What can CBDC designers learn from asking potential users?

Results from a survey of Austrian residents *

Svetlana Abramova† Rainer Böhme† Helmut Elsinger‡ Helmut Stix‡
Martin Summer‡

Abstract

The ongoing initiatives to offer central bank money to consumers in the form of retail central bank digital currency (CBDC) have triggered discussions on its optimal design. So far, the perspective of potential users has not been considered widely. To strengthen this perspective, we survey 2006 Austrian residents using a tailored questionnaire on payment preferences, attitudes towards a digital euro, selected technical features as well as potential security and privacy concerns. We find that the respondents are satisfied with the existing payment options. Only about half of the surveyed express at least some interest in a digital euro. About one half of those expects personal advantages. Central banks are advised to embrace a more user-centric design of CBDC, which must include communicating the key concepts and benefits to the potential users.

JEL Classifications: D14, E42, E51, E52
Keywords: central bank digital currencies, central bank money, retail payments

*We thank Beat Weber and an anonymous working paper referee for very helpful comments and Verena Fritz for excellent research assistance. The views expressed here are those of the authors and do not necessarily represent the views of the Oesterreichische Nationalbank or the Eurosystem.

†University of Innsbruck, Department of Computer Science, {svetlana.abramova | rainer.boehme}@uibk.ac.at
‡Oesterreichische Nationalbank, Research Section, {helmut.elsinger | helmut.stix | martin.summer}@oenb.at

Non-technical Summary

More than 75 central banks around the world are examining whether they should offer central bank money to the public not only as banknotes and coins but also in digital form (Auer et al., 2021). This new form of money is often referred to as central bank digital currency or retail CBDC. The European Central Bank (ECB) has started its own work in 2020 with the appointment of a special task force.

Most central banks, including the ECB, view their work on retail CBDC as a strategic project. It should enable universal access to central bank money in a future in which digital payments are becoming more important, while the payments market could be dominated by new private intermediaries.

The design space for retail CBDC spans technical as well as economic and legal aspects. Central banks' projects are driven by administrative prudence and strategic foresight. Issues like the continued universal access to central bank money, control over monetary policy as well as questions of sovereignty take a lot of room in the discussions of central banks and policy makers. Consumers, by contrast, seem often unaware of these debates.

In our study we want to better understand the current user perspective. We analyze survey data from 2,006 Austrian residents from the age of 16 onwards. The respondents were asked about their demand for a "digital euro" in several use cases. They could also state their preferences on key features of a retail CBDC, such as the access model (account vs digital token), offline functionality, and person-to-person payments. They further reported the perceived importance of attributes, such as payments security and privacy (i. e., data protection). In the survey we stated explicitly that a digital euro would be a complimentary offer to cash and that one digital euro would have the same value as one euro in cash.

Overall we find that about two thirds of the respondents have never heard of a digital euro. 54% show at least some interest when asked. Not surprisingly we find that younger people expect some personal advantage should a digital euro be launched. The respondents want cash to keep an important role in the future. Satisfaction with existing payment options is very high irrespective of the transaction type. Users strongly prefer identified accounts to an anonymous digital equivalent of a bearer instrument. Offline functionality is regarded as important. The possibility to transfer digital euros directly between persons is regarded as less important than the offline functionality. The respondents value payment security considerably higher than transaction data privacy.

In the analyis we do not only control for socio-economic factors (gender, age, income, education), but also identify a typology of consumers based on their current use of payment instruments (cash or non-cash), the degree of technology-savviness, and the reported ownership of cryptoassets. This allows us to give a more detailed picture of the users' needs. We find some marked differences between these user groups.

Our high level lesson is that currently the concept of CBDC is still exotic for large parts of the potential users.

1 Introduction

The question on whether and how central banks should issue central bank money in digital form directly to consumers is high on the policy agenda. Reports and academic papers have contributed to the discussion of retail central bank digital currencies (CBDC) from various angles, including monetary policy (Agur et al., 2022; Bordo and Levin, 2017; Brunnermeier and Landau, 2022), impact on the financial system (e. g., Andolfatto, 2021; Keister and Sanches, 2022), and technology (Auer and Böhme, 2020; Kahn et al., 2021b). Comparatively fewer studies have taken the perspective of potential users, let alone have applied methods to systematically collect data on a representative basis (OMFIF, 2020; Bijlsma et al., 2021). This paper draws on a new dataset collected from Austrian residents, who were asked about their demand for a "digital euro" in several use cases. The respondents could also state their preferences on key features of a retail CBDC, such as the access model (account vs digital token), offline functionality, and person-to-person payments. They further reported the perceived importance of technical attributes, such as payments security and privacy (i. e., data protection). A series of logistic regression models is estimated and discussed with a view on informing the ongoing policy debate.

A distinctive feature of the present study is that we do not only control for socio-economic factors, but also identify a typology of consumers based on their current use of payment instruments, the degree of technology-savviness, and the reported ownership of cryptocurrencies[1]. We conjecture that these types take distinct roles in the adoption path of a potential digital euro. For example, users of non-cash payment instruments, tech-savvy persons, and owners of cryptocurrencies are likely to be among the first adopters of CBDC. Cryptocurrency owners deserve special attention as they have already collected experience with elements of new forms of (arguably) digital money, such as wallets or the handling of cryptographic keys. Their opinion may be more informed given that future CBDC is an abstract concept to most respondents in population surveys. Moreover, cash use is still widespread in many European countries. In prior work, cash-affine users were found to have rather different attitudes towards payment instruments than users exercising a more flexible choice of payment instruments (for example, see Bagnall et al. (2016) or Shy (2022)). Our findings regarding the views of cash-affine users are informative to gauge the initial "market potential" of CBDC. Their adoption behavior might be pivotal for answering the question whether CBDC will develop to become a substitute or remain a complement to existing payment instruments.

Our results speak clearly to user needs, the future role of cash, the preferred access model for CBDC, and its privacy attributes. Perhaps surprisingly to readers of policy reports calling for the need of a retail CBDC, consumers in Austria are largely unaware of a digital euro and show little interest when prompted. The main reason for this seems to be satisfaction with existing payment options. One of them is cash, which receives strong support even from respondents who are in principle open to a digital euro, corroborating the ECB's approach to consider a digital euro as a complement to rather than substitute for cash. Using a series of tailored questions to elicit the preference between an account model for CBDC (inspired by online banking and card payments) and an access model using digital tokens (inspired by cryptocurrencies), we find overwhelming support for account-based access. Even a majority of cryptocurrency owners prefers identified accounts over more anonymous tokens. This result is corroborated by our findings on consumers' attitudes

[1]Referring to currency or money in the context of cryptoassets is controversial as they lack key properties of money. Nevertheless, we use this term as it is widely employed in the literature and by the general public.

towards security and privacy. While a majority assigns high importance to security against fraud and theft, two attributes concerning transaction data privacy rank lowest in a list of nine general attributes: less than one third of the respondents considers it very important that individual transactions are untraceable. One possible explanation seems plausible, namely that the reported high level of trust in the issuing institution is so broad that privacy risks appear negligible. However, this post-hoc interpretation requires further validation.

Our high-level lesson for CBDC designers is that they must not underestimate how exotic the concept of CBDC is for large parts of its potential users. This stands in contrast to the impression conveyed in policy reports, and calls for a more user-centric and empirically founded approach to CBDC design. Our own reading of this result is to take it as a sign of caution: if the mismatch between policy vision and real users' needs prevails, CBDC could be at risk of becoming a government information technology project that fails to live up to its ambition.

This paper is organized as follows. The next chapter recalls the background of this study and relates it to prior work. Chapter 3 describes our method, Chapter 4 presents the results in detail, whereas Chapter 5 discusses our results on a higher level along three guiding questions. The paper closes with a brief conclusion.

2 Background

This chapter sets the scene. Section 2.1 briefly recalls the justifications for central banks' CBDC projects and relates them to the perspective of consumers studied in the present work. Section 2.2 introduces selected challenges in CBDC design and the associated terminology. Section 2.3 contrasts CBDC to cryptocurrencies and argues why CBDC designers might learn from existing cryptocurrency owners. The chapter closes with a review of closely related work in Section 2.4. Readers familiar with these topics can safely skip this chapter.

2.1 Why are central banks working on CBDC?

According to the Bank for International Settlements (BIS), more than 75 central banks around the world are examining whether they should offer central bank money to the public not only as banknotes and coins but also in digital form (Auer et al., 2021). This new form of money is often referred to as central bank digital currency or retail CBDC. Central banks' projects are in various different stages of development.

The European Central Bank (ECB) has started its own work in 2020 with the appointment of a special task force and the publication of a report (ECB, 2020b).[2] In July 2021, it started a formal two year project to look deeper into the issues that need to be clarified, should it decide to actually develop and launch a digital euro. The report identifies a host of important open issues, such as legal questions, consequences of a digital euro on monetary and financial stability, questions concerning the precise technology to be used for such a purpose.

Most central banks, including the ECB, view their work on retail CBDC as a strategic project. It should enable universal access to central bank money in a future in which digital payments are becoming more important, while the payments market could be dominated by new private intermediaries, including the

[2]In addition to the report (ECB, 2020b), the European Central Bank also published a report on the results of a European public consultation (ECB, 2021a) as well as results from preliminary technological experiments (ECB, 2021b).

big global platform firms of the internet economy. The majority of central banks' projects are driven by administrative prudence and strategic foresight rather than the desire to phase out existing forms of money such as cash (ECB, 2020b; Bank of Canada et al., 2020). Issues like the continued universal access to central bank money, control over monetary policy as well as questions of sovereignty take a lot of room in the discussions of central banks and policy makers.

Consumers, by contrast, seem often unaware of these debates and currently do not exert much active pressure on central banks to offer new forms of money and payment instruments. A new form of central bank money can, however, not be developed and implemented by a central bank decision alone. It needs to be adopted by users and provide functions that cater to real user needs and preferences. In our study, we want to better understand the current user perspective in order to inform the debate on CBDC.

2.2 Key CBDC design decisions

The design space for retail CBDC is large. It spans technical as well as economic and legal aspects. Central banks face the challenge of finding a sweet spot in which CBDC is adopted for the intended use cases, while at the same time ensuring that the functioning of the monetary system is impaired as little as possible (Auer and Böhme, 2021). Our survey touches on a number of technical design decisions to be made before the launch of a CBDC that are costly (if not infeasible) to revert later. The selection of aspects was guided on the one hand by relevance in the policy debate and on the other hand by what consumers can meaningfully state in a survey about an imagined new form of money.

Account or token-based access The way how end users can access CBDC has far-reaching implications ranging from usability, privacy, security against theft and losses, perhaps including the mental model future consumers form about money.[3] While the technical design space is rich and not fully explored, it is commonly simplified to a dichotomy between account versus token-based access (Auer and Böhme, 2020). The former follows a conventional account model used in banking systems: ownership of and control over digital money is established by verifying the identity of an account holder. By contrast, the token-based model seeks to mimic the nature of banknotes and coins in digital form. Inspired by how cryptocurrencies manage access, token-based access conditions control (and hence ownership) on the mere knowledge of a secret, typically a private cryptographic key. Strictly speaking, token-based access refers to digital tokens; the model should not be confused with physical tokens (e. g., pieces of hardware) than can change hands just like cash. To illustrate the differences between account and token-based access, consider the protection against financial losses and privacy risks. The token-based model can offer more privacy by de-linking one's identity from payment transactions, however suffers from a higher risk of losing funds in case of stolen or forgotten keys. The loss of cryptographic keys would resemble the loss of a printed financial bearer instrument.

Offline and person-to-person payments Most consumers have experience with several of the existing electronic payment options offered by the private sector. Retail CBDC differs in the institutional arrangement and requires a new legal framework to ensure the stability of the currency chiefly in times of crises or when the demand for cash vanishes. However, it may be difficult for individual consumers to appreciate these social

[3]The economic importance of privacy is discussed in Kahn et al. (2005) and Garratt and van Oordt (2021).

advantages in normal times and while cash is still widely used. Therefore, in order to increase the individual benefits of CBDC, policy makers may explore the idea of equipping CBDC with features that most existing electronic payments do not offer.

The features considered in our study are offline functionality and person-to-person payments. The former refers to the ability to make payments when there is no network coverage, for example in remote areas or during a temporary blackout. The latter refers to a simple way of passing money directly between individuals (i. e., without a merchant), typically in interpersonal exchange. Scenarios include pocket money to children, donations and tips to unknown people, splitting bills, or yard sales.

Security and privacy Security and privacy are relevant non-functional properties of any payment system that processes large values or is widely adopted. As such they set crucial boundary conditions for the design of digital currencies (Kahn et al., 2021a). From the perspective of the central bank, each property is costly to engineer, and certain security and privacy features are technically incompatible with each other (Auer et al., 2022).

Security primarily means that nobody except the legitimate owner can spend funds. As it is widely acknowledged that absolute security is infeasible, a broader notion of CBDC security should include the ease of becoming a proficient user, that is one who makes few mistakes and does not fall for fraudulent requests (e. g., like phishing attempts, which cause a main security risk in online banking). The broadest notion of security from a consumer's point of view also incorporates means to recover from failure, e. g., to dispute a transaction and revert payments in justified cases.

While security protects the user from unintended transactions, privacy means that intended transactions do not reveal unintended information about the transaction and the involved parties. As digital technology has matured to a level where storage of information is extremely cheap, many systems are designed to never forget. Such designs pose significant privacy risks. Electronic payments data is considered particularly sensitive as it may reveal information about individuals' wealth, attitudes, preferences, and behaviors spanning virtually every aspect of life, including their intimate sphere. To protect individuals from undesirable consequences of secondary use (or misuse) of personal data that was initially collected for the purpose of payment processing, CBDCs could employ advanced technologies, some of which are still under ongoing research. These technologies support the principle of data minimization, which is adopted in many data protection laws, chiefly the EU's General Data Protection Regulation.

However, the deliberate choice to offer privacy is also subject to policy discussion: should CBDC offer the same level of anonymity and untraceability as cash payments, or should some data be retained and certain secondary uses be enabled? For example, law enforcement agencies could be allowed in justified cases to "follow the money" in order to solve crimes. This promises an increase in security at the cost of privacy. Such trade-offs appear in many forms. For example, having a record about a payee's identity makes it easier (if not enables) for the payer to claim back misdirected payments through the legal system.

2.3 Relation to cryptocurrency

While the emergence of cryptocurrency is perhaps one of several triggers for the exploration of CBDC, it has been argued at length that the technology is not a model because cryptocurrencies are technical protocols designed to enable money not requiring a central party (Böhme et al., 2015). Their technology is misaligned for the needs of CBDC, which derives its value from the existence of a central governing institution, namely the central bank. However, different technical approaches to CBDC share some features with cryptocurrencies, for instance the notion of wallet software or public–private key pairs to authorize transactions (Auer and Böhme, 2020).

Therefore, our interest is to understand what CBDC designers can learn from cryptocurrency owners on specific aspects concerning their user experience. For some key aspects of technical CBDC design, e. g., whether a CBDC should follow a token or account-based access model or how to trade off security and privacy, cryptocurrency owners may in fact be the only sub-population with developed preferences. In contrast to CBDC, which is purely hypothetical for residents of all major economies, empirical research of cryptocurrency ownership has matured in the past couple of years, allowing us to reuse and adapt tested questions and, in principle, compare to published results.

2.4 Related research

The literature on CBDC has been growing quickly during the last years. Most of the papers in policy discussions have been concerned with the strategic considerations as well as technological and economic analyses (Auer et al., 2021).

Research on user expectations, their preferences for digital central bank money, and the perspective on security and privacy aspects, however, has remained relatively scarce. We are aware of three current studies that have directly asked potential users for their preferences and expectations concerning a potential new and digital form of central bank money. Two of the three studies are based on surveys (OMFIF, 2020; Bijlsma et al., 2021), while one is based on focus groups (Kantar Public, 2022). An alternative approach is to use survey data on existing payment instruments in order to predict demand for CBDC with structural models (Huynh et al., 2020; Li, 2021). The following paragraphs summarize the most closely related studies based on CBDC-specific survey questions.

An early study is OMFIF (2020). This paper analyzes survey data from more than 13,000 individuals in the age range from 16 to 75. The respondents have been recruited from an online panel covering 12 countries. The questions of this survey were focussed on trust in different institutions as potential issuers of digital money, on the importance of different characteristics of payment methods from the user perspective, as well as the subjective assessment of some properties of different payment methods, such as speed, safety etc. The main findings are that respondents globally trusted their domestic central banks relatively most as issuers of digital money, while credit card and technology companies are less trusted. Young and high income respondents have the most positive attitudes to existing and prospective digital forms of money. Openness to the prospective adoption rises with income and education but declines with age. Safety from theft and fraud ranks highest in the preferred ideal characteristics of a payment method.

An early survey study on potential adoption of CBDC was Bijlsma et al. (2021). The paper analyzes a sample

of 3293 individuals recruited from the CentERpanel, an online panel of Dutch residents aged 16 and above. In line with the OMFIF survey, the authors find that potential early adopters of a CBDC are younger, higher educated, and earn higher incomes. While the majority of respondents have never heard of CBDC before participating in the survey, when prompted about 50% expressed a general interest in CBDC, both as a means of payment and as a savings instrument. The reported satisfaction with current payment options is high.

The most recent study on consumer attitudes and expectations of a digital currency was published in a report by Kantar Public (Kantar Public, 2022), which documents results from various focus groups analyzed for countries in the euro area on behalf of the ECB. Thus these results are not based on representative surveys. Like in the studies by OMFIF (2020) and DNB, few people, including individuals who are characterized as "tech-savvy," have heard about a digital euro. The individuals analyzed in this study would value universal access, ease and simplicity of use as well as speed and security most highly as properties of digital money in general. While people in the Kantar study do rank security highly, they do not express very strong concerns regarding privacy of transaction data.

Compared to this state of the art, the present study offers insights from representative – to the extent possible in times of a pandemic – data of a country in the euro area (Austria, 9 million residents, € 50,000 GDP per capita). A new breakdown of results by consumer types helps us to map the heterogeneity in attitudes and user needs with regard to payments in general, and possible future use of CBDC in particular. Collecting data in a country with a relatively high share of cryptocurrency ownership, and at the same time a large sub-group of users who have a strong preference for cash, allows us to contrast the needs and expectations of potential early adopters better than looking at broad mean values.

3 Method

The sections in this chapter document the data collection, the definition of consumer types and other control variables, and the technical specification of the regression analyses.

3.1 Data

Our data are collected as part of a survey commissioned by the Austrian Central Bank ("OeNB Barometer 2021/1"). The survey is undertaken semi-annually and mainly focuses on economic sentiments and expectations. The questionnaire used in this paper has been devised by the authors and appended as a special module to the regular survey.[4] It was administered between 18 June and 20 July 2021 by the Austrian IFES institute. The sample consists of 2,006 Austrian residents from age 16 and above, sampled at random from a database of phone numbers. The sampled persons were asked whether they would like to participate in the survey via telephone interview (CATI, 353 interviews) or online interview (CAWI, 1653 interviews). This mixed-mode design differed from past OeNB Barometer surveys, which were based on in-person interviews only. This choice had to be made due to the pandemic situation, which made personal interviews unfeasible.

Figure 1 illustrates the basic flow of the relevant question blocks from left to right. Two filters allowed

[4]The questionnaire in German is available from the authors upon request.

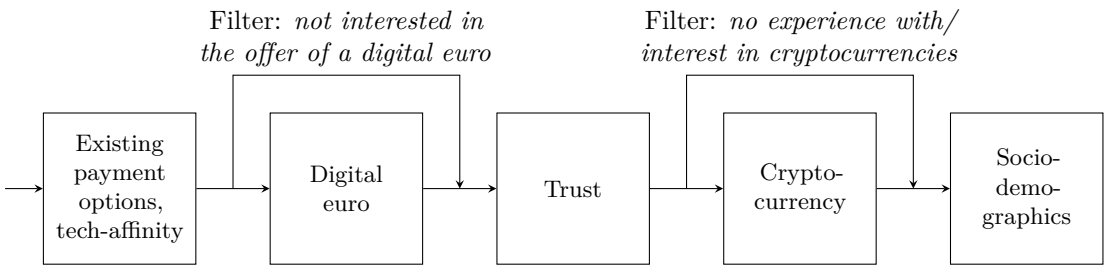

Figure 1: Basic structure of the questionnaire

respondents to skip parts of the questionnaire they could not answer competently.

Due to the new sampling procedure (relative to prior OeNB Barometer surveys), we have limited information on the non-response bias. Both the initial contact via telephone and a rather high share of self-selected CAWI interviews cause uncertainty. To compensate for this, we checked for potential biases in relevant variables by benchmarking against external data sources and past OeNB Barometer surveys (see Appendix A). This analysis indicates that our sample seems somewhat biased with respect to the internet use, financial market participation, and risk appetite in financial investments. As these variables are likely to be correlated with the willingness to adopt CBDC and since non-response rates cannot be controlled for, we take a cautious approach. First, we will only present unweighted results.[5] Second and more importantly, when discussing aggregate results, we will refer only to the "sample" and not to the "population." The potential sample bias is less problematic when discussing results from our multivariate analyses as we control for variables that are correlated with internet use, financial market participation, and risk attitudes (e. g., age, education, income, cryptocurrency ownership).

3.2 Approach

To analyze individuals' attitudes towards CBDC, we estimate regression models which evaluate the effect of different socio-economic characteristics. In addition, we analyze three types of consumers: cryptocurrency owners, tech-savvy persons, and cash-affine consumers.

Consumer types Our typology of consumers is based on the following considerations. First, since both future CBDCs and existing cryptocurrencies represent some form of "digital money," we assume that it is easier for cryptocurrency owners to imagine handling a digital euro and the necessary elements (wallets, cryptographic keys). Cryptocurrency owners may serve as valuable informants to the designers of CBDCs concerning certain aspects relating to user experience, security, or privacy. In addition, collecting individuals' attitudes toward a visionary, non-existent technology is evidently prone to biases and misreporting (Maiden Labs (2021)). For cryptocurrency owners, these biases will be alleviated.

Second, tech-savvy persons are likely to be among the first adopters of the new technology.[6] This is supported

[5]Post-stratification weights are available. Qualitatively, the use of weights has only a minor impact on reported percentages. See Table A.2 in the appendix for a comparison of weighted and unweighted sample means.

[6]The take-up of financial innovations or digital services by tech-savvy persons is substantially higher than that of non tech-savvy persons. As a case in point, unpublished survey data shows they are about three times more likely to use alternative payment services providers like Apple Pay or Google Pay or mobile apps to send/receive money to/from persons.

by studies showing that there exists a segment of consumers who tend to adopt innovative technologies early on (Bruner and Kumar, 2007; Reith et al., 2020; Agárdi and Alt, 2022). These consumers take the role of opinion leaders and influence others' attitudes or adoption decisions regarding technological products. They are characterized by a strong intrinsic affinity to high-tech, cutting-edge products and services, and are often deemed to play a special role in the process of the diffusion of innovations (Reith et al., 2019). Hence, these persons' attitudes are informative, e. g., to assess potential initial demand for CBDC. While it is evident that cryptocurrency ownership and tech-affinity correlate, it turns out that the correlation is not as strong as one might think—most tech-affine consumers do not own cryptocurrencies. This allows us to separately analyze both tech-savviness and cryptocurrency ownership.

Third, cash still accounts for a large share of payment transactions in many advanced economies (ECB, 2020a). The payments literature has established that cash use is to a large extent driven by consumers' preferences: cash is used for its low costs, for convenience, for its simplicity, for expenditure control, and to preserve privacy (Shy, 2022). There are two main competing conjectures about how cash-affine consumers view CBDC. On the one hand, it is well conceivable that cash-affine people will not have a demand for a (new) digital payment instrument—simply because cash fulfills their needs. On the other hand, CBDC could as well be attractive for cash-affine users, in particular if the use of CBDC is convenient, generates low costs, and resolves the concerns that might have stopped them from adopting digital payments offered by the private sector (Huynh et al., 2020).

The three consumer types are measured with the dummy variables *Cash-affine*, *Tech-savvy* and *Cryptocurrency owner*, respectively. Appendix B presents a definition of all variables and Table A.2 reports descriptive statistics. In our sample, 8% are cryptocurrency owners, 15% are tech-savvy and 35% are cash-affine. While the groups are intentionally not disjoint, as visualized in Figure 2, the correlation between these three groups is rather low such that we can include all three dummies simultaneously.

Further controls In order to account for confounding effects, we consider a number of basic socio-economic controls. Moreover, we include a set of background variables that could potentially have implications on respondents' attitudes towards CBDC: the stated importance of retaining cash for anonymous payments, the stated importance of hoarding cash, and trust in the central bank. To rule out that the latter variable merely reflects whether a person is generally less or more trusting, we also include a variable measuring trust in people.

Table A.1 exemplifies large differences in the socio-economic characteristics across the three consumer types. Cash-affine users have an average age of 50 years, while tech-savvy and cryptocurrency owners are, on average, about 39 years old. About 50% of cash-affine users are female, while the respective share is only 31–34% in the other two groups. In addition, cash-affine users have lower net income and lower education. 54% of cash-affine respondents are risk averse, while this applies to only 24% among the tech-savvy and 13% among cryptocurrency owners. We also find that trust in the central bank is significantly higher among tech-savvy than among cash-affine users and cryptocurrency owners.

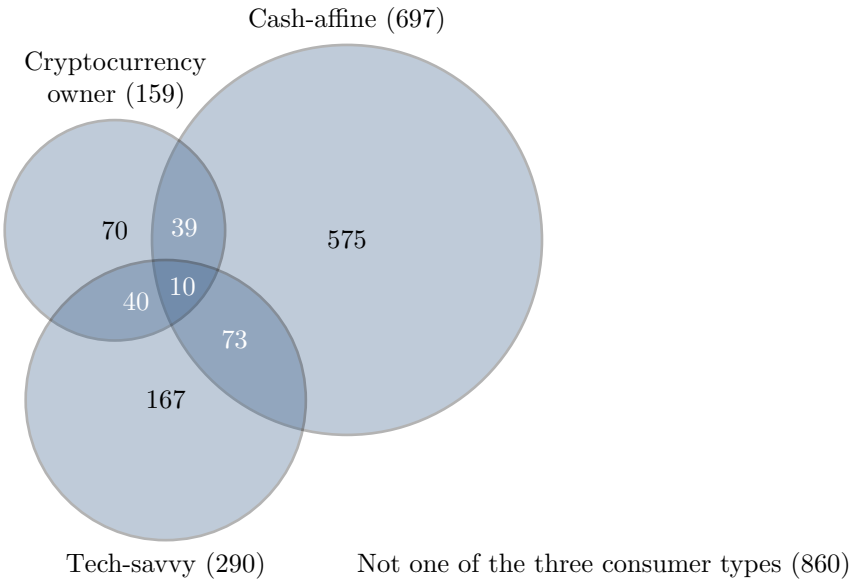

Figure 2: Venn diagram for the three consumer types (in absolute numbers). The total number of observations for each consumer type is provided in parentheses.

3.3 Specification

For each binary dependent variable of interest Y_i, we estimate a series of multivariate logistic regression models, specified in the basic form as

$$P(Y_i = 1|X_i) = \frac{\exp(X_i\beta)}{1 + \exp(X_i\beta)}, \tag{1}$$

where X_i denotes the row vector of respective control variables. We dichotomize individual responses reported on ordinal scales to a binary outcome following predefined rules. In the default specification X_i consists of a constant term and the three consumer types defined above. This default specification (specification 1) is extended with binary control variables in three steps. Specification (2) adds a set of socio-economic controls (*age group 36–65*, *age group 66+*, *female*, *academic*, *urban*, *high net income*, *income NA*). This specification is fitted *without* the consumer types. Specification (3) combines the consumer types and the socio-economic controls. Specification (4) additionally includes the behavioral controls discussed above (*hoarding of cash important*, *anonymity of cash important*, *trust in central bank*, *trust in people*). Occasionally, special controls are included for selected dependent variables and discussed in the respective sections below.

The logistic regression models are fitted with the maximum likelihood method. For the sake of interpretability, we refrain from reporting raw logistic regression coefficients. Instead, we calculate the average marginal effects for the given data with associated standard errors and statistical significance tests. We perform these calculations in Stata and R (using the `margins` package) and confirm that the results are identical. The coefficient values indicate the average percentage points change in the dependent variable if the binary predictor changes from zero to one. For convenience, each table also reports the means of the dependent variable (which may slightly vary across specifications due to a list-wise exclusion of missing values), the

number of cases, and two goodness-of-fit measures, namely McFadden's pseudo-R^2 and the log likelihood.

Empirical analyses of cryptoasset owners (e.g., Abramova et al. (2021), Balutel et al. (2022), Stix (2021)) find that a large share of owners mention an interest in the technology as a prime reason for their ownership. This would suggest that cryptocurrency owners are rather similar to tech-savvy consumers. A smaller fraction of cryptocurrency ownership, however, has been found to be driven by other considerations, like the independence from banks, the idea of decentralized finance, etc. This would suggest that cryptocurrency owners have different attitudes towards money and finance than tech-savvy persons. To test whether the respective coefficients of *Cryptocurrency owners* and *Tech-savvy* differ statistically, we report results from a likelihood ratio test (LRT) for the null hypothesis that the two coefficients are equal. The test statistic is computed from the underlying logistic model and we report the p-value for each specification where it applies.

Deliberately, each regression table is similar regarding our four specifications. This approach inhibits the search for statistically significant effects and limits potential model selection bias.

4 Results

Before discussing results, we note that the survey module on the digital euro was introduced by a general and simplified explanation of the digital euro. It was explicitly stated that a digital euro would be a complementary offer to cash and that one digital euro would have the same value as one euro in cash. In addition, respondents were told that digital euro payments would be free of charge, secure, and convenient.[7]

4.1 Interest in CBDC

We first assess people's principal interest in the digital euro. The corresponding survey block started with a question on whether respondents have already heard of a digital euro before the interview, then we have provided the briefing about what a digital euro would be. This was followed by the question: "Would the introduction of a digital euro be an interesting offer for you?" We have constructed a binary variable, *CBDC-interest*, which takes a value of 1 if the answer is "I am interested" or "My interest is rather limited", and 0 if respondents answer "I am not interested at all." Overall, we find that 17% of the sample express an explicit interest and 37% state that their interest is rather limited (in the subsequent regressions these two categories are collated). 46% of the sample is not interested at all.

Column 2 of Table 1 shows that interest is significantly higher among younger, higher income, and higher educated respondents. These findings largely mirror the results of other studies about the adoption of financial technologies (Shy, 2022; Bagnall et al., 2016). We find strong differences between our consumer types: tech-savvy respondents are 23 percentage points (pp) more likely to be interested and cryptocurrency owners are 15 pp more likely to be interested (column 1) than the respective comparison groups, confirming

[7]The briefing text in German was: *"Die Europäische Zentralbank (EZB) und die nationalen Notenbanken des Euroraums, also auch die Oesterreichische Nationalbank, prüfen gemeinsam, ob ein digitaler Euro eingeführt werden soll. Ein digitaler Euro wäre eine elektronische Form von Zentralbankgeld, das alle Personen und Unternehmen nutzen können. Es wäre sozusagen wie Banknoten in digitaler Form, mit denen tägliche Zahlungen schnell, einfach, kostenlos und sicher getätigt werden könnten. Der digitale Euro wäre ein ergänzendes Angebot – zusätzlich zu Bargeld. Ein digitaler Euro wäre genauso viel wert wie ein Euro in bar. Es ist momentan noch nicht entschieden, ob ein digitaler Euro eingeführt wird. Wir möchten Sie fragen, welche Einstellung Sie dazu haben und was Sie sich wünschen würden."*

Table 1: Dependent variable: Interested in the introduction of a digital euro

	(1)	(2)	(3)	(4)
Cash-affine	−0.288 ***		−0.262 ***	−0.223 ***
	(0.018)		(0.018)	(0.020)
Tech-savvy	0.232 ***		0.178 ***	0.168 ***
	(0.032)		(0.032)	(0.033)
Cryptocurrency owner	0.152 ***		0.106 *	0.137 **
	(0.042)		(0.042)	(0.044)
Age group 36–65		−0.185 ***	−0.152 ***	−0.149 ***
		(0.023)	(0.023)	(0.025)
Age group 66+		−0.268 ***	−0.208 ***	−0.223 ***
		(0.029)	(0.031)	(0.032)
Female		−0.053 *	−0.029	−0.022
		(0.022)	(0.021)	(0.022)
Academic		0.150 ***	0.111 ***	0.084 **
		(0.028)	(0.028)	(0.030)
Urban		0.055 *	0.035	0.028
		(0.022)	(0.021)	(0.022)
High net income		0.073 **	0.041	0.030
		(0.026)	(0.025)	(0.026)
Income NA		−0.058 *	−0.045	−0.035
		(0.028)	(0.026)	(0.029)
Hoarding of cash important				−0.108 ***
				(0.022)
Anonymity of cash important				−0.109 **
				(0.036)
Trust in central bank				0.080 ***
				(0.024)
Trust in people				0.042
				(0.041)
Mean dependent variable	0.542	0.540	0.542	0.548
LRT tech-savvy = crypto owner	0.017		0.049	0.183
Pseudo-R^2	0.11	0.05	0.14	0.27
Log likelihood	−1237	−1310	−1194	−1013
Observations	1984	2006	1984	1738

The table shows marginal effects from logit regressions.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

our presumption that tech-savvy persons and cryptocurrency owners are open-minded to this new technology. In contrast, cash-affine consumers are 29 pp less likely to be interested than non cash-affine consumers. In column 3, we include socio-demographic controls and our type variables jointly. The respective results are qualitatively very similar, which shows that the differences across type variables are not driven by socio-demographic factors.

To ascertain that these results are not driven by background variables that affect both cash use and interest in CBDC, specification 4 includes a set of additional variables: the stated importance of hoarding cash and making anonymous cash payments, as well as trust in the central bank. These variables enter significantly with the expected signs. The point estimate for *Cash-affine* is reduced slightly. Qualitatively, however, the finding that cash-affine users have a much lower interest in CBDC remains unchanged. This corroborates results from the payment literature which show that cash users tend to react to payment innovations only sluggishly.[8] Our results indicate that this reaction is unaffected by whether the payment innovation is a new

[8]For example, Brown et al. (2022) show that payment behavior of (intensive) cash users is barely affected by the availability

Table 2: Sample comparison: Interested vs not interested in the digital euro

	Not interested Mean (1)	Interested Mean (2)	Test of equal means p-value (3)
Cash-affine	**0.51**	0.22	***
Tech-savvy	0.08	**0.20**	***
Cryptocurrency owner	0.05	**0.11**	***
Age group 36–65	**0.57**	0.48	***
Age group 66+	**0.21**	0.12	***
Female	**0.53**	0.50	
Academic	0.12	**0.21**	***
Urban	0.44	**0.50**	**
High net income	0.20	**0.29**	***
Income NA	**0.24**	0.19	**
Hoarding of cash important	**0.68**	0.51	***
Anonymity of cash important	**0.93**	0.82	***
Trust in central bank	0.63	**0.74**	***
Trust in people	0.38	**0.42**	**
Risk averse	**0.63**	0.35	***

Note: The table shows means of variables (in rows) for the sample of uninterested respondents and the sample of interested respondents. Row-wise maxima are highlighted. Significance levels for t-tests of equal means: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

payment card, for example, issued by a private entity, or a new form of money issued by a central bank.

The results of Table 1 are of significant importance for the remainder of our paper as most of the **subsequent analyses are based on the subsample of persons reporting at least some interest in the digital euro**. This avoids noise in the data which would arise if persons who are completely uninterested in the digital euro were asked for their attitudes and preferences. To appreciate the subsequent results, it is important to keep the extent of sample selection in mind that is generated by this focus on a subsample of respondents. About two thirds of cash-affine users are not interested in a digital euro. In contrast, more than 70% of tech-savvy persons and cryptocurrency owners are interested. Table 2 contrasts the sample characteristics for interested (column 2) and uninterested persons (column 1). For almost all variables we find significant and often sizable differences, e. g., the sample we analyze henceforth is characterized by a substantial underrepresentation of cash-affine users, older persons, persons with a preference for anonymous payments, persons for whom hoarding of cash is important, and risk averse persons. In contrast, there is a strong overrepresentation of tech-savvy persons, cryptocurrency owners, young, higher educated, high income respondents, and of persons who trust in both central banks and people.

4.2 Potential demand for CBDC

Persons who are, in principle, not opposed to a digital euro will make their adoption decision contingent on the expected utility.[9] To elicit whether respondents expect a net benefit from CBDC adoption, we have

of contactless debit cards.

[9]While it is known that network effects are the lever between wide success or failure of a payment innovation (Gowrinsakaran and Stavins, 2004), we focus on perceived individual advantages of a future digital euro. Individual perceptions are better measurable than indirect network externalities. Their aggregate effect may lead to the critical mass needed for network effects to

asked "Do you believe that the digital euro, overall, will bring you personal advantages?" The dummy variable *CBDC-benefit* takes a value of 1 if respondents answered "certainly yes" or "somewhat yes," and 0 for "somewhat not" and "certainly not." It is important to know that this question was asked at the very end of all questions on the digital euro such that respondents were already informed about the topic. Overall, about 36% of the sample expect some personal advantages (7% are certain and 29% are somewhat certain). About 16% state that they don't know.[10]

Table 3: Belief that the digital euro brings personal advantages

	(1)	(2)	(3)	(4)
Cash-affine	−0.087 *		−0.091 *	−0.091 *
	(0.038)		(0.037)	(0.040)
Tech-savvy	0.223 ***		0.196 ***	0.193 ***
	(0.036)		(0.036)	(0.038)
Cryptocurrency owner	0.248 ***		0.226 ***	0.259 ***
	(0.051)		(0.051)	(0.053)
Age group 36–65		−0.136 ***	−0.110 **	−0.122 ***
		(0.034)	(0.034)	(0.035)
Age group 66+		−0.194 ***	−0.140 **	−0.131 **
		(0.044)	(0.047)	(0.049)
Female		−0.084 *	−0.043	−0.012
		(0.033)	(0.033)	(0.034)
Academic		0.042	0.030	0.016
		(0.040)	(0.039)	(0.040)
Urban		−0.009	−0.010	−0.025
		(0.032)	(0.031)	(0.032)
High net income		0.002	−0.016	−0.025
		(0.037)	(0.036)	(0.037)
Income NA		−0.092 *	−0.093 *	−0.081
		(0.043)	(0.042)	(0.046)
Hoarding of cash important				−0.015
				(0.034)
Anonymity of cash important				−0.035
				(0.043)
Trust in central bank				0.012
				(0.038)
Trust in people				0.307 ***
				(0.061)
Mean dependent variable	0.426	0.426	0.426	0.434
LRT tech-savvy = crypto owner	0.098		0.149	0.055
Pseudo-R^2	0.06	0.02	0.08	0.18
Log likelihood	−584	−608	−575	−509
Observations	908	914	908	829

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

The regression results in Table 3 indicate that younger persons are more likely to expect advantages than older persons, while all other socio-economic controls have little effect. Again, the strongest effects are found for the consumer types: cash-affine users are 9 pp less likely than the respective comparison group to expect personal advantages. Tech-savvy and cryptocurrency owners are in the order of 20 pp more likely to expect advantages.

carry on.

[10] If don't know answers are disregarded, then 43% expect personal advantages (cf. Table A.2).

Both Tables 1 and 3 show that cash-affine persons are much less likely to adopt CBDC. Among persons open to a digital euro, cash-affine users tend to be more skeptical about personal advantages, and much more skeptical than tech-savvy individuals and cryptocurrency owners.

Against this backdrop, it is instructive to analyze preferences on the future of cash. A common thread in discussions on CBDC among policy makers and stakeholders is the question whether a CBDC may complement or substitute cash. Cash payments have declined in many countries over the past couple of years, with Sweden or Norway being known as forerunners in the transition to a cashless society (Engert et al., 2019). CBDC could potentially accelerate this shift. To clarify the Austrian population's opinion on this matter, we asked all survey respondents whether they believe that cash should keep its current relevance or whether they think that cash can lose importance or disappear altogether.[11] Overall, 64% of the respondents state that cash should retain its current relevance.

Table 4: Cash should keep its current relevance

	(1)	(2)	(3)	(4)
Cash-affine	0.344 ***		0.329 ***	0.220 ***
	(0.021)		(0.021)	(0.022)
Tech-savvy	−0.107 ***		−0.074 **	−0.080 **
	(0.027)		(0.028)	(0.027)
Cryptocurrency owner	−0.111 **		−0.088 *	−0.085 *
	(0.036)		(0.036)	(0.036)
Age group 36–65		0.155 ***	0.117 ***	0.117 ***
		(0.023)	(0.022)	(0.023)
Age group 66+		0.138 ***	0.083 **	0.087 **
		(0.027)	(0.029)	(0.028)
Female		0.042 *	0.031	0.019
		(0.021)	(0.021)	(0.020)
Academic		−0.110 ***	−0.069 *	−0.045
		(0.029)	(0.027)	(0.027)
Urban		−0.014	0.008	0.014
		(0.021)	(0.020)	(0.020)
High net income		−0.061 *	−0.031	−0.035
		(0.026)	(0.024)	(0.023)
Income NA		0.061 *	0.053 *	0.034
		(0.027)	(0.026)	(0.027)
Hoarding of cash important				0.206 ***
				(0.018)
Anonymity of cash important				0.264 ***
				(0.028)
Trust in central bank				−0.022
				(0.022)
Trust in people				−0.084 *
				(0.038)
Mean dependent variable	0.646	0.644	0.646	0.647
LRT tech-savvy = crypto owner	0.192		0.311	0.233
Pseudo-R^2	0.11	0.03	0.13	0.33
Log likelihood	−1148	−1254	−1126	−868
Observations	1975	1991	1975	1736

The table shows marginal effects from logit regressions.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 4 reports the logistic regression results. Consistent with the literature (Harris et al., 2016; Shy, 2022;

[11] This question was placed before the block on the digital euro.

Brown et al., 2022), older consumers value traditional experiences and, as a result of their technology inertia, strongly advocate for the retention of cash payments. Persons with higher education or higher income tend to accept a decline in the relevance of cash (specification 2). The effect fades out as the consumer types and other behavioral controls are added (specifications 3 and 4). Unsurprisingly, cash-affine users are much more likely, whereas tech-savvy persons and cryptocurrency owners are much less likely to state that "cash should keep its current relevance." These results show that cash-affine users not only tend to oppose a digital euro. They want cash to remain important. Some drivers for this, included in specification (4), turn out to have strong effects. People who state that cash is needed for making anonymous payments are 26 pp more likely to support that cash should remain relevant. The importance of hoarding cash adds 20 pp. On average, people who agree to both reasons support the retention of cash almost unanimously. While tech-savvy respondents have a significantly lower support for cash than the comparison group, on average, the share supporting cash is still above 50%. The same holds for cryptocurrency owners. These results provide a strong justification for the approach of central banks to offer CBDC as an additional offer to consumers such that cash will not be replaced.[12]

4.3 Demand for specific transactions and satisfaction with existing payment instruments

The survey elicited the need for a digital euro for specific types of transactions. Figure 3 presents descriptive results. Overall, the need for a digital euro is not (yet) pronounced. In neither of the eight transaction categories that were presented to respondents, there are more than 50% of respondents who say that they have a need. For three types of transactions, close to 50% of the respondents express a need: for internet payments, for larger-value transactions (e. g., the purchase of furniture worth 2,000 euro), and for payments when traveling abroad.

A reason for the lacking need for CBDC is satisfaction with existing payment options. The survey has measured this for each of the transaction types shown in Figure 3.[13]

We start our analysis with "daily grocery shopping," as the most pertinent transaction type in consumers' daily lives. About 37% of respondents state that they have a "high need" or "some need" for a digital euro. We also find a high level of satisfaction with existing payment instruments for daily payments. 75% of respondents are "fully content", and about 21% are "somewhat content". We define a dummy variable "Not fully content." It takes a value of 1 if respondents answered "somewhat content", "somewhat discontent" or "not content at all," and 0 if they answered "fully content". Table 5 shows the results of logistic regressions with the need for a digital euro for daily grocery shopping as the dependent variable and the "Not fully content" dummy included as a special control variable in specifications (2) and (4).

The results in Table 5 reveal, again, a very consistent pattern. Cash-affine users express a sizably lower need for a digital euro for daily payments than the reference group. Tech-savvy persons and cryptocurrency owners express a significantly higher need. In addition, we find a significant effect of the level of satisfaction with

[12] E. g., "The digital euro would not replace cash", ECB President Lagarde (`https://www.ecb.europa.eu/press/key/date/2022/html/ecb.sp220114~fe1e70ec1a.en.html`).

[13] The questions on satisfaction with existing payment options were positioned before the block on the digital euro in order to avoid that respondents are primed with the fear of a declining relevance of cash.

Do you see a need for a digital euro in one of the following payment situations?
(% of respondents who report at least some interest in the digital euro, $N = 1083$)

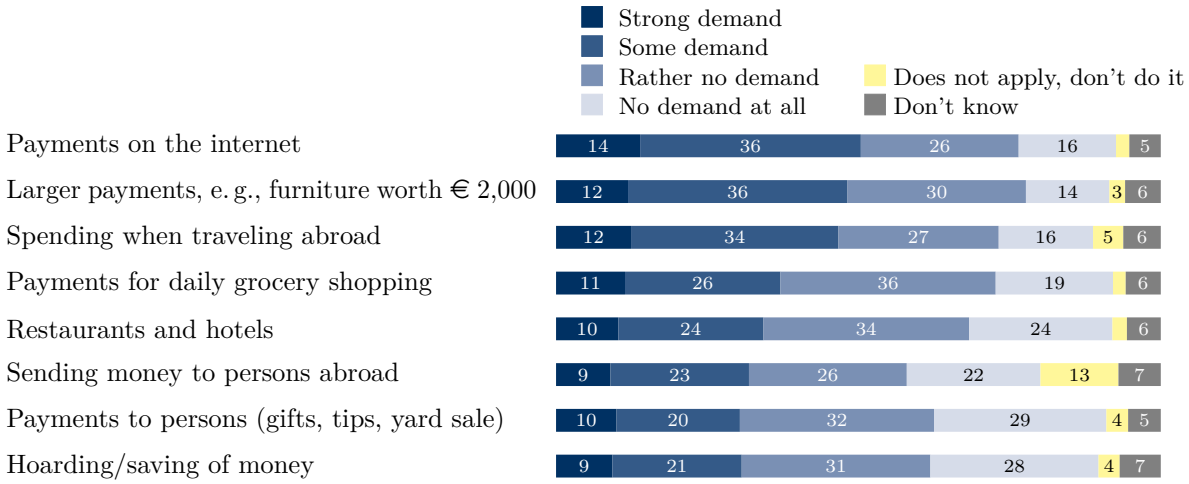

Figure 3: Self-assessed need for a digital euro by transaction type

existing payment options. Those who are not fully content are about 8 pp more likely to say that they have a need for a digital euro (specification 2). The effect is qualitatively similar if consumer types are added to the regression (specification 4).

The results for five other transaction types are summarized in Table 6. Each column has a different dependent variable corresponding to the transaction type whose dummy variable for satisfaction with existing payment options is included. For all transactions types, tech-savvy persons see a higher demand for a digital euro than the reference group. Cash users have a lower need for a digital euro – with one notable exception: internet payments. This makes perfect sense as cash cannot easily be used for internet transactions. Cryptocurrency owners have a higher need for a digital euro for some transaction types (large purchases, payments to persons), but not for others (payments abroad). Finally, we find that dissatisfaction with existing payment options increases the need for a digital euro only for transactions in hotels/restaurants, but not for the other transaction types.

Summarizing, these results show that the need for a digital euro is rather heterogeneous across the sample, with a higher need among tech-savvy persons or, more generally, among persons who are not cash-affine. Owners of cryptocurrencies tend to have a lower need than tech-savvy persons, likely because they are already using a digital form of money. The results also show that dissatisfaction with existing payment options increases demand for some types of transactions, but not for all. Given the overall high level of satisfaction with existing payment options, it seems that dissatisfaction is not a main driver of demand for CBDC.

4.4 Account or token-based access

Considering the implications and path dependencies emerging from the choice of an access model, it is of interest to find out which option is more preferred by the general public. Two idealized access models, account and token-based, were presented to respondents in simplified scenarios – using the analogy of debit card and

Table 5: Demand for a digital euro for daily grocery shopping

	(1)	(2)	(3)	(4)
Cash-affine	−0.217 ***		−0.235 ***	−0.232 ***
	(0.038)		(0.037)	(0.037)
Tech-savvy	0.169 ***		0.140 ***	0.139 ***
	(0.035)		(0.036)	(0.036)
Cryptocurrency owner	0.104 *		0.098 *	0.095 *
	(0.048)		(0.048)	(0.048)
Age group 36–65		−0.143 ***	−0.138 ***	−0.134 ***
		(0.032)	(0.032)	(0.032)
Age group 66+		−0.168 ***	−0.157 ***	−0.151 ***
		(0.042)	(0.042)	(0.043)
Female		−0.049	−0.024	−0.021
		(0.031)	(0.031)	(0.031)
Academic		0.002	−0.009	−0.006
		(0.038)	(0.037)	(0.037)
Urban		−0.012	−0.022	−0.023
		(0.031)	(0.030)	(0.030)
High net income		−0.054	−0.074 *	−0.078 *
		(0.035)	(0.033)	(0.033)
Income NA		−0.097 *	−0.101 *	−0.104 **
		(0.040)	(0.039)	(0.039)
Not fully content/daily shopping		0.081 *		0.071 *
		(0.033)		(0.033)
Mean dependent variable	0.402	0.403	0.402	0.403
LRT tech-savvy = crypto owner	0.057		0.067	0.065
Pseudo-R^2	0.05	0.03	0.07	0.08
Log likelihood	−638	−651	−623	−619
Observations	992	994	992	990

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

cash payments and avoiding any technical jargon. As it is not trivial to present these choices to respondents and since the formulation may affect responses, Figure 4 displays the formulation of questions and the respective answers. Specifically, we have used a sequence of three questions to introduce the trade-off to the respondents. The final question is "Would you rather disclose your identity and open an account to keep the risk of loss low, or would you prefer a cash-like digital euro?". The answers show that an account-based digital euro is preferred to a token-based system (50% versus 23%). Some 15% of respondents have no clear preference and 13% answer that they don't know. The support for an account-based implementation can be found also in the sub-samples of cash-affine users, tech-savvypersons, and cryptocurrency owners.

For the logistic regressions we have constructed a dummy variable which is 1 if respondents are in favor of a cash-like (token-based) system and 0 if they are in favor of an account-like system or if they do not care.[14] The results presented in Table 7 show that the cash-like digital euro – or the token-based access model in the original interpretation – is significantly less likely to be endorsed by female and older repondents. Cash-affine persons are more likely to prefer digital tokens over identity-based accounts (specification 3), however the difference of 7 pp is not large enough to make a majority of cash-affine consumers to support a cash-like CBDC. Cryptocurrency owner show the strongest support (in relative terms) for a token-based access model,

[14]Omitting don't know answers does not affect the regression results qualitatively.

Table 6: Demand for a digital euro by transaction type (dependent variable changes per column)

	large purchase	hotel restaurant	P2P	internet	spending abroad
Cash-affine	−0.077 *	−0.200 ***	−0.201 ***	−0.014	−0.104 **
	(0.038)	(0.038)	(0.038)	(0.038)	(0.039)
Tech-savvy	0.126 **	0.157 ***	0.140 ***	0.127 **	0.107 **
	(0.040)	(0.035)	(0.034)	(0.040)	(0.041)
Cryptocurrency owner	0.116 *	0.067	0.111 *	0.081	0.075
	(0.053)	(0.047)	(0.045)	(0.053)	(0.052)
Age group 36–65	−0.054	−0.078 *	−0.115 ***	−0.047	−0.010
	(0.035)	(0.033)	(0.031)	(0.035)	(0.036)
Age group 66+	−0.048	−0.139 **	−0.162 ***	−0.098	−0.025
	(0.053)	(0.043)	(0.040)	(0.052)	(0.055)
Female	−0.033	−0.000	−0.050	−0.058	−0.032
	(0.033)	(0.031)	(0.031)	(0.033)	(0.034)
Academic	−0.026	0.011	−0.017	0.010	0.001
	(0.040)	(0.037)	(0.036)	(0.038)	(0.040)
Urban	0.032	−0.017	−0.006	−0.025	0.018
	(0.032)	(0.030)	(0.029)	(0.031)	(0.033)
High net income	−0.023	−0.066 *	−0.058	−0.052	−0.038
	(0.037)	(0.033)	(0.032)	(0.036)	(0.038)
Income NA	−0.128 **	−0.087 *	−0.131 ***	−0.036	−0.084
	(0.045)	(0.039)	(0.037)	(0.044)	(0.046)
Not fully content/large purchase	0.048				
	(0.032)				
Not fully content/hotel restaurant		0.070 *			
		(0.030)			
Not fully content/P2P			0.007		
			(0.030)		
Not fully content/internet				0.019	
				(0.032)	
Not fully content/spending abroad					0.016
					(0.034)
Mean dependent variable	0.529	0.373	0.337	0.545	0.533
LRT tech-savvy = crypto owner	0.006	0.083	0.331	0.108	0.080
Log likelihood	−637	−610	−564	−668	−615
Observations	949	984	953	989	906

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

which we explain with the greater familiarity of cryptocurrency owners with token-based access.

Typically, females and older persons are found to be more risk averse than the average consumer (Falk et al. (2018)). Specification 4 includes a dummy variable *Risk averse* which is 1 if a person states that she is not willing to accept any financial risks in exchange for a higher than average return (see the Appendix for a definition of variables), which applies to 50% of the sample. The results show that risk averse persons have a lower preference for a token-based system, on average. Controlling for risk aversion also moderates the effect of gender, age and cash affinity, as expected. Finally, column 4 also includes trust in the central bank. The results show that the preference for an account model increases with the amount of trust in central banks.

Taken together, our results indicate that an overwhelming share of the sample has a preference for an account-like CBDC. This holds for cash-affine consumers, tech-savvy persons, and for cryptocurrency owners.

Table 7: Preference for a cash-like digital euro (i. e., token-based access)

	(1)	(2)	(3)	(4)
Cash-affine	0.079 *		0.073 *	0.054
	(0.033)		(0.032)	(0.035)
Tech-savvy	0.073 *		0.044	0.043
	(0.033)		(0.033)	(0.034)
Cryptocurrency owner	0.135 ***		0.101 *	0.080
	(0.039)		(0.040)	(0.041)
Age group 36–65		−0.089 **	−0.076 **	−0.053
		(0.029)	(0.030)	(0.032)
Age group 66+		−0.197 ***	−0.183 ***	−0.155 ***
		(0.029)	(0.032)	(0.038)
Female		−0.110 ***	−0.093 **	−0.070 *
		(0.028)	(0.029)	(0.030)
Academic		0.066	0.059	0.065
		(0.036)	(0.036)	(0.038)
Urban		0.024	0.028	0.019
		(0.028)	(0.028)	(0.029)
High net income		−0.002	−0.004	−0.005
		(0.032)	(0.032)	(0.033)
Income NA		−0.024	−0.021	−0.042
		(0.038)	(0.038)	(0.040)
Hoarding of cash important				−0.000
				(0.031)
Anonymity of cash important				0.089 *
				(0.041)
Trust in central bank				−0.065 *
				(0.033)
Trust in people				0.097
				(0.057)
Risk averse				−0.093 **
				(0.035)
Mean dependent variable	0.261	0.259	0.261	0.259
LRT tech-savvy = crypto owner	0.014		0.044	0.108
Pseudo-R^2	0.03	0.04	0.05	0.16
Log likelihood	−527	−521	−513	−455
Observations	940	945	940	853

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

The results suggest that this finding is connected to the risk of financial losses with risk averse persons being significantly more likely to prefer an account-based access model. As about half of the sample is risk averse, this is important.[15]

4.5 Offline and person-to-person payments

We also asked the respondents about their preferences on selected features that have been brought up in policy discussions on CBDC design. The perceived importance of an offline functionality was elicited with the question "How important is it for you personally to be able to make payments with a digital euro when there is no internet connection available?" About 40% of the respondents stated that offline functionality is

[15]Although we are confident about these general findings, we note that answers are likely biased in the direction of an account-based CBDC as the questions emphasize the risk of financial losses. In future implementations of such surveys, it would be interesting to implement survey experiments with different formulations.

Q Cash-like digital euro

"Suppose that the digital euro works very similar to cash. Payments are not linked to your identity and are hard to trace. However, in case you loose such a digital euro or if you fall victim to theft, the monetary loss is irrevocable. Under such conditions, would you use a digital euro?"

Q Account-like digital euro

*"And now suppose that the digital euro functions like a debit card with an account. Such payments can be linked to your identity and are traceable, but the risk of loss is very low. Under such conditions, would you use a digital euro?"*s

%	Would use cash-like	Would use account-like
Yes, certainly	10	15
Rather yes	31	45
Rather not	25	21
No, certainly not	24	8
I don't know.	10	11
	100	100

Q Preferences cash-like vs. account-like

"And which of these variants would you prefer: Would you rather disclose your identity and open an account to keep the risk of loss low, or would you prefer a cash-like digital euro?"

Identified account and thus no risk of loss	50
No account, but risk of loss	23
I don't care.	15
I don't know.	13
	100

Note: Subset of respondents who are generally interested in the digital euro.

Figure 4: Sequence of questions: Cash-like or account-like digital euro?

"very important," another 33% considered it "important," 11% "rather not important," and only 8% "not important at all." 7% responded that they do not know. We construct a dummy variable taking a value of 1 for the top two categories and 0 otherwise (omitting don't knows).

Table 8 reports the logistics regression results. Tech-savvy users are 12 pp more likely to consider offline functionality important than the reference group. Considering the high mean of the dependent variable across the sample, this suggests that this consumer type overwhelmingly considers an offline option indispensable. Reflecting on the question wording, the finding also means that even tech-savvy persons do not believe that internet connectivity can always be taken for granted in all future payment situations. By contrast, cash-affine users are at least 6 pp less likely to consider offline features of CBDC important. While this decline is modest against the high mean value, the result might reflect that cash-affine users have already an offline payment instrument in use.[16]

[16]In specification 4 we find a strong and significant effect for *Trust in the central bank*. We have no good explanation for how

Table 8: Importance of offline functionality

	(1)	(2)	(3)	(4)
Cash-affine	−0.059 *		−0.063 *	−0.081 *
	(0.030)		(0.030)	(0.031)
Tech-savvy	0.119 **		0.114 **	0.123 **
	(0.036)		(0.037)	(0.038)
Cryptocurrency owner	0.005		−0.002	0.038
	(0.043)		(0.043)	(0.046)
Age group 36–65		−0.045	−0.040	−0.036
		(0.029)	(0.029)	(0.031)
Age group 66+		−0.130 **	−0.115 *	−0.103 *
		(0.050)	(0.049)	(0.050)
Female		0.034	0.043	0.041
		(0.026)	(0.026)	(0.028)
Academic		0.050	0.045	0.023
		(0.030)	(0.030)	(0.033)
Urban		−0.008	−0.012	−0.010
		(0.026)	(0.026)	(0.027)
High net income		−0.007	−0.012	−0.029
		(0.030)	(0.030)	(0.032)
Income NA		−0.013	−0.016	−0.038
		(0.036)	(0.036)	(0.041)
Hoarding of cash important				0.023
				(0.028)
Anonymity of cash important				0.024
				(0.035)
Trust in central bank				0.081 **
				(0.030)
Trust in people				0.035
				(0.053)
Mean dependent variable	0.790	0.789	0.790	0.793
LRT tech-savvy = crypto owner	0.425		0.313	0.197
Pseudo-R^2	0.02	0.01	0.04	0.15
Log likelihood	−506	−511	−499	−439
Observations	1000	1007	1000	897

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

A similar picture emerges for person-to-person (P2P) payments. We asked "How important is it for you personally to be able to make payments directly to other persons, e. g., for yard sales, splitting a restaurant bill, pocket money, making donations?" About 20% of the respondents considered this "very important", 33% "important," 23% "rather not important," and 16% "not important at all;" again, 7% do not know. Table 9 shows the regression results for a dummy variable that is constructed in the same way as before. Although fewer respondents, on average, consider P2P functionality important than the offline fallback, we observe the same direction of effects for the controls. Tech-savvy persons are more likely to demand P2P functionality. Cash-affine users demand it less, confirming our interpretation above that cash-affine users cannot be "bought in" with features. Moreover, respondents who value the anonymity of cash payments are 12 pp less likely to demand P2P functionality than the reference group. Perhaps, they believe that cash is and will remain unchallenged for P2P payments, which indeed involve some anonymity in many social contexts (e. g., donations, but also bribes, which were not prompted). Most interestingly, cryptocurrency owners are 20

this result could be rationalized. In the end, it could reflect a statistical curiosity.

Table 9: Importance of P2P functionality

	(1)	(2)	(3)	(4)
Cash-affine	−0.157 ***		−0.162 ***	−0.182 ***
	(0.036)		(0.035)	(0.037)
Tech-savvy	0.142 ***		0.104 **	0.099 *
	(0.038)		(0.039)	(0.040)
Cryptocurrency owner	0.205 ***		0.175 **	0.215 ***
	(0.054)		(0.053)	(0.057)
Age group 36–65		−0.157 ***	−0.145 ***	−0.150 ***
		(0.032)	(0.032)	(0.034)
Age group 66+		−0.300 ***	−0.271 ***	−0.260 ***
		(0.045)	(0.046)	(0.048)
Female		−0.062 *	−0.037	−0.032
		(0.031)	(0.031)	(0.033)
Academic		0.047	0.036	0.010
		(0.038)	(0.037)	(0.039)
Urban		0.047	0.041	0.047
		(0.030)	(0.030)	(0.031)
High net income		0.029	0.008	0.002
		(0.035)	(0.035)	(0.036)
Income NA		0.007	−0.003	−0.023
		(0.042)	(0.041)	(0.045)
Hoarding of cash important				0.053
				(0.033)
Anonymity of cash important				−0.124 **
				(0.043)
Trust in central bank				0.058
				(0.037)
Trust in people				0.066
				(0.061)
Mean dependent variable	0.571	0.573	0.571	0.573
LRT tech-savvy = crypto owner	0.140		0.150	0.053
Pseudo-R^2	0.04	0.04	0.07	0.18
Log likelihood	−659	−663	−640	−565
Observations	1001	1007	1001	905

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

pp more supportive of the P2P functionality. One possible explanation for this is that cryptocurrency owners in principle like the P2P functionality offered by cryptocurrencies, but it is not very useful for them in daily life as too few counterparties exist to transact with. Currently, making payments with cryptocurrency is a niche application.[17] Cryptocurrency owners might expect that a CBDC would lead to a wide adoption of digital P2P payments throughout the general economy. As a result, they can enjoy the benefits of the emerging network externalities.

In summary, our respondents consider an offline fallback relatively more important than P2P functionality. Both features will make tech-savvy users happy, in particular, but are unlikely to convince cash-affine persons to revisit their aversion against a digital euro.

[17] A striking 67% of cryptocurrency owners in our sample state that they have "never" used Bitcoin or other cryptocurrencies to pay for goods or services. Only 5% state that they do so "one or more times per month."

How important are the following attributes of a digital euro to you?
(% of respondents who indicated at least some interest in the digital euro, $N = 1083$)

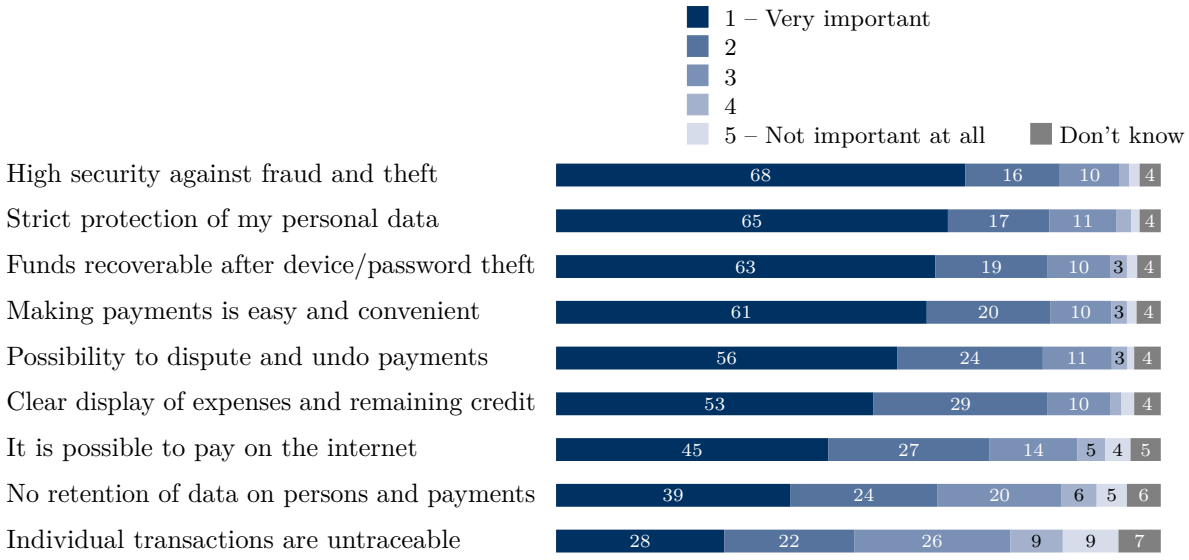

Figure 5: Importance of attributes

4.6 Attitudes to security and privacy

CBDC design decisions regarding security and privacy are considered among the most critical for a broad acceptance of CBDC among consumers.

To inform CBDC designers, the survey elicits respondents' assessment of several basic attributes of a digital euro with the question "How important would you consider the following attributes of a digital euro?" Answers were given on a scale from 1 (very important) to 5 (not important at all). Before discussing results, we would like to note that such an exercise, evidently, represents only a first attempt to eliciting the needs of potential users. As outlined above, the involved trade-offs are complex (e. g., between privacy and retention of transaction data) and it is difficult to make survey respondents aware of these trade-offs by means of short survey questions. In addition, answers will depend on how questions are formulated. This cautions against stretching the interpretation of the results. Nevertheless, we consider the responses informative on how potential users of CBDC rank security and privacy aspects.

Figure 5 summarizes the answers on all items, ranked by their importance. We have asked respondents to rate three aspects of security ("high security against fraud and theft", "funds recoverable after device/password theft", "possibility to dispute and undo payments") and three aspects of privacy ("strict protection of my personal data", "no retention of data on persons and payments", "individual transactions are untraceable"). On average, security aspects tend to be considered more important than privacy aspects. For example, almost 70% of the respondents state that high security against fraud and theft is very important. Interestingly, two privacy aspects are ranked lowest by respondents, on average. This likely reflects that most consumers have experience with electronic forms of money and have not encountered problems with the processing of respective data (e. g., by banks).

Table 10: Security: high security against fraud and theft is important

	(1)	(2)	(3)	(4)
Cash-affine	−0.049 *		−0.040	−0.063 **
	(0.024)		(0.023)	(0.024)
Tech-savvy	0.028		0.063 *	0.059 *
	(0.027)		(0.027)	(0.026)
Cryptocurrency owner	−0.040		−0.010	0.007
	(0.032)		(0.032)	(0.031)
Age group 36–65		0.134 ***	0.137 ***	0.101 ***
		(0.022)	(0.022)	(0.023)
Age group 66+		0.107 ***	0.109 ***	0.071 **
		(0.020)	(0.020)	(0.025)
Female		0.096 ***	0.103 ***	0.080 ***
		(0.021)	(0.022)	(0.022)
Academic		0.032	0.030	0.019
		(0.024)	(0.024)	(0.025)
Urban		0.022	0.020	0.038
		(0.021)	(0.021)	(0.021)
High net income		0.006	0.001	−0.002
		(0.024)	(0.024)	(0.024)
Income NA		−0.029	−0.031	−0.014
		(0.030)	(0.030)	(0.031)
Hoarding of cash important				0.023
				(0.022)
Anonymity of cash important				0.038
				(0.026)
Trust in central bank				0.067 **
				(0.022)
Trust in people				−0.023
				(0.042)
Risk averse				0.083 **
				(0.028)
Mean dependent variable	0.864	0.863	0.864	0.876
LRT tech-savvy = crypto owner	0.131		0.118	0.326
Pseudo-R^2	0.02	0.07	0.09	0.26
Log likelihood	−409	−388	−380	−309
Observations	1039	1045	1039	929

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 10 reports the regression results for the leading security attribute ("high security against fraud and theft").[18] The findings show that there is no qualitative difference between cryptocurrency owners, tech-savvy persons and cash users in the importance of security.

Some differences are found for female and older respondents, who value security significantly more than males and the young generation (up to 35 years). In addition, risk averse persons and persons with high trust in the central bank attach more importance to security. As with regards to the consumer types, we find small significant effects, e. g., cash-affine users are 5 pp less likely to favor "high security against fraud and theft" in comparison to the reference group (specification 1 of Table 10). Overall, these differences appear negligible in comparison to the average support for a high security against fraud and theft.

[18]We have recoded answers to a dummy variable which is 1 for "very important" and "rather important" and 0 otherwise (omitting don't know answers).

Table 11: Privacy: strict protection of personal data is important

	(1)	(2)	(3)	(4)
Cash-affine	−0.026		−0.020	−0.045
	(0.026)		(0.026)	(0.027)
Tech-savvy	−0.018		0.014	0.013
	(0.027)		(0.027)	(0.027)
Cryptocurrency owner	−0.024		0.002	0.038
	(0.034)		(0.034)	(0.035)
Age group 36–65		0.104 ***	0.099 ***	0.071 **
		(0.023)	(0.023)	(0.025)
Age group 66+		0.106 ***	0.103 ***	0.068 *
		(0.023)	(0.024)	(0.030)
Female		0.095 ***	0.095 ***	0.065 **
		(0.022)	(0.023)	(0.024)
Academic		0.046	0.042	0.041
		(0.025)	(0.025)	(0.026)
Urban		−0.009	−0.011	−0.008
		(0.022)	(0.022)	(0.023)
High net income		−0.022	−0.024	−0.036
		(0.026)	(0.026)	(0.027)
Income NA		−0.001	−0.004	−0.013
		(0.030)	(0.031)	(0.035)
Hoarding of cash important				0.042
				(0.024)
Anonymity of cash important				0.068 *
				(0.027)
Trust in central bank				0.106 ***
				(0.024)
Trust in people				−0.093 *
				(0.045)
Risk averse				0.097 ***
				(0.030)
Mean dependent variable	0.848	0.846	0.848	0.849
LRT tech-savvy = crypto owner	0.664		0.952	0.610
Pseudo-R^2	0.02	0.05	0.06	0.21
Log likelihood	−442	−429	−424	−353
Observations	1039	1045	1039	929

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Table 11 with results for the leading privacy attribute ("strict protection of personal data") looks very similar in terms of socio-demographic controls. Interestingly, we do not find any significant differences between the consumer types. Quite expectedly, respondents who value the anonymity of cash are more likely to emphasize the importance of personal data protection (specification 4 of Table 11).

To rule out that the absence of significant correlations is caused by the generally high approval of these attributes, we present the results for the lowest-ranked item ("individual transactions are untraceable") in Table 12. We do not find any significant differences across socio-demographic variables. Among the consumer types, cryptocurrency owners are the only ones who express a sizably higher preference for untraceable transactions. This is interesting given the well-known privacy limitation of Bitcoin and other similar cryptocurrencies, in which all the transactions are public and traceable (Böhme et al. (2015)). It is also notable that cash-affine users do not endorse this privacy feature significantly more, although attitudes on the importance of the anonymity of cash as well as cash hoarding are strongly and positively associated.

Perhaps only a fraction of the cash-affine respondents could link anonymity to untraceability, two non-trivial concepts, whereas many others stick to cash for convenience, conservatism, or out of habit.

Table 12: Privacy: importance of individual transactions being untraceable

	(1)	(2)	(3)	(4)
Cash-affine	0.064		0.060	−0.013
	(0.038)		(0.038)	(0.040)
Tech-savvy	0.055		0.060	0.033
	(0.038)		(0.039)	(0.040)
Cryptocurrency owner	0.153 **		0.165 **	0.165 **
	(0.052)		(0.053)	(0.054)
Age group 36–65		−0.037	−0.023	−0.034
		(0.034)	(0.034)	(0.037)
Age group 66+		0.018	0.050	0.044
		(0.052)	(0.052)	(0.054)
Female		−0.008	0.015	0.001
		(0.032)	(0.033)	(0.034)
Academic		−0.007	−0.015	0.000
		(0.039)	(0.039)	(0.040)
Urban		−0.013	−0.009	−0.013
		(0.031)	(0.031)	(0.032)
High net income		−0.028	−0.033	−0.046
		(0.037)	(0.037)	(0.037)
Income NA		0.034	0.031	−0.011
		(0.043)	(0.043)	(0.046)
Hoarding of cash important				0.095 **
				(0.033)
Anonymity of cash important				0.231 ***
				(0.042)
Trust in central bank				−0.017
				(0.038)
Trust in people				−0.029
				(0.064)
Risk averse				−0.061
				(0.037)
Mean dependent variable	0.531	0.530	0.531	0.533
LRT tech-savvy = crypto owner	0.023		0.016	0.016
Pseudo-R^2	0.02	0.00	0.02	0.15
Log likelihood	−685	−694	−683	−592
Observations	1002	1007	1002	903

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

4.7 Trust in the issuing institution

Consumer trust matters when it comes to financial decision making (e. g. Guiso et al. (2004)). In the context of CBDCs, it is of interest to examine the level of trust respondents extend towards potential issuers: besides national central banks, digital money could be issued by commercial banks, credit card providers, or internet platforms. We asked respondents to state their level of confidence in the different potential providers: "Digital money does not need to be issued by central banks. This can be done by commercial banks, payment card issuers or internet platforms. To what extent would you trust the following issuers of digital money?". We define dummy variables for "very high" and "high" (coded as 1) and "rather low", "very low" coded as 0. Overall, the own (commercial) bank receives the most trust (75% trust), followed by central banks (71% trust).

The lowest level of trust is extended to internet platforms and tech-companies (23% and 32%, respectively).

We report the regression results for trust in central banks and trust in the own bank of respondents in Tables 13 and 14.[19] We are particularly interested in the effect of the consumer types. The results show that cash-affine users are sizeably and significantly less trusting than the reference group. Likewise, tech-savvy persons are significantly more trusting. We do not find any significant effect for cryptocurrency owners.

Table 13: Trust in central bank as issuer of CBDC

	(1)	(2)	(3)	(4)	(5)
Cash-affine	−0.146 ***		−0.131 ***	−0.091 ***	−0.120 ***
	(0.021)		(0.021)	(0.021)	(0.022)
Tech-savvy	0.092 **		0.078 *	0.058	0.072 *
	(0.032)		(0.033)	(0.030)	(0.032)
Cryptocurrency owner	−0.017		−0.043	0.013	−0.040
	(0.039)		(0.039)	(0.037)	(0.039)
Age group 36–65		0.016	0.026	0.007	0.026
		(0.024)	(0.025)	(0.024)	(0.025)
Age group 66+		−0.007	0.012	−0.044	0.008
		(0.033)	(0.032)	(0.033)	(0.033)
Female		−0.061 **	−0.053 *	−0.040	−0.038
		(0.022)	(0.022)	(0.021)	(0.022)
Academic		0.113 ***	0.095 ***	0.044	0.068 *
		(0.026)	(0.027)	(0.028)	(0.028)
Urban		0.028	0.019	0.029	0.035
		(0.021)	(0.021)	(0.020)	(0.021)
High net income		0.081 **	0.068 **	0.040	0.061 *
		(0.025)	(0.025)	(0.024)	(0.025)
Income NA		−0.035	−0.029	−0.005	−0.010
		(0.029)	(0.028)	(0.027)	(0.028)
Hoarding of cash important				−0.012	−0.023
				(0.022)	(0.023)
Anonymity of cash important				0.015	0.007
				(0.032)	(0.034)
Trust in central bank				0.260 ***	
				(0.017)	
Trust in people				0.175 ***	0.275 ***
				(0.038)	(0.039)
Risk averse					−0.019
					(0.023)
Mean dependent variable	0.709	0.707	0.709	0.724	0.717
LRT tech-savvy = crypto owner	0.044		0.025	0.356	0.049
Pseudo-R^2	0.04	0.02	0.05	0.26	0.12
Log likelihood	−1030	−1045	−1014	−795	−938
Observations	1755	1765	1755	1596	1683

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

The relative skepticism of cash-affine users may reflect that this group generally extends less trust towards the central bank (cf. Table A.1). These differences persist when controlling for confounding variables.

[19] We differentiate between the own bank and other banks. Typically, trust is much lower for other banks than for the own bank. The fifth specification in Tables 13 and 14 omits *Trust in central bank*.

Table 14: Trust in own commercial bank as issuer of CBDC

	(1)	(2)	(3)	(4)	(5)
Cash-affine	−0.119 ***		−0.113 ***	−0.076 ***	−0.100 ***
	(0.020)		(0.020)	(0.021)	(0.021)
Tech-savvy	0.077 **		0.089 **	0.078 **	0.097 **
	(0.030)		(0.031)	(0.030)	(0.031)
Cryptocurrency owner	−0.066		−0.061	−0.031	−0.065
	(0.035)		(0.035)	(0.035)	(0.036)
Age group 36–65		0.025	0.036	0.032	0.037
		(0.023)	(0.023)	(0.023)	(0.024)
Age group 66+		−0.009	0.010	−0.029	−0.003
		(0.030)	(0.030)	(0.032)	(0.031)
Female		0.046 *	0.051 *	0.047 *	0.051 *
		(0.020)	(0.020)	(0.020)	(0.021)
Academic		0.026	0.011	−0.019	−0.002
		(0.026)	(0.027)	(0.028)	(0.028)
Urban		0.027	0.016	0.020	0.025
		(0.020)	(0.020)	(0.020)	(0.020)
High net income		0.045	0.038	0.017	0.030
		(0.023)	(0.024)	(0.024)	(0.024)
Income NA		−0.023	−0.013	0.015	0.005
		(0.027)	(0.026)	(0.026)	(0.026)
Hoarding of cash important				−0.043 *	−0.049 *
				(0.022)	(0.022)
Anonymity of cash important				0.047	0.041
				(0.031)	(0.031)
Trust in central bank				0.202 ***	
				(0.019)	
Trust in people				0.040	0.114 **
				(0.038)	(0.038)
Risk averse					0.008
					(0.022)
Mean dependent variable	0.756	0.753	0.756	0.764	0.761
LRT tech-savvy = crypto owner	0.003		0.002	0.019	0.001
Pseudo-R^2	0.03	0.01	0.04	0.20	0.10
Log likelihood	−995	−1020	−989	−820	−929
Observations	1831	1840	1831	1645	1750

The table shows marginal effects from logit regressions.
Subset of respondents who report at least some interest in the digital euro.
Standard errors in parentheses. Significance levels: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

5 Discussion

"What can CBDC designers learn from asking potential users?" This was the leading question in our research. The people we have asked show a divide between those who still use cash more intensively for various reasons – a group we have called cash-affine – from all others, in particular tech-savvy respondents and cryptocurrency owners. While there is some overlap between the groups, this divide is fairly sharp. Among the cash-affine users roughly two thirds are not interested in the digital euro. In the other groups, the tech-savvy and the cryptocurrency owners, more than 70% are interested, illustrating this fairly pronounced divide. For our discussion this fact means that in the subgroup of people who answered our questions on the digital euro, cash-affine users are under-represented and other users groups are over-represented. Our data provide evidence that the significantly lower interest in the digital euro by cash-affine respondents is not primarily driven by socio-economic characteristics or by background variables that affect both cash-use and interest in

CBDC. Overall, only slightly more than half of the respondents show some interest in the digital euro at all. It is important to keep in mind that the following discussion refers to the rather peculiar subgroup of the sample that shows some interest.

The results presented in Section 4 relate to three key questions that need to be addressed in CBDC design:

1. User needs: how strong is the demand for a digital euro and does such an offer address actual user needs?
2. Technology preference: should the digital euro resemble a bank account or be more similar to cash?
3. Security and privacy preferences: how important are security and transaction data privacy?

We discuss each of them in turn.

User needs In terms of user needs, roughly one third of the respondents expect some advantage for themselves, should a digital euro be available as a payment instrument. Not very surprisingly and in line with OMFIF (2020) and Bijlsma et al. (2021), the responses show that younger people see more advantages than older ones. Cash-affine respondents are less likely to see an advantage from the digital euro than tech-savvy respondents or cryptocurrency owners. The sharp divide between cash-affine users and the others is corroborated by the fact that this user group not only is hesitant about the adoption of a digital euro, but also wants to see an important role for cash in the future. Note that even among the tech-savvy respondents, who are most likely to adopt a digital euro, the support for cash is strong. More than 50% wish that cash retains an important role in the future. We acknowledge that this finding may well reflect an Austrian specificity, given its still high cash intensity. Contrasting this with results from a highly cash-less society, for example the Netherlands, could be instructive future research.

When investigating for which transaction types potential users see a specific need for a digital euro, the overall picture we obtain is that the need for a digital euro is not pronounced in any transaction type included in the study. Instead respondents show a high level of satisfaction with the existing payment options. This indicates that at present there is no pressure from users on the central bank to provide a digital euro soon. Interestingly, this concurs with the result obtained using structural models (Huynh et al., 2020).

Technology preference CBDC developers face a number of challenges when choosing specific technical implementations. The decisions often involve trade-offs. The ECB (2020b) presents some of these challenges in terms of principles or desiderata to be fulfilled simultaneously. Our data allow us to inform this discussion with a perspective from potential users. When confronted with simplified versions of a key trade-off, users strongly prefer an access model that resembles a bank account rather than a digital token (i.e., a digital equivalent of a bearer instrument that can get lost). This holds across all consumer types. The data suggest that risk aversion might be a key driver of this preference, which could have been amplified by the chosen question wording emphasizing the risk of losses. Despite the strength of this result, it should be considered tentative and the sensitivity to framing effects should be evaluated before deriving design decisions.

The question whether a digital euro should be equipped with offline functionality is debated among policy makers. While sometimes justified with better resilience, an offline functionality could also give the digital euro a comparative advantage to most existing forms of electronic payments. The main lesson we can learn

from the survey responses is that such a feature is regarded important by the user group we describe as tech-savvy. Cash-affine users, however, express less need for this feature, indicating that the missing offline functionality is not the main reason why they prefer cash over the electronic payment options available today. When it comes to the opportunity to use the digital euro for direct payments between persons (P2P), it is overall regarded as less important compared to the offline functionality. Among the three consumer types studied, cryptocurrency owners are most supportive for a P2P functionality of a digital euro. In summary, although offline and P2P functions could make the digital euro more cash-like, offering these features would not be sufficient to convince cash-affine users to adopt it.

Security and privacy preference The public consultation by the ECB (2021a) revealed that security and the privacy of transaction are high priority issues (for the participants of the consultation). Of course such a consultation is prone to selection bias, and it is not straightforward to correct for this. We asked potential users about specific security and privacy concerns. Overall, our respondents seem to attribute more importance to security than to transaction data privacy. This is in some contrast to the findings of the ECB consultation but concords with the results in Kantar Public (2022). Note that we stressed in our questionnaire that physical cash will remain available. This could imply that respondents see no need for CBDC to provide privacy in payments.

Summing up, a story emerges that holds some lessons for the designers of CBDC. In contrast to the discussion in policy circles, the debate and the feeling of urgency for the development and provision of CBDC is not mirrored in our sample: many people have not heard about the idea and concept of a digital euro at all, and many respondents show no interest. In the group that shows some interest, we see a marked division between cash-affine users and the rest. Cash-affine users want to stick to cash now and in the future. They seem difficult to buy in to the idea of a CBDC. So, the most likely early adopters belong to the consumer type of tech-savvy users and current cryptocurrency owners. These two groups, however, do not always share the same views with respect to some key design considerations, like offline and P2P functionality as well as security and privacy attributes. In terms of implementation, users seem to prefer an account-like solution and seem to be surprisingly (to the authors) indifferent with respect to transaction data privacy. These conclusions need, however, qualifications, which we have tried to provide in the text. We believe that CBDC designers should at least be aware how new, how unknown, and how exotic their considerations are to the general public. To minimize the risk of retail CBDC becoming an unsuccessful government information technology project, designers are advised to explain the available options and their trade-offs to the group of likely early adopters extensively and clearly.

Perhaps the most general lesson that emerges from this study is that CBDC designers cannot hope to get very precise guidance on their key design decisions by just asking users about a payment instrument that does not yet exist and that necessarily must appear a bit elusive and mysterious to prospective users. The development and design of a retail CBDC will need an intensive interaction and dialogue with prospective users. This involves monitoring the effectiveness of communication activities as well as collecting information about prevailing concerns with repeated empirical studies using methods that are robust to selection bias.

6 Conclusion

The results of our survey reveal a potential disconnect between policy makers' ambitions with regards to the introduction of retail CBDC and consumers' stated attitudes and demand for a digital euro. Almost half of the sample expresses no interest in the digital euro, and almost half of those who are interested state that cash should keep its current relevance. The Austrian residents we surveyed are generally satisfied with the existing payment options. If at all they would like a CBDC with offline functionality that they seem to miss in the existing, privately provided electronic payment instruments. Moreover, the respondents assign utmost importance to the security of a CBDC and seem willing to make compromises on privacy (under the assumption that physical cash will remain available). A large majority prefers CBDC access through identified accounts over more anonymous digital tokens. Overall, our data suggest that it is far from certain that the introduction of a digital euro will unconditionally lead to a widespread adoption.

While our specific results may give some guidance for CBDC design, we consider them as tentative. A number of limitations may impede their validity. First, our survey demanded a lot of imagination from its participants as we were asking questions on a hypothetical technology many of them knew nothing about. Second and relatedly, the data quality hinges on the instrument design, specifically the wording of questions. For many concepts we could not draw on established constructs and scales. While we tried to evade all avoidable pitfalls with extensive pretests, and are generally confident in the results given their coherence and plausibility, some potential framing effects cannot be fully ruled out. Finally, Austria is a small country with comparatively high cash use. Not all results from Austrian consumers might generalize to more cashless societies or the euro area as a whole.

Taking together our high-level lesson, the call for a more user-centric approach, and the methodological challenges, we can derive an outline for a research agenda on empirically founded CBDC design (see e.g., Maiden Labs, 2021). The scope of the data collection should be extended beyond Austria, either to the euro area as a whole or to a selected set of countries with distinct payment conventions. While the current survey instrument can serve as a model, its robustness to framing effects should be studied with tailored split-ballot experiments. Some of our results lead to post-hoc interpretations or hypotheses about statistical relationships that could not be conclusively studied with the items in our survey. This can be addressed with specific new questions, while questions that revealed little information can be removed or streamlined. Finally and more broadly, some of the assumed social benefits of CBDC, such as stability and privacy, seem incredibly hard to evaluate with direct questions to potential users. Innovative (combinations of) empirical methods are needed to collect valid and generalizable evidence that speaks to these questions. Our approach to identify consumer types that are more experienced with specific aspects than the general population may seem promising here as well. Using theoretically founded structural models appears promising, too (Huynh et al., 2020; Li, 2021). Carrying out this research agenda certainly requires a lot of effort, which we think is worthwhile given the strategic importance attributed to retail CBDC and the strong path dependencies inherent to its technical and economic design.

References

S. Abramova, A. Voskobojnikov, K. Beznosov, and R. Böhme. Bits under the mattress: Understanding different risk perceptions and security behaviors of crypto-asset users. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, CHI '21, New York, NY, USA, 2021. Association for Computing Machinery. URL https://doi.org/10.1145/3411764.3445679.

I. Agárdi and M. A. Alt. Do digital natives use mobile payment differently than digital immigrants? A comparative study between generation X and Z. *Electronic Commerce Research*, forthcoming, 2022.

I. Agur, A. Ari, and G. Dell'Ariccia. Designing central bank digital currencies. *Journal of Monetary Economics*, 125:62–79, 2022. ISSN 03043932. doi: 10.1016/j.jmoneco.2021.05.002.

D. Andolfatto. Assessing the impact of central bank digital currency on private banks. *The Economic Journal*, 131(634):525–540, 2021.

R. Auer and R. Böhme. The technology of retail central bank digital currency. *BIS Quartely Review*, pages 85–100, March 2020.

R. Auer and R. Böhme. Central bank digital currency: The quest for minimally invasive technology. Working Paper 948, BIS, June 2021. URL https://www.bis.org/publ/work948.htm.

R. Auer, G. Cornelli, and J. Frost. Rise of the central bank digital currencies: drivers, approaches and technologies. Working Paper 880, BIS, August 2021. URL https://www.bis.org/publ/work880.htm.

R. Auer, R. Böhme, J. Clark, and D. Demirag. Mapping the privacy landscape for central bank digital currencies. *ACM Queue*, forthcoming, 2022.

J. Bagnall, D. Bounie, K. P. Huynh, A. Kossed, T. Schmidt, S. Schuh, and H. Stix. Consumer cash usage: A cross-country comparison with payment diary survey data. *International Journal of Central Banking*, 12 (4):1–61, 2016.

D. Balutel, M.-H. Felt, G. Nicholls, and M. Voia. Bitcoin awareness, ownership and use: 2016–20. Staff Discussion Paper 2022-10, Bank of Canada, April 2022. URL https://EconPapers.repec.org/RePEc:bca:bocadp:22-10.

Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors, and Bank for International Settlements. Central bank digital currencies: foundational principles and core features. Task force report, Bank of Canada and European Central Bank and Bank of Japan and Sveriges Riksbank and Swiss National Bank and Bank of England and Board of Governors and Bank for International Settlements, October 2020. URL https://www.bis.org/publ/othp33.htm.

M. Bijlsma, C. van der Cruijsen, N. Jonker, and J. Reijerink. What triggers consumer adoption of CBDC? Working Paper 709, De Nederlandsche Bank, April 2021. URL https://www.dnb.nl/media/amwfjgey/working_paper_no-_709.pdf.

R. Böhme, N. Christin, B. Edelman, and T. Moore. Bitcoin: Economics, technology, and governance. *Journal of Economic Perspectives*, 29(2):213–238, 2015.

M. D. Bordo and A. T. Levin. Central bank digital currency and the future of monetary policy. Working Paper 23711, National Bureau of Economic Research, August 2017. URL https://www.nber.org/papers/w23711.

M. Brown, N. Hentschel, H. Mettler, and H. Stix. The convenience of electronic payments and consumer cash demand. *Journal of Monetary Economics*, forthcoming, 2022. URL https://osf.io/27xzg/.

G. C. Bruner and A. Kumar. Gadget lovers. *Journal of the Academy of Marketing Science*, 35(3):329–339, 2007.

M. Brunnermeier and J.-P. Landau. The digital euro: Policy implications and perspectives. Policy report, European Parlament, October 2022. URL https://www.europarl.europa.eu/thinktank/en/document/IPOL_STU(2022)703337.

ECB. Study on the payment attitudes of consumers in the euro area (SPACE). https://www.ecb.europa.eu/stats/ecb_surveys/space/html/index.en.html, 2020a.

ECB. Report on a digital euro. Task force report, European Central Bank, October 2020b. URL https://www.ecb.europa.eu/pub/pdf/other/Report_on_a_digital_euro~4d7268b458.en.pdf.

ECB. Eurosystem report on the public consultation on a digital euro. Consultation report, European Central Bank, April 2021a. URL https://www.ecb.europa.eu/pub/pdf/other/Eurosystem_report_on_the_public_consultation_on_a_digital_euro~539fa8cd8d.en.pdf.

ECB. Digital euro: Experimentation, scope and key learnings. Technical report, European Central Bank, April 2021b. URL https://www.ecb.europa.eu/pub/pdf/other/ecb.digitaleuroscopekeylearnings202107~564d89045e.en.pdf.

W. Engert, B. Fung, and B. Segendorf. A tale of two countries: Cash demand in Canada and Sweden. Staff Discussion Paper 2019-7, Bank of Canada, August 2019. URL https://ideas.repec.org/p/bca/bocadp/19-7.html.

A. Falk, A. Becker, T. Dohmen, B. Enke, D. Huffman, and U. Sunde. Global evidence on economic preferences. *The Quarterly Journal of Economics*, 133(4):1645–1692, 2018.

R. J. Garratt and M. R. C. van Oordt. Privacy as a public good: A case for electronic cash. *Journal of Political Economy*, 129(7):2157–2180, 2021. ISSN 0022-3808. doi: 10.1086/714133.

G. Gowrinsakaran and J. Stavins. Network externalities and technology adoption: Lessons from electronic payments. *RAND Journal of Economics*, 35(2):260–276, 2004.

L. Guiso, P. Sapienza, and L. Zingales. The role of social capital in financial development. *American Economic Review*, 94(3):526–556, 2004.

M. Harris, K. C. Cox, C. F. Musgrove, and K. W. Ernstberger. Consumer preferences for banking technologies by age groups. *International Journal of Bank Marketing*, 34(4):587–602, 2016. doi: 10.1108/IJBM-04-2015-0056.

K. P. Huynh, J. Molnar, O. Shcherbakov, and Q. Yu. Demand for payment services and consumer welfare: The introduction of a central bank digital currency. Staff Working Paper 2020-7, Bank of Canada, March 2020. URL https://www.bankofcanada.ca/2020/03/staff-working-paper-2020-7/.

C. Kahn, F. Rivadeneyra, and T.-N. Wong. Eggs in one basket: Security and convenience of digital currencies. Staff Working Paper 2021-6, Bank of Canada, January 2021a.

C. M. Kahn, J. McAndrews, and R. William. Money is privacy. *International Economic Review*, 46(2):377–399, 2005.

C. M. Kahn, M. van Oordt, and Y. Zhu. Best before: Expiring cbdc and loss recovery. Staff Working Paper 2021-67, Bank of Canada, 2021b. URL https://doi.org/10.34989/swp-2021-67.

Kantar Public. Study on new digital payment methods. Kantar Public - commissioned by the European Central Bank, 2022. URL https://www.ecb.europa.eu/paym/digital_euro/investigation/profuse/shared/files/dedocs/ecb.dedocs220330_report.en.pdf.

T. Keister and D. Sanches. Should central banks issue digital currency? *The Review of Economic Studies*, forthcoming, 2022. URL https://doi.org/10.1093/restud/rdac017.

J. Li. Predicting the demand for central bank digital currency: A structural analysis with survey data. 2021. URL https://jiaqili.io/docs/Predict_CBDC_demand_Li.pdf.

Maiden Labs. Centering users in the design of digital currency. Report, MIT Digital Currency Initiative, 2021. URL https://dci.mit.edu/s/Maiden_US-CBDC-Report-Executive-Summary_Dec16_v3.pdf.

OMFIF. Digital currencies: A question of trust. Report, Official Monetary and Financial Institutions Forum, 2020. URL https://www.omfif.org/wp-content/uploads/2020/02/Digital-currencies-A-question-of-trust-1.pdf.

R. Reith, C. Buck, D. Walther, B. Lis, and T. Eymann. How privacy affects the acceptance of mobile payment solutions. In *Proceedings of the 27th European Conference on Information Systems (ECIS)*. Association for Information Systems, 2019.

R. Reith, M. Fischer, and B. Lis. How to reach technological early adopters? An empirical analysis of early adopters‘ internet usage behavior in Germany. *International Journal of Innovation and Technology Management*, 17(02):2050010, 2020.

O. Shy. Cash is alive: How economists explain holding and use of cash. *Journal of Economic Literature*, forthcoming, 2022.

H. Stix. Ownership and purchase intention of crypto-assets – survey results. *Empirica*, 48(1):65–99, 2021. URL https://doi.org/10.1007/s10663-020-09499-x.

A Data quality check

Given the break in the survey mode, the fact that we have very little information on non response bias due to the contact via telephone and a rather high share of self-selected CAWI interviews, we checked for potential biases in relevant variables by comparing against external data sources and past OeNB Barometer surveys.

With respect to region, age, gender, education and income our sample is comparable with samples from previous OeNB Barometer surveys. Also employment status is comparable with a slightly lower share of retired individuals when compared to past surveys. The unweigthed sample has a slightly higher share of highly educated individuals if compared to past surveys.

As regards internet use, 94 % of individuals report that the use the internet privately on a regular base. This number can be checked against two external sources: the Austrian Internet Monitor (AIM, 2021/1)[20] with 90% and a survey by Statistics Austria from 2020 with 92%.[21]

Further splitting internet use across sub-samples, we find that internet use is 95 % among men and 93 % among women. In comparison AIM reports 94% and 87%. In our sample 80% of individuals report daily use of the internet. This compares to a rate of 80% at AIM. While the comparison suggests that our sample is by and large representative, we see nevertheless a bias in the joint consideration of age and internet use. In the age group 20-59 the gap between the OeNB-Barometer and AIM is minor with respect to internet use, the gap increases if we look at the age group above 60. For example in our sample internet use in the group 60-69 is 96% compared to 83% at AIM. For individuals above 70 we have 74% and AIM has 57%. We therefore must take into account that our sample is biased with internet use in general and in particular when we look at older internet users. We suspect that the participation rate among the individuals who chose the online option is higher than for those who could give an interview by phone only.

With respect to risk attitudes we see that in the OeNB Barometer 2018 and 2019 55% reported zero risk tolerance with respect to financial decisions. In our sample the comparative rate is 50%. In past waves, 14% reported that they would accept a higher risk for a higher expected return. In our sample this share is 20%.

A direct comparison with respect to ownership of financial products is not possible since external data refer to households whereas the OeNB Barometer refers to individuals. If we take the third wave of the Household Finance and Consumption Survey (HFCS) as a reference point, we can say that 86% of households had a savings account, a life insurance or a home loan and savings contract.[22] Our sample has 79%. According to HFCS 5% of households in Austria hold stocks. In our survey 13% of individuals report stock ownership. In the OeNB-Barometer 2020/2 which was conducted with mixed methods also the stock ownership rate was 8% and thus nearer to the HFCS numbers.

Finally, we note that 8% of respondents state that they own cryptocurrencies. Previous surveys from 2019 report an ownership rate of about 2% (Stix (2021)). We consider it likely that ownership has increased from 2019 to 2021. The finding that about 40% of respondents state that they hold less than 1,000 euro in cryptocurencies suggest an inflow of new investors. Nevertheless, the ownership seems rather high when comparing with international surveys. For example, in the U.K. ownership was estimated to be 4.4% (Source: Financial Conduct Authority, `https://www.fca.org.uk/publications/research/research-note-cryptoasset-consumer-research-2021`).

[20] Source: INTEGRAL Markt- und Meinungsforschungsges.m.b.H. `https://www.integral.co.at/downloads/Internet/2021/07/AIM-C_1HJ21.pdf`.

[21] Source: Statistik Austria `https://www.statistik.at/web_de/statistiken/energie_umwelt_innovation_mobilitaet/informationsgesellschaft/ikt-einsatz_in_haushalten/index.html`.

[22] See `https://www.hfcs.at/ergebnisse-tabellen/hfcs-2017.html`.

B Description of variables

Cryptocurrency owner: Derived from two survey questions. The first question asks whether respondents have heard of "Bitcoin or of other so-called cryptocurrencies". For those respondents that have heard of cryptocurrencies, a follow-up question elicits the degree of interest in cryptocurrencies. Dummy variable = 1 for answers "I currently own Bitcoin" and "I currently own other cryptocurrencies", 0 otherwise.

Tech-savvy: Based on the following question: "How would you assess yourself in relation to technological developments, e.g. new devices or applications? Which of the following statement best applies to you?" Answers comprise "a) Highly interested, I would like to try new devices or applications immediately", "b) I am interested, but would not want to buy or try new devices or applications immediately", "c) I buy new devices or applications only if I see a benefit", "d) I am not interested in technological developments and only buy new devices when I need them". Tech interest high = 1 if respondents choose answer a, 0 otherwise.

Cash-affine: Derived from self-stated payment behavior. "If you think about all your purchases, including those made online, for food, clothing, services, gasoline, etc. Do you spend more (by value) in cash or more cashless – with cards or cell-phone?". Dummy variable=1 if "exclusively cash" and "more cash than cashless", 0 if "about equal", "more cashless than cash", "predominantly cashless."

Age: Measured by three dummy variables *Age group 16–35*, *Age group 36–65* and *Age group 66+*.

Female: Binary variable coded 1 for female respondents and 0 otherwise.

Urban: Dummy variable which takes a value of 1 if a respondent reports to reside in a municipality with 20,000 and more inhabitants.

High net income; income NA: Dummy variables. For those respondents who provided an answer about their household income, we compute tercils. *High net income* is coded 1 for respondents with a reported household income in the highest tercil (3.750 euro, mid-point of income brackets). *Income NA* is coded 1 for respondents who did not provide their household income (about 21% of the sample).

Academic: Dummy variable which encodes respondents with university education (1) and with non-academic background (0; e. g., mandatory schooling or technical colleges).

Hoarding of cash important: Based on "There are many people who like to have more cash at their disposal than would be necessary for daily life, as a reserve or to save. How important is it for you personally that one can hold a higher amount of cash?". Dummy variable coded as 1 for "very important" and "important", 0 for "rather not important" and "not important at all".

Anonymity of cash important: Based on the statement "Cash should be retained such that anonymuous payments can be made". Dummy variable coded as 1 if respondents "fully agree" or "somewhat agree", 0 if "somewhat disagree" and "fully disagree."

Trust in central bank: Based on "How much do you trust the following institution ... the Österreichische Nationalbank" (Central Bank of Austria)? Dummy variable coded as 1 if "very high" and "high", 0 if "rather low" or "very low".

Trust in people: Based on "Generally speaking, would you say that most people can be trusted or that you cannot be too careful in life?". Answers range from 0 ("cannot be too careful") to 10 "most people can be trusted," linearly rescaled to the unit interval.

Risk averse: Based on the question: "If there are financial decisions in your household: which of the following statements best describes your attitude toward risk: a) if I can expect a substantial profit, I am willing to take substantial financial risks; b) if I can expect an above-average profit, I am willing to take above-average risks; c) if I can expect average profits, I am willing to take average financial risks; d) I do not want to take any risk." *Risk averse* = 1 if respondents choose answer d), 0 otherwise.

C Descriptive statistics

Table A.1: Sample comparison: Socio-demographics of the consumer types

	Cash-affine (1)	Tech-savvy (2)	Cryptocurrency owner (3)
Age (numeric)	**50.40**	39.21	39.40
Female	**0.49**	0.34	0.31
Academic	0.12	0.21	**0.24**
Urban	0.41	0.44	**0.49**
High net income	0.21	0.35	**0.39**
Income NA	**0.20**	0.17	0.18
Hoarding of cash important	**0.74**	0.60	0.60
Anonymity of cash important	**0.94**	0.83	0.82
Trust in central bank	0.61	**0.72**	0.56
Trust in people	0.41	0.40	**0.42**
Risk averse	**0.54**	0.24	0.13
Observations	621	271	144

Note: The table shows sample means of variables (in rows) for the consumer types. Row-wise maxima are highlighted. All variables were restricted to have the same number of observations by consumer type. The results refer to the full sample.

Table A.2: Descriptive statistics

Variable	N	Mean value	
		unweighted	weighted
Panel A. Dependent variables (full sample)			
Interested in the introduction of a digital euro	2006	0.54	0.52
Panel B. Dependent variables (interested in the offer of a digital euro = 1)			
Belief that the digital euro brings personal advantages	914	0.43	0.43
Cash should keep its current relevance	1078	0.48	0.48
Need for a digital euro for payments on the internet	1003	0.54	0.54
Need for a digital euro for larger payments	991	0.53	0.52
Need for a digital euro for spending when traveling abroad	962	0.53	0.53
Need for a digital euro for payments for daily grocery shopping	997	0.40	0.39
Need for a digital euro for payments in hotels and restaurants	996	0.37	0.37
Need for a digital euro for sending money to persons abroad	868	0.40	0.40
Need for a digital euro for payments to persons (gifts, tips, yard sale)	986	0.33	0.34
Need for a digital euro for hoarding/saving of money	971	0.34	0.34
Preference for a cash-like digital euro	945	0.26	0.27
Would use if cash-like	970	0.46	0.47
Would use if account-like	969	0.67	0.66
Importance of offline functionality	1007	0.79	0.78
Importance of P2P functionality	1007	0.57	0.57
High security against fraud and theft	1045	0.86	0.86
Strict protection of my personal data	1045	0.85	0.83
Funds recoverable after device/password theft	1041	0.85	0.84
Making payments is easy and convenient	1040	0.85	0.84
Possibility to dispute and undo payments	1035	0.84	0.84
Clear display of expenses and remaining credit	1035	0.85	0.84
It is possible to pay on the internet	1029	0.76	0.74
No retention of data on persons and payments	1022	0.67	0.66
Individual transactions are untraceable	1007	0.53	0.53
Trust in central bank as issuer of CBDC	983	0.81	0.81
Trust in own commerical bank as issuer of CBDC	1030	0.83	0.82
Panel C. Main explanatory variables (full sample)			
Cash-affine	1984	0.35	0.38
Tech-savvy	2006	0.15	0.14
Cryptocurrency owner	2006	0.08	0.07
Panel D. Explanatory variables (interested in the offer of a digital euro = 1)			
Cash-affine	1075	0.22	0.22
Tech-savvy	1083	0.20	0.21
Cryptocurrency owner	1083	0.11	0.10
Age group 16–35	1083	0.40	0.37
Age group 36–65	1083	0.48	0.50
Age group 66+	1083	0.12	0.13
Female	1083	0.50	0.46
Academic	1083	0.21	0.17
Urban	1083	0.50	0.53
High net income	1083	0.29	0.28
Income NA	1083	0.19	0.18
Hoarding of cash important	1046	0.51	0.51
Anonymity of cash important	1060	0.82	0.82
Trust in central bank	1000	0.74	0.73
Trust in people	1071	0.42	0.43
Risk averse	1083	0.35	0.36