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**Working Paper**

## Consumer payment preferences in the euro area

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## **Abstract**

Payments are a key focus of central banks, as - together with the safe, efficient operation of the payments market – wide access to cash is fundamentally important for a healthy economy. In this study, three main research areas were investigated: 1. socioeconomic characteristics that can be associated with financial inclusion; 2. factors behind consumers’ payment choices; 3. underlying factors for holding cash in a wallet (i.e. for transactional purposes). Regression results for the first research question confirmed the findings of international literature, i.e. mainly older age, lower income and lower educational level is associated with the lack of access to electronic payment options. The study pursues various approaches to investigate consumer payments choices, and the results from most models showed that those with higher level of income and education, or lower level of cash income are more likely to prefer and actually use electronic payment methods. Finally, concerning the holding of cash the initial expectations were confirmed i.e. those who do not use cash for daily transactions tend to keep less cash in their wallet, while those who indicated preference for cash payments or higher importance of cash payment option are more likely to keep higher cash amounts.

JEL classification: D11, D12, E42, J33

Keywords: payments, cash, financial inclusion

## NON-TECHNICAL SUMMARY

Payments are an essential part of our daily lives and affect everyone. In order to obtain goods and services, every day we choose between the available payment methods, taking into account numerous factors such as individual habits, costs, convenience, safety and speed. The choice is also influenced by merchants in various ways, e.g. by limiting the scope of accepted payment methods or by setting transaction value thresholds for acquiring. With the rising level of digitalization in recent decades, payment options are continuously expanding. New solutions emerge on the market, and more and more often these are provided by fintech or bigtech companies rather than by incumbent service providers. However, cash is still the most frequently used mean of payment in most European countries.

Payments are also a focal point for the European Central Bank's (ECB) and National Central Banks' (NCB) work, as – together with the safe, efficient operation of the payments market – wide access to cash is a fundamental factor for a healthy economy. In addition, it is also important that consumers be able to carry out payments in a convenient manner, preferably by choosing from several alternatives. Effective payments markets can also contribute to the functioning of the economy as a whole, since safe, reliable and convenient means of payments can support household consumption which is a significant part in most country's GDP. Central banks, including the ECB regularly monitor consumer payment habits with surveys, in order to be able to identify obstacles which may hinder the smooth functioning of the payments market and future innovation. In 2016, the ECB conducted a survey on the use of cash by households (SUCH) in the euro area (Esselink and Hernández, 2017), which was followed by a study on the payment attitudes of consumers in the euro area (SPACE) in 2019 (ECB, 2020b) with an even wider scope.

This study focuses on three main research questions:

1. Which socioeconomic characteristics can be associated with the lack of access to electronic payment options?
2. What are the underlying factors which have a significant relationship with consumers' choices between different payment methods?
3. What are the underlying factors for holding cash in a wallet (i.e. for transactional purposes)?

Regression results for the first research question confirmed the findings of the international literature, i.e. it is mainly older age, lower income and lower educational level that is associated with the lack of access to electronic payment options. The internet usage variable showed that there is strong correlation between digital literacy and the use of electronic payment methods. In addition, although the cause-effect chain cannot be revealed in

a completely unequivocal manner due to the lack of data, those who receive their income in cash are also more likely to be unbanked.

Following various approaches to investigate consumer payments choices, regression results in most models showed that income level, ratio of cash income and educational level play the most important role: those with higher level of income and education, or a lower level of cash income are more likely to prefer and actually use electronic payment methods.

Finally, the results on the holding of cash confirmed the initial expectation that people who do not use cash for daily transactions tend to keep less cash in their wallet, while those respondents who indicated preference for cash payments or higher importance of the cash payment option are more likely to hold higher cash amounts.

## 1. INTRODUCTION

Payments are an essential part of our daily lives and affect everyone. In order to obtain goods and services, every day we choose between the available payment methods, taking into account numerous factors such as individual habits, costs, convenience, safety and speed. The choice is also influenced by merchants in various ways, e.g. by limiting the scope of accepted payment methods or setting transaction value thresholds for acquiring. With the rising level of digitalization in recent decades, payment options are continuously expanding. New solutions emerge on the market, and more and more often these are provided by fintech or bigtech companies rather than by incumbent service providers. However, cash is still the most frequently used mean of payment in most European countries.

Payments are also a focal point for the European Central Bank (ECB) and National Central Banks (NCB), as – together with the safe, efficient operation of the payments market – wide access to cash is a fundamental factor for a healthy economy. In addition, it is important that consumers be able to carry out payments in a convenient manner, preferably by choosing from several alternatives. Effective payments markets also contribute to the functioning of the economy as a whole, since safe, reliable and convenient means of payments support household consumption, which is a significant part in most country's GDP.

In the past decade, the number of available payment options increased massively: cards are accepted by a continuously growing merchant network including online retailers; credit transfers are easier to initiate with new mobile applications, and with the introduction of instant payments they are expected to be used much more frequently and in almost all payment situations; many fintech companies offer solutions, often on the basis of electronic-money (i.e. using prepaid cards or closed-loop systems where users can top-up their account balances). This growing number of alternatives (and their soaring usage) is clearly favourable from the point of view of many consumers, as the increased competition facilitates innovation and results in more convenient and faster payments. However, this process also has its drawbacks: certain population groups, such as the digitally less educated or those who are not able to afford these new electronic solutions or devices, may be excluded from such options for daily payments. Moreover, in certain countries or merchant categories, retailers accept cash payments less and less, which may also result in severe difficulties for people who are less capable of using electronic alternatives or simply prefer cash usage. Central banks, including the ECB regularly monitor consumer payment habits with surveys, in order to be able to identify obstacles which may hinder the smooth functioning of the payments market and future innovation. In 2016, the ECB conducted a survey on the use of cash by households (SUCH) in the euro area (Esselink and Hernández, 2017), which was followed by a study on the payment attitudes of consumers in the euro area (SPACE) in 2019 (ECB, 2020b) with an even wider scope.

The goal of this study is to provide a deeper insight into key policy questions which are in the focus of central banks' work with the use of SPACE data. The main research questions are:

1. What are the specificities of the unbanked or “cash-only” population? What socioeconomic characteristics can be associated with the lack of access to electronic payment options? – This can help more effectively target the future policy measures concerning financial inclusion.
2. What are the underlying factors which have a significant relationship with consumers’ choices between different payment methods? – This can help identify areas where consumers would like to use or gain access to a certain payment method, but for various reasons this is not realised and which may also require further policy steps.
3. What are the underlying factors for holding cash in a wallet (i.e. for transactional purposes)? – This can provide a better understanding for both central banks and market stakeholders in terms of consumers’ motivations for cash holding and usage for transactional purposes. This can also be useful for the design of future central bank digital currency (CBDC) solutions such as the digital euro (for instance, for setting holding limits if needed).

The structure of the study is the following: after providing an overview of the relevant research literature in the second section, the data and econometric methods used are introduced in the third part. The fourth section presents the results in relation to the initial research questions. First, the specificities of the unbanked or “cash-only” population are examined as the main target group for financial inclusion policy measures. Second, we try to identify the key underlying factors for differences in consumers’ preference regarding payment methods. Third, the socioeconomic factors associated with holding cash for transactional purposes are investigated. The final, fifth section of the study presents the conclusions and discusses the possible use of the results for public policy work and future research directions. The primary purpose is to provide general results for the entire euro area, disregarding the differences between the individual euro area countries which were covered in the survey<sup>1</sup>.

The research questions and the results may be relevant for central bankers and other regulators, as they can serve as a starting point for evidence-based policies and decision makings, but may also be of interest for market participants who would like to better understand consumers’ payment behaviour. However, it should be pointed out that since the SPACE survey was carried out in 2019, the effect of COVID19 pandemic on payment habits was not investigated. Finally, the results can also be used in the process of investigating the possible introduction of CBDC, as these projects are often motivated by issues identified in the payments market (for example, limited access to cash or an overly high ratio of unbanked population).

<sup>1</sup> Since the Deutsche Bundesbank and De Nederlandsche Bank carried out their own consumer surveys separately from SPACE, German and Dutch data are not covered in the paper.

## 2. LITERATURE OVERVIEW

The relevant literature can be categorised under three main questions: who (i.e. which population groups) has access to electronic payments; what are the preferences between the payment choices; why consumers choose a certain payment option, i.e. which factors can certain payment options be associated with.

As for the first question, international organisations (e.g. BIS CPMI, 2020; World Bank, 2014) frequently highlight the importance of financial inclusion, in respect of which increasing the share of persons with a payment account or card (the “banked” population) is also a key area. This is also one of the drivers of future payment innovations as in the case of CBDC (ECB, 2020a). For the sake of research, the possession of a bank account or payment card can be considered as a good proxy for financial inclusion. In its comprehensive study covering data from 123 countries Allen et al. (2012) found that the consumers’ financial situation is a key factor associated with being unbanked, since most people in the group without a bank account responded that they either have too little money to keep it in a bank, or they cannot afford to pay the bank fees. Regression models in studies (e.g. Ampudia – Ehrmann, 2017; Bergman et al., 2007; Fondeville et al., 2010; Goczek – Witkowski, 2015) found, that age (older persons tend to have less access to a bank account or card), economic activity (unemployed persons are more likely to be unbanked), income (with higher income it is more likely to have an account or card), and the level of education (i.e. persons with lower education tend to be unbanked with a higher probability) are the most important underlying sociodemographic factors associated with a higher probability of being in the cash-only population. However, there may also be country-specific factors which can provide somewhat different results in certain aspects, as shown by the study of Fungacova – Weill (2015) for instance, whose analysis of Chinese data found that being an older person is associated with a stronger use of accounts.

Concerning the second question, i.e. what payment methods are used, several studies intend to identify consumer preferences, i.e. what means of payments consumers use the most frequently. As Ilyés-Varga (2015) presented in their study of Hungarian consumer payment habits, in line with the growth in income, the intensity of using electronic payment methods also increases. However, their cluster analysis revealed that one quarter of persons with higher income still prefer to use cash as a primary means of payment. Research on Spanish data (Banco de Espana, 2020) showed that especially the youngest and oldest age-groups reported cash as the most usual means of payment. A survey on German consumers (Deutsche Bundesbank, 2015) suggests that while cash is still very dominant in terms of the number of transactions, its usage declines in line with the increase in the amount of the transaction. Concerning age, while in the oldest age group the preference for cash is still the strongest, descriptive statistics for German data show somewhat different trends compared to the above-mentioned Spanish ones: among the youngest respondents cash usage declined significantly. Results of Australian surveys (Doyle et al., 2017; Caddy et al., 2020) provided evidence for a much steeper decline in cash use than in most countries in Europe: in less than a decade the share of cash transactions fell to 27 per cent in 2019, from 62 per cent 2010.



Underlying factors behind consumers' preferences, i.e. why consumers choose the payment methods in the different situations are also a focus of research activity. Huynh et al. (2014) and Arango et al. (2015) came to similar conclusions after examining datasets from Austria and Canada, i.e. the level of development of the card acceptance network is a key factor. If consumers cannot be certain that they will be able to pay with their cards, they hold a higher amount of cash for precautionary reasons. Hence, an increased level of card acceptance is expected to bring lower usage and demand for cash. Descriptive data from the Australian survey (Caddy et al., 2020) also confirm this conclusion.

An analysis of Dutch data (Crujisen et al., 2017) showed that there can be differences between the consumers' preferred payment option and how they actually pay. The results of regression models pointed to the fact, that the payment habits strongly influence the actual payment method, i.e. even those who otherwise indicated a preference for card payment, quite frequently use cash simply because they are used to it. This study was further elaborated by Crujisen – van der Horst (2019), who focused mainly on the psychological background of the payers and also found that the initial intention of the use of a payment method and the consumer habits of using one method are key factors. In addition – similarly to other studies – the analysis showed a positive relationship between the use of electronic payment methods, and income and educational level (i.e. those with higher education and income tend to prefer electronic payments). Górká (2012) also explains as the key factor for the dominance of cash in the Polish payments market, that both consumers and merchants have a strong emotional attitude towards it. Regarding qualitative characteristics such as convenience or safety, cash has a much better perception among consumers than cards.

Analysis of US survey data (Koulayev et al., 2016) suggests that there is a significant difference between the use of credit and debit cards (the former are preferred to a greater extent by high-income, highly educated persons). In addition, no evidence was found regarding that older persons would prefer cash over card payments, however, this may be biased by the use of cheques, which is the most frequently used payment instrument in this age-group, and which is rather typical to the US market. Using three years of transactions data from a large US merchant (Wang – Wolman, 2016), results showed on the one hand that (in accordance with the above-mentioned German study, for instance) cash usage declines with the increase in the value of transaction. One additional feature of this study is that it also examines weekly and monthly changes in payment habits. Consumers' financial position changes constantly as they receive their salaries, pay their bills, etc. For certain groups of the population these larger financial in- and outflows may also have a significant effect on payment and consumer choices: as the cash reserves decrease, some people delay the additional transactions, while others tend to switch the use of cards. The results of SUCH (Esselink and Hernández, 2017) also point to the fact that the amount of cash held for transactional purposes may have a significant relationship with payments behaviour (in addition to other factors such as perceived card acceptance, etc.).

### 3. DATA AND METHODOLOGY

For the analysis, the datasets of the SPACE survey<sup>2</sup> were used. In the case of SPACE, the sample was smaller than the previous SUCH survey, with 41,155 respondents and 119,053 transactions (compared to 65,281 respondents and 128,677 transactions in SUCH), but with a larger share of telephone (CATI) interviews to exploit more the advantages of mixed-mode surveys (see for instance de Leeuw, 2004). The surveys were conducted in 17 euro area countries. The central banks of Germany and the Netherlands carried out their own surveys, and hence the data for these two countries are not included in our analysis. The SPACE sample was designed in a way to ensure representativeness of the population for gender, age, education and region. In addition, as payment behaviour may be different in terms of the days of the week, quotas were also defined on the day of the transactions, which helped to achieve representativeness for each day of the week. The main difference between SUCH and SPACE was the extension of the scope in the case of SPACE i.e. besides point-of-sale transactions, separate modules were added to cover online (remote) and bill (recurring) payments as well. Therefore, with SPACE data we can have a more comprehensive overview of consumer payment habits. More detailed information on the two survey methodologies is available in Esselink and Hernández (2017) and the ECB (2020b).

SPACE data were used in two forms i.e. for certain models the so-called “wide” format was used, in which the records of the dataset consist of an individual respondent’s data, while other models were built on the “long” format, where the rows of the dataset are payment transactions instead of respondents. With this approach, the research question on consumers’ payment method preference was investigated from two directions, providing a higher level of robustness for the results.

In order to gain a deeper insight into consumer payment habits, regression models were built to identify the relationship between certain variables. For our purposes and research questions, logistic regression seemed to be the most applicable in most cases, i.e. we used binary dependent variables to estimate the relationships with explanatory variables. However, since in the case of cash holdings in the wallet a numeric variable was used as a dependent variable, the application of linear regression seemed to be a better choice.

In the case of models using the “long” transactional dataset (see Table 5 in section 4.2.), selection bias may occur, i.e. in these models only those transactions were considered where the payer had a card, and the merchant accepted both card and cash. However, the possession of cards or card acceptance on the retailer side may not occur randomly, as evidence is also presented in Table 2, section 4.1. In other words, individuals with higher income may have a higher probability of having a card, and hence their transactions will also be included in the

<sup>2</sup> Data are available here: [https://www.ecb.europa.eu/stats/ecb\\_surveys/space/html/index.en.html](https://www.ecb.europa.eu/stats/ecb_surveys/space/html/index.en.html)

filtered transactional dataset with a higher probability. As this may distort our results, the Heckman selection method (Heckman 1976, 1979) was used to control for this bias.

## 4. RESULTS

As described above, we grouped our research activity around three main questions: 1) the characteristics of the “unbanked” population; 2) consumers’ choices between payment methods; and 3) the characteristics of holding cash reserves. In this section we follow this structure when presenting the main results.

### 4.1. Main characteristics of the unbanked population

The comprehensive studies on the SUCH and SPACE surveys (Esselink and Hernández, 2017; ECB, 2020b), present several tables and charts on the different breakdowns and distributions of consumers by certain features. On this basis, some main patterns can already be identified. However, different variables may be interrelated: for instance according to SPACE results there is a slightly higher ratio of women who only have access to cash, but this may be influenced by the difference in the age or education structure among men and women. To handle this issue, we used regression analysis to better understand the relationship between having access to cash only and other variables.

In SPACE monthly household income data were collected by categories as presented in Table 1, which shows that 30 percent of respondents were in the two categories between EUR 1,000 and 2,000. In the analysis, we followed two approaches to include income data into our models. First, we converted our categorical variable into numeric: we created a new variable by assigning random numbers to the respondents within the given income categories, hence this way we had concrete income data, but remained consistent with our original categories, as well. Then, since the initial data were reflected the households’ income and not that of the individual persons’, the income data were divided with the square root of the household size, following amongst others the OECD (2020) methodology to obtain personal level income data. Finally, we had to deal with cross-country differences in the income level, for this we “de-meanned” the data, i.e. divided the income data with the mean income of respondents in the given country. Hence, the final income data showed whether the respondent’s income is below or above the average of respondents’ income in the given country. In this way we were able to mitigate the bias stemming from the fact that for instance a monthly income of EUR 2,000 does not have the same purchasing power across countries. In our second approach we included our original categorical income variables in the models together with the household size and the respondent’s country variables to handle the above-mentioned issues. As both approaches provided basically the same results, but the first one is much easier to interpret, we present in our tables only the results with the continuous income variable (i.e. the first approach).

**Table 1**

**Distribution of respondents by income\* categories**

Income category	Ratio of respondents (%)
EUR 500 or less	4.53
Between EUR 501 and EUR 750	5.07
Between EUR 751 and EUR 1,000	7.54
Between EUR 1,001 and EUR 1,500	15.38
Between EUR 1,501 and EUR 2,000	15.16
Between EUR 2,001 and EUR 2,500	12.44
Between EUR 2,501 and EUR 3,000	11.38
Between EUR 3,001 and EUR 4,000	13.82
Between EUR 4,001 and EUR 6,000	10.80
More than EUR 6,000	3.88
Total	100

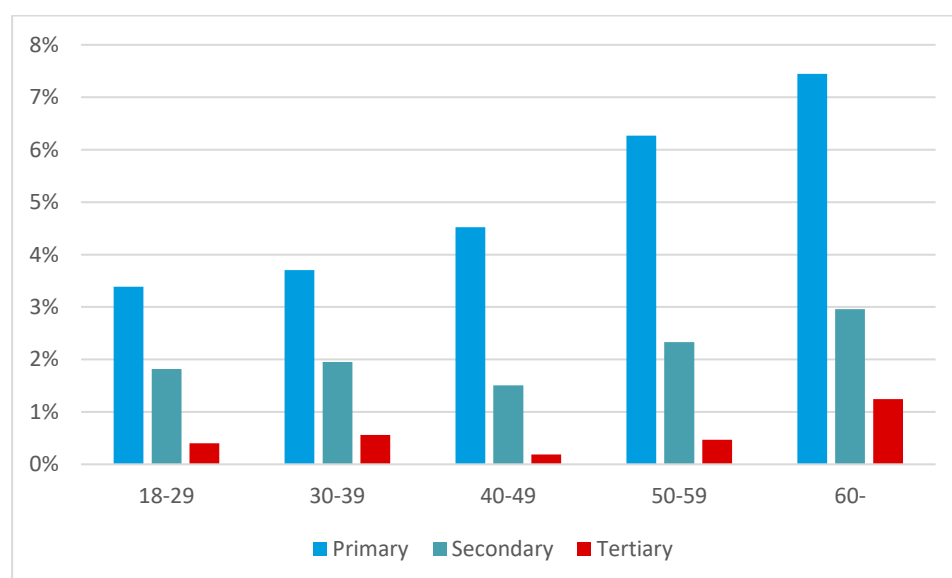
\* Household net monthly income

Source: SPACE survey data, author’s calculation

According to the SPACE study (ECB, 2020b, pp. 64), 94 per cent of the European population has at least a payment card (debit or credit), while the ratio of those without access to any payment options other than cash is below 2 per cent. The descriptive data (Chart 1) suggest that older and less educated persons are somewhat overrepresented in the “cash-only” population.

**Chart 1**

**Ratio of “unbanked” population by age category and level of education**



Source: SPACE survey data, author’s calculation

To obtain a deeper insight on this, we estimated logistic regression models with binary dependent variables. Since in SPACE there was no specific question on the possession of a bank account, we used the responses to the following question: “QQ\_a1. Which of the following payment methods do you currently have access to?” (for the response options see ECB, 2020b). Based on this we examined two models:

- Model 1: the dependent variable is 0 if somebody does not possess a debit or a credit card and 1 if the respondent has either one, since this can be a good proxy for measuring the “cash-only” population;
- Model 2: the dependent variable is 0 if somebody has no access to any other payment options beyond cash, and 1 if the respondent has access to at least one of the non-cash options.

For our models we used the following explanatory variables (see descriptive statistics in the Annex):

- Gender of the respondents: 1 if male, 2 if female.
- Age: We used age categories (18-29, 30-39, 40-49, 50-59, 60-) in order to better capture the relationship between the probability of being unbanked and the respondent’s age, since the ratio of respondents possessing a card is not linear with age (see chart in Annex). We also tried to use age-squared variable, but this did not prove to be better for our models.
- Type of residence: This is a binary variable showing whether the respondent lived in a rural (value 1) or an urban (value 2) area.
- Level of education: We used a three-level scale for the highest level of education: 1. primary (primary/lower secondary education), 2. secondary (upper/post-secondary education), 3. tertiary (University/PhD.).
- Economic activity: Five categories were included here on the basis of the economic activity of the respondent: 1: self-employed, 2: employed, 3: stays at home or a student, 4: unemployed, 5: retired.
- Income: As described above, we converted the categories into numerical values. In order to obtain a close-to-normal distribution, we used the logarithm of the income (see chart in Annex).
- Internet usage: This variable was included as it can be a good proxy for “digital literacy”, which may be important for those who prefer cashless payments. It was measured on a three-level scale i.e. whether the respondent used internet in the last three months 1. every day, 2. weekly, 3. monthly or less often.
- Income in cash: How much of the respondent’s income was received in cash was also measured with three categories: 1. none, 2. half or less, 3. more than half.

**Table 2****Results of logistic regressions (odds ratios) on financial inclusion**

	<b>Model 1</b> (0=no card, 1=has card)	<b>Model 2</b> (0=no access at all, 1=has access)
<b>Gender (male=1)</b>	0.95	1.07
<b>Age (18-29 years=1)</b>		
30-39 years	0.83	0.53
40-49 years	0.80	0.37
50-59 years	0.66	0.30
60 years and above	0.62	0.36
<b>Type of residence (rural=1)</b>	1.01	1.04
<b>Level of education (primary=1)</b>		
secondary	1.30	1.10
tertiary	1.86	2.03
<b>Economic activity (self-employed=1)</b>		
employed	1.21	1.13
stays at home or a student	0.50	0.26
unemployed	0.73	0.28
retired	0.97	0.74
<b>Income (logarithm)</b>	1.49	1.47
<b>Internet usage (daily=1)</b>		
weekly	0.73	0.83
monthly or less frequent	0.28	0.23
<b>Income in cash (none=1)</b>		
half or less	0.90	1.22
more than half	0.31	0.18
<b>Constant</b>	30.45	344.38
<b>N (unweighted)</b>	35,558	35,558

Source: SPACE survey data, author's calculation

As can be seen from the regression outputs in Table 2, the main results are almost identical in both models. However, while in the case of Model 1 we could consider 3165 respondents without a card, for Model 2 the (unweighted) number of respondents without access to any means of payments besides cash is much lower, at only 802 cases. In the table the odds ratios should be interpreted in a way that no effect can be identified if the odds ratio is 1, a negative relationship occurs when it is between 0 and 1, while it indicates a positive relationship when it is more than 1.

Our results are in line with our previous assumptions on the basis of descriptive data and the relevant literature (Ampudia – Ehrmann, 2017; Bergman et al., 2007; Fondeville et al., 2010; Goczek – Witkowski, 2015): older (especially when considering card possession) and less educated people are unbanked with a higher probability. We can also see a positive relationship with income i.e. the higher income the respondent has the less likely it is that

she/he is unbanked. Internet usage seems to be a good proxy for measuring digital literacy: those who use internet only on a weekly or monthly basis are less likely to be banked (i.e. having a card or access to electronic payment solutions). The ratio of income in cash was also a significant explanatory variable showing that if the ratio of income in cash is more than 50 per cent, the respondent is much more likely to be unbanked. The results concerning economic activity show that the self-employed and employees are the ones who tend to possess cards or have access to non-cash payment options with the highest probability. However, as could be expected there is a higher probability of the respondent being unbanked among unemployed persons, and even more among students and those who stay at home. Controlling for other characteristics no clear differences were seen between male and female respondents, and the results of the two models are controversial in this respect.

#### **4.2. Consumer preferences on payment methods**

In our second research question we focus on consumers' choices between payment methods which may help to identify certain key points for policy makers to address when setting strategic goals for the development of retail payments or access to cash. In this part, the goal is to gain a better understanding of the relationship between the respondents' socioeconomic characteristics and their choices leading to intensive use of cash or electronic payment methods. We also tried to provide insights into the possible factors that influence consumer choices. As this is a rather complex topic, we conducted our analysis with three approaches.

First, we used the question included in the SPACE survey specifically on this topic i.e. 'If you were offered various payment methods in a shop, what would be your preference?'. Respondents had three options for this: 1 cash (almost 22 per cent of respondents), 2 card or other cashless payment (55%), 3 no clear preference (24%)<sup>3</sup>.

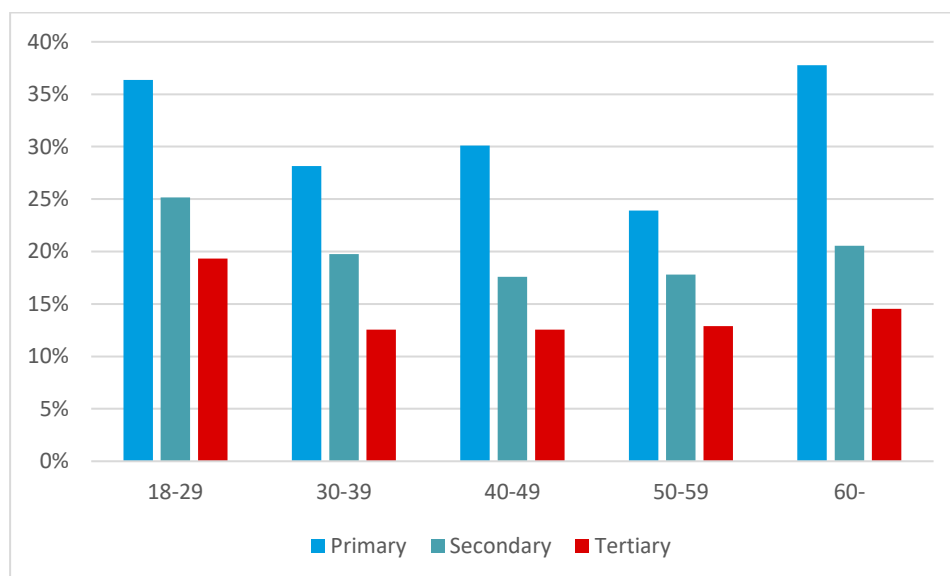
Based on descriptive data (ECB, 2020b, Chart 44 and 45, pp. 60) and the relevant literature, the initial expectations would be that older persons and those with a higher level of education are more likely to prefer card usage. Nevertheless, if we create a cross-chart with these two variables, we can see that the picture may be more complex, since the cash preference of the oldest age group only slightly exceeds that found among young respondents and can be attributed especially to persons with primary education.

<sup>3</sup> The data differ slightly from those presented on page 57 of the SPACE study (ECB, 2020b), as our dataset does not include data from DE and NL.



**Chart 2**

**Ratio of respondents preferring cash by age category and level of education**



Source: SPACE survey data, author's calculation

We built logistic regression models again, considering only those respondents who have a clear preference (cash or card), hence the dependent variable is 0 if the respondent prefers to pay with card and 1 if cash is preferred. As for the explanatory variables, for the basic model ("Model 1") we used the same ones (i.e. gender, age, type of residence, level of education, economic activity, income, internet usage, income in cash) already introduced in the previous section, while in Model 2 cash in wallet was also included as an additional independent variable. The distribution of respondents by the categories of cash in wallet used for the regression is presented in Table 3.

**Table 3**

**Distribution of respondents by the amount of cash in wallet at the beginning of the day**

Amount of cash in wallet at the beginning of the day (EUR)	Ratio of respondents (%)
0	4.7
1-49	54.5
50-99	23.0
100-249	13.6
250-	4.2
Total	100

Source: SPACE survey data

Note: the data exclude DE and NL and respondents answering "Don't know"

In order to handle differences by countries (i.e. since the same amount of money may have different purchasing power across countries, and therefore respondents from different countries may keep different amount of cash in their wallets) we “de-meant” the data on the cash amount kept in the respondents’ wallet as well, similarly to the method applied in the case of incomes. Also, to normalise our data, the logarithm of the amounts of cash in wallet was built in the model.

**Table 4**

**Results of logistic regressions (odds ratios) on consumers’ preferred payment methods**

	Model 1 (0=prefers card, 1=prefers cash)	Model 2 (0=prefers card, 1=prefers cash)
Gender (male=1)	0.86	0.91
Age (18-29 years=1)		
30-39 years	0.88	0.81
40-49 years	0.92	0.79
50-59 years	0.86	0.72
60 years and above	1.00	0.79
Type of residence (rural=1)	1.06	1.07
Level of education (primary=1)		
secondary	0.74	0.71
tertiary	0.55	0.54
Economic activity (self-employed=1)		
employed	0.58	0.64
stays at home or a student	1.11	1.21
unemployed	0.87	0.97
retired	0.54	0.58
Income (logarithm)	0.71	0.68
Internet usage (daily=1)		
weekly	1.48	1.50
monthly or less frequent	3.42	3.67
Income in cash (none=1)		
half or less	1.75	1.59
more than half	4.75	4.56
Cash in wallet (logarithm)		1.34
Constant	0.51	0.69
N (unweighted)	28,007	26,422

Notes Odds ratios are presented in the tables. All variables became significant on a 95% confidence level.

Source: SPACE survey data, author’s calculation

The results clearly confirm the initial expectations based on descriptive data concerning the level of education, i.e. respondents with a university degree are more likely to prefer card usage. Concerning age-effects, in both models we can see the same picture presented in Chart 2: the oldest age-groups tend to exhibit the highest card preference. Income seems important from two perspectives: a negative relationship with cash usage is observed, i.e. the higher the income the less likely the respondent prefers cash. The effect of income in cash is even higher i.e. the larger part of income is received in cash, the stronger the cash preference is. Unfortunately, in the absence of further questions on this topic, it is hard to reveal the exact chain of cause and causation: some may prefer cash payments, and therefore they expect their employer to provide their income in cash; on the other hand, it can also be envisaged, that the employer prefers to pay salaries in cash (e.g. because the revenues are also in cash, or maybe even because of tax evasion), and hence the employee (respondent) is “forced” to use cash to spend his/her income. Regarding economic activity, we can see that employed people tend to show lower cash preference. In addition, the results for retired people also suggest that they rather prefer cards. One possible explanation for this, is that in some countries people may retire in late middle ages in certain jobs (e.g. police) and this might bias our results. Furthermore, one quarter of respondents in the oldest age-group was not retired.

In Model 2 we can capture a clear positive relationship between the amount of cash in wallet and the preference for using cash for payments. In other words, a preference for cash payments is associated with carrying more cash around, but the causal direction is unclear. We did not exclude from our model those who reported no cash in their wallet at all, since our variable only refers to the beginning of the day, and they may withdraw additional amounts during the course of the day. It is also important, that the results here should be interpreted carefully, since from our questions the cause-effect chain is not straightforward: some people may pay by card because they do not have enough money in cash, while some intentionally do not keep large amounts of cash with themselves, because they prefer to use their cards. As presented in the literature review part, certain studies (Huynh et al., 2014, Arango et al., 2015) show that one of the reasons for keeping a higher amount of cash in wallet and using it more frequently is the underdeveloped card acceptance network.

As a second approach the “long” format dataset was used, in which the records are payment transactions and not respondents. With this approach, additional explanatory variables can be incorporated into our models, such as the value or the place of the transaction. For transaction values the same de-meaning method was applied as presented before in the case of income and cash in wallet, and the logarithms were also considered.

Logistic regressions were built similarly to the previous models, and our binary dependent variable referred to the used method of payment: 0 if the transaction was done by (debit or credit) card, 1 if it was done with cash. Although there are some other payment options which were recorded by respondents in point-of-sale (POS) situations, but due to the low case numbers the inclusion of these does not change the results. The results of a model, in which an other binary variable is used as a dependent variable (i.e. 0=all types of electronic payment

methods, not only cards, 1= cash or cheques) would basically be the same as Model 1 below, and therefore we do not present it separately. Hence, for the sake of easier interpretation we present here only the results of those models where only cash and card payments were considered.

It is also important to see, that the means of payment used is not solely the decision of the payer, but also the payee (i.e. not all types of payment methods are accepted in the different payment situations). To focus specifically on consumers' payment choices (i.e. the preference of the payer side), we used additional questions in the SPACE questionnaire to filter the transactions. In the case of POS payments, it was asked from respondents whether the other option (i.e. in the case of cash payments card, and vice versa) was accepted. Therefore, we considered only those transactions:

- which were carried out in POS situations;
- in which both cards and cash were accepted (i.e. from the payee side it was actually possible to use both);
- in relation to which the payer (respondent) reported the possession of a card (i.e. from the payer side it was actually possible to use both).

Since selection bias may occur for card possession (i.e. there may be structural differences between the groups having and not having cards) and card acceptance (i.e. differences between card acquiring and "cash-only" merchants), the Heckman correction method was applied as described in the section on methodology. A technical dummy variable was created dividing POS transactions into two groups: transactions in which the payer had a card and the merchant accepted both cash and card had a value of 1, while in the case of every other transaction the value was 0. This dummy variable was used to build logistic regression in the first step (i.e. whether the transaction will be included in our final model or filtered out) and on the basis of this lambda values were created for the Heckman correction.

Finally, we had to consider that in the transactional "long" dataset, those respondents who reported more transactions will occur several times, basically having a larger weight. Although the number of respondents with several transactions was relatively low (almost one third of the respondents recorded only one transaction, while two thirds of them recorded a maximum of three), to check the robustness of the results we estimated a model (Model 2), in which we filtered for only the first transactions of each respondent, so each respondent occurred only once. An other model (Model 3) was also built in which a random sample of each respondents' transactions was used (i.e. only one transaction was included from a respondent, but in contrast to Model 2, not necessarily the first one).

**Table 5**

**Results of logistic regressions (odds ratios) on consumers' preferred payment methods using transaction data**

	<b>Model 1</b> (0=card, 1=cash)	<b>Model 2</b> (0=card, 1=cash)	<b>Model 3</b> (0=card, 1=cash)
<b>Gender (male=1)</b>	0.98	1.02	1.04
<b>Age (18-29 years=1)</b>			
30-39 years	1.04	0.97	1.00
40-49 years	1.02	1.01	1.11
50-59 years	1.03	1.07	1.21
60 years and above	1.24	1.22	1.28
<b>Type of residence (rural=1)</b>	1.30	1.32	1.42
<b>Level of education (primary=1)</b>			
secondary	0.76	0.78	0.82
tertiary	0.60	0.65	0.71
<b>Economic activity (self-employed=1)</b>			
employed	0.70	0.74	0.90
stays at home or a student	0.82	0.79	1.13
unemployed	1.11	1.05	1.15
retired	0.67	0.73	0.88
<b>Income (logarithm)</b>	0.85	0.90	0.92
<b>Internet usage (daily=1)</b>			
weekly	0.91	0.81	0.87
monthly or less frequent	0.75	0.65	0.95
<b>Income in cash (none=1)</b>			
half or less	1.45	1.45	1.59
more than half	1.98	1.49	1.88
<b>Value of the transaction (logarithm)</b>	0.60	0.66	0.65
<b>Place of the transaction (supermarket=1)</b>			
small shops (e.g. bakery)	1.30	1.29	1.48
sellers on the street or market	0.71	0.61	1.34
shops selling durable goods (e.g. clothes)	0.72	0.74	0.96
petrol station	1.10	1.14	1.11
restaurants, hotels, entertainment	1.44	1.09	1.40
vending or ticketing machine	0.22	0.25	0.52
services	0.74	0.54	0.83
other POS	0.82	0.66	1.00
<b>Lambda</b>	3.86	6.07	3.06
<b>Constant</b>	0.81	1.01	0.64
<b>N (unweighted)</b>	41,731	17,483	17,483

Notes Odds ratios are presented in the tables. All variables became significant on a 95% confidence level.

Source: SPACE survey data, author's calculation

The results show that there are no major differences between the three models, which is presumably due to the low number of respondents with several transactions in the diary. Concerning age, the results here confirm our original expectation, as elderly people are more likely to use cash. When comparing the results to the model in Table 4, it should be highlighted that although the research question was quite similar (i.e. consumer preferences), the scope of respondents was different in the models, which explain differences. Also, as previous research (Crujisen et al., 2017; Crujisen – van der Horst, 2019) show, preferences and actual payment habits may differ. Concerning the variable for the type of place of residence, we can observe that those living in urban areas are more likely to use cash. The effects of the variables for education, level of income and the ratio of income in cash were basically the same compared to previous models: those with higher education, higher income and lower cash income tend to prefer card usage. The new variables in these models also have important implications. Cash payments are more likely to preferred for low value payments (in line with the findings of Deutsche Bundesbank, 2015 and Wang – Wolman, 2016), also perhaps because the faster and more convenient contactless payments are not available everywhere. As for the place of payments, small shops and restaurants, hotels have a “cash-heavy” turnover (for them the unit costs of card acquiring may be higher, therefore presumably these merchants are less incentivised to promote card payments).

Finally, as a third approach, we used the question of the SPACE survey ‘How important is it for you to have the option to use cash?’ to better understand respondents’ preferences. Although this does not specifically point to consumer choices, it can still accurately reflect on cash preference. Respondents could answer this question by indicating the importance on a 1-10 scale. Table 6 shows the distribution of responses by this scale.

**Table 6**  
**Distribution of respondents by the importance of having the option to pay with cash**

Importance of cash as a payment option	Ratio of respondents (%)
1	11.46
2	4.17
3	6.41
4	5.56
5	16.61
6	7.79
7	11.01
8	12.05
9	5.11
10	19.84
<b>Total</b>	<b>100</b>

Source: SPACE survey data

Note: the data exclude DE and NL and respondents answering “Don’t know”

We used logistic regressions again on the “wide” dataset (i.e. each respondent is one record) to obtain a better understanding of the importance of cash usage for consumers. To this end, the respondents were divided into two groups to have binary dependent variables: 0 if cash is rather unimportant, and 1 if cash is rather important. Since it is somewhat arbitrary to decide on the basis of this scale who is considered to prefer cash or cashless payment methods, two models were estimated here as well:

- Model 1: if respondents indicated that the importance of cash usage is 5 or less, then they were considered as those for whom cash usage is rather unimportant. Similarly, if they indicated that the importance is 6 or more, then they were categorised as those for whom cash usage is rather important.
- Model 2: those who seemed not to have a clear preference i.e. respondents who indicated the importance 5 or 6 were omitted from the model. Consequently, respondents with 1 to 4 were considered as those for whom cash is rather unimportant, while those with responses 7 to 10 were considered as those for whom cash usage is rather important.

**Table 7**

**Results of logistic regressions (odds ratios) on the importance of cash as a payment option**

	Model 1 (0=cash not important, 1=cash important)	Model 2 (0=cash not important, 1=cash important)
Gender (male=1)	1.02	1.06
Age (18-29 years=1)		
30-39 years	0.91	0.94
40-49 years	0.96	0.96
50-59 years	0.89	0.96
60 years and above	0.92	1.03
Type of residence (rural=1)	0.95	0.91
Level of education (primary=1)		
secondary	0.91	0.82
tertiary	0.77	0.60
Economic activity (self-employed=1)		
employed	0.84	0.85
stays at home or a student	1.17	1.25
unemployed	0.89	1.04
retired	0.77	0.78
Income (logarithm)	0.85	0.76
Internet usage (daily=1)		
weekly	1.33	1.64
monthly or less frequent	1.69	2.30
Income in cash (none=1)		
half or less	1.55	2.16
more than half	2.38	4.00
Constant	1.45	1.76
N (unweighted)	35,499	21,325

Notes Odds ratios are presented in the tables. All variables became significant on a 95% confidence level.

Source: SPACE survey data, author's calculation

The results in general correspond to those of the previous models, cash preference has a negative relationship with educational level and income, and a positive relationship with the ratio of cash income. In other words, these models also show that persons with a higher educational level and income, and a lower share of cash income tend to consider cash payment option as being less important. More digitally literate persons (who use the internet more frequently) also more likely to consider the option of cash usage less important, while in the case of the type of residence no major differences were seen. Concerning the economic activity variable, the importance of the cash payment option is especially important for those who stay at home.



### 4.3. Holding cash for transactional purposes

An additional angle of our analysis on payment habits can be to investigate how much money people keep in their wallet i.e. presumably mainly for transactional purposes. This can also contribute to our results on consumers' choices by assuming that those who keep more money in their wallet are expecting larger cash payments during the day, and hence they are primarily cash users (as presented by Arango et al., 2015; Caddy et al., 2020; Huynh et. al., 2014). However, one minor difference versus our previous analysis on preferred payment methods is that in this case we do not talk about preferences, but rather consumers' expectations about cash usage during the day. This differentiation is notable, since some people may have no other option than using cash because of the lack of availability of other payment methods on the acceptance side. That is to say, some people may prefer to use electronic payments (currently mainly cards), but due to the low coverage of the acquiring network they become frequent cash users – and keep higher amounts of cash in their wallet for daily spending.

To obtain a clearer picture of this, one of the payment diary questions in SPACE was used: 'QA\_1. How much cash did you have – e.g. in your wallet, purse or pockets – at the beginning of the day?'. Although respondents may obtain additional cash during the course of the day from different sources (mainly from ATMs), on one hand it may be used for savings purposes, on the other hand we assumed that this does not bias our results due to the high number of records. Hence, we disregard this.

Since this involved a numeric variable (the amount of euro in the wallet), we estimated linear regression, using the logarithm of the de-measured value of cash as a dependent variable. In general, the same explanatory variables were applied that were already used in other models. As a small difference, in this case five-levels of categories were created to measure the perceived importance of cash usage (similar to ECB, 2020b, Chart 46, pp. 61). We also included the variable on the consumers' preferred means of payment, and a variable on the ratio of the value of cash payments in the total value of payments at POS to capture payment habits.

**Table 8****Results of linear regression on cash for transactional purposes (cash in wallet)**

	Amount of cash in the wallet (log)
Gender (male=1)	-0.14
Age (18-29 years=1)	
30-39 years	0.15
40-49 years	0.24
50-59 years	0.41
60 years and above	0.52
Type of residence (rural=1)	-0.08
Level of education (primary=1)	
secondary	0.09
tertiary	0.08
Economic activity (self-employed=1)	
employed	-0.23
stays at home or a student	-0.31
unemployed	-0.30
retired	-0.14
Income (logarithm)	0.13
Income in cash (none=1)	
half or less	0.17
more than half	0.11
Ratio of the value of cash payments in the total value of payments at POS (0%=1)	
0-49%	0.39
50%-99%	0.68
100%	0.38
Preferred payment method (cash=1)	
card	-0.16
no preference	-0.11
Importance of cash payment option (not important at all=1)	
not important	0.10
neutral	0.16
important	0.29
very important	0.33
Constant	-1.16
N (unweighted)	24,392
R2	0.1057

Notes: All coefficient's standard error is 0.00. All variables became significant on a 95% confidence level. The data excludes DE, NL and the countries with 3 days diary (MT and CY)

Source: SPACE survey data, author's calculation

Concerning the demographic variables, we see a moderate effect of the gender variable i.e. female respondents tend to have less cash in the wallet, while a clear positive relationship with age was found: older people are more likely to keep more cash with themselves for daily purposes<sup>4</sup>. As for economic activity, self-employed respondents keep the highest amount of cash, while the effect of other categories' seems almost equal. Higher income<sup>5</sup>, and income in cash exhibits a positive relationship with our dependent variable i.e. those respondents with higher salaries and a higher ratio of cash in their income tend to keep more money in their wallets. The results for the ratio of value of cash payments within the total value of payments at POS also confirms that the cash in wallet is used for daily transactional purposes: compared to those who do not use cash at all at the POS, all other categories keep more cash. The same applies to consumers' preference, i.e. as expected, those who prefer cash payments keep more cash in their wallets. Finally, it can also be seen that as expected, the higher the level of perceived importance of the cash usage option, the more cash is kept in the wallet.

Nevertheless, it may be worth to emphasising again that although the results show clear tendencies, we have an ambiguous picture of the underlying causes. From our models it is hard to reveal whether those people who hold more cash simply prefer cash usage as a convenient and fast way of payment, or they are "forced" to use cash, either because they receive their income in this manner or because of the underdevelopment of (card) acquiring network (i.e. the lack of places where there are other options provided to pay).

<sup>4</sup> Since the logarithm of cash amount was used as the dependent variable, the interpretation of results for instance for the oldest age-group: We consider  $(\exp(0.53)-1)*100=70$ , which means that compared to our reference group (age 18-28) elderly people above the age of 60 tend to have more cash by 70 per cent.

<sup>5</sup> Since the logarithm of income was used, we can interpret the results for this variable corresponding to log-log case: a one percent increase in income will result in a 0.14 percent increase in the amount of money in our wallet. We can also say that a higher income by 100 euro means a higher amount of cash in the wallet by 14 euro.

## 5. CONCLUSIONS

In this study we tried to provide a deeper insight into consumer payment habits and preferences between different payment methods. Since common socio-demographic variables were used, models considering the European population (more precisely the countries covered by SPACE survey) as a whole were estimated.

When focusing on the “cash-only” population, on the one hand the descriptive results of the previous SPACE study (ECB, 2020b) were confirmed by our models, i.e. older persons with lower income and educational level are more likely to be unbanked. The internet usage variable showed that there is strong correlation between digital literacy and the use of electronic payment methods. Thus, financial education should play a crucial role in future policy steps as well. In other words, the complexity of electronic payment solutions (such as mobile wallets) prevents certain groups from using such means of payment. In addition, although the cause-effect chain cannot be revealed in a completely unequivocal manner, those who receive their income in cash are also more likely to be unbanked. This implies that a certain part of the population do not feel the need to have a bank account or card<sup>6</sup>, because they receive their income in cash in any case, and it would be cumbersome to regularly deposit cash into a bank account. Also, if we consider economic activity, we can see that especially the group of unemployed people should be targeted with financial inclusion policy measures.

When trying to understand the underlying factors of consumer payment choices, i.e. why they prefer any payment method, we face a complex challenge. Preference between payment methods may be influenced by the respondent (i.e. individual payment habits, income in cash etc.), the payee (i.e. whether the merchant provides the acceptance of cashless methods), and even by other factors such as the amount to be paid. Therefore, different approaches were followed to investigate this topic, which in certain parts provided somewhat diverging results. As presented in the literature review part, previous studies also came to different conclusions in terms of the role of age. But there were also some common findings from our models, which can be then considered to be even more robust. Income level, the ratio of cash income and educational level were significant in all of the models, which may also mark future policy work as well. Electronic payment solutions should be provided at moderate fee levels, and this may be further facilitated by regulators, see for instance the Payment Accounts Directive<sup>7</sup> which resulted in the provision of accounts with basic features for moderate fees, and also improved the situation concerning fee comparison. Also, the digital euro can be mentioned as a step with an impact in this field, since it is planned to be provided for consumers for free (ECB, 2020a). It could also be considered how to

<sup>6</sup> As It is described at section 4.1 in the case of the regression model on financial inclusion, the SPACE dataset does not contain specific questions on the possession of a bank account or a card, therefore proxies (i.e. “access” to card or other electronic means of payments) were used to identify the unbanked population.

<sup>7</sup> Directive 2014/92/EU of the European Parliament and of the Council of 23 July 2014 on the comparability of fees related to payment accounts, payment account switching and access to payment accounts with basic features

facilitate consumers receiving their income electronically (i.e. to an account at a payment service provider) if they prefer it that way.

Our results on the holding of cash for transactional purposes may also be interesting from the perspective of the digital euro, since it can help to better understand why people hold cash. However, it should be emphasised again that revealing the exact underlying cause and effect chains requires further investigations, as this question is rather complex.

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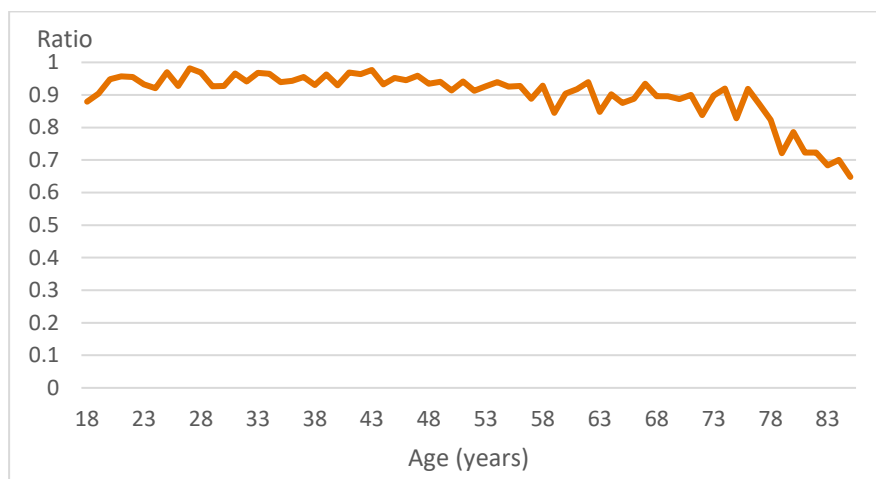
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## ANNEX

Chart 3

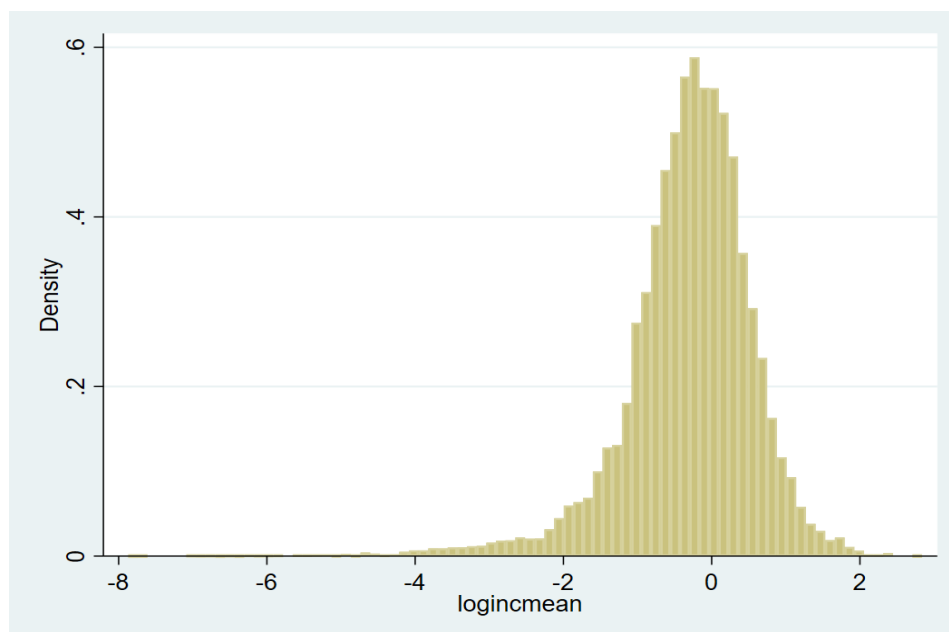
Ratio of respondents possessing a debit or credit card by age



Source: SPACE survey data, authors' calculation

Chart 4

Histogram of income logarithms



Source: SPACE survey data, authors' calculation



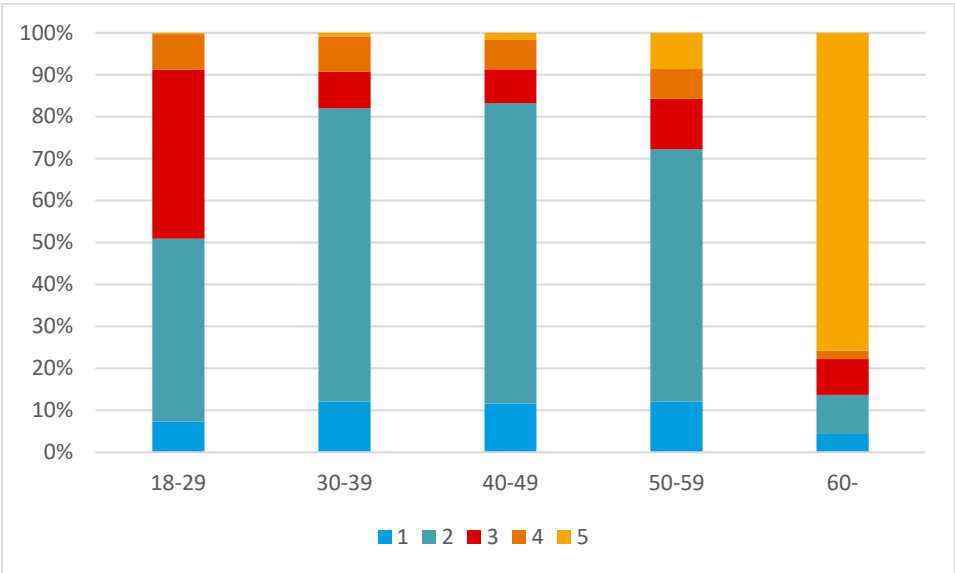
**Table 9****Share of the different categories in certain explanatory variables**

Variable	Share of sub-categories (%)
<b>Age categories</b>	
18-29	14
30-39	19
40-49	19
50-59	20
60-	29
Total	100
<b>Type of residence</b>	
Urban	47
Rural	53
Total	100
<b>Gender</b>	
Female	52
Male	48
Total	100
<b>Education</b>	
Primary	27
Secondary	43
Tertiary	30
Total	100
<b>Amount of cash in wallet at the beginning of the day (EUR)</b>	
0	4.7
1-49	54.5
50-99	23.0
100-249	13.6
250-	4.2
Total	100

Source: SPACE survey data, author's calculation

**Chart 5**

**Ratio of the different categories of amount of cash in wallet by age-groups**



Source: SPACE survey data, author’s calculation

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