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by Alberto Di Iorio and Giorgia Rocco

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EASIER SAID THAN DONE: WHY ITALIANS PAY IN CASH WHILE PREFERRING CASHLESS

by Alberto Di Iorio* and Giorgia Rocco*

Abstract

In this study we use data from the 2019 Study on the Payment Attitudes of Consumers in the Euro area (SPACE) to analyse the main drivers of payment choices at the point of sale (POS) in Italy. We find that transaction-related features are the most important drivers of 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 Classification: D12, E58, G02.

Keywords: payment habits, consumer choice, payment preferences, cash, payment cards, survey data, diary data.

DOI: 10.32057/0.QEF.2022.0731

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* Bank of Italy, Directorate General for Currency Circulation and Retail Payments.

1 Introduction¹

Reliability, efficiency, and inclusiveness of retail payment systems are key topics in current central bank policy discussions. In the last decades, innovations and technologies affected the market of retail payments which have become increasingly electronic. Cash alternatives have been growing for years: combined with the widespread adoption of more traditional debit and credit cards, the usage of new payment technologies – such as contactless, mobile and instant payments – is rapidly increasing. At the same time, the transition towards a cashless society can imply restrictions to access to payment services in some social classes and difficulty to rely on safe and liquid assets in times of financial distress. For these reasons, central banks, including the European Central Bank, are today evaluating electronic cash substitutes, namely the design and the implementation of a central bank digital currency - CBDC (European Central Bank, 2020a).

Investigating what factors affect the consumers' payment choice is of primary importance to understand what drives the retail payments market, thus enabling policymakers to address and evaluate their actions. To this aim, 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) day, recording some attributes characterizing the transaction (i.e. the payment instrument used, the value, the acceptance of other instruments, etc.).

Bagnall et al. (2016) analyses 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 to the transaction value (Bounie and François, 2006, Klee, 2008, Von Kalckreuth, Schmidt, and Stix, 2014, Świecka, Terefenko, and Paprotny, 2021), as well as to 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 change received in the form of banknotes and metal coins discourages the use of cash (Brancatelli, 2019, Chen, Huynh, and Shy, 2019) and the individual cash attitude measured by the cash-in-hand at the beginning of the diary heightens the probability of paying cash (Borzekowski, Elizabeth, and Shaista, 2008, Arango, Hogg,

¹We would like to thank Massimo Doria, Michele Lanotte, Andrea Nobili, Gabriele Sene, Gabriele Coletti, and the participants of the Dec. 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 the remaining errors are ours.

and Lee, 2015, Alvarez and Lippi, 2017).

A large body of studies emphasises the role played by incentives, discount and surcharges in the payment choice. Ching and Hayashi (2010) and Carbó-Valverde and Liñares-Zegarra (2011) show that payment card rewards significantly modify payment choice in favour of cards; Arango, Huynh, and Sabetti (2015) find that participation in a credit card rewards program induces a shift towards 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-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 extensively across many developed economies.

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

The present study wants 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 analyse payment diary data from the Study on the Payment Attitudes of Consumers in the Euro area (SPACE, European Central Bank, 2020b). ECB survey data for Italy have been analysed only in a descriptive way so far (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, not allowing them to conclude what and to what extent influences consumers' payment habits.

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

In addition, we want to investigate the role of digitisation on payment behaviour. 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 both in terms of yearly cashless transactions per capita (Bank of Italy, 2022) and in terms of individual digital skills (European Commission, 2022). Therefore, we create an indicator for the individuals' digital attitudes. We also enrich the study with an in-depth analysis of the gender gap, the geographical divide and the role of digitisation.

Another topic faced 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. On the contrary, a difference between usage and preference is assessed for Netherlands (Van der Cruisen, Hernandez, and Jonker, 2017) while SPACE data highlights this discrepancy for many other euro-area countries, including Italy (European Central Bank, 2020b). Hence, we explore why Italian consumers fail to express a consistent choice at the 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 the payment choice at the POS. Specifically, the acceptance of other 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 they also have a pivotal role in the decoupling between the use and preferences, with consumers who, due to a supply constraint 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 socio-demographic and individual characteristics, we find a significant gender gap and geographical divide in the usage of cash. The consumer's digital attitude decreases the likelihood of cash usage, 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 behaviour by concurrently analysing 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 digitisation represents a novelty in the payment habits literature.

The remainder of this paper is 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 European Central Bank (ECB) conducted the SPACE survey to update the previous consumers' payment behaviour data (SUCH, Esselink and Hernández, 2017)², exploring POS and P2P, online, remote and recurring payments, to allow a deeper understanding of the use of payment instruments. At the time of writing, these are the most recent payment diaries data available for Italy.³ The euro-area results were published in December 2020 in a report (European Central Bank, 2020b) which also explains the survey methodology.⁴ In the SPACE survey, euro-area residents⁵ older than 18 years were interviewed by filling in three modules covering i) POS and P2P payments, ii) online payments including online purchases, telephone and mail orders, and iii) bill and recurring payments. The first two modules refer to a one-day diary, while the last one reports any bill payments made during the last 7 days. Furthermore, the interviewees had to answer a questionnaire with questions about their behaviour and attitudes towards cash and other payment instruments. Between mid-March and mid-December 2019, three different waves were conducted; 41,155 respondents were interviewed. In Italy, 4,199 individuals have been interviewed for a total amount of 11,722 transactions: 8,293 reported in the POS diary, 2,557 in bill one, and 872 registered as remote payments (Fig. 1a). Although cash is widely used at the POS, by looking at other transactions, such as remote and bill payments, the role of cash appears more limited. Cards (both credit and debit) and PayPal are the most used instruments for remote payments, while in settling bill payments cash, cards or direct debits have an almost equal role (Fig. 1b).

The analysis will therefore focus on POS payments, as they represent the bulk of transactions detected through the diaries and are peculiar in terms of payment behaviour with still extensive use of cash. Our models aim to describe what factors influence cash, and cards as the main cashless electronic instrument, usage at POS since the transactions made with other instruments are relatively low compared to those made with cash and cards.

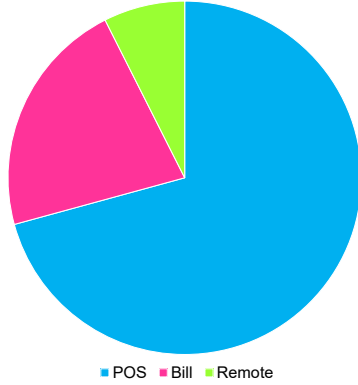
²In 2016, the ECB conducted the Study on the Use of Cash by Households (SUCH), being the first study analysing consumers' payment behaviour at POS and P2P for the euro area.

³In July 2020, the ECB conducted the IMPACT survey to assess the impacts of the COVID-19 pandemic on consumers' payment habits. This survey, unlike SPACE, was not based on payment diaries and therefore did not present the same detailed information on individual transactions made by respondents.

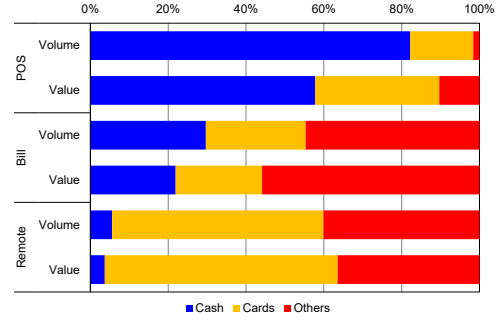
⁴The report also includes results from the IMPACT survey.

⁵SUCH and SPACE samples refer to 17 of all 19 euro-area countries excluding Germany and the Netherlands that carry out their surveys on payment behaviour. Their data have been integrated where possible in the ECB reports.

Figure 1: Diaries composition.



(a) Diaries distribution



(b) Instruments share per diary

Note: Unweighted amount of all diaries transactions sums to 11,722. "Others" category includes: credit transfers, direct debits, bank cheques, mobile phone payments online payments method, gift cards or vouchers and crypto-assets.

3 Factors affecting payment instrument choice

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

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

We identify three groups of covariates: (i) transaction-related variables, (ii) individual and socio-demographic characteristics, and (iii) the preferences expressed for payment instruments.⁶ In Table 1 a comprehensive list of the variables with a brief description is reported.

⁶Please note that preferences are also individual characteristics in the sense that we assume they vary only between individuals, but because of their importance we have separated them from other individuals' characteristics.

Table 1: List of independent variables.

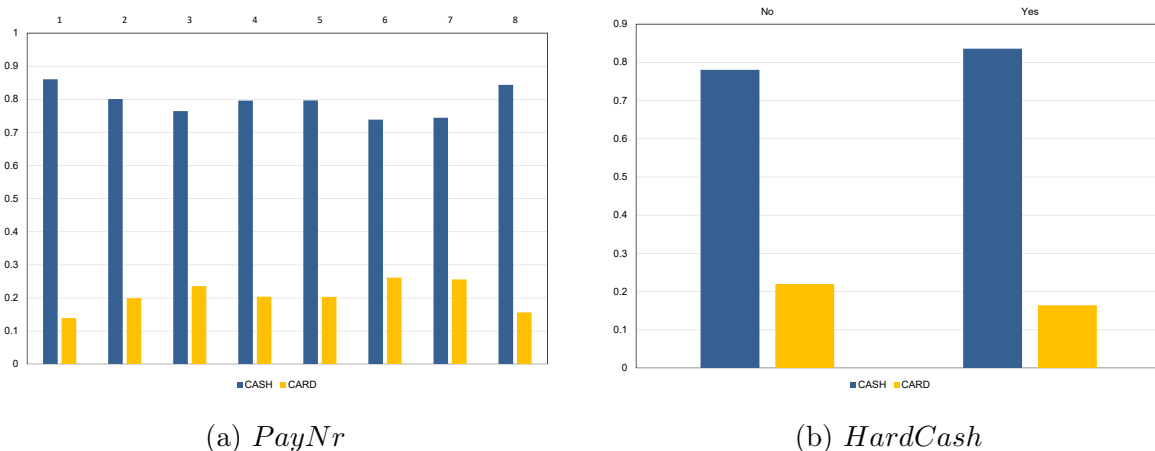
	Variable	Description
Transaction features $TRANS_{ij}$	Acceptance	Binary variable describing whether or not other payment instruments than the one used to settle the transaction are accepted according to the subject perception.
	Value	Logarithmic transformation of the value of the transaction.
	PayNr	The sequential number of the transaction of the day.
	HardCash	Binary variable that takes value 1 if the transaction is supposed to be "hardly settled" in cash.
Individual characteristics $INDIV_i$	Education	Binary variable that turns on if the respondent has a post-secondary education.
	Income	3-levels categorical variable representing the tertiles of the income distribution
	Employment	3-levels categorical variable describing the employment status of the respondent.
	Age	5-levels categorical variable representing different age classes of the respondent.
	Gender	Binary variable indicating the respondent's gender.
	Cless	Binary variable indicating if the respondent possesses a payment card with contactless function.
	DigitallyInclined	Binary variable that takes value of 1 if the subject has access to more innovative payments instruments or crypto-assets or makes extensive use of technological devices.
	Urban	Binary variable that turns on if the area of residence of the subject is urban instead of rural.
	South	Binary variable indicating if the subject is resident in the south (or islands) or in 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.	
$PREF_i$	Preference	3-levels categorical variable representing subject's preferred instruments.

Note: Preference categories are: cash, cashless instrument, not a clear preference. Income levels are: $<€2000$, $€2000-3000$, $€3000+$. Employment status is: unemployed/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.

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). In the SPACE survey, respondents were asked to indicate for each payment whether any other payment option than the one they used would have been accepted, thus we use this variable as a proxy of the merchant acceptance of alternative instruments although, strictly speaking, this represents perceived acceptance of more payment instruments. In addition, consumers perception of a lack of acceptance could be seen as a supply constraint. Among the

Figure 2: Transaction features other than acceptance and value.



Note: Frequency of use of cash vs card for different values of *PayNr* (a) and *HardCash* (b).

transaction characteristics we also include the sequential number of payments made by an individual during the reporting day (*PayNr*, Fig 2a). This variable control for the possible effect of reducing the proportion of cash held as the number of payments increases with the resulting increase in the likelihood of using an alternative instrument. Moreover, we include a variable indicating whether the transaction can be "hardly" settled in cash (*HardCash*, Fig 2b). *HardCash* is a binary variable assuming value 1 if the value of the transaction is not a multiple of 5, or said differently if the transaction cannot be settled using only banknotes. This variable comes from 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.

3.2 Socio-demographic and individual factors

Respondents report their socio-demographic characteristics in the questionnaire. These factors are often viewed as determinants of consumers' payment choice. Alongside socio-demographics such as age, gender, income, and employment, we exploit also consumers' geographic characteristics. In particular, we introduce the feature that indicates if a respondent's residence is a rural or an urban area, and a binary variable that identifies the macro-region South and Islands 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).

In addition to the 'typical' socio-demographic variables, we also consider individual characteristics that could be related to the propensity to use a payment instrument. Firstly, to assess the role of cash balance we consider the amount of cash available at the start of the day (*InitialAmount*) (Borzekowski, Elizabeth, and Shaista, 2008, Arango, Hogg, and Lee, 2015, Alvarez and Lippi, 2017). Secondly, since the convenience of electronic payments especially using the contactless technology is an important driver for the use of payment cards (Bounie and Camara, 2020, Brown et al., 2020, Trütsch, 2020) we employ an indicator for possession of a card with contactless technology (*Cless*).

3.2.1 Individual digital attitude

To investigate the role of digitisation and technology on the likelihood of using a certain instrument rather than another, we created a binary variable as a measure of the consumers' digital attitude, called *DigitallyInclined*, indicating the possession of innovative payment instruments or the frequent use of digital devices. In detail, we constructed a synthetic indicator using 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 high use of electronic devices as those who belong to the third tertile of the distribution of the synthetic indicator. In the end, the *DigitallyInclined* variable assumes a value of 1 if the individual makes high use of electronic devices to access the internet or possesses crypto-assets, or mobile or internet payment services. Fig. 3a shows that about 60 percent of respondents belongs to this category.

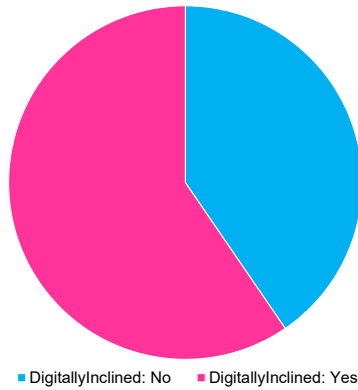
This type of construction, made feasible by the structure of the SPACE questionnaire, makes it possible to assess the individual's digital inclination with a focus on the world of payment instruments. It also pairs a point-in-time assessment, i.e., one related to the possession of crypto-assets, mobile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

As the intuition suggests, younger people are more inclined towards technology with respect 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 central-northern residents tend to have a stronger attitude towards digital than southern residents and females, respectively (Fig. 3b).

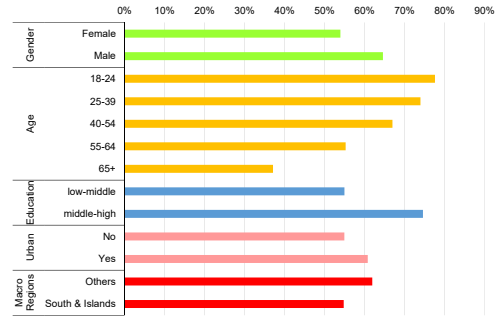
3.3 Stated preferences for a payment instrument

Preferences are a key factor expected to primarily influence the payment instrument choice. In a dedicated question, respondents can state their preference for cash, cashless means of payment, or not a clear preference between these classes of instruments. It

Figure 3: DigitallyInclined descriptives.



(a) *DigitallyInclined* distribution in the sample



(b) *DigitallyInclined* distribution across socio-demographic features.

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

is worth noting that self-reported consumer preferences could be biased since other factors could influence the expression of the preference, for example, people may have different preferences depending on the transaction value (small vs large) (European Central Bank, 2020b).

Table 2 shows that, for Italy, almost 50 percent of respondents prefer cashless instruments while the remainder is essentially split in half between those who prefer cash and those who do not have a preference. Cashless instruments are then those for which individuals express a greater preference, although cash turns out to be the instrument they actually use the most. In addition, Table 3 reports the cross-referencing preferences with usage: cash is the most widely used instrument even among those who prefer alternative instruments, although in a smaller share than those who prefer cash or have no clear preference. This evidence highlights that consumers deviate from their preferred payment instrument and claims for further analysis to understand the underlying reasons of the mismatch.

Table 2: Overall respondents' reported preferences and use at POS.

	Preference	Use
Cashless	46.9	17,8
Cash	28.1	82,2
Not a clear preference	24.9	

Note: Percentages of preferences are computed counting the expressed preferences one time for each respondent ("wide" format). Percentage 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
Not a 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.

4 Modelling the payment choice at the POS

The dataset has the form of repeated measures since each individual reports 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, there are the transactions-related features, while among the latter there are the characteristics of those conducting the transactions.

Formally speaking, our variables of interest are the binary variables $CASHUSE_{ij}$ and $CARDUSE_{ij}$ presenting value 1 if the j -th transaction at the POS of the i -th individual is settled with cash or cards, respectively.

Given the binary nature of our dependent variables, the reference model will be logistic regression. 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 involves also an individual-specific interpretation of the effects.⁷ However, to account for correlations that may exist among observations related to the same respondent, we have clustered standard errors at the individual level.

The complete models are the following:

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

$$\log \left(\frac{\mathbb{P}(CARDUSE_{ij} = 1)}{\mathbb{P}(CARDUSE_{ij} = 0)} \right) = \alpha + \beta TRANS_{ij} + \gamma INDIV_i + \delta PREF_i + \epsilon_{ij} \quad (2)$$

⁷We have also challenged the models by using a random effects multilevel Linear Probability Model that confirms our findings.

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 model the probability of paying with cash or cards against only transaction-related variables (model (i) for cash and model (iv) for cards in the sequel). Then, model (ii) and (v) add individual attributes to the transaction characteristics, for cash and cards respectively. Finally, the last specifications, models (iii) and (vi), are the complete models which includes also the stated preferences of each respondents.

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 by 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.

To measure the goodness of fit of our estimated models we have provided different metrics: the Akaike and Bayesian information criteria (AIC and BIC) and the area under the ROC curve (AUROC).

Table 4 shows the results of estimated marginal effects across the different model specifications introduced in the previous section. Overall, the stability of the coefficients across different specifications as well as the size of the standard errors rules out problems due to multicollinearity. This is also confirmed by the VIF analysis of the specification for the complete models (iii) and (vi) with all the variables showing an inflation factor less (or at most equal) to 2.

Starting with the transaction-related features, we find that the effects are significant and stable across all the specifications for both cash and cards, with *Acceptance* and *Value* exhibiting the strongest marginal effects respectively. Specifically, the acceptance of alternative instruments decreases the probability of paying cash by more than 16 percent. In addition, the number of payments made during the day is strongly 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" seems to have an empirical confirmation also in the Italian data representing a statistically significant penalty of approximately 4 percent on the probability of using cash. Results of comparable magnitude but opposite sign hold for the probability of using cards.

Table 4: Transaction-level logistic regressions estimating the marginal probability of using a specific payment instrument (Cash or Card).

	Cash (i)	Cash (ii)	Cash (iii)	Card (iv)	Card (v)	Card (vi)
Acceptance : Yes	-0.1823*** (0.0119)	-0.1679*** (0.0109)	-0.1666*** (0.0111)	0.1853*** (0.0109)	0.1741*** (0.0102)	0.1730*** (0.0104)
Value	-0.1178*** (0.0061)	-0.1289*** (0.0054)	-0.1244*** (0.0057)	0.1065*** (0.0063)	0.1160*** (0.0056)	0.1111*** (0.0056)
PayNr	-0.0223*** (0.0049)	-0.0266*** (0.0041)	-0.0254*** (0.0041)	0.0210*** (0.0047)	0.0246*** (0.0040)	0.0233*** (0.0039)
HardCash :Yes	-0.0490*** (0.0134)	-0.0405*** (0.0115)	-0.0396*** (0.0113)	0.0382*** (0.0134)	0.0304*** (0.0113)	0.0291*** (0.0109)
InitialAmount		0.0834*** (0.0067)	0.0753*** (0.0065)		-0.0789*** (0.0068)	-0.0708*** (0.0067)
Education:Middle-High		0.0084 (0.0129)	0.0032 (0.0121)		-0.0176 (0.0124)	-0.0116 (0.0118)
Income: €2000-3000		-0.0321** (0.0157)	-0.0167 (0.0143)		0.0353** (0.0157)	0.0203 (0.0141)
Income: €3000+		-0.0607*** (0.0166)	-0.0458*** (0.0154)		0.0559*** (0.0160)	0.0423*** (0.0154)
Employment:NotEmployed		0.0301 (0.0216)	0.0201 (0.0216)		-0.0323 (0.0212)	-0.0212 (0.0214)
Employment:Employee		-0.0018 (0.0180)	0.0040 (0.0177)		-0.0087 (0.0176)	-0.0140 (0.0175)
Gender:Male		-0.0242* (0.0124)	-0.0265** (0.0118)		0.0170 (0.0123)	0.0193* (0.0116)
Age:25-39		0.0127 (0.0264)	0.0356 (0.0249)		-0.0123 (0.0247)	-0.0335 (0.0241)
Age:40-54		-0.0130 (0.0267)	0.0118 (0.0259)		0.0177 (0.0253)	-0.0054 (0.0253)
Age:55-64		-0.0405 (0.0279)	-0.0065 (0.0261)		0.0475* (0.0265)	0.0138 (0.0253)
Age:65+		-0.0425 (0.0273)	-0.0112 (0.0256)		0.0428* (0.0259)	0.0120 (0.0245)
Cless : Yes		-0.0629*** (0.0132)	-0.0356*** (0.0126)		0.0653*** (0.0130)	0.0380*** (0.0126)
DigitallyInclined: Yes		-0.0413*** (0.0141)	-0.0302** (0.0140)		0.0442*** (0.0139)	0.0338** (0.0138)
Urban		-0.0128 (0.0146)	-0.0020 (0.0153)		0.0213 (0.0144)	0.0115 (0.0145)
South : Yes		0.0353*** (0.0129)	0.0298** (0.0125)		-0.0298** (0.0129)	-0.0237* (0.0125)
Preference:Cash			0.1639*** (0.0166)			-0.1636*** (0.0161)
Preference:NoPref			0.1126*** (0.0145)			-0.1028*** (0.0141)
Observations	6667	6667	6667	6667	6667	6667
AIC	4619.293	4004.956	3762.12	4465.517	3875.531	3638.745
BIC	4653.317	4141.054	3911.828	4499.542	4011.63	3788.454
AUROC	0.813	0.847	0.866	0.816	0.851	0.871

Note: for all the specification the sample size has been fixed equal to that of the most comprehensive model. Baseline levels: *HardCash* - "No", *Education* - "Low-Middle", *Income* - "<€2000", *Employment* - "Unemployed/Student", *Gender* - "Female", *Age* - "18-24", *Cless* - "No", *DigitallyInclined* - "No", *South* - "No", *Preference* - "Cashless". Clustered standard errors in parentheses. *p<0.10, ** p<0.05, *** p<0.01.

Marginal effects for models (ii) and (v) that include also individual characteristics or for complete models (iii) and (vi) that include all the variables are very similar. Among the individual features, a higher level of income is associated with a lower/higher probability of using cash/cards. *Ceteris paribus*, the probability of paying with cash (cards) at the POS is about 3 (2) percent lower (higher) for men than for women confirming the existence of a gender gap. A similar result is found for digitally inclined people versus those who are not. Moreover, results show also a geographical divide, since for those who reside in the South, the likelihood of using cash (cards) is higher (lower) 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 attitudes will be further explored in a dedicated section. The possession of a contactless payment card decreases (increases) significantly the probability of paying with cash (cards) 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 at the beginning of the day by the respondent 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 one's wallet is an incentive to use cash to pay. This is a well-known finding in the payment habits literature (see Eschelbach and Schmidt, 2013, Arango, Huynh, and Sabetti, 2015). Finally, age, education level, area of residence urbanisation, and employment status seem to be little factors affecting payment choice.

Consistent with expectations, preference for cash strongly raises (reduces) the probability of using cash (cards), 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 of the goodness of fit measures confirm that the (complete) model (vi) shows the best fit. However, specifications (ii) and (v), which include individual and socio-demographic characteristics in addition to transaction features, exhibit comparable goodness of fit to the complete one. This evidence suggests that preferences and other individual variables convey the same information about a consumer's payment behaviour.

According to these results, Italians' payment choice at the POS are mainly driven by transaction-related features. Indeed, fitting metrics of models (i) and (iv) that include only these covariates are very similar to those of complete models (iii) and (vi) that include also all individual characteristics. In other words, the information contribution of individual variables 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, *Acceptance* first and *Value* later are the characteristics that most affect the likelihood of instrument use.

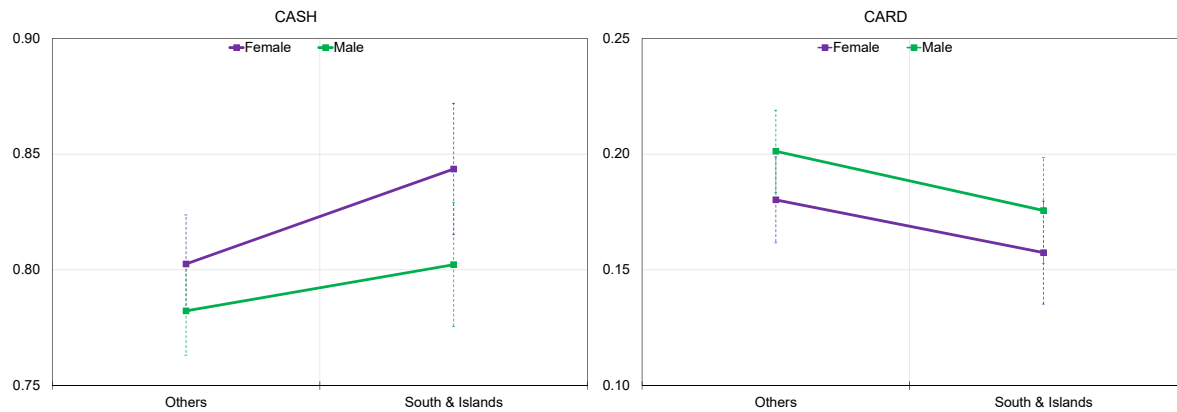
4.1 Exploring the gender gap and the digital and geographical divide

The comprehensive model reveals the presence of significant gender, geographic, and digital gaps in the use of alternative instruments even when controlling for numerous other individual factors. To understand whether these gaps are in turn influenced by the gender, geography, and digital culture of individuals, we enriched specifications (iii) and (vi) with the three two-way interactions of these variables. Marginal effects of these interactions are reported in Table 5. To facilitate the interpretation of the results, we report in a graphical form (Figure 4) the probability of using cash or cards predicted by these enriched models for the different levels of interactions.

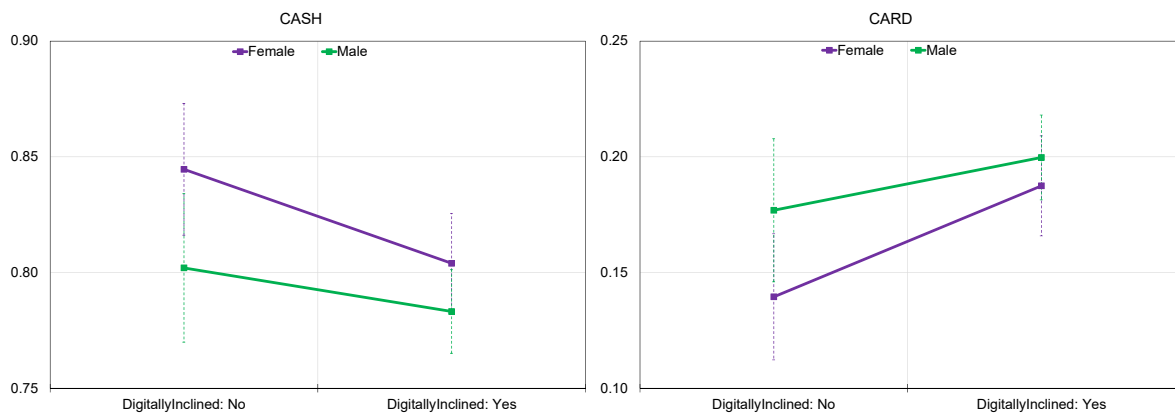
Taking advantage of the greater degree of detail resulting from the introduction of interactions, regarding the gender gap at the geographic level Figure 4a shows that the gap for cash widens as you move south. This widening is due to women being more likely than men to use cash when their residence is located in a southern region; differently stated, the geographical divide is more pronounced for women than for men. This graphical evidence matches the statistical one contained in Table 5a since we find that the gender gap in other regions is non-significant, while it becomes so in the South. Flipping the perspective, the geographic divide is significant for women but not for men. For cards, the figures are very similar unless for the gender gap that appears not statistically significant in the South.

The same kind of reasoning just outlined can be applied to the cases of the interaction between gender, geography and digital inclination (Figs 4b and 4c, respectively). For those who are more inclined towards digital tools, the gender gap and geographical divide are reduced. In both cases, the reduction is primarily attributable to a greater effect of digitisation on the disadvantaged category (women/South). In particular, this is equivalent to saying that the digital divide affects more women and the inhabitants of southern Italy. Estimated marginal effects in Tables 5b and 5c show a significant gender and geographical gap for those that are not digital inclined, which vanishes when they become so. The digital divide is significant for women and residents in the South, while the evidence fades in other regions and for men.

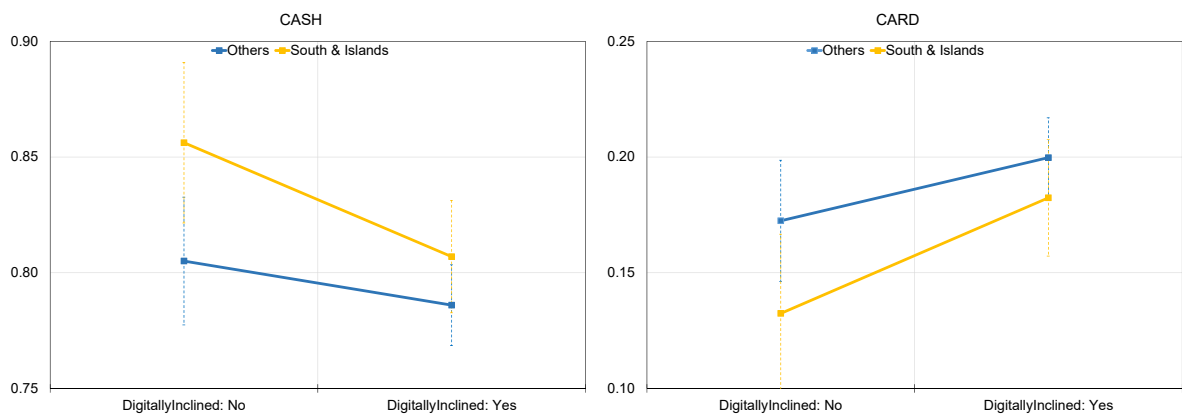
Figure 4: Probability of using cash or card: gender gap, digital and geographical divide.



(a) $Gender \times South$



(b) $Gender \times DigitallyInclined$



(c) $South \times DigitallyInclined$

Note: probability are predicted for cash and card from model (iii) and (vi), respectively, where the two-way interactions " $Gender \times South$ ", " $Gender \times DigitallyInclined$ " and " $South \times DigitallyInclined$ " are included.

Table 5: Interactions effects on probability of using cash or card.

Gender			South		
<i>South</i>	Cash	Card	<i>Gender</i>	Cash	Card
Others	-0.0202 (0.0144)	0.0166 (0.0139)	Female	0.0409** (0.0182)	-0.0294* (0.018)
South	-0.0413** (0.02)	0.0267 (0.0203)	Male	0.0199 (0.0167)	-0.0193 (0.0169)

(a) Marginal effects of *Gender* × *South* interaction

Gender			DigitallyInclined		
<i>DigitallyInclined</i>	Cash	Card	<i>Gender</i>	Cash	Card
No	-0.0415* (0.0215)	0.0372* (0.0207)	Female	-0.0425** (0.0185)	0.0481*** (0.0182)
Yes	-0.0212 (0.0139)	0.0124 (0.0139)	Male	-0.0223 (0.0189)	0.0232 (0.0186)

(b) Marginal effects of *Gender* × *DigitallyInclined* interaction

South			DigitallyInclined		
<i>DigitallyInclined</i>	Cash	Card	<i>South</i>	Cash	Card
No	0.0518** (0.0223)	-0.0395* (0.0218)	Others	-0.0213 (0.0169)	0.0278* (0.0164)
Yes	0.0203 (0.0149)	-0.0176 (0.0151)	South	-0.0528** (0.0217)	0.0497** (0.0219)

(c) Marginal effects of *South* × *DigitallyInclined* interaction

Note: Clustered standard errors in parentheses. *p<0.10, ** p<0.05, *** p<0.01.

5 Exploring the mismatch between preferences and actual use

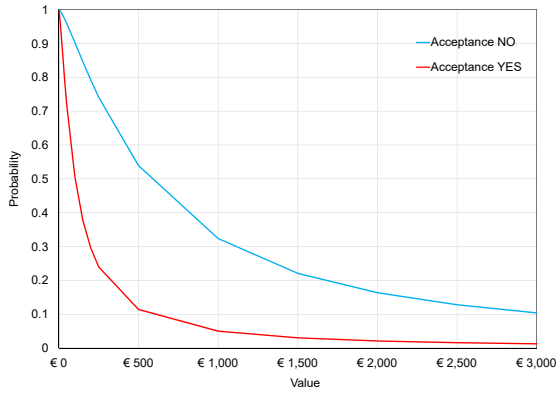
In this section, we explore the actual use of payment instruments against the preferences investigating why consumers deviate from their preferred method. A first clue on the reasons for this mismatch comes from the usage probability curves estimated from models (iii) and (vi) in Section 4, given the stated preferences and let varying the two main factors affecting the usage: the value of the transaction and the acceptance of other payment instruments (Fig. 5a - 5f). Consistently with the findings in Stavins (2018) and O'Brien (2014), the probability of using cash generally declines with transaction value, and the probability of using cards increases with transaction value; in contrast to their findings, consumers do not always have a higher probability of using their preferred payment method. For example, people stating their preference for cashless instruments have a higher probability of using cash for transactions with a value lower than €25 when more payment instruments are accepted, and for transactions below €250 when only a payment instrument is accepted. Also, people stating their preference for cash have a higher probability of using cards for transactions above €3,000 when only a payment instrument is accepted (likely also about the legal limit to cash usage), and for transactions above €200 when more than one instrument is accepted.

Overall, this evidence suggests that the stated preferences could be different if asked about the payment value. Actually, cash leads the segment of micro-payments (under €25) despite the stated preference and the acceptance of other payment instruments, while cards are more used for very large transactions. The acceptance of more payment instruments fosters the use of cards, despite the stated preferences, thus suggesting that lack of acceptance is an important supply barrier.

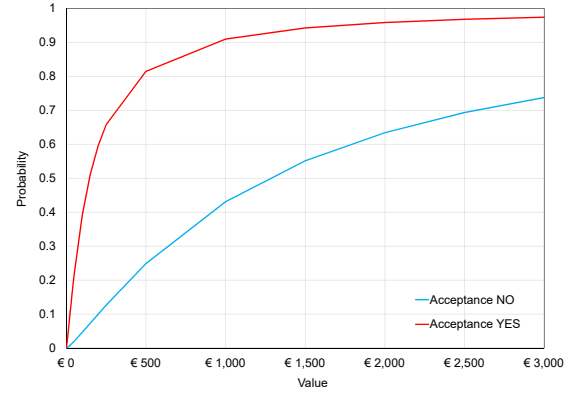
5.1 Why do consumers deviate from their preferred method?

To better assess the reasons why consumers fail to express a consistent choice at the POS by using a different payment instrument than the one they prefer, we employ logistic models on two mismatch measures which act as dependent variables. The first model considers the probability of a "cashless mismatch", which is a deviation from the preferred payment method when this is cashless. The dependent variable refers to each transaction and takes a value equal to 1 when a cashless payment instrument has not been used and 0 when there is a match between use and preference. Similarly, the second model considers the probability of "cash mismatch", which is a deviation from the preferred method when this is cash. Regressions are performed for the two groups separately, while people stating "not a clear preference" has not been included since it

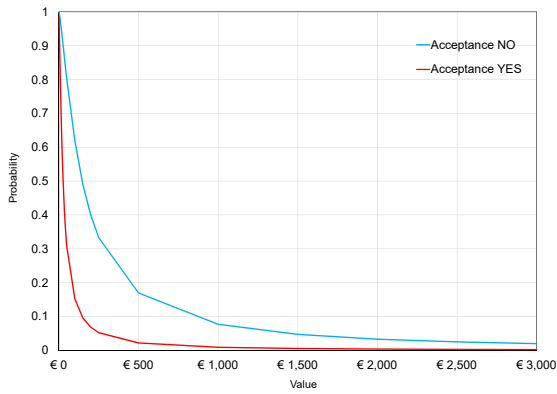
Figure 5: Probability function for cash and card usage: the role of the acceptance and value.



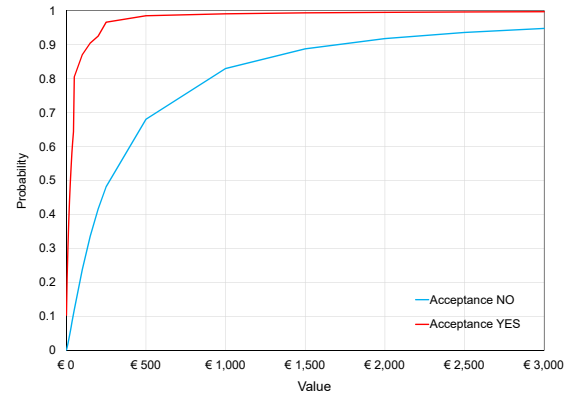
(a) Cash \times Preference cash



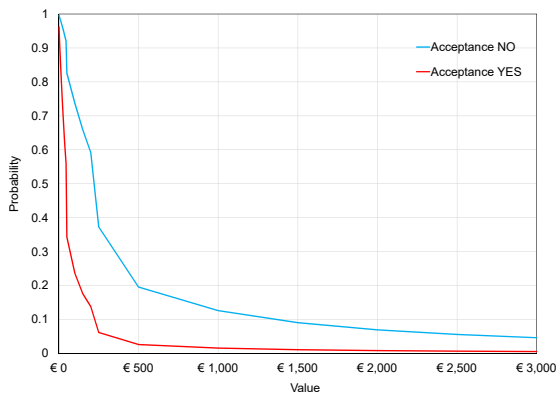
(b) Card \times Preference cash



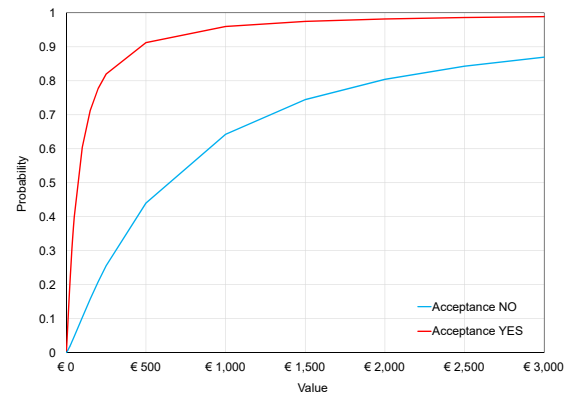
(c) Cash \times Preference cashless



(d) Card \times Preference cashless



(e) Cash \times Not a clear preference



(f) Card \times Not a clear preference

Note: probability are predicted from models (iii) and (vi) in Section 4.

is assumed that is impossible to have a mismatch in absence of preference.

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

Results in Table 6 show that the acceptance of other instruments and the value of the transactions have the strongest effect in deviating from a cashless preference. For example, in the case of acceptance of other payment instruments the probability of using cash when the consumer prefers a cashless method drops by 27 percent, while doubling the transaction value reduces the probability by 15 percent.

Acceptance and *Value* act symmetrically in the sense that they are also significant factors (with opposite signs) in the model (viii) that describes the deviation from a cash preference, although their effect is considerably smaller in this case. In addition, differently from what happens in the model (vii) *Value* shows a stronger effect than *Acceptance*.

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

The *HardCash* indicator significantly reduces the probability of a conflicting use with cashless preference, while it has no effect in deviating from the cash preference. In other words, the "burden of coins" seems to affect only those with cashless preference, while it is not a sufficient deterrent to using an alternative instrument when cash is preferred.

Amid individual characteristics, the strongest effect is that of *InitialAmount*. Doubling this quantity increases the probability of a "cashless mismatch" by about 10 percent, while it decreases the probability of a "cash mismatch" by about 6 percent. 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).

The possession of a contactless payment card reduces the probability of deviating from the preferred method when this is cashless, while it has not effect when the preferred instrument is cash. The same holds for people with middle/upper income in contrast to low income people.

The probability of mismatch when preferring cashless instruments is lower for men than for women. This suggests that, all other factors being equal, acceptance included, being a woman implies greater difficulty in implementing one's preference. A digital attitude increases the probability of paying with a cashless instrument when the favourite one is cash, but has no significant effect in the opposite situation. Living in an urban

area, rather than rural, seems to reflect greater citizen awareness of their preference as it reduces the likelihood of mismatch in both cases analysed. On the contrary, living in the South increases the probability of a "cashless mismatch" likely reflecting a lower inclination of people towards alternative-to-cash instruments even if they declare their preference for them.

Table 6: Transaction-level logistic regression estimating the probability of deviating from preferred payment instrument stratified for stated preferences.

	Deviating from a cashless preference (vii)	Deviating from a cash preference (viii)
Acceptance: Yes	-0.2705*** (0.0181)	0.0444*** (0.0125)
Value	-0.1490*** (0.0068)	0.0662*** (0.0116)
PayNr	-0.0298*** (0.0063)	0.0127* (0.0070)
HardCash: Yes	-0.0581*** (0.0180)	0.0120 (0.0159)
InitialAmount	0.0931*** (0.0093)	-0.0618*** (0.0105)
Education: Middle-High	-0.0075 (0.0180)	0.0108 (0.0202)
Income: €2000-3000	-0.0438* (0.0227)	0.0357 (0.0232)
Income: €3000+	-0.0858*** (0.0230)	-0.0079 (0.0189)
Employment: NotEmployed	-0.0021 (0.0319)	-0.0124 (0.0291)
Employment: Employee	-0.0243 (0.0259)	-0.0218 (0.0243)
Gender : Male	-0.0441** (0.0185)	0.0055 (0.0159)
Age: 25-39	0.0281 (0.0444)	0.0004 (0.0241)
Age: 40-54	-0.0013 (0.0449)	0.0299 (0.0277)
Age: 55-64	-0.0453 (0.0455)	0.0075 (0.0332)
Age: 65+	-0.0045 (0.0437)	0.0055 (0.0257)
Cless: Yes	-0.0322* (0.0191)	0.0193 (0.0166)
DigitallyInclined : Yes	-0.0265 (0.0235)	0.0471*** (0.0179)
Urban	-0.0417* (0.0224)	-0.0525** (0.0248)
South : Yes	0.0409** (0.0194)	-0.0157 (0.0139)
Observations	3563	1320
AIC	2306.8	486.179
BIC	2430.368	589.8867
AUROC	0.8615	0.7957

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

6 Discussion and conclusions

This study analyses the payment behaviour in Italy using payment diary data for the first time, shading light on what influences a payment at the physical point of sale where cash is still extensively used also with respect to other countries. By modelling the probability of using cash or payment cards at the POS against several variables, we find that the transaction-related features are the most significant drivers in the 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 for the lack of acceptance of cashless payment instruments, which is a supply constraint. At the survey date, cash is the only accepted means of payment in more than one in three cash-settled transactions, although the legal obligation to card acceptance at the POS has been introduced since 2012. However, acceptance of cashless instruments is not the one-size-fits-all solution to foster payment digitisation. 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 micro-payments.

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

A consumer's digital attitude is a relevant factor in payment habits, decreasing the likelihood of cash usage, especially for cash-intensive groups, 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 attitude towards digital and easy-to-use tools reduces the likelihood of cash usage, especially for those groups that use them more. On the flip side, however, it should be noted that these population groups 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 towards more innovative and digital instruments, including the CBDC, could completely change payment behaviour. The take-up at the POS may be fostered by a widespread acceptance by merchants tied to a handily use for consumers, especially for micro-payments. In addition, adoption in Italy might be greater with an increase in the digital culture, especially for women and

South residents.

Finally, some recent works (Ardizzi, Nobili, and Rocco, 2020, Ardizzi et al., 2021), based on macro data from clearing and processing systems, show an acceleration of digital payments in Italy, suggesting possible changes in consumer payment habits. Therefore, possible future developments include the analysis of payment diaries in the post-pandemic period, so further evidence can be provided following this disruptive event.

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