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Nils Brouwer and Jakob de Haan

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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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De Nederlandsche Bank NV
P.O. Box 98
1000 AB AMSTERDAM
The Netherlands

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Nils Brouwer[a], Jakob de Haan[b,c]

[a] *De Nederlandsche Bank, Spaklerweg 4, 1096BA Amsterdam, The Netherlands*
[b] *University of Groningen, Faculty of Economics and Business, PO BOX 800, 9700 AV Groningen, The Netherlands*
[c] *CESifo, Poschingerstr. 5, 81679 Munich, Germany*

Abstract

Using data from the Dutch Household Survey, we examine what individuals know about cryptocurrencies and how they acquire information about these assets. Our results suggest that higher-educated respondents with a stronger desire to be informed use more different information sources, which results in better knowledge. However, respondents relying on social media or friends for information on cryptocurrencies do not have better knowledge. We also observe that individuals who hold cryptocurrencies are better informed. Furthermore, the longer they own cryptocurrencies, the better knowledge respondents have. Finally, we find that individuals who acquire cryptocurrencies for investment purposes demonstrate a higher level of understanding than those who buy cryptocurrencies for other reasons.

Keywords: cryptocurrencies; general public; information sources; knowledge
JEL: codes D12; D14; G11; E41

1. Introduction

The surge in household ownership of cryptocurrencies has raised concerns among regulators about consumer understanding of these complex digital assets. Recent studies have fueled these concerns. While awareness of cryptocurrencies is widespread[1], actual knowledge about these assets is rather limited. According to Der Postbank (2018), only 20% of German households believe they possess a (very) high level of cryptocurrency knowledge. Similarly, Financial Conduct Authority (2020) reports that merely 27% of UK households identify the correct definition of cryptocurrencies.

Limited general knowledge about cryptocurrencies may not be problematic as long as (potential) buyers are adequately informed before acquiring these assets. A study by the British Financial Conduct Authority (2021) reports that 92% of cryptocurrency owners identify the correct definition of cryptocurrencies and 77% recognize at least three different cryptocurrencies. However, even a substantial share (42%) of cryptocurrency owners indicate that they lack a thorough understanding of how cryptocurrencies work. Moreover, based on answers to true/false statements about cryptocurrencies, Balutel et al. (2022) observe that 69% of Canadian cryptocurrency owners have a low (28%) or medium level (41%) of knowledge about cryptocurrencies.

While research on cryptocurrencies has surged in recent years Pattnaik et al. (2023), differences in individuals' knowledge about cryptocurrencies have not been extensively explored in academic research (Steinmetz et al. (2021) being a clear exception). While the results of survey studies on knowledge about cryptocurrencies by market research firms are fairly consistent, many of these studies provide limited information about their methodology. Moreover, they do not provide a formal analysis of the drivers of knowledge about cryptocurrencies and do not examine which sources of information about cryptocurrencies respondents use.

How knowledge about assets affects investment behavior is studied in the literature on financial literacy, which is vast.[2] However, it is uncertain whether conclusions in this line of research apply to cryptocurrencies. A recent study by Weber et al. (2023), who utilize repeated large-scale U.S. household surveys, highlights substantial differences between investors in cryptocurrency and investors in other asset classes. The authors report that crypto owners are more hesitant to predict the expected return of assets invested in than owners of other assets. Weber et al. (2023) also find that information about cryptocurrencies is important. Using a randomized controlled trial (RCT) set-up, they observe that providing information about historical returns on crypto assets increases individuals' desire to hold these assets. However, in an RCT, respondents are exposed to information, which they may never acquire in real life. It is therefore important to explore the relation between people's desire to be informed about cryptocurrencies, their information sources, and their knowledge in more detail.

In the first part of the paper, we propose a theoretical model guiding our analysis of individuals' knowledge about cryptocurrencies and how they acquire information about cryptocurrencies. Drawing on the work of Blinder and Krueger (2004) and Van der

[1] For example, SCHUFA (2019) and VCIOM (2022) report that over 80% of the population in Germany and Russia, respectively, have heard of Bitcoin.

[2] Lusardi and Mitchell (2014) provide a comprehensive overview and discuss studies such as Van Rooij et al. (2011) about financial literacy and retail investment.

Cruijsen et al. (2013, 2015), this framework considers factors such as individuals' desire to be informed, their sources of information, and information-seeking intensity.

In the second part of the paper, we test hypotheses derived from our model using data from the Dutch Household Survey (DHS). The DHS is a rich source of information about individuals, including demographic characteristics and psychological traits. Its longitudinal structure offers detailed insights about cryptocurrency ownership. In a special survey wave conducted in May 2022, we asked several questions about cryptocurrencies that were designed to measure respondents' knowledge of and interest in cryptocurrencies. For this, we asked respondents for a self-assessment of their knowledge about cryptocurrencies and we posed a set of true/false questions about the cryptocurrency market and the technology underlying Bitcoin, which is the most popular cryptocurrency.

Our study is most closely related to the work of Steinmetz et al. (2021). These authors explore the prevalence of cryptocurrency ownership and knowledge levels regarding cryptocurrencies among a sample of 3,864 Germans. Their findings suggest that 83% of respondents are aware of cryptocurrencies, but self-assessed knowledge remains limited. They identify that knowledge about cryptocurrencies is a significant driver of ownership, mediated by trust. While Steinmetz et al. (2021) emphasize subjective knowledge, which pertains to individuals' self-perceived understanding, our research delves into objective knowledge, referring to factual information and technical comprehension of cryptocurrencies. Although both types of knowledge are undoubtedly intertwined, our paper posits that the relation between each type of knowledge and cryptocurrency ownership may differ. Specifically, we argue that while subjective knowledge may lead to ownership due to increased confidence, objective knowledge does not necessarily exhibit a similar causal pathway. Hence, our research complements and extends the analysis by Steinmetz et al. (2021) by distinguishing between the roles of subjective and objective knowledge and their relation with cryptocurrency ownership and by exploring sources of information about cryptocurrencies.

Our empirical results support the theoretical framework, suggesting that respondents with higher education levels and a stronger desire to be informed use more different information sources, which results in better knowledge. However, not all types of information sources lead to better knowledge: respondents relying on social media or friends for information on cryptocurrencies do not have better knowledge. This could be a concern for policymakers given that large shares of the population (46%) and cryptocurrency owners (28%) use these sources.

Furthermore, we observe that cryptocurrency owners know more than the general public, which has a very low level of understanding: nearly 50% of respondents do not correctly answer any true/false statement about cryptocurrencies. We find that individuals holding more cryptocurrencies — both absolutely (in euros) and relative to their total investment portfolio — are better informed. Our results also suggest a 'learning-by-doing' effect: respondents have better knowledge the longer they own cryptocurrencies, even when we account for a potential early adopter effect. Additionally, we observe that individuals who acquire cryptocurrencies for investment purposes demonstrate a higher level of understanding than those who buy cryptocurrencies for other reasons.

The rest of the paper is structured as follows. The next section discusses the conceptual framework and hypotheses. The third section describes the data used. The fourth section presents the estimation results of the model, while the fifth section examines the relation between ownership and knowledge of cryptocurrencies in more detail. The final

section concludes.

2. Theoretical framework and hypotheses

Figure 1 shows our theoretical framework which is inspired by Blinder and Krueger (2004) and Van der Cruijsen et al. (2013, 2015). Our model formalizes the interdependencies among four elements: knowledge of cryptocurrencies (K_i), desire to be informed (D_i), ownership of cryptocurrencies (O_i), and intensity of information seeking (I_i). This framework constructs a triangular system of equations, which are each explained in more detail below.

2.1. The determinants of knowledge about cryptocurrencies

We model the determinants of knowledge about cryptocurrencies (K_i) as follows:

$$K_i = \beta_{ED} ED_i + \beta_X{}' X_i + \beta_O O_i + \beta_{IQ} I_i^Q + \beta_{IT} I_i^T + \beta_D D_i + e_{1,i} \tag{1}$$

We assume that individuals' knowledge about cryptocurrencies depends on their educational background (ED_i), as some previous studies report evidence that education is related to knowledge about cryptocurrencies. For instance, based on a survey among 3,864 adult German internet users, Steinmetz et al. (2021) observe a negative relation between educational achievements and knowledge about cryptocurrencies and blockchain technology. Likewise, using data from the Survey of Consumer Payment Choice, Auer and Tercero-Lucas (2022) report that US investors with higher levels of education were more likely to know about at least one cryptocurrency.

The control variable vector X_i encompasses demographic characteristics such as age, gender, and income. Some previous studies suggest that these characteristics matter. Steinmetz et al. (2021), for instance, report that knowledge about cryptocurrencies and blockchain technology are negatively related to age and positively related to male gender and income. We also include risk preferences, as research has indicated that these may be related to cognitive abilities Benjamin et al. (2013).

Aside from these characteristics, we anticipate that ownership of cryptocurrencies (O_i) influences individuals' knowledge about these digital assets.[3] Acquiring cryptocurrencies, either via trading or mining, might teach individuals more about the technology behind cryptocurrencies and their markets. The results of Steinmetz et al. (2021) lend support to this hypothesis. Our first hypothesis is, therefore:

Hypothesis 1 (H1): *Individuals who own cryptocurrencies have better knowledge about cryptocurrencies.*

$$\beta_O > 0$$

We also expect that the information sought by individuals matters. We expect that both the intensity of information seeking (I_i^Q) and the types of information sources used (I_i^T) matters.

[3] In Section 4.3 we investigate reverse causality, i.e., whether ownership is driven by objective knowledge. We do not find evidence for this.

The number of sources, the seeking intensity, might affect individuals' knowledge as using multiple sources might help individuals to identify correct information or expose them to information which they might miss if they were to use only one information source. Therefore, similar to Van der Cruijsen et al. (2015), we also expect that the number of information sources has a positive impact on individuals' knowledge level.

We expect that not only the number of information sources to matter, but also the type of information source as some sources may provide more accurate information than others (Van der Cruijsen et al. (2015)). In particular, we hypothesize that relying on traditional media sources (radio, TV, and newspapers) fosters better knowledge compared to other sources such as friends or social media, due to the quality assurance procedures typically in place in traditional media (e.g. fact-checking by an editorial office).

Our second and third hypothesis are therefore:

Hypothesis 2 (H2): *There is a positive relation between the number of information sources used by individuals and their knowledge about cryptocurrencies.*

$$\beta_{IQ} > 0$$

Hypothesis 3 (H3): *Individuals who acquire their information about cryptocurrencies through newspapers, radio, or television possess more (accurate) knowledge about cryptocurrencies compared to those relying on other information sources.*

$$\beta_{IT} > 0$$

Finally, we expect that the desire to being informed (D_i) also has an impact on knowledge.

2.2. The determinants of individuals' desire to be informed

The desire to be informed (D_i), one of the drivers of knowledge, is assumed to depend on self-interest (SI_i), education, and several other covariates:

$$D_i = \gamma_{SI} SI_i + \gamma_{ED} ED_i + \gamma_X{}' X_i + e_{2,i} \tag{2}$$

Given the costs associated with acquiring information, individuals will only seek information if the expected benefits outweigh these costs. Individuals will benefit little from knowledge about cryptocurrencies if they are unlikely to buy cryptocurrencies in the foreseeable future. Therefore, our fourth hypothesis is:

Hypothesis 4 (H4): *Individuals who (intend to) own cryptocurrencies have a larger desire to be informed about them.*

$$\gamma_{SI} > 0$$

2.3. The determinants of individuals' intensity of information seeking

And the final equation looks at the determinants of the intensity of information seeking about cryptocurrencies (I_i^Q). In which we assume that the number of sources used by an individual to acquire information about cryptocurrencies depends on the desire to be informed, self-interest, education, ideology (ID_i), and various other control variables.

$$I_i^Q = \zeta_D D_i + \zeta_{SI} SI_i + \zeta_{ED} ED_i + \zeta_{ID} ID_i + \zeta_X{}' X_i + e_{3,i}$$

(3)

We assume that the choice and intensity of use of information sources depend on the desire to be informed, self-interest, education, ideology (ID_i), and various other control variables.[4] An individual's desire to be informed about cryptocurrencies likely increases the variety of information sources used.

So, our fifth hypothesis is:

Hypothesis 5 (H5): *Individuals with a larger desire to be informed about cryptocurrencies will use more information sources*

$$\zeta_D > 0$$

It is well known that individuals with a higher level of education tend to read different newspapers compared to those with lower levels of education. Furthermore, the level of education might influence the diversity of media sources used. We expect that highly educated individuals use a wide range of information sources as they may find it easier to process (contradictory) pieces of information, reducing the cost of using diverse sources. Our final hypothesis is therefore:

Hypothesis 6 (H6): *More highly educated individuals use more information sources to acquire information about cryptocurrencies than less-educated individuals.*

$$\zeta_{ED} > 0$$

3. Data

We collected data using an online questionnaire[5], which was distributed to DHS participants.[6] In December 2021, 3,213 members received the questionnaire and were given fourteen days to respond. Compared with surveys conducted by telephone or mail, the response rate to this continuous internet-based survey is usually very high. In our case, we had a response rate of 80.6%, equating to 2,589 individuals.

[4] Controlling for individuals' ideology is motivated by the (extensive) literature about political media slant, which may be defined as bias in news coverage that favours a certain ideology or political party (Garz and Rickardsson (2023)). Political media slant can be driven by both the news market's demand and supply side. Regarding the demand side, consumers often have preferences for news that confirms their existing beliefs. Under supply side explanations, media slant could be driven by journalists, editors, and media owners if these actors let their personal views affect newsroom decisions, or it could also be a result of the influence of lobbies and government capture (Garz and Rickardsson (2023)). Evidence for US newspapers suggests that their slant is largely driven by consumer preferences (Gentzkow and Shapiro (2010)). Likewise, using a long-term panel survey surrounding the 2014 election for the European Parliament in the Netherlands, Kleinnijenhuis et al. (2020) report that people selectively turn to like-minded media. Another motivation to consider ideology is that Fisch et al. (2021) report that investors' ideology affects their interest in initial coin offerings (ICOs). In an ICO, firms raise capital by selling tokens, i.e., cryptographically protected digital assets implemented on a blockchain.

[5] See online Appendix A for an overview of the questions raised in our survey.

[6] Panel members are Dutch individuals aged sixteen years and older who have been selected to provide a representative sample of the Dutch population.

Figure 1: Conceptual framework on the determinents of knowledge about cryptocurrencies

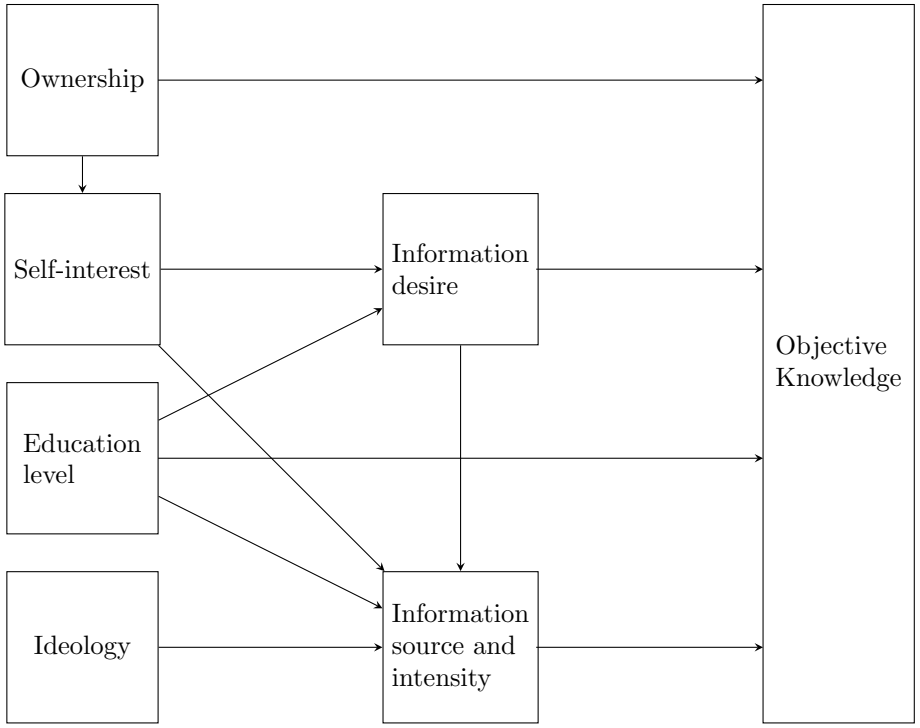


Table 1 provides information on the demographic characteristics of the respondents. The average respondent is in their mid-fifties, lives with a partner, and has not received higher education. For this study's external validity, respondents' demographic characteristics should be representative of the Dutch population at large. Table 1 also shows the averages for the Dutch population (provided by Statistics Netherlands (CBS)). The table suggests that our sample differs significantly from the Dutch population in certain aspects. The average age of the participants in the survey is almost eight years higher, unemployment is substantially lower, gross household income is lower, the education level of respondents is four points higher, while a larger share of the sample is retired compared to the population at large. We checked, similar to Van der Cruijsen et al. (2015), who also found differences between the DHS and the Dutch population at large, whether re-weighting observations based on average age, income, education level, and unemployment of the Dutch population changes our main conclusions. We find that re-weighting does not change our main findings (results are available upon request).

3.1. Ownership of cryptocurrencies

The DHS has been surveying respondents annually about cryptocurrency ownership since 2018. Figure 2 presents the percentage of respondents owning cryptocurrencies at each wave of the DHS. The ownership rate has risen over time, increasing from 2.6% in 2018 to 4.3% in 2021, with the most notable growth occurring between 2020 and 2021. The substantial increase in ownership in the latest year for which data were available

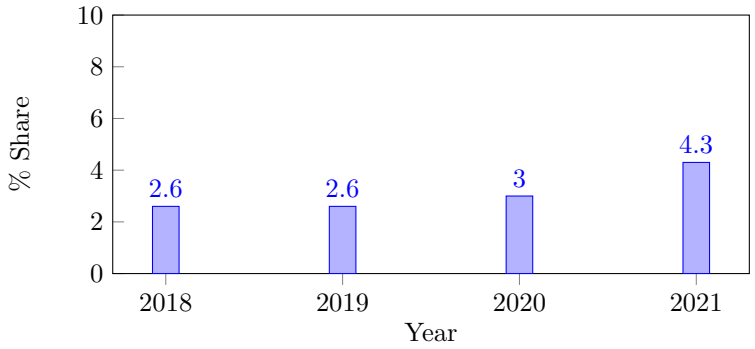
Table 1: Demographic characteristics

	Survey mean	Population mean
Male	51%	50%
Age	56.6	48.7
Partner *(1 = living with partner)*	69%	55%
Unemployed	1.7%	3.8%
Retired	33%	18.7%
Monthly gross income *(in €1,000)*	2.28	2.78
Education *(1 = higher educated)*	40%	36%

Source for Population Means: Statistics Netherlands (CBS). **Notes:** Education is coded as 1 if higher vocational education and/or university education was the highest degree, and 0 if otherwise.

may be attributed to the significant rise in Bitcoin prices, which might have spurred interest in cryptocurrencies. [7]

Figure 2: Share of DHS respondents owning cryptocurrencies



Note: This bar chart shows the share of DHS respondents owning cryptocurrencies at the end of each year.

3.2. Motive to purchase cryptocurrencies

Our survey also inquired about the motives of individuals who intended to purchase cryptocurrencies in the next twelve months. Respondents were allowed to choose more than one motive for buying cryptocurrencies. The results are shown in Figure 3.

Investment emerges as the primary motivation for purchasing cryptocurrencies, with 83% of respondents indicating it as a reason. This observation is consistent with the finding of Auer and Tercero-Lucas (2022) that the majority of US crypto owners acquire these assets for speculative purposes. On the other hand, only 14% of respondents intend

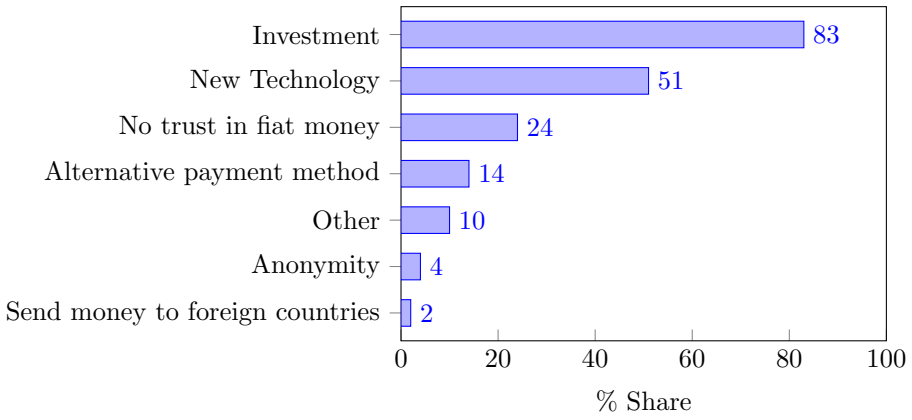
[7] The rise in interest during this period is also visible in the number of Google searches for Bitcoin in the Netherlands since December 2020 (see online Appendix B).

to use cryptocurrencies as an alternative payment method. As a result, we predominantly regard cryptocurrency purchases as an investment in this paper.[8]

While investment is the primary motivation, there are other reasons why some individuals purchase cryptocurrencies. This is in line with the results of Mattke et al. (2021) that certain individuals buy Bitcoins without anticipating profits. Interest in the underlying technology is the second most cited reason, with 51% of respondents echoing this sentiment, a result that resembles the findings of Stix (2021). Somewhat surprisingly, a substantial proportion of respondents (24%) stated a lack of trust in traditional fiat money as a reason to purchase cryptocurrencies. A possible explanation why this result might deviate from the findings of previous research, is that our survey allowed respondents to select multiple reasons. In other words, lack of trust in traditional currencies might not be the primary reason for purchasing cryptocurrencies but may still play a role.

Finally, anonymity and sending money to foreign countries were less commonly cited motives, ticked by only 4% and 2% of the respondents, respectively.

Figure 3: Motive to buy cryptocurrencies



Note: This bar chart displays the shares of responses to the question: "What is your motive to buy any cryptocurrencies in the next year?". This question was only posed to respondents who indicated that they were likely or very likely planning to purchase cryptocurrencies in the next twelve months. Respondents were permitted to select more than one answer.

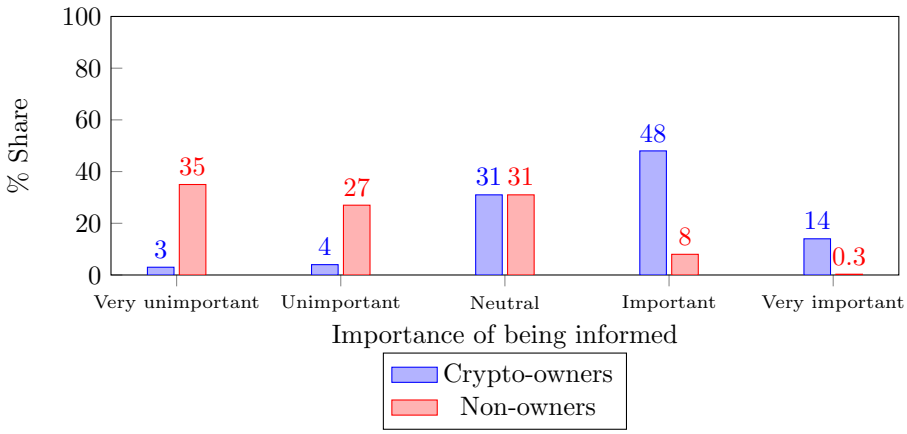
3.3. Information seeking

Figure 4 shows the responses to the question: "Do you find it important to stay up-to-date about the developments of cryptocurrencies?". Most respondents indicated that they do not consider it (very) important to be informed about cryptocurrencies. Unsurprisingly, individuals who own cryptocurrencies have a substantially higher desire to be informed about cryptocurrencies than non-owners. Only 8% of the individuals who do not own cryptocurrencies consider it (very) important to be informed about these

[8]The perspective of treating cryptocurrencies more as an investment than a currency is supported by White et al. (2020). These authors examined the nature of cryptocurrencies. Their results suggest that Bitcoin aligns more with an asset class and a technology-driven product than with a currency.

instruments. In contrast, 62% of cryptocurrency owners find it very important to be well informed.

Figure 4: Importance of being informed about cryptocurrencies



Note: Response shares to the question "How important is it to you to be up-to-date on cryptocurrencies?".

Figure 5 shows the sources used by individuals who deem it (very) important to stay informed about cryptocurrencies. The most common sources of information about cryptocurrencies were the internet (73%) and friends (46%). In contrast, traditional media, particularly the radio (12%), are not frequently used as an information source.

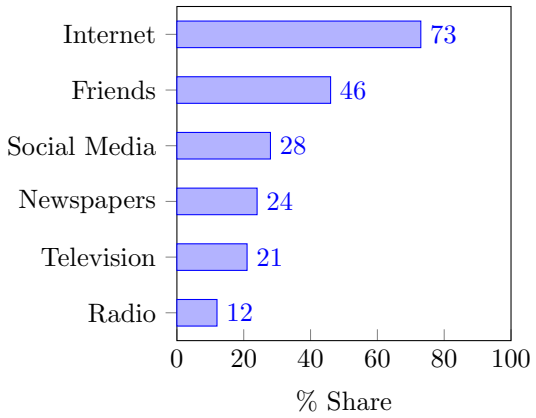
These outcomes indicate that individuals resort to different sources for information on these digital assets compared to information on, for instance, the European Central Bank (ECB). Through a survey among Dutch respondents, Van der Cruijsen et al. (2015) find that the most prominent information sources to acquire information about the ECB are TV and newspapers, with these being indicated by 42% and 33% of the respondents, respectively. In contrast, only a very small portion of the respondents reports obtaining information via the internet (5%) or through friends (1%).[9]

3.4. Knowledge about cryptocurrencies

Figure 6a displays the number of correct answers given by respondents to our statements regarding cryptocurrency markets. A significant discrepancy exists between the knowledge of cryptocurrency owners and non-owners. 88% of the respondents who do not own cryptocurrencies did not answer any of the statements correctly; for cryptocurrency owners this share was 44%. Even though cryptocurrency owners, on average, thus perform better than non-owners, the number of correct answers given by owners varies greatly. Approximately 20% of the cryptocurrency owners gave 1, 2, or 3 correct answers.

[9]It is important to note that, aside from the difference in the subject matter (information on the ECB vs. cryptocurrencies), the variation in responses might also be attributed to the fact that the survey of Van der Cruijsen et al. (2015) was conducted some time ago, when perhaps fewer people were using the internet as a primary source of information. Additionally, respondents in the Van der Cruijsen et al. (2015) survey could indicate only one source, whereas in our survey respondents could mention multiple information sources.

Figure 5: Source of information about cryptocurrencies



Note: This bar charts shows the information sources used by respondents who indicated to find it (very) important to being informed about cryptocurrencies. Respondents could give multiple answers.

Figure 6b shows the number of correct answers given by respondents to our statements about the technology underlying Bitcoin.[10] Once again, we observe that owners possess more knowledge than non-owners. 47% of non-owners did not provide any correct answer to our technology-related statements; this percentage rises to 88% for market-related statements. In contrast, cryptocurrency owners provided either 2 (50%) or 3 (31%) correct answers to the technology-related statements. However, owners' knowledge about markets is much lower, as only 17% provided 2 or 3 correct answers.

Most respondents considered their knowledge about cryptocurrencies as being (very) poor to neutral. Figure 7 shows the average number of correct responses grouped by participants' self-reported knowledge level. Our data suggest that participants accurately assessed their knowledge: respondents with higher self-assessed knowledge levels had a better understanding of cryptocurrencies.

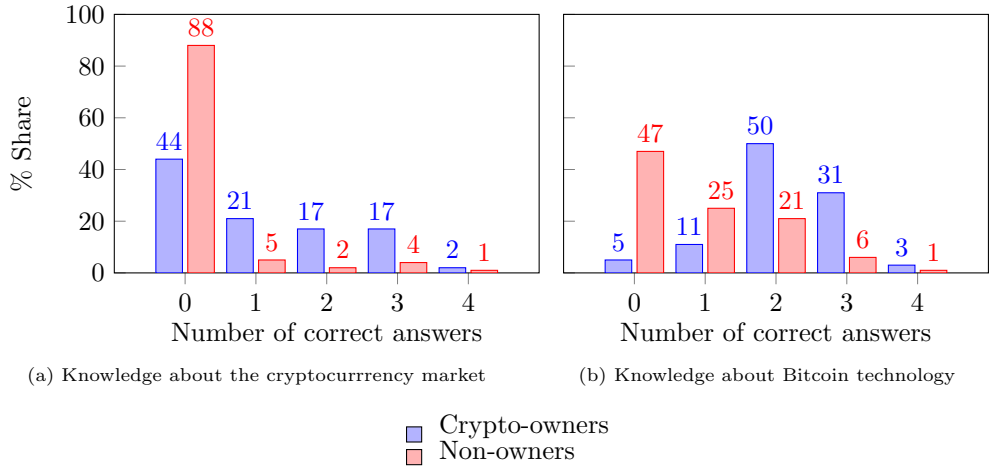
4. Baseline estimates

4.1. Desire to be informed about cryptocurrencies

This section presents the estimates of our model for the factors influencing an individual's desire to be informed about cryptocurrencies (equation 2 of section 2). The dependent variable, *Information Desire*, is an ordinal variable ranging from 1 (very unimportant to be up-to-date about cryptocurrencies) to 5 (very important to be up-to-date about cryptocurrencies). The explanatory variables of interest in this model are *Owner* and *Purchase Intention*. *Owner* is assigned a value of 1 if an individual owned cryptocurrencies at the end of 2021, and *Purchase Intention* is assigned a value of 1 if an

[10] Our statements to test respondents' knowledge about cryptocurrency technology are inspired by the statements used by Henry et al. (2018).

Figure 6: Knowledge about the cryptocurrency market and technology

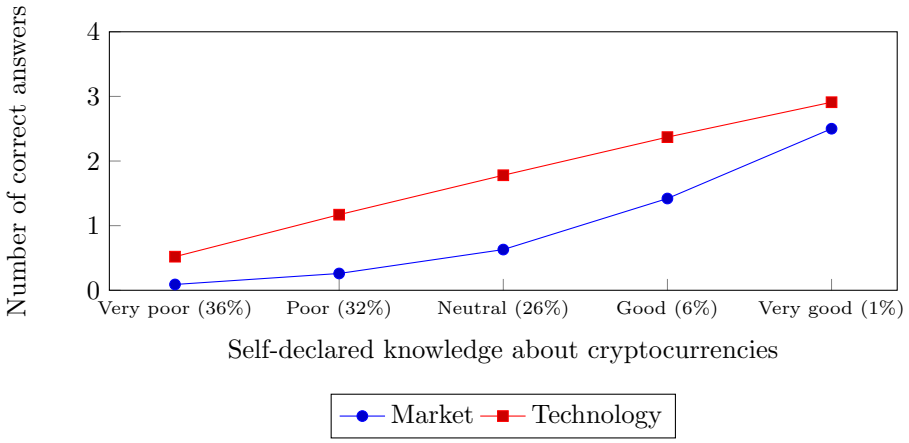


(a) Knowledge about the cryptocurrrency market

(b) Knowledge about Bitcoin technology

Note: These bar charts show the share of respondents (vertical axis) who provided a particular number of correct answers (horizontal axis) to sets of true/false statements about the market capitalization of various cryptocurrencies and the underlying technology of Bitcoin, respectively.

Figure 7: Actual vs. self-declared knowledge



Note: Response shares are shown in parentheses. The dots denote the average percentage of correct questions.

individual intends to buy cryptocurrencies in the next 12 months but currently does not own any cryptocurrencies.[11]

[11]The variable *Owner* is derived from the annual DHS survey and not from our special wave (which also includes a question on ownership). We use the data from the annual wave for consistency reasons: the analysis in Section 5 can only be conducted using the annual DHS data as the special wave does not contain information about the amount of cryptocurrencies owned by a household or on the timing of the first purchase. Using the ownership data from the special survey wave yields similar results (available upon request). Relying on the ownership data from the annual survey, however, reduces the sample size

Several control variables were incorporated in our model. *Male* is a dummy variable that is 1 if individual i is male and 0 otherwise. *Age* is a discrete variable representing the age of individual i in years. *Educated* is a binary variable that is 1 for respondents who completed vocational or university education and 0 otherwise. *Income* is a continuous variable representing the gross monthly income of individual i, *Unemployed*, a binary variable where 1 indicates that an individual is unemployed, and 0 otherwise. Finally, we include *Risk preference*; this discrete variable is based on participants' self-reported risk preference, ranging from 0 (not at all willing to take risks) to 10 (very willing to take risks).

We estimate this model using ordered logit regressions with heteroscedasticity-robust standard errors. Table 2 shows the results. In the first column, only control variables are taken up, while in the second and third columns the explanatory variables of interest are added. The final column shows the results if all explanatory variables are included.

Our findings indicate that younger, more educated males with higher risk preference have an elevated desire to be informed about cryptocurrencies. Moreover, individuals who own cryptocurrencies or intend to purchase them within the upcoming 12 months have a stronger than average desire to be informed about cryptocurrencies. This evidence supports Hypothesis H4.

Table 2: Drivers of importance of being informed

	(1)	(2)	(3)	(4)
Owner		2.51***		2.78***
		(0.26)		(0.27)
Purchase intention			2.26***	2.60***
			(0.27)	(0.30)
Male	0.53***	0.47***	0.49***	0.42***
	(0.09)	(0.09)	(0.09)	(0.09)
Age	-0.02***	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Higher education	0.33***	0.34***	0.32***	0.33***
	(0.09)	(0.09)	(0.09)	(0.09)
Unemployed	0.40	0.37	0.42	0.39
	(0.32)	(0.31)	(0.32)	(0.31)
Income	0.00*	0.00*	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Risk preference	0.19***	0.17***	0.20***	0.17***
	(0.02)	(0.02)	(0.02)	(0.02)
N	1756	1756	1756	1756

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

to 1,756 observations due to the exit of some participants between the completion of the annual survey and our special wave survey.

4.2. Number of information sources used

Next, we examine what drives the number of different information sources used by respondents (equation 3 of section 2. The dependent variable, *Sources*, ranges from 0 (no information sources used) to 6 (all information sources specified in our survey were used). In addition to the control variables mentioned previously, individuals' *Information Desire* is also included as an explanatory variable. This model tests whether individuals with a stronger desire to be informed use more information sources (as per Hypothesis H5), and whether those with higher education use more sources to acquire information about cryptocurrencies (as per Hypothesis H6). Finally, we include a variable to account for a person's ideology. In 2019, DHS members were asked to specify their ideology. We create a binary dummy variable, set to 1 if respondents indicated they do not have an ideology, and 0 otherwise.[12]

We estimate our model using ordered logit regressions with heteroscedasticity-robust standard errors. Table 3 shows the results. The first column shows the results if only controls are included, while the next columns present the outcomes if more variables are sequentially taken up.

Our findings suggest that respondents who completed higher education and have a strong desire to be informed tend to use more information sources, consistent with Hypotheses H5 and H6. Additionally, our results indicate that older males with a clear ideology and who are not unemployed use more information sources. Interestingly, cryptocurrency ownership does not affect the number of different sources used. When combined with the previous finding that ownership increases the desire for information, this suggests that cryptocurrency owners prefer to intensively use a limited number of sources for gathering information.

[12]The inclusion of this variable reduces our sample size because the question about ideology was asked only in 2019, thus excluding DHS panel members who joined later.

Table 3: Drivers of the number of sources used for information

	(1)	(2)	(3)	(4)
Male	0.88***	0.69***	0.69***	0.61***
	(0.11)	(0.12)	(0.12)	(0.12)
Age	-0.00	0.01***	0.01***	0.01*
	(0.00)	(0.00)	(0.00)	(0.00)
Higher education	0.37***	0.32***	0.32***	0.29**
	(0.11)	(0.11)	(0.11)	(0.12)
Unemployed	-0.21	-0.71*	-0.70*	-0.73*
	(0.34)	(0.41)	(0.40)	(0.40)
Income	0.00	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Risk preference	0.14***	0.01	0.01	0.01
	(0.02)	(0.03)	(0.03)	(0.03)
Information desire		1.31***	1.31***	1.32***
		(0.06)	(0.06)	(0.06)
Owner			-0.17	-0.18
			(0.26)	(0.29)
No ideology				-0.66***
				(0.17)
N	1396	1396	1396	1292

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.3. Drivers of knowledge about cryptocurrencies

As a last step to corroborate our theoretical model, we explore the factors affecting respondents' knowledge about cryptocurrencies. The dependent variable, *Objective Knowledge*, represents the average number of correct answers to the statements about crypto technology and markets. In addition to the control variables used in the previous section, we include the dummies *Owner* and *Purchase Intention*, which were introduced earlier.

We also include variables related to the sources individuals use to acquire information about cryptocurrencies. We include the variable *Sources*, as discussed in the previous section, and construct the binary variables *Media*, *Internet*, *Friends*, and *Social Media* which are set to 1 if a respondent indicated using the corresponding information source.

We estimate our model using ordered logit regressions with heteroscedasticity-robust standard errors. Table 4 shows the results. The first column displays results including only control variables. In the next two columns, we add variables related to the number of information sources and the various media dummies. We do not include these variables simultaneously to avoid potential multicollinearity concerns. The last two columns successively include variables associated with ownership and the various reasons for buying cryptocurrencies. We introduce these variables one at a time to avoid potential multicollinearity issues, since the questions about purchasing motives were only posed to individuals who intend to buy cryptocurrencies.

The results imply that individuals with a clear desire to be informed about cryptocurrencies and who utilize multiple information sources, particularly traditional media or the internet, tend to have better knowledge about cryptocurrencies. These results are consistent with Hypotheses 2 and 3. We also find that individuals who own cryptocurrencies have greater knowledge, which confirms hypothesis H1. Furthermore, the intention to purchase cryptocurrencies is also related to an individual's level of knowledge. In addition, if respondents acquire cryptocurrencies primarily for investment purposes, they seem better informed than people who have different motives. Finally, we find that several demographic characteristics influence knowledge about cryptocurrencies. More specifically, the coefficients of gender, age, education, income, and risk attitude are significant.

5. Ownership and knowledge

5.1. Coping with potential endogeneity issues

In this part of the paper, we will take a closer look at how ownership of cryptocurrency influences knowledge. This relation is particularly difficult to investigate, as endogeneity might lead to biased estimates. For instance, Van Rooij et al. (2011) linked financial literacy and stock ownership in a Dutch household survey, and Cupák et al. (2020) found, using US microdata, that individuals with higher financial literacy are more inclined to invest in risky assets.

Given the potential two-way relation between financial literacy and investment decisions, most researchers use an instrumental variable approach to investigate this link.[13]

[13]See Lusardi and Mitchell (2014) for an overview of the instruments applied by researchers to investigate the relation between financial literacy and financial decisions.

Table 4: Drivers of knowledge about cryptocurrencies

	(1)	(2)	(3)	(4)	(5)
Male	0.83***	0.68***	0.77***	0.75***	0.75***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Age	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Higher education	0.59***	0.58***	0.58***	0.62***	0.61***
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Unemployed	-0.53	-0.51	-0.52	-0.48	-0.44
	(0.33)	(0.34)	(0.34)	(0.33)	(0.33)
Income	0.01	0.00	0.01*	0.01**	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Risk preference	0.07***	0.07***	0.07***	0.06***	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Information desire	0.77***	0.60***	0.66***	0.58***	0.59***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Media		0.22**			
		(0.10)			
Internet		0.70***			
		(0.12)			
Friends		0.06			
		(0.15)			
Social media		0.15			
		(0.20)			
Sources			0.18***	0.17***	0.18***
			(0.05)	(0.05)	(0.05)
Owner				0.65***	
				(0.25)	
Purchase intention				0.74***	
				(0.22)	
Motive: investment					1.16***
					(0.24)
Motive: technology					0.06
					(0.31)
N	1756	1756	1756	1756	1756

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

However, while financial literacy and ownership of stocks in general may have a bidirectional relation, the link between knowledge about a specific financial product and ownership is more likely to run from ownership to knowledge than the other way around. For example, owning cryptocurrencies directly enhances knowledge as individuals monitor their investments, compare the performance of various cryptocurrencies, or delve into the technical details of mining.

To further substantiate our assumption of one-way causality, we investigate whether an individual's current level of knowledge is correlated with future ownership of cryptocurrencies. Although we have information on cryptocurrency knowledge for only one point in time (May 2021), the DHS provides information about when individuals purchased cryptocurrencies from Q1 2018 to Q1 2023. We leverage this feature of the DHS to examine whether respondents' knowledge in May 2021 is correlated with purchasing cryptocurrencies for the first time in the second half of 2022 or first quarter of 2023. A positive correlation would be consistent with causality running from financial knowledge to ownership. The dependent variable we use is the dummy *Future owner*, which is 1 if an individual indicated to own cryptocurrencies in 2022 or 2023 and did not own cryptocurrencies prior to these dates. Aside from *Objective knowledge*, the variable of interest, we include several control variables such as gender and age, all of which have been discussed previously.

Our reasoning might appear to be at odds with Steinmetz et al. (2021) as these authors (implicitly) assume that causality flows from knowledge about cryptocurrencies to ownership (and not from ownership to knowledge as suggested by our paper). However, the type of knowledge each study emphasizes differs: Steinmetz et al. (2021) focus on subjective knowledge, while we look at objective knowledge. While these two types of knowledge are interrelated, as elaborated in Section 3.4, their relation with ownership might differ. We agree with Steinmetz et al. (2021) that it is likely that individuals with greater subjective knowledge are more inclined to own cryptocurrencies, driven by confidence in their understanding. This is also in line with the findings of Kaur et al. (2023), who found, using a survey among 473 Indian crypto retail investors, that (over)confidence is related to crypto ownership. [14] However, this 'confidence' effect does not hold for objective knowledge. If people are not aware of what they actually know about cryptocurrencies, there is no reason why we would expect them to be more inclined to purchase such digital coins.[15] To test this difference between objective and subjective knowledge, we use the variable *Subjective knowledge* which is the self-assessed level of knowledge about cryptocurrencies. It ranges from 1 (very little knowledge) to 5 (very much knowledge).

We estimate our model using ordered logit regressions with heteroscedasticity-robust standard errors. Table 5 shows the results. The first column displays findings with only control variables included. The next column introduces the number of information sources consumers use. In the final two columns, we sequentially add the variables of

[14] Alternatively, individuals who feel they have limited knowledge about cryptocurrencies might view them as complicated and, as a result, be less likely to invest in them. Perceived complexity is often cited as an impediment to adopting new financial technologies. For instance, Kajol et al. (2022) conclude from a literature review that perceived complexity acts as a significant barrier for digital financial transactions.

[15] For example, Lim et al. (2018) found among young Malaysian adults, that self-rated financial knowledge displayed more pronounced effects on the intention to invest compared to actual financial knowledge.

interest: *Objective knowledge* and *Subjective knowledge*. We do not include *Objective knowledge* and *Subjective knowledge* simultaneously to avoid potential multicollinearity issues.

Interestingly, we find that the coefficient of *Objective knowledge* is not significant, suggesting that this type of knowledge does not influence future ownership, thereby alleviating potential endogeneity concerns. In contrast, we do find that *Subjective knowledge* has a weakly significant and positive impact on future ownership. This provides (weak) evidence for the view of Steinmetz et al. (2021) that subjective knowledge has an impact on cryptocurrency ownership.

Table 5: Drivers of future ownership

	(1)	(2)	(3)	(4)
Male	0.67	0.64	0.60	0.49
	(0.48)	(0.47)	(0.48)	(0.51)
Age	-0.01	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Higher education	-0.67*	-0.69*	-0.73*	-0.73*
	(0.39)	(0.39)	(0.40)	(0.39)
Unemployed	0.27	0.32	0.36	0.33
	(0.99)	(0.99)	(1.00)	(1.05)
Income	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Risk preference	0.10	0.10	0.09	0.09
	(0.09)	(0.09)	(0.09)	(0.09)
Information desire	0.86***	0.81***	0.75***	0.61***
	(0.17)	(0.20)	(0.22)	(0.19)
Sources		0.09	0.09	0.08
		(0.16)	(0.16)	(0.16)
Objective knowledge			0.15	
			(0.21)	
Subjective knowledge				0.39*
				(0.23)
N	1463	1463	1463	1463

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2. Does timing or duration of ownership matter?

Subsequently, we investigate the extent to which early adoption or the duration of ownership affects an individual's understanding of cryptocurrencies. To this end, we use *Objective knowledge* as the dependent variable.

We hypothesize that being an early adopter could be associated with more knowledge as the process of purchasing these products was more complex before they became more popular, which could have imposed a higher barrier to entry. Overcoming this barrier may lead to better knowledge about cryptocurrencies. Owners who bought cryptocurrencies more recently did not face these hurdles, which might correspond to less knowledge.

Furthermore, we evaluate the effect of ownership duration on knowledge levels. The stock market literature suggests that ownership enhances an individual's investment capabilities. For instance, Seru et al. (2010) found that trading activity improves investors' performance, observing two distinct learning patterns from panel data spanning 2000 to 2007: some investors refine their trading skills through experience, while others cease trading upon recognizing their limitations. Thus, we will examine if prolonged ownership of cryptocurrency correlates with better knowledge.

To test both channels, we create two new variables. First, an ordinal variable *Duration* which is the number of quarters since an individual purchased cryptocurrency for the first time and the end of 2021. This variable ranges from 0 to 16, where the upper bound (16) applies to individuals who purchased cryptocurrencies for the first time in Q1 2018 or earlier. Second, a variable *Early adopter* which is 1 if an individual purchased cryptocurrencies for the first time in Q1 2018 or earlier.[16] Online Appendix C provides descriptive statistics for both variables.

We use ordered logit regressions with heteroscedasticity-robust standard errors to estimate our model. The results are presented in Table 6. The first column details outcomes when only control variables are taken up. Subsequent columns progressively introduce our variables of interest, yet exclude those related to ownership. Specifically, the second column incorporates the variable *Duration*, the third column introduces *Early Adopter*, and the fourth column includes both. Following this, the next three columns simultaneously consider our variables of interest alongside ownership-related variables.[17]

The coefficient of the variable *Duration* is significant at a 95% confidence level in all estimations, indicating that individuals' knowledge increases the longer they own cryptocurrencies. This is consistent with our view that causality runs from ownership to knowledge. Contrary to our expectations, we find that being an early adopter appears to have no impact. While the coefficient of *Early adopter* is significant and positive if we do not include *Duration*, it turns insignificant once this variable is added.

Furthermore, we find that the coefficient of *Purchase intention* is significant and positive in all specifications. In contrast, the coefficient of *Owner* loses its significance once *Duration* is added. This outcome implies that the duration of cryptocurrency ownership is a more critical determinant of knowledge than the mere fact of ownership.

5.3. Amount invested

Finally, we examine whether the amount invested in cryptocurrencies is positively related to knowledge. To examine this relationship we, similar to the the two previous sections, use *Objective knowledge* as the dependent variable. We test whether individuals who hold large amounts of cryptocurrencies – both in absolute terms (in euros) and relative to their total investments – demonstrate better knowledge. We identify two

[16] Changing the cut-off point for *Early adopter* does not affect our results. Results are available upon request.

[17] Our analysis reveals no significant multicollinearity between our variables of interest—*Early Adopter* and *Duration*—and the ownership-related variables. This conclusion is supported by the correlation matrix and VIF values. Specifically, the VIF values for *Early Adopter* and *Duration* stand at 2.3 and 3.3, respectively, indicating only a moderate correlation. Furthermore, the ownership variables display even lower VIF values. These findings suggest that multicollinearity does not substantially influence our results.

Table 6: The role of ownership duration and being an early adopter

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Male	0.73***	0.69***	0.72***	0.69***	0.69***	0.70***	0.69***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Age	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Higher education	0.66***	0.62***	0.61***	0.62***	0.65***	0.65***	0.65***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Unemployed	-0.76*	-0.78*	-0.82**	-0.78*	-0.78*	-0.82**	-0.78*
	(0.40)	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)
Income	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Risk preference	0.07***	0.06***	0.07***	0.06***	0.06**	0.06***	0.06**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Information desire	0.57***	0.58***	0.63***	0.58***	0.55***	0.56***	0.55***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Sources	0.17***	0.19***	0.18***	0.19***	0.18***	0.18***	0.18***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Owner	0.84***				0.25	0.65***	0.25
	(0.26)				(0.25)	(0.25)	(0.25)
Purchase intention	0.69***				0.60***	0.70***	0.60***
	(0.24)				(0.23)	(0.24)	(0.23)
Duration		0.12***		0.13***	0.10***		0.10***
		(0.02)		(0.02)	(0.02)		(0.02)
Early adopter			1.65***	-0.28		1.37***	0.01
			(0.36)	(0.50)		(0.38)	(0.49)
N	1463	1463	1463	1463	1463	1463	1463

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

channels through which the amount invested in cryptocurrencies can increase knowledge. Firstly, holding a larger amount of cryptocurrency might expose an individual more frequently and intensively to relevant information and experiences, thereby enhancing the likelihood of acquiring knowledge. Secondly, larger holdings can heighten the motivation for knowledge acquisition as the perceived benefits of more knowledge is more likely to exceed the information search costs. This hypothesis aligns with the findings of Lin and Lee (2004). In their study involving 3,759 US consumers, these authors observe that the total amount invested is positively associated with more extensive information search behaviour.

The DHS collects detailed information on the amounts of cryptocurrency, mutual funds, shares, and bonds owned by individuals. If respondents do not know the exact amount invested, they are asked to indicate the most probable range (e.g. between 500 and 1,500 euro). In that case, we use the mean value of the range indicated. Based on this information, we generate the variable *Crypto share*, which ranges from 0 to 1 and reflects the proportion of cryptocurrencies in an individual's investment portfolio, and the variable *Crypto value* which captures the cryptocurrency investment in thousands of euros. We include only one variable of interest at a time to avoid possible multicollinearity issues.[18]

Besides the control variables already discussed in the previous section, we include *Investment portfolio*, representing the size of the non-crypto portfolio in thousands of euro. This variable accounts for the overall investment experience of the participants. It is plausible that individuals with larger investment portfolios might be more financially literate, which could influence their knowledge about cryptocurrencies.

We estimate our model using an ordered logistic model with heteroscedasticity-robust standard errors. Table 7 shows the results. The first column shows the results when only control variables are included, while the two subsequent columns present the outcomes when our variables of interest are added: *Crypto portfolio* and *Crypto share*. Furthermore, in these final two columns we also add *Investment portfolio* as an additional control variable. We do not include *Crypto portfolio* and *Crypto share* simultaneously to avoid potential multicollinearity concerns.

Our findings suggest that cryptocurrency holdings, both in absolute and relative terms, are positively associated with knowledge. In contrast, the amount invested in financial products aside from cryptocurrencies is not associated with greater knowledge.

6. Concluding remarks

So far, only a few papers have examined the drivers of the heterogeneity in individuals' knowledge about cryptocurrencies. Prior research focused on public awareness regarding the existence of cryptocurrencies, as well as the public's self-perceived comprehension (subjective knowledge) of these digital assets. This apparent gap in the literature is quite surprising in view of the increasing significance of cryptocurrencies and interest in the topic by academics and policy-makers alike. From a policy perspective, individuals' comprehension of cryptocurrencies – assets often associated with high risk – is of paramount

[18]For further details about the distribution of crypto ownership of the survey participants, see online Appendix D.

Table 7: Amount invested and knowledge

	(1)	(2)	(3)
Male	0.72***	0.73***	0.72***
	(0.11)	(0.11)	(0.11)
Age	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)
Higher education	0.62***	0.63***	0.62***
	(0.10)	(0.10)	(0.10)
Unemployed	-0.77*	-0.75*	-0.76*
	(0.40)	(0.40)	(0.40)
Income	0.01*	0.01*	0.01*
	(0.00)	(0.00)	(0.00)
Risk preference	0.07***	0.07***	0.07***
	(0.02)	(0.02)	(0.02)
Information desire	0.56***	0.56***	0.56***
	(0.07)	(0.07)	(0.07)
Sources	0.18***	0.18***	0.18***
	(0.06)	(0.06)	(0.06)
Owner	0.77***	0.62**	0.72***
	(0.27)	(0.27)	(0.27)
Purchase intention	0.68***	0.62**	0.65***
	(0.25)	(0.25)	(0.25)
Investment portfolio		-0.00	-0.00
		(0.00)	(0.00)
Crypto portfolio		0.03***	
		(0.01)	
Crypto share			0.18**
			(0.08)
N	1396	1396	1396

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

importance. This is particularly true for consumers who (intent to) participate in the cryptocurrency market.

In the first part of this paper, we proposed a theoretical framework to guide our empirical analysis on cryptocurrency knowledge. We hypothesize that respondents' knowledge is determined by their ownership of cryptocurrencies, their desire to be informed, their education level, and the number and intensity of information sources used.

For our empirical analysis, we have collected data about crypto ownership, information-seeking behaviour, and knowledge using a large panel of Dutch households. Our results provide support for the hypotheses derived from our theoretical framework. More specifically, we find that individuals who received higher education and have a stronger desire to be informed about cryptocurrencies use more different information sources. In turn, the use of more information sources translates into greater knowledge about cryptocurrencies. However, it matters which information source is used. Individuals who use traditional media (tv/radio) or the internet are better informed about cryptocurrencies than those who rely on information provided by social media or friends.

Lastly, we find that ownership has a significant effect on knowledge. Owners of cryptocurrencies tend to know more than the general public, and this effect is most pronounced for individuals who purchase cryptocurrencies as an investment. Moreover, we observe that knowledge increases with the duration of cryptocurrency ownership, suggesting a learning-by-doing effect. Lastly, the amount invested in cryptocurrencies appears to matter. Those who own more cryptocurrencies (both in absolute terms and relative to other assets) are better informed.

The outcomes of our study are relevant for policymakers. Our results indicate that cryptocurrency owners, particularly those who have owned cryptocurrency for a long time and those with substantial investments, tend to be better informed. This suggests better knowledge for those facing higher risks. However, the public relies on several sources of information and not all of them lead to an increase in knowledge about cryptocurrencies. Notably information received from friends and social media does not contribute to a more comprehensive understanding of cryptocurrencies.

While our study may not provide definitive answers — for example, we do not analyze whether better knowledge results in better investment performance — it does offer valuable insights into individuals' understanding of cryptocurrencies and presents a framework for future research. Policymakers do not need to wait for conclusive answers before taking action. Our findings underscore concerns about the generally low level of knowledge, even among people who intend to buy cryptocurrencies. Policymakers should therefore endeavor to reach out to these individuals to ensure they better understand what they are purchasing.

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Online appendices

A. Questionnaire

The next questions are about cryptocurriencies (for example Bitcoin).

1. Did you ever hear of cryptocurrencies?

- ☐ Yes
- ☐ No

2. Do you find it important to stay up-to-date about the developments of cryptocurrencies?

- ☐ Very unimportant
- ☐ Not important
- ☐ Not important but also not unimportant
- ☐ Important
- ☐ Very important

3. Via which sources do you keep track of the developments of cryptocurrencies? You can select more than one answer.

- ☐ Newspapers
- ☐ Radio
- ☐ Television
- ☐ Friends / collegues / family
- ☐ Internet
- ☐ Social media
- ☐ Other...

4. How much do you know about cryptocurrencies?

- ☐ Very little
- ☐ Little
- ☐ Not little but also not much
- ☐ Much
- ☐ Very much

5. Do you think that the following statements about Bitcoins are **true** or **false**?

a) A Bitcoin transaction can take place between two parties without the involvement of a third party.

☐ True
☐ False
☐ I do not know

b) All Bitcoin transactions are publicly visible.

☐ True
☐ False
☐ I do not know

c) Bitcoins are based on blockchain technology.

☐ True
☐ False
☐ I do not know

d) Bitcoin transactions happen instantly.

☐ True
☐ False
☐ I do not know

6. There are many other cryptocurrencies next to Bitcoin. Indicate for each of the coins listed below whether the coin **is** among the 10 most traded cryptocurrencies in 2020 (yes) or **is not** among the most traded coins (no)?

a) Tether

☐ Yes
☐ No
☐ I do not know

b) Neo

☐ Yes
☐ No
☐ I do not know

c) Dash

☐ Yes
☐ No
☐ I do not know

d) Etherium

☐ Yes
☐ No
☐ I do not know

e) Doge Coin

☐ Yes
☐ No

☐ I do not know

7. Do you currently own Bitcoins or other cryptocurrencies or have you owned them in the past?

☐ I currently own Bitcoins or other cryptocurrencies.
☐ I have owned Bitcoins or other cryptocurrencies but do not own it anymore.
☐ I have never owned Bitcoins or other cryptocurrencies.

8. How probable is it that in the next year you will buy (more) Bitcoin(s) or other cryptocurrencies?

☐ Very improbable
☐ Improbable
☐ Neutral
☐ Probable
☐ Very probable

9. (if Q8 = (very) improbable) What is your motive to not buy any cryptocurrencies in the next year? It is possible to give multiple answers.

☐ My current payment methods meet my requirements.
☐ I do not understand the underlying technology.
☐ I do not trust a currency if it is not issued by a government.
☐ Cryptocurrencies are not accepted by a sufficient number of merchants.
☐ I am worried about cybertheft.
☐ I am worried about the lack of supervision on cryptocurrencies.
☐ The value of cryptocurrencies is not stable enough.
☐ Otherwise, namely:

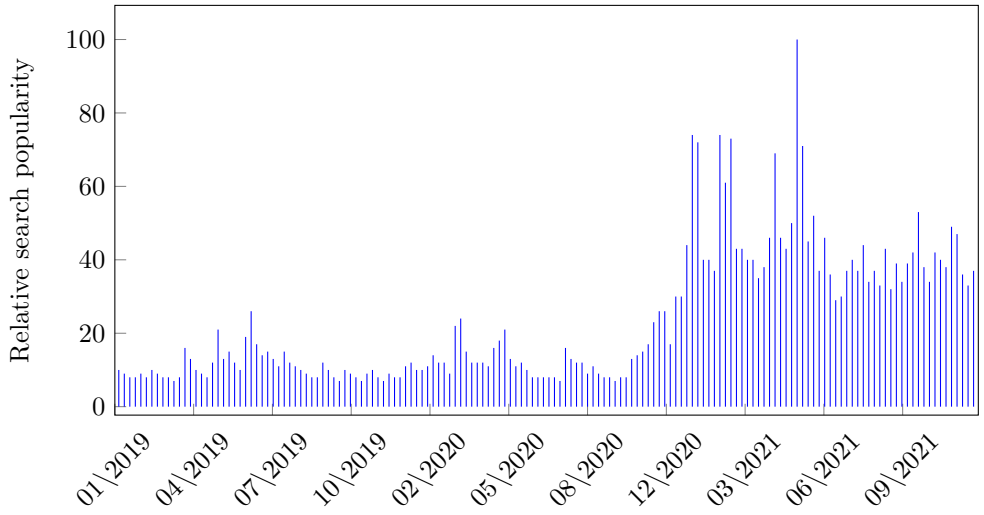
10. (if Q8 = (very) probable) What is your motive to buy any cryptocurrencies in the next year? It is possible to give multiple answers.

☐ I am interested in new technologies.
☐ I want to use it as a payment method.
☐ As an investment.
☐ It enables me to make anonymous payments.
☐ I do not trust euro banknotes or bank balances.
☐ I want to use it to send money to family/friends in foreign countries.
☐ Otherwise, namely:

B. Google search trend for Bitcoin

The number of Google searches on "Bitcoin" has increased strongly at the end of 2021. Figure 8 shows the relative number of searches on this keyword from 2019 to 2022 in the Netherlands. A possible explanation for this surge in searches could be the strong price increase of Bitcoin around this period.

Figure 8: Share of DHS respondents owning crypto-assets



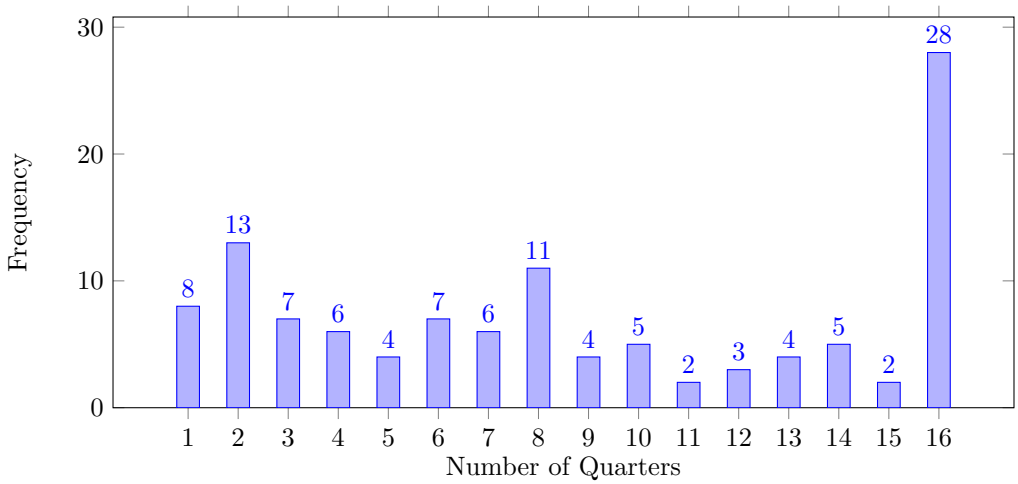
Note: This bar chart shows the trend on google searches on the word "Bitcoin" from 2019 to 2022 in the Netherlands. The vertical axis represents search interest relative to the highest point on the chart during this period in the Netherlands. A value of 100 is the peak popularity for the term during this period.
Source: `https://trends.google.com/trends/explore?date=2019-08-20%202022-09-20&geo=NL&q=bitcoin`

C. Duration and timing

Figure 9 illustrates the diversity in duration (in quarters) of cryptocurrency holders. Here, if individuals have owned cryptocurrencies for one quarter, it implies that they made their first purchase in 2023Q1. Ownership of 16 quarters means the initial purchase was made in or before the beginning of 2018.

Of the current owners, a majority have held cryptocurrencies for 16 quarters or longer. Beyond this, the figure also indicates a recent uptrend in cryptocurrency purchases, starting from the 11th quarter, i.e., 2021Q2. This observed increase in acquisition is consistent with the data presented in figure 2, which indicates a significant rise in ownership during 2021.

Figure 9: Number of Quarters Individuals Own Cryptocurrencies

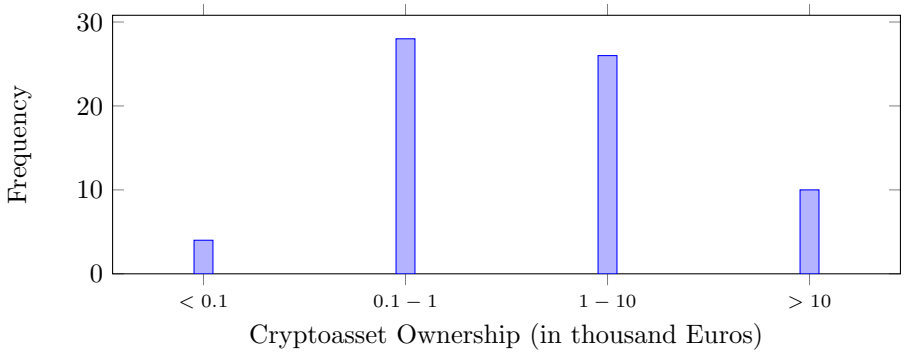


D. Amount of cryptocurrencies owned

Figure 10 shows the distribution of the ownership of cryptocurrencies among respondents, excluding individuals who do not possess any cryptocurrencies. The horizontal axis represents the value of cryptocurrencies owned on a logarithmic scale, expressed in thousands of euros, while the vertical denotes the cumulative percentage of respondents.

A majority of cryprocurrency owners (28%) owns between 100 and 1,000 euros worth of cryptocurrencies. The lowest observed value is 38 euros, whereas the median value is 990 euros, and the maximum amounts to 93,000 euros, highlighting a substantial variation in the amounts of cryptocurrencies owned by different individuals.

Figure 10: Amount of cryptocurrencies owned



Note: The bars denote the amount of cryptocurrencies owned by the respondents who own cryptocurrencies.

DeNederlandscheBank

EUROSYSTEEM

De Nederlandsche Bank N.V.
Postbus 98, 1000 AB Amsterdam
020 524 91 11
dnb.nl