Society Index Report."

Huynh, K. P., P. Schmidt-Dengler, and H. Stix. 2014. "The Role of Card Acceptance in the Transaction Demand for Money." Working Paper No. 2014/44, Bank of Canada.

Klee, E. 2008. "How People Pay: Evidence from Grocery Store Data." *Journal of Monetary Economics* 55 (3): 526–41.

O'Brien, S. 2014. "Consumer Preferences and the Use of Cash: Evidence from the Diary of Consumer Payments Choice." Technical Report, Federal Reserve Bank of San Francisco.

Rocco, G. 2019. "L'Utilizzo del Contante in Italia: Evidenze dall'Indagine della BCE Study on the Use of Cash by Household." Occasional Paper No. 481, Bank of Italy.

Stavins, J. 2017. "How Do Consumers Make Their Payment Choices?" Research Data Report No. 17-1, Federal Reserve Bank of Boston. https://ideas.repec.org/p/fip/fedbdr/17-1.html.

———. 2018. "Consumer Preferences for Payment Methods: Role of Discounts and Surcharges." *Journal of Banking and Finance* 94 (September): 35–53.

Świecka, B., P. Terefenko, and D. Paprotny. 2021. "Transaction Factors' Influence on the Choice of Payment by Polish

Consumers." *Journal of Retailing and Consumer Services* 58 (January): Article 102264.

Trütsch, T. 2020. "The Impact of Contactless Payment on Cash Usage at an Early Stage of Diffusion." *Swiss Journal of Economics and Statistics* 156 (1): 1–35.

Van der Cruijsen, C., L. Hernandez, and N. Jonker. 2017. "In Love with the Debit Card but Still Married to Cash." *Applied Economics* 49 (30): 2989–3004.

Van der Cruijsen, C., and J. Knoben. 2021. "Ctrl+ C Ctrl+ Pay: Do People Mirror Electronic Payment Behavior of Their Peers?" *Journal of Financial Services Research* 59 (1): 69–96.

Von Kalckreuth, U., T. Schmidt, and H. Stix. 2014. "Choosing and Using Payment Instruments: Evidence from German Microdata." *Empirical Economics* 46 (3): 1019–55.

Wakamori, N., and A. Welte. 2017. "Why Do Shoppers Use Cash? Evidence from Shopping Diary Data." *Journal of Money, Credit and Banking* 49 (1): 115–69.